

U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Elimia melanoides

Common Name:

Black mudalia

Lead region:

Region 4 (Southeast Region)

Information current as of:

06/15/2011

Status/Action

Funding provided for a proposed rule. Assessment not updated.

Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

New Candidate

Continuing Candidate

Candidate Removal

Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status

Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species

Range is no longer a U.S. territory

Insufficient information exists on biological vulnerability and threats to support listing

Taxon mistakenly included in past notice of review

Taxon does not meet the definition of "species"

Taxon believed to be extinct

Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

X Petitioned - Date petition received: 04/20/2010

90-Day Positive:09/27/2011

12 Month Positive:

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing?
Yes

Explanation of why precluded:

We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, the majority our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements; meeting statutory deadlines for petition findings or listing determinations; emergency listing evaluations and determinations; and essential litigation-related administrative and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of Progress on Revising the Lists, in the current CNOR which can be viewed on our Internet website (<http://endangered.fws.gov/>).

Historical States/Territories/Countries of Occurrence:

- **States/US Territories:** Alabama
- **US Counties:**County information not available
- **Countries:**Country information not available

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories:** Alabama
- **US Counties:** Blount, AL
- **Countries:**Country information not available

Land Ownership:

Rivers and streams where this species occurs are under State jurisdiction. Riparian lands are in private ownership.

Lead Region Contact:

ARD-ECOL SVCS, Rob Tawes, 4046797142, robert_tawes@fws.gov

Lead Field Office Contact:

ALABAMA ESFO, Jeff Powell, 251-441-5858, jeff_powell@fws.gov

Biological Information

Species Description:

The black mudalia is a small species of aquatic snail growing to 13 millimeters (0.5 inches) in length. The shell is thin, ovately conic in shape, smooth, and the top of the shell is usually eroded. The aperture (shell opening) is oval, and about one-half the length of the shell. The columella (area of thick shell between the body of the shell and the aperture) is smooth, white, and tinged with violet, pink, or red. Shell color is green to brown, occasionally with brown transverse color bands. In the wild, however, the shell is almost always covered with black mineral deposits. The operculum (hard structure that covers the aperture when the snail body is drawn into the shell) is thin, dark, oval, and impressed at occasional growth lines (Goodrich 1922, pp. 51-52; Minton et al. 2003, p. 537).

Taxonomy:

The black mudalia belongs to the aquatic snail family of Pleuroceridae. The species was described from “rivers in North Alabama” by T.A. Conrad (1834) as *Anculosa melanoides*. Subsequently, it was established that the oldest available name for this genus was *Leptoxis Rafinesque*, 1819, and not *Anculosa Say*, 1821 (Stein 1976, p. 29). Early treatments of *Anculosa melanoides* (e.g., Goodrich 1941, p. 10) recognized that certain characters of the radulae (ribbon-like organ used in rasping food) and operculum suggested a closer affinity with the pleurocerid genus *Elimia*. Recent genetic and morphological studies have confirmed this affinity, and the species was recently redescribed as *Elimia melanoides* (Minton et al. 2003, pp. 533-537). This peer-reviewed publication (Minton et al. 2003) supports recognition of the black mudalia as a valid taxon that meets the Endangered Species Act definition of a species.

Habitat/Life History:

The black mudalia is found clinging to clean gravel, cobble, boulders and/or logs in flowing water on shoals and riffles. Little is known of its life history, however pleurocerid snails may live as long as 6 years (Huryn et al. 1994, p. 540), and generally feed by ingesting periphyton (algae attached to hard surfaces) and biofilm detritus scraped off of the substrate by the snail’s radula (Morales and Ward 2000, p. 289).

Historical Range/Distribution:

The historical distribution of the black mudalia included much of the upper half of the Black Warrior River drainage in Alabama. Museum records for black mudalia are known from the Black Warrior River from Tuscaloosa to the confluence of the Locust and Mulberry Forks (Tuscaloosa/Jefferson Counties); the Locust Fork to approximately US 278 (Jefferson/Blount Counties); the Mulberry Fork to the confluence of Sipsey Fork (Walker County); Sipsey Fork to Forest Service Road (FSR) 234 (Walker/Winston Counties); and from Valley Creek, Little Warrior River, and Blackburn Fork of the Little Warrior (Jefferson/Blount Counties) (Florida State Museum of Natural History (FSMNH) in litt. 2006). This encompasses over 250 miles of river and stream channel.

Current Range Distribution:

The black mudalia is currently known from two shoals in Gurley Creek, Jefferson County (Pierson 2006, p. 8-9); five localized shoals in an approximately 30 mile reach of the upper Locust Fork of the Black Warrior River, located between US 278 and the mouth of the Little Warrior River, Blount County (Minton et al. 2003, p. 532); two shoals in a one mile reach of the Blackburn Fork of the Little Warrior River, at and below AL 75, and Hendrick Mill Brook (Clark in litt. 2006), a tributary to Blackburn Fork within this area, Blount County, Alabama. There are 1985 and 1990 museum records of black mudalia from the Sipsey Fork, Bankhead National Forest, Winston County (FSMNH in litt. 2006), and Forest Service biologists collected a single animal from the same area in 1993 (Haag 2006, pers. comm.). Pierson (in litt. 2006) collected several black mudalia from the same location in 2006.

Population Estimates/Status:

Early in the Twentieth century, Goodrich (1922, p. 51) noted that the black mudalia was "...perhaps a vanishing race..." based on its narrow range and low numbers. By 1976, the species was considered possibly extinct (Stein 1976, p. 31). Survey efforts in the early 1990s (Service field records, 1990-95; M. Pierson, Calera, Alabama, field records, 1993) failed to locate or to recognize and appropriately identify the species. Given that the black mudalia had not been documented in over 50 years, Bogan et al. (1995, p. 251) listed it as presumed extinct, a status adopted by Turgeon et al. (1988, 1998). In 1996, a snail survey of 57 sites in the Locust Fork drainage of the Black Warrior River located the black mudalia at seven sites in Blount County, Alabama (Minton et al. 2003, p. 532).

In 2006, black mudalia densities at one shoal on the Blackburn Fork were measured from 248 to 616 per square meter (Pierson in litt. 2006). Population estimates are not available for the other sites; however, population densities in the Blackburn Fork are much higher than other locations (Johnson 2003, pers. comm.; Pierson 2006, pers. comm.). The State of Alabama considers the black mudalia as a Priority 2 species of high conservation concern (Mirarchi et al. 2004, pp. 133, 136; Alabama Department of Conservation and Natural Resources (ADCNR) 2005, Appendix 1-3). The NatureServe global ranking is G2, imperiled (www.natureserve.org).

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

The historical habitat of the black mudalia included shoals and riffles throughout much of the upper Black Warrior River drainage above the Fall Line at Tuscaloosa, Alabama. The species has been extirpated from more than 80 percent of that range. The black mudalia requires flowing water, and the construction of two major dams on the main stem Black Warrior River above the Fall Line (Oliver Lock and Dam, 1940; Holt Dam, 1966) and another dam on the lower Sipsey Fork (Bankhead Dam, 1975), destroyed or severely modified over 150 miles of stream and river habitat within the historical range of black mudalia.

Other historical causes of range curtailment in the remaining unimpounded river and stream channels of the upper Black Warrior River drainage included coal mine drainage, industrial and municipal pollution events, and agricultural runoff (e.g., Shepard et al. 2004, pp. 1-3). The Black Warrior River drains the largest, southernmost coalfield in North America (Mettee et al. 1989, p. 2). During the early 1800s, coal was mined directly from some stream channels in the drainage. Later in the Nineteenth century, most coal was obtained through strip mining, and coal washing effluent was directly discharged into surface waters. Prior to 1969, there were no laws or regulations governing strip mining in Alabama (Dodd et al. 1986, pp. 3-5), and by the late 1960s, the cumulative impacts of mining and industrial wastes had eliminated all signs of plant and

animal life in some portions of the Locust Fork drainage (Barcly 1973 as cited in O'Neil and Shepard 2001, pp. 1-2).

The black mudalia is currently known from localized shoals in discrete reaches of the Locust Fork of the Black Warrior River, Little Warrior River, and Hendricks Mill Brook in Blount County; Gurley Creek in Jefferson County; and the Sipsey Fork in Winston County, Alabama. The primary threat to the localized black mudalia snail populations in these areas is habitat modification or destruction related to water quality. Point source discharges and land surface runoff (nonpoint pollution) can cause eutrophication, decreased dissolved oxygen concentration, increased acidity and conductivity, and other changes in water chemistry that are likely to seriously impact aquatic snails.

Nonpoint source pollution from land surface runoff can include sediments, fertilizers, herbicides, pesticides, animal wastes, septic tank and gray water leakage, and oils and greases. Land uses in the vicinity of black mudalia populations include pasture, row crops, timber production, and chicken farms. Most pollutants in surface and groundwater within the upper Black Warrior Basin have originated from agricultural activities, abandoned mine runoff, construction, silviculture, failing septic tanks and contaminated runoff from urban areas (Upper Black Warrior Technical Task Force 1991, p. 1; O'Neil and Shepard 2001, p. 2).

Excessive sediments can impact riverine snails requiring clean, hard shoal stream and river bottoms, by making the habitat unsuitable for feeding or reproduction. Similar impacts resulting from sediments have been noted for many other components of aquatic communities. For example, sediments have been shown to abrade and/or suffocate periphyton (organisms attached to underwater surfaces, upon which pleurocerid snails feed); affect respiration, growth, reproductive success, and behavior of aquatic insects and mussels; and affect fish growth, survival, and reproduction (Waters 1995, pp. 173-175). Potential sediment sources within a watershed include virtually all activities that disturb the land surface, and all localities currently occupied by these snails are affected to varying degrees by sedimentation (O'Neil and Shepard 2001, Appendix B, p. 5).

Land surface runoff also contributes human-induced nutrients to streams and rivers. Excessive nutrient input (from fertilizers, sewage waste, animal manure, etc.) can result in periodic low dissolved oxygen levels that are detrimental to aquatic species, including pleurocerid snails. Nutrients also promote heavy algal growth that may cover and eliminate clean rock or gravel habitats of shoal dwelling snails. Nutrient and sediment pollution may have synergistic effects (a condition in which the toxic effect of two or more pollutants is much greater than the sum of the effects of the pollutants when operating individually) on freshwater snails and their habitats, as has been suggested for aquatic insects (Waters 1995, p. 67). A 2001 water quality study identified the Locust Fork reach occupied by the snails as eutrophic due to excess nutrients and high quantities of algae (O'Neil and Shepard 2001, Appendix B, p. 11).

Studies of habitat quality in the Locust Fork (Shepard et al. 2004, p. 27) have found habitat conditions generally "good" within the reach currently occupied by the black mudalia, but conditions deteriorated at sample stations above the occupied reach. Fine sediments were identified as the primary potential threat to habitat conditions.

Habitat quality was reported as "excellent" in the vicinity of the two shoal populations of black mudalia in the Blackburn Fork of the Little Warrior River; however habitat was rated as poor at stations in the Calvert Prong of the Little Warrior River (Shepard et al. 2004, pp. 27, 34-35).

In summary, the historical loss of habitat and range is currently, and projected to continue to be, a significant threat to the black mudalia. Curtailment of habitat and range also amplifies threats from nonpoint source water and habitat quality degradation, accidental spills, or violation of permitted discharges. Due to the limited extent of habitat currently occupied by the species, and the severity and magnitude of ongoing

impacts within its current limited distribution, we consider that the present or threatened destruction, modification, or curtailment of habitat and range represents a threat to the black mudalia.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

The black mudalia has no commercial value, and overutilization has not been a problem. Therefore, we do not consider overutilization for commercial, recreational, scientific, or educational purposes a threat to this species.

C. Disease or predation:

Disease is not currently known to be a factor in the decline of the black mudalia. Aquatic snails are consumed by various vertebrate predators, including fishes, mammals, and possibly birds. Predation by naturally occurring predators is a normal aspect of the population dynamics of a species and is not considered a threat to the black mudalia. However, the potential now exists for the black carp (*Mylopharyngodon piceus*), a mollusk-eating Asian fish recently introduced into the waters of the United States, to eventually enter the Mobile River Basin. Therefore, we do not consider disease or predation a threat to the species at this time; however predation has the potential to become a significant future threat.

D. The inadequacy of existing regulatory mechanisms:

The black mudalia has been extirpated from approximately 60 percent of its historical range as a result of the construction of Federal water projects. Surviving populations are currently affected by discharges, highway construction, mining, pesticide registration, and other actions with a Federal nexus (see factor A, above).

There is currently no information on the sensitivity of the black mudalia to common industrial or municipal pollutants. Existing State and Federal regulations regarding such discharges are assumed to be protective; however, the species has disappeared from large portions of range that have been affected by historical pollution events. Black mudalia may also be more susceptible to some pollutants than test organisms currently used in bioassays. A lack of adequate research and data may prevent existing authorities, such as the Clean Water Act, administered by the Environmental Protection Agency and the Army Corps of Engineers, from being fully utilized.

Stream segments within the Locust Fork drainage currently occupied by the black mudalia have been assigned water-use classifications of “fish and wildlife” (F&W) by the Alabama Department of Environmental Management (ADEM). The F&W designation establishes minimum water quality standards that are believed to protect existing species and their uses within the designated area; most of the stream segments draining into black mudalia habitat currently support their F&W classification standards. However, about 75 miles of the Locust Fork have been identified on the Alabama 303(d) List (a list of water bodies failing to meet their designated water-use classifications) as impaired by siltation, nutrients, and/or other habitat alterations (ADEM 2006, p. 2; ADEM 2008, p. 2; ADEM 2010, p. 2). The Sipsey Fork is currently meeting its F&W classification, and is also designated as an Outstanding National Resource Water.

ADEM maintains water-use classifications through issuance of National Pollutant Discharge Elimination System (NPDES) permits to industries, municipalities and others that set maximum limits on certain pollutants or pollutant parameters. There are at least eight permitted point source discharges that drain into the current range of the black mudalia, including four municipal, one industrial, two schools, and one private business (O’Neil and Shepard 2001, pp. 16, 18).

The black mudalia has been identified by the Alabama Department of Conservation and Natural Resources (ADCNR) as a “Priority 2” species of high conservation concern due to its rarity and restricted distribution (Mirarchi et al. 2004, pp. 133, 136; ADCNR 2005, Appendix 1-3, p. 302). These classifications, however,

offer no legal protection. Lacking State or Federal protection, the black mudalia is not currently given any special consideration under other environmental laws when project impacts are reviewed.

In summary, although regulatory mechanisms are in place to protect aquatic species, at least one stream reach supporting a surviving population of black mudalia (Locust Fork) fails to meet current regulatory standards. In addition, the lack of specific information on the sensitivity of the black mudalia to common industrial and municipal pollutants limits their application. Therefore, we consider existing regulatory mechanisms as currently applied, are not fully protective of the black mudalia.

E. Other natural or manmade factors affecting its continued existence:

Limited distribution and the nature of its habitat (i.e., small to moderate sized streams) make the black mudalia highly vulnerable to random natural or manmade catastrophic events such as droughts, floods or chemical spills. The black mudalia population in the Sipsey Fork is apparently very small, and inbreeding may become a factor in conservation of that population. Genetic flow between the Sipsey Fork and Locust Fork populations is prevented by a major dam and more than 50 miles of impounded channel. Although genetics of the species is poorly known, inbreeding and reduced genetic diversity may become a threat if population declines continue (Lynch 1996, pp. 493-494). Therefore, we consider that the black mudalia is vulnerable to other natural or manmade factors, such as droughts, floods, spills, and/or inbreeding.

Conservation Measures Planned or Implemented :

The State of Alabama has established a propagation facility for imperiled mussels and snails, and has worked with the Service to prepare and implement a Plan for Controlled Propagation, Augmentation, and Reintroduction for freshwater mollusks of the Mobile Basin (Mobile River Basin Mollusk Restoration Committee 2010). The need for life history and propagation studies of black mudalia are identified. ADCNR has also identified the need to conduct a comprehensive inventory of black mudalia, evaluate population viability, and identify potential reintroduction sites (Mirarchi et al. 2004, p. 136). To date, these projects are on hold due to higher priorities and lack of funding.

Summary of Threats :

Black mudalia has experienced significant curtailment of range and habitat. After being considered extinct for two decades, the black mudalia was rediscovered in a small portion of its' historical range in the Black Warrior drainage, Alabama. Impounded waters from dams have destroyed much of its habitat and fragmented its range. Populations that may have avoided impoundment apparently disappeared due to historical pollution events and/or natural catastrophic events. Today, localized populations are known from five streams in the upper Black Warrior River drainage. Because of their limited range and localized distributions, the surviving shoal populations of black mudalia are vulnerable to gradual degradation and loss of habitat through nonpoint source pollution, and to natural or human induced catastrophic events affecting its stream and river habitats (e.g., toxic spills, droughts, etc.). However, additional sampling is needed to determine the full extent of the range of the species within the Black Warrior River drainage, as well as population trends.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

Surveys of historical habitat are required to establish range and threat levels. A captive population should be

established for study and to produce propagules for potential reintroduction into appropriate historical habitats. Life history and toxicity studies should be conducted. Potential reintroduction sites need to be identified. The surviving populations should be routinely monitored for population trends (ADCNR 2005).

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

Discovery of surviving populations in shoals of five streams in the upper Black Warrior River reduces the magnitude of stochastic threats; however, all known populations are currently affected by point and/or nonpoint source pollution. Overall, we believe the magnitude of threats to be moderate.

Imminence :

Nonpoint source threats posed by water and habitat quality degradation are currently affecting all populations to some degree. Human land uses, including cattle grazing, row crops, timber, chicken farms, and home construction are currently causing sedimentation and eutrophication of black mudalia habitats. Overall, threats are considered to be imminent.

Yes No Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

No Yes Is Emergency Listing Warranted?

No, at this time, we do not believe that the current immediacy or magnitude of identified threats to the species warrant the need for emergency listing as outlined in section 4 of the Endangered Species Act. The Service will continue to monitor and assess the status and trends of the species and may adjust this conclusion using the best scientific and commercial information as it becomes available.

Description of Monitoring:

Species experts and appropriate individuals with State and Federal agencies were contacted and asked to provide data on the black mudalia. These include Dr. Paul Johnson and Jeff Garner, ADCNR; Stuart McGregor, Geological Survey of Alabama (GSA); Paul Hartfield, USFWS, Jackson (previous lead), and Jeff Powell, USFWS, Daphne, AL. Black mudalia were last monitored in 2006 (Pierson 2006). Dr. Paul Johnson and Jeff Garner began initial surveys in late 2011. Surveys should be completed in 2012. Nothing new to report.

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

Alabama

Indicate which State(s) did not provide any information or comment:

none

State Coordination:

Dr. Paul Johnson and Jeff Garner, ADCNR, and Stuart McGregor, GSA, reviewed this species assessment and provided editorial comments. This species is listed as a "priority 2" species in Alabama's State Wildlife Action Plan (ADCNR 2005, Appendix 1-3).

Literature Cited:

Alabama Department of Environmental Management (ADEM). 2006. Final 2006 Section 303(d) List. Montgomery, Alabama. Pp. 1-2.

Alabama Department of Environmental Management (ADEM). 2008. Final 2008 Section 303(d) List. Montgomery, Alabama. Pp. 1-2.

Alabama Department of Environmental Management (ADEM). 2010. Final 2010 Section 303(d) List. Montgomery, Alabama. Pp. 1-2.

Alabama Department of Conservation and Natural Resources (ADCNR). 2005. Alabama's comprehensive wildlife conservation strategy. Montgomery, Alabama. P. 302.

Bogan, A.E., J.M. Pierson, and P. Hartfield. 1995. Decline in the freshwater gastropod fauna in the Mobile Bay Basin. In: E.T. LaRoe, G.S. Farris, C.E. Puckett, P.D. Doran, M.J. Mac, Eds. Our living Resources, a report to the Nation on the distribution, abundance and health of U.S. plants, animals and ecosystems. U.S. Department of Interior, National Biological Survey, Washington, D.C. pp. 249-252.

Clark, S. 2006. Re: new location for black mudalia. 03/22/2006 e-mail to Paul Hartfield, U.S. Fish and Wildlife Service, Jackson, MS, from Stephanie Clark, University of Alabama, Tuscaloosa, AL.

Conrad, T.A. 1834. New freshwater shells of the United States, with colored illustrations, and a monograph of the Genus Anculotus of Say: also a synopsis of the American naiades. Philadelphia, Pennsylvania.

Dodd, C.K., K.M. Enge, and J.N. Stuart. 1986. The effects of mining siltation on the distribution and abundance of the flattened musk turtle, *Sternotherus depressus*, in northern Alabama. Denver Wildlife Research Center, Gainesville, FL 82 pp.

Florida State Museum of Natural History. 2006. Invertebrate Zoology Master Database: Mollusca: *Leptoxis melanoides*.

Goodrich, C. 1922. The Anculosae of the Alabama River Drainage. Miscellaneous Publications, Museum of Zoology, University of Michigan (7):1-57.

Goodrich, C. 1941. Pleuroceridae of the small streams of the Alabama River system. Occasional Papers of the Museum of Zoology, University of Michigan (427):1-10.

Haag, W. 2006. Forest Service biologists collected a single black mudalia from the Locust Fork in 1993. Wendell Haag, Biologist, U.S. Forest Service, Oxford, MS, conversation with Paul Hartfield, U.S. Fish and Wildlife Service, Jackson, MS.

Huryn, A.D., J.W. Koebel, and A.C. Benke. 1994. Life history and longevity of the pleurocerid snail *elimia*: a comparative study of eight populations. J. N. Am. Benthol. Soc. 13(4): 540-556.

Johnson, P. 2003. Population densities of black mudalia are much higher in the Blackburn Fork than at other locations. Paul Johnson, Director, Alabama Aquatic Biodiversity Conservation Center, conversation with Paul Hartfield, U.S. Fish and Wildlife Service, Jackson, MS.

Lynch, M. 1996. A quantitative-genetic perspective on conservation issues. In: Avise, J.C. and J.L. Hambrick (eds.). Conservation genetics: case histories from nature. Chapman and Hall, New York. pp. 493-494.

Mettee, M.F., P.E. O'Neill, J.M. Pierson, and R.D. Suttkus. 1989. Fishes of the Black Warrior River system in Alabama. Geological Survey of Alabama Bulletin 133. 201 pp.

Minton, R.L., J. T. Garner, and C. Lydeard. 2003. Rediscovery, systematic position, and redescription of "*Leptoxis*" *melanoides* (Conrad, 1834) (Mollusca: Gastropoda: Cerithioidea: Pleuroceridae) from the Black Warrior River, Alabama, U.S.A. Proceedings of the Biological Society of Washington 116(3):531-541.

Mobile River Basin Mollusk Restoration Committee. 2010. Plan for the controlled propagation, reintroduction, and augmentation of freshwater mollusks of the Mobile River Basin. Paul Hartfield, Chairman, U.S. Fish and Wildlife Service, Jackson, MS. 103 pp.

Morales, J.B.T., and A.K. Ward. 2000. Differential incorporation of algae and bacteria by *Elimia clara* (Prosobanchia:Pleuroceridae) - a study using dual-labeled epilithon. Journal of the North American Benthological Society 19(2): 289-297.

Mirarchi, R.E., J.T. Garner, M.F. Mettee, P.E. O'Neil, eds. 2004. Alabama wildlife. Volume 2. Imperiled aquatic mollusks and fishes. The University of Alabama Press, Tuscaloosa, AL. 255 pp.

O'Neil, P.E., and T.E. Shepard. 2001. Water-quality assessment of the Locust Fork watershed, Alabama. Geological Survey of Alabama. 33 pp.

Pierson, J.M., 2006. A report on the habitat and distribution of the rough hornsnail, black mudalia and interrupted rocksnail in Alabama. Report to US Fish and Wildlife Service, Jackson, MS. 14 pp.

Pierson, M. 2006. Population densities of black mudalia are much higher in the Blackburn Fork than at other locations. Malcolm Pierson, Alabama Power Company, conversation with Paul Hartfield, U.S. Fish and Wildlife Service, Jackson, MS.

Pierson, M. 2006. M. Pierson Field notes from select sites in the Black Warrior Basin. Malcolm Pierson,

Alabama Power Company.

Shepard, T.E., P.E. O'Neil, S.W. McGregor, and M.F. Mettee. 2004. Biomonitoring in the Locust Fork watershed, 1997-98. Geological Survey of Alabama Bulletin 175. 61 pp.

Stein, C.B. 1976. Gastropods. Pp. 21-41. In: H. Boschung, (Ed.) Endangered and threatened species of Alabama. Bulletin Alabama Museum of Natural History, No. 2.

Turgeon, D.D., A.E. Bogan, E.V. Coan, W.K. Emerson, W.G. Lyons, W.L. Pratt, C.F.E. Roper, A. Scheltema, F.G. Thompson, and J.D. Williams. 1988. Common and Scientific names of aquatic invertebrates from the United States and Canada: Mollusks. American Fisheries Society Special Publication 16. American Fisheries Society, Bethesda, Maryland. 277 pp.

Turgeon, D. D., J. F. Quinn Jr., A. E. Bogan, E. V. Coan, F. G. Hochberg, W. G. Lyons, P. M. Mikkelsen, R. J. Neves, C. F. E. Roper, G. Rosenberg, B. Roth, A. Schletema, F. G. Thompson, M. Vecchione, & G. D. Williams. 1998. Common and scientific names of aquatic invertebrates from the United States and Canada: Mollusks (2nd edition). American Fisheries Society Special Publication 26. 526 pp.

Upper Black Warrior Technical Task Force. 1991. Upper Black Warrior water quality improvement plan. USDA Soil Conservation Service. 34 pp.

Waters, Thomas F. 1995. Sediment in streams: sources, biological effects and control. American Fisheries Society Monograph 7. 251 pp.

Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

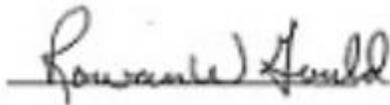
Approve:



06/12/2012

Date

Concur:



11/06/2012

Date

Did not concur: _____

_____ Date

Director's Remarks: