HABITAT ASSESSMENT & SURVEY
for
Wood Turtle (*Glyptemys insculpta*)
Located at
PROPOSED QUINEBAUG REGIONAL TECHNICAL PARK SITE
Putnam, CT

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Abstract

GZA GeoEnvironmental, Inc. (GZA) conducted a habitat assessment and site survey for the Wood Turtle (*Glyptemys insculpta*) in Putnam, Connecticut in support of a proposed development of a 230± acre site of active sand and gravel mining operation, riparian corridor along the Quinebaug River, upland forest and forested wetlands. The study area included all areas within the site and adjacent areas (via aerial photo and GIS interpretation). Two biologists knowledgeable of the habitat requirements of this species spent approximately 30 man-hours surveying the area, taking notes of existing natural community composition, structure and salient habitat features that may be associated with the wood turtle. Two wood turtles were found during the course of the survey, within the Quinebaug River. Additionally, potential habitat for this species was found, both on the site and within natural areas in the immediate vicinity. On site, forage habitat is abundant as the dense early successional field and field edges provide excellent cover and forage for this species. Nesting opportunities are also present, although many are highly compromised from the active mining operation.

Introduction

At the request of the Connecticut Department of Economic and Community Development (DECD), GZA GeoEnvironmental, Inc. (GZA) has conducted a Wood Turtle (*Glyptemys insculpta*) habitat assessment and site survey for a proposed technology park located west of Kennedy Road in Putnam, CT (Figure 1, Locus Map). The CT Natural Diversity Data Base (NDDB) mapping and correspondences indicate that a population of wood turtle is known to occur in the vicinity to this project.

Methodology

GZA biologists surveyed the site relative to potential habitat (nesting, breeding, feeding, overwintering, migration and aestivating) for the wood turtle. Plant community information within the study area was collected and the area delineated into basic natural community types. Evaluation of off-site areas was based on current aerial photos, soils maps, surficial geology maps, limited site observations and
available GIS information. During the course of the survey, visual encounter surveys (VES) were conducted throughout the study area looking for direct and indirect evidence of turtle breeding within the project area (e.g., potential nesting areas on site; direct observation of predated nests, or other signs of nesting). This study was conducted by Mr. Steven Riberdy, MS, PWS, and Certified Ecologist (Attachment A).

More intensive site surveys specifically looking for wood turtle occupancy of the site were conducted in early fall, 2012 (September-October). Survey dates were selected in which air temperatures were >50°F for multiple days, sunny, and occurred between 11am and 3pm. Surveys this time of year are not as ideal as spring surveys, however the initiation date of the project precluded spring surveys in 2012. Fall surveys were selected as this is when wood turtles return to the riverine systems from their diffuse upland distribution over the summer. During this time they are more likely to be within the floodplain areas and along the stream banks. These fall surveys included meander transects by one to three biologists, systematically searching the floodplain areas, banks, shallow in-water areas and any bank undercuts.

In addition, limited in-water surveys were conducted within aquatic habitats and sandy areas of potential nesting habitat identified earlier. These areas were examined to look for signs of nesting and for any depredated turtle nests.

**Study Area Description**

The study area is located on the west side of the Quinebaug River, west of Kennedy Road, in Putnam, Connecticut. The study area is approximately 230 acres in size most of which is located to the west of the Quinebaug River. The area is a mixture of forested riparian areas, open sandy areas and forested upland habitat with interspersed wetland areas. The overall site is situated in a mostly undisturbed area, with low density residential to the west and I-395 to the east, on the opposite side of the Quinebaug River.

**Natural Communities**

The site was surveyed and several distinct natural community and land use types across the study area and adjacent parcels were identified (Figure 2), these include:

- Coniferous Forest
- Mixed Upland Forest
- Maintained Grasslands
- Scrub Shrub Upland
- Forested Wetlands
- Seasonal Pools
- Emergent/Open water Wetlands
- Quinebaug River
- Open Sand

**Coniferous Forest**

Coniferous forest stands are common on site and make up over half the forest cover on the site. There are four sub categories of this habitat type found on site including: monotypic stands of white pine, mixed stands of white pine and hemlock, pitch pine/white pine, and pitch pine/scrublands. For the most part, the coniferous forest types are found on the eastern half of the site, mainly along the river edges with the pitch pine communities found in the areas of undisturbed Hinckley soils. The stands of monotypic white pine are comprised of very dense stands of 60-70 foot white pine, with no understory or groundcover because of the dense canopy. The mixed stands of white pine and hemlock are present along the steep slopes of the Quinebaug River, again with very little understory density or diversity.

Pitch pine communities vary in density and composition across the site. The northern third of the site contains stands of mature pitch pine with some interspersed white pine, with a relatively open understory and groundcover dominated by lycopodiums and Pennsylvania sedge. In the southern extreme of the site, a pitch pine scrubland is developing within a flat sandy area that appears to have been mined over 20 years ago and has now begun to re-vegetate. Small patches of mixed pitch pine-white pine communities are present in flatter, sandier, areas along the Quinebaug River.
**Mixed Upland Forest**

Forested upland communities consisting of primarily oaks and pines are located on the western half of the site, primarily formed on till soils. These mature forest stands are most prevalent in the northwestern portion of the study area with other smaller areas in the central portion of the parcel near the river. This forested community consists mainly of red and white oak with white pine as a common canopy constituent. Other common trees are black birch, white birch, sassafras, white ash, sugar maple and red maple. The understory varies in density and diversity with species such as mountain laurel, highbush blueberry, maple leaf viburnum, hazelnut, witch hazel, lowbush blueberry common in most areas. Ground cover also varies in density and diversity, depending on light and hydrology. Pennsylvania sedge, *lycopodiums*, dewberry, partridge berry, hayscented fern are common groundcover throughout.

**Maintained Grassland**

Located in the central-eastern portion of the site is a flat area of alluvial soils that is farmed for hay. This area is 16± acres in size and consists of a upland field of various forbs and grasses, which is harvested 1-2 times per year. This community of dense herbaceous growth includes common species such as goldenrods, sedges, Queen Anne’s lace, yarrow, clover, plantain, asters, and other common forbs of old fields. The dense nature of the herbaceous growth does not provide any nesting habitat within the field itself however some gravel access roads traverse this field area and provide open soil locations.

**Scrub Shrub Uplands**

Numerous areas of scrub-shrub are present on site and consist of edge areas along forest/open area transitions and early successional areas revegetating from past gravel mining. The edge areas are present throughout the site, mainly around the edges of the agricultural field and gravel mining areas. These transitional communities are relatively narrow (5-30 feet) and consist of densely growing shrubs and sapling trees. Common native an non-native plants dominate these areas including grape, poison ivy, multiflora rose, raspberry, autumn olive, alder, morrow’s honeysuckle, aspen, grey birch, Japanese barberry. Located in the southwest portion for the property is an area of re-claimed mining which is re-vegetating into a pitch-pine/scrub shrub upland.

The dense nature of the plant community precludes any turtle nesting within this area as no sunlight reaches the ground and stem density is such that it diminishes the ability to burrow into the soil. Being near open areas and at the interface of forested and open areas means that some of these areas are highly utilized as cover habitat, particularly during pre-nesting behavior by wood and other turtle species.
Forested Wetlands

Several forested wetland areas are located on site, mostly associated with three distinctive systems, the largest is a forested wetland complex in the central-eastern portion of the site, between the agricultural field and the gravel processing areas to the south. This wetland consists of areas of varying hydrology ranging from seasonally saturated terrestrial wetland to areas of long term seasonal pooling water. Dominant canopy trees include red maple and American elm. The understory is more densely vegetated with highbush blueberry, northern arrowwood and Japanese barberry prevalent. The groundcover is dense with fern and graminoid cover in areas with increased light penetration. A second wetland system is located in the northern most extreme of the site, this system is centered on a perennial stream that drains west towards the east, ultimately to the Quinebaug River. Portions of this stream flow within the till upland and associated upland forested area within a thin wetland corridor bordering the stream. Once this stream reaches the flatter terrain a large open water marsh is formed with the stream continuing past this marsh within a wider forested wetland system ultimately to the river off site to the north. These forested wetland areas are dominated by red maple, with sycamore and big tooth aspen present in the eastern most areas closest to the Quinebaug River. The understory structure is very dense with highbush blueberry, spicebush, winterberry, barberry, northern arrowwood and multiflora rose. A third and smaller wetland system is situated in the southwestern portion of the site on the western most limits of the study area. This wetland is also situated on a stream system and is a medium width red maple swamp bordering this watercourse.

Seasonal Pools

Eight seasonal pools of varying hydrology have been identified on site. All are located within large wetland complexes, (either forested or emergent), with seven of the eight located in the eastern-central area in and around the agricultural field. Some of these seasonal pools are likely vernal pools and some are long hydroperiod seasonal ponds as evidenced by aquatic vegetation, green frog breeding, and hydrology. While wood turtle do not exclusively use vernal pools, they likely provide a food source during late spring and early summer as amphibian eggs and larva develop.

Emergent/Open Water Wetlands

Several emergent and open water wetlands are present on site, the largest being an emergent wetland located in the northern portion of the study site, on a perennial stream that drains from the western upland areas. This system is 3.8± acres in area and dominated by emergent graminoids and cattail, standing dead trees indicate past beaver activity and this wetland was likely a shallow pond at one point in the recent past which has now succeeded to a beaver meadow. Some smaller areas of open water remain in the northern most potion of this wetland. Located within the agricultural field in the central portion of the site are several drainage ditches and isolated pockets of wetlands containing dense forb, graminoid and short woody species.
Quinebaug River

The Quinebaug River flows along the eastern side of the site, flowing in a north-south direction. Through the study area, the river is deeply incised into the surrounding sand/gravel substrate with a flat floodplain shelf located in the central to southern portions of the study area. The river is approximately 75 feet wide at normal flow, with a sandy/cobble substrate over most of its length in the study area. Most in-stream habitats can be classified as shallow riffle, with areas of deeper pools and deep runs also present. There is a high degree of submerged coarse woody debris present in several areas, creating good overwintering habitat where this is present in areas of deeper pools. The banks in the northern portions of the river are steep, particularly on cut banks, where exposed sands and gravels create some turtle nesting areas.

The Quinebaug River provides good aquatic habitat for the wood turtle, which likely uses the river for overwintering habitat as well as a travel corridor and for forage and aestivation.

Open Sand

Approximately 30% of the study site is in an open condition, devoid of vegetation save for early successional weeds that have developed in areas that have been disturbed greater than on season. Most of the open areas are actively being mined or are process areas for the gravel mining operation. The open sandy nature of these areas makes ideal nesting conditions, albeit the quality of the nesting habitat is impacted by the intensity of the gravel operation. Nests laid in active areas are likely not viable. The edges of these areas are less disturbed on a routine basis, and may provide for some successful nesting. Smaller pockets of open areas are present along the river (on high sand bars) and within the coniferous riparian forest where tree falls have created canopy opening on the steep, east facing slope.

Habitat Context

Overall, the study area a large, 230± acre habitat block made up of open sand, early successional areas, forested areas, wetlands areas and riparian forest located within a larger forested matrix. The site is highly connected to other natural areas, with minimal road fragmentation present in the general vicinity (west side of the river) and minimal development located in the immediate area as well. There are numerous connections to other habitats with the primary migration route being north-south along the river. Eastward movement, across I-395, likely causes significant turtle mortality as this is a heavily travelled road.

Soils and Topography

The slopes in this area are generally steep, with grades descending toward the Quinebaug River to the east. Based on published soils and geologic mapping as well as direct field observations, the property is situated at the
interfaces of till, glacial outwash and recent floodplain alluvium. The steepest slopes lie directly along the river banks, where in places a 1:1 slope ascends 50 feet from the river.

According to the Soil Survey of Windham County, (NRCS, 1981), the project falls within the Hinckley-Merrimac drainage associated with the Quinebaug River and Charlton-Canton-Leicester Till uplands. Through field observation floodplain alluvium is also included in the level areas along the river. Specific soil series that compose most of the site include:

**Hinckley Gravelly Sandy Loam:** Sandy soils found along river and eastern half of site, much of this area is actively mined. Some slopes are in excess of 40%.

**Canton-Charlton, Extremely Stony Sandy Loam:** Rocky till soils, mostly located in the western half of the parcel. On site these soils are mostly forested and consist of upland habitats and fairly steep slopes in excess of 20%.

**Gloucester Extremely Stony Sandy Loam:** Similar distribution and location of Canton-Charlton.

**Udorthents:** Disturbed soils associated with mined areas of gravel pit.

**Windsor Loamy Sand:** Flat agricultural soils found in central-eastern portion of the site. Some floodplain alluvium has been deposited within these areas. Also some pockets of Hinckley soils are found within this area as well.

## Habitat Assessment

Wood turtles are typically found within, and in proximity to slow-moving, highly meandering, medium sized streams with a sandy to gravelly substrate. These streams typically have dense riparian vegetation, which also overhangs portions of the watercourse. Wood turtles typically emerge from their aquatic hibernacula in the early spring, basking along the stream banks and returning to the water. Once air temperatures reach or exceed that of the water temperatures, the turtles are typically active on land and are found within their linear home ranges along their preferred streams. Wood turtles spend a significant portion of their life cycle on land and forage both in water and on land. In early fall, this species typically returns to the stream and overwinters in the sandy/muddy substrate, or may remain semi-active all winter (Ernst et al. 1994).

**Nesting Habitat:** Wood turtles, like other turtles, generally nest in upland sandy soils, with a high degree of sun exposure to incubate the developing embryos. The preferred nesting sites typically contain well-drained, sandy soils, with sparse groundcover to allow easy excavation. These sites are also typically on southern or eastern facing slopes, where sun exposure is maximized. Wood turtles also tend to nest in sandy and gravelly banks, open meadows, and roadsides, all typically within 500 feet of their favored streams. Nesting typically occurs in areas several feet above the water line that are exposed to the sun. This species may nest anywhere suitable habitat exists within its range, or if a suitable nesting area is not present, they may travel outside their typical home range in search of suitable areas. The heavily forested bank of the Quinebaug River limits the available nesting along the watercourse in proximity to the site. The open sandy areas on site likely provide attractive nesting sites for wood as well as other turtle species. However, the usefulness of these areas on site as viable nesting habitat is limited by the degree of mining occurring on site. (Figure 3. Turtle Habitat Map). The areas with the highest potential to provide viable nesting habitat are along the edges of the gravel pits, where active disturbance is more limited, within open areas on the steep, eastern facing slopes, and within high sand bars deposited by flooding events. For the most part, the higher quality nesting areas are found either directly along the river, within the riparian forest or the immediate edges of the gravel pits, with a few other potential areas found on site. Most of these nesting areas are within 200 feet of the edge of the river. It is not likely that turtles actively seek out the interior of the gravel...
pits, as there is suitable nesting areas closer to the river and the active disturbances likely deter them from nesting. Most nesting areas are located to the east of the site access road, allowing nesting to occur without road crossings, however some good nesting habitat is located near the site entrance on the western side of the access road.

*Breeding Habitat:* Wood turtles tend to breed in aquatic habitats in spring and/or fall. The primary breeding habitat for this species on site is the Quinebaug River, which contains suitable characteristics for this species.

*Overwintering Habitat:* Wood turtles overwinter in aquatic habitats, sometimes remaining active beneath the ice during the winter. They tend to favor medium sized, slow moving, meandering streams with a sandy to gravelly substrate. On site, the Quinebaug River is highly suitable habitat for the wood turtle, with an abundance of downed logs, undercut banks, deep pools and other cover objects located within the stream channel.

*Foraging Habitat:* Wood turtles forage in both upland and wetland habitats, feeding on an omnivorous diet ranging from upland vegetation to tadpoles. Foraging habitat is plentiful on site and throughout the area. Forage within the forest includes earthworms in the rich alluvial wetland areas, mushrooms, soft mast fruits, vegetation, invertebrates and amphibians. The shrubby portions of the upland area also offer suitable forage opportunities for this species. The best foraging opportunities are found within the river itself and the adjacent floodplain/riparian forest. The early successional shrub ecotones between the riparian corridor and open areas are also likely used as forage habitat, but to a lesser degree than the more productive and less disturbed and natural areas. The agricultural fields and edges are also likely highly used, given the relatively close proximity to the river.
**Migratory/Travel:** Wood turtles travel throughout the riparian areas adjacent to their stream during the summer months to forage, aestivate and nest. Typically wood turtles tend to stay relatively close to their overwintering streams and are rarely found beyond 1,000 feet from their home stream channel, more typically within 600 feet of the stream. On site, the Quinebaug River is the primary travel corridor for this species. Turtles likely travel through, and are encountered within, the upland/wetland forested areas along the river and within the river as well. Individuals are less likely to be encountered in the extreme western portion of the property (within the steep forested upland areas west of the access road).

The floodplain/riparian forest and shrubby ecotones between the river and open/disturbed upland habitats likely have the highest concentration of turtles as female turtles likely use these areas for staging (pre-nesting behavior), prior to venturing into the open areas to nest in mid-spring. The river riparian area also likely contains a higher density of turtles in early spring, when they emerge from their overwintering habitat. The slopes, although moderate to steep on site, would not appear to be a migratory barrier as this species is known to possess notable climbing ability amidst rough terrain. The majority of turtle movement likely occurs within the river, parallel to the river within the riparian forest, approximately 500 feet outward from the river (within the successional/open habitat complex). Outward migration beyond this likely does not occur much beyond the interior site access road.

**Aestivation:** Wood turtles aestivate on both the land and in wetland habitats. Aestivation typically occurs during the mid to late summer, within the turtle’s home range (approximately 1,000 feet to either side of their preferred overwintering stream). The only portion of the site that is not some form of potential aestivation habitat are the open, gravel pit areas located in the central portion of the parcel.

**Habitat Summary**

Table 1 summarizes the acreages of available turtle habitat both on and off site. Off site areas were evaluated by aerial photo ½ mile up- and down-gradient of the study site and 1,000 feet outward from the Quinebaug River in order to have a sense of the site’s overall habitat context.

In general, the Quinebaug River, adjacent wooded floodplain and shrubby successional ecotones are high quality habitats for wood turtles, particularly given the proximity to the River which contains high quality aquatic habitat for this species.

High quality wood turtle habitat is also present both up- and down-gradient of the site as the entire area is located within a relatively undeveloped habitat block with a variety of upland, wetland and aquatic habitats, interspersed with openings for nesting.

Migratory travel is likely in and near the Quinebaug River and the floodplain/riparian forest, with turtles venturing out to the upland areas to forage, nest and disperse.

Overwintering and breeding habitats are provided within the river, which contains areas of high quality habitats interspersed with shallow, fast riffle habitats. The deeper pools contain slow, deep water, with a sandy substrate and an abundance of underwater cover objects, which is ideal for wood turtles.

Turtles likely emerge from the rivers in early-mid spring and stay close within the riparian floodplain forest and along the river banks until nesting begins in late spring. For nesting, some turtles may use the open sandy patches on site as nesting habitat, with the edges and isolated open areas close to the river more vital than the areas within the active gravel mine. Off site nesting opportunities are in abundance within the general area.
Of the nesting habitats on site, the edge areas are likely highly utilized as they occur along the tree/shrub lines and edge ecotones, which female turtles likely use as staging areas prior to nesting. The interior areas of the agricultural field and gravel pits contain suitable habitat, however the disturbance and distance from cover limits their potential usefulness.

Foraging and aestivation likely occurs within any of the forested/shrub areas on site, particularly in areas closer to the river.

### Survey Results

GZA was on site specifically surveying for wood turtles on five days. In addition to these days dedicated solely to wood turtle surveys, two additional days of survey were conducted for spadefoot toad and spadefoot toad habitat between which wood turtles were also searched.

Survey dates and observations are presented in Table 2 below. Early September was very warm, with daytime temperature in the high in the low 80’s over multiple days and low in the 60’s. Mid September was relative cool and rainy, with highs in the low 70’s and nights in the low 40’s, no surveys were conducted over this period. Late September and early October was again warm with daytime temperatures in the 70’s over long stretches and night time temperatures averaging in the 50’s several surveys were conducted during this period ranging from 9/24 to 10/29. Days were selected when several sunny warm days in a row. All surveys during this period were conducted with air temperature was greater than the water temperature to maximize probability of finding wood turtles along the banks or in floodplain areas. During this time period surveys were limited to the river banks and adjacent floodplain areas, with the final survey conducted along the river bank in in-water habitats.

### Summary

Based on our habitat assessment and on-site findings it is evident that the wood turtle does occupy the site, particularly the Quinebaug River, which provides excellent over wintering, forage, aestivation and breeding habitat. The immediate banks of the river also contain numerous areas of undercut and flat areas ideal for basking and some narrow floodplain shelves (5-30 feet wide)
dominated by dense herbaceous cover, ideal for forage and cover. Beyond that, the thin wooded riparian corridor provides cover and limited forage allowing for lateral movement along the river. Just to the west of the wooded riparian corridor is an active and open gravel pit, comprising numerous acres. Most of these areas are actively being mined and are presently not likely viable nesting habitat, and may represent a nesting sink to this species. The best nesting areas are located on the immediate edges of this open gravel pit, where disturbance is minimal and shrub cover is provided by the riparian corridor. Some isolated patches of sandy soil are also located close to the river and by the entrance drive.

Selected References


Attachments

Attachment A: Surveyor Qualifications
WOOD TURTLE HABITAT SURVEY FINDINGS

Quinebaug Regional Tech Park
Putnam, Connecticut

Figure 4

Legend
- Turtle Nest Sites (species not identified)
- Wood Turtle Location
- Project Limits

INTERSTATE I-395

BASE MAP: BING MAPS, 2010
Data obtained from Connecticut Department of Environmental Protection,
Natural Diversity Database layer published by Connecticut Geological and
Natural History Survey (DEP)
ATTACHMENT A:

Surveyor’s Qualifications
Steven D. Riberdy, M.S., PWS
Certified Ecologist

RESUME

Herpetological Survey and Management

Mr. Riberdy is an experienced ecologist, botanist and wildlife specialist, employed at GZA since 2001. His relevant experience in the herpetological realm is extensive and includes survey work on all major families of reptiles and amphibians that exist in New England. Mr. Riberdy primarily focuses on freshwater, wetland-dependent herpetiles of southern New England; however, he has worked on xeric upland species as well. Mr. Riberdy has worked with all non-marine species of amphibians and reptiles in New England. Mr. Riberdy has a strong personal interest in herpetiles and actively volunteers his time on herpetological and vernal pool issues and projects. Mr. Riberdy is an active contributor to the Massachusetts Herpetological Atlas project. Mr. Riberdy’s MS degree is in wetland ecology with his graduate research focused on the marbled salamander.

Freshwater and Terrestrial Turtles

Over the past 11 years, Mr. Riberdy has been involved in numerous herpetological studies, including many of the region’s terrestrial and freshwater turtles. Mr. Riberdy has conducted numerous habitat assessments for eastern box (Terrapene carolina), spotted (Clemmys guttata), wood (Glyptemys insculpta) and Blandings (Emydoidea blotanii) turtles. Mr. Riberdy has conducted numerous habitat assessments, prepared protection plans and implemented monitoring of over 50 MA Highway projects dealing with turtles, and is MA NHESP approved to conduct these surveys. Similarly, Mr. Riberdy has conducted habitat assessments and prepared protection plans in Connecticut for ConnDOT and is an approved biologist with CT Wildlife Division. Mr. Riberdy has prepared several Conservation and Management Plans (CMP) for turtles in Massachusetts and has conducted on site monitoring to avoid construction impacts to turtles for both small and large projects. As part of these CMPs Mr. Riberdy has designed mitigation for impacts to turtle and their habitat including nesting mitigation, overwintering mitigation and mitigation for the terrestrial habitats of these species. Also, as part of these construction related projects, Mr. Riberdy has provided educational materials and instruction to work crews and property owners to avoid impacts to turtles during construction. Mr. Riberdy has conducted turtle projects in New Marlboro, Hatfield, Leverett, Amherst, Pittsfield, Palmer, Barre, Lee, Canton, Marshfield, Mansfield, Taunton, Sheffield, Westfield, East Longmeadow, Ludlow, Wilbraham, Hampden, Agawam, and Sutton MA. Other work outside of Massachusetts includes turtle projects in East Windsor, South Windsor, Griswold, Enfield, Suffield, Sherman, Ridgefield, Bethel, Danbury, Redding, Connecticut and Nashua, New Hampshire. Mr. Riberdy has also conducted several habitat assessments for the federally endangered bog turtle (Glyptemys muhlenbergii) and is a US FWS approved Phase I surveyor for this species. Mr. Riberdy has conducted several of these assessments in Ridgefield, Danbury, Sherman and Bethel, CT.
Mr. Riberdy is familiar with conducting visual encounter surveys, hoop net trapping to locate and capture turtles, and radio telemetry techniques for tracking turtles as well as GIS applications for depicting home ranges based on kernel and minimum convex polygon analysis.

**Ambystomatid Salamanders and Vernal Pools**

Mr. Riberdy has extensive familiarity with all local ambystomatid Salamanders with his graduate research conducted on the marbled salamander (*Ambystoma opacum*) studying the relationship of upland habitats to in-pool abundance data in a large metapopulations in South Hadley MA. Over his years at GZA and as a naturalist, Mr. Riberdy has assessed and analyzed over one hundred vernal pools in New England. Mr. Riberdy has surveyed for and can identify eggs, larvae and adult yellow (*A. maculatum*), blue (*A. laterale*), Jefferson (*A. jeffersonianum*) and marbled salamanders. Mr. Riberdy is familiar with the installation, maintenance and use of drift fencing and pitfall traps to capture, document and census ambystomatid salamanders. He is also familiar with minnow trapping to census and identify larval salamander, dip net sampling, egg mass counts, and nocturnal visual encounter surveys to identify larvae particularly marbled salamander larvae. In addition to ambystomatid salamanders, Mr. Riberdy’s vernal pool experience included assessments of both the in-pool and terrestrial habitats around the pools for ambystomatid salamanders and other vernal pool dependent species including spotted turtles wood frogs, grey treefrogs, eastern newt, spadefoot toad and fairy shrimp.

**Amphibians**

Another rare or uncommon amphibian species that Mr. Riberdy has familiarity with includes the eastern spadefoot toad (*Scaphiopus holbrookii*) for which Mr. Riberdy has conducted habitat suitability assessments, breeding pool surveys, larval surveys and nocturnal calling and visual encounter surveys for this species in East Longmeadow, MA, Brooklyn, CT and Colchester, CT. Mr. Riberdy has also conducted surveys for stream salamanders (*Eurycea bislineata*) in Massachusetts and New Hampshire. Mr. Riberdy is familiar with four toed salamander (*Hemidactylium scutatum*) and its habitats, having conducted habitat assessments, surveys and management planning for this species in MA, CT and NH. In addition, Mr. Riberdy has also conducted daytime surveys and habitat assessments for the northern slimy salamander (*Plethodon glutinosus*) in southwestern CT.

**Reptiles**

In addition to the region’s terrestrial and freshwater turtles, Mr. Riberdy is also familiar with all reptiles of New England. Over his time as an ecologist, he has conducted surveys for the eastern worm snake (*Carphophis amoenus*) in East Longmeadow, Springfield and Agawam. Mr. Riberdy also conducted surveys for and prepared conservation permits for rare venomous snakes, the timber rattlesnake (*Crotalus horridus*) and copperhead (*Agkistrodon contortrix*) at a highly protected site in western Massachusetts and is familiar with the habitat requirements, identification and natural history of the other rare and uncommon reptiles such as the northern rat snake (*Pantherophis alleghaniensis*) and eastern hognose snake (*Heterodon platirhinos*). Mr. Riberdy has conducted numerous habitat, connectivity and suitability assessments for common and non-regulated reptiles for a variety of projects through the region.