United States Department of the Interior

FISH AND WILDLIFE SERVICE

West Virginia Field Office
90 Vance Drive
Elkins, West Virginia 26241

August 9, 2019

Mr. Kevin Rose
Federal Highway Administration
Eastern Federal Lands Highway Division
21400 Ridgetop Circle
Sterling, Virginia 20166

Re: WV ERFO FS 2016-1 (2), (3), (4), (5) Repair of Storm Damaged Roads FRs 86, 133, and 150 on the Monongahela National Forest; FWS File #2019-F-0289

Dear Mr. Rose:

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) based on our review of the WV Emergency Relief for Federally Owned Roads (ERFO) Forest Service (FS) 2016-1 (2), (3), (4), (5) Repair of Storm Damaged Roads (Forest Service Roads (FRs) 86, 133, and 150) on the Monongahela National Forest (MNF) project, hereafter referred to as ERFO (2), (3), (4), (5), and its effects on the federally listed endangered candy darter (*Etheostoma osburni*) and its proposed critical habitat in accordance with section 7 of the Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA).

This Opinion is based on information provided in the updated biological assessment (BA) and associated appendices, dated June 7 2019, and received by the Service on June 11, 2019, additional environmental baseline information received July 1, 2019, various telephone conversations, emails, the ERFO (2), (3), (4), (5) BA and Botanical Resources Survey Report received June 7, 2018, a site visit conducted on May 7, 2019, and other sources of information. The consultation history is located in Appendix B. A complete administrative record of this consultation is on file in this office.

Project History

A June 5, 2018 letter submitted by the Federal Highway Administration (FHWA), in cooperation with the U.S. Forest Service (FS) included a request for Service concurrence with "may affect, not likely to adversely affect" determinations for certain listed species in the ERFO (2), (3), (4), (5) BA.

There have been three versions of the BA for the current project; one dated January 28, 2019, a revised version from March 27, 2019, and a final updated BA, dated June 7, 2019. The June 7,

2019 BA is the basis for this Opinion. There have been a number of project modifications and information addendums, as described in the consultation history (Appendix B).

This Opinion will address the effects of the proposed project, ERFO (2), (3), (4), (5), on the candy darter and its proposed critical habitat. Federally listed bat and plant species for Sections (2) and (5) will also be addressed in this BO. Because the terrestrial footprint of the project area, and therefore the effects expected on terrestrial species, has not changed from the June 7, 2018 BA and project plan sheets, the concurrence received from the Service on July 30, 2018 for federally listed bat and plant species listed in WV ERFO FS 2016-1 (3) and (4) Repair of Storm Damaged Roads (FR 86) remains valid.

SPECIES NOT AFFECTED/ NOT LIKLEY TO BE ADVERSELY AFFECTED

The June 7, 2019 BA for project sections (2) and (5) included a request for Service concurrence with "may affect, not likely to adversely affect" determinations for certain listed species. FHWA and the USFS have determined the proposed action "may affect, is not likely to adversely affect" the Virginia spiraea (*Spiraea virginiana)*, shale barren rockcress (*Arabis serotina*), northeastern bulrush (*Scirpus ancistrochaetus*), small whorled pogonia (*Isotria medeoloides*) (SWP), and running buffalo clover (*Trifolium stoloniferum*) (RBC) based on the results of vegetation surveys performed within the Action Area in September 2017 by qualified plant surveyors at AllStar Ecology, LLC (ASE). The action agencies have also determined that the project "may affect, is not likely to adversely affect" the Indiana bat. The BA did not include a determination of effects for NLEB, but did state the project activities will not cause prohibited take.

Virginia spiraea, shale barren rock cress, and northeastern bulrush: Virginia spiraea, shale barren rock cress, and northeastern bulrush are currently not known to occur in Pocahontas or Webster Counties in WV and no individuals were detected during the 2017 plant surveys, conducted within the Action Area by qualified plant surveyors from ASE. Therefore, the Service concurs that this project "may affect, is not likely to adversely affect" these species.

SWP: The agencies determined that there is a small amount of potentially suitable habitat for this species located within forested areas of the Action Area. However, botanical surveys conducted in 2017 failed to detect the species within the project area. Therefore, the Service concurs with the determination that this project "may affect, is not likely to adversely affect" SWP.

RBC: While potential habitat for RBC exists within the project area, qualified plant surveyors from ASE failed to detect any individuals of this species within the Action Area for this project during the vegetation surveys performed in September 2017. Therefore, the Service concurs with the determination that this project "may affect, is not likely to adversely affect" RBC.

Indiana Bat: The Indiana bat may use the project area for foraging and roosting during the non-hibernation season from April 1 to November 14. Indiana bat summer foraging habitats are generally defined as riparian, bottomland, upland forest, and old fields or pastures with scattered trees. Roosting/maternity habitat consists primarily of live or dead hardwood tree species with

exfoliating bark that provides space for bats to roost between the bark and the bole of the tree. Tree cavities, crevices, splits, or hollow portions of tree boles and limbs also provide roost sites. In West Virginia, the Service considers all forested habitat containing trees greater than or equal to 5 inches in diameter at breast height (DBH) to be potentially suitable as summer roosting and foraging habitat for the Indiana bat.

Indiana bats feed on emerged aquatic and terrestrial flying insects. Moths, caddisflies, flies, mosquitoes, and midges are major prey items. Aquatic insects that have concentrated emergences or that form large mating aggregations above or near water appear to be preferred prey items. As a result, streams, wetlands, and associated riparian forests are often preferred foraging habitats for pregnant and lactating Indiana bats. Indiana bats also forage within the canopy of upland forests, over clearings with early successional vegetation (e.g., old fields), along the borders of croplands, along wooded fencerows, and over farm ponds in pastures. Increased erosion and sedimentation of streams has been shown to reduce diversity and biomass of benthic invertebrates.

Indiana bats use caves or mine portals for winter hibernation between November 15 and March 31. They also use the hibernacula and the areas around them for fall-swarming and spring-staging activity (August 15 to November 14 and April 1 to May 14, respectively). Some males have been known to stay close to the hibernacula during the summer and may use the hibernacula as summer roosts.

Telemetry data has demonstrated that Indiana bats are known to forage and roost in areas that are within 10 miles of a known priority 1 or 2 Indiana bat hibernaculum, 5 miles of a known priority 3 or 4 Indiana bat hibernaculum, 2.5 miles of any known maternity roost, and 5 miles of summer detection sites where no roosts were identified.

The Service concurs that this project “may affect, is not likely to adversely affect” the Indiana bat because your project: 1) incorporates a time of year restriction on cutting trees over 5 inches DBH from April 1-November 14, during the active bat season, 2) will affect a small number of trees over 5 inches DBH (37), distributed over a 19.06 mile long Action Area and the total acreage of LOD effected by tree clearing is less than 0.34 acre; 3) is not within any of the Indiana bat hibernacula or summer use buffers described above; and 4) will not affect any potential caves or mines that could be used as hibernacula for this species.

Northern long-eared bat: The NLEB may use the project area for foraging and roosting between April 1 and November 14. NLEB foraging habitat is similar to Indiana bat foraging habitat and includes forested hillsides and ridges, as well as small ponds or streams. NLEB are typically associated with large tracts of mature, upland forests with more canopy cover than is preferred by Indiana bats. NLEB seem to be flexible in selecting roosts. They choose roost trees based on suitability to retain bark or provide cavities or crevices, and this species is known to use a wider variety of roost types than the Indiana bat. Males and non-reproductive females may also roost in cooler places like caves and mines. Although rare, this bat has also been found roosting in structures like barns and sheds.

Like the Indiana bat, NLEB use caves or mine portals and the areas around them during winter hibernation between November 15 and March 31, as well as during the fall-swarming and spring-staging activity (August 15 to November 14 and April 1 to May 14, respectively). Some males have been known to stay close to the hibernacula during the summer and may use the hibernacula as summer roosts. There may be other landscape features being used as hibernacula by NLEB during the winter that have yet to be documented.

Since potential summer habitat, foraging habitat, and travel corridors for the NLEB occur in the proposed Action Area, the species may be effected by the project activities. However, individual NLEB are not expected to be affected by tree-clearing activities, as FHWA has committed to a time of year restriction, in which no tree clearing will occur during the active bat season from April 1 through November 14. Any take of NLEB occurring in conjunction with other project activities that complies with the conservation measures (as outlined in the 4(d) rule), as necessary, is exempted from section 9 prohibitions by the 4(d) rule and does not require site specific incidental take authorization. Note that the 4(d) rule does not exempt take that may occur as a result of adverse effects to hibernacula and that no conservation measures are required as part of the 4(d) rule unless the proposed project: 1) involves tree removal within 0.25 miles of known NLEB hibernacula; or 2) cuts or destroys known, occupied maternity roost trees or any other trees within a 150-foot radius around known, occupied maternity tree during the pup season (June 1 to July 31). This proposed project is not located within any of these radii around known hibernacula or roost trees and will not affect any known NLEB hibernacula, therefore any take of NLEB associated with this project is exempted under the 4(d) rule and no conservation measures are required. Therefore, this project will result in a "may affect, is likely to adversely affect" determination for the NLEB, and this Opinion satisfies the FHWA's responsibilities under Section 7(a)(2) of the ESA relative to the NLEB for the proposed action.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

As defined in the ESA section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas."

On June 23, 2016, the Williams River watershed experienced an extraordinary precipitation event. According to official records for peak stream flows in the Williams River from 1930 – 2017 (USGS 2019), the storm generated the greatest flood of record for the Williams River discharge peaked at 32,300 cubic feet/second (cfs) and a gage height of 22.75 feet was recorded near Dyer, West Virginia. The previous record for peak stream flow on the Williams River was 21,500 cfs (gage height of 17.73 feet) recorded on August 30, 1984, or approximately 67% of the peak flow recorded in 2016. Documented peak flows have exceeded 20,000 cfs only three other times in the Williams River during the period of record.

The June 23, 2016 precipitation event and subsequent run-off resulted in a record high stream flow, numerous landslides, damage to culverts and bridges on FS roads, and other elements of

disturbance in the watershed that severely altered conditions, which had contributed to a long-term state of channel equilibrium in the Williams River. During the flood event, the Williams River and its network of tributary streams experienced extensive bank erosion, massive volumes of sediment input, and a vast re-distribution of material (e.g. stream substrates, bank material, landslide inputs, in-stream wood material) during the record flood. Consequently, channel morphology of the Williams River was dramatically altered, including widespread incidence of channel widening. Many locations of river channel widening occurred coincident to embankments associated with FR 86. Due to severe damage incurred during the flood event, a portion of the Williams River Road, or FR 86, has been closed to traffic for the past three years, preventing through traffic on much of the road. In addition to allowing the public access to the many recreational opportunities provided by the MNF in the area, the Williams River Road also serves as an important connecting route for the rural communities in this part of West Virginia. The reopening of this route will restore connectivity among these communities and within the MNF that has been impaired since the flood event.

In order to address these issues, activities identified in this project's BA include efforts to repair and stabilize flood damaged roads and their embankments adjacent to the Williams River. Various repair projects within this BA call for the placement of large rock and other fill material to help restore the road width and re-establish stable road fills adjacent to the river, replacement of damaged structures to help restore flow, and for contouring and removal of debris from roadside ditches and shoulders to restore proper stormwater flow. Actions taken to stabilize damaged road embankments that currently exist adjacent to the Williams River are expected to reduce the risk for bank erosion at these locations in the future and contribute to the long-term recovery of the Williams River channel to a state of channel dynamic equilibrium.

FHWA, in cooperation with the FS, proposes to perform road repair work at 41 discrete work areas located along three separate Forest Service roads within the MNF. There are 38 repair locations along FR 86 (Williams River Road) between mileposts (MP) 0.2 and 18.4, two along FR 150 (Highland Scenic Highway) at MPs 7.7 and 10.8, and one repair site on FR 133 (White Oak Road) at MP 1.19. The length of time over which construction work is expected to occur at any one project repair site varies by site, depending on the nature of work activities planned. The majority of the repair work along the affected areas of FR 86 is expected to last 10 or fewer working days (28 of the 38 repair locations along this road). However, work is projected to take from 2-3 weeks at 7 other locations, 2 ½ months at an additional 2 repair sites, and 3 ½ months at one location. Work at the one repair site on FR 133 is expected to take approximately 2 months, and work at two locations along FR 150 is expected to take a total of 10 working days. In total, in-water repairs are scheduled to take place on 439 days over 26 months, from the fall of 2019 through 2021. The proposed construction schedule, proposed start and completion dates, and number of working days for each section of work can be found in Section 4.1.4 of the project BA, and the projected number of working days spent at individual repair sites can be found in Tables 5-8 of the BA. Repair work will occur throughout most of the year, except from mid-December to March 31, when repair work typically shuts down to avoid winter weather conditions.

FR 86: As FR 86 parallels the Williams River, both in-water and terrestrial work to repair damaged sections of FR 86 are proposed in 38 different locations along an 18.2 mile section of this road. A 14.78 mile section of the Williams River and sections of five tributaries to the Williams River (Bridge Creek, Elbow Branch, Hateful Run, Little Lick Branch, and White Oak Fork) will receive both in-stream and bank repair work. An additional stretch of 4.28 miles of the Williams River is included in the Action Area, but road repairs on this section of FR 86 will not leave the current road prism (no in-water or bank repairs). Work activities to be completed along FR 86 include embankment and side slope repairs, culvert replacements and/or new culvert placements, bridge replacements, shoulder and ditch reconditioning, riprap placement at existing culverts, asphalt concrete paving, and clearing of slides and trees.

FR 133: Both in-water and terrestrial work activities are expected to occur at one repair location on FR 133. The work site is located at MP 1.19, where FR 133 crosses an unnamed tributary to the White Oak Fork. Specific repair work proposed at this location involves the replacement of an existing culvert with an open bottom structural arch culvert.

FR 150: There will be no in-water work associated with the 2 repair sites along FR 150. The first work location is at MP 7.7, and involves repair of a washed out parking area. Repairs in the parking lot area include replacement of a 24 inch pipe culvert, masonry repair to a stone wall, asphalt concrete pavement of the parking area, and replacement of a split rail fence. The second work location, at MP 10.8, involves repairs to a damaged section of roadway. Repairs to the roadway include shoulder and ditch reconditioning, replacement of the culvert, riprap placement, and resetting of the guardrail.

The BA contains descriptions of the major activities associated with this project. Due to the complexity of the proposed action, we have broken the major activities down into subactivities for the purposes of the effects analysis. Below is a summary of each subactivity, with project changes and added information incorporated. A list of the specific repair activities to be performed at each work location is included in Section 4.1.6 of the BA (Tables 5-8). Additionally, project plan sheets with diagrams and specifications for repairs, with the exception of Type III embankment repairs, are included in Appendix A of the project BA; diagrams of example Type III repairs are included in the main portion of the BA.

Heavy equipment, including paving machines, heavy rollers, a crane, dump trucks, dozers, loaders, and excavators will be used in work activities.

1. <u>Terrestrial site preparation, (clearing and grading and ESC)</u>- Project-wide
    - Removal of herbaceous groundcover, brush, and shrubs from all Limits of Disturbance (LOD)
    - Leveling of the staging areas as needed to allow for operation of construction equipment
    - Select tree clearing. This project involves the removal of 37 trees that are 5 inches and greater diameter at breast height (DBH) over the project area (Table 1). All trees to be cleared are along FR 86.

Table 1. Trees over 5 inches DBH to be cleared by Mile Post on FR 86

MP	Number of Trees
0.2	5
8.9	3
9.1	1
9.5	2
10.6	8
15.8	6
16.6	12

- Installation of erosion and sediment controls (ESCs); best management practices (BMPs) include installation of triple-stacked fiber roll as perimeter controls at all work site LODs and rolled erosion product in ditches, in accordance with the Erosion and Sediment Control Narrative included in the project plan sheets (Appendix A) and in the Standard Specifications for Construction of Roads and Bridges on Federal Highway projects, FP-14 (FP-14) (US Department of Transportation, n.d.).

2. Embankment and side slope repairs- This includes grading, creation of slope benches, and placement of rocks to stabilize eroding banks. Embankment repairs will be performed along FR 86 and the Williams River. There are four types of embankment repairs that will be completed throughout the project area: Types I, II, III, and Type III with a key. The type of embankment repair to be performed at each location is dependent on site specific characteristics related to the severity of bank erosion, the steepness of the bank, and proximity to water resources. All repair locations have been assessed by FHWA and FS to determine the type of embankment repair that is required to provide bank stability at each location. Some bank repairs will not involve in-stream work, while other embankment repair locations will require in-water placement of rocks to create or maintain a stable bank Vertical Rise: Horizontal Run (V: H) ratio. In-water embankment repairs are required in locations with severely-eroded banks.

   - During all types of embankment repair, failing banks and side slopes will be graded and slope benches created as needed to provide bank stability and stable foundations for rock embankments.

   - During all types of embankment repair, native boulders and rocks that are too large to be moved or are already in a location that will assist in providing stability for the bank will be left in place, and imported rocks will be placed around them (Norman Evans, FHWA, conversation with B. Smrekar, Service, May 7, 2019).

   - Type I and Type II embankment repairs include the use of heavy equipment to excavate failing parent material to a depth of 3-8 feet or 8-27 feet, respectively, followed by the placement of geotextile fabric to maintain rock placement, and mechanical placement of rocks ranging in size from 10-29 inches or 10-48 inches,

respectively, in the excavated bank from the road edge to the water's edge to create a stable rock embankment. Larger rocks will be placed at the toe of the slope and along the slope, while smaller rocks will be placed in any voids, creating the stable bank. Aggregate is then placed on top of rocks at the road edge. The slope of the embankment will be maintained at 1.0 V: 1.5 H or a match to the existing side slope. No rocks will be placed in the water, no equipment will enter the water, and ESCs will be installed to protect aquatic resources. A total of 7,458 linear feet (1.4 miles) on one bank of the Williams River bank in 11 different locations will be repaired in this manner.

- Type III embankment repairs involve in-water placement of rocks. Like a Type II repair, the failing parent material is excavated to a depth of 8-27 feet. All excavation will occur within the terrestrial slope, with no streambed excavation. Geotextile fabric will be placed, and rocks ranging from 10-48 inches will then be mechanically placed to build a bank that extends from the road edge out into the water body. The rock embankment will extend from 5 to 10 feet out into the Williams River from the bank, depending on the location. Again, the larger rocks will be placed at the toe and along the slope, with smaller ones placed in voids. All equipment used to mechanically place the rocks will be staged on the road, and the equipment will be reaching down into the water to place the rocks. The slope of the embankment will maintained at 1.0 V: 1.5 H or a match to the existing side slope. A total of 2,377 linear feet (0.45 miles) of one bank of the Williams River will be replaced in this manner.

- Type III embankment repair with an in-stream key will be constructed at one location; FR 86, MP 10.6. At this location, there is extreme erosion of a steep, tall bank. A total of 180 linear feet of the Williams River bank will be replaced in this manner. This repair involves the excavation of the failing parent material to a depth of 15 feet, including excavation of the Williams River streambed, in order to mechanically place (key, or bury) rocks ranging from 10-48 inches into the river bed to form a stable toe on which the embankment will rest. Once the rocks have been keyed into the streambed, additional rocks will be placed, as in a Type III embankment repair, creating a rock bank that will extend from the road edge out into the Williams River. The rock embankment will extend 10 feet out into the river at this location. The slope of the embankment will be maintained at 1.0 V: 1.5 H or a match to the existing side slope. The installation of a coffer dam to divert water from the work area will be necessary to perform this activity. As with a regular Type III repair, all equipment used to place the cofferdam, excavate the streambed, and mechanically place the rocks will be staged on the road, and the equipment will be reaching down into the water to perform work activities.

3. Installation of temporary stream diversions- These are methods used to divert water flow around the work area during construction activities that require instream work, such that all work can be completed in mostly dry streambed conditions. There are six specific repair locations in this project that will require the installation of temporary stream

diversions in tributaries to the Williams River to complete bridge or culvert replacement work; MPs 5.9, 6.7, 9.5, 10.8, and 16.6 on FR 86, and at MP 1.19 on FR 133. There are three types of stream diversions that will be used during this project, depending on the contours of the site, the characteristics of the channel to be diverted, and the length of time each channel diversion is anticipated to be in place at each work location: temporary diversion channel, temporary bypass dam/pipe, and a phased sandbag/barrier diversion. Although FHWA does not dictate the type of temporary stream diversion that will be installed at each location in their contracts, all diversions must be constructed using approved designs fitting specifications in the Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (FP-14) guidance document. Additionally, FHWA has committed to submitting the contractor plans for temporary channel diversion plans to the Service for review and comment; comments from the Service will be resolved prior to installation of the diversions.

- Prior to installation of any temporary stream diversion, rocks and boulders will be removed from the area where the channel diversion will be installed. Only those rocks whose removal is necessary for proper installation/operation of the diversion channel will be moved.

- Locations where stream diversions are to be installed will be electroshocked for fish species prior to dewatering. Fish will be collected and relocated by permitted individuals. Prior to any electroshocking or relocation activities, an electroshocking and relocation plan, along with the qualifications and appropriate state and federal permits for individuals performing the task will be submitted to the Service for approval.

- Temporary diversion channel and temporary bypass dam/pipe diversion – The temporary diversion channel will be used to divert a stream where the floodplain and/or area surrounding the stream to be diverted is large enough to accommodate a new channel, whereas the bypass dam/pipe diversion is used when the area is too narrow or steep to accommodate a temporary channel. During a temporary diversion channel installation, a bypass channel will be excavated near the channel that is to be diverted and lined with an impermeable membrane. Sandbag dams are then placed in the stream channel upstream and downstream of the work area, forcing the stream to flow through the bypass channel. Water flows naturally (passive bypass) through the bypass channel and either empties out into the Williams River or continues in the bypass channel until it meets back with the original stream after bypassing the work area, depending on proximity of the work area to the Williams River. In a method similar to a temporary channel diversion, temporary bypass dam/pipe diversions are installed by placing sandbag dams in the stream channel upstream and downstream of the work area to divert the stream flow. However, instead of flow being directed through a channel, it will be directed into a hose or pipe, where it will be actively pumped through the hose or pipe and discharged below the downstream sandbag dam.

If necessary to maintain traffic flow on a road, these two stream diversion types can direct flow to a temporary culvert that has been installed under the roadway. The flow passes through the culvert pipe, and then continues in the bypass channel or hose/pipe. After either type of channel diversion is installed, the streambed in the work area will be dewatered by using a pump to move water from the work area to a filter bag that will be staged in a nearby upland location. The water will be allowed to filter through the bag into a vegetated area, for additional filtration. A series of different sized mesh filters will be installed over the entrance of the intake pipe of the pump to prevent aquatic animals from being taken into the pump during dewatering of the work area. As the water level drops in the dewatering area, fish and other visible aquatic life left in the area after electroshocking activities will be scooped out using nets and deposited in an unaffected upstream portion of the stream. Work will then be conducted in the dry natural channel. After the work is completed, the sandbag dams will be removed, and placed at the ends of the temporary bypass channel, so that the stream flows naturally back through the original channel. If a temporary bypass channel has been excavated, the area will be restored to original contours and reseeded. Rocks that were removed for construction will be replaced with guidance from the MNF aquatic specialists. One of these 2 types of stream diversions will be used at work locations on FR 86 at MPs 5.9 and 9.5 where FR 86 crosses over Hateful Run and Lick Branch, which are both tributaries to the Williams River. The duration of each channel diversion is expected to be 10 days at MP 5.9 and 12 days at MP 9.5.

- Phased sandbag/barrier diversion are used to divert the water flow from one half of the streambed into the other half, such that flow is maintained while work is completed in the dry half of the channel. This diversion type will be used in locations with larger streams or where the diversion will be in place for longer time periods. Sandbags will be placed parallel to water flow along the median line of the stream through the work area and then angled to meet the bank at the upstream limit and downstream limit of the work area. In this manner, flow from the entire stream will be forced to flow through one half of the stream channel, leaving one half of the stream in the dry. Dewatering of the work area in one half of the channel will be completed as in the other diversion methods. After diversion-dependent work is completed in one half of the streambed/bank, the diversion will be reversed so that the flow is directed down the other side of the streambed. The new work area will then be dewatered as before and work will be completed in the opposite half of the streambed. Upon completion of work, the sandbags will be removed and flow will be restored to the full width of the channel. This type of channel diversion will be installed at repair locations where the road crosses over the following tributaries to the Williams River: Bridge Creek at MP 6.7, Elbow Branch at MP 10.8, and White Oak Fork at MP 16.6.

- Additionally, an unnamed tributary to White Oak Fork will be diverted in this manner, where FR 133 crosses over it at MP 1.19. Channel diversions are anticipated to last 55 days at MP 6.7, 70 days at MP 10.8, 75 days at MP 16.6 on FR 86 and 59 days at MP 1.19 on FR 133.

4. Installation of a coffer dam – A coffer dam will be used to isolate a portion of the Williams River, so that in-water work (Type III embankment repair with a key) can be performed at MP 10.6 on FR 86. A crane, stationed on FR 86, will be used to set 1 cubic yard super sandbags in place in the Williams River. The sandbags will be placed in an elongated crescent shape 10 feet out from the bank and extend 180 feet along the river, creating a wall to block off an area of the river next to the embankment repair site that will be approximately 1800 ft^2 in size. Sandbags will be stacked high enough to accommodate the normal flows expected over the course of the work period. The sandbag wall will be lined with plastic to minimize water intrusion through the diversion. The now-isolated work area will then be dewatered as described above in the temporary stream diversion sections. The work area will be electroshocked for fish species prior to dewatering, as described in the stream channel diversion descriptions. After completion of in-water work, the sandbag dam will be removed using a crane stationed on the road and flow will return to that section of the river. The coffer dam is expected to be in place in the Williams River for a duration of 6 days.

5. Roadside ditch culvert replacements and riprap placement- Culverts along FR 86, of varying sizes, will be repaired, replaced in kind, or replaced with larger culverts. Riprap will be added to all locations where culverts have been repaired or replaced, as well as to locations of existing culverts that require additional outfall protection. New culverts will be installed at locations where runoff direction is needed to protect FR 86. Roadside drainage culvert installations and replacements will occur only during dry conditions and do not require any in-water work.

    - Riprap will be placed at the outfalls of existing pipe culverts located at MPs 0.5, 2.0, and 7.4 along FR 86.

    - Most pipe culvert replacement and repairs, as well as new culvert installations involve small-diameter pipes, ranging from 18 inches to 36 inches, and will occur during embankment repair work activities. Culvert repairs and installations will coincide with embankment repairs at MPs 0.2, 3.9-4.0, 6.2, 12.3-12.45, 12.6-12.8, 14.0-14.4, and 15.8 on FR 86 and at MP 10.8 on FR 150. After bank excavation has occurred, and while rocks are being placed to create and/or stabilize the existing bank, the new pipe culverts will be placed. The road pavement is sawcut and removed, and existing material under the roadbed is excavated so that old culvert pipe can be removed and/or new pipe can be placed under the road. The culvert running under the road is then covered with an aggregate base, and paved over. The culvert pipes extend from the roadside ditch, under the road to the Williams River bank, and provide discharge points for stormwater runoff. Runoff from pipe culverts does not flow directly into the Williams River, but is

discharged from the roadside ditch to the river embankments, for filtering and/or infiltration before it enters the Williams River. Riprap will be placed at the culvert outfalls as needed. At MPs 2.0, 7.4, and 18.3-18.4 on FR 86, where pipe culverts are being installed in the absence of embankment repairs, the process is very similar, except that the pipe culverts will discharge into a vegetated bank, instead of rock embankments. At MP 0.2, a larger, 60 inch-diameter pipe culvert will be replaced in kind during embankment reconstruction.

6. Replacement of pipe culverts with box culverts in tributaries- Larger scale culvert replacements are occurring at 2 locations along FR 86 and one location on FR 133, where damage has occurred to culverts that carry tributaries to the Williams River. At MP 5.9, where FR 86 crosses Hateful Run, the existing set of double 4.5 ft. X 39 ft. long pipe culverts will be replaced with a 12 ft. X 6 ft. X 32 ft. precast concrete box culvert. The existing 6 ft. X 37 ft. long arch culvert at MP 9.5, where FR 86 crosses Lick Branch, will be replaced with a 12 ft. X 5 ft. X 28 ft. precast concrete box culvert. Following the installation of a temporary stream diversion, the bank around each existing culvert will be excavated so that the damaged culvert can be removed. Rocks and boulders in the streambed will be removed. Further excavation in the streambed will occur to a depth sufficient to install the new box culvert. Each streambed and bank will be excavated to a minimum of 4 ft. deep and 14 ft. wide so that the precast concrete box culverts can be set in place. The culvert bottoms will then be backfilled with native materials and/or imported rocks to a minimum depth of 6 inches. The excavated areas surrounding the new box culverts will be filled in with the native material, and riprap will be installed at the inlet and outlet of the culverts to prevent scouring. Rocks and boulders will be replaced in the streambed before the diversion is reversed. In both cases, the hydraulic opening of the stream will be widened to accommodate natural flows. The roadbed will then be reconstructed and paved. The anticipated duration of all work at MP 5.9 and 9.5 is 16 and 20 days, respectively.

   At MP 1.19, where FR 133 crosses an unnamed tributary to White Oak Fork, an existing 9 ft. diameter by 36 ft. long pipe culvert will be replaced with a steel or aluminum structural plate arch culvert, 30 ft. X 10 ft. X 37 ft. in size. A temporary bridge has been in place over this crossing since the existing culvert was damaged during the 2016 flood. The temporary bridge will be removed, but the existing culvert will remain in place while rocks, sediment, and fill material are removed on either side of the culvert. Additional material and sediment will be excavated from the bank on each side of the culvert, where concrete footings for the culvert will be constructed. After the footings are in place, the existing culvert will be removed and a phased sandbag/barrier channel diversion will be installed, such that work can occur in the dry half of the streambed. On the dry side of the channel, the existing streambed will be excavated to a depth of 10 ft. and width of 8 ft. to accommodate the headwall. The structural plate headwall will be constructed in the bank and riprap will be placed to form the bottom of the channel with a 1 V: 1.5 H bank ratio. After tasks requiring work in the dry are completed, the channel diversion will be reversed and installation of the other plate headwall and riprap placement will proceed. The channel diversion will be removed, allowing for the channel to flow naturally through the newly constructed channel, without a pipe culvert. The areas above and

surrounding the new arch culvert will be restored and the road reconstructed. The new plate arch culvert will completely span the banks of the tributary after installation. At this location, work is expected to last for 59 days.

7. Bridge replacements- Bridge replacements will occur at MPs 6.7 and 10.8, where FR 86 crosses Bridge Creek and Elbow Branch, respectively. In both locations, the existing 20 ft. timber bridge with stacked stone abutments will be replaced with a 30 ft. long single span concrete bridge with concrete abutments. Both bridge replacement locations will employ phased sandbag/barrier stream diversions, such that flow will be maintained in half of the stream at any given time during work. Bridge replacement is expected to take 55 days at Bridge Creek and 70 days at Elbow Branch.

    - After installation of a phased sandbag/barrier stream diversion, existing boulders will be removed from the dry half of the streambed. The bank and streambed will be excavated to remove the existing stone abutment. The streambed and bank will be further excavated an additional 10 ft. to fit the new concrete abutment and place riprap protection around the base of the abutment. After completion of structures on one side of the stream, the stream diversion is reversed, the remaining abutment is replaced, and the riprap protection is added. The bridge deck will then be lowered into place, rocks and boulders will be returned to the channel, the channel diversion will be removed and natural flow is then restored to the stream. The road and approaches will be reconstructed. A debris shield will be installed over the flowing half of the stream during active demolition of the structures, such that sediment and debris will not accidentally fall from the work area into the active part of the stream.

8. Culvert replacement with a bridge- Two 6 ft. X 42 ft. pipe culverts will be replaced with a 40 ft. bridge at MP 16.6 on FR 86, where it crosses the White Oak Fork. A phased sandbag/barrier stream diversion will be installed, such that flow will be maintained in half of the stream at any given time during work. The work is expected to last for 75 days at this location.

    - A 20 ft. X 50 ft. temporary bridge, with new road approaches will be installed over White Oak Fork approximately 25 feet to the south of the current road. Tree debris from 12 cut trees will be removed from the banks and streambed at this location. The temporary bridge will span the banks of the tributary and requires no in-stream work. Traffic will be diverted over this temporary span for approximately 75 days. After the new bridge is constructed, the temporary bridge span will be removed, the ground graded, and the seedbed prepared in accordance with FP-14, 625.04 to provide friable soil to a minimum depth of 4 inches, prior to reseeding.

    - The dry half of the bank and streambed will be excavated so that one of the pipe culverts can be removed. Excavation of the streambed to an additional 6 ft. in depth will occur. One of the new concrete bridge abutments will be constructed, and a riprap embankment will be created around the abutment. The riprap

embankment will be 3 ft. in width at the toe of the slope, and 2 ft. wide on the rest of the bank. The stream diversion is then moved to opposite side of the channel for the process to occur on the remaining bank. Once the abutments and riprap banks are complete, the stream diversion will be removed and the 40 ft. X 24 ft. concrete span will be lowered into place. The road approaches will be reconstructed. A debris shield will be installed over the flowing half of the stream during active demolition of the structures, such that sediment and debris will not accidentally fall from the work area into the active part of the stream.

9. Reconditioning of roadside shoulders and ditches- During this activity, accumulated debris, sediment, and vegetation will be removed from the existing roadway ditches and culvert inlets, the ditches will be reshaped to achieve positive roadway drainage, any soft or unstable shoulders will be repaired and soil will be added to build up the shoulder as necessary. All soil added will be existing soil that was stockpiled after removal, and no new soil will be brought into the MNF. This activity will occur over the majority of the project area, along the 18.2 mile stretch of FR 86. Ditch and shoulder reconditioning will also occur on FR 150 at MP 10.8 for a distance of 135 linear feet.

10. Road construction- This project activity involves saw-cutting of the pavement to remove damaged areas, placement of an aggregate base, and asphalt concrete paving of FR 86 over most of the project area, and select locations on FR 150. Throughout the anticipated 26 months of the project, damaged areas of the road are saw cut and removed, as bridge, culvert, and embankment repairs are made throughout the project area. These saw cut areas will then be covered with an aggregate base until the entire project nears completion, at which time all repaired road surfaces will be paved with asphalt (combination of stone, sand, and gravel bound with cement). A paver machine will be used to place asphalt and a heavy roller machine will compact the asphalt into a durable, level road surface.

11. An additional work site on FR 150, where a trailhead parking lot will be repaired is included in this BA. The work is proposed at the Honeycomb Rock Trailhead parking area at MP 7.7 on FR 150. A 24 inch pipe culvert in the roadside ditch will be replaced, a split rail fence replaced, masonry repairs will be made to a stone wall, and the parking area will be repaved. Work in this location is expected to last 9 days.

Conservation Measures

FHWA and FS are proposing conservation measures to reduce the exposure to and effects of project activities on resources, particularly the Williams River. The following minimization and mitigation measures have been incorporated into the project:

1. All in-water work will occur under low-flow conditions, which are typically July to October, based on USGS average monthly discharge volumes for the Williams River stream gage, located in Dyer, WV. As clarified in an addendum to the project BA, low-flow conditions are defined as “the amount of stream discharge that can be effectively managed during project operations to prevent harm to candy darter from exceeding the

level of take that is permitted in the Biological Opinion." During work activities, FWHA or their contractors shall closely monitor weather forecasts. When weather events with 1.0 inch or more of precipitation are forecasted to occur in the Williams River watershed upstream of or within the Action Area, all in-water work will cease, except as needed to immediately stabilize active work sites in preparation for rising waters. Temporary stabilization for coming rain events must occur when Doppler radar indicates rain is likely within 1 hour, or during unexpected rain events which cause project area streams to rise to a level that exceeds this definition of low-flow working conditions. Increased flows caused by typical rain events are expected to subside within half a day of the end of the rain event. In-water work may resume when low-flow conditions have returned and when turbidity readings are once again at or below levels considered to be below the take threshold in the Service-approved Turbidity Monitoring Plan. FHWA is planning to conduct in-water work from July 1 through October 31 to the maximum extent possible, although there is a brief period of time between the end of winter shutdown (late March) and April 15 during which work outside of the normal low-flow timeframe could occur. Although it is unlikely that in-water work would occur during this timeframe, in-water work may occur during this period if conditions of low flow are met and at least one of the following situations exists:

a) the continued sloughing of the embankment has created safety concerns;
b) further erosion would create hazardous road conditions; and/or
c) immediate repair is otherwise deemed critical.

2. No in-water work will occur during the typical candy darter spawning period from April 15 to June 30.
3. No trees will be cleared during the active Indiana bat season from April 1 to November 15.
4. ESC BMPs will be installed as perimeter controls. Proposed ESC installation exceeds standard practice, as triple-high stacks of fiber rolls will be installed along all LODs with aquatic resources, and rolled erosion control product will be installed in ditches.
5. ESC devices will be properly maintained and inspected. All ESC BMPs will be inspected once every four calendar days and within 24 hours after any storm event greater than 0.25 inches per 24-hour period, or when the occurrence of runoff from snow melt is sufficient to cause a discharge. BMPs will be immediately repaired when damaged. Sediment deposits will be removed from behind the fiber roll when they reach half the height of the device. The sediment will be disposed of legally off-site.
6. Within 4 days of reaching the final grade, permanent seeding and mulching will be applied to stabilize all disturbed project areas. Temporary seeding and mulching will be applied within 4 days when areas will not be disturbed for more than 14 days.
7. All disturbed areas will be temporarily and permanently seeded with FS-approved native species seed mixes.
8. Temporary stream channel diversions will be utilized during streambed and bank excavations and during replacement of in-stream culverts and bridges in tributaries.
9. A coffer dam will be utilized during the Type III embankment repair with a key in the Williams River.

10. Protection measures will be employed during active dewatering, including; a series of protective mesh screens, from 1 inch to 1/8 inch sized mesh will be placed over the intake pipe to prevent aquatic organisms from entering the pipe; the pump will be run at lowest revolutions per minute (RPM) possible; the pump will be set up as far from the water resource as possible; and a backup pump will be available if a primary pump fails.
11. The temporary channels and cofferdam sandbag walls will be lined with impermeable membrane to prevent leaking.
12. Water from the dewatering activities will be pumped through a filter bag in an upland area to filter sediment from the water before it discharges onto vegetated ground.
13. The only rocks moved prior to installation of the stream diversion will be those necessary to get the diversion installed; other rocks/boulders that must be moved out of the project area will be moved after the diversion is in place, limiting sedimentation.
14. After all in-stream repairs have been completed, the replacement of native boulders and rocks in streambeds will occur with consultation from FS aquatic specialists, so that the flows through the work areas will be restored to pre-flood flow patterns and velocity, as closely as possible.
15. All temporary pipe culverts and/or pumps and hoses will be large enough to accommodate expected flows.
16. If a bypass pump is used in an active channel diversion, the pump and process will employ the same protection measures as those associated with pumps used in dewatering work areas, as listed in # 10 above.
17. All filter bags will be located in areas that have been previously surveyed for and cleared of sensitive botanical resources.
18. Each work area where a stream diversion or a coffer dam has been installed will be electroshocked to locate and remove all fish species prior to commencement of dewatering. Additionally, during dewatering of the work areas, manual removal of fish left in the work area will occur.
19. Trained, qualified personnel, familiar with the candy darter and its habitat, will be present during all in-channel and over-channel demolition or construction activities. A summary of the qualifications and experience of the person, along with a plan that details the means and methods of electrofishing, capture, transport, and proposed relocation area will be provided to the FS and FWS for review prior to any electroshocking activities.
20. The Service will be notified immediately if any candy darter are observed during dewatering or electroshocking activities.
21. Special conditions if candy darter(s) are found during construction:
    a) The finding of the darter(s) will be documented by providing notes of its condition and by taking photos of the fish.
    b) The darter(s) will be placed into separate plastic bags filled with the stream water and filled with oxygen (a portable oxygen tank/cylinder would be on-site at all times during construction activities); and
    c) The oxygenated bags(s) containing the darter(s) will then be transferred in iced down coolers that maintain the thermal tolerance of the fish. Fish will be immediately taken to the predetermined, appropriate habitat located upstream and released.

22. Suitable habitat for candy darter relocation, located as close as possible to each work site where electroshocking will occur, will be selected by a qualified aquatic specialist prior to electroshocking activities.
23. All stream channel diversions will be inspected and maintained daily.
24. There will be daily monitoring of turbidity for all in-stream work. A Turbidity Monitoring Plan was developed and submitted to FWS on August 2, 2019 and is pending edits and final Service approval.
25. Debris shields will be installed prior to bridge and large culvert demolition to minimize the potential for debris to enter the waterway.
26. Geotextile fabric will be placed before any rock embankments are created to secure rocks in place.
27. All rocks and boulders will be mechanically placed during embankment repairs, to reduce the likelihood that rocks will slip or roll into the water.
28. Equipment will be cleaned of all sediment, vegetation, and seeds and inspected prior to entering MNF lands.
29. When work is performed in areas of known non-native invasive species (NNIS) plant infestations (as reported in the 2017 botanical resources survey by ASE), equipment will be cleaned before it is moved to another location within the MNF.
30. During construction and for one year post-construction, monitoring and selective hand removal of NNIS will be performed.
31. NNIS monitoring in project areas by the FS will continue post-construction.
32. All imported materials, such as rock, culverts, and precast concrete elements will be free from excessive sediment, chemicals, or nonnative plant materials to the extent possible.
33. All construction vehicles are staged on and perform work from the existing roadway. During in-stream work, the equipment bucket will reach down into the stream to perform work and no equipment will enter streams.
34. All construction equipment will be parked in designated areas when not in use.
35. All stockpiled soils and materials will have appropriate ESC installed around the bases of the piles and will only be stored in designated staging areas.
36. Maintenance of all equipment will occur only in designated staging areas.
37. Equipment will be refueled as far from aquatic resources as possible along the existing road bench. The fuel operator will visually observe all fuel transfers until operations are completed to prevent overfilling. The fuel hose nozzle and all hose couplings will have drip pans with absorbent pads designed to trap leaking fuel underneath them. A spill kit and absorbent pads, as well as spill response equipment will always be on hand during refueling operations.
38. Construction vehicles will not be allowed to track sediment outside of the LODs.
39. Equipment will not be allowed to operate on or access the down-slope side of perimeter control measures.
40. All standards in The Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (FP-14), will be strictly adhered to, including:
    a) materials will be stored only in designated areas, excess material will be disposed of legally off-site (FP-14, 203.05)

b) adherence to the Spill Prevention Control, and Countermeasure (SPCC) Plan and the controls set forth in the Federal Water Pollution Control Act (Clean Water Act) and permit conditions set by US Army Corps of Engineer permits (FP-14, 107.10)

41. No ditch culvert replacements will occur during rain events.
42. A FHWA construction engineer will be on-site throughout construction to ensure that contract requirements are being observed.
43. A more detailed Stream Diversion and Dewatering Plan will be prepared by the construction contractor and provided to FS and FWS for review. Comments provided by FS and FWS will be resolved prior to the start of any in-water work activities.

ACTION AREA

The Action Area is defined (50 CFR 402.02) as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action."

The Service has determined that the Action Area for this project includes both terrestrial and aquatic repair locations on FRs 86, 133, and 150, and their corresponding in-water and/or on land bank repair area extents. Road repair work will occur in forty-one (41) discrete work areas on stretches of FRs 86, 150, and 133 within the MNF. Repair work will occur at thirty-eight (38) locations on FR 86, from MP 0.2 to MP 18.4. The total area covered by the LODs on FR 86 is 7.67 acres (334,013 ft^2). Road repairs will also be completed at MP 7.7 and MP 10.8 on FR 150, where the LODs encompass 0.031 acres (1370 ft^2) and 0.017 acres (730 ft^2), respectively. One final work site is located at MP 1.19 on FR 133, where the LOD is 0.21 acres (9287 ft^2).

The terrestrial portion of the Action Area associated with road repair work includes all areas within the project LODs, an 18.2 mile stretch of FR 86, a 1.2 mile stretch of FR 133, used to access the repair site, and a total of 191 feet of FR 150, in two different locations. The Action Area includes the limits of all vegetation clearing and ground disturbance activities associated with the embankment repairs, culvert repairs and replacements, bridge repairs and replacements, ditch shoulder reconditioning, and asphalt concrete paving, and the roadway prism (aggregate-surfaced travel lanes, shoulders, and ditches) that would receive regular roadway maintenance, as well as portions of the roads that will be used to access the project areas. All project staging areas are located either on the road itself or within the LOD designated for each repair site in the BA.

The aquatic portion of the Action Area for this project is bank to bank of the Williams River, beginning at the upstream extent of the work areas that are located along the river, at MP 0.2 of FR 86, and extending 19.06 stream miles to the downstream extent of repairs, at MP 18.4 of FR 86. Although a total of 19.06 miles of the Williams River is included in the Action Area, only 14.78 miles are receiving in-stream or bank repairs. In addition to the Williams River, the aquatic Action Area includes portions of the following 5 tributaries to the Williams River, where in-water work will be performed: 77 ft. of Bridge Creek, 115 ft. of Elbow Branch, 103 ft. of Hateful Run, 79.2 ft. of Lick Branch, and 112 ft. of White Oak Fork. Additional work will be conducted along a 150 ft. portion of the unnamed tributary to the White Oak Fork. The aquatic

Action Area of the 5 tributaries includes an upstream buffer of 5 meters outside of the LOD, plus the length of the stream through the LOD, and all downstream portions until it flows into the Williams River. For the unnamed tributary to White Oak Fork, the Action Area includes the 5 m upstream buffer, the length of the stream through the work site, and an additional distance of 0.25 miles downstream. All stream lengths that will be directly affected during the repair work are located entirely within the terrestrial work LOD specified above.

The Action Area is located entirely within the boundaries of the Monongahela National Forest, in Pocahontas and Webster Counties, West Virginia, and within the Williams River Hydrological Unit Code 0505000501.

STATUS OF THE SPECIES

Per ESA section 7 regulations (50 CFR 402.14(g)(2)), it is the Service's responsibility to "evaluate the current status of the listed species or critical habitat." The Service listed the candy darter as endangered on December 21, 2018 (83 FR 58747-58754). The following is a summary of candy darter general life history drawn from the Species Status Assessment (Service, 2018a). For a more detailed account of the species description, life history, population dynamics, threats, and conservation needs, refer to https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=E03K.

The candy darter is a small, freshwater fish endemic to second order and larger streams and rivers within portions of the upper Kanawha River basin, which is synonymous with the Gauley and greater New River watersheds in Virginia and West Virginia. The candy darter is considered a habitat specialist, occupying benthic niches associated with swift-flowing, shallow riffle habitats with coarse substrate (e.g., gravel, cobble, and boulders), and lacking fine substrates, that are capable of providing shelter, cover and breeding habitat within interstitial spaces. The species has typically been found in high to moderate-gradient, cool or cold water stream ecosystems, although warm water conditions may also be tolerated. The species is most often found in riffle, glide, or run habitats, and is relatively uncommon in pool habitats. Candy darters are generally intolerant of excessive stream sedimentation and associated cobble embeddedness (the degree to which cobbles are covered in fine-sized substrate particles). However, young-of-the-year and juveniles may be more capable of utilizing habitats with slower-moving water containing smaller substrate and a greater proportion of fine sediments than adults. Candy darters are categorized as benthic invertivores (McCormick et al. 2001) and their main prey items are benthic macroinvertebrates, such as mayflies and caddisflies.

Candy darters have a relatively short life cycle, reaching sexual maturity by age 2 and often dying during their third year (Jenkins and Burkhead 1994). Spawning typically occurs from late spring to early summer, typically April 15 through June 30 in West Virginia. The candy darter is considered a brood-hiding, benthic spawner, with gravid females depositing eggs in pebble and gravel substrate among larger cobbles and boulders, where they are fertilized by attendant males. Although females may lay multiple clutches, they have a relatively low number of ova per clutch

(Schoolcraft and Tarter 2002). Eggs incubate for 5 to 30 days depending on stream water temperature.

Recent research suggests ontogenetic shifts and seasonal habitat plasticity may introduce complexity when identifying suitable habitat for some candy darter populations (Dunn and Angermeier 2016). There is uncertainty whether individual candy darters complete their lifecycle within habitat complexes spanning relatively short distances of perhaps a few hundred meters, or if they are capable of longer, seasonally mediated movements among suitable habitat. Studies have suggested that both *Etheostoma* and *Percina* darter species may exhibit seasonal migration, in which they move from warmer main-stem waters into cooler, spring-fed tributaries during the late summer and early fall (Mundahl and Ingersoll 1983; Schaefer et al. 2003), and candy darters are suspected to act similarly (S. Welsh, WVU, phone call with B. Smrekar and A. Murnane, Service, November 30, 2018).

The historic distribution of candy darter was more expansive than the current distribution (Jenkins and Burkhead 1994). Historically, the candy darter occurred in 35 populations distributed across 7 metapopulations located in the Bluestone, Lower New River, Upper Gauley, Lower Gauley, Greenbrier, Upper New, and Middle New watersheds. However, the candy darter has been extirpated from almost half of its historical range; 17 of 35 known populations and 2 of 7 known metapopulations have been extirpated. The species is no longer known to occur in the Bluestone and Lower New River watersheds. Chipps and Perry (1993) reported on the status of candy darter on the Monongahela National Forest and found them to be well-distributed in the Cherry, Upper Greenbrier and Upper Gauley river systems. However, they expressed concerns for populations in the Williams River, Deer Creek and Anthony Creek and identified siltation as the major threat to these candy darter populations. The species has since been extirpated from Anthony Creek, largely due to hybridization with the variegate darter (Service 2018a).

Hybridization with the introduced, but closely related variegate darter (*Etheostoma variatum*) is the primary threat to the viability of the species, rangewide. Other contributing threats to candy darter populations include increases in water temperature, excessive sedimentation, habitat fragmentation, changes in water chemistry and water flow, and competition with non-native species. Recent evaluation of candy darter range and speciation has helped to identify streams where extant candy darter populations still occur, where variegate darter are hybridizing with candy darter, and where there is relative robustness of remaining intact populations of candy darter (Switzer et al. 2008; Gibson 2017). The meta-population in the Upper Gauley watershed (which includes the ERFO (2), (3), (4), (5) Project area) is primarily genetically pure, although genetic analysis of a few sampled individuals revealed the presence of variegate darter alleles (Gibson 2017). Summersville Lake dam functions as an effective physical barrier to upstream migration of fish that occur in the Lower Gauley River, including the variegate darter. It is possible that variegate darter could come to inhabit areas upstream of the dam at some time in the future by means other than natural migrations; however, proactive management of various state and federal agencies are attempting to reduce the potential for variegate darter introductions into the Upper Gauley River system.

To assess the current status of the species, it is helpful to understand the species' conservation needs, which are generally described in terms of reproduction, numbers, and distribution (RND). The Service frequently characterizes RND for a given species via the conservation principles of resiliency (ability of species/populations to withstand stochastic events which is measured in metrics such as numbers, growth rates), redundancy (ability of a species to withstand catastrophic events which is measured in metrics such as number of populations and their distribution), and representation (variation/ability of a species to adapt to changing conditions which may include behavioral, morphological, genetics, or other variation) (collectively known as the three Rs).

As described in the Candy Darter Recovery Outline (Service 2018b), conservation needs include: an absence of nonnative species; unembedded gravel and cobble substrates with minimal sedimentation; adequate water quality (temperatures, physical and chemical parameters); an abundant, diverse benthic macroinvertebrate community; and sufficient water quantity and velocities. Absence or degradation of these features could limit populations of the candy darter.

The primary actions to address these criteria include: maintain extant populations by conserving the genetic diversity and physical and biological features on the landscape that are essential for the species' conservation; minimize the risk of variegate darter introductions or spread in areas with little evidence of introgression; investigate factors that would minimize and control hybridization, and implement those measures in currently occupied areas that are affected by ongoing hybridization; repatriate candy darters to historically occupied areas where variegate darters are not present; and investigate feasible methods to remove variegate darters and repatriate candy darters. In summary, as a whole, the rangewide status of the species is declining.

STATUS OF PROPOSED CRITICAL HABITAT

Critical habitat was proposed for the candy darter in the following watersheds in WV and VA: Greenbrier River, Middle New River, Lower Gauley River, Upper New River, and Upper Gauley River watershed, on November 18, 2018 (83 FR 59232-59268). The Upper Gauley River proposed critical habitat includes the Williams River, which is located within the Action Area and may be affected by the proposed action. A final determination of critical habitat should be made on or before November 18, 2019. Because the proposed action is scheduled to be implemented starting in August 2019 and ending in September of 2021, this Opinion addresses the effect of the proposed action on the proposed critical habitat for the candy darter.

The critical habitat proposed by the Service is characterized by having the following physical or biological features (PBFs) that are essential for the conservation needs of the candy darter: ratios or densities of nonnative species that allow for maintaining populations of candy darters; a blend of unembedded gravel and cobble that allows for normal breeding, feeding, and sheltering behavior; adequate water quality characterized by seasonally moderated temperatures and

physical and chemical parameters (e.g., pH, dissolved oxygen levels, turbidity) that support normal behavior, growth, and viability of all life stages of the candy darter; an abundant, diverse benthic macroinvertebrate community (e.g., mayfly nymphs, midge larvae, caddisfly larvae) that allows for normal feeding behavior; and sufficient water quantity and velocities that support normal behavior, growth, and viability of all life stages of the candy darter

A total of 370 stream miles in 5 different units has been proposed as critical habitat for the candy darter. Of the 5 units, 4 are evaluated as marginally secure, and one, the Upper New River proposed critical habitat unit, is generally insecure (Service 2018a). The Upper Gauley watershed has been evaluated as the most secure proposed critical habitat, based on a high percentage of forest cover, (an indicator of low levels of siltation and embeddedness of stream substrate), absence of variegate darters, and the high degree of connectivity among populations. The Greenbrier River watershed generally has better water quality than the Upper Gauley, but the watershed has a high degree of hybridization with the variegate darter.

The Upper Gauley Unit, where the Williams River is located, contains 182 miles, or almost half, of the total stream miles proposed as critical habitat for the species. Generally, the Upper Gauley watershed is in good condition. The metapopulation has the highest overall condition score of the species' 5 extant metapopulations and has six populations of candy darters. Throughout the watershed, the habitat condition is considered to be moderately conducive to the species; there is generally high forest cover (over 90%), which is an indicator of higher quality habitat conditions specific to the candy darter (lower water temperature, and lower in-stream sedimentation and substrate embeddedness). There is a high percentage of public land ownership for some of the subpopulations, including the Williams River, but a mix of private and public landownership in other parts of the watershed. The water conditions throughout the Upper Gauley watershed are cold waters, with some degree of water quality impairment. Most of the streams within the watershed have some degree of impairment by aluminum, iron, or high water acidity. The Upper Gauley watershed has some stocking of brown and rainbow trout, which are known voracious predators of darters; trout are reproducing in some of the rivers. However, the Upper Gauley River metapopulation is the only one that is currently secure from hybridization with the variegate darter. As this is considered the greatest threat to the species' continued existence, the importance of the pure candy darter genetics in the Upper Gauley watershed is likely to increase in time, with the expected increase in hybridization in other watersheds. Finally, the Upper Gauley watershed exhibits good connectivity among populations and subpopulations, such that darters can migrate between different populations. Good connectivity is especially important in watersheds with limited habitat availability, such as with the Upper Gauley River unit, where just 4 of the 11 occupied streams and rivers have 10 or more miles of habitat (all from Service 2018a).

ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the past and present effects of all federal, state, or private actions and other human activities in the

Action Area. Also included in the environmental baseline are the anticipated and/or ongoing effects of all proposed federal projects in the Action Area that have undergone section 7 consultation, and the effects of state and private actions which are contemporaneous with the consultation in progress.

Status of the Species within the Action Area

Presence/absence surveys for candy darters were not conducted in preparation for the proposed action; however WVDNR fish surveys have documented the presence of candy darters in the Williams River since 1953. The most recent survey detections occurred in 2008, 2009, and 2016, and have documented the presence of candy darters throughout the upper and lower portions of the main stem of the Williams River, and in the lower 3.2 miles of Tea Creek (Figure 1). During the listing process for the species and its proposed critical habitat designation, the Service determined that, although all sections of the Williams River have not been surveyed for candy darters, the entire 32.59 miles of the Williams River contains habitat that is suitable for the species; thus, candy darter presence is assumed throughout the Williams River, and the Action Area.

Although population estimates for the Williams River are unavailable, the Williams River candy darter population has been found to contain very few variegate darter alleles, and it is considered to be one of the most genetically pure populations (Gibson et al. 2018). This gives added importance to this particular population for the future conservation and recovery of this species. Based on a review of physical habitat metrics, non-native competition metrics, and population demographic metrics, the Williams River population was determined to be "generally secure" in the Species Status Assessment (Service 2018a), and is considered so in the Action Area for the purposes of this Opinion.

Status of Proposed Critical Habitat within the Action Area

The Upper Gauley Unit, where the Williams River is located, contains a total of 182 stream miles of proposed critical habitat for the species. There are a total of 6 stream subunits within the Upper Gauley Unit, and the Williams River is designated as Unit 5d. Unit 5d is comprised of the Williams River from the confluence with Beaverdam Run, downstream to the confluence of the Williams River and the Gauley River at Donaldson, West Virginia; and 3.2 mi of Tea Creek from a point on Lick Creek approximately 1.7 mi upstream of the Lick Creek confluence, downstream to the Tea Creek confluence with the Williams River. The Tea Creek portion of the CH unit is not part of the Action Area. The Williams River unit is located entirely within the MNF. The Williams River comprises 32.6 miles, or approximately 18%, of the total stream miles of critical habitat in Unit 5 and 8.8% of the total stream miles of critical habitat proposed for the species. The Williams River serves as proposed critical habitat for the candy darter in all stages of its lifecycle, and is occupied year-around by the species. The Williams River is noted as being important as to the redundancy of the Upper Gauley candy darter metapopulation, and may

serve as a connection among candy darter-occupied streams in the Upper Gauley watershed (Service 2018b).

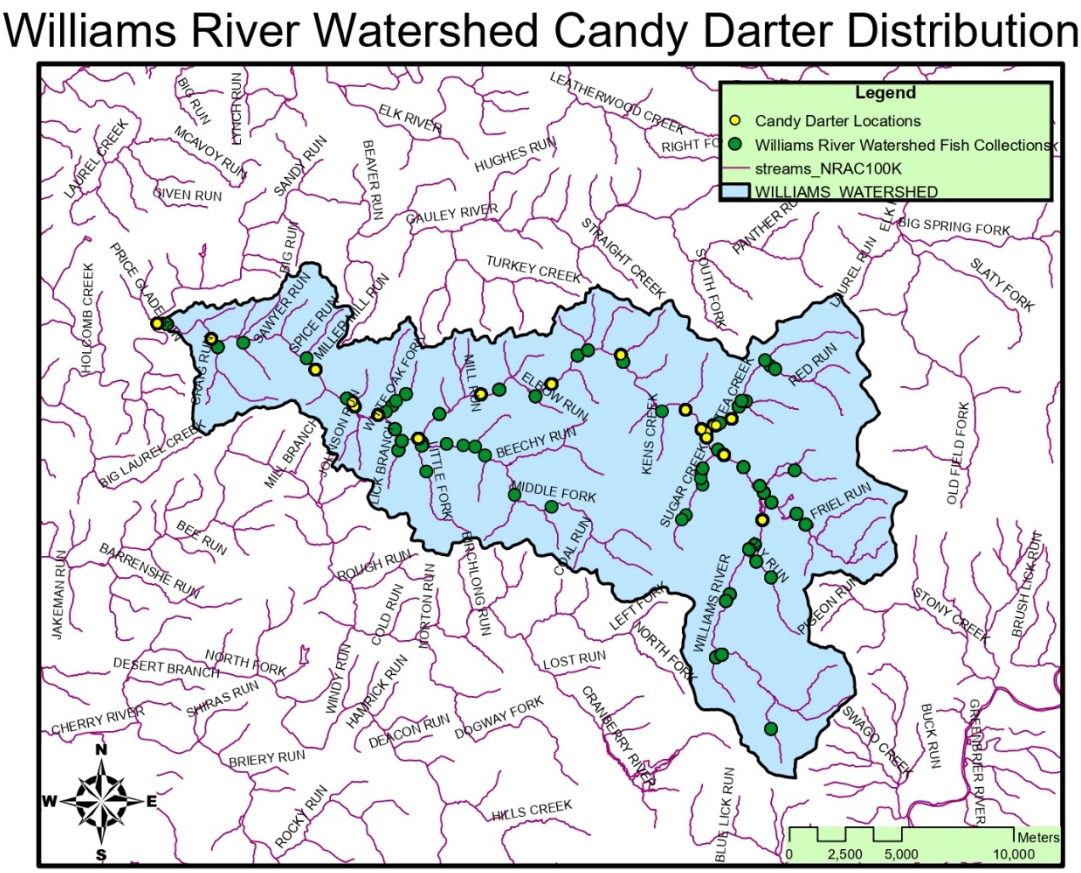
Habitat conditions within the Williams River proposed critical habitat unit habitat are generally good. The Williams River watershed is highly forested (97% forest cover), which is an indicator of higher quality habitat conditions specific to the candy darter (lower water temperature, and lower in-stream sedimentation and substrate embeddedness). The river is located entirely within the MNF, which provides protection to aquatic resources and endangered species under the 2006 MNF Revised Forest Plan (RFP). The water conditions are cold waters, with some degree of water quality impairment from aluminum. Because of the insoluble sandstone and shale bedrocks underlying most of the Appalachian Plateau physiographic province where the Williams River is located, tributaries to the river are often highly acidic, as they are poorly buffered and subject to low pH conditions as a result of acid precipitation. The Williams River is stocked with brown and rainbow trout, which are reproducing in the river; however there has been no (or very limited) exposure to the variegate darter, and the Williams River population is comprised of genetically pure candy darters. The entire Upper Gauley River watershed candy darter metapopulation is the only one that is currently considered secure from hybridization with the variegate darter. Finally, the Williams River exhibits good connectivity with other populations in the Upper Gauley metapopulation, and is thought to be occupied by candy darters throughout most of its length (all from Service 2018a). The proposed critical habitat present within the Action Area comprises 19.06 mi of the Williams River, from MP 0.2 on FR 86 downstream to MP 18.4 on FR 86, just before Cove Run enters the Williams River. As the Action Area comprises a significant portion of the Williams River (58%), the generally good condition of the Williams River watershed is representative of the Williams River condition within the Action Area. While there are numerous tributaries to the Williams River in the Action Area, none have been proposed as critical habitat. Additionally, office and/or field evaluations of the Action Area tributaries with the potential to be affected by the proposed action were performed by MNF aquatic specialists. All tributary streams in the Action Area, with the exception of the lower 0.6 miles of White Oak Fork, are characterized as having a low pH and a high gradient, providing unsuitable conditions for candy darters during most of the year (M. Owen, MNF, email to B. Smrekar, Service April 12, 2019). However, during periods of high flow, areas in some tributaries that are immediately adjacent to the Williams River channel may provide temporary suitable habitat, when the volume of water is sufficient to raise the pH and allow access. The Williams River was historically and is currently occupied by the candy darter; therefore, it is assumed that all conditions are present within the Williams River to satisfy the PBFs that are essential for the conservation of the candy darter.

The flood event of 2016, which caused wide-spread changes in the stream morphology of the Williams River, is likely to have affected the candy darter population present in the Action Area. The effect of the 2016 flood event on the candy darter population in the Williams River is unknown, as surveys have not been performed in the watershed since the flood event. Rivers and streams in the Appalachian Plateau physiographic province, in which the Williams River is located, are subject to highly variable seasonal flows and periodic flooding is a naturally

recurring phenomenon in the drainage. The area is characterized as having somewhat steep mountainsides, separated by deep, narrow valleys, and it is susceptible to flooding events ranging from minor flooding during seasonal thunderstorms or frontal passages to major flooding caused by hurricanes or tropical storms. These physical environment factors suggest that the candy darter population in the Williams River is at least somewhat tolerant and able to adapt and survive periodic flooding events. However, the 2016 flood was historic, in that it recorded much higher water flows with much higher volumes than any other high water event since 1930, when records started to be kept. The USGS flow gage on the Williams River recorded flow more than 5 feet higher than any previous recording, and a water volume 33% higher than any other event. Such drastic change in normal flow alteration changes is likely to have affected the species through changes in habitat and/or water quality. The flood event is known to have caused the Williams River channel to widen, as a result of the extensive bank erosion, massive volumes of sediment input, and a vast re-distribution of material (e.g. stream substrates, bank material, landslide inputs, in-stream wood material) during the record flood (M. Owen, MNF, email to B. Smrekar, Service, June 28, 2019). These changes may have resulted in the degradation of habitat conditions for the species and are likely causing continued sediment inputs to the system.

Beyond the flood event in 2016, other historic and ongoing activities and conditions which could affect the candy darter and its proposed critical habitat in the Action Area include continued stocking of non-native trout into the Williams River by the WVDNR, timber harvesting activities on the MNF, MNF road maintenance (mowing), and the existence of FR 86 and other Forest Service roads, many of which are culverted. While there is no urban development within in the Action Area, there are Forest Service dirt roads, which are likely contributing additional sedimentation to tributaries and the Williams River itself, during rain events. FR 86 is a paved road, and it meanders along the floodplain of the Williams River for approximately 23 miles. As FR 86 is paved for most of its length, it presents an impervious surface running along one side of the Williams River. Numerous roadside pipe culverts connect to the roadside ditches and discharge stormwater directly into the banks of the Williams River, which have limited filtration capabilities; these roadside ditch culverts have been in place for many years. There are also campsites located along the Williams River, which also are likely contributing to sedimentation of the Williams River during rain events. Timber harvests are common throughout the MNF, and most areas of the Forest, including areas near the Action Area, have been cut during past harvests. There are 2 currently-active timber harvests within the Williams River watershed, but not within the Action Area. One harvest is located on the ridgeline above White Oak Fork, and is not expected to affect aquatic resources in the Action Area, while the other is located downstream and on the opposite side of the watershed of the Action Area (M. Owen, MNF, phone call to B. Smrekar, Service July 27, 2019). Strict adherence to river and stream buffers, aquatic resource protections, and sedimentation restrictions present in the 2006 MNF RFP limit adverse effects to aquatic resources from timber harvests on the MNF.

Figure 1. Distribution of candy darters in the Williams River, as documented by WVDNR.



WVDNR

EFFECTS OF THE ACTION

Direct effects are the direct or immediate effects of the project on the species, its habitat, or designated/proposed critical habitat. Indirect effects are defined as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. Direct and indirect effects of the proposed action along with the effects of interrelated/interdependent activities are all considered together as the "effects of the action."

To standardize the effects analysis, the proposed action was divided into discrete actions described as subactivities. Defining subactivities allows for easier interpretation and consideration of complex activities. The project subactivities and their potential effects on the candy darter are summarized in the species effects table (Appendix A, Table 1).

Effects to the candy darter and/or its habitat are expected in repair locations where in-stream work activities are proposed, or where the proposed terrestrial repair activities could affect aquatic resources. While adverse effects are expected to candy darters and their habitat during various project subactivities, project implementation is also expected to result in long-term beneficial effects to candy darter habitat within the Action Area. Adverse effects expected include crushing or injury from rock placement during embankment repairs and sandbag placement during cofferdam and channel diversions, injury or death resulting from electrofishing activities, temporary loss of instream habitat during cofferdam and temporary channel diversions, and habitat and water quality degradation due to sedimentation resulting from in-water rock placement and temporary channel diversions, which will induce behavioral and physiological changes in affected individuals. While there will be some injury and mortality to candy darters during project implementation, the majority of the effects to habitat and water quality from project activities is expected to be short-term and result in sub-lethal effects. Long-term beneficial effects due to bank stabilization should result in the significant reduction of continued sediment input from the continually-eroding banks along the Williams River within the Action Area, and the replacement of culverts with a bridge is expected to expand candy darter access to suitable habitat in the White Oak Fork. Figure 2 shows an example of the different types of effects that could occur as a result of project activities at one representative repair location, which may affect the candy darter and its habitats. Figure 3 provides an example from project section 3, illustrating the distribution of repair sites along the Williams River and FR 86, as well as the extent of potential effects of sedimentation from in-water repairs.

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Figure 2. Direct and Indirect Effect Areas for a Type III Embankment Repair, with a Bridge Replacement, in the Elbow Branch Tributary to the Williams River on FR 86, MP 10.7-10.8.

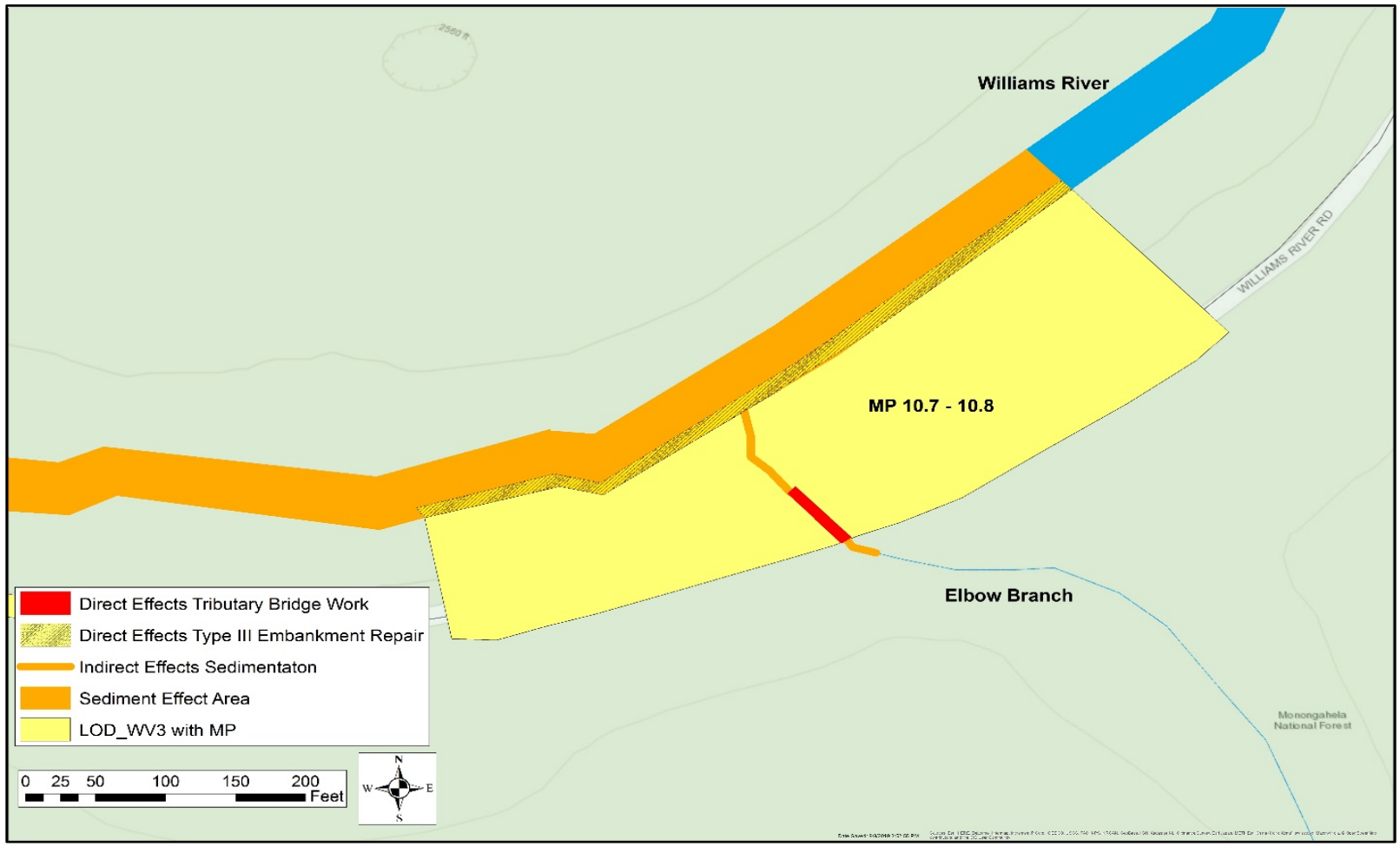
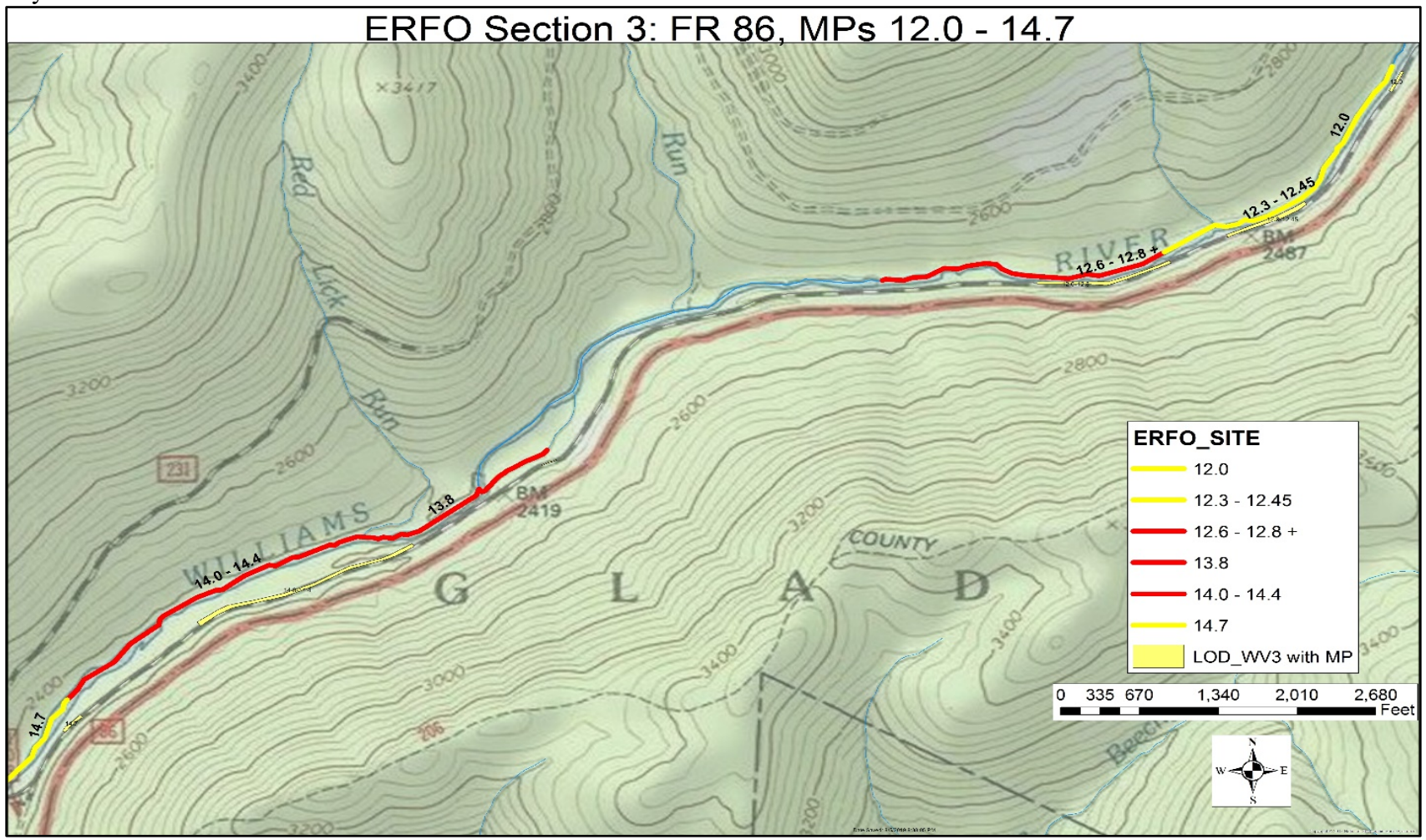


Figure 3. Extent of Effects for ERFO Section 3 Project Activities with Effects Determinations. LAA activities in red, NLAA activities in yellow.



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Increased sedimentation in the Williams River and its tributaries caused by embankment repairs and temporary channel diversions associated with bridge and culvert replacements is expected to have a more significant effect on the candy darter population in the Action Area and its habitat than any other project-related stressor. Therefore, a summary of the myriad effects that sedimentation can have on fish is described below. Following that, the manner and extent of sediment effects on the candy darter and its habitat from specific project components will be addressed.

Multiple components of the project have been identified as having the potential to adversely affect the candy darter and its habitat (Appendix A, Table A-1). These include:

- Temporary Channel Diversions
- Bridge Replacements at MPs 6.7 (Bridge Creek) and 10.8 (Elbow Branch) on FR 86
- Arch Culvert Replacements with Box Culverts at MPs 5.9 (Hateful Run) and 9.5 (Lick Branch) on FR 86
- Electroshocking and Relocation

Multiple components of the project have been identified as having the potential to have both adverse and long-term beneficial effects on the candy darter and its habitat (Appendix A, Table A-1). These include:

- Type III Embankment Repairs
- Type III Embankment Repairs with a Key and Cofferdam Installation
- Culvert Replacement with a Bridge at MP 16.6 (White Oak Fork) on FR 86

One project component is identified as having the potential to have wholly beneficial long-term effects on candy darter habitat (Appendix A, Table A-1):

- Type I and II Embankment Repairs

Activities with Adverse Effects

Sedimentation:
Many of the adverse effects, direct or indirect, expected to affect candy darters and their habitat as a result of the proposed activity are associated with sedimentation. In this Opinion, sedimentation will refer to both sediments suspended in the water column and sediment accumulation on the stream substrate.

Sediment Effect Areas
The area of effect to aquatic resources due to sedimentation is defined in this Opinion as the portions of the natural width of the Williams River in areas of in-channel work or where terrestrial or in-water work is expected to generate or disturb sediment that will be transferred to and through aquatic resources, downstream of the work area. Based on a review of sedimentation studies, other Service Opinions, and site-specific reviews of habitat characteristics present on the Williams River in the Action Area, we determined that effects of sedimentation from project activities are reasonably expected to travel no more than 0.25 miles downstream, given the conservation measures, ESC BMPs and the types of sediment-disturbing construction

activities included in the proposed action. During site-specific assessments of the Williams River in 2019 prior to project commencement, it was determined that the in-stream habitat contains at least 1, and up to 3, separate pool/riffle habitat sequences within any given 0.25 mile stretch of river (M. Owen, phone call to B. Smrekar, Service, July 19, 2019). Locations that have only one pool/riffle sequence contain one long pool (up to 650 ft. in length). Other locations of the river where there are 2-3 pool/riffle habitat sequences present typically contain pools ranging from 250-300 ft. in length. Sediments settle out in the slow-moving water of pools; therefore, the presence of one long pool or several smaller pools within each 0.25 mile stretch of the Williams River indicates that the effects of sedimentation should not extend beyond that distance. While sedimentation of aquatic resources are difficult to predict, based on the site-specific in-stream habitat sequence rates present in the Williams River, coupled with the fact that all in-stream work will occur during low-flow conditions, the Service believes that the effects of sedimentation on the candy darter are expected to be limited to the first 0.25 miles downstream of any sediment-disturbing work.

Sediment Effects on the Candy Darter and its Habitat
Adult and juvenile candy darters present within 0.25 miles downstream of Type III embankment repairs and repair locations with in-stream tributary work, such that a temporary channel diversion or a cofferdam will be installed, are expected to experience adverse effects related to increased stream sedimentation. Additionally, although a time of year restriction for in-stream work will be implemented during candy darter spawning season, there is the possibility that small numbers of young of the year (YOY) candy darters and unhatched nests that were hatched or laid late in the spawning season will remain in the in-stream work sites after June 30.

Excessive sedimentation and suspended sediments in aquatic systems can cause multiple adverse effects on all life stages of benthic fish, including loss of stream habitat essential for sheltering, foraging, and spawning; increased mortality of eggs, YOY, juveniles, and adults; increased predation on eggs by sediment-dwelling invertebrates; avoidance of previously occupied habitat; increased vulnerability of adults to predation; reduced reproductive success; induced physiological stress; reduced feeding and weight loss; reduced prey availability; increased parasitism; reduced disease resistance; and clogging, abrasion, and necrosis of gills (Kundell and Rasmussen 1995; Newcombe and Jensen 1996).

A commonly documented effect of in-water work includes silt deposition that fills interstitial spaces in gravel and cobble substrates and reduces water flow through the substrate in the direct effects area, as well as in areas downstream of the disturbance; the resulting increase in substrate embeddedness is expected to reduce spawning, foraging, and sheltering habitat quality for the candy darter. Sediment deposition can also reduce pool depth and decrease substrate complexity (Berkman and Rabeni 1987; Wood and Armitage 1997). Physiological stress from damage to gills caused by increased turbidity is also possible; studies have found signs of physiological stress, such as increased oxygen consumption and loss of equilibrium, in remaining fish downstream of disturbed areas, as well as decreased abundance of fish downstream of instream work sites (Reid and Anderson 1999; Levesque and Dube 2007). In particular, fish species that

require clean cobble and gravel for spawning had decreased abundance in sediment-impaired streams (Sutherland et al. 2002) and typical riffle-dwelling fish species declined in the presence of increased siltation (Berkman and Rabeni 1987), indicating that candy darter numbers may be reduced by increased sedimentation in the sediment affected areas. Increased sediment deposition and substrate compaction from instream construction can degrade spawning habitat, resulting in the production of fewer and smaller fish eggs, impaired egg and larvae development, and limited food availability for YOY (Reid and Anderson 1999; Levesque and Dube 2007). Increased sedimentation can be expected to not only affect the suitability of in-stream habitat, but also to effect the availability and quality of prey items by altering the composition and reducing the density of the benthic invertebrate communities within and downstream of in-water work areas (Berkman and Rabeni 1987; Kundell and Rasmussen 1995). These effects on the benthic invertebrate community can persist after construction has been completed, and various studies have documented adverse effects to the benthic community that have been apparent for between six months and four years post-construction (Reid and Anderson 1999; Levesque and Dube 2007; Penkal and Phillips 2011).

Behavioral changes in fish species have been linked to increased sedimentation. These behavioral changes are most likely the result of decreased vision in turbid waters. Fountain darters exhibited impaired anti-predation movements in increased turbidity conditions (Becker and Gabor 2012). Other darter species, which are largely dependent on visual cues when feeding, have been found to exhibit depressed feeding rates and total prey consumption with increased turbidity (Hazelton and Grossman 2009; Becker and Gabor 2012; Becker et al. 2016); similar effects are expected to candy darters. Collectively, research indicates that in habitat with increased turbidity, darter species expend more energy foraging, which reduces the amount of energy that is devoted to other essential behaviors (summarized in Potoka et al. 2016). Avoidance or abandonment of sediment-affected disturbed areas have been observed (Burkhead and Williams 1992), which further affects fish, as they expend extra energy seeking out new habitat, and competing for resources in new areas; fish are also likely to experience an increased risk of predation in the new habitat. The avoidance or abandonment of previously-suitable habitat can result in decreased growth rates, decreased reproductive success, and decreased survivorship of individuals. Furthermore, avoidance can also lead to a reduction in distribution or an alteration in distribution of some fish species (summarized in Kellogg and Leipzig-Scott 2017).

The duration and severity of the effects of increased sedimentation on individuals and populations depends on factors such as the duration of disturbance, the amount of sediment loading, the length of stream segment directly affected by construction, and whether there were repeated disturbances (Newcombe and Jensen 1996; Yount and Niemi 1999; Vondracek et al. 2003) however most studies documented recovery of the affected stream reach within one to three years after construction (Reid and Anderson 1999; Yount and Niemi 1999).

The manner in which the Williams River and its tributaries will be exposed to disturbed sediments will mostly be via many, moderate-intensity sediment plumes (or pulses), that are generated as the existing streambed is disturbed during rock placement and rock manipulation during Type III embankment repairs. While each pulse may contain only moderate amounts of sediment, the effect of multiple pulses in one area will increase the total duration of exposure. The duration of work varies considerably, depending on the size of the repair area and the activity being conducted. Embankment repairs are scheduled to last 21 days or less, with repeated sediment pulses expected daily. The sediment pulses are expected to have a more intense effect in the immediate vicinity of the work, but then become diluted with increasing distance from the disturbance, until effects are ameliorated at 0.25 miles downstream. The work activities with the longest duration are bridge and culvert replacements, ranging from 59 to 104 days each; however these sediment pulses are limited to just the beginning and ending of the activity. Additional sediment will be added to the river during the installation and removal of stream channel diversions and the cofferdam, although these pulses are limited to specific time periods in the installation and removal process. There is potential for highly-turbid pulses to be generated during the removal of the temporary channel diversions and the cofferdam. The specific effects and extent of sedimentation on the candy darter and its proposed critical habitat for each project subactivity are addressed below.

Temporary Channel Diversions:

Temporary channel diversions are proposed at locations on six different tributaries to the Williams River, so that bridge and culvert repairs or replacements can be performed in the tributary channels: White Oak Fork, Bridge Creek, Elbow Branch, Hateful Run, Little Lick Branch, and an unnamed tributary to White Oak Fork. However, the diversion of the unnamed tributary to White Oak Fork at MP 1.19 on FR 133 is not expected to effect the candy darter or its habitat. There is no suitable habitat present in this work area, and the total distance from the work area in the unnamed tributary to the potentially suitable darter habitat in the White Oak Fork is approximately 0.53 miles, well beyond the expected effect area of in-water sedimentation.

Direct effects to candy darters from channel diversions are expected to be very limited. Based on an office and/or field review of the tributaries that are part of the proposed activity by MNF aquatic ecologists, it was determined that, due to site characteristics (water chemistry and stream gradient), four of the tributaries to the Williams River have unsuitable conditions for candy darters during most of the year (M. Owen, MNF, email to B. Smrekar, Service, April 12, 2019). Furthermore, although White Oak Fork likely has suitable conditions for candy darters in its lower 0.6 miles year around, a site specific habitat evaluation revealed that the White Oak Fork is inaccessible to candy darters that are in the Williams River during low-flow conditions (M. Owen, MNF, phone call to B. Smrekar, Service, July 26, 2019). There is a large deposit of sediment at the confluence of the White Oak Fork and the Williams River that isolates the tributary, blocking flow and causing the White Oak Fork to flow subsurface for approximately 525 feet before reaching the Williams River. These tributaries are only accessible in high flow conditions, and since darters are not expected to migrate into tributaries during high flow, candy

darter occupation of the tributaries is expected to be limited to a few occasional individual adults or juveniles. Therefore, we believe that a very limited number of individuals have a very low probability of exposure to the direct effects of the proposed work occurring within these tributaries.

Diversion Installation and Removal:
Sedimentation: Although there are several types of channel diversions that will be installed in various tributaries during the proposed action (temporary diversion channel, temporary bypass dam/pipe diversion, and phased sandbag/barrier diversion), the effects to candy darters and their associated habitat is expected to be similar for all diversion types. The main effects to candy darters and their habitat will result from the effects of the 2 (temporary diversion channel, temporary bypass dam/pipe diversion types) or 4 (phased sandbag/barrier diversion type) distinct sediment pulses, which could introduce sediment from outside the system to candy darter habitat in the Williams River. The first exposure is expected during installation of the temporary channel, as the tributary flow is first directed through the diversion channel or hose and to the Williams River. This flow should contain only a small to moderate amount of sediment, generated during excavation, gravel placement, and lining of the temporary channel. The second, larger pulse of sediment is expected to be flushed into the Williams River when flow is restored to the natural tributary channel. During the time that the tributary channels are diverted, the tributary substrate will be disturbed by work activities that involve excavation of the banks and channel bottom to remove and install bridges and culverts. As such, some amount of loose sediment is expected to accumulate in the channel during work, and it will be flushed through the channel when natural flow is restored. The sediment will be suspended and/or be deposited in the Williams River. The effects of increased siltation that can be expected on both candy darters and their habitat in the downstream sediment effect areas are described above. Because some of the rocks and boulders that need to be removed for in-channel work will be replaced under guidance provided by the MNF aquatic specialists, stream flow patterns and velocity in the tributaries are expected to return to conditions similar to those that were present prior to the flood event. The effects of sedimentation resulting from the installation and removal of channel diversions are expected to affect 0.25 miles of the Williams River, downstream of the work areas. Because of the number of this type of activity proposed, the total miles of the Williams River that are expected to be affected from 4 stream diversions in Bridge Creek, Elbow Branch, Hateful Run, and Lick Branch is 1.00 mile. There will be an additional 0.25 mile sediment effect area within White Oak Fork, downstream of the work site.

Direct Injury/Crushing: The placement of sandbags to create temporary stream diversions in the tributaries could kill or harm adult or juvenile individual candy darters that are present in the area and fail to move away from the disturbance. Injury or crushing of darters during sandbag placement will be limited to adults and juveniles in the tributary work areas; nests or YOY are not expected in the tributaries, as suitable habitat is not present in the tributaries during the candy darter spawning season. The total stream length affected by sandbag placement for all five diversions is 438 linear feet, limiting candy darter exposure to direct injury or crushing. Furthermore, conditions present in the project tributaries are unsuitable for candy darters during

the majority of the year, and so candy darter use of the tributaries is expected to be extremely limited, such that a very small number of individuals could occasionally and temporarily be found in the project tributaries.

Temporary Habitat Loss: Temporary habitat loss in the diverted tributaries is expected to have little effect on candy darters. Although a total of 4,649 $ft.^2$ (0.11 acres) is expected to be temporarily effected during work activities in the five tributaries to the Williams River, given that there are very few individuals expected to be present in the tributaries, the overall effect to the candy darter population in the Action Area is expected to be small. The effects of the channel diversions on darters present in the tributaries are also temporary, lasting from 16 to 104 days, (depending on the specific repair location) until instream construction is complete and the channel diversions are removed. After construction, darters present in the tributaries are expected to redistribute into the areas that were temporarily inaccessible during instream work, resulting in a return to pre-construction distribution. There is no critical habitat loss from channel diversions, as none of the tributaries in the Williams River watershed are part of the proposed critical habitat.

Operation of Temporary Diversions: The main effect from the operation of the temporary channel diversions is the potential for alteration of water velocity and flow patterns at the confluence of the diverted tributary channel and the Williams River. All of the tributary channel diversions (except White Oak Fork) will occur within 30 feet of the confluence with the Williams River; therefore, all channel diversions are expected to flow directly into the river. The water coming through the diversions is expected to have an increased velocity because the dimensions of the bypass channel or hose are typically much narrower than the natural channel dimensions. There is the possibility that the increased water velocity could alter the micro-habitat at the location where the diversion meets the Williams River by stirring up substrate sedimentation or by displacing small gravel or cobble directly under the diversion discharge. These effects to critical habitat are expected to be very localized and limited because all in-water work will occur during low-flow conditions. It is likely that at least some of these tributaries will be completely dry during the late summer and early fall, and flow is expected to be very low in other tributaries. However, storm events occurring during active channel diversions could provide increased diversion discharge.

Finally, while channel diversions are expected to introduce some amount of added sediment to the tributaries and the Williams River, the installation of the diversions themselves are a conservation measure that significantly limits the sediment generated during in-channel work that enters the aquatic system. Working in a dry streambed during excavation of banks and substrate, removal of existing culverts and bridges, and replacement with new structures allows the effects of sedimentation to be confined to a much smaller area. Working during low flow conditions also allows for greater control of the work areas, and enables sediment escape during work to be effectively controlled, so that very limited quantities of sediments will enter candy darter habitat.

Bridge Replacements on FR 86 at MPs 6.7 and 10.8:
Two existing 20 foot long timber bridges with stone abutments that were damaged during the flood will be replaced with new concrete abutments and a 30 foot long single span concrete bridge along FR 86, where the road crosses Bridge Creek (MP 6.7) and Elbow Branch (MP 10.8). These work sites are located in tributaries to the Williams River. Although conditions within the tributaries themselves are not conducive to candy darter occupation during the majority of the year, the bridge replacements will occur at the confluence of each tributary with the Williams River; thus effects to a limited number of individual candy darters and their habitat in the Williams River are expected.

Significant excavation of both the existing bank and streambed are expected to occur during this subactivity. Existing boulders and river rocks will also be removed from the tributaries' streambeds and banks during in-channel work and channel diversion. Phased sandbag/barrier temporary channel diversions will be installed in the work area of each tributary, so that bank and substrate excavation to remove the existing abutments and construct the new bridge abutments and wingwalls can occur in the dry (see effects expected in the Temporary Channel Diversion subactivity description). Working in the dry stream bed significantly reduces aquatic resource exposure to sedimentation caused by project activities. A debris shield will be placed under the existing bridges to catch loose debris that may fall during bridge removal, further protecting the water flowing through half of the diverted channel below, which should significantly reduce excess sediments and debris input into the Williams River during work activities. Potential effects to habitat include effects from increased sedimentation (as discussed above) and the change in water flow velocity over the length of the diversion. The phased sandbag/barrier diversion directs flow to one half of the stream using sandbags, while allowing flow to continue in the other half of the natural channel. The diversion type likely leads to increased velocity of the water as the volume of water flow is doubled where it flows through half the channel. This change in flow velocity may alter the channel bottom by dislodging and redepositing smaller rocks and cobble, redistributing the sediment and finer substrate, and increasing in-stream turbidity. The change in flow and increased sediments may also effect the habitat by altering the prey base. Finally, there will be a permanent alteration in the bank contours of the tributary at the site of the replacements. The natural stone abutments will be replaced with larger, concrete abutments. There will be riprap placed along the banks at the abutments and wingwalls, as well. Along with permanent alteration of the bank, lasting alterations in flow patterns in the area of the new bridge abutments are possible.

Despite the implementation of ESC BMPs, and even with careful equipment operation by workers who are cognizant of the potential presence of the candy darter in the work area, some amount of new sediment input is expected to enter the water during work. The expected effects from increased sedimentation on candy darters and their associated habitat are described above, and are expected to occur over a 0.25 mile area of the Williams River, downstream of each tributary's confluence with the Williams. However, with the implementation of the extensive conservation measures proposed as part of this project, and given the restrictions under which in-stream work will occur (during low-flow, outside of darter spawning season), the effects of

sedimentation on candy darters are expected to remain sub-lethal, and no significant alteration of their critical habitat in the Williams River is expected from the proposed action.

Culvert Replacements on FR 86 at MP 5.9 (Hateful Run) and MP 9.5 (Lick Branch):
Existing pipe culverts that were damaged during the flood will be replaced with box culverts at two locations where FR 86 crosses Hateful Run (MP 5.9) and Lick Branch (MP 9.5). These work sites are located in tributaries to the Williams River. Although conditions within the tributaries themselves are not conducive to candy darter occupation during the majority of the year, the culvert replacements will occur near the confluence of each tributary with the Williams River; thus effects of sedimentation to a limited number of individual candy darters that may be present in the tributary and individual candy darters, as well as their habitats in the Williams River are expected. Additionally, effects to candy darters are expected from the alteration in water flow pattern and velocity that will result from replacement of a pipe culvert with a box culvert. There will also be a permanent alteration in the bank contours of the tributary at the site of the replacements and extra riprap placed along the banks at the wingwalls, as well.

Temporary channel diversions will be installed for a short period of time for culvert replacements at MP 5.9 (10 days) and MP 9.5 (12 days). Large culverts (4.5 ft. and 6 ft. diameter) will be removed and replaced with larger box culverts, requiring significant excavation of the existing bank and streambed. Existing boulders and river rocks will also be removed from the tributaries' streambeds and banks during in-channel work and channel diversion. The effects of sedimentation are expected to be similar to those arising from other project subactivities occurring in tributaries, and will likely result in sub-lethal effects to candy darters in the 0.25 miles sediment effect areas in the Williams River, but cause no significant alteration of in-stream habitat in the Williams River.

Electroshocking and Relocation
Electroshocking and Relocation: Electroshocking, capturing, handling, and relocation of fish, including candy darters, from areas that will be isolated and dewatered during project activities is included as part of the project description in order to reduce the adverse effects from instream construction activities. The goal of the electroshocking and relocation effort is to remove individual candy darters from specific locations within the Action Area where dewatering will occur, thus reducing or preventing mortality resulting from the installation of temporary channel diversions. The efficacy of relocation efforts for this particular species is unknown at this time. Conservation measures for the proposed action include the collection and relocation of candy darters to nearby suitable habitat during the installation of temporary channel diversions in six areas: White Oak Fork, the Williams River at MP 10.6, Bridge Creek, Lick Branch, Elbow Branch, and Hateful Run.

Few individual candy darters are expected to be effected during this subactivity, as the total area to be dewatered and subjected to electroshocking activities is relatively small, and includes 879 $ft.^2$ of Bridge Creek, 703 $ft.^2$ of Lick Branch, 925 $ft.^2$ of Elbow Branch, 753 $ft.^2$ of Hateful Run, 1800 $ft.^2$ of the Williams River and 312 $ft.^2$ of the White Oak Fork. Candy darters are much

more likely to be found in the White Oak Fork and Williams River repair locations than the other electrofishing areas, as these locations are suitable for candy darters year around. Chances are very low that candy darters will be affected by electroshocking efforts in Bridge Creek, Lick Branch, Elbow Branch, and Hateful Run, as they do not contain suitable candy darter habitat for the majority of the year. Nonetheless, there is a small chance that a few individual darters could occasionally be present in these tributaries during certain times of the year.

Electroshocking will occur at the start of instream work at each location. While electroshocking and relocation will result in the reduction of direct take during dewatering activities, and will thus minimize adverse effects, there can also be some adverse effects associated with this activity. Direct adverse effects may occur through physical injury or mortality associated with the application of a low frequency, direct current of electricity to the water and through dip-netting or seining for capture; stress or injury from handling, holding, and transportation to the relocation site; and stress or injury associated with the removal of individuals from familiar habitat and placement in new surroundings. Indirect effects may occur through mortality as a result of injury during collection and handling or through activity-induced stress, as candy darters move away from the electroshocking area to less suitable habitats. Suitable habitat for candy darter relocation, located upstream, outside of any repair sites, and as close as possible to each work site where relocation activities are to occur, will be selected by a qualified aquatic specialist prior to initiating electroshocking activities, which will limit the effects of handling and transportation on captured candy darters.

The relocation of candy darters can also have indirect effects on individuals through mortality or reduced survival related to introduction to unfamiliar surroundings, as well as through intra- and interspecies competition in the relocation areas. Relocated individuals may be more easily predated when placed in their new habitat. They are also likely to expend more energy searching for suitable microhabitat and establishing new territories while competing for food resources. Resident darters in the relocation area could also be exposed to these stressors when the relocated darters are introduced. Individual candy darters will experience some lethal or sub-lethal effects from electroshocking and relocation; however these adverse effects will be less than if the darters were crushed, injured, or left in the dewatering area during the installation of temporary channel diversions and the cofferdam, which would result in mortality for all individuals trapped in the dammed area. Additionally, these electroshocking and relocation efforts will be completed by individuals possessing a scientific collecting permit for candy darters and who have prior experience surveying for and collecting darters and other fish species, which will help to minimize adverse direct and indirect effects from these efforts.

Overall, the electroshocking and relocation efforts may result in reduced survival rates of captured adults and juveniles, as well as resident darters in the relocation areas, leading to a localized reduction in numbers and reproduction in this population of darters. Relocation could also result in a reduction in the distribution of darters in area where electroshocking activities are employed. This effect will last only until project-related instream activity has been completed, as darters are expected to redistribute throughout the Action Area. Because of the low number of

individual darters that are expected to be present in the relatively small electroshocking areas, the effects of electroshocking and relocation are expected to affect low numbers of individuals, but leave the Williams River population of candy darters relatively unchanged.

Activities with both Adverse and Long-term Beneficial Effects

Type III Embankment Repairs:

Crushing/Injury: In-water Rock Placement

Candy darter adults, juveniles, YOY, and their eggs that are present in repair sites could be killed or injured when rock is placed in the water by equipment working in the Williams River channel during Type III embankment repairs. While most adults and juveniles will likely move away from the instream work, individuals that are sheltering under or between rocks may not leave the area and may be directly affected. YOY and eggs that are present in the work area would be unable to move away from the disturbance due to their limited or lack of mobility. Additionally, sediment deposited on or near nests in the immediate area of rock placement would cause eggs and YOY to suffocate. Lethal effects to candy darters from rock placement is anticipated to affect only a small subset of individuals; effects would be limited to those adults and juveniles that do not move away from the work activity, and to nests or YOY that are unable to move from the area. Effects to YOY and eggs should be further limited by the implementation of the time of year restriction for in-water work, which restricts work during the candy darter spawning period from April 15 to June 30. Adverse effects would be restricted to those few nests that were laid late in the spawning period.

There are 13 separate locations where the Type III embankment repair is the only major in-water construction activity in the Williams River; in these areas the effects of in-stream rock placement occur over a total of 12,740 ft^2, or 0.45 river miles. This equates to 2.4% of the length of the Williams River included in the Action Area, and approximately 1.4% of the total length of the Williams River critical habitat; thus the effects of the killing or crushing via direct rock placement on candy darters is very small and not expected to affect the overall population of darters in the Action Area. The effect of the loss of individual darters or nests that are present in any one Type III embankment repair area should remain localized, and not be felt throughout the Williams River system. Direct effects will be confined to the areas of in-river rock placement, which extends out into the water for 5-10 feet (depending on the repair site specifications) for the linear length of the bank repair in each work area, which ranges from 40-520 ft. (average length of Type III embankment repair is approximately 183 linear feet). Specific repair site dimensions for in-water rock placement are available in Tables 5-8 of the BA.

Sedimentation

While we anticipate immediate and long-term beneficial effects to the candy darter critical habitat in the Williams River as a result of a reduction in new sediment inputs associated with Type III embankment repairs, project construction activities will first result in increased

sedimentation associated with the disturbance, suspension, and redistribution of substrate sediments that is expected to negatively affect the species and its critical habitat within the Action Area.

Most of the stressors that are expected to have an adverse effect on candy darters and their habitat during Type III embankment repairs stem from the increased water turbidity and siltation that is likely to occur during work activities. While the conservation measures implemented as part of the proposed action are expected to limit the amount of additional sediment input to the river during Type III embankment repairs, this type of repair involves manipulation of rocks and boulders already present in the river, as well as the placement of additional rocks into the water, which will result in substantial disturbance of the stream substrate. Sediments already present in the river channel will be disturbed as rocks that are located at or below the existing water level are manipulated out of the bank, then replaced or moved to a different location in the bank. Sediment disturbed during rock placement will be suspended in the water column and/or be flushed from the local work area and deposit elsewhere. This type of work will likely result in the generation of many short term pulses of turbid water from the work site. Although these types of sediment plumes, or pulses, are usually of relatively short duration and there is typically a rapid return to background conditions after activities cease, instream work can have considerable effects on aquatic ecosystems.

Work areas where the embankment repairs are the main activity being implemented (i.e. not combined with other the other project subactivities of culvert or bridge replacement and temporary channel diversions) will take a relatively short period of time to complete; the average number of in-water working days for the Type III embankment repairs is 7.2 days, with a range of 2 to 21 days total, depending on the length of each repair. For the 13 different repair sites where the Type III embankment repair is the only in-water activity, which have a total of 3.25 miles of in-water sediment effect areas along the Williams River, the effects of the sediment plumes are expected to range from negligible to injurious or lethal. Most injurious or lethal effects are expected in the immediate area of the embankment repair, where the darters will be exposed to the highest turbidity levels. The effects of sedimentation from this type of repair are limited in scope; 17% of the Williams River within the Action Area will be affected and approximately 10% of the total length of the Williams River proposed critical habitat. The manner of exposure (via sediment pulses) and the length of exposure (average of 7.2 days) of candy darters to sedimentation associated with this subactivity may lessen the adverse effects on the candy darter and its habitat, resulting in fewer injurious or lethal effects, overall.

Placement of additional quarried limestone rocks in the river during bank repairs is also expected to cause alterations in the stream substrate of the Williams River and cause short-term increases in turbidity (or suspended sediments) in the water column. Since new sediment inputs are expected to be limited during this subactivity, as one of the conservation measures included in the BA is that all imported materials will be clean and free of excess sediment and/or vegetation, most adverse effects should be limited to the effects of suspension and re-distribution of the original sediments contained in the substrate and banks. We are assuming a general evenness of

habitat suitability within all parts of the Williams River, since candy darters are found throughout the River, and so effects of sedimentation are limited to a re-distribution of the original sediments contained in the substrate. Disturbed sediments will be suspended and flushed via the current some distance downstream (less than 0.25 miles), where they will settle out in new areas of cobble and gravel. It is expected that the same degree of total embeddedness will be present before and after the activity, although areas of higher embeddedness will likely have a different distribution pattern throughout the reach after disturbance. Within this sediment effect area there may be localized increased embeddedness in some gravel, cobble, and boulder micro-habitats within the substrate of the shallow pools and runs inhabited by the species.

Placement of rocks in the Williams River will alter the bank and stream bottom substrate in the areas of embankment repair as well. Imported limestone rocks of varying sizes will be placed in the river. The limestone rocks are not anticipated to erode or leach any minerals into the water, leaving the water chemistry unchanged. However, the size and positioning of the rocks will be unnatural. Additionally, the rock embankment repairs will be extending up to 10 feet out into the river from the bank. The rock placement is expected to reduce the channel width in these areas, and may alter water velocity and flow patterns in the Williams River. While these embankment repairs will likely result in some minor alterations in flow patterns and velocity of the River as it contacts the new rocks, the overall effect is anticipated to be beneficial. According to the MNF, the 2016 flood resulted in a widening of the channel in locations of bank failure, which led to the current, unstable conditions of the Williams River (M. Owen, MNF, email to B. Smrekar, Service, June 28, 2019). While the embankment repairs are not designed to restore channel dimensions, the placement of rocks in the channel to stabilize the banks is expected to narrow the channel by 5-10 feet, so that it more closely resembles the channel baseline dimensions of the Williams River prior to the flood. As the pre-flood baseline channel morphology of the Williams River was considered to be in a general state of dynamic equilibrium, in which the river maintains its general dimensions, flow pattern, and profile long-term (Rosgen, 1996), the restoration of the channel widths in areas of bank stabilization is expected to assist in the Williams River returning to a stable condition.

The effect of rock added during Type I and II embankment repair (discussed later), and of in-stream rocks placed in-water during Type III embankment repairs on candy darter habitat remains unclear; the added rocks may serve as candy darter habitat and as additional substrate for their macroinvertebrate prey or the added rock structure may be avoided. While the suitability of rocks placed during embankment repairs as candy darter habitat remains uncertain, there is at minimum, no anticipated adverse effect of these rock repairs. If darters fail to use the new rock embankments as habitat, there will not be a net loss of habitat to the population in the Action Area, as the currently eroding bank does not provide suitable habitat (B. Smrekar, Service and M. Owen, MNF, pers. obs. May 7, 2019).

Beneficial Effect: The immediate beneficial effect of bank stabilization after construction of the Type III rock embankments will be the reduction in continued sediment input from the eroding banks (see effects of Type I and II embankment repairs also). However, in-water construction

can also directly alter the stream channel, bed, and banks, and may result in changes in cover, channel morphology, and sediment transport dynamics. While these changes can produce adverse effects to aquatic resources in some circumstances, the effects of instream rock placement on the Williams River channel morphology are expected to produce desirable effects, and assist in returning the Williams River to its pre-flood state of dynamic equilibrium. As described in the Description of the Proposed Action, prior to the flood event in 2016, channel morphology of the Williams River was considered to be in a general state of dynamic equilibrium; accordingly, the factors identified by Leopold et al. (1964) that primarily govern river channel dimension, pattern, and profile were noted as being relatively stable through time by the MNF aquatic ecologist (M. Owen, MNF, email to B. Smrekar, Service, June 28, 2019). The 2016 flood event caused drastic alterations to the Williams River banks and channel, which resulted in widespread widening of the channel and other changes to channel morphology. The creation of in-water rock embankments during Type III embankment repairs will actually be a re-construction of areas that were eroded away during the flood event, or have been continually eroding since they were destabilized during the flood. Rock placement during Type III embankment repairs will re-occupy a portion of the footprint that the natural dirt and rock bank once occupied in and along the Williams River prior to the 2016 flood. Therefore, the width of the river channel is expected to remain at least as wide as it had been prior to the 2016 flood. Project repairs, as proposed, are expected to avoid encroaching into the Williams River channel beyond the pre-flood condition, and as such, are not expected to result in adverse effects to hydrologic or hydraulic properties that influence the long-term maintenance and stability of the river channel and associated aquatic habitat. Furthermore, activities that stabilize the damaged road embankments adjacent to the Williams River are expected to reduce the risk for bank erosion at these locations in the future and contribute to the long-term recovery of a river channel in a state of channel dynamic equilibrium.

Type III Embankment Repair with a Key and Cofferdam

The direct and indirect effects of a Type III embankment repair on candy darters and their associated habitat are described above, and will apply to a Type III embankment repair with a key. However, additional effects to candy darters and their habitat are expected during the bank repair with a key, as it requires the installation of a cofferdam to perform in-river work and the excavation of the streambed to install or "key" rocks into the river substrate to form a stable rock toe. This type of work activity will occur at one work location; MP 10.6 on FR 86, where an 1800 ft^2 area of candy darter habitat in the Williams River will be affected.

Cofferdam Installation and Removal

Most effects to candy darters and their habitat from the cofferdam will occur during installation and removal of the structure in the Williams River. The installation of a cofferdam is expected to disturb substrate sediments, causing them to become suspended in the water when the super-sandbags are placed on the streambed. After work is completed, a large plume of sediment is expected to be flushed through the area as the dam is removed, and residual loose sediment from channel bottom disturbance during the excavation and installation of rocks, as well as sediments that have built-up on the upstream edge of the cofferdam structure, are released and suspended in

the water column and/or flushed through the area. The effects of sedimentation to candy darters and their habitat will be similar to those occurring during other types of embankment repairs, and are expected to affect candy darters and their habitats 0.25 miles downstream of the work area. Most of the sediment generated during work at this location is expected to be short-term and will likely settle out in the immediate area of the cofferdam installation, as the area of cofferdam installation contains a long pool of slow-moving water. Additionally, no new sediment is anticipated to be introduced to the river. Direct effects to proposed critical habitat are expected by the alteration of the Williams River in the area of the key. An unnatural substrate will be introduced to the river in this area and newly placed rocks may also result in a change to the water flow or velocity in the immediate area of the key and embankment; however effects to proposed critical habitat from this activity are not expected to alter the habitat suitability for the species overall. The bank stabilization is expected to result in less sediment input to the system, and will have a beneficial long-term effect on the candy darter critical habitat.

The in-water placement of super sandbags to create the cofferdam could kill or harm adult, juvenile, or YOY candy darters that are in the area of sandbag placement and fail to or cannot move away from the disturbance. Effects to adults and juveniles should be very limited; the cofferdam site contains a long pool, which is likely only used by adult and juvenile candy darters for dispersal or migration, given the species' preference for swift, shallow riffle habitats with coarse substrates lacking fine substrates for feeding, sheltering, and breeding (Chipps et al. 1994, Dunn and Angermeier 2016); adults and juveniles are expected to move away from disturbance. However, since YOY tend to occupy shallower and slower-moving water than adults or juveniles, it is possible that they will occur near the cofferdam installation. If present, YOY will be crushed or injured, as they have limited mobility and may not be able to move from the area. Although direct death or harm to YOY is possible, the chance that there will be YOY present during work is significantly decreased by the time of year restriction for in-stream work that is being implemented as part of the conservation measures for this proposed activity. Additionally, adverse effects related to direct injury or crushing of adults, juveniles, and YOY at the cofferdam location will be limited, as the area covered by sandbags is only 180 ft. long, further reducing the chances that any individuals will be effected during sandbag placement. No nests are anticipated to be affected by this activity, as the habitat present in this portion of the Williams River is not typical of spawning or nesting habitat.

Direct effects to candy darters present in the dammed area are expected during the dewatering of the 1800 ft^2 cofferdam area. Adult and juvenile candy darters will be removed from the isolated work cells using electroshocking and capturing techniques; the effects expected from this activity were described above. However, it is not possible to capture or remove YOY using this methodology, and any YOY that are trapped in the cofferdam area will likely be killed during dewatering. However, the implementation of the time of year restriction and the fact that the effect area of the cofferdam is small compared to the available habitat within the project area further limit the exposure of YOY candy darters to dewatering in the cofferdam.

Cofferdam operation: Candy darters will experience a temporary loss and alteration of approximately 1800 ft^2 of habitat during the time period that the cofferdam is in place. During cofferdam operation, the area occupied by the cofferdam will be unavailable to individual darters, and the cofferdam itself will alter the water velocity and flow of the Williams River around the structure. Additionally, should unexpected weather events while the cofferdam is in operation cause water levels in the Williams River to rise, such that the cofferdam is overtopped, additional scouring of the substrate may occur. Based on a site-specific evaluation of the Williams River work area at MP 10.6, the effects of this activity are expected to be short-term and will likely effect only a few individuals. A long, shallow pool is present at the site of the cofferdam installation, and this habitat type is typically only used by candy darters for dispersal. Adverse effects to candy darters will be limited to those few individuals that may disperse through the work area during repairs. Furthermore, the cofferdam is expected to be in place for only 6 days, further limiting individual candy darter exposure to the cofferdam work area.

Culvert replacement with a Bridge at MP 16.6 on FR 86:
Effects to candy darters from the proposed replacement of 2 large culverts with a bridge over the White Oak Fork are expected to be limited to a few individual adults or juveniles that are present in the tributary during work activities.

Habitat Loss and Degradation: A temporary loss of habitat in the in-stream work area and an increase in sedimentation are expected to effect the limited number of candy darters that are present in potentially suitable habitat in White Oak Fork. Effects to habitat in the work area and for 0.25 miles downstream of the work area in the White Oak Fork are also expected to be temporary, lasting for the 75 day duration of the stream diversion. Effects are expected to be similar to those described for the Bridge Replacements on FR 86 at MPs 6.7 and 10.8; however sediments that enter the water flowing through the work space during construction will not enter the Williams River and all in-water effects will be confined to the tributary.

Installation and Removal of Temporary Bridge and Operation of Temporary Bridge: The installation of the temporary bridge is expected have limited effects on the candy darter and its habitat because the in-channel work associated with this subactivity is limited to the removal of debris from the channel and the temporary bridge will span White Oak Fork in its entirety. Some amount of sedimentation is expected to be suspended in the water column and/or flushed through the lower 0.25 miles of White Oak Fork when equipment reaches down into the channel to remove the cut and/or fallen canopy trees that are wholly or partly in the channel and trash debris that is currently present in the stream channel. This sedimentation will be limited to a few pulses over a short time span (less than one day). As discussed previously, effects would be restricted to the few individual candy darters that could possibly be in White Oak Fork. The short pulses of sediment disturbance over the course of several hours are expected to flush through the reach and settle back into the substrate. No new sedimentation is expected to be added to the system during this subactivity; thus effects are limited to a re-distribution of the original sediments contained in the substrate. It is expected that the same degree of total cobble and gravel embeddedness will be present before and after the activity, although areas of higher

embeddedness will likely have a different distribution pattern throughout the reach. Sediments will be disturbed and suspended in this particular work area, and are therefore expected to be flushed downstream, where they will settle out in new areas.

Placement of the temporary span will not affect the banks of White Oak Fork, but will contact the soils in the wide flood plain present at this site, well away from the actual channel itself. The span will be placed without the need for any in-channel manipulation. Because there are no expected effects to the banks of the tributary during span placement, and conservation measures proposed with the project call for rehabilitation of the soil in all disturbed areas, (soil conditioning, re-seeding), the temporary bridge placement is not likely to adversely affect candy darter or their habitat.

The proposed activity calls for placement of the temporary bridge, so that traffic can begin to traverse FR 86 in this area for the first time since damage prompted the post-flood road closure in 2016. The operation of the bridge (i.e. traffic using the temporary bridge) could cause the lower portion of White Oak Fork to be exposed to sedimentation and pollutants from vehicles above the stream. However, these effects are not expected to be any different than the effect that traffic has had on the bridge area since FR 86 became a developed road. There are no additional or new effects expected during operation of the temporary bridge beyond what would be normal traffic along this section of FR 86. Therefore, the effects of temporary bridge operation are discountable.

Removal of Culvert and Installation of the New Bridge:
Although there will be significant excavation of both banks and the stream bottom of White Oak Fork within the LOD in order to construct the bridge abutments, limited effects are expected to the candy darter. Because a phased sandbag/barrier channel diversion will be installed at this location, all work is expected to occur in the dry. Working in the dry streambed significantly reduces aquatic resource exposure to sedimentation caused by project activities. Conservation measures, such as the placement of a wall of sandbags lined with impermeable membrane, staging all equipment so that it is working from the road, ESC BMPs, placement of a debris shield under the culverts during removal, and working only during low flow conditions should also limit candy darter habitat exposure to sediments and other pollutants during work in the White Oak Fork channel. Despite the implementation of ESC BMPs, and even with careful equipment operation by workers who are cognizant of the potential presence of the candy darter in the work area, some amount of new sediment input is expected to enter the water.

Another effect of the culvert removal and bridge installation at MP 16.6 on candy darters is an alteration of their habitat at the stream crossing. Currently, there are natural banks upstream and downstream of the crossing, and two large culverts through which water flows. After the bridge is completed, the banks on both sides of White Oak Fork will consist of riprap embankments. The banks will be of an unnatural contour and be constructed of rocks that are not naturally occurring in this area. Although the limestone rocks are not expected to alter water chemistry, their suitability for sheltering candy darters is uncertain. Individual candy darters may use the

rocks as cover, or conversely, avoid the new rocks. Whichever response occurs, the current bank provides a limited amount of suitable habitat for the species (B. Smrekar, Service, pers. obs. May 7, 2019), and so a negative response of darters to the riprap will not significantly change the amount of rock bank habitat available to the species, given baseline conditions. Channel dimensions (the hydraulic opening) will be increased with the removal of the 2 culverts, which should result in a return to natural flow patterns in this portion of the stream.

Candy darters in the area of the culvert removal and bridge construction on White Oak Fork could be exposed to increased sedimentation throughout the 75 days of work in the area, and experience stress from alterations in stream flow as a result of the temporary channel diversion. Additionally, there will be permanent changes to the stream bank in the immediate area of the bridge construction. However, negative effects are expected to be limited to a very few individual candy darters that are present in White Oak Fork during low-flow conditions. Furthermore, although there are some permanent alterations to the stream bank, these changes are not expected to significantly alter current darter use patterns in the work site. Because White Oak Fork does not connect to the Williams River during low-flow when work will be performed in the channel, no effects to candy darter proposed critical habitat are expected.

Beneficial Effects: The replacement of the 2 large culverts with a bridge that completely spans White Oak Fork may have a long term beneficial effect on candy darters and their habitats, as the bridge will improve habitat connectivity and enhance opportunities for candy darters and other aquatic species to move and disperse upstream of the work site in White Oak Fork. Current conditions at MP 16.6 restrict dispersal; the two 6 ft. pipe culverts are perched several inches above the stream bottom at this location during low-flow conditions (B. Smrekar, Service, pers. obs. May 7, 2019), making it unlikely that candy darter could move past these pipe culverts during most of the year. Removal of these culverts and installation of a bridge spanning White Oak Fork will result in an increase in the channel dimensions and the removal of a physical barrier to fish movement. Habitat connectivity of White Oak Fork and the Williams River is expected to improve over time as well, such that White Oak Fork will be accessible during all flow levels. Based on 20 years of personal observations of the Williams River area, the MNF aquatic ecologist believes that it is probable that the large deposit of sediment currently blocking White Oak Fork from connecting to the Williams River during low flow periods was formed during the flood of 2016 (M. Owen, phone call to B. Smrekar, Service July 19, 2019). Therefore, it is likely that, over time, the Williams River will begin to erode the deposit, once again providing connectivity between White Oak Fork and the Williams River, year around. In the future, White Oak Fork could become a refugia for the candy darter during late summer/early fall low-flow conditions, as adult and juvenile darters could escape rising main-stem temperatures and migrate up into an additional 0.33 miles of potentially suitable candy darter habitat in the lower White Oak Fork that is currently inaccessible to the species.

Activities with Wholly-Beneficial Effects

Type I and II Embankment Repairs

Beneficial Effects: No direct mortality is expected to candy darters during the construction of Type I and II embankments, since there is no in-stream work associated with the repairs. There may be occasional exposure to small amounts of sediment during construction, since in some cases, excavation and rock placement will occur near the edge of the Williams River. Sediment that is clinging to a bucket on a piece of equipment could be dropped or flung into the river. Severe storms that arise during construction could result in small amounts of sediment escaping the ESCs surrounding the work area, since ESC do not capture 100% of the sediment. However, due to the ESC BMPs in place, the use of geotextile fabric to anchor rocks, and the mechanical placement of rocks in the embankment, adverse effects to candy darters and their habitats from these small sediment inputs are expected to be discountable.

The main effect of Type I and II rock embankment repairs will be an indirect beneficial effect to proposed critical habitat, through a reduction in sediment inputs into the Williams River. As a result of the 2016 flood, destabilized banks along the Williams River have been continually eroding, adding sediments to the river. The added sediment load to the river is likely to have had adverse effects on the blend of unembedded gravel and cobble that is necessary for normal candy darter sheltering, feeding, and breeding behavior. A chronic increase in turbidity near the destabilized banks and a reduction in the benthic macroinvertebrate community are also likely adverse effects resulting from the continued bank erosion that has been occurring since 2016. Individual candy darters have likely experienced a loss or degradation of their sheltering, feeding, and breeding habitat in areas near slope failures. The increased sediment load is likely to have resulted in sediments settling into the interstitial spaces between rocks, boulders, and gravel, reducing its suitability for candy darters. The increased sedimentation is also likely to have caused a reduction in prey abundance, decreasing the candy darters' feeding rates, growth rates, and may eventually lead to reductions in survival and reproductive success of darters living near the failing embankments.

While all work will occur during low-flow conditions, portions of the rock embankments created during Type I and II repairs will be accessible to candy darters during high-flow periods. When waters rise in the winter and spring, rocks placed during embankment repairs could serve as habitat, if the rock sizes and placement provide the type of interstitial spaces that adult and juvenile candy darters use for shelter. This added rock habitat may serve as additional substrate for macroinvertebrate prey. Conversely, individual candy darters could avoid the new rock embankments, if rock placement is not conducive to normal sheltering and feeding behavior. We are unable to determine if rock placement during embankment repairs will provide additional darter habitat, or if it will be avoided, as there are no studies on the use of these type of bank repairs by candy darters. While the suitability of rocks placed during embankment repairs as candy darter habitat remains unclear, there are no anticipated adverse effects from these rock

repairs. If darters do not use the new rock embankments as habitat, there will not be a net loss of habitat to the population in the Action Area, as the currently eroding bank does not provide suitable habitat (B. Smrekar, Service and M. Owen, MNF, pers. obs. May 7, 2019).

In summary, the effects of Type I and II embankment repairs are expected to be wholly beneficial to candy darter proposed critical habitat, while their effect on candy darter individuals will range from negligible to beneficial. A total of 7,458 linear feet (1.4 miles) of bank will be repaired in this manner, which will provide considerable beneficial bank stabilization to the Williams River candy darter population.

One final consideration is the project implementation schedule. Project activities are scheduled to occur over a total of 26 months and in-water work is spread throughout 14.78 stream miles of the Williams River. The Action Area covers a significant portion of the species' habitats in the Williams River, and the duration of exposure to project-related stressors is lengthy. The project is split into 4 sections; in-water work for each section will span roughly 2.5 to 5.0 miles of the river, and the duration of work in each section ranges from approximately 6 months to 24 months. However, despite the long distance of river that will be affected, any one reach of river will be affected for a relatively short period of time. No one section is scheduled to be active for more than 212 days, and all work will stop during the winter months (typically from mid-December to the end of March). Thus, adverse effects to candy darters should be short-term (up to 212 days). Furthermore, after project completion, an overall long-term beneficial effect to candy darters and their critical habitat is expected because of the substantial reduction in sediment input into the Williams River.

Activities Not Likely to Adversely Affect; No Effect

The following components of the proposed action have resulted in "may affect, not likely to adversely affect" or "no effect" determinations for candy darters and are not likely to cause adverse modifications to their proposed critical habitat. They are described in Appendix A, Table A-1 and will not be further discussed in this Opinion, except for canopy tree removal:

- Terrestrial Site Preparation
- Shoulder and Ditch Reconditioning
- Small Roadside Ditch Culvert Installations and Riprap Placement
- Road Construction (Repairs and Paving)
- In-water Equipment Operation Noise
- Work at MPs 7.7 and 10.8 on FR 150 and at MP 1.13 on FR 133

Terrestrial Site Preparation:

Canopy Tree Removal

A total of 37 trees are expected to be cut during implementation of this project. The effects of tree clearing are expected to be localized, as over the project area, there are few trees being cleared and the areas affected by this activity are distributed throughout the 19.06 mile length of the Action Area. Most tree clearing involves few trees in areas along FR 86 that are on the

roadside or bank in flood-damaged areas. At MPs 0.2, 8.9, 9.1, 9.5, and 15.8 along FR 86, the removal of 6 or fewer trees in these areas will likely have no effect on the candy darter or its habitat because vegetation cover and stream shading is expected to experience no appreciable change as a result of this activity.

The removal of 8 trees over a 180 ft. linear length of bank at MP 10.6 is expected to have a slight effect on darter habitat through increases in stream sedimentation and water temperature at a micro-habitat scale (i.e. only the margin of the Williams River along one bank). However, increased stream sedimentation will be intermittent during the project and will last only until the embankment is constructed. Soon after completion of the work, stream sedimentation from this site is expected to be reduced when compared to the baseline condition. The potential for tree removal at this repair site to adversely affect stream temperature is limited by the relatively large volume of water in the Williams River at this location, and the fact that the bank of the Williams River along this project site currently is largely devoid of trees that provide shade for the river. The slight effect that reduced stream shading may have on water temperatures associated with lateral micro-habitat at this project site will persist until streamside vegetation is capable of restoring the current condition of infrequent patches of shade along the river margin. This particular project site extent has been field-evaluated by the aquatic ecologist at the MNF as having prototypical habitat conditions for candy darter along approximately 30% of the project site (i.e. a series of riffles and runs among boulders). The remaining 70% of this project site possesses habitat characteristics that are suitable for the species, but typically have much lower incidence of occupancy (i.e. a long pool). The low percentage of preferred habitat along the length of this project site reduces the potential for effects to individual candy darters.

At MP 16.6, minor, localized adverse effects to candy darter habitat and individuals are expected in the approximately 2400 ft^2 LOD where 12 trees are to be cleared. The removal of these trees may result in localized increases in water temperature and sedimentation. In this area, a short segment of White Oak Fork that is canopy-covered in its baseline condition will be exposed to solar radiation. White Oak Fork may experience a slight increase in stream temperature at this project site where shading effects from the existing forest canopy would be reduced. This localized effect to the water quality will be more pronounced, though still very minor, during the late summer/early fall period of the year. During this time period, ambient air temperatures tend to be at their greatest value, stream flows tend to be at their lowest levels, and pH values tend to moderate, which likely results in habitat conditions in White Oak Fork becoming more accommodating for individual candy darters to emigrate from the Williams River. Although there is no current research regarding candy darter movements, it is thought that they may exhibit tendencies to move to cooler tributaries with rising main-stem water temperatures (S. Welsh, WVU, phone call with B. Smrekar and A. Murnane, Service, November 30, 2018). Furthermore, other *Etheostoma* and *Percina* darter species may make seasonal movements related to water temperature increases (Mundahl and Ingersoll 1983; Schaefer et al. 2003). Thus, individual candy darters may be deterred from accessing the project site in White Oak Fork during project construction. Changes in micro-habitat conditions could result in candy darter avoidance or movement from the affected area. The limited spatial extent of the potential adverse effects from

canopy removal of 12 trees and the incremental change that is expected when compared to baseline conditions indicate the current suitability of habitat for candy darters in White Oak Fork should be preserved.

The largely in-tact forest surrounding the Williams River watershed, the fact that many of the project activities will significantly reduce or eliminate sediment inputs into the River, the narrowing of the channel in locations of embankment repair, which will return the bank to approximate pre-flood dimensions (see Beneficial Effects section), and the fact that all land within the Action Area, as well as most of the areas along the entire length of the main stem Williams River are under FS jurisdiction with added protections for aquatic resources under the 2006 RFP, makes it likely that the species and its habitats should recover within a few years from any adverse effects of the project. Additionally, the rural nature of the Williams River area means that even on non-FS owned lands, development should be fairly limited. The Action Area should not have the usual suite of impediments to recovery that rivers located in more urbanized landscapes are subjected to; thus, it is expected that recovery of the Williams River and its tributaries from the effects of sedimentation caused by the proposed action will take no longer, and perhaps less time, than rivers in more developed locations with similar construction activities. As studies have shown, stream reaches affected by construction have typically recovered within a few years after construction; we have no evidence to suggest that the Williams River and its affected tributaries within the Action Area will not recover in this time frame.

CUMULATIVE EFFECTS

Cumulative effects are those "effects of future State or private activities, not involving federal activities, that are reasonably certain to occur within the Action Area" considered in this Opinion (50 CFR 402.02). Future Federal actions, unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. All lands within the Action Area are owned by the MNF. All actions taking place on Federal lands will require a section 7 consultation and therefore are not considered cumulative effects of the action. Therefore, no cumulative effects are expected to occur.

JEOPARDY AND ADVERSE MODIFICATION ANALYSIS

Section 7(a)(2) of the ESA requires that federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

Jeopardy Analysis Framework

"Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and

recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). The following analysis relies on 4 components: (1) Status of the Species, (2) Environmental Baseline, (3) Effects of the Action, and (4) Cumulative Effects. The jeopardy analysis in this Opinion emphasizes the rangewide survival and recovery needs of the listed species and the role of the Action Area in providing for those needs. It is within this context that we evaluate the significance of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Destruction/Adverse Modification Analysis Framework

The final rule revising the regulatory definition of "destruction or adverse modification of critical habitat" became effective on March 14, 2016 (81 FR 7214). The revised definition states: "Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features."

The following analysis relies on 4 components: (1) Status of Critical Habitat, (2) Environmental Baseline, (3) Effects of the Action, and (4) Cumulative Effects. For purposes of making the destruction or adverse modification determination, the effects of the proposed federal action, together with any cumulative effects, are evaluated to determine if the critical habitat rangewide would remain functional (or retain the current ability for the physical or biological features [PBFs] to be functionally re-established in areas of currently unsuitable but capable habitat) to serve its intended conservation/recovery role for the species.

Analysis for Jeopardy/Adverse Modification

Effects to Individuals –The proposed action includes electrofishing and relocation of darters, in-water embankment repairs, temporary channel diversions, the installation of a coffer dam, and bridge and culvert replacements. As discussed in the Effects of the Action, potential effects of the action include adverse effects to adult and juvenile candy darters present within the Action Area during the construction period (typically from Late March to mid-December) and to YOY and eggs from nests that were hatched or laid late in the spawning period, which is typically estimated to be from April 15 through June 30 in West Virginia. Effects generally stem from increased sedimentation, and include localized loss or degradation of stream habitat essential for sheltering, foraging, and spawning; increased mortality of eggs, YOY, juveniles, and adults; increased vulnerability of adults to predation; reduced reproductive success; induced physiological stress; reduced feeding and weight loss; reduced prey availability; and reduced survivorship. Effects of sedimentation are expected to occur within 0.25 miles downstream of in-water work areas. Additional adverse effects include direct mortality or injury of adults,

juveniles, YOY, and nests laid late in the spawning season in areas of in-stream rock placement; direct mortality of adults, juveniles, and YOY when sandbags are placed in the water for diversions and the cofferdam; and direct mortality or injury during collection and relocation of adults and juveniles.

The adverse effects of sedimentation to individuals are expected to be limited, both in scope and severity, due to the implementation of several project conservation measures. The commitment to working during low-flow conditions allows for more effective control of sedimentation generated during in-water work, as well as a decrease in the total extent of in-water work, owing to greater exposure of banks along the Williams River and its tributaries. Other conservation measures, such as enhanced ESCs, the use of a debris shield over streams during existing structure demolitions, the use of geotextile fabric and mechanical placement of rocks during embankment repairs, and the use of temporary channel diversions and a cofferdam should further reduce both streambed disturbance and new sediment inputs to aquatic resources. Reductions in sedimentation are expected to lessen adverse effects to all life stages of the candy darter. Work occurring in tributaries to the Williams River is expected to adversely affect a very small number of individual adult and juvenile darters.

Individual adult and juvenile candy darters are expected to move away from areas of active in-water work and will be collected and removed from areas that will be dammed and dewatered. Although YOY and eggs have limited mobility/are immobile and are too small to be captured during dewatering procedures, adherence to the proposed conservation measure restricting work during the spring spawning period reduces their exposure to sediment deposition and direct crushing during project activities.

Effects to Proposed Critical Habitat- The Action Area includes 19.06 miles of proposed critical habitat within the Williams River, which constitutes a substantial amount of the total amount of proposed critical habitat within the Williams River subunit (58.5%). Modification of in-river habitat is expected to occur over 4.5 miles of the river, or approximately 23% of the Action Area during in-water work related to embankment repairs, which is approximately 2.5% of the Upper Gauley proposed critical habitat unit, and 1.2% of the total proposed critical habitat for this species.

As discussed in the Effects of the Action, potential effects of the action to the proposed critical habitat in the Williams River include increased embeddedness of cobble and gravel substrate, increased water turbidity, and possible alterations in the macroinvertebrate prey base and availability. However, these effects are expected to be limited in relative severity, as most of the sediment disturbance in the proposed habitat will come from sediments already present in the watershed; and very few new sediment inputs are expected to be added to the system. While there may be some short-term and immediate changes in critical habitat conditions due to suspension and then re-deposition of substrate sediments disturbed during embankment repairs, there will be very little net change in sediment accumulation within the sediment effect areas. Because of the site-specific assessment of the Williams River within the Action Area, we know

that each 0.25 mile stretch of the stream contains at least 1, and up to 3 separate pool/riffle habitat sequences; therefore, we can infer that effects to the habitat will be an alteration of the matrix of unembedded and embedded gravel, cobble, and boulders present in each 0.25 mile stream reach effected by sediment disturbance from embankment repairs.

Beneficial Effects to the Species and Proposed Critical Habitat- Repair of the continually eroding banks along FR 86 is expected to have a long-term beneficial effect on the candy darter and its habitats within the Action Area by reducing or eliminating some of the sources of continued sediment input into the Williams River. Given the Conservation Measures that will be implemented during project activities, including the requirement that in-water work will only be conducted in periods of low flow, as well as the relatively short duration of much of the in-stream work, much of the project effects are expected to be sub-lethal to individual candy darters. Furthermore, the embankment repairs are expected to improve long-term habitat conditions for the candy darter in the Action Area. Each sediment effect area should still have areas of unembedded, suitable cobble and gravel habitat, after disturbed in-stream substrate re-settles. Additionally, turbidity in the affected reaches is expected to decrease as a result of stabilization of the continually-eroding banks, and will likely reduce turbidity throughout the Williams River, with time. After a possible initial decline in benthic invertebrates, populations are expected to rebound, and macroinvertebrates that require clean water, such as mayflies, which are a preferred prey items of the candy darter, may even increase.

In summary, we anticipate effects to individual candy darters in either their annual survival or reproductive rate. We do not expect that project activities will appreciably diminish the ability of the proposed critical habitat in the Williams River to support the survival and recovery of the candy darter.

Effects to Populations – As we have concluded that individual candy darters are likely to experience effects to their annual survival or reproductive rates, we need to assess the aggregated consequences of the anticipated effects on the population to which these individuals belong.

Candy darters present in the project Action Area are part of the Williams River population, which is part of the Upper Gauley River metapopulation. Most of the effects of sedimentation on individual candy darters in the project area are expected to be sub-lethal; therefore, we do not expect the Williams River population to be effected by a large reduction in numbers. Although there are no numbers available for the Williams River population, the abundance estimate for the Williams River candy darter population is generally good, and this area is currently contributing to the maintenance and recovery of the species (Service 2018a). We do not anticipate a long-term reduction in this subpopulation's fitness because candy darters are likely to be present in suitable habitat located upstream and downstream of the Action Area that will not be affected by project activities. Additionally, although across its range the most serious threat to the survival of the species is increasing hybridization with the variegate darter, the Williams River candy darter population, and the entirety of the Upper Gauley metapopulation are mostly genetically pure, and project activities will not have any effect on the genetic health of the population. The

population in the Williams River is also connected to other populations within the Upper Gauley watershed, so reductions in annual survival or reproductive rates of individuals in the Action Area can likely be replaced through natural dispersal and migration from other populations within the Upper Gauley system, without the possibility of introduction of variegate darter alleles.

Finally, we expect the long-term distribution of the candy darter population in the Williams River to be unchanged. The Williams River candy darter population in the Action Area will be adversely affected at different times during the 26 month project implementation timeline; however, not all portions of the population will be effected at once, or for the same length of time. As we are considering the entire length of the Williams River to be suitable habitat (Service, 2018a), it is expected that many adult and juvenile candy darters will move away from effected areas, and return to their current (or an extended) distribution in the River over time, after project completion. Individuals are expected to redistribute throughout the Action Area post-construction, given the expected beneficial reductions of sediment inputs into the River in the many locations of bank slope failures throughout the Action Area. Therefore, only a small portion of the overall population will experience reduced survival or reproductive rates, and these effects are anticipated to be short-term in nature. The proposed action is not expected to cause any long-term adverse effects to the Williams River candy darter population.

As we have concluded that Williams River population of candy darters is unlikely to experience reductions in in fitness, there will be no harmful effects (i.e., there will be no reduction in RND) on the species as a whole.

CONCLUSION

We considered the current overall declining rangewide status of candy darter and the Upper Gauley River watershed metapopulation's possibly more stable condition. We then assessed the effects of the proposed action and the potential for cumulative effects in the Action Area on individuals, populations, and the species as a whole. As stated in the Jeopardy Analysis, we do not anticipate any reductions in the overall RND of the candy darter. It is the Service's Opinion that the ERFO (2), (3), (4), (5) project, as proposed, is not likely to jeopardize the continued existence of the candy darter and is not likely to destroy or adversely modify proposed critical habitat. The Service expects long-term beneficial effects to the Williams River candy darter critical habitat, due to the restorative nature of project activities on the Williams River and its tributaries.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined in section 3 of the ESA as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to

include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering (50 CFR § 17.3). 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 ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by the FHWA and FS so that they become binding conditions of any grant or permit issued to the federal contractor(s), as appropriate, for the exemption in section 7(o)(2) to apply. The FHWA and FS have a continuing duty to regulate the activity covered by this incidental take statement. If the FHWA and FS: (1) fail to assume and implement the terms and conditions or (2) fail to require the federal contractor(s) to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of Section 7(o)(2) may lapse. To monitor the effect of incidental take, the FHWA and FS must report the progress of the action and its effect on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The anticipated take from the proposed action is described in Table 2 below. Because of the variations in types of effects anticipated form the project, take has been estimated in two different ways, depending on project subactivity.

Numerical take of individual candy darters anticipated from electroshocking and relocation activities was estimated using the results of electroshocking surveys performed in portions of the Williams River by the WVDNR. Because no survey lengths were recorded for the electroshocking results provided by WVDNR, we calculated a range of estimated survey areas, based on the median stream length and width of typical WVDNR electrofishing survey methodology. A range of candy darter density estimates were then calculated by using the range of estimated survey areas and the number of candy darter captures in Williams River electrofishing surveys. We then applied the greatest calculated estimate of candy darter density to the electrofishing effect areas associated with the project. Estimating take in terms of number of individuals affected for these types of activities is the most practical and easiest means of determining when take has been exceeded, because individual candy darters will be captured and handled during the electrofishing effort.

In addition to the number of candy darters that may be taken during electroshocking activities, the Service anticipates take from habitat degradation stemming from the effects of sedimentation during in-water project repairs in the Williams River and from in-stream rock placement in the Williams River and sandbag placement during channel diversions. In these cases, take in terms of amount of habitat affected will be used as a surrogate.

50 CFR 402.14(i)(1)(i) states that surrogates may be used to express the amount or extent of anticipated take provided the Opinion or incidental take statement (ITS): (1) describes the causal link between the surrogate and take of the listed species; (2) describes why it is not practical to express the amount of anticipated take or to monitor take-related effects in terms of individuals of the listed species; and (3) sets a clear standard for determining when the amount or extent of the taking has been exceeded.

The following ITS will use the total amount of in-stream habitat where rocks will be placed during Type III embankment repairs in the Williams River and during sandbag placement for channel diversions (direct effect area) and the amount of aquatic habitat contained within the Williams River subject to the effects of sedimentation generated during project implementation (indirect effect area), as a surrogate because determining the exact numerical limits on the amount of incidental take are not practical, as described below.

The direct effect area includes a total of 12,740 ft^2 (0.29 acres) from in-stream rock placement, plus an additional 618 linear feet of in-stream sandbag placement. The indirect effect area includes the aquatic habitat in the Williams River, bank to bank in width and for a length of 0.25 miles downstream of the Type III embankment repairs and temporary channel diversions, which is a total of 23,760 linear feet (or 4.5 miles). The Service believes that these aquatic habitat areas will serve as reasonable and appropriate surrogates for incidental take of candy darters. Although these activities may result in the harm, injury, or death of candy darters, these effects are the result of modifications to candy darter habitat. Effects to habitat from these activities are more easily quantifiable, and measurable means of monitoring habitat-related effects are readily available.

Site specific assessments of the Williams River have determined that the existing pool/riffle sequences should restrict the effects of sedimentation to a 0.25 mile downstream area of all in-water work areas. The implementation of daily turbidity monitoring during in-water project activities will assess the extent of effects related to in-water work and ensure that take limits are not exceeded. Turbidity is not expected to impair aquatic systems (including aquatic fish), if turbidity readings are consistent with the following conditions, which are based on the WV Department of Environmental Protection water quality standards (47CSR2), section 8.33 (2016), as well as the Oregon and Washington state standards (electronic references, Accessed July and August 2019):

- When background turbidity levels are at 50 NTUs (Nephelometric Turbidity Units) or less, turbidity measurements will not exceed 10 NTUs over the background measurement taken prior to in-stream work activities; OR

- When background turbidity levels are higher than 50 NTUs, turbidity measurements will not exceed a 10% increase (plus 10 NTU minimum) over the background measurement taken prior to in-stream work activities.

Increases in turbidity are known to have lethal and sub-lethal effects on fish species (see Effects of the Action section); however, a thorough review of research conducted on the responses of a variety of salmonids and non-salmonids to differing levels of turbidity in locations across the United States and Canada has indicated that turbidity levels that are consistent with the boundaries set above will provide adequate protection to fish and other aquatic organisms (summarized in Bash et al. 2001; USEPA 2003). If these water quality standards are met at the downstream extent of the 0.25 mile sediment effect area, the project will be within the take anticipated for this project.

The ESA does not require use of precise, empirical scientific data to make decisions, but instead requires use of the best available scientific and commercial data to make determinations within specified statutory time frames. Therefore, when lacking empirical data, the Service must make science-based assumptions in its decision-making process. This is often the case when the Service must complete its effects analysis, jeopardy and adverse modification determinations, and incidental take statements based on data that is incomplete, and lacks site-specific, empirical data.

For the candy darter, it is not practical to express the amount of anticipated take in terms of individuals over the Action Area, except for where the electrofishing activities are occurring in very specific sites. For electrofishing and relocation activities, individual candy darters will be handled and counted. However, for habitat related effects, it would be impracticable to monitor the number of individuals candy darters present within the 4.5 miles of habitat affected by this project. Attempts to capture and monitor the total number of individuals present within the affected area would result in additional disturbance and potential injury to the fish and may be more disruptive to the overall population than the project-related effects themselves.

Additionally, it is not practical to monitor take-related effects in terms of individual candy darters for the following reasons: 1) the number of individuals within the Action Area at the time of project implementation will be unknown; 2) encountering dead or injured individuals during or following project implementation is unlikely, except for electrofishing activities; 3) candy darter losses may be masked by annual fluctuations in numbers or other natural causes; 4) loss of YOY and eggs, which are small and difficult to detect, would be difficult to quantify; 5) most incidental take is expected to occur as harm, due to sub-lethal levels of sedimentation and water quality degradation, which temporary disrupt movement, breeding, feeding, and sheltering of individuals are likely undetectable and unmeasurable; and 6) incidental take that occurs as harm resulting in injury or death from larger amounts of sedimentation and habitat degradation would be difficult to determine.

However, because changes in stream turbidity before, during, and after in-water work activities can be readily identified, measured, and monitored, this surrogate is the most reasonable means for detecting when take may be exceeded. While working outside of the evaluated parameters (e.g., work zones, seasonal or timing restrictions, and specified acreages) does not automatically

mean that take has been exceeded, these events provide a clear trigger that requires the FHWA and FS to reinitiate consultation, during which the Service will determine whether incidental take has been exceeded since detection of individuals taken, as described above, it not practical.

Table 2. Amount and type of anticipated incidental take.

Species	**Amount of Take Anticipated (Number of Individuals)**	**Amount of Take Anticipated (Surrogate)**	**Life Stage when Take is Anticipated**	**Type of Take**	**Take is Anticipated as a Result of**
Candy Darter	(a) 15 (b) 5 (c) 5	N/A	Adults or juveniles	Kill, Harm	Electrofishing and relocation in (a)Williams River, (b) White Oak Fork and (c) 4 tributaries
Candy Darter	N/A	(a) 12,740 ft^2 (b) 618 linear feet	All	Kill, Harm	Injury or Crushing from (a) In-water rock placement in the Williams River, (b) Sandbag Placement in Channel Diversions and Cofferdam
Candy Darter	N/A	23,760 linear feet (4.5 mi) and width of Williams River, bank to bank	All	Harm (most sub-lethal)- or Kill	Temporary Reduction in Survival, Recruitment, and Distribution as a Result of Increased Turbidity in the Williams River

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize take of candy darters:

1. The FHWA shall implement all planned ESC BMPs and conservation measures as described in the project description to avoid or minimize to the greatest extent possible, sedimentation and water quality degradation of the Williams River.

2. Prior to in-stream construction in the Williams River at MP 10.6 on FR 86, and in Bridge Creek, Hateful Run, Little Lick Branch, and Elbow Branch, FHWA shall relocate all fishes from the dewatering area to a suitable upstream location nearby.

3. FHWA shall provide information to individuals involved in project construction on how to avoid and minimize potential effects to candy darters and their proposed or final critical habitat.

4. FHWA shall appropriately restore all terrestrial construction work areas and in-stream work areas, as specified in the project description BA, Appendices, and all associated project addendums, upon project completion.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, the FHWA and FS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

Terms and Conditions Related to RPM 1

1a. FHWA shall implement all required measures as described in the BA, including sediment ESC BMPs, as described in the associated project plan sheet Appendices, and other supplemental project information.

1b. FS engineers or aquatic specialists shall make occasional site visits to active work areas (minimum of two to three times a month) to observe and confirm that all Conservation Measures are being met. FS will notify the FHWA and the Service of any failures to meet these Measures.

1c. The FHWA shall ensure that the Service-approved monitoring plan is fully implemented during project activities.

1d. Where pool size, depth, and velocity allow, install sediment curtains in the Williams River within the 0.25 mile downstream sedimentation effect area to further reduce the spread of sediments.

Terms and Conditions Related to RPM 2

2a. The Service-approved Electrofishing and Relocation Plan shall be implemented by a qualified biologist, in possession of appropriate federal and state permits. Qualified biologists from the MNF, who are in possession of appropriate permits and with sufficient experience may perform this task.

2b. The relocation area for candy darters shall be located outside of any other in-stream work area and the 0.25 mile downstream sediment effect area associated with in-stream work areas.

2c. Within 30 days of the completion of electrofishing activities, FHWA or FS shall submit a report to the Service documenting incidental take of candy darters. The report will specify the actual number of individual candy darters that were effected and include photos, measurements, and the sex (if determinable) of all candy darters that were relocated.

2d. FHWA shall keep block nets (exclusion nets) on site, and install them at the ends of temporary channel diversions, if candy darters or other fish species are observed in the temporary channels.

Terms and Conditions Related to RPM 3

3a. Prior to any project work activities, FHWA shall notify all prospective and current project contractors of the presence of federally endangered species in the project area and the special provisions necessary to protect them, including the reasonable and prudent measures listed in this document. The contractor(s) shall be instructed on the importance of the natural resources in the project area and the need to ensure proper implementation of the required erosion and sedimentation controls, invasive species prevention measures, and spill avoidance/remediation practices. The contractor(s) shall also be instructed on the importance of careful equipment operation practices that will limit accidental sediment inputs into the Williams River and its tributaries during near-stream earth-moving activities, as well as limit substrate disturbance during in-stream rock placement activities.

3b. The FHWA shall include the following conditions (language) in all construction and demolition contracts awarded for project implementation:

i. Federally endangered species are present in the Action Area and there is a risk of unauthorized take (ESA section 9 violation) if the attached Terms and Conditions of the Service's Opinion are not closely followed.
ii. Best Management Practices for erosion and sedimentation control shall be in place before, during, and after any work is conducted and until revegetation of disturbed soil has achieved 70% coverage.
iii. Contractors shall monitor the Action Areas daily when the sites are active and not stabilized, and as soon as possible following severe storms or snow melt, when the sites are inactive and/or otherwise stabilized, to ensure the erosion and sedimentation control and spill avoidance practices are implemented and effective. Action shall be taken as soon possible to correct malfunctioning erosion and sedimentation control practices.

Terms and Conditions Related to RPM 4

4a MNF aquatic specialists shall provide FHWA or its contractor with guidance during the replacement of boulders and rocks removed during in-stream construction and in temporary channel diversion areas. MNF aquatic specialists shall evaluate each site condition prior to work activities, so that guidance can be formulated and provided during restoration efforts after completion of the project. Rocks and boulders shall be replaced or removed as deemed appropriate to return the stream channel to approximate pre-flood conditions, such that channel stream flow, velocity, discharge, and channel roughness, width, depth, and slope will be restored.

MONITORING AND REPORTING REQUIREMENTS

1. The FHWA and FS shall notify the Service, in writing (digital format), regarding the projected and actual start dates, progress, and completion of the electroshocking and relocation activities and verify that the take of candy darter was not exceeded, and all conservation measures were followed in a report, **within 30 days of electroshocking and relocation completion**.

2. The FHWA and FS shall notify the Service, in writing (digital format), regarding the projected and actual start dates, progress, and completion of the project activities and verify that the take of candy darter in the in-stream sediment effect areas was not exceeded, and all conservation measures were followed in a report, **within 30 days of the completion of work in each of the sections (2, 3, 4, and 5)**.

3. The FHWA and FS shall notify the Service of any unauthorized activities (regardless of who conducted said activities) or emergencies resulting in any adverse effects not described in the BA and addressed in this Opinion. This notification shall be made within 48 hours or sooner, if possible.

4. Any high water event that disturbs the construction areas and results in failure or overtopping of the cofferdam or temporary channel diversions must be reported to the Service at the contact number/email address provided below **within 48 hours of the incident**.

5. The FHWA and FS shall make all reasonable efforts to educate personnel to report any sick, injured, and/or dead candy darters located during project-related activities. Care must be taken in handling any dead specimens of proposed or listed species to preserve biological material in the best possible state. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead specimens does not imply enforcement proceedings pursuant to the ESA.

The reporting of dead specimens is required to enable the Service to determine if take is reached or exceeded and to ensure that the terms and conditions are appropriate and effective. Upon locating a dead specimen, notify the Service's West Virginia Field Office at the phone number listed below.

6. The contact for these reporting requirements is as follows:

Field Supervisor
U.S. Fish and Wildlife Service
West Virginia Field Office
90 Vance Drive
Elkins, WV 26241
Attn: Briana Smrekar
briana_smrekar@fws.gov
(304) 636-6586

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA 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 implement recovery plans, or to develop information.

The Service recommends that the FHWA and FS consider implementing the following conservation actions:

- Perform additional turbidity monitoring at varying distances downstream of effect areas, and for various project activities that are expected to effect in-stream habitat, so that more accurate information regarding the extent of effects for construction activities can be determined.

- Provide funding for population abundance and distribution surveys of candy darters in the Williams River.

- Provide funding for population dispersal and migration studies in the Williams River watershed.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the request for consultation on the candy darter for WV ERFO FS 2016-1 (2) (3) (4) and (5). As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions regarding this Opinion, our response to your concurrence requests, or our shared responsibilities under the ESA, please contact Briana Smrekar of my staff at (304) 636-6586, Ext. 22, or at the letterhead address.

Sincerely,

Daphne Carlson Bremer

Daphne Carlson Bremer, DVM, PhD
Acting Field Supervisor

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Mr. Kevin Rose
August 9, 2019

Appendix A. Table A-1. Potential Effects of Project on Candy Darter (*Etheostoma osburni*).

Construction Activity	***Sub-activity***	***Interaction*** *Direct interaction (crushing, trampling, etc.) OR Indirect interaction (Stressor)*	***Resources exposed*** *to Direct interaction or Indirect interaction (Stressor)*			***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to Individuals***	***Effect to Population***	***Avoidance Minimiza-tion Mitigation***	***Effects remaining***	***Determin-ation*** *(No Effect, Not Likely to Adversely Affect, Likely to Adversely Affect)*
			Resource or Individuals (if direct)	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Migration/ Dispersal)*						
Terrestrial site preparation	Clearing and grading	Sedimentation, vegetation NNIS	Habitat, Individuals	Adults, Juveniles, Young of the Year (YOY), Eggs	Breeding, Feeding, Sheltering, Dispersal	No response anticipated	Negligible	Negligible	#4, 5, 6, 7, 28, 29, 30, 31, 33, 34, 35, 38, 39, No in-water work	Could increase surface runoff temporarily, small amounts of sedimentation could escape ESC BMPs into aquatic resources	NLAA
	Select tree clearing	Sedimentation and Increased Stream Temperature	Localized at a micro-habitat scale (stream substrate and water quality), Individuals	Adults, Juveniles, YOY	Feeding, Sheltering	Avoidance, Stress, Displacement	Negligible to reduced survivorship	Negligible	#3, 4, 5, 6, 7, 33, 39, No in-water work	Reduced shade leading to localized changes in micro-habitat (in the extreme margins of the river)	NLAA

Embankment and Side Slope Repairs (project-wide on FR 86)	Type I and II Embankment Repair	Sedimentation, Habitat and Water quality degradation	Habitat, Individuals	Adults, Juveniles, YOY, Eggs	Breeding, Feeding, Sheltering	No response anticipated	Negligible	Negligible	#1, 4, 5, 6, 7, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, No in-water work	Minor amounts of sedimentation could escape ESC BMPs, Alteration of bank habitat	NLAA
	Type III Embankment Repair and Type III Embankment Repair with a Key	Crushing/Injury (area of rock placement)	Individuals	Adults, Juveniles, YOY, Eggs	Breeding	Mortality, Injury, Avoidance, stress	Reduced survivorship Stress, Increased energy expenditure	Negligible	#1, 2, 26, 42	There may still be a limited number of eggs/YOY left in spawning locations at the beginning of July. Although most adults and juveniles may move away from the disturbance, YOY and eggs are less mobile/ immobile.	LAA

		Sedimentation, Habitat degradation, Water quality degradation, Alteration in habitat	Habitat, Individuals	Adults, Juveniles, YOY, Eggs	Feeding, Breeding, Sheltering	Mortality, Injury, Stress, Avoidance, Loss of and change to habitat, Increased energy expenditure, Stress, Reduction or alteration in prey population	Reduced fitness (extra energy expense to avoid area), Reduced survivorship, Reduced recruitment	Reduced reproduction Reduced numbers, Reduced distribution	#1, 2, 6, 7, 9, 12, 17, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42	Because of the in-stream placement of rocks, it is not possible to use ESC BMPs at the edge of the water in these work sites; thus in-stream sedimentation is expected; Water quality and habitat degradation, Permanent alteration of bank and streambed habitat.	LAA
	All	Long-term reduction in sedimentation due to stabilization of actively-eroding banks, Improved water quality	Habitat, Individuals	Adults, Juveniles, YOY, Eggs	Feeding, Breeding, Sheltering, Dispersal	Increased habitat and water quality	Increased survivorship, Increased reproduction, Connectivity to populations	Increase in distribution, Increased numbers	N/A	N/A	Long-term BE
Electroshocking, Capture, Relocation of candy darters in White Oak Fork, the	Electroshocking and Capture	Capture, Collect, Handle, Transport	Individuals	Adults, Juveniles	Breeding	Stress, Injury, Mortality, Increased energy expenditure	Reduced survivorship Reduced recruitment, Reduced connectivity	Negligible to reduced numbers	# 2, 19, 20, 21, 22	Some captured individuals may experience stress, injury, or death due to electroshocking	LAA

Williams River at MP 10.6, Elbow Branch, Bridge Creek, Hateful Run, and Lick Branch										and handling. YOY may be present in Williams River, but will be too small for capture.	
	Relocation	Handle, Release	Individuals	Adults, Juveniles	Breeding, Feeding, Sheltering	Stress, Increased energy expenditure, Competition	Reduced survivorship Reduced recruitment	Negligible to reduced numbers	# 2, 19, 20, 21, 22	May experience increased competition or predation after relocation.	LAA
Temporary Stream Diversions (3 types): 1)Temporary Diversion Channel; 2)Temporary Bypass Dam/Pipe Diversion; 3)Phased Sandbag/Barrier Diversion At White Oak Fork (WOF), Elbow Branch, Bridge Creek, Hateful Run, Lick Branch	Construction of Temporary Stream Diversion	Sediment pulses, Temporary habitat degradation, Temporary abandonment of site, Temporary habitat loss, injury or crushing by sandbags	Habitat, Individuals	Adults, Juveniles, YOY, Eggs	Feeding, Breeding, Sheltering, Dispersal	Limited mortality or injury, Avoidance, Stress, Displacement	Reduced fitness (extra energy expense to avoid, relocate), Reduced survivorship (few individuals)	Reduced reproduction and numbers	# 1, 2, 4, 8, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 28, 29, 30, 32, 33, 37, 38, 40, 42, 43	Effects to Williams River are expected to be limited to downstream sediment impact areas; Effects in tributaries are expected to expose a few individuals	LAA
	Operation of Temporary Stream Diversion	Change in water flow pattern and velocity, Localized habitat degradation, Temporary habitat loss	Habitat, Individuals	Adults, Juveniles, YOY	Dispersal, Sheltering	Localized Avoidance in Williams River, Limited injury and mortality to individuals	Reduced fitness (extra energy expense to avoid), Reduced	Negligible	# 1, 2, 5, 8, 10, 12, 15, 16, 17, 23, 24, 28, 29, 30, 32, 33, 37, 38, 40, 42	Localized habitat degradation at location of diversion discharge into Williams River (except WOF), temporary	LAA

						in WOF only	survivorship (WOF only)			habitat loss in tributary	
	Removal of Temporary Stream Diversions	Sediment pulses, Temporary habitat degradation, Temporary abandonment of site, Temporary habitat loss	Habitat, Individuals	Adults, Juveniles, YOY, Eggs	Feeding, Breeding, Sheltering, Dispersal	Limited mortality, Injury, Avoidance, Stress, Displacement	Reduced fitness (extra energy expense to avoid, relocate), Reduced survivorship (few individuals)	Reduced reproduction and numbers	# 1, 2, 5, 6, 7, 14, 24, 28, 29, 30, 31, 32, 33, 37, 38, 40, 42	Effects to Williams River are expected to be limited to downstream sediment impact areas; Effects in tributaries are expected to expose a few individuals	LAA
Cofferdam in Williams River on FS 86, at MP 10.6	Cofferdam Construction	Sediment pulses, Temporary habitat degradation, Temporary abandonment of site, Temporary habitat loss Crushing or Injury from sandbags	Habitat, Individuals	Adults, Juveniles, late-season YOY	Dispersal (Adults and Juveniles) Sheltering (late-season YOY)	Avoidance, Stress, Displacement Limited mortality, injury	Reduced fitness (extra energy expense to avoid area), Reduced survivorship Reduced connectivity among the population	Reduced numbers	# 1, 2, 4, 9, 10, 11, 12, 15, 17, 18, 19, 20, 21, 22, 23, 24, 28, 29, 30, 32, 33, 37, 38, 40, 42, 43	While work is planned outside spawning season (April 15 to June 30), there may still be some late-season YOY at the beginning of July; the pool area of the cofferdam installation is YOY habitat. Although most adults and juveniles may move away	LAA

										from the disturbance, YOY have limited mobility	
	Cofferdam Operation	Sedimentation/ Habitat degradation, Temporary habitat loss, Change to water flow	Habitat	Adults, Juveniles, YOY	Dispersal	Avoidance, Stress, Displacement	Reduced fitness (extra energy expense to avoid area), Reduced survivorship Reduced recruitment	Temporary Reduction in distribution	# 1, 2, 5, 9, 10, 12, 15, 17, 23, 24, 28, 29, 30, 32, 33, 37, 38, 40, 42	Temporary habitat loss, Temporary change in water flow	LAA
	Cofferdam Removal	Change to water flow, Sedimentation	Habitat	Adults, Juveniles, YOY	Dispersal (Adults and Juveniles) Sheltering (YOY)	Avoidance, Alteration of habitat due to downstream scouring or upstream sediment deposition, Limited mortality, Injury, Stress	Reduced connectivity among the population, Reduced survival	Reduced distribution numbers	# 1, 2, 5, 6, 7, 24, 28, 29, 30, 31, 32, 33, 37, 38, 40, 42	Sediment plumes, Habitat degradation	LAA

Culvert Replacements and Riprap Placement	Roadside Ditch Culvert Replacement (various locations along FR 86)	Stormwater runoff and sedimentation	Habitat, Individuals	Adults, Juveniles, YOY, Eggs	Feeding, Breeding, Sheltering, Dispersal	Negligible to Localized Avoidance	Negligible to reduced fitness (energy expense)	Negligible	#4, 5, 6, 7, 28, 28, 29, 30, 31, 32, 34, 35, 36, 37, 38, 39, 40, 41, 42 No in-water work	Roadside vegetation left in place on one side allows for infiltration and some sedimentation to settle out before discharge through culverts into the Williams River bank; Stormwater runoff and drainage from the roadway has been the historical , baseline condition and does not represent a change in pre-project conditions; No appreciable effects from this activity.	NLAA

	Large Pipe Culvert Replacement with a Box Culvert FR 133, MP 1.19 (unnamed tributary to White Oak Fork)	Sedimentation, Habitat and water quality degradation, Change to water flow	–	–	–	–	–	–	#1, 2, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 16, 17, 23, 25, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 43	None, Work site and downstream sediment impact area are 0.53 miles from any potential habitat in the White Oak Fork and 1.1 miles to Williams River; with AMMs, no effects	NE
	Large Pipe Culvert Replacement with a Box Culvert (FR 86, MPs 5.9 at Hateful Run and 9.5 Lick Branch)	Sedimentation, Permanent alteration in bank and water flow	Habitat, Individuals	Adults, Juveniles	Migration/ Dispersal	Avoidance	Reduced fitness (energy expense)	Negligible	#1, 4, 5, 6, 7, 8, 10, 12, 13, 14, 17, 24, 25, 28, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42	Permanent alteration in bank and water flow, Effects are limited to the few individuals expected to be in the tributaries	LAA
Bridge Replacements On FR 86, MPs 6.7 (Bridge Creek) and 10.8 (Elbow Branch)	Current Bridge Removal, New Bridge Construction, Placement of Riprap	Sedimentation, Permanent alteration in bank and water flow	Habitat, Individuals	Adults, Juveniles	Migration/ Dispersal	Avoidance	Reduced fitness (energy expense)	Negligible	#1, 4, 5, 6, 7, 8, 10, 12, 13, 14, 17, 24, 25, 28, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42	Permanent alteration in bank and water flow, Effects are limited to the few individuals expected to be	LAA

										in the tributaries	
Culvert Replacement with a Bridge FR 86, MP 16.6 (White Oak Fork-WOF)	Culvert Removal	Sedimentation, Habitat and water quality degradation	Habitat, Individuals	Adults, Juveniles	Feeding, Sheltering, Migration/ Dispersal	Avoidance	Reduced fitness (energy expense)	Negligible	#1, 2, 4, 5, 8, 12, 17, 23, 24, 25, 28, 29, 33, 34, 35, 36, 37, 38, 39, 40, 42	Effects are limited to the few individuals expected to be in WOF, Small amount of sedimentation may escape the diversion area	NLAA
	Bridge Placement	Sedimentation, Habitat and water quality degradation, Permanent alteration of banks, Change to water flow and velocity	Habitat, Individuals	Adults, Juveniles	Feeding, Sheltering, Migration/ Dispersal	Avoidance, Stress, Displacement	Reduced fitness	Negligible	#1, 2, 4, 5, 6, 7, 8, 13, 14, 17, 23, 24, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42	Effects are limited to the few individuals expected to be in WOF, Permanent change in banks at the stream, Change to water flow and velocity	LAA

	Temporary Bridge Installation and Removal	Sedimentation from in-stream debris removal, Temporary habitat and water quality degradation	Habitat, Individuals	Adults, Juveniles	Feeding, Sheltering	Avoidance, Stress, Injury and mortality	Negligible to reduced survivorship	Negligible	# 1, 2, 4, 5, 6, 7, 28, 29, 30, 31, 32, 36, 37, 38, 39, 40, 42	Effects are limited to the few individuals expected to be in WOF, Adults and juveniles may avoid the area during initial sediment pulses during debris removal, Injury and mortality from sediment pulses possible	LAA
	Temporary Bridge Operation	Water quality degradation	Habitat	Adults, Juveniles	Feeding, Sheltering	No response expected	Negligible to reduced survivorship Reduced recruitment	Negligible	#4, 5, 6, 7, 40	None	NLAA
	Bridge over WOF, Culverts restricting flow will be removed	Increase in potential habitat	Individuals	Adults, Juveniles	Feeding, Sheltering, Migration/ Dispersal	Increased habitat availability	Increased access to cold water refugia during late summer/early fall, Connectivity of populations	Increase in distribution Survivorship	N/A	Water flow will be improved, Increased access to 0.33 miles of potentially suitable habitat upstream	BE

Reconditioning of Roadside Shoulders and Ditches	Grading, Repair to Shoulders, Clear Vegetation	Sedimentation, Vegetation NNIS	Habitat, Individuals	Adults, Juveniles, YOY, Eggs	Breeding, Feeding, Sheltering, Dispersal	No response anticipated	Negligible	Negligible	#4, 5, 6, 7, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, No in-water work	Could increase surface runoff temporarily, Small amounts of sedimentation could escape ESC BMPs into aquatic resources, Stormwater discharge into Williams River bank	NLAA, no change from baseline conditions
Road Construction	Saw-cutting of damaged portions of roadway, Aggregate base placement, Asphalt concrete pavement	Sedimentation, Vegetation NNIS, Chemicals	Habitat, Individuals	Adults, Juveniles, YOY, Eggs	Breeding, Feeding, Sheltering, Dispersal	No response anticipated	Negligible	Negligible	#4, 5, 6, 7, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, No in-water work	Could increase surface runoff temporarily, Small amounts of sedimentation could escape ESC BMPs into aquatic resources	NLAA
Additional Work Sites with no connecting water source (FR 150, MPs 7.7 and 10..8)	MP 7.7- parking lot repairs and MP 10.8- roadside repairs	-	-	-	-	-	-	-	No connecting water sources to work areas, No in-water work	None	NE

In-water Equipment Operations		Noise	Individuals	Adults, Juveniles	Feeding, Sheltering	Localized Avoidance possible	Negligible to Stress	Negligible	#2, 8, 9, 18, 19, 26, 27, 33, 42 Most locations of excavations are isolated work cells, Working in the dry	Some small noise during in-water rock placement, Limited by mechanical rock placement	NLAA

Mr. Kevin Rose
August 9, 2019

Appendix B. CONSULTATION HISTORY

06-07-18 The Service received the initial request for consultation for WV ERFO FS 2016-1 (2), (3), (4), (5), (6), and (7). This BA stated that there would be no in-water work and no effects to the candy darter.

07-30-18 The Service sent concurrence on WV ERFO FS 2016-1 (3), (4), (6), and (7); FWS File Numbers: 2018-I-0950 and 2018-I-0997. Sections (2) and (5) were not reviewed by the Service at that time, due to missing project information.

10-24-18 The Service received a request for Section 7 consultation on the candy darter for the WV ERFO FS 2016-1 (5) Repair of Storm Damaged Roads (FRs 86 and 150) on the MNF project. The agencies determined that due to in-water work, the proposed activity "may affect, is likely to adversely affect" the candy darter.

01-29-19 The Service received a request for formal consultation on the candy darter in the WV ERFO FS 2016-1 (2), (3), (4), (5) Repair of Storm Damaged Roads (FR 86, FR 133, and FR 150) in the MNF BA when the proposed project activities changed and it was determined that the amount of in-water work necessary to complete the project was greatly expanded. Concurrence was also requested for Indiana bat, NLEB, Virginia spiraea, shale barren rockcress, northeastern bulrush, and SWP for WV ERFO FS 2016-1 (2) and (5). A BA was received by the Service 1/29/19. FWS File Number 2019-F-0289 assigned.

03-07-19 The Service asked for and received clarification of seed mixes used on the FS lands from A. Coleman.

03-18-19 The Service determined there was insufficient information to initiate consultation. The Service and FHWA had a call to discuss questions about and clarifications needed for the project BA.

03-21-19 The Service sent a document to FHWA summarizing the discussion and questions/clarifications needed to for the BA.

03-26-19 FHWA sent link giving the Service access to project plan sheets and shapefiles

03-27-19 Updated BA received by the Service

04-12-19 Service requested and received additional project information from the FS regarding potential candy darter habitat in tributaries to the Williams River

04-15-19 Service requested a site visit

05-07-19 Site visit with Service, FHWA, and FS personnel

05-24-19 Service requested and received additional information from FS on the stream diversion options that could be employed during the project

05-29-19 The Service determined there was insufficient information to initiate consultation. The Service sent an email document to FHWA and FS detailing outstanding questions and additional information or clarifications necessary for a complete BA

06-04-19 Service received additional project information and clarifications from FHWA; Service sent BA guidance documents to FHWA

06-05-19 Call between the Service, FHWA, and FS to discuss outstanding questions and clarifications on the updated BA.

06-07-19 Updated BA received via email by the Service. The Service subsequently determined that this BA contained sufficient information to initiation consultation.

06-07-19 Revised shapefiles and project plan sheets received via email by the Service

06-11-19 Hardcopy of updated BA received by the Service

06-20-19 Updated project plan sheets and project effect areas received via email by the Service

06-24-19 Project Effects Assessment on candy darter Critical Habitat received via email by the Service

06-28-19 Additional project information on the environmental baseline of the Action Area received via email by the Service

07-12-19 The WV FS ERFO 2016-1 (2) FR 425 project effects to the FR 425 RBC population were analyzed under a separate Opinion, FWS File #2019-F-0288.

07-25-19 Draft Turbidity Monitoring Plan was received by the Service.

08-01-19 Service sent draft Reasonable and Prudent Measures (RPMs) and Terms and Conditions (Ts and Cs) to FHWA and FS and received comments back from FS. Second draft of the Turbidity Monitoring Plan was received by the Service.

08-02-19 Service sent comments on Turbidity Monitoring Plan to FHWA and FS. Service discussed RPMs and Ts and Cs with FWHA in a phone call.

cc:
MNF Elkins - Connor
MNF Elkins - Jones
MNF Richwood- Raione
MNF Richwood- Bard
MNF Marlinton - Taylor
Project File
Reader File
ES:WVFO:BSmrekar:skd:8/9/2019
Filename: P:\1 - Users\Briana Smrekar\ERFO FS 2016-1 (3,4,5) FR 86, 150, 133\Final_08092019_WV_ERFO_2_3_4_5_Biological Opinion.docx