

**A Species Action Plan for
Florida's Alligator Snapping Turtles
Macrochelys suwanniensis
Macrochelys apalachicola
*Macrochelys temminckii***

September 26, 2018



Florida Fish and Wildlife Conservation Commission
620 South Meridian Street
Tallahassee, FL 32399-1600
Visit us at MyFWC.com

ALLIGATOR SNAPPING TURTLE ACTION PLAN TEAM

Team Leader: Bradley M. O’Hanlon, Division of Habitat and Species Conservation

Team Members: Brooke L. Talley, Ph.D., Division of Habitat and Species Conservation
Claire Sunquist Blunden, Division of Habitat and Species Conservation

Acknowledgements: Jonathan Mays, Fish and Wildlife Research Institute
Brie Ochoa, Division of Habitat and Species Conservation
Blair Hayman, Division of Habitat and Species Conservation
Eric Suarez, Division of Habitat and Species Conservation

The 2018 revision of this plan built upon the significant work of the authors and contributors of the original plan, published in 2013. These individuals include:

William M. Turner, Dale R. Jackson, Ph.D., Jen M. Williams, Ph.D., Laura Barrett, Brian Beneke, Mark Barrett, Claire Sunquist Blunden, Brie Ochoa, Mary Ann Poole.

Cover photograph: Adult Suwannee alligator snapping turtle, Suwannee River, Florida.
Photograph by Kevin M. Enge, Florida Fish and Wildlife Conservation Commission.

Recommended citation:

Florida Fish and Wildlife Conservation Commission. 2018. A species action plan for Florida’s alligator snapping turtles. Tallahassee, Florida.

EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) developed this plan as a component of Florida's Imperiled Species Management Plan (FWC 2016). In 2015, the FWC convened a biological review group (BRG) to reassess the status of the alligator snapping turtle (*Macrochelys temminckii*) using criteria specified in Rule 68A-27.001, Florida Administrative Code (F.A.C.). The findings of the BRG are based on recent research (Thomas et al. 2014) indicating that there are 3 genetically distinct species in Florida, the singular species was split into the alligator snapping turtle (*M. temminckii*), the Apalachicola alligator snapping turtle (*M. apalachicola*), and the Suwannee alligator snapping turtle (*M. suwanniensis*).

Although the exact taxonomic alignment is under review and further study by scientists, it is generally agreed that the Suwannee alligator snapping turtle is the most physically and genetically distinct of the group, and that it warrants full species designation. The BRG's findings are published in the [2017 Biological Status Review report](#) (FWC 2017). The report concludes that the Suwannee alligator snapping turtle (*M. suwanniensis*) meets criteria to be listed as a state-Threatened species under requirements within Chapter 68A-27, F.A.C.; *M. apalachicola* does not meet listing criteria; *M. temminckii* meets listing criteria in Florida, but because of this species' extensive range outside of Florida, staff recommended *M. temminckii* not be listed on the Florida Endangered and Threatened Species List.

Though only 1 of the 3 species is recommended to be listed, alligator snapping turtles in Florida remain a conservation concern. Each species continues to be vulnerable to deliberate human take, incidental take with fishing gear, pollution, riverine habitat alteration, and nest predation. The goals of this plan are to A) improve or maintain the conservation status of *M. suwanniensis* to a point that this species is secure within its historical range; and B) maintain or improve the conservation status of *M. temminckii* and *M. apalachicola* so that they do not warrant listing again on the Florida Endangered and Threatened Species List.

Actions in the plan are focused on maintaining quality habitat along the rivers where alligator snapping turtles occur, preventing mortality from known threats, and improving enforcement in targeted areas. When implemented across the ranges of each species, actions will benefit all alligator snapping turtle species occurring in Florida. Successful management of Florida's alligator snapping turtles will require cooperation among local, state, and federal governmental agencies; non-governmental organizations; development and industrial interests; private landowners; academic institutions; and the public.

A summary of this plan is included in Florida's ISMP in satisfaction of the management plan requirements in Chapter 68A-27, F.A.C., Rules Relating to Endangered or Threatened Species. Florida's ISMP addresses comprehensive management needs for Florida's imperiled species and includes an implementation plan; regulatory framework; relevant policies; anticipated economic, ecological, and social impacts; projected costs of implementation; and a revision schedule. Achieving the objectives of the ISMP depends heavily on stakeholder input and partner support.

TABLE OF CONTENTS

ALLIGATOR SNAPPING TURTLE ACTION PLAN TEAM..... ii

EXECUTIVE SUMMARY iii

LIST OF TABLES v

LIST OF FIGURES vi

GLOSSARY OF TERMS AND ACRONYMS..... vii

INTRODUCTION 1

 Biological Background..... 1

 Threats and Recommended Listing Status 6

CONSERVATION GOALS AND OBJECTIVES 9

CONSERVATION ACTIONS 10

 Habitat Conservation and Management 10

 Population Management..... 13

 Monitoring and Research 14

 Rule and Permitting Intent 18

 Law Enforcement 18

 Incentives and Influencing 19

 Education and Outreach 20

 Coordination with Other Entities 21

LITERATURE CITED 28

APPENDICES 32

 Appendix 1. Protection status of waters inhabited by alligator snapping turtles. 32

 Appendix 2. Example format for data collection. 35

LIST OF TABLES

Table 1. Mean number of turtles captured in various studies of alligator snapping turtles 16
Table 2. Agencies responsible for managing areas inhabited by alligator snapping turtles 22
Table 3. Conservation action table..... 24

LIST OF FIGURES

Figure 1. Physical characteristics of alligator snapping turtle species in Florida..... 1
 Figure 2. Underside of *M. suwanniensis* from the Suwannee River, Florida 2
 Figure 3. Hatchling *M. apalachicola* from the lower Apalachicola River..... 2
 Figure 4. Head and mouth of alligator snapping turtle showing lure 3
 Figure 5. North American distribution of alligator snapping turtle species. 3
 Figure 6. Distribution and recorded observations of the alligator snapping turtle in Florida. 4
 Figure 7. Alligator snapping turtle species ranges and major rivers of the Florida Panhandle. 5
 Figure 8. Alligator snapping turtle mortality resulting from entanglement..... 14

GLOSSARY OF TERMS AND ACRONYMS

Area of Occupancy: The area within a species' extent of occurrence (see Extent of Occurrence) that is occupied by the taxon, excluding cases of vagrancy. This reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats (as defined by the International Union for the Conservation of Nature [IUCN]).

BMP: Best Management Practices. Generally, BMPs represent methods, measures or practices that are developed, selected, or approved by various agencies to protect, enhance and preserve natural resources including wildlife habitat. In this plan, BMPs refer specifically to those maintained by The Florida Department of Agriculture and Consumer Services: [Agriculture Wildlife BMP's for State Imperiled Species](#).

BRG: Biological Review Group, a group of species experts convened to assess the biological status of species using criteria specified in Rule 68A-27.001, Florida Administrative Code, which were adopted from the Guidelines for Application of the IUCN Red List Criteria at Regional Levels (Version 3.0) and Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1).

BSR: Biological status review report, the summary of the biological review group's findings. Includes a Florida Fish and Wildlife Conservation Commission (FWC) staff recommendation on whether or not the species status meets the listing criteria in Rule 68A-27-001, Florida Administrative Code. These criteria, based on the IUCN criteria and IUCN guidelines, are used to help decide if a species should be added or removed from the Florida Endangered or Threatened Species List. In addition, FWC staff may provide within the report a biologically justified opinion that differs from the criteria-based finding.

Carapace: Upper (dorsal) portion of a turtle's shell.

CCAA: Candidate Conservation Agreement with Assurances

CPUE: Catch per unit effort, a term used in surveys.

DEP: Florida Department of Environmental Protection

DNA: Deoxyribonucleic acid

Extent of Occurrence: The geographic area encompassing all observations of individuals of a species, including intervening areas of unoccupied habitat. Synonymous with range. See also Area of Occupancy above (as defined by IUCN).

F.A.C.: Florida Administrative Code. The Department of State's Administrative Code, Register and Laws Section, is the filing point for rules promulgated by state regulatory agencies.

Agency rulemaking is governed by Chapter 120, Florida Statutes, the Administrative Procedures Act. Rules are published in the Florida Administrative Code.

FDACS: Florida Department of Agriculture and Consumer Services

FNAI: The Florida Natural Areas Inventory, a non-profit organization administered by Florida State University and dedicated to gathering, interpreting, and disseminating information critical to the conservation of Florida's biological diversity.

FWC: The Florida Fish and Wildlife Conservation Commission, the state agency constitutionally mandated to protect and manage Florida's native fish and wildlife species.

Habitat: The area used for the life cycle of a species (including foraging, breeding, and sheltering).

HCP: Habitat Conservation Plan

Incidental Take (as defined in Rule 68A-27.001(5), F.A.C.): Any taking otherwise prohibited, if such taking is incidental to, and not the purpose of the carrying out of an otherwise lawful activity.

ISMP: Florida's Imperiled Species Management Plan

IUCN: International Union for Conservation of Nature, a professional global conservation network.

IUCN Red List (IUCN Red List of Threatened Species): An objective, global approach for evaluating the conservation status of plant and animal species to identify and document those species most in need of conservation attention if global extinction rates are to be reduced, and to provide a global index of the state of change of biodiversity.

MFL: Minimum Flows and Levels, the minimum water flows and/or levels adopted by the District Governing Board as being necessary to prevent significant harm to the water resources or ecology of an area resulting from permitted water withdrawals. MFLs define how often and for how long high, average, and low water levels and/or flows should occur to prevent significant harm. When use of water resources alters the water levels below the defined MFLs, significant ecological harm can occur.

NFWFMD: Northwest Florida Water Management District

OFW: Outstanding Florida Water; see Rule 62-302.700 F.A.C.

Population: The total number of individuals of the taxon. Population numbers are expressed as numbers of mature individuals only (as defined by IUCN).

Plastron: Lower (ventral) portion of a turtle's shell.

Predation (depredation): To be killed or destroyed by a predator.

Riparian: The zone or area at the interface between a river or stream and terrestrial habitat, from the water's edge to the upland edge of the floodplain.

Special Management Zone: A BMP that consists of a specific area associated with a stream, lake, or other waterbody that is designated and maintained during silvicultural operations. The purpose of the SMZ is to protect water quality by reducing or eliminating forestry related inputs of sediment, nutrients, logging debris, chemicals, and water temperature fluctuations that can adversely affect aquatic communities. The Special Management Zones provide shade, stream bank stability, and erosion control, as well as detritus and woody debris that benefit the aquatic ecosystem in general. In addition, the Special Management Zone is designed to maintain certain forest attributes that will provide specific wildlife habitat values. Snags, den and cavity trees, and mast-producing trees left in the Special Management Zone are necessary to meet habitat requirements for certain types of wildlife.

SRWMD: Suwannee River Water Management District

Take: As defined in Chapter 68A-1.004, F.A.C. (General Prohibitions). "Taking, attempting to take, pursuing, hunting, molesting, capturing, or killing any wildlife or freshwater fish, or their nests or eggs by any means whether or not such actions result in obtaining possession of such wildlife or freshwater fish or their nests or eggs."

As defined in Rule 68A-27.001(4), F.A.C., pertaining to Threatened species "To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in such conduct." The term "harm" in the definition of take means an act that actually kills or injures fish or wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. The term "harass" in the definition of take means an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering.

USFWS: United States Fish and Wildlife Service, the federal agency mandated to protect and manage the nation's native freshwater fish and wildlife resources.

INTRODUCTION

Please note that in this plan, individual alligator snapping turtle species are referred to by scientific name (*M. temminckii*, *M. apalachicola*, and *M. suwanniensis*). “Alligator snapping turtles” refers collectively to all species of alligator snapping turtles (i.e., *Macrochelys* spp.).

Biological Background

Species Description

Alligator snapping turtles are the largest freshwater turtles in the New World (Enge et al. 2013), with males reaching 75 kg (165 lbs) or more; females weigh less than half this, often weighing below 25 kg (55 lbs) (Ewert et al. 2006). Differences among species’ physical characteristics are shown in Figure 1. Both sexes have a massive head with a hooked beak, and a brown carapace bearing 3 longitudinal ridges that are especially pronounced in younger individuals. The plastron is relatively small and cross shaped (Figure 2). With their large heads and long tails, hatchlings resemble miniature versions of adults (Figure 3). All life stages have a unique worm-like appendage on the floor of the mouth (Figure 4); this is used as a lure to attract prey. The mouth lining is camouflaged or mottled, in contrast to the pink mouth lining of the common snapping turtle (*Chelydra serpentina*).



Figure 1. Physical characteristics of alligator snapping turtle species in Florida. (A) Adult male *M. suwanniensis*. Notice the massive head, hooked beak, the 3 longitudinal ridges on the brown carapace. (B) Young *M. suwanniensis*. Notice the 3 longitudinal ridges on the carapace. (C) Adult female *M. temminckii*. (D) Adult female *M. apalachicola*, with telemetry equipment on shell. Note the similarity of appearance between all 3 species (A, C, and D). Photographs: (A), (B) Kevin M. Enge, FWC; (C), (D) Bradley M. O’Hanlon, FWC.

Taxonomy

In 2014, Thomas et al. described 2 new species of alligator snapping turtles, the Apalachicola alligator snapping turtle, *Macrochelys apalachicola*; and the Suwannee alligator snapping turtle, *Macrochelys suwanniensis*. The description is based on genetic differentiation and differences in skull and carapace morphology. These lineages were first identified by Roman et al. (1999) and Echelle et al. (2010). *M. suwanniensis* was described as the most genetically and morphologically distinct from *M.*



Figure 2. Underside of *M. suwanniensis* from the Suwannee River, Florida, showing the cross-shaped (cruciform) plastron. Photograph by Kevin M. Enge, FWC.

temminckii. Despite disagreement on *M. apalachicola* warranting full species designation (Folt and Guyer 2015), the Biological Status Review report considered all 3 species independently for potential listing actions (FWC 2017). Scientific consensus appears to be forming around the idea that only 2 significantly distinct species exist: *M. temminckii* (including *M. apalachicola*), and *M. suwanniensis* (Folt and Guyer 2015, Iverson et al. 2017). However, this Species Action Plan



Figure 3. Hatchling *M. apalachicola* from the lower Apalachicola River, Franklin County, Florida. Notice the long tail and large head, even in the hatchling. Photograph © Dale R. Jackson.

follows the recommendations of the [Biological Status Review report](#) (FWC 2017) and addresses Florida's alligator snapping turtles as 3 distinct terminal taxa. This is done with the expectation that as the species complex is further studied, taxonomic revisions may necessitate further revision of this Species Action Plan. Regardless of differences in taxonomy, actions within this plan are designed to benefit all alligator snapping turtles in Florida.

Distribution

In Florida, alligator snapping turtles occur in coastal rivers and floodplains throughout the Panhandle from the Escambia River eastward to the Suwannee River system. The species' combined range centers on the lower Mississippi River and extends westward to Texas, northward to Illinois, and eastward to Florida (Figure 5). In Florida *M. temminckii* is constrained to the extreme westernmost panhandle and is only found in Escambia, Santa Rosa, Okaloosa, and Walton Counties (Figure 6). The *M. apalachicola* is restricted to the Apalachicola, Choctawhatchee, and Ochlockonee River drainages and occurs in eastern Walton County, Holmes, Washington, Bay, Jackson, Calhoun, Gulf, Gadsden, Liberty, Franklin Counties, and western Leon and Wakulla counties (Figure 7).



Figure 4. Head and mouth of alligator snapping turtle showing lure on the bottom of the mouth. Photograph by Kevin M. Enge, FWC.

The *M. suwanniensis* is restricted to the Suwannee river drainage and can be found in Madison, Lafayette, Dixie, Hamilton, Columbia, Gilchrist, Union, Bradford, and Alachua Counties (Figure 5; Ewert et al. 2006, Krysko et al. 2011). There is a 2018 record of an alligator snapping turtle (lineage unknown) from the St. Marks River (J. Mays, personal communication, 2018). There are records of alligator snapping turtles from Eureka and the Ocklawaha River in Marion County that may have been the result of introductions from the Ross Allen’s Reptile Institute at Silver Springs (Krysko et al. 2011). There are 2 sightings reported from the Wacissa River (Pritchard 1989), but recent

trapping efforts have failed to confirm the presence of alligator snapping turtles in this river (P. Moler, personal communication). There are also records of hatchling alligator snapping turtles near the Orlando area, and observations from the Gainesville area. It remains unclear if these are naturally occurring animals or releases (E. Suarez, personal communication, 2018).

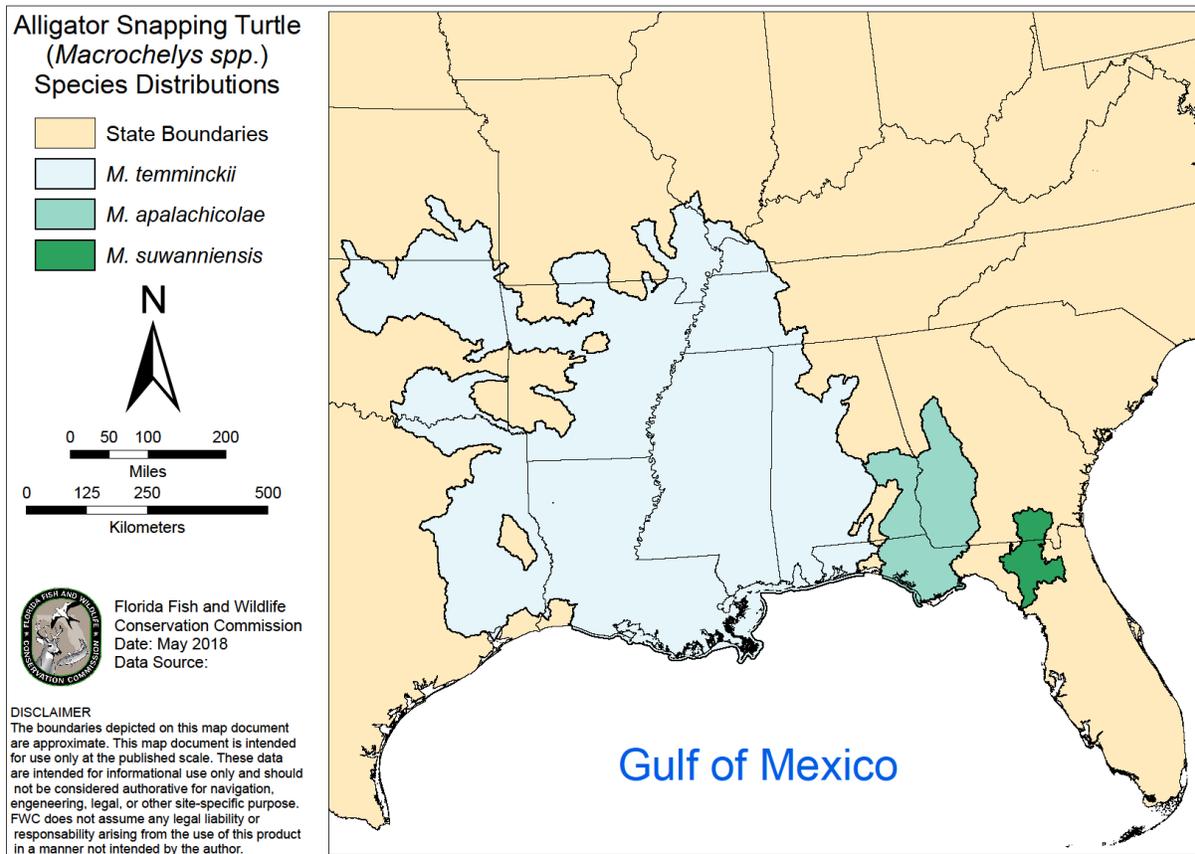


Figure 5. North American distribution of alligator snapping turtle species.

Habitat

In Florida, alligator snapping turtles are restricted to rivers, streams, floodplains, and associated permanent freshwater habitats, including impoundments. Food items include fish, turtles, snakes, birds, mollusks, and other aquatic organisms, with some vegetation, including nuts and fruits (Elsley 2006).

Breeding Behavior

Females lay a single clutch of 17 to 52 eggs per year; nesting typically occurs from late April to mid-May along river berms, high banks, and artificial spoil mounds (Ewert and Jackson 1994). Young emerge from nests in August and September. Additional life history information is available in Ewert et al. (2006), Pritchard (2006), and Ernst and Lovich (2009).

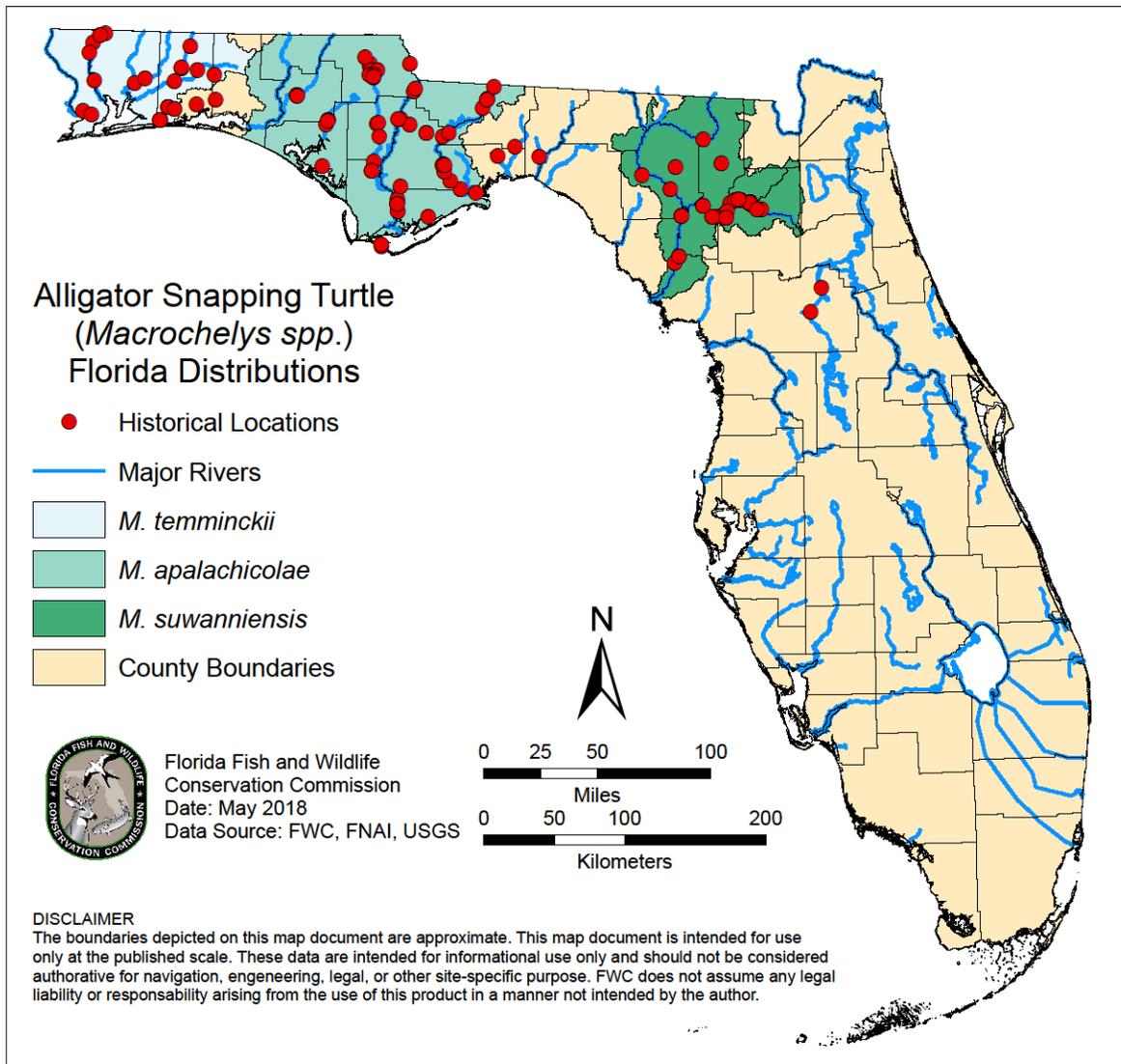


Figure 6. Distribution and recorded observations of the alligator snapping turtle in Florida. Specific localities are drawn from Krysko et al. (2011) as supplemented by data in the Florida Natural Areas Inventory (FNAI) element occurrence database.

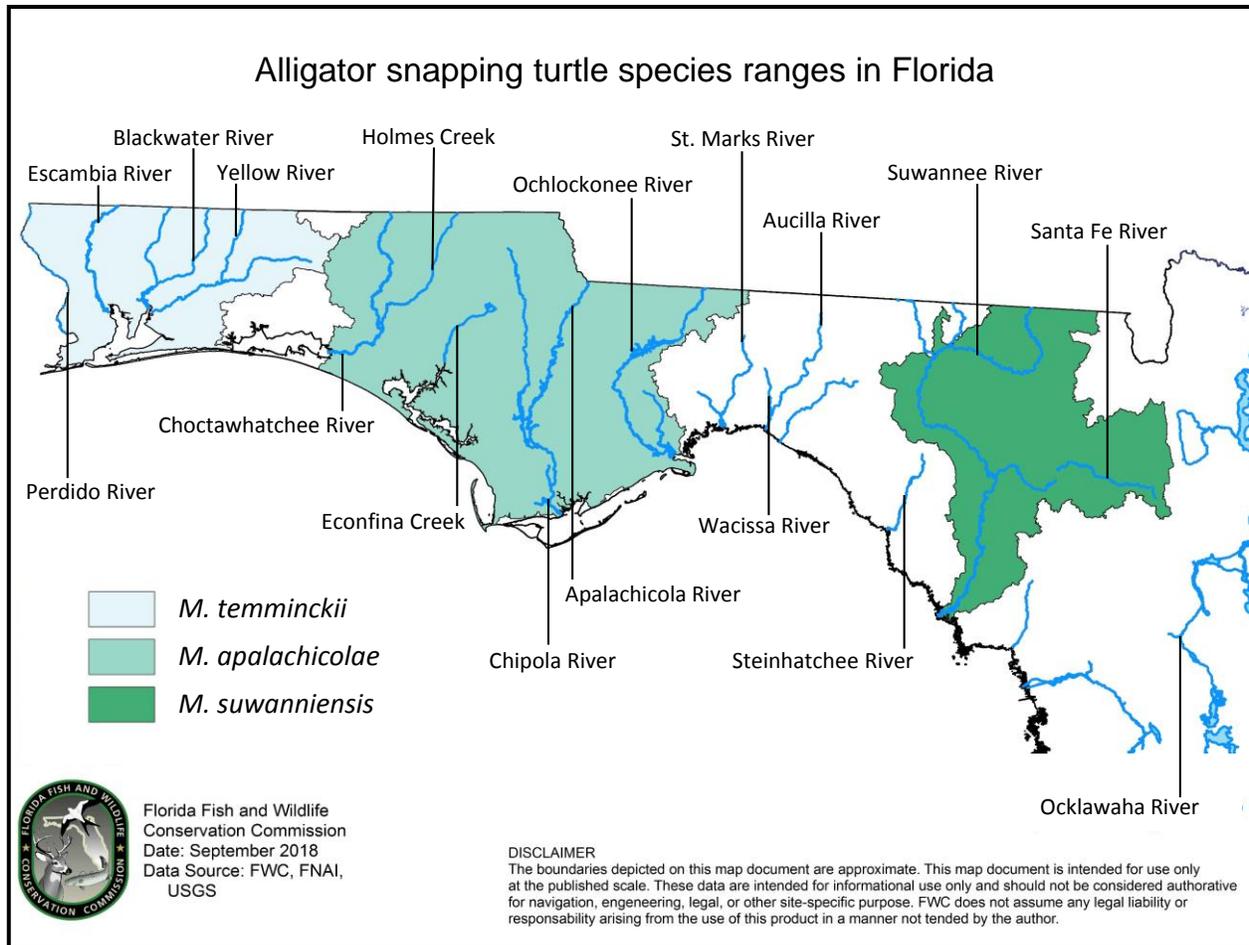


Figure 7. Alligator snapping turtle species ranges and major rivers of the Florida Panhandle.

Conservation History

Because of past threats and probable declines, principally from harvest for food, the FWC enacted a series of protective measures for alligator snapping turtles over the past 40 years. Chronologically, the most significant were limiting possession to one animal in 1974 and listing the alligator snapping turtle as a Species of Special Concern on the Florida Endangered and Threatened Species List in 1985. In 2009, FWC removed possession allowances for the alligator snapping turtle and prohibited all take and possession of the species. Take of the common snapping turtle was prohibited at the same time because of its similarity of appearance to alligator snapping turtles. To facilitate compliance with the prohibition of take from the wild, pet owners who possessed alligator snapping turtles before 20 July 2009 were required to obtain a [Class III Personal Pet Permit](#) to keep those turtles; the permit limits possession to one alligator snapping turtle. More information on permits can be found on the FWC's website for [possession of turtles](#). Note that use of "take" in this paragraph is as defined in Rule 68A-1.004(79), F.A.C.

Because most alligator snapping turtles in Florida inhabit river systems that drain from Alabama and Georgia, protective measures in those states are significant to Florida. The alligator snapping turtle is listed in Georgia as state-Threatened, with no take allowed except by permit (Georgia Endangered Wildlife Act of 1973; 391-4-10-.08). Although it does not have an Endangered

species law, the State of Alabama lists the alligator snapping turtle as a nongame species with no allowable take except by special permit (Alabama Department of Conservation and Natural Resources, Nongame Species Regulation 220-2-.92).

Although not directed solely toward the species, conservation of alligator snapping turtles in Florida has been enhanced greatly by decades of extensive effort to conserve lands within its range. As a result, state, local, and federal agencies, as well as private organizations, have acquired much of the land bordering rivers inhabited by the species (see [Habitat Conservation and Management](#)). There are also numerous regulations in Florida that protect this state's waters, although threats to water quality and quantity remain. State and local regulations addressing water quality of Alabama and Georgia streams and rivers likewise are important for protecting habitat of alligator snapping turtles downstream in Florida.

Since the original Species Action Plan for the Alligator Snapping Turtle was published in 2013, research has provided a greater understanding of the genetic relationships between groups of alligator snapping turtles in Florida. The primary result of this knowledge is the split from 1 to 3 species in the state (Thomas et al. 2014). Many ongoing actions identified in the original plan have been addressed through FWC and partner efforts. Biologists have intensively surveyed alligator snapping turtle habitat within the Suwannee, Apalachicola and Ochlockonee Rivers, including with the use of radio-telemetry, to better understand alligator snapping turtle habitats and to better understand population size and demography. The FWC has maintained and improved rules protecting alligator snapping turtles, and the agency continues training for law enforcement officers on the nuances of freshwater turtle regulations.

Threats and Recommended Listing Status

Threats

Principal threats to alligator snapping turtles include deliberate human take for food or use as pets, incidental take with fishing gear (trotlines, bush hooks), pollution, riverine habitat alteration (channel dredging, snag removal, siltation, impoundment), and nest predation. The historical levels of take of *M. suwanniensis* are unknown, but trapping data suggests that the species was not heavily harvested (FWC 2017).

Listing Actions

In 2010, FWC directed staff to review the status of all state-listed species that had not undergone a status review in the past decade. To address this charge, staff conducted a literature review and solicited information from the public on the status of the species. The FWC convened a BRG in 2011 consisting of experts on the alligator snapping turtle to assess the biological status of the species using criteria specified in Rule 68A-27.001, F.A.C. Staff from FWC drafted a [Biological Status Review report](#) (FWC 2011), which included the BRG's findings and a listing recommendation. Based on the literature review, information received from the public, the BRG findings, staff's evaluation of the findings, and peer reviewer input of the staff-modified findings, the FWC recommended that the species (considered singular at the time) not be listed as Threatened and that it be removed from the Florida Endangered and Threatened Species List. Shortly thereafter, research began to indicate the potential genetic uniqueness among groups of alligator snapping turtles in Florida, and staff initiated an updated evaluation based on this emerging information (FWC 2015). In 2015, staff recommended that the alligator snapping turtle

remained on the Florida Endangered and Threatened Species List as a Species of Special Concern until the assessment could be completed (FWC 2015).

To fully assess the species and review the needs of the newly described species, the FWC convened a 2015 BRG of alligator snapping turtle experts to reassess the biological status of all 3 species using criteria specified in Rule 68A-27.001, F.A.C. This rule includes a requirement for BRGs to follow Guidelines for Application of the International Union for the Conservation of Nature (IUCN) Red List Criteria at Regional Levels (Version 3.0) and Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1). The BRG’s findings for all 3 species are published in a [Biological Status Review report](#), which also includes peer-reviewer input and staff listing recommendation (FWC 2017).

As outlined in the [Biological Status Review report](#), the 2015 BRG determined the following:

M. suwanniensis met the following criteria to warrant listing:

- Criterion B, Geographic Range: a limited extent of occurrence and area of occupancy with continuing decline (inferred or projected) in area, extent and/or quality of habitat, along with the population occurring in fewer than 10 locations.
- Criterion D: A very small or restricted population. The Suwannee alligator snapping turtle has five or fewer locations.

M. apalachicola did not meet criteria sufficient to warrant listing.

M. temminckii met the following criteria to warrant listing*:

- Criterion B, Geographic Range: a limited extent of occurrence and area of occupancy with continuing decline (inferred or projected) in area, extent and/or quality of habitat, along with the population occurring in fewer than 10 locations.

*For *M. temminckii*, FWC staff provided a biologically justified opinion differing from the criteria-based finding (staff listing recommendation is allowable under Rule 68A-27.0012(c)(1)(c), F.A.C.). Due to the higher elevation of the coastal counties in which *M. temminckii* occurs, staff felt this species would be the least affected by sea level rise projections. Also, the majority of the rivers in which the species occurs are relatively long and extend into higher elevations. Finally, the assessment was conducted for the species’ Florida range, which is at the edge of the species’ North American range, which extends westward to Texas and Northward to Illinois and Iowa. These combined factors led FWC staff to determine that *M. temminckii* is not at a high risk of extinction, and thus the staff recommendation was that *M. temminckii* should not be listed as a Threatened species (FWC 2017).

As part of the regional assessment portion of the evaluations, the BRG examined a “rescue effect” of turtles from out-of-state waters in the event of a catastrophic event. The BRG determined that a rescue effect for all three species is unknown because little is known about alligator snapping turtle movements, and only 1 or 2 rivers for each species may be capable of providing a rescue effect. Because the plausibility of a rescue effect is unknown, guidelines state that initial findings should not be changed. After the evaluation concluded, FWC staff further examined the concepts of “severely fragmented,” “number of locations, including plausible

threat(s),” and a “rescue effect.” Staff’s further examination found that the concept of “severely fragmented” did not apply to alligator snapping turtles because the isolation of turtles by river drainages is naturally occurring, and some genetic exchange between drainages is likely.

Based on the literature review, information received from the public, the BRG findings, staff’s evaluation of the findings, and peer reviewer input of the staff-modified recommendations, the FWC recommended that *M. suwanniensis* be listed as threatened due to meeting criterion D2 (population with a very restricted area of occupancy). *M. apalachicola* did not meet any listing criteria and staff recommended not listing the species. *M. temminckii* met criterion B, with a limited extent of occurrence and area of occupancy, fewer than 10 locations, and a projected decline in extent or quality of habitat. Because of the extent of the species range outside of Florida, in addition to uncertainty surrounding the perceived continuing decline in extent or quality of habitat, debate surrounding the actual number of locations where this species occurs in Florida, the FWC recommended not listing *M. temminckii*.

As part of the Biological Status Review, the biological assessment was reviewed by 6 independent scientists not affiliated with the FWC. All reviewers agreed that that *M. suwanniensis* is a distinct species and warranted protection as state-Threatened based on IUCN Red List criteria. Based on a rebuttal by Folt and Guyer (2015), 5 of the 6 reviewers questioned the validity of *M. apalachicola* as a distinct species. Of those 5, 3 reviewers were in favor of addressing *M. apalachicola* as a distinct population unit for management purposes. Furthermore, if future genetic analyses indicate that *M. temminckii* and *M. apalachicola* are indeed a single species (albeit with distinct population units), the FWC staff recommendation to not list either would be further justified.

CONSERVATION GOALS AND OBJECTIVES

Goals

- A. Improve or maintain the conservation status of *M. suwanniensis* to a point that the species is secure within its historical range.
- B. Maintain or improve the conservation status of *M. temminckii* and *M. apalachicola* so that they do not warrant listing again on the Florida Endangered and Threatened Species List.

Objectives

- I. Maintain or increase the current extent of occurrence (i.e., range) of alligator snapping turtles in Florida.

Rationale

The extent of occurrence for alligator snapping turtles in Florida must be maintained so as not to meet listing criteria. The extent of occurrence of the alligator snapping turtle in Florida is affected by factors such as siltation, changes in river hydrology, invasive species, and pollution, all of which degrade habitat quality. Maintaining or improving habitat quality is essential to maintaining alligator snapping turtle populations throughout their current extent of occurrence so that these species do not face extirpations.

- II. Maintain or increase current alligator snapping turtle populations within Florida in all rivers where they naturally occur, with a focus on the Suwannee River drainage.

Rationale

Alligator snapping turtles historically were exploited by targeted harvest and continue to be at risk of incidental take. Rules adopted by FWC in 2009 eliminate legal harvest; minimization of illegal harvest is accomplished by law enforcement. Trotlines and bush hooks can also cause mortality. For alligator snapping turtles to remain secure in Florida, these threats must be minimized to levels where they do not cause populations to decline.

CONSERVATION ACTIONS

Achieving the goals of this plan entails a 2-tiered approach. First, protect the species' habitat from direct loss or degradation. Second, minimize take of individuals from existing populations. Education and enforcement are vital to minimizing illegal harvest of alligator snapping turtles. The following sections describe conservation actions necessary to achieving the objectives of this plan. Actions are grouped by category (e.g., Habitat Conservation and Management, Population Management). The Conservation Action Table ([Table 3](#)) provides additional information on implementation.

Habitat Conservation and Management

Action 1 Identify conservation lands along rivers and streams inhabited by or supporting alligator snapping turtle populations. In conjunction, identify private lands suitable for protection and which could complement the habitat in conservation lands. As feasible, acquire or secure protection of these private lands. Land acquisitions should be prioritized to protect parcels that are of high value to the Suwannee alligator snapping turtle. When possible, land should extend 1 km (0.6 mi) or more into adjacent uplands.

The purchase of river floodplains and adjacent uplands (river bottoms themselves already are under state jurisdiction) is a key measure to conservation of alligator snapping turtle habitat. These lands are important to alligator snapping turtles because they contain nesting habitat. Land use and management activities on these lands affect water quality of the rivers that they border, and acquisition, along with management, can protect habitat quality. Land has been purchased with great success across alligator snapping turtle ranges in Florida and has involved programs at the federal, state, local, and private levels. However, mere ownership of property by conservation agencies and organizations is not sufficient to protect this species. A review of maps and supporting data on the status of habitat for Florida's alligator snapping turtles is included in [Appendix 1](#).

Action 2 Maintain natural physiographic and structural integrity of streams and rivers within the ranges of alligator snapping turtles in Florida and maintain current extent of occurrence. Focus should be placed on actions that will maintain habitat quality along the Suwannee and Santa Fe Rivers.

Habitat management for alligator snapping turtles should focus on maintaining natural, free-flowing rivers and streams as well as their floodplains and adjacent uplands. While alligator snapping turtles can coexist with controlled channel-dredging on large rivers such as the Apalachicola, negative effects of this activity include removal of significant numbers of snags and live woody vegetation, alteration of flow regime and hydrology, disruption of nesting sites, and introduction of hydrocarbons and other pollutants into the water. Dredging is probably deleterious to conservation of the species, but if it must occur, it should adhere to avoidance and minimization measures, or permit conditions (see [Species Conservation Measures and Permitting Guidelines](#)).

Although alligator snapping turtles are riverine species, they are known to survive in at least some impounded stretches of rivers and streams (FWC 2011, Jensen et al. 2011) and there is

even documentation of a small adult being found in a small, seepage-fed stream (Ewert et al. 2006). Most turtles observed in impounded areas are large individuals, and there is no documentation of nesting or recruitment. Impounding streams reduces the abundance of floodplain swamp habitat that alligator snapping turtles favor and likely a river's carrying capacity for this turtle. Large dams may serve as barriers to movement and thereby fragment populations. Further, although little studied in Florida, studies elsewhere have documented a variety of potentially negative effects of riverine impoundment on freshwater turtles, including disease as well as changes in growth, diet, and reproductive patterns (Thomas 1993, Herrington 1994, Lovich et al. 1996, Tucker 2012). Thus, additional impoundment of rivers or streams within the Florida range of the species should be discouraged, and proposed dams should be considered as potentially negative to the conservation of these species.

Action 3 Identify and conserve *M. suwanniensis* nesting sites throughout the Florida range.

In addition to aquatic habitat, alligator snapping turtles require areas with well-drained upland soils that receive moderate to high solar exposure for nesting. Such sites are typically only a few meters above and within 1 km (0.6 mi) of the floodplain (usually much closer; Ewert and Jackson 1994). The riverine habitat and upland areas must be protected to ensure stable populations because these habitats serve as nesting sites and thus, are needed for reproduction. For nesting, it is imperative to maintain all moderate to high sandy beaches, natural berms, and uplands extending at least 100 m (328 ft) beyond the floodplain. Along the Apalachicola River, manmade spoil mounds or supplemented beaches have supported nesting since their construction in the 1960s and 1970s (Ewert and Jackson 1994, Ewert et al. 2006). From the standpoint of alligator snapping turtle conservation, they merit retention as long as they do not substantially disrupt natural stream functions. Suitable nesting sites within the range of *M. suwanniensis* should be identified, mapped, and monitored to ensure that suitable nesting habitat is not being lost.

If disturbance reduces canopy cover in uplands near the floodplain, additional nesting habitat may be provided. To avoid nesting beneath fully-closed forest canopy, females sometimes nest along roads and in wildlife food plots where those plots are near inhabited waterways (D. Jackson, FNAI, personal observation). In sites where pine-dominated uplands lie above or near river floodplains, it can be expected that the use of prescribed fire to limit hardwood encroachment is compatible with alligator snapping turtle conservation, given the frequent selection of sites with sparse canopy for nesting, as long as the pines are not planted so closely that the canopy becomes closed.

Because alligator snapping turtle sex is temperature dependent, nesting sites exposed to more sun are more likely to produce female offspring than shadier nesting sites (Ewert et al. 1994). Any local management program for this species should include monitoring of known nesting sites for shrubby and hardwood encroachment. Mining sand from spoil mounds suitable for alligator snapping turtle nesting should also be avoided. Known nesting areas should be protected from disturbance (e.g., off-road vehicles) between mid-April to mid-May at a minimum.

Action 4 Maintain or enhance water quality in all Florida river and stream systems occupied by alligator snapping turtles.

Like all aquatic species, conservation of alligator snapping turtles depends on availability of high-quality waters. Because the species feeds on mussels, fish, and other habitat-sensitive aquatic animals, waters must retain sufficient quality and clarity to support native biota. This requires management of riparian and streamside zones as well as regulations and enforcement sufficient to prevent or strongly limit pollution and sedimentation.

Several federal and state regulatory agencies in Florida work together to maintain high-quality aquatic habitats that will benefit alligator snapping turtles. The U.S. Environmental Protection Agency, Florida Department of Environmental Protection (DEP), United States Army Corps of Engineers, and 3 water management districts monitor and regulate water quality and quantity (e.g., minimum flows and levels [MFLs]) to maintain healthy conditions for aquatic plants, fish, and other wildlife within the ranges of alligator snapping turtles. The FWC's Aquatic Habitat Enhancement and Restoration section conducts and supports enhancement projects to improve habitats for fish and other wildlife. The combined regulatory and habitat management functions of these agencies should significantly facilitate maintenance of alligator snapping turtle aquatic habitats in Florida.

System-wide benefits can be achieved by designation of entire rivers as [Outstanding Florida Waters](#) (OFWs). The following rivers or river systems inhabited by alligator snapping turtles are designated as OFWs: Perdido, Blackwater, Shoal, Choctawhatchee, Apalachicola–Chipola, Ochlockonee, St. Marks–Wakulla (possible occurrence), Aucilla–Wacissa, and Suwannee–Santa Fe rivers. Waters with this designation receive special protection to maintain water quality. Because water sources for these river systems originate in Georgia and Alabama, these 2 states also play a key role in influencing the habitat quality and prey availability of alligator snapping turtles.

Other regulations that protect water quality in Florida include the [Total Maximum Daily Loads Program](#), which determines the amount of pollution that can enter a system; the [Numeric Nutrient Water Quality Standards](#), which set water quality standards to protect statewide waters from nutrient pollution; and the [Clean Water Act](#), which maintains and restores water quality in regard to its chemical, physical and biological parameters.

Riparian and streamside zone management

The riparian zone is influenced by its proximity to freshwater rivers and streams including alluvial streams, blackwater streams, seepage streams, and spring-run streams. Riparian zones in Florida include both banks and floodplains, which support such habitats as floodplain swamps, bottomland forest, hydric hammock, and alluvial forest. Functional riparian zones reduce siltation and pollution as well as the risk of flooding. Riparian zones provide nutrients, vegetative cover, and detritus to riverine systems, all of which are critical to alligator snapping turtles and other wildlife.

Riparian zones are best conserved by securing them (through acquisition or easement) in conjunction with adjacent uplands, as recommended above. In Florida, a set of best management practices (BMPs) that can extend protection to water quality along and downstream of private as well as public lands has been developed by the Florida Department of Agriculture and Consumer Services (FDACS). The BMPs specify measures to reduce or eliminate inputs of sediments,

nutrients, logging debris, and chemicals, as well as to prevent unnatural temperature fluctuations. The [silvicultural BMPs](#) (FDACS 2008) identifies Special Management Zones with widths (35 to 300 ft, or roughly 10.6 m to 91.4 m) based on the size and type of waterbody, soil type, and slope of the site. BMPs have the potential to benefit a far greater range of wildlife than just alligator snapping turtles.

Minimum flows and levels

The water management districts establish MFLs for lakes, streams, rivers, wetlands, springs and aquifers. These MFLs identify a range of water flows and/or levels below which significant harm to the aquatic ecosystem could occur. Establishing MFLs is a requirement of the State Legislature under [s. 373.042, Florida Statutes](#). The Northwest Florida Water Management District (NFWFMD) is initiating development of MFLs in most of the river systems that contain alligator snapping turtles. The Suwannee River Water Management District addressed [MFLs for the Aucilla and Wacissa Rivers in 2016](#). As part of the [Monitoring and Research](#), information that is gathered regarding specific habitat and water quality needs of the alligator snapping turtle will be provided to the NFWFMD, SRWMD, and St. Johns Water Management District. The FWC will encourage the water management districts to use this information in development of their 5-year priority lists and timeframes for MFL plan development and incorporate it into individual MFLs in waterbodies containing alligator snapping turtles.

Population Management

Population management of alligator snapping turtles should focus on actions that increase or maintain the number of healthy adults within a population and increase natural recruitment of individuals into the population. These actions are ultimately informed by the results of monitoring and research. Therefore, as research and monitoring actions are completed, population management actions should be updated to reflect the expanded knowledge through adaptive management. Further discussion of incidental take and actions proposed to address it are included below in [Rule and Permitting Intent](#). Although vehicle collision is a significant source of mortality for many freshwater turtles, this does not seem to be the case for alligator snapping turtles in Florida. However, isolated reports of such mortality exist for alligator snapping turtles (FNAI records).

Action 5 Investigate the effects of trot lines and bush hooks on alligator snapping turtles.

Further information is needed on mortality of alligator snapping turtles caused by untended fishing methods such as multiple- and single-hook trotlines and bush hooks. To maintain robust populations of alligator snapping turtles, management efforts should attempt to reduce mortality from incidental take. Deaths from trot lines, bush hooks, and other untended hooks are a documented source of mortality for the alligator snapping turtle, including large adults (Ewert et al. 2006). Bush hooks may snag a turtle anywhere, and entangle turtles in heavy twine used as fishing line, preventing the animal from surfacing to breathe (Figure 8). Alligator snapping turtles also swallow stainless steel fishing hooks from trot lines and bush hooks. Of 11 alligator snapping turtles x-rayed from the Santa Fe River, 4 (36%) had stainless steel fishing hooks in their digestive tract. Hooks also have been found in alligator snapping turtles from the Suwannee River; one had 3 fishing hooks in its digestive tract (Enge et al. 2014).



Figure 8. Alligator snapping turtle mortality resulting from entanglement with fishing equipment in the Apalachicola River. Because of their large size these turtles can create a boating hazard. Photograph by Jonathan Mays, FWC.

The frequency of capture and resulting mortality from trot lines and bush hooks on alligator snapping turtles is unknown, so if these devices continue to be allowed in drainages supporting alligator snapping turtles, research is needed to inform management and regulation.

If mortality from trot lines and bush hooks is determined to be significant, a regulation that required use of circle hooks (versus J hooks) in trotlines and bush hooks in waters with alligator snapping turtles could reduce the rate in which hooks cause death (Parga 2012).

Action 6 Identify the occurrence of non-native species within the historic range thought to impact alligator snapping turtle populations, determine if those non-native species are having effects on alligator snapping turtles, and, if so, develop means for mitigating those threats.

There is insufficient evidence to prove that any invasive species has a substantial deleterious effect on alligator snapping turtles. However, fire ants (*Solenopsis invicta*) and wild hogs (*Sus scrofa*) both have the potential to prey upon turtle eggs and hatchlings, and Ewert and Jackson (1994) recorded fire ants in some alligator snapping turtle nests along the Apalachicola River, although they could not determine whether this represented predation or scavenging of unviable eggs. If these invasive species are documented to predate the nests, predator control methods may be needed to protect eggs and young.

Monitoring and Research

Action 7 Continue to survey and monitor alligator snapping turtle habitats within known occupied stream drainages, including upstream and downstream extents of habitation. In addition, survey and monitor systems where the species is not yet documented, but where its occurrence might be anticipated based on known range and presence of suitable habitat.

Intensive trapping surveys since the mid-1990's, particularly those by Moler and Mays (Mays et al. 2015, Enge et al. 2014, Moler 1996a) have greatly refined our knowledge of alligator snapping turtle distribution in Florida. Nonetheless, knowledge gaps remain. More recent surveys (Enge et al. 2014) have further identified a distributional gap between the eastern extent of the *M. apalachicola* range and western extent of the *M. suwanniensis* range, although incidental observations of animals occur within this region. These include the Wakulla, St. Marks, Aucilla, Econfina, Fenholloway, and Steinhatchee Rivers. Surveys are needed to determine whether the Ocklawaha River, a tributary of the St. Johns River, supports a subpopulation and to determine if it is native or introduced. Even in rivers known to be inhabited by the species, its extent of occurrence in tributary streams remains inadequately known.

Recommended survey techniques are included in the Species Conservation Measures and Permitting Guidelines (FWC 2018).

Population size and demography

Action 8 Survey and monitor alligator snapping turtle population size, demography, and recruitment. Survey methodology and protocol should continuously be refined to capture emerging questions.

Data documenting population size and demography would provide a powerful indicator for measuring management success and identifying threats and population changes. In this regard, data collected from a suite of selected sites taken at regular intervals would provide the most valuable comparisons. Mays et al. (2015) performed the first large-scale, *M. apalachicola* trapping effort in Florida. Surveys should focus first on monitoring population trends for *M. suwanniensis*, although data from rivers inhabited by other populations is important to achieve the goals of this plan.

As alligator snapping turtles are long lived, population trends may not be readily apparent. Regular monitoring may be able to detect sudden population decreases (see [Action 9](#)) which may warrant immediate conservation actions.

Surveys should include reliable trapping methods (see [Appendix 2](#)), so results can be compared among studies and sites. Such methods include baited hoop traps and snorkeling/hand-capture. Capture per unit effort (CPUE) should be recorded as turtles captured per trap-night, and turtles captured per man hour, respectively. When possible, data on captured turtles should include at a minimum: capture locations, turtle size (length and mass), and sex. Until taxonomic issues are resolved, taking tissue samples may be useful. Size-based estimates of age classes can be recorded, although those estimates may be site-specific and may take years to produce robust results. Nonetheless, alligator snapping turtles will enter baited hoop traps (however, see [Action 9](#)), so trapping can be efficiently conducted using large, heavy-duty hoop traps baited with fish (Jensen 1998) that are anchored just upstream of favorable stream microhabitats (e.g., deep holes with submerged wood). Although alligator snapping turtles normally do not bask, individuals can be found visually by snorkeling and diving in clear-water streams (Jensen and Birkhead 2003). By repeating such surveys at the same locales on a regular basis, population trends may be estimated. Any multi-year data that suggest substantial declines either locally or within a basin should prompt immediate further investigation for potential causes. These data can be compared to those available from other studies ([Table 1](#)) and across time within sites. They also can reveal evidence of recruitment.

Table 1. Mean number of turtles captured (catch per unit effort [CPUE]) per trap-night in various studies of alligator snapping turtles.

Site	Year(s)	CPUE	Notes	Source
Arkansas, all	1994-1995	0.234	1,905 trap nights	Wagner et al. 1996
Arkansas, northeast	1995-1997	0.273	352 trap nights, 3 creeks	Trauth et al. 1998
Florida	1993-1996	0.251	367 trap nights	Moler 1996a
Florida, Suwannee River	2013-2015	0.22	714 trap nights, middle reaches had 0.48 CPUE with 60 trap nights	Enge et al. 2014
Florida, Apalachicola River	2013-2015	0.36		Mays et al. 2015
Florida, Ochlockonee River	2013-2015	0.56		Mays et al. 2015
Georgia Coastal Plain statewide	1997-2001	0.20	4:1 adults: juveniles overall. Max recorded was 0.45 CPUE.	Jensen and Birkhead 2003

Action 9 Evaluate alligator snapping turtle detectability.

Although alligator snapping turtles can be successfully captured by using baited traps, recapture of individuals within the weeks and months of initial capture is low (J. Mays, personal communication, 2018). Studying the detectability of alligator snapping turtles can address survey methodology questions that will allow for more robust population and demography estimations, such as informing the timescale needed for resurveying efforts. The use of sonic or radio transmitters in conjunction with standard trapping methodology can address several questions; how often do alligator snapping turtles enter traps, how far will they move to enter a trap, and if animals become weary of traps.

Action 10 Monitor alligator snapping turtle nesting sites.

Monitoring nesting sites (for nests or nesting females) could provide information on local population trends. Favoring this technique is the relative brevity of alligator snapping turtles’ nesting season (females maximally lay a single clutch annually during a period of 1 month or less) and the degree to which females disturb the soil at some (but not all) sites. This disturbance can make nests visible for a time after laying (Ewert and Jackson 1994). Although nests destroyed by predators may be identifiable for months (remains of the large, rounded eggshells are not easily confused with those of other species), relying on counts of depredated nests alone may be misleading in that it may relate to predation rather than nest density. Nest-site surveys may be more useful for monitoring local trends (at least of adult females) of this species than for most Florida freshwater turtles, and should be combined with solicitation for public sightings of nesting individuals. This monitoring could also inform habitat recommendations, such as controlling encroachment of woody plants, to maintain nesting site quality.

Action 11 Determine the effects of impoundments on alligator snapping turtle behavior.

Portions of 2 Florida rivers inhabited by alligator snapping turtles are impounded, Lake Talquin on the Ochlockonee River and Lake Seminole on the Apalachicola River. Although alligator snapping turtles survive in at least 1 (Lake Talquin) and probably both lakes, virtually nothing is known of the status and viability of impoundment subpopulations, if they reproduce and, if so, where. Determining whether these individuals nest and recruit successfully in such situations, or whether these habitats represent ecological dead ends, merits specific research. Data from existing impoundments would be especially useful to evaluate the potential effects additional impoundments might have on this species. The NFWFMD Regional Water Supply Plan (NFWFMD 2008) identifies several sites for potential water supply reservoirs in Okaloosa County. Additionally, NFWFMD has acquired >129.5 ha (>320 ac) along the Shoal River as a potential reservoir site and has received local support for a reservoir on the Yellow River. If any new impoundment is to be built within the range of these species, research should be conducted before and after construction to compare trends, microhabitat use, demography, movements, survival, reproduction, and interactions with other individuals downstream of dams. If the Suwannee River was ever impounded, effects to *M. suwanniensis* should be anticipated and avoided or minimized.

Alligator snapping turtle species downstream of dams appear healthy. Mays et al. (2015) captured 14 turtles below Lake Seminole and 25 turtles below Lake Talquin. Unless there are future developments that would propose placing a dam within the Suwannee River drainage, this action remains low among research priorities.

Action 12 Continue to use genetic or molecular techniques to refine the relationships among alligator snapping turtles across river systems throughout the species' extent of occurrence in Florida and neighboring states. If necessary, revise this Species Action Plan to reflect scientific consensus.

Recent taxonomic studies have determined that there are at least 2 distinct species of alligator snapping turtles, and that *M. suwanniensis* is distinct from other alligator snapping turtles (Roman et al. 1999, Echelle et al. 2010, Thomas et al. 2011, 2014). Thomas et al. (2014) also suggested that a third species, *M. apalachicola* is distinct, though that determination has received little support (Folt and Guyer 2015). The BRG convened in 2015 used the most current data at the time and evaluated 3 species of alligator snapping turtles against listing criteria (FWC 2017). Once the scientific community comes to consensus, this plan can be revised to reflect the agreement of the species' taxonomy. Based on the conservative approach of the 2015 BRG, taxonomic consolidation does not affect listing decisions.

Action 13 Evaluate the effects of deadhead logging (removal of submerged logs) on alligator snapping turtles within the Suwannee River.

In areas where both undercut banks and submerged woody debris are available, undercut banks are preferentially selected (Enge et al. 2014). In the Suwannee river, tracked alligator snapping turtles were most frequently found using submerged woody debris. Deadhead logging is the practice of reclaiming abandoned submerged logs from waterways. In Florida, deadhead logging is overseen by the [Florida Department of Environmental Protection](#). Deadhead logging is legal in many rivers inhabited by alligator snapping turtles, including stretches in the Suwannee and Santa Fe Rivers. Restrictions to deadhead logging in the Suwannee River apply within state park

boundaries, the Lower Suwannee River National Wildlife Refuge, and near the Florida Sheriff's Boys Ranch during the spring. The FWC should act as a commenting agency on all deadhead logging permits issued by the DEP, and recommend avoiding areas that have high quality habitat. Additionally, research should be done to examine the importance of deadhead logging on alligator snapping turtle essential life behaviors.

Rule and Permitting Intent

Action 14 Maintain current rules that prohibit take and possession (including eggs) of unlisted alligator snapping turtle species, as well as take of common snapping turtles (*Chelydra serpentina*) based on similarity of appearance, except as authorized by FWC permit (Rule 68A-25.002, F.A.C.).

Maintaining the protections provided with the State-Threatened status of *M. suwanniensis* (Rule 68A-27.003, F.A.C.) protects the species from take and facilitates conditions that will lead to this species no longer warranting listing. State-Threatened species are protected from any form of take without a permit. This rule also limits possession to permitted individuals.

The prohibitions against take in Rule 68A-25.002, F.A.C., protecting *M. temminckii* and *M. apalachicola* from take, possession, and commercialization should be maintained.

Law Enforcement

Action 15 Publish freshwater turtle rules annually in FWC fishing and hunting handbooks.

Rules pertaining to freshwater turtles should be reviewed and published annually to inform the public about current restrictions. Rules pertaining to freshwater turtles should be reviewed by FWC biologists and law enforcement personnel to ensure accuracy.

Action 16 Train law enforcement officers from FWC and other agencies in turtle identification and regulations to facilitate education about and enforcement of existing protections.

Although habitat conservation and management are key to protecting and managing these species, enforcement of wildlife regulations is essential to maintaining populations of alligator snapping turtles. In Florida, enforcement responsibility lies chiefly with the FWC in conjunction with agencies and organizations that manage lands containing alligator snapping turtle habitats. Considering F.A.C. rules prohibiting take and possession of these species, it is critical that law enforcement officers be knowledgeable about freshwater turtles. Ideally, every officer should be able to identify such species or have contact information for taxa experts. Since 2009, the FWC has conducted local training programs for FWC law enforcement personnel; training focuses on turtle identification and an overview of pertinent rules. Such programs should continue regularly to accommodate for personnel turnover and rule changes. They should also be offered statewide, and if feasible, expanded to include law enforcement officers from other agencies. Beginning in 2016, the FWC developed resources to assist law enforcement officers with turtle identification and species-specific rules. These resources include a ticket-book guide, an electronic guide, and

a comprehensive guide to freshwater turtle regulations including regulations from partner agencies (i.e., FDACS).

Genetic techniques (based on mitochondrial deoxyribonucleic acid [DNA]) have been developed to assist FWC’s Division of Law Enforcement in distinguishing alligator snapping turtle meat from that of other turtles (Moler 1996*b*, Roman et al. 1999, Roman and Bowen 2000). These techniques also can differentiate each species of alligator snapping turtles. This ability has the potential to facilitate prosecutions under the federal Lacey Act, should meat, parts of, or whole animals be found crossing state lines (e.g., Ewert et al. 2006).

Action 17 Law enforcement officers should monitor areas with high densities of bush hook and trotline use and ensure that fishing gear is being used within regulations.

M. suwanniensis are protected from negligent take in Chapter 68A-27, F.A.C. This includes catching alligator snapping turtles with fishing gear that is out of regulations (68A-23 F.A.C., trotline, set lines and bush hooks are covered under 68A-23.004 F.A.C.). Unmarked trotlines, bush hooks and set lines should be monitored by law enforcement to determine the owner, or removed from the water. In addition to posing a hazard to wildlife, these hooks can also snag and injure individuals recreating on the water.

Incentives and Influencing

Influencing

County growth management plans and land development regulations provide an avenue by which FWC can inform and influence land and water uses that are relevant to the conservation of Florida’s fish and wildlife, including state-listed species. The FWC offers conservation planning services to local governments during growth management plan development as well as during consideration of plan amendments and associated development proposals. To promote an understanding of technical assistance and incentives available to landowners, FWC typically provides information to local governments regarding species management plans, permitting options, and incentive programs that are available to applicants, developers, landowners, and the general public.

In accordance with Florida’s Imperiled Species Management Plan, [Species Conservation Measures and Permitting Guidelines](#) have been developed for alligator snapping turtles. These Guidelines define essential behavioral patterns in the context of the species’ unique biological background, summarize threats, and outline measures to avoid take. If incidental take is unavoidable, minimization and mitigation options are presented. Intentional take for *M. suwanniensis* requires a permit, typically issued only for scientific collecting. The Guidelines are supplementary to the permitting process and designed to assist potential applicants.

Incentive Programs

FWC currently employs several programs that promote conservation by providing technical and financial assistance to private landowners. These programs are voluntary and some may provide financial incentives, depending on annual appropriation, for wildlife conservation and/or habitat management on private lands. Florida also provides tax incentives, including property tax

exemptions for landowners that put a perpetual conservation easement on their lands. Additional incentives may include exemption from permits for activities that enhance wildlife values, such as mowing, roller-chopping, and tree-stand thinning, where these management activities are not a precursor to development. A specific example of an incentive program is [FWC's Landowner Assistance Program](#). It advances species conservation objectives through public-private conservation partnerships.

Action 18 The FWC and the United States Fish and Wildlife Service (USFWS) staff should coordinate to evaluate and implement, as appropriate, Habitat Conservation Plans (HCPs) and Candidate Conservation Agreements with Assurances (CCAA) as means to improve habitat conditions (e.g., water quality and conditions necessary to a stable prey base) for alligator snapping turtles and other riverine species, and to provide incentives to private landowners.

Because the USFWS was petitioned to list alligator snapping turtles as federally Threatened (USFWS 2015), HCPs and CCAs may provide incentives for private landowners to conduct activities that benefit alligator snapping turtles on private lands. HCPs are planning documents that are developed during the application process for an incidental take permit for a federally listed species. These plans outline the effects of anticipated future impacts and proposed actions to be undertaken to minimize and mitigate such impacts. Habitat Conservation Plans may apply to any federal At-Risk species. As proactive, voluntary agreements between the USFWS and a private party, CCAs allow a property owner to voluntarily implement conservation measures that benefit the species in the agreement, while providing regulatory assurances to the landowner should the species become federally listed under the federal Endangered Species Act. The FWC will work cooperatively with landowners and the USFWS to determine if HCPs and CCAs are useful tools for furthering the conservation of alligator snapping turtles in Florida.

Education and Outreach

Action 19 Develop education and outreach materials about alligator snapping turtles, their habitats, and threats.

Turtles are popular animals with most members of the public, especially those who recreate within Florida's natural ecosystems. As such, any materials or activities that provide educational information to those who use or visit waters inhabited alligator snapping turtles are likely to be appreciated and, in turn, generate support for conservation. Local governments, state and federal agencies, and landowners should be provided with these educational materials. Opportunities to disseminate information about the alligator snapping turtle and other turtles exist in schools, zoos, environmental centers, and at special events (e.g., wildlife festivals).

Given the number of public lands that provide access to rivers occupied by alligator snapping turtles, there are many opportunities for public education. Kiosks, signage, brochures, and even special tour activities can focus on or include information specific to alligator snapping turtles, including their limited distribution and threats. To date, relatively few public land units have capitalized on this opportunity. One way to address this may be for the FWC to offer information, expertise, simple publications (pamphlets and brochures), and even direct assistance to land management agencies throughout the species' Florida range.

Though many hunters and anglers are knowledgeable about regulations pertaining to birds, mammals, and fish, this is less true for reptiles and amphibians. Although freshwater turtle rules have been added to the annual FWC fishing regulations (see [Action 15](#)), many members of the public remain unaware of FWC rules that limit or prohibit take of alligator snapping turtles. The FWC has posted some waterways. Signage should be posted and maintained at public boat ramps along watercourses inhabited by alligator snapping turtles, and include potential threats, such as unattended fishing gear. Supplementing this with educational kiosks at the more heavily used access points could be valuable in generating understanding and support.

Coordination with Other Entities

There are extensive tracts of land along the rivers inhabited by alligator snapping turtles that have been protected by numerous agencies and organizations, all of which are potential partners in implementing this plan. These partners include 5 federal agencies, 7 state agencies, 8 local government agencies, and 1 private organization ([Table 2](#)). Because of their vital role as partners, special note is made of the water management districts following [Table 2](#). In addition, because most of the rivers inhabited by this species emanate from Alabama and Georgia, it is imperative that these states be considered as partners as well, as they have significant influence on the quality and quantity of water that reaches north Florida's rivers. The FWC should coordinate with each potential partner about protecting alligator snapping turtles and their habitat and provide copies of this plan to all appropriate offices and personnel.

Water Management Districts

Of the many agencies identified as potential partners in this plan, the role of the state's water management districts is integral to protecting habitat and the quality of water in rivers inhabited by this species. Details about the districts' roles and resources are available in their strategic plans or annual reports, as well as on their websites. In total, the 5 districts have secured vast tracts of land that are key to protecting freshwater habitats; this includes hundreds of miles of frontage along rivers which support species of greatest conservation need. Although the districts' network previously operated discrete programs for land acquisition (e.g., Save Our Rivers), most land acquisition is now done through the state's Florida Forever program. Because of budget constraints, funding for the Florida Forever program has been substantially reduced since 2009.

Table 2. Agencies and organizations responsible for managing conservation lands (managed areas) within Florida along rivers inhabited by alligator snapping turtles.

Federal	State	Local	Private
U.S. Army Corps of Engineers	Florida Department of Agriculture and Consumer Services: Florida Forest Service	Alachua County	Coastal Plains Institute
U.S. Department of Agriculture: U.S. Forest Service	Florida Department of Corrections: PRIDE Enterprises	City of Chattahoochee	
U.S. Department of Defense:	Florida Department of Environmental Protection	Emerald Coast Utilities Authority	
	Florida Fish and Wildlife Conservation Commission	Gilchrest County	
	Northwest Florida Water Management District	Jefferson County	
U.S. Department of the Interior: U.S. Fish and Wildlife Service	Suwannee River Water Management District	Leon County Parks and Recreation Department	
	University of Florida	Levy County Parks and Recreation	
		Okaloosa County	

Without continuation or new bond funds appropriated, future land acquisitions will be severely limited, with potential negative effects upon habitat essential to the conservation of alligator snapping turtles. The following are synoptic summaries of the 2 water management districts that are especially pertinent to this plan.

Suwannee River Water Management District (SRWMD)

The management of rivers from the Aucilla to the Waccasassa is a key part of the [SRWMD](#)'s overall mission. Principal goals are to minimize flood impacts, protect water quality, and preserve natural communities. To facilitate meeting these goals, a SRWMD priority is the acquisition of lands within the 100-year floodplain of the Suwannee River, its tributaries, and other rivers. As of 2011, the SRWMD owned or controlled roughly 554.6 km (344 miles) of riverfront property; >40% of land protection has been achieved using less-than-fee (conservation easement) measures. Currently, although it has identified additional lands warranting greater protection, the SRWMD does not maintain a separate list for land acquisition projects but relies upon the Florida Forever Work Plan (T. Demott, SRWMD, personal communication). The SRWMD participates in the Excellence in Land Management Program, which encompasses water management and nonstructural flood protection, public access and use, habitat management, and hydrologic restoration (SRWMD 2011).

Northwest Florida Water Management District (NFWMD)

The [NFWFMD](#) encompasses most of Panhandle Florida, from the Perdido River to the St. Marks River. It currently has jurisdiction over >89,435 ha (>221,000 ac) and actively owns and manages >84,934 ha (>210,000 ac) of lands. These lands include extensive floodplains, a major Floridan Aquifer recharge area, and estuarine salt marshes. District lands protect fish and wildlife, natural water resource systems, water quality, recharge, and other wetland and floodplain functions. All NFWFMD lands are open to public access and enjoyment. Currently, although it has identified additional lands warranting greater protection, the NFWFMD does not maintain a separate list for land acquisition projects, but instead relies upon the Florida Forever Work Plan (T. Macmillan, NFWFMD, personal communication). Three of the NFWFMD's 4 divisions – Resource Management, Land Management and Acquisition, and Resource Regulation – are directly involved in activities integral to the conservation of riverine turtles (NFWFMD 2011).

Action 20 Continue coordination among the FWC, USFWS, and other relevant partners on At-Risk species conservation to improve the status of these species, including alligator snapping turtles.

Coordinated information exchange is foundational to improving management and understanding threats and trends; surveys conducted jointly among agencies are one example of how the FWC and the USFWS partner in this area. Continuing to share data collected promotes efficient use of resources and allows for calibration to ensure state and federal efforts align.

Action 21 Include *M. suwanniensis* in the Agriculture Wildlife Best Management Practices for State Imperiled Species.

The [Agriculture Wildlife BMP's for State Imperiled Species](#) (FDACS 2015) addresses several aquatic species, including the Barbour's map turtle (*Graptemys barbouri*), which cooccurs with *M. suwanniensis*. The BMP's are voluntary practices that landowners may opt into. Many of the guidelines for the animals already included in the aquatic species section would benefit *M. suwanniensis*, such as temperature regulation (providing a mixture of sun and shade for nesting habitat), large and small woody debris, and conservation buffers.

Action 22 Provide outreach and education to partner agencies.

When appropriate, FWC staff should provide educational training to partner agencies to guide management of State-Threatened wildlife species ([Table 2](#)). As the FWC acts a commenting agency for our partners, providing educational outreach will help out partners anticipate permitting requirements and empower them to take actions that will benefit alligator snapping turtles as well as other imperiled species. Emphasis should be placed on removing potentially lethal hazards to alligator snapping turtles (i.e., unmonitored and abandoned bush hooks) from rivers. One means to accomplish this is through publication and implementation of the Guidelines, but additional staff expertise may be needed.

Table 1. Alligator snapping turtles conservation action table.

NOTE: An explanation of acronyms used is below the table.

Objective(s) Addressed	Team Assigned Priority Level	Action Number	Action	Conservation Action Category	Status	Implementation leads: FWC divisions or sections	External partners	Likely Effectiveness	Feasibility	Urgency: Is the action immediately critical to the species' survival?
1,2	2	1	Identify conservation lands along rivers and streams inhabited by or supporting alligator snapping turtle populations. In conjunction, identify private lands suitable for protection and which could complement the habitat in conservation lands. As feasible, acquire or secure protection of these private lands. Land acquisitions should be prioritized to protect parcels that are of high value to the Suwannee alligator snapping turtle. When possible, land should extend 1 km (0.6 mi) or more into adjacent uplands.	Habitat Conservation & Mgmt	EXPANDED	HSC, WHM, SCP	DEP, FNAI, WMDs	Some progress likely, but 100% success is improbable.	Practical, but insufficient funding is likely to become available to complete the task. Relationships exist by limited by budgetary constraints.	Not urgent. Not critical to the alligator snapping turtles' immediate survival given moderately widespread FL distribution (multiple drainages) and existence of substantial network of protected lands already.
1,2	1	2	Maintain natural physiographic and structural integrity of streams and rivers within the ranges of alligator snapping turtles in Florida to populations and maintain current extent of occurrence. Focus should be placed on actions that will maintain habitat quality along the Suwannee and Santa Fe Rivers.	Habitat Conservation & Mgmt, Population Mgmt	ONGOING	HSC	DEP, USACE, WMDs	Likely to continue comments, but success is unlikely given competing uses.	Commenting is practical, but other parts are practical only if partners consider them so. Relationships already exist.	Not urgent. Not critical to the alligator snapping turtles' immediate survival given moderately widespread FL distribution (multiple drainages) and substantial but unquantified statewide population size.
1,2	5	3	Identify and conserve <i>M. suwanniensis</i> nesting sites throughout the Florida range	Habitat Conservation & Mgmt, Population Mgmt, Monitoring & Research	ONGOING	FWRI, HSC	All managing agencies that supervise appropriate sites; see Tables 1 and 3 within plan. Also universities and others.	Likely.	Practical, feasible.	Not urgent. Not critical to alligator snapping turtles' immediate survival but nonetheless potentially important to maintaining robust populations. A focus on adult AST should be a priority - nesting sites will be conserved defacto via Actions 1 and 2.
1,2	1	4	Maintain or enhance water quality in all Florida river and stream systems occupied by alligator snapping turtles.	Habitat Conservation & Mgmt	EXPANDED	HSC	DEP, FDACS, WMDs, EPA, landowners	Likely.	Feasible but will take commitment and cooperation.	Not urgent. Not critical to alligator snapping turtles' immediate survival but could become so if habitat severely degraded.
1,2	1	5	Investigate the effects of trot lines and bush hooks on alligator snapping turtles.	Habitat Conservation & Mgmt, Population Mgmt, Monitoring & Research	NEW	FWRI, HSC, LE	WMDs, private citizens	Likely.	Practical, feasible.	Not urgent. Not critical, but about as highly ranked as a need can be without being critical. Maintaining populations of adult animals is needed for the persistence of the species.
1,2	3	6	Identify the occurrence of non-native species within the historic range thought to impact alligator snapping turtle populations, determine if those non-native species are having effects on alligator snapping turtles, and, if so, develop means for mitigating those threats.	Habitat Conservation & Mgmt, Population Mgmt, Monitoring & Research	EXPANDED	FWC Invasive Plant Management and Aquatic Habitat Enhancement and Restoration sections	DEP, FDACS, WMDs	Likely.	Practical.	Not urgent. Not critical to alligator snapping turtles' immediate survival given moderately widespread FL distribution (multiple drainages) and substantial but unquantified statewide population size.
2	3	7	Continue to survey and monitor alligator snapping turtle habitats within known occupied stream drainages, including upstream and downstream extents of habitation. In addition, survey and monitor systems where the species is not yet documented, but where its occurrence might be anticipated based on known range and presence of suitable habitat.	Population Mgmt, Monitoring & Research	EXPANDED	HSC, SCP, FWRI	Georgia and Alabama, FNAI, Universities.	Likely.	Practical.	Not urgent. Not critical to alligator snapping turtles' immediate survival given current distribution and possibly substantial but unquantified statewide population size.

Table 1. Alligator snapping turtles conservation action table.

Objective(s) Addressed	Team Assigned Priority Level	Action Number	Action	Conservation Action Category	Status	Implementation leads: FWC divisions or sections	External partners	Likely Effectiveness	Feasibility	Urgency: Is the action immediately critical to the species' survival?
1,2	2	8	Survey and monitor alligator snapping turtle population size, demography, and recruitment. Survey methodology and protocol should continuously be refined to capture emerging questions.	Monitoring & Research	EXPANDED	HSC, SCP, FWRI	FNAI, universities, others.	Highly likely	Highly feasible.	Not urgent. Not critical to alligator snapping turtles' immediate survival given already known moderately widespread FL distribution (multiple drainages).
1,2	2	9	Evaluate alligator snapping turtle detectability.	Monitoring & Research, Population Mgmt	NEW	HSC - SCP, FWRI	Universities would be appropriate partners in this effort if they can provide long-term commitment.	Likely.	Highly feasible.	Not urgent. Not critical to alligator snapping turtles' immediate survival however the results of this research would better inform estimates of populations based on mark/recapture data.
1	5	10	Monitor alligator snapping turtle nesting sites.	Monitoring & Research	NEW	FWRI, HSC		Likely.	Highly feasible.	Not urgent. Not critical to alligator snapping turtles' immediate survival but nonetheless potentially important to maintaining robust populations, may be the limiting factor in populations.
1,2	5	11	Determine the effects of impoundments on alligator snapping turtle behavior.	Monitoring & Research	NEW	FWRI, HSC	DEP, FDACS, WMDs	Moderate.	Somewhat practical.	Not urgent. Not critical to <i>M. suwanniensis</i> immediate survival, however should water use increase and climate change affect rainfall, a potential dam on the Suwannee River is not out of the question.
1,2	2	12	Continue to use genetic or molecular techniques to refine the relationships among alligator snapping turtles across river systems throughout the species' extent of occurrence in Florida and neighboring states. If necessary, revise this Species Action Plan to reflect scientific consensus.	Protections & Permitting, Population Mgmt	ONGOING	FWRI, HSC	Universities would be appropriate partners in this effort .	Extremely Likely.	Fully practical, already being done, mostly completed.	Not urgent. Not critical to alligator snapping turtles' immediate survival. <i>M. suwanniensis</i> is described as a species, however no consensus on the relationship between <i>M. apalachicola</i> and <i>M. temminckii</i> . Could inform management decisions of distinct genetic groups.
1,2	3	13	Evaluate the effects of deadhead logging (removal of submerged logs) on alligator snapping turtles within the Suwannee River.	Habitat Conservation & Mgmt, Protections & Permitting, Monitoring & Research, Incentives & Influencing	NEW	FWRI, HSC	DEP, WMDs	Likely.	Feasible but will take commitment and cooperation.	Not urgent. Not critical to <i>M. suwanniensis</i> survival, however telemetry found that woody debris was the most used refugia on the river. If there is a high interest in deadhead logging this may impact essential behavior patterns.

Table 1. Alligator snapping turtles conservation action table.

Objective(s) Addressed	Team Assigned Priority Level	Action Number	Action	Conservation Action Category	Status	Implementation leads: FWC divisions or sections	External partners	Likely Effectiveness	Feasibility	Urgency: Is the action immediately critical to the species' survival?
2	2	14	Maintain current rules that prohibit take and possession (including eggs) of unlisted alligator snapping turtle species, as well as take of common snapping turtles (<i>Chelydra serpentina</i>) based on similarity of appearance, except as authorized by FWC permit (Rule 68A-25.002, F.A.C.).	Protections & Permitting, Population Mgmt	ONGOING	Law Enforcement	DEP, FDACS, WMDs, commercial pet trade.	Likely.	Practical.	No, not critical to alligator snapping turtles' immediate survival but nonetheless potentially important to maintaining robust populations.
2	2	15	Publish freshwater turtle rules annually in FWC fishing and hunting handbooks.	Protections & Permitting, Population Mgmt	ONGOING	Freshwater Fisheries, Law Enforcement	N/A	Likely.	Practical though likely to meet with some public resistance.	Urgent. Very important to understand the rules that protect the species in light of <i>M. suwanniensis</i> being state-Threatened. This is an ongoing annual need.
1,2	2	16	Train law enforcement officers from FWC and other agencies in turtle identification and regulations to facilitate education about and enforcement of existing protections.	Law Enforcement	ONGOING	HSC, SCP	USFWS	Highly likely.	Highly feasible.	Urgent. Very important to understand the rules that protect the species in light of <i>M. suwanniensis</i> being state-Threatened. Recruit training happens 1-2 times per year, and resources are being created for law enforcement use.
1,2	1	17	Law enforcement officers should monitor areas with high densities of bush hook and trotline use and ensure that fishing gear is being used within regulations.	Law Enforcement, Protections & Permitting	NEW	HSC, SCP, LE	USFWS	Highly likely.	Highly feasible.	Not urgent. Not critical to alligator snapping turtles' immediate survival. Take from animals drowning from bush-hooks is probably higher than reported. The majority of bush-hook sets in the state are out of regulation (unlabeled, abandoned, etc.).
1,2	2	18	The FWC and the USFWS staff should coordinate to evaluate and implement, as appropriate, Habitat Conservation Plans and Candidate Conservation Agreements with Assurances as means to improve habitat conditions (e.g., water quality and conditions necessary to a stable prey base) for alligator snapping turtles and other riverine species, and to provide incentives to private landowners.	Incentives & Influencing	ONGOING	HSC	USFWS; All managing agencies that supervise appropriate sites; see Table 2 within plan.	Highly likely.	Highly feasible.	Not urgent. Not critical to alligator snapping turtles' immediate survival given moderately widespread FL distribution (multiple drainages), substantial but unquantified statewide population size, and current rules prohibiting take.
1,2	4	19	Develop education and outreach materials about alligator snapping turtles, their habitats, and threats.	Education & Outreach	ONGOING	HSC, SCP	NGO's	Likely.	Highly feasible.	Not urgent. Not critical to alligator snapping turtles' immediate survival.
1,2	1	20	Continue coordination between the FWC, USFWS, and other relevant partners on At-Risk species conservation to improve the status of these species, including alligator snapping turtles.	Coordination with Other Entities	ONGOING	HSC, SCP	USFWS	Likely.	Highly feasible.	Not urgent. Not critical to alligator snapping turtles' immediate survival; however information gained during this coordination may help assess urgency of other actions.

Table 1. Alligator snapping turtles conservation action table.

Objective(s) Addressed	Team Assigned Priority Level	Action Number	Action	Conservation Action Category	Status	Implementation leads: FWC divisions or sections	External partners	Likely Effectiveness	Feasibility	Urgency: Is the action immediately critical to the species' survival?
1,2	4	21	Include <i>M. suwanniensis</i> in the Agriculture Wildlife Best Management Practices for State Imperiled Species.	Coordination with Other Entities	NEW	HSC, SCP	FDACS	Likely.	Feasible but will take commitment and cooperation.	Not urgent. Not critical to alligator snapping turtles' immediate survival.
1,2	3	22	Provide outreach and education to partner agencies.	Coordination with Other Entities	NEW	HSC, SCP	NA	Likely.	Practical and feasible but will take commitment and cooperation.	Not urgent. Not critical to alligator snapping turtles' immediate survival.
2	Complete	Complete	Develop education and outreach materials about alligator snapping turtle habitat needs and conservation measures that can benefit the species.	Education & Outreach	COMPLETE	HSC, OPAWVS, OCR	All managing agencies that supervise appropriate sites.	Likely.	Practical.	Not urgent. Not critical to alligator snapping turtles' immediate survival given current distribution and possibly substantial but unquantified statewide population size.

Acronyms used in this table:

- DEP: Florida Department of Environmental Protection
- FWC: Florida Fish and Wildlife Conservation Commission
- FDACS: Florida Department of Agriculture and Consumer Services
- FNAI: Florida Natural Areas Inventory
- FWRI: Fish and Wildlife Research Institute, the research branch of the Florida Fish and Wildlife Conservation Commission
- HSC: Habitat and Species Conservation, a Division of the Florida Fish and Wildlife Conservation Commission
- OCR: Office of Community Relations, administered by the Florida Fish and Wildlife Conservation Commission
- OPAWVS: Office of Public Access and Wildlife Viewing Services, administered by the Florida Fish and Wildlife Conservation Commission
- SCP: Species Conservation Planning, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation
- TBD: To be determined
- USACE: U.S. Army Corps of Engineers
- USFWS: United States Fish and Wildlife Service
- WHM: Wildlife and Habitat Management, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation
- WMDs: Water Management Districts

LITERATURE CITED

- Echelle, A. A., J. C. Hackler, J. B. Lack, S. R. Ballard, J. Roman, S. F. Fox, D. M. Leslie, Jr., and R. A. Van Den Bussche. 2010. Conservation genetics of the alligator snapping turtle: cytonuclear evidence of range-wide bottleneck effects and unusually pronounced geographic structure. *Conservation Genetics* 11:1375–1387.
- Elsley, R. M. 2006. Food habits of *Macrochelys temminckii* (alligator snapping turtle) from Arkansas and Louisiana. *Southeastern Naturalist* 5:443-452.
- Enge, K. M., T. M. Thomas, and E. Suarez. 2014. Population status and distribution of the alligator snapping turtle in the Suwannee River, Florida. Florida Fish and Wildlife Conservation Commission, Conserve Wildlife Tags Grant Project No. 1112-04, Gainesville, Florida.
- Ernst, C. H., and J. E. Lovich. 2009. *Turtles of the United States and Canada*. Second edition. The Johns Hopkins University Press, Baltimore, Maryland.
- Ewert, M. A., and D. R. Jackson. 1994. Nesting ecology of the alligator snapping turtle (*Macrochelys temminckii*) along the lower Apalachicola River, Florida. Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program Report NC89-020, Tallahassee.
- Ewert, M. A., D. R. Jackson, and C. E. Nelson. 1994. Patterns of temperature-dependent sex determination in turtles. *Journal of Experimental Zoology* 270:3-15.
- Ewert, M. A., P. C. H. Pritchard, and G. E. Wallace. 2006. *Graptemys barbouri* – Barbour’s map turtle. Pages 260–272 in P. A. Meylan, editor. *Biology and conservation of Florida turtles*. Chelonian Research Monographs No. 3.
- Florida Department of Agriculture and Consumer Services [FDACS]. 2008. *Silviculture best management practices*. Florida Department of Agriculture and Consumer Services, Tallahassee, Florida.
- Florida Department of Agriculture and Consumer Services [FDACS]. 2015. *Agriculture wildlife best management practices for state imperiled species*. Florida Department of Agriculture and Consumer Services, Tallahassee, Florida.
- Florida Fish and Wildlife Conservation Commission [FWC]. 2011. *Alligator snapping turtle biological status review report*. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.
- Florida Fish and Wildlife Conservation Commission [FWC]. 2015. *Briefing memo: imperiled species management plan update*. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida. <http://myfwc.com/media/3056492/4B-ISMPMemo.pdf>. Accessed 18 May 2018.

- Florida Fish and Wildlife Conservation Commission [FWC]. 2017. Alligator snapping turtle species biological status review report. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.
<http://myfwc.com/wildlifehabitats/imperiled/biological-status/>. Accessed 5 June 2018.
- Florida Fish and Wildlife Conservation Commission [FWC]. 2018. Alligator snapping turtle species conservation measures and permitting guidelines. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.
<http://myfwc.com/wildlifehabitats/imperiled/species-guidelines/>
- Folt, B., and C. Guyer. 2015. Evaluating recent taxonomic changes for alligator snapping turtles (Testudines: Chelydridae). *Zootaxa* 3947(3):447–450.
- Herrington, R. 1994. Proliferative shell disease in Lake Blackshear turtles. Report to Georgia Department of Natural Resources, Atlanta.
- Iverson, J. B., P. A. Meylan, and M. E. Sidel. 2017. Testudines (in part) – turtles. Pages 1-102 in B. I. Crother (ed.), *Scientific and standard English names of amphibians and reptiles of North America North of Mexico, with comments regarding confidence in our understanding*. SSAR Herpetological Circular 43.
- Jensen, J. B. 1998. Bait preferences of southeastern United States Coastal Plain riverine turtles: fish or fowl? *Chelonian Conservation and Biology* 3:109-111.
- Jensen, J. B., and W. S. Birkhead. 2003. Distribution and status of the alligator snapping turtle (*Macrochelys temminckii*) in Georgia. *Southeastern Naturalist* 2:25-34.
- Jensen, J. B., K. Sorensen, and S. P. Graham. 2011. *Macrochelys temminckii* (alligator snapping turtle). *Herpetological Review* 42(4):565-566.
- Krysko, K. L., K. M. Enge, and P. E. Moler. 2011. Atlas of amphibians and reptiles in Florida. Final report to Florida Fish and Wildlife Conservation Commission, Tallahassee. Submitted 15 December 2011. <http://www.flmnh.ufl.edu/herpetology/reptiles.htm>. Accessed 4 March 2018.
- Lovich, J. E., S. W. Gotte, C. H. Ernst, J. Harshbarger, A. F. Laemmerzahl, and J. W. Gibbons. 1996. Prevalence and histopathology of shell disease in turtles from Lake Blackshear, Georgia. *Journal of Wildlife Diseases* 32:259-265.
- Mays, J., T. Thomas, and K. Enge. 2015. Alligator snapping turtle survey. Final report 9157-295-6263. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.
- Moler, P. E. 1996a. Alligator snapping turtle distribution and relative abundance. Final report 7544, Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

- Moler, P. E. 1996*b*. Forensic identification of alligator snapping turtle meat. Final Report 7545. Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.
- Northwest Florida Water Management District [NFWFMD]. 2008. 2008 Water supply assessment update. Water Resources Assessment 08-02. Northwest Florida Water Management District, Havana, Florida.
- Northwest Florida Water Management District [NFWFMD]. 2011. District strategic water management plan, fiscal year 2011. Program Development Series 2010-03, Northwest Florida Water Management District, Havana, Florida.
- Parga, M. L. 2012. Hooks and sea turtles: a veterinarian's perspective. *Bulletin of Marine Science* 731-741.
- Pritchard, P. C. H. 1989. The alligator snapping turtle. Biology and conservation. Milwaukee Public Museum, Milwaukee, Wisconsin.
- Pritchard, P. C. H. 2006. The alligator snapping turtle: biology and conservation. Second edition. Krieger Publishing Company, Malabar, Florida.
- Roman, J., and B. W. Bowen. 2000. The mock turtle syndrome: identification of turtle meat purchased in the southeastern United States of America. *Animal Conservation* 3:61-65.
- Roman, J., S. D. Santhuff, P. E. Moler, and B. W. Bowen. 1999. Population structure and cryptic evolutionary units in the alligator snapping turtle. *Conservation Biology* 13:135-142.
- Suwannee River Water Management District [SRWMD]. 2011. 2011–2020 strategic plan. Suwannee River Water Management District, Live Oak, Florida.
- Suwannee River Water Management District [SRWMD]. 2017. Florida forever work plan 2018 annual update. Suwannee River Water Management District, Live Oak, Florida.
- Thomas, R. B. 1993. Growth, diet, and reproduction of the red-eared slider (*Trachemys scripta*) inhabiting a reservoir receiving a cold effluent. M.S. Thesis, Southwest Missouri State University, Springfield, Missouri.
- Thomas, T. M., M. C. Granatosky, and P. E. Moler. 2011. Morphology of the alligator snapping turtle (*Macrochelys temminckii*). 9th annual symposium on the conservation and biology of tortoises and freshwater turtles. Joint Annual Meeting of the Turtle Survival Alliance and IUCN Tortoise and Freshwater Turtle Specialist Group. 14–17 August 2011, Orlando, Florida.
- Thomas, T. M., M. C. Granatosky, Jason R. Bourque, K. L. Krysko, P. E. Moler, T. Gamble, E. Suarez, E. Leone, K. M. Enge, and J. Roman. 2014. Taxonomic assessment of alligator snapping turtles (Chelydridae: *Macrochelys*), with the description of two new species from the southeastern United States. *Zootaxa* 3768(2):141–165.

- Tucker, A. D., F. Guarino, and T. E. Priest. 2012. Where lakes were once rivers: contrasts of freshwater turtle diets in dams and rivers of southeastern Queensland. *Chelonian Conservation and Biology* 11:12-23.
- Trauth, S., I. Wilhide, and A. Holt. 1998. Population structure and movement patterns of alligator snapping turtles (*Macrolemys temminckii*) in northeastern Arkansas. *Chelonian Conservation and Biology* 3:64-70.
- U.S. Fish and Wildlife Service [USFWS]. 2015. 50 CFR part 17. Federal register volume 80, number 126. <https://www.gpo.gov/fdsys/pkg/FR-2015-07-01/pdf/2015-16001.pdf>. Accessed 18 May 2018.
- Wagner, B. K., D. Urbston, and D. Leek. 1996. Status and distribution of the alligator snapping turtle in Arkansas. *Proceedings, Annual Conference, Southeastern Association of Fish and Wildlife Agencies* 50:264-270.

APPENDICES

Appendix 1. Protection status of waters inhabited by alligator snapping turtles.

M. suwanniensis

Suwannee River (Outstanding Florida Waters)

The Suwannee River Water Management District (SRWMD) is responsible for land acquisition along the borders of waterways under their jurisdiction. The SRWMD also manages land, with objectives falling under four main categories: protection, enhancement and restoration of natural and cultural resources, providing opportunities for recreation, coordination between stakeholders, and managing district lands in an efficient manner. These strategies include maintaining minimum flows and levels, and is a science based process to conserve natural resources.

Conservation lands border much of this river system, although protection of additional lands to fill the gaps could offer greater long-term protection of water quality for alligator snapping turtles. More protected lands are especially needed within the upper Santa Fe River system, including along the New River and Olustee Creek.

Currently, there are 65,937 acres in state ownership (fee acres) and 28,693 acres under conservation easements along the Suwannee basin (less-than-fee acres), and 15,606 fee acres and 8,632 less-than-fee acres protected along the Santa Fe basin. Within the Suwannee basin there are 23,916 potential acquisition project acres, and 9,920 potential acquisition project areas within the Santa Fe basin (SRWMD 2017).

M. temminckii

Perdido River and Bay (Outstanding Florida Waters)

Much of the lower river and upper Perdido Bay is bordered by managed areas, although gaps exist, including parts of Bayou Marcus and Elevenmile creeks (both known to support alligator snapping turtles). However, the upper 60% of the river within Florida is not afforded the same protection as the other portions that are protected by managed areas. Protection of the remaining private lands bordering these creeks and the river would undoubtedly benefit long-term conservation of this turtle and other wildlife species. Additional protection is needed on the Alabama (i.e., western) side of the river as well.

Escambia River

Most of the Florida stretch of this river, from Escambia Bay to within 9 river km (approximately 6 mi) of the state line, is bordered by Northwest Florida Water Management District (NFWMD) land. Extension of protected lands to the state line, as well as upstream into Alabama (Conecuh River), would benefit alligator snapping turtles and other fauna.

Blackwater River–Coldwater Creek (Outstanding Florida Waters)

Blackwater River State Forest encompasses an estimated 75% of the combined Florida reaches of the Blackwater River and its principal tributary, Coldwater Creek. Additional land protection in the lower reaches of both would further enhance conservation of alligator snapping turtles and other fauna.

Yellow River–Shoal River (Outstanding Florida Waters)

State and federal lands border extensive portions of the lower Yellow and lower Shoal rivers. However, substantial stretches of private land border the Florida portion of the upper Yellow River and most of the Shoal River. Greater protection of these lands would benefit alligator snapping turtles and other fauna. Water reservoir (impoundment) proposals under county consideration are considered a threat to the natural hydrology of this system (Aresco and Shealy 2006) and to local alligator snapping turtles.

East Bay River

Eglin Air Force Base borders much of this small river, but not the southern bank of the river's lower reach.

M. apalachicola*Choctawhatchee River (Outstanding Florida Waters)*

State lands border most of the Choctawhatchee River except for a few km below the Alabama state line. Private tracts under conservation easement as well as state parcels provide patchwork protection to lower Holmes Creek, but the upper half of this major tributary is in need of protection.

Econfina Creek

State lands border an estimated 70% of the creek, but protection of the upper end of the watershed (which is currently platted for development) would protect water quality.

Apalachicola River–Chipola River (Outstanding Florida Waters)

This drainage and the Suwannee are the largest and most important drainages for alligator snapping turtles in Florida; they represent distinct evolutionary lineages. Extensive tracts of protected lands border both the Apalachicola and Chipola rivers, with the largest significant gaps being in the middle Florida reaches of both. Acquisition of existing Florida Forever projects would help to reduce these gaps. Additional coordination with the neighboring states of Alabama (Chipola and Chattahoochee rivers) and Georgia (Chattahoochee and Flint rivers) are vital to protecting water quality in the Florida portions of this drainage. For more than a half century, water flow in the Apalachicola River system has been controlled and limited by a series of dams, including the Jim Woodruff Dam in Florida (all other dams that control this river are in Alabama and Georgia). Additionally, in periods of low rainfall, maintenance of a central 3-m (9.8-ft) channel to facilitate commercial shipping reduces water depth closer to shorelines. These activities and structures disturb natural, littoral zone habitats (where turtles spend most of their time) and likely are deleterious to populations of both turtles and their prey. Currently, the State of Georgia is seeking to divert more water from this river system, with opposition from both Alabama and Florida. From the perspective of alligator snapping turtle conservation, management should be directed toward ending or limiting disturbance to natural flow regimes throughout this entire system.

Ochlockonee River (Outstanding Florida Waters)

Substantial tracts of land are protected along this river, especially from Lake Talquin to Ochlockonee Bay; however, more land conservation would be beneficial to alligator snapping turtle conservation, especially north of Lake Talquin to the Georgia Line.

St. Marks River–Wakulla River (Outstanding Florida Waters)

Significant protected lands exist in some key areas, especially Wakulla Springs State Park; however, more is needed along both the Wakulla and St. Marks rivers. Additional land preservation along lower St. Marks River within Wakulla County would provide further conservation benefits.

Aucilla River–Wacissa River (Outstanding Florida Waters)

An extensive system of protected lands borders most of these 2 rivers, but privately-owned stretches remain along both as well.

Appendix 2. Example format for data collection.

COLLECTION DATA

Site/Trap#: _____
 Date: _____ 1st Recapture
 Personnel: _____

 Capture Method: _____

MACROCHELYS DATA

Sex: ♂ / ♀ / Unknown
Age Class: Adult / Sub-Adult / Juvenile
 Marking/ID # _____
 PIT Tag # _____

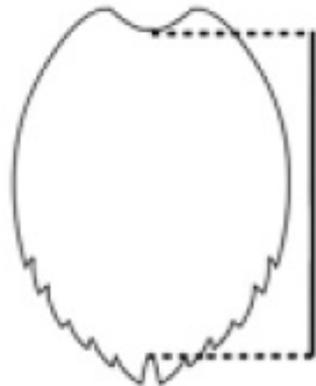
SPECIMEN DATA

Carapacial Scutes: ____ - ____ - ____ - ____ - ____
 Supramarginals: ____ - ____
 Anomalies/Injuries: _____

{Each state should use its current carapacial scute marking system.}

Measurements

Carapace Length (SCLmin): _____ mm
 Tail Length (ant-to-vent): _____ mm
 Weight: _____ kg



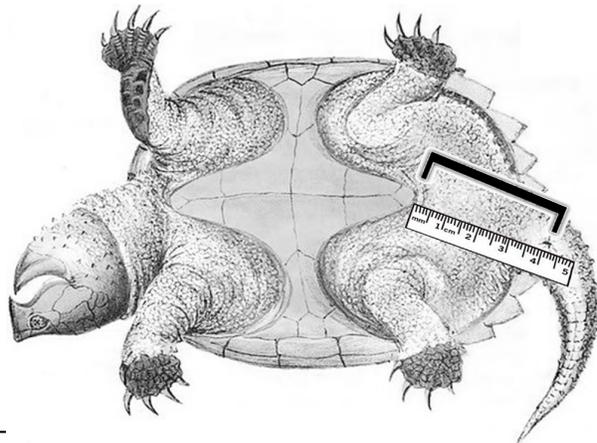
Minimum straight carapace length (SCLmin) is measured from the anterior point at midline (nuchal scute) to the posterior notch at midline between the supracaudals.

Blood/Tissue Sample Taken: Y N

FEMALES ONLY

Palpated: Not Gravid Gravid Unknown

RELEASE DATE (if different): _____



TRAP SITE ENVIRONMENTAL CONDITIONS

Location

Coordinates (Decimal Degrees): _____ N _____ W (WGS84)

State: _____

County/Parish: _____

Body of Water: _____

Type of Trap/Net (if multipartite, describe components): _____

Site/Trap#: _____

Personnel: _____

Mesh Size: _____ Hoop Diameter: _____

Bait: _____

Date Set: _____

Time Set: _____ (CDT/CST/EDT/EST)

Water Body Width at Trap Site: _____ m

Water Level (circle): Normal / High / Low

Trap Site Vicinity Micro-Habitat Features

(Check All That Apply and Indicate Approximate Distance From Trap Site):

____ Vegetative Debris Mats (Distance _____ m)

____ Log Jams (Distance _____ m)

____ Submerged Aquatic Veg. (Distance _____ m)

____ Floating Aquatic Veg. (Distance _____ m)

____ Emergent Vegetation

____ Grasses/Sedges/Etc (Distance _____ m)

____ Shrubs (Distance _____ m)

____ Trees (Distance _____ m)

____ Other - _____ (Distance _____ m)

Trap Site Habitat

(refers to the habitat WITHIN WHICH the trap is set - and not to adjacent habitats)

General

____ Lentic ____ Lotic

Specific

____ Riverine

____ Palustrine

____ Cypress/Tupelo Swamp

____ Flooded Hardwoods

____ Non-Tidal Fresh Marsh

____ Lacustrine

____ Estuarine

____ Other - _____

Bank Habitat Disturbance

(Check All That Apply):

____ Mechanical Removal of Vegetation

____ Chemical Treatment of Vegetation

____ Active Row-Crop Agriculture

____ Pasture Maintenance / Cattle Grazing

____ Development (Residential/Commercial)

____ NONE

____ Other - _____

Water Quality

Water Temp. _____ °C

Salinity (coastal areas only) _____ ppt

Other Conditions

Canopy Coverage _____ % Air Temp. _____ °C

Other Significant Hydrologic Influences (e.g., dam, recent dredging, channelization, water control structure, etc.): _____

■ **Trap Checked** Date: _____ Time: _____ CDT/CST/EDT/EST
 Personnel: _____
 Captures/Observations: _____
 Rebaited _____

■ **Trap Checked** Date: _____ Time: _____ CDT/CST/EDT/EST
 Personnel: _____
 Captures/Observations: _____
 Rebaited _____