PROGRAMMATIC BIOLOGICAL ASSESSMENT
of
PROPOSED, THREATENED, ENDANGERED AND CANDIDATE SPECIES

REVISED LAND AND RESOURCE MANAGEMENT PLAN
NATIONAL FORESTS IN ALABAMA

Biodiversity – Alabama's Treasures

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NATIONAL FORESTS IN ALABAMA
Supervisor's Office
Montgomery, Alabama
Bankhead, Conecuh, Talladega & Tuskegee National Forests

TABLE OF CONTENTS

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I. INTRODUCTION

This Programmatic Biological Assessment (BA) will summarize and document the process and make the appropriate determinations regarding the effects on the respective Proposed, Endangered, and Threatened species on the National Forests in Alabama from planned management direction as presented in the Preferred Alternative, Alternative I, in the 2003 Revised Land and Resource Management Plan for the National Forests in Alabama.

A Biological Assessment, to be used in conjunction with formal consultation, is required of all proposed U.S Forest Service (Forest Service) management actions pertaining to the potential effects on Proposed, Threatened, and Endangered (T&E) species. According to Section 7 of the Endangered Species Act, the effects of all proposed actions must be analyzed regarding Federally listed or proposed.

The direction in the revised Forest Plan is general and does not preclude or replace the requirement for specific, project-level consideration of threatened, endangered, or proposed species or their critical habitat and further consultation, if necessary, with the U.S. Fish and Wildlife Service. Project areas will be inventoried for these species in accordance with procedures outlined in the Region 8 supplement to the Forest Service Manual §2672, which will provide another facet of protection.

According to the Forest Service Manual (FSM) 2670.31, the Forest Service shall, through the biological evaluation process, review actions and programs authorized, funded, or carried out by the Forest Service to determine their potential for effect on threatened and endangered species and species proposed for listing. In addition, the agency shall initiate consultation or conference with the U.S. Fish and Wildlife Service (FWS), when the Forest Service determines

that proposed activities may have an effect on threatened or endangered species; is likely to jeopardize the continued existence of a proposed species; or result in the destruction or adverse modification of critical or proposed critical habitat. Finally, in conjunction with the regulatory agencies, action should be taken to identify and prescribe measures to prevent adverse modification or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species. Individual organisms or populations should be protected from harm or harassment as appropriate.

II. PROPOSED ALTERNATIVE

The management action analyzed in this BA is **Alternative I which is currently considered the preferred alternative for the revised** Land and Resource Management Plan for the National Forests in Alabama.

This alternative emphasizes management of forest ecosystems through restoration and maintenance—which ensures healthy watersheds; provides for sustainable and diverse ecosystems that support viable plant, wildlife, and fish populations; and provides for high quality, nature-based recreation opportunities, especially in non-motorized settings with high quality landscapes. Habitats for those species needing large, contiguous forested landscapes would be maintained or increased. Management actions would be taken where needed to conserve and recover threatened, endangered, sensitive, and locally rare species. Emphasis on restoration and maintenance of forest ecosystems and rare communities would be expected to have additional benefits for Federally listed species.

Inventoried roadless and un-roaded areas would be managed to retain their un-roaded character. Most of the inventoried roadless areas adjacent to or connected with existing wilderness areas would be recommended for wilderness. A spectrum of high-quality, nature-based recreation settings would be provided, and there would be an emphasis on providing those recreation opportunities that are not widely available on non-Federal lands.

All existing inventoried old growth would be protected, and there would be an adequate representation of old-growth patches of those communities found on national forest lands. The health of the forest vegetation would improve by replacing off-site species, thinning overstocked stands, and restoring fire-dependent and fire-associated communities The total ten year allowable sale quantity (ASQ) of timber would be 85.3 million cubic feet. Generally, access will be limited to those areas that can be accessed by maintaining or reconstructing existing system roads, or through the construction of temporary administrative roads.

This preferred alternative strives to balance a wide range of public interests, diverse fish, wildlife, and ecological needs, and other stewardship responsibilities as we manage the National Forests in Alabama over the next decade. This alternative is identified in the Draft EIS as the alternative that provides the most acceptable resolution to the needed changes in management. It is the alternative that is carried forward as the Draft Revised Land and Resource Management Plan, as released for public review in January 2003.

The final decision will be based on the analysis contained in the Final EIS, which considers public comments on the Draft EIS. The Record of Decision issued after the Final EIS (approximately December, 2003) will document the final decision and supporting rationale. This will accompany the Final Forest Plan.

Since this is a programmatic BA, it does not address the site-specific effects of individual projects, but rather the direct, indirect, and cumulative effects of broad program level management direction as described in the preferred alternative (alternative I) for the 2003 Revised Land and Resource Management Plan for the National Forests in Alabama.

III. AFFECTED AREA

The National Forest in Alabama are seperated into five distinct management areas, which are geographically isolated from one-another by large expanses of primarily private lands (See Map 1). These National Forest units are part of the Bankhead, Conecuh, Talladega and Tuskegee National Forests. The Talladega National Forests consists of three units: The Oakmulgee, Shoal Creek and Talladega Ranger Districts. Because the Shoal Creek and Talladega divisions share the same ecoregions and similar habitat as well as species, these units have been placed together for the analysis process.

Desired future conditions for each management area resulted in the management direction detailed in Chapter 4 of the Draft Revised Forest Plan (January 2003). Unit acres were taken from the Draft Environmental Impact Statement (DEIS) Appendices, Appendix B, Table B-2, and have been rounded to the nearest thousand. The affected areas of proposed management are described below :

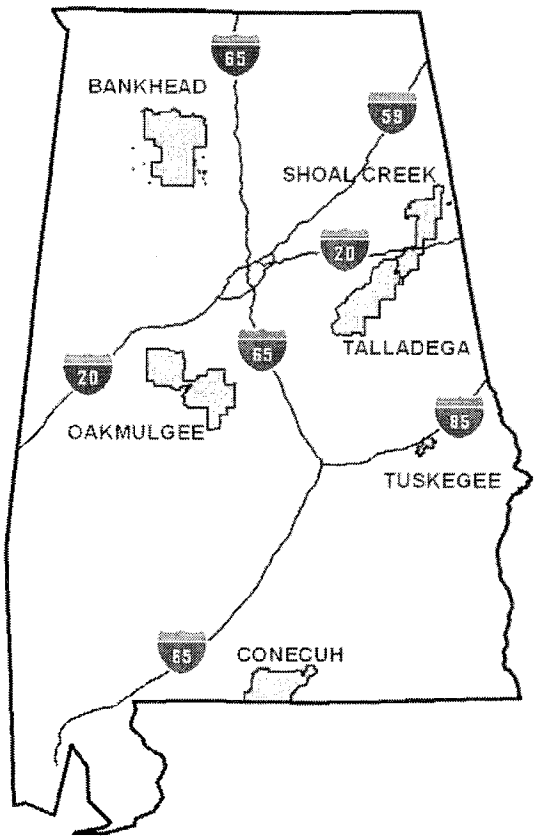
The **Bankhead National Forest**, consists of nearly 182,000 acres. Forest ownership is in Lawrence, Franklin and Winston counties, in northwest Alabama. The majority of this management unit falls within the Cumberland Plateau ecoregion. The southwestern portion of Bankhead National Forest is in the upper Gulf Coastal Plain.

The **Conecuh National Forest** contains almost 84,000 acres within Covington and Escambia counties in south central Alabama. It is completely contained within the lower Gulf Coastal Plain, with land types including the Dougherty Plains, Pine Hills, Wet Pine Flatwoods, and the Conecuh & Yellow River Floodplains.

The **Oakmulgee Division of the Talladega National Forest** has over 157,000 acres, spreading across Hale, Bibb, Chilton, Perry, Dallas & Tuscaloosa counties in west central Alabama. Located in the upper Gulf Coastal Plain, its northern section lies along the Alabama Fall Line, thus ensuring inclusions of Cumberland Plateau community associations.

The **Shoal Creek and Talladega Districts of the Talladega National Forest** contain the southernmost portion of the southern Appalachians, as well as a section of the Piedmont ecoregion. Situated in northeast Alabama, these two Districts span Cleburne, Calhoun, Talladega, Clay and Cherokee Counties, and encompass over 230,000 acres.

The **Tuskegee National Forest**, containing a little over 11,000 acres, lies within Macon county. It runs across the middle to upper Gulf Coastal Plain, making up a major portion of the Uphapee floodplain and the Tuskegee Hills land type associations.



Map 1 – Vicinity map for Alabama of National Forest Lands by unit.

IV. METHOD OF SPECIES SELECTION AND ANALYSIS

The most recent U.S. Fish and Wildlife Service list of species by Alabama counties, current available literature, best scientific information, and National Forests data bases were reviewed to reveal a list of federally listed (T&E) species of potential concern for the National Forests in Alabama. Further species list refinement was possible through a more thorough examination of distributional maps and the National Forests in Alabama T&E species data base. Species were dropped from further consideration only if there was a high degree of certainty that the species does not continue to inhabit Forest Service System lands within the State of Alabama. Species thought to be extinct throughout Alabama are not included whereas species that may be extirpated from the National Forests, but are extant within other nearby areas are retained for analysis. In addition, the distribution and occurrence of suitable rare communities were

reviewed which contained potential to harbor T&E species. Particular attention was given to those habitat associations known to contain T&E species on the National Forests in Alabama.

Species are included in detailed effects analysis if they are known or likely to inhabit the National Forests in Alabama. Species may also be discussed if suitable habitat is present and the species is known or is likely to inhabit nearby areas. Five miles was typically considered the maximum distance for species occurrences to be considered as "near" the National Forests. Exceptions included less mobile and habitat isolated species. Downstream watershed effects were also considered for up to 5 miles below Forest Service system lands.

V. FEDERALLY LISTED SPECIES – NATIONAL FORESTS IN ALABAMA

The National Forests in Alabama make up less than 3 percent of the land base of Alabama, yet contain over half of the threatened and endangered (T&E) species listed in the State. There are 51 T&E species known or suspected to occur on or near one or more of the management units comprising the National Forests in Alabama (Tables V.1, V.2, V.3). Over 50% of these species (25) are primarily aquatic, 25% are riparian obligates (10), and 25% are upland or transitional inhabitants (10). Almost all of the upland species live in or derive benefits from riparian habitat during some portion of their life cycle. Molluscs compose nearly half (23) of the listed species associated with the National Forests in Alabama, whereas plants represent 23% (12 species) and fish 12% (6 species). Amphibians (1), reptiles (3), birds (3), and mammals (2) make up most of the remainder, including 1 insect.

Terrestrial Animals:

Scientific Name	Common Name	Federal Status[1]	Management Unit of Consideration[2]				
			BA	CO	OA	TA	TU
Myotis grisescens	Gray bat	E	X	NA	NA	X	NA
Myotis sodalis	Indiana bat	E	X	NA	NA	NA	NA
Haliaeetus leucocephalus	Bald eagle	T	X	X	X	X	X
Mycteria Americana	Wood stork	E	NA	X	X	NA	X
Picoides borealis	Red-cockaded woodpecker	E	NA	X	X	X	NA
Neonympha mitchellii	Mitchell's satyr	E	NA	NA	X	NA	NA
Drymarchon corais couperi	Eastern indigo snake	T	NA	X	NA	NA	NA
Ambystoma cingulatum	Flatwoods salamander	T	NA	X	NA	NA	NA

[1] **Status: E = endangered; T = threatened; P = proposed; C = candidate; TSA = threatened due to similar appearance; S = sensitive (USFS, Southeast Region)** It should be noted that some species are listed which have historical occurrence in the vicinity of National Forest lands, are located on private lands within the admistrative boundaries, or are known to occur in one of the counties of the Forest unit.
[2]**Management Unit of Consideration: X** – Indicates species is acknowledged as known to be present (presence may be only migrational stopover, post-breeding dispersal, etc., or presence may be as seasonal or year-round resident), high potential for presence, or presence is known from near/adjacent lands, and presumed to be present on National Forest Management Unit. **NA - Not Applicable** to Management Unit; Species is Not Known, Historic, Extirpated, or Outside of Range on Management Unit.

Aquatic Animals:

Scientific Name	Common Name	Federal Status[1]	Management Unit of Consideration[2]				
			BA	CO	OA	TA	TU
Sternotherus depressus	Flattened musk turtle	T	R	-	-	-	-
Alligator mississippiensis	American alligator	TSA	-	R	-	-	-
Acipenser oxyrinchus desotoi	Gulf sturgeon	T	-	R	H	-	-
Cottus pygmaeus	Pygmy sculpin	T	-	-	-	N	-
Cyprinella caerulea	Blue shiner	T	-	-	P	R	-
Notropis cahabae	Cahaba shiner	E	-	-	P	-	-
Percina aurolineata	Goldline darter	T	-	-	R	-	-
Scaphirhynchus suttkusi	Alabama sturgeon	E	-	-	H	-	-
Epioblasma metastriata	Upland combshell	E	E	-	E	E	-
Epioblasma othcaloogensis	Southern acornshell	E	-	-	E	R	-
Epioblasma turgidula	Turgid blossom pearly mussel	E	E	-	-	-	-
Epioblasma brevidens	Cumberlandian combshell	E	HN	-	-	-	-
Lampsilis altilis	Fine-lined pocketbook	E	R	-	H	R	R
Lampsilis orbiculata	Pink mucket (pearly mussel)	E	HN	-	-	-	-
Lampsilis perovalis	Orange-nacre mucket	T	R	-	?	-	R
Lampsilis virescens	Alabama lampmussel	E	HN	-	-	-	-
Medionidus acutissimus	Alabama moccasinshell	T	R	-	-	R	-
Medionidus parvulus	Coosa moccasinshell	E	H	-	-	R	-
Pleurobema dicisum	Southern clubshell	E	-	-	R	R	P
Pleurobema furvum	Dark pigtoe	E	R	-	-	-	-
Pleurobema georgianum	Southern pigtoe	E	-	-	-	R	R
Pleurobema perovatum	Ovate clubshell	E	H	-	-	R	R
Pleurobema plenum	Rough pigtoe	E	H	-	-	-	-
Potamilus inflatus	Inflated heelspliter	T	-	-	N	-	-
Ptychobranchus greeni	Triangular kidneyshell	E	R	-	H	P	-
Elimia crenatella	Lacy Elimia	T	-	-		N	-
Leptoxis ampla	Round rocksnail	T	-	-	N	E	-
Leptoxis taeniata	Painted rocksnail	T	-	-	E	P	-
Lepyrium showalteri	Flat pebblesnail	E	-	-	P	H	-
Lioplax cyclostomaformis	Cylindrical Lioplax snail	E	-	-	P	E	-
Tulotoma magifica	Tulotoma	E	-	-	-	N	-

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[2] **Forest Units: Ba = Bankhead, Co = Conecuh, Oa = Oakmulgee, Ta – Talladega & Shoal Creek, Tu - Tuskegee**

[3] **Occurrence on Forest Units: R = recorded; P = high potential; H = historic; ? = questionable presence; N = near and likely; E = exterpated or extinct and unlikely;**

Aquatic and Terrestrial Plants:

Scientific Name	Common Name	Status[1]	Management Unit of Consideration[2]				
			BA	CO	OA	TA	TU
Clematis socialis	Alabama leather flower	E	-	-	-	N	-
Dalea foliosa	Leafy prairie-clover	E	N	-	-	-	-
Helianthus eggertii	Eggert's sunflower	T	N	-	-	-	-
Lesquerella lyrata	Lyrate bladderpod	T	N	-	-	-	-
Marshallia mohrii	Mohr's Barbara's buttons	T	R	-	N	N	-
Ptilimnium nodosum	Harperella	E	-	-	-	N	-
Sagittaria secundifolia	Kral's water-plantain	T	R	-	-	N	-
Sarracenia oreophila	Green pitcher plant	E	-	-	-	NH	-
Sarracenia rubra var al.	Alabama canebrake pitcher plant	E	-	-	RH	-	-
Thelypteris pilosa var al.	Alabama streak-sorus fern	T	R	-	-	-	-
Trillium reliquum	Relict Trillium	E	-	-	-	-	N
Xyris tennesseensis	Tennessee yellow-eyed grass	E	N	-	N	N	-

[1] **Status: E = endangered; T = threatened; P = proposed; C = candidate; TSA = threatened due to similar appearance; S = sensitive (USFS, Southeast Region)** It should be noted that some species are listed which have historical occurrence in the vicinity of National Forest lands, are located on private lands within the admistrative boundaries, or are known to occur in one of the counties of the Forest unit.

[3] **Forest Units: Ba = Bankhead, Co = Conecuh, Oa = Oakmulgee, Ta – Talladega & Shoal Creek, Tu - Tuskegee**

[3] **Occurrence on Forest Units: R = recorded; P = high potential; H = historic; ? = questionable presence; N = near and likely; E = exterpated or extinct and unlikely**

Other federally listed species are not discussed due to lack of evidence of their presence in the general geographical area, currently unsuitable habitat conditions, and/or a very low probability of occurrence on or near National Forest Lands. For example, the turgid blossom pearly mussel (*Epioblasma turgidula*) is considered extinct (TNC 2003) and is therefore not included in this assessment. The Alabama lampmussel (*Lampsilis virescens*) is now believed to be extinct in Tennessee and extant in Alabama only in the Paint Rock River, a distant watershed to the National Forests in Alabama (TNC 2003). The Pink mucket (*Lampsilis orbiculata*), the inflated heelsplitter (*Potamilus inflatus*), and the rough pigtoe (*Pleurobema plenum*) are dropped from further consideration since the last remaining habitat is confined to large rivers below dams (Wilson, Lewis Smith, and Wilson and Pickwick respectively) over 10 miles downstream from the Bankhead National Forest (TNC 2003). The intervening reservoirs, dams, tributary inflows, and downstream distances would minimize any of the possible cumulative watershed effects of Forest Service activities to insignificant. The American alligator (*Alligator mississippiensis*) has been delisted, but is retained as threatened due to a similarity of appearance to crocodiles and therefore does not need to be addressed in this assessment (USFWS 1987) (Lori Wilson, personal communication).

There currently are no species proposed for federal listing within or near the National Forests in Alabama. Candidate species will be addressed through a separate Biological Evaluation (BE) according to FS policy and regulations. Effects on Forest Service sensitive species will also be analyzed within the separate BE document as well as within the final Environmental Impact Statement (EIS).

VI. EXPLANATION OF DETERMINATIONS

Possible Determinations and the Needed Follow-up Action – The three possible determinations of effects are (1) "no effect", (2) "not likely to adversely effect", and (3) "likely to adversely affect". All the possible effects can and should be included under one of the above determinations. A "not likely to adversely affect" determination should be used for totally beneficial, insignificant, or discountable effects on federally listed, proposed, or candidate (T&E) species. A "likely to adversely affect" determination should be used for significant adverse effects, even if there may also be some beneficial effects. A "no affect" determination should be used when the proposed actions have no positive or negative effects on T&E species.

The needed follow-up actions vary depending on the species listing status and the determination. No follow-up action is required for any species if the determination is "no effect". If the species is proposed for listing, or listed as endangered, or threatened and the determination is "not likely to adversely affect" or "likely to adversely affect", coordination with the U.S. Fish and Wildlife (FWS) is needed. If the determination is "not likely to adversely affect", written concurrence is required from the FWS for both proposed and listed species. If the determination is "likely to adversely affect" and the species is proposed for listing, conference with the FWS is required. Conference is a legally required "informal consultation" with the FWS. If the determination is "likely to adversely affect" and the species is listed as threatened or endangered, formal consultation with the FWS is required. All requests to initiate formal consultation must be sent through the Regional Forester.

VII. FEDERALLY LISTED SPECIES

VII. A. FEDERALLY LISTED TERRESTRIAL AND SEMI-TERRESTRIAL ANIMALS

VII. A. 1. Red-cockaded woodpecker *(Picoides borealis)*

VII. A. 1. a. Environmental Baseline

The red-cockaded woodpecker (*Picoides borealis*) is a federally listed endangered species endemic to open, mature and old–growth pine ecosystems in the southeastern United States. Currently, there are an estimated 12,500 red-cockaded woodpeckers living in roughly 5,000 family groups across twelve states. This is less than three percent of estimated abundance at the time of European settlement (USFWS, 2003). The red-cockaded woodpecker was listed as endangered in 1970 (35 Federal Register 16047) and received federal protection under the Endangered Species Act of 1973. The precipitous decline in population size that led to the species' listing was caused by an almost complete loss of habitat. Fire-maintained old-growth pine savannas and woodlands that once dominated the southeast, no longer exist except in a few, isolated, small patches. Longleaf pine (*Pinus palustris*) ecosystems, of primary importance to red-cockaded woodpeckers, are now among the most endangered ecosystems on earth. Shortleaf (*P. echinata*), loblolly (*P. taeda*), and slash pine (*P. elliottii*) ecosystems, important to red-cockaded woodpeckers outside the range of longleaf, also have suffered severe declines (USFWS, 2003).

In 1986, red-cockaded woodpecker populations were on Bankhead NF, Conecuh NF, Oakmulgee Division (of Talladega NF), Talladega Division (of Talladega NF), and Tuskegee NF (Costa and Escano, 1989). By 1992 the Tuskegee population had been extirpated (Escano 1995). Today, red-cockaded woodpecker populations remain on Conecuh NF, Oakmulgee Division, and Talladega Division. Populations on Bankhead NF were extirpated since 1992. The Bankhead and Tuskegee populations were already very small in 1986. Unlike earlier declines that led to the species' listing, these later extirpations were not the result of timber harvesting. Two trends account for these later population extirpations: first, a loss of the two-layered, (open pine canopy and herbaceous groundcover) forest structure; followed by a loss of the pine-dominated forest composition, required by red-cockaded woodpeckers. Hardwood midstory within active clusters has been associated with cluster abandonment (Loeb et al. 1992). These extirpations were the result of unimpeded succession, through a lack of adequate burning and thinning in pine and pine-hardwood stands. Fire suppression has severe and numerous impacts on southern pine ecosystems, including changes in tree species composition and forest structure (USFWS, 2003).

Table RCW-1 identifies remaining red-cockaded woodpecker populations on National Forests in Alabama, and their current size. Long-term population goals were determined in cooperation with the U.S. Fish and Wildlife Service as part of the Revised Recovery Plan in defining species recovery standards. Short-term population goals, established as part of this Forest Plan revision, are defined as population increase objectives over the next ten years. These objectives reflect the minimum population growth rate directed in the Revised Recovery Plan. Greater population growth rates during the planning period are desirable and encouraged, where aggressive habitat restoration progress is possible.

Southern pine forests today are very different from pre-colonial forest communities, not only in extent but also in species composition, age, and structure (Ware et al. 1993, Noel et al 1998). Original pine forests were old, open, and contained a two-layered structure of canopy trees and diverse, pyrophytic grass and forb groundcovers. These forests were dominated by longleaf in the coastal plain, longleaf/shortleaf/loblolly in the Piedmont and interior highlands, and slash in south Florida. Much of today's pine forests are young, dense, and dominated by loblolly pine, with a substantial hardwood component resultant of fire exclusion or the exclusive use of dormant season burning. Today's pine forests have dense, shade-tolerant mid-stories and little or no groundcover (Ware et al. 1993).

Table RCW-1: Red-cockaded Woodpecker Habitat Management Area Population Objectives

RCW HMA	2002 Active Clusters	Long-Term Population Goal	Short Term Population Goal	Recovery Designation
Shoal Creek	8	125	18	Essential Support
Talladega	0	110	10	Essential Support

Oakmulgee	120	394	185	Secondary Core
Conecuh	19	309	28	Secondary Core

Current threats to red-cockaded woodpecker recovery on National Forest lands are: the loss of roosting and nesting substrate through past over-harvest or die-off of mature pines; the loss of foraging habitat and proper stand structure through encroachment of woody vegetation into preferred herbaceous ground-covers in the absence of dormant- and, especially, growing-season fires; and the loss of suitable habitat through unimpeded succession of pine and pine-hardwood stands toward hardwood-dominated conditions. Red-cockaded woodpeckers' naturally low fecundity and the potential effects of isolation, habitat fragmentation, and cavity competition exacerbate these habitat limitations (USFWS 2003). Management actions to alleviate these threats include: the production and retention of pine trees 100+ to 120+ years old, depending on tree species; the installation of artificial roosting and nesting cavities; the protection of artificial and natural cavities from competitors; the restoration and maintenance of low (50-80 sq. ft per acre) basal areas of trees in upland pine and pine hardwood forest stands; the restoration of native pine species to altered, off-site plantations and other appropriate upland sites; and control of hardwood midstory encroachment through the use of mechanical, chemical, and prescribed burning methods.

Both dormant season and growing season burns can be utilized to maintain red-cockaded woodpecker habitats; however, growing season burns are more efficacious in killing encroaching hardwoods, restoring habitat structure, and favoring the development of native, pyrophytic grasses and forbs. Population management techniques to be utilized include: capture, banding and monitoring of individual birds; translocation of birds from donor populations; and intra-population translocations. Population management techniques will follow Revised Recovery Plan requirements for permits, training, and compliance.

Project-level decisions implementing red-cockaded woodpecker improvement actions will include: restoration of off-site pine stands with native pine species; regeneration of limited mature pine stands with retention of potential roost trees; thinning of mid-successional and mature pine and pine-hardwood stands; prescribed burning to remove encroaching woody vegetation and restore herbaceous ground-covers; and chemical and mechanical treatment of midstory hardwoods where fire is not a viable management tool.

Table RCW-2: Red-cockaded Woodpecker Habitat Management Area Objectives

RCW HMA	**Total HMA Size**	**Sub-HMA Size**	**Minimum Number of *Recovery Standard* Foraging Acres Restored**
Shoal Creek	67,397	25,000	3000 (25 cluster sites)

Talladega	56,850	19,000	1800 (15 cluster sites)
Oakmulgee	98,584	NA	24600 (205 cluster sites)
Conecuh	56,223	NA	4200 (35 cluster sites)

Table RCW-2 shows the minimum number of acres that must be restored to the level defined in the Revised Recovery Plan as the Recovery Standard foraging acres. The Recovery Standard for foraging states: For medium to high productivity sites (defined in that Plan as site index 60 or higher) provide each group of woodpeckers 120 acres of good quality habitat which has some large old pines, low densities of small and medium pines, sparse ($\leq$ 7 ft tall) or no hardwood midstory, and groundcovers consisting of $\geq$ 40% native bunchgrasses and pyrophytic forbs within 0.5-miles of the cluster. This habitat condition can only be achieved through the use of all of the habitat management actions previously described. For sites with low productivity (site index < 60) provide 200 – 300 acres of good quality foraging habitat.

VII. A. 1. b. Direct, Indirect, and Cumulative Effects – Red-cockaded woodpecker

Direct effects to red-cockaded woodpeckers include mortality of individual red-cockaded woodpeckers related to capture, handling, translocation, or prescribed fire. Prescribed fire, even when employed within prescription and Revised Recovery Plan guidelines, may result in the loss of individuals if nest trees are burned during nesting season. However, for the period of 1998-2002 all RCW properties managing their habitats with prescribed fire, burned 6195 active clusters with no losses of nests (Costa 2003). The Revised Recovery Plan increases the protection standard (area raked around each roost tree) above those used during the compilation of the data cited above. Therefore, the potential for mortality red0cockaded woodpeckers during nesting season due to prescribed fire is deemed insignificant and discountable, with standard mitigations given in the Recovery Plan. Losses of individual cavity trees to fire can be compensated by installation of artificial cavities. Avoidance of prescribed burning during the nesting season is not recommended, since nesting season coincides with timing favorable for other important ecological fire effects.

Indirect effects to red-cockaded woodpeckers occur at the landscape level and at the population level. There will be beneficial effects of the habitat management actions to red-cockaded woodpecker habitats and populations. Harmful habitat isolation and fragmentation effects will be reduced as suitable habitat areas are enlarged and joined across the Habitat Management Areas. Population expansion will be fostered by: restoration of off-site pine stands with native pine species; regeneration of limited mature pine stands with retention of potential roost trees; thinning of mid-successional and mature pine and pine-hardwood stands; prescribed burning to remove encroaching woody vegetation and restore herbaceous ground-covers; chemical and mechanical treatment of encroaching midstory where fire is not a viable management tool; installation of artificial roosting and nesting cavities; protection of artificial and natural cavities from competitors through the installation of excluder devices; capture, banding and monitoring

of individual birds to facilitate monitoring of the population; and translocation of birds as necessary to optimize annual reproduction.

Cumulative effects to red-cockaded woodpecker populations over the long-term are expected to be population growth at rates prescribed in the Revised Recovery Plan, Recovery Plan population objective attainment, and ultimately, recovery of the species. Management of red-cockaded woodpecker populations on National Forests in Alabama will be according to the RCW EIS Record of Decision and the Revised Recovery Plan as required by the Endangered Species Act, and will not vary by alternative. Habitat Management Areas for red-cockaded woodpeckers have been established on the Talladega, Conecuh, and Oconee National Forests through direction in the Revised Recovery Plan for red-cockaded woodpeckers. Management direction has been incorporated into forest plans through the allocation of acres to the Red-cockaded Woodpecker Habitat Management Area Prescription (RX-8.D.) and/or the Red-cockaded Woodpecker sub-Habitat Management Area Prescription (RX-8.D.1) and through forest-wide protections of endangered species. Additional benefits to the red-cockaded woodpecker will be derived from areas in the following Prescription Allocations: Rare Communities Prescriptions (Coastal Plain Sandhills, Coastal Plain Bogs, Woodlands, savannas and grasslands), Restoration of Longleaf and Shortleaf Ecosystem Prescriptions, and Dispersed Recreation with Vegetation Management Prescriptions (where the target recreational activity requires vegetation management producing open, park-like forest stands (e.g. quail hunting)).

Beneficial management actions required to implement the Revised Recovery Plan include: the harvesting of timber, including thinning and regeneration; the use of mechanical, chemical, and prescribed burning midstory and hardwood encroachment control methods; the installation of artificial roosting and nesting cavities; the protection of artificial and natural cavities from competitors through the installation of excluder devices; the capture, banding and monitoring of individual birds; the translocation of birds from donor populations to recipient populations; and intra-population translocations, as necessary to optimize annual reproduction. Mitigation actions required under the Revised Recovery Plan for habitat management include: protection of active and inactive cavity trees within burn units; utilization of two-aged regeneration method rather than clear-cutting; rotation ages not less than 120 years for longleaf and shortleaf, and 100 years for loblolly and slash pines; limitation of regeneration area size; and limitation of operable season to avoid nesting and brood-rearing periods in active clusters.

VII. A. 1. c. Determination of Effect – Red-cockaded woodpecker

Implementation of the Revised Land and Resource Management Plan for the National Forests in Alabama is **"not likely to adversely affect"** the red-cockaded woodpecker, as residual potential risks to individuals after full implementation of protective measures are insignificant and discountable. Additional site-specific analysis would be done on all projects with the potential for affecting this species.

VII. A. 2. Bald eagle *(Heliaeetus leucocephalus)*

VII. A. 2. a. Environmental Baseline

The bald eagle ranges over most of the North American continent, from as far north as Alaska and Canada, down to Mexico. Experts believe that in 1782 when the bald eagle was adopted as our national bird, their numbers may have ranged from 25,000 to 75,000 nesting pairs in the lower 48 states. Since that time the species has suffered from habitat destruction and degradation, illegal shooting, and most notably from contamination of its food source by the pesticide DDT. In the early 1960's, only 417 nesting pairs were found in the lower 48 states. In 1999, more than 5,748 nesting pairs of bald eagles were recorded for the same area, resulting primarily from the banning of DDT in the United States in 1972 aided by additional protection afforded under the Endangered Species Act (USDI, Fish & Wildlife Service, 1999).

Bald eagles have few natural enemies but usually prefer an environment of quiet isolation from areas of human activity (i.e. boat traffic, pedestrians, or buildings), especially for nesting. Their breeding areas are generally close to (within 4 km) coastal areas, bays, rivers, lakes, or other bodies of water that reflect general availability of primary food sources including fish, waterfowl, rodents, reptiles, amphibians, seabirds, and carrion (Andrew and Mosher 1982, Campbell et al. 1990). Although nesting territory size is variable, it typically may encompass about 2.59 square kilometers. Most nest sites are found in the midst of large wooded areas adjacent to marshes, on farmland, or in logged-over areas where scattered seed trees remain (Andrew and Mosher, 1982). The same nest may be used year after year, or the birds may alternate between two nest sites in successive years. Bald eagles mate for life and are believed to live 30 years or more in the wild. Breeding bald eagles in Virginia appear to be permanent residents, whereas the young disperse extensively northward and southward. Although bald eagles may range over great distances, they usually return to nest within 100 miles of where they were raised (USDI, Fish & Wildlife Service, 1995).

Winter home ranges for eagles can be very large, especially for non-breeding birds. They generally winter throughout the breeding range but are more frequent along the coast. These birds commonly roost communally. The Bald Eagle was a locally common, breeding and wintering resident in Alabama on the Gulf Coast and the Tennessee Valley before 1960 (Imhof, 1976). Today the species is a rare to uncommon breeding and wintering resident. There have been confirmed sightings on the CNF, usually around large bodies of water such as lakes or ponds, at Open Pond, private land north of Wing, AL, and at Brooks Hines Lake. As recently as 1999, a pair of eagles established a nest at Brooks Hines Lake and successfully fledged at least one chick. During 2001, eagles nested on the opposite side of Brooks Hines Lake but no success was observed.

The primary threats to the bald eagle include loss of nesting, foraging, and roosting habitat especially along shorelines, disturbance by humans, biocide contamination, decreasing food supply, and illegal shooting (Byrd and Johnstone, 1991, Buehler et al, 1991). Bald eagles also have died from lead poisoning as a result of feeding on waterfowl that had inadvertently ingested lead shot. In 1991, the U.S. Fish and Wildlife Service completed a program to phase out lead shot for waterfowl hunting.

VII. A. 2. b. Direct, Indirect, and Cumulative Effects – Bald eagle

Direct effects to bald eagles, in the form of fatalities to individual birds, are not likely to occur through normal, legal, management actions and activities occuring on National Forests in Alabama.

Indirect effects to bald eagles and their habitat could occur. Negative indirect effects include disturbance that would result in breeding or nesting failure, and alteration of occupied habitats. Timber harvesting or road building activities have the potential to impact the bald eagle or its habitat, should it occur near streams, lakes, or other wetlands. Human disturbance from roads, trails, and campgrounds can also adversely affect the use of an area for nesting or roosting by eagles. Beneficial indirect effects could result through the protective emphases in Canyon Corridor, Rare Community, Riparian, and Wild and Scenic River prescriptions allocated to suitable potential habitats.

Cumulative effects to bald eagle populations are expected to be negligible under all alternatives. The Revised Forest Plan and all alternatives include a standard establishing 1500-foot protection zones around bald eagle nests and communal roost sites. Vegetation management that would affect forest canopy within these zones is prohibited, and other activities that may disturb eagles are prohibited within these zones during periods of use. The Riparian Prescription, with its emphasis on low levels of disturbance and maintenance of mature forest, provides direction for management of shorelines where bald eagles may forage. No additional specific provisions related to foraging habitat are included due to the variety of circumstances that may be involved. These issues would be addressed during site-specific analysis.

VII. A. 2. c. Determination of Effect – Bald eagle

Because this management direction addresses critical needs for habitat and protection of roosts and nests from human disturbance, the Revised Forest Plan and alternatives are **"not likely to adversely affect"** the bald eagle, and should provide conditions beneficial to this species. Additional site-specific analysis would be done on all projects with the potential for affecting this species.

VII. A. 3. Wood stork *(Mycteria americana)*

VII. A. 3. a. Environmental Baseline

The United States breeding population of wood storks is listed as an endangered species. This species may have formerly bred in all the coastal Southeastern United States from Texas to South Carolina. Currently, they breed throughout Florida, Georgia, and coastal South Carolina Post-breeding storks from Florida, Georgia, and South Carolina occasionally disperse as far north as North Carolina and as far west as Mississippi and Alabama. Storks sighted in Arkansas, Louisiana, Texas, and points farther west may have dispersed from colonies in Mexico. The amount of overlap and/or population interchange is unknown (U. S. Fish and Wildlife Service 1996).

The estimated total population of nesting storks throughout the southeastern United States declined from 15,000 to 20,000 pairs during the 1930's to a low of between 4,500 and 5,700 pairs for most years between 1977 and 1980. Since 1983, the U.S. population has ranged between 5,500 and 6,500 pairs. Factors contributing to the decline include loss of feeding habitat, water level manipulations affecting drainage, predation and/or lack of nest tree regeneration, and human disturbance (U. S. Fish and Wildlife Service 1996).

Wood storks use a variety of freshwater and estuarine wetlands for nesting, feeding, and roosting. Freshwater colony sites must remain inundated throughout the nesting cycle to protect against predation and abandonment. Foraging sites occur in shallow, open water where prey concentrations are high enough to ensure successful feeding. Good feeding conditions usually occur where the water column is uncluttered by dense patches of aquatic vegetation. Typical foraging sites throughout the species range include freshwater marshes and stock ponds, shallow, seasonally flooded roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, managed impoundments and depressions in cypress heads and swamp sloughs. Almost any shallow wetland depression where fish become concentrated, either through local reproduction or the consequences of area drying may be used as feeding habitat (U. S. Fish and Wildlife Service 1996).

The wood stork is fairly common but irregular in the coastal plain of Alabama in the summer and fall, and farther north it is rare to uncommon, occuring mostly in the Tennessee Valley (Imhof 1976). Wood storks are not known to be resident during breeding or wintering seasons on National Forests in Alabama. Occasional transients are known to occur on the Conecuh, and may exploit seasonal wetlands on Oakmulgee and Tuskegee as post-breeding storks disperse in late summer and fall.

VII. A. 3. b. Direct, Indirect, and Cumulative Effects – Wood stork

No direct effects to woodstorks are expected under any of the alternatives. No breeding colonies of woodstorks are known to occur on National Forests in Alabama.

Indirect effects include alteration of habitat being utilized by woodstorks on National Forests in Alabama. Woodstorks are only known to utilize shallow wetlands on National Forest management units in the lower coastal plain during the late summer and early fall. This period is called the post-breeding dispersal period. Openings in forested wetlands, beaver swamps, and other open, shallowly flooded wetlands used by wood storks as foraging sites are all protected by the riparian prescription (11), and are not often the target of management actions. The riparian corridor standards insure that these sites would be managed to retain, restore, and/or enhance the inherent ecological processes and function of the associated aquatic, riparian, and upland components within the corridor. The appropriate Wetland Rare Community (9F) standards also would be applied to natural wetland sites which may be used for foraging as well as other wetland sites that may be used in the future. The wetland rare communities would be managed under all alternatives for protection, maintenance, and where possible, restoration. Additional potentially suitable habitats are protected in the Wilderness (1), and Wild and Scenic River (2) prescriptions. The riparian corridor and rare community standards discussed above would ensure that vegetative and hydrologic conditions of existing

and potential wood stork foraging areas will be protected under all alternatives. These potential indirect effects to woodstork habitat, though beneficial, are insignificant, due to the relatively low level of use of heavily forested lands such as National Forests in Alabama, by woodstorks. No indirect effects to woodstorks are expected under any of the alternatives.

No nesting colonies are present on any National Forests in Alabama management unit. However, as loss of foraging habitat is considered one of the causes for the decline of this species, protection of foraging habitat can contribute to the recovery of this species. The riparian corridor and wetland rare community standards and foraging area standards described above are the same under all alternatives and across all Forests. Therefore, there will be no adverse cumulative effects to these wetland communities or to the wood stork and other associated species.

VII. A. 3. c. Determination of Effect – Wood stork

Through the implementation of riparian corridor and wetland rare community standards, and foraging areas standard discussed above, implementation of any Plan alternative will have **"no effect"** to wood stork. Additional site-specific analysis would be done on all projects with the potential for affecting this species.

VII. A. 4. Gray bat *(Myotis grisescens)*

VII. A. 4. a. Environmental Baseline

The gray bat occupies a limited geographic range in limestone karst areas of the southeastern U.S. (USDI FWS 1982). The bat is more narrowly restricted to cave habitats than any other mammal occurring in the U.S., and occupies caves year-round. Most individuals migrate seasonally between maternity and hibernating caves. About 95% of the known population inhabits nine winter caves, none of which is located on or near NFAL.

Limiting factors for the gray bat may include warm caves in the northern portion of its range, and cold caves in the southern portion. A key cause of decline appears to be human disturbance and loss of cave habitat quality. The recovery plan (USDI FWS 1982) recommends actions focused on cave acquisition and gating.

Deforestation of areas around occupied cave entrances and in between caves and large water sources (feeding corridors) may have a detrimental effect. Forest cover provides protection from predators, especially for young bats. Retention of forested corridors around cave entrances, along river and perennial stream edges, and along reservoir shorelines within 25 km of known gray bat maternity caves is important (USDI FWS 1982, Best et al 1995).

Although the gray bat is currently listed as endangered, some bat researchers have endorsed a proposed status change to threatened due to population increases and successful protection of many inhabited caves (Currie and Harvey 2002). Gray bats are now estimated to number over 2.6 million individuals.

Both major hibernacula and Priority 1 maternity caves are known from Alabama and Tennessee. However, those caves are over 50 miles from the nearest Forest Service management unit, that being the northern extent of the Talladega Division of Talladega National Forest. An individual Gray bat was reportedly mist-netted over Choccolocco Creek in 1995 near the Talladega Division. A new cave was recently found on Talladega Division, but contained no Gray bats during the initial, and a subsequent, survey. There is potential for gray bat use of Talladega Division. Gray bats are known from two caves on Bankhead National Forest. No known maternity sites exist on or within the proclamation boundary of either management unit.

VII. A. 4. b. Direct, Indirect, and Cumulative Effects – Gray bat

Direct effects to individual gray bats are not likely through normal, legal activities. Possible indirect effects under all alternatives are alteration of cave habitats through management or human recreation activities; removal of forest cover around caves or along riparian foraging corridors; and loss of water quality limiting production of aquatic insects.

Indirect effects to gray bat caves would be the same under all alternatives. For each alternative, standards would protect all hibernacula and maternity colony sites that are discovered or purchased. Forest wide standards require installation of gates or other protective structures at entrances of all caves and mines occupied by significant populations of all bats. Human intrusion would be controlled within .25 miles of these sites. These sites would be protected by maintenance of a .25 mile vegetated buffer. Standards also require development of prescribed burning plans that identify caves and mines as smoke-sensitive targets. Until caves and mines have been surveyed for use by bats, it is assumed that federally-listed bats are present and habitat is maintained for them.

Indirect effects on foraging habitat are expected to be the similar under all alternatives since riparian corridors will be well protected by SMZ guidelines and/or the Riparian Prescription. The National Forests in Alabama have allocated 112,387 acres of riparian corridor along all perennial streams (1,648 miles) and all intermittent streams (1,491 miles). These acres will be managed under Prescription 11 (Riparian Corridors) for all alternatives. The objective of this prescription is to retain, restore or enhance ecological processes and functions of these systems. The minimum forested corridor width provided for perennial streams, lakes and ponds is 100 feet on either side of the waterway. In addition, National Forests in Alabama will retain its pre-existing Streamside Management Zone guidelines that provide protection for an additional 11,306 miles (64,494 acres) of ephemeral drainages. These standards will not only provide forest cover for foraging and protection from predation, but will also ensure high water quality to support the aquatic insect prey base. Further site-specific consultation with U.S. Fish and Wildlife Service would be required for projects within 20 miles of known maternity sites, if those projects may affect canopy cover along perennial streams or forested lake shorelines.

VII. A. 4. c. Determination of Effect – Gray bat

The Revised Forest Plan and its alternatives is **"not likely to adversely affect"** this species because this management direction addresses the critical needs for habitat and protection of the

gray bat and should improve or maintain foraging, roosting and maternity/hibernacula habitat conditions for this species. Additional site-specific analysis would be done on all projects with the potential for affecting the species.

VII. A. 5. Indiana bat *(Myotis sodalis)*

VII. A. 5. a. Environmental Baseline

The distribution of Indiana bats is generally associated with limestone caves in the eastern U.S. (Menzel et al. 2001). Within this range, the bats occupy two distinct types of habitat. During summer months, maternity colonies of more than 100 adult females roost under sloughing bark of dead and partially-dead trees of many species, often in forested settings (Callahan et al. 1997). Reproductive females require multiple alternate roost trees to fulfill summer habitat needs. Adults forage on winged insects within three miles of the occupied maternity roost. Swarming of both males and females and subsequent mating activity occurs at cave entrances prior to hibernation (MacGregor et al. 1999). During this autumn period, bats roost under sloughing bark and in cracks of dead, partially-dead and live trees.

Wintering colonies require very specific climatic regimes within cold, humid caves or mines primarily west of the Appalachian Mountains (Barbour and Davis 1969; Menzel et al. 2001). Few sites provide these conditions, and approximately 85% of the entire known population inhabits only nine caves or mine shafts (Menzel et al. 2001; USDI FWS 1999).

Although most hibernacula have been protected, the Indiana bat range-wide population has declined by about 60% since the 1960's (USDI FWS 1999). Causes of decline are not known; declines have continued despite efforts to protect all known major hibernacula. Researchers are focusing studies on land use practices in summer habitat, heavy metals, pesticides and genetic variability in attempt to find causes for the declines.

Hibernacula are known to Bankhead National Forest. Recommended habitat management includes protecting known significant hibernacula from human impacts, retaining forested condition around the entrances to significant hibernacula, and evaluating opportunities to protect Indiana bats through land acquisition (Menzel et al. 2001).

It is difficult to quantify summer roosting habitat for Indiana bat at a range-wide, regional or local level due to the variability of known roost sites and lack of knowledge about landscape scale habitat characteristics of maternity roosts. Within the planning area, maternity roost sites are known from Virginia and Tennessee. Forest management practices that affect occupied roost trees may have local impacts on Indiana bat populations. However, the bats live in highly altered landscapes, depend on an ephemeral resource--dead and dying trees--and may be very adaptable. Anecdotal evidence suggests that these bats may respond positively to some degree of habitat disturbance (USDI FWS 1999).

Two winter hibernacula are known from the Bankhead National Forest. Current research efforts are seeking to establish the use of Bankhead National Forest by Indiana bats outside of the hibernation period. Research partially funded by Forest Service has documented the use of

tree roosts on Bankhead National Forests in fall, prior to the winter hibernation period. No maternity roosts or summer tree roosts have been identified on Bankhead National Forest. However, there is some likelihood that portions of Bankhead National Forest near, and north of the winter hibernacula, may support summer maternity colonies.

General standards that would help ensure adequate roost habitat include retention of snags whenever possible; prescribed burning to restore and maintain uncluttered, open midstory foraging conditions (using only cool season backing fires in karst areas); and ensuring a continuous supply of oaks, hickories, and ash as well as other trees with exfoliating bark (Menzel et al. 2001).

VII. A. 5. b. Direct, Indirect, and Cumulative Effects – Indiana bat

Properly implemented prescribed burns have the potential to provide beneficial effects including improvement of foraging habitat conditions and creation of additional roosts. The flame lengths of prescribed burns are not likely to have a direct effect on roost trees. Indiana bats would be absent from the general forest area during all dormant season fires.

Potential roost trees could be directly affected by vegetation management, firewood and salvage sales, routine maintenance/permitting of small clearings including easements, rights-of-way and reasonable access to privately-owned lands, and road construction. Implementation of Alternative D could result in the highest levels of vegetation disturbance and possible impact to currently occupied and potentially occupied roost trees. For any alternative that allows active vegetation management during the period young are nonvolant, there is a small potential for "take" of a maternity roost tree. However, standards described below would further minimize the chance of take for all alternatives.

Growing season burns (conducted June 1 through August 1) have the potential to have direct effects on roost trees and particularly nonvolant young, and there is potential for "take". To avoid injury to young bats, site-specific (project level) surveys for Indiana bat would be required in potential maternity roost habitat under all alternatives to determine that the bats are not likely present before implementing the burn. If Indiana bats are detected, project-level consultation with U.S. Fish and Wildlife Service would occur.

Indirect effects would be similar under alternatives A, B, E, G, and I, because Streamside Management Zones, and Riparian and Rare Community (Caves and Mines) prescription standards would provide consistent protective measures. Alternatives D and F do not afford Riparian Prescription protections, however all alternatives include the use of Stramside Management Zone Protections as amended to the existing Forest Plan. Until caves and mines have been surveyed for use by bats, it is assumed that federally-listed bats are present and habitat is maintained for them. Human intrusion would be controlled within 0.25 miles of these sites by closing public access routes and by prohibiting recreational activities (camping, fire-building) within this zone. Forest wide standards require installation of gates or other protective structures at entrances of all caves and mines occupied by significant populations of all bats, including Indiana bats.

Under all alternatives, known Indiana bat roosts would be protected from cutting and modification until they were no longer suitable, unless treatments were needed for public or employee safety. This action would require project-level consultation with U.S. Fish and Wildlife Service. Snags with exfoliating bark would be protected unless projects involved salvage harvests, insect and disease control, or facility construction. Larger shagbark hickories would not be cut for fuel wood, and snags would not be cut for fuel wood between May 1 and August 15, when maternity roosts may be present. All types of vegetation treatments (salvage, even-aged and uneven-aged regeneration) would require varying levels of snag retention and specific retention of leave trees. Routine (non-catastrophic) salvage treatments occurring between May 15 and August 15 would require site-specific (project level) surveys for Indiana bat to determine that the bats are not likely present before implementing the treatment. This would require project-level consultation with U.S. Fish and Wildlife Service. Treatment of catastrophic salvage events would require a separate NEPA analysis and appropriate level of consultation with U.S. Fish and Wildlife Service.

VII. A. 5. c. Determination of Effect – Indiana bat

For all alternatives of the Revised Forest Land and Resource Management Plan, the determination of effect is **"not likely to adversely affect"** Indiana bat. Management direction addresses the critical needs for habitat and protection of the Indiana bat and should improve or maintain foraging, roosting and hibernacula habitat conditions for this species. The levels of vegetation management allowed within cave protection zones are not likely to diminish summer roosting or foraging habitat in a significant way. Summer roosting use on Bankhead National Forest has not been established by ongoing research efforts. However, the possibility for "take" cannot be completely eliminated with any level of management. Forestwide standards should reduce the potential for "take" to levels that are insignificant and discountable. Additional site-specific analysis would be done on all projects with the potential for affecting this species.

VII. A. 6. Mitchell's satyr *(Neonympha mitchellii)*

VII. A. 6. a. Environmental Baseline

Neonympha mitchellii French has been referred to as one of the most restricted (Parshall and Kral, 1989) and critically endangered butterflies in eastern North America (Shuey, 1997; Roble et al., 2001). Prior to the discovery of an additional population in 1983, the species' known global range included occurrences from Michigan, Indiana, northeastern Ohio, northern New Jersey, and perhaps Maryland. Over 30 historical populations were collectively known from these states, but by 1990, the species was considered extirpated from all but Michigan and Indiana (USFWS, 1998). The results of a morphological comparison of individuals found by Parshall and Kral in 1983 in North Carolina, led to the separation of *N. mitchellii* into a complex of two subspecies: the nominate form, *N. m. mitchellii* (Mitchell's satyr), representing the Michigan-Indiana populations and the North Carolina population as *N. m. francisci* (St. Francis satyr). On 11 July 1998, an additional population of *N. mitchellii* was discovered in Floyd County, Virginia. Preliminary morphological examinations of *N. mitchellii* from Virginia suggest that these populations may be assigned to the subspecies *francisci* (Roble et

al., 2001).

On 24 June 2000, a single male Mitchell's satyr was photographed in the Oakmulgee Ranger District of the Talladega National Forest, Bibb County, Alabama. On 5 June 2001, the first colony or deme for Alabama was located and documented by a series of photographs. However, the taxonomic identity of Alabama's population(s) has not been determined. If the satyr in Alabama is determined to be either subspecies *mitchellii* or *francisci*, the same legal status and protection afforded to each taxon will also be applied to the colonies in Alabama. Conversely, if the satyr is determined to represent a taxon new to science, then a description of this butterfly will have to be undertaken and a new federal listing process initiated, if deemed appropriate.

Both *N. m. mitchellii* and *N. m. francisci* are highly specialized and selective in their habitats. Both species are federally listed: *N. m. mitchellii* was listed as Endangered on 20 May 1992 and *N. m. francisci* was listed as Endangered on 26 January 1995. The nominate subspecies inhabits calcareous fens that support a herbaceous community dominated by sedges with scattered shrubs (Shuey, 1997). *N. m. francisci* satyr is found primarily in wet meadows dominated by an assortment of sedges and wetland graminoids; often relicts of beaver activity (USFWS, 1996). Based on observations on the Oakmulgee Ranger District of the Talladega National Forest, the apparent habitat preference for the satyr in Alabama, is the interface of lowland shrub-sedge marshes and forested swamps that have been influenced or created by beaver activity. Due to such high habitat specificity, both subspecies have experienced alarming declines and extirpations from former localities throughout their respective ranges. The primary cause of these declines is centered upon wetland alteration, degradation, and destruction through the draining and conversion of these habitats to other forms of land use such as agriculture, road construction, and development (Shuey, 1997). Secondary factors adversely affecting this species complex can be attributed to the removal and elimination of the elements that help to create suitable wetland habitat for the satyr such as widespread beaver eradication and control programs and the disruption of the natural fire regime. This secondary factor in habitat loss seems particularly relevant to Alabama populations. A third factor implicated as the cause for some localized extinctions (e.g., as reported for the New Jersey populations) is over-collection (TNC, ALNHP 2002).

VII. A. 6. b. Direct, Indirect, and Cumulative Effects – Mitchell's satyr

The main factors in local extirpation of Mitchell's satyr, wetland alteration, degradation, and destruction through draining and conversion of land use, occurred on surrounding private lands across the landscape in the past. These factors are beyond the control of the Forest Service. Secondary factors adversely affecting this species complex can be attributed to the removal and elimination of the disturbance elements that historically created suitable wetland habitat for the satyr. Beaver impoundments that later succeeded into wet herbaceous ecosystems, and herbaceous wetlands occurring in woodland and savanna complexes maintained by fire, were likely the historic native habitat of satyrs. Widespread beaver eradication and disruption of the natural fire regime allowed natural succession to further reduce suitable habitat. A Forest Supervisor's Closure Order on the collection of butterflies, especially for Mitchell's Satyrs was

enacted on the Oakmulgee Division. Enforcement of this Order aims to protect satyrs from local extirpation due to collection.

Habitat succession factors are particularly relevant to Alabama populations and may be controlled by purposeful forest management. The Forest Plan Revision includes a rare community prescription that would protect many wetland types potentially utilized by satyrs. The Oakmulgee Division is targeted to restore woodlands and savanna complexes, increasing the area and types of wetlands available as potential satyr habitat. Alternatives A, B, E, G, and I include the Riparian Prescription which conserves riparian values in a corridor along streams. These areas include open water, and perennial and intermittent streams. National Forests in Alabama instituted Streamside Management Zones in 1995, which would be continued under all of the alternatives, to protect ephemeral, intermittent and perennial drainages. The wetlands protected under these management directions would adequately protect known and potential satyr habitats.

VII. A. 6. c. Determination of Effect – Mitchell's satyr

Implementation of the Revised Land and Resource Management Plan for the National Forests in Alabama is **"not likely to adversely affect"** Mitchell's satyr. Genetic taxonomic identity of Alabama's Mitchell's satyr occurences has not yet been confirmed. None-the-less, management direction addresses the critical needs for habitat and protection of Mitchell's satyr and should improve or maintain suitable habitats for this species. The possibility for "take" cannot be completely eliminated with any level of management. Forestwide standards for riparian and streamside management zone protections should reduce the potential for "take" to levels that are insignificant and discountable. Additional site-specific analysis would be done on all projects with the potential for affecting this species.

VII. A. 7. Eastern indigo snake *(Drymarchon corais couperi)*

VII. A. 7. a. Environmental Baseline

Drymarchon corais couperi (Holbrook) was federally listed as Threatened in January of 1978 (USFWS 1982). This long, heavy-bodied snake is shiny blue-black overall, with chin, head, and sides of neck suffused with cream, orange, or red. Individuals range widely (50-100 ha) in warmer months between sandhills and riparian and swamp habitats. During cooler months they remain within a smaller range (10 ha) and utilize the deep holes of rotting tree roots, or gopher tortoise burrows in sandhills communities. The species historic range included southern Alabama, however, its current range indicates that they are likely very rare or extirpated in Alabama (NatureServe 2001).

In a survey conducted by Bob Mount (1980) in fulfillment of a contract with Forest Service, Mount concluded, " Intensive efforts to locate this snake, or substantive evidence of its presence, in Conecuh National Forest were unsuccessful. It has not been located anywhere in Alabama since 1954, although it does occur at a few localities in the Florida panhandle. I am reasonably certain that there are no remnants of the native population of this species in Conecuh National Forest, although the possibility should not be discounted." Reintroduction

efforts followed on Solon Dixon Forestry Center. This population was considered successful in a 1990 USFWS report to Congress (NatureServe, 2001), however, the last documented occurrence of an individual of this population was in 1991 (Johnson, personal communication), and no Indigo snakes have been documented on Conecuh National Forest during recent and ongoing herpetofaunal surveys (Guyer, pers. comm., and Bailey, pers comm.). Experimental reintroductions of that era were usually exempt from Endangered Species Act protections.

VII. A. 7. b. Direct, Indirect, and Cumulative Effects – Eastern indigo snake

As a top carnivore, the indigo snake likely existed in low population densities. The main factors in local extirpations of indigo snakes remains conversion of habitats, fragmentation of habitats by roads, agricultural uses, and other inhospitable habitats, followed by a loss of long-term population viability (NatureServe, 2001). Decline of the species is attributed to loss of mature longleaf pine habitat due to conversion to slash and sand pine plantations, urbanization, and agricultural uses, commercial collection of the species for the pet trade, and former widespread gassing of gopher tortoise burrows to collect rattlesnakes.

In Georgia indigo snakes occur in sandhill regions dominated by mature longleaf pines, turkey oaks, and wiregrass, such as those available on Conecuh National Forest. Large areas of contiguous suitable habitat (2400-10,000 acres) have been identified as necessary for the restoration of viable populations of indigo snakes (NatureServe 2001). Under all alternatives of the Revised Forest and Land Resource Management Plan, adequate suitable habitats in sandhill and riparian ecosystems will be maintained and restored, to potentially support viable populations of indigo snakes. Recovery actions to reintroduce the species into suitable habitat areas could be considered under the Revised Forest Plan.

VII. A. 7. c. Determination of Effect – Eastern indigo snake

Implementation of any alternative of the Revised Forest and Land Management Plan will have **"no effect"** on Eastern indigo snakes. Management direction addresses the critical needs for habitat improvement, conservation, and protection of eastern indigo snakes and should improve or maintain suitable habitat quality and quantity for this species. This species has not been known to naturally occur in the area since 1954. Forestwide standards for riparian and rare community (sandhill) protections should protect potential habitat. Additional site-specific analysis would be done on all projects with the potential for affecting this species.

VII. A. 8. Flatwoods salamander *(Ambystoma cingulatum)*

VII. A. 8. a. Environmental Baseline

The flatwoods salamander was federally listed as Threatened, on April 1, 1999. Sekerek et al. (1996) states that the flatwoods salamander occurs in pine-flatwoods-wiregrass habitat. This species reproduces in shallow ponds and lives under large woody debris or in small animal burrows near these ponds as an adult. The flatwoods salamander has been reported only once on Conecuh National Forest by Bob Mount (1980), who caught two larvae in an ephemeral pond. Mount described the ephemeral pond as a small, ephemeral flatwoods pond, exposed to

sunlight about three feet in maximum depth and containing no fish. Mount also reported that optimal habitat for the species occurred routinely. He hypothesized in his report that a potential reason for the scarcity of this species on the Conecuh, despite that amount of suitable habitat available, may be that the Conecuh National Forest is on the northwestern periphery of the species' known range, and it is possible that minimum temperatures in November and December are limiting (Mount 1980). The effects of habitat fragmentation by private, converted, or otherwise unsuitable lands are amplified on the periphery of a species' range.

The closest collection of flatwoods salamanders near the Conecuh National Forest was made less than 10 miles east of the Conecuh National Forest (Bailey and Jensen, 1992.) Bailey and Jenson have made (and continue to make) numerous attempts to locate the salamander on Conecuh National Forest in subsequent years. Although their attempts to locate Flatwoods Salamander on Conecuh National Forest have been unsuccessful, their efforts continue. Additionally, Bailey and Jensen (1992) also identified habitat likely to support the flatwoods salamander on Conecuh National Forest.

VII. A. 8. b. Direct, Indirect, and Cumulative Effects – Flatwoods salamander

Forest management is compatible with flatwoods salamander habitat maintenance when activities mimic natural conditions in pine flatwoods. Fire is an essential tool in maintaining flatwoods salamander habitat, particularly fire in the lightning- or growing season when salamanders are not breeding or dispersing (Johnson and Wehrle, 2002.) Standards protecting soil and water resources will serve to protect salamander populations, by protecting seasonally wet sites from actions that alter hydrologic regimes. Community protections for seeps, coastal plain flatwoods, riparian corridors, and upland coastal plain ponds insure habitat protections for flatwoods salamanders. Recovery actions to reintroduce the species into suitable habitat areas could be considered under any alternative of the Revised Forest Plan.

VII. A. 8. c. Determination of Effect – Flatwoods salamander

For all alternatives of the Revised Forest and Land Resource Management Plan, the determination of effect is **"not likely to adversely affect"** flatwoods salamanders. Management direction addresses the critical needs for habitat maintenance, restoration, and protection of flatwoods salamanders and should improve or maintain the quality and quantity of suitable habitat for this species. This species has not been found on Conecuh National Forest since 1980, despite numerous attempts to find the species in the suitable habitat that occurs on Conecuh National Forest. However, the possibility for the species' presence, and therefore "take" cannot be completely eliminated with any level of management. Forestwide standards for rare communities and wetlands, riparian and streamside management zone protections should reduce the potential for "take" to levels that are insignificant and discountable. Forestwide objectives for native community structure, function, and composition restoration should improve the amount and quality of suitable habitat available for flatwoods salamanders. Additional site-specific analysis would be done on all projects with the potential for affecting this species.

VII. B. AQUATIC SPECIES

The National Forests encompass less than 3% of the State's land mass, but support more than 60% of Alabama's federally listed freshwater species. There are 25 federally listed aquatic species (T&E), including 14 endangered and 11 threatened species located on or near the National Forests in Alabama. Critical habitat has been proposed for 11 freshwater mussel species on or near the Bankhead, Talladega, and Tuskegee National Forests. Critical habitat has been designated for the Gulf sturgeon, including portions of riverine habitat within or adjacent to the Conecuh National Forest. Consequently, the National Forests in Alabama are highly significant as habitat reserves for listed species and biodiversity in general.

Aquatic T&E species primarily inhabit the lotic habitats associated with the 7,700 miles of streams and rivers of the National Forests in Alabama. Of the 25 listed aquatic species located on or near the National Forests, only one species is dependent on springs, and one species is dependent on backwater oxbows and swamps. Large river species are also in the minority; however, this is largely a geographical artifact of limited riverine habitat falling within the National Forest boundaries and that many of the large river dependent species are already extinct. Although most T&E species are highly specialized in their selection of physical meso-habitat (i.e. pools, shoals, or runs), they share similar micro-habitat and water chemistry requirements. Consequently, they have common sensitivities to environmental alterations. To varying degrees, all T&E species are sensitive to alterations in habitat structure, water quality, sediment, flow, and, in less obvious ways, to the quality and quantity of interaction between aquatic habitat and the riparian zone (Gregory et al. 1991). General environmental sensitivities common among all aquatic T&E speices are discussed in the following section. Habitat requirements specific to each species are addressed in sections VII.B.1-B.25.

Envrionmental Sensitivities Common to Most Aquatic T&E Species

1. Water Quality: At high concentrations, most synthetic and many natural compounds can be acutely or chronically toxic to a wide variety of species (Terrell and Perfetti 1989). Heavy metals may naturally occur in the environment, but excess quantities released through mining, industrial processes, or use of solvents and paints, can harm organisms, particularly through altered neurology and early development (Huebner & Pynnonen 1992). Heavy metals are persistant in the environment (Miettinen 1977), remaining available for uptake and bioaccumulation for long periods of time. At low levels, synthetic chemicals can subtly but irreversibly affect aquatic species by disrupting hormonal processes governing development, growth, reproduction, behavior, and resistance to disease (Naimo 1995, Moulton et al. 1996, Gilbertson et al. 2003). Organochlorine pesticides and polycyclic aromatic hydrocarbons (PAHs) are endrocrine mimics and they may persist in the environment for decades even after they have been banned from use (Frick et al. 1998). PAHs may enter waterways from road runoff (Gucinski et al. 2001), point source pollution (including oil and gas wells), or atmospheric deposition. In streams, PAHs generally are at sublethal levels for fish, but may build up to toxic levels for macroinvertebrates, including mussels (MacKenzie and Hunter 1979). The toxicity of many chemical compounds is increased under acidic conditions. Heavy metals are more readily biologically active at low pH (Truscott et al. 1995, Reed-Judkins et al. 1997). Extreme acidity, in and of itself, can also affect aquatic organisms, particularly invertebrates, including mussels and snails.

In addition to the generalized effects of chemical contamination on most aquatic species (see section VII.B), mussels may be particularly sensitive to pesticides (Havlik and Marking 1987, Keller 1993), heavy metals (Keller and Zam 1991, Naimo 1995), mine discharge (McCann and Neves 1992), and other substances that may negatively affect biological processes, particularly in the larval (Goudreau et al. 1993) and juvenile life stages (Robinson et al. 1996). Heavy metals may also contribute to accelerated shell erosion, especially under acidic conditions caused by industrial and mine discharge and/or atmospheric deposition (USFWS 2003). In streams, PAHs generally are at sublethal levels for fish, but may build up to toxic levels for macroinvertebrates, including mussels (MacKenzie and Hunter 1979). Research has indicated that host fish are more susceptible to contaminants and poor water quality while infected with mussel glochidia (Moles 1980, Havlik and Marking 1987, Keller 1993). Invasive species are generalists, tolerant of a wide range of habitat and water quality conditions, and consequently, invasive species may have an advantage within enriched ecosystems. The introduction of nonindigenous mollusks, such as the Asian clam (*Corbicula fluminea*) and zebra mussel (*Dreissena polymorpha*) are implicated as factors in native mussel decline (Gardner et al. 1976, Anderson et al. 1991, Hunter and Bailey 1992). Zebra mussels have not yet become established in the National Forests in Alabama; however, they are located in waters in northern Alabama, near to the Bankhead National Forest. Asian clams are widespread in Alabama (Jenkinson 1979) and may affect native mussels by competing for food (Belenger 1990), consuming or disrupting the development of larvae of other mussel species (Leff et al. 1990, Yeager 1994), or indirectly by the toxic effects (ammonia release, pathogens, and low dissolved oxygen) due to regular, and apparently normal (end of 3 year life-span), Corbicula die-offs (Scheller 1997).

2. Sediment: Excessive quantities and altered qualities of substrate and water column sediments can adversely affect many riverine aquatic species, even though they may be adapted to survive at some level of background channel bedload movement and sediment suspension within the water column. Although sediment-mobilizing floods are a recurrent and inevitable force of nature, native aquatic organisms may not be able to adjust to an increased frequency and magnitude of sediment loading, especially within the context of other adverse cumulative influences that place limitations on general health (and consequently tolerance of adverse conditions), ability to move, or reproductive capacity. Suspended sediments may compromise feeding (Dennis 1984), metabolism (Chaney 1993), and respiration (Roper and Hickey 1995). Turbidity may also affect aquatic species by reducing the amount of light available for photosynthesis, the basis of the food chain within lower riverine reaches (Kanehl and Lyons 1992). If a species uses visual cues to attract a mate or a host for its young (as in the case of many mussel species), then turbid water may also negatively affect reproduction and recruitment (Haag et al. 1995, Hartfield and Hartfield 1996). Excessive fine sediments fill in the interstitial spaces within the substrate, interfering with respiration, feeding, and mobility (Brim Box 1999). Rapid deposition of thick layers of coarse or fine sediments can also compromise respiration and movements (Houp 1993). Conversely, sand and gravel-starved dam tailwaters may be inhospitable due to a lack of sufficient unconsolidated sediments necessary for mobility and cover (Layzer et al. 1993). In extreme cases of altered sediment supply, there may be changes in the gross

structure of stream channels and banks (Hartfield 1993, Waters 1995) (see also the discussion on channel alterations).

Most riverine substrate inhabitants (i.e. mussels) require access to patches of relatively silt-free and stable substrates (Strayer and Ralley 1993). Suspended sediments have been shown to compromise mussel feeding (Dennis 1984), metabolism (Chaney 1993), and respiration (Roper and Hickey 1995). Turbidity may also affect mussels by reducing the amount of light available for photosynthesis and production of food (Kanehl and Lyons 1992). If the species attracts hosts through mantle displays or larval (glochidia) dispersal by the way of a superconglutinate "lure", water turbidity may decrease the effectiveness of host attraction and glochidia dispersion and consequently limit the distribution and recruitment of juveniles (Haag et al. 1995, Hartfield and Hartfield 1996). Most riverine mussel species require access to patches of relatively silt-free and stable substrates (Strayer and Ralley 1993, Brim Box 1999). Excessive fine sediments fill in the interstitial spaces within the substrate, and have been implicated in the decline of mussel populations in Alabama, and elsewhere (Neves 1993, Brim Box 1999). Rapid deposition of thick layers of sediment (i.e. reported at less than 5 inches in depth) may physically entrap mussels and lead to their suffocation (Houp 1993, Brim Box 1999). Conversely, sand and gravel-starved dam tailwaters may also be inhospitable to mussels due to a lack of sufficient soft sediments for mobility and cover (Layzer et al. 1993). Beaver dams can have an impact on mussels by cyclically retaining and pulsing slugs of sediment through the watershed. Beaver build dams keyed in to such artificial channel constrictions as culverts and road crossings. Often, the configuration of the artificial constriction is such that beaver dams are unstable and liable to blow out during high flow events, causing additional downstream sedimentation and mussel mortality. Beaver dam associated mussel deaths have been observed and appear to be more common within the steeper Appalachian mountain headwater streams of the Talladega National Forest. Healthy contiguous mussel populations can withstand periodic catastrophic events; however, smaller fragmented populations may take years to recover and re-colonize. Excessive sediment has also been correlated with shifts in fish community composition away from darters and shiners toward centrarchids and other invasive species (Scott & Helfman 2002). Consequently, sediment can indirectly affect most T&E mussels as they specialize in darter and shiner hosts for their glochidia.

3. Temperatures: Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Riparian forests appear to be critical for Southern Appalachian highland streams through their regulation of sunlight, primary and secondary productivity, and temperatures (Burkhead et al. 1997). With reduction in streamside shading, warmer water temperatures and increased sunlight may result in shifts in food webs and the availability of preferred food items (Jones et al. 1999) leading to reduced growth and disruption of reproductive cycles (Zale and Neves 1982, Parker et al 1984, Lellis and Johnson 1996). Invasive species generally gain the advantage over native species with warmer water temperatures (Claudi and Leach 1999). The introduced Asian clam (*Corbicula fluminea*) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and nutrient dynamics

and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Consequently, retention of on-site and upstream canopy shading is important for the health of most aquatic T&E species.

4. Nutrients: Nutrient enrichment has the potential to affect aquatic T&E species by direct toxicity, reducing oxygen levels, altering primary productivity and food webs, favoring non-native more tolerant species (Claudi & Leach 1999), or increased transmission and virulence of pathogens. Nitrogen and phosphorus are natural nutrients in the environment. However, stream ecosystems are easily impacted by artificial nutrient additions if the total amounts exceed the capabilities for assimilation or if the proportions of various nutrients lead to a shift away from normal biological processes. Ammonia normally does not exist or persist within the environment in large quantities. However, ammonia can build up to toxic levels due to overall nutrient loading, excessive accumulation of detritus, and/or direct inputs.

   Nutrient enrichment may affect mussels through increased competition from invasive species and direct toxicity (Strayer 1993, Buddensiek 1995, Scheller 1997, Patzner and Muller 2001). Ammonia is the most toxic form of nitrogen and may occur in the highest and potentially lethal concentrations within the substrate-water interface where mussels live (USFWS 2003). Altered nutrient availability would likewise disrupt feeding by decreasing the availability of appropriate food and increasing turbidity with inedible or potentially toxic blue-green algae (Nedeau et al. 2000). Mussels are susceptible to low dissolved oxygen levels, not only for respiratory functions (Dimock and Wright 1993), but also for successful reproduction (Tankersley and Dimock 1993).

5. Channel Structure: Additions or subtractions of normal sediment loads may grossly alter channel morphology to the extent that it could affect aquatic species by decreasing habitat qualities necessary for feeding, resting, or reproduction (Brim Box & Moosa 1999). Channel morphology may also change due to the addition or removal of instream or bankside structures. Road crossings have the potential to alter channel structure through blockage of flow, channelization, erosion, and deposition (Dodd & Webster 2000). Large woody debris (LWD) has been shown to provide important instream structure that creates and maintains pool habitat, provides cover, and offers productive substrate for macroinvertebrates, important for proper nutrient cycling and stream productivity (Benke et al. 1985, Dolloff & Webster 2000, Lassettre & Harris 2001). Logs, stumps, and brush appear to serve as some of the most stable refugia areas for substrate dwelling organisms, such as mussels (Pierson 1991). Mussel abundance and diversity may be related to the physical stability of channel structure, as has been reported by Obermeyer et al. (1997) and Hartfield (1993). Long-term persistence is tied to the availability of refugia areas where substrates are stable during floods and water flow remains during drought (Strayer 1999).

6. Flow: Without protective measures, changes in hydrology have the potential to negatively affect aquatic T&E species through elimination, degradation (Collier et al. 1996) or fragmentation of suitable habitat, physical blockage of movements (see also item 7), favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food organisms. During periods of drought, small streams may partially

or entirely cease to flow, resulting in direct mortality, restricted food and growth rates, movements to other areas, predation and disease, invasion of exotics (Strayer 1999), or limited reproductive success (Johnson et al. 2001). Low flows exacerbate other problems such as alterations in habitat structure, low oxygen (Johnson et al. 2001), limited food resources, chemical contaminants, and barriers to movements (Luttrell et al. 1999, Albertson & Torak 2002).

7. Habitat Connectivity: Most aquatic species are mobile during some portion of their life history, moving between various habitat areas necessary for reproduction, safety from predators, proper feeding and growth, or as refugia from seasonal or periodic disturbance (drought, floods, etc.). Consequently, barriers to movements can disrupt reproduction, increase mortality, limit growth, and restrict post disturbance dispersal and re-colonization. Mussels may also be affected through limitations of host species and juvenile dispersal (Watters 1996). In the southeast, most stream species are adapted to low gradients and moderate currents. Although there are, and always have been natural barriers such as waterfalls, rapids, and sometimes beaver dams during low flow, human activities can greatly increase the number, frequency, and extent of aquatic biota passage problems. Low water fords, bridge aprons, and culvert pipes may include artificial cascades or waterfalls that are beyond the jumping and swimming capabilities of many aquatic species. The shallow laminate flows of aprons or the concentrated flow of culverts can impede aquatic organism movements at either low or high flows.

Current Environmental Baseline Common to all Aquatic T&E Species

Under current Forest Plan direction (including amendments), aquatic T&E habitat has improved over historical conditions. Watershed conditions have steadily been improving due to changes in land use both on and off the National Forests (SAMAB 1996; McDougal et al. 2001). The Forest Service engages in less extensive and intensive activities than in the past. Forestry practices have changed in favor of the lower impact approaches of small-scale seed and shelterwood cuts. Riparian and streamside zones are no longer included in commercial timber sales. Runoff from roadways and trails continues to be potential a source of sediments; however, current management standards provide additional measures (such as 50 to 210-foot buffers) to minimize the transport of sediment to waterways. Current management standards also minimize soil disturbance from prescribed burns and firelines. Healthy, well-vegetated riparian corridors provide a filtering capacity so that sediment may be trapped, deposited, and stored, and consequently, less sediment reaches waterways (Rhodes et al. 1985, Swanston 1991). Forest Service actions have retained fairly continuous streamside vegetation and shading within the prime lower watershed large stream habitat. Recent Forest Service silvicultural practices have largely been limited within the riparian corridors adjoining aquatic habitat. There has been some loss of small patches of streamside forest canopies due to insect infestations. Cut and leave or remove pest control measures have sometimes extended to the streambanks. Some wildlife openings have been located along streambanks adjoining T&E species habitat. Large woody debris has historically been removed from both on and off-Forest stream channels with the aim of controlling flood damage or facilitating boat traffic (Dolloff & Webster 2000). Deadheading (removing vintage logs for specialty lumber products) is not a sanctioned Forest Service activity, but may occur off-Forest.

Habitat fragmentation is another ongoing environmental condition affecting aquatic T&E species. Main stem dams and reservoirs have historically fragmented and isolated aquatic habitat. Road stream crossings both on and off the National Forests have also caused habitat fragmentation and blockage of fish movements. A comprehensive fish passage assessment has not been completed for the National Forests in Alabama. However, based on the typical configuration, number, and distribution of road crossings, it is likely that fish movements have been restricted by as much as a quarter to a third of their normal range, particularly within the upper portions of many watersheds. Road crossing density is highest on the Tuskegee National Forest, followed by individual watersheds of the Conecuh, Bankhead, and Talladega National Forests (see also EIS Chapter 2, Section B.4.01). Roads and trails have been shown to contribute to bank instability, excessive sedimentation, turbidity, water quality degradation, and channel alterations (Gucinski et al. 2001). On the Talladega National Forest, unauthorized vehicle and bicycle trail use have been of particular concern. On the Bankhead National Forest and Shoal Creek Districts, equestrian use has contributed to some identifiable problems, particularly in and around the 16 and 13 designated stream crossings (USFWS 1994; USFS 1993). In some areas, drivers, hikers, and riders have strayed from designated trails with such frequency as to create unauthorized paths. Vehicle and bicycle tires, hiking boot treads, and horse hooves can disturb soil and instream substrates, potentially leading to streambank erosion and channel instability. In agreement with USFWS (1994), Bankhead and Talladega National Forest horse trail crossings have largely been eliminated, mitigated, or improved through trail rerouting, closings, or erosion control structures and hardening.

Effects Applicable to All Aquatic T&E Species

Implementation of the revised Forest Plan would preclude direct effects, such as mechanical damage or mortality associated with vehicles, equipment, or horse, bicycle, or foot traffic. Proposed Plan direction limits additional road and motorized-trail construction within riparian corridors (standards 11-40, 11-8). Use of heavy equipment and terrestrial vehicles would only be allowed at designated stream crossings (standards FW-68, FW-69, FW-72, 11-8, 11-9, and 11-37). Stream crossings would also be constructed so "that they do not adversely affect threatened and endangered species" (standard 11-10). Although not specified, the revised Forest Plan implies that Forest or District Biologists will determine where and when such crossings will be utilized as part of site-specific analyses.

The strengthened standards for various Forest Service activities would protect T&E species from the potential indirect adverse effects of altered water quality, sedimentation, nutrient cycling, channel configuration, flow, and habitat connectivity. The potential for species-specific effects are discussed in sections VII.B.1-B.25. Effects of the proposed actions common to all T&E aquatic species are as follows:

1. Water Quality: Sources of chemical pollutants are not generally permitted on the National Forests, with the exceptions of: a) lime and fertilizer applications for lake fisheries enhancement; b) petroleum-based compounds associated with oil and gas extraction; c) roadways and mechanized equipment; and d) herbicide and pesticide applications used in forestry practices and right-of-ways.

a. In the past, lakes and reservoirs have been regularly limed and fertilized in order to increase production of game and pan fish. However, the proposed actions under the revised Forest Plan would include a reduction and/or a modification in liming and fertilization activities in order to meet revised Forest Plan standards and State regulations against nutrient discharge. Under the revised Forest Plan, "lakes, ponds, and reservoirs are to be managed in order to support balanced, productive recreational fisheries to the extent appropriate for native aquatic species viability, PETS, State & Federal water quality standards, funding, and public demand" (goal 10). Additionally, application of fertilizer for fisheries habitat improvements "must have prior approval of the Forest hydrologist and Forest Biologists" (standard 11-29). The coordinated development and periodic update of lake and reservoir management plans (objective 10.1) would further assist in focusing fertilization efforts on those areas and methods that will be the most effective and least obtrusive to T&E species. Consequently, liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative application methods could be utilized so as to safeguard against downstream discharge of lime and fertilizer.

b. Oil and gas leasing currently occurs only on the Conecuh National Forest. According to revised Forest Plan direction, oil and gas leases will contain a No Surface Occupancy stipulation or Controlled Surface Use stipulation within the riparian corridor (standard 11-16). Potential effects are discussed in greater detail for the Gulf sturgeon in section VII.B.2 of this document.

c. Revised Forest Plan direction restricts the use of mechanized equipment to designated stream crossings (standard FW-69) and prohibits equipment servicing within the riparian corridor (FW-74). The Forest Service follows hazardous material handling protocols on Forest Service vehicles and equipment. However, the Forest Service does not have control over accidental or chronic leakage of non-Forest Service motor vehicle fluids onto roadways, parking lots, and other on or off-Forest facilities. Implementation of best management practices and other measures in road design and maintenance (standard FW-49) would minimize the opportunities for direct runoff of such chemical contaminants into Forest Service stream reaches. Restrictions on the number and configuration of road stream crossings (standards 11-8, 11-34, 11-36) would further limit the potential for chemical contamination.

d. Possible effects on aquatic species would be minimized since aerial or ground-applied treatments of pesticides will not be allowed in the riparian corridors (standard FW-46). Cut surface treatments may occur (FW-46); however, only approved formulations and protocols would be utilized (FW-50) so as to avoid contamination of the aquatic environment.

In summary, implementation of the proposed Forest Plan standards would greatly minimize the opportunities for chemical contamination from Forest Service activities; however, there may still be the potential for runoff of chemicals from roadways or illegal activities. And Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and

development would continue to contribute chemical contaminants, regardless of future Forest Service actions.

2. Sediment: Under the revised Forest Plan, Forest-wide streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as: a) mining, b) silviculture, c) pest control, d) prescribed burning, e) construction and maintenance of temporary roads and permanent roads and trails, f) herbicide use, and g) livestock grazing. General standards for minimization and stabilization of disturbed soils (standards FW-47, FW-50, FW-53, FW-55, FW-78, 11-23, 11-25,11-33, 11-35, 11-37) apply to all types of activities.

   a) Mining operations must also comply with rigorous standards, as well as federal and State laws. There currently is only one non-energy mineral lease on the National Forests in Alabama and this operation has no known adverse effects on aquatic habitat or T&E species. To date, gold panning has not been a popular activity; however there are occasional inquiries and interest. According to general Forest Service policies, recreational gold panning can occur within Forest streams, but only within the active channel and not within streambanks. Under the revised Forest Plan, "recreational mining is only allowed where it does not adversely affect stream channel stability, substrates, aquatic species or their habitats" (standard 11-17). Consequently, aquatic T&E species should be adequately protected.

   b) The standards of the riparian strategy provide protection measures such as the application of the State's Best Management Practices as a minimum (standard FW-49), and the stipulation that lands in the riparian corridor are classified as not suitable for timber production (standard 11-21).

   c) Revised Forest Plan direction includes a standard (11-26) for a preference of cut and leave, rather than cut and remove methods of insect control. Within the 15 and 35-foot reserved sections of the streamside management zones, cut and leave or removal of vegetation can only occur if Forest Biologists and Hydrologists determine that desired resource conditions will be met (standard FW-65). Alternative pest control methods may be utilized (11-27).

   d) There is a standard for the limitation of plowed firelines and stipulation of the use of handlines (or their equivalent minimal impact method) within 10 feet of streams for prescribed burns (FW-77). Immediately after plowing, all fireline disturbances must be stabilized to prevent off-site soil movement into stream channels (FW-77).

   e) Motorized, biking, hiking, and equestrian trails have the potential to indirectly affect aquatic species and their habitat through channel destabilization, mobilization of sediment, and increased turbidity. Proposed actions under the revised Forest Plan limit construction of roads and motorized, bike, or equestrian trails within riparian zones (standards 11-8, 11-37). New motorized trails would only cross streams at designated sites (standard 11-8), with the unspecified implication that the total number of crossings would be kept to a minimum, and that District or Forest Biologists will be involved in

selection of the sites. Riparian and road stream crossings would be constructed so that they minimize channel impacts and adverse effects on T&E species (standard 11-34, 11-36). Camping, driving, and horse tethering is prohibited within 50 feet of perennial streams and lakes unless areas are specifically designated for such use (standards 11-2 and 11-13). Equestrian use is limited to designated horse trails and roads unless covered under a special use permit (standards 93 and 94). Existing roads and motorized, bike, or horse trails would be annually monitored for their potential effects on aquatic ecosystems and species of concern (objective 21.2). If additional impacts to T&E species are discovered, action to avoid or mitigate further impacts would be taken in consultation with USFWS (objective 21.2). Road maintenance and reconstruction is to be prioritized in accordance with T&E recovery efforts (objective 31.2). The revised Forest Plan also provides direction to provide for a transportation system that protects forest resources (Goal 31), improves the condition of roads and bridges that adversely affect resource values (goal 33), and to "accelerate the pace of decommissioning of un-needed roads" (goal 32).

f) Herbicide use will be limited within riparian corridors, and thus, ground cover should be retained and sediment mobilization avoided (standards FW-46 and FW-50).

g) Livestock grazing is a minor activity, only situated on a few allotments on the Conecuh National Forest. Range-related Forest Plan standards provide measures to avoid or minimize resource damage, including controlling existing permitted operations to maintain the integrity of stream channels and banks (standard 11-4), reauthorizing grazing in riparian corridors only if compatible with desired conditions and objectives (standard 11-4), new grazing permits will exclude the riparian corridor (standard 11-4), armoring and locating livestock watering and crossing areas in order to maintain bank stability and minimize impacts to riparian vegetation and function (standard 11-5), and locating feeding troughs and mineral blocks outside of the riparian corridor unless the pasture is entirely within the riparian corridor (standard 11-6), and locating watering troughs so as to protect streams (standard 11-6).

Implementation of revised Forest Plan standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities; however, there may still be the potential for localized low levels of sediment runoff from permanent roadways and temporary roads associated with forest health projects. Consequently, the potential for incremental, additive, and synergistic cumulative effects must be addressed, particularly in watersheds where excessive sediment loading has been identified as a potential issue for aquatic species. In the Forest Plan EIS, a model was developed as a means to address cumulative watershed effects. This model was used to compare watershed conditions to a hypothetical undisturbed forested baseline. Sediment thresholds were established based upon the research of Scott & Helfman (2001), which indicates that there is a correlation between increasing sediment loading and decreasing endemic fish species composition. According to this model, there is a broad threshold along the endemism curve whereby those watersheds with low predicted sediment increases over baseline can be considered as in "excellent" condition and unlikely a concern for cumulative sediment watershed effects. Watersheds in the middle or "average" range of

sediment elevation over baseline may warrant further investigation and discussion of possible cumulative effects if the Forest Service contribution would be moderately high and/or there are extenuating circumstances of proximity and concentration of sediment inputs in relation to important habitat for highly sensitive species. Below average watersheds should be considered as within the zone of possible cumulative effects (Scott et al. 2003).

"Average" watersheds include Town Creek, tributary to the Tennessee River on the Bankhead National Forest (with very low Forest Service involvement and no T&E species), Uphapee and Chewacla Creeks, tributaries to the Tallapoosa on the Tuskegee National Forest, and Talladega Creek, tributary to the Coosa River on the Talladega District. The Forest Service has less than, 1%, 10%, and 22% ownership within the Chewacla, Uphapee, and Talladega watersheds. Consequently, there is potential for cumulative effects only for species in Talladega, and possibly Uphapee watersheds, depending on whether there are extenuating circumstances of concentration and proximity of effects to species occurrences and habitat. In general, Uphapee is an important watershed for several aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority as per objective 11.4. Revised Forest Plan direction adds further encouragement for proactive T&E species recovery efforts through the development, implementation, annual review, and periodic update of an aquatic conservation strategy (objective 11.3). The Forest Service will have limited influence on instream water quality however, since Forest Service ownership is within the lower 10% of the watershed. Forest Service ownership is higher within Talladega Creek; however, this ownership is a patchwork among private inholdings within the middle portion of the watershed, and other off-Forest factors within the headwaters will continue to have the greatest influence on downstream water quality.

There are six "below average" watersheds associated with the National Forests in Alabama: two are Tennessee River tributaries with an extremely low proportion of Bankhead National Forest lands and no known T&E aquatic species, one is a Black Warrior watershed with an insignificant proportion of Forest Service ownership, and three are Coosa River tributaries, including the most southerly Tallaseehatchee Creek and Middle Choccolocco Creek, both with more substantial proportions of Talladega National Forest ownership (the other Tallaseehatchee Creek to the north, has less than 1% Forest Service ownership). The potential for cumulative effects is therefore discussed in sections VII.B.1-B.25 for those species that inhabit or have proposed critical habitat within either Middle Choccolocco or Tallaseehatchee Creeks.

3. Temperatures: Without protective measures, the main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow.

   a) Under the revised Forest Plan, "lands in the riparian corridor are classified as not suitable for timber production" (standard 11-21). "Removal of dominant, co-dominant, intermediate or suppressed trees is not permitted in the reserved section"of the streamside management zone, with the exception of cut and leave or cut and removal of

vegetation, which only can take place if Forest Biologists and Hydrologists determine that the desired future conditions will be met (standard FW-65). Forestwide and riparian corridor standards would further discourage cutting and removal of streamside vegetation for pest management (standards FW-65, 11-26, 11-27). The revised Forest Plan also stipulates that new canopy openings may be created within riparian areas, but only for the restoration or enhancement of riparian dependent species (standard 11-03). Silvicultural and prescribed burning techniques may be utilized within riparian areas in order to achieve the objective of up to 10% of riparian areas in a non-forested condition and an additional 1-2% of riparian areas maintained as early successional forests (objective 8.2). However, with standards prohibiting the cutting of trees within the reserved streamside management zone except with Forest Biologist and Hydrologist approval, it is not likely that riparian canopy openings and non-forested or early successional forest habitat will be situated within the immediate streamside zone. New wildlife openings will not be permitted within riparian corridors, and existing openings can only be maintained if they achieve desired conditions and protect soil and water resources (standard 4.L-06).

b) The effects of Forest Service controlled stream impoundments on downstream thermal regimes are expected to be minor, given the small size and number of impoundments (only one, Brushy Lake, is upstream from T&E species supporting aquatic habitat and managed by the Forest Service).

Full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Regardless of Forest Service actions, off-Forest silviculture and development would continue to contribute to elevated water temperatures, regardless of future Forest Service actions.

4. Nutrients: There are only a few Forest Service activities that could potentially contribute to nutrient enrichment without protective measures; these are a) permitting of livestock and equestrian use, b) fertilization of lakes, or c) discharge from facility sewage or septic systems.

a) Livestock grazing is a minor activity, only situated on a few allotments within the Conecuh National Forest. As discussed for sediment effects, revised Forest Plan standards would minimize livestock access and use of stream and riparian corridors. On a low scale, direct input or runoff of manure from equestrian trails, stream crossings, camps, and corrals has the potential to add nutrients that may not be immediately assimilated into normal nutrient cycles, particularly during periods of low flow. Camping, driving, and horse tethering/corralling is prohibited within 50 feet of perennial streams and lakes unless areas are specifically designated for such use (standards 11-2 and 11-13). Equestrian use is limited to designated horse trails and roads unless covered under a special use permit (standards 93 and 94). Existing roads and motorized, bike, or horse trails would be annually monitored for their potential effects on aquatic ecosystems and species of concern (objective 21.2). If additional impacts to T&E species are discovered, action to avoid or mitigate further impacts would be taken in consultation with USFWS (objective 21.2).

b) In the past, lakes and reservoirs have been regularly limed and fertilized in order to increase production of game and pan fish. However, the proposed actions under the revised Forest Plan would include a reduction and/or a modification in liming and fertilization activities in order to meet revised Forest Plan standards and State regulations against nutrient discharge. Under the revised Forest Plan, "lakes, ponds, and reservoirs are to be managed in order to support balanced, productive recreational fisheries to the extent appropriate for native aquatic species viability, PETS, State & Federal water quality standards, funding, and public demand" (goal 10, 2-21). Additionally, application of fertilizer for fisheries habitat improvements "must have prior approval of the Forest hydrologist and Forest Biologists" (standard 11-29). The coordinated development and periodic update of lake and reservoir management plans (objective 10.1 p2-21) would further assist in focusing fertilization efforts on those areas and methods that will be the most effective and least obtrusive to T&E species. Consequently, liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer.

c) Under the revised Forest Plan, all facilities, campgrounds and day use areas will continue to be on pump-out, municipal sewage treatment systems, or septic fields located outside of the riparian corridor. Consequently, Forest Service facilities will not contribute to surface water contamination and adversely effect aquatic T&E species.

5. Channel Structure: The Forest Service generally does not engage in activities that could potentially modify instream habitat. Exceptions may include: a) localized channel alterations in and around trail and road stream crossings, and b) indirect alteration in structure due to removal or additions of large woody debris.

a) Under the direction of the revised Forest Plan, stream crossings are less likely to cause irreparable and widespread channel alterations. Direction includes provision for a transportation system that protects forest resources (Goal 31) and improvement of roads and bridges that are adversely affecting surrounding resource values and conditions (Goal 33). Proposed actions under the revised Forest Plan limit construction of roads and motorized, bike, or equestrian trails within riparian zones (standards 11-8, 11-37). New motorized trails would only cross streams at designated sites (standard 11-8), with the unspecified implication that the total number of crossings would be kept to a minimum and that District or Forest Biologists will be involved in selection of the sites. Riparian and road stream crossings would be constructed so that they minimize channel impacts and adverse affects on T&E species (standard 11-34, 11-36).

b) Under the revised Forest Plan, large woody debris is to be retained unless it poses a risk to water quality, aquatic habitat, recreation, private property, or Forest Service infrastructures (standard 11-1). Proposed actions under the revised Forest Plan also would allow for a buildup and recruitment of future instream woody debris. Also, there is a stipulation that lands in the riparian corridor are classified as not suitable for timber production (standard 11-21), and limitation to removal of streamside trees only if the

Forest Biologists and Hydrologists determine that the desired future conditions will be met (standard FW-65). The revised Forest Plan also stipulates that new canopy openings may be created within riparian areas, but only for the restoration or enhancement of riparian dependent species (standard 11-03). Silvicultural and prescribed burning techniques may be utilized within riparian areas in order to achieve the objective of up to 10% of riparian areas in a non-forested condition and an additional 1-2% of riparian areas maintained as early successional forests (objective 8.2). However, with standards prohibiting the cutting of trees within the reserved streamside management zone except with Forest Biologist and Hydrologist approval, it is not likely that riparian canopy openings and non-forested or early successional forest habitat will be situated within the immediate streamside zone. No new wildlife openings will be permitted, and existing openings can only be maintained if they achieve desired conditions and protect soil and water resources (standard 4.L-06). Full implementation of the revised Forest Plan standards would therefore minimize the potential for channel alterations due to Forest Service activities.

6. Flow: Proposed actions under the revised Forest Plan would provide protective measures to minimize or avoid adverse effects of flow alteration due to such Forest Service activities as a) silvicultural techniques, b) water extraction, and c) impoundments. Localized impoundment of flow due to road crossing structures is discussed in item # 5, channel alterations.

   a) Under the proposed actions of the revised Forest Plan, potential flow-altering land uses are expected to be moderated, and on-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives, see discussions on other environmental factors). Forest Service activities would therefore have a very limited effect on the magnitude and duration of flood flows.

   b) Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams.

   c) Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, all but one of these impoundments (upstream from T&E species) are either off-Forest and/or operated by municipalities for water supplies or flood control, and therefore not under the management of the Forest Service. The exception is Brushy Lake on the Brushy Fork

of the upper Black Warrior River Basin. Downstream effects are expected to be minimal, given the small size of the Brushy Lake reservoir and dam. The proposed actions do not include any changes in the operation of Brushy Lake, nor the creation of additional impoundments or reservoirs.

7. Habitat Connectivity: Without protective measures, road stream crossings are the primary Forest Service activities that have the potential to limit turtle, fish, and mussel movements. The revised Forest Plan includes such measures as completion of a comprehensive passage assessment (objective 31.1) and consequential prioritization and modification of barriers (objective 31.2), improvements on roads and bridges (goal 33), limitations on construction of additional road (FW-72, 11-34, 11-35, 11-36, 11-37) and trail (standards 11-8, 11-10, 11-37) crossings, accelerated decommissioning of unneeded classified and unclassified roads (goal 32), seasonal closures (objective 31), improved conditions to reduce adverse resource effects (goal 33), and relocation and rehabilitation (standard 11-9) with top priority given to T&E species (objective 21.2). The implementation of the revised Forest Plan would substantially improve passage for aquatic T&E species and thus benefit T&E species through expansion of habitat connectivity.

In addition to protective and mitigating measures, the revised Forest Plan will include proactive actions beneficial for T&E species and their habitat. The revised Forest Plan encourages habitat restoration and T&E species protection through consolidation of Forest ownership (goal 35, goal 36, objective 41.2), contributions to recovery and conservation (goal 11, objective 11.1), participation in population and habitat enhancements and restoration (objective 11.1), and commitment to ongoing surveys and monitoring (objective 11.2). Revised Forest Plan direction adds further encouragement for proactive T&E species recovery efforts through the development, implementation, and periodic update of an aquatic conservation strategy (objective 11.3). As evidenced by revised Forest Plan direction and recent FS actions, it is probable that recovery opportunities will be pursued and coordinated with the U.S. Fish and Wildlife Service. Natural resource education and interpretation are also key elements to T&E species recovery. The revised Forest Plan includes direction to increase public awareness, knowledge, understanding, appreciation, and involvement in Forest Service natural resource management activities (Goal 43) through development of a five-year interpretive strategy (objective 43.1) and fostering of public and inter-agency cooperation (Goals 44 and 45). Collectively, these proposed actions would encourage collaborative approaches to species and habitat conservation and discourage inappropriate behaviors that would otherwise adversely affect T&E species.

Cumulative Effects Common to All Aquatic T&E Species: Historic Forest and current off-Forest activities contribute to ongoing effects that have been and could continue to be cumulative to present and proposed Forest Service actions. Historically, widespread deforestation and agricultural cultivation contributed to extensive changes to Alabama streams, still evident today (Albright 1996). Industrial pollution continues to have an impact throughout watersheds with urban centers (particularly the Cahaba River and Choccolocco Creek). Residential development and agriculture contribute nutrients, pesticides, polycyclic aromatic hydrocarbons (PAHs), and sediments. Poultry farming and feedlots may release nitrates, ammonia, arsenic, pesticides, and antibiotics. Aging bridges may leach chemicals and heavy

metals as lead-based paints and other chemical coatings deteriorate and wash into the waterways. Improperly mitigated silvicultural practices lead to erosion and runoff of sediment and herbicides. Removal of streamside trees due to agriculture, development, or silviculture has cumulatively increased water temperatures (Moring et al. 1994). Southern pine beetle continue to kill streamside trees, potentially affecting stream temperatures, nutrient cycling, and habitat structure. The wooly adelgid (Adelges piceae) has not yet reached Alabama, but may influence Bankhead National Forest stream temperatures if there is a hemlock die-off as has occurred elsewhere in the southeast. If concentrated in high densities, private ponds and tanks may cumulatively alter downstream water flow and temperatures. Global warming is predicted to result in alterations in climatic conditions, possibly contributing to more extreme seasonal and annual fluctuations in water flow and temperatures (Peters and Lovejoy 1992), particularly within headwater streams such as in the Appalachian highlands (Eaton and Scheller 1996). Downstream dams and reservoirs have fragmented and isolated aquatic habitat. Fluctuating water levels of Lewis Smith Reservoir contributes to habitat fragmentation, vegetative reduction, streambank instability, and altered hydrology and water chemistry. Road stream crossings both on and off the Bankhead National Forest have also caused habitat fragmentation and blockage of fish species and molluscan hosts.

Generally, all human activities that drastically alter aquatic habitat, temperatures, and water quality will benefit exotic invasive species at the expense of native aquatic species (Claudi and Leach 1999). It may only be a matter of time before zebra mussels reach the National Forests, with their most heavy infestations expected in mainstem rivers and large tributaries in and around reservoirs (USFWS 2003). There are also a number of other non-native species poised to invade Alabama watersheds (e.g. bighead carp and toxic blue-green algae *Cylindrospermopsis raciborskii*), with potential adverse effects on native aquatic species and communities (Strayer 1999b). The spread of indigenous or exotic diseases may also have adverse cumulative effects on aquatic species.

Detailed effects analysis and determinations are discussed for each of the 25 aquatic T&E species as follows.

VII. B.1 Flattened musk turtle (*Sternotherus depressus*)

VII. B.1.a. Environmental Baseline -- Flattened musk turtle

Flattened musk turtles are listed as threatened under the Endangered Species Act (USFWS 1987). A recovery plan has been completed for this species (USFWS 1990a). They are endemic to the upper Black Warrior River system in Alabama. Historically, flattened musk turtles inhabited 10 to 20 percent of the streams in the upper third of this river basin. Currently, they have been extirpated from over 30% of their historical range. Extant populations and potential habitats on or near Alabama National Forests are displayed in Table VII.B.1. All of these populations are within the Bankhead National Forest in Alabama, and there are no other occurrences of this species on National Forest system lands. Only about 15% of the habitat appears to support healthy reproducing populations. The species is considered to be in decline range-wide (USFWS 2000b). According to the recovery plan (USFWS 1990a), the species can be delisted when there is a viable population maintained over a 10-year period in at least 12

streams, including 8 or more streams with the best quality habitat. Specific objectives include 1) development and implementation of a habitat restoration plan, 2) development of a study plan including monitoring priorities, 3) reduction of habitat fragmentation and population isolation, 4) decrease in incidence of disease (if appropriate), and 5) reduction in genetic exchange with *Stenotherus m. peltifer*. A target date for recovery and delisting has not been set.

Table VII. B.1 Overview of known or suspected flattened musk turtle occurrences and potential habitat on or within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watersheds	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Bankhead	Winston	Black Warrior	Clear	14	0	0	Historic	none	TF	S
			Lewis Smith	32	4	15	Present	none		SF
			Lower Brushy	36	13	3	Dense	protect expand	T	PF
			L. Sipsey Fork	32	20	4	Present	protect increase	T	F
			U. Sipsey Fork	87	17	0	Present	protect	F	
Total					54	22				

[1] Population status based on Bailey (1989), Schnuell and Guyer (1996), USFS 1996, Holmes & Marion (2002)
[2] Viability risks: M = moderate, H = high; S = sediment, P = point-source pollution, T = thermal, F = altered flow

Flattened musk turtles are found primarily in the lower higher order (3rd-4th) sections of headwater streams. Optimal habitat appears to be free flowing large streams or small rivers having vegetated shallows alternating with deeper pools (USFWS 1990a). They appear to require detectable currents and an abundance of crevices and submerged cobble and boulders or bedrock for cover (USFWS 1990a). Other factors contributing to habitat quality include a low silt load and substrate deposits, low nutrient content and bacterial counts, moderate temperatures, and minimal chemical pollution (Mount 1981). Moderate temperatures may also be important both in summer and winter (Mount 1981).

Flattened musk turtles mature in 4 to 8 years and typically lay 1-2 clutches of 1 to 3 eggs (USFWS 2003). This species is a highly aquatic species that rarely basks, only leaves the water to lay eggs, and does not stray far from the immediate stream channel and lower terraces of the riparian corridor (Holmes & Marion 2002). Higher densities have been observed in areas with extensive lower terrace sand deposits (Ernst et al. 1989), possibly in correlation with the availability of suitable nesting habitat. Disease related mortality has been identified as a potential concern (Dodd 1988). Female turtles rely on a diet of mussels and snails to provide the essential nutrients for reproduction (Marion et al. 1991, Schnuelle and Guyer 1996). Consequently, availability of mollusk prey is necessary for this species and the habitat requirements for T&E mussels are also applicable (see also sections VII.B.8-20)

Historically, siltation, chemical pollution, and hydrological changes associated with mining, navigation, and flood control projects have had adverse effects on flattened musk turtles and their habitat (Dodd et al. 1988). Habitat fragmentation has also been cited as a contributor to the species decline (Dodd 1990). Turtle populations continue to be vulnerable to decline, given their low fecundity and dependence on molluscan prey. Mussels are sensitive to sedimentation,

pollution, barriers to host fish passage, and other forms of habitat alteration (see also effects the discussion for T&E mussel species, sections VII.B.8-VII.B.20). Such historical watershed-wide conditions have lead to the current status of this species being considered as at a high risk of continued decline in 4 out of 5 potential species-inhabited Forest Service watersheds (Table VII.B.1) (also see EIS, section 3.B.4, for the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment and flow alterations may contribute the greatest risk to the viability of this species. Clear Creek has limited opportunities for restoration due to the small proportion of Forest Service system lands and the legacy of strip mining. Lower Brushy Creek offers the best opportunity for ongoing protection of a viable and possible source population. Lower Sipsey Fork provides an opportunity for future restoration and enhancements.

VII. B.1.b. Direct, Indirect, and Cumulative Effects – Flattened musk turtle

Direct effects, such as crushing of turtles or their eggs, are not expected to occur as a result of the proposed actions under the revised Forest Plan. Flattened musk turtles are highly aquatic and do not stray far from the immediate stream channel and lower terraces. They are not susceptible to boating injuries, as they predominantly inhabit deeper water pools. As discussed in section VII.B, revised Forest Plan standards will minimize opportunities for mechanical damage due to vehicles or equipment. Moreover, on the Bankhead National Forest, roadways are limited adjacent to flattened musk turtle habitat within the Sipsey Wild and Scenic River corridor and the Wilderness.

Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) temperatures, 4) nutrient cycling, 5) channel structure, 6) flow, or 7) blockage of mussel host fish passage could indirectly and negatively affect flattened musk turtles. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical pollutants can affect turtles through endocrine disruption, developmental disorders, and shell erosion (Mount 1981). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Brushy Lake is the only Forest Service controlled facility that could be considered for liming and fertilization (which could alter pH and the toxicity of other chemical contaminants). However, given the revised Forest Plan standards (see general effects section VII.B) and the diversity of aquatic T&E mussels downstream from Brushy Lake, it is unlikely that fertilization would be chosen as a viable action unless there is an alternative method that would not contribute to downstream nutrient inputs. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this

species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service Forest Service roads, equipment, and herbicide/pesticide use. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit herbicide and pesticide activities within or adjacent to flattened musk turtle mainstem habitat. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within lower Brushy Fork where point source pollution has been identified as a viability concern for this species (Table VII.B.1).

2) Sediment: Excessive siltation and sedimentation could affect flattened musk turtles by reducing their mollusk food supplies, altering the rocky habitats where they seek food and cover, decreasing the quality and availability of sand bar nest sites, and accumulating and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Turbid waters could also impede turtle foraging activities. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit sediment mobilizing activities within or adjacent to flattened musk turtle mainstem habitat. Implementation of these standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities and given the "excellent" condition rating within all flattened musk turtle watersheds associated with the Bankhead National Forest, cumulative effects due to overall Forest Service management activities are not likely (see also general effects discussion, section VII.B). Moreover, Upper and lower Sipsey Fork watersheds have been identified as possible priority watersheds and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within Lewis Smith Lake and Clear Creek where excessive sedimentation has been identified as a high viability concern for this species (Table VII.B.1).

3) Temperatures: Elevated water temperature has the potential to adversely affect flattened musk turtles. Since musk turtles rarely bask, they are dependent on the ambient water temperature. Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Warmer water temperatures and increased sunlight may result in shifts in food webs and the availability of their preferred molluscan prey. The introduced Asian clam (Corbicula fluminea) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and

nutrient dynamics and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Invasive species generally gain the advantage over native species with warmer water temperatures (Claudi and Leach 1999).

The main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further discourage vegetation removal within or adjacent to flattened musk turtle mainstem habitat. Regardless of Forest Service actions, off-Forest silviculture and residential development will continue to contribute to elevated water temperatures, particularly within Clear Creek and lower Brushy Fork where thermal alterations have been identified as of moderate viability concern for this species (Table VII.B.1).

4) Nutrient Cycling: Nutrient enrichment has the potential to affect flattened musk turtles by altering primary productivity and food webs, favoring non-native invasive species (Claudi and Leach 1999) (Claudi and Leach 1999), direct toxicity to molluscan prey, or increased transmission and susceptibility to pathogens. There are only a few forest service activities that could potentially contribute to nutrient enrichment; These are a) permitting of livestock and equestrian use, b) fertilization of lakes, or c) discharge from facility sewage or septic systems. As discussed in the general effects section (VII.B), the revised Forest Plan standards would minimize the potential for nutrient enrichment due to Forest Service activities. Brushy Lake is the only Forest Service controlled facility that could be considered for liming and fertilization. However, given the revised Forest Plan standards (see general effects section VII.B) and the diversity of aquatic T&E species downstream from Brushy Lake, it is unlikely that fertilization would be chosen as a viable action unless there is an alternative method that would not contribute to downstream nutrient inputs. Therefore, and given full implementation of the revised Forest Plan direction as well as State regulations and necessary site-specific analysis, adverse effects on flattened musk turtles would be unlikely. Off-Forest agricultural and residential activities would continue to contribute to nutrient enrichment, regardless of Forest Service actions.

5) Flow: Without protective measures, changes in hydrology have the potential to negatively affect flattened musk turtles through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of prey. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow-altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest

Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Ongoing maintenance and operation of the Brushy Lake dam and impoundment likely has an influence on base flow in the immediate reach downstream from the dam. This influence likely does not extend as far as the flattened musk turtle populations and habitat within the lower portion of the Brushy watershed. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within Clear Creek, Lewis Smith Lake, and lower Brushy Fork where flow alterations have been identified as a moderate to high viability concern for this species (Table VII.B.1). Municipal and private water withdrawals occur within the lower watersheds, but their effects may not be large enough to be measurable in relation to the overall watershed discharge. The ongoing operation of the Lewis Smith Lake dam and reservoir will continue to impound water and cause extreme water level fluctuations extending at least 5 miles into the lower portions of tributary flattened musk turtle habitat.

6) Habitat Connectivity: Passage barriers have the potential to indirectly affect flattened musk turtles through either direct blockage of turtle movements or through reduced availability of molluscan prey due to the limitations on the dispersion of fish species that host and transport mussel glochidia (larvae) (Watters 1996). Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. There is only one dam (Brushy Lake) that is administered by the Forest Service. Since flattened musk turtles are a large riverine inhabitant, this upper watershed dam is not expected to contribute to habitat fragmentation for this species. Road crossing density is high within Brushy Fork but low within the Sipsey Fork watershed (see also EIS Chapter 2, Section B.4.01). Roads are less likely to hamper movements of turtles or their molluscan prey within the preferred flattened musk turtle larger mainstream habitat of the lower portions of the watersheds. Within these areas, bridges are in place to span the larger stream channels. However, it is possible that road stream crossings within the upper tributaries are potential barriers for mussel hosts and it is not yet clear how mussel population viability may or may not be tied to habitat availability throughout the watershed. It is clear that the implementation of revised Forest Plan direction would substantially improve passage for mussel fish hosts, perhaps to the benefit of flattened musk turtles. Off-Forest effects such as the habitat fragmentation due to the Lewis Smith reservoir will continue regardless of Forest Service actions.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact flattened musk turtles through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. Coal mines, particularly in the Clear Creek

watershed, have negatively affected flattened musk turtles through alterations in pH, sedimentation, and release of heavy metals. For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, the potential effects of Forest Service activities would be greatly minimized given the implementation of revised Forest Plan protection measures. Watershed and habitat conditions would continue to improve over historic conditions. Additionally, pro-active conservation and recovery measures would have beneficial effects for this species. Habitat protection and monitoring will be the primary conservation objectives (Table VII.B). Representative populations will be monitored by trapping and/or tagging with appropriate permits from USFWS. Turtle habitat and mussel prey abundance will also be monitored. Actions will be taken in order to identify additional suitable habitat and repatriate turtles and their mussel prey to unoccupied areas on National Forest lands.

VII. B.1.c. Determination of Effects – Flattened musk turtle

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that otherwise negative effects would be minimized and that there would be beneficial effects as watershed and habitat conditions improve. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan is **not likely to adversely affect the flattened musk turtle.**

VII. B.2. Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)

VII. B.2.a. Environmental Baseline – Gulf sturgeon

Gulf sturgeon are listed as threatened under the Endangered Species Act (USFWS 1991a). A recovery plan has been completed for this species (USFWS 1995b). Gulf sturgeon historically occurred throughout most major river systems extending from the Mississippi River to the Suwanee River and Tampa Bay in Florida (USFWS 1991a). At one time, sturgeon probably migrated up all of the large coastal rivers of Alabama as well as the far reaches of the Mobile basin. Currently, Gulf sturgeon are known to inhabit the Mobile River Basin only as far upstream as lower sections of the Tombigbee and Alabama Rivers. They have also recently been documented in the Escambia, Conecuh, Blackwater, and Yellow Rivers in and around the Conecuh National Forest. Critical habitat has been designated for the Gulf sturgeon, including portions of the mainstem Yellow and Conecuh Rivers within the Conecuh National Forest (USFWS 2003b). Extant populations and critical habitats on or near National Forests are displayed in Table VII. B.4. Within Alabama, Gulf sturgeon and their critical habitat are only known to occur within or adjacent to the Conecuh National Forest in Alabama; However, critical habitat has also been designated in the Pascagoula River adjacent to the De Soto National Forest in Mississippi and in the Apalachicola River, adjacent to the Apalachicola National Forest in Florida. The Suwannee River in Florida (not associated with any National Forest unit) is thought to support the healthiest and most stable remaining population throughout its range (USFWS 1991a). Alabama populations are considered rare and unstable. The most viable Alabama population is thought to be in the Chataqhatchee River Basin (Mettee

et al. 1986). According to the recovery plan (USFWS 1995b), Gulf sturgeon may be delisted if, 1) population levels are stabilized within discrete management units, and 2) population levels are sufficient to withstand fishing pressure. A target date for recovery has not been specified.

Table VII. B.2. Overview of Gulf sturgeon occurrences and critical habitat on or within 5 miles of the National Forests in Alabama.

Forest	Counties	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Conecuh	Escambia	Escambia	L. Conecuh	3	0	2	dstrm C.Hab	WQ		SF
Conecuh	Covington	Blackwater	Blackwater	48	0	5	dstrm habitat	none		
Conecuh	Covington	Yellow	Yellow	2	8	5	C.Hab	Protect	P	S
			North	14	5	5	C.Hab	Protect		S
			Five Runs	21	1	5		WQ	P	
			L. Yellow	10	6	5	occupied C.Hab	Protect		S
Total					20	27				

[1] Population status based on Metee et al. (1996), USFWS (1998)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

The Gulf sturgeon is anadromous and highly mobile, migrating hundreds of miles between the primary Gulf coast feeding areas and the spawning and rearing areas within mainstem rivers and lower tributaries. Gulf sturgeon reach sexual maturity around 12 to 17 years of age; Females may only spawn every 3 to 6 years (Huff 1975). Spawning migrations are thought to occur in late winter and early spring (Foster and Clugston 1997). Spawning typically occurs in March and April over hardened clay, rubble, gravel, or shell bottoms with a strong current (NS 2003). Optimal water temperatures are between 15-20 °C with a maximum tolerance of 25 °C for larval development. Eggs are demersal and adhesive on the bottom (USFWS 2003b). Adults may stay within the riverine environment for up to 9 months of the year. Early life history is not clear. Juveniles may stay within fresh water for several years. Preferred adult and juvenile habitat appears to be deep channels or "holes" (i.e. pocket water and pools) with sand interspersed with rocky bottoms (USFWS 2003b). Adults may go without food while on their spawning migrations. Young-of-the-year feed on aquatic insects and detritus (Sulak and Clugston 1999). Juveniles feed on a diversity of aquatic insects, worms, and freshwater mussels (Mason and Clugston 1993). The primary constituent elements of critical habitat have been identified as: abundant food items, suitable riverine spawning substrates, suitable resting holes, necessary water flow, water quality, sediment quality, and unobstructed migratory pathways (USFWS 2003b).

Over exploitation, habitat modification, and water quality degradation are the primary factors believed to have led to the decline of the sturgeon. Dams and other channel modifications have also impeded upstream passage into many historic habitat areas. Research done on Florida populations has identified concentrations of heavy metals, pesticides, and polycyclic aromatic hydrocarbons at levels known to disrupt reproduction and survival (Smith and Clugston 1997). Similar contaminant levels may also be present within Conecuh and Yellow River populations

(see also general effects discussion, Section VII.B). Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in 5 out of 6 potential species-inhabited Forest Service watersheds (Table VII.B.2) (see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment and flow alterations may contribute the greatest risk to the viability of this species. The opportunities for Forest Service influence, either positive or negative, are limited, however, due to the overwhelming contributions of extensive upstream perturbations.

As discussed in the section on general conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Conecuh National Forest, silvicultural practices have largely been limited to restoration projects within upland pine forests and have not recently occurred within the riparian corridors adjoining Gulf sturgeon critical habitat. The Conecuh National Forest does not have Southern pine beetle infestations like the more northerly Alabama National Forests.

VII. B.2.b. Direct, Indirect, and Cumulative Effects – Gulf sturgeon

Direct effects, such as mortality of Gulf sturgeon eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The Forest Service will not be engaging in any in-channel disturbing activities within the large river habitat. On-Forest oil and gas leases will contain a no-surface occupancy stipulation or controlled-surface-use stipulation within the riparian corridor (standard 11-16), and consequently, should be of sufficient distance to preclude direct disturbance effects. The Forest Service is not responsible for enforcement of commercial or recreational fishing regulations.

Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) channel configurations, 4) flow, or 5) blockage of fish passage could indirectly and negatively affect Gulf sturgeon and their critical habitat. If done without protective measures, such adverse effects could potentially be caused by the following Forest Service activities: application of pesticides/herbicides, road and trail construction, maintenance or use, silvicultural treatments for pest management and forest health, and prescribed burning. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1. Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. On the Conecuh National Forest, there are no lakes or reservoirs upstream from Gulf sturgeon habitat that would receive fertilizer. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service permitted activities associated with roads, vehicles, equipment, herbicide and pesticide

applications. Moreover, oil and gas leases will contain a no-surface occupancy stipulation or controlled-surface-use stipulation within the riparian corridor (standard 11-16), and consequently, should be of sufficient distance from aquatic habitat so as to preclude spills and other adverse effects to surface water quality. Implementation of these standards would greatly minimize the opportunities for chemical contamination from Forest Service activities. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within the Yellow River and Five Runs Creek where point source pollution has been identified as a moderate viability concern for this species (Table VII.B.2).

2. Sediment: Without protective measures, excessive siltation and sedimentation could affect Gulf sturgeon by eliminating or reducing their mollusk and in food supplies, altering the rocky habitats where they seek food and cover, reducing the quality and availability of spawning and rearing shoals, and accumulating and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such management activities as silvicultural thinning, pest control, prescribed burning, herbicide use, construction and maintenance of temporary roads and permanent roads and trails (see full discussion under section V.II.B. on effects common to all aquatic T&E species). Erosion and siltation due to a few livestock grazing operations is not likely, due to both the situation of the allotments within upland areas not adjacent to sturgeon critical habitat, and the application of protective standards designed to minimize erosion. Implementation of protective standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities; and given the "excellent" condition rating within all of the Gulf sturgeon watersheds associated with the Conecuh National Forest, cumulative effects due to overall Forest Service management activities are not likely (see also general effects discussion, section VII.B). Moreover, the Yellow River has been identified as possible priority watershed and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within Conecuh and Yellow River critical habitat where excessive sedimentation has been identified as a high viability concern for this species (Table VII.B.2).

3. Channel Structure: Without protective measures, changes in channel structure could affect Gulf sturgeon by decreasing quality spawning beds or degrading deep holding pools. The Forest Service does not, and would not engage in activities that modify their large riverine critical habitat. Forest Service lands would however, continue to protect and contribute large woody debris, a factor that may be responsible for creation of the deep large channel pools (Dolloff & Webster 2000) that have been identified as important resting and holding areas for migrating sturgeon. Under the revised Forest Plan, standards will protect and maintain future supplies of large woody debris (see discussion in section VII.B on effects common to all T&E species). If river boating becomes a popular activity on the Conecuh National Forest, additional stipulations and mitigation measures would be prudent. Current

conditions of little to no Forest Service vegetative removal adjacent to Gulf sturgeon habitat would continue. Large woody debris supplies would likely remain the same or possibly increase, and there would not be adverse effects on Gulf sturgeon due to alterations of their critical habitat. Regardless of Forest Service actions, ongoing off-Forest activities such as reservoirs, road crossings, woody debris removal, dredging, mining, and channelization, will undoubtedly contribute to channel alteration particularly within portions of the Conecuh and Yellow Rivers, critical habitat for this species.

4. Flow: Without protective measures, changes in hydrology have the potential to negatively affect Gulf sturgeon through degradation or fragmentation of suitable habitat, reduction in the quality and availability of prey, or blockage of fish passage. Without protective measures, Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. The Forest Service does not operate any upstream flow altering reservoirs. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within the Conecuh River where flow alterations have been identified as a high viability concern for this species (Table VII.B.2). Municipal and private water withdrawals occur throughout the upper and lower watersheds, impacting base flows during summer or periods of extended drought.

5. Habitat Connectivity: Passage barriers have the potential to affect Gulf sturgeon through either direct blockage of their migratory movements or indirectly through reduced availability of molluscan prey due to the limitations on the dispersion of fish species that host and transport mussel glochidia (larvae) (Watters 1996). Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Roads are not likely to hamper movements of Gulf sturgeon or their molluscan prey within the preferred large mainstream habitat of the Yellow and Conecuh Rivers. Within these areas, bridges are in place to span the larger stream channels and these bridges are maintained by the counties, rather than the Forest Service. There are no Forest Service maintained dams within the Conecuh National Forest.

Consequently, the Forest Service is not likely to adversely affect Gulf sturgeon due to habitat fragmentation caused by passage barriers.

In summary, Forest Service activities are not likely to adversely affect Gulf sturgeon populations. Overall direction provided in the revised Forest Plan will be beneficial for Gulf sturgeon and their habitat (see also general effects discussion, section VII.B). Also, as discussed in the introductory section, there would be ample opportunities for proactive and beneficial actions.

Under the direction of the revised Forest Plan, critical habitat protection will be the primary recovery objectives (Table VII.B.2). The Forest Service will continue coordination and cooperation with other agencies and academic institutions on research and monitoring using the latest science-based methodologies.

VII. B.2.c. Determination of Effects – Gulf sturgeon

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that otherwise negative effects would be minimized to a discountable and insignificant level and overall effects on the species and its critical habitat will be beneficial. It is therefore my determination that the revised National Forests of Alabama Land and Resource Management Plan is **not likely to adversely affect the Gulf sturgeon or adversely modify critical habitat.**

VII. B.3. Pygmy sculpin *(Cottus pygmaeus)*

VII. B.3.a. Environmental Baseline – Pygmy sculpin

Pygmy sculpins are listed as threatened under the Endangered Species Act (USFWS 1989). The sculpin is endemic to the Coosa River basin and currently only occupies habitat within one isolated spring and a spring-run (Coldwater Spring) near, but not downstream from the Shoal Creek District of the Talladega National Forest (Table VII. B.3). This population is considered stable at around 7,000 to 9,000 individuals, but at risk due to its restriction to and dependence on one spring (USFWS 2003). There are no other occurrences of this species on or off National Forest system lands. The recovery objective is to protect pygmy sculpins and their restricted habitat so as to eventually allow delisting (USFWS 1991b).

Table VII. B.3. Overview of known or suspected pygmy sculpin occurrences and potential habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Talladega	Calhoun	Coosa	M.Choccolocco	23	0	?	unlikely	none		SP TF
		Total				?				

[1] Population status based on USFWS (1989); Page & Burr (1991), Phillips & Johnston (1999), USFWS (2003)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations; E = already extirpated

Pygmy sculpin are apparently restricted to one high volume spring and the downstream spring-run. Temperatures are consistently between 87-88° F. Pygmy sculpins are primarily benthic in behavior and habitat use, inhabiting a wide variety of microhabitats ranging from vegetated pools and spring edges to downstream sand and gravel runs. Pygmy sculpin feed on small snails, microcrustaceans, and aquatic insect larvae. Spawning may occur year round, however activity is most intense from April to August. Eggs are laid beneath cobble substrates. (USFWS 1989)

Historically, the decline and extirpation of most spring dependent species may be attributed to habitat modification, water diversion, sedimentation, eutrophication, and other forms of water quality degradation. Changes in water temperature and pH could also be critical to this species.

VII. B.3.b. Direct, Indirect, and Cumulative Effects – Pygmy sculpin

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. Pygmy sculpins are currently not known to inhabit Forest Service system lands.

Potential management influences could include any activity that increases sedimentation, alters flow, nutrient levels, or temperature, or reduces water quality. However, this species is only known to currently inhabit one isolated spring and a spring-run section of stream several miles away from, but not immediately downstream of the Talladega National Forest. The Forest Service does not have control or influence over the spring that appears to be supporting this population. Therefore, Forest Service activities are unlikely to influence this species.

There are no established Forest Service recovery objectives for this species. Biologists will continue to watch for other populations of this species and/or potential suitable habitat. However, surveys would be incidental to other inventory priorities, given the low likelihood of Forest Service involvement. If at a later date, there is opportunity to expand the population, the riparian strategy and other standards of the revised Forest Plan would provide protective measures. In addition to the riparian standards (standard 9-9), springs and spring dependent species would receive protection through: restoration and inventories (goal 13 and 14), possible removal of encroaching vegetation (standard 9), and grazing exclusion (standard 9-55 and standard 9-11).

Therefore, it would appear that current Forest Service practices do not affect pygmy sculpins since their habitat is not downstream from Forest Service system lands and the Forest Service does not engage in activities that would affect the water source of the spring.

VII. B.3.c. Determination of Effects – Pygmy sculpin

Given the currently known distribution of pygmy sculpin and their suitable habitat, it is my determination that there will be **no effects** from implementation of the revised Land and Resource Management Plan. Additional conservation measures will be discussed with USFWS, if and when recovery actions reveal expansion of suitable habitat and/or species

establishment on, or within a reasonable zone of influence downstream from the National Forests.

VII. B.4 Blue shiner (*Cyprinella caerulea*)

VII. B.4.a. Environmental Baseline -- Blue shiner

Blue shiners are listed as threatened under the Endangered Species Act (USFWS 1992a). A recovery plan has been completed for this species (USFWS 1995a). The species historically was endemic to the Cahaba and Coosa River systems and their tributaries in Alabama, Tennessee, and Georgia. Within Alabama, this species probably once occupied most of the Coosa and Alabama River drainages. Blue shiners were historically known to inhabit over 60 miles of the Cahaba River extending from Jefferson to Bibb Counties (Pierson et al. 1989). However, blue shiners were last collected in the Cahaba River in 1971 and are now considered extirpated from that system (Pierson and Krotzer 1987). Currently, there are approximately six definable populations occurring in headwater streams of the Coosa River system in Georgia, Tennessee, and tributary streams in northeastern Alabama (USFWS 1995a). Three of these populations are in Alabama, and of these, two are partially located on, or downstream, from the National Forests in Alabama. Extant populations and potential habitats on or near Alabama National Forests are displayed in Table VII. B.4. All of these habitat areas are within or downstream of either the Talladega or Oakmulgee Divisions of the Talladega National Forest in Alabama. Two additional extant populations are known to occur outside of Alabama. Several populations inhabit the headwaters of the Conasauga River on the Chattahooche National Forest in Georgia and the Cherokee National Forest in Tennessee. The Conasauga River populations are the most extensive in habitat mileage; however, the actual amount of occupied habitat is much smaller due to habitat heterogeneity and patchiness of blue shiner distribution (USFWS 1995a). According to the recovery plan (USFWS 1995a), blue shiners may be delisted if, 1) significant threats in specified stream reaches are reduced, and 2) populations of these specified reaches are documented as viable. The recovery plan specifies that the Cahaba River upstream from the fall-line, Choccolocco Creek and tributaries above Highway 78, and Weogufka Creek and tributaries above Lake Mitchell are 3 out of the 4 Alabama habitat areas essential for the recovery of blue shiners. A target date for recovery has not been specified.

Table VII. B.4. Overview of blue shiner occurrences and potential habitat on or within five miles of the National Forests in Alabama.

Forest	Counties	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Talladega	Calhoun	Lower Coosa	U. Choccolocco	71	3	6	present	protect survey monitor		
	Clay		M. Choccolocco	23	0	10	downstrm 6% fish[2]	WQ	PF	T
	Cleburne		Cheaha	36	0	1	potential	none	TF	

	Coosa		Tallaseehatchee	22	0	1	potential	none	PT F	
	Coosa		U.Hatchet	11	0	1	potential	none	P	S
				1	0	2	15% fish[2]	WQ		S
Oakmulgee	Bibb	Cahaba	Affonee	24	2	5	extirpated	none		
			Gully	24	1	5	extirpated	none		
		Total			6	29				

[1] Population status based on Boschung & Mettee (1974), Ramsey & Pierson (1986), Pierson and Krotzer (1987), Phillips & Johnston (1999), USFWS (1997), USFS (1998),
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

This species is found in 4th to 2nd order cool, clear moderate gradient medium to large streams and adjoining tributaries (Dobson 1994). The blue shiner typically avoids both small tributaries and large rivers, preferring to inhabit mid sized streams and large tributaries. Blue shiners are found in riffles and runs of low to moderate velocity currents at depths of about 0.5 to 3 feet and seem to prefer predominantly sand or sand and gravel substrates (Pierson and Krotzer 1987; Dobson 1994). They are often found in association with submerged woody debris, brush, and water willow (*Justicia americana*) (USFWS 1995a). Blue shiners are reported to congregate in upwelling current below leaky beaver dams (USFWS 1995a), however it is not clear whether this is due to a positive attraction to the flow and habitat or simply an artifact of the dam's impediment to further upstream movement. This species appears to share habitat preferences and may school together with other shiners, especially as juveniles (USFWS 1995a; Dobson 1994). Blue shiners spawn from early May to late August, probably laying multiple clutches of eggs (USFWS 1995a). It is assumed that blue shiners depend upon small rock crevices for egg laying, as do other members of its genera (Mayden 1989); therefore they are susceptible to excessive sedimentation during their breeding period. Reproduction is also dependent on a mating strategy involving active courtship displays (Mayden 1989). Furthermore, the blue shiner is a visual feeder, feeding on floating terrestrial insects and submerged immature aquatic insects (Etnier and Starnes 1993), and can therefore be greatly impacted by turbid waters (Burkhead and Jenkins 1991). Members of this genus are also sensitive to low dissolved oxygen levels, which may be caused by low flows and nutrient enrichment. Excessive sediment (Stiles 1990) and low dissolved oxygen levels (< 3mg/l) have been documented and implicated as reasons for the apparent extirpation of this species from the Cahaba River (USFWS 1995a). Chemical contaminants are also present within both the Cahaba and Choccolocco River systems. Chemical pollutants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species, including fish (Terrell and Perfetti 1989) (see general effects discussion in section VII.B).

Reservoirs, urbanization, sewage pollution, and strip mining are the human activities that have most likely influenced this species. Such historical and recent conditions have lead to the current status of this species being considered as at a high risk of continued decline in 3 out of 8 potential species-inhabited Forest Service watersheds (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment and thermal alterations may contribute the greatest risk to the viability of this species (Table VII.B.4). The opportunities for Forest Service influence, either positive or negative, are limited, however, due

to the small proportion of each watershed under Forest Service management and the interspersion of private lands.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, Forest Service actions have contributed to improved watershed conditions.

VII. B.4.b. Direct, Indirect, and Cumulative Effects – Blue shiner

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The proposed actions will continue the current situation of limited Forest Service roads and motorized trails within the mainstem riverine and lower tributary habitat areas of this species. Stream crossings are typically bridges, and in many cases not managed by the Forest Service. As discussed in section VII.B, revised Forest Plan standards will minimize opportunities for mechanical damage due to vehicles or equipment.

Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) temperature, 4) nutrient cycling, 5) flow, or 6) blockage of fish passage. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of petroleum-based compounds associated with a) oil and gas extraction, b) roadways, and mechanized equipment, and c) herbicide and pesticide applications used in forestry practices and right-of-ways. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service Forest Service roads, equipment, and herbicide/pesticide use. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within Choccoloco, Tallaseehatchee, and Hatchet Creeks where point source pollution may be a moderate viability concern for this species (Table VII.B.4).

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect blue shiners by limiting food availability and feeding efficiency, impeding respiration, decreasing the quality and availability of spawning habitat, favoring non-native invasive species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management

zone and riparian standards would minimize sediment release during such management activities as silvicultural thinning, pest control, prescribed burning, herbicide use, and construction and maintenance of temporary roads and permanent roads and trails. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. In the long term, increasing emphasis on forest health restoration would decrease background levels of sediments from upland erosion, a benefit to the species. Implementation of the revised Forest Plan standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities. Although there could be some ongoing sediment runoff from roadways, standards for construction, maintenance, and closures would minimize and localize sediment inputs. Any remaining small effects would likely be insignificant, especially when distributed across the watershed. Most watersheds supporting this species are ranked as above average. Within the two watersheds ranked as "below average" (Middle Choccolocco and Tallaseehatchee), proposed prescriptions include red-cockaded woodpecker habitat restoration, dispersed recreation and remote backcountry non-motorized recreation, encompassing activities that are likely to be fully mitigated for downstream sediment effects. Middle Choccolocco road density is high both within and outside of the Talladega National Forest, indicating a potential for cumulative road related sediment effects. However, since Forest Service lands are less than 23% of the watershed, Forest Service sediment contributions would be expected to be minor portions of the much more pervasive sediment loading associated with off-Forest agricultural, silvicultural, and residential activities (see also general effects discussion, section VII.B). Blue shiner habitat is downstream from these tributary watersheds primarily within the mainstem of Choccolocco Creek, and these areas continue to be severely impacted by off-Forest activities. Also, upper Choccolocco Creek, including the headwaters of middle Choccolocco Creek is an important watershed for several other aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority when a conservation strategy is developed (objective 11.4). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within portions of Hatchet and Weogufka Creeks where excessive sedimentation has been identified as a high viability concern for this species (Table VII.B.4).

3) Temperature: Elevated water temperature has the potential to affect blue shiner through increased metabolism, food demands, non-native species invasions (Claudi and Leach 1999), and risks of infection from pathogens. Warmer water may also result in shifts in food webs and prey availability. Activities that remove streamside vegetation and impound water flow are potential contributors to elevated water temperatures. Without protective measures, the main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would effectively minimize the potential for thermal alterations due to Forest Service activities. Regardless of Forest Service actions, off-Forest silviculture and development would continue to contribute to elevated water temperatures, particularly within lower portions of Weogufka

Creek where thermal alterations have been identified as of high viability concern for this species (Table VII.B.4).

4) Nutrients: Nutrient enrichment has the potential to affect blue shiners by altering primary productivity and food webs, favoring non-native invasive species (Claudi and Leach 1999), direct toxicity, reduced dissolved oxygen, or increased transmission and susceptibility to pathogens. There are only a few forest service activities that could potentially contribute to nutrient enrichment; These are a) permitting of livestock and equestrian use, b) fertilization of lakes, or c) discharge from facility sewage or septic systems. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for nutrient enrichment due to Forest Service activities. Liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Therefore, given full implementation of the revised Forest Plan direction as well as State regulations and necessary site-specific analysis, adverse effects on blue shiners would be unlikely. Regardless of Forest Service actions, off-Forest land uses such as agriculture, residential development, and pond fertilization will undoubtedly continue to contribute to nutrient enrichment, which has been identified as a moderate viability concern within Choccolocco, Tallaseehatchee, and Hatchet Creeks (Table VII.B.4).

5) Flow: Without protective measures, changes in hydrology have the potential to negatively affect blue shiners through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of prey. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows without implementation of protective measures. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, all of the impoundments associated with this species are operated by other agencies for municipal water supplies or flood control and therefore not under the

management of the Forest Service. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within Choccoloco, Cheaha, and Tallaseehatchee Creeks where flow alterations have been identified as a moderate viability concern for this species (Table VII.B.4).

6) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. However, the Forest Service is unlikely to contribute to passage barriers for this species since blue shiners are primarily a riverine and lower tributary species and thus not inhabitants of the blockage prone smaller headwater streams. Within these lower portions of the watersheds, dams and road crossings are unlikely to affect fish passage. If further fish passage assessments, as stipulated in the revised Forest Plan (objective 31.1) indicate otherwise, action would be taken to restore blue shiner access in coordination with USFWS (objective 31.2). Consequently, the Forest Service is not likely to adversely affect blue shiner due to habitat fragmentation caused by passage barriers.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact blue shiners through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect blue shiner populations. Overall, direction provided in the revised Forest Plan will be beneficial for blue shiners and their habitat. As discussed in the introductory section, there would be ample opportunities for proactive and beneficial actions that could serve as mitigation for any minor insignificant negative effects not fully eliminated by protective measures. Under the direction of the revised Forest Plan, continued habitat and watershed protection and monitoring will be the primary restoration objectives (Table VII.B.4). Habitat will be monitored in conjunction with comprehensive surveys and project monitoring. Surveys are recommended to more fully establish the status of the Upper Choccoloco Creek population, and to be used as a baseline for subsequent population monitoring. As appropriate, additional suitable habitat may be identified and cooperative action taken to repatriate blue shiners into unoccupied areas on National Forest lands.

VII. B.4.c. Determination of Effects – Blue shiner

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, blue shiners and their habitat should benefit. It is therefore my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect blue shiners.**

VII. B.5. Cahaba shiner (*Notropis cahabae)*

VII. B.5.a. Environmental Baseline -- Cahaba shiner

Cahaba shiners are listed as endangered under the Endangered Species Act (USFWS 1990b). A recovery plan has been completed for this species (USFWS 1992b). Cahaba shiners historically occurred only in the Cahaba River and lower reaches of its tributaries. The current range has been reduced by over a third to approximately 60 river miles with the largest remaining concentration extending 15 miles below the fall line (Mayden and Kuhajda 1989). Extant populations are considered to be in decline (USFWS 1992b). Four sites are known within several miles upstream and downstream from the Oakmulgee Division of the Talladega National Forest; however, these sites may be peripheral to the preferred habitat above the fall-line (Shepard et al. 1995). It is probable, but not confirmed, that Cahaba shiners inhabit the ¼ mile section of the Cahaba River adjoining the Oakmulgee Division of the Talladega National Forest. Extant populations and historical or potential habitats on or near National Forests are displayed in Table VII. B.5. All of these populations are within the Oakmulgee Division of the Talladega National Forest in Alabama; and there are no other occurrences of this species on National Forest system lands. According to the recovery plan (USFWS 1992b), Cahaba shiners may be reclassified as threatened if, 1) densities are achieved of at least 5 per hour catch per unit effort (using 12 foot seine in suitable habitat) throughout their 76 miles of historic mainstem Cahaba River habitat, 2) populations are documented as viable over a 10 year period, and 3) the Cahaba River drainage is protected from water quality degradation. A target date for reclassification or recovery is not specified.

Table VII. B.5. Overview of Cahaba shiner occurrences and potential habitat located within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Oakmulgee	Perry	Cahaba	Cahaba	11	1	2	Probable declining[2]	protect/increase minor FS influence		S
	Bibb		Gully	24	0	3	dnstrm	minor FS influence		
		Total			1	5				

[1] Population status based on Stiles (1978, 1990), Pierson et al. (1989), USFWS (1992b)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

This species is normally confined to the main channel of the Cahaba River, however it may seasonally move into the lower reaches of tributaries during periods of rapidly rising water levels. The primary habitat appears to be the interface between quiet waters less than 1.6 feet deep and swift riffle areas associated with large shoals (Howell et al. 1982). Within these areas, it is found in the greatest abundance in slow currents over patches of sand or gravel substrates immediately downstream from boulders. Spawning occurs in May through June, a more limited spawning period than most other shiner species (USFWS 1992b). Spawning fish aggregate in moderate current of pool tails (Ramsey 1982).

Cahaba shiners depend upon small rocky crevices in which to lay eggs; therefore, they are susceptible to excessive sedimentation. Furthermore, the Cahaba shiner is a visual feeder, feeding on floating terrestrial insects and submerged immature aquatic insects (USFWS 1992), and can therefore be greatly impacted by turbid waters (Burkhead and Jenkins 1991). Members of this genus are also sensitive to low dissolved oxygen levels, which may be caused by low flows and nutrient enrichment. Excessive sediment has been documented in the Cahaba River

and identified as a concern for this species (Stiles 1990). Low dissolved oxygen levels (<3mg/l) have also been reported in the Cahaba River (USFWS 1992b). Chemical contaminants are also present within both the Cahaba River. Chemical pollutants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species, including fish (Terrell and Perfetti 1989) (see general effects discussion in section VII.B). Therefore, reservoirs, urbanization, sewage pollution, and strip mining have most likely greatly influenced this species. Such historical and recent conditions have lead to the current status of this species being considered as at a high risk of continued decline in 1 out of 2 potential species-inhabited Forest Service watersheds (Table VII.B.5) (also see EIS, section 3.B.5, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment has been identified as a possible high risk to the viability of this species in the Cahaba River. The opportunities for Forest Service influence, either positive or negative, are limited, however, given the small portion of habitat under Forest Service management (< ½ acre) and due to the overwhelming of upper basin development, industry, agriculture, and other land uses.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have generally been improving under the current Forest Plan. Specifically, on the Talladega National Forest, Cahaba shiner habitat conditions have largely remained the same, due to the overwhelming influence of off-Forest impacts. Upstream and downstream off-Forest land uses will continue to adversely impact Cahaba shiners through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals.

VII. B.5.b. Direct, Indirect, and Cumulative Effects – Cahaba shiner

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The Forest Service will not be engaging in any in-channel disturbing activities within their large river habitat.

Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) flow, or 4) blockage of fish passage could indirectly and negatively affect Cahaba shiners. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, d) herbicide and pesticide applications used in forestry practices and right-of-ways. On the Oakmulgee Division

of the Talladega National Forest, there are no lakes upstream from Cahaba shiner habitat that will receive fertilizer. Bridges upstream from Cahaba shiner habitat are not maintained or within the control of the U.S. Forest Service. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service permitted activities associated with roads, vehicles, equipment, herbicide and pesticide applications. Off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, regardless of Forest Service actions.

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect Cahaba shiners by limiting food availability and feeding efficiency, impeding respiration, decreasing the quality and availability of spawning habitat, favoring non-native invasive species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such management activities as silvicultural thinning, pest control, prescribed burning, herbicide use, and construction and maintenance of temporary roads and permanent roads and trails. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. In the long term, increasing emphasis on forest health restoration would decrease background levels of sediments from upland erosion, a benefit to the species. Implementation of the revised Forest Plan standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities and given the "excellent" condition rating within all Cahaba River tributary watersheds associated with the Oakmulgee Division of the Talladega National Forest, cumulative effects due to overall Forest Service management activities are not likely (see also general effects discussion, section VII.B). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within the Cahaba River where excessive sedimentation has been identified as a high viability concern for this species (Table VII.B.5).

3) Flow: Without protective measures, changes in hydrology have the potential to negatively affect Cahaba shiners through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of prey. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have

minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. There may be cumulative impacts from the ongoing maintenance and operation of numerous off-Forest dams and impoundments. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, all of the impoundments associated with this species are off-Forest and/or operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within the Cahaba River. Municipal and private water withdrawals occur throughout the upper watershed, and their effects may be cumulatively significant in relation to overall watershed discharge values.

4) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. However, the Forest Service is unlikely to contribute to passage barriers for this species since Cahaba shiners are primarily a riverine and lower tributary species and thus not inhabitants of the blockage prone smaller headwater streams. Within these lower portions of the watersheds, dams and road crossings are unlikely to affect fish passage. If further fish passage assessments, as stipulated in the revised Forest Plan (objective 31.1) indicate otherwise, action would be taken to restore Cahaba shiner access in coordination with USFWS (objective 31.2). Consequently, the Forest Service is not likely to adversely affect Cahaba shiner due to habitat fragmentation caused by passage barriers.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact Cahaba shiners through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect Cahaba shiner populations. Overall direction provided in the revised Forest Plan will be beneficial for Cahaba shiners and their habitat. As discussed in the introductory section, there would be ample opportunities for proactive and beneficial actions. Under the direction of the revised Forest Plan, continued watershed protection will be the primary recovery objective (Table VII.B.5). Monitoring for the presence of Cahaba shiners would not be a high priority given that the opportunities for Forest Service influence are extremely limited. However, periodic surveys

for species presence would be conducted in conjunction with comprehensive aquatic community monitoring.

VII. B.5.c. Determination of Effects – Cahaba shiner

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, Cahaba shiner and their habitat should benefit. It is therefore my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the Cahaba shiner.**

VII. B.6. Goldline darter (*Percina aurolineata*)

VII. B.6.a. Environmental Baseline – Goldline darter

Goldline darters are listed as threatened under the Endangered Species Act (USFWS 1992a). Goldline darters are covered under the multi-species Mobile Basin Recovery Plan of 2003 (USFWS). Their historical range is assumed to have extended throughout all of the major tributaries of the Alabama River Basin since extant populations are also located within tributaries of the Coosa River in Georgia. It is known that they once ranged over nearly 50 miles of the mainstem Cahaba River as well as several large tributaries (USFWS 2003). Currently, goldline darters are thought to inhabit approximately half of their historical Cahaba River basin habitat including portions of the Oakmulgee Division of the Talladega National Forest. Extant populations and potential or historical habitats on or near National Forests are displayed in Table VII. B.6. All of these are associated with the Oakmulgee Division of the Talladega National Forest; however goldine darters may also inhabit the Cherokee National Forest. According to the recovery plan (USFWS 2003), goldline darters may be reclassified if, 1) all occupied watersheds support stable or increasing populations, 2) populations are documented as viable over a 10-year period, and 3) the Cahaba River drainage is protected from water quality degradation. A target date for recovery and delisting has been set as 2010.

Table VII. B.6 Overview of goldline darter occurrences and potential habitat located within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Habitat Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Oakmulgee	Bibb	Cahaba	Affonee	24	0	1	unknown	WQ		
	Perry		Cahaba	11	<1	2	unknown	stabilize		S
	Bibb		Gully	24	<1	1	unknown	WQ		
		Total			2	4				

[1] Population status based on Stiles (1978), Mount (1986), UA (1986), Pierson et al. (1989)
[2] Viability risks: M – moderate, H – high, S – sedimentation, P – point-source pollution, T – thermal, F – flow alterations

The goldline darter prefers moderate to swift currents and deeper waters (> 3 feet) of large tributary streams and rivers above the fall line (Lee et al. 1980). It is usually encountered within white-water rapids over predominantly gravel substrates interspersed among cobble, rubble, bedrock or small boulders as well as among patches of water willow (*Justicia*) or river-weed (*Podostemum*) (Page and Burr 1991).

Water quality degradation is cited as the probable cause in the species' reduction in range and numbers. Pollution due to rapid urbanization and sedimentation has likely also played a role in their decline. The continued decline of goldline darter populations may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Excessive sediment has been documented in the Cahaba River and identified as a concern for this species (Stiles 1990). Low dissolved oxygen levels (<3mg/l) have also been reported in the Cahaba River (USFWS 1992a). Chemical contaminants are also present within both the Cahaba and Choccolocco River systems. Chemical pollutants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species, including fish (Terrell and Perfetti 1989) (see general effects discussion in section VII.B). Therefore, reservoirs, urbanization, sewage pollution, and strip mining have most likely greatly influenced this species. Such historical and recent conditions have lead to the current status of this species being considered as at a high risk of continued decline in 1 out of 3 potential species-inhabited Forest Service watersheds (Table VII.B.6) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment has been identified as a possible high risk to the viability of this species in Cahaba River. The opportunities for Forest Service influence, either positive or negative, are limited, however, given the small portion of habitat under Forest Service management (< ½ acre) and due to the overwhelming of upper basin development, industry, agriculture, and other land uses.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, goldline darter habitat conditions have largely remained the same. However, upstream and downstream off-Forest land uses will continue to adversely impact goldline darters through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals.

VII. B.6.b. Direct, Indirect, and Cumulative Effects – Goldline darter

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The Forest Service will not be engaging in any in-channel disturbing activities within their large river habitat.

Since goldline darters are not expected to be directly on Forest Service tributary habitat, the primary concerns are with overall downstream watershed affects. Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) flow, or 4) blockage of fish passage could indirectly and negatively affect goldline darters. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. On the Oakmulgee Division of the Talladega National Forest, there are no lakes upstream from Cahaba shiner habitat that will receive fertilizer. Bridges upstream from goldline darter habitat are not maintained or within the control of the U.S. Forest Service. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service permitted activities associated with roads, vehicles, equipment, and herbicide and pesticide applications. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within the Cahaba River.

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect goldline darters by limiting food availability and feeding efficiency, impeding respiration, decreasing the quality and availability of spawning habitat, favoring non-native invasive species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such management activities as silvicultural thinning, pest control, prescribed burning, herbicide use, and construction and maintenance of temporary roads and permanent roads and trails. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. In the long term, increasing emphasis on forest health restoration would decrease background levels of sediments from upland erosion, a benefit to the species. Implementation of the revised Forest Plan standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities and given the "excellent" condition rating within all goldline darter watersheds associated with the Oakmulgee Division of the Talladega National Forest, cumulative effects due to overall Forest Service management activities are not likely (see also general effects discussion, section VII.B). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within the Cahaba River where excessive sedimentation has been identified as a high viability concern for this species (Table VII.B.6).

3) Flow: Without protective measures, changes in hydrology have the potential to negatively affect goldline darters through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of prey. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised

Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. There may be cumulative impacts from the ongoing maintenance and operation of numerous off-Forest dams and impoundments. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, all of the impoundments associated with this species are off-Forest and/or operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within the Cahaba River. Municipal and private water withdrawals occur throughout the watersheds, and their effects may be cumulatively significant in relation to overall watershed discharge values.

4) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. However, the Forest Service is unlikely to contribute to passage barriers for this species since goldline darters are primarily a riverine and lower tributary species and thus not inhabitants of the blockage prone smaller headwater streams. Within these lower portions of the watersheds, dams and road crossings are unlikely to affect fish passage. If further fish passage assessments, as stipulated in the revised Forest Plan (objective 31.1) indicate otherwise, action would be taken to restore goldline darter access in coordination with USFWS (objective 31.2). Consequently, the Forest Service is not likely to adversely affect goldline darters due to habitat fragmentation caused by passage barriers.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact goldline darters through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect goldline darter populations. Overall direction provided in the revised Forest Plan will be beneficial for goldline darters and their habitat. As discussed in the introductory section, there would be ample opportunities for proactive and beneficial actions. Under the direction of the revised Forest

Plan, continued watershed protection and monitoring will be the primary restoration objectives (Table VII.B.6). Periodic surveys for species presence will be conducted in conjunction with comprehensive aquatic community monitoring. Habitat will be monitored in conjunction with comprehensive surveys and project monitoring. As appropriate, additional suitable habitat may be identified and cooperative action taken to repatriate goldline darters into unoccupied areas on National Forest lands.

VII. B.6.c. Determination of Effects – Goldline darter

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, goldline darters and their habitat should benefit. It is therefore my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the Goldline darter.**

VII. B.7. Alabama sturgeon (*Scaphirhynchus suttkusi*)

VII. B.7.a. Environmental Baseline – Alabama sturgeon

The Alabama sturgeon is listed as endangered under the Endangered Species Act (USFWS 2000a) and included in the multi-species Mobile River Basin recovery plan (USFWS 2000b). Critical habitat was proposed but not designated (USFWS 1993a). This species is endemic to the Mobile Bay drainage and historically ranged over 750 miles within the Tombigbee River system in Alabama and Mississippi and the mainstem Alabama River and lower portions of the Cahaba, Coosa, and Tallapoosa Rivers in Alabama. The sturgeon has been largely extirpated. Its current habitat has been reduced by over 90% to less than 150 miles within the lower Alabama River. Although the Oakmulgee Division of the Talladega National Forest touches upon historical habitat within the mainstem of the Cahaba River, this species has not been confirmed within this area since the 1980's. Extant populations and historical or potential habitats on or near National Forests are displayed in TableVII. B.7. All of these are within or adjacent to the Oakmulgee Division of the Talladega National Forest in Alabama; and there are no other occurrences of this species on National Forest system lands. Recovery objectives and downlisting criteria have not yet been developed (USFWS 2000b).

Table VII. B.7. Overview of Alabama sturgeon occurrences and potential habitat located within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Oakmulgee	Perry	Cahaba	Cahaba	11	1	10	Unlikely	none		S

[1] Population status based on Mayden et al. 1996, , USFWS (2000b)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

This species is anadromous, moving between estuarine feeding areas and mid to lower river basin spawning and rearing habitat. Alabama sturgeon appear to prefer unmodified main channel habitat of larger rivers (USFWS 2000a). Closely related species are associated with strong currents over sand and gravel substrates. Sturgeon are opportunistic bottom feeders on fish, mollusks, and aquatic insects. Spawning occurs in late spring to early summer (Burke and

Ramsey 1995). Spawning habitats are thought to be within main channel areas of tributaries where there are strong currents over hardened substrates. The eggs are adhesive. Larvae temporarily have the ability to cling to rocks and vegetation through the use of a sucker.

The construction of dams and impoundment of prime channel habitats are thought to be the principal reasons for the reduction in the range and population size of the Alabama sturgeon. Over fishing, channelization, water flow alteration, and water quality degradation undoubtedly also played roles in their decline.

As discussed in the general baseline condition section (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically on the Oakmulgee Division of the Talladega National Forest, watershed conditions have improved or remained the same. However, downstream and upstream off-Forest land uses continue to adversely impact Alabama sturgeon through impediments to passage, elevated levels of sediment runoff, channel alterations, and the release of toxic chemicals.

VII. B.7.b. Direct, Indirect, and Cumulative Effects – Alabama sturgeon

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. Alabama sturgeon are currently not known or expected to occur on Forest Service system lands.

Due to its limited distribution to the lower portion of the mainstem Cahaba, and its possible extirpation throughout the area, this species is unlikely to be influenced by Forest Service activities in the near future. If the species is re-discovered or recovery plans include active repatriation within or adjacent to National Forest lands, additional cooperative and coordinated research and protective actions would be undertaken.

VII. B.7.c. Determination of Effects – Alabama sturgeon

Given the currently known distribution of Alabama sturgeon and their mainstem suitable habitat, it is my determination that there will be **no effect** from the revised Land and Resource Management Plan. Additional conservation measures will be discussed with FWS, if and when recovery actions reveal expansion of suitable habitat and/or species establishment on or within the zone of influence downstream from the National Forests.

VII. B.8. Cumberlandian combshell (*Epioblasma brevidens)*

VII. B.8. a. Environmental Baseline -- Cumberlandian combshell

Cumberlandian combshells are listed as endangered under the Endangered Species Act (USFWS 1997). A recovery plan has been drafted but not finalized (USFWS 2003d). The species historically occurred throughout the mainstem of the Tennessee River basin in Alabama, Georgia, and Tennessee. This species has largely bee extirpated from its former range, with only seven remaining tributary population scattered across Kentucky, Tennessee, Virginia, and Alabama. The largest extant population is that of the Clinch River in Virginia.

Bear Creek, tributary to the Tennessee River, and downstream from the Bankhead National Forest, is the last known population in Alabama; this population is small (USFWS 1997). Extant populations and historical or potential habitat on or near the National Forests in Alabama are displayed in Table VII. B.8. Cumberlandian combshells are known to inhabit portions of the upper Clinch River in Virginia and the Powell River in Tennessee, both within the Jefferson National Forest. According to the draft recovery plan (USFWS 2003d), this species can be downlisted when there at least 7 distinct viable stream population, including two in the Cumberland River system, 3 in the upper Tennessee River system, and 2 in the lower Tennessee River system. These goals will be attained by protecting and/or expanding the Bear Creek population downstream from the Bankhead National Forest.

Table VII.B.8. Overview of Cumberlandian combshell occurrences and potential habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Bankhead	Lawrence	Tennessee	Upper Bear	2	0	>1	dwnstrm small	WQ	PT F	S

[1] Population status after Jeff Garner (personal communication), USFWS (2003d)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

This species was historically found in normally clear water, on stable coarse sand-gravel-cobble substrates in shoals of medium tributary streams and large rivers with medium to fast current velocities (Dennis 1984, Gordon 1991). Viable populations appear to only inhabit shallow water (<1m) although relic non-reproducing populations may remain in areas of inundation (Gordon & Layzer 1989). Cumberlandian combshells were, and continue to be absent from the smaller tributary streams (Parmalee and Bogan 1998). This species also does not extend far upstream in tributaries (USFWS 2003d). Freshwater mussels are filter feeders, removing organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Spawning probably occurs in late summer with the glochidia (larvae) being held over winter and released in late spring (Gordon 1991). Cumberlandian combshells are reportedly gravid in May through June (Ahlstedt 1991), utilizing a variety of fish species including, but not limited to banded sculpin (*Cottus carolinae*), mottled sculpin (*Cottus bairdi*), logperch (*Percina caprodes*), redline darter (*E. rufilineatum*), and Tennessee snubnose darter (*E. simoterum*) (Yeager and Saylor 1995; Parmalee and Bogan 1998). As for most freshwater mussels, this species is likely long-lived, and not reproductively mature until attaining 8 or more years of age (Neves and Moyer 1988). Predation is normally a minor mortality factor, with the exception of muskrats, otters, and some types of turtles. A few species of fish may also consume juvenile mollusks. Mussels are parasitized by a variety of organisms with the possibility of excessive infestations causing reduction in growth, longevity, and fertility (Zale and Neves 1982, Parmalee and Bogan 1998).

Currently, there is only one watershed that could include this species downstream from the National Forests in Alabama. This species is considered at risk in the Bear Creek watershed primarily due to off-Forest influences (EIS Section 3.B.4). As discussed in the section on general baseline conditions common to all T&E species (VII.B), downstream habitat conditions have been improving under the current Forest Plan. Specifically, on the Bankhead National Forest, watershed conditions have generally improved over historical conditions (SAMAB

1996; McDougal et al. 2001). However, downstream off-Forest land uses continue to adversely impact Cumberlandian combshells through impeded fish passage, excessive sedimentation, channel alterations, and the release of toxic chemicals. Historically, coal mines negatively affected the Bear Creek Cumberlandian combshells through alteration of pH, sedimentation, and release of heavy metals.

VII. B.8.b. Direct, Indirect, and Cumulative Effects – Cumberlandian combshell

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. Cumberlandian combshells are currently not known to inhabit Forest Service system lands.

This species is not likely to be found on the Bankhead National Forest since the primary habitat is the large river reaches within the lower portion of the watershed. Potential Forest Service management activities that could influence Cumberlandian combshells would therefore include actions that could increase downstream sedimentation and turbidity. Siltation, sedimentation, and turbidity would affect Cumberlandian combshells by altering the rocky interstitial spaces where they live, reducing feeding abilities, and impeding respiration. Increased turbidity would also affect biological processes. Given the long distances between Forest Service activities and the lower watershed large riverine habitat of this species, and also given full implementation of revised Forest Plan standards, downstream effects on Cumberlandian combshell should be negligible and insignificant.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Coal mines, have negatively affected mussels through alterations in pH, sedimentation, and release of heavy metals. Malathion contamination has been identified as a particular concern for the Bear Creek population of the Cumberlandian combshell (USFWS 2003). For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect Cumberlandian combshells or their habitat. Continued watershed protection and water quality monitoring will be the primary Forest Service restoration objectives. Water quality will be monitored in conjunction with comprehensive surveys and project monitoring. Since this species and suitable habitat is not likely on the Bankhead National Forest, population surveys and expansion activities will not be a Forest Service priority.

VII. B.8.c. Determination of Effects -- Cumberlandian combshell

Given full implementation of the Forest-wide and riparian standards, it is likely that otherwise potential cummulative effects on downstream water quality will be minimized to a discountable and insignificant level. It is therefore my determination that the revised National Forests of Alabama Land and Resource Management Plan is **not likely to adversely affect the Cumberlandian combshell.**

VII. B.9. Upland combshell (*Epioblasma metastriata*) Conrad

VII. B.9. a. Environmental Baseline – Upland combshell

Upland combshells are listed as endangered under the Endangered Species Act (USFWS 1993b). The Upland combshell is included in the multi-species Mobile River Basin recovery plan (USFWS 1994b). Upland combshells historically occurred in the Black Warrior, Cahaba, and Coosa Rivers, and some of their tributaries in Alabama, Georgia, and Tennessee. When listed, the mussel was believed to be restricted to only the Conasauga River in the upper Coosa River Basin in Georgia. Recent surveys of historic habitat have been unable to locate any extant populations. The species may be extinct, however, biologists continue to retain hope that additional surveys may locate these mussels (USFWS 2003c). Critical habitat has been proposed for 8 watersheds in Alabama, Georgia, and Tennessee (USFWS 2003c). Portions of the proposed critical habitat are located on Terrapin Creek within the Shoal Creek District of the Talladega National Forest. Proposed critical habitat is also located within Hatchet Creek, downstream from the Talladega National Forest. Historical, potential, and proposed critical habitats on or near National Forests are displayed in Table VII. B.9. All of these are within or adjacent to the Bankhead or the Oakmulgee and Talladega Divisions of the Talladega National Forest; historical and potential habitat also occurs on the Cherokee National Forest in Georgia. This species is considered to be rare and declining within the Conasauga River and possibly extirpated from the Cahaba and Black Warrior drainages (USFWS 2003c). According to the recovery plan (USFWS 2003c), neither downlisting nor delisting is a realistic goal within the next decade. Instead, the main goal is to prevent the continued decline and possible extirpation of remaining populations. Specific objectives include 1) surveys to identify the extent of extant populations, and 2) implementation of habitat protection and restoration measures. A target date for recovery and delisting has not been set.

Table VII. B.9. Overview of upland combshell historical, potential, and proposed critical habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles on	Miles near	Status	FS Recovery Goals	Viability Risk[1] M	Viability Risk[1] H
Oakmulgee	Perry	Cahaba	Cahaba	11	1	2	extirpated?			S
Talladega	Calhoun Cleburne	L. Coosa	U. Chocolocco	71	10	5	extirpated?	survey		
	Cherokee Calhoun Cleburne		U. Terrapin	26	5	5	48 mi unoccupied C.Hab	protect, survey	P	
	Coosa		U. Hatchet	11	0	1	41 mi downstream unoccupied C.Hab	protect, survey	P	S
Bankhead	Winston	B. Warrior	U. Sipsey Fork	87	0	0	extirpated		F	
		Total			16	13				

[1] Population status based on Pierson (1991), USFWS (2003c)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

Upland combshells typically inhabit stable sand and gravel substrates in riffles and shoals of small to medium sized rivers (Parmalee and Bogan 1998; USFWS 2003c). This species is associated with moderate to swift currents (USFWS 2003c). Freshwater mussels are filter feeders, removing organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Based upon the biology of similar species, it is assumed that this species probably releases glochidia in late spring to early summer (USFWS 2000). Host fish have not been identified. As for most freshwater mussels, this species is likely long-lived, and not reproductively mature until attaining 8 or more years of age (Neves and Moyer 1988). Predation is normally a minor mortality factor, with the exception of muskrats, otters, and some types of turtles. A few species of fish may also consume juvenile mollusks. Mussels are parasitized by a variety of organisms with the possibility of excessive infestations causing reduction in growth, longevity, and fertility (Zale and Neves 1982, Parmalee and Bogan 1998).

The primary constituent elements identified as of importance for proposed critical habitat include: stable channels, appropriate flows, necessary water quality, clean substrates, available fish hosts, and lack of competitive non-native species (USFWS 2003). Habitat qualities and environmental sensitivities common to all T&E mussels are discussed in section VII.B.

The historical decline of upland combshells may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Impediment of host fish passage may also be a factor. Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in 2 out of 5 potential species-inhabited Forest Service watersheds (Table VII.B.9) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment has been identified as a possible high risk to the viability of this species in Upper Hatchet Creek. Within Hatchet Creek, the opportunities for Forest Service influence, either positive or negative, are limited given the relatively small (but not insignificant) portion of habitat under Forest Service management (%11). The Forest Service may have a greater role in watershed restoration within the Upper Chocolocco, and Terrapin watersheds. However, since this is a lower watershed riverine species, other factors such as off-Forest habitat fragmentation and pollution may over-ride Forest Service watershed improvements. Restoration is unlikely in the Cahaba and Upper Sipsey Fork watersheds, unless efforts are undertaken to repatriate the species into its former range.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, upland combshell habitat conditions have likely improved. However, downstream and upstream off-Forest land uses continue to adversely impact upland combshells through impeded fish passage, excessive sedimentation, channel alterations, and the release of toxic chemicals.

VII. B.9.b. Direct, Indirect, and Cumulative Effects -- Upland combshell

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. Upland combshells are thought to be extirpated and thus are currently not known to inhabit Forest Service system lands.

Upland combshells are probably extirpated from the historic and proposed critical habitat on the four watersheds associated with the National Forests in Alabama. Ongoing effects, therefore can be considered the potential for modification of the primary constituent elements of the areas proposed for critical habitat designation. Based upon the biology and distribution of this species, any activities that could lead to altered downstream 1) water quality, 2) sedimentation, 3) temperatures, 4) nutrient cycling, 5) channel structure, 6) flow, or 7) blockage of mussel host fish passage could indirectly and negatively affect upland combshells. If done without fully protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Coleman, Morgan, and Liberty Hill Lakes are the only Forest Service controlled facility that may be considered for liming and fertilization (which could alter pH and the toxicity of other chemical contaminants). However, given the diversity of downstream aquatic T&E mussels, project specific environmental analysis would be necessary, and it is unlikely that fertilization would be chosen as a viable action unless there is an alternative method that would not contribute to downstream nutrient inputs unless some means of contaminant could be arranged and monitored to prove effectiveness. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service roads, equipment, and herbicide/pesticide use. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within Terrapin and Hatchet Creeks where point source pollution may be a moderate viability concern for this species (Table VII.B.9).

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect upland combshells by reducing food availability and feeding efficiency, altering the substrates where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize

sediment release during such management activities as silvicultural thinning, pest control, prescribed burning, herbicide use, construction and maintenance of temporary roads and permanent roads and trails. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. In the long term, increasing emphasis on forest health restoration would decrease background levels of sediments from upland erosion, a benefit to the species. Implementation of the revised Forest Plan standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities and given the "excellent" watershed condition rating within all areas of proposed critical habitat associated with the Talladega National Forest, cumulative effects due to overall Forest Service management activities are not likely (see also general effects discussion, section VII.B). In general, Terrapin Creek is an important watershed for several aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority when a conservation strategy is developed (objective 11.4). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within portions of Hatchet Creek where excessive sedimentation has been identified as a viability concern for this species (Table VII.B.9).

3) Temperatures: Elevated water temperature has the potential to affect upland combshells. Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Warmer water temperatures and increased sunlight may result in shifts in food webs and food availability. The introduced Asian clam (*Corbicula fluminea*) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and nutrient dynamics and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Invasive species generally gain the advantage over native species with warmer water temperatures.

   The main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow. Current conditions of little to no Forest Service vegetative removal adjacent to upland combshell critical habitat would continue. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further discourage vegetation removal within or adjacent to upland combshell mainstem habitat. Regardless of Forest Service actions, off-Forest silviculture and development would continue to contribute to elevated water temperatures, particularly within portions of Terrapin and Hatchet Creeks.

4) Nutrients: Nutrient enrichment has the potential to affect upland combshells by altering primary productivity and food webs, favoring non-native invasive species (Claudi and Leach 1999), direct toxicity, or increased transmission and susceptibility to pathogens. There are only a few forest service activities that could potentially contribute to nutrient

enrichment; These are a) permitting of livestock and equestrian use, b) fertilization of lakes, or c) discharge from facility sewage or septic systems. Horse manure can contribute to locally elevated nutrient levels, which may be toxic to mussels and alter the availability of suitable planktonic and detrital foods. Revised Forest Plan standards would minimize the potential for such nutrification by limiting equestrian use to roads and designated trails (standards FW-93 and FW-94) and prohibiting tethering or corralling within 50 feet of stream courses or lakes (standard 11-14). Also, other standards restricting the location and configuration of trail crossings would likely decrease such impacts (see also effects common to all T&E species discussion, section VII.B). As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for nutrient enrichment due to Forest Service activities. Liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Therefore, given full implementation of the revised Forest Plan direction as well as State regulations and necessary site-specific analysis, adverse effects on upland combshells would be unlikely. Regardless of Forest Service actions, ongoing off-Forest activities such as municipal and residential effluents, lake and pond management, and agriculture, will undoubtedly contribute to elevated nutrient levels particularly within portions of Terrapin and Hatchet Creeks where point-source pollution has been identified as a moderate concern for the viability of this species (Table VII.B.9).

5) Channel Structure: Without protective measures, alteration in channel configuration has the potential to adversely affect species by degrading or eliminating habitat qualities necessary for feeding, resting, or reproduction (Brim Box & Moosa 1999). Mussels are particularly sensitive to channel alterations since substrate qualities such as depth, area, particle composition, consolidation, oxygen levels, subsurface water flow, and susceptibility to scouring or deposition can all change dramatically with relatively small adjustments in channel dimensions or structural components. Logs, stumps, and brush appear to serve as some of the most stable refugia areas for substrate dwelling organisms, such as mussels (Pierson 1991).

The Forest Service generally does not engage in activities that modify instream habitat. Exceptions may include: a) localized channel alterations in and around trail and road stream crossings, and b) indirect alteration in structure due to removal or additions of large woody debris. As discussed in the general effect section (VII.B), the proposed actions under the revised Forest Plan will have minimal and eventually fully mitigated effects on stream channels due to standards of action applied to woody debris recruitment and road and trail construction, maintenance, removal, and monitoring. Application of streamside management zone standards would serve to protect, and possibly increase woody debris supplies. Also, woody debris surveys would be conducted and opportunities to restore woody debris densities may be pursued according to survey results. Over time, given the implementation of the revised Forest Plan, stream crossings will come to resemble natural stream channels due to the removal of water constricting culverts or other similar structures. New crossings will be designed to avoid channel-altering effects. Although there could be continuing localized effects of channel alterations, such short term effects

are not expected to influence upland combshells, as this species is not currently known to be occupying these areas within or downstream from the National Forest.

6) Flow: Decreased water flow has the potential to negatively affect upland combshells through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, all of the impoundments upstream from proposed critical habitat are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service.

7) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Road stream crossings have the potential to indirectly affect upland combshells due to the limitations on the dispersion of fish species that host and transport mussel glochidia (Watters 1996). However, roads are less likely to hamper movements of host fish within the preferred upland combshell larger mainstream habitat of the lower portions of the watersheds. Within these areas, bridges are in place to span the larger stream channels. However, it is possible that road stream crossings within the upper tributaries are potential barriers for mussel hosts and it is not yet clear how mussel population viability may or may not be tied to habitat availability throughout the watershed. It is clear that the implementation of revised Forest Plan direction would substantially improve passage for mussel fish hosts. As discussed in the general effects section (VII.B), full implementation of revised Forest Plan standards would eventually lead to the removal of fish passage problems due to road crossings. Reservoirs may also negatively affect aquatic species by blocking movements. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. An exception is the Forest Service maintained dam impounding Brushy

Lake, which is an ongoing and at least partial barrier to aquatic organism passage within the upper Brushy Fork watershed. Since the Brushy Fork watershed is not known to support upland combshells and is not proposed as critical habitat there likely would not be adverse effects due to the dam. Historically, the Lewis Smith Reservoir may have had cumulative effects on Upland combshells, when they were still present in the Upper Sipsey Fork. Therefore, it is unlikely that Forest Service activities would block upland combshell movements along river corridors. Further research on host fish population viability would be advisable, particularly if this species is ever repatriated into the Brushy Creek watershed.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact upland combshells through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. Coal mines, particularly in the Clear Creek watershed, have negatively affected upland combshells through alterations in pH, sedimentation, and release of heavy metals. For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect upland combshell populations or proposed critical habitat. Watershed and habitat conditions would continue to improve over historic conditions.

In addition to the protective standards, the revised Forest Plan includes goals and objectives conducive to pro-active and beneficial actions. Habitat and watershed protection and monitoring will be the primary objectives for this species (Table VII.B.9). Upper Terrapin has been identified as a possible priority watershed and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). The proposed direction of the revised Forest Plan also aims to foster participation in cooperative watershed assessment, planning, and restoration (objective 43.1, goals 44 and 45). Plan direction includes goals and objectives encouraging Forest Service leadership in natural resource education (goal 43). Critical habitat will be monitored in conjunction with comprehensive surveys and project level monitoring. Inventories of other potential habitat areas (Upper Choccolocco Creek) will also be conducted. As appropriate, additional suitable habitat may be identified and cooperative action taken to repatriate upland combshells into unoccupied areas on National Forest lands.

VII. B.9.c. Determination of Effects – Upland combshell

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration efforts. This species is probably extirpated from most habitat areas on the National Forests in Alabama. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan is **not likely to adversely affect Upland combshells and is not likely to adversely modify proposed critical habitat.**

VII. B.10. Southern acornshell (*Epioblasma othcaloogensis*) Lea

VII. B.10.a. Environmental Baseline – Southern acornshell

Southern acornshells are listed as endangered under the Endangered Species Act (USFWS 1993b). The Southern acornshell is included in the multi-species Mobile River Basin recovery plan (USFWS 1994b). Southern acornshells historically were endemic the upper Coosa River system in Alabama and Georgia and the Cahaba River above the fall line in Alabama. The most recent records are from the early 1970's in the Coosa River tributaries and the 1930's in the Cahaba (USFWS 2003c). Therefore, this species may be considered historical and possibly extirpated from many areas. Due to its originally wide distribution and the impossibility of comprehensive surveys, biologists retain hope that the species is not extinct and may be re-discovered in subsequent surveys. Critical habitat has been proposed for 7 watersheds in Alabama, Georgia, and Tennessee (USFWS 2003c). Portions of the proposed critical habitat are located on Terrapin Creek within the Shoal Creek District of the Talladega National Forest. Proposed critical habitat is also located within Hatchet Creek, downstream from the Talladega National Forest and within the Cahaba River, upstream from the Oakmulgee Division of the Talladega National Forest. Extant populations and potential habitats on or near National Forests are displayed in Table VII. B.10. All of these are within or adjacent to the Oakmulgee and Shoal Creek Districts of the Talladega National Forest; historical or potential habitat also occurs within the Cherokee National Forest in Georgia. This species is considered to be rare and declining throughout its range and it may be extirpated from the Cahaba River (USFWS 2003c). According to the recovery plan (USFWS 2003c), neither downlisting nor delisting is a realistic goal within the next decade. Instead, the main goal is to prevent the continued decline and possible extirpation of remaining populations. Specific objectives include 1) surveys to identify the extent of extant populations, 2) implementation of habitat protection and restoration measures, and 3) possible future use of captive propagation to expand and secure populations. A target date for recovery and delisting has not been set.

Table VII. B.10. Overview of Southern acornshell mussel occurrences and potential and proposed critical habitat within five miles of the National Forests.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Oakmulgee	Perry	Cahaba	Cahaba	11	1	2	77 mi upstrm unoccupied C.Hab	survey		S
Talladega	Calhoun	Coosa	U. Choccolocco	71	10	6	historical	none		
	Cherokee Calhoun Cleburne		U. Terrapin	26	5	5	48 mi unoccupied C.Hab	survey protect WQ	P	
		Total			16	13				

[1] Population status based on Pierson (1992), USFWS (2000b, 2003c)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

Southern acornshells typically inhabit fine gravel substrates in riffles and runs of rivers and large tributary streams above the fall line (Parmalee and Bogan 1998). The Southern acornshell is not known to survive impoundment and appears to require swift currents, coarse

low silt substrates, and highly oxygenated water (Pierson 1992). Freshwater mussels are filter feeders, removing organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Inhabitants of small headwater streams may utilize a larger proportion of detritus in their diets (Gordon 1991). Life history and host fish are unknown for this species, although based on records from other similar species, Southern acornshells may be winter brooders with release of glochidia in spring (Parmalee and Bogan 1998). Freshwater mussels are filter feeders taking organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Inhabitants of small headwater streams may utilize a larger proportion of detritus in their diets (Gordon 1991).

The primary constituent elements identified as of importance for proposed critical habitat include: stable channels, appropriate flows, necessary water quality, clean substrates, available fish hosts, and lack of competitive non-native species (USFWS 2003c). Habitat qualities and environmental sensitivities common to all T&E mussels are discussed in section VII.B.

The decline and extirpation of most populations of Southern acornshell may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Impediments to host fish passage may also be a factor. Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in 1 out of 3 potential species-inhabited Forest Service watersheds (Table VII.B.10) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment has been identified as a possible high risk to the viability of this species in the Cahaba River. Point-source pollution may be a more moderate risk within Terrapin Creek. Within the Cahaba River, the opportunities for Forest Service influence, either positive or negative, are limited given the small portion of habitat under Forest Service management (< ½ acre) and due to the overwhelming of upper basin development, industry, agriculture, and other land uses. The Forest Service may have a greater role in restoration within the Upper Chocolocco and Terrapin watersheds. However, these two suspected extant populations of Southern acornshell mussels may inhabit only a portion of the suitable habitat within the National Forests in Alabama. Recent drought conditions and existing barriers to fish passage may currently limit populations within the upper portions of these two watersheds. Also, due to the off-Forest reservoirs, there is a high level of habitat fragmentation and the additional barriers of numerous road stream crossings could hamper host fish passage and further the risks of decline or extirpation due to catastrophic events.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, Southern acornshell habitat conditions have been maintained or improved.

VII. B.10.b. Direct, Indirect, and Cumulative Effects – Southern acornshell

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. Southern acornshells are thought to be extirpated from Forest Service system lands.

Southern acornshell are probably extirpated from the historic and proposed critical habitat on four watersheds associated with the National Forests in Alabama. The primary affects, therefore must be considered the potential for modification of the primary constituent elements of the area proposed for critical habitat designation within Terrapin Creek. Based upon the biology and distribution of proposed critical habitat, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) temperatures, 4, channel morphology, 5) flow, or 6) blockage of mussel host fish passage could indirectly and negatively affect Southern acornshells. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Coleman, Morgan, and Liberty Hill Lakes are the only Forest Service controlled facility that may be considered for liming and fertilization (which could alter pH and the toxicity of other chemical contaminants). However, given the diversity of downstream aquatic T&E mussels, project specific environmental analysis would be necessary, and it is unlikely that fertilization would be chosen as a viable action unless there is an alternative method that would not contribute to downstream nutrient inputs unless some means of contaminant could be arranged and monitored to prove effectiveness. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service roads, equipment, and herbicide/pesticide use. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within Terrapin Creek where point source pollution has been identified as a viability concern for this species (Table VII.B.10).

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect Southern acornshells by reducing food availability and feeding efficiency, altering the substrates where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of

sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. In the long term, increasing emphasis on forest health restoration would decrease background levels of sediments from upland erosion, a benefit to the species. Implementation of the revised Forest Plan standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities and given the "excellent" watershed condition rating within the proposed critical habitat of Terrapin Creek (Talladega National Forest), cumulative effects due to overall Forest Service management activities are not likely (see also general effects discussion, section VII.B). Moreover, Terrapin is an important watershed for several aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority when a conservation strategy is developed (objective 11.4). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within the Cahaba River where excessive sedimentation has been identified as a viability concern for this species (Table VII.B.10).

3) Temperatures: Elevated water temperature has the potential to affect Southern acornshells. Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Warmer water temperatures and increased sunlight may result in shifts in food webs and food availability. The introduced Asian clam (Corbicula fluminea) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and nutrient dynamics and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Invasive species generally gain the advantage over native species with warmer water temperatures.

   The main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. The current conditions of little to no Forest Service vegetative removal adjacent to Southern acornshell habitat would continue. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further discourage vegetation removal within or adjacent to Southern acornshell mainstem habitat. Regardless of Forest Service actions, off-Forest silviculture and development may continue to contribute to elevated water temperatures.

4) Channel Structure: As discussed in the section on effects common to all aquatic T&E species, alteration in channel configuration has the potential to adversely affect species by degrading or eliminating habitat qualities necessary for feeding, resting, or reproduction (Brim Box & Moosa 1999). Mussels are particularly sensitive to channel alterations since substrate qualities such as depth, area, particle composition, consolidation, oxygen levels, subsurface water flow, and susceptibility to scouring or deposition can all change dramatically with relatively small adjustments in channel dimensions or structural components. Logs, stumps, and brush appear to serve as some of the most stable refugia areas for substrate dwelling organisms, such as mussels (Pierson 1991).

The Forest Service generally does not engage in activities that modify instream habitat. Exceptions may include: a) localized channel alterations in and around trail and road stream crossings, and b) indirect alteration in structure due to removal or additions of large woody debris. As discussed in the general effect section (VII.B), the proposed actions under the revised Forest Plan will have minimal and eventually fully mitigated effects on stream channels due to standards of action applied to woody debris recruitment and road and trail construction, maintenance, removal, and monitoring. Application of streamside management zone standards would serve to protect, and possibly increase woody debris supplies. Also, woody debris surveys would be conducted and opportunities to restore woody debris densities may be pursued according to survey results. Over time, given the implementation of the revised Forest Plan, stream crossings will come to resemble natural stream channels due to the removal of water constricting culverts or other similar structures. New crossings will be designed to avoid channel-altering effects. In the meantime, there could be temporary ongoing negative effects on proposed mussel habitat due to localized ponding or down-cutting. Such effects are expected to be minor, temporary, and consequently insignificant. Existing road crossings may constitute an attractive nuisance and an indirect risk to downstream mussels, if beaver build dams that are inherently unstable at these sites (see general effects discussion, section VII.B). Beaver dam management could be a useful course of action, if and when this species is shown to be extant within these watersheds. Regardless of Forest Service actions, ongoing off-Forest activities such as road crossings, woody debris removal, dredging, mining, and channelization, will undoubtedly contribute to channel alteration particularly within portions of the Cahaba River and to a lesser extent in Terrapin Creek, proposed critical habitat for this species.

5) Flow: Without protective measures, changes in hydrology have the potential to negatively affect Southern acornshells through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining

wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, all of the impoundments associated with this species are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within lower Terrapin Creeks.

6) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Road stream crossings have the potential to indirectly affect Southern acornshells due to the limitations on the dispersion of fish species that host and transport mussel glochidia (larvae) (Watters 1996). As discussed in the general effects section (VII.B), full implementation of revised Forest Plan standards would eventually lead to the removal of fish passage problems due to road crossings. Reservoirs may also negatively affect aquatic species by blocking movements. However, all of the impoundments on Terrapin Creek are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact southern acornshells through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect Southern acornshell populations or the proposed critical habitat. Watershed and habitat conditions would continue to improve over historic conditions.

In addition to the protective standards, the revised Forest Plan includes goals and objectives conducive to pro-active and beneficial actions. Habitat and watershed protection and monitoring will be the primary objectives for this species (Table VII.B.10). Terrapin Creek has been identified as a possible priority watershed and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). The proposed direction of the revised Forest Plan also aims to foster participation in cooperative watershed assessment, planning, and restoration (objective 43.1, goals 44 and 45). Plan direction includes goals and objectives encouraging Forest Service leadership in natural resource education (goal 43). Critical habitat will be monitored in conjunction with comprehensive surveys and project level monitoring. Inventories of other potential habitat areas (Upper Terrapin Creek and Cahaba River) will also be conducted. As appropriate, additional suitable habitat may be identified and cooperative action taken to repatriate southern acornshells into unoccupied areas on National Forest lands.

VII. B.10.c. Determination of Effects – Southern acornshell

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration efforts. This species is probably extirpated from most habitat areas on the National Forests in Alabama. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan is **not likely to adversely affect Southern acornshells and is not likely to adversely modify proposed critical habitat.**

VII. B.11. Fine-lined pocketbook (*Lampsilis altilis)* Conrad

VII. B.11.a. Environmental Baseline – Fine-lined pocketbook

Fine-lined pocketbooks are listed as threatened under the Endangered Species Act (USFWS 1993b). The fine-lined pocketbook is included in the multi-species Mobile River Basin recovery plan (USFWS 1994b). Fine-lined pocketbooks historically occurred in the Alabama, Tombigbee, Black Warrior, Cahaba, Tallapoosa, Coosa River systems, and their tributaries. Currently, this species is limited to small streams above the fall line within the Cahaba, Coosa, and Tallapoosa River Basins (USFWS 2003c). Critical habitat has been proposed for 12 watersheds including portions of the Uphapee and Chewacla Creeks on the Tuskegee National Forest, Cane Creek, and the Tallapoosa River downstream of the Shoal Creek District of the Talladega National Forest, Hatchet Creek downstream of the Talladega District, Shoal Creek tributary to the Upper Choccolocco largely within the Shoal Creek District of the Talladega, and Cheaha Creek tributary to the middle Choccolocco largely within the Talladega District (USFWS 2003c). Extant populations and historical habitats on or near Alabama National Forests are displayed in Table VII. B.11. All of these are within or adjacent to the Bankhead, Talladega, or Tuskegee National Forests. An additional population is known to inhabit the Conasauga River of Tennessee and Georgia, on and downstream from the Cherokee National Forest. This species is considered to be present only in small and localized populations (USFWS 2003c). According to the recovery plan (USFWS 2003c), neither downlisting nor delisting is a realistic goal within the next decade. Instead, the main goal is to prevent the continued decline and possible extirpation of remaining populations. Specific objectives include 1) surveys to identify the extent of extant populations, 2) implementation of habitat protection and restoration measures, and 3) possible future re-expansion of populations into additional restored habitat areas. A target date for recovery and delisting has not been set.

Table VII.B.11. Overview of fine-lined pocketbook mussel historical, potential, and proposed critical habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Bankhead	Winston	Black Warrior	Lower Brushy	36	13	8	unknown		PST	F

					Miles				Viability Risk[2]	
			L. Sipsey Fork	32	24	8	unknown		PST	F
			Upper Brushy	82	40	0	unknown		F	
			U. Sipsey Fork	87	27	0	unknown		F	
Tuskegee	Macon	Tallapoosa	Chewacla	1	1	2	46 mi occupied C.Hab common (1973)	protect monitor	SPF	
			Uphapee	10	13	2			P	
Talladega	Cleburne		Cane	19	0	1	100 mi dwnst occupied C.Hab	WQ		
			Muscadine	2	0	1	unknown	none		S
	Calhoun	U. Coosa	U. Choccolocco	71	16	6	16 mi occupied C.Hab	protect monitor		
	Calhoun		U. Terrapin	26	20	5	48 mi occupied C.Hab	protect monitor	P	
	Talladega		Cheaha	36	20	5	17 mi occupied C.Hab	protect monitor		
	Calhoun		M. Choccolocco	23	10	10	unknown		PFT	
	Talladega		Talladega	22	10	5	unknown	survey restore?	PT	
	Talladega		Tallaseehatchee	22	10	5	unknown		PFT	
	Clay		Upper Hatchet	11	5	3	41 mi dwnst occupied C.Hab	WQ survey	P	S
Total:					229	61				

[1] Population status based on van der Schalie (1938), Hurd (1971), Hurd 1973, Jenkinson (1973), Pierson (1991, 1992), USFWS (1993, 1994, 1996), Feminella & Gangloff (2002)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

Fine-lined pocketbooks are typically found in a sand-mud mixture with gravel in moderate current and depths (Parmalee and Bogan 1998). It is a fairly ubiquitous species, inhabiting both rivers and headwater streams. Freshwater mussels are filter feeders, removing organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Inhabitants of small headwater streams may utilize a larger proportion of detritus in their diets (Gordon 1991). Gravid females have been observed to release a single large conglutinate of glochidia (larvae) from March through June (Haag et al.1999). Largemouth (*Micropterus salmoides*), redeye (*Micropterus coosae*), and spotted bass (*M. punctulatus*), as well as green sunfish have been identified as suitable fish hosts for the glochidia (Haag et al. 1999). As for most freshwater mussels, this species is likely long-lived, and not reproductively mature until attaining 8 or more years of age (Neves and Moyer 1988). Predation is normally a minor mortality factor, with the exception of muskrats, otters, and some types of turtles. A few

species of fish may also consume juvenile mollusks. Mussels are parasitized by a variety of organisms with the possibility of excessive infestations causing reduction in growth, longevity, and fertility (Zale and Neves 1982, Parmalee and Bogan 1998).

The primary constituent elements identified as of importance for proposed critical habitat include: stable channels, appropriate flows, necessary water quality, clean substrates, available fish hosts, and lack of competitive non-native species (USFWS 2003). Habitat qualities and environmental sensitivities common to all T&E mussels are discussed in section VII.B.

The decline and extirpation of most populations of fine-lined pocketbook mussels may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Impediment of host fish passage may also be a factor. Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in 6 out of 15 potential species-inhabited Forest Service watersheds (Table VII.B.11) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment and flow alterations may contribute the greatest risk to the viability of this species. Within the Chewacla, Middle Choccolocco, and Talladega watersheds, the opportunities for Forest Service influence, either positive or negative, are limited given the small portion of habitat under Forest Service management and due to combinations of upstream and downstream industry, agriculture, and other land uses. Restoration is unlikely in the Upper Sipsey Fork watershed, unless efforts are undertaken to repatriate the species into its suspected extirpated range.

The 15 known or suspected extant populations of fine-lined pocketbook mussels probably inhabit less than half of the suitable habitat for this species within the National Forests in Alabama. Recent drought conditions and existing barriers to fish passage may further limit populations within the upper portions of these watersheds. Two populations in the Upper Terrapin and Upper Hatchet watersheds may be at risk for decline primarily due to off-Forest factors, however, there may be opportunities for positively increasing the security of the species through restoration (reconfiguring road stream crossings for fish passage) and protective measures (such as land acquisition), on portions of the Talladega National Forest.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, fine-lined pocketbook habitat conditions have been maintained or improved. However, downstream off-Forest land uses continue to adversely impact fine-lined pocketbooks and their habitat through elevated levels of sediment runoff, channel alterations, and the release of toxic chemicals.

VII. B.11.b. Direct, Indirect, and Cumulative Effects – Fine-lined pocketbook

Direct effects, such as mortality of glochidia, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The proposed actions will continue the current situation of limited Forest Service roads and motorized trails within the mainstem riverine and lower tributary habitat areas of this species. As discussed in section

VII.B, revised Forest Plan standards will minimize opportunities for mechanical damage due to vehicles or equipment. Moreover, on the Bankhead National Forest, roadways are limited adjacent to fine-lined pocketbook habitat within the Sipsey Wild and Scenic River corridor and the Wilderness.

Fine-lined pocketbooks were once widely distributed across the more northerly National Forest units in Alabama. They are also a species that can inhabit long reaches extending from the mainstem to tributary headwaters. Consequently, the potential affects of Forest Service management activities are much broader than for other less ubiquitous species. Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) temperatures, 4) nutrient cycling, 5) channel structure, 6) flow, or 7) blockage of mussel host fish passage could indirectly and negatively affect fine-lined pocketbooks. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Coleman, Morgan, and Liberty Hill Lakes are the only Forest Service controlled facility that may be considered for liming and fertilization (which could alter pH and the toxicity of other chemical contaminants). However, given the diversity of downstream aquatic T&E mussels, project specific environmental analysis would be necessary, and it is unlikely that fertilization would be chosen as a viable action unless there is an alternative method that would not contribute to downstream nutrient inputs unless some means of contaminant could be arranged and monitored to prove effectiveness. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service roads, equipment, and herbicide/pesticide use. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within Chewacla, Uphapee, Terrapin, and Hatchet Creek proposed critical habitat where point source pollution has been identified as a viability concern for this species (Table VII.B.11).

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect fine-lined pocketbooks by reducing food availability and feeding efficiency, altering the substrates where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals

that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such management activities as silvicultural thinning, pest control, prescribed burning, herbicide use, construction and maintenance of temporary roads and permanent roads and trails. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. In the long term, increasing emphasis on forest health restoration would decrease background levels of sediments from upland erosion, a benefit to the species. Implementation of the revised Forest Plan standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities. Any remaining small effects would likely be insignificant, especially when distributed across the watershed.

All proposed critical habitat is within watersheds ranked as above average. Status of the species within the two watersheds ranked as "below average" (Middle Choccolocco and Tallaseehatchee) is uncertain, and these areas are not considered essential to the recovery of the species. Also, within these below average watersheds, proposed prescriptions include red-cockaded woodpecker habitat restoration, dispersed recreation and remote backcountry non-motorized recreation, with activities that are less likely to contribute to cumulative sedimentation effects. Middle Choccolocco road density is high both within and outside of the Talladega National Forest, indicating a potential for cumulative road related sediment effects. Therefore, when considered within the context of watershed-wide conditions, it is possible that Forest Service contributions to sediment loading may be an incremental addition to already stressed aquatic systems within middle Choccolocco Creek. However, since Forest Service lands are less than 23% of the watershed, Forest Service sediment contributions would be expected to be minor, and perhaps insignificant portions of the much more pervasive sediment loading associated with off-Forest agricultural, silvicultural, and residential activities (see also general effects discussion, section VII.B). Also, upper Choccolocco Creek, including the headwaters of middle Choccolocco Creek is an important watershed for several other aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority when a conservation strategy is developed (objective 11.4). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within portions of Hatchet Creek proposed critical habitat where excessive sedimentation has been identified as a viability concern for this species (Table VII.B.11).

3) Temperatures: Elevated water temperature has the potential to affect fine-lined pocketbooks. Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Warmer water temperatures and increased sunlight may result in shifts in food webs and food availability. The introduced

Asian clam (Corbicula fluminea) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and nutrient dynamics and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Invasive species generally gain the advantage over native species with warmer water temperatures.

The main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River prescriptions (Prescriptions 2.A.1 and 2.A.2) and Bankhead National Forest canyon corridor prescription (Prescription 4.L) place emphasis on protection and restoration of aquatic natural resources and T&E species and therefore would further minimize vegetative removal activities along fine-lined pocketbook mainstem habitat. Current conditions of little to no Forest Service vegetative removal adjacent to fine-lined pocketbook habitat would continue. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further discourage vegetation removal within or adjacent to fin-lined pocketbook mainstem habitat. Regardless of Forest Service actions, off-Forest silviculture and development would continue to contribute to elevated water temperatures, particularly within Talladega, middle Choccolocco, and Tallaseehatchee Creeks (none of which are proposed critical habitat) where thermal alterations may be moderate viability concerns for this species (Table VII.B.11).

4) Nutrient enrichment has the potential to affect fine-lined pocketbooks by altering primary productivity and food webs, favoring non-native invasive species (Claudi and Leach 1999), direct toxicity, or increased transmission and susceptibility to pathogens. There are only a few forest service activities that could potentially contribute to nutrient enrichment; These are a) permitting of livestock and equestrian use, b) fertilization of lakes, or c) discharge from facility sewage or septic systems. Horse manure can contribute to locally elevated nutrient levels, which may be toxic to mussels and alter the availability of suitable planktonic and detrital foods. Revised Forest Plan standards would minimize the potential for such nutrification by limiting equestrian use to roads and designated trails (standards FW-93 and FW-94) and prohibiting tethering or corralling within 50 feet of stream courses or lakes (standard 11-14). Also, other standards restricting the location and configuration of trail crossings would likely decrease such impacts (see also sedimentation effects discussion). Consequently, liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Therefore, given full implementation of the revised Forest Plan direction as well as State regulations and necessary site-specific analysis, adverse effects on fine-lined pocketbooks would be unlikely. Regardless of Forest Service actions, ongoing off-Forest activities such as municipal and residential effluents, lake and pond management, and agriculture, will

undoubtedly contribute to elevated nutrient levels particularly within portions of Chewacla, Uphapee, Terrapin, and Hatchet Creek proposed critical habitat where point-source pollution has been identified as a moderate concern for the viability of this species (Table VII.B.9).

5) Channel Structure: As discussed in the section on effects common to all aquatic T&E species, alteration in channel configuration has the potential to adversely affect species by degrading or eliminating habitat qualities necessary for feeding, resting, or reproduction (Brim Box & Moosa 1999). Mussels are particularly sensitive to channel alterations since substrate qualities such as depth, area, particle composition, consolidation, oxygen levels, subsurface water flow, and susceptibility to scouring or deposition can all change dramatically with relatively small adjustments in channel dimensions or structural components. Logs, stumps, and brush appear to serve as some of the most stable refugia areas for substrate dwelling organisms, such as mussels (Pierson 1991).

   The Forest Service generally does not engage in activities that modify instream habitat. Exceptions may include: a) localized channel alterations in and around trail and road stream crossings, and b) indirect alteration in structure due to removal or additions of large woody debris. As discussed in the general effect section (VII.B), the proposed actions under the revised Forest Plan will have minimal and eventually fully mitigated effects on stream channels due to standards of action applied to woody debris recruitment and road and trail construction, maintenance, removal, and monitoring. Application of streamside management zone standards would serve to protect, and possibly increase woody debris supplies. Also, woody debris surveys would be conducted and opportunities to restore woody debris densities may be pursued according to survey results. Over time, given the implementation of the revised Forest Plan, stream crossings will come to resemble natural stream channels due to the removal of water constricting culverts or other similar structures. Greatest benefits would be realized within the Uphapee watershed where there is a high density of road crossings. New crossings will be designed to avoid channel-altering effects. In the meantime, however, there may be some continuing negative effects on mussels due to localized ponding or down-cutting. Such effects are expected to be minor, temporary, and consequently insignificant. Existing road crossings may constitute an attractive nuisance and an indirect risk to downstream mussels if beaver build dams that are inherently unstable at these sites (see general effects discussion, section VII.B). Under the revised plan, road crossing assessments may also assist in identifying areas where beaver dam management would be advisable. Regardless of Forest Service actions, ongoing off-Forest activities such as road crossings, woody debris removal, dredging, mining, and channelization, will undoubtedly contribute to channel alteration particularly within portions of Chewacla, Uphapee, and Terrapin Creeks, proposed critical habitat for this species.

6) Flow: Without protective measures, changes in hydrology have the potential to negatively affect fine-lined pocketbooks through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter

downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is on the Bankhead National Forest where Brushy Lake is maintained by the Forest Service as a small recreational impoundment within the upper Brushy Fork watershed. It is not clear if continued operation of the Brushy Lake reservoir may be slightly beneficial or adverse to downstream mussel populations, particularly during extended periods of drought (see general effects section VII.B for additional discussion). Ongoing maintenance and operation of the Brushy Lake dam and impoundment likely has an influence on base flow in the immediate reach downstream from the dam. However, given the small size of the lake and dam, this influence likely does not extend far downstream. And since this species may be extirpated from this drainage, there would be no adverse effects on the species unless it is repatriated in the future. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow. The ongoing operation of the Lewis Smith Lake dam and reservoir will continue to impound water and cause extreme water level fluctuations extending at least 5 miles into the lower portions of the tributary fine-lined pocketbook habitat.

7) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Road stream crossings have the potential to indirectly affect fine-lined pocketbooks due to the limitations on the dispersion of fish species that host and transport mussel glochidia (larvae) (Watters 1996). Implementation of the revised Forest Plan would substantially improve passage for mussel fish hosts. As discussed in the general effects section (VII.B), full implementation of revised Forest Plan standards would eventually lead to the removal of fish passage problems due to road crossings. Reservoirs may also negatively affect aquatic species by blocking movements. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is the Forest Service maintained Brushy

Lake dam which is located in the upper Brushy Fork watershed. Since this species may be extirpated from this drainage, there would be no adverse effects on the species unless it is repatriated in the future. Off-Forest activities undoubtedly contribute to a more substantial fragmentation of habitat. The Alabama Power Company controlled Lewis Smith Reservoir continues to fragment the habitat and populations of mussels among the five major tributary streams. Further research on host fish population viability would be advisable, particularly if and when this species is repatriated into the Brushy Creek watershed.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact fine-lined pocketbooks through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect fine-lined pocketbook populations and their proposed critical habitat. Watershed and habitat conditions would continue to improve over historic conditions.

In addition to the protective standards, the revised Forest Plan includes goals and objectives conducive to pro-active and beneficial actions. Habitat and watershed protection and monitoring will be the primary objectives for this species (Table VII.B.11). Uphapee, Upper Choccolocco, Terrapin and Hatchet Creeks have been identified as a possible priority watershed and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). The proposed direction of the revised Forest Plan also aims to foster participation in cooperative watershed assessment, planning, and restoration (objective 43.1, goals 44 and 45). Plan direction includes goals and objectives encouraging Forest Service leadership in natural resource education (goal 43). Habitat and representative populations (Uphapee, Cheaha, Upper Choccolocco, and Upper Terrapin) will be monitored in conjunction with comprehensive surveys and project monitoring. Monitoring will include either search indices or transects depending on local conditions and mussel densities. Inventories of other potential habitat areas (Upper Hatchet and Talladega) will also be conducted. As appropriate, additional suitable habitat may be identified and cooperative action taken to repatriate fine-lined pocketbooks into unoccupied areas on National Forest lands.

VII. B.11.c. Determination of Effects – Fine-lined pocketbook

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration efforts. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the fine-lined pocketbook and not likely to adversely modify proposed critical habitat.**

VII. B.12. Orange-nacre mucket (*Lampsilis perovalis)*

VII. B.12.a. Environmental Baseline – Orange-nacre mucket

Orange-nacre muckets are listed as threatened under the Endangered Species Act (USFWS 1993b). The orange-nacre mucket is included in the multi-species Mobile River Basin recovery plan (USFWS 1994b). The species historically occurred in the mainstem and tributaries of the Alabama, Tombigbee, Black Warrior, and Cahaba, River systems in Alabama, Mississippi, and Georgia. Currently, the mussel may be extirpated from the mainstem Tombigbee, Black Warrior, and Alabama Rivers; however it may still be found within several river basins including the Black Warrior and Cahaba Rivers (USFWS 2003c). Critical habitat has been proposed for 15 watersheds in Alabama and Mississippi (USFWS 2003c). Portions of the proposed critical habitat are located in the Sipsey Fork largely on the Bankhead National Forest and within the Cahaba River upstream from the Oakmulgee Division of the Talladega National Forest. Extant populations and potential habitats on or near National Forests are displayed in Table VII.B.12. All of these are within or adjacent to the Bankhead and Tuskegee National Forests, or the Oakmulgee Division of the Talladega National Forest in Alabama; and there are no other occurrences of this species on National Forest system lands. This species is considered to be locally common in the Sipsey Fork and several tributaries, but present only in small and localized populations elsewhere (USFWS 2003c). According to the recovery plan (USFWS 2003c), neither downlisting nor delisting is a realistic goal within the next decade. Instead, the main goal is to prevent the continued decline and possible extirpation of remaining populations. Specific objectives include 1) surveys to identify the extent of extant populations, and 2) implementation of habitat protection and restoration measures. A target date for recovery and delisting has not been set.

Table VII.B.12. Overview of the orange-nacre mucket historical, potential, and proposed critical habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Bankhead	Winston	Black Warrior	Clear	14	5	10	unlikely	none	TF	PS
			Lower Brushy	36	13	8	unknown	restore? survey	ST	PF
			L. Sipsey Fork	32	24	8	24 mi occupied C.Hab	protect monitor	ST	F
			U. Sipsey Fork	87	27		27 mi occupied C.Hab	protect monitor	F	
Oakmulgee	Perry		Big Brush	2	16	2	downstream ?	survey	SF	
Oakmulgee	Perry	Cahaba	Cahaba	11	16	2	unknown	none		S
Tuskegee	Macon	Tallapoosa	Uphapee	10	13		present	survey	SP	F
Total					114	30				

[1] Population status after Pierson (1991), USFWS (1993, 1994), USFS (1998), USFWS (2003c)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

Orange-nacre muckets inhabits headwater streams and small rivers among stable sand, gravel, or cobble substrates in moderate to swift currents. Relatively clean substrates (low silt), high

oxygen, and low turbidity is required (USFWS 2003c). Freshwater mussels are filter feeders, removing organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Inhabitants of small headwater streams may utilize a larger proportion of detritus in their diets (Gordon 1991). Larval glochidia are released as superconglutinates (Haag et al. 1995) within the months of March through June (Hartfield and Butler 1997). Redeye bass (*Micropterus coosae*), spotted bass (*Micropterus punctulatus*), and largemouth bass (*Micropterus salmoides*) have been identified as suitable fish hosts for the glochidia (Haag and Warren 1997). As for most freshwater mussels, this species is likely long-lived, and not reproductively mature until attaining 8 or more years of age (Neves and Moyer 1988). Predation is normally a minor mortality factor, with the exception of muskrats, otters, and some types of turtles. A few species of fish may also consume juvenile mollusks. Mussels are parasitized by a variety of organisms with the possibility of excessive infestations causing reduction in growth, longevity, and fertility (Zale and Neves 1982, Parmalee and Bogan 1998).

The primary constituent elements identified as of importance for proposed critical habitat include: stable channels, appropriate flows, necessary water quality, clean substrates, available fish hosts, and lack of competitive non-native species (USFWS 2003c). Habitat qualities and environmental sensitivities common to all T&E mussels are discussed in section VII.B.

The decline and extirpation of most populations of orange-nacre mucket mussels may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Impediment of host fish passage may also be a factor. The 7 known or suspected extant populations of orange-nacre muckets probably inhabit only a portion of the suitable habitat within the National Forests in Alabama. Recent drought conditions and existing barriers to fish passage may limit the extent of populations within the upper portions of most watersheds. Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in 2 out of 8 potential species-inhabited Forest Service watersheds (Table VII.B.12) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment, pollution, and flow alterations may contribute the greatest risk to the viability of this species. The opportunities for Forest Service influence, either positive or negative, are limited, however, due to the small proportion of each watershed under Forest Service management and the interspersion of private lands and overwhelming habitat fragmentation due to the Lewis Smith Reservoir on the Sipsey tributaries and uncertain species status within the other river basins. Clear Creek has limited opportunities for restoration due to the small proportion of Forest Service system lands and the ongoing impacts of upper basin strip mining.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Bankhead and Tuskegee National Forests, orange-nacre mucket habitat conditions have been maintained or improved. However, upstream and downstream off-Forest land uses will continue to adversely impact these mussels through excessive sedimentation, channel alterations, and the release of toxic chemicals.

VII. B.12.b. Direct, Indirect, and Cumulative Effects – Orange-nacre mucket

Direct effects, such as mortality of glochidia, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The proposed actions will continue the current situation of limited Forest Service roads and motorized trails within the stream and small river habitat areas of this species. As discussed in section VII.B, revised Forest Plan standards will minimize opportunities for mechanical damage due to vehicles or equipment. Moreover, on the Bankhead National Forest, roadways are limited adjacent to orange-nacre mucket habitat within the Sipsey Wild and Scenic River corridor and the Wilderness.

Orange-nacre muckets are fairly widely distributed across the more northerly National Forest units in Alabama. They are also a species that can inhabit long reaches extending from the mainstem to tributary headwaters. Consequently, the potential affects of Forest Service management activities are much broader than for other less ubiquitous species. Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) temperatures, 4) nutrient cycling, 5) channel structure, 6) flow, or 7) blockage of mussel host fish passage could indirectly and negatively affect orange-nacre muckets. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Brushy Lake on the Bankhead and Chutkee and Thloko Ponds on the Tuskegee National Forest are the only Forest Service controlled facilities that could be considered for liming and fertilization (which could alter pH and the toxicity of other chemical contaminants). However, given the revised Forest Plan standards (see general effects section VII.B) and the diversity of aquatic T&E species downstream from Brushy Lake, it is unlikely that fertilization would be chosen as a viable action unless there is an alternative method that would not contribute to downstream nutrient inputs. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service Forest Service roads, equipment, and herbicide/pesticide use. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit herbicide and pesticide activities within or adjacent to orange-nacre mucket mainstem habitat.

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect orange-nacre muckets by reducing food availability and feeding efficiency, altering the substrates where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit sediment mobilizing activities within or adjacent to mainstem habitat. Implementation of these standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities and given the "excellent" condition rating within all proposed critical habitat areas and other potential watersheds associated with the Bankhead National Forest, cumulative effects due to overall Forest Service management activities are not likely (see also general effects discussion, section VII.B). Moreover, Upper and lower Sipsey Fork, and Uphapee watersheds have been identified as possible priority watersheds and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within Clear and lower Brushy Creeks and the Cahaba River (probably not occupied habitat and not proposed critical habitat) where excessive sedimentation has been identified as a viability concern for this species (Table VII.B.12).

3) Temperatures: Elevated water temperature has the potential to affect orange-nacre muckets. Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Warmer water temperatures and increased sunlight may result in shifts in food webs and food availability. The introduced Asian clam (Corbicula fluminea) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and nutrient dynamics and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Invasive species generally gain the advantage over native species with warmer water temperatures.

   The main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescription place emphasis on protection and restoration of aquatic natural resources and T&E species and therefore

would further minimize vegetative removal activities along orange-nacre mucket mainstem habitat. Current conditions of little to no Forest Service vegetative removal adjacent to orange-nacre mucket habitat would continue. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further discourage vegetation removal within or adjacent to orange-nacre mucket mainstem habitat. Regardless of Forest Service actions, off-Forest silviculture and development would continue to contribute to elevated water temperatures, particularly within proposed critical habitat of lower Sipsey Fork where thermal alterations have been identified as of moderate viability concern for this species (Table VII.B.12).

4) Nutrients: Nutrient enrichment has the potential to affect orange-nacre muckets by altering primary productivity and food webs, favoring non-native invasive species (Claudi and Leach 1999), direct toxicity, or increased transmission and susceptibility to pathogens. Horse manure can contribute to locally elevated nutrient levels, which may be toxic to mussels and alter the availability of suitable planktonic and detrital foods. Revised Forest Plan standards would minimize the potential for such nutrification by limiting equestrian use to roads and designated trails (standards FW-93 and FW-94) and prohibiting tethering or corralling within 50 feet of stream courses or lakes (standard 11-14). Also, other standards restricting the location and configuration of trail crossings would likely decrease such impacts (see also sedimentation effects discussion). As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for nutrient enrichment due to Forest Service activities. Liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Regardless of Forest Service actions, ongoing off-Forest activities such as municipal and residential effluents, lake and pond management, and agriculture, will undoubtedly contribute to elevated nutrient levels particularly within portions of Clear, lower Brushy, and Uphapee Creeks (not proposed critical habitat) where point-source pollution has been identified as a moderate to high concern for the viability of this species (Table VII.B.12).

5) Channel Structure: As discussed in the section on effects common to all aquatic T&E species, alteration in channel configuration has the potential to adversely affect species by degrading or eliminating habitat qualities necessary for feeding, resting, or reproduction (Brim Box & Moosa 1999). Mussels are particularly sensitive to channel alterations since substrate qualities such as depth, area, particle composition, consolidation, oxygen levels, subsurface water flow, and susceptibility to scouring or deposition can all change dramatically with relatively small adjustments in channel dimensions or structural components. Logs, stumps, and brush appear to serve as some of the most stable refugia areas for substrate dwelling organisms, such as mussels (Pierson 1991).

The Forest Service generally does not engage in activities that modify instream habitat. Exceptions may include: a) localized channel alterations in and around trail and road stream crossings, and b) indirect alteration in structure due to removal or additions of large woody

debris. As discussed in the general effect section (VII.B), the proposed actions under the revised Forest Plan will have minimal and eventually fully mitigated effects on stream channels due to standards of action applied to woody debris recruitment and road and trail construction, maintenance, removal, and monitoring. Application of streamside management zone standards would serve to protect, and possibly increase woody debris supplies. Also, woody debris surveys would be conducted and opportunities to restore woody debris densities may be pursued according to survey results. Over time, given the implementation of the revised Forest Plan, stream crossings will come to resemble natural stream channels due to the removal of water constricting culverts or other similar structures. Greatest benefits may be realized within the Uphapee and Brushy Fork watersheds where there is a high density of road crossings. New crossings will be designed to avoid channel-altering effects. In the meantime, however, there may be some continuing negative effects on mussels due to localized ponding or down-cutting. Such effects are expected to be minor, temporary, and consequently insignificant. Regardless of Forest Service actions, ongoing off-Forest activities such as road crossings, woody debris removal, dredging, mining, and channelization, will undoubtedly contribute to channel alteration particularly within Uphapee Creek (not proposed critical habitat).

6) Flow: Without protective measures, changes in hydrology have the potential to negatively affect orange-nacre muckets through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is on the Bankhead National Forest where Brushy Lake is maintained by the Forest Service as a small recreational impoundment within the upper Brushy Fork watershed. Ongoing maintenance and operation of the Brushy Lake dam and impoundment likely has an

influence on base flow in the immediate reach downstream from the dam. However, given the small size of the lake and dam, this influence likely does not extend far downstream. And since this species may be extirpated from this drainage, there would be no adverse effects on the species unless it is repatriated in the future. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within Clear Creek and lower Sipsey Fork (unoccupied and proposed critical habitat, respectively) where flow alterations have been identified as a moderate to high viability concern for this species (Table VII.B.12). The ongoing operation of the Lewis Smith Lake dam and reservoir will continue to impound water and cause extreme water level fluctuations extending at least 5 miles into the lower portions of the tributary orange-nacre mucket habitat.

7) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Road stream crossings have the potential to indirectly affect orange-nacre muckets due to the limitations on the dispersion of fish species that host and transport mussel glochidia (larvae) (Watters 1996). The implementation of revised Forest Plan direction would substantially improve passage for mussel fish hosts, particularly within the Brushy Fork watershed where there is a high density of road crossings. As discussed in the general effects section (VII.B), full implementation of revised Forest Plan standards would eventually lead to the removal of fish passage problems due to road crossings. Reservoirs may also negatively affect aquatic species by blocking movements. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is the Forest Service maintained Brushy Lake dam which is located in the upper Brushy Fork watershed. Since this species may be extirpated from this drainage, there would be no adverse effects on the species unless it is repatriated in the future. The Alabama Power Company controlled Lewis Smith Reservoir continues to fragment the habitat and populations of mussels among the five major tributary streams. Further research on host fish population viability would be advisable, especially within the Brushy Fork watersheds.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact orange-nacre muckets through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. Coal mines, particularly in the Clear Creek watershed, have negatively affected orange-nacre muckets through alterations in pH, sedimentation, and release of heavy metals. For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect orange-nacre mucket populations and their proposed critical habitat. Watershed and habitat conditions would continue to improve over historic conditions.

In addition to the protective standards, the revised Forest Plan includes goals and objectives conducive to pro-active and beneficial actions. Habitat and watershed protection and monitoring will be the primary objectives for this species (Table VII.B.12). Upper and lower Sipsey Fork, and Uphapee watersheds have been identified as possible priority watersheds and

would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). The proposed direction of the revised Forest Plan also aims to foster participation in cooperative watershed assessment, planning, and restoration (objective 43.1, goals 44 and 45). Plan direction includes goals and objectives encouraging Forest Service leadership in natural resource education (goal 43). Habitat and representative populations (Lower and Upper Sipsey Forks) will be monitored in conjunction with comprehensive surveys and project monitoring. Monitoring will include either search indices or transects depending on local conditions and mussel densities. Inventories of other potential habitat areas (Lower Brushy, Uphapee, and Big Brush) will also be conducted. As appropriate, additional suitable habitat may be identified and cooperative action taken to repatriate orange-nacre muckets into unoccupied areas on National Forest lands.

VII. B.12.c. Determination of Effects – Orange-nacre mucket

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration efforts. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the orange-nacre mucket and is not likely to adversely modify proposed critical habitat.**

VII. B.13. Alabama moccasinshell (*Medionidus acutissimus)* Lea

VII. B.13.a. Environmental Baseline – Alabama moccasinshell

Alabama moccasinshells are listed as threatened under the Endangered Species Act (USFWS 1993b). The Alabama moccasinshell is included in the multi-species Mobile River Basin recovery plan (USFWS 1994b). Alabama moccasinshells historically occurred in the Alabama, Tombigbee, Black Warrior, Cahaba, Coosa River systems, and their tributaries in Alabama, Mississippi, and Georgia. The species appears to have declined or disappeared from mainstem-rivers of all basins but continues to survive in many tributary streams (USFWS 2003c). Highest densities have been observed within the Sipsey Fork tributaries on the Bankhead National Forest (Warren and Haag 1994). Critical habitat has been proposed for 16 watersheds including portions within the Sipsey Fork largely on the Bankhead National Forest and within the Cahaba River upstream from the Oakmulgee Division of the Talladega National Forest (USFWS 2003c). Extant populations and historical habitats on or near National Forests are displayed in Table VII. B.13. All of these are within or adjacent to the Bankhead or Talladega National Forests in Alabama; and there are no other occurrences of this species on National Forest system lands. This species is considered to be present only in small and localized populations (USFWS 2003c). According to the recovery plan (USFWS 2003c), neither downlisting nor delisting is a realistic goal within the next decade. Instead, the main goal is to prevent the continued decline and possible extirpation of remaining populations. Specific objectives include 1) surveys to identify the extent of extant populations, and 2) implementation of habitat protection and restoration measures. A target date for recovery and delisting has not been set.

Table VII. B.13. Overview of Alabama moccasinshell mussel occurrences and historical, potential, and proposed critical habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Bankhead	Winston	Black Warrior	Lower Brushy	36	13	8	Small local	increase	T	PF
			Upper Brushy	82	40	0	Small local	increase monitor	F	
			L. Sipsey Fork	32	24	8	91 mi occupied C.Hab	protect	T	F
			U. Sipsey Fork	87	27	0	91 mi occupied C.Hab; highest densities	protect monitor	F	
Talladega	Calhoun	Lower Coosa	U. Choccolocco	71	27	6	uncertain	survey		
			M. Choccolocco	23	30	10	uncertain	none	PF	
	Talladega		Talladega	22	26	5	uncertain	none	P	
	Clay		Upper Hatchet	11	11	3	uncertain	none	P	S
Total					198	40				

[1] Population status based on Hurd (1974), Pierson (1991), McGregor (1992), USFS (1993, 1999), Haag & Warren (2001), USFWS (2003c)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

Alabama moccasinshells typically inhabit moderate current over sand, gravel, and cobble in shallow water shoals of small streams (Parmalee and Bogan 1998). This species also inhabits sandy shelves of stream edge margins (NS 2001). Freshwater mussels are filter feeders, removing organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Inhabitants of small headwater streams may utilize a larger proportion of detritus in their diets (Gordon 1991). Alabama moccasinshells remain completely embedded in the stream bottom most of the year, only emerging in March through June for the release of glochidia (USFWS 2003c). This species attracts host fish by flickering its white patches along the otherwise black mantle margins (Haag & Warren 2001). The blackspotted topminnow (*Fundulus olivaceus*), Tuscaloosa darter (*Etheostoma douglasi*), redfin darter (*E. whipplei*), blackbanded darter (*Percina nigrofaciata*), naked sand darter (*Ammocrypta beani*), Southern sand darter (*A. meridiana*), Johnny darter (*E. nigrum*), speckled darter (*E. stigmaeum*), saddleback darter (*Percina vigil*), and logperch (*P. caprodes*) have been identified as suitable fish hosts for the glochidia (Haag and Warren 1997, 2001). Based on similar species, glochidia may be released in both fall and spring (Parmalee and Bogan 1998). As for most freshwater mussels, this species is likely long-lived, and not reproductively mature until attaining 8 or more years of age (Neves and Moyer 1988). Predation is normally a minor mortality factor, with the exception of muskrats, otters, and some types of turtles. A few species of fish may also consume juvenile mollusks. Mussels are parasitized by a variety of organisms with the possibility of excessive infestations causing reduction in growth, longevity, and fertility (Zale and Neves 1982, Parmalee and Bogan 1998).

The primary constituent elements identified as of importance for proposed critical habitat include: stable channels, appropriate flows, necessary water quality, clean substrates, available fish hosts, and lack of competitive non-native species (USFWS 2003c). Habitat qualities and environmental sensitivities common to all T&E mussels are discussed in section VII.B.

The 8 known or suspected extant populations of Alabama moccasinshell probably inhabit less than half of the suitable habitat for this species within the National Forests in Alabama. Recent drought conditions and existing barriers to fish passage may limit populations within the upper portions of many these 8 watersheds. The decline and extirpation of most populations of Alabama moccasinshell may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Impediment of host fish passage may also be a factor. Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in 2 out of 5 potential species-inhabited Forest Service watersheds (Table VII.B.13) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, flow alterations, pollution, and excessive sediment may contribute the greatest risk to the viability of this species. The opportunities for Forest Service influence, either positive or negative, are limited, however, primarily due to the overwhelming effects of Lewis Smith Reservoir and development within the lower portion of the watersheds. Clear Creek has limited opportunities for restoration due to the small proportion of Forest Service system lands and the ongoing impacts of upper basin strip mining. Other areas are of limited potential for restoration due to unknown population status.

Under current Forest Plan direction, Alabama moccasinshell habitat conditions have been maintained or improved. Regardless of Forest Service actions, off-Forest land uses continue to adversely impact these mussels through elevated levels of sediment runoff, channel alterations, and the release of toxic chemicals.

VII. B.13.b. Direct, Indirect, and Cumulative Effects – Alabama moccasinshell

Direct effects, such as mortality of glochidia, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The proposed actions will continue the current situation of limited Forest Service roads and motorized trails within the stream and small river habitat areas of this species. As discussed in section VII.B, revised Forest Plan standards will minimize opportunities for mechanical damage due to vehicles or equipment. Moreover, on the Bankhead National Forest, roadways are limited adjacent to flattened musk turtle habitat within the Sipsey Wild and Scenic River corridor and the Wilderness.

Alabama moccasinshells are fairly widely distributed across the more northerly National Forest units in Alabama. They are also a species that can inhabit long reaches extending from the mainstem to tributary headwaters. Consequently, the potential affects of Forest Service management activities are much broader than for other less ubiquitous species. Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) temperatures, 4) nutrient cycling, 5) channel structure, 6) flow, or 7) blockage of mussel host fish passage could indirectly and negatively affect Alabama

moccasinshells. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Brushy Lake is the only Forest Service controlled facility that could be considered for liming and fertilization (which could alter pH and the toxicity of other chemical contaminants). However, given the revised Forest Plan standards (see general effects section VII.B) and the diversity of aquatic T&E species downstream from Brushy Lake, it is unlikely that fertilization would be chosen as a viable action unless there is an alternative method that would not contribute to downstream nutrient inputs. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service Forest Service roads, equipment, and herbicide/pesticide use. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit herbicide and pesticide activities within or adjacent to Alabama moccasinshell mainstem habitat. Bridges, however, may represent an ongoing adverse effect to aquatic species, particularly native mussels that are most sensitive to heavy metals during their early life stages. Although a complete assessment and testing have not been completed, there are at least 13 bridges located on the Bankhead National Forest with the potential for releasing old lead-based paint into the environment. The revised Forest plan offers some general goals that suggest this situation would be addressed. However, this potential adverse effect could be further minimized by additional assurances that the Forest Service would 1) test pre-1978 bridges for lead, 2) prioritize action for paint removal based upon bridge condition and location in relation to the most sensitive aquatic T&E species, and 3) develop and implement a plan for careful paint removal and disposal within a reasonable time-frame according to the highest priorities. There may still be the potential for runoff of chemicals from roadways or illegal activities not entirely under the control of the Forest Service. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within Lower Brushy, Talladega, and Hatchet Creeks (not proposed critical habitat) where point source pollution may be a moderate to high viability concern for this species (Table VII.B.13). These cumulative effects will be most pronounced downstream from the Bankhead National Forest.

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect Alabama moccasinshells by reducing food availability and feeding efficiency, altering the

substrates where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit sediment mobilizing activities within or adjacent to Alabama moccasinshell mainstem habitat. Implementation of these standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities and given the "excellent" condition rating within all proposed critical habitat areas and Alabama moccasinshell supporting watersheds associated with the Bankhead National Forest, cumulative effects due to overall Forest Service management activities are not likely (see also general effects discussion, section VII.B). Moreover, Upper and lower Sipsey Fork, and Uphapee watersheds have been identified as possible priority watersheds and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within Brushy Fork, Sipsey Fork (proposed critical habitat), and Hatchet Creek where excessive sedimentation has been identified as a moderate to high viability concern for this species (Table VII.B.13).

3) Temperatures: Elevated water temperature has the potential to affect Alabama moccasinshells. Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Warmer water temperatures and increased sunlight may result in shifts in food webs and food availability. The introduced Asian clam (Corbicula fluminea) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and nutrient dynamics and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Invasive species generally gain the advantage over native species with warmer water temperatures.

   The main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River prescriptions (Prescriptions 2.A.1 and 2.A.2) and Bankhead National Forest canyon corridor prescription (Prescription 4.L) place emphasis on protection and restoration of aquatic natural resources and T&E species and therefore

would further minimize vegetative removal activities along Alabama moccasinshell mainstem habitat. Current conditions of little to no Forest Service vegetative removal adjacent to Alabama moccasinshells habitat would continue. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further discourage vegetation removal within or adjacent to Alabama moccasinshell mainstem habitat. Regardless of Forest Service actions, off-Forest silviculture and development would continue to contribute to elevated water temperatures, particularly within lower Brushy and Sipsey Forks (the latter, proposed critical habitat) where thermal alterations may be of the moderate viability concern for this species (Table VII.B.12).

4) Channel Structure: As discussed in the section on effects common to all aquatic T&E species, alteration in channel configuration has the potential to adversely affect species by degrading or eliminating habitat qualities necessary for feeding, resting, or reproduction (Brim Box & Moosa 1999). Mussels are particularly sensitive to channel alterations since substrate qualities such as depth, area, particle composition, consolidation, oxygen levels, subsurface water flow, and susceptibility to scouring or deposition can all change dramatically with relatively small adjustments in channel dimensions or structural components. Logs, stumps, and brush appear to serve as some of the most stable refugia areas for substrate dwelling organisms, such as mussels (Pierson 1991).

   The Forest Service generally does not engage in activities that modify instream habitat. Exceptions may include: a) localized channel alterations in and around trail and road stream crossings, and b) indirect alteration in structure due to removal or additions of large woody debris. As discussed in the general effect section (VII.B), the proposed actions under the revised Forest Plan will have minimal and eventually fully mitigated effects on stream channels due to standards of action applied to woody debris recruitment and road and trail construction, maintenance, removal, and monitoring. Application of streamside management zone standards would serve to protect, and possibly increase woody debris supplies. Also, woody debris surveys would be conducted and opportunities to restore woody debris densities may be pursued according to survey results. Over time; given the implementation of the revised Forest Plan, stream crossings will come to resemble natural stream channels due to the removal of water constricting culverts or other similar structures. The greatest benefits may be realized within the Brushy Fork watershed where there is a high density of road crossings. New crossings will be designed to avoid channel-altering effects. In the meantime, however, there may be some continuing negative effects on mussels due to localized ponding or down-cutting. Such effects are expected to be minor, temporary, and consequently insignificant. Regardless of Forest Service actions, ongoing off-Forest activities such as road crossings, woody debris removal, dredging, mining, and channelization, will undoubtedly contribute to channel alteration particularly within portions of middle Choccolocco Creek (not likely occupied and not proposed critical habitat).

5) Nutrients: Nutrient enrichment has the potential to affect Alabama moccasinshells by altering primary productivity and food webs, favoring non-native invasive species (Claudi and Leach 1999), direct toxicity, or increased transmission and susceptibility to pathogens. There are only a few forest service activities that could potentially contribute to nutrient enrichment; These are a) permitting of livestock and equestrian use, b) fertilization of lakes, or c) discharge from facility sewage or septic systems. Horse manure can contribute to locally elevated nutrient levels, which may be toxic to mussels and alter the availability of suitable planktonic and detrital foods. Revised Forest Plan standards would minimize the potential for such nutrification by limiting equestrian use to roads and designated trails (standards FW-93 and FW-94) and prohibiting tethering or corralling within 50 feet of stream courses or lakes (standard 11-14). Also, other standards restricting the location and configuration of trail crossings would likely decrease such impacts (see also sedimentation effects discussion). As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for nutrient enrichment due to Forest Service activities. Liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Therefore, given full implementation of the revised Forest Plan direction as well as State regulations and necessary site-specific analysis, adverse effects on Alabama moccasinshells would be unlikely. Regardless of Forest Service actions, ongoing off-Forest activities such as municipal and residential effluents, lake and pond management, and agriculture, will undoubtedly contribute to elevated nutrient levels particularly within portions of Brushy Fork and Talladega and Hatchet Creeks (not proposed critical habitat) where point-source pollution has been identified as a moderate to high concern for the viability of this species (Table VII.B.13).

6) Flow: Without protective measures, changes in hydrology have the potential to negatively affect Alabama moccasinshells through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining

wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is on the Bankhead National Forest where Brushy Lake is maintained by the Forest Service as a small recreational impoundment within the upper Brushy Fork watershed. Ongoing maintenance and operation of the Brushy Lake dam and impoundment likely has an influence on base flow in the immediate reach downstream from the dam. However, given the small size of the lake and dam, this influence likely does not extend far downstream. Although this effect is likely small, ongoing, and not within the scope of the proposed actions, further research on the downstream effects of Brushy Lake are recommended. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within lower portions of Brushy and Sipsey Forks where flow alterations have been identified as a high viability concern for this species (Table VII.B.13). The ongoing operation of the Lewis Smith Lake dam and reservoir will continue to impound water and cause extreme water level fluctuations extending at least 5 miles into the lower portions of the tributary Alabama moccasinshells habitat.

7) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Road stream crossings have the potential to indirectly affect Alabama moccasinshells due to the limitations on the dispersion of fish species that host and transport mussel glochidia (larvae) (Watters 1996). However, roads are less likely to hamper movements of host fish within the preferred Alabama moccasinshells larger mainstream habitat of the lower portions of the watersheds. Within these areas, bridges are in place to span the larger stream channels. However, it is possible that road stream crossings within the upper tributaries are potential barriers for mussel hosts and it is not yet clear how mussel population viability may or may not be tied to habitat availability throughout the watershed. Implementation of revised Forest Plan direction would substantially improve passage for mussel fish hosts, particularly within the Brushy Fork watershed (where there is a high road crossing density). As discussed in the general effects section (VII.B), full implementation of revised Forest Plan standards would eventually lead to the removal of fish passage problems due to road crossings. Reservoirs may also negatively affect aquatic species by blocking movements. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is the Forest Service maintained Brushy Lake dam which is located in the upper Brushy Fork watershed. Since this species may be extirpated from the upper portion of the drainage, there would be no adverse effects on the species unless it is expanded into the upper Brushy Fork in the future. Conversely, it may be useful to conduct research on the downstream effects of Brushy Lake, in order to better understand why this species appears to be on the decline within this watershed. The Alabama Power Company controlled Lewis Smith Reservoir continues to fragment the habitat and populations of mussels among the five major tributary streams. Further research on host fish population viability would be advisable, particularly if it becomes desirable to increase the Brushy Fork Alabama moccasinshell population as a means towards recovery.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact Alabama moccasinshells through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. Coal mines, particularly in the Clear Creek watershed, have negatively affected flattened musk turtles through alterations in pH, sedimentation, and release of heavy metals. On the Talladega National Forest, historical gold mines continue their influence today, through channel alterations and elevated levels of lead and mercury. Upstream and downstream dams and reservoirs have fragmented and isolated aquatic habitat. Fluctuating water levels of Lewis Smith Reservoir contributes to habitat fragmentation, vegetative reduction, streambank instability, and altered hydrology and water chemistry. For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect Alabama moccasinshell populations and their proposed critical habitat. Watershed and habitat conditions would continue to improve over historic conditions.

In addition to the protective standards, the revised Forest Plan includes goals and objectives conducive to pro-active and beneficial actions. Habitat and watershed protection and monitoring will be the primary objectives for this species (Table VII.B.13). Sipsey Fork, Upper Choccolocco, and Hatchet Creeks been identified as a possible priority watershed and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). The proposed direction of the revised Forest Plan also aims to foster participation in cooperative watershed assessment, planning, and restoration (objective 43.1, goals 44 and 45). Plan direction includes goals and objectives encouraging Forest Service leadership in natural resource education (goal 43). Habitat and representative populations (Upper Brushy, Upper and lower Sipsey Forks) will be monitored in conjunction with comprehensive surveys and project monitoring. Monitoring will include either search indices or transects depending on local conditions and mussel densities. Inventories of other potential habitat areas (Upper Choccolocco) will also be conducted. As appropriate, additional suitable habitat may be identified and cooperative action taken to repatriate Alabama moccasinshells into unoccupied areas on National Forest lands.

VII. B.13.c. Determination of Effects – Alabama moccasinshell

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration efforts. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the Alabama moccasinshell and not likely to adversely modify proposed critical habitat.**

VII. B.14. Coosa moccasinshell (*Medionidus parvulus)* Lea

VII. B.14.a. Environmental Baseline – Coosa moccasinshell

Coosa moccasinshells are listed as endangered under the Endangered Species Act (USFWS 1993b). The Coosa moccasinshell is included in the multi-species Mobile River Basin recovery plan (USFWS 1994b). Coosa moccasinshells historically occurred in the Cahaba, Sipsey Fork of the Black Warrior, Coosa River systems, and their tributaries in Alabama, Georgia, and Tennessee. Currently, the species may be extirpated from the Cahaba and Black Warrior River basins. Since listing, the species has only been documented in the Conasauga River of the upper Coosa River Basin (USFWS 2003c). Critical habitat has been proposed on 9 watersheds of Alabama, Georgia, and Tennessee including portions of Terrapin and Shoal Creeks on the Shoal Creek District of the Talladega National Forest, Cheaha Creek on the Talladega District, and Hatchet Creek downstream from the Talladega District (USFWS 2003c). Historical, potential, and proposed critical habitats on or near National Forests are displayed in Table VII. B.14. All of these are within or adjacent to the Bankhead and Talladega National Forests; additional populations may also occur on the Cherokee National Forest in Georgia and Tennessee. This species is considered to be locally common in the Conasauga River within Tennessee, but present only in small and localized populations elsewhere (USFWS 2003c). According to the recovery plan (USFWS 2003c), neither downlisting nor delisting is a realistic goal within the next decade. Instead, the main goal is to prevent the continued decline and possible extirpation of remaining populations. Specific objectives include 1) surveys to identify the extent of extant populations, and 2) implementation of habitat protection and restoration measures. A target date for recovery and delisting has not been set.

Table VII. B.14. Overview of Coosa moccasinshell historical, potential, and proposed critical habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watersheds	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Bankhead	Winston Lawrence	Black Warrior	L. Sipsey Fork	32	24	8	historical	none	ST	F
			U. Sipsey Fork	87	27	0	historical	none	F	
Talladega	Cherokee Cleburne	Lower Coosa	U. Terrapin	26	19	5	48 mi unoccupied C.Hab	survey habitat WQ	P	
	Calhoun		U. Choccolocco	71	27	6	16 mi unoccupied C.Hab	survey habitat		
	Calhoun		M. Choccolocco	23	10	10	17 mi unoccupied C.Hab	WQ	PF	
	Clay		Upper Hatchet	11	5	5	41 mi dwnstrm unoccupied C.Hab	survey WQ		S
Total					112	34				

[1] Population status based on Hurd (1974), Pierson (1991), USFWS (2003c)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

Coosa moccasinshells typically inhabit sand-gravel-cobble substrates in and around bedrock in moderate current shoals or runs of various sized streams and small rivers (Parmalee and Bogan 1998). The mussel is usually completely buried within the interstitial spaces of the stream bottom (USFWS 2003c). Freshwater mussels are filter feeders, removing organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Inhabitants of small headwater streams may utilize a larger proportion of detritus in their diets (Gordon 1991). They appear to require clear (low turbidity) and high oxygen water. Gravid females are thought to migrate to the surface during spring for release of their larval glochidia. They are known to utilize blackbanded darters (*Percina nigrofasciata*) as glochidial hosts (USFWS 2003c). Reproductive seasons are not known, however based on similar species, glochidia are most likely brooded and released from September through June (Parmalee and Bogan 1998). As for most freshwater mussels, this species is likely long-lived, and not reproductively mature until attaining 8 or more years of age (Neves and Moyer 1988). Predation is normally a minor mortality factor, with the exception of muskrats, otters, and some types of turtles. A few species of fish may also consume juvenile mollusks. Mussels are parasitized by a variety of organisms with the possibility of excessive infestations causing reduction in growth, longevity, and fertility (Zale and Neves 1982, Parmalee and Bogan 1998).

The primary constituent elements identified as of importance for proposed critical habitat include: stable channels, appropriate flows, necessary water quality, clean substrates, available fish hosts, and lack of competitive non-native species (USFWS 2003c). Habitat qualities and environmental sensitivities common to all T&E mussels are discussed in section VII.B.

The 5 known or suspected extant populations of Coosa moccasinshell mussels probably inhabit only a small fraction of the suitable habitat remaining for this species within the National Forests in Alabama. Recent drought conditions and existing barriers to fish passage, such as the presence of numerous reservoirs, may limit populations within the upper portions of these watersheds. The decline and extirpation of most populations of Coosa moccasinshells may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Impediment of host fish passage may also be a factor. Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in 2 out of 6 potential species-inhabited Forest Service watersheds (Table VII.B.14) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment and altered flow may contribute the greatest risk to the viability of this species. Restoration is unlikely in the Upper Sipsey Fork watershed, unless efforts are undertaken to repatriate the species into its former range. The opportunities for Forest Service influence, either positive or negative, are limited, however, due to the small proportion of each watershed under Forest Service management and the interspersion of private lands, and reservoirs and development within the lower portion of the watersheds.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, Coosa moccasinshell habitat conditions have been maintained or improved.

VII. B.14.b. Direct, Indirect, and Cumulative Effects – Coosa moccasinshell

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. Coosa moccasinshells are thought to be extirpated and thus are currently not known to inhabit Forest Service system lands.

Coosa moccasinshells once were fairly widely distributed across the more northerly National Forest units in Alabama. They are also a species that can inhabit long reaches extending from the mainstem to tributary headwaters. Consequently, the potential affects of Forest Service habitat management activities are much broader than for other less ubiquitous species. Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) temperatures, 4) nutrient cycling, 5) channel structure, 6) flow, or 7) blockage of mussel host fish passage could indirectly and negatively affect Coosa moccasinshells. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Coleman, Morgan, and Liberty Hill Lakes are the only Forest Service controlled facility that may be considered for liming and fertilization (which could alter pH and the toxicity of other chemical contaminants). However, given the diversity of downstream aquatic T&E mussels, project specific environmental analysis would be necessary, and it is unlikely that fertilization would be chosen as a viable action unless there is an alternative method that would not contribute to downstream nutrient inputs unless some means of contaminant could be arranged and monitored to prove effectiveness. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service roads, equipment, and herbicide/pesticide use. Bridges, however, may represent an ongoing adverse effect to aquatic species, particularly native mussels that are most sensitive to heavy metals during their early life stages. Although a complete assessment and testing have not been completed, there are at least 13 bridges located on the Talladega National Forest with the potential for releasing old lead-based paint into the environment. The revised Forest plan offers some general goals that suggest this situation would be addressed. However, this potential adverse effect could be further minimized by additional assurances that the Forest Service would 1) test pre-1978 bridges for lead, 2) prioritize action for paint removal based upon bridge condition and location in relation to the most sensitive aquatic T&E species,

and 3) develop and implement a plan for careful paint removal and disposal within a reasonable time-frame according to the highest priorities. If these additional measures are taken, ongoing adverse effects will diminish and eventually be eliminated. There may still be the potential for runoff of chemicals from roadways or illegal activities not entirely under the control of the Forest Service. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within Terrapin and middle Choccolocco Creeks (both proposed critical habitat) where point source pollution has been identified as a moderate viability concern for this species (Table VII.B.14).

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect Coosa moccasinshells by reducing food availability and feeding efficiency, altering the substrates where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit sediment mobilizing activities within or adjacent to Coosa moccasinshell mainstem habitat. Implementation of these standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities. Although there could be some ongoing sediment runoff from roadways, standards for construction, maintenance, and closures would minimize and localize sediment inputs. Any remaining small effects would likely be insignificant, especially when distributed across the watershed. Critical habitat has been proposed within one watershed ranked as "below average" (Middle Choccolocco). Within this watershed, activity prescriptions include dispersed recreation and remote backcountry non-motorized recreation, activities that are likely to be fully mitigated for adverse water quality effects. Middle Choccolocco road density is high both within and outside of the Talladega National Forest, indicating a potential for cumulative road related sediment effects. Therefore, when considered within the context of watershed-wide conditions, it is possible that Forest Service contributions to sediment loading may be an incremental addition to already stressed aquatic systems within the proposed critical habitat of middle Choccolocco Creek. However, since Forest Service lands are less than 23% of the watershed, Forest Service sediment contributions would be expected to be minor, and perhaps insignificant portions of the much more pervasive sediment loading associated with off-Forest agricultural, silvicultural, and residential activities (see also general effects discussion, section VII.B). Also, upper Choccolocco Creek, including the headwaters of middle Choccolocco Creek is an important watershed for several other aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority when a conservation strategy is developed (objective 11.4). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will

undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within Hatchet Creek (proposed critical habitat) where excessive sedimentation has been identified as a high viability concern for this species (Table VII.B.14).

3) Temperatures: Elevated water temperature has the potential to affect Coosa moccasinshells. Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Warmer water temperatures and increased sunlight may result in shifts in food webs and food availability. The introduced Asian clam (Corbicula fluminea) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and nutrient dynamics and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Invasive species generally gain the advantage over native species with warmer water temperatures.

   The main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River prescriptions (Prescriptions 2.A.1 and 2.A.2) and Bankhead National Forest canyon corridor prescription (Prescription 4.L) place emphasis on protection and restoration of aquatic natural resources and T&E species and therefore would further minimize vegetative removal activities along Coosa moccasinshell mainstem habitat. Current conditions of little to no Forest Service vegetative removal adjacent to Coosa moccasinshell habitat would continue. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further discourage vegetation removal within or adjacent to Coosa moccasinshell mainstem habitat. Regardless of Forest Service actions, off-Forest silviculture and development would continue to contribute to elevated water temperatures, particularly within historical habitat of lower and upper Sipsey Fork where thermal alterations have been identified as of high viability concern for this species (Table VII.B.14).

4) Nutrients: Nutrient enrichment has the potential to affect Coosa moccasinshells by altering primary productivity and food webs, favoring non-native invasive species (Claudi and Leach 1999), direct toxicity, or increased transmission and susceptibility to pathogens. There are only a few forest service activities that could potentially contribute to nutrient enrichment; These are a) permitting of livestock and equestrian use, b) fertilization of lakes, or c) discharge from facility sewage or septic systems. Horse manure can contribute to locally elevated nutrient levels, which may be toxic to mussels and alter the availability of suitable planktonic and detrital foods. Revised Forest Plan standards would minimize the potential for such nutrification by limiting equestrian use to roads and designated trails (standards FW-93 and FW-94) and prohibiting tethering or corralling within 50 feet of stream courses or lakes (standard 11-14). Also, other standards restricting the location and configuration of trail crossings would likely decrease such impacts (see also sedimentation

effects discussion). As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for nutrient enrichment due to Forest Service activities. Liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Therefore, given full implementation of the revised Forest Plan direction as well as State regulations and necessary site-specific analysis, adverse effects on Coosa moccasinshells would be unlikely. Regardless of Forest Service actions, ongoing off-Forest activities such as municipal and residential effluents, lake and pond management, and agriculture, will undoubtedly contribute to elevated nutrient levels particularly within portions of Terrapin and middle Choccolocco Creeks where point-source pollution has been identified as a moderate concern for the viability of this species (Table VII.B.14).

5) Channel Structure: As discussed in the section on effects common to all aquatic T&E species, alteration in channel configuration has the potential to adversely affect species by degrading or eliminating habitat qualities necessary for feeding, resting, or reproduction (Brim Box & Moosa 1999). Mussels are particularly sensitive to channel alterations since substrate qualities such as depth, area, particle composition, consolidation, oxygen levels, subsurface water flow, and susceptibility to scouring or deposition can all change dramatically with relatively small adjustments in channel dimensions or structural components. Logs, stumps, and brush appear to serve as some of the most stable refugia areas for substrate dwelling organisms, such as mussels (Pierson 1991).

   The Forest Service generally does not engage in activities that modify instream habitat. Exceptions may include: a) localized channel alterations in and around trail and road stream crossings, and b) indirect alteration in structure due to removal or additions of large woody debris. As discussed in the general effect section (VII.B), the proposed actions under the revised Forest Plan will have minimal and eventually fully mitigated effects on stream channels due to standards of action applied to woody debris recruitment and road and trail construction, maintenance, removal, and monitoring. Application of streamside management zone standards would serve to protect, and possibly increase woody debris supplies. Also, woody debris surveys would be conducted and opportunities to restore woody debris densities may be pursued according to survey results. Over time, given the implementation of the revised Forest Plan, stream crossings will come to resemble natural stream channels due to the removal of water constricting culverts or other similar structures. New crossings will be designed to avoid channel-altering effects. In the meantime, however, there may be some continuing negative effects on mussels due to localized ponding or down-cutting. Such effects are expected to be minor, temporary, and consequently insignificant. Existing road crossings may constitute an attractive nuisance and an indirect risk to downstream mussels, if beaver build dams that are inherently unstable at these sites (see general effects discussion, section VII.B). Under the revised plan, road crossing assessments may also assist in identifying areas where beaver dam management would be advisable. Although potentially labor intensive, beaver dams can be managed by periodic notching or alternatively by installation of a standing pipe drain. There is also the possibility of directly removing or re-locating the beaver. Regardless of Forest Service actions, ongoing off-Forest activities such as road crossings, woody debris

removal, dredging, mining, and channelization, will undoubtedly contribute to channel alteration particularly within portions of Terrapin, middle Choccolocco, and Hatchet Creeks, proposed critical habitat for this species.

6) Flow: Without protective measures, changes in hydrology have the potential to negatively affect Coosa moccasinshells through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is on the Bankhead National Forest where Brushy Lake is maintained by the Forest Service as a small recreational impoundment within the upper Brushy Fork watershed. Ongoing maintenance and operation of the Brushy Lake dam and impoundment likely has an influence on base flow in the immediate reach downstream from the dam. However, given the small size of the lake and dam, this influence likely does not extend far downstream. And since this species may be extirpated from this drainage, there would be no adverse effects on the species unless it is repatriated in the future. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within historical habitat of the Sipsey Fork and proposed critical habitat of the middle Choccolocco Creek where flow alterations have been identified as a high to moderate viability concern for this species (Table VII.B.14). The ongoing operation of the Lewis Smith Lake dam and reservoir will continue to impound water and cause extreme water level fluctuations extending at least 5 miles into the lower portions of the tributary Coosa moccasinshell habitat. The extent of such cumulative effects on the Coosa moccasinshell are not entirely clear.

7) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Road stream crossings have the potential to indirectly affect Coosa moccasinshells due to the limitations on the dispersion of fish species that host and transport mussel glochidia (larvae) (Watters 1996). Implementation of revised Forest Plan direction would substantially improve passage for mussel fish hosts. As discussed in the general effects section (VII.B), full implementation of revised Forest Plan standards would eventually lead to the removal of fish passage problems due to road crossings. Reservoirs may also negatively affect aquatic species by blocking movements. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is the Forest Service maintained Brushy Lake dam which is located in the upper Brushy Fork watershed. Since this species may be extirpated from this drainage, there would be no adverse effects on the species unless it is repatriated in the future. Conversely, it may be useful to conduct research on the downstream effects of Brushy Lake, in order to better understand why this species has declined within this watershed. The Alabama Power Company controlled Lewis Smith Reservoir continues to fragment the habitat and populations of mussels among the five major tributary streams. Further research on host fish population viability would be advisable, particularly if and when this species is repatriated into the Brushy Creek watershed.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact Coosa moccasinshells through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. Coal mines, particularly in the Clear Creek watershed, have negatively affected flattened musk turtles through alterations in pH, sedimentation, and release of heavy metals. On the Talladega National Forest, historical gold mines continue their influence today, through channel alterations and elevated levels of lead and mercury. Fluctuating water levels of Lewis Smith Reservoir contributes to habitat fragmentation, vegetative reduction, streambank instability, and altered hydrology and water chemistry. For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect Coosa moccasinshell populations and their proposed critical habitat. Watershed and habitat conditions would continue to improve over historic conditions.

In addition to the protective standards, the revised Forest Plan includes goals and objectives conducive to pro-active and beneficial actions. Habitat and watershed protection and monitoring will be the primary objectives for this species (Table VII.B.14). Sipsey Fork, Terrapin, upper Choccolocco, and Hatchet Creeks have been identified as a possible priority watershed and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). The proposed direction of the revised Forest Plan also aims to foster participation in cooperative watershed assessment, planning, and restoration (objective 43.1, goals 44 and 45). Plan direction includes goals and

objectives encouraging Forest Service leadership in natural resource education (goal 43). Critical habitat will be monitored in conjunction with comprehensive surveys and project monitoring. Inventories of potential extant population habitat areas (Upper Terrapin, Upper Choccolocco, and Upper Hatchet) will also be conducted. As appropriate, additional suitable habitat may be identified and cooperative action taken to repatriate Coosa moccasinshells into unoccupied areas on National Forest lands.

VII. B.14.c. Determination of Effects – Coosa moccasinshell

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration efforts. This species may be extirpated from Alabama habitat. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the Coosa moccasinshell and is not likely to adversely modify proposed critical habitat.**

VII. B.15. Southern clubshell (*Pleurobema decisum*)

VII. B.15.a. Environmental Baseline – Southern clubshell

Southern clubshells are listed as endangered under the Endangered Species Act (USFWS 1993b). The Southern clubshell is included in the multi-species Mobile River Basin recovery plan (USFWS 1994b). The species was historically known to occur in every major sub-basin of the Mobile River Basin with the exception of the Tensaw River, but including the Alabama, Tombigbee, Black Warrior, Cahaba, Tallapoosa, and Coosa Rivers in Mississippi, Alabama, and Georgia. At one time, Southern clubshells were reported to be extremely common in the Cahaba River (van der Schalie 1938). The species may be extirpated from the Cahaba River and appears to be gone from the main channels of the Tombigbee and the Black Warrior Rivers (USFWS 2003c). Critical habitat has been proposed for 19 watersheds in Alabama, Mississippi, Georgia, and Tennessee (USFWS 2003c). Portions of proposed critical habitat are within Uphapee and Chewacla Creeks on the Tuskegee National Forest, Terrapin Creek on the Shoal Creek District of the Talladega National Forest, Hatchet Creek downstream of the Talladega District, and the Cahaba River upstream from the Oakmulgee Division of the Talladega National Forest. Historical, potential, and proposed critical habitats on or near National Forests in Alabama are displayed in Table VII. B.15. All of these are within or adjacent to the Tuskegee National Forest or the Oakmulgee, Shoal Creek, or Talladega Districts of the Talladega National Forest; additional habitat and occurrences are on the Cherokee National Forest in Tennessee and Georgia. This species is considered to be locally common in the Buttahatchee and Sipsey Rivers, but it is rare to uncommon elsewhere (USFWS 2003c). According to the recovery plan (USFWS 2003c), neither downlisting nor delisting is a realistic goal within the next decade. Instead, the main goal is to prevent the continued decline and possible extirpation of remaining populations. Specific objectives include 1) surveys to identify the extent of extant populations, and 2) implementation of habitat protection and restoration measures. A target date for recovery and delisting has not been set.

Table VII. B.15. Overview of Southern clubshell historical, potential, and proposed critical habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles on	Miles near	Population Status[1]	FS Recovery Goals	Viability Risk[2] M	Viability Risk[2] H
Oakmulgee	Perry	Cahaba	Cahaba	11	1	2	extirpated	none		S
Talladega	Calhoun	Lower Coosa	U. Choccolocco	71	27	6		survey		
			U. Terrapin	26	19	5	4 mi occupied C.Hab; 44 mi unoccupied C.Hab	protect monitor	P	
			M. Choccolocco	23	0	10	unknown	none	PF	
			Talladega	22	0	5		WQ		
	Coosa		U. Hatchet	11	0	5	41 mi unoccupied dwnstm C.Hab	WQ	P	S
Tuskegee	Macon	Tallapoosa	Chewacla	1	1	2	46 mi occupied C.Hab common (1991)	protect monitor	SP F	
			Uphapee	10		13	46 mi occupied C.Hab rare (1991)	protect monitor	SP	
Total					61	33				

[1] Population status based on van der Schalie (1938), Hurd (1974), Jenkingson (1973), Pierson (1991, 1993), , Feminella & Gangloff (2002), Haag & Warren (2001), USFWS (2003c)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

The Southern clubshell is found in slow to moderate currents over coarse gravel-cobble habitat adjacent to riffle-runs of large streams and small rivers (Pierson 1991). Occasionally, this species is also encountered in firm sand and gravel shelves along stream margins (Pierson 1991, NS 2003). Southern clubshells do not appear to survive in beaver ponds or other slack water habitats with silty substrates (Pierson 1991). Large woody debris may be an important habitat component as it provides sheltered areas with stable substrates in otherwise rapidly shifting channel bottoms (Pierson 1991). Large woody debris may be of greatest significance within lower tributary and riverine reaches where stable bedrock controls are a less common feature. Woody debris is also correlated with the abundance and diversity of native fishes, typically host species for mussels (Herrington et al. 2001). Freshwater mussels are filter feeders, removing organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Gravid females are observed from June through July (USFWS 2003c) and the glochidia are released in well-formed orange and white conglutinates (Haag and Warren 2001). The blacktail shiner (*Cyprinella venusta*), Alabama shiner (*C. callistia*), and tricolor shiner (*C. trichroistira*) have been identified as a suitable fish hosts (Haag and Warren

2001, USFWS 2003). As for most freshwater mussels, this species is likely long-lived, and not reproductively mature until attaining 8 or more years of age (Neves and Moyer 1988). Predation is normally a minor mortality factor, with the exception of muskrats, otters, and some types of turtles. A few species of fish may also consume juvenile mollusks. Mussels are parasitized by a variety of organisms with the possibility of excessive infestations causing reduction in growth, longevity, and fertility (Zale and Neves 1982, Parmalee and Bogan 1998).

The primary constituent elements identified as of importance for proposed critical habitat include: stable channels, appropriate flows, necessary water quality, clean substrates, available fish hosts, and lack of competitive non-native species (USFWS 2003). Habitat qualities and environmental sensitivities common to all T&E mussels are discussed in section VII.B.

The decline of Southern clubshells is attributed to a combination of impacts including channel modification, impoundment, gravel mining, agricultural runoff and urban or industrial discharges (Pierson 1991). Such historical conditions have lead to the current status of this species being considered at high risk of continued decline in 4 out of 7 potential species-inhabited Forest Service watersheds (Table VII.B.15) (also see the Forest Plan EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment and flow alterations may contribute the greatest risk to the viability of this species. The opportunities for Forest Service influence, either positive or negative, are limited, however, due to the small proportion of each watershed under Forest Service management and the interspersion of private lands and the overwhelming influence of both upstream and downstream areas. The Terrapin population is at risk due to reservoirs fragmenting habitat and restricting the ability of this species to re-colonize the upper watershed. The Uphapee and Chewacla populations appear to be stable (Pierson 1991), but remain at risk due to upstream and surrounding land uses that influence base flows. Within the Uphapee and Chewacla drainages, pesticide and herbicide runoff may also be a factor as demonstrated by fish kills attributed to that cause (Pierson 1991). The lower Talladega Creek population has been reportedly affected by organic enrichment as evidenced by excessive algal growth, turbidity, and water odor (Pierson 1991). Georgia populations within the Upper Coosa River Basin, although only occurring along a short reach of the river, continue to be fairly robust, while mussel populations in Chewacla Creek appear to be small and localized. Southern clubshell mussels probably inhabit less than half of the suitable habitat for this species within the National Forests in Alabama. Recent drought conditions and existing barriers to fish passage may further limit populations within the upper portions of most these watersheds.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, Southern clubshell habitat conditions have been maintained or improved.

VII. B.15.b. Direct, Indirect, and Cumulative Effects – Southern clubshell

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The Forest Service will not be

engaging in any in-channel disturbing activities within their large stream and lower watershed habitat.

Southern clubshells historically were well distributed across the more northerly National Forest units in Alabama. They are also a species that can inhabit long reaches extending from the mainstem to tributary headwaters. Consequently, the potential affects of Forest Service management activities are much broader than for other less ubiquitous species. Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) temperatures, 4) nutrient cycling, 5) channel structure, 6) flow, or 7) blockage of mussel host fish passage could indirectly and negatively affect Southern clubshells. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Coleman, Morgan, and Liberty Hill Lakes on the Tuskegee, and Chutkee and Thioko Ponds on the Tuskegee are the only Forest Service controlled facility that may be considered for liming and fertilization (which could alter pH and the toxicity of other chemical contaminants). However, given the diversity of downstream aquatic T&E mussels, project specific environmental analysis would be necessary, and it is unlikely that fertilization would be chosen as a viable action unless there is an alternative method that would not contribute to downstream nutrient inputs unless some means of contaminant could be arranged and monitored to prove effectiveness. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service roads, equipment, and herbicide/pesticide use. Bridges, however, may represent an ongoing adverse effect to aquatic species, particularly native mussels that are most sensitive to heavy metals during their early life stages. Although a complete assessment and testing have not been completed, there are at least 13 bridges located on the Talladega National Forest with the potential for releasing old lead-based paint into the environment. All of the Tuskegee National Forest bridges are maintained by the State or County. The revised Forest plan offers some general goals that suggest this situation would be addressed. However, this potential adverse effect could be further minimized by additional assurances that the Forest Service would 1) test pre-1978 bridges for lead, 2) prioritize action for paint removal based upon bridge condition and location in relation to the most sensitive aquatic T&E species, and 3) develop and implement a plan for careful paint removal and disposal within a

reasonable time-frame according to the highest priorities. If these additional measures are taken, ongoing adverse effects will diminish and eventually be eliminated. There may still be the potential for runoff of chemicals from roadways or illegal activities not entirely under the control of the Forest Service. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within Terrapin, Hatchet, Chewacla, and Uphapee Creeks (all proposed critical habitat) where point source pollution has been identified as a moderate viability concern for this species (Table VII.B.15).

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect Southern clubshells by reducing food availability and feeding efficiency, altering the substrates where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. In the long term, increasing emphasis on forest health restoration would decrease background levels of sediments from upland erosion, a benefit to the species. Implementation of the revised Forest Plan standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities. Although there could be some ongoing sediment runoff from roadways, standards for construction, maintenance, and closures would minimize and localize sediment inputs. Any remaining small effects would likely be insignificant, especially when distributed across the watershed. Most watersheds supporting this species are ranked as above average. Within the one watershed ranked as "below average" (Middle Choccolocco), proposed prescriptions include red-cockaded woodpecker habitat restoration, including activities that will likely be fully mitigated for erosional effects. Middle Choccolocco road density is high both within and outside of the Talladega National Forest, indicating a potential for cumulative road related sediment effects. Therefore, when considered within the context of watershed-wide conditions, it is possible that Forest Service contributions to sediment loading may be an incremental addition to already stressed aquatic system within the potential habitat areas of middle Choccolocco Creek. However, since Forest Service lands are less than 23% of the watershed, Forest Service sediment contributions would be expected to be minor, and perhaps insignificant, portions of the much more pervasive sediment loading associated with off-Forest agricultural, silvicultural, and residential activities (see also general effects discussion, section VII.B). Moreover, Terrapin and Uphapee are important watershed for several aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority when a conservation strategy is developed (objective 11.4). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within Hatchet, Chewacla, and Uphapee Creeks (proposed critical habitat) where excessive

sedimentation has been identified as a moderate to high viability concern for this species (Table VII.B.15).

3) Temperature: Elevated water temperature has the potential to affect Southern clubshells. Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Warmer water temperatures and increased sunlight may result in shifts in food webs and food availability. The introduced Asian clam (Corbicula fluminea) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and nutrient dynamics and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Invasive species generally gain the advantage over native species with warmer water temperatures.

   The main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River prescriptions (Prescriptions 2.A.1 and 2.A.2) and Bankhead National Forest canyon corridor prescription (Prescription 4.L) place emphasis on protection and restoration of aquatic natural resources and T&E species and therefore would further minimize vegetative removal activities along Southern clubshell mainstem habitat. Current conditions of little to no Forest Service vegetative removal adjacent to Southern clubshell habitat would continue. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further discourage vegetation removal within or adjacent to Southern clubshell mainstem habitat. Regardless of Forest Service actions, off-Forest silviculture and development would continue to contribute to elevated water temperatures, regardless of Forest Service actions.

4) Nutrients: Nutrient enrichment has the potential to affect Southern clubshells by altering primary productivity and food webs, favoring non-native invasive species (Claudi and Leach 1999), direct toxicity, or increased transmission and susceptibility to pathogens. There are only a few forest service activities that could potentially contribute to nutrient enrichment; These are a) permitting of livestock and equestrian use, b) fertilization of lakes, or c) discharge from facility sewage or septic systems. Horse manure can contribute to locally elevated nutrient levels, which may be toxic to mussels and alter the availability of suitable planktonic and detrital foods. Revised Forest Plan standards would minimize the potential for such nutrification by limiting equestrian use to roads and designated trails (standards FW-93 and FW-94) and prohibiting tethering or corralling within 50 feet of stream courses or lakes (standard 11-14). Also, other standards restricting the location and configuration of trail crossings would likely decrease such impacts (see also sedimentation effects discussion). As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for nutrient enrichment

due to Forest Service activities. Liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Therefore, given full implementation of the revised Forest Plan direction as well as State regulations and necessary site-specific analysis, adverse effects on Southern clubshells would be unlikely. Regardless of Forest Service actions, ongoing off-Forest activities such as municipal and residential effluents, lake and pond management, and agriculture, will undoubtedly contribute to elevated nutrient levels particularly within portions of Terrapin, Hatchet, Chewacla, and Uphapee Creeks where point-source pollution has been identified as a moderate concern for the viability of this species (Table VII.B.15).

5) Channel Structure: As discussed in the section on effects common to all aquatic T&E species, alteration in channel configuration has the potential to adversely affect species by degrading or eliminating habitat qualities necessary for feeding, resting, or reproduction (Brim Box & Moosa 1999). Mussels are particularly sensitive to channel alterations since substrate qualities such as depth, area, particle composition, consolidation, oxygen levels, subsurface water flow, and susceptibility to scouring or deposition can all change dramatically with relatively small adjustments in channel dimensions or structural components. Logs, stumps, and brush appear to serve as some of the most stable refugia areas for substrate dwelling organisms, such as mussels (Pierson 1991).

The Forest Service generally does not engage in activities that modify instream habitat. Exceptions may include: a) localized channel alterations in and around trail and road stream crossings, and b) indirect alteration in structure due to removal or additions of large woody debris. As discussed in the general effect section (VII.B), the proposed actions under the revised Forest Plan will have minimal and eventually fully mitigated effects on stream channels due to standards of action applied to woody debris recruitment and road and trail construction, maintenance, removal, and monitoring. Application of streamside management zone standards would serve to protect, and possibly increase woody debris supplies. Also, woody debris surveys would be conducted and opportunities to restore woody debris densities may be pursued according to survey results. Over time, given the implementation of the revised Forest Plan, stream crossings will come to resemble natural stream channels due to the removal of water constricting culverts or other similar structures. The greatest benefits may be realized in the Uphapee watershed where there is a high density of road crossings. New crossings will be designed to avoid channel-altering effects. In the meantime, however, there may be some continuing negative effects on mussels due to localized ponding or down-cutting. Such effects are expected to be minor, temporary, and consequently insignificant. Existing road crossings may constitute an attractive nuisance and an indirect risk to downstream mussels, if beaver build dams that are inherently unstable at these sites (see general effects discussion, section VII.B). Under the revised plan, road crossing assessments may also assist in identifying areas where beaver dam management would be advisable. Although potentially labor intensive, beaver dams can be managed by periodic notching or alternatively by installation of a standing pipe drain. There is also the possibility of directly removing or re-locating the beaver. Regardless of Forest Service actions, ongoing off-Forest activities such as road crossings, woody debris removal, dredging, mining, and channelization, will undoubtedly contribute

to channel alteration particularly within portions of Terrapin, Chewacla, and Uphapee Creeks, proposed critical habitat for this species.

6) Flow: Without protective measures, changes in hydrology have the potential to negatively affect Southern clubshells through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, all of the impoundments associated with this species are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within proposed critical habitat of Chewacla and Uphapee Creeks where flow alterations have been identified as a moderate viability concern for this species (Table VII.B.15).

7) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Road stream crossings have the potential to indirectly affect Southern clubshells due to the limitations on the dispersion of fish species that host and transport mussel glochidia (larvae) (Watters 1996). Road stream crossings are the primary Forest Service activities that have the potential to limit fish, and mussel distributions. However, roads are less likely to hamper movements of host fish within the preferred Southern clubshell larger mainstream habitat of the lower portions of the watersheds. Within these areas, bridges are in place to span the larger stream channels. However, it is possible that road stream crossings within the upper tributaries are potential barriers for mussel hosts and it is not yet clear how mussel population viability may or may not be tied to habitat availability throughout the watershed. Implementation of revised Forest Plan direction would substantially improve passage for mussel fish hosts, particularly within the Uphapee

watershed where there is a high road crossing density. As discussed in the general effects section (VII.B), full implementation of revised Forest Plan standards would eventually lead to the removal of fish passage problems due to road crossings. Reservoirs may also negatively affect aquatic species by blocking movements. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact Southern clubshells through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. On the Talladega National Forest, historical gold mines continue their influence today, through channel alterations and elevated levels of lead and mercury. The loss of American chestnut trees from riparian forests has probably had long-lasting ramifications for streamside vegetation (Baker & Van Lear 1998) and aquatic habitat (Smock & MacGregor 1988), especially in headwater streams of the mountain and plateaus of northern Alabama. Industrial pollution has had an impact throughout the lower portions of watersheds with urban centers (particularly the Cahaba River and Choccolocco Creek). For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect Southern clubshell populations and their proposed habitat. Watershed and habitat conditions would continue to improve over historic conditions.

In addition to the protective standards, the revised Forest Plan includes goals and objectives conducive to pro-active and beneficial actions. Habitat and watershed protection and monitoring will be the primary objectives for this species (Table VII.B.15). Upper Choccolocco, Terrapin, Hatchet, and Uphapee Creeks have been identified as a possible priority watershed and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). The proposed direction of the revised Forest Plan also aims to foster participation in cooperative watershed assessment, planning, and restoration (objective 43.1, goals 44 and 45). Plan direction includes goals and objectives encouraging Forest Service leadership in natural resource education (goal 43). Habitat and representative populations (Upper Terrapin, Chewacla, and Uphapee Creeks) will be monitored in conjunction with comprehensive surveys and project monitoring. Monitoring will include either search indices or transects depending on local conditions and mussel densities. Inventories of other potential habitat areas (Upper Choccolocco) will also be conducted. As appropriate, additional suitable habitat may be identified and cooperative action taken to repatriate Southern clubshells into unoccupied areas on National Forest lands.

VII. B.15.c. Determination of Effects – Southern clubshell

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration

efforts. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the Southern clubshell and is not likely to adversely modify proposed critical habitat.**

VII. B.16. Dark pigtoe (Pleuorbema furvum)

VII. B.16.a. Environmental Baseline – Dark pigtoe

Dark pigtoes are listed as endangered under the Endangered Species Act (USFWS 1993b). The dark pigtoe is included in the multi-species Mobile River Basin recovery plan (USFWS 1994b). The species historically was restricted to the Black Warrior River basin above the fall line (USFWS 2003c). Since listing, it has been confirmed in the Sipsey Fork and its tributaries and from the North River and a tributary (USFWS 2003c). Highest densities have been recorded in the Sipsey Fork and its tributaries on the Bankhead National Forest (Warren and Haag 1994). Critical habitat has been proposed for 3 watersheds in Alabama (USFWS 2003c). Portions of proposed critical habitat are within the Sipsey Fork largely on the Bankhead National Forest. Extant populations and historical, potential, and proposed critical habitats on or near National Forests are displayed in Table VII.B.16. All of these are within the Bankhead National Forest in Alabama; and there are no other occurrences of this species on National Forest system lands. Populations are localized and with low numbers of individuals in all known occupied streams (USFWS 2003c). According to the recovery plan (USFWS 2003c), neither downlisting nor delisting is a realistic goal within the next decade. Instead, the main goal is to prevent the continued decline and possible extirpation of remaining populations. Specific objectives include 1) surveys to identify the extent of extant populations, and 2) implementation of habitat protection and restoration measures. A target date for recovery and delisting has not been set.

Table VII.B.16. Overview of known or suspected dark pigtoe mussel historical, potential, and proposed critical habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles on	Miles near	Population Status[1]	FS Recovery Goals	Viability Risk[2] M	Viability Risk[2] H
Bankhead	Winston	Black Warrior	Clear	14	0	1	unlikely	none	TF	P S
			Lower Brushy	36	13	5	present	restore? monitor	T	P F
			Upper Brushy	82	5	0	present	survey	F	
			L. Sipsey Fork	32	24	8	91 mi occupied C.Hab; small local	protect monitor	T	F
			U. Sipsey Fork	87	10	0	present	survey	F	
Total					52	14				

[1] Population status based on Dodd et al. (1986), McGregor (1992), USFWS (1993), USFWS (2003c)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

Dark pigtoes are found in shallow and swift current portions of sand, gravel, and cobble shoals and rapids in small rivers and large streams. It may be found in mostly sandy substrates, but it

usually is encountered in a mixture of sand and gravel (NS 2003). This species is gravid in June and releases glochidia in peach to pink colored conglutinates (Haag and Warren 1997). Fish hosts have been identified as the largescale stoneroller (*Campostoma oligolepis*), Alabama shiner (*Cyprinella callistia*), blacktail shiner (*Cyprinella venusta*), creek chub (*Semotilus atromaculatus*), and blackspotted topminnow (*Fundulus olivaceus*) (Haag and Warren 1997). Freshwater mussels are filter feeders taking organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Inhabitants of small headwater streams may utilize a larger proportion of detritus in their diets (Gordon 1991). As for most freshwater mussels, this species is likely long-lived, and not reproductively mature until attaining 8 or more years of age (Neves and Moyer 1988). Predation is normally a minor mortality factor, with the exception of muskrats, otters, and some types of turtles. A few species of fish may also consume juvenile mollusks. Mussels are parasitized by a variety of organisms with the possibility of excessive infestations causing reduction in growth, longevity, and fertility (Zale and Neves 1982, Parmalee and Bogan 1998).

The primary constituent elements identified as of importance for proposed critical habitat include: stable channels, appropriate flows, necessary water quality, clean substrates, available fish hosts, and lack of competitive non-native species (USFWS 2003c). Habitat qualities and environmental sensitivities common to all T&E mussels are discussed in section VII.B.

Historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in 2 out of 5 potential species-inhabited Forest Service watersheds (Table VII.B.16) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, pollution and flow alterations may contribute the greatest risk to the viability of this species. The opportunities for Forest Service influence, either positive or negative, are limited, however, primarily due to the overwhelming effects of Lewis Smith Reservoir and development within the lower portion of the watersheds. Clear Creek has limited opportunities for restoration due to the small proportion of Forest Service system lands and the ongoing impacts of upper basin strip mining.

The five known or suspected extant populations of dark pigtoe mussels probably inhabit less than half of the suitable habitat for this species within the National Forests in Alabama. Recent drought conditions and existing barriers to fish passage may further limit populations within the upper portions of these watersheds.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, dark pigtoe habitat conditions have been maintained or improved.

VII. B.16.b. Direct, Indirect, and Cumulative Effects -- Dark pigtoe

Direct effects, such as mortality of glochidia, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The proposed actions will continue the current situation of limited Forest Service roads and motorized trails within the streams and small river habitat areas of this species. As discussed in section VII.B, revised

Forest Plan standards will minimize opportunities for mechanical damage due to vehicles or equipment. Moreover, on the Bankhead National Forest, roadways are limited adjacent to dark pigtoe habitat within the Sipsey Wild and Scenic River corridor and the Wilderness.

Dark pigtoes are limited to the Bankhead National Forest. Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) temperatures, 4) nutrient cycling, 5) channel structure, 6) flow, or 7) blockage of mussel host fish passage could indirectly and negatively affect dark pigtoes. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Brushy Lake is the only Forest Service controlled facility that could be considered for liming and fertilization (which could alter pH and the toxicity of other chemical contaminants). However, given the revised Forest Plan standards (see general effects section VII.B) and the diversity of aquatic T&E species downstream from Brushy Lake, it is unlikely that fertilization would be chosen as a viable action unless there is an alternative method that would not contribute to downstream nutrient inputs. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service Forest Service roads, equipment, and herbicide/pesticide use. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit herbicide and pesticide activities within or adjacent to dark pigtoe mainstem habitat. Bridges, however, may represent an ongoing adverse effect to aquatic species, particularly native mussels that are most sensitive to heavy metals during their early life stages. Although a complete assessment and testing have not been completed, there are at least 13 bridges located on the Bankhead National Forest with the potential for releasing old lead-based paint into the environment. The revised Forest plan offers some general goals that suggest this situation would be addressed. However, this potential adverse effect could be further minimized by additional assurances that the Forest Service would 1) test pre-1978 bridges for lead, 2) prioritize action for paint removal based upon bridge condition and location in relation to the most sensitive aquatic T&E species, and 3) develop and implement a plan for careful paint removal and disposal within a reasonable time-frame according to the highest priorities. There may still be the potential for runoff of chemicals from roadways or illegal activities not entirely under the control of the Forest Service. Regardless of Forest Service

actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within Clear Creek and lower Brushy Fork (unoccupied and occupied habitat) where point source pollution has been identified as a high viability concern for this species (Table VII.B.16).

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect dark pigtoes by reducing food availability and feeding efficiency, altering the substrates where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. In the long term, increasing emphasis on forest health restoration would decrease background levels of sediments from upland erosion, a benefit to the species. Implementation of the revised Forest Plan standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities and given the "excellent" condition rating within all potential and proposed critical habitat watersheds associated with the Bankhead National Forest, cumulative effects due to overall Forest Service management activities are not likely (see also general effects discussion, section VII.B). Moreover, Upper and lower Sipsey Fork, and Uphapee watersheds have been identified as possible priority watersheds and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within Clear Creek (unoccupied habitat), Brushy Fork, and Sipsey Fork (proposed critical habitat) where excessive sedimentation has been identified as a high to moderate viability concern for this species (Table VII.B.16).

3) Temperatures: Elevated water temperature has the potential to affect dark pigtoes. Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Warmer water temperatures and increased sunlight may result in shifts in food webs and food availability. The introduced Asian clam (Corbicula fluminea) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and nutrient dynamics and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Invasive species generally gain the advantage over native species with warmer water temperatures.

   The main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b)

impoundment of water flow. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River prescriptions (Prescriptions 2.A.1 and 2.A.2) and Bankhead National Forest canyon corridor prescription (Prescription 4.L) place emphasis on protection and restoration of aquatic natural resources and T&E species and therefore would further minimize vegetative removal activities along dark pigtoe mainstem habitat. Current conditions of little to no Forest Service vegetative removal adjacent to dark pigtoe habitat would continue. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further discourage vegetation removal within or adjacent to dark pigtoe mainstem habitat. Regardless of Forest Service actions, off-Forest silviculture and development would continue to contribute to elevated water temperatures, particularly within Clear Creek (unoccupied habitat), lower Brushy Fork, and lower Sipsey Fork (proposed critical habitat) where thermal alterations have been identified as of high to moderate viability concern for this species (Table VII.B.15).

4) Nutrients: Nutrient enrichment has the potential to affect dark pigtoes by altering primary productivity and food webs, favoring non-native invasive species (Claudi and Leach 1999), direct toxicity, or increased transmission and susceptibility to pathogens. There are only a few forest service activities that could potentially contribute to nutrient enrichment; These are a) permitting of livestock and equestrian use, b) fertilization of lakes, or c) discharge from facility sewage or septic systems. Horse manure can contribute to locally elevated nutrient levels, which may be toxic to mussels and alter the availability of suitable planktonic and detrital foods. Revised Forest Plan standards would minimize the potential for such nutrification by limiting equestrian use to roads and designated trails (standards FW-93 and FW-94) and prohibiting tethering or corralling within 50 feet of stream courses or lakes (standard 11-14). Also, other standards restricting the location and configuration of trail crossings would likely decrease such impacts (see also sedimentation effects discussion). As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for nutrient enrichment due to Forest Service activities. Liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Therefore, given full implementation of the revised Forest Plan direction as well as State regulations and necessary site-specific analysis, adverse effects on dark pigtoes would be unlikely. Regardless of Forest Service actions, ongoing off-Forest activities such as municipal and residential effluents, lake and pond management, and agriculture, will undoubtedly contribute to elevated nutrient levels particularly within portions of Clear Creek (unoccupied habitat) and lower Brushy Fork where point-source pollution has been identified as a moderate concern for the viability of this species (Table VII.B.16).

5) Channel Structure: As discussed in the section on effects common to all aquatic T&E species, alteration in channel configuration has the potential to adversely affect species by

degrading or eliminating habitat qualities necessary for feeding, resting, or reproduction (Brim Box & Moosa 1999). Mussels are particularly sensitive to channel alterations since substrate qualities such as depth, area, particle composition, consolidation, oxygen levels, subsurface water flow, and susceptibility to scouring or deposition can all change dramatically with relatively small adjustments in channel dimensions or structural components. Logs, stumps, and brush appear to serve as some of the most stable refugia areas for substrate dwelling organisms, such as mussels (Pierson 1991).

The Forest Service generally does not engage in activities that modify instream habitat. Exceptions may include: a) localized channel alterations in and around trail and road stream crossings, and b) indirect alteration in structure due to removal or additions of large woody debris. As discussed in the general effect section (VII.B), the proposed actions under the revised Forest Plan will have minimal and eventually fully mitigated effects on stream channels due to standards of action applied to woody debris recruitment and road and trail construction, maintenance, removal, and monitoring. Application of streamside management zone standards would serve to protect, and possibly increase woody debris supplies. Also, woody debris surveys would be conducted and opportunities to restore woody debris densities may be pursued according to survey results. Over time, given the implementation of the revised Forest Plan, stream crossings will come to resemble natural stream channels due to the removal of water constricting culverts or other similar structures. The greatest benefits may be realized in the Brushy Fork watershed where there is a high density of road crossings. New crossings will be designed to avoid channel-altering effects. In the meantime, however, there may be some continuing negative effects on mussels due to localized ponding or down-cutting. Such effects are expected to be minor, temporary, and consequently insignificant. Regardless of Forest Service actions, ongoing off-Forest activities such as road crossings, woody debris removal, and mining, will undoubtedly contribute to channel alteration particularly within portions of Clear Creek (unoccupied habitat), lower Brushy Fork, and proposed critical habitat of lower Sipsey Fork.

6) Flow: Without protective measures, changes in hydrology have the potential to negatively affect dark pigtoes through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also,

groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is on the Bankhead National Forest where Brushy Lake is maintained by the Forest Service as a small recreational impoundment within the upper Brushy Fork watershed. Ongoing maintenance and operation of the Brushy Lake dam and impoundment likely has an influence on base flow in the immediate reach downstream from the dam. However, given the small size of the lake and dam, this influence likely does not extend downstream to the primary larger river habitat of this species. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within unoccupied habitat of Clear Creek, lower and upper Brushy Fork, and proposed critical habitat of lower Brushy Fork where flow alterations have been identified as a moderate to high viability concern for this species (Table VII.B.16). The ongoing operation of the Lewis Smith Lake dam and reservoir will continue to impound water and cause extreme water level fluctuations extending at least 5 miles into the lower portions of the tributary dark pigtoe habitat.

7) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Road stream crossings have the potential to indirectly affect dark pigtoes due to the limitations on the dispersion of fish species that host and transport mussel glochidia (larvae) (Watters 1996). However, roads are less likely to hamper movements of host fish within the preferred dark pigtoe larger mainstream habitat of the lower portions of the watersheds. Within these areas, bridges are in place to span the larger stream channels. However, it is possible that road stream crossings within the upper tributaries are potential barriers for mussel hosts and it is not yet clear how mussel population viability may or may not be tied to habitat availability throughout the watershed. Implementation of revised Forest Plan direction would substantially improve passage for mussel fish hosts, particularly within the Brushy Fork watershed where there is a high density of road crossings. As discussed in the general effects section (VII.B), full implementation of revised Forest Plan standards would eventually lead to the removal of fish passage problems due to road crossings. Reservoirs may also negatively affect aquatic species by blocking movements. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is the Forest Service maintained Brushy Lake dam which is located in the upper Brushy Fork watershed. Since this species primarily inhabits the lower large stream sections of this drainage, Brushy Lake should not be a barrier to upstream dispersal. Since this species may be extirpated from the upper portion of the drainage, there would be no adverse effects on the species unless it is expanded into the upper Brushy Fork in the future. Conversely, it may be useful to conduct research on the downstream effects of Brushy Lake, in order to better understand why this species appears to be on the decline

within this watershed. Since this species may be extirpated from this drainage, there would be no adverse effects on the species unless it is repatriated in the future. Conversely, it may be useful to conduct research on the downstream effects of Brushy Lake, in order to better understand why this species has declined within this watershed. Although this effect is likely small, ongoing, and not within the scope of the proposed actions, further research on the downstream effects of Brushy Lake are recommended. The Alabama Power Company controlled Lewis Smith Reservoir continues to fragment the habitat and populations of mussels among the five major tributary streams. Further research on host fish population viability would be advisable..

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact dark pigtoes through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. Coal mines, particularly in the Clear Creek watershed, have negatively affected mussels through alterations in pH, sedimentation, and release of heavy metals. The loss of American chestnut trees from riparian forests has probably had long-lasting ramifications for streamside vegetation (Baker & Van Lear 1998) and aquatic habitat (Smock & MacGregor 1988), especially in headwater streams of the mountain and plateaus of northern Alabama. The wooly adelgid (*Adelges piceae*) has not yet reached Alabama, but may influence Bankhead National Forest streams if there is a hemlock die-off as is occurring elsewhere in the southeast. For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect dark pigtoe populations and their proposed critical habitat, except in situations where there may be ongoing and temporary effects of lead inputs from weathering bridges, slightly elevated sediment contributions from roads and temporary roads associated with forest health maintenance activities, temporary and localized channel alterations associated with road crossings, and continued habitat fragmentation and downstream water quality effects from the ongoing operation of the Brushy Lake reservoir. . Watershed and habitat conditions would continue to improve over historic conditions.

In addition to the protective standards, the revised Forest Plan includes goals and objectives conducive to pro-active and beneficial actions. Habitat and watershed protection and monitoring will be the primary objectives for this species (Table VII.B.16). Sipsey Fork has been identified as a possible priority watershed and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). The proposed direction of the revised Forest Plan also aims to foster participation in cooperative watershed assessment, planning, and restoration (objective 43.1, goals 44 and 45). Plan direction includes goals and objectives encouraging Forest Service leadership in natural resource education (goal 43). Habitat and representative populations (Lower Sipsey and Brushy Forks) will be monitored in conjunction with comprehensive surveys and project monitoring. Monitoring will include either search indices or transects depending on local conditions and mussel densities. Inventories of other potential habitat areas (Upper Sipsey and Brushy Forks) will also be conducted. As appropriate, additional suitable

habitat may be identified and cooperative action taken to repatriate dark pigtoes into unoccupied areas on National Forest lands.

VII. B.16.c. Determination of Effects – Dark pigtoe

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration efforts. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the dark pigtoe and is not likely to adversely modify proposed critical habitat.**

VII. B.17. Southern pigtoe (*Pleurobema georgianum*) Lea

VII. B.17.a. Environmental Baseline – Southern pigtoe

Southern pigtoes are listed as endangered under the Endangered Species Act (USFWS 1993b). The Southern pigtoe is included in the multi-species Mobile River Basin recovery plan (USFWS 1994b). Southern pigtoes historically occurred in the Coosa River system and its tributaries in Alabama, Georgia, and Tennessee. Southern pigtoes are currently confirmed in the Conasauga River and Holly Creeks in Georgia, and Shoal, Big Canoe, and Cheaha Creeks in Alabama (USFWS 2003c). Critical habitat has been proposed for 9 watersheds in Alabama, Georgia, and Tennessee (USFWS 2003c). Portions of proposed critical habitat are within Terrapin and Shoal Creeks on the Shoal Creek District of the Talladega National Forest, Hatchet Creek downstream of the Talladega District, and Cheaha Creek largely on the Talladega District. Historical, potential, and proposed critical habitats on or near the National Forests in Alabama are displayed in Table VII.B.17. All of these are within or adjacent to the Tuskegee or Talladega National Forests. An additional extant population inhabits the Conasauga River in Georgia and Tennessee on the Cherokee National Forest. Populations are small and restricted (USFWS 2003c). According to the recovery plan (USFWS 2003c), neither downlisting nor delisting is a realistic goal within the next decade. Instead, the main goal is to prevent the continued decline and possible extirpation of remaining populations. Specific objectives include 1) surveys to identify the extent of extant populations, and 2) implementation of habitat protection and restoration measures. A target date for recovery and delisting has not been set.

Table VII. B.17. Overview of known or suspected Southern pigtoe mussel historical, potential, and proposed critical habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Talladega	Calhoun	Lower Coosa	U. Choccolocco	71	12	6	16 mi C.Hab	protect monitor		
			U. Terrapin	26	8	5	48 mi unoccupied C.Hab	survey restore	P	

			M. Choccolocco	23	0	10	17 mi C.Hab	WQ	PF	
			U. Hatchet	11	0	3	unknown	none	P	S
Tuskegee	Macon	Tallapoosa	Chewacla	1	1	2	unknown	survey	SP F	
			Uphapee	10	13	5	unknown	survey	SP	F
Total					34	31				

[1] Population status based on Jenkinson (1973), Hurd (1971, 1974), Pierson (1992), USFS (1994), USFWS (1993b, 2003c), Feminella & Gangloff (2002)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

Southern pigtoes typically inhabit coarse gravel and sand substrates in moderate current of shallow riffles in small rivers and large tributary streams (Parmalee and Bogan 1998, USFWS 2003c). Host fish are Alabama shiner (*Cyprinella callistia*), blacktail shiner (*C. venusta*), and tricolor shiner (*C. trichroistia*) (USFWS 2003c). It is probable that this species produces and releases a superconglutinate in spring, as do the other species in the genera. Freshwater mussels are filter feeders taking organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Inhabitants of small headwater streams may utilize a larger proportion of detritus in their diets (Gordon 1991). As for most freshwater mussels, this species is likely long-lived, and not reproductively mature until attaining 8 or more years of age (Neves and Moyer 1988). Predation is normally a minor mortality factor, with the exception of muskrats, otters, and some types of turtles. A few species of fish may also consume juvenile mollusks. Mussels are parasitized by a variety of organisms with the possibility of excessive infestations causing reduction in growth, longevity, and fertility (Zale and Neves 1982, Parmalee and Bogan 1998).

The primary constituent elements identified as of importance for proposed critical habitat include: stable channels, appropriate flows, necessary water quality, clean substrates, available fish hosts, and lack of competitive non-native species (USFWS 2003c). Habitat qualities and environmental sensitivities common to all T&E mussels are discussed in section VII.B.

The 6 known or suspected extant populations of Southern pigtoe mussels probably inhabit the majority of suitable habitat for this species within the National Forests in Alabama. However, recent drought conditions and existing barriers to fish passage may limit populations within the upper portions of these 6 watersheds. Historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in 2 out of 5 potential species-inhabited Forest Service watersheds (Table VII.B.17) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment and flow alterations may contribute the greatest risk to the viability of this species. Within the Middle Choccolocco watershed, the opportunities for Forest Service influence, either positive or negative, are limited given the overwhelming effects of lower basin development, reservoirs, industry, agriculture, and other land uses. The Forest Service is more likely to have a role in restoration within the Upper Chocolocco and Terrapin watersheds. However, since this is a riverine species, other factors such as off-Forest habitat fragmentation and pollution may over-ride Forest Service watershed improvements. Two populations are potentially at risk of

population decline due to reservoir fragmentation of habitat in the Upper Terrapin and base flow reductions due to surrounding off-Forest land uses in the Uphapee.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, Southern pigtoe habitat conditions have been maintained or improved.

VII. B.17.b. Direct, Indirect, and Cumulative Effects – Southern pigtoe

Direct effects, such as mortality of glochidia, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The proposed actions will continue the current situation of limited Forest Service roads and motorized trails within the stream and small river habitat areas of this species. As discussed in section VII.B, revised Forest Plan standards will minimize opportunities for mechanical damage due to vehicles or equipment.

Southern pigtoes are primarily distributed within the Talladega National Forest. Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) temperatures, 4) nutrient cycling, 5) channel structure, 6) flow, or 7) blockage of mussel host fish passage could indirectly and negatively affect Southern pigtoes. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Coleman, Morgan, and Liberty Hill Lakes are the only Forest Service controlled facility that may be considered for liming and fertilization (which could alter pH and the toxicity of other chemical contaminants). However, given the diversity of downstream aquatic T&E mussels, project specific environmental analysis would be necessary, and it is unlikely that fertilization would be chosen as a viable action unless there is an alternative method that would not contribute to downstream nutrient inputs unless some means of contaminant could be arranged and monitored to prove effectiveness. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service roads, equipment, and herbicide/pesticide use. Bridges, however, may represent an ongoing adverse effect to

aquatic species, particularly native mussels that are most sensitive to heavy metals during their early life stages. Although a complete assessment and testing have not been completed, there are at least 13 bridges located on the Talladega National Forest with the potential for releasing old lead-based paint into the environment. The revised Forest plan offers some general goals that suggest this situation would be addressed. However, this potential adverse effect could be further minimized by additional assurances that the Forest Service would 1) test pre-1978 bridges for lead, 2) prioritize action for paint removal based upon bridge condition and location in relation to the most sensitive aquatic T&E species, and 3) develop and implement a plan for careful paint removal and disposal within a reasonable time-frame according to the highest priorities. If these additional measures are taken, ongoing adverse effects will diminish and eventually be eliminated. There may still be the potential for runoff of chemicals from roadways or illegal activities not entirely under the control of the Forest Service. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within proposed critical habitat of Terrapin and middle Choccolocco Creeks, and the undetermined habitat of Hatchet, Chewacla, and Uphapee Creeks where point source pollution has been identified as a moderate viability concern for this species (Table VII.B.17).

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect Southern pigtoes by reducing food availability and feeding efficiency, altering the substrates where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit sediment mobilizing activities within or adjacent to Southern pigtoe mainstem habitat. Implementation of these standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities. Although there could be some ongoing sediment runoff from roadways, standards for construction, maintenance, and closures would minimize and localize sediment inputs. Any remaining small effects would likely be insignificant, especially when distributed across the watershed. Most watersheds supporting this species are ranked as above average. Within the one watershed ranked as "below average" (Middle Choccolocco), proposed prescriptions include red-cockaded woodpecker habitat restoration, including activities that should be fully mitigated by Forest Plan standards. Middle Choccolocco road density is high both within and outside of the Talladega National Forest, indicating a potential for cumulative road related sediment effects. Therefore, when considered within the context of watershed-wide conditions, it is possible that Forest Service contributions to sediment loading may be an incremental addition to already stressed aquatic systems within the middle Choccolocco Creek.

However, since Forest Service lands are less than 23% of the watershed, Forest Service sediment contributions would be expected to be minor, and perhaps insignificant, portions of the much more pervasive sediment loading associated with off-Forest agricultural, silvicultural, and residential activities (see also general effects discussion, section VII.B). Dark pigtoe habitat is primarily downstream from these tributary watersheds primarily within the mainstem of Choccolocco Creek, and these areas continue to be severely impacted by off-Forest activities. Also, upper Choccolocco Creek, including the headwaters of middle Choccolocco Creek is an important watershed for several other aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority when a conservation strategy is developed (objective 11.4). Moreover, Uphapee is an important watershed for several aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority when a conservation strategy is developed (objective 11.4). Moreover, Upper and lower Sipsey Fork, and Uphapee watersheds have been identified as possible priority watersheds and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within Hatchet Creek where excessive sedimentation has been identified as a high viability concern for this species (Table VII.B.17).

3) Temperatures: Elevated water temperature has the potential to affect Southern pigtoes. Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Warmer water temperatures and increased sunlight may result in shifts in food webs and food availability. The introduced Asian clam (Corbicula fluminea) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and nutrient dynamics and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Invasive species generally gain the advantage over native species with warmer water temperatures.

The main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River prescriptions (Prescriptions 2.A.1 and 2.A.2) and Bankhead National Forest canyon corridor prescription (Prescription 4.L) place emphasis on protection and restoration of aquatic natural resources and T&E species and therefore would further minimize vegetative removal activities along Southern pigtoe mainstem habitat. Current conditions of little to no Forest Service vegetative removal adjacent to Southern pigtoe habitat would continue. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions

would further discourage vegetation removal within or adjacent to Southern pigtoe mainstem habitat. Regardless of Forest Service actions, off-Forest silviculture and development would continue to contribute to elevated water temperatures, regardless of Forest Service actions.

4) Nutrients: Nutrient enrichment has the potential to affect Southern pigtoes by altering primary productivity and food webs, favoring non-native invasive species (Claudi and Leach 1999), direct toxicity, or increased transmission and susceptibility to pathogens. There are only a few forest service activities that could potentially contribute to nutrient enrichment; These are a) permitting of livestock and equestrian use, b) fertilization of lakes, or c) discharge from facility sewage or septic systems. Horse manure can contribute to locally elevated nutrient levels, which may be toxic to mussels and alter the availability of suitable planktonic and detrital foods. Revised Forest Plan standards would minimize the potential for such nutrification by limiting equestrian use to roads and designated trails (standards FW-93 and FW-94) and prohibiting tethering or corralling within 50 feet of stream courses or lakes (standard 11-14). Also, other standards restricting the location and configuration of trail crossings would likely decrease such impacts (see also sedimentation effects discussion). As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for nutrient enrichment due to Forest Service activities. Liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Therefore, given full implementation of the revised Forest Plan direction as well as State regulations and necessary site-specific analysis, adverse effects on Southern pigtoes would be unlikely. Regardless of Forest Service actions, ongoing off-Forest activities such as municipal and residential effluents, lake and pond management, and agriculture, will undoubtedly contribute to elevated nutrient levels particularly within portions of proposed critical habitat in Terrapin and middle Choccolocco Creeks where point-source pollution has been identified as a moderate concern for the viability of this species (Table VII.B.17).

5) Channel Structure: As discussed in the section on effects common to all aquatic T&E species, alteration in channel configuration has the potential to adversely affect species by degrading or eliminating habitat qualities necessary for feeding, resting, or reproduction (Brim Box & Moosa 1999). Mussels are particularly sensitive to channel alterations since substrate qualities such as depth, area, particle composition, consolidation, oxygen levels, subsurface water flow, and susceptibility to scouring or deposition can all change dramatically with relatively small adjustments in channel dimensions or structural components. Logs, stumps, and brush appear to serve as some of the most stable refugia areas for substrate dwelling organisms, such as mussels (Pierson 1991).

The Forest Service generally does not engage in activities that modify instream habitat. Exceptions may include: a) localized channel alterations in and around trail and road stream crossings, and b) indirect alteration in structure due to removal or additions of large woody debris. As discussed in the general effect section (VII.B), the proposed actions under the revised Forest Plan will have minimal and eventually fully mitigated effects on stream channels due to standards of action applied to woody debris recruitment and road and trail

construction, maintenance, removal, and monitoring. Application of streamside management zone standards would serve to protect, and possibly increase woody debris supplies. Also, woody debris surveys would be conducted and opportunities to restore woody debris densities may be pursued according to survey results. Over time, given the implementation of the revised Forest Plan, stream crossings will come to resemble natural stream channels due to the removal of water constricting culverts or other similar structures. New crossings will be designed to avoid channel-altering effects. In the meantime, however, there may be some continuing negative effects on mussels due to localized ponding or down-cutting. Such effects are expected to be minor, temporary, and consequently insignificant. Existing road crossings may constitute an attractive nuisance and an indirect risk to downstream mussels, if beaver build dams that are inherently unstable at these sites (see general effects discussion, section VII.B). Under the revised plan, road crossing assessments may also assist in identifying areas where beaver dam management would be advisable. Although potentially labor intensive, beaver dams can be managed by periodic notching or alternatively by installation of a standing pipe drain. There is also the possibility of directly removing or re-locating the beaver. Regardless of Forest Service actions, ongoing off-Forest activities such as road crossings, woody debris removal, dredging, mining, and channelization, will undoubtedly contribute to channel alteration particularly within portions of Terrapin and middle Choccolocco Creeks, proposed critical habitat for this species.

6) Flow: Without protective measures, changes in hydrology have the potential to negatively affect Southern pigtoes through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, all of the impoundments associated with this species are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest

Service. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within proposed critical habitat of middle Choccolocco Creeks where flow alterations have been identified as a moderate viability concern for this species (Table VII.B.17).

7) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Road stream crossings have the potential to indirectly affect Southern pigtoes due to the limitations on the dispersion of fish species that host and transport mussel glochidia (larvae) (Watters 1996). However, roads are less likely to hamper movements of host fish within the preferred Southern pigtoe larger mainstream habitat of the lower portions of the watersheds. Within these areas, bridges are in place to span the larger stream channels. However, it is possible that road stream crossings within the upper tributaries are potential barriers for mussel hosts and it is not yet clear how mussel population viability may or may not be tied to habitat availability throughout the watershed. Implementation of revised Forest Plan direction would substantially improve passage for mussel fish hosts. Therefore, it is unlikely that Forest Service activities would block Southern pigtoe movements along river corridors. As discussed in the general effects section (VII.B), full implementation of revised Forest Plan standards would eventually lead to the removal of fish passage problems due to road crossings. Reservoirs may also negatively affect aquatic species by blocking movements. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact Southern pigtoes through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. On the Talladega National Forest, historical gold mines continue their influence today, through channel alterations and elevated levels of lead and mercury. The loss of American chestnut trees from riparian forests has probably had long-lasting ramifications for streamside vegetation (Baker & Van Lear 1998) and aquatic habitat (Smock & MacGregor 1988), especially in headwater streams of the mountain and plateaus of northern Alabama. Industrial pollution has had an impact throughout the lower portions of watersheds with urban centers (particularly Choccolocco Creek). For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect Southern pigtoe populations or their proposed critical habitat. Watershed and habitat conditions would continue to improve over historic conditions.

In addition to the protective standards, the revised Forest Plan includes goals and objectives conducive to pro-active and beneficial actions. Habitat and watershed protection and monitoring will be the primary objectives for this species (Table VII.B.17). Upper Choccolocco, Terrapin, Hatchet, and Uphapee Creeks been identified as a possible priority watershed and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects

that could add to cumulative effects on this species (objective 11.3). The proposed direction of the revised Forest Plan also aims to foster participation in cooperative watershed assessment, planning, and restoration (objective 43.1, goals 44 and 45). Plan direction includes goals and objectives encouraging Forest Service leadership in natural resource education (goal 43). Habitat and the only known on-Forest extant population (Upper Choccolocco Creek) will be monitored in conjunction with comprehensive surveys and project monitoring. Monitoring will include either search indices or transects depending on local conditions and mussel densities. Inventories of other potential habitat areas (Upper Terrapin Creek) will also be conducted. As appropriate, additional suitable habitat may be identified and cooperative action taken to repatriate Southern pigtoes into unoccupied areas on National Forest lands.

VII. B.17.c. Determination of Effects – Southern pigtoe

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration efforts. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the Southern pigtoe and is not likely to adversely modify proposed critical habitat.**

VII. B.18. Ovate clubshell (*Pleurobema perovatum*) Lea

VII. B.18.a. Environmental Baseline – Ovate clubshell

Ovate clubshells are listed as endangered under the Endangered Species Act (USFWS 1993b). The ovate clubshell is included in the multi-species Mobile River Basin recovery plan (USFWS 1994b). The species historically occurred in the Tombigbee, Black Warrior, Alabama, Cahaba, Tallapoosa and Coosa Rivers, and their tributaries in Mississippi, Alabama, and Georgia. Apparently, the species is extirpated from the Black Warrior, Cahaba, and Alabama River basins and it may no longer survive in the mainstem Tombigbee River and Uphapee and Opintlocco Creeks (USFWS 2003c). Critical habitat has been proposed for 20 watersheds in Alabama, Mississippi, Georgia, and Tennessee (USFWS 2003c). Portions of proposed critical habitat are within Uphapee and Chewacla Creeks on the Tuskegee National Forest, Terrapin Creek on the Shoal Creek District of the Talladega National Forest, Hatchet Creek downstream of the Talladega District, Sipsey Fork largely on the Bankhead National Forest, and the Cahaba River upstream from the Oakmulgee Division of the Talladega National Forest. Historical, potential, and proposed critical habitats on or near National Forests are displayed in Table VII.B.18. All of these are within the Bankhead and Tuskegee National Forests or the Shoal Creek and Talladega Districts of the Talladega National Forest. Additional populations may be located on the Cherokee National Forest in Tennessee and Georgia. Populations are small and localized (USFWS 2003c). According to the recovery plan (USFWS 2003c), neither downlisting nor delisting is a realistic goal within the next decade. Instead, the main goal is to prevent the continued decline and possible extirpation of remaining populations. Specific objectives include 1) surveys to identify the extent of extant populations, and 2) implementation of habitat protection and restoration measures. A target date for recovery and delisting has not been set.

Table VII.B.18. Overview of known or suspected ovate clubshell mussel historical, potential and proposed critical habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Bankhead	Winston	Black Warrior	Lower Brushy	36	13	5	extirpated?	none	TP	F
			Upper Brushy	82	5	0	extirpated?	none	F	
			U. Sipsey Fork	87	10	0	unoccupied C.Hab	survey restore?		
Talladega	Calhoun	Lower Coosa	U. Choccolocco	71	12	6	unknown	survey		
			U. Terrapin	26	8	5	11 mi dwnstrm occupied C.Hab; 37 mi unoccupied C.Hab	survey protect	P	
	Coosa		U. Hatchet	11	0	5	41 mi dwnstrm unoccupied C.Hab	WQ	P	S
Tuskegee	Macon	Tallapoosa	Chewacla	1	1	5	46 mi C.Hab rare (1991)	protect	SP F	
			Uphapee	10	13	5	46 mi C.Hab rare (1991)	monitor protect	SP	F
		Total			162	20				

[1] Population status based on Dodd et al. (1986), Pierson (1991, 1992), McGregor (1993), , USFWS (2003c)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

Ovate clubshells typically inhabit sand and fine gravel substrates under moderate current in shoals and runs of large streams and small rivers (Parmalee and Bogan 1998). Freshwater mussels are filter feeders, removing organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Gravid females are observed from June through July and glochidia are released as well-formed white conglutinates (USFWS 2003c). Host fish are unknown for this species but may be primarily cyprinids. As for most freshwater mussels, this species is likely long-lived, and not reproductively mature until attaining 8 or more years of age (Neves and Moyer 1988). Predation is normally a minor mortality factor, with the exception of muskrats, otters, and some types of turtles. A few species of fish may also consume juvenile mollusks. Mussels are parasitized by a variety of organisms with the possibility of excessive infestations causing reduction in growth, longevity, and fertility (Zale and Neves 1982, Parmalee and Bogan 1998).

The primary constituent elements identified as of importance for proposed critical habitat include: stable channels, appropriate flows, necessary water quality, clean substrates, available fish hosts, and lack of competitive non-native species (USFWS 2003). Habitat qualities and environmental sensitivities common to all T&E mussels are discussed in section VII.B.

The 8 known or suspected extant populations of ovate clubshell mussels probably inhabit less than half of the suitable habitat remaining for this species within the National Forests in Alabama. Recent drought conditions and existing barriers to fish passage, such as the presence of numerous reservoirs, may limit populations within the upper portions of these watersheds. The decline and extirpation of most populations of mussels may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Impediment of host fish passage may also be a factor. Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in 2 out of 8 potential species-inhabited Forest Service watersheds (Table VII.B.18) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, altered flow and excessive sediment may contribute the greatest risk to the viability of this species. The Forest Service may have a role in restoration within the Upper Chocolocco, Terrapin, and Uphapee watersheds. The Upper Terrapin population is at risk due to a reservoir fragmenting habitat and reducing the ability of the species to re-colonize the upper watershed. However, since this is a riverine species, other factors such as off-Forest habitat fragmentation and pollution may over-ride upper watershed improvements. The Upper Sipsey Fork population is at risk due to reduced base reference flows and a downstream reservoir making it difficult for the species to re-colonize the upper watershed. Restoration is unlikely in the Upper Sipsey Fork watershed, unless efforts are undertaken to repatriate the species into additional areas within it's currently extirpated range.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, ovate clubshell habitat conditions have been maintained or improved.

VII. B.18.b. Direct, Indirect, and Cumulative Effects – Ovate clubshell

Direct effects, such as mortality of glochidia, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The proposed actions will continue the current situation of limited Forest Service roads and motorized trails within the stream and small river habitat areas of this species. As discussed in section VII.B, revised Forest Plan standards will minimize opportunities for mechanical damage due to vehicles or equipment. Moreover, on the Bankhead National Forest, roadways are limited adjacent to ovate clubshell habitat within the Sipsey Wild and Scenic River corridor and the Wilderness.

Ovate clubshells are fairly widely distributed across the more northerly National Forest units in Alabama. They are also a species that can inhabit long reaches extending from the mainstem to tributary headwaters. Consequently, the potential affects of Forest Service management activities are much broader than for other less ubiquitous species. Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) temperatures, 4) nutrient cycling, 5) channel structure, 6) flow, or 7) blockage of mussel host fish passage could indirectly and negatively affect ovate clubshells. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural

treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Coleman, Morgan, and Liberty Hill Lakes on the Tuskegee, and Chutkee and Thioko Ponds on the Tuskegee are the only Forest Service controlled facility that may be considered for liming and fertilization (which could alter pH and the toxicity of other chemical contaminants). However, given the diversity of downstream aquatic T&E mussels, project specific environmental analysis would be necessary, and it is unlikely that fertilization would be chosen as a viable action unless there is an alternative method that would not contribute to downstream nutrient inputs unless some means of contaminant could be arranged and monitored to prove effectiveness. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service roads, equipment, and herbicide/pesticide use.

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect ovate clubshells by reducing food availability and feeding efficiency, altering the substrates where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit sediment mobilizing activities within or adjacent to ovate clubshell mainstem habitat. Implementation of these standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities. Although there could be some ongoing sediment runoff from roadways, standards for construction, maintenance, and closures would minimize and localize sediment inputs. Any remaining small effects would likely be insignificant, especially when distributed across the watershed. Most watersheds supporting this species are ranked as above average. Within the two watersheds ranked as average (Chewacla and Uphapee Creeks), proposed prescriptions include dispersed

recreation, including activities that are likely to be fully mitigated for erosional effects. Uphapee road density is high both within and outside of the Tuskegee National Forest, indicating a potential for cumulative road related sediment effects. Therefore, when considered within the context of watershed-wide conditions, it is possible that Forest Service contributions to sediment loading may be an incremental addition to already stressed aquatic systems within the proposed critical habitat of Uphapee Creeks. However, since Forest Service lands are less than 10% of the watershed, Forest Service sediment contributions would be expected to be minor, and perhaps insignificant, portions of the much more pervasive sediment loading associated with off-Forest agricultural, silvicultural, and residential activities (see also general effects discussion, section VII.B). Moreover, Uphapee, Sipsey Fork, and Upper Choccolocco Creeks are important watersheds for several aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as high priorities when a conservation strategy is developed (objective 11.4). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within unoccupied upper Brushy Fork and proposed critical habitat of Hatchet, Chewacla, and Uphapee Creeks where excessive sedimentation has been identified as a moderate to high viability concern for this species (Table VII.B.18).

3) Temperatures: Elevated water temperature has the potential to affect ovate clubshells. Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Warmer water temperatures and increased sunlight may result in shifts in food webs and food availability. The introduced Asian clam (Corbicula fluminea) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and nutrient dynamics and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Invasive species generally gain the advantage over native species with warmer water temperatures.

   The main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River prescriptions (Prescriptions 2.A.1 and 2.A.2) and Bankhead National Forest canyon corridor prescription (Prescription 4.L) place emphasis on protection and restoration of aquatic natural resources and T&E species and therefore would further minimize vegetative removal activities along ovate clubshell mainstem habitat. Current conditions of little to no Forest Service vegetative removal adjacent to ovate clubshell habitat would continue. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further discourage vegetation removal within or adjacent to ovate clubshell mainstem habitat. Regardless of Forest Service actions, off-Forest silviculture and development would continue to contribute to elevated water temperatures, particularly within unoccupied

habitat of lower Brushy Fork where thermal alterations have been identified as of high viability concern for this species (Table VII.B.18).

4) Nutrients: Nutrient enrichment has the potential to affect ovate clubshells by altering primary productivity and food webs, favoring non-native invasive species (Claudi and Leach 1999), direct toxicity, or increased transmission and susceptibility to pathogens. There are only a few forest service activities that could potentially contribute to nutrient enrichment; These are a) permitting of livestock and equestrian use, b) fertilization of lakes, or c) discharge from facility sewage or septic systems. Horse manure can contribute to locally elevated nutrient levels, which may be toxic to mussels and alter the availability of suitable planktonic and detrital foods. Revised Forest Plan standards would minimize the potential for such nutrification by limiting equestrian use to roads and designated trails (standards FW-93 and FW-94) and prohibiting tethering or corralling within 50 feet of stream courses or lakes (standard 11-14). Also, other standards restricting the location and configuration of trail crossings would likely decrease such impacts (see also sedimentation effects discussion). As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for nutrient enrichment due to Forest Service activities. Liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Therefore, given full implementation of the revised Forest Plan direction as well as State regulations and necessary site-specific analysis, adverse effects on ovate clubshells would be unlikely. Regardless of Forest Service actions, ongoing off-Forest activities such as municipal and residential effluents, lake and pond management, and agriculture, will undoubtedly contribute to elevated nutrient levels particularly within portions of unoccupied lower Brushy Fork and proposed critical habitat of Terrapin, Hatchet, Chewacla, and Uphapee Creeks where point-source pollution has been identified as a moderate concern for the viability of this species (Table VII.B.18).

5) Channel Structure: As discussed in the section on effects common to all aquatic T&E species, alteration in channel configuration has the potential to adversely affect species by degrading or eliminating habitat qualities necessary for feeding, resting, or reproduction (Brim Box & Moosa 1999). Mussels are particularly sensitive to channel alterations since substrate qualities such as depth, area, particle composition, consolidation, oxygen levels, subsurface water flow, and susceptibility to scouring or deposition can all change dramatically with relatively small adjustments in channel dimensions or structural components. Logs, stumps, and brush appear to serve as some of the most stable refugia areas for substrate dwelling organisms, such as mussels (Pierson 1991).

The Forest Service generally does not engage in activities that modify instream habitat. Exceptions may include: a) localized channel alterations in and around trail and road stream crossings, and b) indirect alteration in structure due to removal or additions of large woody debris. As discussed in the general effect section (VII.B), the proposed actions under the revised Forest Plan will have minimal and eventually fully mitigated effects on stream channels due to standards of action applied to woody debris recruitment and road and trail construction, maintenance, removal, and monitoring. Application of streamside

management zone standards would serve to protect, and possibly increase woody debris supplies. Also, woody debris surveys would be conducted and opportunities to restore woody debris densities may be pursued according to survey results. Over time, given the implementation of the revised Forest Plan, stream crossings will come to resemble natural stream channels due to the removal of water constricting culverts or other similar structures. Greatest benefits would be realized within the Uphapee watershed where there is a high density of road crossings. New crossings will be designed to avoid channel-altering effects. In the meantime, however, there may be some continuing negative effects on mussels due to localized ponding or down-cutting. Such effects are expected to be minor, temporary, and consequently insignificant. Existing road crossings may constitute an attractive nuisance and an indirect risk to downstream mussels, if beaver build dams that are inherently unstable at these sites (see general effects discussion, section VII.B). Under the revised plan, road crossing assessments may also assist in identifying areas where beaver dam management would be advisable. Although potentially labor intensive, beaver dams can be managed by periodic notching or alternatively by installation of a standing pipe drain. There is also the possibility of directly removing or re-locating the beaver. Regardless of Forest Service actions, ongoing off-Forest activities such as road crossings, woody debris removal, dredging, mining, and channelization, will undoubtedly contribute to channel alteration particularly within portions of proposed critical habitat of Terrapin, Chewacla, and Uphapee Creeks.

6) Flow: Without protective measures, changes in hydrology have the potential to negatively affect ovate clubshells through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is on the

Bankhead National Forest where Brushy Lake is maintained by the Forest Service as a small recreational impoundment within the upper Brushy Fork watershed. Ongoing maintenance and operation of the Brushy Lake dam and impoundment likely has an influence on base flow in the immediate reach downstream from the dam. However, given the small size of the lake and dam, this influence likely does not extend downstream to the primary larger river habitat of this species. And since this species may be extirpated from this drainage, there would be no adverse effects on the species unless it is repatriated in the future. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within unoccupied upper Brushy Fork proposed critical habitat and occupied critical habitat in Chewacla and Uphapee Creeks where flow alterations have been identified as a moderate to high viability concern for this species (Table VII.B.19). The ongoing operation of the Lewis Smith Lake dam and reservoir will continue to impound water and cause extreme water level fluctuations extending at least 5 miles into the lower portions of the tributary ovate clubshell habitat.

7) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Road stream crossings have the potential to indirectly affect ovate clubshells due to the limitations on the dispersion of fish species that host and transport mussel glochidia (larvae) (Watters 1996). However, roads are less likely to hamper movements of host fish within the preferred ovate clubshell larger mainstream habitat of the lower portions of the watersheds. Within these areas, bridges are in place to span the larger stream channels. However, it is possible that road stream crossings within the upper tributaries are potential barriers for mussel hosts and it is not yet clear how mussel population viability may or may not be tied to habitat availability throughout the watershed. Implementation of revised Forest Plan direction would substantially improve passage for mussel fish hosts, particularly within the Uphapee watershed where there is a high density of road crossings. As discussed in the general effects section (VII.B), full implementation of revised Forest Plan standards would eventually lead to the removal of fish passage problems due to road crossings. Reservoirs may also negatively affect aquatic species by blocking movements. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is the Forest Service maintained Brushy Lake dam which is located in the upper Brushy Fork watershed. Since this species may be extirpated from this drainage, there would be no adverse effects on the species unless it is repatriated in the future. Conversely, it may be useful to conduct research on the downstream effects of Brushy Lake, in order to better understand why this species has declined within this watershed. The Alabama Power Company controlled Lewis Smith Reservoir continues to fragment the habitat and populations of mussels among the five major tributary streams. Further research on host fish population viability would be advisable, particularly if and when this species is repatriated into the Brushy Creek watershed.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact ovate clubshells through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. Coal mines, particularly in the Clear Creek watershed, have

negatively affected mussels through alterations in pH, sedimentation, and release of heavy metals. On the Talladega National Forest, historical gold mines continue their influence today, through channel alterations and elevated levels of lead and mercury. The loss of American chestnut trees from riparian forests has probably had long-lasting ramifications for streamside vegetation (Baker & Van Lear 1998) and aquatic habitat (Smock & MacGregor 1988), especially in headwater streams of the mountain and plateaus of northern Alabama. Industrial pollution has had an impact throughout the lower portions of watersheds with urban centers (particularly Choccolocco Creek). For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect ovate clubshell populations and their proposed critical habitat. Watershed and habitat conditions would continue to improve over historic conditions.

In addition to the protective standards, the revised Forest Plan includes goals and objectives conducive to pro-active and beneficial actions. Habitat and watershed protection and monitoring will be the primary objectives for this species (Table VII.B.18). Sipsey Fork and Terrapin, Hatchet, and Uphapee Creeks have been identified as a possible priority watershed and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). The proposed direction of the revised Forest Plan also aims to foster participation in cooperative watershed assessment, planning, and restoration (objective 43.1, goals 44 and 45). Plan direction includes goals and objectives encouraging Forest Service leadership in natural resource education (goal 43). Habitat and the only known on-Forest extant population (Uphapee Creek) will be monitored in conjunction with comprehensive surveys and project level monitoring. Monitoring will include either search indices or transects depending on local conditions and mussel densities. Inventories of other potential habitat areas (Upper Sipsey Fork, Upper Choccolocco, and Upper Terrapin Creek) will also be conducted. As appropriate, additional suitable habitat may be identified and cooperative action taken to repatriate ovate clubshells into unoccupied areas on National Forest lands.

VII. B.18.c. Determination of Effects – Ovate clubshell

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration efforts. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the ovate clubshell and is not likely to adversely modify proposed critical habitat.**

VII. B.19. Triangular kidneyshell (*Ptychobranchus greeni)* Conrad

VII. B.19.a. Environmental Baseline -- Triangular kidneyshell

Triangular kidneyshells are listed as endangered under the Endangered Species Act (USFWS 1993b). The triangular kidneyshell is included in the multi-species Mobile River Basin recovery plan (USFWS 1994b). The species historically occurred in the Black Warrior, Cahaba, Alabama, and Coosa River systems, and their tributaries in Alabama, Georgia, and Tennessee. The species may be extirpated from the Alabama River and may no longer inhabit the mainstems of the Black Warrior and Coosa Rivers (USFWS 2003c). Critical habitat has been proposed for 13 watersheds in Alabama, Georgia, and Tennessee (USFWS 2003c). Portions of proposed critical habitat are within Terrapin and Shoal Creeks on the Shoal Creek District of the Talladega National Forest, Hatchet Creek downstream of the Talladega District, Cheaha Creek on the Talladega District, Sipsey Fork largely on the Bankhead National Forest, and the Cahaba River upstream from the Oakmulgee Division of the Talladega National Forest. Historical, potential, and proposed critical habitats on or near National Forests are displayed in Table VII.B.19. All of these are within or adjacent to the Bankhead National Forest or the Oakmulgee, Shoal Creek, or Talladega Districts of the Talladega National Forest. Additional populations may occur within the Cherokee National Forest in Tennessee and Georgia. This species is considered to be locally common in the Sipsey Fork drainage and the Conasauga River (USFWS 2003c). According to the recovery plan (USFWS 2003c), neither downlisting nor delisting is a realistic goal within the next decade. Instead, the main goal is to prevent the continued decline and possible extirpation of remaining populations. Specific objectives include 1) surveys to identify the extent of extant populations, and 2) implementation of habitat protection and restoration measures. A target date for recovery and delisting has not been set.

Table VII.B.19. Overview of known or suspected triangular kidneyshell mussel historical, potential, and proposed critical habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Bankhead	Winston	Black Warrior	L. Sipsey Fork	32	20	6	91 mi occupied C.Hab; small local	protect	ST	F
	Lawrence		U. Sipsey Fork	87	10	0	91 mi occupied C.Hab; small local	protect monitor		
	Winston		Upper Brushy	82	5	0	present	survey		
Talladega	Calhoun	Lower Coosa	U.Choccolocco	71	12	6	16 mi occupied C.Hab	protect monitor		
			Upper Terrapin	26	8	5	48 mi unoccupied C.Hab	survey restore?	P	
			M.Choccolocco	23	0	10	17 mi unoccupied C.Hab	WQ	PF	
	Coosa		U. Hatchet	11	0	3	41 mi unoccupied C.Hab	WQ	P	S

Oakmulgee	Bibb	Cahaba	Cahaba	11	0	0	upstrm C.Hab			S
Total					55	30				

[1] Population status based on van der Schalie (1938), USFS (1986, 1992, 1993, 1994), Feminella & Gangloff (2002), USFWS (2003c)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

Triangular kidneyshells typically inhabit runs and shoals with firm coarse gravel and sand substrates and good currents in large streams and small rivers (Parmalee and Bogan 1998). Freshwater mussels are filter feeders, removing organic detritus, diatoms, phytoplankton, and zooplankton from the water column (Neves et al. 1996). Larval glochidia are released from March through April as conglutinates that mimic dipteran larvae (Hartfield and Hartfield 1996) or fish eggs (Haag and Warren 1997) and serve to attract potential host fish. The Warrior darter (*Etheostoma bellator*), Tuscaloosa darter (*E. douglasi*), redfin darter (*E. whipplei*), blackbanded darter (*Percina nigrofasciata*), river darter (*P. shumardi*), and logperch (*Percina caproides*) have been identified as suitable fish hosts for the glochidia (Haag and Warren 1997, Parmalee and Bogan 1998). As for most freshwater mussels, this species is likely long-lived, and not reproductively mature until attaining 8 or more years of age (Neves and Moyer 1988). Predation is normally a minor mortality factor, with the exception of muskrats, otters, and some types of turtles. A few species of fish may also consume juvenile mollusks. Mussels are parasitized by a variety of organisms with the possibility of excessive infestations causing reduction in growth, longevity, and fertility (Zale and Neves 1982, Parmalee and Bogan 1998).

The primary constituent elements identified as of importance for proposed critical habitat include: stable channels, appropriate flows, necessary water quality, clean substrates, available fish hosts, and lack of competitive non-native species (USFWS 2003c). Habitat qualities and environmental sensitivities common to all T&E mussels are discussed in section VII.B.

The 8 known or suspected extant populations of triangular kidneyshell probably inhabit less than half of the suitable habitat for this species within the National Forests in Alabama. Recent drought conditions and existing barriers to fish passage may further limit populations within the upper portions of these watersheds. The decline and extirpation of most populations of triangular kidneyshell may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Impediment of host fish passage may also be a factor. Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in 2 out of 8 potential species-inhabited Forest Service watersheds (Table VII.B.19) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, altered flow and excessive sediment may contribute the greatest risk to the viability of this species. Within the Middle Choccolocco watershed, the opportunities for Forest Service influence, either positive or negative, are limited given the interspersion of private and due to the overwhelming of lower basin development, industry, agriculture, and other land uses. The Forest Service may have a greater role in restoration within the Upper Chocolocco, Terrapin, and Hatchet watersheds. However, since this is a riverine species, other factors such as off-Forest habitat fragmentation and pollution may over-ride Forest Service watershed improvements. The Upper Terrapin population is at risk due to reservoirs fragmenting habitat that may reduce the ability of this species to re-colonize the

upper watershed. Restoration is possible in the Sipsey Fork watershed, although the ongoing effects of reservoir habitat fragmentation would require some active mitigation (such as repatriation into portions of Brushy Creek).

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega and Bankhead National Forests, triangular kidneyshell habitat conditions have been maintained or improved.

VII. B.19.b. Direct, Indirect, and Cumulative Effects – Triangular kidneyshell

Direct effects, such as mortality of glochidia, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The proposed actions will continue the current situation of limited Forest Service roads and motorized trails within the mainstem riverine and lower tributary habitat areas of this species. As discussed in section VII.B, revised Forest Plan standards will minimize opportunities for mechanical damage due to vehicles or equipment. Moreover, on the Bankhead National Forest, roadways are limited adjacent to flattened musk turtle habitat within the Sipsey Wild and Scenic River corridor and the Wilderness.

Triangular kidneyshells are fairly widely distributed across the more northerly National Forest units in Alabama. They are also a species that can inhabit long reaches extending from the mainstem to tributary headwaters. Consequently, the potential affects of Forest Service management activities are much broader than for other less ubiquitous species. Based upon the biology and distribution of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) temperatures, 4) nutrient cycling, 5) channel structure, 6) flow, or 7) blockage of mussel host fish passage could indirectly and negatively affect triangular kidneyshells. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Brushy Lake on the Bankhead, and Coleman, Morgan, and Liberty Hill Lakes on the Talladega National Forest are the only Forest Service controlled facilities that may be considered for liming and fertilization (which could alter pH and the toxicity of other chemical contaminants). However, given the diversity of downstream aquatic T&E mussels, project specific environmental analysis would be necessary, and it is unlikely that fertilization would be chosen as a viable action

unless there is an alternative method that would not contribute to downstream nutrient inputs unless some means of contaminant could be arranged and monitored to prove effectiveness. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service roads, equipment, and herbicide/pesticide use. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit herbicide and pesticide activities within or adjacent to triangular kidneyshell mainstem habitat. Bridges, however, may represent an ongoing adverse effect to aquatic species, particularly native mussels that are most sensitive to heavy metals during their early life stages. Although a complete assessment and testing have not been completed, there are at least 13 bridges located on the Talladega and 5 bridges on the Bankhead National Forest with the potential for releasing old lead-based paint into the environment. The revised Forest plan offers some general goals that suggest this situation would be addressed. However, this potential adverse effect could be further minimized by additional assurances that the Forest Service would 1) test pre-1978 bridges for lead, 2) prioritize action for paint removal based upon bridge condition and location in relation to the most sensitive aquatic T&E species, and 3) develop and implement a plan for careful paint removal and disposal within a reasonable time-frame according to the highest priorities. If these additional measures are taken, ongoing adverse effects will diminish and eventually be eliminated. There may still be the potential for runoff of chemicals from roadways or illegal activities not entirely under the control of the Forest Service. Regardless of Forest Service actions; off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within proposed critical habitat of Terrapin, middle Choccolocco, and Hatchet Creeks where point source pollution has been identified as a moderate viability concern for this species (Table VII.B.19). These cumulative effects will be most pronounced downstream from the Talladega National Forest.

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect triangular kidneyshells by reducing food availability and feeding efficiency, altering the substrates where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit sediment mobilizing activities within or adjacent to triangular kidneyshell mainstem habitat. Implementation of these standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities. Although there could be some ongoing sediment runoff from roadways, standards for construction,

maintenance, and closures would minimize and localize sediment inputs. Any remaining small effects would likely be insignificant, especially when distributed across the watershed. Most watersheds supporting this species are ranked as above average. Within the one watershed ranked as "below average" (Middle Choccolocco), proposed prescriptions include red-cockaded woodpecker habitat restoration, encompassing activities that are likely to be fully mitigated by application of Forest Plan standards. Middle Choccolocco road density is high both within and outside of the Talladega National Forest, indicating a potential for cumulative road related sediment effects. Therefore, when considered within the context of watershed-wide conditions, it is possible that Forest Service contributions to sediment loading may be an incremental addition to already stressed aquatic systems within the proposed critical habitat of middle Choccolocco Creek. However, since Forest Service lands are less than 23% of the watershed, Forest Service sediment contributions would be expected to be minor, and perhaps insignificant, portions of the much more pervasive sediment loading associated with off-Forest agricultural, silvicultural, and residential activities (see also general effects discussion, section VII.B). Also, upper Choccolocco Creek, including the headwaters of middle Choccolocco Creek is an important watershed for several other aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority when a conservation strategy is developed (objective 11.4). Moreover, Sipsey Fork and Terrapin Creeks would most likely also receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within proposed critical habitat of Sipsey Fork and middle Choccolocco Creek where excessive sedimentation has been identified as a viability concern for this species (Table VII.B.19).

3) Temperatures: Elevated water temperature has the potential to affect triangular kidneyshells. Warmer water temperatures equate to higher metabolism, increased food demands, and greater risks of infection from pathogens. Warmer water temperatures and increased sunlight may result in shifts in food webs and food availability. The introduced Asian clam (Corbicula fluminea) has spread and achieved high densities throughout most drainages in Alabama. Asian clams are more tolerant of habitat alterations and water quality degradation and consequently may alter trophic and nutrient dynamics and displace native species (Gottfried and Osborne 1982, Devick 1991; Stites et al. 1995). Invasive species generally gain the advantage over native species with warmer water temperatures.

   The main Forest Service activities that could influence stream temperatures without protective measures include: a) removal of streamside canopy and reduction in shade, or b) impoundment of water flow. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for thermal alterations due to Forest Service activities. The current conditions of little to no Forest Service vegetative removal adjacent to triangular kidneyshell habitat would continue. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further discourage vegetation removal within or adjacent to triangular kidneyshell mainstem habitat. Regardless of Forest Service actions,

off-Forest silviculture and development would continue to contribute to elevated water temperatures, particularly within proposed critical habitat of lower Sipsey Fork where thermal alterations have been identified as a moderate viability concern for this species (Table VII.B.19).

4) Nutrients: Nutrient enrichment has the potential to affect triangular kidneyshells by altering primary productivity and food webs, favoring non-native invasive species (Claudi and Leach 1999), direct toxicity, or increased transmission and susceptibility to pathogens. There are only a few forest service activities that could potentially contribute to nutrient enrichment; These are a) permitting of livestock and equestrian use, b) fertilization of lakes, or c) discharge from facility sewage or septic systems. Horse manure can contribute to locally elevated nutrient levels, which may be toxic to mussels and alter the availability of suitable planktonic and detrital foods. Revised Forest Plan standards would minimize the potential for such nutrification by limiting equestrian use to roads and designated trails (standards FW-93 and FW-94) and prohibiting tethering or corralling within 50 feet of stream courses or lakes (standard 11-14). Also, other standards restricting the location and configuration of trail crossings would likely decrease such impacts (see also sedimentation effects discussion). As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for nutrient enrichment due to Forest Service activities. Liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Therefore, given full implementation of the revised Forest Plan direction as well as State regulations and necessary site-specific analysis, adverse effects on triangular kidneyshells would be unlikely. Regardless of Forest Service actions, ongoing off-Forest activities such as municipal and residential effluents, lake and pond management, and agriculture, will undoubtedly contribute to elevated nutrient levels particularly within portions of proposed critical habitat of Terrapin, middle Choccolocco, and Hatchet Creeks where point-source pollution has been identified as a moderate concern for the viability of this species (Table VII.B.19).

5) Channel Structure: As discussed in the section on effects common to all aquatic T&E species, alteration in channel configuration has the potential to adversely affect species by degrading or eliminating habitat qualities necessary for feeding, resting, or reproduction (Brim Box & Moosa 1999). Mussels are particularly sensitive to channel alterations since substrate qualities such as depth, area, particle composition, consolidation, oxygen levels, subsurface water flow, and susceptibility to scouring or deposition can all change dramatically with relatively small adjustments in channel dimensions or structural components. Logs, stumps, and brush appear to serve as some of the most stable refugia areas for substrate dwelling organisms, such as mussels (Pierson 1991).

The Forest Service generally does not engage in activities that modify instream habitat. Exceptions may include: a) localized channel alterations in and around trail and road stream crossings, and b) indirect alteration in structure due to removal or additions of large woody debris. As discussed in the general effect section (VII.B), the proposed actions under the revised Forest Plan will have minimal and eventually fully mitigated effects on stream

channels due to standards of action applied to woody debris recruitment and road and trail construction, maintenance, removal, and monitoring. Application of streamside management zone standards would serve to protect, and possibly increase woody debris supplies. Also, woody debris surveys would be conducted and opportunities to restore woody debris densities may be pursued according to survey results. Over time, given the implementation of the revised Forest Plan, stream crossings will come to resemble natural stream channels due to the removal of water constricting culverts or other similar structures. Greatest benefits would be realized within the Brushy Fork watershed where there is a high density of road crossings. New crossings will be designed to avoid channel-altering effects. In the meantime, however, there may be some continuing negative effects on mussels due to localized ponding or down-cutting. Such effects are expected to be minor, temporary, and consequently insignificant. Existing road crossings may constitute an attractive nuisance and an indirect risk to downstream mussels, if beaver build dams that are inherently unstable at these sites (see general effects discussion, section VII.B). Under the revised plan, road crossing assessments may also assist in identifying areas where beaver dam management would be advisable. Although potentially labor intensive, beaver dams can be managed by periodic notching or alternatively by installation of a standing pipe drain. There is also the possibility of directly removing or re-locating the beaver. Regardless of Forest Service actions, ongoing off-Forest activities such as road crossings, woody debris removal, dredging, mining, and channelization, will undoubtedly contribute to channel alteration particularly within portions of Terrapin and middle Choccolocco Creeks, proposed critical habitat for this species.

6) Flow: Without protective measures, changes in hydrology have the potential to negatively affect triangular kidneyshells through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. However, most

impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is on the Bankhead National Forest where Brushy Lake is maintained by the Forest Service as a small recreational impoundment within the upper Brushy Fork watershed. Ongoing maintenance and operation of the Brushy Lake dam and impoundment likely has an influence on base flow in the immediate reach downstream from the dam. However, given the small size of the lake and dam, this influence likely does not extend far downstream. Although this effect is likely small, ongoing, and not within the scope of the proposed actions, further research on the downstream effects of Brushy Lake are recommended. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within proposed critical habitat of the middle Choccolocco Creek where flow alterations have been identified as a moderate viability concern for this species (Table VII.B.19). The ongoing operation of the Lewis Smith Lake dam and reservoir will continue to impound water and cause extreme water level fluctuations extending at least 5 miles into the lower portions of the tributary triangular kidneyshell habitat.

7) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Road stream crossings have the potential to indirectly affect triangular kidneyshells due to the limitations on the dispersion of fish species that host and transport mussel glochidia (larvae) (Watters 1996). However, roads are less likely to hamper movements of host fish within the preferred triangular kidneyshell larger mainstream habitat of the lower portions of the watersheds. Within these areas, bridges are in place to span the larger stream channels. However, it is possible that road stream crossings within the upper tributaries are potential barriers for mussel hosts and it is not yet clear how mussel population viability may or may not be tied to habitat availability throughout the watershed. Implementation of revised Forest Plan direction would substantially improve passage for mussel fish hosts. Greatest benefits would be realized within the Brushy Fork watershed where there is a high density of road crossings. As discussed in the general effects section (VII.B), full implementation of revised Forest Plan standards would eventually lead to the removal of fish passage problems due to road crossings. Reservoirs may also negatively affect aquatic species by blocking movements. However, most impoundments are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. The exception is the Forest Service maintained Brushy Lake dam which is located in the upper Brushy Fork watershed. Since this species primarily inhabits the lower large stream sections of this drainage, Brushy Lake should not be a barrier to upstream dispersal. The Alabama Power Company controlled Lewis Smith Reservoir continues to fragment the habitat and populations of mussels among the five major tributary streams. Further research on host fish population viability would be advisable, particularly if and when this species is repatriated into the Brushy Creek watershed.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact triangular kidneyshells through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals.

In summary, Forest Service activities are not likely to adversely affect triangular kidneyshell populations or their proposed critical habitat. Watershed and habitat conditions would continue to improve over historic conditions.

In addition to the protective standards, the revised Forest Plan includes goals and objectives conducive to pro-active and beneficial actions. Habitat and watershed protection and monitoring will be the primary objectives for this species (Table VII.B.19). Sipsey Fork, upper Choccolocco, Terrapin, and Hatchet have been identified as a possible priority watershed and would therefore receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). The proposed direction of the revised Forest Plan also aims to foster participation in cooperative watershed assessment, planning, and restoration (objective 43.1, goals 44 and 45). Plan direction includes goals and objectives encouraging Forest Service leadership in natural resource education (goal 43). Habitat and representative populations (Upper Sipsey Fork and Upper Choccolocco Creek) will be monitored in conjunction with comprehensive surveys and project level monitoring. Monitoring will include either search indices or transects depending on local conditions and mussel densities. Inventories of other potential habitat areas (Upper Brushy and Upper Terrapin Creeks) will also be conducted. As appropriate, additional suitable habitat may be identified and cooperative action taken to repatriate upland combshells into unoccupied areas on National Forest lands.

VII. B.19.c. Determination of Effects – Triangular kidneyshell

Given the positive opportunities for pro-active conservation and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration efforts. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the triangular kidneyshell and is not likely to adversely modify proposed critical habitat.**

VII. B.20. Lacy Elimia (*Elimia crenatella*)

VII. B.20.a. Environmental Baseline – Lacy Elimia

Lacy Elimia snails are listed as endangered under the Endangered Species Act (USFWS 1998). The Mobile River Basin multi-species recovery plan (2000b) covers round rocksnails. The snail is endemic to the Coosa portion of the Alabama River system. Historically, the snail ranged from St. Clair to Chilton counties within the Coosa River and was known to inhabit several large tributaries including Big Will's Creek, Kelley's Creek, Choccolocco Creek, and Tallaseehatchee Creek. None of these historical sites have proved to be occupied. Currently, the Lacy Elimia snail is restricted to several disjunct populations within the lower portions of Cheaha, Emauhee, and Weewoka Creeks, tributary to the middle Coosa River. One of these populations (Cheaha) is located downstream of the Talladega District. Lacy Elimia are locally abundant in the lower reaches of Cheaha Creek but apparently very rare elsewhere (USFWS

1998). Extant populations and potential habitats on or near National Forests are displayed in Table VII.B.20. All of these are adjacent to the Oakmulgee or Talladega Districts of the Talladega National Forest in Alabama; and there are no other occurrences of this species on National Forest system lands.

Table VII.B.20. Overview of known or suspected Lacy Elimia occurrences and potential habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Oakmulgee	Perry	Cahaba	Cahaba	11	0	2	historic?	none		S
Talladega	Talladega	Lower Coosa	Cheaha	36	0	2	downstrm	WQ	F	
	Calhoun		M. Choccolocco	23	0	10	downstrm historic	WQ	PF	
	Talladega		Talladega	22	0	5	downstrm historic	WQ	P	
			Tallaseehatchee	22	0	5	downstrm historic	WQ	PF	
Total					0	22				

[1] Population status based on Bogan et al. (1993), USFWS (2000B)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

Lacy Elimia snails prefer riffles, bars, and shoals of medium to large tributary streams. This species is typically inhabits undersides of rock slabs or lives among gravel and cobble substrates (Hartfield 1994). The Lacy Elimia is a gill-breathing snail and therefore requires clear well-oxygenated water. Snails graze on periphyton growing on benthic substrates. Snails mature in 1 to 2 years and live for approximately 3 years (USFWS 2000b). Eggs are laid in early spring, hatching in several weeks (USFWS 1998). The extent of snail movements are not well known; However there is evidence that snails make some longitudinal movements along streams and rivers, and that upstream movements may be blocked by suspended culverts (Dillon 1988, Vaughan 2002).

Historical influences have included impoundment by reservoirs, sedimentation, and nutrient enrichment (USFWS 2000b). The decline and extirpation of most populations of snails may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in 1 out of 5 potential species-inhabited Forest Service watersheds (Table VII.B.20) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, chemical pollution has been identified as a possible high risk to the viability of this species in middle Choccolocco, Talladega, and Tallaseehatchee Creeks Within the Cahaba River, the opportunities for Forest Service influence, either positive or negative, are limited given the questionable status of the species, small portion of habitat under Forest Service management (< ½ acre) and due to the overwhelming of upper basin development, industry, agriculture, and other land uses. The Forest Service may have a limited role in restoration within the Middle Chocolocco, Talladega, and Tallaseehatchee watersheds, since other factors such as off-Forest habitat fragmentation and pollution may over-ride Forest Service watershed improvements. The opportunities for Forest Service influence, either

positive or negative, are limited, however, due to the small proportion of each watershed under Forest Service management and the interspersion of private lands.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, Lacy Elimia habitat conditions have been maintained or improved.

VII. B.20.b. Direct, Indirect, and Cumulative Effects – Lacy Elimia

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. Lacy Elimia are currently not known to inhabit Forest Service system lands.

This species is not likely to be found on the Talladega National Forest, however it does occur within 5 miles downstream from the Forest Service boundary. Therefore, the primary concern is with cumulative downstream effects of sedimentation or altered water quality. Based upon the biology and downstream location of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, and 3) flow may indirectly and negatively affect Lacy Elimia snails. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Alterations in pH and the release of heavy metals could also be detrimental to snail physiology (Truscott et al. 1995, Reed-Judkins et al. 1997, Desy et al. 2000). Alterations in pH are possible through lake and reservoir liming and fertilizing. However, according to the standards of the revised Forest Plan, liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service activities. Therefore, given full implementation of the revised Forest Plan direction as well as State regulation and required site-specific analysis, adverse effects on Lacy Elimia due to alteration of water quality would be unlikely. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within historic habitat of middle

Choccolocco, Talladega, and Tallaseehatchee Creeks where point source pollution has been identified as a moderate viability concern for this species (Table VII.B.20). Historic placer gold mining would continue to add cumulative effects through the release of mercury and lead.

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect Lacy Elimia by reducing their food supplies, altering the rocky interstitial spaces where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. In the long term, increasing emphasis on forest health restoration would decrease background levels of sediments from upland erosion, a benefit to the species. Implementation of the revised Forest Plan standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities. Although there could be some ongoing sediment runoff from roadways, standards for construction, maintenance, and closures would minimize and localize sediment inputs. Any remaining small effects would likely be insignificant, especially when distributed across the watershed. Most watersheds supporting this species are ranked as above average. Within the two watersheds ranked as "below average" (Middle Choccolocco and Tallaseehatchee), proposed prescriptions include red-cockaded woodpecker habitat restoration, dispersed recreation and remote backcountry non-motorized recreation, encompassing activities that should be fully mitigated by Forest standards. Middle Choccolocco road density is high both within and outside of the Talladega National Forest, indicating a potential for cumulative road related sediment effects. Therefore, when considered within the context of watershed-wide conditions, it is possible that Forest Service contributions to sediment loading may be an incremental addition to already stressed aquatic systems within the historic habitat of middle Choccolocco and Tallaseehatchee Creeks. However, since Forest Service lands are less than 23% and 22% of the watersheds, Forest Service sediment contributions would be expected to be minor, and perhaps insignificant, portions of the much more pervasive sediment loading associated with off-Forest agricultural, silvicultural, and residential activities (see also general effects discussion, section VII.B). Also, upper Choccolocco Creek, including the headwaters of middle Choccolocco Creek is an important watershed for several other aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority when a conservation strategy is developed (objective 11.4). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within historic habitat of the Cahaba River where excessive sedimentation has been identified as a high viability concern for this species (Table VII.B.20).

3) Flow: Without protective measures, changes in hydrology have the potential to negatively affect Lacy Elimia through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. Typically, however, reservoirs will result in a loss of downstream water flow due to infiltration evaporation, or direct water removal. However, these operations are not under Forest Service permit. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within occupied habitat of Cheaha Creek and historic habitat of middle Choccolocco and Tallaseehatchee Creeks where flow alterations have been identified as a moderate viability concern for this species (Table VII.B.20).

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact Lacy Elimia through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. On the Talladega National Forest, historical gold mines continue their influence today, through channel alterations and elevated levels of lead and mercury. The loss of American chestnut trees from riparian forests has probably had long-lasting ramifications for streamside vegetation (Baker & Van Lear 1998) and aquatic habitat (Smock & MacGregor 1988), especially in headwater streams of the mountain and plateaus of northern Alabama. Industrial pollution has had an impact throughout the lower portions of watersheds with urban centers (particularly the Cahaba River and Choccolocco Creek). For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect Lacy Elimia populations.

Overall direction provided in the revised Forest Plan will be beneficial for Lacy Elimia and their habitat. As discussed in the introductory section, there would be ample opportunities for proactive and beneficial actions. Under the direction of the revised Forest Plan, continued watershed protection and water quality monitoring will be the primary restoration objectives (Table VII.B.20) for Lacy Elimia. Water quality will be monitored in conjunction with comprehensive surveys and project monitoring.

VII. B.20.c. Determination of Effects – Lacy Elimia

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration efforts. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the Lacy Elimia snail.**

VII. B.21. Round rocksnail *(Leptoxis ampla)*

VII. B.21.a. Environmental Baseline – Round rocksnail

Round rocksnails are listed as threatened under the Endangered Species Act (USFWS1998). The Mobile River Basin multi-species recovery plan (2000b) covers round rocksnails. The snail is endemic to the Alabama-Mobile River basin and currently only occupies habitat above the fall-line in the Cahaba River. It is possible that round rocksnails are within 5 miles upstream from the Oakmulgee Division of the Talladega National Forest. However, given the differences in habitat above and below the fall-line, it is unlikely that this snail successfully lives within habitat on or downstream from the National Forests. Extant populations and potential habitats on or near National Forests are displayed in Table VII.B.21. All of these are adjacent to the Oakmulgee District of the Talladega National Forest in Alabama; and there are no other occurrences of this species on National Forest system lands.

Table VII.B.21. Overview of known or suspected round rocksnail occurrences and potential habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Status	FS Recovery Goals	Viability Risk[1]	
					on	near			M	H
Oakmulgee	Perry	Cahaba	Cahaba	11	0	?	upstream	none		S
Total						?				

[1] Population status is based on Pierson (1993) and USFWS (2000b)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

The round rocksnail inhabits riffles and shoals over gravel, cobble, or other rocky substrates of the Cahaba River above the fall-line (USFWS 2000b). The round rocksnail is a gill-breathing snail and therefore requires clear well-oxygenated water. Snails graze on periphyton growing on benthic substrates. Adult snails are fairly sedentary, however juvenile snails may disperse during periods of higher flow. Reproductive biology and early life history are not well known. Eggs are probably affixed onto cobble surfaces (USFWS 1998).

This species may be affected by siltation, impoundments, habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in the 1 potential species-inhabited Forest Service watersheds (Table VII.B.21) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment has been identified as a possible high risk to the viability of this species in the Cahaba River. Within the Cahaba River, the opportunities for Forest Service influence, either positive or negative, are limited given the small portion of habitat under Forest Service management (< ½ acre) and due to the overwhelming of upper basin development, industry, agriculture, and other land uses.

Currently, round rocksnails are only known to inhabit portions of the Cahaba River upstream from the Oakmulgee Division of the Talladega National Forest. Consequently, recent and current Forest practices probably have not had an affect on this species.

VII. B.21.b. Direct, Indirect, and Cumulative Effects – Round rocksnail

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. Round rocksnails are currently not known to inhabit Forest Service system lands.

Round rocksnails are only known to inhabit portions of the Cahaba River upstream from the Oakmulgee Division of the Talladega National Forest. Therefore, Forest Service activities are unlikely to influence this species. Under the direction of the revised Forest Plan, surveys to find this species would be a low priority, but may be conducted in conjunction with other comprehensive surveys and/or project specific monitoring. There are no established Forest Service recovery objectives for this species.

VII. B.21.c. Determination of Effects – Round rocksnail

Given the currently known distribution of round rocksnails and their habitat, it is my determination that there will be **no effect** of the Forest Service proposed actions. Additional conservation measures will be discussed with FWS, if and when recovery actions reveal expansion of suitable habitat and/or species establishment on or downstream from the National Forests.

VII. B.22. Painted rocksnail *(Leptoxis taeniata)*

VII. B.22.a. Environmental Baseline – Painted rocksnail

Painted rocksnails are listed as threatened under the Endangered Species Act (USFWS 1998). The Mobile River Basin multi-species recovery plan (2000b) covers round rocksnails. Historically, the snail ranged widely within the Coosa, Cahaba, and Alabama Rivers and their tributaries. It is now extant within two reaches of the mainstem Choccolocco Creek and lower reaches of Buxahatchee and Ohatchee Creeks. Extant populations and potential habitats on or

near Alabama National Forests are displayed in Table VII.B.22. All of these are within or adjacent to the Talladega District of the Talladega National Forest in Alabama; and there are no other occurrences of this species on National Forest system lands.

Table VII.B.22. Overview of known or suspected painted rocksnail occurrences and potential habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Talladega	Talladega	Lower Coosa	Cheaha	36		2	potential	WQ survey	F	
	Calhoun		M.Choccolocco	23		1	downstrm	WQ	PF	
	Talladega		Talladega	22	1	5	Likely low #	WQ protect, survey	P	
			Tallaseehatchee	22		1	potential	WQ survey	PF	
Total					1	9				

[1] Population status after USFWS (1998, 2003)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

The painted rocksnail appears to prefer medium to large rivers with ample flow and cobble or slab rapids and shoals (USFWS 2000b). All rocksnails are gill-breathers and therefore require clear well-oxygenated water. Snails graze on periphyton growing on benthic substrates. Adult snails are fairly sedentary, however juvenile snails may disperse during periods of higher flow. Reproductive biology and early life history are not well known. Eggs are probably affixed onto cobble surfaces (USFWS 1998). The extent of snail movements are not well known; However there is evidence that snails make some longitudinal movements along streams and rivers, and that upstream movements may be blocked by suspended culverts (Dillon 1988, Vaughan 2002).

Historical influences have included impoundment by reservoirs, sedimentation, and nutrient enrichment (USFWS 2000). Such historical conditions have lead to the current status of this species being considered as at a moderate risk of continued decline in 3 out of 4 potential species-inhabited Forest Service watersheds (Table VII.B.22) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, altered flows and pollution may contribute the greatest risk to the viability of this species. The opportunities for Forest Service influence, either positive or negative, are limited given the interspersion of private lands and other factors such as off-Forest habitat fragmentation and pollution.

As discussed in the section on general baseline conditions common to all T&E species (VII.B), downstream habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, activities have contributed to improving tributary watershed conditions.

VII. B.22.b. Direct, Indirect, and Cumulative Effects – Painted rocksnail

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The Forest Service will not be engaging in any in-channel disturbing activities within their large stream and lower watershed habitat.

This species is not likely to be found on the Talladega National Forest as it prefers the larger riverine habitat of the lower watersheds; It does, however, occur within 5 miles downstream from the Forest Service boundary. Therefore, the primary concern is with cumulative downstream effects of sedimentation or altered water quality. Based upon the biology and downstream location of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, 3) flow, and 4) barriers to passage could indirectly and negatively affect painted rocksnails. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Alterations in pH and the release of heavy metals could also be detrimental to snail physiology (Truscott et al. 1995, Reed-Judkins et al. 1997). Alterations in pH are possible through lake and reservoir liming and fertilizing. In the past, lakes and reservoirs have been regularly limed and fertilized in order to increase production of game and pan fish. However, the proposed actions under the revised Forest Plan would include a reduction and/or a modification in liming and fertilization activities in order to meet revised Forest Plan standards and State regulations against nutrient discharge Consequently, liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Therefore, given full implementation of the revised Forest Plan standards, as well as State regulation and required site-specific analysis, adverse effects on painted rocksnails would be unlikely.

   Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit herbicide and pesticide activities within or adjacent to painted rocksnail mainstem habitat. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within middle Choccolocco, Talladega, and Tallaseehatchee Creeks where point source pollution has been identified as a moderate viability concern for this species (Table VII.B.22). Historic placer gold mining would continue to add cumulative effects through the release of mercury and lead.

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect painted rocksnail by reducing their food supplies, altering the rocky interstitial spaces where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. In the long term, increasing emphasis on forest health restoration would decrease background levels of sediments from upland erosion, a benefit to the species. Implementation of the revised Forest Plan standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities. Although there could be some ongoing sediment runoff from roadways, standards for construction, maintenance, and closures would minimize and localize sediment inputs. Any remaining small effects would likely be insignificant, especially when distributed across the watershed. However, cumulative effect should occur, they would be most likely within the middle Choccolocco and Tallaseehatchee Creeks as these watersheds were ranked as "below average" in watershed conditions. Most watersheds supporting this species are ranked as above average. Within these two watersheds, proposed prescriptions include red-cockaded woodpecker habitat restoration, dispersed recreation and remote backcountry non-motorized recreation, encompassing activities that are likely to be fully mitigated for downstream sediment effects. Middle Choccolocco road density is high both within and outside of the Talladega National Forest, indicating a potential for cumulative road related sediment effects. Therefore, when considered within the context of watershed-wide conditions, it is possible that Forest Service contributions to sediment may be an incremental addition to already stressed aquatic systems within the downstream potential habitat of middle Choccolocco Creek. However, since Forest Service lands are less than 23% of the watershed, Forest Service sediment contributions would be expected to be minor, and perhaps insignificant, portions of the much more pervasive sediment loading associated with off-Forest agricultural, silvicultural, and residential activities (see also general effects discussion, section VII.B). Also, upper Choccolocco Creek, including the headwaters of middle Choccolocco Creek is an important watershed for several other aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority when a conservation strategy is developed (objective 11.4). Consequently, Choccolocco Creek would most likely also receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, within lower portions of the drainages.

3) Flow: Without protective measures, changes in hydrology have the potential to negatively affect painted rocksnail through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. Typically, however, reservoirs will result in a loss of downstream water flow due to infiltration evaporation, or direct water removal. However, these operations are not under Forest Service permit. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within Cheaha, middle Choccolocco, and Tallaseehatchee Creeks where flow alterations have been identified as a moderate viability concern for this species (Table VII.B.22).

4) Habitat Connectivity: Without protective measures, roads and dams are the two Forest Service activities that have the potential to limit movement and distribution of this species. Road stream crossings have the potential to indirectly affect painted rocksnail. However, roads are less likely to hamper movements within the preferred painted rocksnail larger mainstream habitat of the lower portions of the watersheds. Within these areas, bridges are in place to span the larger stream channels. Implementation of revised Forest Plan direction would substantially improve passage for snails. As discussed in the general effects section (VII.B), full implementation of revised Forest Plan standards would eventually lead to the removal of fish passage problems due to road crossings. Reservoirs may also negatively affect aquatic species by blocking movements. However, all of the impoundments associated with this species are operated by other agencies for municipal water supplies or flood control and therefore not under the management of the Forest Service. Over time, the revised Forest Plan would reduce but not eliminate the indirect and cumulative adverse effects of intra and inter watershed blockage of snail distributions.

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact painted rocksnails through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. On the Talladega National Forest, historical gold mines continue their influence today, through channel alterations and elevated levels of lead and mercury. The loss of American chestnut trees from riparian forests has probably had long-lasting ramifications for streamside vegetation (Baker & Van Lear 1998) and aquatic habitat (Smock & MacGregor 1988), especially in headwater streams of the mountain and plateaus of northern Alabama. Industrial pollution has had an impact throughout the lower portions of watersheds with urban centers (particularly the Cahaba River and Choccolocco Creek). For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect painted rocksnail populations and their habitat. Overall direction provided in the revised Forest Plan will be beneficial for painted rocksnails and their habitat. As discussed in the introductory section, there would be ample opportunities for proactive and beneficial actions. Under the direction of the revised Forest Plan, continued watershed protection and water quality monitoring will be the primary restoration objectives (Table VII.B.22) for Painted rocksnail. Water quality will be monitored in conjunction with comprehensive surveys and project monitoring.

VII. B.22.c. Determination of Effects – Painted rocksnail

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that otherwise negative effects would be minimized to a discountable and insignificant level and overall effects on the species will be beneficial. It is therefore my determination that the revised National Forests of Alabama Land and Resource Management Plan is **not likely to adversely affect the Painted rocksnail.**

VII. B.23. Flat pebblesnail *(Lepyrium showalteri)*

VII. B.23.a. Environmental Baseline – Flat pebblesnail

Flat pebblesnails are listed as endangered under the Endangered Species Act (USFWS 1998). The Mobile River Basin multi-species recovery plan (2000b) covers round rocksnails. The snail is endemic to the Alabama-Mobile River basin and historically occupied habitat above the fall-line in the Cahaba River. It is not certain whether this species was also historically found in the Coosa River Basin (NS 2001). Currently, this species is only known to inhabit one shoal complex within the Cahaba River and the Little Cahaba River (both sites in Bibb County). Flat pebblesnails are common at this one multiple site complex, but they are rare elsewhere (USFWS 2000b). It is possible that flat pebblesnails are within 5 miles upstream from the Oakmulgee Division of the Talladega National Forest. However, given the differences in habitat above and below the fall-line, it is unlikely that this snail successfully lives within habitat on or downstream from the National Forests. Extant populations and potential habitats on or near National Forests are displayed in Table VII.B.23. All of these are adjacent to the

Oakmulgee or Talladega Districts of the Talladega National Forest in Alabama; and there are no other occurrences of this species on National Forest system lands.

Table VII.B.23. Overview of known or suspected flat pebblesnail occurrences and potential habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Talladega	Calhoun	Lower Coosa	M Choccolocco	23	0	?	extirpated	none	PF	
Oakmulgee	Perry	Cahaba	Cahaba	11	0	?	upstream, locally common	none		S
Total						?				

[1] Population status based on Bogan & Pierson (1993), USFWS (2000b)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

The flat pebblesnail is known to inhabit "clean" (i.e. relatively silt free) smooth cobble, boulder, or bedrock substrates within high gradient swift current riffles or shoals of the mainstem Cahaba above the fall line (USFWS 1995). If it is present in the Choccolocco watershed, it is likely to inhabit the mainstem and lower portions of the tributaries. Eggs are singly laid in capsules on hard surfaces (Thompson 1984). Other information on life history is generally lacking. The extent of snail movements are not well known; However there is evidence that snails make some longitudinal movements along streams and rivers, and that upstream movements may be blocked by suspended culverts (Dillon 1988, Vaughan 2002).

The decline and extirpation of most populations of snails may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in both potential species-inhabited Forest Service watersheds (Table VII.B.23) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment has been identified as a possible high risk to the viability of this species in the Cahaba River. Within the Cahaba River, the opportunities for Forest Service influence, either positive or negative, are limited given the uncertain status of the species, location of potential habitat within the watershed, and overwhelming effects of upper basin development, industry, agriculture, and other land uses. The Forest Service may have a greater role in restoration within the Middle Chocolocco watershed. However, since this is primarily a riverine species, other factors such as off-Forest habitat fragmentation and pollution may over-ride upper watershed improvements.

Flat pebblesnails are unlikely to inhabit the Oakmulgee Division of the Talladega National Forest as they prefer the larger riverine habitat within the mainstem Cahaba River above the fall-line. It is possible that flat pebblesnails may be found in the middle Choccolocco Creek, downstream from the Talladega District. Consequently, current and recent Oakmulgee Division activities probably have not had an affect on this species. However, upstream and downstream off-Forest land uses will continue to adversely impact this species through elevated levels of sediment runoff, channel alterations, and the release of toxic chemicals. Since flat pebblesnails tends to inhabit larger mainstem riverine habitats, it is likely that

Talladega District activities have not directly impacted this species. There may have been and may be indirect and cumulative watershed effects, however. But On-Forest watershed conditions have generally been improving (SAMAB 1996; McDougal et al. 2001). As discussed in the section on general baseline conditions common to all T&E species (VII.B), downstream habitat conditions have been improving under the current Forest Plan. Specifically, on the Talladega National Forest, the Forest Service engages in only a few activities that potentially could result in elevated levels of sediment runoff.

VII. B.23.b. Direct, Indirect, and Cumulative Effects – Flat pebblesnail

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. Flat pebblesnails are currently not known to inhabit Forest Service system lands.

This species is only known to currently inhabit portions of the Cahaba River upstream from the Oakmulgee Division of the Talladega National Forest. There is historic habitat downstream from the Talladega District. Therefore, unless future surveys discover a downstream population, Forest Service activities are unlikely to influence this species.

As discussed in the introductory section, there would be ample opportunities for proactive and beneficial actions. Under the direction of the revised Forest Plan, surveys for this species are a low priority, but may be conducted in conjunction with other comprehensive surveys and/or project specific monitoring. There are no established Forest Service recovery objectives for this species.

VII. B.23.c. Determination of Effects – Flat pebblesnail

Given the currently known distribution of flat pebblesnails and their habitat, it is my determination that there will be **no effect** of the Forest Service proposed actions. Additional conservation measures will be discussed with FWS, if and when recovery actions may reveal expansion of suitable habitat and/or species establishment on or downstream from the National Forests.

VII. B.24 Cylindrical Lioplax snail *(Lioplax cyclostomaformis)*

VII. B.24.a. Environmental Baseline – Cylindrical Lioplax snail

Cylindrical Lioplax snails are listed as endangered under the Endangered Species Act (USFWS 1998). The Mobile River Basin multi-species recovery plan (2000b) covers round rocksnails. The snail was historically recorded in the Coosa, Cahaba, Black Warrior, and Alabama Rivers of Alabama and Georgia. It has also been reported from the Tensaw River in Louisiana (USFWS 1998). Currently, this species is only known to inhabit two to three sites within a 15-mile reach of the Cahaba River above the fall-line. The cylindrical Lioplax snail is uncommon at these known sites of occurrence (USFWS 2000b). It is possible that cylindrical Lioplax snails are within 5 miles upstream from the Oakmulgee Division of the Talladega National Forest. Given the differences in habitat above and below the fall-line, it is unlikely that this

snail successfully lives within habitat on or downstream from the National Forests. Extant populations and potential habitats on or near National Forests are displayed in Table VII.B.24. All of these are adjacent to the Oakmulgee or Talladega Districts of the Talladega National Forest in Alabama; and there are no other occurrences of this species on National Forest system lands.

Table VII.B.24. Overview of known or suspected cylindrical Lioplax snail occurrences and potential habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Population Status[1]	FS Recovery Goals	Viability Risk[2]	
					on	near			M	H
Talladega	Calhoun	Lower Coosa	M. Choccolocco	23	0	?	extirpated?	none	PF	
Oakmulgee	Perry	Cahaba	Cahaba	11	0	?	upstream uncommon	none		S
Total						?				

[1] Population status based on Stein (1976), USFWS (2000b)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations; E = already extirpated

The cylindrical Lioplax snail is known to inhabit mud and shell fragment interstitial spaces among tabular boulders and bedrock slabs in moderate to fast current shoals in high to moderate gradient of rivers and streams (USFWS 2000b). This snail is a gill-breather, therefore requiring clear (relatively silt free) well-oxygenated water. This species filter feeds on plankton and detritus suspended in the water column. Adult snails are fairly sedentary, however juvenile snails may disperse during periods of higher flow. Reproductive biology and early life history are not well known. It may brood its young and filter-feed on diatoms and plankton suspended in the water column (USFWS 1998). Snails may live for 3 to 11 years. The extent of snail movements are not well known; however there is evidence that snails make some longitudinal movements along streams and rivers, and that upstream movements may be blocked by suspended culverts (Dillon 1988, Vaughan 2002).

The decline and extirpation of most populations of snails may be attributed to habitat modification, sedimentation, eutrophication, and other forms of water quality degradation. The main continued threats to this species include impoundments, sedimentation, and nonpoint source pollution (Hartfield 1994). Such historical conditions have lead to the current status of this species being considered as at a high risk of continued decline in both of the potentially species-inhabited Forest Service watersheds (Table VII.B.24) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment has been identified as a possible high risk to the viability of this species in the Cahaba River. Within the Cahaba River, the opportunities for Forest Service influence, either positive or negative, are limited given the small portion of habitat under Forest Service management (< ½ acre) and due to the overwhelming of upper basin development, industry, agriculture, and other land uses. If rediscovered or repatriated to the Choccolocco watershed, the Forest Service may have a greater role in restoration and recovery. However, since this is a riverine species, other factors such as off-Forest habitat fragmentation and pollution may over-ride upper watershed improvements.

The cylindrical Lioplax is unlikely to inhabit the Oakmulgee Division of the Talladega National Forest as they prefer the larger riverine habitat within the mainstem Cahaba River above the fall-line. It is possible that the cylindrical Lioplax may be rediscovered in the middle Choccolocco Creek, downstream from the Talladega District. Consequently, current and recent Oakmulgee Division activities probably have not had an affect on this species. However, upstream and downstream off-Forest land uses will continue to adversely impact this species through elevated levels of sediment runoff, channel alterations, and the release of toxic chemicals. Since the cylindrical Lioplax tends to inhabit larger mainstem riverine habitats, it is likely that Talladega District activities have not directly impacted this species. There may have been and may be indirect and cumulative watershed effects, however. But On-Forest watershed conditions have generally been improving (SAMAB 1996; McDougal et al. 2001). As discussed in the section on general baseline conditions common to all T&E species (VII.B), habitat conditions have been improving under the current Forest Plan.

VII. B.24.b. Direct, Indirect, and Cumulative Effects – Cylindrical Lioplax snail

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. Cylindrical Lioplax are currently not known to inhabit Forest Service system lands.

This species is only known to currently inhabit portions of the Cahaba River upstream from the Oakmulgee Division of the Talladega National Forest. It probably has been extirpated from the middle Choccolocco watershed downstream from the Talladega District. Therefore, Forest Service activities are unlikely to influence this species.

Under the direction of the revised Forest Plan, surveys for this species would be a low priority, but may be conducted in conjunction with other comprehensive surveys and/or project specific monitoring. There are no established Forest Service recovery objectives for this species.

VII. B.24.c. Determination of Effects – Cylindrical Lioplax snail

Given the currently known distribution of cylindrical Lioplax snails and their habitat, it is my determination that there will be **no effect** of the Forest Service proposed actions. Additional conservation measures will be discussed with FWS, if and when recovery actions may reveal expansion of suitable habitat and/or species establishment on or downstream from the National Forests.

VII. B.25. Tulotoma snail (*Tulotoma magnifica*)

VII. B.25.a. Environmental Baseline – Tulotoma snail

Tulotoma snails are listed as endangered under the Endangered Species Act (USFWS 1991). The Mobile River Basin multi-species recovery plan (2000b) covers Tulotoma snails. The snail is endemic to the Coosa portion of the Alabama River system. Historically, the snail ranged widely from Big Canoe Creek south to the confluence with the Tallapoosa River.

Historical localities were numerous throughout the mainstem of the Coosa River as well as the lower reaches of several large tributaries. Currently, the Tulotoma snail is restricted to several large populations within the mainstem Coosa and a few small populations within the tributaries. Two of these populations are located downstream of the Talladega District in tributaries of the Coosa River. Extant populations and historical habitats on or near National Forests are displayed in Table VII.B.25. All of these are within or adjacent to the Talladega District of the Talladega National Forest in Alabama; and there are no other occurrences of this species on National Forest system lands. Populations are extremely restricted, but relatively abundant in Kelly, Weogufka, Hatchet, and Choccolocco Creeks; the mainstem Coosa River below Jordan Dam has high densities of tulotoma snails (USFWS 2000b). According to the recovery plan (USFWS 2003), Tulotoma snails may be reclassified if, 1) there is confirmation of a stable or increasing population in the Coosa River below Jordan Dam. Delisting would require 1) confirmation that all occupied four Coosa river watersheds (Kelly, Weogufka, Hatchet, and Choccolocco Creeks) support stable or increasing populations, and 2) there are plans to monitor and protect water and habitat quality within these four watersheds. A target date for recovery and delisting has been set as 2010.

Table VII.B.25. Overview of known or suspected Tulotoma snail occurrences and potential habitat within five miles of the National Forests in Alabama.

Forest	County	River Basin	Watershed	% FS	Miles		Status	FS Recovery Goals	Viability Risk[1]	
					on	near			M	H
Talladega	Calhoun	Lower Coosa	M. Choccolocco	23	0	10	Downstrm restricted relatively abundant	WQ	PF	
	Talladega		Talladega	22	0	5	Downstrm restricted relatively abundant	WQ	P	
	Clay		U. Hatchet	11	0	1	Downstrm restricted relatively abundant	WQ	P	S
			Weogufka	1	1	5	Downstrm restricted relatively abundant	protect, WQ		S
Total					1	21				

[1] Population status based on Pierson (1992), USFWS (1991, 2003)
[2] Viability risks: M = moderate, H = high, S = sedimentation, P = point-source pollution, T = thermal, F = flow alterations

The Tulotoma snail congregates in colonies among boulders and rocky ledges of riverine and lower watershed tributary shoal and run habitats (Devries 1994). It clings tightly to the undersides of large cobble, boulders, or bedrock shelves and prefers microhabitats with moderate to swift currents (Hershler et al. 1990). The Tulotoma snail filter feeds on plankton, diatoms, or detritus from the water column or the interstitial spaces of the substrate. It broods its young year round but usually in the spring. Tulotoma snails mature at 1 year and live for 2 to 4 years (USFWS 2000b). Dispersal is concentrated during periods of high water. The extent of snail movements are not well known; However there is evidence that snails make some longitudinal movements along streams and rivers, and that upstream movements may be blocked by suspended culverts (Dillon 1988, Vaughan 2002).

Tulotoma populations have been on the decline for over 50 years. Major habitat alterations of dams, dredging, and channelization are largely the cause of its decline. Water quality degradation associated with agriculture and industry has also been implicated. Such historical

conditions have lead to the current status of this species being considered as at a high risk of continued decline in 2 out of 4 potential species-inhabited Forest Service watersheds (Table VII.B.25) (also see EIS, section 3.B.4, for discussion of the derivation and interpretation of these rankings). Based on the watershed assessment completed in conjunction with the Forest Plan EIS, excessive sediment has been identified as a possible high risk to the viability of this species in Hatchet and Weogufka Creeks. Within the Middle Choccolocco, Talladega, and Upper Hatchet watersheds, the opportunities for Forest Service influence, either positive or negative, are limited given the interspersion of private lands the overwhelming influence of downstream reservoirs, development, industry, agriculture, and other land uses. The Forest Service may have a greater role in restoration within theWeogufka watershed.

The opportunities for Forest Service influence, either positive or negative, are limited, however, due to the small proportion of each watershed under Forest Service management and the interspersion of private lands. The high risk rating for the mainstem Cahaba River population is primarily influenced by off-Forest upstream factors.

The four known or suspected extant populations of Tulotoma snails probably inhabit less than half of the suitable habitat remaining for this species within or downstream of the National Forests in Alabama. This species is a large river inhabitant that may only be peripheral in tributaries.

Tulotoma snails are unlikely to inhabit the Talladega National Forest as they prefer the larger riverine habitat downstream of the Forest boundaries. It is possible that Tulotoma snails may be found in middle Choccolocco Creek and the lower reaches of its tributaries, downstream from the Talladega District. As discussed in the section on general baseline conditions common to all T&E species (VII.B) on-Forest watershed conditions have generally been improving (SAMAB 1996; McDougal et al. 2001).

VII. B.25.b. Direct, Indirect, and Cumulative Effects – Tulotoma snail

Direct effects, such as mortality of eggs, juveniles, or adults, are not expected to occur as a result of the proposed actions under the revised Forest Plan. The Forest Service will not be engaging in any in-channel disturbing activities within their large stream and lower watershed habitat.

This species is not likely to be found on the Talladega National Forest as it prefers the larger riverine habitat; however it does occur within 5 miles downstream from the Forest Service boundary. Therefore, the primary concern is with cumulative downstream effects of sedimentation or altered water quality. Siltation would affect Tulotoma snails by altering the rocky interstitial spaces where they live and reducing feeding abilities. Increased turbidity would also affect biological processes. However, given the minimization of soil disturbing activities as stipulated under the revised Forest Plan, downstream effects on Tulotoma snails should be insignificant. Forest Service activities are not likely to be of the magnitude or intensity to affect water flow. There are local municipal water withdrawals and reservoirs that may contribute to loss of water to infiltration and evaporation. However, these operations are not under Forest Service permit. Sources of chemical pollutants are not generally permitted on

the National Forests with the exceptions of lime and fertilizer sometimes used for lake fisheries enhancement, petroleum-based compounds associated with oil and gas extraction, roadways, and mechanized equipment, herbicide and pesticide applications used in forestry practices and right-of-ways, or . Under the revised Forest Plan, the new standards of the riparian strategy would provide additional protection such as limiting use of soil-active herbicides within ephemeral stream zones, clearly marking SMZ buffers, and locating pesticide-handling sites to areas outside of the SMZ. Implementation of these standards will be monitored.

Based upon the biology and downstream location of this species, any activities that could lead to altered 1) water quality, 2) sedimentation, and 3) flow may indirectly and negatively affect Tulotoma snails. If done without protective measures, such adverse effects could be caused by the following Forest Service activities: application of pesticides/herbicides, prescribed burning, silvicultural treatments for pest management and forest health, reservoir management, and road and trail construction, maintenance or use. However, as discussed below, adverse effects will largely be minimized and/or mitigated by the implementation of protective standards in the revised Forest Plan.

1) Water Quality: Chemical contaminants have been shown to disrupt neurological, endocrine, developmental, and reproductive functions in a wide variety of species (Terrell and Perfetti 1989). Alterations in pH and the release of heavy metals could also be detrimental to snail physiology (Truscott et al. 1995, Reed-Judkins et al. 1997). Alterations in pH are possible through lake and reservoir liming and fertilizing. In the past, lakes and reservoirs have been regularly limed and fertilized in order to increase production of game and pan fish. However, the proposed actions under the revised Forest Plan would include a reduction and/or a modification in liming and fertilization activities in order to meet revised Forest Plan standards and State regulations against nutrient discharge Consequently, liming and fertilizing would only occur under either circumstances where there are no known T&E species or where alternative methods could be utilized so as to safe-guard against downstream discharge of lime and fertilizer. Therefore, given full implementation of the revised Forest Plan standards, as well as State regulation and required site-specific analysis, adverse effects on flat pebblesnails would be unlikely.

   Sources of chemical pollutants are not generally permitted on the National Forests with the exceptions of a) lime and fertilizer applications for lake fisheries enhancement, petroleum-based compounds associated with b) oil and gas extraction, c) roadways, and mechanized equipment, and d) herbicide and pesticide applications used in forestry practices and right-of-ways. Oil and gas operations are not currently present, proposed, or likely within the Forest Service watersheds supporting this species. As discussed in the general effects section (VII.B), full implementation of the revised Forest Plan standards would minimize the potential for chemical contamination from Forest Service activities. Moreover, on the Bankhead National Forest, the Wild & Scenic River and canyon corridor prescriptions would further limit herbicide and pesticide activities within or adjacent to Tulotoma mainstem habitat. Regardless of Forest Service actions, off-Forest mining, agriculture, industry, and development would continue to contribute chemical contaminants, particularly within middle Choccolocco, Talladega, and Hatchet Creeks where point source

pollution has been identified as a moderate viability concern for this species (Table VII.B.25).

2) Sediment: Without protective measures, excessive siltation and sedimentation could affect Tulotoma snails by reducing their food supplies, altering the rocky interstitial spaces where they seek food and cover, limiting host attraction and juvenile recruitment, restricting respiration, favoring invasive non-native species, and mobilizing toxic chemicals that are detrimental to their individual and reproductive health. Under the revised Forest Plan, Forest-wide, streamside management zone and riparian standards would minimize sediment release during such Forest Service permitted activities as a) silvicultural thinning, b) pest control, c) prescribed burning, d) construction and maintenance of temporary roads and permanent roads and trails, e) herbicide use, and f) livestock grazing. As discussed in section VII.B, given full implementation of revised Forest Plan direction, the effects of sediment transport, siltation, alteration of channel substrates, and turbidity, would be minimized and decline from current conditions. In the long term, increasing emphasis on forest health restoration would decrease background levels of sediments from upland erosion, a benefit to the species. Implementation of the revised Forest Plan standards would greatly minimize the opportunities for erosion and excessive sediment loading from Forest Service activities. Although there could be some ongoing sediment runoff from roadways, standards for construction, maintenance, and closures would minimize and localize sediment inputs. Any remaining small effects would likely be insignificant, especially when distributed across the watershed. Most watersheds supporting this species are ranked as above average. Within the one watershed ranked as "below average" (Middle Choccolocco), proposed prescriptions include red-cockaded woodpecker habitat restoration, encompassing activities that are likely to be fully mitigated for downstream sediment effects. Middle Choccolocco road density is high both within and outside of the Talladega National Forest, indicating a potential for cumulative road related sediment effects. Therefore, when considered within the context of watershed-wide conditions, it is possible that Forest Service contributions to sediment loading may be an incremental addition to already stressed aquatic systems within the downstream habitat of middle Choccolocco Creek. However, since Forest Service lands are less than 23% of the watershed, Forest Service sediment contributions would be expected to be minor, and perhaps insignificant, portions of the much more pervasive sediment loading associated with off-Forest agricultural, silvicultural, and residential activities (see also general effects discussion, section VII.B). Also, upper Choccolocco Creek, including the headwaters of middle Choccolocco Creek is an important watershed for several other aquatic T&E species, and consequently, protection and restoration of habitat would likely be identified as a high priority when a conservation strategy is developed (objective 11.4). Consequently, Choccolocco Creek would most likely also receive additional emphasis through focused funding of watershed restoration efforts and additional consideration of mitigation measures for projects that could add to cumulative effects on this species (objective 11.3). Regardless of Forest Service actions, off-Forest silviculture, agriculture, and development will undoubtedly continue to contribute to elevated levels of fine sediments and turbidity, particularly within downstream occupied habitat of Hatchet and Weogufka Creeks where excessive sedimentation has been identified as a viability concern for this species (Table VII.B.25).

3) Flow: Without protective measures, changes in hydrology have the potential to negatively affect Tulotoma snails through degradation or fragmentation of suitable habitat, favoring non-native invasive species (Claudi and Leach 1999), and reduction in the quality and availability of food. Forest Service activities such as a) silvicultural techniques, b) water extraction, and c) reservoir or pond impoundments have the potential to alter downstream flows. Cumulatively there could be some alteration in runoff and hydrology due to watershed wide patterns of land use. However, under the proposed actions of the revised Forest Plan, flow altering land uses are expected to be moderated and On-Forest watershed conditions would continue to improve from historic conditions. The revised Forest Plan stipulates the use of protective measures and limitations on the extent and methods of vegetative removal, road and facility construction and maintenance, and soil compaction (numerous Forest-wide and watershed standards and objectives). Forest Service activities would therefore have minimal negative effects on the magnitude and duration of flood flows. Proposed actions also would have negligible effects on base levels of stream flow. Application of the revised Forest Plan standards and the proposed prescriptions would assist in restoration of watershed processes, including maintenance of surface flows. Also, groundwater is currently withdrawn from eight wells located at administrative sites and recreation areas across the National Forests in Alabama. Currently, the Forest Service has decommissioned or is in the process of decommissioning these wells and switching to municipal water supplies where available. To date, all of the remaining wells tap deep aquifers and are unlikely to have measurable effects on surface water flows in T&E supporting streams. Reservoirs may either benefit or negatively affect aquatic species by increasing or decreasing the amount and duration of base flows. Typically, however, reservoirs will result in a loss of downstream water flow due to infiltration evaporation, or direct water removal. However, these operations are not under Forest Service permit. Off-Forest activities undoubtedly contribute to a more substantial alteration in water flow, particularly within middle Choccolocco Creek where flow alterations have been identified as a moderate viability concern for this species (Table VII.B.25).

Historic and off-Forest activities will contribute to ongoing effects, regardless of Forest Service actions. Upstream and downstream off-Forest land uses will continue to adversely impact flat pebblesnails through excessive sediment runoff, channel alterations, nutrient enrichment, and the release of toxic chemicals. On the Talladega National Forest, historical gold mines continue their influence today, through channel alterations and elevated levels of lead and mercury. The loss of American chestnut trees from riparian forests has probably had long-lasting ramifications for streamside vegetation (Baker & Van Lear 1998) and aquatic habitat (Smock & MacGregor 1988), especially in headwater streams of the mountain and plateaus of northern Alabama. Industrial pollution has had an impact throughout the lower portions of watersheds with urban centers (particularly the Cahaba River and Choccolocco Creek). For further discussion of non-federal actions with potential to affect all T&E aquatic species, see section VII.B.

In summary, Forest Service activities are not likely to adversely affect Tulotoma populations and their habitat. Overall direction provided in the revised Forest Plan will be beneficial for Tulotoma and their habitat. As discussed in the introductory section, there would be ample

opportunities for proactive and beneficial actions. Under the direction of the revised Forest Plan, continued watershed protection and water quality monitoring would be the primary restoration objectives (Table VII.B.25) for Tulotoma snail. Water quality will be monitored in conjunction with comprehensive surveys and project monitoring.

VII. B.25.c. Determination of Effects – Tulotoma snail

Given the positive opportunities for pro-active conservation of the species and the protection afforded by the Forest-wide and riparian standards, it is likely that negative effects will be minimized and mitigated. There will be beneficial effects due to Forest Service restoration efforts. Therefore, it is my determination that the revised National Forests of Alabama Land and Resource Management Plan **is not likely to adversely affect the Tulotoma snail.**

VII. C. FEDERALLY LISTED PLANTS

T&E Plants Introduction

The National Forests in Alabama have 53 T&E and 7 candidate species on or near national forest lands, 16 of which are plants. This NFAL total is over half of all the T&E species federally listed in Alabama, and in spite of the small land-base with the National Forests in Alabama occupying less than 3% of the total land base in Alabama. This places the National Forests in Alabama as a critical refugium for many habitats and federally listed species throughout Alabama.

All of the species listed above are rare throughout their range. The federal listing of these species is primarily a result of their apparent limited distribution and the fragile nature of the habitats upon which they depend. Even though suitable habitat has been found to occur on National Forests in Alabama lands, it is rarely occupied by these T&E species. Habitat loss through land conversion and development remain the principle reasons cited by all sources as contributing to a trend toward listing or keeping these species federally listed. Additional impacts include modification of habitat, loss of fire, changes in hydrological function, changes in landform, building of dams, invasion of non-native plant species and over-collection or poaching from wild populations.

Broadcast herbicide (including boom spraying and backpack spraying) is detrimental to all these Threatened and Endangered plant species (Kral, pers comm 2002) specifically because most herbicides target broad-leaved herbaceous species. Mechanical soil disturbance, compaction, rutting and activities that could alter the hydrology or landform of the populations sites, habitat or potential suitable sites should be avoided. State highway and powerline rights-of-way are often vulnerable to herbicide spraying or other roadside maintenance activities, drought, and competition with successional vegetation or invasive non-native species.

Based on several of the plants dependence on wetland habitat these species could be positively managed by protecting sites from encroachment by woody shrub species leaving a partial (or thinned) overstory canopy in place and ensuring that activities taking place in areas where the plant occurs do not adversely affect the hydrology of the site (Moffett, 2002). Management

options would include hand removal of woody midstory/shrub encroachment, thinning based on site-specific recommendations and mitigation, and burning. Total canopy removal is not recommended for most species (Moffett 2002). In cases where National Forest lands lie downstream from known federally listed plant populations, suitable habitat sites need to be monitored to survey for new colonies.

Many of these federally listed and candidate species occur within rare communities. Several standards for rare communities will ensure their maintenance and restoration across the landscape. Rare communities would be protected from detrimental effects caused by management actions across all alternatives. Rare communities would be inventoried in proposed project areas when projects are being proposed which have the potential to adversely affect them. Because of these standards, most federally listed species will have additional protection and restoration mandates.

T&E Plants summary of effects

The combination of prescription allocations, forest-wide standards, and site specific mitigations described above afford very good protection to the federally listed species populations and habitats from potential negative effects due to forest management activities. Despite this, some species may have some inherent biological limitations that could continue to pose risks to long-term viability, especially at sites where population numbers are low. Based upon this, it is apparent that while Forest Service conservation actions may contribute to improve rangewide viability, they cannot, in all cases, maintain it.

Under the draft Plan the integrity of these sites will be protected in all alternatives by adherence to the standards listed in the rare community (9F) and riparian (11) prescriptions. In some cases, such as restoration efforts or reintroduction of species, the National Forests in Alabama can play a positive role in recovery, which may render alternatives B & F as the most likely to result in positive impacts. Because these federally listed and candidate species are protected under the Endangered Species Act, no activities with potential to affect areas where the plants are found can take place in the sites without concurrence from, or consultation with, USFWS.

Therefore, under all alternatives, the current Endangered Species Act and the current Forest Service Manual and Handbook regulations will continue to ensure that habitat and populations of T&E and candidate species will be protected and conserved.

As previously stated, the National Forests in Alabama will continue to play a critical role as refugia for federally threatened and endangered species. Inherent biological limitations based upon population dynamics may continue to pose risks to the species long-term viability, especially at small sites. Potential impacts to individuals remain at all sites through plant poaching. As conversion and habitat modifications continue on private lands, it is to be expected that more species and critical habitat will be lost. For example, out of 27 quality wetlands documented by Dr. Robert Kral in Alabama 20 years ago, only 3 currently exist in any shape or form (Kral, 2002). This trend is not expected to change over the next 50 years. As a result, the role for protection and restoration of these federally listed species on the National Forests in Alabama will continue to become more critical over time. Surveys are will

continue to be conducted to inventory for federally listed and candidate species and suitable habitat, and monitoring of known sites will continue.

Because rare plants often receive little or no protection on private land, and are often not well inventoried, public land plays a critical role in their conservation. . Cumulatively, therefore, persistence of these species in the area of the national forest, as well as across their ranges, will be greatly enhanced from efforts on the national forest to maintain, manage and expand populations.

VII. C. 1. Alabama leather flower (*Clematis socialis)*

VII. C. 1. a. Environmental Baseline

The Alabama leather flower was federally listed as an endangered species in 1986. The species is typically found in mesic flats near intermittent streams where plants are rooted in silty-clay soils of the Conasauga Soil Series. These soils are circumneutral or slightly basic with a high hydroperiod. Plants occur in full sun or partial shade in a grass-sedge-rush community (Recovery Plan, 1989) and contiguous leather flower occurs with Mohr's Barbara's buttons (*Marshallia mohrii*) at two locations in northeastern Alabama (Barbara's buttons Recovery Plan, 1991).

The Alabama leather flower is rhizomatous and forms dense clones with erect stems (singly or in clusters) reaching 7-12 inches. The flowers are solitary, urn- to bell-shaped, and blue-violet in color. Flowering occurs in April and May. However, most reproduction occurs vegetatively by rhizomes (Recovery Plan, 1989).

At listing, three locations were known to occur in Alabama in Cherokee and St. Clair Counties (Recovery Plan, 1989). No known populations occur on the National Forests in Alabama; however, suitable habitat is present on the Talladega Division of the Talladega National Forest and potentially on the Oakmulgee Ranger District of the Talladega National Forest and Bankhead National Forest.

Primary threats to the species include highway rights-of-way maintenance (e.g., herbicides and excessive mowing/scraping) and potential loss of habitat resulting from land use changes. Due to the small population size and limited distribution of this plant, indiscriminate collection could result in its extinction (Recovery Plan, 1989). Kral (1983) indicated that prescribe burning may damage existing populations while intensive site preparation of known localities would destroy the plant. Potential beneficial management practices, if done properly, might include thinning and cutting of overstory trees.

All three of the known populations are in private ownership, although one occurs on land owned by The Nature Conservancy. All three populations support 12-50 individual plants (Recovery Plan, 1989).

VII. C. 1. b. Direct, Indirect, and Cumulative Effects – Alabama leather flower

Alabama leather flower is not found on the National Forests in Alabama, therefore there are not direct, indirect or cumulative effects of implementing alternative I.

VII. C. 1. c. Determination of Effect – Alabama leather flower

Due to the fact that there are no known sites found directly on National Forests in Alabama lands, the selection of any alternatives will have **No Effect** on the Alabama leather flower.

VII. C. 2. Leafy Prairie-Clover (*Dalea foliosa)*

VII. C. 2. a. Environmental Baseline

The leafy prairie-clover was federally listed as **endangered** in 1991. This species typically prefers thin-soiled limestone or dolomite glades and limestone barrens. The plant may also be found on wet calcareous barrens and moist prairies or cedar glades, usually near a stream or seepage from limestone that provides seasonal moisture. *Sabatia angularis* and *Rudbeckia triloba* are associates of this species. The plant requires full sun, and high competition from other plant species may interfere with the plants ability to reproduce. (NatureServe Explorer, 2001)

The leafy prairie-clover is a stout perennial herb, 18-30 inches tall. The plant has no hair except on the inflorescence. Several stems rise out of a hardened root crown. Flower spikes are small, purple and dense. The plant flowers from late July to early August, but may also bloom sporadically into September. (Isely, 1990)

This species occurs in Tennessee, Alabama, and Illinois. There are 44 occurrences in Tennessee; however, only 17 populations are considered to be marginal or better. Illinois has three known occurrences and there are four different populations in Alabama. In Tennessee and Alabama the plant tends to be found mainly on open limestone glades, and in Tennessee, it may also be found growing on wet calcareous barrens and moist prairies. In Illinois, the plant seems restricted to thin-soiled, wet or moist, open dolomite prairies and on river terraces in the northeastern part of the state. (NatureServe Explorer, 2001)

Decline of the leafy prairie-clover may be attributed for the most part to habitat destruction and alteration caused by commercial and industrial development, overgrazing, and fire suppression. The species is also greatly threatened by encroachment of exotic species, especially exotic shrub species, particularly privet (*Ligustrum sinense*) and Eurasian bush honeysuckle (*Lonicera maackii*). Fire suppression resulting in succession of other woody vegetation also threatens the populations of the leafy prairie-clover. This species is short-lived and does not spread vegetatively therefore; population survival is dependent on seed production. Natural communities containing the leafy prairie-clover need to be subjected to periodic prescribed burning to help build a persistent seed bank of the species. (NatureServe Explorer, 2001)

The species appears to maintain itself only in areas that are naturally or artificially cleared and where hardwood and understory shrubs are at low densities. In Alabama, the majority of the populations are found on cedar glades.

VII. C. 2. b. Direct, Indirect, and Cumulative Effects – Leafy prairie-clover

All cedar glade communities, habitat for leafy prairie-clover, would be managed under the 9F (rare community) prescription under all alternatives. Several standards for rare communities ensure their maintenance and restoration across the landscape. Rare communities would be protected from detrimental effects caused by management actions across all alternatives. Rare communities would be inventoried in proposed project areas when projects are being proposed which have the potential to adversely affect them.

Since federally listed plants receive little or no legal protection on private land, this makes these species may be vulnerable to extirpation. Since no populations are known to occur on National Forest land, the direct and cumulative effects of National Forest planning alternatives on this plant are likely to be negligible.

VII. C. 2. c. Determination of Effect – Leafy prairie-clover

Through implementation of the Forest-wide, Rare Community, T&E species and Riparian Standards, the selection of any of the alternatives will have **No Effect** on leafy prairie-clover.

VII. C. 3. Eggert's Sunflower (*Helianthus eggertii)*

VII. C. 3. a. Environmental Baseline

Another plant that lives in open oak/pine woodlands and grasslands is the federally listed **threatened** Eggert's sunflower (Helianthus eggertii). It blooms in July and August, like most sunflowers; its flowers (actually composite heads of many small flowers) are relatively large (about 3.5 inches across), its stem is smooth and waxy, and the tapering leaves with rounded bases are smooth except for a scattered roughness on the upper surface (Pyne, 1998).

The habitat has been described as rocky hills, barrens or open upland oak-pine woods. Soils can be sands, clays, chert or gravel or open upland woods (Kral 1983). The open wood habitats are often dominated by oak forests, specifically white oak, black oak and southern red oaks, as well as hickories and pines. The barrens are openings dominated by perennial grasses and herbs (Jones 1994).

It prefers a habitat type that was presumably more widespread when fire was a more common event in the landscape. This grass and herb-dominated habitat type is grasslands, woodlands and barrens, and is related to the prairies of the Midwest, both in structure, species composition, and ecology (Pyne, 1998). Eggert's sunflower is thought to be a relict species of the fire-dependent barrens habitats, sustained by lightning fires and aboriginal burning at a landscape scale (Jones, 1994).

Presumably, when fire occurred more frequently, and large grazing animals (such as bison) roamed free, there were large areas of parts of Tennessee and the Southeast which had relatively few trees, with abundant stands of native grasses and flowering herbs, like composites and legumes (Pyne, 1998). Under present conditions, this community persists on

roadsides and recently disturbed areas. In Alabama, this species occurs in Winston County, within a mile of the Bankhead National Forest administrative boundary, in open ridgetop oak savannahs.

VII. C. 3. b. Direct, Indirect, and Cumulative Effects – Eggert's sunflower

Maintenance of existing potential habitat sites would likely involve prescribed burning, but could also include other vegetation management treatments, such as vegetation cutting where needed to control competing vegetation. Broadcast herbicide is detrimental to any broadleaf herbaceous species. Site-specific planning of these activities would be used to ensure that adverse effects to any potential populations would not occur. Seed collection, propagation, or out planting, may also be used to begin reintroduction of populations on suitably identified national forest lands.

Additional objectives included in the Draft Revised Forest Plan should increase abundance of optimal habitat for this species and create opportunity for establishment of new populations. Objectives call for restoration and maintenance of woodland, savanna, and grassland habitats. Expected levels of such restoration and maintenance vary by alternative (see Section on Woodlands, Savannas, and Grasslands), but all would provide some potential benefit. Permanently open woodlands, savannas, or grasslands will be provided across the greater landscape in Alternative I. In addition, glades and barrens, with which this species is sometimes associated, are identified as rare communities and would be restored or maintained across all alternatives. Ongoing inventories would continue to document new occurrences in these habitats, providing them with the site-specific protections afforded to existing sites.

VII. C. 3. c. Determination of Effect – Eggert's sunflower

Through implementation of the Forest-wide, Rare Community, T&E species and Riparian Standards, the selection of any of the alternatives will have **No Effect** on Eggert's sunflower.

VII. C. 4. Lyrate Bladderpod- (*Lesquerella lyrata)* Rollins

VII. C. 4. a. Environmental Baseline

Lyrate bladderpod was federally listed as **threatened** in 1990. The species is typically found in disturbed limestone outcroppings, cedar glades and glade-like areas, which includes, open pastures, cultivated fields and roadsides in calcareous areas. The plant prefers thin soils covering limestone as well as red soils and is a plant of full sunlight (NatureServe Explorer, 2001). This species may be found growing in association with *Juniperus virginiana* and some species of *Leavenworthia* (Kral, 1983).

Lyrate bladderpod is an annual herb up to 12 inches in height. The stems are pale green and usually numerous with long, soft hairs. The plant is leafy from the base to the flower head. The basal leaves form a rosette about 4 – 10 cm long and resembles that of a dandelion. Leaf color is pale green and has many hairs, especially at the margins and along the midrib beneath.

The plant flowers from late February into late April and produces flowers on ascending stalks. The flowers have small weak hairs and are bright yellow with backs that are yellowish-green. The species closely resembles Lesquerella densipila in type, amount of hairs, in flower size and color, in pedicel and fruit shape but differs in that it has slightly smaller fruit, together with persistent styles, are perfectly smooth. (Kral, 1983)

In 1983 the only populations of the lyrate bladderpod were known from cedar glade areas in the eastern part of Franklin county in northwestern Alabama (Kral, 1983). In 2001, this species was reported from Franklin, Lawrence, and Colbert counties, Alabama. It occurs within the administrative boundary of the Bankhead National Forest on private land; no populations have yet been found on national forest lands. Only six populations have been found in Alabama (NatureServe Explorer, 2001).

Primary threats to the species include woody plant succession and urban and intensive agricultural development that destroys cedar glades. According to Kral (1983), the establishment of pine plantations would probably destroy the plant populations and grazing may cause damage to the species. Potential beneficial management practices, if done properly, might include thinning and cutting of overstory trees and would probably increase populations. They are definitely decreased by intensive row crop agriculture, or by the improvement of lowland pasture with grass species, which would close the canopy.

The species appears to maintain itself only in areas that are naturally or artificially cleared and where hardwood and understory shrubs are at low densities. The majority of the populations are found along roads rights-of-way and in pastures on private land.

VII. C. 4. b. Direct, Indirect, and Cumulative Effects – Lyrate bladderpod

All cedar glade communities, habitat at for lyrate bladderpod, would be managed under the 9F (rare community) prescription under all alternatives. Several standards for rare communities ensure their maintenance and restoration across the landscape. Rare communities would be protected from detrimental effects caused by management actions across all alternatives. Rare communities would be inventoried in proposed project areas when projects are being proposed which have the potential to adversely affect them.

Since federally listed plants receive little or no legal protection on private land, this species may be vulnerable to extirpation. Since no populations are known to occur on National Forest land, the direct and cumulative effects of National Forest planning alternatives on this plant are likely to be negligible.

VII. C. 4. c. Determination of Effects – Lyrate bladderpod

Through implementation of the Forest-wide, Rare Community, T&E species and Riparian Standards, the selection of any of the alternatives will have **No Effect** on lyrate bladderpod.

VII. C. 5. Mohr's Barbara's buttons-(*Marshallia mohrii)*

VII. C. 5. a. Environmental Baseline

Mohr's Barbara's buttons is a federally **threatened** species of moist prairie-like openings in woodlands and along shale-bedded streams in a grass-sedge community. Additionally, several populations are located within, or extend into, rights-of-ways. Soil associations are typically alkaline sandy clays that are seasonally wet and have a high organic matter content. Plant associations include *Helenium autumnale*, *Helianthus angustifolius*, *Lythrum alatum*, *Ruellia caroliniensis*, and prairie elements such as *Asclepias viridis*, *Asclepias hirtella*, *Helianthus mollis*, and *Silphium terebinthinaceum*.

Mohr's Barbara's buttons is an erect, perennial herb up to 30 inches tall, with a short, thickened, fibril-bearing, erect and thick-rooted rhizome. Stems branch only at the inflorescence and are often purplish. The flowers are all discoid, the corollas whitish, with linear, spreading lobes from which project the pale lavender anthers and the narrow, blunt-tipped whitish style branches. The fruit is an achene. Blooming occurs from mid-May through June (Kral, 1983).

At listing, 22 locations were known to occur in Alabama and Georgia in the Cumberland Plateau and Ridge and Valley physiographic regions (Recovery Plan, 1991). One extant population was recently discovered within the administration boundary of the Bankhead National Forest (Whetstone, 2002, personal communication), but on private lands, not on national forest lands. Approximately 10 new locations have been found in Georgia since listing (Protected Plants of Georgia).

Primary threats to the species include loss of habitat resulting from fire suppression and conversion of suitable habitat to pine plantations and agricultural land (Protected Plants of Georgia). Drainage of sites where extant populations occur would most likely be detrimental (Kral, 1983). Herbicide use, mowing during the flowering period, and installation of underground cable or gas lines also has the potential to impact populations that occur within rights-of-ways (Recovery Plan, 1991).

The species appears to maintain itself only in areas that are naturally or artificially cleared and where hardwood and understory shrubs are at low densities. Historically, fire may have maintained the open conditions required by this plant. The largest populations of this species occur in Cherokee County, Alabama, with an estimated 1000 plants at each of two sites. Ten populations in Alabama and Georgia are moderate-sized with 100-300 individuals present. The remainder of extant populations support limited populations of 12-50 individuals.

VII. C. 5. b. Direct, Indirect, and Cumulative Effects – Mohr's Barbara's buttons

Mohr's Barbara's buttons are associated with riparian and rare communities and suitable habitat is present; therefore, these areas would be protected and managed under the 9F (rare community) and 11 (riparian) prescriptions under all alternatives. Several standards for rare communities ensure their maintenance and restoration across the landscape. Rare communities would be protected from detrimental effects caused by management actions across all

alternatives. Rare communities would be inventoried in proposed project areas when projects are being proposed which have the potential to adversely affect them

Federally listed plants receive little or no legal protection on private land, thus this species may be vulnerable to extirpation. Since one population is known to occur within the Bankhead National Forest administrative boundary directly adjacent to but not on national forest lands, , the direct and cumulative effects of National Forest planning alternatives on this plant should have no effect on this species

VII. C. 5. c. Determination of Effects – Mohr's Barbara's buttons

Through implementation of the Forest-Wide, Rare Community, T&E species and Riparian Standards, the selection of alternative I will result in a **No Effect** determination for Mohr's Barbara's buttons.

VII. C. 6. Harperella-(*Ptilimnium nodosum)*

VII. C. 6. a. Environmental Baseline

Harperella was federally listed as an **endangered** species in 1988. The species is typically found in seasonally flooded streams and coastal plain ponds and low savannah meadows. One known population occurs on a granite outcrop. The plant only occurs in a narrow range of water depths and is intolerant of deep water or conditions that are too dry. In it's riverine habitat, the plant is found in areas that are sheltered from rapidly moving water (Recovery Plan, 1990).

Harperella is an annual herb that sometimes overwinters (riverine habitat) by vegetative buds produced in the axils of lower stem leaves. Plants are 4-16 inches tall, rarely more robust, sometimes reclining and rooting from the lower stem when submerged. Plants vary in size and fluctuate year-to-year in abundance. The flowering period for this species is late May to early August, with fruiting occurring from July to August (Protected Plants of Georgia)

At listing, thirteen locations were known to occur in seven southeastern states. Historically, there were twenty-six known populations (Recovery Plan, 1990). No known populations occur on the National Forests in Alabama; however, suitable habitat is present on the Talladega National Forest and Bankhead National Forest.

Primary threats to the species include hydrological manipulation and physical destruction of pond habitat (Recovery Plan, 1990). Kral (1983) indicated that prescribe burning, site preparation, plantation establishment, and grazing would destroy this plant. However, thinning and/or cutting of the overstory may be beneficial if done properly.

VII. C. 6. b. Direct, Indirect, and Cumulative Effects - Harperella

Harperella is associated with rare communities and riparian areas; therefore, these areas would be protected and managed under the 9F (rare community) and 11 (riparian) prescriptions under

all alternatives. Several standards for rare communities ensure their maintenance and restoration across the landscape. Rare communities would be protected from detrimental effects caused by management actions across all alternatives. Rare communities would be inventoried in proposed project areas when projects are being proposed which have the potential to adversely affect them.

Federally listed plants receive little or no legal protection on private land, thus this species may be vulnerable to extirpation. Since no populations are known to occur on National Forest land, the direct and cumulative effects of National Forest planning alternatives on this plant are likely to be negligible.

VII. C. 6. c. Determination of Effects - Harperella

Through implementation of the Forest-Wide, Rare Community, T&E species and Riparian Standards, and due to the fact that there are no known sites found directly on National Forests in Alabama lands, the selection of any alternatives will have **No Effect** on the Harperella.

VII. C. 7. Kral's water-plantain (*Sagittaria secundifolia)*

VII. C. 7. a. Environmental Baseline

Kral's Water-plantain was listed as **threatened** by the USFWS in 1990. It was first listed as occurring in Little River drainage system, but in recent years 3 sites were discovered in the Sipsey fork on the Bankhead National Forest. In the summer of 2000 one additional population was found in Brushy Creek (unpublished CCS reports, USFWS), also on the Bankhead National Forest, National Forests in Alabama.

This species typically occurs on frequently exposed shoals or rooted among loose boulders in quiet pools up to 1 meter in depth. Plants grow in pure stands or in association with various submergents (Bowker 1991). Flowering is infrequent, and occurs from May into July and intermittently into the fall (Kral 1983). Flowering has only been observed in areas of direct sunlight and at a water level that allows emergent leaves (Whetstone 1988).

Sphagnum seeps are frequently found with this species, and it prefers areas with stream bottoms that are narrow and bounded by steep slopes. Extant populations have only been found to occur on underlying formations of Pottsville sandstone (Bowker 1991). Eight of the twelve populations on the Little River system occur in pools or in riverine areas with partial canopy coverage, reporting individuals of 5-40. The remaining 4 occur in shallow shoals, supporting several dozen plants (Whetstone 1988).

VII. C. 7. b. Direct, Indirect, and Cumulative Effects – Kral's water-plantain

The most severe threat to this species is the elimination or adverse modification of the already limited habitat. Clearing, sedimentation, hydrological function alteration and similar impacts have already caused the extirpation of at least one population (Kral 1983). Extreme water

turbidity and dense filamentous algae decrease the amount of light available to the plants for growth and flowering.

A number of sites on the Bankhead National Forest as well as on private lands occupied by Kral's water-plantain are used as fords and are often a center for recreational activity, subjecting them to damage by off-road vehicle use (Bowker 1991). These sites are vulnurable to direct and indirect impacts by human-caused disturbances. . Impoundments may have destroyed additional undocumented populations, since populations have been found above and below impoundments currently in place (Bowker 1991). These populations are particularly vulnerable to single disaster or human caused disturbances which could conceivably wipe out over a third of the known populations in a single event. Any management other than strict protection of these sites may be detrimental to the habitat and populations. Thus it is even more critical that the populations that occur on federal lands be protected and managed to retain and improve habitat critical to this species. The preferred alternative provides guidance to minimize or eliminate impacts, while it provides management direction for protection for this species and it's habitat.

VII. C. 7. c. Determination of Effects – Kral's water-plantain

The sites located on the Bankhead all occur on the mid-reaches of the Brushy and Sipsey Rivers, above the Smith Lake impoundment. However, the protection measures and management guidelines provided in the preferred alternative are **not likely to adversely affect** Kral's water-plantain.

VII. C. 8. Green pitcher plant (*Sarracenia oreophila*)

VII. C. 8. a. Environmental Baseline

The U. S. Fish and Wildlife Service (USFWS) listed the green pitcher plant (*Sarracenia oreophila*) as an **endangered** species on September 21, 1979. Much of the following is taken from the 1994 revision of the Recovery Plan (U.S. Fish and Wildlife Service 1994) written for the species.

The green pitcher plant is restricted to sites in the Cumberland Plateau and Ridge and Valley Provinces in northeast Alabama, and to the Blue Ridge Province in Georgia and North Carolina. Only 35 natural populations of this species are known to be extant in Alabama (32), Georgia (1), and southwest North Carolina (2). Habitat for the plant is variable, and consists of both moist upland areas, many of which are described as seepage bogs, as well as boggy, sandy stream edges (U.S. Fish and Wildlife Service 1994).

Historical *Sarracenia oreophila* populations have been destroyed by residential development and clearing and disruption of the hydrological regime for agriculture, silviculture and industrial use. Flooding of sites through construction of reservoirs, collection of plants, and cattle grazing are also cited as reasons sites have been destroyed. All of these activities continue to be threats to extant populations of the green pitcher plant. Plant succession and

woody encroachment in green pitcher plant bogs also threaten the bog habitat where this species occurs (U.S. Fish and Wildlife Service 1994).

This pitcher plant is not known to naturally occur on National Forest lands in the analysis area. However, there are populations that are in 4 of the counties (north, east & west) of the Talladega/Shoal Creek units, and both of these units are within the historical range.. Suitable habitat has been found, but is currently unoccupied. Surveys will continue to include analysis of areas suitable for the green pitcher plant, and there is potential for establishing an orphan site in suitable habitat on-forest. Private landowners are not required to protect federally listed plants, and thus public land is critical in protecting and aiding in recovery of *Sarracenia oreophila* where possible.

VII. C. 8. b. Direct, Indirect, and Cumulative Effects – Green pitcher plant

Recovery opportunities on National Forest lands consist primarily of continuing to survey for additional populations, protecting and managing populations if they are found, and protecting and managing any transplanted populations. Management actions are primarily those of controlling vegetative competition through pruning and prescribed burning, increasing light levels in the sites, and restoring the natural hydrological regime where necessary (U.S. Fish and Wildlife Service 1994). Effects to the green pitcher plant could occur through habitat manipulation, but any canopy opening or prescribed burning should be beneficial to the plants. Mechanical soil disturbance, compaction, rutting and activities that could alter the hydrology of the potential suitable sites should be avoided. Because the pitcher plant is protected under the Endangered Species Act, no activities with potential to affect areas where the plants are found either adversely or beneficially can take place in the sites without concurrence from, or consultation with, USFWS.

Fire is needed to maintain suitable pitcher plant habitat (NatureServe 2001, USFWS 1994). Prescribed burning on the Little River Canyon Wildlife Refuge green pitcher plants sites in 2000, 2001 and 2002, conducted jointly between the USFWS, Alabama Natural Heritage Program and the USFS have shown dramatic increases in flowering, numbers of plants and increase in suitable habitat. Myers (1997) noted in his paper on management of a green pitcher plant bog in North Carolina, that without fire the site would eventually become a shrub-dominated bog. Sutter et al. (1994) reported positive effects to green pitcher plants following prescribed burning.

The National Forests in Alabama conduct project-level botanical inventories in sites providing potential habitat for TES plants, prior to any ground disturbing activities taking place. This will continue to occur under all alternatives. This species often occurs in riparian corridors, and protection will be provided for any pitcher plants if they are found located there. Forest-wide standards in National Forests in the Alabama Draft Plan revision that provide additional protection to the green pitcher plant are those that protect wetland rare communities, standards that protect individuals and sites of federally listed species and those that control exotic species where they are adversely affecting federally listed species.

Of the 35 natural green pitcher plant populations, the 1994 Recovery Plan revision (U.S. Fish and Wildlife Service) states that 6 sites are protected and considered secure in the long-term. In addition, The Nature Conservancy recently acquired the population located on private land in Georgia, thereby assuring its protection. There are 12 green pitcher plant populations protected on private land through Conservation Agreements with US Fish and Wildlife Service. Thus a total of 19 natural populations are currently protected, with 16 being at risk. However, the 12 populations on privately owned land are under Conservation Agreements and protected only as long as the landowner agrees to do so (U.S. Fish and Wildlife Service 1994). Continued protection and management of the established populations in Alabama will mitigate and should prevent any cumulative effects to the species. Throughout its range, however, the green pitcher plant remains at risk where it occurs on private land.

VII. C. 8. c. Determination of Effects – Green pitcher plant

To ensure no adverse effects to green pitcher plant occur on the Forest, botanical inventories will be conducted in potential habitat before any ground disturbing activities take place. Site manipulation for introduction of green pitcher plant populations and habitat will be conducted only in consultation with USFWS. Because of the protective measures discussed above and the fact that no populations are currently known to occur on the National Forests in Alabama, implementation of any Plan alternative will have **no effect** on the green pitcher plant.

VII. C. 9. Alabama Canebrake Pitcher Plant (*Sarracenia rubra* ssp. *alabamensis)*

VII. C. 9. a. Environmental Baseline

The Alabama Canebrake Pitcher plant was federally listed as **endangered** in 1989 by the USFWS. This pitcher plant is endemic to Bibb, Autauga, Chilton and Elmore counties in Alabama. Fifteen populations are currently known to occur – one within the Oakmulgee administrative boundary, on private land; there are no populations currently documented on national forest lands. There are Seventeen other populations within this area are believed to be extirpated (Neal et al 1992).

The Alabama Canebrake Pitcher plant is a carnivorous plant that occurs in sandhill seeps, swamps, bogs and canebrakes along the fall-line of Alabama. This species produces two types of pitchers, and occasional phyllodia each season. Spring pitchers appear with the flowers, while summer pitchers are much larger in size (Neal et al 1992). Flowers are a dark maroon in color; the fruit is a capsule. Flowering occurs from late April to early June (Case and Case 1974, Kral 1983).

Habitat includes acidic, highly saturated deep peaty sands or clay. Recent pitcher plant populations were found to occur on the first terrace floodplain, directly at the end of a toe-slope (Goddard & Stewart, pers observation 1999). Colony sites are wet most of the year, and are often characterized as being on the upper slopes, rather than the traditional inset floodplain drainheads (Emanuel, pers comm 2000). Within this habitat type, the species are dependent upon intact hydrological function and maintenance of early successional stage herbaceous vegetation, including canopy openings (Neal et al 1992). Although this species does appear to

be more shade tolerant than other species, its most vigorous flowering and growth occurs in full sunlight (Case and Case, 1974).

Habitat surveys were conducted in the 1990s on the Oakmulgee unit for this species. Additional surveys were initiated in 2001 and 2002, to not only survey potential habitat for occupation by the Alabama Canebrake pitcher plant, but to document suitable habitat. This may prove to be beneficial in aiding restoration or re-introduction of this species to federal lands, a critical juncture, since all but one population are currently located on private lands.

VII. C. 9. b. Direct, Indirect, and Cumulative Effects – Alabama canebrake pitcherplant

Threats to this species include woody successional encroachment, lack of fire, conversion of land, development, soil compaction, construction of stock ponds on bog sites, drainage for pasture and development, and herbicide spraying as well as overcollection by plant dealers. At this time, the USFWS views recovery as an unrealistic goal due to the small number of populations, no establishment on federal lands, poor status of many of the sites, and limited protection on private lands.

Encroachment of competing vegetation resulting from changes in fire cycles, and changes altering the hydrology have limited its current distribution and abundance. Plant dealers and hobbyists have exacerbated these adverse effects by over-collecting and poaching (Neal et al 1992). Over 50% of this species populations have been lost due to habitat destruction, woody encroachment, poaching and over-collection, and adverse land use practices (Neal et al 1992). Most of the current remaining sites are small, and nearly all are located on private lands. Federal lands could provide a critical refugia for this species recovery, if suitable habitat is found.

VII. C. 9. c. Determination of Effects – Alabama canebrake pitcherplant

To ensure no adverse effects to Alabama canebrake pitcher plant occur on the Forest, botanical inventories have been, and continue to be conducted in potential habitat before any ground disturbing activities take place. Site manipulation for introduction of Alabama canebrake pitcher plant populations and habitat will be conducted only in consultation with USFWS. Because of the protective measures discussed above and the fact that no populations are currently known to occur on the National Forests in Alabama, implementation of any Plan alternative will have **no effect** on the Alabama canebrake pitcher plant.

VII. C. 10. Alabama streak-sorus Fern (*Thelypteris pilosa* var. *alabamensis)*

VII. C. 10. a. Environmental Baseline

The Alabama streak-sorus fern was federally listed as **threatened** in 1992 (Gunn 1994) It was first discovered in 1949 on sandstone cliffs above the Sipsey Fork, in Winston County, Alabama. Construction of a bridge destroyed the type locality, and it was believed to have been extirpated until its rediscovery approximately 8 miles upstream (Short & Freeman 1978). Subsequent field surveys have found at least 15 other sites along 4 miles of the Sipsey Fork,

however this species has not been found elsewhere, despite numerous field surveys. Due to its limited distribution along a single river, a single catastrophic event, including an increase in the downstream lake level, could produce negative results.

The Alabama streak-sorus fern is a relatively small spray-cliff fern. It differs from other Thelypteris species in that it has no indusia and has sinuses of the pinnule margins reached by one lateral vein rather than by two (Smith 1993, Kral 1983). It is confined to Pottsville sandstone formations and requires high substrate moisture, high humidity and shade. Plants are located within crevices or fissures, on ceilings and recessed walls or ledges on overhangs associated with small waterfalls. Occasionally plants could be found in moist seepage areas on exposed vertical rock faces. It is a spray-cliff dependent species, and must have moisture by seepage, humidity, shade, but also adequate diffuse light. The herbaceous species assemblage of the sandstone overhangs is part of the river gorge's long-established hemlock forest association on the Bankhead (Kral 1983, Gunn 1997).

VII. C. 10. b. Direct, Indirect, and Cumulative Effects – Alabama streak-sorus fern

The Alabama streak-sorus fern in known only to occur in Winston County, Alabama, on the Bankhead National Forest. The type locality was destroyed, but subsequent work by the Alabama Natural Heritage program revealed 17 distinct extant occurrences distributed along 4 miles of the Sipsey Fork (Gunn 1997). The minimum historical distribution is assumed to include this area plus the stretch of the stream which is now inundated by the Smith Lake impoundment. It is probable that the species also occurred downstream, and perhaps even on the Brushy Creek or Rockhouse Creek (Gunn 1997). The overall greatest threat is described as its vulnerability to a single natural or human-induced disturbance, given its extremely restricted range and the relatively small number of plants that make up its total population (USFS 1997).

The Alabama streak-sorus fern is found primarily on a single drainage on the Bankhead National Forest. The Sipsey River contains the only populations known in the world. It is thought that water impoundments on streams in the Black Warrior River drainage have destroyed a large number of fern colonies, and it is vulnerable to any activities that would change the hydrology of its habitat and dehydrate its microhabitat (USFS, 1997). The proposed action emphasizes protection and restoration actions for this species.

VII. C. 10. c. Determination of Effects – Alabama streak-sorus fern

The section of the Sipsey River, above the Smith Lake impoundment on the Bankhead National Forest is the only known site in the world to contain the Alabama streak-sorus fern. However, based on the management recommendations and protections provided in the preferred alternative, the proposed actions are **not likely to adversely affect** the Alabama Streak-sorus fern.

VII. C. 11. Relict Trillium – (*Trillium reliquum)*

VII. C. 11. a. Environmental Baseline

Relict trillium is a federally **endangered** species of basic mesic hardwood forests occurring on soils that contain a high level of organic matter and medium to high levels of calcium. The largest and most vigorous populations are located in the lower piedmont/fall line sandhills province, in drainages of both the Savannah and Chattahoochee Rivers of Georgia and South Carolina. Relict trillium is known to occur from 21 populations (U.S. Fish and Wildlife Service, 1990) in Alabama, Georgia, and South Carolina, but none of the populations occur on National Forest land. Primary threats to the species are loss of habitat resulting from urban development, and in some cases, competition with invasive exotic species, logging, species conversion, or fire (TNC, 1990).

Although no populations are known from National Forest Land in Alabama, South Carolina, or Georgia, habitat is known to exist there. However, the likelihood of occurrence is low.

VII. C. 11. b. Direct, Indirect, and Cumulative Effects – Relict trillium

All high quality basic mesic forest communities, habitat for relict trillium, would be managed under the 9F (rare community) prescription under all alternatives. Several standards for rare communities ensure their maintenance and restoration across the landscape. Rare communities would be protected from detrimental effects caused by management actions across all alternatives. Rare communities would be inventoried in proposed project areas when projects are being proposed which have the potential to adversely affect them.

Since federally listed plants receive little or no legal protection on private land, this species may be vulnerable to extirpation. Since no populations are known to occur on National Forest land, the direct and cumulative effects of National Forest planning alternatives on this plant are likely to be negligible.

VII. C. 11. c. Determination of Effects – Relict trillium

Since no populations are known to occur on National Forest land, and since habitat will be protected across all alternatives, a determination of "**No Effect**" is made for this species across all alternatives.

VII. C. 12. Tennessee Yellow-Eyed Grass (*Xyris tennesseensis)* Kral

VII. C. 12. a. Environmental Baseline

The Tennessee yellow-eyed grass (*Xyris tennesseensis*) was first described as a separate species by Robert Kral in 1978. It was listed as an **endangered** species in 1991.

The Ridge and Valley physiographic region is a key area for this species, as are portions of the Highland Rim & Upper Gulf Coastal Plain. There are less than 4 locations documented in Georgia (Bartow & Whitfield counties), two documented locations in Tennessee (Lewis county) and less than 12 locations documented in Alabama. Nine of the Alabama sites are located in three Alabama counties – Franklin, Calhoun & Bibb, all of which are counties-of-

occurrence for the Bankhead National Forest, the Shoal Creek & Talladega Districts and the Oakmulgee District, respectively. This alone represents over half of the sites known worldwide. The Gordon county, Georgia population is considered to be extirpated, as is one of the Bartow county, GA populations (Kral, 1990).

The Lewis county population is in the highland rim, as is a single population in Alabama. The Georgia populations and the majority of the Alabama populations are located within the Ridge & Valley. However, the populations in Franklin County, Alabama and the Bibb County sites are just below the fall line occur in the Upper Gulf Coastal Plain (Kral, 1990).

The Tennessee yellow-eyed grass is a perennial herb with basal, erect linear leaves (NatureServe, 2002). The plant typically occurs in clumps, with the leaves clustered at the bulbous base, the outermost leaves being small and having a dark purplish-maroon to pinkish red scale-like appearance (Patrick et al, 1995). The inner leaves are larger and linear in shape, varying in length from 3-18 inches long, deep green in color, and slowly twisting as it ascends up the stalk (Gothard, 1995). The unbranched flowering inflorescence consists of brown cone-like spikes, single at the tips of each one to three foot tall flower stalk, containing small, pale yellow flowers (three petals) which open in the morning, wither in the afternoon, and only appear a few at a time (Somers, 1993, Gothard, 1995). Roots are slender, shallow & fibrous (Kral, 1983). Fruits are obovoid or broadly ellipsoid capsules with thin, plano-convex walls and three sutures, with numerous ellipsoid seeds covered by 18-20 fine, longitudinal lines that are sometimes interconnected (Kral, 1983, Somers, 1993). Blooming occurs from August to September, with fruiting from September to October.

All yellow-eyed grasses require habitats that are moist to wet year round, ranging from sunny to partial shade or very thinly wooded (with little canopy cover) conditions. Preferred landforms include drains, swales, seeps, springs, springy meadows, bogs, fens and banks of small streams. The Tennessee yellow-eyed grass differs from other Xyridaceae in that instead of preferring acidic sites, it is found where calcareous rock such as shale, limestone and dolomite are at, near or have been deposited near the soil surface, or where thin calcareous soils are present (NatureServe 2002, Somers 1993). This character results in soils that are more neutral to basic than acidic (Gothard, 1995). Community types include seepage slopes, springy meadows, bogs and streamside (Kral, 1983, Natureserve 2002). Substrates include gravelbars, sandbars, shallow sand/soil deposits or cracks in the limestone, narrow sandbars located on ketone dolomite, wet ditches of mixed clay and sand, and rich deposits of marshland. One site occurs on an earth dike in an impounded swamp. Soils are slow to establish and prone to erode during heavy rain events because most sites are wet and relatively steep (Somers, 1993). The sites tend to be open, wet disturbance or open-canopy early successional-related herbaceous understory habitats, with an abundant herbaceous layer and few woody shrubs and a thin canopy of trees.

Where populations of Tennessee yellow-eyed grass occur along separate parts of the same stream, continuous corridors of suitable habitat are not available and they are often widely separated (USFWS 1994). In these instances, propagules may move downstream to mix with those of other populations or colonize suitable habitat where it exists, however only seldom

would there be opportunity for upstream movement of propagules or pollinators from site to site (Somers, 1993).

Despite extensive surveys, fewer than 20 populations are known to be extant, with each site occupying less than ½ an acre. Only one site is known to contain more than a few hundred plants, with at least three containing less than 20 individuals (Kral, 1990, Patrick et al, 1995). Due to the small size of most of these population sites, Kral suggested that Tennessee yellow-eyed grass was historically rare throughout its range. Three historical populations have been lost, and at least 4 of the remaining populations are in decline due to highway construction/right-of-way maintenance and other habitat destruction (NatureServe, 2002). In addition to sites lost during road construction, other significant habitat losses have been sustained as a result of drainage of lowland wetlands, conversion to agricultural fields, careless forest management practices and impoundment of wetlands (Patrick et al, 1995, Kral 1990, NatureServe 2002, USFWS 1994).

VII. C. 12. b. Direct, Indirect, and Cumulative Effects – Tennessee yellow-eyed grass

The endangered status of the Tennessee yellow-eyed grass is primarily a result of its apparent limited distribution and the fragile nature of the habitat upon which it depends (Gothard, 1995). The activities responsible for loss of habitat are varied but they all lead to habitat destruction through conversion or loss of the original hydrological function. For the Tennessee yellow-eyed grass, ground disturbing activities, impoundments, road construction and unrestricted herbicide foliar spraying have the greatest potential to affect both individuals and populations. The other sources of habitat modification or destruction, described above, are not permitted on National Forest lands.

Based on the plant's wetland habitat and the general biology of yellow-eyed grasses collectively, Tennessee yellow-eyed grass could be positively managed by protecting sites from encroachment by woody shrub species leaving a partial (or thinned) overstory canopy in place and ensuring that activities taking place in areas where the plant occurs do not adversely affect the hydrology of the site (Moffett, 2002). Management options would include hand removal of woody midstory/shrub encroachment, thinning based on site-specific recommendations and mitigation, and burning. Total canopy removal is not recommended (Moffett 2002). In cases where National Forest lands lie downstream from known populations, suitable habitat sites need to be monitored to survey for new colonies.

There are no known populations located on the National Forests in Alabama, however, three populations in Calhoun County occur near the Talladega National Forest, there is a site within 2 miles of the Bankhead National Forest, and a series of populations along the Cahaba River both above and below the Oakmulgee unit where it crosses the Cahaba. Habitat meeting the general description necessary for the Tennessee yellow-eyed grass is present on those three units for the National Forests in Alabama. Protection, monitoring and continuous surveys for habitat and new populations will be included in our recovery objectives. In addition, habitat surveys will include evaluation for potential of introduction/reintroduction to promote recovery efforts. All ground disturbing activities that occur on national forest lands will employ the

Forest-Wide and Riparian Standards. Implementation of these standards will be monitored and corrected as needed or as new information becomes available.

The effects of management show that although total canopy cover removal induces enhanced flowering of the Tennessee yellow-eyed grass for the first year following the action, subsequent years show that the woody encroachment and other herbaceous species out-compete this species, resulting in a decline (Moffett, 2002). Mowing does not seem to have a direct impact on the Tennessee yellow-eyed grass, however some indirect effects produced are positive (removal of midstory & shrub encroachment) while others are negative (rutting and compacting of the soil by the machines, resulting in change in hydrology) (Moffett 2002). This puts mowing in a no-net-gain category for suggested management actions. Prescribed burning during the winter and early spring (opposite the flowering period) seem to produce positive results, as does careful midstory removal, taking care to keep soil compaction to a minimum and allowing no rutting to occur.

Annually, a portion of the existing populations on national forest lands will be monitored by Forest Biologists and Specialists, and surveys will be conducted to identify and assess potential reintroduction sites. The results will be reported in Monitoring and Evaluation Report. At least once every five years, a professional botanist or ecologist will survey the entire suitable habitat managed by the National Forests in Alabama to evaluate the expansion or contraction in habitat suitability or utilization. If augmentation of existing or re-introduced populations is determined to be necessary, the Forest will assist the lead agency.

VII. C. 12. c. Determination of Effects – Tennessee yellow-eyed grass

Through implementation of the Forest-Wide, Rare Community, T&E species and Riparian Standards, and due to the fact that there are no sites found directly on National Forests in Alabama lands, the selection of any of the alternatives will have **No Effect** on the Tennessee yellow-eyed grass (*Xyris tennesseensis*).

VIII. CONSULTATION PROCESS AND HISTORY

The consultation process was started initially in 1996 with the creation of a Regional biological planning team composed of individuals with expertise in fish, wildlife, range, botany and ecology, referred to as the "FWRBE team". This team consisted not only of Forest fish and wildlife biologists and botanists from the 5 planning forests, but also included members of the public, USFWS, representatives from state resource agencies, state heritage offices, the Nature Conservancy, Sierra Club and many other groups and organizations. The FWRBE Team has continued informal discussions throughout this entire process to ensure inclusion of the best available scientific information, research, and latest findings in the field. Concurrently, the National Forests in Alabama and the Daphne USFWS Field Office have been holding numerous meetings and conference calls to discuss various aspects of the draft Forest Plan and the effects assessments. Throughout this process, our primary USFWS contact has been Biologist, Lori Wilson. Field Supervisor, Larry Goldman, has also been kept appraised of pertinent inter-agency discussions. Specific past and ongoing inter-agency activities are outlined in Table VIII.1.

Table VIII.1. Schedule of National Forests in Alabama Consultation Related Activities.

Date	Format	Discussion and Results
March 1996	Meeting in Atlanta	Formation of FWRBE Team
1996-2002	Multiple meetings	FWRBE team and public meetings working on habitat, DFC, standards and guides, recommendations, etc
September 1999	Meeting in Atlanta	Proposed recovery efforts for the RCW presented to USFWS, Ralph Costa, and the regional ecological team
1998-2003	Multiple conference calls	FWRBE team and subteams with RO working on habitat, S&G, plan recommendations, revisions, viability analysis, habitat analysis, BA and EIS writeups by species and habitat, community writeups and revisions, etc
March 27-29, 2001	Meeting in Atlanta	Coordinated with other Forests and FWS offices; reviewed implementation of MOA.
February 15, 2002	Draft Consultation Agreement	Established consistent protocols, responsibilities and timelines for Forests and FWS offices; candidate species are considered as sensitive
March 7, 2002	Consultation Agreement	Established group leaders and teams for FS and FWS
March 26, 2002	Conference call	Finalized botany sub-teams
March 27, 2002	Meeting in Knoxville	Clarified team objectives.
April 8, 2002	Letter from FS to FWS	Further clarification of team objectives and standardized language
April 8-September 30, 2002	Numerous conference calls among interagency teams	Developed standards to limit effects to threatened and endangered species.
October 23 -30, 2002	Multiple calls between FS and FWS	Reviewed and came to mutual agreement on proposed Indiana bat standards
April 28, 2002	Meeting between FS and FWS (Daphne FO)	Briefed FWS and transmitted copies of the Draft revised Plan and EIS; discussed differences between current and draft revised plan; agreed on process, BA content & formatting.
April 28-May 15, 2003	Multiple calls	Further refinement of BA expectations.
May 5, 2003	Email to FWS (Daphne FO)	Informal transmittal of FS species list for review.
May 16, 2003	Document transmittal	Draft BA transmitted to FWS & FS RO for preliminary review.
May 16-July 15, 2003	Multiple calls	Discussion of preliminary effects analysis, draft BA, and draft Plan direction.
July 18, 2003	Email to FWS (Daphne FO)	Informal transmittal of 2nd draft BA for final FWS comments

Date	Format	Discussion and Results
August 15, 2003	Document transmittal	Formal BA transmittal and request for initiation of formal consultation.

The process used was started initially in 1996 with the creation of a regional biological planning team from Fish, Wildlife, Range, Botany and Ecology, referred to in all other documents as the FWRBE team. This consisted not only of the forest biologists, botanists and fisheries biologists from the 5 planning forests, but included members of the public, USFWS, representatives from the state departments of natural resources, the state heritage offices, the Nature Conservancy, Sierra Club and many other groups and organizations. In addition, each forest has continued informal discussions throughout this entire process to ensure inclusion of the best available scientific information, research, and latest findings in the field.

IX. CONSOLIDATED LIST OF T&E SPECIES WITH DETERMINATIONS

The T&E species considered within the planning guidelines for the National Forests in Alabama programmatic BA have been discussed individually in Section VII, specific to the preferred alternative I. A summary matrix has been provided in this consolidated section for quick reference and ease of locating determination of effect rankings by species or species groups. The terminology used below consists of the official legal determination of effect wording as defined in Section VI.

Table IX.1. Effects Determinations for National Forests in Alabama Terrestrial Animals.

Scientific Name	Common Name	Determination of Effects
Picoides borealis	Red-cockaded woodpecker	**Not Likely to adversely affect**
Haliaeetus leucocephalus	Bald eagle	**Not likely to adversely affect**
Mycteria americana	Wood stork	**No effect**
Myotis grisescens	Gray bat	**Not likely to adversely affect**
Myotis sodalis	Indiana bat	**Not likely to adversely affect**
Neonympha mitchellii	Mitchell's satyr	**Not likely to adversely affect**
Drymarchon corais couperi	Eastern indigo snake	**No effect**
Ambystoma cingulatum	Flatwoods salamander	**Not likely to adversely affect**

Table IX.2. Effects Determinations for National Forests in Alabama Aquatic Animals.

Scientific Name	Common Name	Determination of Effects
Sternotherus depressus	Flattened musk turtle	**Not likely to adversely affect**
Acipenser oxyrinchus desotoi	Gulf sturgeon	**Not likely to adversely affect or modify critical habitat**
Cottus pygmaeus	Pygmy sculpin	**No effect**
Cyprinella caerulea	Blue shiner	**Not likely to adversely affect**
Notropis cahabae	Cahaba shiner	**Not likely to adversely affect**
Percina aurolineata	Goldline darter	**Not likely to adversely affect**
Scaphirhynchus suttkusi	Alabama sturgeon	**No effect**
Epioblasma brevidens	Cumberlandian combshell	**Not likely to adversely affect**
Epioblasma metastriata	Upland combshell	**Not likely to adversely affect or modify critical habitat**
Epioblasma othcaloogensis	Southern acornshell	**Not likely to adversely affect or modify critical habitat**
Lampsilis altilis	Fine-lined pocketbook	**Not likely to adversely affect or modify critical habitat**
Lampsilis perovalis	Orange-nacre mucket	**Not likely to adversely affect or modify critical habitat**
Medionidus acutissimus	Alabama moccasinshell	**Not likely to adversely affect or modify critical habitat**
Medionidus parvulus	Coosa moccasinshell	**Not likely to adversely affect or modify critical habitat**
Pleurobema dicisum	Southern clubshell	**Not likely to adversely affect or modify critical habitat**
Pleurobema furvum	Dark pigtoe	**Not likely to adversely affect or modify critical habitat**
Pleurobema georgianum	Southern pigtoe	**Not likely to adversely affect or modify critical habitat**
Pleurobema perovatum	Ovate clubshell	**Not likely to adversely affect or modify critical habitat**
Ptychobranchus greeni	Triangular kidneyshell	**Not likely to adversely affect or modify critical habitat**
Elimia crenatella	Lacy Elimia	**Not likely to adversely affect**
Leptoxis ampla	Round rocksnail	**No effect**
Leptoxis taeniata	Painted rocksnail	**Not likely to adversely affect**
Lepyrium showalteri	Flat pebblesnail	**No effect**
Lioplax cyclostomaformis	Cylindrical lioplax snail	**No effect**
Tulotoma magnifica	Tulotoma	**Not likely to adversely affect**

Table IX.3. Effects Determinations for National Forests in Alabama Terrestrial and Aquatic Plants.

Clematis socialis	Alabama leather flower	**No Effect**
Dalea foliosa	Leafy prairie-clover	**No Effect**
Helianthus eggertii	Eggert's sunflower	**No Effect**
Lesquerella lyrata	Lyrate bladderpod	**No Effect**
Marshallia mohrii	Mohr's Barbara's buttons	**No Effect**
Ptilimnium nodosum	Harperella	**No Effect**
Sagittaria secundifolia	Kral's water-plantain	**Not Likely to adversely affect**
Sarracenia oreophila	Green pitcher plant	**No Effect**
Sarracenia rubra var al.	Alabama canebrake pitcher plant	**No Effect**
Thelypteris pilosa var al.	Alabama streak-sorus fern	**Not Likely to adversely affect**
Trillium reliquum	Relict Trillium	**No Effect**
Xyris tennesseensis	Tennessee yellow-eyed grass	**No Effect**

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INDEX
Common Name

INDEX
Scientific Names