Herpetological Survey and Vernal Pool Analysis with Conservation Planning Recommendations and Strategies

"The Preserve"

Old Saybrook, Westbrook, and Essex, Connecticut

Michael W. Klemens, LLC
68 Purchase Street, 3rd Floor, Suite 2
Rye, NY 10580

October 26, 2004

Materials and Methods

The documentation of amphibians and reptiles is a labor-intensive and highly specialized activity. Although many common species are readily found, secretive species often require specialized search and detection methods accompanied by an in-depth understanding of each species' predicted activity patterns and movements over both daily and seasonal activity cycles. This requires the deployment of a variety of different capture techniques and strategically spaced field investigations at different times of year and different times of the day. In addition, one must be prepared to maximize field activity and unique moments of weather opportunity, particularly during spring and early summer nocturnal rainstorms.

A variety of capture techniques for amphibians were used; these are outlined in Klemens (1993: 11-13 [appended to this report]). Hand-collection was an important method of capture. This type of collection is most successful during early and mid-morning hours when reptiles are basking. However, during early spring and early autumn days or during cool and damp weather, specimens could be found throughout the day. Logs, rocks, and debris were lifted and carefully replaced. Debris turning was the principal method of detection for adult and subadult marbled salamanders and many of the small snakes found on The Preserve. Depending on the size of objects, the team of three herpetologists turned and replaced between 100 and 175 cover objects per hour. This means that on an average day of fieldwork on The Preserve, as many as 1000 cover objects had been moved and replaced. The level of intensity of work represents a level of effort rarely expended on most studies of this type and is directly responsible for the rich dataset of species occurrences.

Turning of moss and rocks in streams and seepage areas yielded salamanders and their larvae. These were often captured with the aid of a small net or scoop. Driving slowly or walking along roads in wet nighttime weather yielded large numbers of amphibians, especially during the spring or autumn. Unusual or secretive species were often observed in numbers on wet roads. Although there are no paved roads within The Preserve, we extensively sampled the paved roads that bordered the site. Roads bordering wooded swampland were particularly productive.

Dip nets of various sizes were employed in a variety of ways – turtles and frogs were captured by placing the net in front of fleeing animals, or by scooping up mud or aquatic vegetation into which these animals had retreated. Sweeping a dip net through the water while standing at the edge of a vernal pool or pond captured larval amphibians and newts. Unbaited minnow traps were used to collect newts and Ambystomid salamanders. Baited turtle traps consisting of metal hoops covered with one-inch nylon mesh with a single funnel opening, were very effective in sampling aquatic turtles particularly in the detection of spotted turtles (*Clemmys guttata*) in vernal pools. Road kills were an important source of reptile information. The site's database for ribbon snake (*Thamnophis sauritus*), black rat snake (*Elaphe obsoleta*) and spotted turtle were augmented by road kill specimens.

two conditions were rated as Tier Two. Calhoun and Klemens (2002) uses an objective, scientifically determined scoring system to arrive at the Tier level.

Results I: Herpetofaunal Analyses

SALAMANDERS

Spotted Salamander (*Ambystoma maculatum*) – Map 3

The spotted salamander is Connecticut's most common mole salamander, widely distributed throughout the State. None-the-less, it is declining in many areas because of the loss of upland habitat surrounding its breeding habitats (Klemens, 2000). Vernal pool species such as the spotted salamander require that 75% of the upland habitat (defined as 750 feet from the high water level of the vernal pool) remain intact (Calhoun and Klemens, 2002). Spotted salamanders breed in March and April. The distribution of the spotted salamander is shown on Map 3. Breeding pools, confirmed by the presence of eggs and/or larvae are indicated as diamonds. This species breeds in the southern end of Pequot Swamp Pond. Terrestrial observations of spotted salamanders are shown as circles. One should note that the majority of terrestrial observations fall within the outer red lines encircling the breeding (= vernal pools). This outer line corresponds to the 750-foot limit around the pool, supporting the need to conserve upland habitat as described in Calhoun and Klemens (2002).

Marbled Salamander (*Ambystoma opacum*) – Map 4

The marbled salamander is widespread in Connecticut, but most commonly encountered in low-lying areas of the coast and Central Connecticut lowland. It is scarce/absent from areas above 900 feet in elevation. It is much less frequently encountered than the spotted salamander. This is due to its more limited geographic distribution, but also its reliance on long-hydroperiod vernal pools. Marbled salamanders are quite widespread on The Preserve; in fact the concentrations of this species are quite unique to the site. This is because of a convergence of factors including its geographic location, forest cover, and dry, friable soils. However, the most important attribute of The Preserve for marbled salamanders is the abundance of long-hydroperiod vernal pools on the site. This is because almost all of the vernal pools at The Preserve are of the type Calhoun and Klemens (2002) classified as cryptic vernal pools. These are pools imbedded in larger swamp systems, and as such, tend to hold water for longer periods of time than do classic vernal pools, which are stand-alone depressional basins in the forest. Map 4 illustrates the distribution of marbled salamander breeding sites, confirmed by congregating adults, larvae, or metamorphs with diamonds. Marbled salamanders also breed in the southern end of Pequot Swamp Pond. Circles indicate terrestrial observation. Unlike spotted salamanders, marbled salamander return to dry vernal pools to breed from, September to October. As with the spotted salamander, most of the terrestrial observations fall within the 750-foot upland habitat zone of a breeding pool. A cluster of terrestrial observations on the western portion of the site, near the Essex/Old Saybrook/and Westbrook town lines, are likely attributable to a vernal pool that lies just off of The Preserve property.

lived adult to roads mortality and collection. Its distribution within the State is centered along the coast and in the Central Connecticut Lowland northward into Massachusetts. It is absent from the western and eastern hills and highlands (Klemens, 1993). Box turtles are long-lived vertebrates, approaching over 100 years, and usually occur in small populations. A total of five box turtles were found on The Preserve. These were measured, tagged, and released. Two turtles were found associated with a stream corridor in Westbrook, two turtles were found in a seasonally wet, cleared log landing in Essex, and a single turtle was found southeast of Pequot Swamp Pond above a vernal pool near Ingham Hill Road in Old Saybrook.

Turtle Mark No.	Sex	Carapace Length	Weight	Age (Years)
L-1	Male	156.0 mm	630 gm	over 25
L-2	Male	154.5 mm	645 gm	25-35
L-3	Male	126.5 mm	335 gm	13
R-1	Female	151.5 mm	640 gm	18
R-2	Female	141.0 mm	530 gm	15

SNAKES

Eastern Worm Snake (*Carphophis amoenus*) – Map 21

The eastern worm snake is a secretive, fossorial species most commonly found in the low-lying sandy areas of the State. Its status is uncertain, but appears to be secure in Connecticut (Klemens, 2000). My research on The Preserve resulted in six stations for this species. Its distribution correlated with areas of ledges and sandy, dry soils. No worm snakes were found in the southeastern portion of the site, though that may be an artifact of collection, rather than a distributional phenomena.

Northern Black Racer (*Coluber constrictor constrictor*) – Map 22

All but one record of this large, active diurnal black snake occurred on the powerline right-of-way, where the management regimes geared toward managing up-growth of woody vegetation regimes create optimal habitat for this open meadow and field species. A single black racer was found at the edge of a mowed field adjacent to the assisted living facility in Essex. Although widely distributed in Connecticut (except the most upland areas), the black racer has become scarce in many areas due to road mortality and habitat fragmentation, and the succession of open habitats to second growth forest. A major den area for this species was identified just to the northeast of Vernal Pool No.1

Northern Ringneck Snake (*Diadophis punctatus edwarsii*) – Map 23

The small, secretive ringneck snake was widely distributed on the site often associated with forested, mesic slopes above swamps, vernal pools, and other wetlands. Records were concentrated on the western portions of the site (W of Pequot Swamp Pond) and in the northeast section of the site along the Essex and Old Saybrook town lines, but other occurrences were scattered across the site. This species is secure within Connecticut.

of the site. As the majority of these pools were contained within a larger wetland system (i.e., cryptic vernal pools *sensu* Calhoun and Klemens, 2002), a separate numbering system was devised for these specialized wetland areas. These are illustrated on Map 2A and discussed on Tables 1 and 2.

Almost all vernal pools with the site can be classified as Tier One pools based on the criteria developed by Calhoun and Klemens (2002).

> These are pools of the highest quality with several obligate species breeding in them, with intact vernal pool envelopes (the zone from the high water mark of the pool up to 100 feet from the pool edge) AND with more than 50% of the associated critical upland habitat intact. One should note that to be rated Tier One the threshold is 50% development or less, however, as design standards for *de novo* development, these authors recommend no more than 25% development within that zone. The difference is between what parameters are required to rate of pool of conservation quality/concern, versus what the best science shows is optimal for the amount of development to be allowed.

However, upon close observation it became clear that it was important to identify priorities among these pools—so that protecting the most productive and diverse pools as part of the site design process would allow them to remain interconnected as stepping stones of biological diversity in the post-development landscape.

These key priority pools are the most important ecological determinant for preservation of the site. The criteria used to define were therefore based on two categories of information: the relative diversity and productivity of species occurring within and around individual pools.

In terms of VERNAL POOL OBLIGATE SPECIES DIVERSITY, even though there are three obligate species found in The Preserve (spotted salamander, marbled salamander, and wood frog), not all species were present in all the vernal pools. Those pools containing all three obligate species were therefore more important.

In terms of VERNAL POOL OBLIGATE SPECIES PRODUCTIVITY, the egg mass counts of spotted and wood frogs in certain pools numbered in the hundreds. These egg mass count data were collected in 2002 (Pawlak, unpublished data). These productivity levels were reconfirmed in 2003. By sheer numbers of breeding adults, larval amphibians, and productivity, such pools were very important to the maintenance of vernal pool amphibians on the landscape, as well as being important to the production of food and energy cycling within the deciduous forest on The Preserve.

The PRESENCE OF VERNAL POOL FACULATIVE SPECIES, such as spotted turtles and four-toed salamanders within a vernal pool ecosystem was also considered to be important and/or the PRESENCE OF STATE-LISTED SPECIAL CONCERN SPECIES, i.e., the ribbon snake and box turtle was also considered to add value to a pool.

Vernal Pool 31: Contains populations of all three vernal pool obligate species. A single eastern box turtle (State-listed Special Concern Species) was found twice within the vernal pool envelope of Vernal Pool 31.

Vernal Pool 7: Contains robust populations of all three obligate vernal pool amphibians, including approximately 342 spotted salamander egg masses and approximately 43 wood frog egg masses. Marbled salamanders and fairy shrimp were confirmed breeding in this pool in 2002.

The following five vernal pools (Nos. 6, 10, 12, 15, 25) rank as "high priority" in terms of wood frog and spotted salamander production. However, marbled salamanders have not been confirmed in these wetlands, though it is likely that this species may also occur is some of these wetlands.

Vernal Pool No. 15: Also contains a population of eastern ribbon snakes (*Thamnophis s. sauritus*) and eastern box turtles (*Terrapene c. carolina*) were found nearby. Both these are State-listed Special Concern Species. More than 205 spotted salamander eggs masses, and more than 105 wood frog egg masses were found in this pool.

Vernal Pool No. 6: This pool contains a breeding population of wood frogs and spotted salamanders as well as spotted turtles. Approximately 110 spotted salamander egg masses and approximately 125 wood frog eggs masses were present in this pool in 2002.

Vernal Pool No. 10; Vernal Pool No. 12; Vernal Pool 25: These pools contain significant documented breeding populations of both wood frogs and spotted salamanders, Marbled salamanders may also be found In Pool 10 based upon the presence of several terrestrial records within the 750-foot upland habitat zone surrounding the pool. Egg mass counts in 2002 were: Pool 10: more than 355 spotted salamanders and 125 wood frogs; Pool 12: 152 spotted salamanders, approximately 75 wood frogs; Pool 25: 139 spotted salamanders, approximately 100 wood frogs.

The following two vernal pools (Nos. 1, 17) are important for spotted salamander production only. However, they have other important attributes that make them high priority conservation areas.

Vernal Pool No. 17: This is a classic short hydroperiod vernal pool. It contains a large population of spotted salamanders (more than 289 egg masses in 2002). Wood frog production was very low in this pool in 2002 and 2003. A spotted turtle was observed basking in this pool in 2003. It is probably the only example of a short hydroperiod classic vernal pool on The Preserve.

Vernal Pool No. 1: This pool contains a large population of spotted salamanders (approximately 330 egg masse in 2002), but is also part of the critical habitat zone encompassing Wetland 17 (of which this pool is part of) and Wetland 16. The ridge between Wetlands 17 and 16 contains a snake den used by black racers, black rat snakes,

tracks. An additional wetland located to the southeast of this wetland, partially off site was not studied. It may also have some vernal pool functions.)

Discussion

The Preserve is distinguished not so much by the diversity of species that occur on site, but rather by the number of sites where many of these species are found or were documented breeding. Therefore, while The Preserve may be only moderately diverse, it has high levels of biomass of individual species. The number of vernal pools and vernal pool obligate species is noteworthy, and presented special challenges in the site design. As a conservationist, I recognize that the best conservation solution for the site would be its protection, but equally important, if the site is to be developed, it must be developed using the best available science to make informed decisions about the location of development and the design and placement of infrastructure. My goal here was to work on the premise that development was going to occur on site, and that it was going to occur using a PRD (Planned Residential Development) and/or conservation subdivision that would allow for significant open space protection.

Under those premises, the Applicant made a commitment to voluntarily design the project using vernal pool data, and to site the open space and protected areas in a manner that was ecologically meaningful. Percent open space is just a number, but my goal was to make that open space part of an ecologically functional system--using best available science both to call out those areas most in need of protection and stewardship, and to ensure that these critical areas were assembled in the landscape in interconnected habitat blocs. And again, those blocs of habitat needed to be connected using animal movement and occurrence data, not some educated guess of where animals may move and what habitats they might use. The site plan presented by the Applicant is a result of that design process, which involved no fewer than 15 design team meetings at BL in which my data was worked through the site design process.

The resulting proposed development protects all documented occurrences of State-listed Special Concern reptiles (i.e., box turtle and ribbon snake). It protects the snake den, all twelve of the highest priority vernal pools, two intermediate vernal pools, and one of the lowest priority vernal pools. In total fifteen vernal pools are conserved (see Map 2B) protecting representative populations of all other amphibians and reptiles that occur on the site. Therefore, although the biomass of amphibians and reptiles will be reduced by the development, viable populations of amphibians and reptiles will continue to flourish on the site in the post-development phase.

The vernal pool conservation plan is the centerpiece of the biodiversity conservation strategy for The Preserve. This plan has created an interconnected area of habitat, with the vernal pool protection zones functioning as stepping stones for wildlife to use to move throughout the open space areas of The Preserve. Development within the 750-foot conservation zone around each of the 15 conserved pools follow the design guidelines set

protection everywhere. From a biological perspective, a little protection does nothing to secure the long-term values of the site. What is needed, and what was done by this Applicant, is to focus development in certain areas, thereby allowing an ecologically resonant, interconnected system of wetlands and forest to remain on site, with sufficient upland habitat intact to allow animals to function in this vernal pool landscape as they have for centuries.

Literature Cited

Calhoun, A. J. K. and M. W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial development in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.

Evans Associates. 1999. Herpetological survey report for The Preserve site: Towns of Old Saybrook and Essex, Middlesex County, Connecticut.

Klemens, M. W. 1993. Amphibians and reptiles of Connecticut and adjacent regions. State Geological and Natural History Survey of Connecticut, Bulletin 112. Connecticut Department of Environmental Protection, Hartford, CT.

Klemens, M. W. 2000. Amphibians and reptiles in Connecticut: A checklist with notes on conservation status, identification, and distribution. Connecticut Department of Environmental Protection, DEP Bulletin No. 32, Hartford, CT