Alabama Red-bellied Turtle
(*Pseudemys alabamensis*)

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
Southeast Region
Mississippi Ecological Services Field Office
Jackson, Mississippi

5-YEAR REVIEW
Alabama red-bellied turtle / *Pseudemys alabamensis*

I. GENERAL INFORMATION

A. Methodology used to complete the review:

In conducting this 5-year review, we relied on the best available information pertaining to historic and current distributions, life histories, threats to, and habitats of this species. Specific sources included the final rule listing this species under the Endangered Species Act; the Recovery Plan; peer reviewed scientific publications; unpublished field observations by the U.S. Fish and Wildlife Service, State, and other experienced biologists; unpublished survey reports; and notes and communications from other qualified biologists or experts. The completed draft was forwarded to three peer reviewers and their comments were incorporated into the final document as appropriate (see Appendix A). We announced initiation of this review and requested information in a published *Federal Register* notice with a 60-day comment period (72 FR 42425).

B. Reviewers

Lead Region: Southeast Region: Kelly Bibb, 404-679-7132

Lead Field Office: Mississippi Ecological Services Field Office: Linda LaClaire, 601-321-1126

Cooperating Field Office: Daphne Ecological Services Field Office: Jeff Powell, 251-441-5858

C. Background

1. **Federal Register Notice citation announcing initiation of this review:** August 2, 2007 (72 FR 42425)

2. **Species status:** Stable. Surveys have been conducted for a number of years throughout the species' range in Alabama and Mississippi. Although precise population numbers are unavailable, comparisons of survey data over time indicate populations are stable in Alabama. In addition, all age classes of Alabama red-bellied turtles have been found during Mississippi surveys indicating recruitment to the population. An analysis of threats indicates several new threats have been identified and that the threats present at the time of listing are still present.

3. **Recovery achieved**: 1 (1= 0-25% recovery objectives achieved)
Long-term protection has not been established for any nesting habitat nor have basking, feeding, and overwintering habitats been protected. Trapping data indicate that populations are likely stable, but not increasing. Data on the population structure of the Alabama red-bellied turtle are limited.

4. **Listing history**
   Original Listing
   FR notice: 52 FR 22939
   Date listed: June 16, 1987
   Entity listed: species
   Classification: endangered

5. **Associated rulemakings**: None

6. **Review History**:
   Recovery Plan: 1990

   Recovery Data Call: Annually from1999-2013

   Five Year Review: November 6, 1991. (56 FR 56882)
   In this review, multiple species were simultaneously evaluated with no species-specific, in-depth assessment of the five factors as they pertained to the different species' recovery. In particular, no changes were proposed for the status of the Alabama red-bellied turtle in the review.

7. **Species' Recovery Priority Number at start of review (48 FR 43098)**: 5
   Degree of Threat: High
   Recovery Potential: Low
   Taxonomy: **s**pecies

8. **Recovery Plan**
   Name of plan: Alabama Red-bellied Turtle Recovery Plan
   Date issued: January 8, 1990

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy

1. **Is the species under review listed as a DPS?** No

2. **Is there relevant new information that would lead you to re-consider the classification of this species with regard to designation of DPSs?** No

B. Recovery Criteria

1. **Does the species have a final, approved recovery plan containing objective, measurable criteria?** Yes. The Alabama red-bellied turtle has an approved recovery plan with objective measurable criteria.

2. **Adequacy of recovery criteria.**

   a. **Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?** No, we are currently in the initial stages of revising the recovery plan.

   b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?** No, we are currently in the initial stages of revising the recovery plan and the recovery criteria.

3. **List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.**

   The stated Recovery Objective is to reclassify the Alabama red-bellied turtle from endangered to threatened status. This species can be considered for reclassifying to threatened when:

   a. **Long-term protection has been established for three nesting habitats.** This criterion has been partially met. Gravine Island, a known nesting site in Alabama, has been purchased by the U.S. Army Corps of Engineers and is protected as part of the Upper Delta Wildlife Management Area. Predation is still a major problem at Gravine Island; due to low juvenile recruitment, the site may function as a population sink (see discussion under Factor A., below). In Alabama and Mississippi, the overall distribution of nesting areas remains unknown. Nesting sites in Mississippi have been identified along the West Pascagoula River, along the Escatawpa River and at the Grand Bay National Estuarine Reserve (Reserve), however only the Reserve site is under public ownership and protection.

   b. **Basking, feeding and overwintering habitats have been protected.** This criterion has not been met. Some basking, feeding, and overwintering habitats have been identified in Alabama and Mississippi. We are still working to accomplish recovery plan tasks like 2.0 and 3.0. No specific areas have been targeted for protection to secure basking, feeding, and overwintering habitat for Alabama red-bellied turtles.

   c. **Fifteen years of data demonstrate that the population trend is increasing.**
   This criterion has not been met. Survey/monitoring studies have been conducted at varying intervals since the late 1970s in Alabama. Populations in Mississippi were largely unknown before the mid-1990s, and were not formally considered conspecific with those in Alabama until 2003 (Leary *et al.* 2003). Existing data do not support a population trend that is increasing (see discussion below under Biology and Habitat: Abundance, population trends).

C. Updated Information and Current Species Status

1. Biology and Habitat:

a. Abundance, population trends (e.g., increasing, decreasing, stable), demographic features, or demographic trends:

Conclusive population data are unavailable because trapping efforts have not been standardized over time in Alabama and because the population in Mississippi has only recently been discovered. McCoy and Vogt (1979) conducted the first Alabama red-bellied turtle distributional survey in the Tensaw River and lower Mobile Bay areas. They found that the turtle was most abundant in the quiet backwaters of lower Mobile Bay (from where the Mobile and Tensaw rivers split, and south into Mobile Bay), although it occurred sporadically throughout the lower and middle reaches of the bay's tributary rivers. They established the initial known distribution of the species in Alabama and did not attempt to determine abundance.

Post-listing, survey data were collected in 13 individual years between 1992 and 2011 from sites in Alabama (summarized in Godwin 2011b). In these studies, the catch-per-unit effort (CPUE) fluctuated dramatically between a CPUE of 0.01 turtle/trap-day in 1994 to a CPUE of 0.22 turtle/trap-day in 2000 (Godwin 2011b). Nevertheless, when Godwin (2011) conducted a regression analysis of all these survey data from the Mobile-Tensaw Delta, the core of the range of the Alabama red-bellied turtle in Alabama, the results indicated that this population has not changed significantly over the 20-year timeframe.

Populations in Mississippi have only recently been considered to be conspecific with the Mobile Bay Alabama red-bellied turtle populations (Leary *et al.* 2003). Nevertheless, since 1990, turtles recognized now as Alabama red-bellied turtles have been found during surveys of the east and west forks of the Pascagoula River and the lower Escatawpa River (and associated cypress swamps), west to Big Lake at the western end of the Back Bay of the Biloxi River and the lower reaches of several Biloxi River tributaries including Old Fort Bayou and the Tchoutacabouffa River. Some new localities for the species in Mississippi may still be found, but the Biloxi and Pascagoula Rivers and their associated watersheds appear to represent the current distribution of the species in Mississippi. Floyd (2012) concluded that the results of his multi-year study demonstrated wide-spread nesting and recruitment within the known distribution of the species in Mississippi.

Alabama red-bellied turtles are surveyed by the use of large, double-funnel hoop traps. They are herbivorous species and are not attracted to baited traps. In Alabama, population size and structure have been difficult

to determine, in spite of the amount of data collected, because adult turtles have been consistently captured at a much higher rate than juvenile turtles. In contrast, in Mississippi young turtles are often captured using the same trapping method (Floyd 1995, Floyd and Floyd 2009). It is not known whether this means juvenile turtles are a smaller portion of the population relative to adults in Alabama or whether previous trapping efforts favored capture of adult turtles. Traps with large mesh size, placed in deeper water than where smaller juveniles would normally be found, would skew capture results to favor adult Alabama red-bellied turtles. Low levels of juvenile survival (low recruitment) may be characteristic of some turtle populations where adults are long-lived (20+ years) and predation on adults is reduced relative to other age classes such as juveniles. Currently, we do not know if the differences between juvenile capture rates in Alabama and Mississippi represent real differences in population structure and recruitment, or if they are the result of some other variable possibly associated with past trapping methodology.

b. Genetics, genetic variation, or trends in genetic variation:

Within the genus *Pseudemys*, the three species of red-bellied turtles, Alabama red-bellied turtle (*P. alabamensis*), Florida red-bellied turtle (*P. nelsoni*), and northern red-bellied turtle (*P. rubriventris*) have been described as forming a clade with shared unique characters distinguishing them from other species of the genus (Seidel 1994). Unfortunately, genetic studies have not provided much information on the unique genome of the Alabama red-bellied turtle. In general, genetic studies of turtles have been hindered by their reduced rate of mitochondrial DNA (mtDNA) evolution (Avise *et al*. 1992). Soon after the discovery of a red-bellied turtle in Mississippi, attempts were made to see if the turtles in Mississippi were genetically unique or if they were indistinguishable from the red-bellied turtles in Alabama (Lydeard 1996). In the study, no differences were found using a portion of the mtDNA cytochrome *b* gene (Lydeard 1996). Jackson *et al*. (2012) combined data from two mitochondrial gene regions (the control region and cytochrome *b*) to reconstruct phylogenetic relationships within the genus, but low mutation rates resulted in limited resolution among species. Wiens *et al*. (2010) also demonstrated low mtDNA divergence among *Pseudemys* species. However, Wiens *et al*. (2010) took advantage of new genomic resources to address the phylogeny of *Pseudemys* species using a large number of nuclear loci. Although the Alabama red-bellied turtle was not included in their study, they reported that the two other species sharing its clade were clearly resolved (Wiens *et al*. 2010). Pauly and Shaffer (2011) proposed a research project using nuclear and mitochondrial gene sequencing to analyze species divisions within the genus *Pseudemys*, including *alabamensis*, and to determine whether there are genetically well-differentiated management units within

*alabamensi*s. It is hoped this study will also provide data on what level of gene flow is occurring within and among both Alabama and Mississippi drainages occupied by the Alabama red-bellied turtle; on effective population size; and on demographic trends, including whether populations are currently decreasing, increasing, or stable (Pauly and Shaffer 2011). Field work for this project, which included trapping, marking, and collection of tissue samples, has been completed. Initial results are provided by Spinks *et al.* (2013) who provide an analysis of differentiation between all the *Pseudemys* species included in the study. They found little evidence supporting the currently recognized *Pseudemys* species/subspecies. Although their analysis suggests that there may be fewer species than currently recognized, they do not recommend taxonomic changes based on their work. Rather, they suggest that an integrated analysis of morphology and historical biogeographic data coupled with extensive geographic sampling and large amounts of molecular data will be needed to resolve the species within the genus *Pseudemys* (Spinks *et al.* 2013). Analysis of *alabamensis* genetic data, to look for population differences within the species as currently described, is expected to be completed by the end of 2015.

c. Taxonomic classification or changes in nomenclature:

Kingdom: Animalia
Division: Chordata
Class: Reptilia
Order: Testudines
Family: Emydidae
Genus: *Pseudemys*
Species: *Pseudemys alabamensis*
Common name: Alabama red-bellied turtle (= Alabama red-bellied cooter)

d. Spatial distribution, trends in spatial distribution or historic range: The Alabama red-bellied turtle is restricted to streams and sloughs associated with the Mobile Bay drainage in Baldwin and Mobile counties, Alabama (U.S. Fish and Wildlife Service 1990) and the lower Pascagoula River (including the Escatawpa River) and Biloxi Bay watersheds in Harrison and Jackson counties in Mississippi (Leary *et al.* 2003). This species' distribution has been monitored periodically in Alabama since the late 1970s (McCoy and Vogt 1979; Dobie 1985, 1992, 1993; Nelson 1994, 1995, 1996; Godwin 2011b, 2014). Although the discovery of a turtle in Mississippi similar to the Alabama red-bellied turtle was made in 1987 (Leary *et al.* 2003), it has only been since 2003 that this turtle has been accepted as the same species (Leary *et al.* 2003). As a result, the known spatial distribution of the Alabama red-bellied turtle has expanded since the time of the species' listing to include parts of the lower extent of the Pascagoula, Biloxi, and Escatawpa river drainages in Mississippi.

e. Habitat: The decline of the Alabama red-bellied turtle has been attributed to destruction of the beds of submerged aquatic vegetation used for food, basking, and shelter by dredging or intentional efforts to control introduced vegetation; pollution and development which reduce the quality and quantity of habitat; destruction of nesting habitat; and constructing bulkheads and rip-rap along bayous which prevents access by nesting females to uplands (U.S. Fish and Wildlife Service 1990; Leary *et al.* 2008). Since the initial listing of the Alabama red-bellied turtle, it has been found to occupy areas of coastal Mississippi, however, the threats to the habitat of the turtle there are similar to those identified above.

Little information is available on any improvements that have been made in the habitat of the Alabama red-bellied turtle. In Mississippi, new upland developments along many of the coastal streams occupied by the Alabama red-bellied turtle have exacerbated siltation and runoff of pollutants. In Alabama, the majority of the Mobile-Tensaw Delta is in state and Federal ownership, however, the area is still susceptible to degradation from upstream pollutants (Godwin 2002). Dredging, a localized threat in Alabama and Mississippi (U.S. Fish and Wildlife Service 2008, Porter 2010, Godwin 2011b), may continue to reduce the quantity and quality of submerged aquatic vegetation within Alabama red-bellied turtle habitat. In Mississippi, maintenance dredging has occurred in habitat occupied by the Alabama red-bellied turtle. Dredging destroys submerged aquatic vegetation and increases the potential for upstream migration of saltwater which could result in habitat degradation. Some herbicide use to remove introduced vegetation has occurred in the past, but this type of control effort is not currently common (Clay 2010). Some introduced species commonly eaten by Alabama red-bellied turtles (e.g., *Hydrilla verticillata* on Gravine Island) have appeared to decline naturally (Clay 2010). The effects of this decline on Alabama red-bellied turtle habitat suitability are unknown. The loss of nesting habitat due to paving and construction associated with development, and construction of bulkheads along river banks is still continuing (Leary *et al.* 2008; Porter 2010). The extent of this loss is unknown.

2. The Five Listing Factors and a Summary of their Application to the Alabama red-bellied Turtle

Factor A: ***The present or threatened destruction, modification, or curtailment of its habitat or range.*** The Alabama red-bellied turtle occurs in broad, vegetated expanses of sluggish shallow water (1 to 2 meters (3.3 to 6.6 feet in depth) in the fresh (and sometimes brackish, especially in Mississippi) backwater areas of bays, and in and along river channels and bayous (McCoy and Vogt 1979, Dobie 1985, 1991; Mann *et al.* 2000). In Mississippi, Alabama red-bellied turtles occur in this same habitat type most abundantly where it is flanked by brackish or freshwater marsh, but also occur seasonally

in riverine areas flanked by salt marshes at the mouth of the Pascagoula River (Leary *et al.* 2008).

The primary threat to the Alabama red-bellied turtle, as described in the final listing rule (52 FR 22940), was human activity which altered or destroyed nesting habitat at Gravine Island, the only nest site for the species known at that time. Gravine Island is now part of the Upper Delta Wildlife Management Area managed by the state of Alabama. Clearing, logging, dredging, and construction within this area have been reduced or eliminated. Human use of Gravine Island has been reduced to daylight hours and although human disturbance of nesting in the area remains a problem (Nelson *et al.* 2009), it is likely much less than at the time of listing. Nevertheless, the nesting area on Gravine Island may be acting as a population sink because it represents an area of unnatural nest conditions (Godwin 2011b). This nest site is the result of dredge spoil deposition and is primarily composed of sterile sands that attain high daytime temperatures due to a lack of any vegetation which would provide an overstory. Nests at this site are easily located by predators and are often long distances from water. The low quality of this site results in lowered nest success and elevated risk of female mortality. Locations of most natural nest sites are unknown. They are likely widely scattered along major rivers, but differences from the historical distribution of nest sites are unknown.

A reduction of submerged aquatic vegetation in Alabama red-bellied turtle habitat was also mentioned as a threat in the final listing rule. The rule described chemical treatments used to control introduced aquatic species, but this activity was not considered to be a significant factor in the reduction of habitat quality for the turtle. Rather, natural phenomena, such as the movement of saltwater wedges up into bays during hurricanes, were considered more likely sources of seasonal (temporary) reductions in vegetation. Periodic maintenance dredging, which currently occurs at the mouths of occupied channels in Mississippi, may also induce upstream movement of saltwater wedges and act to facilitate reductions in submerged aquatic vegetation.

New threats have become apparent as a result of post-listing studies. Rip-rap and bulkheads on riverbanks and edges of bayous restrict access to upland areas by nesting females (Leary *et al.* 2008). Development of these uplands destroys nesting habitat and increases the potential for pollution entering the aquatic environment via runoff contaminated with substances such as oil, antifreeze, silt, fertilizer, herbicide, and poorly-treated sewage (Leary *et al*. 2008). Saltwater intrusion has altered Alabama red-bellied turtle habitat in areas of Jackson County, Mississippi; freshwater intakes from the Pascagoula River should be carefully monitored to prevent further loss (Floyd 2012). Human-created nest sites through habitat alterations (dredge spoil banks and islands; artificial causeway banks; lawns and cleared areas) can artificially

concentrate nests in certain areas and make them more vulnerable to predation, or in the case of roadways, direct mortality (Leary *et al.* 2008, Nelson *et al.* 2009, Floyd 2012) (see Factor C. and E.).

There is some indication that historic dredging of channels may have destroyed submerged aquatic vegetation used as habitat and food, particularly in the Escatawpa River in Mississippi (Mann *et al.* 2000). Post-listing, dredging would require an Army Corps of Engineers permit (see Factor D.). In Mississippi, dredging may be more of a concern than in Alabama (Porter 2010); maintenance dredging projects are continuing in parts of both the Pascagoula and Biloxi River drainages in Mississippi (U.S. Fish and Wildlife Service 2008; Mann 2010). Other threats to submerged aquatic vegetation include declining water quality and siltation (Moncreiff 2007) (see Factor D.). Recent studies indicate that the amount of submerged aquatic vegetation continues to decline in areas occupied by the Alabama red-bellied turtle in coastal Mississippi and in the Mobile-Tensaw Delta and upper Mobile Bay in Alabama (Sanderson 2010, Vittor and Associates, Inc., 2009).

Removing snags from riparian areas would reduce the number of basking sites for the Alabama red-bellied turtle. This is a concern, but it is not known to what extent this activity is currently being pursued in occupied Alabama red-bellied turtle habitat.

Factor B. Overutilization for commercial, recreational, scientific, or educational purposes. At the time of listing, gathering and eating Alabama red-bellied turtle eggs, and trapping turtles and selling them for food, were identified as threats. The collection and consumption of these turtles and/or their eggs no longer occurs (Floyd 2012) and this activity is not currently considered a threat to the Alabama red-bellied turtle.

Incidental harvesting by commercial fishermen and shrimpers in gill, hoop, and trammel nets was also described as a threat under this factor in the final listing rule. This remains a potential threat to the species (Leary *et al.* 2008), although current state saltwater fishing regulations in Alabama and Mississippi are likely effective in limiting most incidental mortality (Alabama Department of Conservation and Natural Resources (ADCNR) 2015; Mississippi Department of Marine Resources (MDMR) 2013)(see Factor D.).

An additional threat, not evaluated at the time of listing, has been the shooting of basking or nesting turtles for recreation. During Alabama red-bellied turtle surveys, some captured turtles had been shot and often bullets or shotgun pellets were plainly visible in the carapace (Leary *et al.* 2008). The shooting of basking or nesting turtles is considered a current threat.

Factor C: *Disease or predation*. There was no known threat from disease at the time of listing and disease does not appear to be a current threat. Leeches

are routinely found on Alabama red-bellied turtles captured during field surveys (Godwin 2010), however Godwin (2011a) concluded that the occurrence of leeches, as well as blood parasites in the turtle's blood, do not appear to lead to a reduction of body condition due to anemia.

Predation, however, is a past and current threat. Alabama red-bellied turtles continue to endure a very high level of nest predation from vertebrate predators. At the time of listing, domestic pigs and fish crows (*Corvus ossifragus*) were documented as nest predators at Gravine Island, a major nest site for the Alabama red-bellied turtle in Alabama. Domestic pigs no longer occur at the site, but fish crows continue to prey on nests (Leary *et al*. 2008). Alligators (*Alligator mississippiensis*) were included in the final listing rule as predators of the Alabama red-bellied turtle. Alligators continue to prey upon the Alabama red-bellied turtle, as evidenced by alligator tooth marks on most adult turtles captured in both in Alabama and Mississippi (Leary *et al.* 2008). It is likely that few juvenile turtles survive alligator attacks (Leary *et al.* 2008). The introduced red fire ant (*Solenopsis invicta*) was suggested as a nest predator in the final listing rule. Although no eggs of Alabama red-bellied turtles have been found predated by this species, observations of predation on other species of aquatic turtle hatchlings within the range of the Alabama red-bellied turtle indicate the potential for predation by this ant on the listed species (Leary *et al*. 2008). Post-listing, nine-banded armadillos (*Dasypus novemcinctus*) and raccoons (*Procyon lotor*) have been documented as significant nest predators (Godwin 2002, Leary *et al*. 2008, Floyd 2012). An increase in predator populations may be occurring due to human-induced habitat deterioration in the vicinity of the river (Nelson *et al.* 2009). For example, discarding food scraps and leaving garbage containers open provide food sources that attract raccoon nest predators. Since longevity data for Alabama red-bellied turtles indicate they are long-lived animals (Snider and Bowler 1992; Godwin 2010), they are likely limited in their ability to respond to increased mortality of any life-history stage (Congdon *et al*. 1993).

Factor D: ***The inadequacy of existing regulatory mechanisms.*** Prior to listing, the Alabama red-bellied turtle was recognized as a threatened species by the Alabama Department of Conservation (now equals the ADCNR). However, the species was not afforded any statutory protection as a result of this recognition. In Mississippi, the turtle now recognized as the Alabama red-bellied turtle received no protection prior to Federal listing. In addition, there were no state regulations to protect against the loss or alteration of the turtle's habitat.

Currently, the ADCNR protects the Alabama red-bellied turtle against taking, capturing, killing or trading under its Nongame Species Regulation (ADCNR 2015). In Mississippi, the Alabama red-bellied turtle is state-listed as an endangered species under "The Nongame and Endangered Species Conservation Act of 1974" and is protected against take, capture, and trade or

selling (Mississippi Museum of Natural Science 2001). There continue to be no specific regulations in Alabama or Mississippi to protect the species' habitat.

Listing the Alabama red-bellied turtle under the Endangered Species Act has had the effect of educating the public about the species' rarity and making the market for consumption and trade in the species illegal. Listing has also resulted in some habitat protection. An example is review of dredge and fill permits requested from the Army Corps of Engineers within the Mobile-Tensaw Delta and occupied areas of coastal Mississippi. Dredging in occupied habitat may kill adults; even small scale dredging projects, such as those in canals near upland nesting sites, can be hazardous for adult females (Floyd 1995). The Service needs to be vigilant in monitoring permit issuance.

Issuance of dredge and fill permits within occupied Alabama red-bellied turtle habitat is contingent on developing a dredging strategy that would minimize effects to the turtle. Unfortunately, the permit process is not always an effective protection. After Hurricane Katrina, snags (used as basking habitat by turtles) were removed in the lower Escatawpa River as part of a Federal post-Katrina debris removal project, but without consultation with the U.S. Fish and Wildlife Service or the Mississippi Department of Wildlife, Fisheries, and Parks (Leary *et al*. 2008).

Currently, monitoring of water quality is conducted by the states of Alabama and Mississippi under Section 305(b) of the Clean Water Act. Lists of impaired waters in the respective states (303(d) Lists) indicate that, in some cases, water quality and quantity are not fully supporting a minimum designated use of fish and wildlife habitat in river reaches where the Alabama red-bellied turtle occurs (Alabama Department of Environmental Management 2014; Mississippi Department of Environmental Quality 2014). Also identified on the lists are the pollutants causing or potentially causing impairment of designated uses. Pollutants include excessive nutrients, organic enrichment/low dissolved oxygen, pesticides, mercury and other toxics, and pathogens. An overall decline in water quality is thought to be the primary vector for the continued disappearance of submerged aquatic grasses (Moncreiff 2007) which provide food and habitat for the Alabama red-bellied turtle. The effects of pollutants on the Alabama red-bellied turtle are unknown. This lack of data may prevent agencies from exercising their existing regulatory authorities.

Fishing regulations in Alabama and Mississippi state waters restrict most commercial fishing in the shallow waters inhabited by Alabama red-bellied turtles which reduces the potential incidental take of the species (ADCNR 2014, MDMR 2013). Some fishing for bait (fish and/or shrimp) is permitted, but this activity is restricted to limited areas and short trawl tow times which reduces the potential for mortality of Alabama red-bellied turtles.

Factor E: ***Other natural or manmade factors affecting its continued existence.*** The reduction in submerged aquatic vegetation (which is the primary habitat and food source for Alabama red-bellied turtles) as a result of hurricanes, was considered a threat at the time of listing and is still considered a threat today when combined with other factors (see Factors A and D). The winds and rising water levels associated with hurricanes can move saltwater inland. This alters the salinity of Alabama red-bellied turtle habitat and decreases its suitability for submerged aquatic vegetation adapted to fresh or brackish water. The apparent low level of recruitment in Alabama populations of the Alabama red-bellied turtle decreases the ability of the turtle to recover from hurricanes and other catastrophic events.

There have been other effects to submerged aquatic vegetation post-listing. As mentioned above, some introduced species commonly eaten by Alabama red-bellied turtles have appeared to decline naturally (Clay 2010). The effects of this change in plant community structure on the suitability of Alabama red-bellied turtle habitat are unknown.

Boating, and recreational use of sandbars, within occupied Alabama red-bellied turtle habitat represent threats to adults and nests currently, as well as at the time of listing. For example, large numbers of people congregate on the same open, high sandbars (Gravine Island) favored by nesting turtles in Alabama (although in Mississippi, Alabama red-bellied turtles are not known to use sandbars or dredge spoil for nesting). This use of sandbars by humans can limit turtle nesting habitat when turtles avoid these nesting sites or nests may be destroyed inadvertently by human activities on the sandbars (Dobie 1992, Godwin 2002). There has also been an increase in the amount of river traffic, and the speed of boat traffic, since the time of listing. Scars on turtles from injuries received from boat propellers are common (Leary *et al*. 2008) and turtles have been killed from these injuries (Mann 2010).

Commercial fishing (trawling or using submerged hoop nets) and crabbing in occupied habitats were considered a threat at the time of listing; however these activities are restricted in Alabama red-bellied turtle habitat (see Factor D.) and are not currently considered threats. Recreational crab traps are legal and it is possible that juvenile Alabama red-bellied turtles may be captured in them and drown. This threat could be alleviated by the use of turtle excluder devices in pots in their habitat. Adults and large juveniles may be incidentally captured by recreational hook and line fishermen or captured in their gill nets *(*Leary *et al*. 2008*)*. The severity of the threat to Alabama red-bellied turtle populations from recreational fisheries is not known, however it is likely to be localized.

Roads near upland nesting sites are a threat to adult females and hatchlings. The U.S. Highway 90/98 causeway (Mobile Bay Causeway, Battleship

Parkway) is an elevated roadbed constructed in the 1920s that crosses Mobile Bay and connects Baldwin and Mobile counties in Alabama (Godwin 2010). The aquatic habitat in this area supports an important population segment of the Alabama red-bellied turtle and due to the elevated nature of the roadbed, female turtles frequently attempt to nest in this area. Nelson and Scardamalia-Nelson (2014) have summarized the mortality data from 13 years of surveys of dead Alabama red-bellied turtles at this site. They documented 773 dead turtles that had been run over and killed on the causeway; these numbers are considered a minimum since it was unlikely all dead hatchlings were located. Most of the mortality was to hatchling turtles, but twenty-one percent of the mortality was of adult female turtles. Since female turtles may require from 12 to 15 years to reach sexual maturity, a continuous loss of breeding females is likely to result in long-term population decline (Nelson 2013). In 2007, temporary fencing was installed at locations along the causeway, and in July 2008, permanent chain-link fencing was completed along 4.1 kilometers (2.6 miles) of the roadside by the Alabama Department of Transportation (ALDOT) (Nelson 2013). Because of businesses and homes along the causeway and their associated driveways, the fencing is discontinuous and some mortality is still continuing. However, Nelson and Scardamalia-Nelson (2014) describe a 53.4 percent average reduction in annual turtle mortality since the fence was completed. Locations of mortality are being documented and additional conservation measures will be implemented as identified.

Adult Alabama red-bellied turtles have been captured at a much higher rate than juvenile turtles. It is not clear from the data whether this means juvenile turtles are a smaller portion of the population relative to adults, or whether previous trapping efforts favored the capture of adult turtles. Low levels of juvenile survival may be characteristic of turtle populations where adults are long-lived (20+ years) and nearly invulnerable to predation, but juveniles are under intense predation pressure. Nevertheless, population stability may be sensitive to a specific level of juvenile survival (Congdon *et al.*1993). Research is needed to determine the proportion of juveniles within Alabama red-bellied turtle populations.

Gender in many turtles in the family Emydidae, including species of *Pseudemys*, is determined by incubation temperature (Ewert and Nelson 1991). Changes in the quality of nesting sites may be affecting the sex determination of Alabama red-bellied turtle hatchlings. The amount of vegetation at nest sites (overgrowth of vegetation or bare soil deposits) may alter the natural sex ratio of clutches by exposing embryos to higher or lower temperatures than would be the norm. Additional research is needed to better assess temperature dependent sex determination in the Alabama red-bellied turtle and what effect this might have on population dynamics.

D. Synthesis – In spite of surveys being conducted at intervals through-out the period since listing, the status of the Alabama red-bellied turtle is still poorly

known. However, we have gained a better understanding of the distribution of the species and although we have found that its range is larger than previously believed, this range is coincident with a coastal zone of intensive development in both Alabama and Mississippi. A variety of threats to Alabama red-bellied turtle habitat result from coastal development, however,

Many of the threats present at the time of listing still remain. Heavy predation at nest sites is still on-going and the apparent low level of juvenile recruitment in Alabama is troubling. We do not know the trend in quantity and quality of the submerged aquatic vegetation which supports the habitat vital to the survival of the Alabama red-bellied turtle. "Recreational" shooting of turtles continues and an increasing amount of human use of occupied habitat for boating, other recreational uses, and development are having direct and indirect effects on Alabama red-bellied turtle populations. The importance of water quality degradation is unknown. High adult annual survivorship is needed to maintain stable populations of Alabama red-bellied turtles given the high mortality at known turtle nest sites. Human-created nest areas may have resulted in increases in predation at nests in those areas. The fencing of the Mobile Bay causeway has decreased the mortality of adult female Alabama red-bellied turtles at that site; however, continued monitoring will be necessary to ensure the success of this conservation measure.

In summary, threats to the species are continuing. Studies monitoring known populations will need to be continued for 10 to 15 more years to give an adequate picture of population trends due to the long lifespan of the Alabama red-bellied turtle and the newly delineated range of the species in Mississippi. Although there has been some progress towards achieving recovery goals for the Alabama red-bellied turtle, the recovery criteria have not been met and this species continues to meet the definition of endangered species under the Act.

III. RESULTS

A. Recommended Classification: No change is needed.

B. New Recovery Priority Number: No change.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Monitor selected populations of Alabama red-bellied turtles and their habitats on a regular basis using a standardized method. Conduct these surveys in Alabama and Mississippi in order to assess what, if any, differences exist between these populations. Obtain parameters necessary to conduct a Population and Habitat Viability Analysis including improved data on nesting and juvenile recruitment.

2. Complete surveys in Mississippi to ascertain the upstream limits and habitats of Alabama red-bellied turtles in the state, as well as their use of oxbows upstream of open marsh areas.
3. Study effects of high nest predation on selected populations.
4. Complete a genetic analysis to determine the discreteness between and among Alabama and Mississippi populations; to estimate effective population sizes; and to analyze the extent of population declines.
5. Try alternative survey methods (such as nocturnal searches of vegetation in shallow water using a Q-beam) to determine if the apparent low level of juvenile recruitment in Alabama is accurate.
6. Protect natural riverbanks and associated uplands in occupied habitat. Prohibit bulkheads and rip-rap which may reduce access to nest sites by females and result in death of hatchlings moving from the nest to the water.
7. Identify natural nesting habitats in Mississippi. Survey natural riparian Maritime oak woodlands to determine if these are used by nesting Alabama red-bellied turtles; study the utilization of alligator nests as nesting habitat; and determine the degree that females move up tributary streams and nest in uplands remote from adult foraging habitat.
8. Conduct research to determine the comparative abundance (pre-listing and current) of submerged aquatic vegetation, threats to this habitat, and the possible effects on the Alabama red-bellied turtle.
9. Continue monitoring the effectiveness of roadside fencing along Battleship Causeway (Hwy. 90/98) to reduce mortality of Alabama red-bellied turtles at this site, especially mature females.
10. Work with partners to limit other threats to the Alabama red-bellied turtle, such as development of upland nesting areas, and to improve enforcement of regulations regarding water quality, dredging, and recreational boating.
11. Study the scope of temperature dependent sex determination in the Alabama red-bellied turtle.
12. Examine the possibility of restoring the Gravine Island spoil area to native soils and vegetative cover.
13. Conduct radio-telemetry studies to identify basking, feeding, and overwintering sites/habitats and monitor turtle movements between population centers.
14. Implement all other tasks identified in the recovery plan.
15. Accept the extension of the geographic range of the Alabama red-bellied turtle into the Pascagoula and Biloxi river drainages in Mississippi.

V. REFERENCES

Alabama Department of Conservation and Natural Resources (ADCNR). 2015. Website identifying nongame vertebrates protected by Alabama regulations, viewed 1/22/2015. http://www.outdooralabama.com/nongame-vertebrates-protected-alabama-regulations

ADCNR. 2014. Website providing saltwater fishing regulations, viewed 6/18/2014. http://www.outdooralabama.com/fishing/saltwater/regulations

Alabama Department of Environmental Management (ADEM). 2014. 2014 Alabama Section 303(d) List dated September 24, 2014, ADEM, Water Division – Water Quality Branch, Montgomery Alabama. 10 pp.

Avise, J.C., B.W. Bowen, T. Lamb, A.B. Meylan, and E. Bermingham. 1992. Mitochondrial DNA evolution at a turtle's pace: evidence for low genetic variability and reduced microevolutionary rate in the Testudines. Molecular Biology and Evolution 9:457-473.

Clay, R. 2010. Telephone call on September 20, 2010 between Linda LaClaire, U.S. Fish and Wildlife Service, Jackson, Mississippi, and Roger Clay, Alabama Department of Conservation and Natural Resources, Spanish Fort, Alabama, concerning status of Alabama red-bellied turtle.

Congdon, J.D., D.W. Tinkle, G.L. Breitenbach, and R.C. VanLoben Sels. 1993. Delayed sexual maturity and demographics of Blanding's turtles (*Emydoidea blandingii*): Implications for conservation and management of long-lived organisms. Conservation Biology 7:826-833.

Dobie, J.L. 1985. Distribution and status of the Alabama red-bellied turtle, *Pseudemys alabamensis* Baur. Unpublished report submitted to U.S. Fish and Wildlife Service, Jackson, Mississippi [Contract No. 14-16-0009-1546]. 31 pp. + Appendices.

Dobie, J.L. 1991. Final report on the project entitled: A status survey of an undescribed (new) species of *Pseudemys* turtle from Mississippi. Research funded by the Wildlife Heritage Fund to the State of Mississippi, Jackson, Mississippi. 10 pp. + figures.

Dobie, J.L. 1992. Clutch survival of Alabama red-bellied turtles on Gravine Island. Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Montgomery, Alabama. 7 pp. + figures.

Dobie, J.L. 1993. Ascertain population trends based on juvenile/adult ratios, catch rates, and population indices, and provide biological data on other topics including that concerned with nesting. Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Montgomery, Alabama. 25 pp.

Ewert, M.A. and C.E. Nelson. 1991. Sex determination in turtles: Diverse patterns and some possible adaptive values. Copeia 1991:50-69.

Floyd, P.S. 1995. Study of the nesting biology of the Mississippi red-bellied turtle. Final Report, Wildlife Heritage Fund, Research Grant Program, Mississippi Department of Wildlife, Fisheries, and Parks, Jackson, Mississippi. 27 pp.

Floyd, P.S. 2012. Post-Hurricane Katrina assessment of the Alabama red-bellied turtle (*Pseudemys alabamensis*) in coastal Mississippi. Unpublished report submitted to U.S. Fish and Wildlife Service, Jackson, Mississippi. 61 pp.

Godwin, J.C. 2002. Turtle nest success on Gravine Island with emphasis on the Alabama red-bellied turtle (*Pseudemys alabamensis*) and Delta map turtle (*Graptemys nigrinoda delticola*). Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Montgomery, Alabama. 17 pp.

Godwin, J.C. 2010. Unpublished data provided to Linda LaClaire, U.S. Fish and Wildlife Service, Jackson, Mississippi, on August 26, 2010.

Godwin, J.C. 2011a. Blood screening of the Alabama red-bellied turtle (*Pseudemys alabamensis*), river cooter (*Pseudemys concinna*), and Florida cooter (*Pseudemys floridana*). Unpublished report submitted to the U.S. Fish and Wildlife Service, Mississippi Ecological Services Field Office, Jackson, Mississippi. 38 pp.

Godwin, J.C. 2011b. Reassessment of the status of the Federally endangered Alabama red-bellied turtle (*Pseudemys alabamensis.* Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Montgomery, Alabama. 56 pp.

Godwin, J.C. 2014. Status of the endangered Alabama red-bellied turtle (*Pseudemys alabamensis*) in the Bon Secour and Fowl Rivers. Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Montgomery, Alabama. 28 pp.

Jackson, T.G., D.H. Nelson, and A.B. Morris. 2012. Phylogenetic relationships in the North American genus *Pseudemys* (Emydidae) inferred from two mitochondrial genes. Southeastern Naturalist 11:297-310.

Leary, C.J., J.L. Dobie, T.M. Mann, and P.S. Floyd. 2003. Morphological variation in the endangered Alabama red-bellied cooter (*Pseudemys alabamensis*) and taxonomic status in Mississippi. Chelonian Conservation and Biology 4:635-641.

Leary, C.J., J.L. Dobie, T.M. Mann, P.S. Floyd, and D.H. Nelson. 2008. *Pseudemys alabamensis* Baur 1893 – Alabama red-bellied cooter, Alabama red-bellied turtle. Pgs. 019.1-019.9 *In*: Rhodin, A.G.J., P.C.H. Pritchard, P.P. van Dijk, R.A. Saumure, K.A. Buhlmann, and J.B. Iverson (Eds.). Conservation Biology of Freshwater Turtles and Tortoises: A compilation project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs No. 5.

Lydeard, C. 1996. Genetic analysis of *Pseudemys* sp, the undescribed Mississippi redbelly turtle. Unpublished report submitted to U.S. Fish and Wildlife Service, Jackson, Mississippi. 10 pp.

Mann, T.M. 2010. Email dated October 12, 2010 to Linda LaClaire, U.S. Fish and Wildlife Service, Jackson, Mississippi Field Office, from Tom Mann, Clinton, Mississippi, concerning status of Alabama red-bellied turtle.

Mann, T.M., P.S. Floyd, P.S. Floyd, Jr., and J.D. Floyd. 2000. Further investigation of the range of the Alabama red-bellied turtle (*Pseudemys alabamensis*) in Mississippi. Museum Technical Report No. 82, Mississippi Museum of Natural Science for U.S. Fish and Wildlife Service, Project No. E-1, Segment 14, Jackson, Mississippi. 35 pp.

McCoy, C.J. and R.C. Vogt. 1979. Distribution and population status of the Alabama red-bellied turtle *Pseudemys alabamensis*. Unpublished report submitted to U.S. Fish and Wildlife Service, Jackson, Mississippi. 12 pp. + figures.

Mississippi Department of Environmental Quality (MDEQ). 2014. Mississippi 2014 Section 303(d) List of Impaired Water Bodies dated July 24, 2014. MDEQ, Surface Water Division of the Office of Pollution Control, Jackson, Mississippi. 54 pp.

Mississippi Department of Marine Resources. 2013. Guide to Mississippi Saltwater Fishing. Rules and Regulations. Guidance prepared in accordance with Mississippi Code Annotated 49-15-18, Biloxi, Mississippi. 38 pp.

Mississippi Museum of Natural Science. 2001. Endangered Species of Mississippi. Mississippi Department of Wildlife, Fisheries, and Parks, Jackson, Mississippi. 97 pp.

Moncreiff, C.A. 2007. Statewide summary for Mississippi. Pg. 74 *In*: Handley, L., D. Altsman, and R. DeMay (Eds.). Seagrass status and trends in the northern Gulf of Mexico: 1940-3002. U.S. Geological Survey Scientific Investigations Report 2006-5287 and U.S. Environmental Protection Agency 855-R-04-003, Reston, Virginia.

Nelson, D.H. 1994. Population ecology of the Alabama redbelly turtle (*Pseudemys alabamensis*). Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Montgomery, Alabama. 28 pp.

Nelson, D.H. 1995. Population ecology of the Alabama redbelly turtle (*Pseudemys alabamensis*). Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Montgomery, Alabama. 33 pp.

Nelson, D.H. 1996. Population ecology of the Alabama redbelly turtle (*Pseudemys alabamensis*). Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Montgomery, Alabama. 34 pp.

Nelson, D.H. 2013. Monitoring of road-kill mortality and road-side fencing along the Mobile Causeway to conserve Alabama red-bellied turtles (*Pseudemys alabamensis*).

Unpublished report submitted to the Alabama Department of Conservation and Natural Resources, Montgomery, Alabama. 27 pp.

Nelson, D.H., G.J. Langford, J.A. Borden, and W.M. Turner. 2009. Reproductive and hatchling ecology of the Alabama red-bellied cooter (*Pseudemys alabamensis*): implications for conservation and management. Chelonian Conservation and Biology 8:66-73.

Nelson, D.H. and C. Scardamalia-Nelson. 2014. Road-kill survey of Alabama red-bellied turtles on the Mobile Bay Causeway. Abstract, Annual Meeting of Alabama Academy of Science, Auburn University, Auburn, Alabama. 3 pp.

Pauly, G.B. and H.B. Shaffer. 2011. Genetic analysis of the Alabama red-bellied turtle (*Pseudemys alabamensis*): estimation of population subdivision, among population gene flow, and population decline. Section 6 proposal submitted to the Alabama Department of Conservation and Natural Resources, Montgomery, Alabama. 9 pp.

Porter, B. 2010. Telephone call on August 23, 2010 between Linda LaClaire, U.S. Fish and Wildlife Service, Jackson, Mississippi Field Office and Bruce Porter, U.S. Fish and Wildlife Service, Daphne, Alabama Field Office, concerning status of Alabama red-bellied turtle.

Sanderson, P.A. 2010. Telephone call on October 26, 2010 between Linda LaClaire, U.S. Fish and Wildlife Service, Jackson, Mississippi Field Office and Andy Sanderson, Mississippi Museum of Natural Science, Jackson, Mississippi, concerning status of submerged aquatic vegetation along the coast of Mississippi in areas occupied by the Alabama red-bellied turtle.

Seidel, M.E. 1994. Morphometric analysis and taxonomy of cooter and red-bellied turtles in the North American genus *Pseudemys* (Emydidae). Chelonian Conservation and Biology 1(2):117-130.

Snider, A.T. and J.K. Bowler. 1992. Longevity of reptiles and amphibians in North American collections. Herpetological Circular No. 21, Society for the Study of Amphibians and Reptiles, Lawrence, Kansas. 40 pp.

Spinks, P.Q., R.C. Thomson, G.B. Pauly, C.E. Newman, G. Mount, and H.B. Shaffer. 2013. Misleading phylogenetic inferences based on single-exemplar sampling in the genus *Pseudemys*. Molecular Phylogenetics and Evolution 68:269-281.

U.S. Fish and Wildlife Service**.** 1990. Alabama red-bellied turtle (*Pseudemys alabamensis*) recovery plan. Atlanta, Georgia. 17 pp.

U.S. Fish and Wildlife Service**.** 2008. Letter dated October 8, 2008, to U.S. Army Corps of Engineers, Mobile District, Mobile, Alabama, from Field Supervisor, U.S. Fish and

Wildlife Service, Jackson, Mississippi, concluding informal consultation on Pascagoula Harbor Dredged Material Management Plan. 3 pp.

Vittor, Barry A. and Associates, Inc. 2009. Submerged aquatic vegetation mapping in Mobile Bay and adjacent waters of coastal Alabama in 2008 and 2009. Unpublished report prepared for Mobile Bay National Estuary Program, Mobile, Alabama. 16 pp.

Wiens, J.J., C.A. Kuczynski, and P.R. Stephens. 2010. Discordant mitochondrial and nuclear gene phylogenies in emydid turtles: implications for speciation and conservation. Biological Journal of the Linnaean Society 99:445-461.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of
***Pseudemys alabamensis* (Alabama red-bellied turtle)**

Current Classification: Endangered

Recommendation resulting from the 5-Year Review

_X_ No change is needed

The review was completed by Linda LaClaire, Jackson, Mississippi Ecological Services Field Office.

FIELD OFFICE APPROVAL:

for **Lead Field Supervisor, Fish and Wildlife Service**

Approve _____ Date 6/22/15

REGIONAL OFFICE APPROVAL:

for
Lead Regional Director, Fish and Wildlife Service

Approve _____ Date 7-12-15

APPENDIX A
Summary of peer review for the 5-year review of *Alabama red-bellied turtle* (*Pseudemys alabamensis*)

A. Peer Review Method:
The document was peer-reviewed internally by Cary Norquist, Jackson, Mississippi Field Office and a copy was provided to the Daphne, Alabama Field Office. Once the comments received were added to the document, it was sent to five outside reviewers (see below). The outside peer reviewers were chosen based on their qualifications and knowledge of the species.

Peer Reviewers:
Matt Aresco [aquatic turtle expert]
Director, Nokuse Plantation
13292 Co. Hwy. 3280
Bruce, FL 32455
aresco@lakejacksonturtles.org

Pete Floyd [Alabama red-bellied turtle researcher]
515 Hague St.
Pascagoula, MS 39567

Jim Godwin [Alabama red-bellied turtle researcher]
Alabama Natural Heritage Program
1090 S. Donahue Dr.
Auburn University, AL 36849
jcg0001@auburn.edu

Tom Mann [Alabama red-bellied turtle researcher]
114 Auburn Drive
Clinton, MS 39056-6002
natmann@bellsouth.net

Dr. David Nelson [Alabama red-bellied turtle researcher]
Associate Professor (Emeritus)
Department of Biological Sciences
University of South Alabama
Mobile, AL 36688
dnelson@usouthal.edu

B. Peer Review Charge: The below guidance was provided to the reviewers.
1. Review all materials provided by the Service.
2. Identify, review, and provide other relevant data that appears not to have been used by the Service.

3. Do not provide recommendations on the Endangered Species Act classification (e.g., endangered, threatened) of the species.
4. Provide written comments on:
    - Validity of any models, data, or analyses used or relied on in the review.
    - Adequacy of the data (e.g., are the data sufficient to support the biological conclusions reached). If data are inadequate, identify additional data or studies that are needed to adequately justify biological conclusions.
    - Oversights, omissions, and inconsistencies.
    - Reasonableness of judgments made from the scientific evidence.
    - Scientific uncertainties by ensuring that they are clearly identified and characterized and those potential implications of uncertainties for the technical conclusions drawn are clear.
    - Strengths and limitation of the overall product.
5. All peer reviews and comments will be public documents, and portions may be incorporated verbatim into our final document with appropriate credit given to the author of the review.

C. Summary of Peer Review Comments/Report

1. Summary of Mr. Matt Aresco's comments.
   Mr. Aresco provided some specifics about survey methods and offered suggestions for improvements to the review based on his expertise with turtles.

2. Summary of Mr. Pete Floyd's comments.
   Mr. Floyd provided updated data for the Mississippi Alabama red-bellied population and an assessment of current threats in Mississippi.

3. Summary of Mr. Jim Godwin's comments.
   Mr. Godwin provided a reassessment of the status of the Alabama red-bellied turtle in Alabama and current threats to the species there. He also provided management and research recommendations that would support recovery efforts.

4. Summary of Mr. Tom Mann's comments.
   Mr. Mann contributed information on threats to the Alabama red-bellied turtle in Mississippi as well as recommendations for future actions that will benefit the recovery of the species.

5. Summary of Dr. David Nelson's comments.
   Mr. Nelson provided a summary of his Alabama red-bellied turtle capture data from research conducted in Alabama from 1994 through 2001. He also provided specific comments based on this experience working with the species.

D. Response to Peer Review

Peer reviewers' comments were evaluated and incorporated into the document, as appropriate.