

IWPFO00069

*BLANDING'S TURTLE
PURPLE LOOSESTRIFE
SURVEY*

CONDUCTED BY THE LEE COUNTY NATURAL AREA GUARDIANS

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&

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ABSTRACT

A Blanding's Turtle (Emydoidea blandingi)/Purple Loosestrife (Lythrum salicaria) survey was conducted by the Lee County Natural Area Guardians (LeeNAG) in 1989-90, with funding provided by the Illinois Nongame Wildlife Conservation Checkoff program. The project was carried out in the Green River Lowlands area of southwestern Lee County, using data collected in a 1986 LeeNAG survey of the Illinois Mud Turtle as a basis for comparison. The two-part study consisted of a Blanding's turtle live trapping program and a visual inspection of study area wetlands for the presence of purple loosestrife. 246 turtles of 3 species were captured. No purple loosestrife was found.

INTRODUCTION

The Blanding's Turtle/Purple Loosestrife survey was conceived as a follow-up to a 1986 study of the Illinois Mud Turtle (Kinosternon flavescens spooneri) in the Green River Lowlands. Among the 88 turtles of four different species captured in that survey were 13 specimens of Blanding's turtle. With the 1986 project data in hand, LeeNAG proposed to resurvey the area to see how Blanding's turtle had fared in the intervening four years. The turtle study also provided an opportunity to address growing concern over the proliferation of purple loosestrife.

A. The Target Species

Blanding's Turtle is one of only two representatives of the genus *Emys* extant in the world today. The other survives in Europe, western Asia and northern Africa. Blanding's turtle is native to the upper Midwest and parts of the eastern U.S. In Illinois, its range is generally restricted to the northern half of the state. It frequents ponds and marshes in areas formerly occupied by prairie. Blanding's turtle populations have declined due to the loss of suitable habitat. This species is environmentally sensitive; as such, it represents a valuable indicator of habitat availability and quality.

Blanding's turtle is aquatic/semi-aquatic. Adults are usually 150-250 mm in carapace length, with little sexual dimorphism. The carapace is relatively narrow for its length, somewhat domed and olive to dark brown

in color with numerous small, yellow dots. The plastron is hinged in its forward portion and is usually yellow with large black splotches. In male Blanding's turtles the plastron is noticeably concave.

This species has been observed breeding between April and November. Females are believed to lay eggs from late May through July, and hatchlings emerge in August and September. The movements of the young are somewhat mysterious. Juvenile Blanding's turtles are seldom encountered in the field, and individuals under 150 mm in carapace length are infrequently seen.

Blanding's turtle feeds in the water and on land. Although reportedly omnivorous, it seems to prefer faunal fare, with an apparent emphasis on crustaceans and insects. Blanding's turtles will take carrion and in the LeeNag survey entered traps baited with chicken liver.

Purple loosestrife is an aquatic plant of European descent. It was introduced into North America in the 19th century and soon became established in the northeastern United States and Canada. Purple loosestrife has invaded the Midwest via the Great Lakes and other regional waterways. It is a serious problem in parts of southwestern Wisconsin and has been observed in large stands along the Mississippi River in northern Illinois. This aggressive wetland colonizer could presumably enter Lee county by way of the Rock River. Ponds and marshes such as those found in the Green River Lowlands would be particularly susceptible to invasion. Experience dictates that purple loosestrife is very difficult to control once it has become established; thus, regular monitoring and early eradication are the keys to effective control. LeeNAG recognized that the Blanding's turtle survey, by placing observers in prime loosestrife habitat, would provide an excellent opportunity to determine whether this noxious exotic had reached the local area.

Purple loosestrife is an erect, coarse perennial from three to ten feet in height. Its unserrated leaves are either opposite or three in a whorl. Stems are quadrilateral in cross section and semi-woody at the base. Flowers, which appear July to September, have five to seven purple petals, and occur in long spikes at the ends of branches.

B. The Study Area

The Blanding's Turtle/Purple Loosestrife study area lies within the Green River Lowlands section of the Grand Prairie Division. The Green River valley was formed by glacial meltwaters and subsequently filled by outwash gravels and sand. At one time, nearly all of northeastern Illinois was drained through this valley. Following the recession of the Wisconsin ice sheet, wind-blown sands formed the numerous dunes and sand ridges which characterize the area today. Vast swamps developed on the poorly drained flood plains, creating a haven for wildlife. During the warm and dry millennia of the hypsithermal, prairie advanced into the lowlands. Wet prairies of sedges, cordgrass and bluejoint grass occupied the lower areas. Higher ground supported such species as big bluestem, Indian grass and switchgrass, as well as lead plant, compass plant and other mesic forms. Sand prairies appeared on the dry flats and ridges, with such typical dryland species as little bluestem, fall witchgrass and dropseed. These higher and better drained areas also provided habitat for species more commonly associated with the Great Plains, including prickly-pear cactus, poppy mallow, western sunflower and silky aster. Adjoining the timbered

swamps were open marshes and prairie ponds containing cattails, burreed and bulrushes, with lesser occurrences of such aquatic and semi-aquatic plants as arrowhead, water plantain, pond weed and pickerelweed. These wetlands, formerly the dominant physiographic feature of the Green River Lowlands, were favored by Blanding's turtles

Other fauna common to the study area in presettlement times included bison, elk, white-tailed deer, timber wolf, coyote and bobcat. Fossil remains indicate that the extinct American mastodon and stag moose also roamed here. The expanse of swamp was especially attractive to waterfowl, and immense flocks of these birds congregated in the lowlands during spring and fall migrations. Sundry reptiles and amphibians inhabited the area and the streams and impoundments harbored most of the fish species native to this region.

Native American peoples frequented the study area more or less continuously after 8000 B.C. with little or no effect on the environment. Following their removal around 1835, the lowlands began to see dramatic change. Tillable areas came under cultivation by white settlers and the upland prairies were gradually replaced by fields. In the latter part of the 19th century farmers turned their attention to the swamps. Extensive channelization, beginning about 1887, drained the Winnebago and Inlet swamps. Tiling of peripheral areas completed the task and by 1910, 50,000 acres of ancient wetlands had become productive farm ground.

Today, water surface accounts for 0.75% of the total area of Lee County. Of this amount, only a small fraction are natural impoundments. The small ponds and potholes where Blanding's turtle maintains a precarious existence are but scattered remnants of what used to be.

METHODOLOGY

The turtle trapping program commenced in mid-September of 1989 upon execution of the DOC/LeeNAG contract. From the 1986 site roster, ponds were selected which had produced Blanding's turtles. Requests for trapping permission were sent to the owners of these sites. A WANTED poster detailing the appearance and habits of Blanding's turtles and purple loosestrife was distributed throughout southwestern Lee county by the Soil and Water Conservation District office. Fifteen collapsible mesh livetraps were provided by DOC'S Division of Natural Heritage. Traps were placed as soon as landowner cooperation was secured. The traps, baited with chicken liver, were set in places where turtles were likely to feed and checked every 24 hours. Field notes were made during each trapping session and air and water temperatures recorded. Captured Blanding's turtles were taken to the home of program participant Dr. Cassandra Rodgers, where a data recording station had been established. Here, the turtles were weighed on a good quality digital scale, measured with calipers and a metric ruler and photographed. Sex was determined on the basis of plastral curvature. Attempts were made to age the specimens, but were often unsuccessful due to worn age lines on the abdominal scutes (this wear was more evident in males than in females). Each turtle was examined for injuries and indications of disease, and females were palpated for the presence of eggs. After all data were recorded on individual survey sheets, the subjects were humanely marked for future identification. Those captured in the fall of 1989 were marked in the usual manner by notching the appropriate marginal scute with a hack saw. In 1990, this method was abandoned in favor of drilling. A Department of Conservation biologist was consulted

prior to the adoption of this method to confirm its feasibility. Drilling proved to be easier, faster and resulted in a mark which cannot be confused with incidental trauma. The hole was made with a low speed/high torque cordless drill and 3/16" bit. During this procedure, the turtle is hand held and the bit placed at an angle 90 degrees to the plane of the scute and approximately 5-8 mm in from the edge. Very little pressure need be applied. When the hole is correctly positioned, little bleeding occurs and there is no danger of breaking out the edge of the scute. Turtles marked in this fashion appeared to suffer no more distress than when marked by sawing. Blanding's turtles recaptured in water several weeks after the application of this method showed no sign of infection in the drilled hole, which had already hardened internally. LeeNAG investigators intend to monitor the turtles following the conclusion of the survey to check for unanticipated complications which might arise from this marking method. Upon completion of the above, the specimens were returned to the capture site and released.

Drift fence trapping was employed in an effort to catch Blanding's turtles moving overland. A roll of aluminum flashing 15 m long was erected to form a barrier parallel to and roughly 25-30 m from the edge of a pond. 20 l plastic pails were buried on either side of the barrier at each end, their tops flush with the ground surface. Creatures encountering the fence will move along it and drop into the pails. This method is used commonly in field herpetology and will reveal the direction in which the subjects were travelling when trapped.

Turtles were also captured by hand. On several occasions, specimens were stepped on while the investigators were wading to set or check traps. After careful deliberation to assure that the species underfoot was not

a snapping turtle, the animal was simply picked up. Four Blanding's turtles were recovered in this manner.

The six sites which produced Blanding's turtles between 2-13 June 1986 were trapped during that same period in 1990 to obtain an estimate of relative turtle numbers at the same sites four years apart. Additionally, 17 other sites were sampled to determine the local distribution of Blanding's turtles.

All water sites and surrounding land areas were assessed to evaluate the integrity of the habitat. In particular, the investigators were interested in changes which might have taken place since the 1986 survey. Such things as wetland draining, siltation, chemical run off and conversion of adjacent natural lands to agricultural or industrial/commercial uses, and any other activity which might affect the viability of the target species, were noted.

Soil types for each site were taken from maps provided by the Lee County Soil and Water Conservation District. This office also supplied aerial photos and topographical maps upon which the sites were marked for easy reference.

RESULTS

A. Blanding's Turtles

Turtle trapping commenced around the second week of September, 1989. Traps placed at seven different sites yielded 65 painted turtles representing the three subspecies found in this area. No Blanding's turtles were captured until 1 October, when five males and one female were trapped at site one, Spears South. The investigators had to wonder at the reasons for their sudden success after three weeks of fruitless effort. Noting that one trap held one female and four males, it was considered that reproductive behavior might have played a part. Blanding's turtle is known to mate as late as November. Perhaps the lone female had entered the trap first, followed by the four males which were enticed not so much by the chicken liver bait as by an opportunity to mate. Interestingly, no more Blanding's turtles were taken at this site in six trapping sessions subsequent to October first. Several more sites were sampled in the following two weeks. The weather turned cool and wet, and even catches of painted turtles tapered sharply. After 16 October, when water temperatures dropped to around 15 degrees celsius, no turtles of any species were captured. Trapping was suspended until the following spring.

On 31 March, 1990, traps and thermometers were placed at several sites. The investigators wanted to determine the water/air temperatures at which turtle activity resumed. Water temperatures at this time ranged from 7-10 degrees celsius depending on the size and location of the pond. Monitoring of five sites over the following 15 days revealed that water temperatures varied considerably in response to atmospheric conditions.

It was not uncommon to record fluctuations of 5-8 degrees celsius during a 24 hour period in the smaller ponds. No turtles of any species were captured until 15 April, when two painted turtles were trapped at Spears South (site one). Air temperature was 16 degrees celsius, water 19 degrees celsius. Turtle activity was found to be influenced greatly by the weather. On warm, sunny days, turtles were out feeding and basking. If it was cool and wet, no turtles would be seen or trapped. This pattern persisted right up to the closing days of the survey in mid-June. Even with water and air temperatures in the 20-30 degree range, a change from mild to rainy weather would induce relative inactivity in all turtle species.

On 1 May, the Spears/Guanci wetland sites were added to the roster. These sites, designated respectively Spears Big Pond, Guanci Indian Ridge and Guanci Birdsong, are actually three lobes of 7.5 ha marsh located in sections 35 and 36, T. 20 N., R. 10 E. of Lee county. It is exceptionally high-quality habitat, much of it in near original condition. Water depth ranges to 1.5 m with profuse native aquatic vegetation including sedges, bulrushes and water lilies. Turtle prey is present in the form of crayfish, gastropods and aquatic insects. Surrounding the wetland are groves dominated by oak and hickory, interspersed by fallow fields and pastures. The site differs from most of the others in that its timbers are broken by open and unspoiled sand ridges which are used by Blanding's turtles, painted turtles and snapping turtles for nesting. These clearings also support an impressive flora of native prairie species. The entire marsh was dry from June 1988 until the return of normal precipitation in the spring of 1990. The investigators were surprised when it proved to be the largest single producer of Blanding's turtles during the survey.

The Spears/Guanci wetland can be considered the core of the study area's eastern sector, with 14 other sites ranging in size from .04 to 3.1 ha located within 1.5 km.

Between 2 May and 13 June, this tri-lobed wetland produced 16 Blanding's turtles, eight male and eight female. All were breeding-age adults with the exception of one six year old subadult female. Five were recaptured after intervals of from five to 42 days. Of these five, three (two male, one female) had moved to other areas of the marsh. Female L 02-R 03 was taken on 2 May at the Birdsong site. When recaptured on 13 June at Indian Ridge, 215 m to the north, she was 68 g heavier and gravid. Male R 10 was trapped on 2 May at Indian Ridge and recaptured five days later at Birdsong. On 10 June, this turtle turned up again at Indian Ridge, having a round trip of 430 m straight line distance through the marsh in 39 days. Finally, male R 12, trapped on 7 May at Birdsong, was "noodled" 320 m away in the Spears Big Pond lobe on 4 June. At that time, R 12 was in the company of female L 01-R 09. This female was the only specimen taken in the 1989/90 survey that bore a 1986 survey mark. She was originally captured as an 11 year old on 13 June 1986 at Spears Small Pond, a .04 ha pool on a ridge 270 m from Spears Big Pond. Upon comparing her statistics, L 01-R 09 (1986 survey L 07) was found to be very slightly smaller in 1990 in every category except weight. We realize that despite having endured two hard years of drought, this turtle had not actually shrunk. The discrepancy is probably attributable to different investigators using different measuring equipment. In the present survey all measurements were taken by either Osmer or Rogers, and the same equipment was used throughout. Measurements were verified by a D.O.C. biologist. (Another word concerning measurements: During the 1989-90 survey, carapace width was

measured at the widest point, usually at the eighth marginal scute. Near the end of the project, it was pointed out to the investigators by a veteran surveyor that this measurement is more properly taken across the plastral hinge at the fifth marginal scute. Also, it was noticed part way through the survey that the eighth/ninth marginal scute area flares markedly in male Blanding's turtles and very little in females. While this observation may seem of dubious value, it could be used to determine the sex of turtle remains when only the carapace is recovered).

Other sites in the eastern sector which produced Blanding's turtles in 1990 include site 21, Snapping Turtle Pond (one male), and site 23, Fredenhagen Basking Pond (one female). The site 23, female, L 01-R 03, was atypical in that the plastron, normally yellow with black blotches, was a uniform deep mahogany in color. While this condition was not seen in any other survey Blanding's turtles, one researcher (Vogt, 1981) states that it occurs often in Blanding's turtles of the lower Wisconsin River. Vogt offers no possible cause for its coloration, but the investigators feel that it may be due to some property of the site's water. Fifteen painted turtles captured at this site also displayed darker plastrons.

The western sector includes five sites (12-16) in May and East Grove townships, two of which yielded Blanding's turtles. Site 14, Kant Road Pond, is a .5 ha impoundment located 7.5 km southwest of the eastern sector. This site is all that remains of a large (20-25 ha) wetland which was drained within the last 20 years. The pond is dominated by cattails and bulrushes and is surrounded by cultivated fields. Two Blanding's turtles were captured here in 1986. Dry in 1988/89, the site refilled in the spring of 1990. Three Blanding's turtles were trapped in the present survey, two males and one female. None carried 1986 survey marks. Site

16, the Mud Turtle Site, lies 12.2 km southwest of the eastern sector. This .3 ha marsh produced the only specimen of Illinois mud turtle trapped during the 1986 Illinois Mud Turtle Survey. One Blanding's turtle was also captured at that time. This site was dry in 1988/89. Recharged in 1990, it now appears to be very good habitat. However, the only turtle of any species captured here in the present survey was a male Blanding's "noodled" during the first trapping session. This specimen, L 01-R 04, was the largest individual taken during the study (1560 g). It showed no previous survey mark.

Drift fences placed at the Guanci Indian Ridge and Birdsong sites failed to produce Blanding's turtles, but proved to be a good method for sampling other terrestrial/semi-terrestrial species in the area. Among the creatures found in the bucket traps were masked shrews (Sorex cinereus), one short-tailed shrew (Blarina brevicauda), one meadow vole (Microtus pennsylvanicus), a large number of six lined racerunners (Cnemidophorus sexlineatus sexlineatus), crayfish (Gammarus spp.), numerous arachnids and a variety of insects. Although the fence was faithfully checked every 24 hours, the masked shrews had almost invariably succumbed to starvation. The only individual to survive did so by devouring most of a gray treefrog (Hyla versicolor) which was also in the trap. Two female painted turtles were captured on the landward side of the fence, suggesting that they were moving toward water. At 15 m, the drift fence was probably too short to be effective at intercepting Blanding's turtles from a 7.5 ha wetland. A future attempt would utilize a longer fence or a smaller site.

The investigators would like to report some bird sightings made during the survey. The study area, particularly the Spears/Guanci wetland, supports a rich and varied avifauna. Sighted in addition to great blue

heron (Ardea herodias) and green heron (Butorides virescens) were common egret (Casmerodius albus) and sora rail (Porzana carolina). One species which was never seen but often heard has been tentatively identified on the basis of the call as American bittern (Botaurus lentiginosus). On 26 May, Osmer and Rogers were delighted to witness an osprey (Pandion haliaetus) catching a fish from a farm pond site 10.

Another interesting aside to the 1989/90 survey was the discovery of an undocumented parasitism of painted turtle by a stalked protozoan (Epistylis spp.). One Blanding's turtle was similarly afflicted. This organism has been previously reported to parasitize only fish. The occurrence was noted on painted turtles in several study area ponds. An affected specimen is currently being studied by pathologist Rob Horner at the fish hatchery at Sand Ridge. LeeNAG has proposed a study of painted turtles for 1990/91 to determine the extent of this situation.

B. PURPLE LOOSESTRIFE

Study area wetlands were routinely inspected for purple loosestrife during turtle trapping sessions. Even in late summer and early fall of 1989, when the plant would have been in conspicuous bloom, none was found. The WANTED poster generated one response from a landowner who reported seeing a plant similar to purple loosestrife in one of his fallow fields. A walk-over of the site in question failed to locate any plants, although the investigators did find a fair amount of blue vervain (Verbana hastata), a look-alike species which can be mistaken for purple loosestrife by a casual observer. A floral/faunal inventory of three area wetlands conducted concurrently by LeeNAG investigators Hazel Reuter and Dr. Cassandra Rodgers also turned up no purple loosestrife. It is the considered opinion of LeeNAG that this exotic has not yet reached the study area. Monitoring will continue.

DISCUSSION

The results of the Blanding's turtle live-trapping program would seem to indicate that as a species, it is alive and well in the Green River Lowlands. Nine of the 23 sites sampled produced Blanding's turtles, for a total of 31 individuals. While only three of the six 1986 Blanding's turtles sites yielded turtles, the investigators do not see this as cause for alarm. The species' absence from the other three sites is probably attributable to the documented habit of Blanding's turtle (Rowe, 1987) to move freely between adjacent bodies of water. Perhaps the turtles were simply not using these sites at the time the survey was conducted. Moreover, empty traps do not prove that no turtles are present, but only that none were captured. A more disturbing statistic to arise from the survey is the apparent dearth of young Blanding's turtles in the study area. While the secretive nature of young Blanding's turtles has been noted by other researchers (Carr, 1952; Vogt, 1981), it seems reasonable to expect more than one such individual in a sample of this size. In fact, the youngest specimen of the 31 taken in the 1989/90 survey was a six year old, 440 g female from the Guanci Indian Ridge site. LeeNAG hopes that the next generation of lowland Blanding's turtles is out there somewhere and is merely underrepresented in the sample. If, however, this is not the case, other possibilities must be considered.

A real absence of young turtles would most likely be caused by reproductive failure in breeding adults or high hatchling mortality. Although nine females examined between 2 May and 4 June were found not to be gravid, it is likely that egg development had not progressed to

the point that the eggs could be detected by palpation. The last two females, trapped on 12 and 13 June, were carrying eggs. One of these, L 02-R 03, had gained 68 g since her original capture on 2 May. So, it appears that adult Blanding's turtles are breeding successfully.

Reproductive success of Blanding's turtles could be affected by the inavailability of safe nesting sites. Typically, the study area ponds are bordered by oak/hickory timber or farm fields. Forest settings are often too heavily shaded for creatures which rely on sunlight for incubation. Farm fields are subject to repeated disturbance during the nesting season. Studies suggest that populations of Blanding's turtles use the same nesting areas over many generations. Hatchlings apparently imprint on the natural chemical properties of the soil and will return to these areas as adults. These traditional nesting grounds, often former prairie, may continue to attract gravid females even after they have gone under the plow. Perhaps, then, Blanding's turtles nests are being destroyed by farm equipment.

A more likely explanation for the scarcity of young, and the only one for which we have direct evidence, is the destruction of nests by predators. On 14 June, two nests were found dug out of the sand on Indian Ridge. Several intact eggs were judged on the basis of size and shape to be those of snapping turtle (Chelydra serpentina), but there is no reason to believe that nests of Blanding's turtles are not similarly affected. On 17 June, the remnants of seven more clutches were discovered. While the perpetrators have not been identified, it is known that raccoon, skunk, coyote and fox, as well as other species, prey opportunistically on eggs and young. These mammals, currently enjoying the benefits of a depressed fur market, may be on the increase. They apparently work the sand ridge nesting grounds at egg-laying time to exploit this easy resource. The

deleterious effects of predation cannot be overemphasized; still, the investigators feel that losses to predators could be better tolerated if the position of Blanding's turtles had not already been compromised by human activity. In nature, most creatures sustain themselves at the expense of others. While little can be done to stop predation, efforts can be made to preserve and restore conditions which are conducive to a normal balance of predator and prey.

Of all the factors affecting Blanding's turtle populations in the Green River Lowlands, the most significant are habitat loss and the degradation of what habitat remains. The conversion of natural lands to agricultural, commercial and recreational uses has sharply reduced the type of habitat required by this species. Although these losses have stabilized somewhat in recent years, they do still occur to some degree. One site which was bounded by mixed forest/prairie in 1986 has since lost part of the prairie component to agriculture. Not only has this action resulted in the loss of possible nesting sites, but the wetland is now partially without its natural buffer to filter silt and chemicals from incoming water. Another site, fed by a field tile, experienced a rampant growth of submergent vegetation and algae following the heavy spring rains of 1990. This condition may have been caused by farm fertilizer flushing into the pond. While the extent to which choking vegetation affects Blanding's turtles is not known, it should be pointed out that this site produced six Blanding's turtles in autumn 1989 with vegetation at normal levels, and none in several days of trapping during May 1990.

Mention must also be made of the extremely dry conditions which preceded the survey. The drought effectively began in the fall of 1987 and persisted until spring 1990. During this time, several study area wetlands went

completely dry. According to a landowner, the extensive wetland comprising Spears Big Pond and the Guanci Indian Ridge and Birdsong sites was without water by June of 1988. In mid-fall 1989, after several decent rains, LeeNAG members walked directly through the Birdsong lobe and barely wet their boots. Yet today, the whole area has refilled with water to a maximum depth of approximately 1.5 m and aquatic life, including Blanding's turtles, painted turtles (Chrysemys picta), and snapping turtles is once again abundant. What survival strategies does Blanding's turtle employ to cope with a natural calamity such as drought? Do these strategies operate as effectively in the modern lowlands as they did in prehistory? These and related questions are the subject of a LeeNAG study proposal currently under consideration by the Checkoff Advisory Council.

SUMMARY

The outcome of the 1989/90 survey was gratifying in that we found good numbers of Blanding's turtles and no purple loosestrife. LeeNAG hopes that governing agencies will continue to encourage landowners to preserve habitat. Further, we feel that special attention should be given to areas such as the Green River Lowlands which still support viable biosystems. Official designations would publicly acknowledge the real value of these areas. Blanding's turtle and other native species need (and deserve) a safe harbor, a place apart, where they can lead natural lives. It is within our power to provide such places. Progress and preservation need not be mutually exclusive if we conscientiously apply ourselves to the task of developing sound management practices.

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SITE ROSTER

SITE #	SITE NAME	COUNTY	TWP	OWNER
01	SPEARS SOUTH	LEE	AMBOY	MARVIN SPEARS
02	SPEARS GOLDMINE	LEE	AMBOY	MARVIN SPEARS
03	SPEARS BIG POND	LEE	AMBOY	MARVIN SPEARS
04	GUANCI INDIAN RIDGE	LEE	AMBOY	JERRY GUANCI
05	GUANCI BIRDSONG	LEE	AMBOY	JERRY GUANCI
06	GUANCI 50 TURTLE HEAD	LEE	AMBOY	JERRY GUANCI
07	ZELHOFFER HAYFIELD POND #1	LEE	AMBOY	W FREDENHAGEN
08	ZELHOFFER HAYFIELD POND #2	LEE	AMBOY	W FREDENHAGEN
09	ZELHOFFER BIG POND	LEE	AMBOY	W FREDENHAGEN
10	FREDENHAGEN LONG POND	LEE	AMBOY	W FREDENHAGEN
11	TED'S SWAMP	LEE	AMBOY	W FREDENHAGEN
12	WOODHAVEN LAKES POND	LEE	MAY	WOODHAVEN INC
13	CAREY POND	LEE	EAST GROVE	WILLIAM CAREY
14	KANT ROAD POND	LEE	MAY	WILLIAM KANT
15	KANT DEEP POND	LEE	MAY	WILLIAM KANT
16	MUD TURTLE SITE	LEE	EAST GROVE	G SWICKHEIMER
17	GRIGALOUSKI ROAD POND	LEE	AMBOY	RN GRIGALOUSKI
18	GRIGALOUSKI BEAVER POND	LEE	AMBOY	RN GRIGALOUSKI
19	GUANCI DEEP POND	LEE	AMBOY	JERRY GUANCI
20	GUANCI NORTH	LEE	AMBOY	JERRY GUANCI
21	SNAPPING TURTLE POND	LEE	AMBOY	MARVIN SPEARS
22	STERLING ROAD	LEE	AMBOY	WILBERT GENTZ TR
23	FREDENHAGEN BASKING POND	LEE	AMBOY	W FREDENHAGEN
24	SPEARS SMALL POND	LEE	AMBOY	MARVIN SPEARS

SITE SOIL TYPES-EMYDOIDEA BLANDINGI

SITE #	SITE NAME	LOCATION	SOIL SYMBOL	SOIL NAME
1	SPEARS SOUTH	Sec. 35, T.20., R.10E.	779D 204B	Chelsea fine sand, 7-20 percent slopes Ayr sandy loam 1-7 percent slope
3	SPEARS BIG POND	Sec. 35, T.20N., R.10E.	4200 204B	Orio mucky sandy loam, ponded Ayr sandy loam 1-7 percent slopes
4	GUANCI INDIAN RIDGE	Sec. 36, T.20N., R.10E.	4200 779B	Orio mucky sandy loam, ponded Chelsea fine sand 1-7 percent slope
5	GUANCI BIRDSONG	Sec. 36, T20N, R.10E.	4200 204B	Orio mucky sandy loam, ponded Ayr sandy loam 1-7 percent slopes
14	KANT ROAD POND	Sec. 6, T.19N, R.10E.	4200	Orio mucky sandy loam, ponded
16	MUD TURTLE SITE	Sec. 15, T.19N., R.9.E.	4200	Orio mucky sandy loam, ponded
21	SNAPPING TURTLE POND	Sec. 35, T.20N., R.10E.	201	Gilford fine sandy loam
22	STERLING ROAD	Sec. 18, T.20N., R.10E.	508	Selma loam, bedrock substratum
23	FREDENHAGEN BASKING POND	Sec. 34, T.20N., R.10E.	779B	Chelsea fine sandy loam

SPECIES BY SITE

SITE	EMYDOIDEA BLANDINGI	CHRYSEMYS PICTA	CHELYDRA SERPENTINA	TOTAL
1	6	36	0	42
2	0	0	0	0
3	2	16	0	18
4	5	17	2	24
5	11	28	3	42
6	0	14	0	14
7	0	8	0	8
8	0	7	0	7
9	0	21	0	21
10	0	15	0	15
11	0	1	1	2
12	0	0	0	0
13	0	10	0	10
14	3	8	2	13
15	0	0	0	0
16	1	0	0	1
17	0	0	0	0
18	0	6	0	6
19	0	0	0	0
20	0	5	0	5
21	1	0	0	1
22	1	0	0	1
23	1	15	0	16
24	0	0	0	0
TOTAL	31	207	8	246

SPECIMEN PROFILE - EMYDOIDEA BLANDINGI

WGT. - Weight
 C.L. - Carapace Length
 C.W. - Carapace Width
 P.L. - Plastron Length
 S.D. - Shell Depth

DATE	TURTLE #	SEX	SITE	WGT (g)	C.L. (mm)	C.W. (mm)	P.L. (mm)	S.D. (mm)
10-01-89	R 09	F	01	1125	190	137	202	85
10-01-89	R 03	M	01	1451	238	148	204	84
10-01-89	R 08	M	01	1399	219	146	203	81
10-01-89	R 01	M	01	1322	209	152	200	75
10-01-89	R 02	M	01	1148	209	133	181	78
10-01-89	R 10	M	01	972	181	123	176	68
106-04-90	L 01-R 09	F	03	998	176	124	164	73
105-11-90	L 03-R 03	M	03	933	193	132	186	61
105-11-90	L 01-R 01	F	04	1058	181	126	193	69
105-02-90	R 09	F	04	1114	190	121	188	69
105-02-90	R 10	M	04	1118	193	126	183	65
105-04-90	L 10	M	04	1042	197	125	178	68
106-12-90		F	04	440				
105-11-90	L 02-R 02	M	05	1120	192	138	189	74
105-10-90	L 10-R 10	M	05	954	194	131	186	67
105-07-90	R 12	M	05	1343	237	150	205	76
105-02-90	R 02	M	05	1266	208	135	197	80
105-02-90	L 08	F	05	1204	201	130	193	84
105-03-90	L 09	M	05	1184	215	138	192	73
105-08-90	L 12-R 12	F	05	729	186	115	174	71
105-07-90	L 11	F	05	1006	201	126	191	81
105-02-90	L 02-R 03	F	05	900	185	119	174	66

SPECIMEN PROFILE - EMYDOIDEA BLANDINGI

DATE	TURTLE #	SEX	SITE	WGT (g)	C.L. (mm)	C.W. (mm)	P.L. (mm)	S.D. (mm)
106-12-90	L 01-R 12	M	05	1062	189	120	179	65
106-12-90	L 02-R 01	F	05	1032	174	119	173	63
106-04-90	L 01-R 08	M	14	1455	215	150	195	75
106-05-90	L 01-R 11	F	14	1242	216	123	186	70
106-05-90	L 01-R 10	M	14	1263	209	131	187	74
106-03-90	L 01-R 04	M	16	1560	203	138	194	84
105-10-90	L 01-R 02	M	21	1054	187	119	184	64
105-17-90	L 11-R 11	M	22	1168	205	142	189	75
105-27-90	L 01-R 03	F	23	847	176	114	170	63

MEASUREMENTS-EMYDOIDEA BLANDINGI

SEX	CRITERION	WEIGHT	CARAPACE LENGTH	CARAPACE WIDTH	PLASTRON LENGTH	SHELL DEPTH
MALE	MEAN	1200 g	205 mm	136 mm	190 mm	73 mm
	RANGE	933-1560	181-238	119-152	176-205	61-84
	INDIVIDUALS	19	19	19	19	19
FEMALE	MEAN	1023 g	189 mm	123 mm	183 mm	72 mm
	RANGE	729-1242	174-216	114-137	164-202	63-85
	INDIVIDUALS	11	11	11	11	11

DISTRIBUTION BY SEX
EMYDOIDEA BLANDINGI

SITE #	SITE NAME	MALE	FEMALE	TOTAL
1	SPEARS SOUTH	5	1	6
3	SPEARS BIG POND	1	1	2
4	GUANCI INDIAN RIDGE	2	3	5
5	GUANCI BIRDSONG	6	5	11
14	KANT ROAD POND	2	1	3
16	MUD TURTLE SITE	1	0	1
21	SNAPPING TURTLE POND	1	0	1
22	STERLING ROAD	1	0	1
23	FREDENHAGEN BASKING POND	0	1	1
	TOTAL	19	12	31

COMPARATIVE SURVEY RESULTS
EMYDOIDEA BLANDINGI

SITE #	SITE NAME	2-13 JUNE 1986	2-13 JUNE 1990	TOTAL
2	SPEARS GOLDMINE	6	0	6
3	SPEARS BIG POND	1	2	3
11	TED'S SWAMP	1	0	1
14	KANT ROAD POND	2	3	5
16	MUD TURTLE SITE	2	1	3
24	SPEARS SMALL POND	1	0	1
	TOTAL	13	6	19

Site name: Spears Big Pond

Investigators: Rogers & Osmer

Location: Sec. 35 T. 20 N. R. 10 E.

Survey Dates: 5-11-90 thru 6-4-90

Species: *Emydoidea blandingi*

I.D. Number	Capture Date	Sex	Wgt. (g)	Celsius Air	Celsius Water
L-03 R-03 Drilled	5-11	M	933	13.3	17.7
L-01 R-09 Drilled	6-04	F	176	20.0	23.8

Site name: Guanci Birdsong

Investigators: Rogers, Oemer, Janoskey

Location: Sec. 36 T. 20 N. R. 10 E.

Survey Dates: 5-2-90 thru 6-12-90

Species: *Emydoidea blandingi*

I. D. Number	Capture Date	Sex	Wgt. (g)	Celsius Air	Celsius Water
L-08 Drilled	5-02	F	1199		23.3
L-02 R-03 Drilled	5-02	F	900		23.3
R-02 Drilled	5-02	M	1266		23.3
L-09 Drilled	5-03	M	1184		13.3
L-11 Drilled	5-07	F	1006	22.7	22.7
R-12 Drilled	5-07	M	1343	22.7	22.7
L-12 R-12 Drilled	5-08	F	729	23.0	17.7
L-10 R-10 Drilled	5-10	M	954	7.2	12.2
R-02 L-02 Drilled	5-11	M	1120	13.3	18.3
L-01 R-12 Drilled	6-12	M	1062	31.1	24.4
L-02 R-01 Drilled	6-12	F	1032	31.1	24.4

Site name: Kant Road Pond

Investigators: Rogers, Oamer, Malone, Rodgers

Location: Sec. 6 T. 19 N. R. 10 E.

Survey Dates: 6-04-90 thru 6-05-90

Species: Emydoidea blandingi

I.D. Number	Capture Date	Sex	Wgt. (g)	Celsius Air	Celsius Water
L-01 R-08 Drilled	6-04	M	1455	17.7	21.6
L-01 R-11 Drilled	6-05	F	1242	16.6	13.8
L-01 R-10 Drilled	6-05	M	1263	16.6	13.8

Site name: Mud Turtle Site

Investigators: Rogers & Osmer

Location: Sec. 15 T. 19 N. R. 10 E.

Survey Dates: 6-3-90

Species: *Emydoidea blandingi*

I.D. Number	Capture Date	Sex	Wgt. (g)	Celsius Air	Celsius Water
L-01 R-04 Drilled	6-03	M	1560		

Site name: Snapping Turtle Pond

Investigators: Rogers & Osmer

Location: Sec. 35 T. 20 N. R. 10 E.

Survey Dates: 5-10-90

Species: *Emydoidea blandingi*

I.D. Number	Capture Date	Sex	Wgt. (g)	Celsius Air	Celsius Water
L-11 R-11 Drilled	5-10	M	1168	12.2	11.6

Site name: Sterling Road

Investigators: Benson & Edmondson

Location: Sec. 18 T. 20 N. R. 10 E.

Survey Dates: 5-17-90

Species: *Emydoidea blandingi*

I.D. Number	Capture Date	Sex	Wgt. (g)	Celsius Air	Celsius Water
L-01 R-02 Drilled	5-17	M	1054		

Site name: Fredenhagen Basking Pond

Investigators: Rogers & Osmer

Location: Sec. 34 T. 20 N. R. 10 E.

Survey Dates: 5-27-90

Species: *Emydoidea blandingi*

I.D. Number	Capture Date	Sex	Wgt. (g)	Celsius Air	Celsius Water
L-01 R-03 Drilled	5-27	F	847	22.2	21.1

Site name: Spears South

Investigators: Rogers

Location: sec. 35 T. 20 N. R. 10 E.

Survey Dates: 9-30-89 thru 10-01-89

Species: *Emydoidea blandingi*

I.D. Number	Capture Date	Sex	Wgt. (g)	Celsius Air	Celsius Water
R-10 Notched	10-01	M	972		
R-09 Notched	10-01	F	1125		
R-08 Notched	10-01	M	1399		
R-01 Notched	10-01	M	1322		
R-03 Notched	10-01	M	1451		
R-02 Notched	10-01	M	1148		

Site name: Guanci Indian Ridge

Investigators: Rogers, Osmer, Reuter, Rodgers

Location: Sec. 36 T. 20 N. R. 10 E.

Survey Dates: 5-2-90 thru 6-12-90

Species: *Emydoidea blandingi*

I. D. Number	Capture Date	Sex	Wgt. (g)	Celsius Air	Celsius Water
R-10 Drilled	5-02	M	1118		23.3
R-09 Drilled	5-02	F	1114		23.3
L-10 Drilled	5-04	M	1042	5.0	12.2
L-01 R-01 Drilled	5-11	F	1058	14.4	18.8
	6-12	F	440	31.1	24.4