



**US Army Corps
of Engineers**

Waterways Experiment
Station

Technical Report SERDP-97-9
September 1997

Strategic Environmental Research and Development Program

Species Profile: Alligator Snapping Turtle (*Macrocllemys temminckii*) on Military Installations in the Southeastern United States

by John J. Lane, Wilma A. Mitchell

19971022 072

Approved For Public Release; Distribution Is Unlimited

THIS QUALITY INSPECTED 3



Prepared for Headquarters, U.S. Army Corps of Engineers

Improving Mission Readiness through
Environmental Research

The contents of this report are not to be used for advertising, publication, or promotional purposes. Citation of trade names does not constitute an official endorsement or approval of the use of such commercial products.

The findings of this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.



PRINTED ON RECYCLED PAPER

Species Profile: Alligator Snapping Turtle (*Macrolemys temminckii*) on Military Installations in the Southeastern United States

by John J. Lane, Wilma A. Mitchell

U.S. Army Corps of Engineers
Waterways Experiment Station
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

Final report

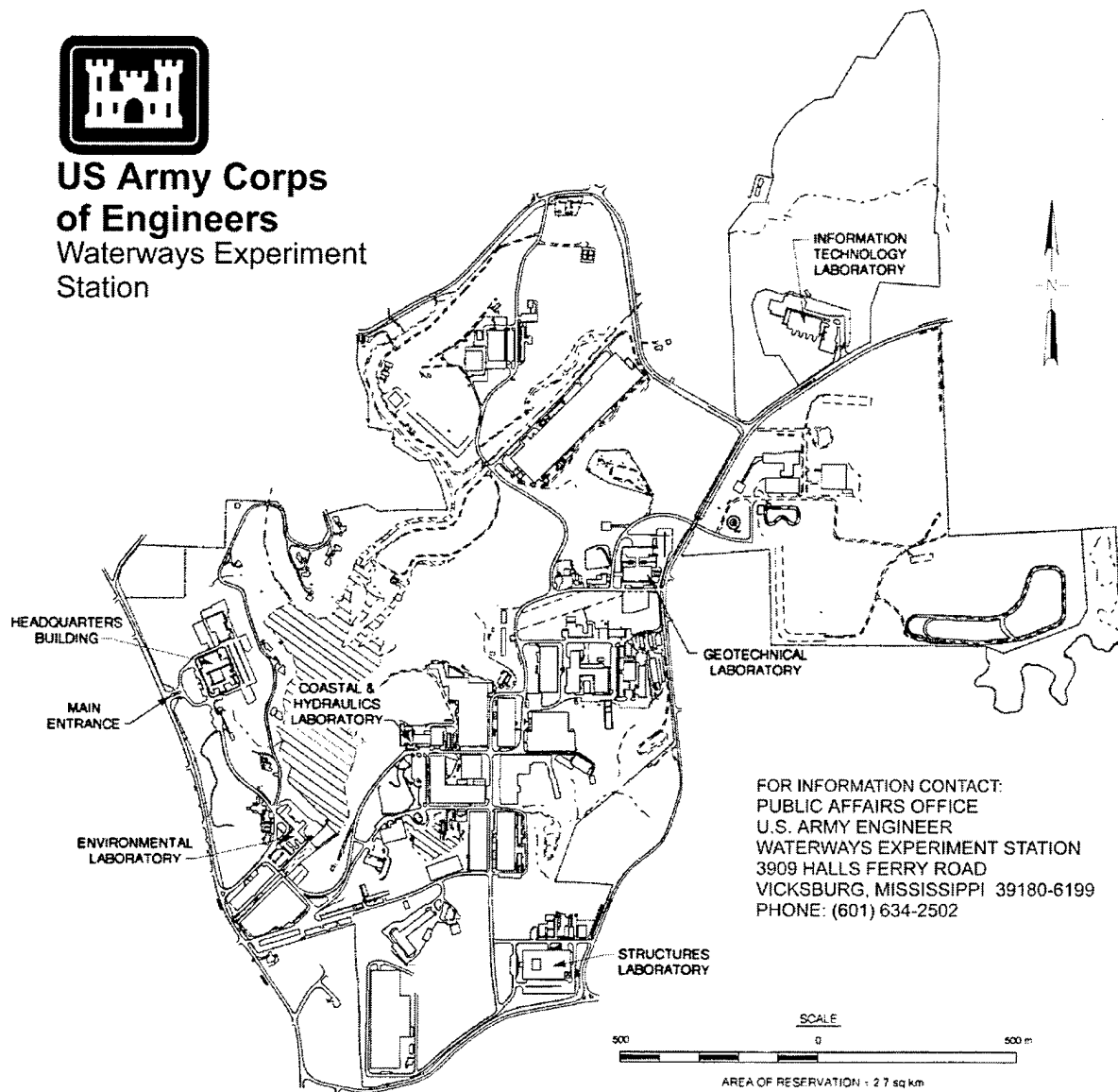
Approved for public release; distribution is unlimited

DTIC QUALITY INSPECTED 3

Prepared for U.S. Army Corps of Engineers
Washington, DC 20314-1000



**US Army Corps
of Engineers**
Waterways Experiment
Station



FOR INFORMATION CONTACT:
PUBLIC AFFAIRS OFFICE
U.S. ARMY ENGINEER
WATERWAYS EXPERIMENT STATION
3909 HALLS FERRY ROAD
VICKSBURG, MISSISSIPPI 39180-6199
PHONE: (601) 634-2502

Waterways Experiment Station Cataloging-in-Publication Data

Lane, John J.

Species profile : Alligator snapping turtle (*Macroclemys temminckii*) on military installations in the Southeastern United States / by John J. Lane, Wilma A. Mitchell ; prepared for U.S. Army Corps of Engineers.

18 p. : ill. ; 28 cm. — (Technical report ; SERDP-97-9)

Includes bibliographic references.

1. Alligator snapping turtle — Speciation — United States. 2. Snapping turtles — Speciation — United States. 3. Endangered species. I. Mitchell, Wilma A. II. United States. Army. Corps of Engineers. III. U.S. Army Engineer Waterways Experiment Station. IV. Strategic Environmental Research and Development Program (U.S.) V. Title. VI. Series: Technical report (U.S. Army Engineer Waterways Experiment Station) ; SERDP-97-9.

TA7 W34 no.SERDP-97-9

Preface

The work described herein was authorized by the Strategic Environmental Research and Development Program (SERDP), Washington, DC. The work was performed under the SERDP study entitled "Regional Guidelines for Managing Threatened and Endangered Species Habitats." Dr. John Harrison was Executive Director, SERDP.

This report was prepared by Mr. John J. Lane and Dr. Wilma A. Mitchell, Natural Resources Division (NRD), Environmental Laboratory (EL), U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, MS. Mr. Lane was employed by WES under a Student Contract Agreement with Tennessee Technological University, Cookeville, TN, during the preparation of this report.

Report review was provided by Mr. J. Brent Harrel, U.S. Department of Agriculture National Wildlife Research Center, Mississippi State University. WES technical review was provided by Messrs. Chester O. Martin and John L. Tingle, Ms. Dena D. Dickerson, and Dr. Richard A. Fischer, EL. Mr. Martin, EL, WES, and Ms. Ann-Marie Trame, Land Management Laboratory, U.S. Army Construction Engineering Research Laboratories, Champaign, IL, were Primary Investigators for the work unit. Dr. Fischer, EL, WES, managed and coordinated preparation of species profiles for this study.

This report was prepared under the general supervision of Dr. Michael F. Passmore, Chief, Stewardship Branch, NRD; Dr. Dave Tazik, Chief, NRD; and Dr. John Harrison, Director, EL.

At the time of publication of this report, Dr. Robert W. Whalin was Director of WES.

This report should be cited as follows:

Lane, J. J., and Mitchell, W. A. (1997). "Species profile: Alligator snapping turtle (*Macroclemys temminckii*) on military installations in the southeastern United States," Technical Report SERDP-97-9, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Species Profile: Alligator Snapping Turtle (*Macrolemys temminckii*)

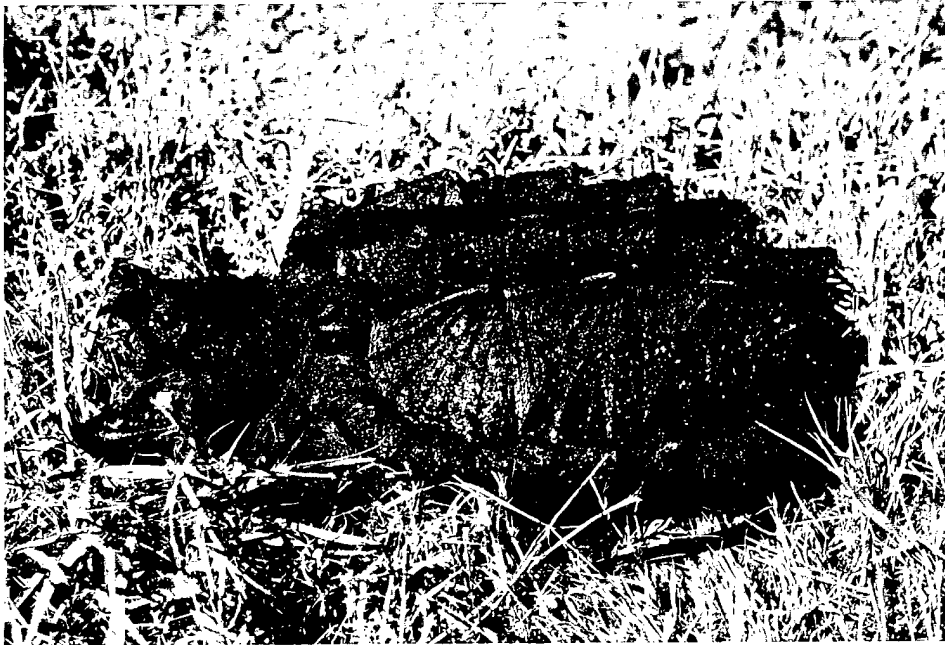


Photo by J. Brent Harrel

Taxonomy

Class	Reptilia
Order	Testudines
Family	Chelydridae
Genus/species	<i>Macrolemys temminckii</i>
Other Common Names	Alligator snapper, snapper, mossy back, loggerhead

Description

The alligator snapping turtle is the only extant species of the genus *Macrolemys* (Ernst et al. 1994). This species is endemic to the United States and is the largest freshwater turtle in North America (Ernst and Barbour 1989). The carapace (dorsal shell) length of adult alligator snapping turtles ranges from 38 to 66 cm (15 to 26 in.), and the weight typically ranges from 16 to 80 kg (35 to 176 lb) (Johnson 1987, Ernst and Barbour 1989). However, weights of 100 kg (220 lb) (Pritchard 1979) and carapace lengths of 80 cm (Pritchard 1980) have been reported. The carapace is approximately two-thirds as wide as it is long, extremely rough, dark brown or gray, and without markings (Pritchard 1979). The anterior carapace margin is smooth; the posterior margin is strongly serrated; and the sides are relatively straight (Carr 1952, Mount 1975, Ernst and Barbour 1989).

The carapace bears three strong, longitudinal, dorsal keels (Pritchard 1989). An extra row of scutes (plates referred to as the supramarginals) is located on the carapace between the costals and marginals. The plastron (ventral shell) is usually dark brown or gray (but can be black or tan), reduced in size, and has a cross-shaped appearance that leaves most of the soft parts exposed (Conant 1975, Ernst and Barbour 1989).

The huge head has a pointed snout, large lateral orbits, and powerful jaws with a prominent hook at the tip of the upper jaw (Carr 1952, Ernst and Barbour 1989). A pink wormlike appendage on the tongue is attached near its center to a rounded muscular base that allows movement of the appendage for attracting prey (Mahmoud and Klicka 1979, Ernst and Barbour 1989). Numerous dermal projections (tubercles) are located on the sides of the head, chin, and neck. The skin is dark brown to gray above and lighter below; darker blotches may be present on the head. The muscular tail is approximately as long as the carapace, with three rows of tubercles above and numerous small scales below (Ernst and Barbour 1989).

Sexes appear similar but can sometimes be distinguished on the basis of size, as mature males are considerably larger than females (Ernst et al. 1994). Males have longer preanal tail lengths than females; the vent is posterior to the rim of the carapace (Johnson 1987, Ernst and Barbour 1989), but this is not always obvious in smaller individuals (e.g., individuals 11.3 kg (25 lb) or less) (J. Brent Harrel, Personal Communication, 1997).

Juvenile skin is generally much rougher and has more exaggerated tubercles than that of adults (Carr 1952). The snout and tail are relatively longer than those of adults, and the juvenile tail is often longer than the carapace.

Similar Species

Alligator snapping turtles commonly occur with many other turtle species. However, they are likely to be confused only with the common snapping turtle (*Chelydra serpentina*), and very young individuals may possibly be confused with musk or mud turtles (Family Kinosternidae). The common snapping turtle has a smaller head, a saw-toothed tail, and lacks an extra row of scutes between the costals and marginals (Conant 1975). It also has low keels on the carapace, and its eyes are situated high enough so that the orbits can be seen when viewed from above (Ernst et al. 1994). The head of the alligator snapping turtle is covered with hard plates, whereas the common snapping turtle's head is covered with soft flesh (Clarke 1956, Conant 1975). Adult musk and mud turtles are much smaller and have shorter tails, smooth shells, and hinged plastrons (Conant 1975). Alligator snapping turtles (except for nesting females) rarely leave the water unless habitat becomes unsuitable; common snapping turtles often move among water bodies (J. Brent Harrel, Personal Communication, 1997).

Status

Legal Designation

Federal. In 1983, the U.S. Fish and Wildlife Service (USFWS) was petitioned to list the alligator snapping turtle as a threatened species, and a notice was published in the *Federal Register* (USFWS 1983) indicating that an action might be warranted. However, the petition was declined in 1984 because insufficient data were available to determine that this species should be listed under the provisions of the Endangered Species Act of 1973 (USFWS 1984). Having reviewed the status of the alligator snapping turtle, the USFWS (1991) concluded that if State actions have not been taken to protect this species and if available biological data suggested continued population declines, the alligator snapping turtle should be listed as threatened. Although the species underwent consideration by the USFWS in 1996 for listing as threatened, it still has not been Federally listed.

USFWS discontinued the designation of C2 species as candidates for listing (50 CFR 17, 28 February 1996). The alligator snapping turtle currently is considered to be a species of concern, but more biological research and field study are needed to resolve its conservation status. The petition for designation of the alligator snapping turtle as a threatened species was declined in 1984 due to a lack of sufficient scientific data concerning population status and trends. A USFWS (1991) report reviewing the status of the alligator snapping turtle concluded that if state actions have not been taken to protect this species and if available biological data suggest continued population declines, the alligator snapping turtle should be listed as a threatened species under the Endangered Species Act of 1973. In 1996, the species underwent consideration by USFWS for threatened species listing, but still has not been listed.

State. In most southeastern States, the alligator snapping turtle is listed as threatened, a species of special concern, or a species in need of conservation (Soule 1992). Because the species underwent Federal review for listing in 1996, some States currently are reviewing and potentially making changes to their protective status (J. Brent Harrel, Personal Communication, 1997). The State Natural Heritage Program ranks indicate that the alligator snapping turtle is rare throughout its range (Soule 1992). In Heritage surveys, the species was considered critically imperiled (S1 State Heritage designation) in Illinois, Kansas, Kentucky, and Missouri and imperiled (S2) in Oklahoma. In the Southeast, the alligator snapping turtle was considered rare (S3) in Alabama, Florida, Georgia, and Texas and was given a tentative S3 by Louisiana, Mississippi, and Tennessee.

Military installations

See Table 1.

Table 1
Known Status of the Alligator Snapping Turtle on Military Installations
in the Southeastern United States

State	Installation	Status on Installation
AL	Fort Rucker	Documented onsite.
	Fort McClellan, Pelham Range	Potential; no specimens were recorded during the latest inventory. "Cane Creek may be large enough to provide habitat for this species. The nearest known localities for the alligator snapping turtle are in the Coosa River, Etowah and Talladega counties, above and below Pelham Range" (Alabama Natural Heritage Program 1994).
AR	Camp Robinson	Documented onsite.
	Fort Chaffee	Documented onsite.
FL	Tyndall Air Force Base (AFB)	Documented onsite (Stephen Shea, Personal Communication, 1996).
	Eglin AFB	Documented onsite (McWhite et al. 1993).
GA	Marine Corps Logistics Base, Albany	Potential.
	Fort Benning	Documented onsite.
LA	Barksdale AFB	Potential.
	Fort Polk	Documented onsite (Kenneth Moore, Personal Communication, 1997)
	Louisiana Army Ammunition Plant	Potential.
	Camp Beauregard	Potential.

Distribution and numbers

The alligator snapping turtle is found in the south-central and southeastern United States throughout the Mississippi River Valley and Gulf Coast States (Figure 1). The southern limit of its range extends from eastern Texas to central Florida with the Suwannee River system as the eastern boundary. The alligator snapping turtle's range extends north through southern Georgia, central Alabama, northeast Mississippi, and the extreme western portions of Tennessee and Kentucky. The northern limit includes southwestern Indiana, central Illinois, southeastern Iowa, and the southern half of Missouri. The western limit extends from southeastern Kansas and central Oklahoma through eastern Texas (Carr 1952, Conant 1975, Ernst and Barbour 1989, Pritchard 1989, USFWS 1991, Soule 1992).

The alligator snapping turtle is extremely rare in the northern portions of its range (Smith 1961, Anderson 1965, Minton 1972, Johnson 1987, Pritchard 1989, USFWS 1991). It was considered extirpated from Indiana until one was caught in the White River in 1991 (Grannan and Anderson 1992), and recent Kansas records revealed no evidence of viable breeding populations (Shipman 1993). Pritchard (1989) speculated that this species has declined, up to 95 percent, over much of its range. However, researchers in Florida and Tennessee have reported that the alligator snapping turtle is less rare than previously believed (USFWS 1991). Although there is general consensus that the alligator snapping turtle has declined, more data are required to accurately assess its status and

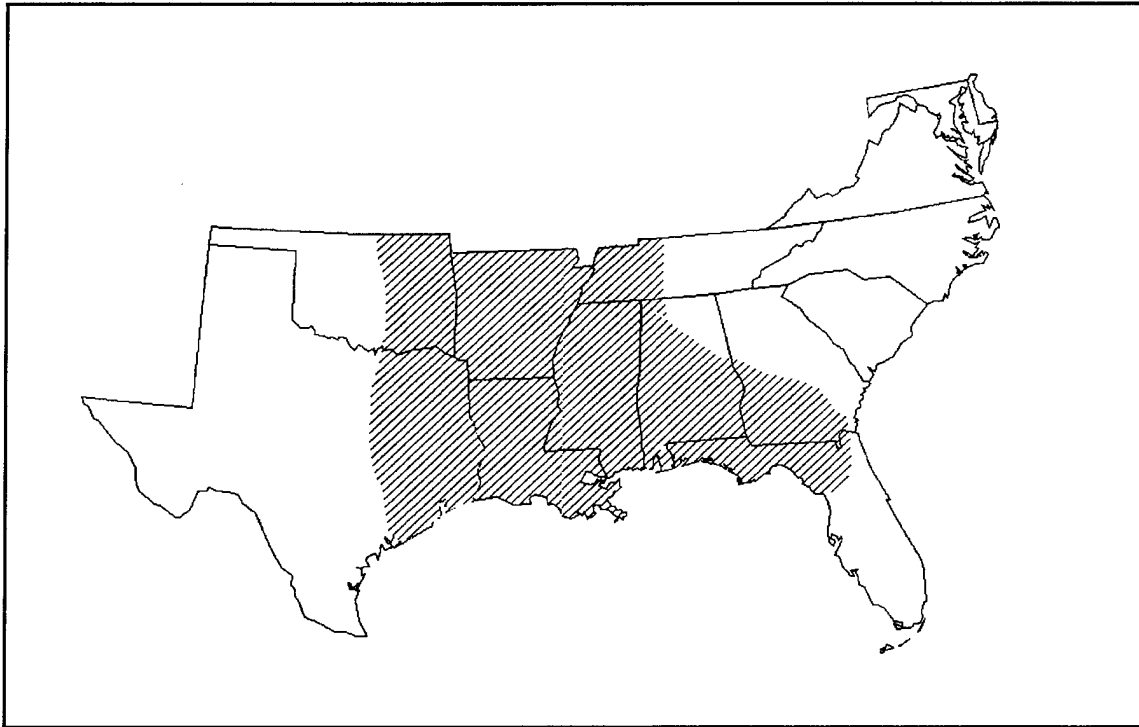


Figure 1. Approximate distribution of alligator snapping turtles in the southeastern United States (Dena Dickerson, Personal Communication, 1997)

conservation needs throughout its range (USFWS 1991, Soule 1992). Censuses to determine population densities of the alligator snapping turtle are difficult to achieve because of its secretive, nocturnal habits and highly aquatic nature (Pritchard 1989, Soule 1992). No known estimates of overall population size are available in the literature.

Plant Communities Used by Alligator Snapping Turtles

Alligator snapping turtles are highly aquatic, very rarely basking in the sun or otherwise leaving the water except to lay eggs (Johnson 1987, Ernst and Barbour 1989). The literature contains little information about plant community types used by these turtles. However, Sloan and Taylor (1987) reported that alligator snapping turtles in Louisiana wetlands preferred aquatic habitat consisting of bayou channels bordered by baldcypress (*Taxodium distichum*) or lakes with flotant (floating mats of dense herbaceous vegetation) associated with baldcypress or buttonbush (*Cephalanthus occidentalis*) habitat. Major species comprising flotant include alligator weed (*Alternanthera philoxeroides*), water hyacinth (*Eichhornia crassipes*), water pennywort (*Hydrocotyle* spp.), water hyssop (*Bacopa caroliniana*), common frogbit (*Limnobium spongia*), bur-marigold (*Bidens laevis*), cattail (*Typha latifolia*), parrotfeather (*Myriophyllum brasiliense*), water-velvet (*Azolla caroliniana*), duckweeds (*Lemna* spp.), and *Ludwigia* spp. (Sloan and Taylor 1987, Harrel et al. 1996). Ewert (1976) found 16 nest sites along 10 km (6 miles) of the Apalachicola River in Franklin and Gulf counties, Florida. Alligator snapping turtles used a wide variety of

terrestrial sites for nesting, but the dominant vegetation along this section of the river was southern floodplain forest.

Significance of Alligator Snapping Turtles

Historically, alligator snapping turtles and their eggs were of local economic importance, harvested for human consumption by individuals and commercial turtle trappers (Carr 1952, Pritchard 1989). Although alligator snappers are still harvested in some States, declining numbers have led to regulation or suspension of harvest by other States (Pritchard 1989, USFWS 1991, Soule 1992). The species may be important in the dispersal of many wetland plant species (Ernst et al. 1994).

Life History and Ecology

Alligator snapping turtles frequent rivers, streams, canals, lakes, oxbows, and sloughs with permanent water (Johnson 1987, Ernst and Barbour 1989). Along the gulf coast, they may inhabit areas of brackish water for considerable periods of time (Mount 1975). The species is primarily nocturnal, usually hiding during daylight hours. Alligator snapping turtles seldom swim but move about by slowly walking along the bottom of a water body (Johnson 1987). In northeast Louisiana, Sloan and Taylor (1987) found that adult alligator snapping turtles in Black Bayou Lake and adjoining Bayou Desiard have a minimum home range of 18 to 247 ha (44.5 to 610 acres). Harrel et al. (1996) calculated the linear home range of subadults in Bayou Desiard and found that mean home range length was 3.5 km (2.2 miles) for subadult males and 1.4 km (0.9 miles) for subadult females. Pritchard (1989) and Shipman (1993) reported that alligator snappers in riverine environments may continue to move upstream for decades, but little quantitative data exist to support this contention.

Alligator snapping turtles are long-lived; ages of captive specimens have exceeded 60 years (Pritchard 1989). Small alligator snapping turtles are probably prey for larger turtles and alligators (*Alligator mississippiensis*). Humans are the only predators of adult alligator snapping turtles (Ernst et al. 1994). Nests often are destroyed by floods and predators (USFWS 1991). For example, raccoon (*Procyon lotor*) predation on nests may be high in some areas (J. Brent Harrel, Personal Communication, 1997).

Reproduction and development

Alligator snapping turtles become sexually mature between 11 and 15 years of age; males are sexually mature at a skull length of 115 mm (4.5 in.) and females at 112 mm (4.4 in.) (Dobie 1971). Breeding occurs from February to April in Florida but probably later in the Mississippi River Valley (Ernst and Barbour 1989). Courtship and mating take place in the water (Johnson 1987). Copulation lasts 5 to 25 min (Allen and Neill 1950, Grimpe 1987, Harrel et al. 1996).

Approximately 2 months after copulation, the female emerges from the water and deposits 16 to 52 eggs (clutch size is positively correlated with female size) in a flask- or funnel-shaped nest cavity excavated with the hind feet; she covers the eggs and immediately returns to the water (Allen and Neill 1950, Dobie 1971, Ernst and Barbour 1989). The spherical eggs are 30 to 51 mm (1.2 to 2.0 in.) in diameter and have a smooth, white, unglazed, hard shell. Incubation lasts from 90 to 140 days, with most young emerging in September or October (Dobie 1971, Ernst and Barbour 1989). Upon emergence, hatchlings immediately proceed to water (Allen and Neill 1950). Hatchlings have dark gray skin, a long tail, and a rough brown to black carapace that is approximately 44 mm (1.7 in.) long (Dobie 1971, Ernst and Barbour 1989).

Food habits

The alligator snapping turtle is an opportunistic omnivore. It feeds mainly on fish but will consume almost anything of animal origin, including carrion (Ernst et al. 1994). Common prey items are fish, mussels, snails, and smaller turtles; other foods include fruits and aquatic plants. Young presumably eat small fish, aquatic insects, mollusks, and snails. This species is unique among North American turtles because of its ability to attract fish to its mouth with its unique wormlike appendage. This appendage is wiggled while the mouth is gaping; when a fish ventures close enough, it is captured and eaten (Carr 1952, Conant 1975, Ernst and Barbour 1989, Mount 1975, Johnson 1987, Pritchard 1989).

Habitat Requirements

Aquatic habitat

Alligator snapping turtles utilize a variety of aquatic habitats and require large areas of permanent water. These turtles prefer mud substrates and abundant aquatic vegetation (Ernst and Barbour 1989). Shipman (1993) found that an alligator snapping turtle in Kansas preferred aquatic habitats with abundant cover, detritus, mud substratum, and pool habitat. Sloan and Taylor (1987) reported that alligator snapping turtles in northeastern Louisiana preferred cypress-bordered channels and shallow-water areas with dense floating vegetation and buttonbush; use of these habitat types was three times greater than availability. Microhabitat was a significant feature of total habitat, and a structure (e.g., logs, buttonbush, stumps, and branches) was the most frequently used microhabitat (Harrel et al. 1996). In addition to cover, the structures are used as climbing aids for obtaining air; these bottom-walking turtles are relatively poor swimmers compared with other aquatic turtles.

Winter hibernacula are important elements of the alligator snapping turtle's habitat. The turtle becomes quiescent in early fall and spends the winter months in hibernacula such as undercut riverbanks and deep holes in bayous and lakes (Pritchard 1989, Harrel et al. 1996).

Nesting habitat

Nests usually are located near water on high and well-drained sites (Pritchard 1989) such as natural or artificial berms bordering aquatic environments (USFWS 1991). Natural sites may consist of large or small sandy mounds (Ewert 1976, Pritchard 1989) or knolls near water (Pritchard 1989). Large mounds used by nesting turtles along the Apalachicola River in Florida were old dredged material sites sparsely covered with vegetation (Ewert 1976, Ewert and Jackson 1996). Sites ranged from unshaded and xeric to shaded and mesic; a preference for any particular plant community type was not evident. However, alligator snapping turtles did not locate nests on open sandbars or low, forested ground with leaf duff and matted roots. Substrate of nests was either sand or sand mixed with silt and organic alluvium. The nests on the Apalachicola River averaged 12 m (39 ft) from the nearest water, but a nest on an island in Lake Iamonia was 72 m (236 ft) away. Allen and Neill (1950) reported that other nests in Florida were up to 50 m (164 ft) from water.

Impacts and Causes of Decline

The long-term decline of the alligator snapping turtle has been attributed to the actual or potential effects of (a) destruction, modification, or reduction of its habitat or range; (b) overharvesting for commercial, recreational, scientific, and educational purposes; and (c) its low reproductive potential. Human-induced habitat alterations such as damming of rivers, channelization and ditching for flood control and navigation, human recreation, and pollution have altered or reduced the quality of the alligator snapping turtle's natural habitat throughout its range (USFWS 1991; Pritchard 1989; J. Brent Harrell, Personal Communication, 1997).

The damming of rivers has eliminated much natural habitat for the alligator snapping turtle (Pritchard 1989). Construction of artificial impoundments has created additional habitat in some areas, but easy access renders turtles more vulnerable to human predation in such impoundments. Dams and roads associated with artificial impoundments may also eliminate or impede movements, resulting in the fragmentation of populations (Johnson 1987, George 1988, Pritchard 1989, USFWS 1991).

Channelization and ditching of rivers and streams for flood control and navigation reduce backwater habitats, the preferred habitat for alligator snapping turtles (Pritchard 1989, USFWS 1991). Channelization reduces species biodiversity and biomass (Robinson and Buchanan 1988), especially by removal of submerged trees (snags) that provide habitat for many aquatic vertebrate and invertebrate species. Consequently, prey item diversity and abundance is decreased (Pritchard 1989, USFWS 1991). Although the deposition of dredge material may bury turtle nests, it has also provided nesting habitat for the alligator snapping turtle (Pritchard 1989). However, J. Brent Harrell (Personal Communication, 1997) suggested these areas may not be suitable nesting sites because they are too open and exposed to sunlight; sex of turtles often is determined by soil/substrate temperature during incubation, and skewed sex ratios may result from artificial nesting habitats (Ewert et al. 1994).

Recreational activities (e.g., off-road vehicles, camping) may impact alligator snapping turtles through disturbances that destroy nests or prevent nesting. In many areas, especially on sandbars, the density of recreational users can be so high that an entire area may be disturbed several times during the nesting season. However, the mechanisms and extent of this impact are unknown (USFWS 1991).

Although water pollution may negatively affect alligator snapping turtles both directly and indirectly, direct effects have not been documented. Indirect effects include impacts on other aquatic organisms that may reduce or eliminate prey items. Because the turtles are long-lived and high on the trophic chain, bioaccumulation of toxic chemicals in body tissues can occur and potentially affect their biology (USFWS 1991). Hall (1980) indicated that pesticide residues negatively affected snake reproduction; however, the extent of effects on turtle health and reproduction are unknown (USFWS 1991).

Unregulated harvest probably has been the factor most responsible for decline of the alligator snapping turtle (Pritchard 1989). Commercial harvest was historically widespread in the Southeast because the turtle was a popular item in markets of New Orleans, LA, and St. Louis, MO (Carr 1952). Although the harvest of alligator snapping turtles has been prohibited in most States within its range, it is still allowed in Louisiana and has only recently been prohibited in Alabama, Florida, Georgia, and Mississippi. No data were available on the levels of commercial harvest in these States. Personal observations and opinions suggested that the alligator snapping turtle is extremely vulnerable to unregulated commercial harvest, and populations could be reduced to levels where combined effects of habitat degradation and fragmentation could result in extinction (Pritchard 1989, USFWS 1991). The extent to which depletion of alligator snapping turtle populations by harvest is exacerbated by habitat loss, habitat fragmentation, and pollution is unknown (USFWS 1991).

Data were not available for levels of recreational or incidental harvest; however, many of the accounts by Pritchard (1989) and post-1983 records found during a status review by the USFWS (1991) were of turtles captured incidentally on setlines and trotlines. When abandoned, these lines may remain in the environment for long periods of time, but the rate of incidental capture of alligator snapping turtles on these lines is unknown (USFWS 1991).

Alligator snapping turtles are captured for sale in the pet trade, and their popularity in the United States has increased as their numbers have declined. They are also popular as pets in Asia (Peter Pritchard, Personal Communication, 1995). Turtles used in the pet trade are often obtained from private turtle farmers. The impact of the pet trade on alligator snapping turtle populations is unknown (USFWS 1991); however, Pritchard (1989) believed it to be inconsequential because the large size of the turtle reduces its widespread appeal.

On military installations, maneuvers that degrade riparian habitats, thereby eliminating nest sites or impacting water quality, may contribute to unsuitable habitat for alligator snapping turtles. Harvest of alligator snapping turtles on Department of Defense lands should be prohibited.

Management and Protection

Habitat management

Known and potential habitat should be managed to protect its ecological integrity. Management should include (a) maintaining the natural vegetation and hydrology; (b) preserving natural upland buffers; and (c) avoiding dams, pollution, and alterations of hydrology, stream course, or bank vegetation (Soule 1992). To protect water quality and nesting habitat, a buffer strip at least 75 m (246 ft) wide can be established around habitats bordering aquatic environments where snapping turtles occur (Soule 1992).

Protection

Humans are the principal predator of the alligator snapping turtle (Soule 1992). Pritchard (1989) recommended protection from commercial harvest and limits on personal collection. Monitoring nest predation and providing appropriate control measures may be necessary to allow a population to recover from low numbers (Soule 1992).

Habitat Assessment Techniques

Military installations within the range of the alligator snapping turtle should conduct periodic surveys to locate, map, and characterize potential habitat for the species. Potential habitats are rivers, lakes, swamps, sloughs, oxbows, canals, and artificial impoundments (Johnson 1987, Ernst and Barbour 1989). Information to be documented includes surface area and average depth of water, annual water level fluctuation, percent of each associated vegetation type, plant species composition, and dominant plants (Sloan and Taylor 1987). These parameters may help define habitats preferred by alligator snapping turtles on a specific installation.

Inventory and Monitoring—Census Methods

Systematic population surveys and censuses of the alligator snapping turtle are difficult to achieve because the secretive nature of the species limits observation, especially where it is rare. Time and manpower required to capture the number of turtles needed for an adequate sample size can also be prohibitive. If a survey or census is desired, available methods for capturing turtles include polling (single-pronged hook attached to stout pole) (Dobie 1971) and baited hoop nets. Dobie (1971) was opportunistic and examined approximately 208 alligator snapping turtles caught on trotlines set by commercial fishermen. Sloan and Taylor (1987) and Harrel et al. (1996) used baited hoop nets to capture alligator snapping turtles for radiotelemetry studies. Weight, sex, and body measurements should be taken at the time of capture (Dobie 1971), and age can be determined by counting the annuli (growth rings) on the second pleural scutes (Dobie 1971, Morris and Sweet 1985).

If time or manpower prohibit censuses, investigations should be focused on determining known and potential habitat present on the installation.

Literature Cited

- Alabama Natural Heritage Program. 1994. Natural Heritage Inventory of Fort McClellan, Pelham Range: Federal Endangered, Threatened, Candidate Species and State-Listed Species. Alabama Natural Heritage Program, Alabama Dept. of Cons. and Nat. Res., State Lands Division, Montgomery, AL.
- Allen, E. R., and W. T. Neill. 1950. The alligator snapping turtle, *Macrolemys temminckii*, in Florida. Ross Allen's Reptile Inst. Special Publ. 4.
- Anderson, P. 1965. The Reptiles of Missouri. University of Missouri Press, Columbia.
- Carr, A. F., Jr. 1952. Handbook of Turtles: The Turtles of the United States, Canada, and Baja California. Cornell University Press, Ithaca, NY.
- Clarke, R. F. 1956. Identification of Kansas turtles. Kansas School Nat. 2:1-3.
- Conant, R. 1975. A Field Guide to Reptiles and Amphibians. Houghton Mifflin Company, Boston, MA.
- Dobie, J. L. 1971. Reproduction and growth in the alligator snapping turtle, *Macrolemys temminckii* (Troost). Copeia 1971:645-658.
- Ernst, C. H., and R. W. Barbour. 1989. Turtles of the World. Smithsonian Institution Press, Washington, DC.
- Ernst, C. H., J. E. Lovich, and R. W. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, DC.
- Ewert, M. A. 1976. Nest, nesting, and aerial basking of *Macrolemys* under natural conditions, and comparisons with *Chelydra*. Herpetologica 32:150-156.
- Ewert, M. A., and D. R. Jackson. 1996. Nesting Ecology of the Alligator Snapping Turtle (*Macrolemys temminckii*) along the Lower Apalachicola River, Florida. FINAL REPORT, Florida Game and Fresh Water Fish Comm. Nongame Wildlife Program, Tallahassee, FL.
- Ewert, M.A., D. R. Jackson, and C. E. Nelson. 1994. Patterns of temperature-dependent sex determination in turtles. The Journal of Experimental Zoology 270:3-15.

- George, G. 1988. The current status of the alligator snapping turtle (*Macrolemys temminckii*) with a review of its natural history. Inter. Herpetological Symposium on Captive Propagation and Husbandry 11:75-81.
- Grannan, L. T., Jr., and R. Anderson. 1992. *Macrolemys temminckii* (alligator snapping turtle). USA: Indiana. *Herpetological Review* 23:88.
- Grimpe, R. 1987. Maintenance, behavior, and reproduction of the alligator snapping turtle, *Macrolemys temminckii* at the Tulsa Zoological Park. Bulletin Oklahoma Herpetological Society 12:1-6.
- Hall, R. J. 1980. Effects of environmental contaminants on reptiles: A review. Special Sci. Rep.-Wildl. No. 228. U.S. Fish and Wildlife Service, Washington, DC.
- Harrel, J. B., C. M. Allen, and S. J. Hebert. (1996). Movements and habitat use of subadult alligator snapping turtles (*Macrolemys temminckii*) in Louisiana. *American Midland Naturalist* 135:60-67.
- Johnson, T. R. 1987. The amphibians and reptiles of Missouri. Missouri Department of Conservation, Jefferson City.
- Kuchler, A. W. 1964. Potential natural vegetation of the conterminous United States. Am. Geogr. Soc. Special Publ. 36:1-38.
- Mahmoud, I. Y., and J. Klicka. 1979. Feeding, drinking, and excretion. Pages 229-243 In M. Harless and H. Morlock, (eds.). *Turtles: Perspectives and Research*. John Wiley and Sons, New York.
- McWhite, R. W., D. R. Green, C. J. Petrick, S. M. Seiber, and J. L. Hardesty. 1993. Eglin Air Force Base Natural Resources Management Plan. Eglin Air Force Base, Florida.
- Minton, S. A., Jr. 1972. Amphibians and reptiles of Indiana. *Indiana Academy of Sciences Monograph* 3:1-346.
- Morris, M. A., and M. J. Sweet. 1985. Size, age, and growth of an alligator snapping turtle, *Macrolemys temminckii*, from Illinois. *Transactions of the Illinois Academy of Sciences* 78:241-245.
- Mount, R. H. 1975. The reptiles and amphibians of Alabama. Auburn University Agricultural Experiment Station, Auburn, AL.
- Pritchard, P. C. H. 1979. Taxonomy, evolution, and zoogeography. Pages 1-42 In M. Harless and H. Morlock, (eds.). *Turtles: Perspectives and Research*. John Wiley and Sons, New York.

- Pritchard, P. C. H. 1980. Record size turtles from Florida and South America. *Chelonologica* 1:113-123.
- Pritchard, P. C. H. 1989. The alligator snapping turtle: Biology and conservation. Milwaukee Public Mus., Milwaukee, WI.
- Robinson, H. W., and T. M. Buchanan. 1988. Fishes of Arkansas. University of Arkansas Press, Fayetteville.
- Shipman, P. A. 1993. Alligator snapping turtle (*Macrolemys temminckii*) habitat selection, movements, and natural history in southeast Kansas. M.S. Thesis, Emporia State Univ., Emporia, KS.
- Sloan, K. N., and D. Taylor. 1987. Habitats and movements of adult alligator snapping turtles in northeastern Louisiana. *Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies* 41:343-348.
- Smith, P. W. 1961. The amphibians and reptiles of Illinois. *Illinois Natural History Survey Bulletin* 28:1-298
- Soule, J. D. 1992. Element stewardship abstract for *Macrolemys temminckii*. Draft Rep. The Nature Conservancy, Boston, MA.
- United States Fish and Wildlife Service (USFWS). 1983. Endangered and threatened wildlife and plants; findings on certain petitions. Fed. Reg. 48-FR 27273-27274.
- USFWS. 1984. Endangered and threatened wildlife and plants; finding on a petition to list the alligator snapping turtle as a threatened species. Fed. Reg. 49-FR 7416-7417.
- USFWS. 1991. Status review of the alligator snapping turtle, *Macrolemys temminckii*. Endangered Species Off., U.S. Fish and Wildlife Service, Jackson, MS.

Personal Communications

Dickerson, Dena. 1997. Research Biologist. U.S. Army Engineer Waterways Experiment Station. 3909 Halls Ferry Road, Vicksburg, MS 39180. 601-634-3772.

Harrel, J. Brent. 1997. U.S. Department of Agriculture National Wildlife Research Center, Mississippi State University. 626 S. Montgomery #32. Starkville, MS. e:mail: JBHarrel@netdoor.com

Moore, Kenneth. 1997. Biologist. ATTN: AFZX-PW-E. Fort Polk, LA 71459-7100. 318-531-7078.

Pritchard, Peter. 1995. Florida Audubon Society, 1101 Audubon Way, Maitland, FL 32751.

Shea, Stephen. 1996. 325 CES/CEV, 119 Alabama Avenue, Tyndall AFB, FL 32403-5014. 904-283-2641.

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE September 1997	3. REPORT TYPE AND DATES COVERED Final report		
4. TITLE AND SUBTITLE Species Profile: Alligator Snapping Turtle (<i>Macroclemys temminckii</i>) on Military Installations in the Southeastern United States		5. FUNDING NUMBERS		
6. AUTHOR(S) John J. Lane, Wilma A. Mitchell				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Engineer Waterways Experiment Station 3909 Halls Ferry Road Vicksburg, MS 39180-6199		8. PERFORMING ORGANIZATION REPORT NUMBER Technical Report SERDP-97-9		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Corps of Engineers Washington, DC 20314-1000		10. SPONSORING/MONITORING AGENCY REPORT NUMBER		
11. SUPPLEMENTARY NOTES Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) The alligator snapping turtle (<i>Macroclemys temminckii</i>) is an uncommon turtle of the Southeast that is a former candidate species for listing as threatened or endangered by the U.S. Fish and Wildlife Service. The species is found in the south-central and southeastern United States throughout the Mississippi River Valley and Gulf Coast States. Alligator snapping turtles utilize a variety of aquatic habitats having permanent water and abundant aquatic vegetation, including rivers, streams, canals, lakes, oxbows, and sloughs. Nests usually are located near water on high and well-drained sites such as natural or artificial berms bordering aquatic environments. The alligator snapping turtle has been documented on several military installations in the Southeast. This report is one of a series of "Species Profiles" being developed for threatened, endangered, and sensitive species inhabiting southeastern United States plant communities. The work is being conducted as part of the Department of Defense (DoD) Strategic Environmental Research and Development Program (SERDP). The report is designed to supplement information provided in plant community management reports for major United States plant communities found on military installations. Information provided on the alligator snapping turtle includes status, life history and ecology, habitat requirements, impacts and cause of decline, management and protection, and inventory and monitoring.				
14. SUBJECT TERMS Alligator snapping turtle SERDP Wetlands DoD installations Species profile Management techniques Threatened and Endangered species			15. NUMBER OF PAGES 18	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT	