



DEPARTMENT OF THE ARMY  
MOBILE DISTRICT, CORPS OF ENGINEERS  
P.O. BOX 2288  
MOBILE, ALABAMA 36628-0001

August 30, 2007

REPLY TO  
ATTENTION OF:

Inland Environment Team  
Planning and Environmental Division

Ms. Gail Carmody  
Field Supervisor  
U.S. Fish and Wildlife Service  
1601 Balboa Avenue  
Panama City, Florida 32405-3721

Dear Ms. Carmody:

On September 5, 2006 the U.S. Fish and Wildlife Service (USFWS) issued a Biological Opinion (BO) and Conference Report for the Jim Woodruff Dam Interim Operations Plan (IOP), pursuant to Section 7 of the Endangered Species Act (ESA). This letter transmits our sediment transport and channel stability evaluation and listed mussel monitoring plan in accordance with Reasonable and Prudent Measure No. 4 (RPM4) and Reasonable and Prudent Measure No. 5 (RPM5) of the BO. RPM4 is intended to improve our understanding of the channel morphology and the dynamic nature of the Apalachicola River as it relates to potential for impacts to listed mussel habitat. RPM5 includes a requirement to evaluate ways to minimize take of listed mussels by studying the distribution and abundance of the listed mussels in the action area. The specific terms and conditions for the two RPMs are included in Enclosure 1.

The BO specifies March 30, 2007 as the date for completion of both the RPM4 and RPM5 actions. By letter dated March 30, 2007 (Enclosure 2), your office agreed to extend the completion date to August 30, 2007 and requested a work schedule for completing the two RPMs. In addition, you requested that we initiate mussel sampling this summer as part of and in support of the mussel monitoring plan. In our letter dated May 11, 2007 (Enclosure 3) we provided the requested information and agreed to initiate a mussel sampling effort this summer. The following describes our actions with regards to RPM4 and RPM5.

**Reasonable and Prudent Measure No. 4**

RPM4 requires an evaluation of the sediment dynamics and channel morphology trends on the Apalachicola River in order to improve our understanding of dynamic conditions and monitor the zone at which take may occur, and to identify possible alternatives to minimize effects to listed mussels in vulnerable locations. The Terms and Conditions of the BO specify that Mobile District and USFWS will consult with experts, jointly identified by both agencies, to assist in identifying the current status of sediment transport and channel stability in the Apalachicola River as it relates to the distribution of listed mussels and their vulnerability to low-flow conditions. The goals of the evaluation are to identify: 1) feasible water and/or habitat management actions that would minimize listed mussel mortality; 2) current patterns and trends

in morphological changes; and, 3) additional information needed, if any, to predict morphological changes that may affect the listed mussels. This evaluation is to be based on available information and tools and best professional judgment.

As a result of previous discussions at our October 2006 and March 2007 semi-annual meetings, we mutually identified three specialists with specific river sediment transport and morphology expertise (Mr. Kirk Vincent, geomorphologist from Department of Interior; Dr. David Biedenharn, sediment transport specialist formerly from the U.S. Army Corps of Engineers Engineering Research Development Center (ERDC), and Dr. Michael Harvey, geomorphologist from the private sector). Additionally, Dr. Andrew Miller, a malacologist formerly from ERDC, with extensive experience regarding freshwater mussels in the Apalachicola River and other large river systems was also identified for participation in this effort. On April 9, 2007, Mobile District and USFWS conducted a teleconference with the potential specialists to determine their availability and willingness to assist in this effort, and to outline the evaluation goals and expectations. Mr. Vincent indicated that he would not be available to participate, but that he could provide comment and review as time allowed. A copy of this letter will be provided to Mr. Vincent for review. All the other specialists were available for the evaluation and their services were procured by Mobile District. Following the teleconference, specific background information was provided to the river specialists to familiarize them with the Apalachicola River and the data available.

We held an initial meeting with Mr. Jerry Ziewitz of your staff and the river and mussel specialists in June 2007, which included a two-day reconnaissance field visit to the Apalachicola River. The field trip consisted of a visual inspection of the entire river from the dam down to the mouth and included numerous stops to more closely investigate sediment sources, potential mussel habitat, and known mortality sites from 2006. During the trip Dr. Miller and Mr. Ziewitz described mussel life history and habitat requirements to the river specialists, and led tours of sites known to provide relatively high, moderate, and low mussel densities. A considerable amount of time was spent discussing the "preferred habitat" at various scales (macro, meso, micro, as well as temporal). A follow-on workshop was held in August 2007, and the individual river specialists shared with both our agencies their observations regarding changes in the river sedimentation and morphology, and opinions regarding any patterns or trends in these processes. Dr. Miller and additional mussel experts from ERDC (Mr. Mark Farr and Mr. Mark Antwine), also provided insight into mussel habitat requirement and mussel responses to predicted or observed riverine sediment or morphological changes. The Memorandum for Record (MFR) for this workshop is provided in Enclosure 4.

Based on review of existing information, the reconnaissance field trip, presentations and discussions at the August workshop, and the summary of findings reports prepared by the river specialists and malacologist, we believe the current version of the IOP adequately meets the intended goal of minimizing or avoiding adverse impacts or providing support to listed species occurring in the Apalachicola River. As documented in the BO, the flow regime in the Apalachicola River has not been changed significantly between the pre- and post- dam periods. The river appears to be in a relatively stable dynamic equilibrium. The morphology of the river could have been impacted over time by land use changes, upstream impoundments and consumptive use of water, and tectonic movement, as well as channel alterations, meander

cutoffs, and channel dredging and snagging operations. Obvious channel degradation impacts are noted below Jim Woodruff Lock and Dam immediately after construction. However, these impacts appear to be reduced through time. Data from the Blountstown and Wewahitchka gages downstream of the dam indicate that there was a small change in low flow water surface elevations at those sites in response to Jim Woodruff construction, but the changes appear to have stabilized. Field observations and data analysis by the river specialists suggests that the river is not continuing to degrade and that it may have attained a state of relative equilibrium. This is consistent with the findings of Light et al. (2006) who concluded that channel conditions had been relatively stable for the past ten year period (1995-2004). Although a large portion of the middle river (River Mile (RM) 78 to RM 35) is very sinuous and actively meandering, maximum erosion rates on the outside of the bends in this reach are low compared to other large alluvial rivers and appear to be part of the natural down-valley meander migration which is common to most meandering streams. This does not appear to be the result of continuing post-dam system-wide adjustment such as degradation, aggradation, or channel widening. It appears unlikely that erosion rates will increase over time unless there are significant changes of the flow regime or reduction in sediment supply. Additional studies that further investigate the river widening phenomenon reported by the USGS based on comparative treeline analysis and sediment budget for the river could provide additional insight into whether or not the river has achieved a somewhat dynamic equilibrium. These studies might include development of a one-dimensional sediment continuity model for the river. Perhaps more importantly, additional studies could also be conducted to better understand the spatial and temporal relationships between the meander dynamics of the river and the formation and maintenance of high quality mussel habitat. A two-dimensional hydrodynamic model could be developed for specific sites. A recommendation for this type of study has been incorporated (Phase III) into the proposed mussel monitoring plan described below.

#### **Reasonable and Prudent Measure No. 5**

RPM5 requires monitoring of the level of take associated with the IOP and an evaluation of ways to minimize take by studying the distribution and abundance of the listed mussels in the action area. Information from the monitoring of mussel distribution and degree of vulnerability over time will be used to prepare biological assessments for future consultations related to water management operations. The goals of the mussel monitoring plan are to 1) periodically estimate total abundance of listed mussels in the action area; and 2) determine the fraction of the population that is located in habitats that are vulnerable to low-flow impacts. Mobile District collaborated with Dr. Miller and mussel specialists at ERDC in the development of a long-term mussel monitoring plan. As mutually agreed in our March 1, 2007 semi-annual meeting, we integrated the efforts for development of this plan with the observations and evaluations presented by the above sediment/morphology river specialists. Therefore, the mussel specialists were included in the river field inspection and follow-on workshop. Your letter extending the due date for development of the mussel monitoring plan also requested that additional mussel sampling of the distribution of mussels in potentially vulnerable areas be conducted this spring or summer, and that information from the mussel sampling effort be used to assist in developing a more comprehensive monitoring plan.

On May 31, 2007, representatives from your office, the Corps, Florida Fish and Wildlife Conservation Commission (FWCC), and Dr. Drew Miller conducted a field investigation to develop a survey methodology that would support improving our understanding of *Amblema neislerii* densities in areas potentially vulnerable to stranding during low flow conditions similar to those experienced in the summer of 2006. The field trip included inspections of areas of known mussel populations, areas where mussel stranding occurred in 2006, and previously unknown areas that supported the following identified mussel habitat conditions: moderately depositional, low to moderate slope towards thalweg (10 – 20 degrees), silty-sand substrate, and relatively new willow growth. All the areas visited that supported this habitat characteristic were observed to also support *A. neislerii*. During the trip it was agreed that the sampling data to be collected should support an estimate of the density of *A. neislerii* at the sites and that the methods should be repeatable at different flows and locations.

The mussel sampling survey took place on July 7-11, 2007 and focused on habitats occurring between RM 40 and RM 50 on the main channel of the Apalachicola River. The USFWS identified 25 study areas along the river which either supported, or appeared likely to support *A. neislerii*. Ten sites were randomly selected by the USFWS for detailed quantitative study and additional qualitative studies were conducted at the remaining sites. The purpose of the study was to collect information on density and relative species abundance of *A. neislerii* at sites that appeared to provide appropriate water depth, velocity, and substratum. In addition, the study was done to provide information that would be used to prepare a long-term mussel monitoring plan for the river. A detailed description of the sampling methodology, results, and proposed monitoring plan are provided in Enclosure 5. Based upon qualitative sampling, *A. neislerii* were found at 23 of the 25 areas between RM 40 and RM 50. *A. neislerii* were observed at all 10 of the sites where detailed studies occurred and this species comprised nearly 37 percent of the total mussel fauna. Furthermore, approximately 30 percent of the quadrats (n=180) had at least one individual *A. neislerii* present. There was also evidence of strong recent recruitment.

The results of this and previous surveys suggest that high density, recruiting populations of *A. neislerii* exist in the Apalachicola River and probably always have. Although a few specimens can generally be found in most any aquatic habitat, this species reaches its greatest numerical abundance in habitats with similar meso- and micro-scale hydraulic characteristics. On the Apalachicola River these characteristics include flow separation zones (eddies) at higher flows. These eddy zones result in moderately depositional sites generally occurring on the inside of river bends immediately downstream of point bars. These areas further concentrate fine-grained sediments, organic matter, and if present, glochidia larvae of the mussels. The locations of these types of habitat are likely to change through time and space as the river bends migrate laterally and downriver through the floodplain.

Because of recent low water in 2006, mussel mortality was observed at the mouths of sloughs and in associated swales along the margins of the main channel. Based on the analysis provided by the river specialists and the investigations of these areas during 2007 it appears that most of these “vulnerable” sites are becoming terrestrial habitat due to natural river meandering processes such as erosion and sedimentation. Although mussel habitat is lost during this process,

new habitat is generally being created simultaneously, resulting in no net loss of habitat. Mussel mortality has likely always occurred due to this phenomenon and it appears that this species is adapted quite well to recovering from these events as they occur in the Apalachicola River. These mussels represent a dynamic population in a dynamic system and it is important to manage for the whole population and not just individuals. We acknowledge that isolated areas of mortality can and do occur, but based on the channel morphology evaluation and mussel density data it appears that these may not be adverse to the population as a whole. However, additional surveys and studies are needed to more confidently understand the effects of these mortality events on the overall mussel populations. Additional information on channel sedimentation and river morphological changes can also assist in determining whether these trends are increasing or decreasing from historical patterns.

A three-phase monitoring plan has been developed in accordance with the requirements of RPM5 based on the results of mussel surveys and the sediment dynamics and channel morphology evaluations. The purpose of the monitoring plan is to provide a reliable estimate of the total abundance of listed mussels in the action area and determine the fraction of the population that is located in habitats that are vulnerable to low flow. Although numerous mussel studies have been conducted on the Apalachicola River by various groups, this proposed monitoring plan would be the first comprehensive study designed to document overall numbers of federally-protected species (within specified confidence limits); and intensively study biotic and physical processes at selected locations. The three proposed study phases include:

- 1) Describe the location and areal extent of mussel habitats that are particularly vulnerable to low flow and/or channel migration;
- 2) Estimate the total abundance of federally-protected mussels in the action area utilizing a stratified random sampling technique, and
- 3) Investigate the relationship between mussel abundance and distribution to geomorphic processes at specific sites in the Apalachicola River.

The purpose of the first phase will be to determine if the surface area of vulnerable habitats represents a substantial portion of aquatic habitats that support *A. neislerii*. This information can then be combined with the data collected during the second phase in order to estimate the portion of the population located in vulnerable habitats. The purpose of the second phase is to provide an overall estimate of the total number and distribution of federally-protected mussels in the action area. This study will also demonstrate which meso- and micro-scale habitats support the highest abundances of listed mussels and might therefore warrant additional protection. The purpose of the final phase is to more thoroughly understand biotic and physical processes at three or more high-quality mussel beds in the Apalachicola River. This study will be used to understand the effects of dynamic riverine processes (sedimentation, benthic scour, channel migration) on the long-term survival of mussel populations. All of these studies will ultimately assist planners in determining feasible water and/or habitat actions that minimize listed mussel mortality. A general description of the three phases of this plan is also provided in Enclosure 5. Upon approval of the general plan and the availability of funds, a detailed study plan for these three phases would be developed in late 2007- early 2008 that will specify the number and location of study sites and number of samples to be collected at each site (based on desired precision). The final plan would be coordinated with the USFWS and FWCC to maximize the conservation value of our collective efforts, and avoid unnecessary duplication of effort where possible. The first and second phase studies would begin in 2008 dependent on availability of funds.

The enclosed MFR of the workshop, associated summary of finding documents and presentations, and the mussel survey report and proposed mussel monitoring plan are submitted pursuant to the requirements of Section 7 of the ESA and in accordance with the terms and conditions of the BO. We believe that this sediment dynamics and channel morphology evaluation meets the requirements of RPM4 by: 1) demonstrating that the current IOP minimizes listed mussel mortality to the extent practicable and that additional water and/or habitat management actions are not required at this time based on our current knowledge; 2) describing the current patterns and trends in morphological changes; and, 3) identifying additional studies that could be conducted in order to predict how and to what degree morphological changes affect listed mussels in the action area. We believe the mussel survey report and proposed mussel monitoring plan meet the requirements of RPM5 by providing a feasible plan to monitor listed mussels in the action area and specifically provide a reliable estimate of total abundance of listed mussels and the fraction of the population that occurs in habitats vulnerable to low-flow impacts. Your approval of the general mussel monitoring plan described is hereby requested. As you are aware, the BO recognizes that certain studies and other outreach programs in the RPMs and conservation measures are subject to the availability of funds from the Congress. We will continue to exercise our best efforts to secure funds for these activities. We look forward to discussing these studies and possible implementation schedules with you at the upcoming semi-annual meeting.

A significant amount of time and resources was dedicated by both of our agencies to conduct the sediment dynamics and channel morphology evaluation and to develop the mussel monitoring plan. We especially appreciate the efforts of Mr. Ziewitz, Ms. Karen Herrington, and Ms. Sandra Pursifull to assist our biologists and mussel specialists during development and execution of this summer's mussel sampling effort. I am forwarding a copy of this letter to the following, Mr. Mike Harvey, Mr. David Biedenharn, Mr. Drew Miller, Mr. Jerry Ziewitz, Mr. Kirk Vincent, Mr. Barry Payne and Mr. Mark Farr.

If you have any further questions or comments regarding our operations under the Jim Woodruff Dam IOP and our efforts to minimize or avoid impacts to the listed species on the Apalachicola River, please feel free to contact Ms. Joanne Brandt, (251) 690-3260, Email: [joanne.u.brandt@sam.usace.army.mil](mailto:joanne.u.brandt@sam.usace.army.mil); or Mr. Brian Zettle, (251) 690-2115, Email: [brian.a.zettle@sam.usace.army.mil](mailto:brian.a.zettle@sam.usace.army.mil).

Sincerely,



Curtis M. Flakes  
Chief, Planning and Environmental  
Division

Enclosures