FINAL REPORT

Survey of pond-breeding amphibians at Warbler Woods Land & Water Reserve

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Introduction

This report details on-going work at Warbler Woods Land & Water Reserve (WWLWR), Coles County, Illinois, an 81.5 ha piece of land owned by L. Barrie Hunt. The overall project concerns the removal of two fish species from two ponds in the southeast portion of the property so that these ponds can be better utilized by endemic amphibian populations as breeding sites.

Study Site

Four ponds in the southeast section of WWLWR (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.

Based on the results of a 1997 IDNR survey, pond B contains a stable population of small *Ameiurus melas* (black bullhead catfish), whereas pond C contains a stable population of centrarchids (*Lepomis macrochirus* [bluegill], and perhaps *Lepomis cyanellus* [green sunfish]). All ponds have stable populations of a variety of invertebrate species (*e.g.*, snails, aquatic insects/larvae, *etc.*). IDNR has suggested the removal of fish from ponds B and C to improve conditions for amphibian breeding activity. I am interested in comparing amphibian species use of these ponds before and after the fish removal is undertaken. Furthermore, with an understanding of the amphibians using these ponds, I can make a better recommendation as to the timing of the fish removal.

The following objectives have been undertaken: 1. Construction of drift fence/pitfall trap arrays around all four ponds (May 2000); 2. Monitoring of the traps to measure, mark and release amphibians caught therein (May 2000 - present); 3. Determine species composition and relative abundance of each species using these ponds; and, 4. Make recommendations to IDNR for removal the fish from ponds B and C so as to minimize the impacts on the amphibian community at those ponds. I also intend to continue monitoring the amphibian community at these ponds to determine how the species respond following the fish removal.

MATERIALS & METHODS

In May and June 2000, drift fences and pitfall trap arrays were constructed around each of four ponds. Buckets were inserted flush with the soil surface every 7.5 m on both sides of the fence. Ponds A, B, C, and D were surrounded with fencing for 100 %, 75 %, 60 %, and 80 % of their circumferences, respectively (the variation is due to logistic feasibility of construction of the fence along variable terrain). Individuals collected in the traps were measured (snout-vent length [SVL], total length [TL]), and toe-clipped to indicate their capture during a particular year (cohort-specific).

The funds from the current grant period were used in their entirety to salary an undergraduate student at Eastern Illinois University (EIU) to monitor amphibian breeding efforts at the site. The student's duties included checking the traps for amphibians entering/exiting the ponds, maintaining the integrity of the fence-trap arrays, and surveying the site for other signs of amphibian breeding activity (*e.g.*, breeding choruses, egg masses). In the context of the funded period, the traps were checked on an alternate day basis from 1 March 2001 to the present.

RESULTS

Table 1 lists the species of all amphibians and reptiles that have been observed at WWLWR (taxonomy follows Phillips et al. 1999). The attached figures illustrate temporal patterns of use of the various species collected in the fence/trap arrays. Note, that not all of the amphibian species found at WWLWR are represented in these figures because some species are not conducive to this trapping regime (*e.g.*, *Hyla chrysoscelis* x *versicolor, Acris crepitans blanchardi*) or were caught in very low numbers. Others were never observed using the ponds but rather seen in close proximity to them (*e.g.*, *Eurycea cirrigera, Bufo woodhousei fowleri*). Also note that construction of the fence/trap array was not completed until the beginning of June 2000; thus, data for the first activity season are incomplete. Table 2 lists mean body sizes for those species for which I have adequate data based on collection in pitfall traps, as well as the occurrence of recaptures. The following are comments on each of the species' temporal usage patterns of the ponds.

Ambystoma texanum – This species is most active at WWLWR in March and April (Figure 2), and appears to favor ponds A and D (Figure 3). Of the 146 individuals observed at the site, 12 were recaptured at some time during the sampling period. The pond usage pattern may be indicative of this species' inability to co-exist in ponds occupied by carnivorous fish species (such as those currently residing in ponds B and C).

Bufo a. americanus – This species is most active from April to June (Figure 4), with most of the June activity being represented by recent metamorphs leaving the ponds for terrestrial habitat. Most of the individuals of this species were observed at ponds A and B (Figure 5). The pond usage pattern is not easily explained, but may reflect historical population trends at WWLWR. Of the 396 individuals collected, 29 were recaptured (7.3 %) indicating a certain degree of fidelity to this habitat.

Pseudacris crucifer– In addition to a few breeding choruses, 8 individuals were collected in the pitfall traps, primarily those at pond A. Pond B was not used, and only one individual was collected from each of ponds C and D. Most of the activity of this species was observed in March and April (only one individual was collected in 2000).

Rana catesbeiana – This species could be described as a generalist; individuals are active between March and October, with a peak of metamorphic emergence from the ponds in September (Figure 6). Furthermore, bullfrogs do not appear to favor any particular pond (Figure 7) – their absence at pond D during 2001 is a sampling artifact (pitfall traps were not always able to contain frogs between sampling periods) because many individuals were observed at pond D during the sampling period.

Rana sylvatica – This species exhibited a peak of activity at the ponds during March (Figure 8), and most of that activity was observed at pond D (Figure 9). Little activity was observed at pond C, perhaps because the fish in that pond prevent successful breeding attempts. Only one of the 49 individuals was recaptured, indicating that the population is larger than is reported herein (especially at pond D).

Most of the amphibian breeding activity appears to be concentrated around ponds A and B (Figure 10). However, most of these individuals are represented by recent metamorphs of *Bufo a. americanus*. Assessments of relative abundance for each of the species (Table 1) is based on numbers seen &/or heard throughout the study, and in comparisons with densities observed at sites other than WWLWR. It should be reiterated, however, that these assessments are subjective, and that not all species of amphibians are conducive to the trapping regime outlined in this study.

STATUS & RECOMMENDATIONS

Of the species that I have listed as "rare" or "very rare" (Table 1), I do not believe that IDNR should be gravely concerned about the population status of any of them because these species all have large populations elsewhere in their geographic distribution. Furthermore, with the exception of *Bufo woodhousei fowleri*, all of these species happen to be at or near a boundary of their geographic distribution. In such instances, populations are often smaller in size &/or more transient in nature (Gilpin 1987, Goodman 1987, Sjögren 1991). Phillips et al. (1999) caution that isolated populations of *Rana sylvatiea* may be more susceptible to extinction than similar populations of other frog species. Therefore, I suggest continued monitoring of amphibians at all four of the ponds at WWLWR, not just those where fish are scheduled for removal. Particular attention should be paid to *Ambystoma texanum* (because it appears to avoid those ponds containing fish and may immigrate to them following the fish removal) and *Rana sylvatica*.

Based on the data reported herein, my knowledge of the conditions at WWLWR, and my understanding of amphibian biology, I recommend that IDNR execute the fish removal process during the second week of December 2001. Applying rotenone to ponds

B and C at this time will ensure that: 1. all of the fish will be killed; 2. the smallest number of amphibians will be affected (most will have already begun to over-winter outside of the ponds by that time); and, 3. that all of the rotenone will be flushed out of the system prior to intense breeding activity by amphibians at the ponds during Spring 2002.

Side-effects/Risks

1. *Rana catesbeiana* tadpoles typically require two years of growth prior to their metamorphosis to the adult form. As such, rotenone application in ponds B and C at the recommended time will kill all of the *R. catesbeiana* tadpoles that hatched from egg masses during 2001. However, this is an acceptable cost because adult frogs over-wintering outside of the ponds will return to there in Spring 2001, and the tadpoles resulting from this breeding activity will grow quickly in absence of competition from the cohort that was killed during the rotenone application. Furthermore, this species has many other robust populations elsewhere in the county and across its entire geographic distribution.

2. Based on estimates of pond depth, it is likely that *Chelydra serpentina* over-winters at the bottom of the ponds. Therefore, rotenone application may threaten the survivorship of the few turtles that inhabit ponds B and C. This species has not been observed in the other ponds, but has nested successfully in each of the past two years. As some of the neonate turtles over-winter in their nest chamber (and not in the ponds), it is likely that recruitment (if successful) will replace any turtles that are killed during the rotenone application. However, productivity for this species in ponds B and C will be severely reduced until these new turtles reach sexual maturity. Alternatively, the adult turtles may

respond to rotenone application by leaving the pond. In this instance, they risk hypothermia if they are unable to find a suitable location in which to continue their over-wintering. This problem can be solved by capturing the turtles either as they leave the ponds, or using large turtle traps, and housing them temporarily in facilities at EIU until Spring 2002 (at which time the rotenone will have been flushed out of the system).

3. Some residual rotenone will undoubtedly be washed down the overflows into the drainage creeks on the downstream edges of the ponds. This action has the potential to effect other amphibian species that are more likely to use the stream habitat (*e.g., Eurycea cirrigera*). However, at the time of application, these species will be over-wintering in the soil layers that form the banks of these creeks and should not be effected by any rotenone runoff. By the time these species return to the creeks for their breeding activity in Spring 2002, all of the rotenone should be flushed out of the system.

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Phillips, C.A., R.A. Brandon, and E.O. Moll. 1999. Field Guide to Amphibians and Reptiles of Illinois. Illinois Natural History Survey, Champaign, IL.

Sjögren, P. 1991. Extinction and isolation gradients in metapopulations: The case of the pool frog (*Rana lessonæ*). Biol. J. Linn. Soc. 42:135-147

Table 1. Species list of amphibians and reptiles observed at Warbler Woods Land & Water Reserve between May 2000 and June 2001. Qualitative assessments of abundance of amphibian species are provided based on trapping and other survey efforts. * = species for which sufficient data exist to illustrate temporal or habitat usage patterns – see attached Figures. † = species abundance assessed from breeding choruses.

		Relative abundance
ORDER URODELA		
Family Ambystomatidae –	*Ambystoma texanum**	common
Family Plethodontidae –	*Eurycea cirrigera*	very rare (only 1 seen)
ORDER ANURA		
Family Bufonidae –	*Bufo a. americanus**	very common
	Bufo woodhousei fowleri	rare
Family Hylidae –	*Acris crepitans blanchardi*	common
	Hyla chrysoscelis x *versicolor* †	moderate (poss. common)
	Pseudacris crucifer	moderate
	Pseudacris triseriata †	very rare (only 3 heard)
Family Ranidae –	*Rana catesbeiana**	very common
	Rana utricularia	rare (poss. moderate?)
	*Rana sylvatica**	common
ORDER CHELONIA		
Family Chelydridae –	*Chelydra serpentina*	
Family Emydidae –	*Terrapene c. carolina*	
	unidentified emydid (probably *Chrysemys* or *Trachemys*)	
ORDER SQUAMATA		
Family Scincidae –	*Eumeces laticeps*	
Family Colubridae –	*Diadophis punctatus*	
	Elaphe o. obsoleta	
	Lampropeltis c. calligaster	
	Lampropeltis t. triangulum	
	Nerodia s. sipedon	
	Storeria dekayi wrightorum	
	Thamnophis s. sirtalis	

Table 2. Mean sizes (± 1 standard deviation) and number of recaptures of amphibians trapped in drift fence/pitfall arrays around four ponds at Warbler Woods Land & Water Reserve between May 2000 and June 2001. Only those species for which sufficient data are available are listed. (SVL = snout vent length; TL = total length; n = sample size).

Species	SVL (mm)	TL (mm)	n	# of recaptures
Ambystoma texanum	73.8 ± 13.1	137.9 ± 24.6	146	12
Bufo a. americanus	28.4 ± 23.2	n/a	396	29
Pseudacris crucifer	27.1 ± 6.6	n/a	8	0
Rana catesbeiana	48.5 ± 11.5	n/a	56	2
Rana sylvatica	47.5 ± 14.5	n/a	49	1

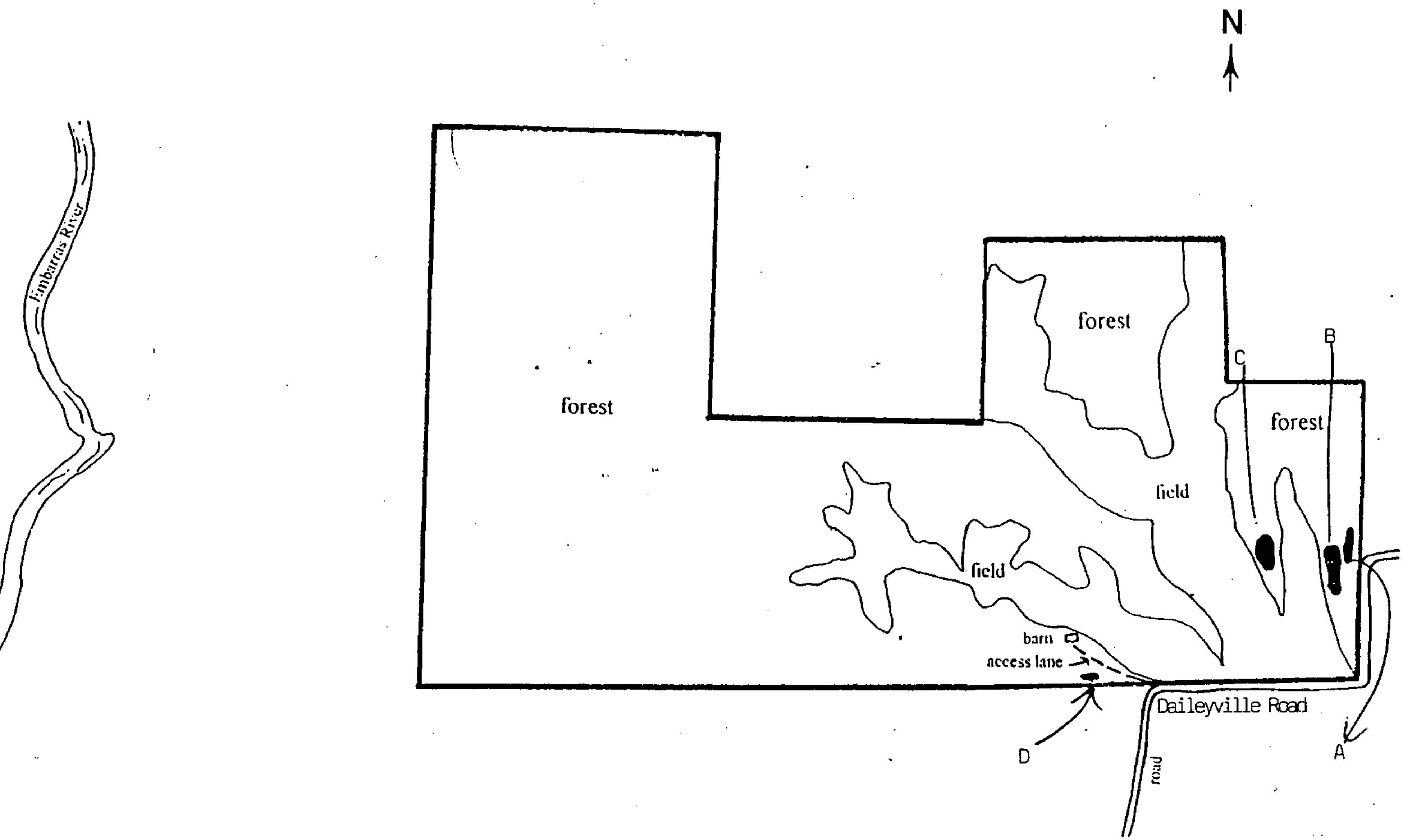

Figure 1. Diagram of Warbler Woods Land & Water Reserve, Coles Co., IL, showing general habitat types and position of ponds surveyed for amphibians from May 2000 - June 2001. [Scale: 1 cm = 78.7 m].

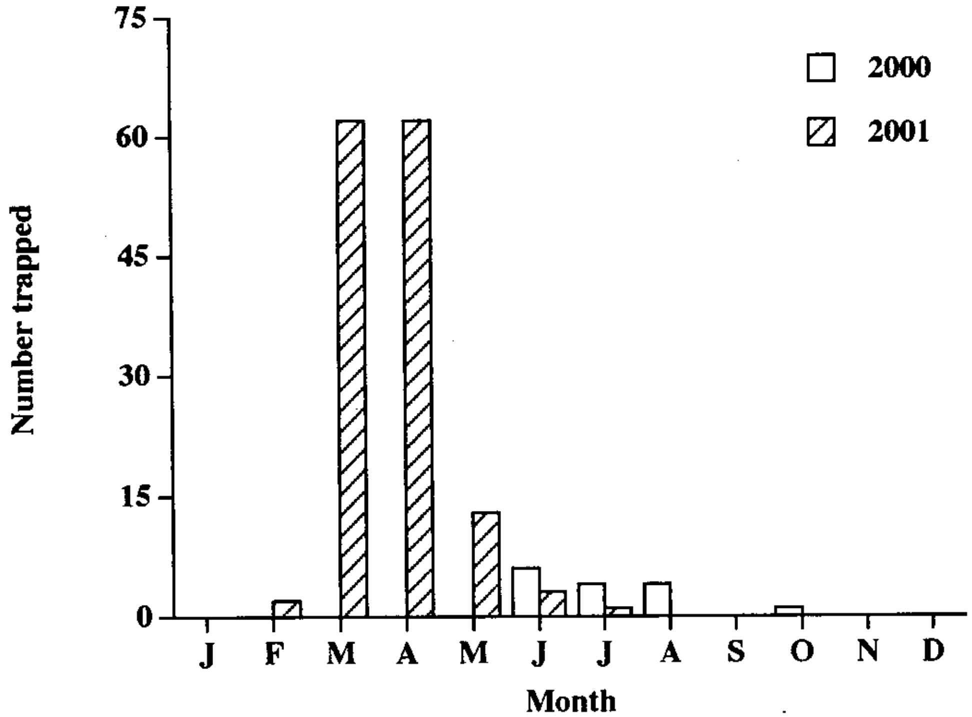

Figure 2. Number of *Ambystoma texanum* observed in each month at WWLWR, shown by sampling year.

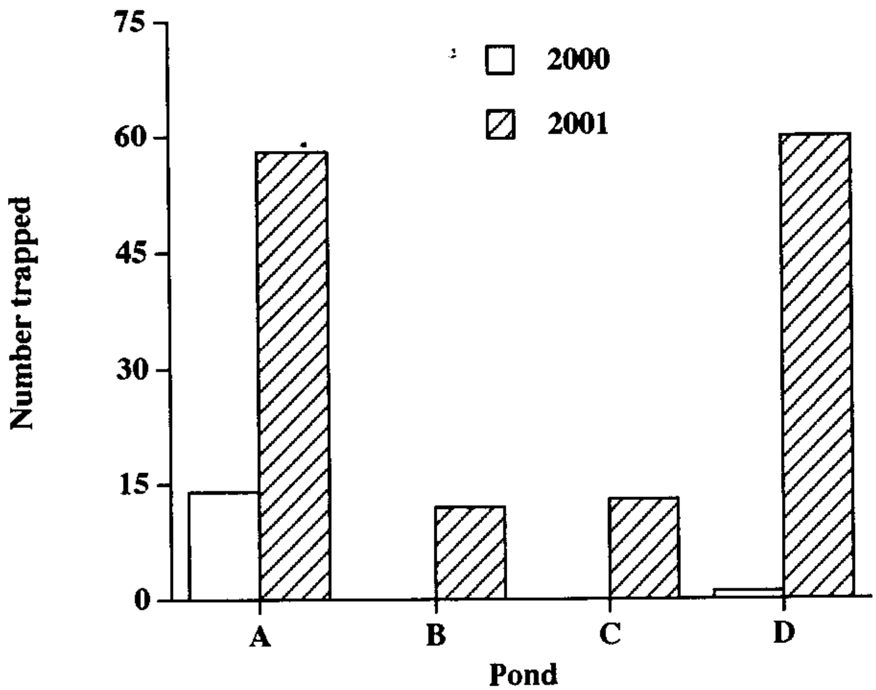

Figure 3. Number of *Ambystoma texanum* observed in each of the ponds at WWLWR during the two sampling years.

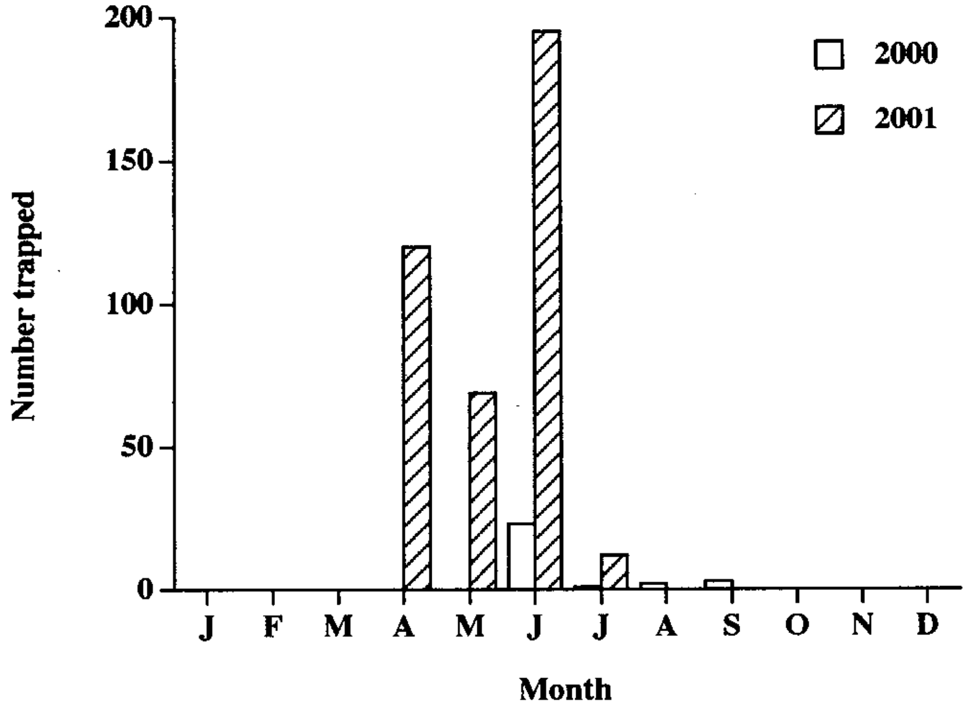

Figure 4. Number of *Bufo a. americanus* observed in each month at WWLWR, shown by sampling year.

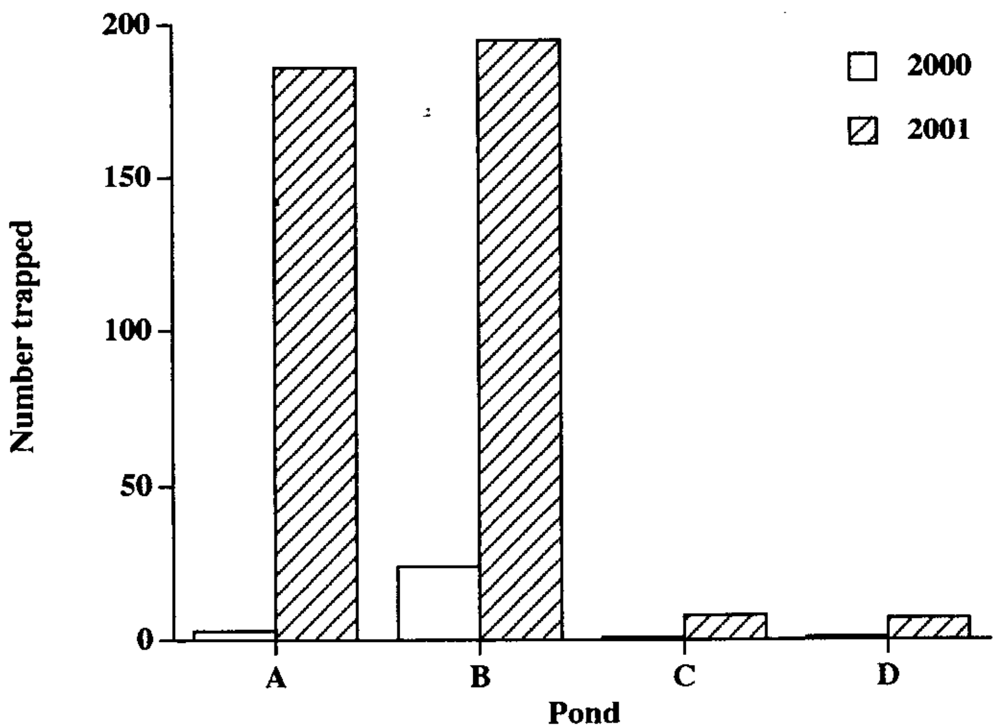

Figure 5. Number of *Bufo a. americanus* observed in each of the ponds at WWLWR during the two sampling years.

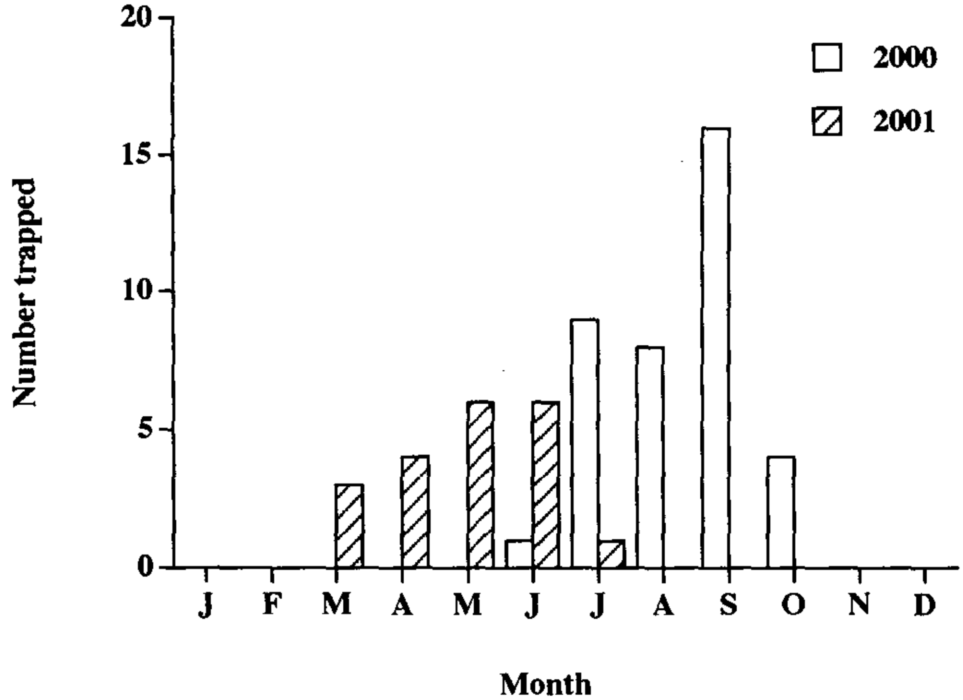

Figure 6. Number of *Rana catesbeiana* observed in each month at WWLWR, shown by sampling year.

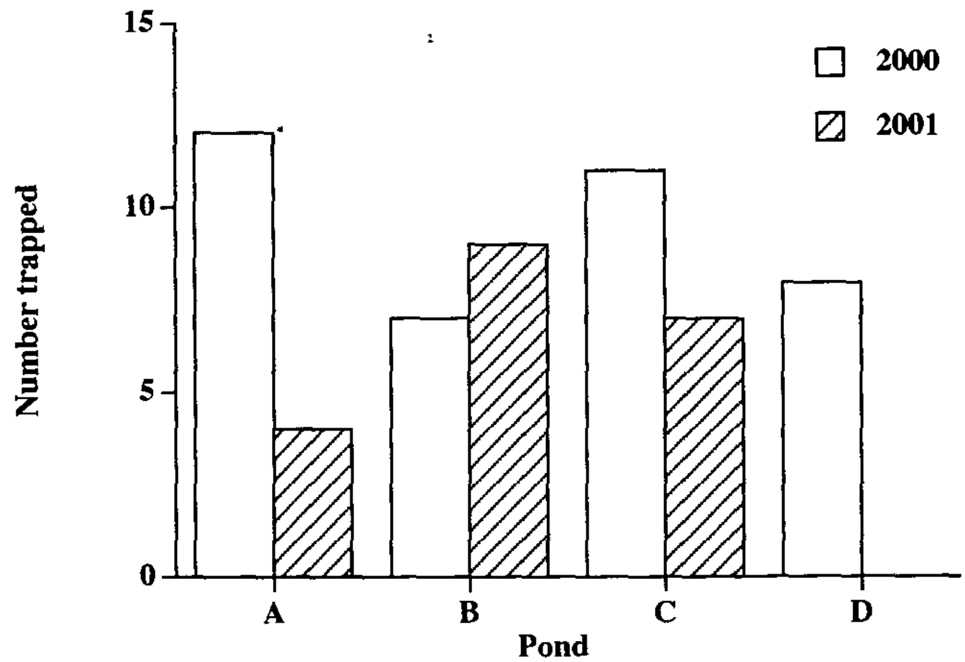

Figure 7. Number of *Rana catesbeiana* observed in each of the ponds at WWLWR during the two sampling years.

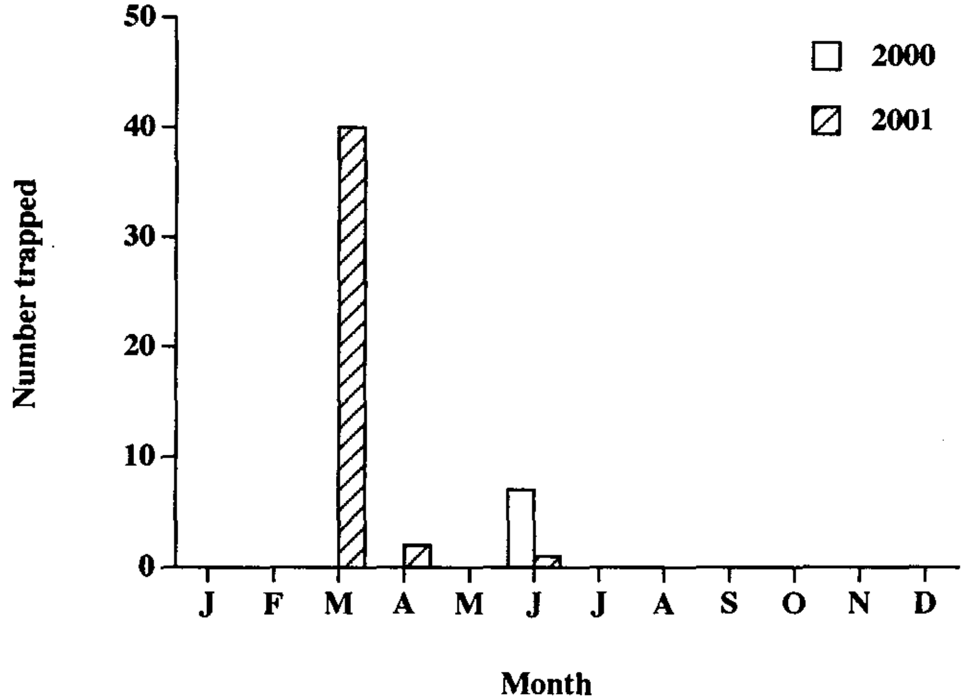

Figure 8. Number of *Rana sylvatica* observed in each month at WWLWR, shown by sampling year.

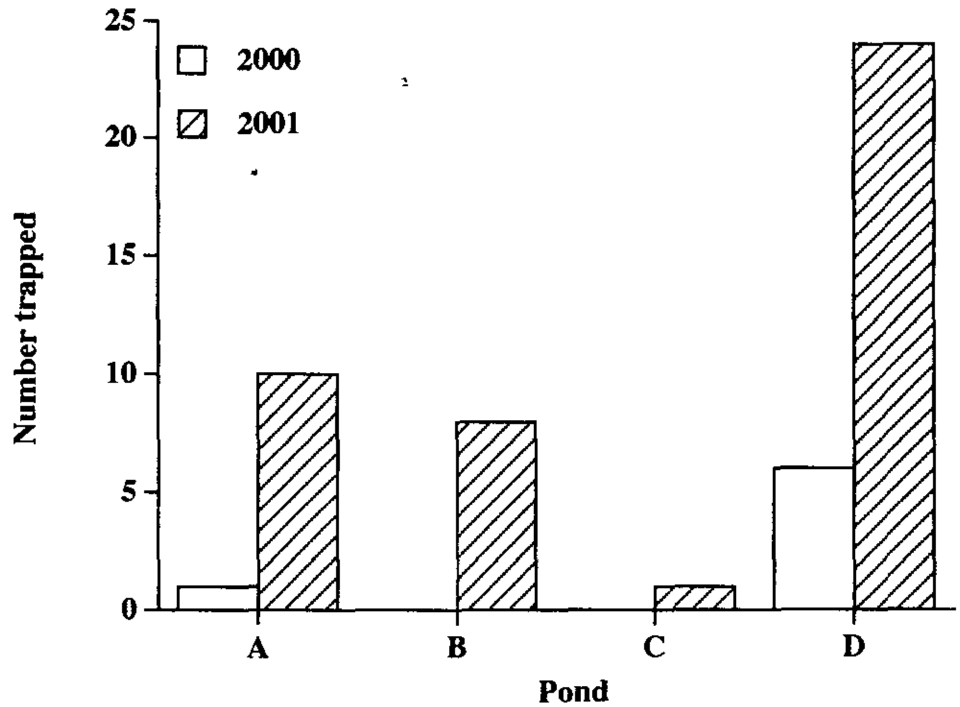

Figure 9. Number of *Rana sylvatica* observed in each of the ponds at WWLWR during the two sampling years.

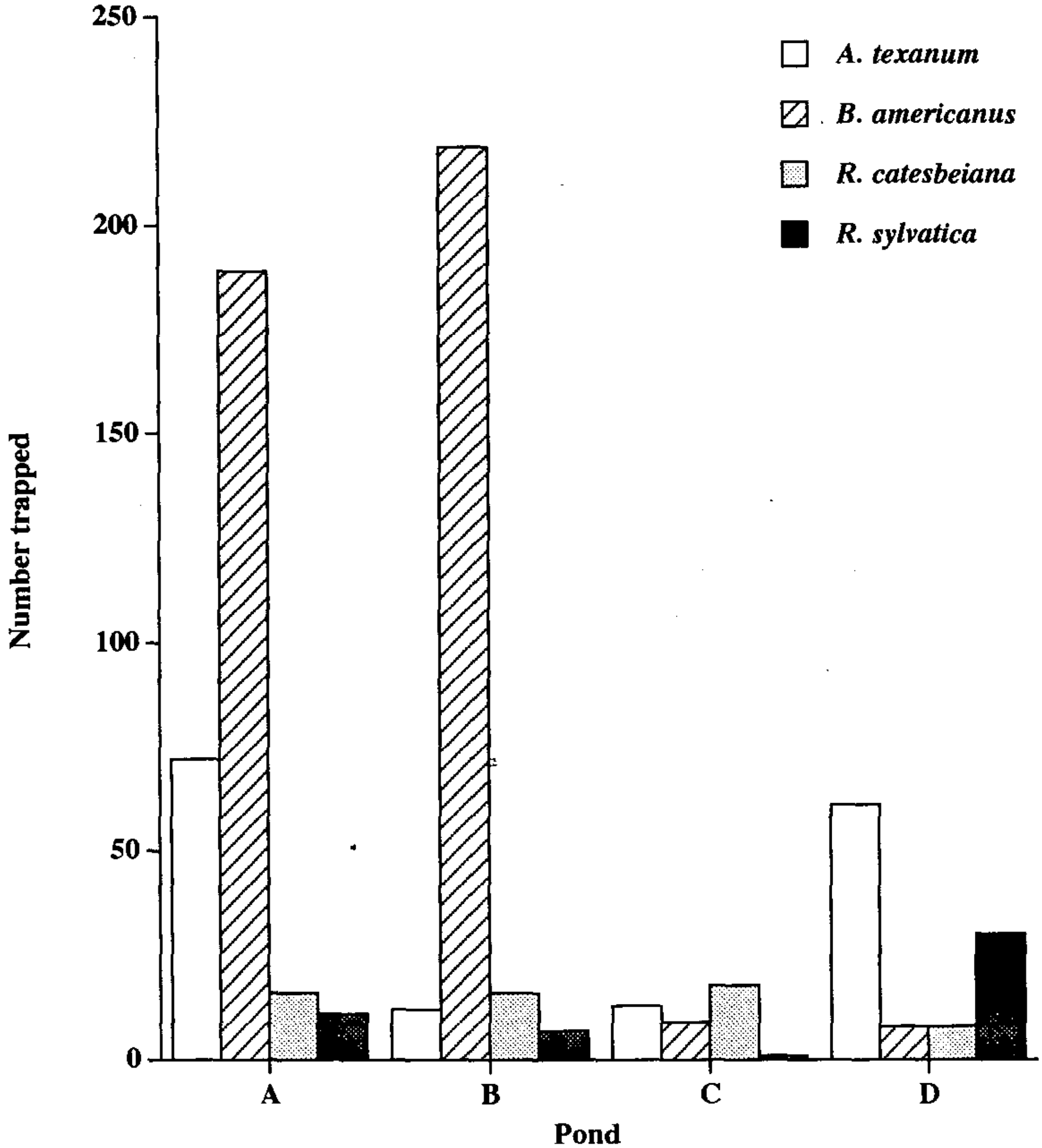

Figure 10. Number of individuals of each of four species of amphibians observed in each of the ponds at WWLWR during the entire sampling period (2000 and 2001 data combined).