



Results of an Amphibian, Reptile, and Turtle Survey of Abraham Lincoln Birthplace and Boyhood Home National Park, Kentucky



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ON THE COVER

Adult Cave Salamander as photographed 05/10/2004
Photograph by: John MacGregor

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Prepared for the National Park Service under Contract **H5028 02 0388 (FIX)** to John MacGregor

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Contents

- 1. Introduction**
- 2. Methods**
- 3. Results**
- 4. Discussion and Conclusions**
- 5. Literature Cited**
- 6. Acknowledgments**

1. Introduction

The historical management of Abraham Lincoln Birthplace and his Knob Creek Boyhood Home National Park (ABLI) as it has passed from a prehistoric pristine wilderness to a mixture of privately owned farmland and forest to a park has undoubtedly affected many species of amphibians, reptiles, and turtles. The Birthplace site has been especially affected; it is a small, isolated tract of pavement and forest that is completely surrounded by agricultural lands and suburbs and it contains no ponds or flowing streams.

The purpose of this project was to document as many amphibian, reptile, and turtle species as possible within the park. The officially stated goal of the surveys, as described by the National Park Service, was to detect and document 90% (42) of the 46 species reasonably expected to occur in the park; this goal was not achieved.

A variety of field methods were employed in the attempt to document species richness of the ABLI herpetofauna. During the three-year survey period covered by this report, 28 of the 46 expected species were encountered at least once within the Park. The success of the effort varied among species groups and ranged from a high of 81.8% (9 of 11 species expected) for frogs and toads to a low of 50.0% (6 of 12 and 2 of 4 species expected respectively) for salamanders and turtles.

2. Methods

The initial list of potential occurrence in the parks was compiled by examining the author's current set of county distribution maps for Kentucky amphibians, reptiles, and turtles and by reviewing various field guides to reptiles and amphibians of the Eastern U.S. (Conant and Collins 1998, Ernst et al. 1994, and Petranks 1998). Field guides typically have geographic range maps depicting the overall extent of occurrence, rather than the actual area of occupancy, and as such usually overestimate the actual precise geographic ranges of the various species. Nonetheless, they offer a starting place for producing lists of potential species. Habitat requirements of each of these species along with habitats present within the park were also considered here. A total of 54 species of amphibians, reptiles, and turtles appeared on an original list but this was reduced to 46 species after an initial visit was made in March 2003 to evaluate habitats available within the Park (see Appendix 1: ABLI Herp Summary Sheet 2006).

Much of the actual sampling effort consisted of unconstrained search efforts (USE) by experienced herpetologists. During unconstrained searches, an investigator moves through a habitat likely to support reptile and amphibian populations, using both visual searches and active searches (raking through leaf litter, rolling over logs, turning rocks, peeling off loose bark, and examining other potential refugia). Some use was also made of running transects along stream corridors while systematically overturning rocks and counting all animals observed, conducting voice surveys for calling frogs at ponds, and dipnetting in ponds and streams for amphibian larvae. The primary field method for snakes and lizards was the use of cover boards (sheets of roofing tin and/or heavy paneling) placed on non-random plots in the park.

Data was recorded for each observed specimen using descriptive terminology. For many specimens, data from handheld global positioning systems (GPS) was also used. The datum used was NAD83. This technologically-challenged author entered locations in the voucher database as a mixture of Universal Transverse Mercator (UTM) units in meters, decimal degrees, degrees-minutes-seconds, or as GPS waypoints (accompanied by a UTM conversion database).

Live animals were photographed as vouchers. Most were released in the field at the time and place of capture, but some were removed temporarily for photography. All such animals were returned to the point of capture at the earliest possible time and released unharmed.

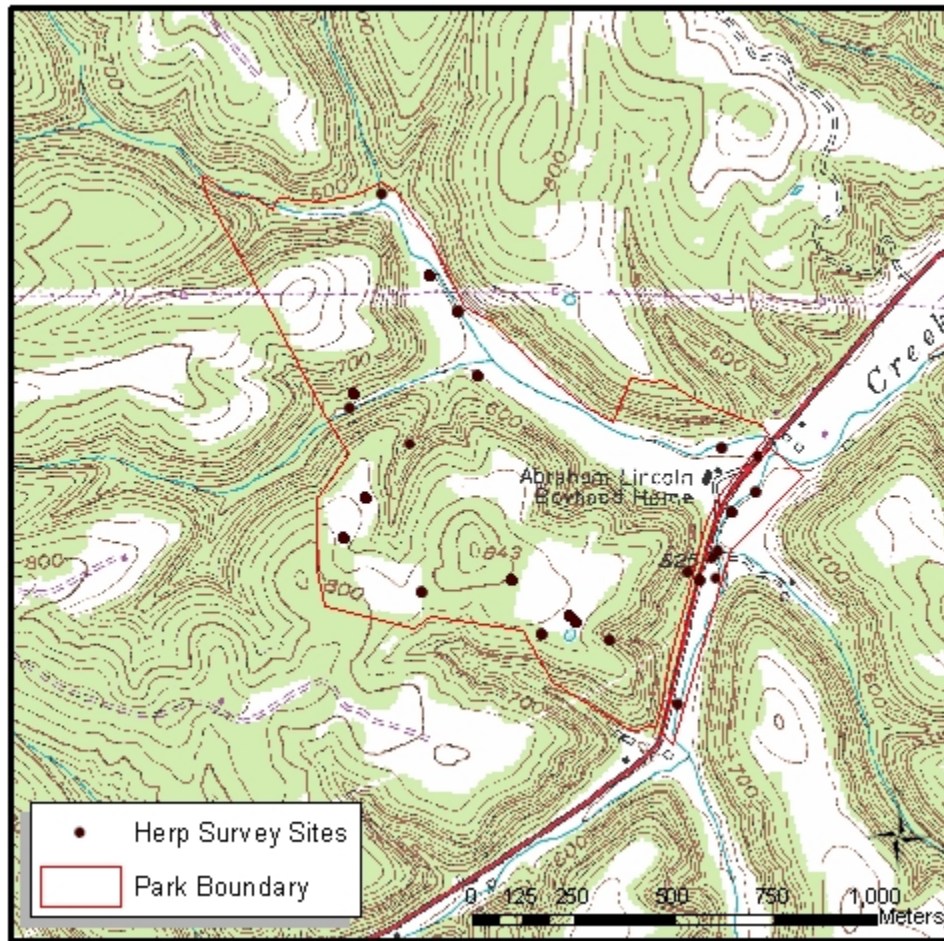


Figure 1. Herpetofauna survey sites at Knob Creek.

3. Results and Discussion

ABLI was visited by one or more investigators a total of 17 times from 2003-2005. Nine frog species, 6 salamanders, 3 lizards, 8 snakes, and 2 turtles were recorded from ABLI during the survey (Table 1); these totaled 28 of the 46 expected species (60.9%). A total of 309 species observations were made during the study period; these are broken down by species group and by year in Table 2 and are listed chronologically by species in Appendix 2. Reptiles and turtles were recorded individually; 170 snakes were encountered on the park along with 41 lizards and 7 turtles. Although amphibians were not strictly counted as individuals (since many observations included breeding choruses, larvae, and/or egg masses), each chorus or egg mass was entered into the database as a sighting of a single individual.

For the following results tables, previous data was derived as follows:

Larue Data: species previously known from Larue County. Adjacent: Species previously known from one or more adjacent counties (Green, Hardin, Hart, Nelson, Taylor, Washington). Source: Kentucky Herp Database (2007)

All observations of amphibians, reptiles, and turtles made within ABLI and ABLI have been tabulated in the accompanying Access file (**NPS Database 3-25-2007**). No previous herpetological data was available for ABLI to provide historical perspective concerning the fauna of the park.

Results: ABLI Frogs and Toads

Species previously known from Larue and adjacent counties E = expected for present study (11 species); O = observed during present study (9 species)	Current ABLI study			Previous data	
	2003 total	2004 total	2005 total	Larue Data	Adja cent
<i>Acris crepitans</i> (Northern Cricket Frog) - E+O	5	6	26	X	X
<i>Bufo americanus</i> (American Toad) - E+O	2	0	4	X	X
<i>Bufo fowleri</i> (Fowler's Toad) - E Only				X	X
<i>Gastrophryne carolinensis</i> (Eastern Narrowmouth Toad)					X
<i>Hyla chrysoscelis</i> (Cope's Gray Treefrog) - E+O	1	1	1	X	X
<i>Pseudacris brachyphona</i> (Mountain Chorus Frog)					X
<i>Pseudacris crucifer</i> (Spring Peeper) - E+O	10	1	8	X	X
<i>Pseudacris triseriata feriarum</i> (Upland Chorus Frog) - E only				X	X
<i>Rana catesbeiana</i> (American Bullfrog) - E+O	1	6	4	X	X
<i>Rana clamitans</i> (Green Frog) - E+O	50	59	43	X	X
<i>Rana palustris</i> (Pickerel Frog) - E+O	0	2	1	X	X
<i>Rana sphenoccephala</i> (Southern Leopard Frog) - E+O	36	12	18	X	X
<i>Rana sylvatica</i> (Wood Frog) - E+O	18	19	1	X	X
<i>Scaphiopus holbrookii</i> (Eastern Spadefoot)				X	X
SPECIES TOTALS	8	8	9	12	14

Fourteen species of frogs and toads were previously known from one or more of the seven counties in the ABLI area, and twelve of these had previously been documented from Larue County prior to the initiation of the present study (Kentucky Herp Database 2007). Eleven species were expected to occur within one or both ABLI management units on the basis of local habitat conditions and the proximity of existing records to the Park, and nine of these were eventually discovered on the Park during three years of inventory and monitoring (17 total visits).

The most common and widely distributed frogs on the park were the Green Frog, Southern Leopard Frog, and Northern Cricket Frog. Each of these species could be found in good numbers in both upland and lowland habitats and were always discovered near standing or flowing water. The only breeding sites located for these species were in the uplands; Green Frogs and Northern Cricket Frogs only used the pond but the Southern Leopard Frogs also bred in a road rut during at least one year. Cope's Gray Treefrogs, Spring Peepers, and Wood Frogs were only observed as calling adults, eggs, or larvae in the vicinity of upland breeding sites (ponds, water-filled road ruts). American Toads, American Bullfrogs, and Pickerel Frogs were widely distributed but seemed uncommon at ABLI.

Fowler's Toads and Upland Chorus Frogs were both discovered within a few miles of ABLI during the inventory but neither species seems to occur within the Park. The primary reason for this is probably the lack of suitable breeding habitat - shallow grassy vernal floodplain pools for Upland Chorus Frogs and muddy ponds or broad quiet stream backwaters for Fowler's Toads. The remaining three anuran species listed above that are known from the general area (Eastern Narrowmouth Toad, Mountain Chorus Frog, Eastern Spadefoot) apparently do not occur anywhere near ABLI at the present time.

Management Recommendations for frogs and toads at ABLI should include:

(1) the construction of several additional permanent and seasonal woodland and/or forest edge breeding ponds in the uplands of the Knob Creek tract (the flat topography and clay soils should be excellent for pond construction);

(2) the construction of several shallow grassy seasonal and permanent wetland habitats along the floodplain areas of both Knob Creek and the unnamed stream behind the Boyhood Home Visitor Center;

(3) the construction of at least one woodland or forest edge pond on each side of KY 61 at the Birthplace tract.

Constructed ponds and wetlands will restore breeding sites for frogs, toads, and pond-breeding salamanders and will also provide habitat for a variety of plants and invertebrates as well as drinking water sources for bats and other wildlife.

Results: ABLI Salamanders

Species previously known from Larue and adjacent counties E = expected for present study (12 species); O = observed during present study (6 species)	Current ABLI study			Previous data	
	2003 total	2004 total	2005 total	Larue Data	Adja cent
<i>Ambystoma barbouri</i> (Streamside Salamander)				X	X
<i>Ambystoma jeffersonianum</i> (Jefferson Salamander) - E only				X	X
<i>Ambystoma maculatum</i> (Spotted Salamander) - E only				X	X
<i>Ambystoma opacum</i> (Marbled Salamander)				X	X
<i>Ambystoma t. tigrinum</i> (Eastern Tiger Salamander) - E+O	5	0	0	X	X
<i>Cryptobranchus alleganiensis</i> (Hellbender)					X
<i>Desmognathus fuscus</i> (Northern Dusky Salamander) - E only					X
<i>Eurycea cirrigera</i> (Southern Two-lined Salamander) - E+O	16	13	72	X	X
<i>Eurycea longicauda</i> (Longtail Salamander) - E+O	1	25	31	X	X
<i>Eurycea lucifuga</i> (Cave Salamander) - E only				X	X
<i>Hemidactylium scutatum</i> (Four-toed Salamander)					X
<i>Necturus maculosus</i> (Mudpuppy)					X
<i>Notophthalmus viridescens</i> (Red-spotted Newt) - E+O	13	5	3	X	X
<i>Plethodon dorsalis</i> (Northern Zigzag Salamander) - E+O	4	1	0	X	X
<i>Plethodon glutinosus</i> (Northern Slimy Salamander) - E+O	4	11	14	X	X
<i>Pseudotriton montanus diastictus</i> (Midland Mud Sal) - E only					X
<i>Pseudotriton ruber</i> (Northern Red Salamander) - E only				X	X
SPECIES TOTALS	6	5	4	12	17

Seventeen species of salamanders were previously known from one or more of the seven counties in the ABLI area, and twelve of these had previously been documented from Larue County prior to the initiation of the present study (Kentucky Herp Database 2007). Twelve species were expected to occur within one or both ABLI management units on the basis of local habitat conditions and the proximity of existing records to the Park, but only six of these were eventually discovered on the Park during three years of inventory and monitoring (17 total visits).

The most common and widely distributed salamander on the park was the Northern Slimy Salamander, a completely terrestrial species that was found in good numbers in both upland and lowland forested habitats. The Northern Zigzag Salamander, another totally terrestrial animal, was found only in forested uplands but may be at least as common and widespread on the Park as the Northern Slimy; Zigzag Salamanders tend to be active at the surface only during cool damp weather from late fall through mid-spring when relatively little fieldwork was done on the project.

Two stream-breeding salamander species – the Longtail Salamander and Southern Two-lined Salamander – were quite common along the unnamed tributary to Knob Creek that drains the valley behind the Boyhood Home Visitor Center; adults and/or larvae were observed here on nearly every visit. This stream provided excellent habitat for both species in that (a) the stream corridor is largely forested and thus well-shaded and (b) the semi-permanent flow regime ensures that the fish fauna consists primarily of a typical headwater stream assemblage of minnows and darters that are not likely to be serious predators on salamander larvae.

Two pond-breeding salamanders (Eastern Tiger Salamander, Red-spotted Newt) were found in the single permanent upland pond at ABLI. This was the only suitable breeding site located for these species within the Park. Several Tiger Salamander larvae were seen during an early visit to ABLI in 2003 but were never subsequently observed, while Red-spotted Newts were always present in the pond and were found each time they were searched for.

Two common and widespread pond-breeding salamanders (Jefferson Salamander, Spotted Salamander) were expected from ABLI but were not found there, and two others (Marbled Salamander, Four-toed Salamander) are known from the general area. The single suitable woodland pond at ABLI, which is located on the top of a ridge near the Boyhood Home, has likely not been colonized by these species because it is man-made, isolated, and remote. Streamside Salamanders are also known to breed in ponds and shallow wetland habitats in addition to headwater streams.

Four kinds of stream-breeding salamanders (Northern Dusky Salamander, Cave Salamander, Midland Mud Salamander, Northern Red Salamander) were likewise expected from the Boyhood Home tract but were not found during the inventory despite extensive targeted searching for both adults and larvae. Each of these species often occurs with Longtail and/or Two-lined Salamanders in forested headwater streams, and the present author can think of no good reason why they were not found during the survey.

Another salamander that typically breeds in streams (Streamside Salamander) is known from some sites in the general vicinity of ABLI, but is relatively uncommon and local in both the Knobs and Mississippian Plateau and its apparent absence from ABLI was not unexpected. Hellbenders and Mudpuppies occur only in large streams and rivers; suitable habitat for both is lacking at ABLI.

Management Recommendations for salamanders at ABLI should include:

- (1) the construction of several additional permanent and seasonal woodland and/or forest edge breeding ponds in the uplands of the Knob Creek tract (the flat topography and clay soils should be excellent for pond construction);
- (2) the construction of several shallow grassy seasonal and permanent wetland habitats along the floodplain areas of both Knob Creek and the unnamed stream behind the Boyhood Home Visitor Center;
- (3) the construction of at least one woodland or forest edge pond on each side of KY 61 at the Birthplace tract.
- (4) the maintenance of tree cover along most of the stream corridor along the unnamed tributary of Knob Creek behind the Boyhood Home visitor center.
- (5) the restoration of natural channel meanders and at least partial tree cover along Knob Creek itself along the east side of US 31E. This stretch of stream has been channelized and bulldozed in the past and provides very poor habitat for semiaquatic amphibians and reptiles in its present state.

Maintaining stream corridors that are largely shaded will provide cool water temperatures that are required by salamanders and frogs that spend a portion of their lives either in the water or in associated riparian habitats. Constructed ponds and wetlands will restore breeding sites for frogs, toads, and pond-breeding salamanders and will also provide habitat for a variety of plants and invertebrates as well as drinking water sources for bats and other wildlife.

Results: ABLI Lizards

Species previously known from Larue and adjacent counties E = expected for present study (4 species); O = observed during present study (3 species)	Current ABLI study			Previous data	
	2003 total	2004 total	2005 total	Larue Data	Adja cent
<i>Cnemidophorus sexlineatus</i> (Six-lined Racerunner)				X	X
<i>Eumeces fasciatus</i> (Five-lined Skink) - E+O	6	3	1	X	X

<i>Eumeces inexpectatus</i> (Southeastern Five-lined Skink)					X
<i>Eumeces laticeps</i> (Broadhead Skink) - E only					X
<i>Ophisaurus attenuatus</i> (Slender Glass Lizard)				X	X
<i>Sceloporus undulatus</i> (Fence Lizard) - E+O	0	3	4	X	X
<i>Scincella lateralis</i> (Ground Skink) - E+O	0	15	9	X	X
SPECIES TOTALS	1	3	3	5	7

Seven species of lizards were previously known from one or more of the seven counties in the ABLI area, and five of these had previously been documented from Larue County prior to the initiation of the present study (Kentucky Herp Database 2007). Four species were expected to occur within one or both ABLI management units on the basis of local habitat conditions and the proximity of existing records to the Park, and three of these were eventually discovered on the Park during three years of inventory and monitoring (17 total visits).

The Ground Skink was the most common and widely distributed lizard on the park and was found in good numbers in forest edge and old field habitats. Five-lined Skinks were found beneath flat rocks along stretches of dry streambed and in crevices in the log buildings at the Boyhood Home visitor center, and Fence Lizards were primarily found along an open shale outcrop under powerlines behind the Boyhood Home.

The Broadhead Skink, a large arboreal species that is widely distributed in Kentucky and seems especially common in the Knobs Region, almost certainly occurs in the forested uplands of the ABLI Boyhood Home tract. This species spends relatively little time on the ground and is often difficult to document during surveys.

Management Recommendations for lizards at ABLI should include:

- (1) the maintenance of snags and hollow or damaged trees and leaving stumps, logs, and large fallen limbs on the ground in woodlands and along woodland edges for Five-lined and Broadhead Skinks and Fence Lizards – such trees serve as important sources of food (insects, spiders, and other invertebrates), perching sites for territorial males, egg-laying sites for females, and refugia from predators for lizards of all ages.
- (2) the use of fire, herbicides, and/or mowing to maintain at least some open weedy grassland and/or prairie and dry open woodland for Ground Skinks.
- (3) the maintenance and/or restoration of tree cover along most stream corridors for Five-lined Skinks.

Results: ABLI Snakes

Species previously known from Larue and adjacent counties E = expected for present study (15 species); O = observed during present study (8 species)	Current ABLI study			Previous data	
	2003 total	2004 total	2005 total	Larue Data	Adja cent
<i>Agkistrodon contortrix</i> (Copperhead) - E+O	0	2	11	X	X
<i>Carphophis amoenus</i> (Worm Snake) - E+O	0	1	3	X	X
<i>Cemophora coccinea</i> (Scarlet Snake)					X
<i>Clonophis kirtlandii</i> (Kirtland's Snake)					X
<i>Coluber constrictor</i> (Black Racer) - E+O	5	25	28	X	X
<i>Crotalus horridus</i> (Timber Rattlesnake)				X	X
<i>Diadophis punctatus</i> (Ringneck Snake) - E+O	13	37	21	X	X
<i>Elaphe guttata</i> (Corn Snake)					X
<i>Elaphe o. obsoleta</i> (Black Rat Snake) - E+O	1	0	0	X	X
<i>Heterodon platirhinos</i> (Eastern Hognose Snake) - E only				X	X
<i>Lampropeltis c. calligaster</i> (Prairie Kingsnake) - E only				X	X
<i>Lampropeltis getula nigra</i> (Black Kingsnake) - E only				X	X
<i>Lampropeltis triangulum</i> (Milk Snake) - E only					X

Nerodia sipedon (Northern Water Snake) - E+O	2	6	3	X	X
Opheodrys aestivus (Rough Green Snake) - E only				X	X
Pituophis m. melanoleucus (Northern Pine Snake)					X
Regina septemvittata (Queen Snake)					X
Storeria dekayi (Brown Snake) - E only				X	X
Storeria o. occipitamaculata (N Redbelly Snake) - E only				X	X
Tantilla coronata (Southeastern Crowned Snake)					X
Thamnophis s. sauritus (Eastern Ribbon Snake)				X	X
Thamnophis s. sirtalis (Eastern Garter Snake) - E+O	1	0	2	X	X
Virginia valeriae elegans (Western Earth Snake) - E+O	4	2	3	X	X
SPECIES TOTALS	6	6	7	16	23

Twenty-three species of snakes were previously known from one or more of the seven counties that make up the ABLI area; sixteen of these had been documented from Larue County prior to the initiation of the present study (Kentucky Herp Database 2007). Fifteen snake species were expected to occur within one or both ABLI management units on the basis of local habitat conditions and the proximity of existing records to the Park, but only eight of these were actually discovered on the Park during three years of inventory and monitoring (17 total visits).

Ringneck Snakes and Black Racers were by far the most common and widely distributed snake on the park; these two species made up more than 75% (129 of 170) of the total number of snakes that were found during the study. Ringnecks were found primarily beneath flat rocks in upland and lowland forests and in edge habitats and were especially common at times under shale flakes bordering a stream under powerlines. Racers occurred in the largest numbers in upland forest edge and old field habitats. Among the remaining documented snakes, Copperheads and Earth Snakes were found along the forest edge in the uplands, Eastern Garter Snakes and Worm Snakes were mostly in riparian zones, Northern Water Snakes were in and along streams, and the lone Black Rat Snake was discovered in a hollow tree beside the Boyhood Home visitor center.

Perhaps most perplexing to this biologist was the lack of records for several kinds of snakes that are common and widely distributed in this section of Kentucky. None of the three local species of kingsnakes (Prairie Kingsnake, Black Kingsnake, Milk Snake) or the two local kinds of brown snakes (Northern Redbelly Snake, Brown Snake) - all of which are most easily found by placing arrays of roofing tin and coverboards in open/edge habitats and periodically checking these for snakes - were discovered at ABLI during the three-year life of this project. It would seem almost a certainty that all five of these snakes (along with the widespread but infrequently encountered Eastern Hognose Snake and Rough Green Snake) would be permanent residents at the Boyhood Home tract. Perhaps some of these species would have turned up at the tin site that was initially established along the Knob Creek corridor if the tin had not been picked up and spirited away by some enterprising local resident...

The remaining seven snake species have been found in the general ABLI area but were not really expected to turn up during this survey. Timber Rattlesnakes prefer steep rocky slopes and adjacent upland forests in the Knobs Region, and habitat for them at ABLI appears marginal to moderate; several local residents who were interviewed during this project expressed doubt that rattlesnakes occurred locally. Scarlet Snakes, Northern Pine Snakes, and Southeastern Crowned Snakes are uncommon to rare burrowing species of dry upland habitats and for the most part barely enter the area. Kirtland's Snakes and Eastern Ribbon Snakes are usually found in wetland habitats (completely lacking at ABLI), while Corn Snakes have a limited distribution in Kentucky and only occur to the west of the Park. The Queen Snake, a semiaquatic crayfish-eating water snake that is widespread in the limestone regions of Kentucky, is near the edge of its range here and has never been recorded from Larue County.

Management Recommendations for snakes at ABLI often largely parallel those for lizards but can also include some activities that benefit amphibians:

(1) the maintenance of snags and hollow or damaged trees and leaving stumps, logs, and large fallen limbs on the ground in woodlands and along woodland edges; such trees serve as important sources of snake food (mice, lizards, and insects), egg-laying sites for females, and refugia from predators.

(2) the use of fire, herbicides, and/or mowing to maintain at least some open weedy grassland and/or prairie and dry open woodland.

(3) the maintenance and/or restoration of tree cover along stream corridors and restoring the natural channel of Knob Creek.

(4) the construction of permanent and seasonal ponds and wetlands, particularly at the Boyhood Home tract where there is connectivity with adjacent natural habitats for reptiles and amphibians. The Birthplace tract is a small isolated patch of forest in a large matrix of urban and agricultural land and has little potential for attracting and sustaining a diverse reptile population.

Results: ABLI Turtles

Species previously known from Larue and adjacent counties E = expected for present study (4 species); O = observed during present study (2 species)	Current ABLI study			Previous data	
	2003 total	2004 total	2005 total	Larue Data	Adja cent
<i>Apalone spiniferus</i> (Spiny Softshell) - E only				X	X
<i>Chelydra serpentina</i> (Common Snapping Turtle) - E+O	0	0	1	X	X
<i>Chrysemys picta</i> (Painted Turtle)				X	X
<i>Graptemys geographica</i> (Common Map Turtle)					X
<i>Graptemys ouachitensis</i> (Ouachita Map Turtle)					X
<i>Kinosternon subrubrum</i> (Mud Turtle)				X	X
<i>Pseudemys concinna</i> (River Cooter)					X
<i>Sternotherus odoratus</i> (Common Musk Turtle) - E only					X
<i>Terrapene carolina</i> (Eastern Box Turtle) - E+O	1	3	2	X	X
<i>Trachemys scripta elegans</i> (Red-eared Slider)				X	X
SPECIES TOTALS	1	1	2	6	10

Ten species of turtles are known from one or more of the seven counties in the ABLI area, and six of these had previously been documented from Larue County prior to the initiation of the present study (Kentucky Herp Database 2007). Four species were expected to occur within one or both ABLI management units on the basis of local habitat conditions and the proximity of existing records to the Park, but only two of these were eventually discovered on the Park during three years of inventory and monitoring (17 total visits).

The Eastern Box Turtle was the only widely distributed turtle on the park and was found in low numbers in forests and forest edge habitats at the Boyhood Home tract. A single Common Snapping Turtle was also discovered there in a water-filled road rut. ABLI personnel reported seeing a Box Turtle some years ago at the Birthplace tract; perhaps this turtle has been brought in (or was carried off!) by a park visitor or a local resident.

The investigator initially anticipated Knob Creek itself might harbor an occasional Common Musk Turtle or Spiny Softshell, but several searches along the length of that stream within the Park failed to yield any aquatic turtles.

Management Recommendations for turtles at ABLI could include:

(1) the maintenance of existing forested habitat for Eastern Box Turtles.

(2) the restoration of natural channel meanders and pools and at least partial tree cover along Knob Creek itself along the east side of US 31E. This stretch of stream has been channelized and bulldozed in the past and provides very poor habitat for semiaquatic amphibians and reptiles in its present state.

(3) the construction of permanent and seasonal ponds and wetlands, particularly at the Boyhood Home tract where there is connectivity with adjacent natural habitats for reptiles and amphibians. The Birthplace tract is a small isolated patch of forest in a large matrix of urban and agricultural land and has little potential for attracting and sustaining a diverse reptile population.

4. Conclusions

Very few species were observed at the Birthplace site; only the five-lined skink seemed established here and all other species seen were likely waifs from adjacent agricultural lands. The author was unable to find even a ringneck snake or a zigzag salamander here despite considerable searching.

The Knob Creek tract, although largely forested, contained only a single isolated permanent pond (used by a few newts, one species of ambystomatid salamander, and several kinds of frogs) located on a ridge above the visitor center. A deep tire rut located near an abandoned leaky pond on the same ridge also served as a breeding site for two frog species (wood frog, southern leopard frog). Of the two streams at Knob Creek, the large permanent stream traversed pasture land beside a major highway (US 31E) and was inhabited only by a few northern water snakes, green frogs, and two-lined salamanders. The smaller stream, although it flowed through a largely forested corridor, was primarily intermittent to semi-permanent in character and did not offer suitable habitat for most larger aquatic forms (red-eared sliders, common map turtles, spiny softshells, etc.). Several transects were run along portions of this stream corridor; this technique can likely be used to monitor populations of some species of frogs and salamanders on ABLI over time.

The lack of lizard and snake diversity at ABLI during the survey was perplexing. The uplands offered a mix of forested and open habitats and appeared excellent for most upland reptiles known to occur in the general area. Perhaps additional monitoring is warranted here.

The author strongly recommends the restoration of the leaky upland pond and the establishment of additional fishless pond breeding sites for amphibians on the Knob Creek tract.

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Table 1. ABLI-Larue County Amphibians, Reptiles, and Turtles**Table 1-A. ABLI Frogs and Toads**

Species	Current ABLI study			Previous data	
	Exp ected	Obs erved	# of Sites	Larue Data	Adja cent
<i>Acris crepitans</i> (Cricket Frog)	X	X	6	X	X
<i>Bufo americanus</i> (American Toad)	X	X	5	X	X
<i>Bufo fowleri</i> (Fowler's Toad)	X			X	X
<i>Gastrophryne carolinensis</i> (E Narrowmouth Toad)					X
<i>Hyla chrysoscelis</i> (Cope's Gray Treefrog)	X	X	3	X	X
<i>Pseudacris brachyphona</i> (Mountain Chorus Frog)					X
<i>Pseudacris crucifer</i> (Spring Peeper)	X	X	4	X	X
<i>Pseudacris triseriata</i> (Upland Chorus Frog)	X			X	X
<i>Rana catesbeiana</i> (American Bullfrog)	X	X	2	X	X
<i>Rana clamitans</i> (Green Frog)	X	X	7	X	X
<i>Rana palustris</i> (Pickerel Frog)	X	X	2	X	X
<i>Rana sphenoccephala</i> (Southern Leopard Frog)	X	X	5	X	X
<i>Rana sylvatica</i> (Wood Frog)	X	X	2	X	X
<i>Scaphiopus holbrookii</i> (Eastern Spadefoot)				X	X
TOTALS	11	9		12	14

Fourteen species of frogs and toads are known from the general area surrounding ABLI; twelve of these had previously been documented from Larue County prior to the initiation of the present study.

Table 1-B. ABLI Salamanders

Species	Current ABLI study			Previous data	
	Exp ected	Obs erved	# of Sites	Larue Data	Adja cent
<i>Ambystoma barbouri</i> (Streamside Salamander)				X	X
<i>Ambystoma jeffersonianum</i> (Jefferson Salamander)	X			X	X
<i>Ambystoma maculatum</i> (Spotted Salamander)	X			X	X
<i>Ambystoma opacum</i> (Marbled Salamander)				X	X
<i>Ambystoma tigrinum</i> (Tiger Salamander)	X	X	1	X	X
<i>Cryptobranchus alleganiensis</i> (Hellbender)					X
<i>Desmognathus fuscus</i> (Northern Dusky Salamander)	X				X
<i>Eurycea cirrigera</i> (Southern Two-lined Salamander)	X	X	2	X	X
<i>Eurycea longicauda</i> (Longtail Salamander)	X	X	5	X	X
<i>Eurycea lucifuga</i> (Cave Salamander)	X			X	X
<i>Hemidactylium scutatum</i> (Four-toed Salamander)					X
<i>Necturus maculosus</i> (Mudpuppy)					X
<i>Notophthalmus viridescens</i> (Red-spotted Newt)	X	X	1	X	X
<i>Plethodon dorsalis</i> (Northern Zigzag Salamander)	X	X	3	X	X
<i>Plethodon glutinosus</i> (Northern Slimy Salamander)	X	X	7	X	X
<i>Pseudotriton montanus diastictus</i> (Midland Mud Sal)	X				X
<i>Pseudotriton ruber</i> (Northern Red Salamander)	X			X	X
TOTALS	12	6		12	17

Table 1-C. ABLI Lizards

Species	Current ABLI study			Previous data	
	Exp ected	Obs erved	# of Sites	Larue Data	Adja cent
<i>Cnemidophorus sexlineatus</i> (Six-lined Racerunner)				X	X
<i>Eumeces fasciatus</i> (Five-lined Skink)	X	X	3	X	X
<i>Eumeces inexpectatus</i> (Southeastern Five-lined Skink)					X
<i>Eumeces laticeps</i> (Broadhead Skink)	X				X
<i>Ophisaurus attenuatus</i> (Slender Glass Lizard)				X	X
<i>Sceloporus undulatus</i> (Fence Lizard)	X	X	2	X	X
<i>Scincella lateralis</i> (Ground Skink)	X	X	7	X	X
TOTALS	4	3		5	7

Table 1-D. ABLI Snakes

Species	Current ABLI study			Previous data	
	Exp ected	Obs erved	# of Sites	Larue Data	Adja cent
<i>Agkistrodon contortrix</i> (Copperhead)	X	X	2	X	X
<i>Carphophis amoenus</i> (Worm Snake)	X	X	3	X	X
<i>Cemophora coccinea</i> (Scarlet Snake)					X
<i>Clonophis kirtlandii</i> (Kirtland's Snake)					X
<i>Coluber constrictor</i> (Black Racer)	X	X	6	X	X
<i>Crotalus horridus</i> (Timber Rattlesnake)				X	X
<i>Diadophis punctatus</i> (Ringneck Snake)	X	X	6	X	X
<i>Elaphe guttata</i> (Corn Snake)					X
<i>Elaphe o. obsoleta</i> (Black Rat Snake)	X	X	1	X	X
<i>Heterodon platirhinos</i> (Eastern Hognose Snake)	X			X	X
<i>Lampropeltis c. calligaster</i> (Prairie Kingsnake)	X			X	X
<i>Lampropeltis getula nigra</i> (Black Kingsnake)	X			X	X
<i>Lampropeltis triangulum</i> (Milk Snake)	X				X
<i>Nerodia sipedon</i> (Northern Water Snake)	X	X	3	X	X
<i>Opheodrys aestivus</i> (Rough Green Snake)	X			X	X
<i>Pituophis m. melanoleucus</i> (Northern Pine Snake)					X
<i>Regina septemvittata</i> (Queen Snake)					X
<i>Storeria dekayi</i> (Brown Snake)	X			X	X
<i>Storeria o. occipitomaculata</i> (N Redbelly Snake)	X			X	X
<i>Tantilla coronata</i> (Southeastern Crowned Snake)					X
<i>Thamnophis s. sauritus</i> (Eastern Ribbon Snake)				X	X
<i>Thamnophis s. sirtalis</i> (Eastern Garter Snake)	X	X	3	X	X
<i>Virginia valeriae elegans</i> (Western Earth Snake)	X	X	2	X	X
TOTALS	15	8		16	23

Table 1-E. ABLI Turtles

Species	Current ABLI study			Previous data	
	Exp ected	Obs erved	# of Sites	Larue Data	Adja cent
<i>Apalone spiniferus</i> (Spiny Softshell)	X			X	X
<i>Chelydra serpentina</i> (Common Snapping Turtle)	X	X	1	X	X
<i>Chrysemys picta</i> (Painted Turtle)				X	X
<i>Graptemys geographica</i> (Common Map Turtle)					X
<i>Graptemys ouachitensis</i> (Ouachita Map Turtle)					X
<i>Kinosternon subrubrum</i> (Mud Turtle)				X	X
<i>Pseudemys concinna</i> (River Cooter)					X
<i>Sternotherus odoratus</i> (Common Musk Turtle)	X				X
<i>Terrapene carolina</i> (Eastern Box Turtle)	X	X	4	X	X
<i>Trachemys scripta elegans</i> (Red-eared Slider)				X	X
TOTALS	4	2		6	10

Table 1 Legend (ABLI)

Expected	Species expected from ABLI in original 2002 project proposal (JRM).
Observed	Species observed on ABLI, 2003-2006.
# of Sites	Number of ABLI sites from which each species was recorded, 2003-2005.
Larue Data	Species previously known from Larue County. Source: Kentucky Herpetological Database and Maps compiled by EKPC-Touchstone Energy Cooperative and JRM from field notes, museum collection records, and scientific literature.
Adjacent	Species previously known from one or more adjacent counties (Green, Hardin, Hart, Nelson, Taylor, Washington). Source: Kentucky Herpetological Database and Maps compiled by EKPC-Touchstone Energy Cooperative and JRM from field notes, museum collection records, and scientific literature.

Table 1 ABLI Summary (2003-2005)

Group	Number of Species Expected	Number of Species Observed	Percent Expected Species Observed
Frogs and Toads	11	9	81.8 %
Salamanders	12	6	50.0 %
ALL AMPHIBIANS	23	15	65.2 %
Lizards	4	3	75.0 %
Snakes	15	8	53.3 %
Turtles	4	2	50.0 %
ALL REPTILES AND TURTLES	23	13	56.5 %
TOTAL ABLI FAUNA	46	28	60.9 %

Table 2. ABLI Amphibian, Reptile, and Turtle Distribution and Abundance

Table 2-A. Yearly Summary of Species and Observations by Group (2003-2005)

	2003 (7 ABLI visits)		2004 (3 ABLI visits)		2005 (7 ABLI visits)	
Group	Observations	Species	Observations	Species	Observations	Species
Frogs	35	8	26	8	31	9
Salamanders	13	6	18	5	15	4
Lizards	3	1	12	3	10	3
Snakes	17	6	29	6	32	7
Turtles	1	1	3	1	3	2
Totals	69	22	88	23	91	25

Table 2-B. Yearly Summary of Frog Observations by Species (2003-2005)

	2003 (7 ABLI visits)		2004 (3 ABLI visits)		2005 (7 ABLI visits)	
Species	Sites	Observations	Sites	Observations	Sites	Observations
acr cre	2	2	2	3	5	6
buf ame	2	2	0	0	3	4
hyl chr	1	1	1	1	1	1
pse cru	2	5	1	1	2	2
ran cat	1	1	1	3	2	2
ran cla	6	10	4	8	4	9
ran pal	0	0	1	2	1	1
ran sph	7	13	3	6	4	5
ran syl	1	1	2	2	1	1
		35		26		31

Table 2-C. Yearly Summary of Salamander Observations by Species (2003-2005)

	2003 (7 ABLI visits)		2004 (3 ABLI visits)		2005 (7 ABLI visits)	
Species	Sites	Observations	Sites	Observations	Sites	Observations
amb tig	1	2	0	0	0	0
eur cir	2	2	2	4	1	2
eur lon	1	1	3	6	4	5
not vir	1	2	1	1	1	1
ple dor	1	2	1	1	0	0
ple glu	2	3	4	6	5	7
		12		18		15

Table 2-D. Yearly Summary of Snake Observations by Species (2003-2005)

	2003 (7 ABLI visits)		2004 (3 ABLI visits)		2005 (7 ABLI visits)	
Species (Total)	Total Site* Encounters	Numbers Observed	Total Site* Encounters	Numbers Observed	Total Site* Encounters	Numbers Observed
agk con (13)	0	0	1	2	2	11
car amo (4)	0	0	1	1	2	3
col con (58)	3	5	5	25	5	28
dia pun (71)	8	13	5	37	3	21
ela obs (1)	1	1	0	0	0	0
ner sip (11)	2	2	2	6	2	3
tha sir (3)	1	1	0	0	2	2
vir val (9)	2	4	2	2	1	3
		26		73		71

* each "Site Encounter" stands for 1 or more individuals found during any visit to any site.

Table 2-E. Yearly Summary of Lizard Observations by Species (2003-2005)

	2003 (7 ABLI visits)		2004 (3 ABLI visits)		2005 (7 ABLI visits)	
Species (Total)	Total Site Encounters	Numbers Observed	Total Site Encounters	Numbers Observed	Total Site Encounters	Numbers Observed
eum fas (10)	3	6	2	3	1	1
sce und (7)	0	0	1	3	2	4
sci lat (24)	0	0	6	15	4	9
		6		21		14

Table 2-F. Yearly Summary of Turtle Observations by Species (2003-2005)

	2003 (7 ABLI visits)		2004 (3 ABLI visits)		2005 (7 ABLI visits)	
Species (Total)	Total Site Encounters	Numbers Observed	Total Site Encounters	Numbers Observed	Total Site Encounters	Numbers Observed
che ser (1)	0	0	0	0	1	1
ter car (6)	1	1	2	3	2	2
		1		3		3

Appendix 1. ABLI Herp Summary Sheet 2003-2006 (by scientific name).

46 species expected - 28 (61%) observed with 21 (46%) photo-documented as of 12/31/2006.

X = observed/documented through 12/31/2003; Y = additional species observed/documented through 12/31/2004; Z = additional species observed/documented through 12/31/2006.

Amphibians Expected (23)

SPECIES	obs	doc		SPECIES	obs	doc
<i>Ambystoma jeffersonianum</i>				<i>Acris crepitans</i>	X	Z
<i>A. maculatum</i>				<i>Bufo americanus</i>	X	
<i>A. tigrinum</i>	X			<i>B. fowleri</i>		
<i>Desmognathus fuscus</i>				<i>Hyla chrysoscelis</i>	X	
<i>Eurycea cirrigera</i>	X	X		<i>P. crucifer</i>	X	
<i>E. longicauda</i>	X	X		<i>P. triseriata feriarum</i>		
<i>E. lucifuga</i>				<i>Rana catesbeiana</i>	X	Y
<i>Notophthalmus viridescens</i>	X	Y		<i>R. clamitans</i>	X	Y
<i>Plethodon dorsalis</i>	X	X		<i>R. palustris</i>	Y	Z
<i>P. glutinosus</i>	X	X		<i>R. sphenoccephala</i>	X	X
<i>Pseudotriton montanus diastictus</i>				<i>R. sylvatica</i>	X	Y
<i>P. ruber</i>						

Reptiles and Turtles Expected (23)

SPECIES	obs	doc		SPECIES	obs	doc
<i>Eumeces fasciatus</i>	X	X		<i>Agkistrodon contortrix</i>	Y	Z
<i>E. laticeps</i>				<i>Carphophis amoenus</i>	Y	Z
<i>Sceloporus undulatus</i>	Y	Y		<i>Coluber constrictor</i>	X	X
<i>Scincella lateralis</i>	Y	Z		<i>Diadophis punctatus</i>	X	X
				<i>E. obsoleta</i>	X	
<i>Apalone spinifera</i>				<i>Heterodon platirhinos</i>		
<i>Chelydra serpentina</i>	Z			<i>Lampropeltis calligaster</i>		
<i>Sternotherus odoratus</i>				<i>L. getula nigra</i>		
<i>Terrapene carolina</i>	Y	Y		<i>L. triangulum</i>		
				<i>Nerodia sipedon</i>	X	Y
				<i>Opheodrys aestivus</i>		
				<i>Storeria dekayi</i>		
				<i>S. occipitamaculata</i>		
				<i>Thamnophis sirtalis</i>	Z	
				<i>Virginia valeriae elegans</i>	X	X

Possible Additions (8)

<i>Ambystoma barbouri</i>				<i>Ophisaurus attenuatus</i>		
<i>A. opacum</i>				<i>Trachemys scripta elegans</i>		
<i>Gastrophryne carolinensis</i>				<i>Regina septemvittata</i>		
<i>Scaphiopus holbrookii</i>				<i>Tantilla coronata</i>		