

APPENDICES

Foss Farm Baseline Assessment

Appendix A - Foss Farm Archeological Sites



The Commonwealth of Massachusetts

September 5, 2006 William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

Timothy Fohl
Office of Conservation Commission
Town of Carlisle
66 Westford St
Carlisle, MA 01741

RE: The Foss Farm, Bedford Road (Route 225), Carlisle, MA. MHC # RC.40470.

Dear Mr. Fohl:

Thank you for your inquiry to the Massachusetts Historical Commission from the Town of Carlisle Conservation Commission received on August 22, 2006. Staff of the Massachusetts Historical Commission have reviewed the information you submitted regarding the property referenced above.

Review of the Inventory of Historic and Archaeological Assets of the Commonwealth has determined that the Foss Farm property contains one inventoried ancient archaeological site (19-MD-524) and is directly adjacent to two others, the Garfield Farm site (19-MD-43) and the Riverneck site (19-MD-909). The Bedford Road and Concord River crossing next to the property have also been documented as corresponding to a primary ancient Native American trail through the region. MHC files contain little specific information about these archaeological sites and the trail.

The property is archaeologically sensitive because of its environmental setting, with well-drained soils close to wetlands and the water resources of the Concord River, favorable for both ancient Native American and historic land use and occupation. The presence of stonewalls bounding the present property might indicate the presence of unidentified historic or archaeological resources related to historic period domestic or agricultural activities, including family cemeteries, house cellar holes or outbuilding foundations, wells, gardens, orchards, privies and trash pits. Further documentary research, using deeds, tax records and historic maps, in combination with professionally conducted archaeological subsurface surveys, would also help to locate and identify any previously unknown ancient occupations or historic structures within the property.

MHC requests that a Project Notification Form (PNF) be completed and submitted with scaled project construction plans for review prior to any development or construction proposed for the Foss Farm or adjacent properties.

Thank you for the opportunity to provide technical assistance in archaeology and historic preservation. These comments are offered to assist in compliance with Massachusetts General Laws Chapter 9, Sections 26-27C (950 CMR 70-71). If you have any questions or need additional information please feel free to contact Jonathan K. Patton at this office.

Sincerely,

A handwritten signature in black ink, appearing to read "Edward L. Bell".

Edward L. Bell
Senior Archaeologist
Massachusetts Historical Commission

cc: Carlisle Historical Commission

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128

Appendix B - Foss Farm and O'Rourke Property Bird List (March 2006)

SPECIES SEEN		
All Dates ~ in Foss Farm ~ 89 seen		
<p>DUCKS, SWANS, GEESE Snow Goose Canada Goose Wood Duck Green-winged Teal Mallard Common Merganser</p> <p>HERONS, EGRETS AND BITTERNs Great Blue Heron</p> <p>OSPREY Osprey</p> <p>HAWKS, EAGLES AND KITES Northern Harrier Sharp-shinned Hawk Cooper's Hawk Northern Goshawk Red-shouldered Hawk Broad-winged Hawk Red-tailed Hawk</p> <p>FALCONS AND CARACARAS American Kestrel Merlin <i>Peregrine Falcon</i></p> <p>PHEASANTS, GROUSE, QUAIL AND TURKEYS Ring-necked Pheasant</p> <p>SANDPIPERS American Woodcock Common Snipe Spotted Sandpiper</p> <p>PLOVERS AND LAPWINGS Killdeer</p> <p>GULLS AND TERNS Ring-billed Gull Herring Gull</p> <p>PIGEONS AND DOVES Mourning Dove</p> <p>OWLS Barred Owl</p> <p>NIGHTJARS Common Nighthawk</p> <p>SWIFTS Chimney Swift</p> <p>WOODPECKERS Red-bellied Woodpecker Downy Woodpecker Hairy Woodpecker Northern Flicker</p> <p>TYRANT FLYCATCHERS Least Flycatcher Eastern Phoebe Eastern Kingbird</p> <p>CROWS AND JAYS Blue Jay American Crow</p> <p>WAXWINGS AND SILKY-FLYCATCHERS</p>	<p>Cedar Waxwing</p> <p>THRUSHES Eastern Bluebird Veery Hermit Thrush American Robin</p> <p>MOCKINGBIRDS AND THRASHERS Gray Catbird Northern Mockingbird</p> <p>NUTHATCHES Red-breasted Nuthatch White-breasted Nuthatch</p> <p>WRENS Carolina Wren</p> <p>GNATCATCHERS Blue-gray Gnatcatcher</p> <p>SWALLOWS Tree Swallow Northern Rough-winged Swallow Bank Swallow Barn Swallow</p> <p>KINGLETS Ruby-crowned Kinglet</p> <p>CHICKADEES, TITS Black-capped Chickadee Tufted Titmouse</p> <p>OLD WORLD SPARROWS House Sparrow</p> <p>WAGTAILS AND PIPITS American Pipit</p> <p>SISKINS, CROSSBILLS AND ALLIES American Goldfinch House Finch</p> <p>NEW WORLD WARBLERS Yellow Warbler Magnolia Warbler Yellow-rumped Warbler Pine Warbler Palm Warbler Black-and-white Warbler American Redstart Ovenbird Common Yellowthroat</p> <p>BUNTINGS, SPARROWS, TANAGERS ALLIES Song Sparrow Lincoln's Sparrow Swamp Sparrow White-crowned Sparrow White-throated Sparrow Dark-eyed Junco Savannah Sparrow American Tree Sparrow Chipping Sparrow Field Sparrow</p>	<p>Vesper Sparrow Eastern Towhee Scarlet Tanager Rose-breasted Grosbeak Northern Cardinal Indigo Bunting</p> <p>BLACKBIRDS, GRACKLES, ORIOLES Baltimore Oriole Red-winged Blackbird Common Grackle Brown-headed Cowbird Bobolink</p> <p style="text-align: center;">////----- STATISTICS -----////</p> <p style="text-align: center;">Species seen - 89</p> <p style="text-align: right; font-style: italic;">J. Hanna Bromberg 3/16/06</p>
<p>Printed March 12, 2006 ~ BIRDCLS data set</p>		<p style="text-align: right;">Page 1</p>

SPECIES SEEN
All Dates ~ in Z-LIST ~ 97 seen

*Foss Farm + Foss Farm /
O'Rourke (GMNWR)*

DUCKS, SWANS, GEESE

Snow Goose
Canada Goose
Wood Duck
Green-winged Teal
Mallard
Common Merganser

HERONS, EGRETS AND BITTERNS

Great Blue Heron

OSPREY

Osprey

HAWKS, EAGLES AND KITES

Northern Harrier
Sharp-shinned Hawk
Cooper's Hawk
Northern Goshawk
Red-shouldered Hawk
Broad-winged Hawk
Red-tailed Hawk

FALCONS AND CARACARAS

American Kestrel
Merlin *Peregrine Falcon*

PHEASANTS, GROUSE, QUAIL AND

TURKEYS

Ring-necked Pheasant

SANDPIPERS

American Woodcock
Common Snipe
Spotted Sandpiper

PLOVERS AND LAPWINGS

Killdeer

GULLS AND TERNS

Ring-billed Gull
Herring Gull

PIGEONS AND DOVES

Rock Dove
Mourning Dove

OWLS

Barred Owl

NIGHTJARS

Common Nighthawk

SWIFTS

Chimney Swift

HUMMINGBIRDS

Ruby-throated Hummingbird

WOODPECKERS

Red-bellied Woodpecker
Downy Woodpecker
Hairy Woodpecker
Northern Flicker

TYRANT FLYCATCHERS

Least Flycatcher
Eastern Phoebe
Great Crested Flycatcher
Eastern Kingbird

CROWS AND JAYS

Blue Jay
American Crow

VIREOS AND ALLIES

Red-eyed Vireo *SHRIKES*
WAXWINGS AND Northern Shrike

SILKY-FLYCATCHERS

Cedar Waxwing

THRUSHES

Eastern Bluebird
Veery
Hermit Thrush
American Robin

MOCKINGBIRDS AND THRASHERS

Gray Catbird
Northern Mockingbird

NUTHATCHES

Red-breasted Nuthatch
White-breasted Nuthatch

CREEPERS

Brown Creeper

WRENS

Carolina Wren
House Wren *Winter Wren*

GNATCATCHERS

Blue-gray Gnatcatcher

SWALLOWS

Tree Swallow
Northern Rough-winged Swallow
Bank Swallow
Barn Swallow

KINGLETS

Ruby-crowned Kinglet

CHICKADEES, TITS

Black-capped Chickadee
Tufted Titmouse

OLD WORLD SPARROWS

House Sparrow

WAGTAILS AND PIPITS

American Pipit

SISKINS, CROSSBILLS AND

ALLIES

American Goldfinch
House Finch

NEW WORLD WARBLERS

Nashville Warbler
Yellow Warbler
Magnolia Warbler
Yellow-rumped Warbler
Pine Warbler
Palm Warbler
Black-and-white Warbler
American Redstart
Ovenbird
Common Yellowthroat
Canada Warbler

BUNTINGS, SPARROWS, TANAGERS

ALLIES

Song Sparrow
Lincoln's Sparrow
Swamp Sparrow
White-crowned Sparrow
White-throated Sparrow
Dark-eyed Junco
Savannah Sparrow
American Tree Sparrow
Chipping Sparrow
Field Sparrow
Vesper Sparrow
Eastern Towhee
Scarlet Tanager
Rose-breasted Grosbeak
Northern Cardinal
Indigo Bunting

BLACKBIRDS, GRACKLES,

ORIOLES

Baltimore Oriole
Red-winged Blackbird
Common Grackle
Brown-headed Cowbird
Bobolink

////— STATISTICS —////

Species seen - 97

*J. Thomas Brownrigg
3/16/06*

Appendix C – Blue-Spotted Salamander



Natural Heritage &
Endangered Species
Program

Commonwealth of Massachusetts
Division of Fisheries & Wildlife
Route 135
Westborough, MA 01581
(508) 792-7270

MASSACHUSETTS SPECIES OF SPECIAL CONCERN

Blue-spotted Salamander (*Ambystoma laterale*)

DESCRIPTION: Blue-spotted Salamanders have a long, slender body, short limbs with long digits, and a narrow, rounded snout. They are characterized by dark blue to black dorsal pigmentation with a paler ventral surface, brilliant sky-blue spots or specks on the lower sides of the body, and black pigmentation surrounding the vent. The tail is long and laterally compressed, averaging 44% of total body length. During breeding season, males are identifiable by a swollen vent area caused by enlarged cloacal glands. Adults range from 9.8 to 12.7 cm (3.9 to 5.0 in.) in total length. Larvae are olive green to black and have a long dorsal fin that extends from behind the head along the back and tail.



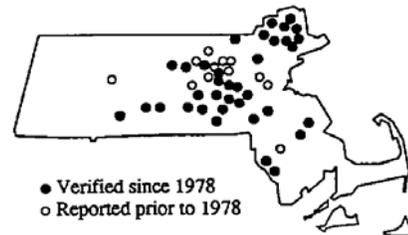
SIMILAR SPECIES IN MASSACHUSETTS: The Blue-spotted Salamander is a member of the Jefferson Salamander complex. Other recognized "mole" salamander members are the Jefferson Salamander (*A. jeffersonianum*), the Silvery Salamander (*A. platineum*), and Tremblay's Salamander (*A. tremblayi*). The Silvery and Tremblay's Salamanders originated from hybridization between the Blue-spotted and Jefferson Salamanders. The two hybrid forms are almost always female and triploid—that is, their cells contain three complete sets of chromosomes rather than the normal two sets (diploid).

Lazell, J.D. *Reptiles and Amphibians in Massachusetts*. Massachusetts Audubon Society. Lincoln, MA. 1972.

When either the Silvery or Tremblay's Salamanders are present in an area, they may outnumber the Blue-spotted or Jefferson Salamanders by a 2:1 margin. A population with many more females than males is a good indicator of the presence of Silvery or Tremblay's Salamanders. The mode of reproduction of these female hybrids is gynogenesis: sperm is obtained from male diploids to stimulate egg division, but no genetic recombination occurs. However, additional hybrid forms such as triploid males and tetraploid and diploid females have been found, indicating that some offspring retain genetic material from two parents.



Range of the Blue-spotted Salamander



Breeding Distribution in Massachusetts

The members of the complex form a continuum in appearance from the grayish-brown coloration, pale blue flecks, and wide snout of the Jefferson Salamander to the bluish-black coloration, prominent blue spots, and narrow snout of the Blue-spotted Salamander. The two main hybrid forms are best identified by chromosome counts or size of red blood cells in conjunction with their external appearance: the Silvery Salamander is almost identical to the Jefferson Salamander but is smaller, and the Tremblay's Salamander closely resembles the Blue-spotted Salamander but is somewhat larger.

RANGE: Blue-spotted Salamanders can be found discontinuously from the northern shore of the Gulf of St. Lawrence across southern Canada to Lake Winnipeg and south to New England, New York, and the northernmost parts of Ohio, Indiana, and Illinois. Disjunct colonies also exist in Labrador, Canada; Long Island; northern New Jersey; and Iowa. In Massachusetts, they occur predominantly within Middlesex and Essex counties and in the adjacent eastern towns of Worcester county. Some occurrences lie within Bristol and Plymouth counties as well. In general, Jefferson-complex salamanders found east of Worcester County's western border are likely to be either Blue-spotted Salamanders or Tremblay's Salamanders.

HABITAT IN MASSACHUSETTS: Blue-spotted Salamanders require moist, moderately shaded environments; they favor northern hardwood/hemlock forests occurring in glaciated areas having depressions available for seasonal flooding. The resulting vernal (temporary) ponds necessary for breeding and egg laying are seldom more than 30–40 cm (12–15 in.) deep. Ponds need to be full of dead and decaying leaves for cover and overhanging bushes and grass for egg deposition. Roadside drainage ditches, small kettle holes, and temporary pasture ponds also provide habitat when flooded in the spring.

LIFE CYCLE/ECOLOGY: A cryptic species, Blue-spotted Salamanders are rarely encountered above ground, except during their early spring breeding season, or as just-metamorphosed juveniles in the late summer. Adults reside most of the year beneath leaf litter or underground to a depth of one meter, usually within 500 meters of their breeding pond. The breeding season is brief, lasting from mid March to late April. As soon as the ground surface thaws, males migrate above ground to temporary ponds; females join them in a few days. An elaborate courtship of approach, contact, nudging, and tail-fanning routines takes place in the water. Females then pick up a deposited spermatophore and store it in the cloaca for egg fertilization. (Normal sexual reproduction occurs in the diploid females, while no true fertilization or recombination takes place in the triploid hybrids.) Eggs are often laid singly, with 6 to 10 eggs per mass, for a total clutch ranging from 82 to 489 eggs. The egg masses cling lightly to overhanging vegetation or fall to the bottom of the pond. Hatching about a month later, larvae are voracious eaters, preying on insect larvae and other small aquatic animals. No overwintering of larvae has been reported in Massachusetts, so by late August larvae have metamorphosed completely into air-breathing adults.

Adult Blue-spotted Salamanders feed on small invertebrates such as larval and adult insects, spiders, worms, and centipedes. They produce noxious skin secretions from specialized poison glands and are thus rarely preyed upon by native predators. If Blue-spotted Salamanders reach adulthood and their habitat is secure, they may live for decades. Except when breeding, adults probably move around within territories of less than one square meter.

POPULATION STATUS IN MASSACHUSETTS: The Blue-spotted Salamander (including triploid and other polyploid forms within the *A. laterale*/*A. jeffersonianum* complex) is currently listed as a "Species of Special Concern" in Massachusetts. Ninety-nine current populations (1978 to the present) have been documented, as well as 22 historical populations (prior to 1978). The major threat to this species—and most salamanders in general—is the loss of wetland habitat to draining, development, and other causes. For example, making temporary ponds deeper and permanent results in fish populations which predate amphibian eggs and larvae. Some population declines may also be attributed to sample overcollection, foot and road traffic, and pesticides or other toxic chemicals. Studies on the effects of acid rain on salamander eggs and larvae have been contradictory, and further studies must be made to resolve this issue, however, it appears that Blue-spotted Salamanders from eastern Massachusetts are highly tolerant of acid conditions and can hatch successfully down to a pH of 4.0.

MANAGEMENT RECOMMENDATIONS: In order to ensure the survival of this species in Massachusetts, the following recommendations regarding habitat preservation are suggested. There are two critical components in the life history of this species: the vernal pool habitat required for reproduction, and the upland forest habitat required for foraging, hibernation, and other terrestrial and fossorial activities. Conservation of the Blue-spotted Salamander—and all native members of the genus *Ambystoma*—must therefore focus on the preservation of vernal pools and small ponds known to be inhabited by this species, as well as a significant parcel (250–1600 meter radius) of upland habitat surrounding such breeding sites. Provided these habitats are not significantly degraded—and that the salamanders are not subject to illegal collection or high road mortality—the salamander populations should be capable of maintaining themselves indefinitely.

It should be kept in mind, however, that every population is unique. The majority of the population, for instance, may be concentrated in a relatively small and discrete upland habitat, which would safely allow carefully conducted development within some portions of the “uninhabited” habitat around the breeding pool without serious effects on the population. The only way to determine if such a case exists, however, is through a detailed environmental study conducted by a qualified researcher(s) over a series of years, charting the movements of the animals to and from the breeding site. Unless such a study is conducted, it should be assumed that the salamanders are relatively evenly distributed around the pool and development should be strongly discouraged within a minimum radius of 500–1,000 meters surrounding the breeding pool.

Vernal pools and breeding ponds must be protected not only from draining, filling, and development, but also from degradation in the form of road and lawn run-off. If lumbering is conducted within surrounding areas, a no-cut buffer zone of 50–100 feet should be established around the pool depression, and no slash or other debris should be dumped in the depression. While vernal pools receive some protection under the Massachusetts Wetlands Protection Act, and several vernal pool species (including the Blue-spotted Salamander) are protected under the Massachusetts Endangered Species Act, efforts should be made to register all vernal pools and to enhance and promote the enforcement of the laws mentioned above. Because of their ephemeral nature, vernal pools are often difficult to locate during dry periods and may be inadvertently damaged if their locations are not surveyed and marked prior to lumbering or construction operations.

Citizens must be encouraged to recognize and report Blue-spotted Salamanders and the locations of their breeding pools. Due to the rarity of this species, its ephemeral terrestrial occurrence, and its very specific habitat requirements, some populations undoubtedly remain undiscovered and therefore underprotected. Interested citizens with access to vernal pools should also be encouraged to monitor the annual production of their local salamander populations, as such data may prove invaluable in detecting population trends as well as catastrophic changes. Finally, citizens and landowners should be made aware that breeding pools degraded through pollution, drainage, or filling can often be restored to some extent, and that the possibility of reintroducing native species to such habitats should be investigated.

1994

NOTE: Vernal pools that are certified by the Natural Heritage and Endangered Species Program (NHESP) may be protected by the Massachusetts Wetlands Protection Act. If you would like more information about vernal pool certification, contact NHESP to obtain copies of the documents entitled “Guidelines for Certification of Vernal Pool Habitat,” along with “Vernal Pool Field Observation Forms.”

Vernal pools constitute a unique and increasingly vulnerable type of wetland that is inhabited by many species of wildlife, some of which are ENTIRELY dependent on vernal pool habitat for one or more stages of their life cycle. Two-thirds of the Commonwealth’s rare amphibians (4 of the 6 species) are totally dependent upon vernal pools for breeding.

(continued overleaf)

SUGGESTED GUIDELINES FOR TIMBER HARVESTING NEAR VERNAL POOLS

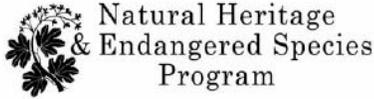
Vernal pools provide critically important habitat for a number of rare and endangered species in Massachusetts. Certain precautions should be taken when harvesting in the vicinity of such pools to minimize impacts and preserve the character and physical environment that these species require. Although these pools may only actually be filled with water for a brief period of time in the spring, the most important measure that can be taken to protect the habitat is to recognize pool locations even in the "dry" season and take precautions to preserve the local environment around the pools. Recognizing these seasonal pools and considering the following guidelines will help protect these critical habitats:

1. Heavy equipment should not be permitted in vernal pool depressions at any time of the year. Avoid locating landings, skid roads, or haul roads through or near these depressions. It is important that the depressions not fill in with sediment from nearby areas of disturbed soil.
2. Similarly, do not stack logs or otherwise create soil compaction in vernal pool depressions.
3. Avoid operating logging machinery within approximately 50 feet of a vernal pool during mud season. Ruts deeper than 6 inches can disrupt migration routes of endangered salamanders. There should be no ruts deeper than 6 inches within 200 feet of a vernal pool. Similarly, the actual vernal pool depression should not be physically altered so that its ability to seasonally hold water is impaired.
4. Tree tops or slash should not be allowed to fall or be placed into vernal pool depressions. While many amphibians use downed woody material to attach their eggs to, no additional material should be added to a pool. If tops or branches do fall into a depression, they should be removed. Similarly, existing natural woody material should NOT be removed from vernal pool depressions.
5. It is important that the temperature and relative humidity at the soil surface be maintained in the cool, moist condition necessary for amphibians that use vernal pools. Thus, it is important that these vernal pools, and an area within 50 feet of these pools, be maintained in a shaded and mostly undisturbed condition.
 - a. Do not clearcut these areas. Some forest cover must be maintained to provide continuous shade and protection from high temperatures at the soil surface. Do not leave only trees with small or damaged tops, or those that appear to be dead or dying. Established understory vegetation such as mountain laurel, hemlock, or naturally established advanced regeneration can provide shade. Similarly, shade can be provided by vigorous hardwood sprouting following a harvest.
 - b. Avoid disturbance of the mineral soil within 50 feet of a vernal pool depression for several reasons. First, it is important that sediment not accumulate in vernal pool depressions. Second, the exposure of mineral soil removes the natural insulation provided by the accumulated litter on the forest floor. This litter can be several inches thick and can keep actual soil moisture and temperature from getting too high, even if exposed to direct sunlight. For these reasons, it would be best to operate in the vicinity of vernal pool depressions when the ground is frozen and covered with snow. Under other dry conditions, it would be advisable to not operate machinery within 50 feet of a pool depression, and to winch timber (if any is cut within this radius) out of this area. Finally, it would be advisable not to operate within 50 feet of a vernal pool depression during mud season, so as to not create ruts.

5/94

Partially funded by a grant from DEM Forest Stewardship Program

Appendix D – Wood Turtle



Massachusetts Division of Fisheries & Wildlife
Route 135, Westborough, MA 01581
tel: (508) 792-7270 ext. 200; fax: (508) 792-7821
www.nhosp.org

DESCRIPTION: The Wood Turtle is a medium-sized turtle that can be recognized by its sculpted shell and orange coloration on the legs and neck. The carapace (upper shell) is rough and each scale (scute) rises upwards in an irregular pyramid of grooves and ridges. The carapace is tan, grayish-brown or brown with a pattern of black or yellow lines on the larger scutes and has a central ridge. The plastron (lower shell) is yellow with oblong dark patches on the outer, posterior corner of each scute. The head is black, but may be speckled with faint yellow dots. The legs and neck can have orange to reddish coloration. Hatchlings have a dull-colored shell that is broad and low, a tail that is almost as long as their carapace and they lack orange coloration on the neck and legs. The best distinguishing characteristics of a male is their concave plastron, thick tail, long front claws, and a wider and more robust head than females.

SIMILAR SPECIES: The habitat of the Eastern Box Turtle (*Terrapene carolina*) and the Blanding's Turtle (*Emydoidea blandingii*) may overlap that of the Wood Turtle, but neither has the Wood Turtle's pyramidal shell segments. Unlike the Wood Turtle, the Box and Blanding's Turtle have hinged plastrons into which they can withdraw or partially withdraw if threatened. The Northern Diamond-backed Terrapin (*Malaclemys terrapin*) has a shell similar to that of the Wood Turtle. However, its skin is grey and it lives only near brackish water, which the Wood Turtle avoids.

RANGE: The Wood Turtle can be found throughout New England, north to Nova Scotia, west to eastern Minnesota, and south to northern Virginia. The Wood Turtle appears to be widespread in Massachusetts. However, it should be kept in mind that little is known about the status of local populations associated with the majority of these sightings. Most of the towns have fewer than 5 known occurrences.

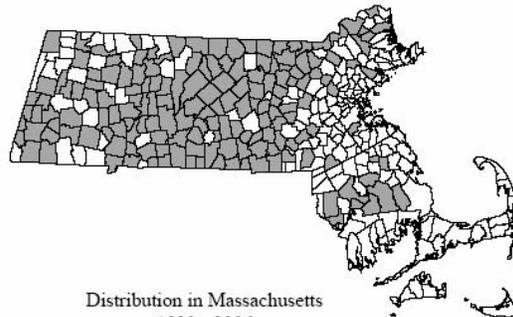
Wood Turtle *Glyptemys insculpta*

State Status: Species of Special Concern
Federal Status: None



Photo by Mike Jones

HABITAT IN MASSACHUSETTS: The preferred habitat of the Wood Turtle is riparian areas. Slower moving mid-sized streams are favored, with sandy bottoms and heavily vegetated stream banks. The stream bottom and muddy banks provide hibernating sites for overwintering, and open areas with sand or gravel substrate near the streams edge are used for nesting. Wood Turtles spend most of the spring and summer in mixed, deciduous forests, riparian wetlands including wet meadows, bogs, and beaver ponds, and hay fields. Then they return to the streams in late summer or early fall to and overwinter.



Distribution in Massachusetts
1980 - 2006
Based on records in Natural Heritage Database

LIFE CYCLE & BEHAVIOR: The Wood Turtle leads a rather solitary life and they are usually observed alone. It typically spends the winter in flowing rivers and perennial streams. Full-time submersion in the water begins in November, once freezing occurs regularly overnight, and continues until temperatures begin to increase in spring. With head and limbs tucked in under the carapace and tail extended, it lies next to submerged and anchored stumps and logs on the sides of the stream away from the main current. It also may hibernate in large groups in community burrows in muddy banks, stream bottoms, deep pools, decaying forest vegetation, and abandoned muskrat burrows.

The Wood Turtle may make underwater movements in the stream during the winter; however, extended periods of activity and emergence from the water do not occur until mid-March to early April. Wood Turtles are active during the day and are usually encountered within a few hundred meters from the stream banks. They have relatively linear home ranges that can be ½ a mile in length in Massachusetts (M. Jones, unpubl data). They will use emergent logs or grassy, sandy and muddy banks to soak up the spring sun. Wood Turtles are opportunistic omnivores; their diet consists of both plant and animal matter that is consumed on land and in the water. The Wood Turtle occasionally exhibits an unusual feeding behavior referred to as “stomping.” In its search for food, this species will stomp on the ground alternating its front feet, creating vibrations in the ground resembling rainfall. Earthworms, responding, rise to the ground’s surface to keep from drowning. Instead of rain, the earthworm is met by the Wood Turtle, and is promptly devoured.

Although the peaks in mating activity occur in the spring and fall, Wood Turtles are known to mate throughout their activity period. Males have been observed exhibiting aggressive behavior such as chasing, biting, and butting both during the mating season and at other times. A courtship ritual “dance” typically takes place at the edge of a stream or brook for several hours prior to mating. The dance involves the male and female approaching each other slowly with necks extended and their heads up. Before they actually touch noses, they lower their heads and swing them from side to side. Copulation usually takes place within the water. Courting adults may produce a very subdued whistle that is rarely heard by observers. Mating may occur multiple times over the course of the active season with different individuals.

Female Wood Turtles lay one clutch a year and females will often congregate in a good nesting area. Clutch size in Massachusetts averages 7 eggs (Jones, 2004, pers. comm.). Nesting sites may be a limited resource for Wood Turtles. In Massachusetts, nesting occurs over a four-week period, primarily in June. Females are known to travel long distances in search of appropriate nesting habitat. Once they have arrived at a suitable nesting area, there may be multiple nesting attempts or false nests that occur over the course of several days, prior to laying eggs.

Hatchling emergence occurs from August through September. The life span of the adult Wood Turtle is easily 46 years and may reach as much as 100 years.

ACTIVE PERIOD

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

THREATS: Population decline of this species has been caused by development of wooded stream banks, roadway casualties, hay-mowing operations, pollution of streams, unnatural increase in populations of predators (such as raccoons and skunks) due to human presence, and commercial and incidental collection of specimens for pets. Hatchling and juvenile survival is very low and the time to sexual maturity is long. These characteristics are compensated by adults being long-lived and reproducing many times. Therefore adult survivorship needs to be very high to sustain a population. Unfortunately, these characteristics also make wood turtles vulnerable to these human disturbances.

MANAGEMENT RECOMMENDATIONS: A habitat model developed by UMASS will be used in conjunction with NHESP records to evaluate and rank Wood Turtle habitat. This information will be used to direct land acquisition and to target areas for Conservation Restrictions (CR’s), Agricultural Preservation Restrictions (APR’s) and Landowner Incentive Program (LIP) projects.

Alternative wildlife corridor structures should be considered at strategic sites on existing roads. In particular, appropriate wildlife corridor structures should be considered for bridge and culvert upgrade and road-widening projects within or near Wood Turtle habitat.

Efforts will be made by the Natural Heritage and Endangered Species Program to inform local regulatory agencies of the new wildlife corridor section in the Mass Highway design guidance document, and to provide them with key locations where these measures would be most effective for Wood Turtle conservation.

Habitat management and restoration practices are currently being developed and implemented in order to create and/or maintain consistent access to nesting habitat within core habitat areas. This is most practical on state-owned conservation lands. However, educational materials will be made available to guide private land-owners on the best management practices for Wood Turtle habitat.

There are two potential ways to decrease turtle injuries resulting from mowing; during the growing season blade height should be raised above 6 inches (15 cm). The other potential way (which will also work for plowing) to avoid turtle mortality is to restrict mowing to early November through mid-March, when the turtles are overwintering. These measures are recommended as standard practice on right-of-ways, roadsides, and other state properties on and near Wood Turtle habitat.

Forestry restrictions apply to Priority Habitat delineated for Wood Turtles in order to avoid direct turtle mortality. Motorized vehicle access to harvesting sites in Wood Turtle habitat is restricted to the period when turtles are inactive during the winter. Seasonal forestry restrictions apply to Wood Turtle habitat and to upland habitat that occurs up to 600 feet (183 m) beyond the stream edge. In order to maintain the structural integrity of overwintering sites, bridges should be laid down across streams prior to any motorized equipment crossing the stream.

REFERENCES:

- Bol, Leslie, In prep., Massachusetts Forestry Conservation Management Practices for Wood Turtles. Massachusetts Natural Heritage and Endangered Species Program
- Compton, Brad. 2006. Personal Communication. University of Massachusetts, Dept of Natural Resources Conservation, Amherst, MA
- DeGraaf, Richard M. and Rudis, Deborah D. 1983. Amphibians and Reptiles of New England. Amherst, Massachusetts: The University of Massachusetts.
- Erb, Lori, In prep., Conservation Strategy for the Wood Turtle in Massachusetts. Massachusetts Natural Heritage and Endangered Species Program
- Ernst, C. H., J. E. Lovich, and R. W. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington and London.
- Jones, Mike. 2006. Personal Communication. University of Massachusetts, Dept. of Natural Resources Conservation, Amherst, MA.
- Kaufmann, John H. 1989. "The Wood Turtle Stomp," Natural History, pp. 9-11.

Appendix E - Foss Farm Land Use Permits

The following table documents all land use permits granted by the Carlisle Conservation Commission from 2005 to 5/2007. By far the greatest number of permits in the last few years were for equestrian events.

Applicant	Activity	Date
Old North Bridge Pony Club (ONBPC) Carlisle Area Equestrians	2-phase equestrian competitive fundraiser	5-6-2007
ONBPC	Spring mounted games practice	4-7-2007
ONBPC	Spring lessons series	3/26 – 6/2007
Tom and D'Ann Brownrigg	Public woodcock/birding walk	4-15, 22 -2006
Nashoba Valley Pony Club	C1-C2 rating	11-4-2006
ONBPC	Fall lessons series	M, F, Sats, Oct – Nov. 2006
ONBPC	Tetrathlon equestrian competitive event	9-9-2006
ONBPC	Mini event	8-30-2006
ONBPC	Eric Smiley education clinic	6-30-2006
ONBPC	Expanded spring lessons series	Weds, 6-2006
Nashoba Valley Pony Club	Spring lessons series	Tuesdays, 4/1 through 6/ 2006
ONBPC/Carlisle Area Equestrians	2-phase equestrian competitive fundraiser	5-7-2006
ONBPC	Winter riding lesson	3-12-2006
ONBPC	Spring lessons series	Mon, Fri 4/1 through 6/2006
ONBPC	Summer jumper series	7/14, 21, 28 - 2006
ONBPC	Fall lessons series	M, T, F Oct – Nov 2005
ONBPC	Mini event	8-30-2005
ONBPC	Rating event	5-15-2005
ONBPC	Summer jumper series	7-15,22,29 - 2005
ONBPC	Spring lessons series	April-June 2005
ONBPC/Carlisle Area Equestrians	Equestrian fund-raising event	March 1, 2005
Tom and D'Ann Brownrigg	Public woodcock/birding walk	April 14, 2005

Prior to 2005, most permits were for equestrian events, in addition to the following:

- Woodcock/birding walks led by the Brownriggs (most years since 2001)
- Viewing the lunar eclipse in 2003
- Night parking for Blue Jay Studio in 2003
- Organized hiking by the Appalachian Mountain Club (several years)
- Moonlight walks and star gazing by the Trails Committee (several years)
- Clinics operated by the Old North Bridge Hound Club (several years)
- Night hikes by the Girl Scouts (several years)
- Dog sled training using all-terrain vehicles (1998 and previous years; several applicants)
- Boy Scout picnics (several years)
- Dog training using blank starter-type guns (Paul Kress, 1991)