

# 1<sup>st</sup> YEAR REPORT

Repatriation as a mechanism for restoring a pond-breeding amphibian community

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1<sup>st</sup> Year Report on Project #T-22-P-1

This report details on-going work at Warbler Woods Nature Preserve (WWNP), Coles County, Illinois, an 81.5 ha piece of land owned by L. Barrie Hunt. The overall project concerns the monitoring of amphibian populations that utilize four breeding ponds in the southeast portion of the property. Predatory fish previously inhabited two of these ponds. The fish populations were removed by January 2003, and now the primary research objective at WWNP is to restore pre-settlement levels of amphibian diversity through the repatriation of tiger salamanders. This report details the continued recovery of amphibians using the breeding ponds at WWNP and the efforts to repatriate tiger salamanders at one of the ponds.

Study Site & Background

Four ponds in the southeast section of WWNP (Figure 1) are labeled from East to West: A, B, C, and D. Ponds A and B are separated by a 5 m ridge of secondary deciduous forest and understory vegetation. Ponds B and C are separated by 80 m of old field that has been planted with seedlings of deciduous hardwoods in accordance with an existing IDNR restoration objective. Ponds C and D are separated by 280 m of primarily old field that also has been planted with seedlings of deciduous hardwoods. A small access road leading to a barn and an extension of deciduous forest ravine bisecting the old field also separate the latter two ponds.

Prior to the fish removal in January 2003, Pond B contained a stable population of small *Ameiurus melas* (black bullhead catfish); Pond C contained a stable population of centrarchids

(*Lepomis macrochirus* [bluegill], and *Lepomis cyanellus* [green sunfish]). All ponds have stable populations of a variety of invertebrate species (e.g., snails, aquatic insects/larvae, *etc.*). All ponds permanently hold water except for Pond D that has gone dry in 5 of the past 7 years (usually on or before 1 August).

#### Activities at WWNP in 2006

From 23 February to 2 December, the drift fence-pitfall trap arrays around the four amphibian breeding ponds (constructed in May 2000) were monitored every other day. Specimens caught in the traps (Table 1) were measured (snout-vent length, tail length for metamorphs and salamanders) and sexed (where possible). Where possible, the gender of trapped individuals was also determined. All trapped specimens were given a pond-by-year series of toe clips for future identification. Occasional maintenance on the fence/trap array was also performed.

On 10 March, approximately 2200 *Ambystoma tigrinum* eggs (in multiple masses) were collected from two sites within Stephen A. Forbes State Park (Marion County, Illinois). These egg masses were transported and immediately placed in enclosures (1 m<sup>3</sup>) within Pond B at WWNP. From these egg masses, 293 larvae survived to hatching and were released into the pond. To date, one juvenile tiger salamander has been caught in the pitfall traps around that pond, although it was not certain if that individual was produced by the cohort of larvae released into the pond in 2006.

From mid-September to mid October, approximately 20 adult and 30 larval bullfrogs were removed from Pond B at WWNP and euthanized. Tissues from the muscle and gastrointestinal tract of adult specimens were preserved for future analysis of parasite content

and levels of chemical pollutants. This action was sanctioned by the Illinois Nature Preserves Commission with the intent of reducing the potential for predation on juvenile tiger salamanders as they left the pond and entered the surrounding forest habitat. On 2 December, all traps sealed to prevent incidental capture during the Winter season of inactivity.

### Results & Projected Outcome

The sizes of most of the amphibian populations of using the breeding ponds at WWNP have increased since this study began, especially in the ponds that previously held fish. The populations of each species have since fluctuated (Fig. 2), due to different levels of precipitation in each year and to adjustments in trophic dynamics of the larval community (in the absence of fish). Levels of species diversity, however, have increased in all ponds as a result of the removal of fish (Table 2).

The initial effort of repatriating tiger salamanders was not successful, with a low survival rate to hatching and even lower survival rate to the conclusion of the larval period. I am not discouraged by this outcome for several reasons:

1. At this latitude, some tiger salamander populations are reported to require two activity seasons to complete larval period. As such, the larvae released into Pond B in Spring 2006 should not be expected to show up in the pitfall trap array surrounding Pond B until the end of the 2007 activity season. Pond B is deep enough (up to 1.5 m at maximum depth) that it will not freeze solid so that larvae can survive periods of surface ice formation.
2. Bullfrog adults are generalist carnivores that attempt to eat much of what they can catch. The sanctioned removal of bullfrog larvae and adults should reduce the predator

population in the 2007 activity season as well as those in the next few years. This will improve the chances of larval tiger salamanders surviving to metamorphosis and entering the forest habitat surrounding Pond B.

3. One of the two donor sites for tiger salamanders (a privately-owned farm pond in Shepardsville, Vigo County, Indiana) experienced a mild drought during the early Spring of 2006. One result from this event is that the tiger salamander population known to breed in that pond either failed to reproduce that year, or experienced 100 % mortality among its egg masses before they could be collected (due to either desiccation or being frozen in shallow water during a subsequent freeze). Better monitoring of conditions at that site in 2007 should assure the collection of an adequate amount of eggs for repatriation to WWNP.

Another attempt at repatriating tiger salamanders through the release of larvae hatched from egg masses that are allowed to complete development in Pond B.

### Research Products

During 2006, the following poster presentations based on research conducted at WWNP were made at scientific conferences:

- Gross, L.M., and S.J. Mullin. 2006. An amphibian community after fish removal: A tale of four ponds. Midwest Partners for Amphibian & Reptile Conservation, Carbondale, IL.
- Walston, L.J., and S.J. Mullin. 2006. Population responses of wood frog (*Rana sylvatica*) tadpoles to overwintered bullfrog (*Rana catesbeiana*) tadpoles. Joint Meetings of Ichthyologists & Herpetologists, New Orleans, LA.

Furthermore, the following manuscripts have been accepted for publication in 2007:

- Walston, L.J., and S.J. Mullin. 2007. Responses of a pond-breeding amphibian community to the experimental removal of predatory fish. Amer. Midl. Nat. 154:in press.

Walston, L.J., and S.J. Mullin. 2007. Population responses of wood frog (*Rana sylvatica*) tadpoles to overwintered bullfrog (*Rana catesbeiana*) tadpoles. J. Herpetol. 41:23-30.

Tissue samples from the bullfrog larvae and adults removed from Pond B were obtained and preserved. These samples represent material that can provide a preliminary data set for future research at WWNP concerning the impacts of chemical fertilizer and pesticide application on agricultural fields that are immediately adjacent to that area of the property.

Table 1. Amphibian and reptile species documented in and around four ponds in the southeast portion of Warbler Woods Nature Preserve (Coles County, Illinois) during the 2006 activity season. Amphibians were all caught in drift fence-pitfall trap arrays around the ponds, whereas reptiles were observed in the ponds or immediately adjacent habitat. Some amphibian specimens were captured on more than one occasion, but were counted only once in the tallies.

<b>Taxa Observed</b>	<b>Number Observed</b>
<u>Caudata</u>	
<i>Ambystoma texanum</i>	794
<i>Ambystoma tigrinum</i>	1
<i>Eurycea cirrigera</i>	2
<u>Anura</u>	
<i>Bufo americanus</i>	43
<i>Acris crepitans blanchardi</i>	4
<i>Pseudacris crucifer</i>	25
<i>Hyla versicolor</i> (x <i>chrysoscelis</i> )	53
<i>Rana catesbeiana</i>	148
<i>Rana sylvatica</i>	26
<i>Rana utricularia</i>	33
<u>Testudines</u>	
<i>Chelydra serpentina</i>	3
<i>Terrapene c. carolina</i>	2
<i>Chrysemys picta marginata</i>	1
<u>Lacertilia</u>	
<i>Eumeces laticeps</i>	2
<u>Serpentes</u>	
<i>Diadophis punctatus</i>	1
<i>Nerodia sipedon</i>	1
<i>Thamnophis sirtalis</i>	2
<i>Elaphe spiloides</i>	1

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Table 2. Composition of an amphibian community (expressed as a percentage of individuals captured for each species) in four breeding ponds at Warbler Woods Nature Preserve (Coles County, Illinois) between 2001 and 2006. Reference ponds lacked any fish, whereas mitigated ponds contained populations of predatory fish that were extirpated by January 2003 (the delineation of the pre- and post-removal periods). Percentages do not sum to 100 % due to rounding errors. The Shannon-Wiener Index of species diversity is also shown.

<u>Species</u>	Pre-removal		Post-removal	
	<u>reference pond</u>	<u>mitigated ponds</u>	<u>reference ponds</u>	<u>mitigated ponds</u>
<i>Ambystoma texanum</i>	16.7	2.6	53.8	40.5
<i>Bufo americanus</i>	66.3	90.3	4.6	12.0
<i>Hyla versicolor</i>	0.6	—	2.3	8.8
<i>Pseudacris crucifer</i>	1.1	—	7.3	14.2
<i>Rana catesbeiana</i>	4.1	4.8	14.1	6.8
<i>Rana sylvatica</i>	7.7	1.0	1.6	2.2
<i>Rana utricularia</i>	3.0	0.7	16.0	14.9
Other species	0.5	0.6	0.3	0.6
Shannon-Weiner Index (H')	0.48	0.20	0.61	0.74

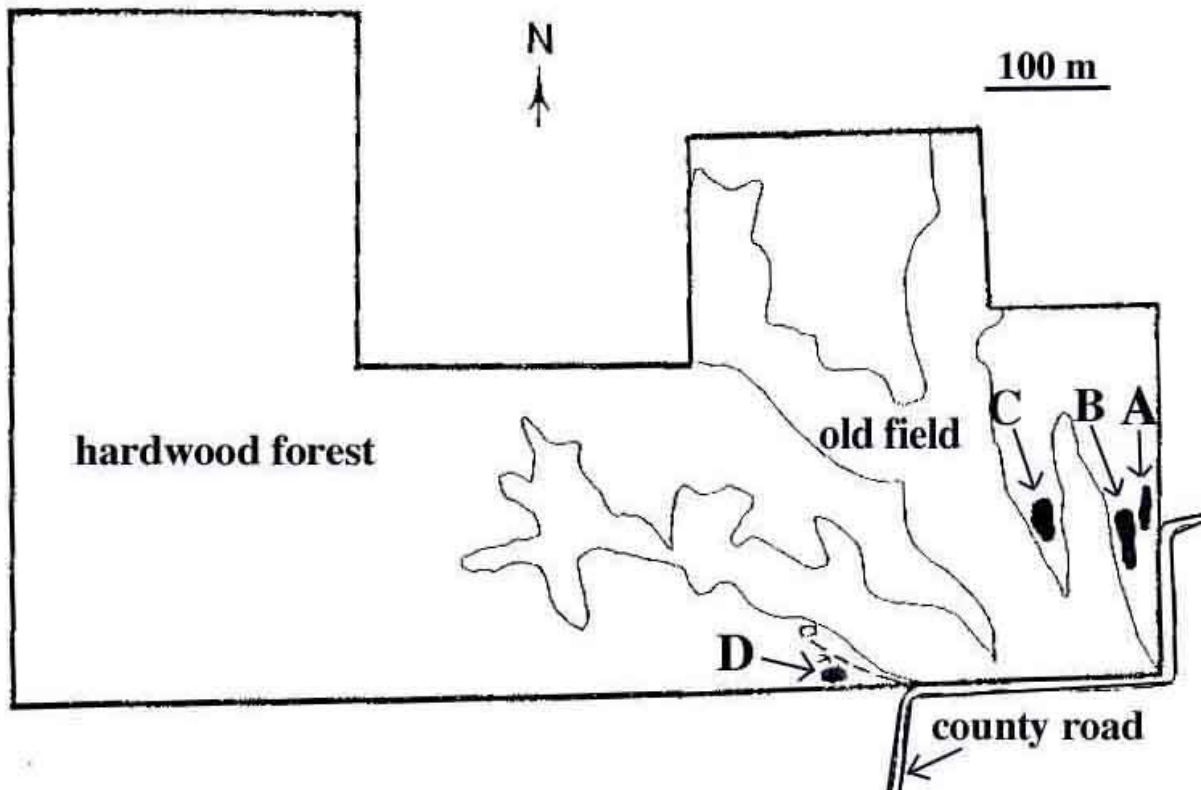


Figure 1. Schematic map of Warbler Woods Nature Preserve (81.5 ha) in Coles County, Illinois. Ponds A, B, and C are permanent, whereas Pond D typically dries down on or before 1 August of each year.

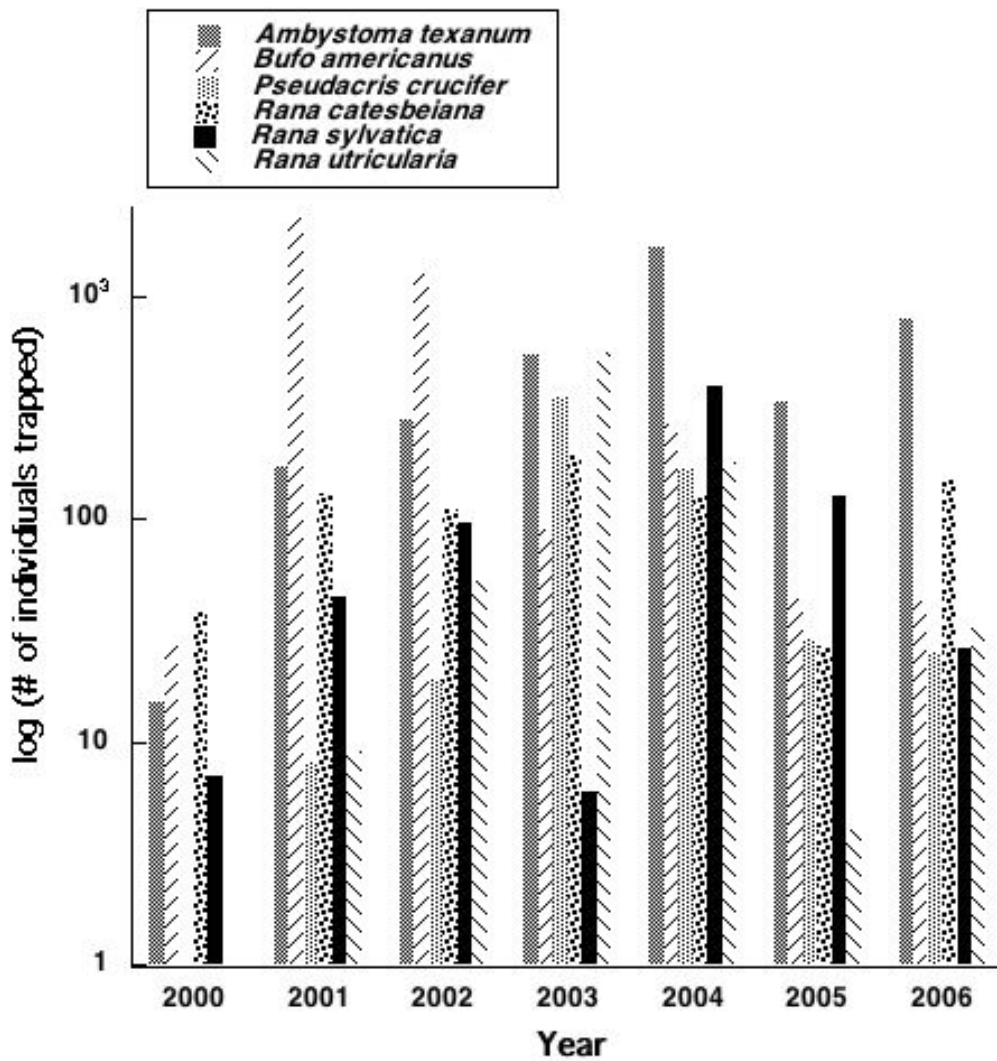


Figure 2. Numbers of individuals (shown in a logarithmic scale) for six species of amphibians trapped at four breeding ponds in Warbler Woods Nature Preserve (Coles County, Illinois) between 2000-2006. Predatory fish were extirpated from two of the ponds prior to the 2003 breeding season.