



United States Department of the Interior

FISH AND WILDLIFE SERVICE

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Nashville District, Corps of Engineers
3701 Bell Road
Nashville, Tennessee 37214

Mr. John T. Baxter, Jr.
Endangered Species Compliance Manager
Tennessee Valley Authority
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Knoxville, Tennessee 37902-1499

Subject: FWS #2014-B-0370 (Corps LRN-2012-00349, River Port); Final Biological Opinion and Conference Opinion on the First Marine Properties, Inc., Port of Calvert City Project, Tennessee River Mile 10.7-11.3 in Marshall County, Kentucky, and its effects on federally listed mussels and proposed critical habitat for the rabbitsfoot mussel

Dear Mr. McDaniel and Mr. Baxter:

This document is the U.S. Fish and Wildlife Service's (Service) biological opinion and conference opinion related to the proposed Port of Calvert City project in Marshall County, Kentucky, that has been proposed by First Marine Properties, LLC (First Marine or applicant) and its effects on three federally listed mussel species and proposed critical habitat under section 7(a) (2) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The U.S. Army Corps of Engineers, Nashville District (Corps) is the lead federal action agency for the proposed action, and the Tennessee Valley Authority (TVA) is a cooperating federal action agency. The Corps' letter requesting formal consultation on the project was received on May 19, 2014, and formal consultation was initiated on June 13, 2014.

The First Marine project addressed in this BO will remove 4.0 acres of potential summer roosting and maternity habitat for the endangered Indiana bat. Another application, Marshall County-Calvert Riverport Authority (FWS#2014-B-0371; Corps LRN-2014-00120, Rail Spur), is also associated with this proposed activity. This project will remove 1.09 acres of potential summer roosting and maternity habitat for the endangered Indiana bat (*Myotis sodalis*). To

address these potential impacts, the applicants for both projects and the Service have entered in a Conservation Memorandum of Agreement (CMOA) regarding the Indiana bat. This CMOA authorizes take of Indiana bats associated with the proposed projects through the Service's January 3, 2011 intra-Service biological opinion on the Service's CMOA process. The CMOA covered the total acreage for these two applicants and was executed on July 11, 2014.

Our biological and conference opinions are based on information provided in a Biological Assessment (BA) prepared by Mainstream Commercial Divers, Inc., meetings (see consultation history), available literature, communications with experts on the federally listed species considered in this biological opinion, and other sources of information available to us and/or in our files. A complete administrative record of this consultation is on file at the Service's Kentucky Field Office in Frankfort, Kentucky (see address above).

The Service reviewed the information contained in the BA and concurs with the Corps that this project is not likely to adversely affect the fat pocketbook (*Potamilus capax*) or pink mucket (*Lampsilis abrupta*). Historically, the fat pocketbook had not been recorded from the Tennessee River until one specimen was observed in 2012 at Tennessee River Mile 13.0. Since this species has been so rarely observed in the Tennessee River, it is unlikely that it occurs at the project site. The pink mucket historically occurred in the lower Tennessee River; however, it has not been observed in this portion of the Tennessee River since 1991 and, therefore, is unlikely to occur at the project site.

In addition to the fat pocketbook and pink mucket, we do not anticipate that the proposed project will result in adverse effects on three other federally listed mussels – the ring pink, fanshell, and spectaclecase – that were not addressed in the Corps' May 19, 2014 letter. The ring pink has not been observed in the lower Tennessee River since 1985 and is not likely to occur at the project site. The fanshell has not been observed in the lower Tennessee River since 1978; however, the Kentucky Department of Fish and Wildlife Resources introduced fanshell mussels at one location in the lower Tennessee River in 2012 as part of a species recovery effort. This stocking site is on the right descending side of the river, and it is not likely that any of these fanshells have moved to the project site or that their progeny have become established at the site. The only record of the spectaclecase mussel from the lower Tennessee River occurred in 1991, so it is unlikely this species occurs at the project site.

Other federally listed species that might occur in the area, specifically the Price's potato-bean (*Apios priceana*), gray bat (*Myotis grisescens*), and Interior least tern (*Sterna antillarum athalassos*), will not be affected by the proposed project, because either habitat for these species will not be affected by the project, or it is not likely that these species will be affected. More specifically, the BA indicated that suitable habitat for Price's potato-bean (Redwing 2014) is not present on the project site, so we do not believe this species will be affected by the project. Also, roosting habitat is not present for gray bats and any impacts to foraging habitat are considered minor and/or insignificant. Nesting habitat for the Interior least tern is not present at the project site, and we do not believe the project will affect its ability to forage on the Tennessee River.

As a result of the analysis present above for the fat pocketbook, pink mucket, ring pink, fanshell, spectaclecase, Price's potato-bean, gray bat, and Interior least tern and the applicant's CMOA to

address likely adverse effects on the Indiana bat, each of these species will not be further addressed in this biological opinion.

The Service agrees with the Corps' determination that the proposed action is likely to adversely affect the endangered sheepsnose (*Plethobasus cyphus*) and orangefoot pimpleback (*Plethobasus cooperianus*) and the threatened rabbitsfoot (*Quadrula cylindrica cylindrica*). The proposed project area lies with an area where critical habitat has been proposed for the rabbitsfoot; therefore, we also have prepared a conference opinion that evaluates the effects of the proposed project on the proposed critical habitat for the rabbitsfoot mussel.

Consultation History

31 March 2014 – The Service received a Public Notice No. 14-06 from the Corps regarding the proposed action.

22 April 2014 – The Service sent an email to Ms. Lisa Morris (Nashville Corps) asking for preparation of a Biological Assessment for the project.

19 May 2014 – The Service received a letter and Biological Assessments from the Corps and Tennessee Valley Authority regarding this project and potential affected species.

13 June 2014 – The Service sent a letter to the Corps initiating formal consultation.

30 June 2014 – The Service received a copy of a letter from Senator Mitch McConnell dated June 27, 2014 that was sent to Service Director Dan Ashe on behalf of two local officials requesting that the Service expedite the biological opinion for this project.

9 July 2014 – The Service, First Marine and Mainstream Commercial Divers, Inc., discussed by telephone additional data needs regarding depth measurements at the project site, potential conservation measures that could be included in the BA and biological opinion, and potential contributions to the Kentucky Aquatic Resource Fund held by the Kentucky Waterways Alliance.

18 July 2014 – The Service received a Biological Assessment Supplement from the Corps for the project.

1 August 2014 – A draft biological opinion and conference opinion on the First Marine (Port of Calvert City) Project was provided to the Corps and TVA for review.

7 August July 2014 – The final biological opinion and conference opinion on the First Marine (Port of Calvert City) Project was provided to the Corps and TVA.

BIOLOGICAL AND CONFERENCE OPINION

DESCRIPTION OF THE PROPOSED ACTION

The project description below is primarily derived from the Biological Assessment (BA). For more complete details on the proposed action, readers are referred to the Biological Assessment (Morgan and Fortenbery 2014).

First Marine plans to construct a barge port, the Port of Calvert City, along the left descending bank of the Tennessee River between TRM 10.7 and 11.3 in Marshall County, Kentucky to take advantage of an anticipated increase in trade goods shipped into the United States. With the ongoing upgrades to the Panama Canal, larger vessels will be able to move more containers per vessel through the Canal to the Gulf of Mexico and eastern seaboard ports, including the Ports of New Orleans and Mobile, among others. An innovative container vessel is currently being designed that will be able to maneuver the shallow waters of the inland waterways, especially the Mississippi River and Tennessee-Tombigbee Waterway, to bring containers to the Port of Calvert City. This vessel will be able to fit into the smallest lock it would encounter on its journey from the Port of Mobile and is projected to be capable of carrying more than 1,000 multi-modal shipping containers.

The container vessel currently in design is unique with a draft of nine feet, dimensions of approximately 600 feet in length and approximately 100 feet in width, and will be rated at approximately 9,000 horsepower with two bow thrusters and a rudderless rear z-drive for maneuverability. In addition to the novel propulsion design, the interior of the vessel will be compartmentalized, allowing the vessel to remain afloat in the occurrence of a hull breach. All operations and mechanical equipment will be confined within the hull rather than above deck.

The Port of Calvert City has the necessary land base along with excellent river, highway and rail access, an extraordinary electric power supply and concomitant facilities, and infrastructure already available to meet the increased demand for container shipping in the lower Tennessee River. This combination of features along with adequate water depth makes this location particularly desirable for handling containers and other commodities.

Borrow Area

To obtain the required development area fill, it will be necessary to obtain the volume of fill material from the borrow area. The current project design will reduce wetland impacts to 3.9 acres, and the intermittent stream would remain untouched; however, in order to raise the loadout and staging area above the 500-year flood stage, excavated material from a 13 acre borrow site would be used as fill to raise the 19 acre development area to an elevation of 346 feet above mean sea level. The proposed borrow area for the project consists of the open field area immediately upstream of the development area. The overburden in this area would be excavated and placed in the fill area (development area). Once excavation is completed, the entire borrow area would be seeded and stabilized. The volume of soil excavated from the borrow area will leave a sufficiently deep depression that will collect runoff precipitation. To prevent this collected water from filling the borrow area and spilling over into the adjacent Tennessee River, most likely washing out much of the river bank in the process, an excavated drainage channel

would be constructed and stabilized with riprap. This channel would be above the normal pool level of the Tennessee River but would allow the pooled water in the borrow area to drain into the river in a controlled fashion that would not threaten the stability of the immediate river bank.

Development Area

Materials excavated from the borrow area onsite would be utilized to create a landmass that will be approximately 19 acres with final grade above the 500-year flood water surface elevation, where the top elevation of the landmass would be 346 feet above mean sea level. This landmass would serve as the development area for all land-based activities for the port and would include access to Shar-Cal Road. This area would be utilized for the temporary storage and manipulation of containers as well as general goods. A sheet pile breasting wall will be installed to encompass an approximate 0.2 acre (8,712 square feet) area of the Tennessee River. The sheet pile wall will be built approximately 45' from the left descending bank of the river and will surround two existing mooring cells. This 0.2 acre area will be an extension of the development area and is expected to be the location for the installation of a cargo loading crane. Three breasting dolphins will be installed out from the left descending bank and are expected to be built in line with the sheet pile breasting wall. One dolphin will be situated 150 feet upstream of the wall, a second dolphin will be situated 150 feet downstream of the wall and the third dolphin will be situated 300 feet downstream of the wall. Each dolphin will be comprised of three 12-inch diameter pipes, where the entirety of each dolphin is expected to be contained within an area approximately 24 inches in diameter. Using these provided dimensions, each dolphin is expected to directly impact approximately 3.14 square feet and the three dolphins together are expected to directly impact a total approximately 9.42 square feet. Construction barges utilized for the sheet pile breasting wall and dolphin installation may hold themselves in position temporarily by employing spud poles (vertical pipe or square steel sections lowered to the river bottom to hold a barge in position), which may directly impact native mussels when dropped. Most frequently these spud poles would be 18 to 24-inch pipe or square stock, with two spuds dropped to the river bottom on a single pile driving barge for each dolphin installation location. Assuming 24-inch square stock, each work barge location using spud poles would directly affect approximately 8 square feet, yielding a total of 24 square feet of river bottom directly impacted via spud poles during the installation of the three dolphins. When combined with the approximate direct impact of the dolphins (9.42 square feet), the total area of direct impact for all three dolphin installations is expected to be approximately 34 square feet. The sheet pile wall installation is expected to require approximately fifty placements of a pile driving barge. If the work barge is spudded down fifty times, that would yield an approximate area of direct spud pole impact of 400 square feet, which in combination with the direct impact area of the fill material to be placed behind it, would total an area of approximately 9,112 square feet.

The landmass that is created will accommodate truck traffic for the loading and unloading of barges, as well as a 250-ton heavy-lift crane for loading/unloading special cargo. The landmass will be connected to Shar-Cal road at the location of the existing entrance road to the barge maintenance facility. The fill material to create this landmass will be comprised of approximately 700,000 cubic yards of material obtained from within the limits of the project and within the limits of the 100-year floodplain for the Tennessee River. All fill slopes will be constructed at 3H:1V or flatter and suitably stabilized against erosion. Once constructed, the landmass will be covered with gravel for one to two years to allow for settlement, at which time

it will then be paved with asphalt and/or concrete. Surface drainage from the site will be provided through shallow inlets and storm sewer piping along with riprap stabilized flumes that drain to the borrow area. The landmass will be constructed to minimize impact to existing jurisdictional wetlands and maintain a 50-foot wide riparian buffer along the bank of the Tennessee River. The total area of wetlands disturbed for the construction of the landmass is expected to be approximately 3.9 acres.

Project Operation

The development area will be utilized primarily for the temporary storage and manipulation of containers. The area will include any machinery required to move containers and large equipment to and from the container vessels and barges. Also included in this area would be any offices/operation facilities necessary for any on-site administrative and coordination tasks.

Proposed initial container vessel traffic rates are expected to be one vessel approximately every three days at the proposed port of Calvert City, where they will dock at the sheet pile breasting wall and await unloading of cargo. The vessels will then be unloaded off shipping containers via overhead crane. The wheel wash of the container vessel and yard tug may affect the river bottom at and around the breasting wall at low water, but any impact is expected to be minimal.

Proposed barge traffic at the port will be for loading and unloading of large equipment as well as continuing currently permitted fleeting. Small yard tugs, operating at no more than 1,200 horsepower, will maneuver barges into and out of dock.

ACTION AREA

The Service considers the action area to include the area from Kentucky Dam, which is just upstream from the project site, downstream to the mouth of the Tennessee River, and the Ohio River downstream to Ohio River Mile 973 near Mound City, Illinois. The action area is designated in this way because (a) it contains the entirety of the proposed action (fleeting site location) and (b) it contains the areas upstream and downstream of the proposed project where the indirect and cumulative effects of the proposed action are likely to occur. For example, the Service believes that the proposed action is likely to result in (a) localized population reductions of the freshwater mussels that may be adversely affected, which would result in corresponding effects on their populations within the described action area, and (b) a reduced likelihood that fish hosts for these freshwater mussel species will provide the same level of pre-project genetic flow throughout the described action area due to the anticipated population reductions of these species within the action area.

The Service views the action area described in the BA as more of a “project footprint” of the proposed barge port, and, therefore, uses the larger action area described above when evaluating all of the effects of the action. This “project footprint” area is approximately 2.32 acres in size.

EFFECTS OF PROPOSED ACTION

This area of the Tennessee River contains a diverse mussel assemblage including federally listed species. The Service recognizes that the proposed barge port has the potential to impact mussels and mussel habitat in a variety of ways. Adverse effects are expected to result from sediment and associated turbidity resulting from wheel wash from towboat propellers, container vessel propellers, and by barges potentially contacting the river bottom and shore. However, these effects may be reduced due to the water depth at the project location, First Marine's planned use of sheet pile breasting and cells for barges to rest against, and low horsepower tow boats to maneuver barges in and out of the fleeting areas. Based on water depths recorded at this project site and other nearby sites, barges (loaded and/or unloaded) are not expected to regularly make contact with the river bed; however, this may occasionally occur under certain conditions.

Sheepnose and rabbitsfoot mussels are known to occur within the project area, and the orangefoot pimpleback mussel is likely to occur at this site. Although the orangefoot pimpleback has not been found in large numbers within the lower Tennessee River, it resides there in very low concentrations and, thus, often goes undetected during mussel surveys. The likely effects of the project on these species would be direct and indirect effects to these species on-site or where they occur downstream of the project area in other portions of the action area. The Service believes that potential impacts from project-related river substrate disturbance and resulting turbidity would lead to (a) mortality of listed mussels, (b) siltation that would harm and harass listed mussels, (c) deposition of material on the river bottom that would harm and harass listed mussels and proposed critical habitat, and (d) short-term avoidance of the fleeting areas by potential mussel fish hosts that would interfere with reproduction, and thus resulting in decreased reproductive success of these mussels.

CONSERVATION MEASURES

First Marine has committed to a variety of design and facility operation features to reduce and minimize impacts of the proposed Port of Calvert City project on terrestrial and aquatic habitat, and federally listed species. These methods can be grouped as short-term (i.e., during project conception and construction) and long-term (i.e., during the continued operation of the facility) and are taken from the BA and associated discussions with First Marine.

Short-term impact conservation measures include:

1. The current design is projected to impact only 3.9 acres of jurisdictional wetlands and minimize impacts to aquatic species. Note: This current design is different from an earlier facility layout. The first design would have permanently impacted a man-made intermittent stream and 40 acres of jurisdictional wetlands. The second design would have impacted approximately 100 linear feet of stream, a portion of the river bottom via dredging, 4.73 acres of jurisdictional wetlands, and a significant amount of archaeological resources.

2. Sheet pile and dolphin installations will be accompanied by a floating turbidity curtain, which will effectively contain and control suspended solids, significantly lessening the impact to listed mussels that occur downstream of the project area.
3. Reseeding and stabilization of the borrow area following fill material removal will occur, thus reducing sedimentation.
4. Conducting all tree clearing between October 15 and March 31, during the daytime, in an effort to avoid directly impacting Indiana and gray bats.

Long-term impact conservation measures include:

1. Keeping a minimum of 10 feet of water depth at the barge port through the use of the sheet pile breasting wall and breasting dolphins, thus avoiding or significantly reducing impacts to mussels on the bottom of the river.
2. Not dredging at the sheet pile breasting wall or the breasting dolphins to maintain adequate depth. Dredging has never been performed at the proposed project site and the velocities of river currents on the left descending side of the river at the project area keeps the river bottom reasonably free of sediment. Natural occurrences may occur that necessitate future dredging, but First Marine has neither plans nor a desire to dredge at this location.
3. Diverting any storm water runoff from the development area into the borrow area, rather than immediately into the Tennessee River, reducing the effects of any suspended sediments that may be carried directly into the river. Once in the pooled water of the borrow area, any suspended sediments are expected to settle to the bottom and not immediately enter the Tennessee River.
4. Operating small yard tugs at no more than 1,200 horsepower, reducing the effect of wheel wash on mussels while maneuvering barges into and out of dock at the Port.
5. Utilizing either LNG or CNG with diesel to power the container vessel, which would reduce air emissions as opposed to a solely diesel powered vessel.
6. First Marine will instruct all pilots involved with moving the container vessel and barges in and out of the fleeting area to attempt to keep the vessel and any barges from striking the substrate when near the shore, and to attempt to orient their vessels so that any wheel wash is directed toward deeper water whenever possible.
7. First Marine has agreed to contribute to the Kentucky Waterways Alliance's (KWA) Kentucky Aquatic Resources Fund (KARF), to minimize the anticipated take of rabbitsfoot mussels, sheepsnose mussels, and orangefoot pimpleback mussels. Currently, it is estimated that an appropriate contribution per individual mussel for each species is as follows: rabbitsfoot - \$500.00; sheepsnose - \$2,000.00; and orangefoot pimpleback - \$4,000.00. These funds will be used in propagation, culture, and other recovery efforts

for these listed species. The total contribution will be made in one payment prior to the establishment of the barge port. The contribution shall be mailed to: Attention: Judith Peterson, Executive Director, Kentucky Waterways Alliance, 120 Webster Street, Suite 217, Louisville, Kentucky 40206. The KWA's office telephone number is 270-524-1774. Ms. Peterson will be contacted to determine if the contribution will be made by direct deposit or a wire transfer.

8. First Marine has agreed to adequately fund a monitoring effort of this project site using primarily side-scan sonar and divers to monitor impacts of this barge port to mussels and mussel habitat. The monitoring plan will be agreed upon prior to the establishment of the barge port and will be approved by the Service's Kentucky Field Office, the Corps, and TVA. This monitoring effort will start prior to the establishment of this barge port, and then again in two years and four years after the barge port is established. After the second monitoring effort of the post-barge port area establishment, a report of the monitoring effort will be provided to the Corps, TVA, and Service. The Corps, TVA, and Service will then determine if further monitoring is needed.

The aforementioned mussel conservation measures were either included in the Biological Assessment and/or provided at a later date as additional information. The Service recognizes that, individually and/or cumulatively, these mussel conservation measures contribute to the avoidance and minimization of adverse effects to the listed and proposed mussels and proposed critical habitat; however, these measures do not necessarily eliminate all adverse effects that may result from the proposed action. These conservation measures are included along with additional minimization actions in the Reasonable and Prudent Measures and Terms and Conditions portion of this biological opinion.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

This biological opinion covers the federally endangered orangefoot pimpleback and sheepsnose and the federally threatened rabbitsfoot mussel. This conference opinion covers the proposed critical habitat for the rabbitsfoot mussel.

Orangefoot pimpleback

The orangefoot pimpleback is an Ohioan species (i.e., Interior Basin) species. Records are only known from the Ohio River basin. It was listed as an endangered species on July 14, 1976 (USFWS 1976). No critical habitat has been designated for this species.

The orangefoot pimpleback is a medium-sized mussel, growing to a length of approximately 3.5 inches. The shell is circular or sub-triangular in shape, with prominent beaks that are directed anteriorly. The periostracum is brown to reddish-brown and the surface of the shell is marked by concentric growth lines. The posterior two-thirds of the shell are covered with numerous raised, irregular pustules (Parmalee and Bogan 1998). Nacre color varies from white to pink inside the pallial line, being more intense toward the hinge-teeth (Bogan and Parmalee 1983).

Sheepnose

The following taxonomic and descriptive information is summarized from the status review of this species (Butler 2003). The sheepnose was described by Constantine Rafinesque in 1820. The type locality is the Falls of the Ohio River near Louisville, Kentucky, and adjacent Indiana.

The following description is generally summarized from Oesch (1984) and Parmalee and Bogan (1998). This medium sized mussel reaches nearly 5.5 inches in length, and the shape of the shell is elongate ovate, moderately inflated, with the valves thick and solid. The anterior end of the shell is rounded and the posterior is truncate to bluntly-pointed. The posterior ridge is gently rounded and flattened ventrally, and there is generally a row of large, broad tubercular swelling on the center of the shell extending from the beak to the ventral margin. A shallow sulcus lies between the posterior ridge and central swellings. Beaks are high and located near the anterior margin. In young individuals the periostracum is often light yellow to yellowish brown, becoming darker with age. The beak cavity is shallow to moderately deep and generally white in color. The right valve contains a large triangular pseudocardinal tooth and the lateral teeth are heavy, long and slightly curved.

Historical and current distribution information on the sheepnose is summarized from Butler (2003). The sheepnose historically occurred throughout much of the Mississippi River system with the exception of the upper Missouri River system and most lowland tributaries in the lower Mississippi River system. This species is known from the Mississippi, Ohio, Cumberland, Tennessee River main stems, and scores of tributary streams rangewide. It historically occurred in at least 77 streams in 15 states. The current distribution includes 26 streams in 14 states. The sheepnose has been eliminated from about two-thirds of the total number of streams from which it was historically known (26 streams currently compared to 77 streams historically), and has been eliminated from long reaches in streams in which it currently occurs. The sheepnose was historically known from 28 streams in the Ohio River system. Currently, only 11 streams are thought to have extant populations. The sheepnose was historically documented from the entire length of the Ohio River. Recent observations of this species from current populations in the main stem Ohio River result in relative abundance numbers of about 0.01 percent to 1.85 percent. The sheepnose has been recently recorded from the main stem Ohio River downstream of Paducah and in several locations in the Tennessee River downstream of Kentucky Dam.

Rabbitsfoot

The following taxonomic and descriptive information is gleaned from the status review for this species (Butler, 2005). The rabbitsfoot was described by Thomas Say in 1817, and the type locality is the Wabash River, probably in the vicinity of New Harmony, Posey County, Indiana.

The following description is summarized from Parmalee and Bogan (1998) and Oesch (1984). The rabbitsfoot is a medium-sized to large mussel reaching about six inches in length with an elongate rectangular and moderately inflated shell. The beaks barely extend above the hinge line on the anterior portion of the mussel. Externally, a posterior ridge extends diagonally from the umbo to the posterior ventral margin. Shell sculpture generally consists of a few large, rounded, low tubercles on the posterior slope, and occasional elongated pustules anteriorly. The periostracum is generally smooth, yellowish, greenish, or olive in color and covered with dark green or black chevrons and triangles. As with many mussel species, growth rest periods appear

as grooves in the shell surface. Internally, the right valve contains a single low and straight to slightly wavy lateral tooth. The left valve has two low, triangular, grooved pseudocardinal teeth and two lateral teeth. The beak cavity is deep and the interdentum is narrow. Nacre color is white and iridescent, often with gray-green tinges of color in the cavity of the umbo. Soft parts are generally orangish in color.

The rabbitsfoot is regarded as primarily a species of the Mississippi drainage, principally the Ohio, Cumberland, and Tennessee River systems, but is also found in portions of the Lower Great Lakes Basin. Historically it was known from 137 streams in 15 states. In the Ohio River system, it historically had populations in 63 streams, but today it is thought to be extant in only 16 Ohio River streams. In the Ohio River main stem, it historically occurred in the entire length of the Ohio River, but, currently, only a few populations are known from the lower Ohio River. By far the largest and probably only significant Ohio River main stem population is from near Paducah, Kentucky downstream to the Mound City, Illinois area, a reach of about 39 miles. This population and a population in the lower Tennessee River downstream of Kentucky Dam, may be considered a single metapopulation due to the absence of a significant barrier separating them. This metapopulation is considered viable with indications of multiple age and size classes.

Critical Habitat has been proposed (Federal Register, 2012) for the rabbitsfoot mussel in portions of several states including: Alabama, Arkansas, Kansas, Kentucky, Mississippi, Missouri, Ohio, Pennsylvania, and Tennessee. The total estimated miles of critical habitat for all states is 1,653.8 miles. In Kentucky, portions of the following counties contain proposed Critical Habitat: Ballard, Green, Hart, Livingston, Logan, Marshall, and McCracken. Under the Endangered Species Act, the Service is required to identify the physical or biological features essential to the conservation of the species. The Service considers primary constituent elements (PCEs) to be the elements of physical or biological features that, when laid out in the appropriate quantity and spatial arrangement to provide for a species' life-history processes, are essential to the conservation of the species. The PCEs proposed for the rabbitsfoot are: 1) Geomorphically stable river channels and banks (channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with habitats that support a diversity of freshwater mussel and native fish (such as, stable riffles, sometimes with runs, and mid-channel island habitats that provide flow refuges consisting of gravel and sand substrates with low to moderate amounts of fine sediments and attached filamentous algae); 2) a hydrologic flow regime (the severity, frequency, duration, and seasonality of discharge over time) necessary to maintain benthic habitats where the species are found and to maintain connectivity of rivers with the floodplain, allowing the exchange of nutrients and sediment for maintenance of mussel and fish host habitat, food availability, spawning habitat for native fishes, and the ability for newly transformed juveniles to settle and become established in their habitats; 3) water and sediment quality (including, but not limited to, conductivity, hardness, turbidity, temperature, pH, ammonia, heavy metals, and chemical constituents) necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages; 4) the presence and abundance (currently unknown) of fish hosts necessary for recruitment of the rabbitsfoot. The occurrence of natural fish assemblages, reflected by fish species richness, relative abundance, and community composition, for each inhabited river or creek will serve as an indication of appropriate presence and abundance of fish hosts until appropriate host fish can

be identified; and 5) either no competitive or predaceous invasive (nonnative) species, or such species in quantities low enough to have minimal effect on survival of freshwater mussels.

Four of the proposed critical habitat units are located in Kentucky. They include:

- 1) Unit RF19b – Tennessee River from Kentucky Lake Dam downstream to its confluence with the Ohio River (approximately 22.1 miles) – which includes the proposed project area. This unit contains PCEs 1, 3, 4, and 5.
- 2) Unit RF20 – Ohio River from the Tennessee River confluence downstream to Lock and Dam 53 near Olmstead, Illinois (approximately 28.5 miles). This unit contains PCEs 1, 3, 4, and 5.
- 3) Unit RF21 – Green River from Green River Lake dam downstream to Maple Springs Ranger Station Road in Mammoth Cave National Park (approximately 109.1 miles). This unit contains PCEs 1,3,4, and 5.
- 4) Unit RF30 – Red River in Kentucky and Tennessee from the South Fork Red River confluence west of Adairville, Kentucky, downstream to the Sulphur Fork confluence south west of Adams, Tennessee (approximately 31.2 miles). This unit contains all 5 PCEs).

It is important to recognize that the aforementioned information is subject to change since the rabbitsfoot mussel critical habitat designation is still under review. The critical habitat designation will not be final until a Final Rule is published in the Federal Register. We anticipate this occurring in fall or winter of 2014.

The First Marine project site is located in Unit RF19b, although the aforementioned action area also encompasses Unit RF20. Approximately 93 percent of adjacent riparian lands in Unit RF19b are in private ownership, 7 percent are in federal ownership, and less than 1 percent is in State or local governmental ownership. The mileage of critical habitat in Unit RF19b is 22.1 miles, which is approximately 0.013 percent of the total estimated mileage for all critical habitat units in all of the nine states with proposed critical habitat. We are not able to estimate total acreage of critical habitat in all units in the nine states; however, we do estimate the total acreage of critical habitat in Unit RF19b is approximately 3,105.5 acres. The acreage estimated to be impacted at the First Marine project is 2.32 acres or about 0.075 percent of the total acreage of proposed critical habitat in Unit RF19b.

Life History

Orangefoot pimpleback

The orangefoot pimpleback is found in medium to large rivers with sand and gravel substrates (USFWS 1984). The reproductive cycle of the orangefoot pimpleback is likely similar to that of other native freshwater mussels. Males release sperm into the water column; the sperm are then taken in by the females through their siphons during feeding and respiration. The females retain the fertilized eggs in their gills until the larvae (glochidia) fully develop. The mussel glochidia

are released into the water, and within a few days they must attach to the appropriate species of fish, which they parasitize for a short time while they develop into juvenile mussels. The orangefoot pimpleback is likely a short term brooder with spawning occurring in the spring and release of glochidia during summer months (USFWS 1984). Wilson and Clark (1914) collected two gravid females in early June. Utterback (1915) reported the orangefoot pimpleback to be a summer breeder and Yokley (1972) observed one specimen with gills charged in August.

The glochidia of the orangefoot pimpleback have not been described, but the sexual glands and soft parts are usually pinkish in color and also grayish or brown (Service 1984). The glochidia have been observed to be pale orange in June (Hubbs 2010b). It is probable that the glochidia are semi-oval, and hookless, similar to those in the closely related species, sheepnose (*Plethobasus cyphus*) (Ortmann 1912, 1919).

Specific glochidial hosts for this species are unknown; however, the sauger (*Stizostedion canadense*) is reported by Surber (1913) and Wilson (1916) to be the fish host for the orangefoot pimpleback. The Kentucky Department of Fish and Wildlife Resources is planning studies to identify the species' fish host(s) and other life history aspects, and is maintaining captive individuals at their Center for Mollusk Conservation in Frankfort, Kentucky.

Sheepnose

The life history information is summarized from the status review of this species (Butler 2003). Thick shelled, larger river mussels such as the sheepnose are thought to live longer than other species. The life span of the sheepnose is thought to be about 21 to 25 years. The reproductive cycle of the sheepnose is likely similar to that of other native freshwater mussels. As with most mussel species the sheepnose has separate sexes. Age at sexual maturity is unknown but is estimated at about 3 years. Female sheepnose utilize only the outer pair of gills as marsupium for its glochidia, and is considered to be a short-term brooder with most reproduction taking place in early summer (Parmalee and Bogan 1998). Glochidia are released in the form of conglomerates, which are narrow and lanceolate in outline, solid and red in color, and discharged in unbroken form (Oesch 1984). Several score to a few hundred glochidia probably occur in each conglomerate. Total fecundity per female sheepnose is probably in the tens of thousands.

Glochidia must come into contact with a specific host fish(es) to survive and develop further. Little is known regarding the host fish for the sheepnose but one known host is the sauger, *Sander canadense*. It is possible that other fish species may also serve as a suitable host. Newly metamorphosed juveniles drop off the host and begin a free living existence on the stream bottom.

The following habitat requirements of the sheepnose are summarized from Oesch (1984) and Parmalee and Bogan (1998). The sheepnose is primarily a larger stream species, usually occurring in shallow shoal habitats with moderate to swift currents over coarse sand and gravel. Habitats also may have mud, cobble, and boulders, and it may occur in deep runs.

Rabbitsfoot

The following life history information is gleaned from the status review for this species (Butler 2005). The rabbitsfoot is a filter-feeding species from the Unionidea family with a diet likely

consisting of a mixture of algae, detritus, bacteria, and microscopic zooplankton. Most mussels, including the rabbitsfoot, generally have separate sexes. Age at sexual maturity for the rabbitsfoot is unknown. Fertilization success is apparently influenced by mussel density and flow conditions. The female rabbitsfoot utilizes all four gills as a marsupium for its glochidia and is considered to be a short-term brooder with an inferred brooding period from May to July. Fish hosts for the rabbitsfoot mussel are thought to be shiners (e.g., spotfin shiner, *Cyprinella spiloptera*; rosyface shiner, *Notropis rubellus*; blacktail shiner, *Cyprinella venusta*; etc).

The following habitat requirements are summarized from Parmalee and Bogan (1998). The rabbitsfoot primarily inhabits small to medium-sized streams and some large rivers. It usually occurs in shallow areas along the bank and adjacent runs and shoals where the water velocity is reduced. Specimens may also occupy deep water runs, having been reported in 9 to 12 feet of water. Bottom substrates generally include sand and gravel. In the Tennessee River in western Tennessee, it is most abundant on marginal shelves of sandy clay in 6 to 10 feet of water. The rabbitsfoot is often found lying on its side.

Population dynamics

Population size - orangefoot pimpleback

Historical records for the orangefoot pimpleback indicate this species is strictly an Ohioan or Interior Basin species (i.e., Ohio, Cumberland and Tennessee river drainages) (Ortmann, 1919). Populations of the orangefoot pimpleback continue to occur in the lower Ohio River and in the Tennessee River, while the best remaining population of the species occurs in the lower, free-flowing reach of the Ohio River, and in the riverine portion of Kentucky Lake downstream of Pickwick Landing Dam in Tennessee.

Hubbs (2010b) collected two individuals from the Pickwick Landing Dam tailwater that were approximately seven years in age, demonstrating recruitment in this Tennessee River population. It is not known if any genetic interchange is occurring between the two populations in the Ohio and Tennessee Rivers. The Cumberland River does not currently contain a known viable population of the species, but individuals may still exist there in low numbers (Widlak 2010).

No new populations of orangefoot pimpleback have been discovered and populations have not yet been reestablished in historic habitat. The lower French Broad River and lower Holston River have, however, been recently designated for establishment of nonessential experimental populations of the species. When the orangefoot pimpleback is collected during surveys, older, often eroded, adult specimens of this species are sampled (Widlak 2010).

Population size – sheepnose

The information below is summarized from the status review of this species by Butler (2003). The sheepnose, although widespread in many Mississippi River system streams was rarely very common. Archaeological evidence on relative abundance indicates that it has been an uncommon or even rare species in many streams for centuries. Museum collections of this species, with few exceptions, are almost always small. Fair numbers were recorded historically from the upper Muskingum River system in Ohio, and the lower Wabash River. Cummings and Mayer (1992) considered it 'rare throughout its range'. The sheepnose has experienced a

significant reduction in range and most of its populations are disjunct, isolated, and appear to be declining rangewide. The extirpation of the sheepsnose from over 50 streams within its historical range indicates substantial population losses have occurred. In the vast majority of streams with extant populations, it appears to be uncommon at best. Small population size and/or restricted stream reaches of current occurrence are currently the norm. No new populations of sheepsnose have been discovered and populations have not yet been reestablished in historic habitat.

Population size – rabbitsfoot

Information on rabbitsfoot population size is summarized from Butler (2005). The rabbitsfoot was widespread and locally common in many Mississippi River Basin streams. Quantitative historical abundance data is rare, but relative abundance information can be gathered from the size and number of museum lots. The historical museum data (pre-1980) indicates that good rabbitsfoot population occurred in many rivers, including the Ohio and Tennessee Rivers. Based on the historical data, an argument can be made that in many locations the rabbitsfoot was locally abundant. When experts started attempts to compile lists of imperiled mussels, the rabbitsfoot was considered to be a rare species as early as 1970. Many studies in recent history have indicated the rabbitsfoot is rare, sporadic, or extirpated throughout most of its range. The American Malacological Union and American Fisheries Society consider the rabbitsfoot to be threatened (Williams et al. 1993). Populations of the rabbitsfoot were last reported decades ago from about one-third of streams where it historically occurred. The compilation of distributional information in the status review by Butler (2005) indicates a severe reduction in range over the past 40 years. About 66 percent of the historical streams of occurrence have lost their populations of this species. Populations in 91 streams of known historical populations are now considered extirpated. It is very likely that other poorly sampled or totally unsampled stream populations of this species have experienced similar declines. The amount of habitat loss and the extirpation of this species from thousands of miles of habitat within its range indicate catastrophic population losses as well. Total range reduction and overall population loss for the rabbitsfoot realistically approaches, if not exceeds, 90 percent.

Population variability – orangefoot pimpleback

This species is considered extremely rare wherever it is found. Little is known on the population variability of the orangefoot pimpleback. Few individuals are observed during survey efforts, making it difficult to accurately assess populations. In the Tennessee River, the Pickwick Landing Dam tailwater supports the only known population in which recent recruitment has been observed. The Tennessee Wildlife Resources Agency collected a seven year old individual at TRM 170 in the vicinity of Swallow Bluff Island in 2009. Finding mussels of this early age indicates that some level of recruitment is occurring in this reach of the Tennessee River (Don Hubbs 2010a). During a June 17-21, 2008 pre-project survey at TRM 160.7, one orangefoot pimpleback was collected and comprised <0.001 percent of the total species composition (11,090 native mussels, representing 17 species) (Shaw 2010).

Population variability – sheepsnose

This species is considered extremely rare wherever it is found. Little is known on the population variability of the sheepsnose. Few individuals are observed during survey efforts, making it difficult to accurately assess populations.

Population variability – rabbitsfoot

Little is known on the population variability of the rabbitsfoot. Few individuals are observed during survey efforts, making it difficult to accurately assess populations. Densities are often so low that only a few individuals may comprise a population.

Population stability – orangefoot pimpleback

The stability of orangefoot pimpleback populations is not well known. In most locations where this species appears to be present, the presence of orangefoot pimplebacks is evident from occasional individuals or only a few individuals recorded. In the Ohio River, the low numbers typically encountered during mussel surveys, is of little value other than indicating the species may be existing in a certain area over a relatively long period of time. In the lower portion of the Tennessee River downstream of Kentucky Lock and Dam, the most recent record of this species was ten years prior to the 2008 record.

Population stability – sheepnose

The stability of sheepnose populations is not well known. In most locations where this species appears to be present, the presence of sheepnose is evident from occasional individuals or only a few individuals recorded. In the lower Ohio River and lower Tennessee River downstream of Kentucky Dam, the low numbers typically encountered during mussel surveys is of little value other than indicating the species may exist in a certain area over a relatively long period of time at low population levels.

Population stability – rabbitsfoot

The stability of rabbitsfoot populations is not well known. In most locations where this species appears to be present, the presence of rabbitsfoot is evident from occasional individuals or only a few individuals recorded. In the lower Ohio River and lower Tennessee River downstream of Kentucky Dam, the low numbers encountered during mussel surveys is of little value other than indicating the species may exist in a certain area over a relatively long period of time at low population levels.

Status and distribution

Reasons for listing – orangefoot pimpleback

The recovery plan for the orangefoot pimpleback provides reasons for listing this species including: impoundments, siltation, and pollution. Impoundments alter flow, temperature regimes, and water quality and habitat conditions creating conditions unsuitable for riverine mussels and/or their host fish. Siltation can increase turbidity which irritates or clogs the gills of mussels and can even physically smother the animal. Mussel life cycles can be affected indirectly from siltation by impacting host fish populations (e.g., smothering fish eggs or larvae, reducing food availability, etc.). Various forms of pollution from municipal, agricultural, and industrial sources can impact mussels in a variety of ways. The orangefoot pimpleback is an extremely rare mussel. Generally, only one or two individuals are collected, if any, in suitable habitat supporting an abundance of other mussel species. Historically, it had a relatively restricted distribution in that the species was only reported from the Ohio, Tennessee and Cumberland rivers and their larger tributary streams (USFWS 1984). Alteration and destruction of habitat, due to creation of impoundments for flood control, navigation, hydroelectric power

production and recreation, and activities resulting in siltation which affected substrate quality (e.g., navigation traffic, sand and gravel mining), led to the listing of the orangefoot pimpleback; these impacts continue to affect the species' habitat (USFWS 1984; James Widlak 2010). The orangefoot pimpleback is not a species that is collected for commercial purposes; however, commercial mussel harvest may have contributed to some decline in populations due to the species being unintentionally collected along with commercially valuable species. However, these impacts are believed to be minor in regards to declining population levels. Due to the rarity of the species and only sporadic finds of one or two individuals, the Service believes that the orangefoot pimpleback should remain an endangered species (Widlak 2010).

Reasons for listing – sheepsnose

The following summary is primarily from Butler (2005). The sheepsnose has experienced a significant reduction in range and most of its populations are disjunct, isolated, and appear to be declining rangewide. The extirpation of the sheepsnose from over 50 streams within its historical range indicates substantial population losses have occurred. The decline of the sheepsnose is primarily the result of habitat loss and degradation from impoundments, sedimentation, and pollution. Chief among the causes of decline are impoundments, channelization, chemical contaminants, mining, and sedimentation (Neves, 1993; Neves et al. 1997; Watters, 2000). Impoundments result in the modification of riffle and shoal habitats and the resulting loss of mussel resources, especially in larger rivers. Dams interrupt most of a river's ecological processes by modifying flood pulses; controlling impounded water elevations; altering water flow, sediments, nutrients, and energy inputs and outputs; increasing depth; decreasing habitat heterogeneity; decreasing stability due to subsequent sedimentation; blocking host fish passage; and isolating mussel populations from fish hosts. Even small low-head dams can have some of these effects on mussels. In addition, dams can alter downstream water quality and habitat. Population losses due to impoundments have probably contributed more to the decline and imperilment of the sheepsnose than any other single factor. Channelization and dredging activities have also altered riverine habitats nationwide. Gravel mining activities may be a localized threat in some streams with extant sheepsnose populations. Chemical contaminants contained in point and non-point discharges can degrade water and substrate quality impacting mussel populations and may be most profound on juvenile mussels. Various forms of pollution from municipal, agricultural, and industrial sources can impact mussels in a variety of ways. Siltation can increase turbidity which irritates or clogs the gills of mussels and can even physically smother the animal. Mussel life cycles can be affected indirectly from siltation by impacting host fish populations (e.g., smothering fish eggs or larvae, reducing food availability, etc.). Currently, the vast majority of the historical range of the sheepsnose has been altered and no longer offers suitable habitat. With few exceptions, extant populations are: 1) invariably small (rarely are more than one or two individuals found per sample), 2) characteristically rare (having low relative abundance), 3) sporadically or occasionally distributed (despite the extent of seemingly suitable habitat it is very patchy in distribution and occurrence), and 4) generally limited in linear extent, and typically lacking evidence for recent recruitment. With many disjunct populations and its overall scarcity, the species is highly susceptible to localized extirpations from the genetic implications of extremely low population size and because of threats that are extremely difficult if not impossible to control. Stochastic events are a real concern for all populations, particularly reach-limited populations and those associated with

navigation channels and other major transportation arteries. Other threats include exotic species, such as Asian clams, zebra mussels, and Asian carp.

Reasons for listing – rabbitsfoot

The following summary is primarily from Butler (2003). The decline of the rabbitsfoot is primarily the result of habitat loss and degradation from impoundments, sedimentation, and pollution. Chief among the causes of decline are impoundments, channelization, chemical contaminants, mining, and sedimentation (Neves, 1993; Neves et al. 1997; Watters, 2000). Impoundments result in the modification of riffle and shoal habitats and the resulting loss of mussel resources, especially in larger rivers. Dams interrupt most of a river's ecological processes by modifying flood pulses; controlling impounded water elevations; altering water flow, sediments, nutrients, and energy inputs and outputs; increasing depth; decreasing habitat heterogeneity; decreasing stability due to subsequent sedimentation; blocking host fish passage; and isolating mussel populations from fish hosts. Even small low-head dams can have some of these effects on mussels. In addition, dams can alter downstream water quality and habitat. Population losses due to impoundments have probably contributed more to the decline and imperilment of the rabbitsfoot than any other single factor. Channelization and dredging activities have also altered riverine habitats nationwide. Chemical contaminants contained in point and non-point discharges can degrade water and substrate quality impacting mussel populations and may be most profound on juvenile mussels. Various forms of pollution from municipal, agricultural, and industrial sources can impact mussels in a variety of ways. Siltation can increase turbidity which irritates or clogs the gills of mussels and can even physically smother the animal. Mussel life cycles can be affected indirectly from siltation by impacting host fish populations (e.g., smothering fish eggs or larvae, reducing food availability, etc.). Currently, the vast majority of the historical range of the rabbitsfoot has been altered and no longer offers suitable habitat. With few exceptions, extant populations are: 1) invariably small (rarely are more than one or two individuals found per sample), 2) characteristically rare (having low relative abundance), 3) sporadically or occasionally distributed (despite the extent of seemingly suitable habitat it is very patchy in distribution and occurrence), and 4) generally limited in linear extent, and typically lacking evidence for recent recruitment. With many disjunct populations and its overall scarcity, the species is highly susceptible to localized extirpations from the genetic implications of extremely low population size and because of threats that are extremely difficult if not impossible to control. Stochastic events are a real concern for all populations, particularly reach-limited populations and those associated with navigation channels and other major transportation arteries. Other threats include exotic species, such as Asian clams, zebra mussels, and Asian carp.

Rangewide trend – orangefoot pimpleback

The orangefoot pimpleback was historically known from the Ohio River (from western Pennsylvania to southern Indiana), the Wabash River (below Mt. Carmel, Illinois), the Cumberland River (from Cumberland County, Kentucky to near Nashville, Tennessee), the lower Clinch River (Anderson County, Tennessee) and the Tennessee River (near Knoxville to Benton County, Tennessee) and has also been reported from the Caney Fork, Holston, and French Broad Rivers in Tennessee, and the Green and Rough Rivers in Kentucky. The largest known populations remain in the lower, free-flowing reach of the Ohio River downriver from the confluence of the Tennessee River at Paducah, and a short reach of the Tennessee River below

Pickwick Landing Dam (USFWS 1984, Miller et al. 1986). The Cumberland River may continue to support individuals of the species, but none have been collected from that system in recent decades. The Service has planned releases of the orangefoot pimpleback into the lower French Broad and lower Holston Rivers Experimental Population Area in Tennessee, under a Non-essential Experimental Population designation to further the recovery and conservation of the species (USFWS 2007).

Live orangefoot pimplebacks have recently been recovered from commercial mussel harvesters in the vicinity of the lower Ohio River near Lock and Dam 52. Several of these individuals are currently being held by the KDFWR to be used for propagation and reintroduction purposes in the near future. Surveys of mussel beds in the lower Ohio River from July through October 2007 yielded 24 orangefoot pimplebacks (Widlak 2010). The TWRA collected a seven year old individual at TRM 170 in the vicinity of Swallow Bluff Island in 2009 and have collected several seven and eight year old orangefoot pimpleback mussels in the Pickwick Landing Dam tailwater in recent years, indicating that some level of recruitment is occurring in this reach of the Tennessee River. The orangefoot pimpleback also continues to be found in the lower Tennessee River downstream of Kentucky Dam, but no recruitment of the species has been recently noted in Kentucky waters (Lewis 2008).

Rangewide trend – sheepsnose

The sheepsnose has experienced a significant reduction in range and most of its population are disjunct, isolated, and appear to be declining rangewide. It is extirpated from over 50 streams in its historical range. In the majority of streams with extant populations, the sheepsnose appears to be uncommon at best. Several extant populations are thought to exhibit some level of population viability; however, given its current distribution, abundance, and trend information, the sheepsnose appears to exhibit a high level of imperilment.

Rangewide trend – rabbitsfoot

Based on rabbitsfoot status information in Butler (2005), about 66 percent of the historical streams of occurrence have lost their populations of this species. Much more than 66 percent of the species' historically available habitat no longer supports populations. Populations in 91 streams having known historical populations are considered extirpated. Habitat losses measured in the thousands of miles have occurred in large streams from which the rabbitsfoot is now considered extirpated, and thousands of additional miles in scores of smaller streams. Total range reduction and overall population loss for the rabbitsfoot likely meets or exceeds 90 percent. With few exceptions, the extant populations are extremely small and occur in relatively short river reaches despite the extent of seemingly suitable habitat in many streams. A majority of populations are essentially limited to discrete reaches making the species in these streams highly susceptible to elimination from catastrophic stochastic events.

New threats

The zebra mussel, *Dreissena polymorpha*, an exotic species that colonizes the shells of native mussels, is a relatively new threat. It is present in the Ohio River 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. An additional new potential threat to both the rabbitsfoot and sheepsnose is a molluscivore (mollusk predator) fish,

the black carp, *Mylopharyngodon piceus*. It has recently been recorded in the Mississippi River near the mouth of the Ohio River and further upstream in the Mississippi River.

Analysis of the species/critical habitat likely to be affected

First Marine's proposed barge port has the potential to affect federally listed mussels, namely the endangered sheepnose mussel, the threatened rabbitsfoot mussel, and the endangered orangefoot pimpleback mussel. Because of the relatively high mussel densities near and within the area of the sheet pile wall and dolphin installation, federally listed mussels could be present and may be directly impacted. However, we believe that the number of endangered mussels potentially affected will be minimized as long as barges are moored in relatively deep water. Any disturbance to the river substrate due to barges/tow boat activity, changes in flow due to construction of the cells and metal breast work, and presence of barges in the water column can have adverse effects on listed mussels; however, the effects on listed mussels in the area is expected to be reduced due to the use of cells and metal breasting to rest barges against. Adverse effects from tugboat operations are also expected to be reduced due to the use of low horsepower tow boats, water depth at the project location, and the conscientious piloting procedures First Marine has proposed that will be employed.

No critical habitat has been designated for the orangefoot pimpleback or sheepnose, but critical habitat is proposed for the rabbitsfoot.

Proposed critical habitat is present at the project site based on all or portions of the primary constituent elements being present. However, rabbitsfoot mussels are not distributed evenly throughout the extent of Unit 19b habitat. Based on recent surveys specifically looking for this species (Lewis, 2013), the rabbitsfoot was found predominantly along the toe of the bank in this section of the Tennessee River downstream of Kentucky Dam. This can be described as a band/ribbon of habitat/substrate conditions that this species seems to prefer. These habitat/substrate conditions are likely present in all or some portion of the project area and will be impacted to varying degrees by the proposed project.

ENVIRONMENTAL BASELINE

Status of the species within the action area

For this project, a mussel survey that was performed in 2012 just upstream of this project site and which overlapped a few hundred meters of the upper portion of the project site was used to determine presence of federally listed mussels at the project area. A reconnaissance mussel survey, such as was performed in 2012, is not specifically intended or designed to detect extremely rare mussels; however, it will usually provide sufficient information on the overall mussel assemblage and habitat, so that a determination can be made as to the likelihood that rare species occur at the survey site.

Orangefoot pimpleback

The reconnaissance mussel survey did not record orangefoot pimpleback mussels; however, this species has been recorded in the Tennessee River within four miles upstream of the project site. The mussel species assemblage and habitat at the project site is one in which this species is often

associated, and portions of the surrounding action area contain suitable habitat. This species also occurs in the Ohio River downstream of the mouth of the Tennessee River within the action area as defined in this biological/conference opinion. The Service believes it is likely that an unknown number of the orangefoot pimpleback mussel occur in the 2.32 acre footprint of the project area.

Rabbitsfoot

The reconnaissance mussel survey confirmed that this species occurs at the project site. This species has been recorded at several sites in the lower Tennessee River between Kentucky Dam and the mouth of the Tennessee River and is known to occur in the Ohio River downstream of the project site within the action area as defined in this biological/conference opinion. Estimates of the federally listed mussels derived from the mussel survey conducted for this project (Fortenbery 2012) indicate that approximately 34 rabbitsfoot mussels occur in an approximate 0.2 acre area within the 2.32 acre project footprint of the proposed barge port area.

Sheepnose

The reconnaissance mussel survey confirmed that this species occurs at the project site. This species also occurs in the Ohio River downstream of the project site and at other locations in the Tennessee River within the action area as defined in this biological/conference opinion. Estimates of the federally listed mussels derived from the mussel survey conducted for this project (Fortenbery 2012) indicate that approximately 23 sheepnose mussels occur in the 2.32 acre footprint of the proposed barge port area.

Factors affecting species environment within the action area

The habitat conditions within the action area consist primarily of sand, soft silt over sand, and small areas of gravel and/or clay. Other factors possibly affecting the species' environment in the action area include runoff from agriculture activities, bank erosion and instability which can increase turbidity and add sediment (including possible contaminants from urban runoff), dams which can affect host fish movement and habitat conditions, sewer outfalls, and industrial complexes located upstream in the watersheds draining into the action area. Barge and navigation traffic will continue to operate in the river channel riverward of the project footprint.

Previous Incidental Take Authorizations

Orangefoot pimpleback

Twenty-four biological opinions involving take of this species are summarized in Appendix A.

The incidental take statements from the above mentioned consultations have authorized the loss of about 14.5 acres of habitat, 116 individuals, and an indeterminate number of individuals from several consultations indicating that an unknown number of individuals would be taken by those projects. The amount of actual take of orangefoot pimpleback mussels associated with these biological opinions is difficult to determine for several reasons:

1. Young mussels are small and may be difficult to detect.
2. A quantitative assessment of the number of mussels taken was not always given.

3. Mussels are long-lived and have a complex life-cycle, making assessment of indirect effects difficult (e.g. effects of water quality changes, long-term relocation effects, impacts to host species, etc.).

Despite the inherent difficulties associated with assessing the actual amount of take associated with projects impacting mussels and the uncertainties associated with the long-term impacts, the orangefoot pimpleback mussel appears to be persisting in the lower Ohio River and selected portions of the Tennessee River in Kentucky and Tennessee. As a result, the Service concludes that the aggregate effects of the activities and incidental take covered in previous biological opinions on the orangefoot pimpleback have not degraded the overall conservation status (i.e., environmental baseline) of the orangefoot pimpleback.

Sheepnose

Six biological opinions which have included take on this species are summarized in Appendix B.

The incidental take statements from the above mentioned consultations have authorized the take of 256 individuals and an indeterminate number of individuals from consultations indicating that an unknown number of individuals would be taken by those projects. The total amount of actual take of sheepnose mussels associated with these biological opinions is difficult to determine for the same reasons enumerated above for the orangefoot pimpleback.

Despite the inherent difficulties associated with assessing the actual amount of take associated with projects impacting mussels and the uncertainties associated with the long-term impacts, the Service concludes that the aggregate effects of the activities and incidental take covered in previous biological opinions on the sheepnose mussel have not degraded the overall conservation status (i.e., environmental baseline) of this species.

Rabbitsfoot

Seven biological opinions involving take of the rabbitsfoot mussel are provided in Appendix C.

The incidental take statements from the above mentioned consultations have authorized the potential loss of about 1,298 acres of habitat, 358 individuals, and an indeterminate number of individuals from several consultations indicating that an unknown number of individuals would be taken by those projects. The amount of actual take of rabbitsfoot mussels associated with these biological opinions is difficult to determine for the same reasons enumerated above for the orangefoot pimpleback.

Despite the inherent difficulties associated with assessing the actual amount of take associated with projects impacting mussels and the uncertainties associated with the long-term impacts, the Service concludes that the aggregate effects of the activities and incidental take covered in previous biological opinions on the rabbitsfoot have not degraded the overall conservation status (i.e., environmental baseline) of the rabbitsfoot.

EFFECTS OF THE ACTION

Factors to be considered

This section includes an analysis of the direct and indirect effects of the proposed action on the species and/or critical habitat and its interrelated and interdependent activities. While analyzing direct and indirect effects of the proposed action, the Service considered the following factors:

- Proximity of the action – We describe known species locations and designated critical habitat in relation to the action area and proposed action;
- Distribution – We describe where the proposed action will occur and the likely impacts of the activities;
- Timing – We describe the likely effects in relation to sensitive periods of the species' lifecycle;
- Nature of the effects – We describe how the effects of the action may be manifested in elements of a species' lifecycle, population size or variability, or distribution, and how individual animals may be affected;
- Duration – We describe whether the effects are short-term, long-term, or permanent;
- Disturbance frequency – We describe how the proposed action will be implemented in terms of the number of events per unit of time;
- Disturbance intensity – We describe the effect of the disturbance on a population or species; and
- Disturbance severity – We describe how long we expect the adverse effects to persist and how long it would take a population to recover.

Proximity of the action:

The proposed action will occur in the Tennessee River downstream of Kentucky Lock and Dam near approximately Tennessee River Mile 10.7 – 11.3. The proposed action area is known to contain sheepsnose and rabbitsfoot mussels, and orangefoot pimplebacks are known to occur near the project location. The project is, therefore, considered to occur in occupied habitat for all three of these species. Proposed critical habitat is considered to be present throughout the project site and in remaining portions of the Tennessee River downstream of Kentucky Dam to its confluence with the Ohio River. Proposed critical habitat is also present in the Ohio River downstream of the mouth of the Tennessee River within the action area.

Distribution:

Direct impacts to the orangefoot pimpleback, sheepsnose, rabbitsfoot, the habitat of these three listed mussels, and the proposed critical habitat for the rabbitsfoot will occur within the project footprint. Indirect impacts will also occur within the project footprint but will also occur in other portions of the action area downstream and riverward of the project footprint. It is expected that the impacts will come from the fleeting activities, especially the use of towboats and barges that can cause disturbance of sediments on the river bank and disturbance to mussels and their habitats in the Tennessee River. In addition, it is possible there will be sedimentation contributions to the river from the construction and operation of the upland portion of this project.

Timing:

The proposed project is expected to operate year-round. It is likely the activity will occur during periods when the orangefoot pimpleback, sheepnose, and rabbitsfoot are thought to become gravid during the spring and/or summer, and when they brood glochidia for a short period of time and release larvae in the late summer (short-term brooder). Sensitive periods in late spring-summer for adults, include the release of sperm into the water column and the fertilization of eggs and brooding of larvae. Another sensitive period for female mussels is the time of release of partially developed larvae or glochidia, and their attachment onto the fish host (summer). Sensitive periods for the juveniles include their attachment to the host fish and excystment from the host fish as they drop to the riverbed and establish themselves in the substrate (summer). These sensitive periods of these mussel species may occur during the fleeting operation and into the foreseeable future. In addition, these mussel species may be impacted if fish host behavior and presence are affected by the various activities (i.e., flow changes, increased turbidity, movement of sediment in the river and/or from the upland portion of the facility, etc.), connected with the proposed action.

Critical habitat and primary constituent elements of critical habitat will likely be affected whenever towboats and/or barges disturb the substrate and create turbidity in the water column.

Nature of the effect:

It is likely that the proposed action will have a variety of effects on the orangefoot pimpleback, sheepnose, and rabbitsfoot mussels. Any of the periods of these species life cycle can potentially be disturbed or disrupted by fleeting activities. This project is likely to result in the (a) direct and/or indirect mortality of individual adults and juveniles from project activity, (b) dislodgement of adults and/or juveniles due to flow alterations and/or fleeting activity, (c) reduction or other modification in the availability of fish hosts that is caused by degradation/alteration of habitat and that may harm and/or harass individuals through interference with respiration, feeding, and reproduction, and (d) creation of turbidity and/or deposition of sediment that may directly and/or indirectly affect adults and/or juveniles by harm and/or harassment. In addition, these species may be impacted if fish host behavior and presence is negatively affected by flow alterations, turbidity, or changes in sediment deposition.

Effects on critical habitat will consist of short-term changes to various primary constituent elements (e.g., PCEs 1, 3, and 4) as described above (e.g., sediment disturbance affecting water quality, disturbance of fish hosts). However, these effects are not considered significant because they only occur within small localized areas within the proposed critical habitat for rabbitsfoot.

Duration:

Potential impacts to these three species and the proposed critical habitat of the rabbitsfoot will be direct and indirect, and remain for the duration of the project whenever towboats and barges disrupt the substrate. Effects will likely be of a varying duration based on flows, substrate conditions, and how towboat and barge activity is conducted, and will occur over the life of the project. It is possible that the fleeting activity will also result in localized changes to flows and other habitat conditions. In addition, it is possible there will be sedimentation contributions to the river from the construction and operation of the upland portion of this project.

Disturbance frequency:

Any disturbances to orangefoot pimpleback, sheepnose, rabbitsfoot, and the proposed critical habitat of the rabbitsfoot that are produced during the fleeting activity are expected to occur on a continual basis. These disturbances (i.e., flow changes, increased turbidity, movement of sediment, etc.) are expected to occur over an unknown frequency during the life of the project.

Disturbance intensity:

The disturbance intensity will not likely be uniform throughout the action area and is expected to occasionally create habitat conditions (i.e., flow changes, increased turbidity, movement of sediment in the river and/or from the upland portion of the facility, etc.), that are unfavorable for the orangefoot pimpleback, sheepnose and rabbitsfoot mussel and that would cause minor alterations to the constituent elements of proposed rabbitsfoot critical habitat.

Disturbance severity:

The disturbance severity of the fleeting is expected to be moderate and permanent or semi-permanent. However, there may be periods of reduced fleeting activity in which the habitat will become more suitable to these three species and the proposed critical habitat of the rabbitsfoot may recover. The recovery rate to these mussel species and the proposed critical habitat of the rabbitsfoot in this part of the action area is unknown.

Analyses for effects of the action

Of the mussels that will be impacted or disturbed during the ports operation, it is likely that some may be federally listed species. The federally listed species likely to occur at or near the site include the federally endangered orangefoot pimpleback and sheepnose, and the federally threatened rabbitsfoot. The Service has also proposed designating much of the lower Tennessee River as critical habitat for the rabbitsfoot. The habitat that is present within the project area is representative of the typical habitat where rabbitsfoot mussels are usually found in the lower Tennessee River. The habitat is also typical of habitat where sheepnose and orangefoot pimpleback mussels are most likely to be found.

The mussel survey used to estimate mussel densities and species presence was conducted in 2012 for an earlier proposed First Marine port project (Fortenbery 2012) and over-lapped a few hundred meters with the present port site. The current port site is considered similar enough to the earlier project site, that the estimates provided in the 2012 survey are applicable to the current project site. The 2012 survey consisted of 12 semi-quantitative 100 meter long transect searches spaced 100 meters apart, eleven qualitative search efforts of 15 minutes duration, and four 30 minute qualitative searches in an area of the river between Tennessee River Mile 12.0 to 11.1 (left descending bank). During the survey, 3,402 live mussels representing 22 species were recorded. Six sheepnose and 26 rabbitsfoot were among the species recorded from survey transects. Based on information from the 2012 mussel survey, we estimate that about 34 rabbitsfoot and 23 sheepnose mussels occur in the 2.32 acre footprint of the proposed port area. Based on this survey and other mussel survey information in the Tennessee River, it is believed that the rabbitsfoot mussel is more prevalent at sites located at or near the toe of the bank; however, this species can also be found at other locations in the river. At this survey site, the sheepnose was recorded at locations that were more riverward from the toe of the bank.

The Service anticipates the primary effects of this project to be in that portion of the project where barges and/or towboats will be affecting the river bottom. The Service believes that wheel wash from the operation of towboats and the container vessels will create disturbance to substrate and mussels, and flow alterations and intensity, due to barge presence in much of the water column, will affect mussels and habitat; however, it is difficult to quantify the extent or severity of this activity.

First Marine intends to instruct towboat operators to use smaller horsepower towboats (1,200 horsepower or less) and operate them in such a manner that wheel wash is directed towards deeper water as much as possible, and to keep them from striking the substrate when near shore. This is intended to minimize the impact of the port activity on federally listed mussels, especially in shallower areas of the project footprint. The following estimates are from that portion of the port area most likely to be impacted by barges possibly contacting or impacting the substrate, and/or from propeller wash or flow alterations and intensity from barge presence. However, the exact area of impact will likely vary depending on water elevations and depth.

The estimated densities of rabbitsfoot mussels in the area of impact for the port is 0.04 rabbitsfoot per square meter. Therefore, it is estimated that approximately 34 rabbitsfoot mussels will be adversely affect in the project area.

The estimated densities of sheepnose mussels in the area of impact for the port is 0.0025 sheepnose per square meter. Therefore, it is estimated that approximately 23 sheepnose mussels will be adversely affected in the project area.

Although no orangefoot pimpleback mussels were recorded in the mussel survey, they likely occur at the site.

Beneficial effects:

No wholly beneficial effects have been identified or are expected to occur. The proposed action is expected to result in adverse effects on orangefoot pimpleback, sheepnose, and rabbitsfoot populations. Similarly, there would be no beneficial effects on proposed critical habitat for the rabbitsfoot.

Direct effects:

Direct effects of the proposed action on the orangefoot pimpleback, sheepnose, and rabbitsfoot include harassment, harm, and mortality from the disturbance of substrate that may contain these species. Other direct effects to the orangefoot pimpleback, sheepnose, and rabbitsfoot and to primary constituent elements (e.g., PCE's 1, 3, and 4) of proposed rabbitsfoot critical habitat include, but are not limited to, habitat modifications such as changes in flow and dissolved oxygen concentrations due to increased turbidity, and sediment deposition which could bury mussels, especially juveniles, and cause injury and/or mortality. These effects could also restrict mussel respiration (e.g., suffocation due to inability to purge sediment from gills), limit feeding (e.g., starvation due to inability to eliminate sediment), and interfere with reproduction (e.g., abortion from stress, host fish absence during critical reproductive periods). These effects can result in premature release of sperm or aborted glochidia negatively impacting reproductive success.

In summary, the following direct effects are anticipated:

1. Mortality that is the result of port activity in occupied habitat. This action could damage, bury or crush orangefoot pimpleback, sheepnose, and rabbitsfoot mussels and affect proposed critical habitat through disturbance or alteration of critical habitat.
2. Harm resulting from mussel dislodgement, increased turbidity, flow alterations, sediment removal, sediment deposition, and decreased dissolved oxygen levels. This may affect the ability of these mussel species to respire, reproduce, and feed. Direct physical harm (e.g., damaged shell or bruised animal) could result in the indirect (i.e., later) death of these listed mussels.
3. Harassment in the form of induced stress including, but not limited to, displacement of mussels during fleeting activities and potential degradation of habitat. This harassment could result in decreased ability of these species to respire, reproduce, and feed.

All of these direct effects can lead to reduced population levels for these mussel species in this portion of the Tennessee River, which, in turn, can reduce their reproductive capacity.

These direct effects will also affect proposed critical habitat of the rabbitsfoot; however, the extent of this removal and/or disturbance is considered minor. As stated above in the *Species/Critical Habitat Description*, the mileage of critical habitat in just Unit RF19b (i.e., Tennessee river downstream of Kentucky Lock and Dam) is 22.1 miles, which is 0.013 percent of the total estimated mileage for all critical habitat units in all of the nine states with proposed critical habitat. The total acreage of critical habitat in Unit RF19b is approximately 3,105.5 acres. The acreage estimated to be covered by this port activity area is about 2.32 acres or about 0.075 percent of the total acreage of proposed critical habitat in Unit RF19b. We do not believe that the expected impacts from this port activity appreciably diminishes the value of constituent elements essential to the species' conservation, and we do not include an estimate of the acreage of critical habitat that could be impacted.

Interrelated and interdependent actions:

No interrelated and interdependent actions have been identified for this project.

Indirect effects:

Indirect effects of this project on the orangefoot pimpleback, sheepnose, rabbitsfoot, and proposed critical habitat for the rabbitsfoot, include changes in fish host behavior and/or presence that could impact the ability of glochidia to attach to the fish at the proper time when released from the female mussel, changes in flow regimes and substrate disturbance in the action area, and increased turbidity due to construction and operation of the facility.

In summary, the following indirect effects are anticipated for these species and/or the proposed critical habitat for the rabbitsfoot:

1. Mortality of adult and juvenile mussels that results from changes in the flow regime, redistributing sediments that smother mussels due to new deposition, and/or that result in sediment loss creating instability and loss of habitat.
2. Harm in the form of decreased ability to respire, reproduce, and feed as a result of the redistribution of sediments resulting from changes in flow regimes and/or fleeting activities in occupied habitat. These activities may affect turbidity, flows, dissolved oxygen levels, and the presence of host fish during the future reproductive seasons of these mussel species.
3. Harassment in the form of induced stress including, but not limited to, potential degradation of habitat from changes in flow regimes, and disturbance of habitat. This harassment could result in the mussel's decreased ability to respire, reproduce, and feed.

Species' response to a proposed action

Numbers of individuals/populations in the action area affected:

Orangefoot pimpleback – Based on the mussel assemblage and habitat conditions recorded during the survey, it is likely orangefoot pimplebacks occur in suitable habitat throughout portions of the project footprint; however, they are not expected to be evenly distributed in this portion of the action area. Previous mussel surveys nearby in the action area have recorded the presence of orangefoot pimpleback mussels near the project footprint; however, the exact number of orangefoot pimpleback mussels in the action area is currently unknown. We expect direct and indirect impacts to adversely affect orangefoot pimplebacks in the project site and elsewhere in the action area; however, it is not possible to accurately determine (or quantify) the indirect effects to orangefoot pimplebacks in the action area.

Sheepnose – Based on the mussel assemblage recorded from the mussel survey (Fortenbery 2012), habitat conditions recorded during the survey, and past record of this species occurrence in the Tennessee River, sheepnose occur in the project footprint. Although they occur in the action area, they are not evenly distributed throughout the action area. Sheepnose mussels occur upstream and downstream of the project area, and in the mainstem of the Ohio River. The exact number of sheepnose mussels in the action area is unknown; however, their number has been estimated in the project footprint area based on the survey conducted in 2012. The total number of sheepnose mussels estimated to occur in the project area is 23 individuals. We expect direct and indirect impacts to adversely affect sheepnose in the project site and elsewhere in the action area; however, it is not possible to accurately determine (or quantify) the indirect effects to sheepnose in the action area.

Rabbitsfoot – Based on the mussel assemblage recorded from the mussel survey (Fortenbery, 2012), habitat conditions recorded during the survey, and past record of this species occurrence in the Tennessee River, rabbitsfoot mussels occur in the project footprint. The exact number of rabbitsfoot mussels in the action area is unknown; however, their number has been estimated at 34 individuals in the project area based on the survey conducted in 2012. We expect direct and indirect impacts to adversely affect rabbitsfoot in the project site and elsewhere in the action

area; however, it is not possible to accurately determine (or quantify) the indirect effects to rabbitsfoot mussels in the action area.

Sensitivity to change:

The degree to which the orangefoot pimpleback, sheepnose, and rabbitsfoot mussels are prone to change when disturbed is unknown. These three species are thought to be relatively sedentary within the substrate. As a result, they are likely unable to respond to change by moving great distances; however, it is possible they could move several meters but not over a short time (i.e., a few hours). 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 area of disturbance 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. The rabbitsfoot mussel has a tendency to position itself on the surface of the substrate and/or partially on the surface of the substrate, a trait which may lend itself more vulnerable to being disturbed.

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 are not appreciably changed, the magnitude of disturbance is expected to be low and resilience is not expected to change from its current level.

Recovery rate:

In this biological/conference opinion, the recovery rate relates to the time required for an orangefoot pimpleback, sheepnose, or rabbitsfoot mussel individual or population to return to equilibrium after exposure to a disturbance. Mussel populations 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, especially in areas that may be subjected to repeated degradation (i.e., the shallow, near-shore areas). The recovery rate for these mussel species is likely to vary within the project area and the action area.

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 pursuant to section 7 of the Act.

Kentucky Lock and Dam is located immediately upstream of the project site. Private actions in the vicinity of the action area are primarily urban, industrial, and agriculture-related activities. We are reasonably certain these actions will continue and do not expect these activities to differ appreciably in the future from current conditions. There are other known applicants in the lower Tennessee River who wish to establish facilities of various types; however, their impacts to the mussels of the lower Tennessee River are not known at this time. Effects from urban and agricultural activities on orangefoot pimpleback, sheepnose, and rabbitsfoot mussels could

include increased sediment deposition, turbidity, and herbicide/pesticide levels in localized portions of the Tennessee River and Ohio River. The lower Tennessee River has experienced discharges, pollutants, and accidental spillages from the multiple chemical and other facilities in the Calvert City area of the lower Tennessee River. The detrimental nature of these activities to mussels of the lower Tennessee River have not been well documented over the years, however it is speculated to have caused the decline of sensitive species in the tailwater. It has also been documented that many of the toxins and chemicals remain trapped in the sediments of the lower Tennessee River in the Calvert City area. However, these effects, if they are occurring, are indeterminable. Private boating and commercial navigation activities also occur in the Tennessee River and Ohio River and are expected to continue to result in unknown number of additional adverse effects such as increased turbidity, physical disruption of habitat, and spills of petroleum products. Essentially, we cannot precisely predict the total extent and/or specific types of adverse effects that will occur.

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

CONCLUSION

After reviewing the current status of the orangefoot pimpleback, the sheepsnose and the rabbitsfoot mussels, 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 orangefoot pimpleback, sheepsnose, or rabbitsfoot, and is not likely to destroy or adversely modify designated or proposed critical habitat (i.e., this action does not appreciably diminish the value of constituent elements essential to the species' conservation). No critical habitat has been designated for the sheepsnose or orangefoot pimpleback; however, critical habitat is proposed for the rabbitsfoot mussel.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or 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 behavioral 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 the Corps and TVA, so that they become binding conditions of any grant, permits or contracts, as appropriate,

for the exemption in section 7(o)(2) to apply. The Corps and TVA have a continuing duty to regulate the activity covered by this Incidental Take Statement. If the Corps and TVA (1) fails to assume and implement the terms and conditions or (2) fails to require the Permittee to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the grant, permit or contract, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps and TVA 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 OF TAKE EXPECTED

The amount of area taken due to direct and/or indirect impacts from this fleeting operation, due primarily to habitat disturbance is unknown.

The take estimate provided below is what the Service believes is a reasonable expectation of take. The amount of take is derived primarily from estimates provided in the BA and additional survey and mussel density information that were available to the Service. The conservation measures proposed to be implemented by First Marine have helped to minimize the estimated amount of take provided. The 0.2 acre area within the 2.32 acre project footprint area is located primarily along the shore where barge port activity is most likely to impact the substrate, and/or which is most likely to be impacted by wheel wash due to a shallower water depth.

The Service expects that one (1) orangefoot pimpleback, twenty-three (23) sheepsnose, and thirty-four (34) rabbitsfoot mussels will be taken as a result of this proposed action. The estimate of take for rabbitsfoot mussels is derived from the estimates of mussel density from the mussel survey (Fortenbery 2012), additional information provided by First Marine, and the approximate 0.2 acre area which was estimated to most likely be impacted by barge and towboat activity. Take for sheepsnose is provided for the entire 2.32 acre project footprint area, because the sheepsnose primarily occurs in deeper water further riverward from the shore. All habitat was not searched in the mussel survey; however, we believe that a small number of sheepsnose occur in the area most likely to be impacted by port activity, so we have assumed a correspondingly low take for this species. Take for the orangefoot pimpleback mussel is provided as one (1) individual, because this species was not recorded during the mussel survey but could be present since not all habitat was surveyed and it is not likely to be present near shore where most impacts are expected to occur.

In the “Analyses for effects of the action” section above, the Service determined that the proposed action would result in incidental take through (a) direct mortality as a result of port activity (e.g., barge/towboat disturbance/dislodgement of mussels and their habitat); (b) harm from habitat disruption due to port activities as in (a) that will likely result in (1) disturbance and dislodgement to mussels, (2) negative effects of sedimentation that could entomb, starve, and/or suffocate individuals, (3) loss and/or degradation of habitat, and (4) disruption of host fish availability at key times during the reproductive cycle; and (c) harassment as a result of disruption in reproductive capabilities by, but not limited to, the spontaneous abortion of glochidia and individuals being dislodged downriver into unsuitable habitat.

The Service also determined that an unknown amount of proposed critical habitat will be affected by the project. This was determined by the effect of barge and towboat actions upon the primary constituent elements provided for the rabbitsfoot mussel under the proposed critical habitat for this species.

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 listed and/or proposed species or the destruction or adverse modification of critical habitat (i.e., this action does not appreciably diminish the value of primary constituent elements essential to the species' conservation).

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of orangefoot pimpleback, sheepnose, and rabbitsfoot mussels and to minimize any diminishment in the value of the primary constituent elements that are essential to the rabbitsfoot's conservation associated with its proposed critical habitat.

1. The Corps and TVA will condition their permits to require that the proposed actions undertaken by First Marine will occur as designed, planned, and documented in the BA (i.e., Conservation Measures), all supporting information provided by First Marine, and this biological opinion.
2. The Corps and TVA will condition their permits to require that First Marine has a plan to monitor orangefoot pimpleback, sheepnose, and rabbitsfoot mussels and habitat likely to be impacted by the proposed action.
3. The Corps and TVA will condition their permits to require that First Marine implements measures to minimize or eliminate impacts of the project to orangefoot pimpleback, sheepnose, rabbitsfoot mussels, and to their habitat at the project site.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of Section 9 of the Act, the Corps, TVA, and First Marine must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting requirements. The following terms and conditions provided below are non-discretionary.

1. The Corps and TVA will condition their permits to require First Marine to implement the proposed action as described in the BA, including the conservation measures listed in this biological opinion and conference opinion, and that are referred to in the BA and the BA's supporting documentation (see "Mussel Conservation Measures" section above). First Marine will supply written confirmation (including appropriate monitoring reports and photographic documentation) to illustrate to the Corps, TVA, and Service that these actions have been taken. **This Term and Condition supports RPMs 1, 2, and 3.**

2. The Corps and TVA will include in their respective authorizations for the project a requirement that First Marine shall contribute \$67,000.00 to the Kentucky Waterways Alliance (KWA) Kentucky Aquatic Resources Fund (KARF) following issuance of this biological opinion and prior to initiating construction of the project. These funds will be used in recovery and mussel propagation and culture efforts for the federally listed mussels (i.e., orangefoot pimpleback, sheepnose and rabbitsfoot) addressed in this biological/conference opinion, thereby minimizing the take expected to occur on this project. **Orangefoot pimpleback** – For the one (1) orangefoot pimpleback taken, we estimate \$4,000.00. Considerations involved in deriving this amount include: (a) there is an anticipated very high cost to locate adults, (b) the fish host is unknown, (c) the species is a short term brooder and has never been propagated or cultured, (d) the species easily aborts larvae when handled, and (e) little is known regarding how this species will respond to captivity. **Sheepnose** – For the 23 sheepnose taken, we estimate \$46,000.00 (i.e., \$2,000 per individual). Considerations involved in deriving this amount include: (a) there is an anticipated high cost to locate adults, (b) the species is a short term brooder and easily aborts larvae when handled, (c) there has been limited previous success on fish host identification with this species, (d) there has been a low amount of previous success on propagation and culture with this species, and (e) little is known regarding how this species will respond to captivity. **Rabbitsfoot** – For the 34 rabbitsfoot taken, we estimate \$17,000.00 (i.e., \$500.00 per individual). Considerations involved in deriving this amount include: (a) there is a relatively moderate cost to locate adults, (b) the species is a short term brooder and easily aborts larvae when handled, (c) there has been previous success on fish host identification with this species, (d) there has been a low amount of previous success on propagation and culture with this species, and (e) little is known regarding how this species will respond to captivity. The total contribution of \$67,000.00 shall be made using certified funds and should be made out to – “Kentucky Waterways Alliance” – with KARF and any other appropriate details in the memo section. The total contribution of \$67,000.00 will be made in one payment prior to fleeing establishment at the project site. The contribution shall be mailed to: Attention: Judith Petersen, Executive Director, Kentucky Waterways Alliance, 120 Webster Street, Suite 217, Louisville, Kentucky 40206. The Kentucky Waterways Alliance’s office telephone number is 270-524-1774. Contact Ms. Petersen if the contribution will be made by direct deposit or a wire transfer. First Marine must supply documentation that these payments have been made as a condition of Corps or TVA permits. **This Term and Condition supports RPM 3.**

3. As a condition of Corps and TVA permits, First Marine will develop a plan to monitor orangefoot pimpleback, sheepnose, and rabbitsfoot mussels and habitat likely to be impacted by the proposed action. This plan must be approved by the Service, prior to establishment of the fleeing area. This plan will involve the use of side-scan sonar along with the use of divers to monitor the impacts of the fleeing activity to the mussels and habitat at the fleeing areas. It is anticipated the monitoring effort will have a pre-fleeing establishment effort (i.e., baseline) and then a post-establishment effort that will be sufficient to determine impacts, if any, to mussels and habitat. **This Term and Condition supports RPM 1 and 2.**

Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification must be made to the Fish and Wildlife Service Law Enforcement Office at 601 W. Broadway, Suite 115A, Gene Snyder Courthouse, Louisville, Kentucky 40202 (phone 502/582-5989 extension 21). Additional notification must be made to the Fish and Wildlife Service Ecological Services Field Office at 330 West Broadway, Room 265, Frankfort, Kentucky 40601 (phone 502/695-0468). Care should be taken in handling sick or injured mussels. All federally listed or proposed mussels that are moribund or have died recently are to be preserved according to standard museum practices (preferably kept frozen and/or preserved in 95% ethyl alcohol and then frozen), 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 the Kentucky Ecological Services Field Office in Frankfort, or to another location if instructed by the Service.

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. The Service believes that no more than 1 orangefoot pimpleback, 23 sheepsnose, and 34 rabbitsfoot mussels, and an unknown extent or acreage of mussel habitat will be incidentally taken. 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. In addition, if any other federally listed mussels are recorded during the fleeting and/or monitoring activities, re-initiation of consultation and review of the reasonable and prudent measures provided is required. The Federal agency 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 RECOMMENDATION

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.

The Corps, TVA, and/or First Marine should consider implementing the following conservation recommendation:

Provide financial and/or other assistance to the Kentucky Department of Fish and Wildlife Resources Center for Mollusk Conservation to support programs that work to restore federally listed mussels and other native mussels in the lower Tennessee River. Such assistance could take the form of protecting or enhancing similar habitat, providing funding to the CMC facility to propagate federally listed mussels and other native mussels, provide locations on the project site, or at other appropriate sites, to hold mussels for use in future recovery activities. We recommend First Marine, the Corps, and TVA work

with the Service and KDFWR to promote such mussel recovery actions as appropriate.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, please provide notification to the Service's Kentucky Field Office of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the Corps request. As written in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Corps 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 Corps action that may affect listed species or critical habitat in a manner or to an extent not considered in this biological opinion; (3) the Corps action is later modified in a manner that causes an effect to the listed species or critical habitat not considered in this biological 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 until re-initiation.

This also concludes the conference for the First Marine project. You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if critical habitat for the rabbitsfoot is designated. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project in writing, and no further section 7 consultation will be necessary.

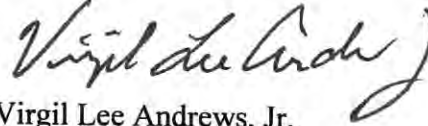
After final designation of critical habitat for the rabbitsfoot and any subsequent adoption of this conference opinion, the Federal agency shall request re-initiation of consultation if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in this conference opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this conference opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

The incidental take statement provided in this conference opinion does not become effective until the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any take of critical habitat for the rabbitsfoot has occurred. Modification of the opinion and incidental take statement may be appropriate to reflect that take.

For this biological and conference opinion, the incidental take would be exceeded when the take exceeds 1 orangefoot pimpleback, or 23 sheepnose, or 34 rabbitsfoot mussels, which is the amount of take exempted from the prohibitions of section 9 by this biological opinion.

The Service appreciates the cooperation of the Corps, TVA, and First Marine during this consultation. For further coordination, please contact me or Leroy Koch of this office at 502/695-0468.

Sincerely,

A handwritten signature in cursive script that reads "Virgil Lee Andrews, Jr." The signature is written in black ink and is positioned above the printed name.

Virgil Lee Andrews, Jr.
Field Supervisor

cc: Doug Dawson, KDFWR, Frankfort, KY

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Appendix A

Orangefoot pimpleback (*Plethobasus cooperianus*) biological opinions including amount and form of take exempted.

PROJECTS	SERVICE OFFICE AND DATE BO ISSUED	INCIDENTAL TAKE (IT) FORM	TAKE EXEMPTED or SURROGATE MEASURE TO MONITOR
USACE – Biological Opinion on the Consolidated Grain and Barge Co. Proposed Cargo Fleeting Area on the Ohio River. Pulaski County, IL	April 3, 1985 MW Regional Office Ft. Snelling, MN	N/A	Jeopardy Opinion – No take authorized
USACE – Final Biological Opinion on the Effects on Threatened and Endangered Species on the Lower Ohio River Navigation Feasibility Study	June 13, 1985 ES Field Office Asheville, NC	N/A	No take authorized
TVA – Biological Opinion on the Proposed Wood Chipping and Barge-Loading Facilities on the Tennessee River	December 2, 1992 SE Regional Office Atlanta, GA	N/A	No take authorized
USACE – Biological Opinion on the Construction of the Olmstead Lock and Dam Facility Supplemental to 1985 BO	January 15, 1993 ES Field Office Cookeville, TN	Habitat loss	No take authorized
USACE – Biological Opinion for the Proposed Construction of Barge Fleeting Facilities, Ohio River, Ballard County, KY	September 1993 SE Regional Office Atlanta, GA	N/A	No take authorized
FHWA - Biological Opinion for the Construction of the Patton Island Bridge	November 23, 1994 ES Field Office Daphne, AL	Harm or harass	One individual
USFWS – Rescue of Critically Endangered Mussels in TN, KY and northern AL	October 1996 ES Field Office Cookeville, TN	Collection of live individuals	Up to 30 live individuals, not more than 10 individual per population

USFWS – Programmatic Biological Opinion Addressing Effects of Section 10(a)(1)(A) Permitting on Freshwater Mussels	August 1, 1998 SE Regional Office Atlanta, GA	Harm or kill	Up to five adult mussels per year
USACE – Biological Opinion for Proposed Maintenance Dredging in the Tennessee River at Diamond Island, Hardin County, TN	July 1999 ES Field Office Cookeville, TN	Harm or harass	Approximately seven acres of habitat loss
Supplement to the 1991 Biological Opinion For The Proposed Bridges and Alignments Modification to the Kentucky Lock Addition Project Livingston and Marshall Counties, Kentucky	January 2000 ES Field Office Cookeville, TN	Harm or kill	All individuals within the 0.04 acre of habitat impacted by drilling and construction activities
FHWA & USACE – Biological Opinion on the Proposed Replacement of the State Route 2 Bridge over the Tennessee River, Loudon County, TN	February 2001 ES Field Office Cookeville, TN	Harm, harass or kill	All individuals within the Project corridor
FHWA and TVA – Amended Biological Opinion for the Proposed Replacement of the State Route 2 Bridge Over the Tennessee River, Loudon County, TN	February 2002 ES Field Office Cookeville, TN	Harm or harass	All individuals within the project corridor
USACE – Chickamauga Lock Project Hamilton County, Tennessee	February 2002 ES Field Office Cookeville, TN	Habitat loss and/or degradation	All within disturbed area
USACE – Mussel relocation Experiment on Tennessee River Near Diamond Island, Hardin County, TN	September 9, 2002 ES Field Office Cookeville, TN	Harm or harass	One individual
USACE – Olmsted Lock and Dam Construction Replaces the 1993 BO	July 16, 2003 ES Field Office Cookeville, TN	N/A	No incidental take authorized

USACE – Tennessee River, Pickwick Landing Dam Mussel Relocation Study, Hardin County, Tennessee	November 13, 2003 ES Field Office Cookeville, TN	Harm, harass, collect	One individual
TVA _ Proposed Wilson Hydro Plan Modernization of Hydroturbine Project, Lauderdale and Colbert counties, AL	2004 ES Field Office Daphne, AL	Harm, harass or kill	20 individuals
USFWS- Amendment to the 1998 Programmatic Section 7 Biological Opinion Addressing Effects of Section 10(a)(1)(A) Permitting on Freshwater Mussels in Region 4	July 16, 2004 ES Field Office Conway, AR	Harm or mortality	Five individuals per 100 handled
TVA – Biological Opinion on the Routine Operation and Maintenance of TVA Dams in AL, GA, KY, MS, NC, TN, and VA	October 17, 2006 Cookeville, TN ES Field Office	Harm, harass	Cannot be determined. All in 2 mile reaches of the TN River below Fort Loudoun, Watts Bar, Guntersville, Pickwick and Kentucky dams.
Paducah Riverfront Development Project Biological Opinion, McCracken County, KY	Kentucky ES Office, Frankfort, KY July 6, 2010	Harm, harass	18 individuals and 7.5 acres of habitat
Biological Opinion on TEPPCO barge terminal project on Tennessee River, Decatur County, TN.	Cookeville, ES Office, Cookeville, TN	Harm, harassment, or kill	25 individuals
Biological Opinion on barge facility on Tennessee River in Perry County, TN	Cookeville, Tennessee ES Office	Harm, harassment, or kill	One individual
Westlake Vinyls, Inc., BO at Tennessee River Mile 17.8-18.0 in Marshall County, KY and effects on listed mussels.	Kentucky Field Office, July 30, 2013	Direct and Indirect impacts.	Provided for take of 7 individuals.
Biological Opinion and Conference Opinion on James Marine, Inc., Fleeting area project in lower Tennessee River at TRM 12.5-13.5 in Marshall Co., KY.	Kentucky Field Office, June 20, 2014	Mortality, harm and harassment	Provided take of 1 individual.

Appendix B

Sheepnose (*Plethobasus cyphus*) biological opinions including amount and form of take exempted.

PROJECTS	SERVICE OFFICE AND DATE BO ISSUED	INCIDENTAL TAKE (IT) FORM	TAKE EXEMPTED or SURROGATE MEASURE TO MONITOR
Biological Opinion and Incidental Take Statement for Fanshell (<i>Cyprogenia stegaria</i>), Pink Mucket Pearly Mussel (<i>Lampsilis abrupta</i>), Snuffbox (<i>Epioblasma triquetra</i>), and Sheepnose (<i>Plethobasus cyphus</i>) at the Ohio Department of Transportation Ironton-Russell Bridge Replacement Project (LAW-93C-0.00, PID 81595) in Lawrence County, Ohio	Ohio Ecological Services Office-2011	Harm and Harassment	Undeterminable but provided a take of 6 individuals
Biological Opinion and on Proposed State Route 70 (Kyles Ford) Bridge replacement over the Clinch River in Hancock County, Tennessee	Cookeville Field Office in Cookeville, Tennessee, April 9, 2014	Harassment	Undeterminable but provided for up to 50 percent of the species.
Westlake Vinyls, Inc., BO at Tennessee River Mile 17.8-18.0 in Marshall County, KY and effects on listed mussels.	Kentucky Field Office, July 30, 2013	Direct and Indirect impacts.	Provided for take of 7 individuals.
Biological Opinion on Effects of PA Dept. of Transportation Bridge Replacement and Maintenance Program on several listed mussels in Pennsylvania	Pennsylvania Field Office, December 13, 2013	Harm and harassment through mortality, injury, and stress	Provided for take of 86 individuals

Biological Opinion on Hunter Station Bridge Replacement in Forest County, PA	Pennsylvania Field Office, November 18, 2013	Killing, harm and harassment from stress, reproductive impairment, changes in hydrology, scour and deposition	Provided take of 103 individuals.
Biological Opinion and Conference Opinion on James Marine, Inc., Fleeting area project in lower Tennessee River at TRM 12.5-13.5 in Marshall Co., KY.	Kentucky Field Office, June 20, 2014	Mortality, harm and harassment	Provided take of 4 individuals.

Appendix C

Rabbitsfoot (*Quadrula cylindrica cylindrica*) biological and/or conference opinions including amount and form of take exempted.

PROJECTS	SERVICE OFFICE AND DATE BO ISSUED	INCIDENTAL TAKE (IT) FORM	TAKE EXEMPTED or SURROGATE MEASURE TO MONITOR
Final Biological and Conference Opinions: Proposed Approval and Participation of Conservation Memorandum of Agreement with Crestwood Midstream Partners LP, to Provide Recovery Benefits for the Speckled Pocketbook (<i>Lampsilis streckeri</i>), Rabbitsfoot (<i>Quadrula cylindrica cylindrica</i>), and Yellowcheek Darter (<i>Etheostoma moorei</i>).	Arkansas Ecological Services Field Office on January 15, 2010 and an amendment to it prepared on March 11, 2011	Provided in the form of acres	Incidental take for rabbitsfoot was not provided as a number of individuals; however, authorized take would be considered exceeded when the take exceeded 256 acres and/or ephemeral and intermittent stream crossings in any one year or 1,280 acres and 875 stream crossings over a period extending from 2010 – 2014
Biological Opinion on Tennessee Department of Transportation's State Route 50 Bridge replacement over the Duck River at River Mile 64 in Hickman County, TN.	Cookeville Field Office in Cookeville, Tennessee, November 13, 2013	Provided as direct mortality, injury or harassment, increased vulnerability to disease and reduced ability to feed and/or respire.	All individuals in 14.46 acre area.
Wolf Pen Gap Trail on Ouachita National Forest and several mussel species.	Arkansas Field Office, December 19, 2013	Provided in form of tons of sediment (1,077 tons) per year.	Difficult to determine so used sedimentation rate as measure.

Westlake Vinyls, Inc., BO at Tennessee River Mile 17.8-18.0 in Marshall County, KY and effects on listed mussels.	Kentucky Field Office, July 30, 2013	Direct and Indirect impacts.	Provided for take of 21 individuals. In addition, the Service expects 0.73 acres of habitat could be taken as a result of this action. The amount of area taken due to indirect impacts from project operation, potential long-term sedimentation, and habitat disturbance is unknown.
Biological Opinion on Effects of PA Dept. of Transportation Bridge Replacement and Maintenance Program on several listed mussels in Pennsylvania	Pennsylvania Field Office, December 13, 2013	Harm and harassment through mortality, injury, and stress	Provided for take of 86 individuals
Amended BO and Conference Opinion on Mead Avenue Bridge replacement project in Crawford Co., PA	Pennsylvania Field Office, February 26, 2014	Direct and Indirect effects from streambed disturbance.	Provided for take of 95 individuals
Biological Opinion and Conference Opinion on James Marine, Inc., Fleeting area project in lower Tennessee River at TRM 12.5-13.5 in Marshall Co., KY.	Kentucky Field Office, June 20, 2014	Mortality, harm and harassment	Provided take of 156 individuals.