

**A Species Action Plan for the  
Barbour's Map Turtle  
*Graptemys barbouri***

**Final Draft  
November 1, 2013**



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**BARBOUR'S MAP TURTLE ACTION PLAN TEAM**

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Cover photograph of juvenile Barbour's map turtle from the Flint River, Upson County, Georgia.  
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*Recommended citation:*

Florida Fish and Wildlife Conservation Commission. 2013. A species action plan for the  
Barbour's map turtle. Tallahassee, Florida.

**EXECUTIVE SUMMARY**

This plan details the actions necessary to improve the conservation status of the Barbour's map turtle (*Graptemys barbouri*). The Barbour's map turtle is a medium-sized freshwater turtle restricted to rivers of the central Florida Panhandle and adjacent Alabama and Georgia, with most populations confined to the Apalachicola River system. Principal threats include the combined effects of human take (e.g., food, pet trade), water pollution, riverine habitat alteration (e.g., impoundment, channel dredging, snag removal, siltation), impacts with motorized boats, and predation to both turtles and nests. A 2011 biological assessment determined that the Barbour's map turtle warranted listing in Florida as Threatened under recently adopted criteria. Staff of the Florida Fish and Wildlife Commission, with stakeholder assistance, developed this plan to guide recovery of the species. The goal of this plan is to improve or maintain the conservation status of the Barbour's map turtle so that the species is safe from extinction in Florida.

Objectives of the plan are to maintain the current extent of occurrence of the species in Florida and to maintain or increase population sizes in each river where it naturally occurs. Major strategies for achieving these objectives are to maintain current prohibitions on possession and take of the species from the wild; maintain or improve to historic levels the water quality, water quantity, and habitat characteristics of occupied rivers, including streamside nesting habitats; identify and conserve (through fee-simple or other means) private lands bordering inhabited rivers and streams; minimize mortality from fishing, boating, and other activities; educate the public and law enforcement personnel about the species and rules governing its protection; encourage land managers, both public and private, to consider the species' welfare and requirements in all management activities on their lands; and support research to determine whether potential hybridization with closely related map turtles poses a threat to the species that should be addressed. Successful management of the Barbour's map turtle through implementation of this plan will require cooperation among local, state, and federal governmental agencies; non-governmental organizations; development and industrial interests; private landowners; academic institutions; and the public. Any significant changes to this plan will be made with the continued involvement of stakeholders.

A summary of this plan will be included in the Imperiled Species Management Plan (ISMP), in satisfaction of the management plan requirements in Chapter 68A-27, Florida Administrative Code, Rules Relating to Endangered or Threatened Species. The ISMP will address comprehensive management needs for 60 of Florida's imperiled species and will include an implementation plan; rule recommendations; permitting standards and exempt activities; anticipated economic, ecological, and social impacts; projected costs of implementation and identification of funding sources; and a revision schedule. The imperiled species management planning process relies heavily on stakeholder input and partner support. This level of involvement and support is also critical to the successful implementation of the ISMP. Any significant changes to this plan will be made with the continued involvement of stakeholders and partners.

**TABLE OF CONTENTS**

BARBOUR’S MAP TURTLE ACTION PLAN TEAM..... ii

EXECUTIVE SUMMARY ..... iii

TABLE OF CONTENTS..... iv

LIST OF TABLES ..... v

LIST OF FIGURES ..... vi

GLOSSARY OF TERMS AND ACRONYMS..... vii

INTRODUCTION ..... 1

    Biological Background..... 1

    Conservation History..... 3

    Threats and Recommended Listing Status ..... 4

CONSERVATION GOAL AND OBJECTIVES ..... 6

CONSERVATION ACTIONS ..... 7

    Habitat Conservation and Management ..... 7

    Population Management..... 13

    Monitoring and Research ..... 15

    Rule and Permitting Intent ..... 18

    Law Enforcement ..... 20

    Incentives and Influencing ..... 20

    Education and Outreach ..... 22

    Coordination with Other Entities ..... 23

LITERATURE CITED ..... 29

APPENDICES ..... 32

    Appendix 1. Conservation lands along Florida rivers inhabited by Barbour’s map turtles. .... 32

    Appendix 2. Private lands within Florida identified as land conservation projects or targets in need of protection along rivers inhabited by Barbour’s map turtles. .... 35

    Appendix 3. Factsheet about Outstanding Florida Waters..... 37

**LIST OF TABLES**

Table 1. Agencies and organizations responsible for managing conservation lands along Florida rivers inhabited by Barbour’s map turtles..... 9  
Table 2. Conservation Action Table. .... 26

**LIST OF FIGURES**

Figure 1. Adult female Barbour’s map turtle on nesting foray ..... 1  
Figure 2. Post-hatchling Barbour’s map turtle basking. .... 2  
Figure 3. Distribution and recorded observations of Barbour’s map turtle in Florida. .... 3

**GLOSSARY OF TERMS AND ACRONYMS**

ADCNR: Alabama Department of Conservation and Natural Resources

Area of Occupancy: The area within its extent of occurrence (see Extent of Occurrence), which is occupied by a 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 Conservation of Nature).

BRG: Biological Review Group, a group of taxa experts convened to assess the biological status of species using criteria specified in Rule 68A-27.001, Florida Administrative Code, and following the protocols in the Guidelines for Application of the International Union for 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).

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 IUCN criteria and IUCN guidelines, are used to help decide if a species should be added or removed from the Florida Endangered and 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 portion of a turtle's shell.

CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora, an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

DEP: Florida Department of Environmental Protection

EPA: United States Environmental Protection Agency

ERP: Environmental Resource Permitting program, administered by the Florida Department of Environmental Protection and the water management districts under Chapter 373, Florida Statutes.

Extent of Occurrence: The geographic area encompassing all observations of individuals of a species, including intervening areas of unoccupied habitat. See also Area of Occupancy (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.

## GLOSSARY OF TERMS AND ACRONYMS

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

**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.

**Forage:** To search for or acquire food.

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

**F.S.:** Florida Statutes

**GIS:** Geographic Information System

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

**HCP:** Habitat Conservation Plan

**Head-starting:** Raising neonates (hatchlings) to a sufficient size in captivity to reduce the likelihood of predation or other form of mortality after the young are released into the wild. This is a common wildlife management technique for species that receive little to no parental care and which are subject to high levels of early juvenile mortality.

**Incidental Take (as defined in 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.

**Interorbital:** Between the eyes, often referring to pigmentation in turtles.

**ISMP:** Imperiled Species Management Plan

**ITP:** Incidental Take Permit

**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.

**Lotic:** Actively moving water, such as streams, springs, and river systems.

## GLOSSARY OF TERMS AND ACRONYMS

Megacephalic: Characterized by a head that is exceptionally large relative to body size.

NFWFMD: Northwest Florida Water Management District

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

Population: As defined by the IUCN, the total number of mature individuals of a taxon. The number of mature individuals is the number of individuals known, estimated or inferred to be capable of reproduction.

Plastron: Lower portion of a turtle's shell.

Predation (depredation): Killing or destruction 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.

Scientific Collection Permit: A permit issued for activities that include salvage, voucher, bird banding, wildlife possession, or special purpose. Applications must demonstrate a scientific or educational benefit for the species and must identify the purpose, scope, objective, methodology, location, and duration of the project.

SRWMD: Suwannee River Water Management District

Take: As defined in 68A-27.001(4), F.A.C. 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.

USACE: United States Army Corps of Engineers

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

WMD: Water Management District

## INTRODUCTION

### Biological Background

The Barbour's map turtle (*Graptemys barbouri*) is a medium-sized, hard-shelled riverine turtle remarkable for the extreme difference in size between sexes. Females (shell up to 13 inches or 330 mm) are as much as 2.6 times longer and 12 to 16 times heavier than the relatively small males (to 5 inches/130 mm) (Cagle 1952, Sanderson 1974, Ewert et al. 2006). Females ([Figure 1](#)) also have massive heads (megacephaly) and jaws for crushing mollusks, their principal diet. Though similar in appearance to the Escambia map turtle (*G. ernsti*) of far western Florida, the 2 species are distinguishable based on differences in morphology, color pattern, and mitochondrial DNA genotype (Lovich et al. 2011). In these and several other species of map turtles (*Graptemys* spp.), a series of spines along the raised central ridge of the upper shell (carapace) of juveniles ([Figure 2](#) and [cover photograph](#)) accounts for the common name of "sawbacks." The spines are somewhat reduced in adult males and nearly totally lost in adult females ([Figure 1](#)). In all life stages, there is a large yellowish blotch behind each eye (postorbital); these normally connect to a third blotch atop the head between the eyes (interorbital), leaving a dark heart- to Y-shaped pattern behind the orbits (Figures [1](#) and [2](#), and [cover photograph](#)). Additional color photographs of various aspects are provided by Ewert et al. (2006) and Krysko et al. (2011).



Figure 1. Adult female Barbour's map turtle on nesting foray. Lower Apalachicola River, Franklin County, Florida. Photograph © Dale R. Jackson.



Figure 2. Post-hatchling Barbour's map turtle basking. Lower Chipola River, Jackson County, Florida. Photograph © Dale R. Jackson.

The Barbour's map turtle was known historically only from the Apalachicola River drainage (including Chattahoochee, Flint, and Chipola Rivers) of Alabama, Georgia, and Florida. Recent observations have extended the range both eastward and westward to include the Ochlockonee and Choctawhatchee river systems, with an isolated report of a nesting female from the Wacissa River in the Aucilla River drainage ([Figure 3](#); Jackson 2003). Whether these additional drainages represent previously overlooked occurrences or stem from released animals is undetermined.

Barbour's map turtles are restricted to rivers, large streams, and associated impoundments. Food items include a variety of aquatic invertebrates (Lindeman in press); as they age, the broad-headed females become mostly molluscivorous (Cagle 1952, Sanderson 1974, Lee et al. 1975, Ewert et al. 2006). Females require as long as 20 years to attain maturity (Sanderson 1974, Ewert et al. 2006), whereas males may mature in only 3 to 4 years (Cagle 1952). Nesting extends from late April to early August with females producing up to 3 to 5 clutches of 3 to 15 eggs per season (Sanderson 1974, Ewert et al. 2006). Apparently, many neonates overwinter in the nest (Wahlquist and Folkerts 1973, Sanderson 1974, Ewert et al. 2006). Additional information is available in Ewert et al. (2006) and Ernst and Lovich (2009).

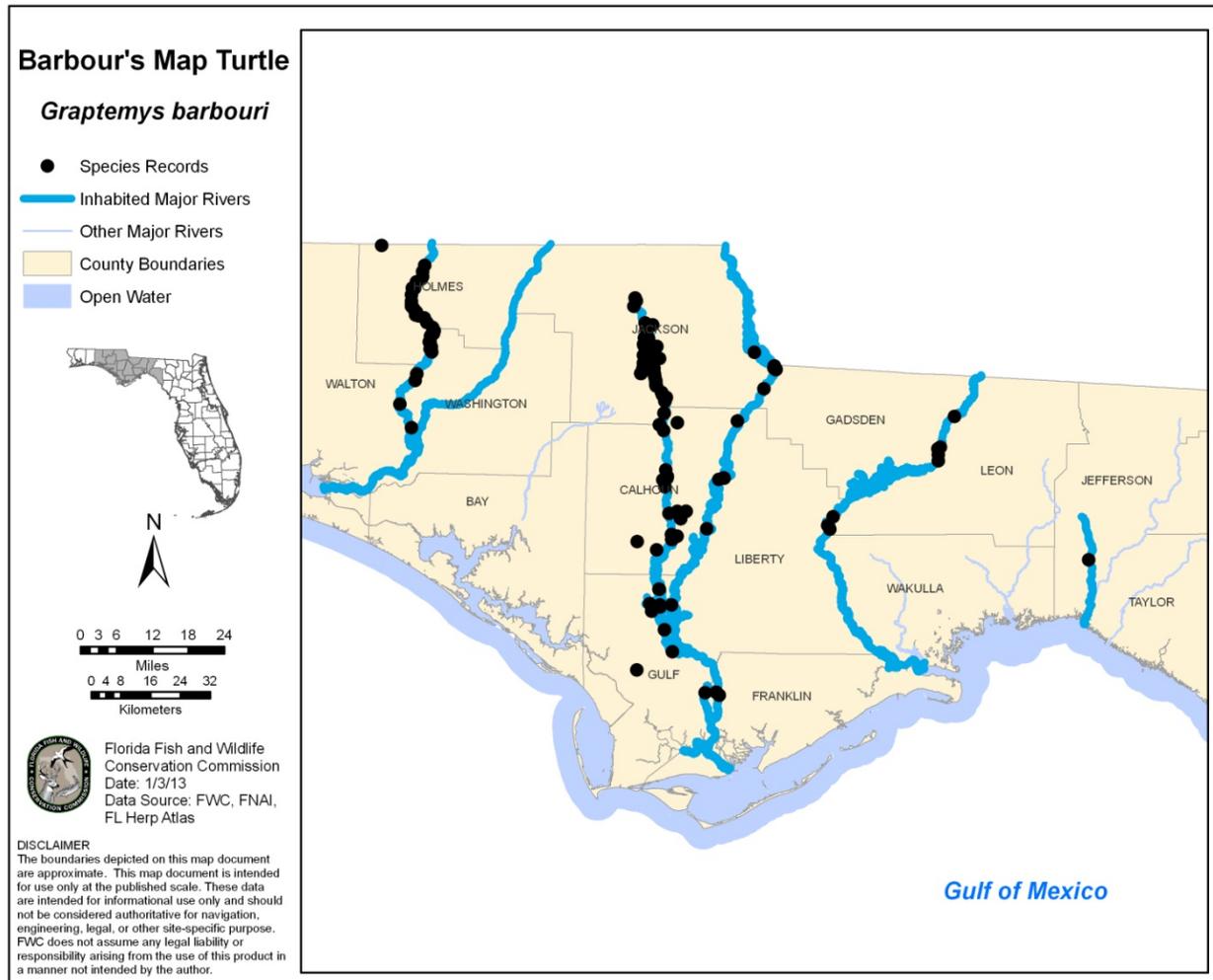


Figure 3. Distribution and recorded observations of Barbour's map turtle in Florida.

### Conservation History

Because of past threats and suspected declines of Barbour's map turtles, principally from human take, the Florida Fish and Wildlife Conservation Commission (FWC) enacted a series of protective measures during the past 4 decades. Chronologically, the most significant were prohibition of commercialization of the species (i.e., a ban on sale or purchase) in 1972, limiting possession to 2 individuals in 1976, and listing as a Threatened Species in 1978. The Barbour's map turtle's status was subsequently changed to Species of Special Concern in 1979. Using firearms to shoot freshwater turtles had already been prohibited by 1974. In 2009, all take of the species, including the Escambia map turtle, *G. ernsti*, was prohibited because of similarity of appearance (Rule 68A-25.002, Florida Administrative Code [F.A.C.]). This prohibition came in recognition of biological constraints that critically limit turtle recruitment (e.g., delayed maturity, high mortality of eggs and juveniles) as well as rapidly increasing demands from the international market. To facilitate compliance with the prohibition of take from the wild, pet owners who possessed Barbour's map turtles before 20 July 2009 are required to obtain a Class

III Personal Pet License to keep those turtles; the license is limited to 2 turtles, the previously allowed [possession limit](#).

Because all Florida river systems (excluding the isolated Wacissa River) with Barbour's map turtle populations drain from Alabama and Georgia, protective measures in those 2 states are significant to Florida populations. The State of Georgia lists the species as Threatened, with no take except by permit, under its Endangered Wildlife Act of 1973 (391-4-10-.08). Although it does not have an endangered species law, the State of Alabama lists Barbour's map turtle as a nongame species with no allowable take except by special permit (Alabama Department of Conservation and Natural Resources [ADCNR], Nongame Species Regulation 220-2-.92). In 2012, both Georgia and Alabama adopted strict rules to curtail commercial harvest of freshwater turtles from the wild. Specifically, the ADCNR imposed an emergency rule in April 2012 to end all commercial take of wild turtles, their eggs, and turtle parts; the rule applies to all of the state's waters. In January 2012, the Georgia Department of Natural Resources also limited commercial harvest of all freshwater turtle species. Although it was already protected from legal take in both states, the Barbour's map turtle may benefit secondarily from the new rules if they heighten awareness about the need for greater turtle conservation. State and local regulations addressing water quality of Alabama and Georgia streams and rivers likewise are important to protecting habitat of Barbour's map turtles downstream in Florida.

Also, at the federal level, the U.S. Fish and Wildlife Service announced in March 2012 that it may propose Convention on International Trades in Endangered Species (CITES) II listing for all species of *Graptemys*. Although no state allows unpermitted take of *G. barbouri* from the wild, this might still benefit the species by further reducing the chances that it (including its eggs) might be included, illegally or inadvertently, in any commercialization of unprotected map turtle species.

Although not directed solely toward the species, conservation of the Barbour's map turtle has been enhanced greatly by decades of extensive effort to protect lands within its Florida 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](#)), although threats to water quality and quantity still remain.

### **Threats and Recommended Listing Status**

Principal threats to the Barbour's map turtle include the combined effects of human take (food, pet trade, wanton killing), riverine habitat degradation (channel dredging, snag removal, siltation), and pollution. Secondary threats may include predation (of turtles and eggs, chiefly by raccoons [*Procyon lotor*], fish crows [*Corvus ossifragus*], and feral hogs [*Sus scrofa*]), impacts with motorized boats, and hybridization with the Escambia map turtle in the Choctawhatchee River (possibly the result of human introductions) (Godwin 2002, Ewert et al. 2006).

In 2010, FWC directed staff to evaluate 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 biological review group (BRG) of experts on the Barbour's map turtle to assess the biological

status of the species using criteria specified in Rule 68A-27.001, Florida Administrative Code (F.A.C.). This rule includes a requirement for BRGs to follow the Guidelines for Application of the International Union for 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). Staff from FWC developed an initial draft of a Biological Status Review Report (BSR), which included the BRG's findings and a preliminary listing recommendation from staff. The draft was sent out for peer review, and the reviewers' input was incorporated into a [final report](#).

The BRG found that the Barbour's map turtle met the following 2 criteria for state listing:

(B) Geographic Range

Extent of occurrence less than 20,000 km<sup>2</sup> (7,722 mi<sup>2</sup>), and area of occupancy less than 2,000 km<sup>2</sup> (772 mi<sup>2</sup>); and exists in a maximum of 10 locations (note: for riverine turtles, each river is considered as 1 location), and continued declines in number of individuals and habitat quality.

(D) Population Very Small or Restricted

Population with a very restricted number of locations (typically 5 or fewer) such that it is prone to the effects of human activities or stochastic events within a short time period in an uncertain future (note: for riverine turtles, each river is considered as 1 location).

Based on the literature review, information received from the public, the BRG findings, and peer reviewer input, FWC staff recommended the species be retained on the Florida Endangered and Threatened Species List.

## CONSERVATION GOAL AND OBJECTIVES

### Goal

Conservation status of the Barbour's map turtle is improved to the point that the species is secure within its historic range.

### Objectives

I. Maintain the current extent (range) of occurrence of the Barbour's map turtle in Florida forever.

#### *Rationale*

In the [Biological Status Review \(BSR\)](#), the Barbour's map turtle triggered criteria related to geographic range, indicating a high risk of extinction unless suspected declines were halted or reversed. To stabilize suspected declines in Barbour's map turtles, these turtles must occupy their historic range and have sufficient habitat quality. This objective focuses on maintaining or increasing both of these factors to secure Barbour's map turtle populations in Florida. It is uncertain whether relatively recent discoveries of the species in rivers outside of the Apalachicola River system reflect natural populations or are the result of human intervention. This objective therefore chiefly applies to the Apalachicola River system but does not necessarily exclude the Ochlockonee, Choctawhatchee, and Aucilla river systems.

II. Maintain or increase population sizes of Barbour's map turtles in perpetuity in each river where the species naturally occurs.

#### *Rationale*

Although Barbour's map turtles are impacted by habitat alteration, there are additional direct threats to the species. Barbour's map turtles were historically harvested for food and the pet trade prior to a recent ban on take. These threats are partly responsible for suspected population declines indicated in the BSR. Note: The same clarification about non-Apalachicola River system populations, espoused in the rationale for [Objective I](#), applies here as well.

## CONSERVATION ACTIONS

Achieving the goal of maintaining or improving the conservation status of the Barbour's map turtle entails a 2-tiered approach. First, actions need to be taken or maintained to prevent excessive removal (e.g., from human harvest, predation, disease, and incidental activities) of individuals of all life stages from existing populations. Second, as for all wildlife, it is essential to conserve the species' habitat from loss or degradation (structurally, chemically, or biotically). Education and enforcement are vital to achieving success.

The following sections describe the conservation actions that will make the greatest contribution toward achieving the conservation objectives. Actions are grouped by category (e.g., Habitat Conservation and Management, Population Management). The Conservation Action Table ([Table 2](#)) provides information on action priority, urgency, potential funding sources, likely effectiveness, identified partners, and leads for implementation.

### Habitat Conservation and Management

#### *Habitat Conservation (Landscape Protection)*

Barbour's map turtles inhabit only a very limited number of rivers (and their major tributaries) that are sufficiently broad, and hence without a closed canopy, to support aquatic vegetation (utilized by their prey) and sunny sites for basking. Upstream, map turtles are less abundant as trees begin to canopy the river. Favored map turtle habitats include free-flowing rivers with limestone outcrops, where gastropod prey is abundant, as well as some silty channels (Ewert et al. 2006). In addition to the aquatic habitat, Barbour's map turtles require, at a minimum, patches of well-drained upland soils receiving moderate solar exposure for nesting. Such sites are frequently no more than a few meters above or at the riverine edge of the floodplain, but in some cases may lie 100 m (328 ft) or more inland. Known nesting sites included dredge spoil mounds and natural river berms (Ewert et al. 2006).

**Action 1** Identify conservation lands along rivers and streams inhabited by or upstream of areas supporting the Barbour's map turtle. In conjunction, identify private lands suitable for protection via fee-simple or less-than-fee-simple measures (e.g., conservation easement) that would complement these conservation lands. As feasible, acquire or secure perpetual protection of these private lands. This action will entail identification of landowners willing to sell their land or certain property rights necessary to ensure protection of wildlife.

The preferred means of protecting Barbour's map turtle habitat is conserving river floodplains and adjacent uplands extending at least 200 m (656 ft) inland (river bottoms themselves already are under state jurisdiction). Less-than-fee-simple protection may suffice if appropriate and perpetual measures can be ensured. This has been accomplished with some success across the Barbour's map turtle's range and has involved programs at the federal, state, local, and private (i.e., non-governmental organization, non-governmental organization) levels. However, numerous remaining opportunities that will entail the input of substantial additional funding exist and need to be pursued.

A Geographic Information System (GIS) review of the Managed Areas Database of FNAI was conducted to evaluate specifically, on a drainage-by-drainage and tract-by-tract basis, the extent of conservation lands along rivers and streams known to be inhabited by Barbour’s map turtles in Florida. The review also noted managing agencies and organizations for all such tracts so that they could be considered as potential partners in the implementation of this plan. Similarly, the FNAI Site Database was examined to determine formal land protection projects under consideration through various programs, chiefly the State’s Florida Forever program (funding subject to annual appropriation by the Florida Legislature).

[Appendix 1](#) identifies waterfront lands that have been protected along each river inhabited by Barbour’s map turtles. [Appendix 2](#) identifies additional lands important to the species that have not yet been protected. Clearly, conservation of Barbour’s map turtles would be enhanced substantially by protection of the acreage, and especially river frontage, as identified in the projects in [Appendix 2](#), especially within the Apalachicola – Chipola drainage. Protection of additional privately owned river and stream frontage lands not highlighted in [Appendices 1](#) and [2](#) would likewise be beneficial. If not available for fee-simple (acquisition) or less-than-fee-simple protection (e.g., conservation easement), the implementation of existing water quality best management practices (BMPs) would be valuable to protect habitat quality.

A review of maps and supporting data summarized in [Appendices 1](#) and [2](#) yields the following perspectives by river drainage.

*Choctawhatchee River.*—State lands border most of the Choctawhatchee River except for the last few kilometers 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.

*Apalachicola-Chipola River.*—This river is the largest and most important drainage for Barbour’s map turtles in Florida. Extensive tracts of protected lands border both 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 in protection. 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.

*Ochlockonee River.*—Substantial tracts of land are protected along this river, especially from Lake Talquin to Ochlockonee Bay, but more land protection is needed, especially above Lake Talquin to the Georgia line. The river extends into Georgia, where it receives less protection than it does in Florida and is subject to water quality degradation.

*Aucilla-Wacissa River.*—An extensive system of protected lands borders most of these two rivers, but some privately owned stretches remain along both rivers that would benefit from protection.

The GIS review utilizing FNAI’s database revealed that extensive tracts of land along the rivers inhabited by Barbour’s map turtles have been protected by numerous agencies and organizations ([Appendix 1](#)), all of which are potential partners for fulfilling this plan. These partners include 3 federal agencies, 5 state agencies (1 with 3 divisions), 2 local government agencies, and 2 private organizations ([Table 1](#)). Because of their vital role as partners, special note is made of the water management districts following [Table 1](#). In addition, because most of the rivers inhabited by this species emanate from Alabama and Georgia, it is imperative that both of these 2 states be considered as partners as well, as they have major roles in determining the quality of water that reaches Florida. The FWC should communicate with each potential partner about its role in protecting Barbour’s map turtles and their habitat and provide copies of this plan to all appropriate offices and personnel.

Table 1. Agencies and organizations responsible for managing conservation lands (managed areas) within Florida along rivers inhabited by Barbour’s map turtles. Compiled from [Appendix 1](#).

Federal	<ul style="list-style-type: none"> <li>• U.S. Army Corps of Engineers (landowner may share management responsibility)</li> <li>• U.S. Department of the Interior: U.S. Fish and Wildlife Service</li> <li>• U.S. Department of the Interior: U.S. Fish and Wildlife Service</li> </ul>
State	<ul style="list-style-type: none"> <li>• Department of Agriculture and Consumer Services: Florida Forest Service</li> <li>• Florida Department of Environmental Protection:               <ul style="list-style-type: none"> <li>- Division of Recreation and Parks</li> <li>- Division of State Lands</li> <li>- Office of Coastal and Aquatic Managed Areas</li> </ul> </li> <li>• Florida Fish and Wildlife Conservation Commission</li> <li>• Northwest Florida Water Management District</li> <li>• Suwannee River Water Management District</li> </ul>
Local	<ul style="list-style-type: none"> <li>• City of Chattahoochee</li> <li>• Jefferson County</li> </ul>
Private	<ul style="list-style-type: none"> <li>• Tall Timbers Research, Inc.</li> <li>• The Nature Conservancy</li> </ul>

*Habitat Management*

**Action 2** Support efforts to maintain natural flow, water volume, and channel structure in all rivers inhabited by the Barbour's map turtle (especially within the Apalachicola drainage). Abandon and restore artificial channels, and remove dams from streams and rivers as feasible, as these not only degrade native riverine turtle habitat but also fragment populations.

Habitat management for the Barbour's map turtle should focus on maintaining physiographic, structural, and chemical characteristics of natural, free-flowing rivers and streams, including their floodplains. This species requires abundant emergent structures, chiefly woody snags (both live and dead) but also limestone rocks, to fulfill their basking requirements. Basking is essential for assimilation of food, sequestration of lipids for reproduction, ecdysis of shell scutes and growth, and presumably elimination of algae and ectoparasites (principally leeches). Removal or displacement of snags (to facilitate commercial and recreational boat traffic) from any riparian stretches inhabited by the species is thus detrimental to its conservation. While Barbour's map turtles can coexist with controlled channel dredging on large rivers such as the Apalachicola, impacts of this activity include not only removal of significant numbers of snags and live woody vegetation, but also alteration of flow regime and hydrology, disruption of nesting sites, and introduction of hydrocarbons and other pollutants into the water. Therefore, dredging is considered deleterious to conservation of the species; if it must occur, it should be subject to stringent regulatory oversight to limit these types of environmental disruption.

Although the Barbour's map turtle is a riverine species, it is known to survive in at least some impounded stretches of rivers and streams (Ewert et al. 2006; see also Appendix 2 of the [BSR](#)). However, there are no data to document nesting or recruitment in such sub-populations. Though these may occur, management of rivers and streams as free-flowing waters best matches the natural conditions in which the species evolved and typically persists. Large dams may also 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, Lovich et al. 1996, Garner et al. 1997, Tucker et al. 2012). Thus, additional impoundment of any rivers or streams within the Florida range of the species is to be discouraged, and any proposals for such should be considered as potentially negative to the conservation of the statewide population of this turtle. Ideal management would also include removal of any existing dams (including Jim Woodruff Dam on the Apalachicola River) within the range of the Barbour's map turtle, coupled with river restoration.

**Action 3** Identify and maintain Barbour's map turtle nesting sites throughout the turtle's Florida range. These sites currently include at least some dredge spoil mounds and supplemented banks, so no action to remove sands from those physical structures should be instigated without determining potential effects on this turtle. Prohibit the use of off-road vehicles in known nesting areas from at least mid-April through September.

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, artificially developed spoil mounds or supplemented beaches have also supported nesting since their construction in the 1960s and 1970s (Ewert and Jackson 1994, Ewert et al. 2006). From the standpoint of Barbour's map turtle conservation, these merit retention rather than removal as long as they do not substantially disrupt natural stream functions. Overgrowth of any nesting site with dense shrubby to hardwood canopy cover can make the site less attractive to females. Open nesting sites are likely to produce female offspring than do more shaded sites, based on the mechanism of temperature-dependent sex determination that operates in this species (Ewert et al.

2006). Thus, any local management program for this species should include monitoring of known nesting sites for potentially deleterious levels of shrubby and hardwood encroachment. Reduction of woody vegetation at such sites might be most safely conducted by mechanical means, as it is unlikely that prescribed fire could easily be applied (but nonetheless could be attempted). Whether reduction of woody stems via chemical means is safe in sites so close to the aquatic system is problematic and would require great care. Mining sand from spoil mounds where nesting has been documented or may occur should also be avoided. Off-road vehicles should be prohibited from known nesting areas from at least mid-April through September to prevent disruption of nesting and to protect developing nests.

*Water Management.*—Like all aquatic species, conservation of the Barbour’s map turtle depends upon maintenance of high-quality waters. This is especially vital to map turtles that rely upon populations of mollusks (especially habitat-sensitive mussels) for food, as do female Barbour’s map turtles.

**Action 4** Maintain or enhance water quality and quantity in all river and stream systems occupied by Barbour’s map turtles. This requires management of riparian and streamside zones as well as regulations and enforcement sufficient to prevent or severely limit pollution and sedimentation from all sources. Effort should ensure maintenance and health of native mollusks that comprise principal diet of females.

There are several federal and state regulatory agencies in Florida that work together to maintain quality aquatic habitats. The U.S. Environmental Protection Agency (EPA), Florida Department of Environmental Protection (DEP), U.S. Army Corps of Engineers (USACE), and the 5 water management districts monitor and regulate water quality and quantity (e.g., minimum flows and levels) to maintain healthy conditions for aquatic plants, fish, and other wildlife. 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 facilitate maintenance of the Barbour’s map turtle’s principal aquatic habitats in Florida in perpetuity. One state program – Outstanding Florida Waters (OFW) – bears specific mention here. Although one of the principal actions recommended in this plan to protect the Barbour’s map turtle is to secure remaining private lands bordering rivers and streams inhabited by the species, complete fulfillment is unlikely for economic reasons. System-wide benefits can still be achieved, however, by designation of entire rivers as OFWs, defined per the following paragraph.

*Outstanding Florida Waters.*—Section 403.061(27), Florida Statutes (F.S.), grants DEP the power to establish rules that provide for a special category of waterbodies within the state, to be referred to as OFWs, which are considered worthy of special protection because of their natural attributes. Such designation empowers the DEP and the appropriate water management district(s) to ensure that activities and proposed projects will not lower existing ambient water quality of the OFWs. [Appendix 3](#) provides additional details about regulatory significance and types of discharges affected, as well as a statewide list of OFWs. All of the rivers or river systems inhabited by Barbour’s map turtle (either native or possibly introduced)

are designated as OFWs, specifically the Choctawhatchee, Apalachicola–Chipola, Ochlockonee, and Aucilla–Wacissa rivers.

*Apalachicola River.*—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 even more water from this river system, with opposition from both Alabama and Florida. From the perspective of Barbour’s map turtle conservation, management should be directed toward ending or limiting disturbance to natural flow regimes throughout this entire system, although this will undoubtedly generate substantial opposition (though concomitantly support from other interests).

*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 floodplain, 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 populations of Barbour’s map turtles and other wildlife.

Riparian zones are best protected by securing them (by acquisition or easement) in conjunction with adjacent uplands, as recommended above. Additionally, in Florida, a set of [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 (DOACS). 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 BMP (DOACS 2011) identifies Special Management Zones with widths (35 to 300 ft [10.6 to 91 m] ) based on the size and type of waterbody, soil type, and slope of the site. BMPs have the potential to benefit many imperiled species.

### *Invasive Species*

**Action 5** Identify the occurrence of any exotic species within the historic range that may affect the habitat, including forage, of the Barbour's map turtle. Determine the effects of these exotic species on the Barbour's map turtle. It may be that the turtle has compensated for declines in native mussels by incorporating large quantities of Asian clams (*Corbicula fluminea*) into the diet.

There is no evidence of deleterious effects on the Barbour’s map turtle associated with the presence of invasive species. In contrast, although creating competition problems for native mollusks, introduction and spread of Asian clams may have enhanced prey availability for the

Barbour's map turtle. However, it is possible that this has come about in conjunction with decline of native mollusks (mussels or snails) upon which the turtle naturally feeds. Although actions to control Asian clams may be ecologically desirable, these do not seem necessary for conservation of this turtle.

Imported fire ants (*Solenopsis invicta*) and wild hogs both have the potential to prey upon turtle eggs and neonates that have yet to reach the water. Where nests can be located, particularly on conservation lands, they should be monitored for predation by both of these invasive species. Invasive species documented to have detrimental impacts to native wildlife and habitats should be adequately controlled.

Although direct effects of invasive plants on the carnivorous Barbour's map turtle are improbable, their potential effects on the species' prey populations are unknown. Further, programs to control invasive plants may conceivably have deleterious effects on freshwater turtles. Therefore, it is important to coordinate any activities involving invasive plants within the range of the Barbour's map turtle with the FWC Invasive Plant Management section, which works to monitor, restore, and control aquatic plants through permit reviews, and to control invasive species via chemical, mechanical, and biological means.

### **Population Management**

Ideally, population management should focus on maintaining or recovering historic Barbour's map turtle abundances throughout the species' limited range. Older literature suggests that local densities may have been quite high, at least at some sites. In the Chipola River, Carr and Marchand (Carr and Marchand 1942, Carr 1952) collected 76 specimens in 5 days by swimming and using a giggering pole. Marchand (Lindeman in press) noted that the species was 2 to 3 times as abundant as the local river cooters (*Pseudemys concinna*). Even more impressively, Chaney and Smith (1950) captured 397 specimens in 3 nights of hand-collecting in a 6.4-km (4-mi) stretch of the river (62 captured turtles/km). Likewise, based on a long-term mark-recapture study, Sanderson (1974) estimated 111 map turtles/km in a Chipola River tributary. It is uncertain whether such high densities, which typify (or once did) favored limestone-underlain habitat along the Chipola River, are (or were) matched in more alluvial to sand-bottomed rivers, where turtles are harder to detect. However, they nonetheless underscore that successful population management programs for this species must not be satisfied with maintenance of a few turtles per river km.

Management of Barbour's map turtle populations should include attempts to reduce mortality from incidental take. Causes include inadvertent capture on trotlines (including bush hooks) and mortality resulting from collisions with boats. Further discussion of these issues and Actions proposed to address them are included below in [Rule and Permitting Intent](#). Although automobiles can be a significant source of mortality for freshwater turtle populations, especially in association with overland movements during drought as well as nesting forays, this does not seem to be the case for any of Florida's riverine turtles, including the Barbour's map turtle. Unless specific sites of regular road mortality are identified in the future, there is little need for active measures such as installing barriers or constructing culverts to limit or direct turtle movements.

**Action 6** Where high levels of predation (on nests or turtles) are documented, especially on managed conservation lands, institute and maintain appropriate measures to reduce predation. These may include various means of predator control but also various forms of habitat management.

Predation is a natural limiting factor for all turtle populations, with nest predation eclipsing all other sources in terms of number of mortalities. Two of the chief nest predators (and occasional, possibly frequent, predators of nesting females) in Florida – the raccoon and fish crow– are species whose populations generally are considered to be anthropogenically enhanced (Ewert et al. 2006, Jackson 2006). Both of these species can devastate nesting success of Barbour’s map turtles, especially if nesting opportunities are restricted as a result of human land use modifications (e.g., dredge spoil mounds and artificially maintained or enhanced beaches; Ewert and Jackson 1994, Ewert et al. 2006). In such cases, a variety of management actions can be employed in an attempt to reduce predation of nests (and simultaneously of nesting females). Raccoon-removal programs have proven successful elsewhere (e.g., Christiansen and Gallaway 1984) but need to be repeated regularly to remain effective. Though perhaps unlikely to happen, restoration of large native predators (e.g., panther, wolf) may provide a longer-term solution if the public is accepting. Habitat management can enhance or restore nest site conditions and increase the area available for nesting, which reduces successful searching by predators. By example, natural nesting sites can be reduced or lost as a result of hardwood encroachment in pyrogenic communities, such as sandhill or upland pine forest, which can closely approach some map turtle-inhabited rivers. Regular use of prescribed fire can limit hardwood encroachment and restore greater insularity at ground level, as preferred by all of Florida’s aquatic emydids. Insufficient data are available to document situations in which Barbour’s map turtles may nest on public park lands ([Appendix 1](#)), but this plan nonetheless encourages management agencies to reduce populations of nest predators by replacing open or lidded garbage containers with predator-resistant models, thereby reducing an additional food source that can otherwise enhance their populations (see also [Invasive Species](#) regarding fire ants and wild hogs as potential nest predators).

Within the aquatic system, small post-hatchling turtles are typically subject to predation by a variety of native predators, including mammals, birds, alligators, and even fish (Suarez et al. 2011). While head-starting provides a tool to reduce this predation (Haskell et al. 1996), it can be costly and time-consuming, and should be reserved for situations in which local populations have been extirpated or extremely reduced in size and for which restoration potential exists. Such a situation does not currently exist for the Barbour’s map turtle, so this tool may be held in reserve for future consideration should circumstances change unexpectedly.

If Barbour’s and Escambia map turtles both exist in the Choctawhatchee drainage, hybridization is likely, given their close genetic affinities (Godwin 2002). The resulting compromise of the Barbour’s map turtle’s genetic purity within that river system (Ewert et al. 2006) could necessitate management consideration and intervention if that hybridization were determined to be unnatural.

## Monitoring and Research

### *Monitoring*

#### *Distributional Surveys.—*

**Action 7** Survey and monitor the Barbour's map turtle microdistribution, including upstream and downstream extents of habitation in all branches within known occupied stream drainages. Include impoundments. Provide detailed records of occurrence to FNAI.

#### *Population Size and Demography.—*

**Action 8** Survey and monitor the Barbour's map turtle population size and demography, as reasonably possible, at appropriate intervals at selected, perhaps rotating sites in every river stretch inhabited by this turtle. Include separate efforts for both major impoundments (Lake Talquin, Lake Seminole) that may be inhabited.

Although the most recent review of the Barbour's map turtle in Florida suggests that populations are generally stable (Ewert et al. 2006), supporting data are lacking or inadequate. Despite being difficult (i.e., resource- and time-consuming) to obtain, data documenting population size, fluctuations, and demography would provide a powerful tool to measure management success as well as to identify threats and population changes. In this regard, repetitive data from a suite of selected sites taken at regular intervals (e.g., 2 to 3 years) would provide the most valuable comparisons. In contrast, comparison of parameters among different sites is less useful, given that carrying capacity and demography may vary with habitat and other site characteristics.

The FWC in cooperation with the United States Fish and Wildlife Service (USFWS) and FNAI has compiled an online [guide](#) that makes publicly available information addressing many aspects of Florida wildlife conservation, including principal survey techniques for most taxonomic groups. Slide 45 of that presentation summarizes common survey protocols for aquatic turtles and provides a link to a bibliography of references on herpetofaunal survey techniques compiled by the FWC. The latter cites dozens of references (not repeated here) describing a variety of turtle-trapping techniques as well as the use of visual (e.g., basking and snorkeling) surveys. A survey and collecting permit from FWC is required for turtle trapping but not for visual surveys. The guide recommends that surveys be conducted by qualified biologists, sites be identified on maps of a scale no greater than 1 in = 400 ft, and results be documented in a final report that specifies all survey methods and explains any modifications used.

Standard methods for determining population size and demography of aquatic turtle populations are extremely time- and labor-intensive. In fact, techniques to this end that rely on trapping and hand-capture may take years to produce robust results. Further, some groups, such as the herbivorous cooters and molluscivorous/insectivorous map turtles, are not readily attracted to simple baited hoop traps, although the installation of long lead nets (e.g., fyke nets) can greatly increase trapping success. However, lead nets may be impractical in lotic situations (due to current, debris, and even boat traffic) as well as in locations with large species (e.g., alligators,

alligator snapping turtles, softshell turtles, sturgeon, and other large fishes) that may become entangled and potentially drown. Basking traps can be effective for map turtles (Jones 2006, Lindeman in press) but are time-consuming to construct, transport, erect, and monitor (although very useful in long-term studies). On the other hand, visual basking surveys can be done more quickly and provide a means to garner some information for emydids that engage in basking, but the resulting data may at best provide only cursory perspectives on presence, relative abundance, and demography. Their use is also limited to periods of warm, sunny weather.

As an example of the difficulty inherent in deriving population data from basking surveys, Lovich et al. (2011) summarize data for the Escambia map turtle, a close relative of Barbour's map turtle that inhabits a few rivers in the western Florida Panhandle. An intensive multi-year study by Shealy (1976) in the Conecuh (Escambia) River estimated population density of 1 turtle per 3 to 4 m (9.8 to 13 ft) of river (= 250 to 333 turtles per km). Yet multiple basking surveys of that and adjacent rivers have yielded basking densities of 0.4 to 2.3 turtles per river km. These results suggest that basking surveys, even when conducted by experts, may miss 95 to >99% of turtles locally present. Furthermore, it is well known that basking surveys may be skewed toward 1 or more demographic groups. Neonates are often overlooked or undercounted, as sometimes are adult females, which may be more wary as a result of greater levels of past harassment.

Despite these limitations, we recommend that basking surveys be regularly conducted at selected locales as a means to verify that populations remain present throughout their range. Potential trends in population sizes could be determined by repeating such surveys at the same locales on a regular basis (e.g., annual to biennial). Because river levels, air and water temperatures, cloud cover, time of day, and season all affect basking, attempts should be made to hold such factors as constant as possible when repeating surveys. Any multi-year data that suggest substantial declines either locally or within a basin should prompt immediate further investigation.

Multi-year monitoring of known nesting sites (for nests or nesting females) potentially can provide important clues to any population trends that may be occurring locally. However, this again can require extensive time, and hence, fiscal resources. Barbour's map turtle nesting season lasts from 2 to 3 months, with each female potentially nesting multiple times (Ewert et al. 2006). Females may retain eggs while awaiting the best nesting conditions (i.e., rain, which can be unpredictable). Unless destroyed by predators, nests can be difficult to identify. Relying upon counts of depredated nests may also be misleading in that it may relate to predator density rather than nest density. There may also be difficulty in positively identifying species from eggshell remains since multiple emydid species can co-occur with *G. barbouri*. Thus, given the fiscal constraints that often typify management agencies, nest site surveys may be able to provide presence-absence data but only very limited population and demographic insight.

*Disease and Mortality.—*

**Action 9** Establish a mechanism to receive, evaluate, and potentially investigate reports of mortality of this species.

All mortality of Barbour's map turtles should be recorded in a single database. Typically this will consist of randomly discovered shells or rarely a dead individual. Unusually high levels of mortality among riverine turtles can occur naturally as a result of predation (e.g., Means and Harvey [1999] for Barbour's map turtle by bald eagle and Jackson and Walker [1997] for Suwannee cooter by raccoon), but unexplained events warrant immediate investigation. Even seemingly natural mortalities, such as those cited, merit monitoring to determine whether they represent chronic or sporadic events.

Any sign of disease of multiple animals within a local population of Barbour's map turtles is a matter of concern and should be investigated and monitored. Initial reports should be called to the immediate attention of FWC's Reptile and Amphibian Taxa Coordinator, who should seek input from wildlife veterinarians. Capture of specimens and their examination by qualified veterinarians are advisable. All precaution should be taken when handling and transporting specimens to reduce risk of cross-contamination. Wild populations from which diseased specimens are observed and/or sampled should be closely monitored to determine whether such disease is isolated or appears to be spreading within the population.

### *Research*

*Impoundments.*—Portions of 2 rivers inhabited by Barbour's map turtles in Florida are impounded: Lake Talquin on the Ochlockonee and Lake Seminole on the Apalachicola. The species has been reported from at least 1 of these impoundments (Lake Seminole; Ewert et al. 2006) in addition to another upstream in Georgia (Lake Blackshear on the Flint River; Lovich et al. 1996, Garner et al. 1997). However, virtually nothing is known of the status and viability of map turtles in these impoundments, and if still present, whether they reproduce and where (original nesting areas would have been inundated). Assuming the species' presence, determining whether it nests and recruits 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 that additional impoundments may have on this species. In 2012, a proposal on a Georgia tributary of the Ochlockonee River (Tired Creek, just north of Florida) received approval from the USACE as well as local government. If any new impoundment is approved to be built within the range of this species, research should be conducted before and after construction to compare turtle populations, microhabitat use, demography, movements, survival, reproduction, and interactions with populations downstream of dams.

### *Systematics.*—

**Action 10** Conduct additional taxonomic studies with a substantial genetic/molecular component to examine the relationships among *G. barbouri* and the 4 other species in the macrocephalic lineage of the genus *Graptemys*. Extend this research to examine potential relationships of populations of *G. barbouri* within the 4 river systems from which it has been reported in Florida in an attempt to determine whether non-Apalachicola River system turtles may have been introduced. If genetic testing indicates unnatural hybridization between *G. ernsti* and *G. barbouri* within the Choctawhatchee River drainage, this situation should be addressed.

The relatively recent discoveries of Barbour’s map turtles in rivers outside the Apalachicola drainage – specifically the Ochlockonee, Choctawhatchee, and Aucilla river systems – remain to be explained. The key question, and one that is important in determining management priorities and actions, is whether these observations represent recent human-mediated introductions (deemed probable at least for the Aucilla and Ochlockonee records; Jackson 2003, Ewert et al. 2006), or whether they are native populations that somehow escaped detection. Detailed molecular analyses may shed light on this question, as might interviews of potentially knowledgeable persons. Given that no other river supports more than 1 member of the megacephalic *Graptemys* lineage (*G. pulchra* species group; Lovich and McCoy 1992 and reviewed by Ennen et al. 2010), the reported occurrence of both Barbour’s and Escambia map turtles in the Choctawhatchee system (Lovich et al. 2011) suggests potential human influence, although natural dispersal cannot be dismissed. That this may be a recent phenomenon is further underscored by the suggestion of potential introgressive hybridization between the 2 species (Godwin 2002; but see Ewert et al. 2006, who question this). Thus, genetic analyses of map turtles from Florida rivers are considered vital to shedding light on these problems. Samples of map turtles from the Alabama portions of *G. barbouri*-inhabited rivers should be included. Any conclusions reached by such analyses are more than academic; they may also have management implications, such as setting priorities for land acquisition (e.g., favoring rivers where *G. barbouri* genomes have not been compromised).

*Predator control.*—Raccoons destroy large numbers of Barbour’s map turtle nests as well as kill nesting females (Ewert et al. 2006). Research to develop inexpensive but effective means of selectively reducing raccoon populations in areas known to be used by nesting cooters would be meritorious.

### **Rule and Permitting Intent**

**Action 11** Maintain current rules that prohibit take (including eggs) and possession of Barbour's map turtle except as authorized by FWC permit.

FWC’s 2009 freshwater turtle rules (see [Conservation History](#)), which included prohibition of take of all map turtles (*Graptemys* spp.), were enacted on the basis of extensive evidence documenting multiple threats and biological attributes of turtles that severely limit their ability to respond to even modest levels of take. Delayed maturity and high mortality rates of most life stages prior to adulthood place a premium on maintaining large populations of adults. Although an extremely robust population of the Barbour’s map turtle (as once occupied the Apalachicola River system) conceivably might be able to support an extremely low level of take, the level would be so low that it would require extraordinary and costly efforts to monitor and enforce. Thus, maintaining a closure on take is by far the most practical management option and hence is recommended by this plan.

Prohibition on possession is considered an important means of limiting potential introduction of diseases into native populations as well as of altering population genomes. Many wild populations of amphibians and reptiles suffer from epizootic diseases. Some, and possibly most, of these stem from diseases introduced from captive-raised animals (whether captive-bred or

wild-caught) that have been released by their owners, whether intentionally or by accident. Because of the potential for severe negative effects – even extirpations and extinctions – that can result from epizootic diseases, the sale of captive-bred map turtles (all of which are closely related) in Florida is inappropriate. This prohibition also helps to limit genetic pollution of locally adapted native populations from released animals that originate from other (especially non-Florida) localities. FWC has the authority to grant exemptions by permit, although this should be done only after appropriate scientific vetting.

Scientific study is a legitimate endeavor that can involve take to produce results that are otherwise unobtainable. Requests for Scientific Collection Permits to allow such take, as authorized under Rule 68A-9.002, F.A.C., must be carefully evaluated by FWC on a case-by-case basis. The FWC may find it useful to establish an appropriate committee of external experts for consultation and to provide recommendations. Evaluators must first consider whether non-take options are available to address the proposed objectives in lieu of take. Non-lethal take to obtain samples (e.g., blood or tissue), followed by release, should be favored. An additional important factor to consider is whether a proposed level of permanent or lethal take may offer future conservation benefit to the species. For species of conservation concern, such as the Barbour’s map turtle, take should be limited to the lowest number of individuals necessary to achieve the stated objectives, as well as to life stages that have the least impact on recruitment into the adult population (e.g., eggs or hatchlings rather than adult females). Local population sizes should also be considered, with large populations better able to withstand low levels of take than smaller ones.

This plan is not meant to preclude the public from participating in rare species conservation. Individual activities that technically constitute take, such as moving a turtle across a road or screening a nest to protect it from predators (and removing and releasing hatchlings within ca. 10 days of hatching), may provide small benefits to turtle populations while raising empathy for wildlife management among the public. If required and requested from conservation-minded individuals, an appropriate guideline is to evaluate the issuance of permits based on whether the proposed activities will further goals and objectives outlined in this plan.

The following 2 actions address some of the causes of incidental take:

**Action 12** Prohibit multiple- and single-hook trotlines (including bush hooks) within habitats occupied by this turtle. If not possible, require attaching identifying labels to all such equipment and require checking at intervals of 12 hours or less.

The use of untended hooks for fishing should be prohibited within habitats occupied by Barbour’s map turtles, as turtles unable to surface frequently quickly drown. If not possible, requiring that such devices are checked no less often than every 12 hours may reduce turtle mortality. Labeling such equipment provides the allowance that unlabeled equipment may be legally removed by others.

**Action 13** Based on surveys (e.g., Actions [3](#), [11](#), and [12](#)) that identify sections of or entire streams/rivers that have moderate to high densities of Barbour's map turtles, implement

restrictions on motorized boat speeds and stream use to reduce impacts and incidental mortality of turtles.

Impacts with motorized boats recently have been documented (Heinrich et al. 2012) as a previously unappreciated threat to another emydid turtle, the Suwannee cooter (*Pseudemys concinna suwanniensis*), that inhabits Florida rivers, and this threat is known to affect map turtle populations inhabiting navigable rivers as well (Lindeman in press). Turtles almost invariably dive toward the bottom to escape oncoming boats; available escape time is reduced with increasing boat speed, making deadly impacts far more likely from faster boats. To reduce this source of mortality, restrictions on boat speeds and, potentially, stream use should be enacted in stretches of streams and rivers that support moderate to high densities of Barbour's map turtles. In large rivers, such as the Apalachicola, high speeds should be restricted to the central channel, which typically is frequented by fewer turtles, as most of the microhabitats used by turtles are relatively near the shore. In most streams and rivers, however, lower boat speeds would decrease turtle mortality by reducing the injurious effects of impacts, as well as by allowing turtles a greater response time to avoid impacts. Surveys to determine relative abundance of Barbour's map turtles can help to identify stretches (which may be extensive) of streams and rivers where low-speed zones would be most beneficial.

### **Law Enforcement**

**Action 14** Publish freshwater turtle rules annually in FWC fishing and hunting handbooks, both in hard copy and online.

**Action 15** Train law enforcement officers from FWC and other agencies in turtle identification and regulations to ensure enforcement and compliance.

### **Incentives and Influencing**

#### *Incentives*

County growth management plans and land development regulations provide the 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. [Appendix 1](#) identifies rivers important to Barbour's map turtle conservation. The [BSR](#) and this plan identify the threats to the Barbour's map turtle that warranted state listing, as well as specific permitting recommendations that specify means to avoid, minimize, or mitigate activities associated with the threats to the Barbour's map turtle. FWC offers conservation planning services to local governments during growth management plan amendments and associated development proposals.

In order 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, and landowners, as well as to the general public. FWC is working to develop conservation measures to address the Barbour's map turtle and its habitat needs; these measures can potentially inform local land development regulations. However, Chapter 163.3184, F.S.,

indicates that a county may not require as a condition of processing a development permit that an applicant obtain a permit or approval from any other state or federal agency unless the agency has issued a notice of intent to deny the federal or state permit before the county action on the local development permit.

FWC’s Landowner Assistance Program advances species conservation objectives through public–private conservation partnerships. These programs are voluntary and some offer financial assistance to landowners implementing conservation plans. Participation in any of these incentive programs would provide FWC opportunities to gather information on private agricultural lands or those slated for development. FWC assistance in evaluating the effects of development practices on the Barbour’s map turtle population would help provide FWC necessary information to develop better avoidance, minimization, and mitigation options for agriculture and development on private landowners’ property.

*Influencing*

FWC currently takes advantage of several programs that promote conservation by providing technical and/or financial assistance to private landowners. FWC partners with other state and federal agencies to administer the Forest Stewardship Program, Wildlife Habitat Incentives Program, Wetlands Reserve Program, Environmental Quality Incentives Program, Partners for Fish and Wildlife Program, and the Cooperative Conservation Blueprint. 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 land. Additional incentives may include exemption from permits for activities that enhance wildlife activities such as mowing, roller-chopping, and tree stand thinning, as long as they are not a precursor to development. Any number of these incentive programs may be applicable for protecting the riparian habitat and water quality in the river identified in [Appendix 2](#).

The Habitat Conservation Plan (HCP) concept was originally developed as a required piece of the application for a federal Incidental Take Permit (ITP). ITPs authorize the take, as defined in the federal Endangered Species Act, of listed species incidental to a lawful activity. The intent of the HCP is to make sure the effects of issuing a take permit are adequately minimized and/or mitigated. While it may not be practical to develop individual HCPs for many of the state-listed species, FWC is investigating the potential for the development of a “watershed based HCP” for multiple aquatic species that are state- or federally listed in the basins containing the Barbour’s map turtle.

Conservation banking is another program available to private landowners interested in habitat conservation. Conservation banking for listed species is comparable to mitigation banking in that lands are permanently protected and can be used to offset development related adverse impacts to wildlife resources, including habitats. FWC may consider developing or supporting a conservation banking program for species in the same “watersheds” as the Barbour’s map turtle.

FWC may develop low-impact development or conservation measures for lands slated for development other than those with an agricultural exemption. Use of these measures could preserve or enhance additional habitat or avoid take of the Barbour's map turtle by identifying such things as the preferred timing of clearing and construction, methods of clearing and re-vegetating (especially important for nesting sites), preferred locations and methods of stormwater management features, preservation of onsite ecosystem features, preferred location of open space/green space/conservation areas, inclusion of development or density buffers, or inclusion of conservation easements over conservation areas. Incentives for incorporating these measures into development proposals could include reduced or expedited permitting, reduced permitting fees, local or state recognition, tax incentives, or density bonuses.

A variety of incentive programs exist that encourage private landowners to protect habitat for wildlife, including protecting water quality of streams and rivers. Though not specifically directed toward riverine turtles, and hence not elaborated upon here, such programs undoubtedly can provide important benefits toward Barbour's map turtle conservation and hence merit support and the expenditure of resources.

### **Education and Outreach**

**Action 16** Develop education and outreach materials for local governments, state and federal agencies, landowners, and the general public to inform them of Barbour's map turtle habitat needs and conservation measures that can benefit the species. In conjunction, develop and maintain a web page that contains popular, scientific, legal, and permitting information for all species and recognized subspecies of Florida freshwater turtles.

**Action 17** Install educational kiosks and regulatory signage at boat ramps and other sites where the public is likely to access Barbour's map turtle habitat.

**Action 18** Provide or enhance Barbour's map turtle viewing opportunities (e.g., at basking sites), particularly on conservation lands that are visited by the public for wildlife appreciation values. Focus at least some opportunities toward children.

Turtles are popular animals with most members of the general public, especially those who find recreational opportunities within Florida's natural ecosystems. As such, materials or activities that educate people about turtles and their habitat are likely to be appreciated and in turn generate support for turtle conservation. Given the number of public lands that provide access to rivers within this species' range, opportunities for public education abound. Kiosks, museum and aquarium displays, signage, brochures, and even special tour activities can focus on or at least include information about the species, including its limited distribution and threats to its existence. To date, relatively few public land units have capitalized on this opportunity (although in 2012 the Apalachicola National Estuarine Research Reserve did maintain a Barbour's map turtle in its live exhibits). One way to address this may be for the FWC to offer information, expertise, simple publications (e.g., pamphlets and brochures), and even direct assistance to land management agencies throughout the species' Florida range. Additional opportunities to disseminate information about imperiled freshwater turtles exist in schools, zoos, environmental

centers, and at special events (e.g., wildlife festivals). Although staff from FWC and other agencies give presentations or assistance to such groups, this role could be expanded with greater agency encouragement and allocation of additional resources, even to the point of hiring personnel specifically to coordinate and conduct such activities.

Although many conservation lands border rivers inhabited by Barbour’s map turtles ([Appendix 1](#)), few members of the public actually observe the species in its natural environment. Provision of readily viewable basking sites, either via construction (Farrell et al. 2009) or movement of natural treefall materials, potentially can rectify this and enhance conservation land visitors’ appreciation for this and other species of turtles. Although initially turtles may be shy, most become acclimated to being observed from a safe distance.

In light of FWC rules prohibiting take of this species, it is critical that all law enforcement officers, including those from agencies besides FWC, be knowledgeable about freshwater turtles to the extent that they are aware of the species for which take is prohibited. Although ideally every officer would be fully able to identify such species, FWC rules have simplified the problem of potentially confusing species by closing take to most such species. Thus, an officer needs simply to be able to recognize a map turtle (*Graptemys* spp.), cooter (*Pseudemys* spp.), or snapping turtle (*Macrochelys* spp. and *Chelydra* spp.). Since at least 2010, the FWC Reptile and Amphibian Taxa Coordinator has conducted local training programs for FWC Law Enforcement personnel; training focuses on turtle identification (all Florida species) and an overview of pertinent rules. Such programs must continue on a regular basis, given personnel turnover as well as occasional rule changes; they should also be offered on a statewide basis, and if feasible, expanded to include law enforcement officers from other agencies. In conjunction, law enforcement staff should also be encouraged to watch for and report potential threats that they may observe in the field to this and other species.

Though most hunters and fishers are knowledgeable about regulations pertaining to birds, mammals, and fishes, this is less true for reptiles and amphibians. Although freshwater turtle rules have been added to the annual FWC fishing regulations (a practice that should be continued), many members of the public remain unaware of FWC rules that limit or prohibit take of freshwater turtles, including the Barbour’s map turtle. The FWC has posted some but far too few waterways. It is recommended that signage be posted and maintained (replaced as needed) at most public boat ramps along watercourses inhabited by this species. Supplementing this with educational kiosks at the more heavily used access points would be valuable in generating understanding and support, rather than resentment, for these important regulations.

### **Coordination with Other Entities**

Throughout this Plan are noted entities that have important roles to play in management of this species and its habitat. Principals, with some of their key roles, include but are not limited to the following:

- DEP: water quality, including OFWs; land protection
- DOACS: BMPs
- FWC Invasive Plant Management section: Invasive plants
- FNAI: data management, species distribution and occurrence

- EPA: water quality
  - USACE: stream flow, impoundments
  - Water management districts (Northwest Florida Water Management District [NFWWMD], Suwannee River Water Management District [SRWMD], Southwest Florida Water Management District [SWFWMD]): river and floodplain protection
- All pertinent land management entities (see [Table 1](#)): habitat protection, education

*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 web sites, which are regularly updated. In total, the five districts of the state have secured vast tracts of land that are key to protecting freshwater habitats; this includes hundreds of miles of frontage along rivers used by turtles of conservation concern. Although previously the districts’ network operated discrete programs for land acquisition (e.g., Save Our Rivers), most land acquisition is now done through the state’s Florida Forever program. In large part because of budget constraints, funding for the Florida Forever program has been substantially reduced since the 2008 – 2009 fiscal year. Without continuation or new bond funds appropriated, future land acquisitions by the districts will be severely limited, with potential negative effects upon habitat vital to the conservation of Barbour’s map turtles. The following are synoptic summaries of the water management districts that are especially pertinent to this plan.

[NFWWMD](#).— The NFWWMD encompasses most of Panhandle Florida, from the Perdido River to the St. Marks River. It currently protects >89,000 ha (>221,000 acres) and actively owns and manages >84,900 (>210,000 acres) of lands. These lands include extensive floodplains, a major Floridan Aquifer recharge area, and estuarine salt marshes. NFWWMD lands protect fish and wildlife, natural water resource systems, water quality, recharge, and other wetland and floodplain functions. All NFWWMD lands are open to public access and enjoyment. Currently, although it has identified additional lands warranting greater protection, the NFWWMD does not maintain a separate list for land acquisition projects, but instead relies upon the Florida Forever Work Plan (Tyler Macmillan, NFWWMD, personal communication, March 2012). Three of the NFWWMD’s 4 divisions – Resource Management, Land Management and Acquisition, and Resource Regulation – are directly involved in activities integral to the conservation of riverine turtles (NFWWMD 2011).

[SRWMD](#).—The SRWMD is included here only because of an enigmatic occurrence record from the Wacissa River. 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 553 km (344 mi) 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 (Terry Demott, SRWMD, personal communication, March 2012). 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).

**Table 2. Barbour's Map Turtle (*Graptemys barbouri*) Conservation Action Table**

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

Objective(s) Addressed	Team Assigned Priority Level	Action Item Number	Action Items	Conservation Action Category	Ongoing, Expanded or New Effort?	Authority	Man Power	Estimated Cost To Implement	Funding Source(s)	Lead for Implementation: FWC Program(s) and/or Section(s)	External partners	Likely Effectiveness	Feasibility	Urgent?
1, 2	2	1	Identify conservation lands along rivers and streams inhabited by or upstream of areas supporting the Barbour's map turtle. In conjunction, identify private lands suitable for protection via fee-simple or less-than-fee-simple measures (e.g., conservation easement) that would complement these conservation lands. As feasible, acquire or secure perpetual protection of these private lands. This action will entail identification of landowners willing to sell their land or certain property rights necessary to ensure protection of wildlife.	Habitat Conservation & Mgmt	EXPANDED	YES	YES	TBD	Legislature, Grant, Unknown	HSC, WHM, SCP	1) Florida Department of Environmental Protection through its administration of the Florida Forever program; 2) Northwest Florida Water Management District; 3) Florida Natural Areas Inventory	Some progress likely, but 100% success is improbable.	Practical, but insufficient funding is likely to become available to complete the acquisition portion of the task. However, every acre or mile of river frontage protected is partial success.	No, not critical to Barbour's map turtle's immediate survival given existence of fairly substantial network of protected lands already.
1, 2	1	2	Support efforts to maintain natural flow, water volume, and channel structure in all rivers inhabited by the Barbour's map turtle (especially within the Apalachicola drainage). Abandon and restore artificial channels, and remove dams from streams and rivers as feasible, as these not only degrade native riverine turtle habitat but also fragment populations.	Habitat Conservation & Mgmt, Population Mgmt	ONGOING	NO	NO	TBD	Existing budget, Unknown	SCP, CPS	Would entail a multi-agency approach including the Northwest Florida Water Management District, U.S. Army Corps of Engineers, Florida Department of Environmental Protection, and FWC	Ranges from likely to unlikely (removal of dams impounding lakes Seminole and Talquin).	Removal of large dams, such as those creating Lake Talquin on the Ochlockonee River and Lake Seminole on the Apalachicola River, may not be feasible given competing uses; nonetheless, they remain desirable from the standpoint of wildlife conservation. Removal of smaller dams may be more practical.	No, not critical to Barbour's map turtle's immediate survival, but decreased flow in Florida likely to be deleterious to species' principal state population.
1, 2	2	3	Identify and maintain Barbour's map turtle nesting sites throughout the turtle's Florida range. These sites currently include at least some dredge spoil mounds and supplemented banks, so no action to remove sands from those physical structures should be instigated without determining potential effects on this turtle. Prohibit the use of off-road vehicles in known nesting areas from at least mid-April through September.	Habitat Conservation & Mgmt, Population Mgmt, Monitoring & Research	NEW	YES	NO	TBD	Existing budget, Unknown	SCP, CPS, WHM, FWRI, Law Enforcement	All managing agencies that supervise appropriate sites; see Tables 1 and 3 within plan. Also universities and others.	Likely.	Practical, feasible.	No, not critical to Barbour's map turtle's immediate survival but nonetheless potentially important to maintaining robust populations.
1, 2	1	4	Maintain or enhance water quality and quantity in all river and stream systems occupied by Barbour's map turtles. This requires management of riparian and streamside zones as well as regulations and enforcement sufficient to prevent or severely limit pollution and sedimentation from all sources. Effort should ensure maintenance and health of native mollusks that comprise principal diet of females.	Habitat Conservation & Mgmt	EXPANDED	YES	NO	TBD	Existing budget, Unknown	SCP, CPS	1) Florida Department of Environmental Protection ; 2) Northwest Florida Water Management District; 3) U.S. Environmental Protection Agency; 4) U.S. Army Corps of Engineers; 5) Florida Department of Agriculture and Consumer Services	Likely.	Maintaining or improving water quality is feasible but will take government commitment and cooperation. Maintaining water quantity in Apalachicola River is a very difficult issue because of competing uses in upstream states, especially Georgia. However, barring major changes in rainfall patterns (which could happen in conjunction with climate change), it is entirely practical to do so, though politically difficult.	No, not critical to Barbour's map turtle's immediate survival but could become so if regulations relaxed too far, or if water flow in Apalachicola River is insufficient to support healthy populations of mollusks.
1, 2	4	5	Identify the occurrence of any exotic species within the historic range that may affect the habitat, including forage, of the Barbour's map turtle. Determine the effects of these exotic species on the Barbour's map turtle. It may be that the turtle has compensated for declines in native mussels by incorporating large quantities of Asian clams ( <i>Corbicula fluminea</i> ) into the diet.	Habitat Conservation & Mgmt, Population Mgmt, Monitoring & Research	EXPANDED	YES	NO	TBD	Existing budget, Unknown	SCP, CPS, IPM, ESC	Florida Department of Environmental Protection, Florida Department of Agriculture and Consumer Services, Northwest Florida Water Management District	Likely.	Practical.	No, not critical to Barbour's map turtle's immediate survival given current FL distribution and possibly substantial but unquantified statewide population size
2	3	6	Where high levels of predation (on nests or turtles) are documented, especially on managed conservation lands, institute and maintain appropriate measures to reduce predation. These may include various means of predator control but also various forms of habitat management.	Habitat Conservation & Mgmt, Population Mgmt, Monitoring & Research	NEW	YES	NO	TBD	Existing budget, Unknown	SCP, CPS, ESC	All managing agencies that supervise appropriate sites; see Table 1 within plan.	Likely.	Practical.	No, not critical to Barbour's map turtle's immediate survival given current distribution and possibly substantial but unquantified statewide population size
1	2	7	Survey and monitor Barbour's map turtle microdistribution, including upstream and downstream extents of habitation in all branches within known occupied stream drainages. Include impoundments. Provide detailed records of occurrence to the Florida Natural Areas Inventory.	Monitoring & Research	EXPANDED	YES	NO	TBD	Existing budget, Unknown	SCP, FWRI	Florida Natural Areas Inventory (part of Florida State University), other universities, others	Highly likely.	Highly feasible.	No, not critical to Barbour's map turtle's immediate survival.

**Table 2. Barbour's Map Turtle (*Graptemys barbouri*) Conservation Action Table**

Objective(s) Addressed	Team Assigned Priority Level	Action Item Number	Action Items	Conservation Action Category	Ongoing, Expanded or New Effort?	Authority	Man Power	Estimated Cost To Implement	Funding Source(s)	Lead for Implementation: FWC Program(s) and/or Section(s)	External partners	Likely Effectiveness	Feasibility	Urgent?
1, 2	3	8	Survey and monitor Barbour's map turtle population size and demography, as reasonably possible, at appropriate intervals at selected, perhaps rotating sites in every river stretch inhabited by this turtle. Include separate efforts for both major impoundments (Lake Talquin, Lake Seminole) that may be inhabited.	Population Mgmt, Monitoring & Research	EXPANDED	YES	NO	TBD	Existing budget, Unknown	SCP, FWRI	Universities and Northwest Florida Water Management District would be appropriate partners in this effort if they can provide long-term commitment.	Likely.	Difficult (see plan text), but nonetheless worth attempting.	No, not critical to Barbour's map turtle's immediate survival given current distribution and possibly substantial but unquantified statewide population size, coupled with current rules prohibiting take; however, critical to monitoring trends that otherwise might be overlooked.
1, 2	2	9	Establish a mechanism to receive, evaluate, and potentially investigate reports of mortality of this species.	Monitoring & Research	NEW	YES	NO	TBD	Existing budget, Unknown	SCP, FWRI	All managing agencies that supervise appropriate sites; see Table 1 within plan.	Likely.	Highly feasible.	No, not critical to Barbour's map turtle's immediate survival but nonetheless potentially important to maintaining robust populations, and could become critical if epidemic disease became established.
1	3	10	Conduct additional taxonomic studies with a substantial genetic/molecular component to examine the relationships among <i>G. barbouri</i> and the 4 other species in the macrocephalic lineage of the genus <i>Graptemys</i> . Extend this research to examine potential relationships of populations of <i>G. barbouri</i> within the 4 river systems from which it has been reported in Florida in an attempt to determine whether non-Apalachicola River system turtles may have been introduced. If genetic testing indicates unnatural hybridization between <i>G. ernsti</i> and <i>G. barbouri</i> within the Choctawhatchee River drainage, this situation should be addressed.	Monitoring & Research	EXPANDED	YES	NO	TBD	Existing budget, Unknown	SCP, FWRI	Universities would be appropriate partners in this effort.	Likely that genetic comparison may help to resolve relationships and possibly shed light on history and origin of Barbour's map turtle populations in rivers outside of the Apalachicola River system.	Sufficient techniques exist to make this research practical.	No, not critical to Barbour's map turtle's immediate survival given current distribution and presumably substantial but unquantified statewide population size.
1, 2	1	11	Maintain current rules that prohibit take (including eggs) and possession of Barbour's map turtle except as authorized by FWC permit.	Protections & Permitting, Population Mgmt	ONGOING	YES	YES	\$0-25k	Existing budget	SCP, Law Enforcement	Florida Department of Environmental Protection, Florida Department of Agriculture and Consumer Services, Northwest Florida Water Management District, commercial pet trade.	100% likely.	Fully practical, already being done.	No, not critical to Barbour's map turtle's immediate survival but could become so if regulations relaxed or if disease were introduced.
1, 2	3	12	Prohibit multiple- and single-hook trotlines (including bush hooks) within habitats occupied by this turtle. If not possible, require attaching identifying labels to all such equipment and require checking at intervals of 12 hours or less.	Protections & Permitting, Population Mgmt	EXPANDED	YES	YES	\$0-25k	Existing budget	SCP, Law Enforcement	Commercial fishermen; Public; Local Law Enforcement	Likely.	Practical.	No, not critical to Barbour's map turtle's immediate survival but nonetheless potentially important to maintaining robust populations.
2	2	13	Based on surveys (e.g., Actions 3, 11, and 12) that identify sections of or entire streams/rivers that have moderate to high densities of Barbour's map turtles, implement restrictions on motorized boat speeds and stream use to reduce impacts and incidental mortality of turtles.	Protections & Permitting, Population Mgmt	EXPANDED	YES	YES	\$0-25k	Existing budget	SCP, Law Enforcement	Posting and enforcement would entail cooperation of various state and federal agencies, including water management districts and all agencies managing appropriate conservation lands.	Likely.	Practical though likely to meet with some public resistance.	No, not critical to Barbour's map turtle's immediate survival but nonetheless potentially important to maintaining robust populations.
2	2	14	Publish freshwater turtle rules annually in FWC fishing and hunting handbooks, both in hard copy and online.	Education & Outreach, Law Enforcement	ONGOING	YES	YES	\$0-25k	Existing budget	SCP, Law Enforcement	Commercial fishermen; Public; Local Law Enforcement	Highly likely.	Highly feasible.	No, not critical to Barbour's map turtle's immediate survival given current distribution and possibly substantial but unquantified statewide population size.
2	2	15	Train Law Enforcement officers from FWC and other agencies in turtle identification and regulations to ensure enforcement and compliance.	Law Enforcement	EXPANDED	YES	YES	\$0-25k	Existing budget	SCP, Law Enforcement	Other Law Enforcement	Highly likely.	Highly feasible.	No, not critical to Barbour's map turtle's immediate survival given current distribution and possibly substantial but unquantified statewide population size.

**Table 2. Barbour's Map Turtle (*Graptemys barbouri*) Conservation Action Table**

Objective(s) Addressed	Team Assigned Priority Level	Action Item Number	Action Items	Conservation Action Category	Ongoing, Expanded or New Effort?	Authority	Man Power	Estimated Cost To Implement	Funding Source(s)	Lead for Implementation: FWC Program(s) and/or Section(s)	External partners	Likely Effectiveness	Feasibility	Urgent?
1, 2	4	16	Develop education and outreach materials for local governments, state and federal agencies, landowners, and the general public to inform them of Barbour's map turtle habitat needs and conservation measures that can benefit the species. In conjunction, develop and maintain a web page that contains popular, scientific, legal, and permitting information for all species and recognized subspecies of Florida freshwater turtles.	Education & Outreach	NEW	YES	NO	TBD	Existing budget, Grant	SCP, OPWVS	None, though potential cooperation could be sought from UF-IFAS Coop Unit	Highly likely.	practical and readily achievable.	Important but not critical to Barbour's map turtle's immediate survival; however, still vital to assure public knowledge of and respect for rules.
1, 2	3	17	Install educational kiosks and regulatory signage at boat ramps and other sites where the public is likely to access Barbour's map turtle habitat.	Education & Outreach	NEW	YES	NO	TBD	Existing budget, Grant	SCP, OPWVS	All managing agencies that supervise appropriate sites; see Table 1 within plan.	Highly likely.	Highly feasible.	No, not critical to Barbour's map turtle's immediate survival given current FL distribution, possibly substantial but unquantified statewide population size, and current rules prohibiting take; however, it may curtail illegal take and wanton killing.
1, 2	5	18	Provide or enhance Barbour's map turtle viewing opportunities (e.g., basking sites), particularly on conservation lands that are visited by the public for wildlife appreciation values. Focus at least some opportunities toward children.	Education & Outreach	EXPANDED	YES	YES	TBD	Existing budget, Grant	SCP, OPWVS	All managing agencies that supervise appropriate sites; see Table 1 within plan.	Likely.	Practical.	No, not critical to Barbour's map turtle's immediate survival given current distribution and possibly substantial but unquantified statewide population size.

**Acronyms used in this table:**

CPS: Conservation Planning Services, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation  
 ESC: Exotic Species Coordination, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation  
 FWC: Florida Fish and Wildlife Conservation Commission  
 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  
 IPM: Invasive Plant Management, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation  
 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  
 WHM: Wildlife and Habitat Management, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation

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## APPENDICES

**Appendix 1. Conservation lands (managed areas) within Florida along rivers inhabited by Barbour's map turtles.**

Rivers are arranged from west to east. Managed areas within a drainage are arranged in ascending order upstream beginning at the mouth. Some units may lie upstream of stretches known to be used by Barbour's map turtles but are nonetheless crucial because of their roles in protecting downstream water quality. Ownership is presented as federal (F), state (S), local (L), or private (P). The information is based on March 2012 data from the Florida Natural Areas Inventory (FNAI).

**Acronyms used in table:**

ANF	Apalachicola National Forest
CA	Conservation Area
CE	Conservation Easement
DOACS: FFS	Florida Forest Service, Florida Department of Agriculture and Consumer Services
DEP: DRP	Division of Recreation and Parks, Florida Department of Environmental Protection
DEP: DSL	Division of State Lands, Florida Department of Environmental Protection
DEP: OCAMA	Office of Coastal and Aquatic Managed Areas, Florida Department of Environmental Protection
FWC	Florida Fish and Wildlife Conservation Commission
MA	Management Area
NF	National Forest
NWFWMD	Northwest FL Water Management District
NWR	National Wildlife Refuge
SCRA	State Conservation and Recreation Area
SF	State Forest
SP	State Park
TNC	The Nature Conservancy
TTRI	Tall Timbers Research, Inc.
USDA: USFS	U.S. Forest Service, U.S. Department of Agriculture
USDI: USFWS	U.S. Fish and Wildlife Service, U.S. Department of the Interior
WEA	Wildlife and Environmental Area
WMA	Wildlife Management Area

<b>Drainage</b>	<b>Managed Area</b>	<b>Ownership</b>	<b>Managing Agency</b>	<b>Comments</b>
Choctawhatchee <sup>1</sup>	Choctawhatchee River Delta Preserve	P	TNC	river delta on Choctawhatchee Bay
-	Nokuse Plantation CE	P	DEP: DSL	on delta and lower river floodplain
-	Choctawhatchee River WMA	S	NFWWMD	most of river within Florida except last 5 km below Alabama line; also tracts along Holmes Creek
-	Glover CE	P	NFWWMD	Holmes Creek
-	Loblolly Tract	S	Undesignated	Holmes Creek;small
-	Haddock CE	P	NFWWMD	Holmes Creek
-	Tupelo Tract	S	Undesignated	Holmes Creek;small
-	Holmes Creek Tract	S	Undesignated	Holmes Creek;small
Apalachicola-Chipola	Apalachicola National Estuarine Research Reserve	S	DEP: OCAMA	Lowermost Apalachicola River and Bay; may be downstream of map turtle occurrence
-	Apalachicola River WEA	S	FWC	Lower Apalachicola River
-	Apalachicola River WMA	S	NFWWMD	lower and middle Apalachicola River, lower Chipola River; extensive
-	ANF	F	USDA: USFS	small tributaries on east side of Apalachicola River
-	Corbin-Tucker CE	S	DEP: DSL	Apalachicola River
-	Apalachicola Bluffs and Ravines Preserve	P	TNC	Apalachicola River
-	Hatcher Family Sweetwater Creek CE	P	DEP: DSL	Apalachicola River
-	Trammell CE	P	NFWWMD	Apalachicola River
-	Torrey SP	S	DEP: DRP	Apalachicola River
-	Angus Gholson Jr. Nature Park of Chattahoochee	L	City of Chattahoochee	Apalachicola River; small frontage

Drainage	Managed Area	Ownership	Managing Agency	Comments
-	Three Rivers SP	F	DEP: DRP Owner: USACE	Lake Seminole
-	Apalachee WMA	S	FWC	Lake Seminole and upper Apalachicola River almost to state line
Ochlockonee <sup>2</sup>	St. Marks NWR	F	USDI: USFWS	lower river; may be downstream of map turtle occurrence
-	Ochlockonee River SP	S	DEP: DRP	lower river; may be downstream of map turtle occurrence
-	Tate's Hell SF	S	DOACS: FFS	lower river; may be downstream of map turtle occurrence
-	ANF	F	USDA: USFS	lower half of river in Florida
-	Davidson/Hosford CE	P	NFWMD	across from ANF; small
-	Shuler CE	P	NFWMD	across from ANF; small
-	Lake Talquin SF	S	DOACS: FFS	Lake Talquin
-	Lake Talquin SP	S	DEP: DRP	Lake Talquin
-	Joe Budd WMA	S	FWC	Lake Talquin
-	Coastal Forest Resources CE	P	NFWMD	above Lake Talquin
-	River Ridge Plantation CE	P	TTRI	near the Georgia border
Aucilla-Wacissa <sup>3</sup>	Aucilla WMA	S	FWC	Wacissa River (mostly) and Aucilla River
-	Headwaters of the Wacissa River	S	Jefferson County	Wacissa River; recreational use

<sup>1</sup> Occurrence in Choctawhatchee River may stem from human introduction but nonetheless is established.

<sup>2</sup> Occurrence in Ochlockonee River may stem from human introduction, is probably established.

<sup>3</sup> Occurrence within Aucilla–Wacissa drainage is based on a single female observed nesting on the Wacissa River. Therefore, only the managed areas containing or adjacent to this observation are included.

**Appendix 2. Private lands within Florida identified as land conservation projects or targets in need of protection along rivers inhabited by Barbour's map turtles.**

Rivers are arranged from west to east. Projects within a drainage are arranged in ascending order upstream beginning at the mouth. Some units may lie upstream of stretches used by map turtles but are nonetheless crucial because of their roles in protecting downstream water quality. Information based on March 2012 data from FNAI.

**Acronyms used in table:**

FF	Florida Forever (2012 data)
NWFWMD	Northwest Florida Water Management District (2008 data; not formal projects)
SRWMD	Suwannee River Water Management District (2011 data; not formal projects)

<b>Drainage</b>	<b>Project Name</b>	<b>Program</b>	<b>Comments</b>
Choctawhatchee <sup>1</sup>	undesignated	NWFWMD	tracts along river and Holmes Creek
-	Florida's First Magnitude Springs	FF	Cypress Spring on Holmes Creek
Apalachicola-Chipola	Pierce Mound Complex	FF	lower Apalachicola River
-	undesignated	NWFWMD	river frontage along Apalachicola and Chipola river mainstems
-	Apalachicola River	FF	Apalachicola River below Lake Seminole; substantial size
-	Middle Chipola River	FF	Chipola River; extensive tracts on river
-	Florida's First Magnitude Springs	FF	Merritts Mill Pond, Jackson Blue Springs (Chipola River)
Ochlockonee <sup>2</sup>	St. Joe Timberland: Tate's Hell/Carabelle Tract	FF	
-	undesignated	NWFWMD	middle river, west bank, across from Apalachicola National Forest
-	undesignated	NWFWMD	upper river
-	Ayavalla Plantation	FF	less-than-fee
	Ochlockonee River Conservation Area	FF	less-than-fee
Aucilla-Wacissa <sup>3</sup>	Wacissa/Aucilla River Sinks	FF	

<b>Drainage</b>	<b>Project Name</b>	<b>Program</b>	<b>Comments</b>
-	Chris & Christine Layman	SRWMD	Aucilla River
-	William & Susan Floyd	SRWMD	Aucilla River
-	Bradley & Linda Cooley	SRWMD	Aucilla River
-	Aucilla A	SRWMD	Aucilla River; multiple disjunct tracts
-	St. Joe Timberland: Wacissa/Aucilla River Sinks	FF	

<sup>1</sup> Occurrence in Choctawhatchee River may stem from human introduction but nonetheless is established.

<sup>2</sup> Occurrence in Ochlockonee River may stem from human introduction.

<sup>3</sup> Occurrence within Aucilla–Wacissa drainage is based on a single female observed nesting on the Wacissa River.

**Appendix 3. Factsheet about Outstanding Florida Waters (OFWs).**

Source: <http://www.dep.state.fl.us/water/wqssp/ofwfs.htm#designation>

**Authority:**

Section 403.061(27), F.S., grants the Department of Environmental Protection (DEP) the power to establish rules that provide for a special category of waterbodies within the state, to be referred to as “Outstanding Florida Waters,” which shall be worthy of special protection because of their natural attributes.

**Implementing Agency:**

DEP is the agency that designates a waterbody as an OFW; however, each OFW must be approved by an arm of DEP known as the Environmental Regulation Commission (ERC). The ERC is a 7-member citizen’s body appointed by the Governor.

**Regulatory Significance:**

Projects regulated by DEP or a water management district (WMD) and which are proposed within an OFW must not lower existing ambient water quality, which is defined for purposes of an OFW designation as the water quality at the time of OFW designation or the year before applying for a permit, whichever water quality is better. In general, DEP cannot issue permits for *direct* discharges to OFWs that would lower ambient (existing) water quality. In most cases, this deters new wastewater discharges directly into an OFW and requires increased treatment for stormwater discharging directly into an OFW. DEP also may not issue permits for *indirect* discharges that would significantly degrade a nearby waterbody designated as an OFW.

In addition, activities or discharges within an OFW, or which significantly degrade an OFW, must meet a more stringent public interest test. The activity or discharge must be “clearly in the public interest.” For example, activities requiring an Environmental Resource Permit (ERP), such as dredging or filling within a wetland or other surface water or construction/operation of a stormwater system, must be clearly in the public interest instead of merely not contrary to the public interest.

In determining whether an activity or discharge that requires an ERP permit is not contrary to the public interest or is clearly in the public interest, DEP or the a WMD must consider and balance the following factors:

1. Whether the activity will adversely affect the public health, safety, welfare or the property of others;
2. Whether the activity will adversely affect the conservation of fish and wildlife, including endangered or threatened species, or their habitats;
3. Whether the activity will adversely affect navigation or the flow of water or cause harmful erosion or shoaling;
4. Whether the activity will adversely affect the fishing or recreational values or marine productivity in the vicinity of the activity;
5. Whether the activity will be of a temporary or permanent nature;
6. Whether the activity will adversely affect or will enhance significant historical and archaeological resources under the provisions of S. 267.061; and

7. The current condition and relative value of functions being performed by areas affected by the proposed activity. See Chapter 373.414(1)(a), Florida Statutes (2010).

Activities or Discharges Not Affected by an OFW Designation:

Permitted activities or discharges existing on the date of designation and activities with a complete application on the date of designation, which are “grandfathered.”

Activities not regulated by DEP for water quality protection purposes, such as fishing regulations, setback ordinances, restrictions on boat motor types, and boat speeds.

Restoration of seawalls at previous locations.

Construction of non-commercial boat docks, on pilings, of less than 500 square feet.

Temporary lowering of water quality during construction activities (with special restrictions).

Activities to allow or enhance public use, or to maintain pre-existing activities (with certain safeguards required by Rule 62-4.242(2)(b), F.A.C.).

List of OFWs:

A complete listing of Outstanding Florida Waters is provided in Rule 62-302.700 (9), Florida Administrative Code. Outstanding Florida Waters generally include surface waters in the following areas:

National Parks

National Wildlife Refuges

National Seashores

National Preserves

National Marine Sanctuaries and Estuarine Research Reserves

National Forests (certain waters)

State Parks & Recreation Areas

State Preserves and Reserves

State Ornamental Gardens and Botanical Sites

Environmentally Endangered Lands Program, Conservation and Recreational Lands Program, and Save Our Coast Program Acquisitions

State Aquatic Preserves

Scenic and Wild Rivers (both National and State)

“Special Waters”

"Special Waters" OFWs include 41 of Florida's 1700 rivers, several lakes and lake chains, several estuarine areas, and the Florida Keys:

Waterbody	Waterbody
Apalachicola River	Myakka River (lower part)
Aucilla River	Ochlockonee River
Blackwater River	Oklawaha River
Butler Chain of Lakes	Orange Lake, River Styx, and Cross Creek
Chassahowitzka River System	Perdido River
Chipola River	Rainbow River
Choctawhatchee River	St. Marks River

Waterbody	Waterbody
Clermont Chain of Lakes	Santa Fe River System
Crooked Lake	Sarasota Bay Estuarine System
Crystal River	Shoal River
Econlockhatchee River System	Silver River
Estero Bay Tributaries	Spruce Creek
Florida Keys	Suwannee River
Hillsborough River	Tomoka River
Homosassa River System	Wacissa River
Kingsley Lake & Black Creek (North Fork)	Wakulla River
Lake Disston	Weeki Wachee Riverine System
Lake Powell	Wekiva River
Lemon Bay Estuarine System	Wiggins Pass Estuarine System
Little Manatee River	Withlacoochee Riverine and Lake System
Lochloosa Lake	

Note: The rule language describing the above “Special Water” OFWs is more detailed. For further information, refer to Rule 62-302.700(9)(i), F.A.C.

#### Requirements for "Special Water" OFW Designation:

1. Rulemaking procedures pursuant to Chapter 120, F.S., must be followed;
2. At least one fact-finding workshop must be held in the affected area;
3. All local county or municipal governments and state legislators whose districts or jurisdictions include all or part of a water body proposed for Special Water designation must be notified at least 60 days prior to the workshop in writing by the Secretary of DEP;
4. A prominent public notice must be placed in a newspaper of general circulation in the area of the proposed Special Water at least 60 days prior to the workshop;
5. An economic impact analysis, consistent with Chapter 120, must be prepared that provides a general analysis of the effect of OFW designation on local growth and real estate development, including such factors as impacts on planned or potential residential, industrial, agricultural or other development or expansion; and
6. The Environmental Regulation Commission may designate a water of the state as a Special Water after making a finding that the waters are of exceptional recreational or ecological significance and a finding that the environmental, social, and economic benefits of the designation outweigh the environmental, social, and economic costs (Rule 62-302.700(5), F.A.C.).

For More Information, Contact: Department of Environmental Protection, Standards and Assessment Section at (850) 245-8064 or view the [Water Quality Standards website](#).