



UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service
Ecological Services Office
4625 Morse Road, Suite 104
Columbus, Ohio 43230
(614) 416-8993 / Fax (614) 416-8994



April 16, 2015

Ms. Laura S. Leffler
Division Administrator
Federal Highway Administration
Ohio Division
200 North High Street
Room 328
Columbus, OH 43215-2408

TAILS
31420-2011-F-0101

PID
(PID 80695)

RE: LUC-475-3.08 (PID 80695)

Dear Ms. Leffler,

This letter accompanies the U.S. Fish and Wildlife Service's enclosed Biological Opinion to address the placement of rock channel protection under the IR 475 bridges and within Swan Creek, in Lucas County, Ohio.

Formal consultation under section 7 of the Endangered Species Act of 1973, as amended, for the project was initiated on March 26, 2015. The consultation concerns the direct and indirect effects of the rock channel protection on the federally endangered rayed bean (*Villosa fabalis*). We submitted a draft Biological Opinion to you for review on April 10, 2015 and received your agency's comments that were provided on April 15, 2015. Upon considering the comments, we have made the appropriate modifications and clarifications in the final document.

This concludes formal consultation for the LUC-475-3.08 project. These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the Endangered Species Act, of 1973, as amended, and are consistent with the intent of the National Environmental Policy Act of 1969, and the U.S. Fish and Wildlife Service's Mitigation Policy.

If you have questions, or if we may be of further assistance in this matter, please contact Marci Lininger at extension 27 or Karen Hallberg at extension 23 in this office.

Sincerely,

Dan Everson
Field Supervisor

cc: N. Mehlo, FHWA, Ohio Division Office, Columbus, OH (*email only*)
M. Perlik, ODOT, Office of Environmental Services, Columbus, OH (*email only*)
M. Pettegrew, ODOT, Office of Environmental Services, Columbus, OH (*email only*)
C. Staron, ODOT, Office of Environmental Services, Columbus, OH (*email only*)
M. Michael, ODOT, Office of Environmental Services, Columbus, OH (*email only*)
P. Clingan, USACE, Ohio Regulatory Transportation Office, Columbus, OH (*email only*)
J. Lung, OEPA, Columbus, OH (*email only*)
J. Kessler, ODNR, Office of Real Estate, Columbus, OH (*email only*)
B. Mitch, ODNR, Office of Real Estate, Columbus, OH (*email only*)
N. Reardon, ODNR, Division of Wildlife, Columbus, OH (*email only*)
J. Navarro, ODNR, Division of Wildlife, Columbus, OH (*email only*)

Biological Opinion and Incidental Take Statement for Rayed Bean (*Villosa fabalis*) at the LUC-475-3.08
(PID 80695) Bridge Rehabilitation Project over Swan Creek in Lucas County, Ohio.

Submitted to the Federal Highway Administration

April 16, 2015

Prepared by:

U.S. Fish and Wildlife Service
Ohio Ecological Services Field Office
4625 Morse Road, Suite 104
Columbus, OH 43230

TABLE OF CONTENTS

| | |
|--|--------|
| TABLE OF CONTENTS | 2 |
| INTRODUCTION..... | 3 |
| CONSULTATION HISTORY..... | 3 |
| BIOLOGICAL OPINION | 4 |
| I. DESCRIPTION OF THE PROPOSED ACTION..... | 4-7 |
| Action Area | 8-9 |
| II. STATUS OF THE SPECIES | 9 |
| Species Description | 9 |
| Life History | 9 |
| Population Dynamics..... | 10 |
| Status and Distribution | 10 |
| Analysis of the Species Likely to be Affected..... | 10 |
| III. ENVIRONMENTAL BASELINE | 11 |
| Status of the Species within the Action Area | 111 |
| Factors Affecting Species Environment within the Action Area | 111 |
| IV. EFFECTS OF THE ACTION | 12 |
| Analysis for Effects of the Action | 12 |
| Species' Response to Proposed Action..... | 13 |
| INCIDENTAL TAKE STATEMENT | 14 |
| Amount or Extent of Take Anticipated..... | 15 |
| Effect of the Take..... | 15 |
| Reasonable and Prudent Measures..... | 15 |
| Terms and Conditions | 16 |
| CONSERVATION RECOMMENDATIONS | 17 |
| REINITIATION NOTICE | 17 |
| LITERATURE CITED | 18, 19 |

INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) based on our review of the LUC-475-3.08 bridge rehabilitation project and its effects on the rayed bean (*Villosa fabalis*), a federally endangered species under section 7(a)(2) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The Service's Columbus Ohio Field Office (COFO) served as the lead Service Field Office for consultation on this project.

The Ohio Department of Transportation (ODOT) District 2 Office of Construction determined that rock channel protection (RCP) must be placed in Swan Creek as part of this project to protect the stream banks from erosion and the bridge footers from scour, thus extending the life of the bridge footers. The request for formal consultation was received from the Federal Highway Administration (FHWA) on March 26, 2015, and formal consultation was initiated as of the date of that request, March 26, 2015. A Biological Assessment (BA) was enclosed with their letter. In a letter dated March 26, 2015 we indicated that the initiation package associated with the request for formal consultation was complete in accordance with 50 CFR §402.14.

This BO is based on information provided in the BA, dated March 26, 2015; meetings (see consultation history below); available literature; communications with experts on the federally listed species considered in this BO; and other sources of information available to us and/or in our files. A complete administrative record of this consultation is on file at COFO.

CONSULTATION HISTORY

| DATE | EVENT/ACTION |
|--------------------|--|
| September 30, 2010 | COFO received original coordination request incorporated into the September 30, 2010 MOA Package. |
| October 2010 | ODOT field biologists observed a fresh dead rayed bean shell under the I-475 bridges and determined that potential habitat for rayed bean may occur within Swan Creek. |
| November 2, 2010 | Rayed bean mussel was proposed as federally endangered. |
| November 3, 2010 | COFO requested additional information from ODOT regarding potential impacts to the rayed bean mussel. |
| November 12, 2010 | ODOT provided COFO with additional information regarding instream work and the potential need for RCP. |
| July 27, 2011 | COFO acknowledged ODOT's October 2010 field observations and requested that a mussel survey be completed due to the possible presence of rayed bean mussel and that ODOT consult with the Service if it is determined that the project may affect rayed bean mussel. |
| February 14, 2012 | The final rule was published listing rayed bean mussel as a federal Endangered species. |
| October 12, 2012 | ODOT informed the Service that the project design had changed and the need for RCP was no longer needed. |
| April 2013 | The project sold for construction. |
| July 22, 2014 | A Phase 1 mussel survey was performed by EnviroScience revealing presence of rayed bean mussel within the project area (a total of 17 live rayed bean were found). |

| | |
|----------------|---|
| October 2014 | ODOT District 2 Office of Construction determined that RCP would need to be placed along the stream banks and bridge footers to provide erosion and scour control. |
| November 2014 | ODOT notified the Service that the project required the use of RCP within the stream. |
| December 2014 | The Service requested that ODOT submit a BA for formal consultation under Section 7 of the Endangered Species Act (ESA) in order to address potential impacts to rayed bean mussel. |
| March 26, 2015 | FHWA submitted final BA to the Service and requested initiation of formal consultation |
| March 26, 2015 | The Service sent letter to FHWA notifying that formal consultation was initiated on March 26, 2015 and a complete initiation package was received. |

Federally Listed, Proposed Species and Species of Concern Not Addressed in this Biological Opinion

The Service has reviewed this project for adverse effects to the following listed and candidate species: **Indiana bat** (*Myotis sodalis*), **rayed bean** (*Villosa fabalis*), **piping plover** (*Charadrius melodus*), **Karner blue butterfly** (*Lycaeides melissa samuelis*), **Kirtland's warbler** (*Dendroica kirtlandii*), **eastern prairie fringed orchid** (*Plantanthera leucophaea*) and **eastern massasauga** (*Sistrurus catenatus*). A Phase 1 mussel survey was performed by EnviroScience revealing presence of rayed bean mussel within the project area (a total of 17 live rayed bean were found). The rayed bean is addressed in this BO. ODOT has determined that this project will have no effect on Indiana bat, Kirtland's warbler, piping plover, Karner blue butterfly, eastern prairie fringed orchid, and eastern massasauga; therefore, these species are not considered in this BO.

Please note: At the time of the original coordination, **Rufa red knot** (*Calidris canutus rufa*), a federal threatened species and the **northern long-eared bat** (*Myotis septentrionalis*), a federally proposed endangered species, had not yet been proposed for federal listing and were not included in the original project coordination. The project will not impact migratory stopover habitat including: sand, gravel, or cobble beaches, and mudflats along the shore of Lake Erie. Additionally, the project does not require tree clearing. Based on this information, ODOT has determined that this project will have **no effect** on the these species; therefore, consultation under section 7(a)(2) of the ESA is not required.

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

The following description of the proposed action is taken largely from the March 26, 2015 BA, supporting correspondence and other information provided from ODOT.

The LUC-475-3.08 project is sponsored by ODOT and the FHWA, and involves widening and rehabilitation of the I-475 bridges (northbound and southbound) over Manley Road, Swan Creek and the Ohio Turnpike in Lucas County, Ohio. The two existing I-475 bridges are 698 feet in length. The bridges were built in 1966 and are 11-span continuous steel beam structures with reinforced concrete decks and substructures. The sufficiency ratings for these two bridges are 76 and 75, out of 100, respectively. The bridge decks have been patched many times and require full replacement. The bridge shoulders are narrow, with widths less than the mainline interstate. To meet design criteria for bridge shoulders and in order to be prepared for the future widening of I-475, the bridges will be widened. The widened/rehabilitated bridge structures will each consist of a new composite reinforced concrete deck on rolled

steel beams and a widened substructure. The roadway width on the widened bridges will be 64 feet (toe/toe parapet) compared to the 30-foot roadway width on the existing bridges.

Activities associated with the proposed project include: 1) removal of the existing deck, scuppers, end cross frames, expansion joints, railings, approach slabs, back walls, wing walls, pier caps and columns; 2) replacement of existing beams and bearings; 3) widening of piers and abutments and replacement of existing abutment back walls; 4) replacement of approach slabs and construction of single slope parapets for the new substructure; 5) replacement of existing end cross frames and expansion joints; and 6) painting the new beam ends and sealing the concrete surfaces. New bridge piers (drilled shafts) will be placed alongside the existing piers. Three drilled shafts, 3.5 feet in diameter, will be used for each pier widening. The addition of RCP will protect the bridge piers and stream banks from erosion. Due to the direct and indirect effects of the rock channel protection on the federally endangered rayed bean mussel, the Service requested that ODOT submit a BA for formal consultation under Section 7 of the Endangered Species Act (ESA) to address potential impacts to the rayed bean. The remainder of this BO will address the potential impacts to this species.

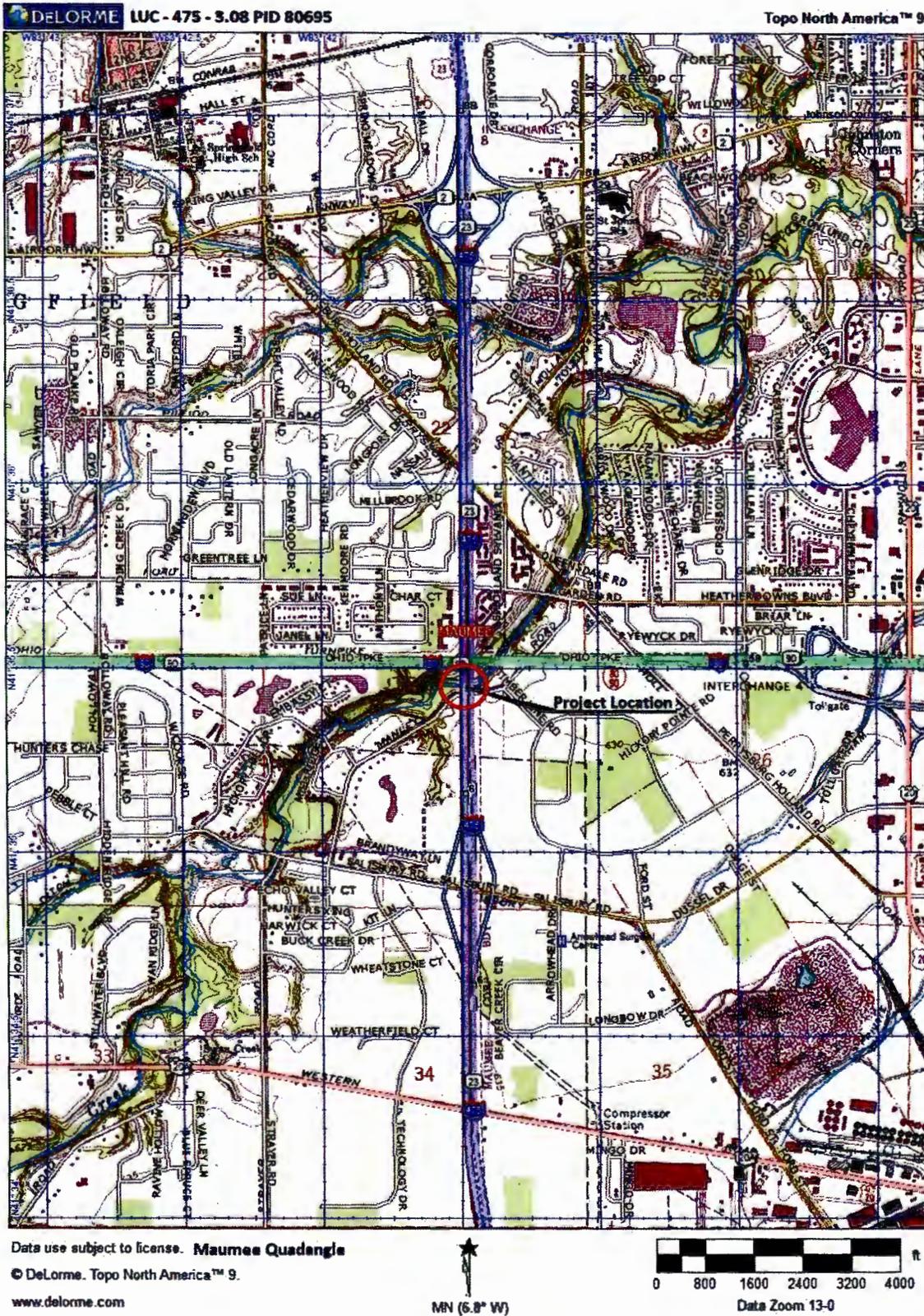
Additional description of the project construction and demolition plans, erosion and sediment control plans, and construction sequence/schedule is as follows:

- The bridge is currently under construction.
- A Phase 2 Mussel Survey and Relocation will be completed in May 2015.
- The RCP will be placed just after the mussel relocation and prior to project completion in June 2015.
- Placement of RCP will occur along the stream slope and around the piers via a backhoe and will not be placed outside of the zones displayed on the plans. Potential increases in sediment/turbidity during and after construction will be minimized through the use of sediment and erosion controls in accordance with ODOT's Construction and Materials Specifications (2010), which conform to Ohio EPA's National Pollutant Elimination Discharge System (NPDES) requirements for construction stormwater management.
- Potential longer-duration water quality impacts associated with roadway runoff will be minimized through the implementation of post-construction Best Management Practices (BMPs) in accordance with the ODOT Location and Design Manual. Notes and estimated quantities have been included in the design plans to address erosion and sediment control.
- Appropriate seeding and re-vegetation will take place after completion of RCP/slope stabilization

Clearing/Grubbing

The Bridge project is currently under construction and mechanical removal of woody vegetation has already taken place. No trees were cut as a result of the project. All necessary sediment and erosion control structures have been installed and have been evaluated for stability as well as maintenance during project construction. Weekly sediment and erosion control reports have been sent to the Service (as requested by USFWS). Other than the RCP material used for the slope and pier protection, no other material will be placed below the ordinary high-water mark (OHWM) of the stream. No work, dewatering, staging, storage, or access will occur outside the outlined zone on the project plans. Disturbed areas will be seeded and mulched as projects are completed.

Figure 1. Project Area



Demobilization

At the end of the project all disturbed areas will be vegetated, all protective fencing will be removed, and all temporary sediment and erosion control structures will be removed when the vegetation has become established.

MUSSEL CONSERVATION MEASURES

Proposed mussel conservation measures were included in the BA on pages 11 and 12. The Service recognizes that, individually and/or cumulatively, these mussel conservation measures contribute to the avoidance and minimization of adverse effects to the rayed bean but they do not necessarily eliminate all adverse effects that may result from the proposed action. These conservation measures are included below and by reference, with additional detail and minimization actions, in the "Reasonable and Prudent Measures" and "Terms and Conditions" sections of this BO. ODOT stated in the BA that the following conservation measures would be implemented as part of this project in order to avoid and/or minimize the effects of the proposed action on the federally listed rayed bean mussel.

Mussel Salvage and Relocation

Effects to the mussel community in the action area will be minimized to the extent practicable. A Phase 2 Mussel Survey and Relocation effort at this site will follow the Ohio Department of Natural Resources' Division of Wildlife (ODNR-DOW) and COFO's most recent version of the Ohio Mussel Survey Protocols.

Mussels will be collected and placed into perforated baskets or tubs and held temporarily while searches in a particular area are completed. The mussels will then be transferred to large tubs and loaded into a vehicle for transport to an upstream relocation area. Mussels will be transported quickly and efficiently to minimize handling stress and the associated potential for mortality.

Relocation areas will be determined during an investigation into suitable habitat upstream of the project site prior to the Phase 2 Mussel Survey and Relocation. Mussels will then be relocated to this selected area on the same day as the Phase 2 Mussel Survey. A follow-up/survival survey will be conducted on all relocated rayed bean mussels approximately one to two years post-relocation. In order to conduct follow-up surveys, any federally listed species found during the rescue will be recorded and tagged before relocation.

Sediment and Erosion Control Plan/Best Management Practices

Effects associated with erosion and sedimentation caused by project continuation and RCP placement will be minimized by implementation of erosion control Best Management Practices (BMPs), which have been and will continue to be regularly inspected and maintained throughout project completion and site restoration. Potential increases in sediment/turbidity during and after construction will be minimized through the use of sediment and erosion controls in accordance with ODOT's Construction and Materials Specifications (2010), which conform to Ohio EPA's National Pollutant Elimination Discharge System (NPDES) requirements for construction stormwater management. Implementation of these BMPs will ensure minimization of effects to water quality by preventing adverse sedimentation effects to water quality and aquatic/terrestrial habitats in the action area.

PROPOSED ACTION ACTIVITIES

Rock Channel Protection Placement

Action Area

The LUC-475-3.08 project is located in Springfield Township, Lucas County, Ohio. The project occurs where I-475 crosses Manley Road, Swan Creek, and the Ohio Turnpike (I-80/I-90). The project construction limits are located within existing I-475 right-of-way. The total land area within the construction limits measures approximately 10.7 acres. Land use/habitat types within the construction limits consist of: roadway pavement/shoulder (3.6 acres), roadway embankment/median (5.5 acres), and wooded riparian corridor (1.6 acres). The project construction limits within Swan Creek occur along the stream bank and will not encroach upon the middle of the channel. There are no wetlands in the project area.

At the I-475 bridge crossing, Swan creek has a drainage area of 132 square miles and is approximately 45 feet wide with a typical water depth of approximately 2 to 3 feet. Swan Creek has an ordinary high water (OHW) elevation of 605.94 feet, and a normal water elevation of 600.70 feet, which falls several feet above/adjacent to the edge of the Swan Creek wetted channel. Flood stage (HW50) for this point of Swan Creek is at 610.12 feet. There are a total of 10 existing bridge pier sets in the project area. Swan Creek flows in an easterly direction between Pier set 3 (located on Swan Creek's south bank) and Pier set 4 (located on Swan Creek's north bank). The existing ground level at these piers is below the OHW elevation (605.94 feet) and at approximately the same elevation as the normal water elevation (600.70 feet).

Under the southbound I-475 bridge, Swan Creek has eroded its north bank near the Pier 4 footer. Contours indicate that there is approximately a 2-foot difference between the edge of channel and the existing Pier 4 footer. Pier 3 (southbound bridge) appears stable and not as susceptible to erosion as Pier 4. Contours indicate that there is approximately a 4-foot difference between the edge of water and the existing Pier 3 footer.

Under the I-475 northbound bridge, Pier 4 appears stable. Contours indicate that there is approximately a 2.5-foot difference between the edge of water and the existing Pier 4 footer. However, Swan Creek has eroded its south bank near the Pier 3 footer. Contours indicate that the edge of the Swan Creek channel now abuts the existing Pier 3 footer.

The action area is defined by the impacts to the environment that would elicit a response in the species addressed in the BO (Service and NMFS 1998). For this project, the action area includes all areas where rayed bean mussels may be directly or indirectly affected by project actions. Potential effects resulting from site preparation, construction, and ongoing use and maintenance were considered when defining the Action Area, which is comprised of the in-stream habitat potentially directly affected by project construction, as well as areas upstream and downstream of the project where indirect water quality impacts could potentially occur.

This BO assesses effects to the rayed bean, an aquatic species. As such, all terrestrial habitats were excluded from the Action Area, with the exception of terrestrial areas immediately adjacent to the Swan Creek channel where project actions may affect the aquatic environment (i.e., location of the new drilled shaft piers near the channel edge). Thus, the Action Area for potential direct impacts to rayed bean habitat is approximately 70 feet long by 64 feet wide (for each bridge) for a total of 8,960 square feet (0.21 acre).

The portions of the Action Area in which potential direct effects to rayed bean would occur include the areas below the existing/proposed I-475 bridge decks. No pier construction, work pads or dewatering is expected in the Swan Creek channel. The proposed rock channel protection to be placed in Swan Creek will directly impact 1,690 square feet (157 square meters) of area along the stream bank. A mussel survey and relocation will be completed before this rock is placed. Therefore, potential direct effects to mussels in the Action Area are limited to crushing and burying from the placement of the rock channel protection as well as species stress during collection and relocation. Potential indirect effects include increased sedimentation/turbidity (increased bedload), chemical exposure due to an accidental fuel spill or other toxic material release, scour, increased roadway pollutants, decreased visibility for reproduction and stress from relocation. The portion of the Action Area in which potential indirect effects to mussels could occur includes the area of potential direct effects, as well as in-stream habitat extending from approximately 100 feet upstream of the southbound bridge to approximately 450 feet downstream of the northbound bridge. The total area of potential indirect effects is 31,400 square feet or 0.72 acre.

II. STATUS OF THE SPECIES

This opinion covers the **rayed bean** (*Villosa fabalis*).

Species Description

The rayed bean is a small mussel, usually less than 1.5 inches (in) 3.8 centimeters (cm) in length (Cummings and Mayer 1992; Parmalee and Bogan 1998; West et al. 2000). The shell outline is elongate or ovate in males and elliptical in females, and moderately inflated in both sexes, but more so in females (Parmalee and Bogan 1998). The valves are thick and solid. The anterior end is rounded in females and bluntly pointed in males (Cummings and Mayer 1992). Females are generally smaller than males (Parmalee and Bogan 1998). Dorsally, the shell margin is straight, while the ventral margin is straight to slightly curved (Cummings and Mayer 1992). The beaks are slightly elevated above the hingeline (West et al. 2000), with sculpture consisting of double loops with some nodules (Parmalee and Bogan 1998). No posterior ridge is evident. Surface texture is smooth and sub-shiny, and green, yellowish-green, or brown in color, with numerous, wavy, dark-green rays of various widths (sometimes obscure in older, blackened specimens) (Cummings and Mayer 1992; West et al. 2000). Internally, the left valve has two pseudocardinal teeth (tooth-like structures along the hingeline of the internal portion of the shell) that are triangular, relatively heavy, and large, and two short, heavy lateral teeth (Cummings and Mayer 1992). The right valve has a low, triangular pseudocardinal tooth, with possibly smaller secondary teeth anteriorly and posteriorly, and a short, heavy, and somewhat elevated lateral tooth (Parmalee and Bogan 1998). The color of the nacre (mother-of-pearl) is silvery white or bluish and iridescent posteriorly. Key characters useful for distinguishing the rayed bean from other mussels are its small size, thick valves, unusually heavy teeth for a small mussel, and color pattern (Cummings and Mayer 1992).

Life History

The general biology of the rayed bean is similar to other bivalve mollusks belonging to the family Unionidae. Adults are suspension-feeders, spending their entire lives partially or completely buried within the substrate (Murray and Leonard 1962). Adults feed on algae, bacteria, detritus, microscopic animals, and dissolved organic material (Silverman et al. 1997; Nichols and Garling 2000; Christian et al. 2004; Strayer et al. 2004). Recent evidence suggests that adult mussels may also deposit-feed on particles in the sediment (Raikow and Hamilton 2001). For their first several months, juvenile mussels employ foot (pedal) feeding, consuming settled algae and detritus (Yeager et al. 1994). Unionids have an unusual mode of reproduction. Their life cycle includes a brief, obligatory parasitic stage on fish. Eggs develop into microscopic larvae called glochidia within special gill chambers of the female mussel. The female expels the mature glochidia, which must attach to the gills or the fins of an appropriate fish host to

complete development. Host fish specificity varies among unionids. Some species appear to use a single host, while others can transform on several host species. Following successful infestation, glochidia encyst (enclose in a cyst-like structure) and drop off as newly transformed juveniles.

Mussel biologists know relatively little about the specific life-history requirements of the rayed bean. Most mussels, including the rayed bean, have separate sexes. The age at sexual maturity, which is unknown for the rayed bean, is highly variable (0–9 years) among and within species (Haag and Staton 2003), and may be sex-dependent (Smith 1979). The rayed bean is thought to be a long-term brooder, with females brooding glochidia from May through October (Parmalee and Bogan 1998; Ecological Specialists, Inc. (ESI) 2000; Woolnough 2002). Tippecanoe darter (*Etheostoma tippecanoe*) and spotted darter (*Etheostoma maculatum*) are the only verified host fish for the rayed bean (White *et al.* 1996, Watters 2011). Other rayed bean hosts are thought to include the greenside darter (*E. blennioides*), rainbow darter (*E. caeruleum*), mottled sculpin (*Cottus bairdi*), and largemouth bass (*Micropterus salmoides*) (Woolnough 2002). Based on inference of closely related species, additional hosts may be suitable, including other darter and sculpin species (Jones 2002, pers. comm.).

Population Dynamics

Based on historical and current data, the rayed bean has declined significantly rangewide and is now known from only 31 streams and 1 lake (down from 115), a 73 percent decline. This species has also been eliminated from long reaches of former habitat in hundreds of miles of the Maumee, Ohio, Wabash, and Tennessee Rivers and from numerous stream reaches and their tributaries. In addition, this species is no longer known from the States of Illinois, Kentucky, and Virginia. The rayed bean was also extirpated in West Virginia until the 2006 reintroduction into the Elk River (Clayton 2007, pers. comm.; USFWS 2012).

Swan Creek is a tributary of the lower Maumee River in northwestern Ohio. This population was discovered in 2005. Surveys conducted in 2010 at six sites (three middle Swan Creek sites and three Upper Swan Creek sites) found that rayed bean occurred in the survey area at a mean abundance of 88 per 100 square meters and have a mean density of .12 per square meter (Grabarkiewicz/Gottgens 2011). The rayed bean was the third most abundant unionid present within the 2011 sample area, with a relative abundance of about 10.2 percent of the total mussel community sampled (Grabarkiewicz/Gottgens 2011). The rayed bean population in Swan Creek is viable and, although limited to a short reach, may be one of the most robust remaining populations (USFWS 2012).

Population variability

The rayed bean has experienced a significant reduction in range and most of its populations are disjunct, isolated, and, with few exceptions, appear to be declining (West *et al.* 2000). The extirpation of this species from over 80 streams and other water bodies within its historical range indicates that substantial population losses have occurred (USFWS 2012).

Population stability

Relatively few streams are thought to harbor sizable viable populations (Sydenham, Blanchard, and Allegheny Rivers, and French and Swan Creeks). Small population size and restricted stream reaches of current occurrence are real threats to the rayed bean due to the negative genetic aspects associated with small, geographically isolated populations. This can be especially true for a species, like the rayed bean, that was historically widespread and had population connectivity among main stem rivers and multiple tributaries (USFWS 2012).

Status and Distribution

Reasons for listing

The rayed bean has been eliminated from about 73 percent of the streams where it historically occurred. Furthermore, extant populations of the species, with few exceptions, are highly fragmented and restricted to short reaches. The primary cause of range curtailment for this species has been modification and destruction of river and stream habitats, primarily by the construction of impoundments (USFWS 2012).

Rangewide trend

The majority of the remaining populations of rayed bean are generally small and geographically isolated (Butler 2002). The patchy distributional pattern of populations in short river reaches makes those populations much more susceptible to extirpation from single catastrophic events, such as toxic chemical spills (Watters and Dunn, 1993–94). Furthermore, this level of isolation makes natural repopulation of any extirpated population virtually impossible without human intervention. Various nonnative species of aquatic organisms are firmly established in the range of the rayed bean; however, the exotic species that poses the most significant threat to these species is the zebra mussel (*Dreissena polymorpha*) (Butler 2002).

New threats

The zebra mussel, an exotic species that colonizes the shells of native mussels, is a relatively new threat. It is present in many watersheds in Ohio and has been observed attached to native mussels. It can restrict the ability of a mussel to move, feed, respire, and reproduce, especially if large numbers are present on the shell of the native mussel. No zebra mussels were identified in the 2014 mussel survey.

Analysis of the Species Likely to be Affected

This BO considers the rayed bean. No critical habitat has been designated or proposed for this species.

III. ENVIRONMENTAL BASELINE

Status of the Species within the Action Area

Rayed bean were found within the project area during the Phase 1 survey conducted by EnviroScience on July 22, 2014. Most individuals were found in the center of the river, with some concentrated in the western limits of the survey area. A total of 17 live rayed bean were detected (EnviroScience 2014).

Factors Affecting Species Environment within the Action Area

Land use/habitat types within the construction limits consist of: roadway pavement/shoulder (3.6 acres), roadway embankment/median (5.5 acres), and wooded riparian corridor (1.6 acres). The project construction limits within Swan Creek occur along the stream bank and will not encroach upon the middle of the channel. No actions are expected to occur within the middle of the Swan Creek channel. There are no wetlands in the project area. The direct construction-related impacts that could potentially affect rayed bean mussel are limited to construction debris/bridge materials potentially falling into Swan Creek, a potential accidental discharge of earth material into the creek during drilled shaft construction, and the placement of the rock channel protection.

IV. EFFECTS OF THE ACTION

Analysis for Effects of the Action

Quantifying incidental take for freshwater mussels is problematic in nature. Mussels are typically buried beneath substrates making location and estimation of their population densities difficult. Even when found, mussels are likely present in larger numbers than discovered. This is especially true for the rayed bean due to their small size (usually less than 1.5 in).

Beneficial effects:

Some beneficial effects have been identified or are expected to occur as a result of the proposed action. During construction, ODOT District 2 Office of Construction determined that RCP would need to be placed along the bridge pier footers and slope of the stream in order to stabilize the bank, thus stopping the erosion of sediment into Swan Creek. Stabilizing the bank of the stream and stopping overall erosion will greatly enhance future available mussel habitat within the Action Area and downstream as well as overall stream health longevity.

Direct effects:

Construction of the bridge could directly affect the rayed bean mussel in a variety of ways. Mussels could be crushed by heavy rocks; they may become stranded on substrate through increased turbidity or become entrapped in substrate during collection and relocation efforts. This is especially prevalent within the stream areas that require placement of RCP.

The mussel survey recovery effort will follow the Ohio Mussel Survey Protocols and rescued mussels will be placed in suitable habitat upstream of the project area. Both phases of the mussel rescue will reduce direct impacts to individual mussels and rescue efforts will continue until live mussels recovered per cell are substantially depleted. However, it is unlikely that every individual will be successfully located. Mussels may be overlooked, especially juvenile mussels and some mussels that have burrowed into the substrate.

We are unable to quantify the number of mussels that may be overlooked and become stranded or entrapped in the substrate. With successful implementation of the Mussel Rescue and Relocation Plan, we expect the number of individuals missed to be low. The Phase 2 Mussel Survey and Relocation includes searching for mussels in the Area of Direct Impact (ADI). Prior to the placement of RCP, mussels will be relocated to an appropriate upstream area.

The EnviroScience (2014) study shows that rayed bean inhabits the area. Because substrates have not been mapped, and because substrates are prone to change over time, the entire river bottom within the Action Area is assumed to be potential habitat for the mussel species under consideration. The total rayed bean habitat to be directly impacted is estimated to be approximately 8,960 square feet, or 0.21 acres within the Action Area.

Indirect effects:

Indirect effects to listed mussel species 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.

Indirect impacts to mussels may occur when in-stream habitat is affected by increased turbidity, siltation, and sedimentation. The amount of affected area and severity of effects will be dependent upon rainfall,

water flow, and other parameters such as amount of organic detritus along the shoreline and in the water, , underlying soil types or bed sediments, and the potential for decreased reproduction and recruitment due to increased sedimentation/turbidity resulting in low visibility for glochidia release during breeding season. In-stream effects will be minimized through use of BMPs and by avoiding construction during times of heavy water flow. Downstream effects are expected to be limited, and are likely to be restricted to the immediate vicinity of current construction activities. Because the indirect effects of construction/demolition on mussels are extremely complex and hard to quantify, they are not specifically delineated. For the purposes of this BO we assume that any temporary or permanent indirect effects (scouring, siltation, sedimentation, chemical exposure due to an accidental fuel spill or other toxic material release, increased roadway pollutants and stress from relocation, etc.) will occur outside of the Action Area. This area includes in-stream habitat extending from approximately 100 feet upstream of the southbound bridge to approximately 450 feet downstream of the northbound bridge. The total area of potential indirect effects is 31,400 square feet or 0.72 acre.

Species Response to Proposed Action

Numbers of individuals/populations in the action area affected:

We assume that ten percent of rayed bean mussels were detected within the potential Action Area during the Phase 1 mussel survey performed by EnviroScience on July 22, 2014. The total number of rayed bean found was 17 individuals at an estimated density of two per ten square meters. For the purposes of this BO and to cover any potential incidental take, we estimate that direct impacts will occur potentially within **157** square meters of the Action Area. Direct effects to rayed bean include the potential to be crushed resulting in injury or death; they may become stranded on substrate or become entrapped in substrate. Potential indirect effects include increased sedimentation/turbidity (increased bedload), chemical exposure due to an accidental fuel spill or other toxic material release, scour, increased roadway pollutants, decreased reproduction and recruitment due to increased sedimentation/turbidity resulting in low visibility for glochidia release during breeding season, and stress from relocation. The portion of the Action Area in which potential indirect effects to mussels could occur includes the area of potential direct effects, as well as in-stream habitat extending from approximately 100 feet upstream of the southbound bridge to approximately 450 feet downstream of the northbound bridge (Figure 3). The total area of potential indirect effects is 31,400 square feet or 0.72 acre. Based on the Phase 1 mussel survey, we are assuming a density of two rayed bean per ten square meters; therefore, we have estimated that **40** rayed bean individuals may be taken and that **157** square meters of habitat will be potentially directly lost.

Sensitivity to change:

The degree to which this mussel species is prone to change when disturbed is unknown. Rayed bean are thought to be relatively sedentary within the substrate. As a result, it is likely unable to respond to change by moving great distances; however, it is possible that mussels could move several meters. When disturbed, mussels, in general, tend to close their valves for a period of time; however, this response will vary depending on the disturbance. Mussels exposed to disturbance events will likely close their valves when disturbed and remain closed if continued to be disturbed. They are not likely to move out of the disturbed area on their own because of their inability to move great distances in a short period of time and because their valves will likely remain closed preventing extension of their foot for movement.

Resilience:

Resilience relates to the characteristics of populations or a species that allow them to recover from different magnitudes of disturbance. Assuming that the flow characteristics and habitat conditions in the Action Area will be improved over time and the magnitude of disturbance is expected to be low, resilience is not expected to decrease from its current level. Mussels can bury themselves or attempt to move toward water.

Recovery rate:

In this BO, the recovery rate relates to the time required for an individual mussel or population to return to equilibrium after exposure to a disturbance. Mussel individuals are expected to continue to spawn and recruit new individuals into the population; however, the level of successful recruitment to the adult stage is unknown.

CUMULATIVE EFFECTS

Potential cumulative effects are those effects likely to result from reasonably foreseeable future private, tribal, local, or State actions not involving federal participation. ODOT/FHWA is unaware of any tribal, local, or State actions (not involving federal participation) that are currently ongoing or planned in the Action Area. However, it is reasonable to assume that private actions will have ongoing or future potential to affect mussels in Swan Creek. As described above, at the LUC-475-3.08 project area, the river has a drainage area of 132 square miles, and much of this area is rural in nature, with private farming activities supplying nutrients and sediments into the upper Swan Creek watershed. Chemical applications from an adjacent golf course may also be degrading water quality in Swan Creek, along with stormwater runoff from neighboring residential subdivisions, which are prevalent in the middle to lower portions of the Swan Creek watershed. De-icing agents are not only used on the interstate, State, and local road network, but are also used on sidewalks and private driveways throughout the Swan Creek watershed. Farming activities, the conversion of farmland to residential subdivision and commercial developments (increased amounts of impervious pavement) and use of de-icing salts on public roads and private drives are expected to continue in the future in the Swan Creek watershed.

We are not aware of any other State, tribal or local actions to include under Cumulative Effects.

VI. CONCLUSION

After reviewing the current status of the rayed bean, the environmental baseline for the Action Area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the rayed bean and is not likely to destroy or adversely modify designated critical habitat. No critical habitat has been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent 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 defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. 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 to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by FHWA, so that they become binding conditions of any grant, permit, or contract, as appropriate, for the exemption in section

7(o)(2) to apply. FHWA has a continuing duty to regulate the activity covered by this Incidental Take Statement. If FHWA fails to assume and implement the terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, FHWA 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 (1)(3)].

Amount or Extent of Take Anticipated

The Service expects that 157 square meters of habitat for rayed bean could be directly impacted as a result of this proposed action. The 157 square meters of habitat is estimated to be impacted as a result of direct physical impacts and the placement of RCP. The Service believes that take of this mussel species is estimated to be 40 individuals (two individuals per ten square meters) and will cover any potential incidental take that may occur as a result of this proposed action.

In the "Analyses for effects of the action" section above, the Service determined that the proposed action would result in incidental take through (a) harm from construction that will likely result in (1) physical harm (i.e., cracked shell, bruising) to mussels that were not included in the relocation, (2) negative effects of sedimentation that could entomb, starve, and/or suffocate individuals, (3) loss and/or degradation of habitat, (4) relocation efforts, and (5) disruption of host fish availability at key times during the reproductive cycle; and (b) harassment as a result of disruption in reproductive capabilities by, but not limited to, the spontaneous abortion of glochidia during relocation and/or monitoring efforts, individuals being dislodged downriver into unsuitable habitat, and potentially low dissolved oxygen levels.

Effect of the Take

In the accompanying BO, the Service determined that, based on the proposed project and the conservation measures described within, this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of rayed bean. These measures are nondiscretionary:

1. FHWA will ensure that the proposed project components (e.g., mussel survey and relocation, RCP placement, etc.) will occur as planned and as documented in the BA and the project plans.
2. FHWA will ensure that one or more federally permitted mussel surveyors will undertake and carry out a Phase 2 Mussel Survey and Relocation effort and future mussel monitoring at this site will follow the ODNR and COFO's most recent version of the Ohio Mussel Survey Protocols. In addition, a survey/work plan proposal must be submitted to the Service by the permitted surveyor for approval prior to the Phase 2 Mussel Survey and Relocation and any follow up monitoring.

Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the Act, FHWA must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The project shall comply with all the lawful requirements of municipalities, counties, or other local agencies regarding the discharge of stormwater from construction activities. Reduction in stormwater runoff will limit the potential of sedimentation which could impact mussels.
2. Inspect all disturbed areas and areas used for storage of materials that are exposed to precipitation for evidence of or the potential for pollutants entering the drainage system in accordance with ODOT's Construction and Materials Specifications (2010), which conform to Ohio EPA's National Pollutant Elimination Discharge System (NPDES) requirements for construction stormwater management. **Inspections should be conducted weekly and continue until vegetation has been established.** This will reduce possible impacts to mussels from pollutants and reduction in water quality.
3. During all mussel survey work, surveyors must return federally listed mussels to the substrate by hand, placing them on their side and allowing them to burrow on their own.
4. Any federally listed mussels found during the survey and relocation must be recorded and tagged before relocation.
5. All RCP not placed below the OHWM should be mulched and vegetated with native plant species incorporating an appropriate prairie seed mix to encourage establishment of beneficial vegetative cover and to decrease future erosion.
6. ODOT will provide the Service with photographic documentation of the RCP placement to ensure placement has occurred in accordance with the project plan.

Please note: Upon locating a dead, injured, or sick individual of an endangered species, notification must be made to COFO at (614) 416-8993. Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury. Preservation of such specimens should be done in ethanol. The Service will advise ODOT/FHWA if the specimens must be retained or if an alternative means of disposition is required.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided. 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 Act directs federal agencies to use 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 adverse effects of a proposed action on listed species or critical habitat, to help carry out recovery plans, or to develop information.

1. Provide educational and outreach materials to District 2 staff, local agencies and the public regarding the importance of stream health and implementation of BMPs to reduce pollutant runoff from neighboring yards, roads and fields.
2. Provide ongoing opportunities for ecology/biology college majors to participate in mussel survey and stream health monitoring efforts within Swan Creek under the supervision of a federally permitted malacologist.
3. Provide roadside signage highlighting prairie seed mix planting and the benefits for native pollinators and long term stream health.

In order for the Service 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 any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation with the FHWA on the proposed placement of RCP within Swan Creek in Lucas County, Ohio. As provided in 50 CFR §402.16, the 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 effects of the agency action that 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.

For this BO, the incidental take would be exceeded, when the take exceeds 40 individuals of the rayed bean, and/or habitat impacts exceed 157 square meters within the Action Area, which is what has been exempted from the prohibitions of section 9 by this BO.

LITERATURE CITED

- Bogan, A.E. 1993. Freshwater bivalve extinctions (Mollusca: Unionoida): a search for causes. *American Zoologist* 33: 599-609.
- Butler, R.S. 2002. Status assessment report for the sheep nose, *Plethobasus cyphus*, occurring in the Mississippi River system (USFWS Regions 3, 4, 5). Asheville, NC: US Fish and Wildlife Service.
- Christian, A.D., B.N. Smith, D.J. Berg, J.C. Smoot, and R.H. Findlay. 2004. Trophic position and potential food sources of 2 species of unionid bivalves (Mollusca: Unionidae) in 2 small Ohio streams. *Journal of the North American Benthological Society* 23(1):101-113.
- Clayton, J.L. 2007. Email communication with J.L. Clayton, West Virginia Department of Natural Resources, Elkins, West Virginia (April 13, 2007).
- Cummings, K.S. and C.A. Mayer. 1992. Field Guide to Freshwater Mussels of the Midwest. *Illinois Natural History Survey Manual 5, Illinois*. Champaign, IL: Illinois Natural History Survey.
- Haag, W.R., and J.L. Staton. 2003. Variation in fecundity and other reproductive traits in freshwater mussels. *Freshwater Biology* 48:2118-2130.
- Hoggarth, M.A. 2009. Email communication with M.A. Hoggarth, Otterbein College, Westerville, Ohio (August 11, 2009).
- Hoggarth, M. A. 2010. Report on the status of mussels relocated from the Great Miami River, Otterbein College, Westerville, 1 September 2010.
- Jones, J.W. 2002. Email communication with J.W. Jones, Virginia Polytechnic Institute and State University, Blacksburg, Virginia (September 24, 2002).
- Murray, H.D., and A.B. Leonard. 1962. Handbook of the unionid mussels of Kansas. University of Kansas Museum of Natural History Miscellaneous Publication No. 28. 184 pp.
- Nichols, S.J., and D. Garling. 2000. Food-web dynamics and trophic-level interactions in a multispecies community of freshwater unionids. *Canadian Journal of Zoology* 78:871-882.
- Oesch, R.D. 1984. *Missouri naiades: a guide to the mussels of Missouri*. Jefferson City, MO: Missouri Department of Conservation.
- Parmalee, P.W. and A.E. Bogan. 1998. *The freshwater mussels of Tennessee*. Knoxville: University of Tennessee Press.
- Raikow, D.F., and S.K. Hamilton. 2001. Bivalve diets in a Midwestern U.S. stream: a stable isotope enrichment study. *Limnology and Oceanography* 46(3):514-522.
- Silverman, H., S.J. Nichols, J.S. Cherry, E. Achberger, J.W. Lynn, and T.H. Dietz. 1997. Clearance of laboratory-cultured bacteria by freshwater bivalves: differences between lentic and lotic unionids. *Canadian Journal of Zoology* 75:1857-1866.

- Smith, D.G. 1979. Sexual characteristics of *Margaritifera margaritifera* (Linnaeus) populations in central New England. *Veliger* 21:381-383.
- Strayer, D.L., J.A. Downing, W.R. Haag, T.L. King, J.B. Layzer, T.J. Newton, and S.J. Nichols. 2004. Changing perspectives on pearly mussels, North America's most imperiled animals. *BioScience* 54(5):429-469.
- U.S. Fish and Wildlife Service. 1976. Endangered Status for 159 Taxa of Animals. Fed. Reg. 41: 24062-24067.
- U.S. Fish and Wildlife Service. 2012. Listing the Rayed Bean and Snuffbox as Endangered. Final Rule. Fed. Reg. 77: 8631.
- U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act.
- Watters, G.T., and H.L. Dunn. 1993-94. The Unionidae of the lower Muskingum River (RM 34.1-0), Ohio, U.S.A. *Walkerana* 7(17/18): 225-263.
- West, E.L., J.L. Metcalfe-Smith, and S.K. Staton. 2000. Status of the rayed bean, *Villosa fabalis* (Bivalvia: Unionidae), in Ontario and Canada. *Canadian Field-Naturalist* 114:248-258.
- White, L.R., B.A. McPheron and J.R. Stauffer, Jr. 1996. Molecular genetic identification tools for the unionids of French Creek, Pennsylvania. *Malacologia*, 38:181-202.
- Woolnough, D.A. 2002. Life history of endangered freshwater mussels of the Sydenham River, southwestern Ontario, Canada. M.S. thesis, University of Guelph, Guelph, Ontario.
- Yeager, M.M., D.S. Cherry, and R.J. Neves. 1994. Feeding and burrowing behaviors of juvenile rainbow mussels, *Villosa iris* (Bivalvia: Unionidae). *Journal of the North American Benthological Society* 13(2):217-222.