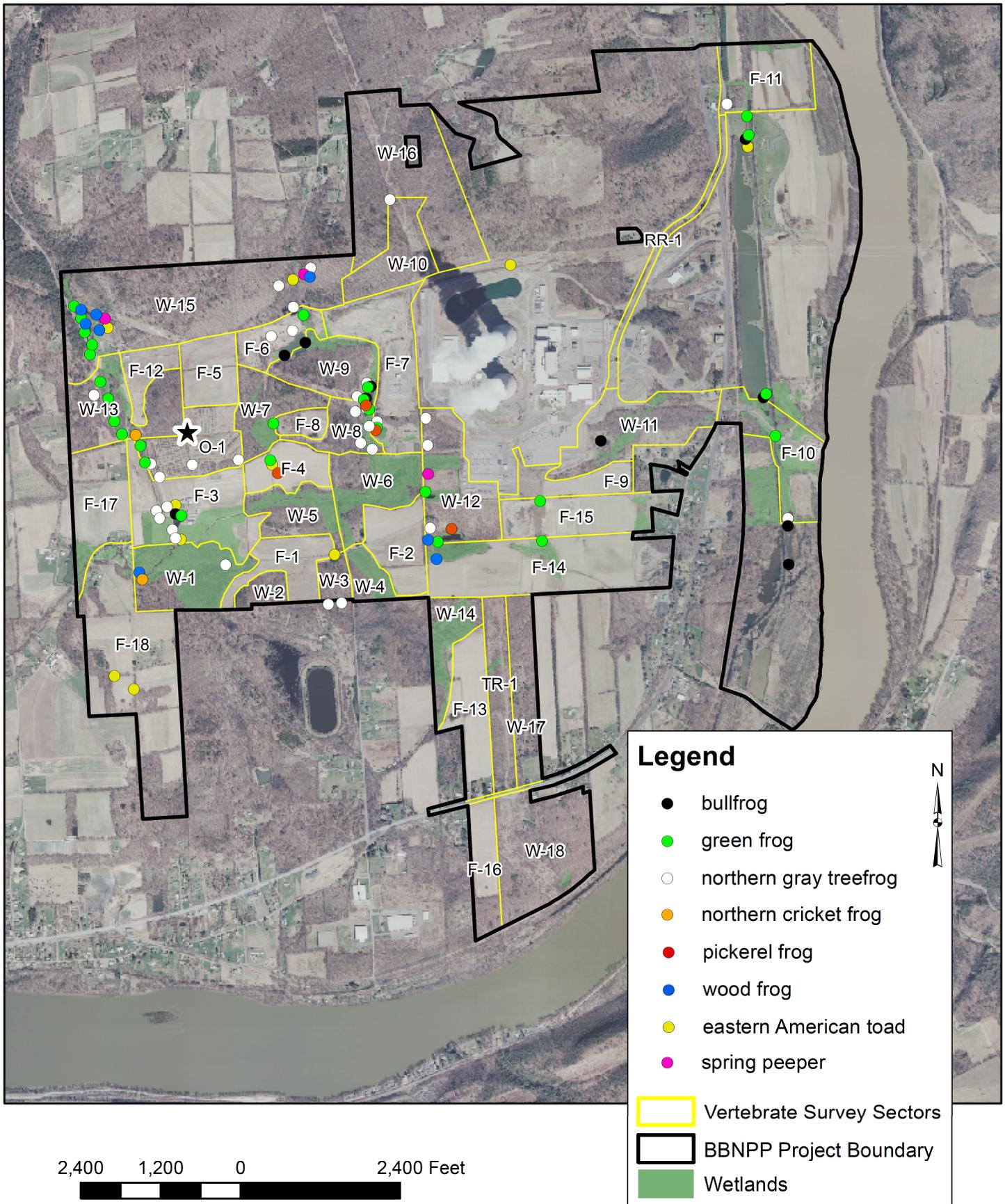


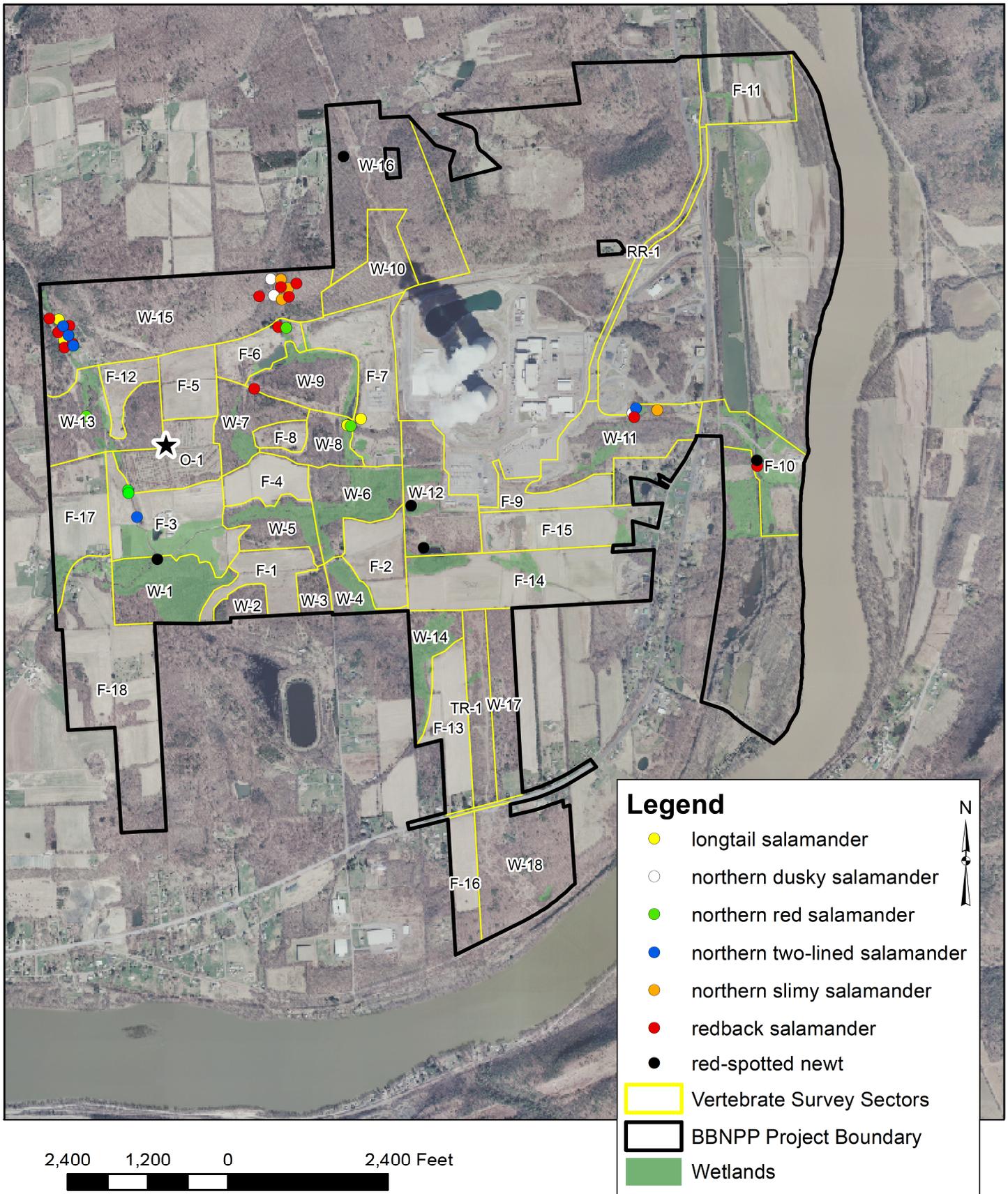
**Figure 4.**

Locations of observations for five species of turtles on the BBNPP site, May through September 2008 and May through June 2010.



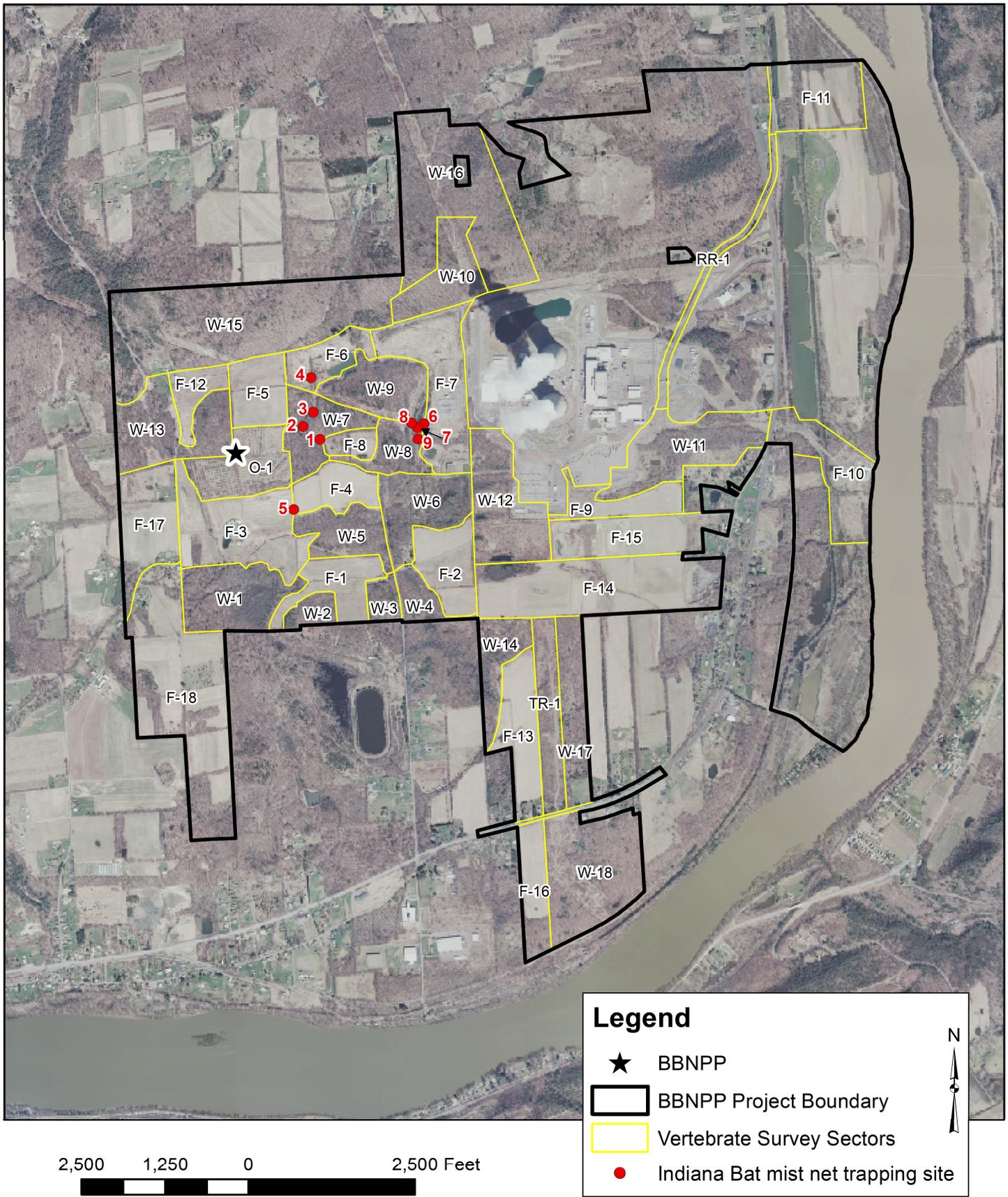
**Figure 5.**

Locations of observations for eight species of frogs and toads on the BBNPP site, May through September 2008 and May through June 2010.



**Figure 6.**

Locations of observations for seven species of salamanders on the BBNPP site, May through September 2008 and May through June 2010.



**Figure 7.**  
Locations of mist net sites used for the  
Indiana Bat mist net survey at the BBNPP site,  
June and July 2008.

## APPENDICES

### NOTE:

The original OCA (Owner Controlled Area) shown in Figures 1 through 5 of Appendix A was changed subsequent to completion of the 2008 field study. The revised boundary, BBNPP Project Boundary, is shown in Figures 2 through 7 of main body of the report. The original OCA has been retained in Appendix A because it was the boundary at the time of the survey.

## APPENDIX A

### REPTILE AND AMPHIBIAN SURVEY AT THE PROPOSED BELL BEND NUCLEAR POWER PLANT SITE, LUZERNE COUNTY, PENNSYLVANIA, MAY THROUGH SEPTEMBER 2008.

By Rudolf G. Arndt, Ph.D., September 2008

#### INTRODUCTION

Reptile and amphibian survey work was done at the proposed Bell Bend Nuclear Power Plant (BBNPP) site, Luzerne County, Pennsylvania, between May 21 and September 7. The purpose of the survey was to determine the presence or absence, relative abundance, and distributions of amphibians and reptile species at the BBNPP site. Consideration was given to the presence of Pennsylvania-listed endangered, threatened, and species of concern, and to their habitats. A total of some 213 hours was spent in field searching on the site during eight multiple-day visits during the survey periods. This survey formed a part of a much larger survey of wetland, plant, mammal, bird, and butterfly species, and prior Amerindian and historical occupation, to identify and characterize the biological and historical history and value of the site. Some of this earlier work was done by other persons in 2007 and on other dates in 2008.

The site was divided into 33 vertebrate survey sectors, based on habitat type (forest, field, orchard, etc.) and topographical features (roads, transmission lines, stone walls, etc.) (Figure 1). The site has been continuously occupied by humans for probably about 4,000 years, first and mostly by paleolithic Indians, then by modern Indian tribes, and most recently, and for the last 200 years or so, by settlers and farmers, these last who no doubt had the greatest impact on the landscape. Historically, and recently, what made the site attractive was the gentle topography, absence of abundant surface bedrock, and the productive soils. Thus, there is probably not a square foot of the site that has not, at one time or another, and probably frequently, been logged, clear-cut, rock-cleared, farmed, dammed, built-upon, or otherwise disturbed by humans. Evidence of human disturbance and occupation are everywhere: farm fields, fallow farm fields, secondary forest, house and barn foundations, abandoned orchards, stone fences, barbed-wire fences, farm gates, paved roads, dirt roads, man-made ponds, etc.

Nevertheless, the original habitat can still be identified. Much of the site is forested, mostly with mature deciduous forest. There are numerous wetlands of several types, including several streams, marshes, and man-made vernal and permanent ponds, much of these located in forest; and some of the streams and marshes are located in active/now inactive farmland. There is considerable wetland forest. Some forest is located on the flood-plain of the Susquehanna River. Some of the site is in fallow fields. Several larger and smaller man-made ponds, created to water former livestock or to reduce or prevent flood damage, are evident. Several areas where slate rock was quarried are present. The area assigned to be surveyed consists of well over a thousand acres.

Many additional acres were added to be surveyed near the end of this survey period as described above. Most of these latter acres are of open and scraped active quarry; of active farmland planted in corn; and of heavily man-disturbed former cropland now in the early successional stages of reverting back to forest. A rapid survey of these indicates that they are expected to contain few additional amphibian or reptile species.

Common and scientific names of species used herein follow those used in Conant and Collins (1998). On locality maps, one dot can represent one specimen, two, and in some cases, many (up to dozens).

## METHODS AND MATERIALS

The survey work can be divided into six categories.

- 1) Most sampling was by random opportunistic searching. In this, for terrestrial reptiles and amphibians, I walked through much of the site to search for specimens and for habitat by looking for basking and foraging individuals, as well as by searching for individuals hidden in and under shelter such as logs, old boards, rocks, old sheet metal, under dead grass, by breaking open rotten logs and stumps, etc. I used the techniques appropriate to certain weather conditions and times of day to find certain species: for example, basking turtles were searched for after the early morning hours and on quiet and sun-lighted days, and frequently with the aid of binoculars. The same was true of snakes, but while a hot afternoon in June and July would be suitable to find turtles, it was often deemed to be too hot to find basking snakes, so snakes would be searched for earlier or later on such days, or on cooler days. Aquatic amphibians could be searched for on the edges of bodies of water during “nicer” weather, as well as by dip-netting in ponds and streams in all types of weather. This work basically required much walking and turning and probing and ripping (into rotting logs and stumps), and in places that corresponded to the various habitat requirements of different species.
- 2) In order to enhance the possibility to discover organisms that are known to seek shelter on land (which includes snakes, lizards, turtles, frogs, toads, and many species of salamanders—essentially, almost all species), I placed out in selected areas a total of 34 pieces of wood (often known as coverboards and “suckerboards”) under which individuals of many reptile and amphibian species might seek shelter, whether it be from high or low temperatures, rain or sun, predators, or as sites at which to find food. These boards were examined at opportune (for the surveyor) times for what might be underneath. Since animals that might be attracted by such boards could come and go at will, such boards did not have to be examined on a specific schedule. Generally, they were examined about once every two days. The wood was of different types, mostly of plywood, and ranged in size from pieces of 8 feet by 4 feet to about 18 inches by 20 inches, and of a thickness of about 1 inch to about ½ inch. Basically, they were pieces of scrap wood that were available for the survey and which we could transport readily to the site. Boards were placed out on 4 and 5 June in seven types of habitats in areas O-1, F-1, F-3, F-6, W-3, and W-8 (Figure 1).
- 3) In order to sample in marshy and aquatic habitats, we constructed some 30 traps of thin-gauge screening, of which 24 were to be placed in runways or rivulets in marshes; such runways or rivulets are frequently or sometimes used by organisms as travel routes. These were deployed largely on a trial basis. Six traps were kept in reserve, in anticipation of some traps being lost or damaged. I discovered upon later and more detailed familiarity with the site that such specific types of habitat (meaning rivulets) did not occur (as it had in earlier surveys I had done), but I placed the traps out anyway. Traps were placed in marsh or ponds

in areas W-8, F-7, and W-12 (Figure 1). Each trap was about 12 inches long by 5 inches wide and 4 inches high, with 1/4 inch mesh, and with a swinging door hung from the top of each end of the trap; each door was about 1/2 inch higher than the trap and when set the door bottom leaned into the trap. The trap was placed where an animal might walk and push or swim through vegetation, not knowingly encounter a door, keep on moving, and, with the door so light that there was little resistance, the animal enters, and the door then swings down behind the animal. The animal cannot go forward through the door ahead, and it cannot back out or turn around to escape through the entry door, which has now swung down and closed from the inside. The trap is not baited, and is set so that the top of the trap is always above water so that an animal has access to air. This type of trap depends only on a moving animal walking into it and is easy to make, transport, set, maintain, and to empty. In previous work, with such a type of trap, which was set in bog turtle habitat, I captured organisms as diverse in size, weight, and biology, as crayfishes, frogs, turtles, and jumping mice. Traps were first placed out on June 27, and examined the last time on the morning of July 18, after which they were removed. They were examined for organism contents on the beginning and the end of each day they were out. Minor repairs, if necessary, were then also made to the traps in order to keep them functioning properly. All traps were removed at the end of each 2-4 day period on which I visited the site for field work.

- 4) Another method to discover reptiles and amphibians was by searching roads for live or dead individuals. Many species are known to prefer to not cross roads, but roads are not a real barrier to any species (of which I am aware) as some individuals, at least at some time or another in their life-history or life, cross roads. Many other species, however, are known to be attracted to roads, especially to take advantage of the possibility to thermoregulate (pick up warmth from the road), especially since many roads accumulate heat from the sun during the day and then release it slowly as the air cools in the evening, at night, or during a rain. Individuals of many species can simply be found much more readily when in the relative open of a road than in their normal forest or field habitats. Little-used, blacktop or similar, clean roads are the easiest to search and the most productive; heavily-used, blacktop or similar roads in very poor repair, and dirt roads, are the opposite. The roads on the site frequently traveled were of the former type. Thus, whenever I drove to the site trailer to sign in or out for the workday, or to leave the site for meals, or to move from one area of the site to another for searching activities, I always carefully observed what I might find on the roads, dead or alive. Likewise, I asked other workers on this overall project to advise me on what they might have observed on the roads and, if possible, to bring me documentation (for example, photographs, dead specimens, etc.) of this.
- 5) Another way to obtain data was by enlisting the help of other individuals that worked on, or were otherwise familiar with, the site. Thus, I asked other Normandeau employees (primarily Charlie Dix, Keith Maurice, Becky Smith), the site managers (Chuck Thompson, Lindsay Stutzman, Steve Finch), and site archeologists (Terry - "Butch"- Newell and his student workers), for information that they might obtain/have obtained in the routines of performing their normal tasks. All were happy to cooperate. Also consulted were local police whom I met on the site, and one long-term resident on the site. This yielded some additional data. Their hours of effort are difficult to quantify and to add to the hours of effort by the author, but their hours and contributions are significant.

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- 6) Consulted were published books and reports and other for information on what species might occur on the site or adjacent. Particularly helpful were Conant and Collins 1998, Reptiles and amphibians of the central and eastern United States, Third Edition, Houghton Mifflin Co., Boston. However, although such publications provided guidelines, the greatest emphasis was placed on the results of groundtruthing the site.

Unless specified otherwise, all dates given in this report refer to the year 2008.

### RESULTS

A total of 27 species of amphibians and reptiles were recorded as occurring on the site, or adjacent. Fifteen species were amphibians, of which eight were toad and frog species, and seven were salamander species. Twelve species were reptiles, of which five were turtle species, and seven were snakes. These species are listed in Table 1.

All these are species that have large and what are referred to as continental distributions, and all are found in large portions of North America. Further, all are widespread throughout the northeastern United States, including large portions of Pennsylvania. None has highly specialized habitat requirements, although those with the most-specialized habitats, the longtail salamander and the northern red salamander, require cool, clean, unpolluted waters, and the common map turtle is restricted to large rivers. Some of the total group of species are extremely adaptive and have been introduced into exotic habitat or have survived the man-made alterations of their natural landscape to survive in man-altered habitat (e. g., farm ponds, man-made lakes, urban environments) within their former natural ranges where they are doing extremely well (e. g., bullfrog, green frog, snapping turtle, eastern painted turtle, eastern garter snake, northern brown snake), and at least one species (bullfrog) into areas outside of its former natural range where it is doing well and often has even become a serious pest, i.e., a competitor with native species.

Most of the 27 species usually occur in large numbers where high-quality habitat is present. Many of these species could be found in abundance on the site, especially in their early life-history stages, namely their eggs and larvae (tadpoles) (e. g., eastern American toad, northern gray treefrog, green frog, red-spotted newt, eastern painted turtle), and the adults of some species could be heard calling by the dozens (e. g., northern gray treefrog, green frog, and spring peeper, the last of which calls in the spring, before I was on the survey, but was so reported to me by a co-worker). However, most reptiles and amphibians, especially the smaller species, survive by making themselves highly inconspicuous (by which they avoid aerial and terrestrial predators, and are also in turn able to closely approach their food), so that by definition, their observed numbers are rarely large, although they most likely are indeed numerous (as based on author observations elsewhere and on published studies). Further, a few of these species (e. g., the longtail salamander and the northern red salamander) are highly secretive and occur in wetlands types in which it is usually difficult to assess their numbers.

The secretive nature of many of these species is accentuated by their usually nocturnal behavior, especially in the warmer months, and by their being most active in rainy weather (e. g., almost all the amphibians listed, as well as the eastern milk snake), or when they become almost inactive (and thus extremely difficult to find) during hot and dry weather (e. g., many of the amphibians listed, and most of the reptiles). As previously mentioned, much of the soils of the area are highly productive.

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This means that as the growing season progressed, the vegetation, especially of fields and marshes and wetlands, grew rampant and made effective searching for specimens extremely difficult. Some species, especially amphibians, can be found readily only during the period in which they concentrate at certain ponds for the purposes of reproduction. At this time, they may travel relatively large distances, some coming up from underground in order to do so, and some then making themselves conspicuous by loud species-specific calls. In our region of the world, most do this in the spring, and under certain weather conditions, usually during or after heavy rains, and mostly at night. Knowing where and when a given species is likely to reproduce is very important, for otherwise their existence in a given area may not be revealed, even to the generally observant person. Actual reproduction by most such species had already occurred by the time I stated on this project. However, another Normandeau employee did spend some time searching in earlier months, during the appropriate times. Species accounts and distributions follow.

Northern cricket frog (Figure 2.) – in November 2007, Enn Kotkas heard what was apparently one individual of this species calling in Walker's Run in the West-Central portion of area W-1, and another individual at the bridge on this creek where it crosses N. Market Street near the far NW corner of Area F-3. The species is probably more common and widespread on the site.

Eastern American toad (Figure 2.) – several adults of this species, numerous tadpoles, and some recently-metamorphosed individuals were noted at several widely scattered localities on the site. Adults were seen on 6/6, 6/29, 7/16 (the last one was an old dead road-killed specimen in very poor condition), and one subadult on 9/6. Tadpoles were noted at two other localities on 6/20 and adjacent dates, and recently-metamorphosed young were noted very near the two localities at which tadpoles were seen, and on the same dates, and also on 8/21. Jayme Schaeffer mentioned seeing several adults on the site, but I do not have specific localities or dates. The species is probably widespread on the site.

Northern gray treefrog (Figure 2.) - this species was heard to call at numerous localities widely-distributed on the site as shown on the figure, and on most dates of my visit. Specific hearing dates for it were 5/29, 6/4, 6/5, 6/17, 6/19, 6/26, 6/27, 6/28, 7/14, 7/16, 7/17, 7/18, 8/19, 8/22, 9/5 and 9/6. It is tied with the green frog for having the greatest number of localities for it on the site. Several of the vernal and permanent bodies of water on the site contained its tadpoles, often in abundance. Calling adults could be heard at any time of the day or evening, and are usually most vociferous during or after rain, especially heavy rain. The incidences of its calling appeared to decrease after mid-July. Since it calls from up in trees, and usually becomes silent as a calling-site is approached, it is difficult to capture, although it is readily identified and located by its call.

Northern spring peeper (Figure 2.) - one young frog was found on 8/21 by Becky Smith, I heard several calling on 9/6, and I found one young on 9/7. Enn Kotkas told me that he heard this species calling commonly throughout much of the site, mostly in lower-lying and wetter forest and also in some adjacent and more dry forest, in late October and November 2007; these records are not plotted because specific localities are not available. This is usually an early-spring breeder, when its calling, often in choruses of hundreds or thousands of frogs, makes it highly conspicuous; after breeding, the species seems to disappear.

Bullfrog (Figure 2.) – this species is moderately common at several localities on the site. Observation/hearing dates for it, all of adults, were 5/29, 6/4, 6/5, 6/6, 6/20, and 7/17. Because it is

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difficult to catch, and easy to confuse with the green frog at a distance, its occurrence on the site is probably underrepresented in the figure. It is widespread in North America and has been widely and unfortunately highly successfully introduced outside its natural distribution.

Green frog (Figure 2.) – this species was observed/heard at a large number of localities on the site. Specific dates of such were 5/29, 6/4, 6/5, 6/6, 6/19, 6/20, 6/26, 6/27, 6/28, 7/14, 7/16, 7/17, 8/19, 8/20, 8/21, 9/5/ and 9/7. Most of these records are of adults and of subadults, and only a few tadpoles were observed. Visually, this was the most ubiquitous amphibian and reptile on the site. The green frog occurs in meadows, marshes, woodlands, on pond, lake, and canal edges, in barren gravel pits, dirt-road pools, and generally any habitat with water, or with water nearby. It has a large distribution in eastern North America and it is usually a common species.

Pickerel frog (Figure 2.) - I have only a few records of this species from the site. Two adults were seen in a small marsh just below the “Beaver Pond” on 5/29, three just-metamorphosed individuals were seen on the edges of a (usually vernal) pond some 400 feet downstream of the previous site on 7/16 and 7/18, one adult was seen in a puddle in south-central area W-12, one adult was noted in a small pond in a corn field near the center of Area F-4 on 8/21, and one adult was noted in a marsh below the beaver dam in the northeastern part of area W-8. More search effort would probably reveal that it is more common and widely distributed on the site than is shown. It has a large distribution in North America, and is usually common in clean, clear, cool water, be it in springs, meadow streams, and woodland streams.

Wood frog (Figure 2.) - I have one record of this species from a Normandeau colleague, taken in April 2008 in Walker’s Run at a point in the NW portion of area W-1, and I observed four more adults on 22 August in the SW portion of area W-12 and in the NW part of new Section No. 100, several adults in the woods along Walker’s Run a short distance north of Beach Grove Road and E of Stone Church Road, and in the stream valley in the central portion of area W-10, those at the last two sites on 9/5, 9/6, and 9/7. A search for it earlier in the year would probably reveal it in much greater abundance as apparently ideal woodland habitat for it is common on the site.

Northern dusky salamander (Figure 3.) - some six specimens, all adults and subadults, were captured under rocks in a small stream in a heavily shaded glen on 7/17 and several other individuals were seen there, and about 10 adults were seen in the stream bed in mature deciduous forest in the center of section W-10 on 9/5 and 9/7. It probably occurs in other permanent and cool-water stream habitat on site. It is a widely distributed species and a usually common species in North America.

Northern two-lined salamander (Figure 3.) – this species was found as both larvae and adults. A few larvae were captured by Normandeau aquatic biologists while electrofishing in Walker’s Run on the gravel by the bridge to the site trailer on 7/14, an adult was captured there on an unknown date in May or June 2008, several more were captured further upstream in this creek on 8/21 and 9/5 in the newly acquired lands, and four adults were noted on 7/17 in a clear, cool, rocky woodland stream (the ideal habitat) located just S of the main access road to the generating station from Rt. 11. It is usually very active, and thus can be difficult to capture and identify. It probably occurs in other clear, cool, stream habitat on the site. It has a large distribution in the United States and it is usually common in appropriate habitat.

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Longtail salamander (Figure 3.) - one adult about 6 inches (14.0 cm) in total length was found under a log on the edge of a small marsh in NE portion of W-8 on 5/29, another adult was found nearby on 8/19 under some rubber matting inside a very large metal pipe with a bit of water inside it, and several more adults were found on 8/21 and 9/5 under stones along Walker's Run near the extreme NW corner of the site, on the newly acquired lands. This species is highly secretive, usually nocturnal, and often difficult to find.

Redback salamander (Figure 3.) – this completely terrestrial salamander is represented on site by both the red-backed and the lead-backed color phases, but only a few individuals, all adult and one sub-adult, were found, and these at widely-distributed points on the site. Capture dates were 5/22, 5/29, 6/18, 7/17, 8/21, 9/5, and 9/7. It is probably much more common on the site than is represented by the few records presented as appropriate woodland habitat is common. This species had a large distribution and it is usually common where it occurs.

Slimy salamander (Figure 3.) - I found one juvenile of this salamander under loose bark of a downed tree near a small stream in central area W-11 on 8/20, and several adults in the woods of central portion of area W-10 on 9/5 and 9/7. It is secretive and nocturnal, usually hiding under wood or stones, and is no doubt more widely distributed on the site.

Red-spotted newt (Figure 3.) – found was one land stage (red eft) immature individual on 6/18 under an old railroad tie. numerous aquatic larvae in one vernal on 6/27 and 7/16 and one red eft here on 9/7, numerous adults in one permanent pond on 7/16, and one red eft where Walker's Run enters the woods at the border of area F-3 and W-1 (summer 2008). It probably occurs in other quiet and slow waters on the site, and the red eft, which is the dispersal phase in the life-history of this species, under appropriate conditions, can be expected to be found moving overland in any wooded habitat on the site, especially after a rain. It is a species with a very wide distribution and where found it is usually common to abundant.

Northern red salamander (Figure 3.) – one adult of this species was found on 6/19, under a coverboard in the same small marsh with a long-tailed salamander in NE area W-8; another adult under a small log next to Walker's Run on 8/21, and another adult under a stone next to a tiny creek on 8/21. This species is usually secretive and occurs burrowed in or otherwise well-hidden in the substrate of clear and clean marshes and mud, and thus is difficult to find. Overall, it has a wide distribution.

Snapping turtle (Figure 4.) – several adults, subadults, and one juvenile were found at several widely-distributed points on the site: some individuals were basking on logs (1 adult and 1 subadult 5/29, 1 subadult. 6/18), some small adults were discovered in water 6/20, 7/16, 9/7, one juvenile was caught in a trap on 7/18, and one large individual was found dead on 6/18 on Route 11 approximately one mile from the SW corner of the site. I have one more record of it, of a “small” snapper, from the archeologists, and another of a female digging a nest just before 5/31 in a field, but sighting dates and places are not exact and thus cannot be mapped. The species spends most of the time in the water and, although it reaches a large size, is thus not readily seen. It is no doubt more widely distributed and common on the site than these records indicate. It is widely distributed in North and Central America, and where it occurs, it is usually common.

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Eastern painted turtle (Figure 4.) - this was the most common turtle on the site and at one time and in one small man-made pond on 7/16 an estimated 200 heads of this species were seen poking out of surface duckweed; this species could be seen on every visit to Beaver Pond basking on logs and rocks; it occurred in the pond just S of the site trailer; one sub-adult was captured in a trap in a small man-made vernal pond near the West Building; the species was common in the canals and ponds in the SE portion of the site near the Susquehanna River and where some six nests were found on 6/18; one was seen in a barren moon-landscape of an active quarry just S of area F-9 (Figure 1); and one was crossing Beach Grove road near “Bullfrog Pond” in area F-6. Overall, I have dates of observation of it from 5/29 to 9/5. This subspecies has a large range in the eastern United States, and the species is distributed from the Atlantic to the Pacific coasts of North America.

Wood turtle (Figure 4.) – at least two adults, and possibly up to four, were noted in this survey. Two, possibly three (one individual noted by RGA might have been the same individual shown to me in a cell phone photograph taken by the site manager, or it might have been another individual—the quality of the photos did not allow positive identification), were noted in and near Walker’s Run in the general vicinity of the site trailer, and one (properly identified?) was noted by an archeologist to cross Beach Grove Road near “Bullfrog Pond” in area F-6 (Figure 1). Dates of observation were 6/1, 6/4, 6/25 and 6/27. In addition to the previous records, Mrs. Hummel, the landowner nearest the junction of Beach Grove Road and N. Market Street, near the NW extreme of the site, told me she saw wood turtles crossing Beach Gove Road at the Walker’s Run passage there frequently over the years. This species hibernates in winter in a creek such as Walker’s Run, and then forages and reproduces in adjacent woods and meadows in the warmer months. Where most of the specimens were found on the site is “classical” habitat for the species.

Common map turtle (Figure 4.) – one adult female was found dead on Route 11 about 1.5 miles from the SW corner of the site on 6/18. This river-dwelling turtle is expected only in the main-stem of the Susquehanna River, except for females, such as this one, on several days of the year, that had moved up a high and steep river embankment and then along a dirt road and then onto a highway, for a total distance from the river of at least 600 feet, in an effort to find a suitable nest site. The dead animal was large and measured 8.1 inches (20.7 cm) straight-line carapace length (and with extended head and legs it appeared even larger), and when I first noted the carcass, as I was rapidly driving by it, I believed it to be a dead snapping turtle. Only the next morning, when I drove past it again and then stopped and returned to examine it, did I discover that it was a map turtle. It contained at least seven eggs (the carcass and some eggs were smashed) that were ready to be deposited.

Eastern box turtle (Figure 4.) - four adults of this terrestrial species were found at widely-distributed parts of the site, on the dates 5/22, 6/5, 6/17, and 9/7. All were found near or on the edges of open fields, or in a field. I have one more record from the archeologists on site, but sight dates and places are inexact and thus cannot be mapped. The juveniles and sub-adults of this species are known to be very difficult to find because they are so secretive, the adults much less so, but in an area such as much of the site, with luxuriant vegetation in the mid- to late-summer, even adults can “disappear”, and hot and dry weather results in it to aestivate. This is a widely-distributed species in North America. While still common in many areas, it is becoming less so as its needs conflict with the increasing human population.

Northern black racer (Figure 5.) – six adults of this species were found, at widely distributed parts of the site, all in open, grassy areas, on the dates 5/22, 6/4, 6/6, and 6/28 (two of these snakes were

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found on more than one date), and one dead-on-road hatchling on Beach Grove Road on 8/21. Four adults were found in proximity to each other: two of these probably hibernated near each other, two were sheltering under the same small area of patio blocks by the West Building; and two others were crossing Beach Grove Road about 200 feet apart just N of the two cooling towers and moving in the same direction. This is a common and widely-distributed snake, and still often survives in proximity to people, such as on popular barrier islands and near farm buildings. It can probably do so because it is highly alert and can readily evade humans, and because it is a generalist feeder.

Eastern milk snake (Figure 5.) – records of four live specimens of this colorful species were obtained, one a 2007 hatchling alive on Beach Grove Road on 7/16, one a 2006 hatchling under a stone on a powerline right-of-way on 6/5 (where I had been tipped off to the possible presence of a snake by finding a shed skin under that same stone a few days earlier), one adult at a farm house at the junction of Beach Grove Road and N. Market Street in summer 2007, and another adult at the edge of the latter road on 5/30. A dead-on-road young snake was found on the edge of N. Market Street and near the junction with Beach Grove Road on 9/5. The owner of a home and out-buildings here, Mrs. Hummel, described snakes she had seen here over the years, and they must have been milk snakes. This species is common in man-disturbed habitat, and especially near and in barns, foundations of occupied homes, and foundations of old and abandoned homes. These structures provide shelter and usually indicate the presence of small mammals, a major food.

Northern water snake (Figure 5.) – this is a species that I had expected more commonly on the site, given how much suitable-looking aquatic habitat is present and my efforts searching in such habitat. However, I have records of only four specimens, all adults, on the site, and by two sets of individuals and myself. One snake was seen swimming in the pond some 150 feet S of the site trailer on 6/17, one was taken by a fish-shocker in “Beaver Pond” in the SE part of area W-9 on 7/14, one was taken by such a shocker in Walker’s Run in the NW corner of area W-1 on 7/14, and one was found under a rock on near Walker’s Run in the newly-acquired land on 8/21. This is a widely-distributed species in much of eastern North America, is usually common, and is common in man-made and man-disturbed areas, such as ponds, lakes, dams, dykes and other retaining walls, etc., where it feeds mostly on fishes, frogs and tadpoles.

Eastern ribbon snake (Figure 5.) - one adult of this snake was reported to me seen in summer 2008 by Chuck Thompson from the pond just S of the site trailer .

Eastern garter snake (Figure 5.) – this was by far the most common and widely-distributed snake on the site, and a total of about 25 different individuals were found, some of them at the same sites repeatedly over a period of several day and doing the same things (exposed and basking or hiding under bark—I got to know some of the snakes and their behavior with predictability). The dates of capture or observation ranged from 5/22 to 9/7. Snakes ranged from young-of-year individuals born in 2008 to adults; as a group they were found basking in stone walls, hiding under rocks, under sheets of plastic, under loose bark of fallen trees, basking on fallen tree trunks, basking on rocks next to a marsh, alive on paved roads, dead on paved roads, in open sunlighted areas (fields), and in mature mesic wood habitat. This species has a large distribution in the eastern North America, and is common even in urban areas such as New York City in parks and in vacant lots, in backyards in suburbia, and in farmed areas. Its relatively small size and food of earthworms and frogs and tadpoles facilitate such lives.

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Northern brown snake (Figure 5.) – four adults of this species were found on the site: one under dead grass next to a small stream in a sunlit wetland on 5/29, two under loose stones of a stone wall within inches of an adult garter snake on the edge of Confers Lane on 6/18, and one under bark of a large dead tree in a moist field in area 100 on 8/20. The adults are about 11 inches (4.3 cm) long. This is a very widely-distributed species, and it occurs commonly in urban and suburban areas, where its small size and camouflaged coloration easily conceal it, and its food of worms and slugs is usually common. It is no doubt widespread and common on the site.

Northern ringneck snake (Figure 5.) – three adults of this species were found, both in mature mesic forest, one near the center of area W-10 among old truck inner tubes next to a paved road on 9/5, and two under adjacent stones on a forested slope on the E side of the valley of Walker's Run (in newly-acquired land) on 9/6. All were of approximately the same total length, and the one that was measured was 39 cm long.

## DISCUSSION

Additional species of amphibians and reptiles can be expected to be found on the site. These include, especially, smooth green snake, *Opheodrys vernalis*; northern red-bellied snake, *Storeria o. occipitamaculata*; and black rat snake, *Elaphe o. obsoleta*. Suitable habitat for these species, and the site is well-within the distribution of all, appears to be present. Perhaps further searching will reveal them to be here. All are widely-distributed and usually common species, and none is a species of concern in Pennsylvania.

Other species that occur generally in this area of Pennsylvania include the timber rattlesnake, *Crotalus horridus*. I found no suitable habitat, such as rock ledges, rock and boulder slides, and relatively wild forested habitat, for this species on site. Further, the long agricultural and other human-occupation history of the site suggests that if the species did once occur, it has by now long been extirpated. The same comments can be made locally about the northern copperhead, *Agkistrodon contortrix mokasen*. Typically, long after such serpents have been extirpated from an area, rumors of their existence there still persist, and I have no indication of even rumors referable to the survey site.

The eastern hognose snake, *Heterodon platyrhinos*, can be expected to occur locally. No specimen was found. Usually, population density of this species in habitat as occurs on the site, if the species indeed occurs, is low. More optimal habitat for it would be areas with more sand and with a higher population of toads, which are its almost exclusive food. Because of the spectacular anti-predator behavior display of this species, with spreading neck hood, hissing, and mouth-gaping, its presence in an area is usually known by local persons, and the presence of the snake on the site would be known (probably exaggerated). So, far, such was not recorded, which makes me believe that the species is absent from the area, or highly uncommon.

According to Conant and Collins (1998), the redbelly turtle, *Pseudemys rubriventris*, does not occur this far away from south-eastern Pennsylvania, along the Delaware River, the only area in the state from which it is reliably known as occurring naturally. When adult, this turtle is large and this, along with its conspicuous basking behavior, make it relatively noticeable. No redbelly turtle was noted in this survey, nor is likely to be. If it should be found in the area, which is highly unlikely, it would be as a result of introduced (released or escaped) individuals.