BIOLOGICAL OPINION

Effects of the
West Hickory and Mill Village Bridge Replacements
over the Allegheny River and French Creek
on the Clubshell and Northern Riffleshell

Forest and Erie Counties,
Pennsylvania

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U.S. Fish and Wildlife Service
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CONSULTATION HISTORY

West Hickory Bridge Replacement; S.R. 0127, Section B00

On March 1, 1994, the Fish and Wildlife Service responded to a February 1, 1994, list request from the Pennsylvania Department of Transportation (PennDOT), who represented the Federal Highway Administration (FHWA) on this and other occasions, by indicating that the clubshell and northern riffleshell may be present in the proposed project area. The Service recommended a survey for these species, and requested additional project information. On March 11, 1994, PennDOT provided the requested project information, including any alternatives under consideration. The Service provided specific recommendations for conducting the species survey on May 5, 1994. PennDOT's agent, Aquatic Systems Corporation, conducted a mussel survey of the project area between August 28 and September 4, 1996. PennDOT supplied a draft of the Aquatic Systems survey results on December 6, 1996; the results confirmed the presence of both clubshell and northern riffleshell in the project area. The Service provided comments on the mussel survey report on December 11, 1997, noted a lack of population density estimates, and provided recommendations to avoid and minimize adverse affects. The Service offered to meet to discuss project alternatives, and advised that if adverse effects could not be avoided, formal consultation would be necessary.

On September 17, 1998, the Service provided PennDOT, via facsimile, additional comments on the mussel survey report, based on new information from similar bridge projects. The Service recommended that PennDOT enlist the Biological Resources Division (BRD) of the U.S. Geological Survey to implement a statistically valid sampling protocol at the West Hickory Bridge site. Information gained from this effort would assist the FHWA and PennDOT in preparing a biological assessment; identify areas of mussel concentration; assist the Service in preparing a valid biological opinion; and aid project proponents (FHWA, PennDOT, and their agents) and the Service in devising measures to reduce take during project implementation.

On November 20, 1998, PennDOT provided the Service with a *Construction Options Evaluation Report* detailing three project alternatives under consideration, and dismissing the existing alignment alternative because of the need for a detour. On December 9, 1998, a meeting was held with project proponents, the Service, and the Pennsylvania Fish and Boat Commission (Commission) to discuss the *Construction Options Evaluation Report*. During that meeting, PennDOT indicated their preference for the downstream alignment, and the Service advised further evaluation to determine and reduce the extent of anticipated take resulting from the preferred alignment. The Service provided written comments to PennDOT based on discussions at the December 9 meeting, again recommending measures to reduce take, including the use of temporary bridges in the construction causeway, rather than a traditional causeway. The Service received an *Addendum to the Construction Options Evaluation Report* on January 1, 1999, and a follow-up meeting of the project proponents, the Service, and the Commission was held on January 8, 1999. Additional revisions to the project plan, dated January 7, 1999, were provided at that time indicating that the causeway width would have to increase from 12 to 30 feet if

bridges were incorporated in the causeway design. PennDOT suggested that flow-through culverts be used instead of temporary bridges in the construction causeway. The Service recommended additional evaluation of methods to reduce the causeway footprint, and a hydrologic analysis of causeway effects based on mean high water discharge rates rather than extreme high discharge events. PennDOT determined that additional reduction of the area of direct effects would be explored in the biological assessment, including an assessment of the feasibility of using sheet-piling around the piers to reduce the causeway area, and an analysis of vibration effects on the river bed during pile-driving operations.

During a May 6, 1999, meeting with the Service, PennDOT confirmed that the Hydraulic and Hydrological analysis requested by the Service on January 1, 1999, would be provided in the biological assessment and that the preferred alternative (D-shifted) would be 50 feet downstream of the existing bridge and take two years to complete. During the meeting of January 8, 1999, PennDOT agreed to provide additional mussel survey results within 60 days of initiation of formal consultation, along with the additional information requested by the Service. Information provided within this timeframe would be considered in the biological opinion. On May 25, 1999, the Service contacted PennDOT to clarify project construction details, and to again recommend use of temporary bridges to minimize direct adverse effects on the clubshell and northern riffleshell. The Service also reiterated the need for additional hydrological analysis at appropriate flows in the biological assessment.

On July 7, 1999, the Service received FHWA's July 2, 1999, request for initiation of formal consultation, accompanied by a May 1999 biological assessment. The Service acknowledged receipt of the formal consultation initiation package on September 2, 1999, stating that the package was complete except for the mussel sampling results, which should be received within 60 days of initiation to avoid a timeline delay. The additional mussel survey results were provided on September 22, 1999. These results concluded that there are 51,875 mussels in the area of anticipated direct project effects, including 9173 northern riffleshells and 7010 clubshells. On October 6, 1999, the Service requested a 15-day extension of the formal consultation period, with a revised conclusion date of December 6, 1999. During an October 20, 1999, meeting, FHWA and PennDOT verbally agreed to the extension. On October 27, 1999, FHWA agreed to the extension in writing.

On October 1, 1999, PennDOT proposed to conduct geotechnical drilling at nine locations within the project area on October 4, 1999. Although geotechnical drilling could have been incorporated into the project biological assessment and considered in the opinion, PennDOT desired to conduct the drilling in the fall, prior to their anticipated receipt of the opinion. During an October 22, 1999, meeting, the Service indicated that due to the potential take associated with drilling, either formal consultation or the adoption of avoidance measures would be necessary, depending on survey results at the drill locations. PennDOT agreed to implement avoidance measures, request formal consultation through FHWA, or request an extension of the formal consultation period. On October 26, 1999, FHWA and PennDOT informed the Service via telephone that they would not seek to extend formal consultation.

During the October 20, 1999, meeting, the Service alerted the project proponents that, based on the best available scientific and commercial data available, the preferred alternative would probably jeopardize the continued existence of the northern riffleshell and clubshell. The Service offered to work with PennDOT and FHWA to develop Reasonable and Prudent Alternatives (RPA) to avoid jeopardy (*e.g.*, no-build, or build at the proposed location with no construction causeway). This would require a significant reduction in direct and indirect adverse effects to reduce take. On November 15, 1999, FHWA and the Service met to discuss the draft biological opinion, and in a November 19, 1999, letter, FHWA requested that formal consultation be discontinued until alternate bridge locations and construction methods could be reviewed.

The project was again discussed in an October 29, 2002, teleconference with PennDOT, the Service, and the Commission regarding design studies and a revised preferred alternative described in *Project Update Report – October 21, 2002*.

On May 17, 2004, we received a request (dated May 11, 2004), from FHWA to initiate formal consultation on replacement of the West Hickory Bridge. On June 14, 2004, we sent a letter to the FHWA acknowledging initiation of formal consultation, and indicating that we would provide FHWA with our biological opinion by September 28, 2004. During a July 27, 2004, meeting with project proponents to discuss mussel salvage options, we suggested that the West Hickory consultation be combined (batched) with the Mill Village formal consultation due to similar timelines, species effects, and issues. Combining these projects was verbally agreed to during that meeting and confirmed in an August 12, 2004, letter, wherein FHWA and PennDOT proposed to salvage as many mussels as feasible from the footprint of the causeway and cofferdams, and relocate these animals to suitable habitat. On September 8, 2004, a meeting was held to discuss monitoring of the mussel community following construction. On September 9, 2004, we responded to FHWA's August 12 letter, indicating that the Service would provide FHWA with its biological opinion by October 28, 2004. The final biological opinion was completed and delivered to FHWA on October 28, 2004.

<u>Mill Village Bridge Replacement; S.R. 0006, Section B02</u>

On April 5, 2002, the Service responded to PennDOT's list request by indicating that the clubshell and northern riffleshell may be present in the proposed project area. We also indicated that two mussel species of concern, the rayed bean (*Villosa fabalis)* and snuffbox (*Epioblasma triquetra*) may also be present. The rayed bean has since been listed as a federal candidate species (*Federal Register* 2004).

The Service recommended a survey for these species, and conducted a June 13, 2002, field view to verify the need for a survey. In response to this recommendation, EnviroScience was enlisted to conduct a species survey of the project area between July 8 and July 18, 2002. The results of this survey were provided to the Service on November 21, 2002. The survey report documented

the presence of the above four species, provided population estimates within the project area, and delineated the distribution of the mussel community.

On April 24, 2003, the Service attended a field meeting to discuss this and other projects over French Creek and the Allegheny River in PennDOT District 1-0. In a September 18, 2003, letter the Service recommended avoidance and minimization measures for the proposed bridge crossing. The preferred project demolition and construction methods, and additional avoidance and minimization measures, were the subject of a March 16, 2004, teleconference between project proponents, the Service and the Commission.

On July 6, 2004, the Service received a July 1, 2004, letter from FHWA requesting initiation of formal consultation for the Mill Village Bridge replacement project, which was expected to adversely affect both clubshell and northern riffleshell. We responded to FHWA's July 1 and August 12, 2004, letters on September 9, 2004, agreeing to combine this formal consultation with the West Hickory project, and indicating that the Service would provide FHWA with its batched biological opinion by October 28, 2004. The final biological opinion was completed on October 28, 2004, and delivered to FHWA.

BIOLOGICAL OPINION

This biological opinion is based on information provided in the following documents: *A Survey of Freshwater Mussel Populations at the West Hickory Bridge on the Allegheny River, M.P. 158.9, S.R. 0127, Section B00, Forest County, Pennsylvania* (USGS 1999); *Biological Assessment, Forest County, Harmony and Hickory Townships, S.R. 0127, Section B00, West Hickory Bridge* (Skelly and Loy 2004); *Mill Village Truss Bridge Replacement, Biological Assessment/Freshwater Mussel Population Survey, French Creek, Erie County, Pennsylvania, July 8- July 18, 2002* (EnviroScience 2002); *Biological Assessment, Mill Village Truss Bridge Replacement Project, S. R. 6 (Section B02) over French Creek, LeBoeuf Township, Erie County, PA* (Michael Baker 2004*); Clubshell* (*Pleurobema clava) and Northern riffleshell* (*Epioblasma torulosa rangiana) Recovery Plan* (U.S. Fish and Wildlife Service 1994); and other information available in Service files. A complete administrative record of this consultation is on file at the Pennsylvania Field Office.

DESCRIPTION OF THE PROPOSED ACTION

As defined in 50 CFR 402.02, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States. The "action area" is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. The direct and indirect effects of the actions and activities must be considered in conjunction with the effects of other past and present

federal, State, or private activities within the action area, as well as cumulative effects of reasonably certain future State or private activities that are reasonably certain to occur within the action area.

This biological opinion evaluates two proposed bridge replacement projects currently under consideration by the FHWA and PennDOT, the West Hickory Bridge replacement and the Mill Village Truss Bridge replacement. This opinion addresses those actions for which the Service believes adverse affects may occur. In their biological assessments, FHWA and PennDOT outlined those activities that would adversely affect the clubshell and northern riffleshell. The following opinion addresses whether implementation of the projects is likely or not likely to jeopardize the continued existence of these two species.

For the purpose of this biological opinion, the action area associated with the West Hickory Bridge replacement project includes the Allegheny River extending from 400 feet (122 meters) upstream to 400 feet (122 meters) downstream of the causeway, as well as those portions of the river bank that will be affected by construction and demolition activities. The action area associated with the Mill Village Truss Bridge replacement project includes French Creek extending from 165 feet (50 meters) upstream to 165 feet (50 meters) downstream of the existing bridge, as well as those portions of the river bank that will be affected by construction and demolition activities. In the case of both projects, the action area is the area within which project-associated environmental effects (*e.g.*, earth disturbance, erosion, siltation, scouring, and causeway-induced pooling) are anticipated to occur.

West Hickory Bridge Replacement; S.R. 0127, Section B00

The following project and project area descriptions are summarized from FHWA and PennDOT District 1-0's March 2004, *Biological Assessment, Forest County, Harmony and Hickory Townships, State Route 0127, Section B00, West Hickory*. An August 12, 2004, letter from FHWA amended the project description to include mussel salvage efforts to reduce take.

Project Area

The West Hickory Bridge connects the village of West Hickory (population 206) in Hickory Township (on the western side of the Allegheny River), to Harmony Township and S.R. 62, the major north/south route along the eastern side of the river in Forest County, Pennsylvania. Forest County is largely forested but, as is the case in the project area, sparsely populated with residences and summer cottages.

The Allegheny River flows southward through the project area. At the existing bridge, the river is about 623 feet wide and generally less than three feet deep. More than 86 miles of the middle Allegheny River was designated as Wild and Scenic on April 20, 1992, including the area from Kinzua Dam to the S.R. 62 Bridge (National Park Service 2004). Kinzua Dam is a large flood control structure located upstream in Warren County; it affects river flow at West Hickory. The Allegheny River in this area has relatively high water quality, and supports an abundant and

diverse aquatic community, including sport and nongame fish (including State-listed, threatened and endangered species).

Project Description

The proposed project involves construction of a new bridge on State Route 0127 over the Allegheny River at West Hickory, and subsequent demolition of the existing S.R. 0127 bridge. The existing four-span iron truss West Hickory Bridge was built in 1896, although the cut stone masonry abutments and piers predate the truss. The bridge is reported to be in an advanced stage of deterioration and in need of extensive repairs, as well as being functionally obsolete due to weight restrictions and its single-lane width. The bridge replacement is proposed to: 1) meet the local transportation need for access to West Hickory and western areas; 2) preclude the need to close the bridge to traffic (the estimated life of the bridge is 3 to 5 years); and 3) remove the existing structure to avoid a future structural failure and collapse of the deteriorating bridge into the Allegheny River.

The new bridge will be approximately 43 feet (13 meters) south of the existing bridge. The construction sequence calls for traffic to be maintained on the existing bridge until the replacement bridge is completed. Construction of the new bridge would occur from an in-stream causeway during the first construction season. Bridge demolition is proposed to occur after traffic is directed onto the new structure during the second construction season. Demolition will occur in part from the new bridge to avoid the need for a causeway during the second construction season. In-stream activity during the second year will be limited to pier removal, which will occur from inside shallow cofferdams. Mussel salvage is proposed from the areas anticipated to be directly affected by construction and demolition activities (Figure 1). The project description below is based on a preliminary bridge design, project schedule, and generalized implementation plan. Final project designs, and detailed pollution prevention and erosion and sedimentation control plans, are proposed to occur later.

The proposed bridge will be 760 feet long (between abutment bearings) and 34 feet wide. The continuous steel girder structure will have two lanes and consist of three spans (approximately 210 feet, 320 feet, and 230 feet, respectively) supported by two in-stream piers. The piers will be wall-type structures typically used for river crossings, and measure approximately 35 feet long by 2.5 feet wide; pier footings will be 37 feet long and 15 feet wide. The new piers will be aligned with the existing piers to reduce the potential hydrological alteration of river flow patterns, reduce scour potential, and minimize in-stream disturbance areas. Additional geotechnical boring investigations may be needed to finalize pier placement and design.

Bridge and in-stream pier construction is proposed to occur from causeway work platforms constructed from each shoreline and connected by temporary bridges. Causeway work platforms will be used only during the first year of construction; they will be installed in mid-May, with scheduled removal occurring in early November of the same year. Pier construction will be done behind cofferdams constructed of sheet piling driven to below the foundation depth and

supported during de-watering. Bridge approaches will be realigned and widened to better access the new bridge, and the S.R. 0127 and S.R. 62 intersection.

The proposed bridge will have grades of 1.82 percent to the west of the high point (located approximately 335 feet from the western abutment), and 3.40 percent sloping to the east end of the bridge. Runoff will flow from the high point of the deck to each end of the bridge. The proposed bridge deck drainage system will consist of scuppers near the ends of the bridge on both sides of the roadway to intercept drainage prior to reaching the deck joints. Run-off from the scuppers will be carried through a piping system and discharged to level stone mats in front of the abutments on top of the river banks. In addition to the scuppers, bridge drainage will be collected at the ends of the bridge by deck joints with tooth dams and drainage troughs. From there, water will be collected in drain pipes and discharged onto stone mats, grassed swales, or similar areas that allow drainage to infiltrate into the ground away from the river.

No additional in-stream causeways are proposed for demolition and removal of the existing bridge. The existing bridge trusses and upper sections of the piers will be removed using the new bridge as a work platform. The lower portions of the piers will removed from behind shallow de-watered cofferdams to accommodate the use of jackhammers and cutting torches. The area of streambed disturbance is expected to extend up to 12 feet beyond each of the three existing pier footings. Cofferdams will be constructed of pre-cast barriers with waterproof fabric, water-filled barriers, portadams, or sheet-piling driven into the streambed (not preferred), depending on the material that will accommodate work options most efficiently, and with the shortest duration. Pier removal is proposed to occur to a depth of two feet below the existing stream bed, with debris being lifted to the new bridge for transport off-site. FHWA and PennDOT propose that the holes formed by removal of the pier footings be allowed to refill with streambed material through natural bed transport.

For both the construction and demolition phases of the project, an erosion and sedimentation control plan will be developed and submitted to the Forest County Conservation District for review and approval. Erosion and sedimentation control measures will be monitored during construction and bridge demolition. Similarly, contingency plans for rapid response or remediation of impacts from unexpected events in the construction area (*e.g.*, floods, fuel spills, and siltation) will be submitted to the Service and Commission for review and comment. During construction, PennDOT will provide an inspector proficient in erosion and sedimentation control; preparedness, prevention, and contingency plan implementation; and other environmental issues related to bridge and roadway construction. This inspector will be on-site daily when the site is not stabilized, and will supplement, not replace, inspections carried out by the contractor(s). All sites will be stabilized during winter or non-construction seasons. Provisions for monitoring un-stabilized areas will be provided for by PennDOT or its contractor.

Figure 1. West Hickory Bridge (S.R. 0127, Section B00) showing proposed causeway design and predicted surface concentration of mussels. (Figure copied from the biological assessment of the Mill Village Truss Bridge replacement project, March 2004).

Cleaning of the bridge deck, drainage structures, and horizontal surfaces is proposed as maintenance. Periodic use of de-icing materials will be necessary to maintain a safe roadway during the winter months. In Forest County, salt brine/sodium chloride is used exclusively. Channel clearing and repair of scour protection will be performed on an as-needed basis, but the scope and timing of these activities is not described in the BA. Bridge maintenance procedures are outlined in PennDOT Publication 55, Bridge Maintenance Manual. The biological assessment states that bridge maintenance and operations are not funded by the federal government, although some of the possible maintenance activities may require a federal authorization (*e.g.*, Clean Water Act permit).

Conservation Measures

Conservation measures represent actions pledged in the project description that the action agency or the applicant will implement to further the species' recovery. Such measures may be tasks recommended in the species' recovery plan, should be closely related to the action, and should be achievable within the authority of the action agency or applicant. The beneficial effects of conservation measures are taken into consideration in the Service's conclusion of jeopardy or non-jeopardy to the listed species, and in the analysis of incidental take. Such measures, however, must minimize adverse effects to listed species within the action area in order to be factored into the Service's analyses.

The following conservation measures have been incorporated into the project description for the West Hickory Bridge replacement project; these measures are designed specifically to avoid and minimize impacts of the proposed action on northern riffleshell and clubshell mussels. The Service has analyzed the effects of the proposed action based on the assumption that all conservation measures will be implemented. More detailed descriptions of these conservation measures are provided in the biological assessment (in part, on page 23 and in the March 2004 Addendum).

On-site Measures:

1. Inform contractors of the presence of endangered mussels in the project area and the special provisions that must be implemented.

2. Delineate direct and indirect impact areas to ensure that only planned activities occur in each area, and to facilitate proposed salvage and monitoring efforts.

3. Avoid impacts outside the construction footprint when performing geotechnical drilling.

4. Minimize use of rock fills and causeway areas through the use of temporary bridges in the causeway. In addition, use gabion baskets to support the sides of the causeway and retain fill; use clean rock fill for the causeway; and completely remove gabions and rock fill following completion of the new bridge.

5. Complete in-stream causeway work in a one-year time frame to minimize disruption of mussel and host fish reproductive success in multiple years. The causeway will be in place for only one construction season.

6. Use only two in-stream piers, which will be aligned with two of the existing piers to minimize changes in river flow patterns, reduce scour potential, and minimize in-stream work areas.

7. Direct runoff from the bridge deck to discharge onto level stone mats in front of the abutments, grassed swales, or similar areas, rather than directly to the Allegheny River. This will reduce the likelihood of roadway contaminants and any accidental spills of hazardous materials from reaching the Allegheny River.

8. Remove the existing bridge trusses from the newly constructed bridge deck. This will avoid in-stream impacts that would have resulted from collapse of the existing bridge, or a drop-and-remove demolition method.

9. Remove the existing piers to below streambed level and allow natural bed material to refill these areas as potential habitat for clubshell and northern riffleshell.

10. Re-vegetate all disturbed areas to limit sediment entering the Allegheny River.

11. Implement pollution prevention and control measures during construction to reduce the potential for hazardous spills entering the Allegheny River. This will include the placement of refueling staging areas, fuel storage, and hazardous materials away from the Allegheny River, as described in the biological opinion for the Kennerdell Bridge Replacement project (USFWS 1998). The pollution prevention plan will be provided to the Service to ensure that the resulting effects are consistent with those considered in this biological opinion.

12. Develop and implement plans for Erosion and Sedimentation Control and Pollution Prevention, utilizing best management practices in accordance with the PADEP Chapter 102 ESPC Manual. The E&S Plan will be reviewed and approved by the Forest County Conservation District. Visual inspections of the project area will be done daily to identify scour and siltation problems. The E&S Plan will be provided to the Service to ensure that the resulting effects are consistent with those considered in this biological opinion.

13. Decontaminate construction equipment that will enter the water to prevent accidental introduction of exotic species (*i.e.*, zebra mussels). Contractors will be required to document the 'exotic free' condition of equipment, as described in the biological opinion for the Kennerdell Bridge Replacement project (USFWS 1998).

14. Salvage as many mussels as feasible from the direct impact area of the causeway and cofferdams (anticipated effort two to three weeks).

15. Monitor re-colonization of the areas subject to direct adverse effects once between three and five years following the final construction season.

Off-site Measures:

1. Relocate salvaged mussels within the Allegheny River and/or collaborate with other agencies to find and move mussels to alternate sites or propagation facilities to benefit species recovery.

Mill Village Bridge Replacement; S.R. 0006, Section B02

The following project and project area descriptions are summarized from FHWA and PennDOT District 1-0's April 2004, *Biological Assessment, Mill Village Truss Bridge Replacement Project, S.R. 6 (Section B02) over French Creek, LeBoeuf Township, Erie County*.

Project Area

The Mill Village Bridge over French Creek on State Route 6 is near the interaction of S.R. 19 and S.R. 6 in LeBoeuf Township, Erie County, Pennsylvania. French Creek flows southward through the proposed project area, and at the existing bridge, the creek is about 110 feet wide and generally less than three feet deep. Union City Reservoir is a flood control structure located upstream in Erie County, and has a large effect on stream discharge at Mill Village. French Creek is the most diverse stream in Pennsylvania in terms of aquatic species diversity, and is the focus of several conservation initiatives directed at maintaining habitat and water quality throughout the watershed.

Project Description

The existing two-lane Mill Village Bridge was built in 1928, and consists of two span lengths of 33 feet and 153 feet. The bridge is reported to be in a stage of deterioration and a functionally obsolete condition. A new bridge has been proposed that will be on the same alignment as is the existing bridge. This will be a single-span, 160-foot long structure with a 40-foot wide deck. The new bridge will not require an in-stream pier, but will be placed on new pier-like abutments located above the 'ordinary high water level of French Creek'.

The existing Mill Village Bridge will be demolished by controlled dropping of the structure into French Creek, and subsequent removal through the selective picking, cutting, and lifting the truss members (Figure 2). Demolition and removal is expected to take three to four days. Prior to dropping the bridge, deck materials and concrete barriers will be removed, as will steel support members as feasible. The bridge will be dropped during normal flow periods in French Creek, not to exceed 1160 cubic feet per second (cfs). Prior to demolition, a mussel salvage is proposed in the anticipated 307 m^2 (3304 square foot) drop area of the bridge.

The new bridge will be completed without in-stream (wetted channel) disturbance or fill in French Creek. Removal of the existing abutments, and the abutment footer on the eastern side of

the creek, and construction of the new pier-like structures, will be above the normal high water level. Abutments will be constructed behind cofferdams, and water entering the project area will be treated before being discharged to French Creek. The bridge superstructure will be either steel or concrete, but will not require in-stream access to complete.

Bridge deck drainage will be directed from the high side of the bridge to drainage inlets that will outlet either behind or through the proposed wing walls to upland areas with rock protection. On the low side of the bridge, scuppers will intercept deck drainage prior to it crossing the deck joints. The downspouts will outlet to upland locations with splash blocks and/or stone protection. Storm water from the roadway approaches will follow the existing drainage patterns to the roadway shoulders.

For both the demolition and construction phases of the project, an approved erosion and sedimentation control plan will be developed and submitted to the Erie County Conservation District for review and approval. Similarly, contingency plans will be developed for rapid response or remediation of impacts from unexpected events in the construction area (*e.g.*, floods, fuel spills, and siltation). Hazardous materials and refueling areas will be located at least 150 feet from French Creek. The Erosion and Sedimentation Control Plan and the Pollution Prevention Plan will be made available to the Service for review.

Conservation Measures

The following conservation measures have been incorporated into the project description for the Mill Village Truss Bridge replacement project. These measures are designed specifically to avoid and minimize impacts of the proposed action on northern riffleshell and clubshell mussels. The Service has analyzed the effects of the proposed action based on the assumption that all conservation measures will be implemented. More detailed descriptions of conservation measures are provided in the biological assessment (in part, on pages 13 and 14).

On-site Measures:

1. Complete bridge demolition as expeditiously as possible during low flow conditions in French Creek (less than 1160 cfs). Demolition will take an estimated three to four days.

2. Implement pollution prevention and control measures during construction to reduce the potential for hazardous spills from entering French Creek. This will include placement of refueling areas, fuel storage, and hazardous materials at least 150 feet from French Creek. The Plan will be developed following PennDOT and Pennsylvania Department of Environmental Protection guidelines, and will be available for the Service to review.

3. Develop an Erosion and Sedimentation Control Plan to address, among other issues, treatment of dewatering return water to French Creek. The Plan will be available for the Service to review.

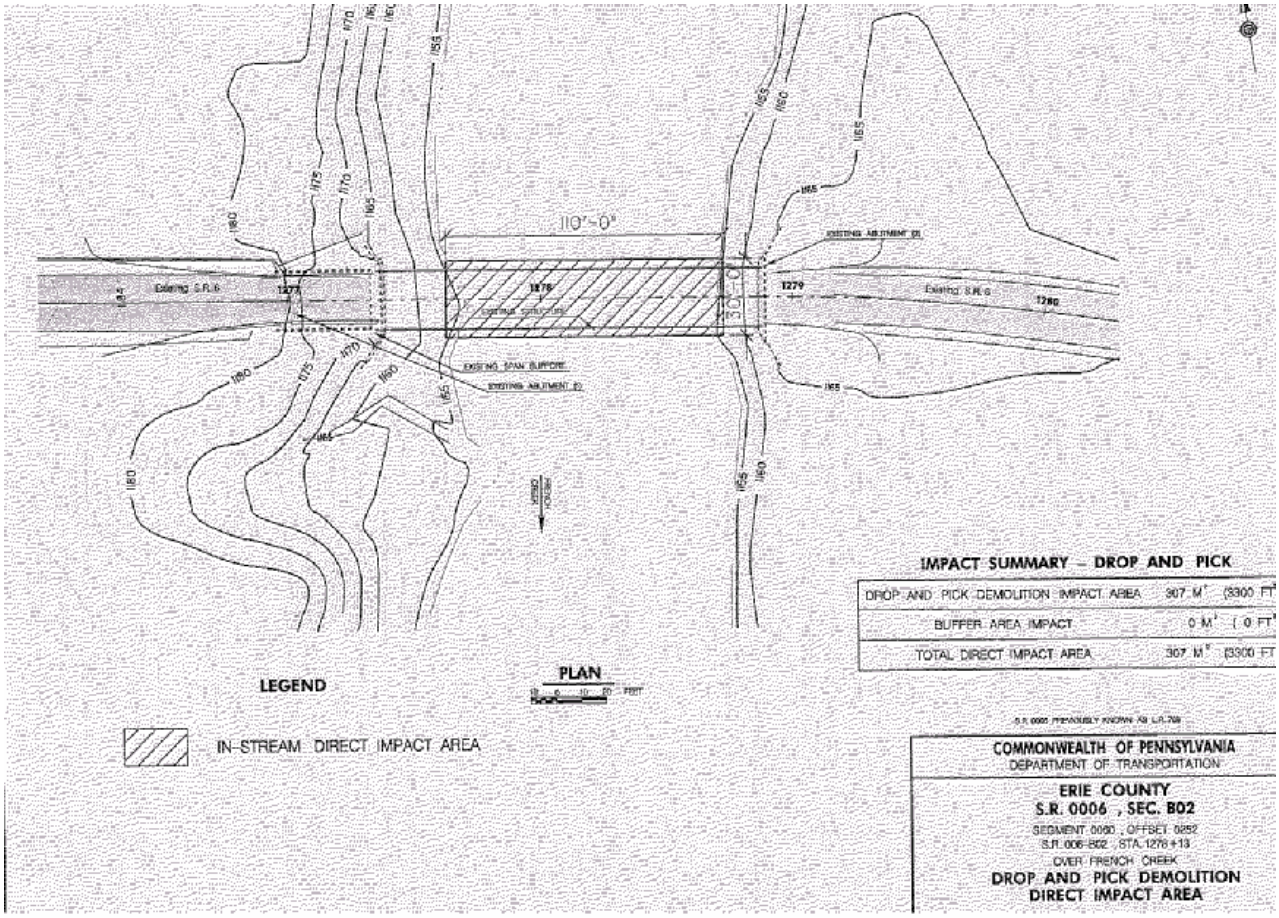

Figure 2. Mill Village Truss Bridge replacement project (S.R. 0127, Section B00) showing the expected fall area of the existing bridge (figure copied from the biological assessment for the Mill Village Truss Bridge replacement project, March 2004).

4. Salvage as many mussels as feasible from the expected bridge fall area prior to bridge demolition (anticipated effort one week).

Off-site Measures:

1. Relocate salvaged mussels to suitable sites within French Creek.

STATUS OF THE SPECIES

Northern Riffleshell

Species Description

The northern riffleshell is a small to medium-size mussel, up to three inches long. The shell exterior is brownish-yellow to yellowish-green with fine green rays. The shell interior is typically white. The species is sexually dimorphic; male shells are irregular ovate in outline, with a wide shallow sulcus just anterior to the posterior ridge. Female shells are obovate in outline, and greatly expanded post-ventrally.

According to Williams *et al.* (1993), the genus *Epioblasma* is among the most diverse of the Unionidae in North America, with 25 recognized taxa. This genus once ranged from the St. Lawrence River system to the Mobile River system, principally in larger rivers. All but one species in this genus are either thought to be extinct or are listed as endangered species under the federal Endangered Species Act. The northern riffleshell's two sibling species, the tubercled blossom (*E. torulosa torulosa*) and green blossom (*E. torulosa gubernaculum*), have not been seen alive or freshly dead in recent decades, and may be extinct.

Life History

No detailed life history studies of the northern riffleshell have been completed, but its life history probably follows that of closely related species, such as the tan riffleshell (*Epioblasma florentina walkeri*), which has been the subject of detailed study by Rogers *et al.* (2001).

The adult northern riffleshell is a sedentary filter feeder, obtaining oxygen and food directly from the water column or from water flowing through the substrate (interstitial flow). The breeding season appears to be initiated by seasonal changes, such as changes in water temperature. Females hold unfertilized eggs in water tubes within a specialized marsupial region of the gill. In the related tan riffleshell, males release sperm into the water in August and September, and downstream females uptake the sperm with incoming water (Rodgers *et al.* 2001). The eggs are then fertilized in the water tubes within the marsupium, where they are held until the following summer. The expanded shell shape of the female riffleshell results from shell growth around the expanded marsupial gill region.

The fertilized eggs develop into minute bivalve larvae, or glochidia, which are unique to freshwater mussels (Parmalee and Bogan 1998). While in the marsupium, developing glochidia are exposed to the adult's circulatory fluid, but not directly to the water column (Gardiner *et al.* 1991, Richard *et al.* 1991). Northern riffleshell glochidia are obligate parasites on fish. From May to September, gravid females of this species expose a brilliant white mantel margin to attract host fishes. Glochidia are discharged primarily in May and June, and become encysted on a suitable host fish where they transform into juvenile mussels over a period of days to weeks. The transformed young then fall from the host fish and burrow into the substrate. Unlike the adults, which are filter feeders, juveniles are relatively mobile and appear to be pedial feeders, sifting food items from sediments with hair-like structures (cilia) arranged on their foot.

The northern riffleshell is a long-term breeder (bradytictic), with fertilization in the late summer and glochidial release the following spring or summer (Ortmann 1919). Individuals within a population exhibit a range of behaviors, and may release glochidia from spring through late summer.

Host suitability studies have identified the host fish of the northern riffleshell as the banded darter *(Etheostoma zonale*), bluebreast darter (*E. camurum*), brown trout (*Salmo trutta*), and banded sculpin (*Cottus carolinae*). Some of these species (brown trout and banded sculpin) are not native within the extant range of this species. These studies did not test all of the fish species that are native to the range of the northern riffleshell; therefore, it is likely that additional host species can be used by northern riffleshell glochidia.

Habitat

The northern riffleshell occurs in clean, packed, coarse sand and gravel in riffles and runs of small and large streams (Stansbery *et al.* 1982, Watters 1990). The common name 'riffleshell' implies habitat often associated with the genus, although several species, including the northern riffleshell, frequently occur in relatively slow flowing and deep runs. It is not clear if specimens living in more typical riffle areas can adapt to slower water should conditions change. Use of low flow areas may also be limited in more turbid waters were concomitant silt deposition may limit survival or successful reproduction. Northern riffleshells bury themselves to the posterior margin of the shell, although females may be more exposed, especially during the breeding season (U.S. Fish and Wildlife Service 1994). The tan riffleshell populations in Virginia are not visible on the substrate surface from November through January (Rogers *et al.* 2001), and northern riffleshells also appear to undergo a seasonal vertical migration (Anderson 2000).

Population Dynamics

Riffleshells appear to have a relatively short life-span for a freshwater mussel. Sexual maturity can be reached in as little as three years, and most individuals probably live for only eight to 15 years (Rodgers *et al.* 2001). Like other mussels, the northern riffleshell probably experiences very low annual juvenile survival. The combination of short life span and low fecundity indicates that populations depend on a large annual cohort resulting from a large population (Musick 1999). Species following this reproductive strategy are susceptible to loss of individuals from predation and stochastic events, and are slow to recover from such losses (Rodgers *et al.* 2001), but may be well suited to exploit dynamic micro-habitat shifts characteristic of free-flowing rivers.

The northern riffleshell is now sparsely distributed within a highly restricted range, although population numbers may be high in localized areas. As stated above, large populations appear to be necessary for the long-term conservation of this species; below this level, mortality exceeds reproductive potential and the population may crash.

Threats

The northern riffleshell is subjected to many of the same threats as are other aquatic species. Pollution from municipal, agricultural, and industrial sources has reduced or eliminated mussel populations directly, as well as indirectly through elimination of host fish, resulting in reproductive failures (U.S. Fish and Wildlife Service 1994). Increases in turbidity and suspended sediments are detrimental in that they decrease the depth and amount of light penetration, affect primary productivity, decrease oxygen levels, increase water temperature, irritate or cause clogging of gills, and result in a blanket of silt on the substrate. Northern riffleshells may be directly affected by siltation through smothering. High turbidity may interfere with sight lures, such as conglutinates, which attract host fish. Siltation also affects mussels by smothering eggs or larvae of the fish host populations and by reducing food availability. Siltation also fills interstitial spaces, eliminating spawning habitat critical to the survival of young fish and juvenile mussels. Altered hydrologic regimes resulting from land-clearing, mining, agriculture, urbanization, and channelization were probably responsible for many of the population losses observed (U.S. Fish and Wildlife Service 1994). Point and non-point source pollution and acid mine drainage probably contributed to the species decline in various portions of its range.

The zebra mussel (*Dreissena polymorpha*) is a highly invasive bivalve native to Europe and western Asia, but accidentally introduced to Lake Erie around 1985 via release of trans-Atlantic ship ballast water. The species has since spread through much of the eastern United States. Zebra mussels can quickly reach enormous population densities that compete for food, oxygen, and space with native mussels, including the northern riffleshell. Zebra mussels produce byssal threads able to firmly attach to many substrates. When zebra mussels attach to native mussels, they can cause mortality of native mussels by preventing them from closing, preventing them from borrowing, and increasing drag to the point that they are scoured from the substrate. Unlike native mussels, zebra mussels do not require a host fish to reproduce. Their planktonic young appear to be relatively intolerant of turbulent free-flowing streams, and may require greater dissolved calcium concentrations than native mussels. Zebra mussels have not become established in all habitats to which they have been introduced, including some currently occupied by northern riffleshell.

Other introduced exotic species now present in the historic range of the northern riffleshell may present a threat should they expand in range or increase in abundance in waters supporting the northern riffleshell. This includes two exotic bivalves, the quagga mussel (*Dreissena bugensis),* and Asiatic clam *(Corbicula fluminea*), and two invasive exotic fish, the round goby *(Neogobius melanostomus)* and black carp *(Mylopharyngodon piceus),* both of which are molluscivores.

Status and Distribution

Historically, the northern riffleshell was relatively common and appears to have been a highly successful species occupying a range of riverine habitats throughout the Ohio River basin and into Michigan and Ontario tributaries of Lake Erie, Lake St. Clair, and the Detroit and St. Clair Rivers

(U.S. Fish and Wildlife Service 1994). The northern riffleshell has suffered a range reduction of over 95 percent. As a result, it was listed as endangered, without critical habitat, in 1993. Of 54 streams once known to be occupied by this species, six still support populations of the northern riffleshell, and only three of these show evidence of reproduction -- two in the Allegheny River system (Allegheny River and French Creek, Pennsylvania), and one in the Sydenham River (Ontario, Canada).

In 1992, a population of the northern riffleshell in the Detroit River in Michigan was threatened by invasion of the exotic zebra mussel (*Dreissena polymorpha*). Divers collected 30 to 40 individuals, which were relocated to the St. Clair River in Michigan. About a dozen individuals were kept in captivity. Populations of northern riffleshell in the St. Clair and Detroit Rivers appear to have been extirpated by zebra mussels (M. DeCapita, USFWS, personal communication 2002). Table 1 lists the known locations and status of remaining northern riffleshell populations.

In the Allegheny River, northern riffleshells are distributed over 66 miles of river (C. Bier, WPAC, *in litt.*, 6 January 1994; in U.S. Fish and Wildlife Service 1994). The species has been documented to occur in good numbers at several locations in the Allegheny River, but its distribution is discontinuous (*i.e.*, localized to areas of suitable habitat) and the condition of these populations ranges from those exhibiting successful reproduction, to those with apparently depressed vigor and a predominance of older adults (USGS 2004). The most upstream location that northern riffleshells have been found alive in recent years is near the City of Warren, Pennsylvania (EnviroScience 2002). The Allegheny River in Warren is strongly influenced by hypolimentic releases from Kinzua Dam, and this population appears to be dependent on warmer, more nutrient-rich water coming from Conewango Creek, which confluences with the Allegheny River immediately upstream of the habitat supporting this species.

Northern riffleshells appear to become a frequent member of the mussel community of the Allegheny River about nine miles below Warren, with peak densities documented near the Forest and Venango County line. There, northern riffleshells are the dominant mussel species with a mean density of 7.57 individuals/m^2, and an estimated population of 169,622 individuals in a 100-meter wide cross-section of the Allegheny River (USGS 2002). Compared to the West Hickory bridge site, where the mean density in 1999 was estimated to be 0.5/m^2 (USGS 2004), northern riffleshells have been found to be more abundant both upstream and downstream, with a mean density of 1.8/m^2 at five sites quantitatively sampled between Tidioute and Tionesta. During the 2000 mussel survey conducted for the West Hickory Bridge project, approximately 42,758 and 42,650 northern riffleshell were estimated to occur in 100-meter wide river sections located 200 and 300 meters downstream of the existing bridge (USGS 2000). Northern riffleshell populations are known from scattered locations in the middle Allegheny River (*e.g.*, near the towns of Kennerdell, Foxburg, Oil City, Parker, East Brady, and downstream to river mile 58) where northern riffleshell population densities are generally less than 0.1/m^2.

The Northern riffleshell population is discontinuously distributed in the lower reaches of French Creek, from its confluence with the Allegheny River at Franklin, upstream to the vicinity of the State Route 6 Bridge at Mill Village. Within this reach, northern riffleshells range from relatively common, to rare or absent at sites that have otherwise diverse mussel communities. For example, of 31 sites investigated along the length of French Creek in 2003, northern riffleshells were documented to occur in nine of the lower 21 sites surveyed. These nine sites had mussel diversity

Table 1. The present range of the northern rifflesheIl has been reduced to the following streams; however, occupied stream reaches are generally restricted to a few miles or less.

Basin	Sub-Basin	Stream	State/ Canadian Province	Range	Status[1]
Lake Erie (St. Lawrence River system)	Detroit River	Detroit River	Mich./Ontario		unknown; possibly extirpated by zebra mussels
	St. Joseph River	Fish Creek	Ohio	~2 miles	rare; possibly extirpated by a 1995 oil spill
	Sydenham River	East Sydenham River	Ontario	lower reaches	present; reproducing
Ohio River	Green River	Green River	**Ky.**	Hart and Edmonson Counties	rare; unknown (only freshly dead shells have been found)
	Scioto River	Big Darby Creek	**Ohio**	15-20 mile reach	rare; unknown reproductive status
	Allegheny River	Allegheny River	Pa.	scattered over 66 miles	present; reproducing
		French Creek	Pa.	Erie, Crawford, and Venango Counties	present; reproducing
	Kanawha River	Elk River	W. Va.	Clay County	rare; only 2 live young animals have been found in recent years

[1] A status of "rare" indicates that less than ten individual living or recently dead specimens have been observed in recent years in that water body.

of between six and 19 species, although they were often separated by apparently equally diverse sites, with up to 15 species, but excluding northern riffleshells (Tamara Smith, Western Pennsylvania Conservancy, personal communication).

Zebra mussels, as noted above, appear to have eliminated northern riffleshells in Lake Erie and the Detroit River. The zebra mussel was documented to be in French Creek in 2002, but is not known to occur in the free-flowing portion of the Allegheny River at this time. Zebra mussel populations are known from the Allegheny River basin at Edinboro Lake and the lower navigation channel of the Allegheny River.

Several federal actions have taken place in Pennsylvania which have adversely affected the northern riffleshell, and for which incidental take has been estimated (Table 2).

Table 2. Previous biological opinions authorizing incidental take of the northern riffleshell

Project Name, State	**Estimated Incidental Take**	**Year**	**Monitoring Report Received**	**Monitoring Report Citation**	**Project Status**
Kennerdell Bridge, Pa.	875	1998	YES	U.S. Geological Survey (2002)	Complete
Utica Bridge, Pa.	389	1998	YES	U.S. Geological Survey (2002)	Complete
Foxburg Bridge, Pa.	65	2001	NO	-	Pending
Forest Plan - Allegheny National Forest, Pa.	unquantified	2001	NO	-	Ongoing
Sugar Creek Pipeline, Pa.	20	2002	NO	-	Pending
East Brady Bridge, Pa.	76	2002	NO	-	Pending
Warren St. Bridge, Pa.	57	2003	NO	-	Active

Clubshell

Species Description

The clubshell is a small to medium-size mussel, up to three inches long. The shell exterior is yellow to brown with bright green blotchy rays. The shell interior is typically white. The shell is wedge-shaped and solid, with a pointed and fairly high umbo. This species does not have sexually dimorphic shells.

Life History

Many aspects of the life history of this rare mussel are not known, but its life history probably follows that of closely related species. The adult clubshell is a sedentary filter feeder, obtaining oxygen and food (most likely algae and detritus with associated fungi and bacteria) directly from the water column or from water flowing through the substrate (interstitial flow**).** The breeding season appears to be initiated by seasonal changes, such as water temperature. Females hold unfertilized eggs in water tubes within specialized regions of the gills called marsupia. Males of the genus *Pleurobema* release sperm into the water in April, May and June, and downstream females uptake the sperm with incoming water (Weaver *et al.* 1991). The eggs are then fertilized in the water tubes within the marsupium.

The fertilized eggs develop into minute bivalve larvae, or glochidia, which are discharged into the water column in June and July (Ortmann 1919). Clubshell glochidia are obligate parasites on fish gills, a possible adaptation for upstream dispersal of a relatively immobile organism living in flowing water, and which would otherwise be flushed from the river system over time. Not all fish species are suitable hosts. The striped shiner (*Notropis chrysocephalus*), central stoneroller (*Campostoma anomalum*), blackside darter (*Percina maculata*), and logperch (*Percina caprodes*) were capable of serving as hosts for the clubshell under laboratory conditions (Watters 1996, Watters and O'Dee 1997, O'Dee and Watters 2000). It is likely that additional untested fish species can be used by clubshell glochidia in the wild.

As a sessile animal, the clubshell must lure a host fish to ingest the glochidia, which are bound together in a mucus matrix called a conglutinate. This structure mimics fish prey items, and often contains a high proportion of unfertilized eggs to make it more palatable. The gills and mouth of the host fish become infested when the fish attempts to eat the conglutinate (U.S. Fish and Wildlife Service 1994). The glochidia quickly become encysted on a suitable host fish and transform into juvenile mussels over a period of days to weeks. The transformed young fall from the host fish and burrow into the substrate. Unlike the adults, which are filter feeders, juveniles are relatively mobile and appear to be pedial feeders, sifting food items from sediments with hair-like structures (cilia) arranged on their foot.

Habitat

The clubshell mussel occupies a variety of stream and river conditions, but is typically associated with clean, stable, coarse sand and gravel runs, often just downstream of riffle areas, in medium to small rivers and streams (Stansbery *et al.* 1982). It typically burrows completely beneath the substrate to a depth of two to four inches, relying on water to percolate between the sediment

particles (Watters 1990). More than 50 percent of a population may be hidden below the substrate surface (Smith *et al.* 2001). As a fluvial organism, the clubshell can tolerate a range of water velocities annually, but appears to be intolerant of permanently slack water conditions (U.S. Fish and Wildlife Service 1994).

Population Dynamics

The clubshell likely reaches sexual maturity between three and five years (Weaver 1991) and has a life span of 20 years or more. The clubshell is long-lived, and annually has low juvenile survival rates. This species, like many mussels, is susceptible to permanent, temporary, and intermittent forms of environmental degradation. Reduced populations may take several decades to recover, even if no further degradation occurs.

Threats

Few mussel species have declined as drastically in numbers as the clubshell. There is probably no single causative factor, but the decline is attributed to physical loss of habitat and degraded water quality resulting from impoundment, altered hydrologic regimes, point and non-point source pollution, agricultural effects, streambank clearing, coal mining, and urbanization (U.S. Fish and Wildlife Service 1994). The clubshell's apparent preference for smaller particle-size substrates that are relatively free of fine particulates (which would block interstitial flow) may also be a factor. Pockets of stable sand and small gravel substrates naturally occur in many streams; however, these areas may be more susceptible to deposition when sediment input is increased. Further, this substrate type may be more susceptible to scour resulting from more rapid precipitation runoff after land-clearing. Most of the remaining populations occur downstream of glacial lakes and reservoirs that reduce silt loads to the receiving stream, and buffer hydrologic changes resulting from land-clearing.

Pollution from municipal, agricultural, and industrial waste discharges has reduced or eliminated mussel populations directly, as well as indirectly through elimination of host fish, resulting in reproductive failures (U.S. Fish and Wildlife Service 1994). Increases in turbidity and suspended sediments are detrimental in that they decrease the depth and amount of light penetration, affect primary productivity, decrease oxygen levels, increase water temperature, irritate or cause clogging of gills, and result in a blanket of silt on the substrate. Clubshells may be directly affected by siltation through smothering. High turbidity may interfere with sight lures, such as conglutinates, which attract host fish. Siltation also affects mussels by smothering eggs or larvae of the fish host populations and by reducing food availability. Siltation also fills interstitial spaces, thus eliminating spawning habitat and habitat critical to the survival of young fish and juvenile mussels.

The invasive zebra mussel also poses a severe threat to the clubshell, through competition for space, food, and survival of glochidia. Zebra mussels are now present in several headwater lakes and reservoirs upstream from extant clubshell populations.

Status and Distribution

The clubshell was listed as endangered, without critical habitat, in 1993. Historically, the clubshell was once abundant, and appears to have been a highly successful species occupying a range of

Table 3. Clubshell populations are presently known to occur (or appear to be extant) in the following streams.

Basin	Sub-Basin	Stream	State	Approximate Range	Status[1]
Lake Erie (St. Lawrence River system)	St. Joseph River	St. Joseph River	Ohio	1 site	fresh-dead shell found
		East Fork of the West Branch of the St. Joseph River	Mich.	scattered over a 10- mile reach	present; reproductive status unknown
		West Branch of the St. Joseph River	Ohio	not reported	present; reproductive status unknown
		Fish Creek	Ohio	7-mile reach	rare (1995 oil spill over entire known population); status unknown
Ohio River	Tippecanoe River	Tippecanoe River	Ind.	scattered over 150 miles	present; reproducing (ESI 1993); zebra mussels in Lake Tippecanoe and other tributary lakes
	Green River	Green River	Ky.	Hart and Taylor Counties	rare; only fresh-dead shells found
	Scioto River	Little Darby Creek	Ohio	12-mile reach	present; reproducing (in metropolitan Columbus Area)
	Beaver River	Pymatuning Creek	Ohio	10 individuals at four sites	rare; no reproduction noted
		Shenango River	Pa.	2 sites	present; reproducing
	Muskingum River	Walhonding River	Ohio	not reported	rare; reproductive status unknown

Basin	Sub-Basin	Stream	State	Approximate Range	Status[1]
Ohio River (Continued)	Allegheny River	Allegheny River	Pa.	scattered over 66 miles	present; reproducing
		Conneaut Outlet	Pa.	500-foot reach	rare; no reproduction (3 live individuals found in 2002)
		Conneauttee Creek	Pa.	1 site	rare; no reproduction
		French Creek	Pa.	scattered--Erie, Venango, & Crawford Co.	present; reproducing
		LeBoeuf Creek	Pa.	3-mile reach	present; reproducing
		Muddy Creek	Pa.	1 site	rare; unknown
	Kanawha River	Elk River	W. Va.	Braxton and Clay Counties	present; reproducing
	Monongahela River	Hackers Creek	W. Va.	100-yard reach	rare; reproductive status unknown
		Meathouse Fork	W. Va.	not reported	rare; reproducing

[1] A status of “rare” indicates that less than ten individual living or recently dead specimens have been observed in recent years in that water body.

riverine habitats throughout the Ohio River basin and tributaries of western Lake Erie (Stansbery *et al.* l982). It has been documented in over 100 streams throughout its range, although it now appears to be limited to only 19 streams (Watters 1988). Table 3 lists the known locations and status of remaining clubshell populations.

The clubshell shows evidence of recent reproductive success in less than half of the streams it occupies. In addition, few extant clubshell populations occupy habitats that are protected from the threats affecting this species. The clubshell often shares habitat with the northern riffleshell in Pennsylvania, but is extant in more streams, particularly those of smaller drainages than typically used by northern riffleshell.

The Tippecanoe River in Indiana, and the Allegheny River and its tributaries, most notably French Creek, in Pennsylvania, support most of the remaining clubshells. Few clubshell populations appear to be stable, and population numbers are typically lower than those of the northern riffleshell, even within the Allegheny and Tippecanoe River watersheds were the species is known to be reproducing. In the mainstem of the Allegheny River and French Creek, the clubshell is locally abundant in some locations, but it appears to have a more restricted distribution in both streams than the northern riffleshell.

In the Allegheny River, the clubshell is absent from many mussel beds supporting apparently healthy mussel communities that include the northern riffleshell, and absent from some superficially suitable habitat between Tidioute and Tionesta (USGS 2004). Clubshells are have not been found alive in the Allegheny River closer than about 16 miles downstream of Warren. Clubshells reach their maximum known population densities (5.86 individuals/m^2) near the Forest and Venango County line, where an estimated 125,423 clubshells occur in a 100-meter wide cross-section of the river. However, the mean density at five qualitatively sampled sites between Tidioute and Tionesta is 0.23/m^2, somewhat less than the 0.377/m^2 estimated in the vicinity of the West Hickory Bridge (USGS 1999, 2004). The West Hickory Bridge site supports the fourth most abundant population of clubshells documented (USGS 2004). Approximately 10,080 and 3025 clubshells were estimated to occur in 100-meter wide river sections located 200 and 300 meters downstream of the existing West Hickory Bridge (USGS 2000). Clubshell populations are known from scattered locations in the middle Allegheny River (*e.g.*, near the towns of Kennerdell, Foxburg, Oil City, Parker and East Brady), downstream to river mile 58, which includes the two upper navigation pools. In many of these locations, mussel population data are based solely on qualitative surveys, and clubshells appear to be relatively less abundant than the other more common species with which it co-occurs in the Allegheny River (*e.g.*, muckets (*Actinonaias ligamentina*) and spikes (*Elliptio dilatata*)).

The clubshell population in French Creek appears to be restricted to the area upstream of Cambridge Springs; it is distributed primarily between the LeBoeuf Creek confluence and the Muddy Creek confluence (Tamara Smith, Western Pennsylvania Conservancy, personal communication). This species has also been documented to persist in several French Creek tributaries, including LeBoeuf Creek, Conneauttee Creek, Muddy Creek, and, in the lower portion of the French Creek watershed, Conneaut Outlet. Documentation of these tributary populations is often based on small numbers of individuals in highly restricted reaches of these streams. In the French Creek watershed, the clubshell populations have a relatively small range that has little overlap with that of the northern riffleshell. Threats to the clubshell population in the French Creek

watershed include water quality degradation (particularly in small tributaries that have limited dilution capability to assimilate sewage, agricultural runoff, and other pollutants); hydrologic and water quality alteration resulting from operation of the Union City Reservoir; and the risk of zebra mussel infestation. Zebra mussels have been documented in French Creek itself and in Edinboro Lake, a natural headwater lake. Numerous other lakes and reservoirs in the French Creek watershed could support zebra mussels, supplying a source for veligers (larva) to colonize downstream reaches, or resulting in increased use of molluscides to treat zebra mussel infestations in the watershed.

Several federal actions have taken place or are proposed that have adversely affected the clubshell, and for which incidental take has been estimated (Table 4).

Table 4. Previous biological opinions authorizing incidental take of the clubshell mussel

Project Name, State	**Estimated Incidental Take**	**Year**	**Monitoring Report Received**	**CITATION**	**Project Status**
Kennerdell Bridge, Pa.	208	1998	YES	U.S. Geological Survey (2002)	Complete
Bicycle Bridge, In.	50	1998	NO	-	Complete
East Brady Bridge, Pa.	12	2002	NO	-	Ongoing
Forest Plan - Allegheny National Forest, Pa.	unquantified	1999	NO	-	Ongoing
Leiter Ford Bridge, In.	2	2004	NO	-	Ongoing

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR §402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation, and the impacts of State and private actions that are contemporaneous with the consultation in progress.

Status of Species within the West Hickory Bridge Replacement Action Area

Between July 12 and 15, 1999, a freshwater mussel survey was conducted in the Allegheny River from 100 meters upstream to 200 meters downstream of the existing West Hickory Bridge (USGS 1999). This 56,250 m^2 study area was divided into twenty-four, 50- by 50-meter cells, encompassing the anticipated direct and indirect effect area of the proposed action. Each cell was qualitatively searched. Total search time for all cells combined was approximately 100 hours.

Shoreline middens were also searched for evidence of additional mussel species in the project area. Quantitative surveys were conducted between 50 meters upstream and downstream of the centerline of the existing bridge. A total of 562, 0.25-square meter quadrats were searched.

A total of 9341 individual mussels were located during qualitative searches, representing 17 species, including the clubshell and northern riffleshell. Based on the results of the quantitative survey, there were an estimated 51,875 mussels of all species within 50 meters (upstream and downstream) of the existing bridge. An estimated 9173 northern riffleshells (95 percent CI: 7897 to 10,654) and 7010 clubshells (95 percent CI: 5946 to 8263) occur within this same area. Population densities of the clubshell and northern riffleshell were estimated to be $0.377/m^2$ and $0.493/m^2$, respectively.

Based on qualitative observations, it appears that mussel population densities increase between 50 and 200 meters downstream of the bridge, in the area of expected indirect adverse effects. The lowest concentration of mussels in the area of expected direct effects appears to be located about 50 meters below the existing bridge, extending 50 to 100 meters from the right descending bank.

Status of Species within the Mill Village Bridge Replacement Action Area

A freshwater mussel survey was conducted in French Creek between July 8 and July 18, 2002, from 100 meters upstream to 400 meters downstream of the Mill Village Truss Bridge. This area was divided into 67 cells of approximately 225 m^2 each, encompassing the anticipated direct and indirect effect area of the proposed action. Each cell was qualitatively searched by at least two individuals using SCUBA gear for a minimum of 30 minutes. This resulted in approximately 7.5 percent of each cell being searched. Shoreline middens were also searched for evidence of additional mussel species in the project area. Quantitative surveys were conducted between 50 meters upstream and downstream of the centerline of the existing bridge. A total of 587, 0.25-square meter quadrats were searched.

A total of 1587 mussels of 22 species were located, including the clubshell and northern riffleshell. The greatest mussel concentration appears to be located between 50 and 100 meters downstream of the existing bridge. In the immediate vicinity of the bridge (*i.e.*, 50 meters upstream to 100 meters downstream), clubshell and northern riffleshell densities were estimated to be $0.2/m^2$ and $0.03/m^2$, respectively. It is estimated that 1040 clubshells (90 percent CI: 662 to 1636) and 149 northern riffleshells (90 percent CI: 51 to 435) occur in the immediate vicinity of the bridge. Northern riffleshells were not found during the qualitative sampling effort, and those individuals located in quantitative surveys were deeply buried.

The rayed bean, a federal candidate species, was also found during the survey. The presence of between 937 to 1371 rayed bean mussels (density $0.9/m^2$) in the project area is notable, since this species may be listed as threatened or endangered in the future. Because the rayed bean currently receives no regulatory protection under the Act, the effect of the proposed action on this species will not be considered in this opinion.

The snuffbox (*Epioblasma triquetra*) and rabbitsfoot (*Quadrula cylindrica cylindrica*) were also located during the survey. The Service is currently conducting a status review of both species, which appear to be under threat and in decline.

EFFECTS OF THE ACTION

"Effects of the action" refers to the direct and indirect effects of an action on listed species or critical habitat, together with the effects of other activities interrelated and interdependent with that action, which will be added to the environmental baseline. In contrast with the project biological assessments, which describe indirect effects as those occurring in a buffer around the direct effect area, indirect effects in the Endangered Species Act are defined as those caused by the proposed action and are later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

Direct Effects

"Direct effects are the immediate effects of the project on the species or its habitat. Direct effects result from the agency action and include the effects of interrelated and interdependent actions. Future Federal actions that are not a direct effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated" (USFWS and NMFS 1998).

West Hickory Bridge Replacement

At the West Hickory Bridge, the zone within which direct effects are expected to occur extends from 50 meters upstream to 50 meters downstream of the existing bridge (totaling 18,600 m^2), where an estimated 9173 northern riffleshells and 7010 clubshells occur. Within this zone, direct adverse effects resulting from bridge demolition and construction will occur in the following in-stream areas: 1) the footprint of the causeway; 2) the footprint of the new piers (permanent habitat loss); 3) areas adjacent to the existing piers and new piers, including those areas within and adjacent to cofferdams; 4) areas adjacent to the causeway; 5) areas subjected to siltation or scouring resulting from bridge construction and demolition activities (*e.g.*, gaps in the causeway); and 6) areas where debris falls during bridge demolition.

Within this zone, minimization efforts and commitments by the project proponents have reduced adverse effects. The footprint of all in-stream project features (*i.e.*, causeway platforms, new piers, cofferdams around old and new piers) is estimated to be 3400 m^2 (36,597 square feet). Of this, new pier placement is expected to affect 315 m^2 (65 m^2 for pier stems and 250 m^2 for the foundations). Configuration of the causeways to avoid concentrations of mussels, including northern riffleshell and clubshell, has reduced potential adverse effects. Any mussels that are not salvaged from the in-stream project footprint will be killed during bridge construction and pier removal. Mussels that are not salvaged from the area immediately adjacent to the cofferdams and causeway will be killed, injured, or significantly disturbed during bridge construction and pier removal. Take (*e.g.*, death, injury, harm, harassment) is expected to occur due to suffocation, crushing, and/or displacement by construction and demolition activities.

The proposed causeway incorporates temporary bridges between work platforms and shore access areas. Similar bridges have been used at other bridge construction sites in the Allegheny River,

including the Kennerdell Bridge. These temporary bridges reduce take by reducing the footprint of the rock fill associated with the causeway. These structures also reduce adverse effects to mussels by decreasing the amount of the river channel blocked by the causeway, thereby reducing backwater effects upstream and potential scour locations downstream. It appears that during replacement of the Kennerdell Bridge, many mussels (including the clubshell and northern riffleshell) within the bridged causeway gaps survived (USGS 2002).

Juvenile and adult clubshell and northern riffleshell, and fishes that serve as hosts for their glochidia, could be taken (*e.g.*, killed, injured, or stressed) or adversely affected by substrate disturbance (*e.g.*, scouring), increased turbidity, sediment deposition, and introduction of petroleum products into the river. The physical presence of construction activities may affect clubshell and northern riffleshell reproduction upstream and downstream by affecting transport of sperm and glochidia, or by modifying host fish behavior, travel patterns, or habitat use. These effects are expected to be short term and localized in extent, but may result in take in the form of harm or harassment.

The extent of adverse effects outside the causeway and cofferdam footprints will depend on construction practices, river flows, silt load in disturbed substrates, and the effectiveness of erosion and sedimentation control measures. The greatest potential for substrate scouring and deposition would occur in association with construction and removal of the causeway, as well as the presence of the causeway during construction, especially during high flows.

PennDOT prepared a *Hydraulic Analysis Report* (June 18, 2004) to assess causeway-related impacts to river flows and substrates. In this report, they modeled various flow conditions, based upon the proposed causeway design (*i.e.*, three rock work platforms and three temporary bridges). Within the project area, high river flows between 3000 and 8500 cfs can be expected, based on flows measured at the USGS West Hickory gage since operation of Kinzua Dam began in 1965. The mussel community at West Hickory is distributed in four zones: 1) from the eastern shore to the first pier; 2) between the first and second piers; 3) mid-channel between the second and third piers; and 4) on the western side of the channel between the third pier and the western shoreline (Figure 1). Under existing conditions, the flow velocity at the monthly mean flows is generally less than three feet per second. Flow velocities in the areas occupied by most of the mussels (*i.e.*, the area considered to be prime habitat for the endangered mussels), are generally less than 2.5 feet per second. At an expected October high flow rate of 5821 cfs, it is predicted that the water velocities at the openings of the causeway will increase sharply over existing conditions, possibly resulting in significant scour in the causeway openings due to bedload transport. The largest flow increase would occur between the western shoreline and the third pier, an area occupied by a moderate concentration of mussels, and between the first and second piers, which support a high population density of mussels. There would be a slight reduction in flow velocity upstream of the causeway, but no apparent areas of flow stagnation. The flow velocities will be significantly reduced approximately 120 feet downstream of the causeway, with resulting sediment deposition expected. These areas of flow reduction should dissipate within 300 to 400 feet downstream of the causeway.

During the construction period, the causeway will also increase river stage in the vicinity of the bridge, especially during higher flows. Backwater effects are expected to occur as far as 200 to 400 feet upstream of the causeway during expected mean high flow events, and even further

during an exceptional high flow event. PennDOT's hydrological analysis suggests that the chance of the causeway being overtopped is low, but that an overtopping event would not be expected to dislodge gabion baskets or transport rock fill from the causeway. No explanation for these conclusions is provided in the biological assessment.

The mussel community is adapted to withstand the effects of high flows under natural conditions, especially in an armored channel. Further, mussels appear to help stabilize the streambeds in high population density areas. However, in the event of significant high flows while the causeway sections are in the river, localized scour is likely to occur in and downstream of the causeway openings, resulting in bed movement that mussels are not likely able to tolerate. The modeling indicates that there will be scouring of the substrate due to increased water velocities at the temporary bridges placed between the causeway sections and the shoreline. The material, and any mussels, will be re-deposited downstream when water velocity decreases. Scouring will cause mussels to become dislodged from the substrate, and either carried downstream by the current, or smothered when sediments redeposit. Those mussels not killed or injured during this process may still suffer death, injury, or increased predation risk if they are unable to right themselves and re-burrow into suitable habitat downstream. Mussels, especially those within 100 feet downstream of the causeway, may be subjected to the impacts (*e.g.*, gill clogging, suffocation) of sediment re-deposition.

Cranes are at risk of flooding or sinking during high flow events if the causeways are overtopped, unless precautions are taken to avoid this. Construction materials and equipment may affect mussels if the equipment is washed into the river and either physically transported downstream by currents, or if toxic materials such as fuel spill into the river. Such spills could directly or indirectly affect both species, and result in take. However, due to PennDOT's commitment to develop and implement a Pollution Prevention Plan, toxic spills are not anticipated; therefore, the effects of such spills have not been evaluated in this opinion.

Any sediment originating from shoreline and causeway activities at both bridges is likely to remain concentrated near the source before becoming mixed in the Allegheny River and will, therefore have more of an effect on animals closer to the source. As filter feeders on microscopic food items, the northern riffleshell and clubshell are very susceptible to smothering by silt and other sediments in the water (Ellis 1936, in U.S. Fish and Wildlife Service 1994). Siltation may also result in reduced dissolved oxygen and increased organic material at the substrate level (Ellis 1936, Harman 1974; both in U.S. Fish and Wildlife Service 1994). At sub-lethal levels, silt interferes with feeding and metabolism in general (Aldridge *et al.* 1987, in U.S. Fish and Wildlife Service 1994). Because the clubshell typically burrows completely beneath the substrate, it is particularly susceptible to siltation, which clogs the substrate interstices and suffocates the animal.

Mill Village Truss Bridge Replacement

At the Mill Village Truss Bridge over French Creek, the zone within which direct and indirect effects are expected to occur extends from 50 meters upstream to 50 meters downstream of the existing bridge, where an estimated 149 northern riffleshells and 1041 clubshells occur. Direct adverse effects are expected to occur in the following in-stream areas: 1) the drop zone and drag-out area associated with demolition of the old bridge superstructure (307 m^2); and 2) the areas subjected to siltation or scouring during bridge demolition and removal, and subsequent new

bridge construction. Minimization efforts and commitments by the project proponents have significantly reduced the area of expected direct adverse effects. Because no in-stream causeway will be used for either construction or demolition, and the existing alignment will be used, streambed disturbance has been significantly reduced. In addition, because in-stream activity will be limited to a three to four day period, take is reduced further. We anticipate that all clubshell and northern riffleshell that are not removed from the fall area of the existing bridge and subsequent drag-out area will likely be killed, injured, or otherwise significantly disturbed. Take (*e.g.*, death, injury, harm, harassment) is expected to occur due to suffocation, crushing, and/or displacement by demolition activities.

At both bridge replacement sites, mussels will be smothered, buried and/or have their gills clogged from project-related silt and other sediments. Mortality, injury, and stress to mussels are expected from siltation and other types of sedimentation caused by in-stream construction and demolition activities (*e.g.*, causeway and cofferdam construction, bridge demolition), as well as on-shore construction (*e.g.*, abutment construction and staging areas). Implementation of erosion and sedimentation control practices should help to minimize these sources of sediment.

Indirect Effects

Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur [50 CFR §402.02].

West Hickory Bridge Replacement

The areas subjected to indirect effects are less well defined. However, indirect effects are expected to occur in the following in-stream areas: 1) areas subjected to altered hydrology resulting from removal of the three existing piers and placement of two new piers, 2) areas that are destabilized during pier removal, and 3) areas affected by new surface runoff patterns. These effects are expected to occur over several years post-construction, as river currents and river bed stability are affected by the placement of piers in new locations. Indirect effects are expected to occur downstream and upstream of the construction/demolition area, even during periods when construction activity is minimal, due to the presence of materials and additional structures (*e.g.*, piers) in the action area. Indirect effects may result from sediment re-deposition and changes in flow patterns, resulting in death or injury of mussels, changes in fish host distribution, and a reduction in habitat availability and/or quality for both mussels and fish. Long term, the removal of one of the three existing bridge piers will likely result in a more stable streambed and, therefore, potentially more suitable habitat for both clubshell and northern riffleshell.

Due to the construction sequence, which calls for removal of the existing West Hickory Bridge only after the new bridge is completed, five piers (two old and three new) will be present in the river during at least one winter, a normally high flow period that is also characterized by ice jams. If a significant high flow event occurs when the new piers and old piers are in the river, scour in the project area could be extensive due to the constriction of the channel. Such an event is likely to directly affect northern riffleshells and clubshells by dislodging them from the substrate, transporting them with shifting substrate, and burying them downstream where the river flow decreases and transported material is deposited. Long-term indirect adverse effects are likely to occur as this material is then redistributed in subsequent flood events until a stable channel

configuration is achieved. The placement of the new piers immediately downstream of the existing piers will significantly reduce the risks of this situation.

A long-term alteration in habitat quality may occur within the action area of the West Hickory Bridge. Water velocities during low flow periods may fall below required thresholds for these species in a less confined channel having two piers rather than the existing three. There is a potential for substrate scouring and re-deposition in association with removal of the existing piers and abutments, as well as the presence of the cofferdams during construction, especially during high flows that induce riverbed movement (*e.g.*, scour). Those mussels not killed or injured during this process may still suffer death, injury, or increased predation risk if they are unable to right themselves and re-burrow into suitable habitat downstream. Mussels downstream of the construction area may be subjected to adverse effects (*e.g.*, gill clogging, suffocation) caused by sediment re-deposition.

The biological assessments indicate that channel clearing and repair of scour protection will be performed on an as-needed basis as part of long term maintenance of the bridge. Because the scope and timing of these activities is not described and cannot be predicted, this opinion does not evaluate the effects of such actions or authorize any take resulting from them.

Mill Village Truss Bridge Replacement

Indirect effects at the Mill Village Bridge are expected to be similar to those described above at the West Hickory Bridge, but are likely to be less severe and of shorter duration. The existing bridge probably has little effect on flow, except during high flow events. The new bridge, with the proposed abutments set further back from the stream, will likely have even less of an effect on the hydrology and flow of French Creek. The streambed in the vicinity of the bridge is expected to become more stable in response to the new bridge structure. The change in hydrology may adversely affect some areas of the streambed as stream flows adjust, but because neither the existing nor the new bridge restrict flow, this change should occur slowly.

Both Bridges

Habitat degradation in the form of water quality impairment may occur as a result of the operation and maintenance of the new bridges. In-stream areas are likely to be degraded by runoff from the bridge deck, when rain flushes oil, dirt, and other road surface deposits directly into the river. Declines in mussel populations have been documented downstream of bridges; these declines appear, in part, to be related to water quality changes (Andersen *et. al* 2003). Water quality degradation may result from bridge deck and approach road runoff carrying silt, hydrocarbons, and deicing materials. New de-icing materials may be adopted, or developed, during the life of the bridge. To the extent that these materials reach the receiving water below the bridge, clubshells and northern riffleshells may be adversely affected. The risk to listed mussels from bridge deck runoff is inversely related to the amount of runoff that can be intercepted and treated, rather than directly discharged to the Allegheny River or French Creek. Directing some runoff to land based areas will ameliorate some of the risk from bridge deck runoff. The design of both new bridges is expected to reduce the maintenance needed, compared to the existing bridges.

Water quality degradation may also result from spilled toxic materials, should an accident occur on the bridge or approach road. Truck traffic and the related risk of potentially toxic spills may increase (in comparison to the existing bridge) because of the improved access provided by a wider bridge and the lifting of weight restrictions. Because the type, toxicity and volume of future spills, if any, cannot be predicted, this opinion does not evaluate the effects of such incidents or authorize any take resulting from them.

Effects of Conservation Measures

The project proponents have incorporated measures into the proposed project design to avoid and minimize the adverse effects of the project to the extent practical. These measures are summarized in the "Conservation Measures" section of this document and further detailed in the respective biological assessments. Limiting the duration and area of streambed disturbance at both project sites during construction and demolition limits temporal and spatial disturbance to mussels. This will allow the northern riffleshell and clubshell the opportunity to recruit from nearby less disturbed habitat, and limit adverse effects to reproduction to only one reproductive season. Developing and implementing Erosion and Sedimentation Control and Pollution Prevention Plans will have the effect of reducing on-site and off-site effects, and the chance of accidental adverse events. This will limit the extent of direct and indirect effects, if the plans are effectively implemented.

Changes in the demolition and construction methods for the West Hickory Bridge replacement project have reduced take by at least 90 percent over the methods proposed in 1999. At that time, the proposed demolition method involved dropping the existing bridge into the Allegheny River and dragging it out. The proposed construction method involved the use of bank-to-bank, rock-fill causeways during two construction seasons. The current project, which involves removal of the old bridge from the new one and construction from a modified causeway, is expected to spare approximately 6800 clubshells and 8260 northern riffleshells from direct take, in comparison to the previous proposal.

The new bridges have been designed to direct bridge deck runoff to upland areas for passive treatment (*i.e.*, infiltration in upland areas prior to in-stream release). This will improve habitat and water quality in the vicinity of the bridge, and provide a time buffer should toxic material be accidentally spilled on the bridge, as has occurred on other streams supporting endangered mussels – with devastating results.

The salvage and relocation of endangered mussels from the in-stream project footprint (piers, cofferdams, causeway) at both bridge sites is expected to further reduce take, although some mortality of translocated mussels is expected due to translocation-induced stress and/or placement in habitat potentially less suitable than that previously occupied. Salvaging and relocating mussels from areas where their survival is unlikely further reduces the number of animals that will be permanently lost. This provides an important opportunity to reduce take and advance recovery of both species by placing them in habitat that has recovered from past pollution or degradation events. If captive holding and propagation are attempted with a portion of the animals salvaged, this will provide an additional conservation tool to offset future habitat disturbance events and advance recovery of the species.

After fully considering the direct and indirect effects of the proposed action, the Service believes that the clubshell and northern riffleshell will recover to levels slightly below their present levels within the action area. This conclusion is based upon the following factors: 1) the Allegheny River watershed populations of the clubshell and northern riffleshell are intermittently distributed within more than 80 miles of the Allegheny River and in portions of French Creek; 2) recruitment has been documented for both species within the action area; 3) the most significant project-related river modifications are, for the most part, temporary; 4) PennDOT will implement conservation measures to minimize impacts, including the translocation of endangered mussels outside of the construction footprint; 5) there will be some mortality and stress of individuals within the action area; and 6) there will probably be some long-term reductions in mussel habitat quality due to the causeway.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation under section 7 of the Endangered Species Act.

No cumulative effects are foreseen; therefore, none have been evaluated for the West Hickory Bridge or Mill Village Truss Bridge replacement projects.

CONCLUSION

The Service has based following determinations on: 1) the scale and duration of anticipated effects on the species due to project implementation; 2) the implementation of project avoidance, minimization, and conservation measures to reduce take; 3) the life history of the clubshell and northern riffleshell; 4) the presence of both species at nearby locations in the free-flowing Allegheny River and French Creek, including some at greater abundance than in the action area; and 5) recent documentation that mussels can survive between bridge causeway sections.

West Hickory Bridge

Larger numbers of both northern riffleshell and clubshell are likely to be killed or injured during replacement of the West Hickory Bridge than during replacement of the Mill Village Bridge. Although once the largest known concentration of both northern riffleshell and clubshell, the West Hickory site is now known to be one of several sites in the Allegheny River that support reproducing populations of these species. Comparable or larger populations have recently been documented both upstream and downstream of the action area; these populations will provide sources for recolonization. The northern riffleshell appears to be a relatively fast-growing, though short-lived mussel species. The reproductive potential of large concentrations of this species downstream of the West Hickory Bridge site suggests that recolonization should begin to occur soon after the causeway is removed. This species has been found to be recolonizing the direct disturbance area at a similar project, the Kennerdell Bridge replacement site, further downstream. Clubshell populations appear to be less resilient, and this species is not as abundant in the action area of the West Hickory Bridge as is the northern riffleshell. Configuring the causeway to avoid

concentrations of this species, and substantially limiting streambed disturbance during bridge demolition significantly reduces the expected take of clubshells, and is expected to preserve portions of the population within the action area that can serve as sources of future recruitment. Salvaging of both species further reduces take and provides an opportunity to use these animals to advance recovery. Finally, although a large mussel population is present at West Hickory, the existing bridge appears to be affecting habitat, as evidenced by mid-stream scour and low population densities of some species, including the northern riffleshell and clubshell, that occur lower in the action area and beyond. The proposed new bridge will have one less pier in the river, and a drainage system that directs runoff to passive shoreline treatment areas; these factors should result in overall habitat improvement in the action area, facilitating recovery.

Northern Riffleshell

After reviewing the status of the northern riffleshell, the environmental baseline for the action area, the effects of the proposed replacement of the West Hickory Bridge over the Allegheny River, and the cumulative effects, it is the Service's biological opinion that the bridge replacement, as proposed, is not likely to jeopardize the continued existence of the northern riffleshell. No critical habitat has been designated for this species; therefore, none will be affected.

Clubshell

After reviewing the status of the clubshell, the environmental baseline for the action area, the effects of the proposed replacement of the West Hickory Bridge over the Allegheny River, and the cumulative effects, it is the Service's biological opinion that the bridge replacement, as proposed, is not likely to jeopardize the continued existence of the clubshell. No critical habitat has been designated for this species; therefore, none will be affected.

Mill Village Bridge

Relatively few northern riffleshells and clubshells are likely to be killed or injured at the Mill Village Truss Bridge replacement site, in part due to minimization commitments and conservation measures, including salvage and relocation efforts.

Northern Riffleshell

After reviewing the status of the northern riffleshell, the environmental baseline for the action area, the effects of the proposed replacement of the Mill Village Truss Bridge over French Creek, and the cumulative effects, it is the Service's biological opinion that the bridge replacement, as proposed, is not likely to jeopardize the continued existence of the northern riffleshell. No critical habitat has been designated for this species; therefore, none will be affected.

Clubshell

After reviewing the status of the clubshell, the environmental baseline for the action area, the effects of the proposed replacement of the Mill Village Truss Bridge over French Creek, and the cumulative effects, it is the Service's biological opinion that the bridge replacement, as proposed, is not likely to jeopardize the continued existence of the clubshell. No critical habitat has been designated for this species; therefore, none will be affected.

Based on the anticipated effects of both actions on these species, and on our range-wide review of the species' status, reproduction, numbers, and distribution, the Service has determined that the proposed actions will adversely affect endangered mussels in both action areas, but not to the extent that this will appreciably reduce the likelihood of survival and recovery of the northern riffleshell and clubshell.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of Endangered Species Act, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

It is our understanding that these projects may require a Special Permit from the Pennsylvania Fish and Boat Commission under 30 Pa. Code §2305 (relating to threatened and endangered species) due to the anticipated take of State-listed endangered species (*i.e.*, the northern riffleshell and clubshell). Under Title 58 (§75.4), permits for the take of threatened and endangered species are issued only upon showing of unique or extraordinary circumstances justifying the permit, and the demonstration that the permitted action does one of the following: 1) has no demonstrable adverse impacts on the population of the species in the Commonwealth; 2) is in the best interest of the protection, conservation and management of the species; or 3) is necessary and appropriate in the interests of public health and safety or promotes essential research or public education and information.

Because incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity, this Incidental Take Statement is valid only upon receipt by the applicant of all appropriate authorizations and permits from Federal, State and local permitting authorities. These permits/authorizations may include, but are not limited to, a permit under section 404 of the Clean Water Act from the Corps of Engineers; a section 401 Water Quality Certification and a Chapter 105 Dam Safety and Encroachment Permit from the Pennsylvania Department of Environmental Protection; a section 75.4 Special Permit from the Pennsylvania Fish and Boat Commission; and approved Erosion and Sedimentation Control Plans from the Forest and Erie County Conservation Districts. It is incumbent upon the Service to make it clear to the FHWA and the applicant that the incidental take statement (along with its exemption from the section 9 prohibitions of the Endangered Species Act) is valid only upon receipt of all required permits and authorizations.

The measures described below are non-discretionary, and must be undertaken by the FHWA so that they become binding conditions of any funding, permits, and/or approvals, as appropriate, issued to PennDOT for the exemption in section 7(o)(2) to apply. The FHWA has a continuing duty to regulate the activity covered by this incidental take statement. If the FHWA 1) fails to require PennDOT to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit, authorization, or funding document; and/or 2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the FHWA or PennDOT must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(I)(3)].

AMOUNT OR EXTENT OF TAKE

The Service anticipates that take in the form of killing, harm, and harassment (as defined in 50 CFR §17.3) will occur as a result of the proposed actions. We anticipate that clubshell and northern riffleshell will be taken during replacement of both the West Hickory Bridge and the Mill Village Bridge through direct mortality, injury, and stress. At West Hickory, mortality will occur within the footprints of the causeway, cofferdams and piers. At Mill Village, mortality will occur within the demolition area of the existing bridge. Mortality and injury may also occur outside these directly affected areas during and after demolition and construction due to sedimentation, scouring, and changes in hydrology related to the new West Hickory bridge design.

Stress, short-term reproductive impairment, and limited mortality due to changes in hydrology and construction-induced scour and deposition, are predicted to occur in an area extending from 400 feet upstream to 400 feet downstream of the proposed construction causeway at West Hickory, and from 165 feet upstream to 165 downstream of the existing Mill Village Bridge. Stressors include low oxygen, decreased food, and sperm availability in the water column, and increased silt and other sediment loading. The project will also result in loss or decreased suitability of mussel habitat due to sedimentation and scouring. These events could result in harm to adult clubshell and northern riffleshell, the glochidial life stage of these species, and populations of host fishes.

We anticipate that clubshell and northern riffleshell populations within both project action areas will recover to near their present levels. Once the project is constructed, much of the mussel habitat will be restored following removal of the construction materials and equipment; therefore, we anticipate that mussels will eventually recolonize the area.

As discussed under “Effects of the Action”, mussel mortality at West Hickory is expected to occur within a 3400 m^2 area (*i.e.*, the area within and immediately adjacent to the causeway, cofferdams and piers). Considering a northern riffleshell and clubshell density of 0.493 and 0.377 respectively within this area, 1676 northern riffleshells and 1282 clubshells would be killed if the mussels were evenly distributed throughout the 3400 m^2 area. However, because these populations are highly clustered within this area (Figure 1), configuring the causeway to avoid high-density areas (mussel beds) has reduced northern riffleshell and clubshell mortality to 905 and 211, respectively. Mortality will be further reduced to 453 northern riffleshells and 106 clubshells if a successful salvage operation is conducted, assuming 50 percent of the population is visible on the substrate

Table 5. Incidental take estimates for the West Hickory Bridge replacement project.

Species	Individuals	Type of Take	Area Within Which Take Will Occur
Clubshell	106	Harm resulting in mortality during construction (mussels missed during salvage)	3400 m^2 project footprint (*i.e.*, causeway platforms, piers, cofferdams)
	105	Harassment during salvage and relocation prior to construction	3400 m^2 project footprint (*i.e.*, causeway platforms, piers, cofferdams)
	unquantified	Harassment or harm during and after construction resulting in mortality, injury, or temporary effects to breeding, feeding or sheltering	400 feet (120 m) upstream to 400 feet (120 m) downstream of the causeway
Northern riffleshell	453	Harm resulting in mortality during construction (mussels missed during salvage)	3400 m^2 project footprint (*i.e.*, causeway platforms, piers, cofferdams)
	452	Harassment during salvage and relocation prior to construction	3400 m^2 project footprint (*i.e.*, causeway platforms, piers, cofferdams)
	unquantified	Harassment or harm during and after construction resulting in mortality, injury, or temporary effects to breeding, feeding or sheltering	400 feet (120 m) upstream to 400 feet (120 m) downstream of the causeway

Table 6. Incidental take estimates for the Mill Village Truss Bridge replacement project.

Species	**Individuals**	**Type of Take**	**Area Within Which Take Will Occur**
Clubshell	19	Harm resulting in mortality during construction (mussels missed during salvage)	307 m^2 project footprint (*i.e.,* the fall and drag-out area of the existing bridge)
	42	Harassment during salvage and relocation prior to construction	307 m^2 project footprint (*i.e.,* the fall and drag-out area of the existing bridge)
	unquantified	Harassment or harm during and after construction resulting in mortality, injury, or temporary effects to breeding, feeding or sheltering	165 feet (50 m) upstream to 165 feet (50 m) downstream of the bridge
Northern riffleshell	3	Harm resulting in mortality during construction (mussels missed during salvage)	307 m^2 project footprint (*i.e.,* the fall and drag-out area of the existing bridge)
	6	Harassment during salvage and relocation prior to construction	307 m^2 project footprint (*i.e.,* the fall and drag-out area of the existing bridge)
	unquantified	Harassment or harm during and after construction resulting in mortality, injury, or temporary effects to breeding, feeding or sheltering	165 feet (50 m) upstream to 165 feet (50 m) downstream of the bridge

surface at the time of the salvage (Smith *et al.* 2001). However, some mortality, injury, and stress are expected to occur from salvage activities. In addition, when handling mussels during salvage activities, spontaneous abortion of glochidia may occur. Therefore, we anticipate an 80 percent to 85 percent survival rate of relocated mussels after three years (USGS 2002).

At the Mill Village project site, areas of high mussel concentration will not be avoided during bridge demolition. Therefore, considering a northern riffleshell and clubshell density of 0.028 and 0.198, respectively in the 307 m^2 drop area, nine northern riffleshells and 61 clubshells are expected to be killed. This will be reduced to three northern riffleshells and 19 clubshells if a successful salvage operation is conducted, assuming 70 percent of the population is either visible on or located near the substrate surface at the time of the salvage.

Tables 5 and 6 provide estimates of the take expected due to direct and indirect effects at the West Hickory and Mill Village Bridge sites, respectively. We were able to estimate the type and amount of take within the project footprints because the density and distribution of mussels within those footprints are known, and the effects within the footprint are obvious. However, outside the footprints, a myriad of direct and indirect effects may occur. These effects are anticipated to occur up to 400 feet upstream and downstream of the causeway at West Hickory. At Mill Village, these effects are anticipated to occur within about 150 feet of the bridge, a substantially smaller area than at West Hickory due to a smaller and shorter-duration in-stream disturbance. Because the extent of these effects will be influenced by several factors, including time of year, stream flows, and the effectiveness of erosion and sedimentation controls, it is not possible to predict how many individuals or what percentage of the population will be taken. We expect some portion of the population to be harmed and/or harassed, and expect that more mussels will be temporarily affected (*e.g.*, by sedimentation, scouring, backwater effects, disruption of breeding) than will be killed. At both bridge site, the actual level of incidental take will be difficult to detect or quantify because individuals (juveniles and adults) of both species are small, and often buried in the substrate, making them difficult to locate; therefore, finding dead or injured specimens is unlikely.

Due to our inability to fully quantify take, the Service is supplementing the numerical take estimates in Tables 5 and 6 with the following narrative take statement to further clarify and encompass all levels of take of the clubshell and northern riffleshell. This take statement is based on preliminary project design, and assumptions about the effectiveness of the conservation measures (*e.g.*, erosion and sedimentation controls, mussel salvage).

1. Death and injury of all mussels not found and removed from the areas of direct streambed disturbance (*i.e.*, at causeway placement areas, within cofferdams, beneath the fall area of the Mill Village Truss Bridge).

2. Death of up to 20 percent of the translocated or captively-held mussels, due to factors such as translocation-induced stress, migration out of monitoring plots, and/or predation, as determined during monitoring of relocation and captive holding sites.

3. Long-term habitat loss, as indicated by the loss of up to five percent of the mussel habitat within the project footprint due to incomplete removal of project-related materials (*e.g.*,

causeway rocks, demolition debris) from the river following construction, as determined by post-construction monitoring.

4. Death or injury of mussels resulting from the discharge of sediment during construction. Sediment plumes and take resulting from sedimentation might occur as far as 400 feet downstream of the West Hickory Bridge and 165 feet downstream of the Mill Village Bridge. This only includes take that occurs when the projects are being implemented in accordance with approved erosion and sedimentation control plans.

5. Death or injury of mussels resulting from scouring and associated re-deposition of substrates in the project action areas (*e.g.*, near the cofferdams and piers, under the temporary bridges, in and immediately downstream of the fall area of the Mill Village Bridge, up to 400 feet downstream of the West Hickory Bridge).

If criterion 2, 3, 4, or 5 is exceeded, or if any hazardous substances (*e.g.*, petroleum products) are spilled in the Allegheny River or French Creek or their respective floodplains, the FHWA shall immediately take remedial action(s), and contact the Service for recommendations and to determine if reinitiation of consultation will be required.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of expected take is not likely to result in jeopardy to the clubshell or northern riffleshell.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize incidental take of the clubshell (*Pleurobema clava*) and northern riffleshell (*Epioblasma torulosa rangiana*) at both bridge replacement projects.

1. The FHWA and PennDOT must implement all conservation measures described in the biological assessments and amendments, except as noted below in Term and Condition 1B. These measures are hereby incorporated by reference as mandatory project features. A summary of these conservation measures is found on pages 11-15 of this opinion. The Service believes that all measures proposed are necessary and appropriate to minimize take of northern riffleshell and clubshell.

2. Minimize take by salvaging endangered mussels and relocating them to suitable habitat and/or a holding facility.

3. Monitor and report the take of mussels resulting from project implementation.

4. Monitor the survival of salvaged clubshell and northern riffleshell (or appropriate surrogate mussel species) to determine whether translocation-associated mortality is consistent with that anticipated in this opinion.

5. Minimize the impact of bridge operation and maintenance on mussels and their habitat.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, FHWA must comply with the following terms and conditions, which carry out the reasonable and prudent measures described above, and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary. Unless specifically noted, all terms and conditions apply to both bridge replacement projects.

1. The FHWA, PennDOT, and their agents and contractors will implement all proposed avoidance and minimization measures to reduce adverse effects to the clubshell and northern riffleshell. These obligations include, but are not limited to:

   A. FHWA and/or PennDOT will provide a description of the final bridge design, erosion and sedimentation control plan, and pollution prevention plan to the Service for review and concurrence at least three months prior to the start of any proposed construction activities to ensure that the resulting effects are consistent with those disclosed in the biological assessments and evaluated in this opinion (as related to the preliminary design).

      i) Develop and implement an erosion and sedimentation control plan to address all sources of project-related erosion and sedimentation, including, but not limited to, construction access roads, roadway approaches, staging areas, pier and abutment removal and replacement, causeway placement and removal, etc**.**

         (a) FHWA and/or PennDOT, and contractors, will monitor the project site daily when the site is active and not stabilized, and as soon as possible following severe storms or ice flows when the site is inactive and/or otherwise stabilized, to ensure the erosion and sedimentation control practices are implemented, and to identify any project-related impacts due to scouring or sedimentation.

         (b) Best Management Practices for erosion and sedimentation control will be in place before, during, and after any work is conducted.

         (c) A penalty system will be established for contractors that do not fully implement the erosion and sedimentation control plan.

      ii) Develop and implement a spill avoidance/remediation plan based on the most effective prevention and remediation practices to prevent hazardous materials (*e.g.*, petroleum products, solvents, paints, etc.) from entering the Allegheny River or French Creek, or contaminating soils or waters within these watersheds. Such measures will include, but are not limited to, stationing of emergency response equipment at the project site,

and designation of contained fueling and fuel storage areas at least 150 feet away from the rivers.

(a) FHWA and/or PennDOT, and contractors, will monitor the project site daily when the site is active and not stabilized, and as soon as possible following severe storms or ice flows when the site is inactive and/or otherwise stabilized, to ensure that spill avoidance practices are implemented.

(b) If a spill does occur, implement emergency remediation procedures to contain the spill, and prevent the spill from entering the Allegheny River or French Creek.

(c) Implement a penalty system for contractors that do not fully implement the spill avoidance/remediation plan.

(d) If flooding is anticipated, weather and river stages will be monitored and hazardous materials will be removed from the river and floodplain.

(e) The Service will be notified immediately of any spills of hazardous materials.

iii) No project-related or project-generated materials, waste, or fill will be deposited in areas that would result in fills of, or sedimentation to, any streams inhabited by threatened or endangered mussels.

iv) Evidence will be provided to the Service that either 1) all equipment to be used in the Allegheny River or French Creek (during construction or mussel relocation) has never been in zebra mussel-infested waters; or that 2) equipment has been appropriately cleaned, disinfected, and inspected for zebra mussel adults and veligers, using accepted protocols.

v) During the bidding process, prospective project contractors will be notified regarding the presence of endangered species in the project area and the special provisions necessary to protect them. The successful contractor(s) will be instructed on the importance of the natural resources in the project area and the need to ensure proper implementation of the required erosion and sedimentation control, and spill avoidance/remediation practices.

(a) The following conditions (language) will be included in all construction and demolition contracts awarded for project implementation:

(1) Endangered species are present in the project area and there is a risk of take (Endangered Species Act section 9 violation) if the Terms and Conditions of the Service's biological opinion are not closely followed.

(2) All equipment to be used in the Allegheny River or French Creek (during construction or mussel relocation) must either never have been used in zebra mussel-infested waters, or have been appropriately cleaned, disinfected, and inspected for zebra mussel adults and veligers, using accepted protocols.

(3) Best Management Practices for erosion and sedimentation control will be in place before, during, and after any work is conducted.

(4) Contractors will monitor the project site daily when the site is active and not stabilized, and as soon as possible following severe storms or ice flows when the site is inactive and/or otherwise stabilized, to ensure the erosion and sedimentation control and spill avoidance practices are implemented.

(5) Develop and implement a spill avoidance/remediation plan based on the most effective prevention and remediation practices to prevent hazardous materials (*e.g.*, petroleum products, solvents, paints, etc.) from entering the Allegheny River or French Creek, or contaminating soils or waters within these watersheds. Such measures will include, but are not limited to, stationing of emergency response equipment at the project site, and designation of contained fueling and fuel storage areas at least 150 feet away from the river. This plan will be submitted to the Service for review and concurrence at least three months prior to construction.

(6) Contractors will monitor weather and river stages, and remove any hazardous materials from the river and the floodplain in the event that flooding is expected.

(7) If a spill does occur, implement emergency remediation procedures to contain the spill, and prevent the spill from entering the Allegheny River or French Creek.

(8) The Service will be notified immediately of any failures of erosion and sedimentation control measures or spills of hazardous materials.

(9) No project-related or project-generated materials, waste, or fill will be deposited in areas that would result in fills of, or sedimentation in, any streams inhabited by endangered mussels.

vi) Evidence will be provided to the Service that Term and Condition 1A(v) has been included in construction and demolition contracts prior to the initiation of construction.

B. After pier removal at West Hickory, fill the resulting holes in the riverbed to conform to the surrounding bed elevations. This will be done using natural bed material reserved from the new pier locations (or areas not inhabited by mussels). This differs from the conservation measure proposed in the biological assessment, but will allow for more rapid mussel recolonization and limit erosion when the cofferdams are removed.

2. To minimize take of endangered mussels in areas that will be directly affected by bridge demolition and construction, conduct a mussel salvage and relocation in the summer/fall season (*i.e.*, July thru September) prior to initiation of construction. We anticipate that the level of effort necessary to accomplish the salvage operations will less than two weeks for either bridge.

A. The salvage will be conducted in and immediately adjacent to the in-stream project footprint. This includes areas immediately adjacent to, and within, causeway sections, the new and old pier locations, and associated cofferdams in the Allegheny River at West Hickory. It also includes the expected debris fall area in French Creek beneath the existing bridge at Mill Village. These areas constitute the "salvage areas."

B. Develop and implement a plan for the salvage of mussels from the salvage areas (see above), and the relocation of these mussels to appropriate habitat and/or a holding and propagation facility elsewhere. The plan should include a protocol for maximizing the probability of finding the endangered mussels; a protocol for removing mussels from the substrate; and protocols for handling, holding, transporting, and relocating mussels. Salvage of mussels must be done only when the water temperature is above 55 degrees Fahrenheit and water clarity is good. All procedures and techniques will require Service approval through the Pennsylvania Ecological Services Field Office. The mussel salvage plan will be submitted to the Service for approval at least three months prior to initiating any in-stream salvage activities.

C. Prior to the salvage effort, identify appropriate relocation sites, in coordination with the Fish and Wildlife Service. Field reconnaissance will be necessary to identify appropriate sites. Preliminary and final relocation sites will require Fish and Wildlife Service review and approval. The relocation sites should have characteristics that optimize species survival and recovery, in consideration of the following:

    i) Relocating mussels to nearby habitat has had mixed success in the Allegheny River and French Creek. Mortality of relocated northern riffleshells of between 52% and 85%, and an unexpected mortality of resident northern riffleshells at the relocation site of 60% to 85% has been documented. Although relocation sites must have suitable habitat, which is most easily determined by the presence of resident mussel populations, overall mortality of resident and relocated animals may exceed total numbers moved in some situations. Relocation to nearby sites has limited benefits to meeting species recovery objectives at either West Hickory or Mill Village.

    ii) Relocating mussels to alternate sites within the historic range of the species provides an opportunity to augment otherwise weak populations and reduce adverse effects to resident animals, but site selection must ensure that suitable habitat conditions exist and that genetic alteration will not adversely affect the population. Relocation to alternate sites may significantly advance recovery objectives, while reducing project-associated take.

    iii) Relocating mussels to captive holding provides the possibility of placing the animals back into the disturbed habitat post-project, thereby reducing adverse effects to resident populations and accelerating local recovery of the affected populations. There are also opportunities to develop and refine captive husbandry techniques, providing options for placing progeny of captive animals in the area of direct effects. Relocation to a captive holding facility and subsequent return of adults or captive-bred progeny to the area most affected provides the most direct reduction of adverse effects, and may

significantly advance recovery objectives through greater understanding of captive husbandry and reproduction.

D. Prior to the salvage effort, the salvage areas will be clearly marked. Temporary and/or permanent marking shall be done in such a manner as to assist the salvage team. Bank and in-stream reference marking shall be done for the purposes of defining the salvage areas prior to the construction season.

E. Service-approved, qualified personnel who are thoroughly briefed on the techniques to be used will perform the salvage of mussels. These personnel will survey the salvage areas via diving, wading, and/or snorkeling, as appropriate. Because dive conditions at the river bottom will preclude consistent and accurate identification of mussels by divers, all mussels located shall be collected by hand and transported to the surface for identification. All mussel identifications will be done by a Service-approved biologist.

F. Personnel conducting the salvage and relocation of clubshell and northern riffleshell must obtain a Scientific Collector's Permit from the Pennsylvania Fish and Boat Commission.

G. A report documenting the salvage and relocation effort shall be prepared and submitted to the Service's Pennsylvania Field Office and the Pennsylvania Fish and Boat Commission within six months of completion of the salvage. The report shall include an introduction, methods section, results section, conclusion and/or summary, and any relevant supplementary information (*e.g.*, names and qualifications of surveyors). The methods section should detail protocols used for surveying, holding, handling, transporting and relocating mussels. The results section should include the total number of individuals of each mussel species found; date found; water and air temperatures; river stage; total number of live and dead clubshell and northern riffleshell found; condition, size and approximate age of live clubshell and northern riffleshell; data regarding non-endangered mussels; and maps or figures showing project features (cofferdams, causeway, piers, old bridge, new bridge) and salvage areas. The report should also detail the relocation effort, including, but not limited to: map of the relocation site(s); mussel death or injury during transit; time of departure from the salvage area; time of arrival at the relocation site(s); methods for handling and placement of mussels at the relocation sites, list of mussels (number, sex, size) placed at each relocation site; etc.

H. In accordance with the project conservation measures, FWHA and PennDOT will incur the cost of relocating salvaged mussels to nearby suitable habitat, to a Service-approved alternate site(s), or into captive holding for up to one year post-construction. A plan to ensure survival of salvaged mussels will be submitted to the Service for review and concurrence at least three months prior to commencing salvage efforts.

3. Assess impacts to the mussel community (including specifically the clubshell and northern riffleshell) within the direct and indirect effect areas associated with the West Hickory Bridge replacement project. The purpose of this survey is to document take and to determine whether the effects of the project on mussels and their habitat are consistent with those anticipated in this opinion.

A. Survey the area extending from 50 meters upstream to 50 meters downstream of the old West Hickory Bridge, in accordance with Smith *et al*. 2001. This is the same area that was quantitatively surveyed previously **(**USGS 1999). The survey will be conducted between May 1 and October 15, during the second summer/fall season following removal of the causeway. Surveys for mussels will be performed by Service-approved, qualified personnel who are thoroughly briefed on the techniques to be used. These personnel will survey the area via diving, wading, and/or snorkeling, as appropriate. All mussels located shall be identified to species, recorded, and replaced in the substrate. The site-specific survey protocol will be submitted to the Service for review and approval at least three months prior to the survey.

B. Mussel diversity, abundance, and distribution will be compared to that observed in 1999 **(**USGS 1999) to determine the effects of the project on mussels and their habitat.

C. During the survey, determine the extent (percent cover) of project-related materials (*e.g.*, causeway rock) remaining in the river, and report this to the Service. If debris cover exceeds five percent of the project footprint, further consultation with the Service will be necessary to determine what remediation actions are necessary to remedy the situation.

D. A report documenting the survey effort will be prepared and submitted to the Service's Pennsylvania Field Office and the Pennsylvania Fish and Boat Commission within six months of completion of monitoring. The report shall include an introduction, methods section, results section, conclusion and/or summary, and any relevant supplementary information (*e.g.*, names and qualifications of surveyors). The methods section should describe the survey protocol used. The results section should include the total number of individuals of each mussel species found; date found; water and air temperatures; river stage; total number of live and dead clubshell and northern riffleshell found; condition, size, and approximate age of live clubshell and northern riffleshell; data regarding non-endangered mussels; and maps or figures showing project features (cofferdams, piers, causeway, temporary bridges, old bridge, new bridge) and salvage areas. The report should also include clubshell, northern riffleshell, and overall mussel density and distribution maps, as found in the 1999 USGS report. In the results section, maps should also be provided that show differences in mussel density and distribution between 1999 and this survey (*e.g.*, positive or negative changes in density, diversity, and distribution).

4. Monitor relocated mussels to determine the effectiveness of the salvage and relocation effort, and document relocation-associated mortality (*i.e.*, document take). Monitoring will be done in accordance with a survey plan that will be submitted to the Service for review and approval at least three months prior to the monitoring. Should mortality exceed that estimated in this opinion, a re-evaluation of project impacts on the clubshell and northern riffleshell will be necessary. This may result in reinitiation of consultation with the Service.

5. Operation and maintenance of the West Hickory and Mill Village Bridges over the expected life of these projects represents an ongoing potential effect to the northern riffleshell and clubshell. A plan should be developed to limit this effect.

A. Review alternatives for de-icing the roadway surface, and select materials that have minimal effects on aquatic biota.

B. Utilize materials in the construction of the new bridges that do not require maintenance sand-blasting or painting.

C. The effects of in-stream bridge maintenance activities on federally listed species were not evaluated or considered in this opinion. Therefore, consult with the Service prior to implementing any future maintenance activities that may directly or indirectly affect any federally listed species, including mussels or their habitat (*e.g.*, channel clearing, scour-hole repair, pier and abutment work, etc.).

6. If the in-stream portions of these projects are not completed by 2009, FWHA shall reinitiate consultation with the Service to re-evaluate project impacts on the clubshell and northern riffleshell, and to determine the appropriateness of the reasonable and prudent measures contained in this biological opinion.

7. The Service's Pennsylvania Field Office and Region 5 Division of Law Enforcement are to be notified within 24 hours should any endangered or threatened species be found dead or injured as a direct or indirect result of the implementation of this project. Notification must include the date, time, and location of the carcass, and any other pertinent information. Clubshell or northern riffleshells that are accidentally killed, or that are moribund or freshly-dead and contain soft tissues, are to be preserved according to standard museum practices, properly identified or indexed (date of collection, complete scientific and common name, latitude and longitude of collection site, description of collection site), and submitted to a recognized museum or research facility (*e.g.*, USGS facility in Leetown, WV). The appropriate person at the selected repository institution should be contacted regarding proper specimen preservation and shipping procedures.

8. Notification must be made to the following Fish and Wildlife Service offices at least two weeks prior to beginning in-stream salvage activities.

   - Region 5 Division of Law Enforcement; 300 Westgate Center Drive, Hadley, MA 01035-9589 (telephone: 413-253-8343).

   - State College, Pennsylvania Field Office (Attn: Endangered Species Specialist); 315 South Allen Street, Suite 322, State College, PA 16801 (telephone: 814-234-4090).

The reasonable and prudent measures, and their implementing terms and conditions are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that at least 914 northern riffleshell and 272 clubshell will be incidentally taken during construction of the two bridges. An additional unknown number of northern riffleshell and clubshell will be harmed or harassed in the vicinity of these bridges. If during the course of the action, the numerical or narrative levels of incidental take are exceeded; such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The FHWA must immediately provide an explanation

of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Endangered Species Act directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid the adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The Service has identified the following actions which, if undertaken by PennDOT and/or the FHWA, would further the conservation and assist in the recovery of the clubshell and northern riffleshell.

1. Implement conservation strategies identified by PennDOT's working group on mussels.

2. Participate in the development of a conservation plan for the northern riffleshell and clubshell in Pennsylvania, along with agencies that carry out activities that potentially affect these species (Recovery Plan, Task 1).

3. Seek opportunities to participate in efforts to recover northern riffleshell and clubshell throughout the species historic range (Recovery Plan, Task 4).

4. Support research to determine captive husbandry techniques suitable for propagation of the clubshell and northern riffleshell. This action would partially meet the objectives of the Recovery Plan (Tasks 4.23, 4.24, and 4.3) for these species and may offset project-related effects elsewhere.

5. Within the Allegheny River watershed, implement and/or support projects that would improve water quality by reducing non-point source pollution. Such projects would include, but are not limited to, wetland preservation, wetland restoration, streambank fencing, and streambank restoration (via establishment of native plant species). This action would partially meet the objectives of the recovery plan (Recovery Plan, Task 2.2) for these species and may offset project-related effects elsewhere.

6. Develop best management practices (BMP’s) for bridge demolition and construction in habitats occupied by threatened and endangered freshwater mussels, and conduct outreach to make successful BMP’s available to transportation interests in the range of these species (Recovery Plan, Task 2).

7. Participate in studies that characterize the clubshell and northern riffleshell’s habitat requirements (Recovery Plan, Task 3), and provide additional details regarding the species’ distribution and threats (Recovery Plan, Task 2.5).

To be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of the conservation recommendations carried out.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the information presented with the Federal Highway Administration's May 11 and July 6, 2004, requests for initiation of formal consultation. As written in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law), and if (1) the amount or extent of incidental take is exceeded; (2) new information reveals the agency action may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

David Densmore, Supervisor	Date

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