Area while noise is occurring is relatively unlikely. Thus, the probability of Virginia big-eared bats being harmed or harassed during migration due to Project activities is insignificant and discountable.

8.4.2 Direct Effects on Habitat

The Project would not directly impact any suitable caves within counties adjacent to Fayette County. Therefore there would be no effects on potential winter hibernating, summer roosting, autumn swarming, spring staging or migration habitat for Virginia big-eared bat.

8.4.3 Indirect Effects

8.4.3.1 Detrimental Actions

To the extent that sedimentation resulting from construction of the MVP within Project-adjacent waterbodies reduces flying insects in these resources, the Project could have an effect on Virginia big-eared bats in the area. However, since Virginia big-eared bats do not occur within the Action Area except, potentially during migration, this effect is insignificant and discountable.

8.4.3.2 Beneficial Actions

Project Area restoration includes planting of native seed mixes within temporary work areas and subsequently allowing forest regeneration. Woodland edges provide high quality foraging and commuting habitat. Restoration using native herbaceous species in the permanent right-of-way and continuous maintenance would provide suitable foraging and commuting habitat for Virginia big-eared bats.

8.4.4 Determination of Effects and Rationale

Based on the lack of summer captures during field surveys and absence of occupied roosting or hibernating cave habitat for the species within the Action Area, no direct or indirect effects on the species would be expected. Therefore, a ***Not Likely to Adversely Affect*** determination is appropriate for Virginia big-eared bats.

8.5 ROANOKE LOGPERCH

Analyses of effects on Roanoke logperch as a result of Project construction and operation are restricted to areas of known, occupied habitat, where the species is presumed to be present, and areas of suitable habitat, where the species has the potential to be present. This includes 13 stream crossings where presence of the species is assumed present and impacts could occur. Known, occupied habitats include the North Fork Roanoke (three crossings), Roanoke (one crossing), and Pigg (one crossing) Rivers. Suitable habitats (and assumed occupation) occur in the North Fork Blackwater River (one crossing), Blackwater River (one crossing), Little Creek (two crossings), and portions of Bradshaw (two crossings), Teels (one crossing), Maggodee (one crossing), and Harpen (one crossing) Creeks. No instream construction activities would occur at one of the crossings of the North Fork Roanoke River due to the crossing being an access road across an existing bridge, thus only 13 crossings are relevant to impacts on the species. Potential effects of

Project activities on individuals and habitat are addressed in the sections below. Based on this analysis, the Project is expected to harass 3,618 Roanoke logperch and harm 29 Roanoke logperch. In the final EIS, we recommend that Mountain Valley use the HDD method to cross the Pigg River in Pittsylvania County, Virginia. A successful HDD crossing would eliminate instream disturbance and would likely reduce potential impacts on Roanoke logperch in the Pigg River and thereby reduce the number of Roanoke logperch expected to be harassed or harmed. However, the HDD method could result in an inadvertent release of drilling fluid into the river. An inadvertent release of drilling fluid would result in sedimentation and turbidity, the effects of which are described in section 4.1.3.1. If the HDD crossing were to be unsuccessful or deemed infeasible, Mountain Valley would revert to the originally planned dry open-cut crossing method. We are including the analysis of the dry open-cut crossing of the Pigg River to account for the worst-case scenario.

8.5.1 Direct Effects on Individuals

Project activities with potential to affect Roanoke logperch include (but are not limited to) instream, benthic disturbances (e.g., use or operation of machinery and equipment within a stream, trenching, blasting, etc.), upland disturbances (e.g., erosion, sedimentation), water-uses (e.g., hydrostatic testing, hydroseeding, dust control), noise, and artificial lighting. Effects on individuals by life stage are addressed in the sections below. Adults and subadults are individuals one year old or older. As defined in section 7.5.4.1, YOY are individuals born within the past year. The methods and results of predictive models used to estimate abundance of logperch are provided in appendix C and summarized in section 7.5.4.

8.5.1.1 Adults and Subadults

Effects on adults and subadults (i.e., Age-1+) can be broken up into three spatial scales: effects within the construction workspaces; effects downstream of the construction workspaces; and effects from sedimentation due to construction in upstream catchments. Each of these are addressed further below, beginning with effects within the construction workspaces.

Effects within the Construction Workspaces

The greatest potential for harm and harassment of individuals is due to instream construction activities. Although Roanoke logperch may demonstrate avoidance behaviors, individuals hiding under substrates may be susceptible to harm by being crushed by heavy equipment operations and construction in the stream. It is assumed that all individuals occupying a proposed stream crossing within the construction workspace could be subject to harm as a result of instream disturbance activities.

Effects from Removal and Translocation

Per recommendations from the VADGIF to minimize this risk of harm, Mountain Valley would remove fishes, including Roanoke logperch (where present), from instream disturbance areas (including, but not limited to, cofferdam, dewatered areas, and/or the pipeline construction footprint) immediately prior to instream construction activities (including blasting). Therefore, Roanoke logperch would be removed to the extent possible from the construction workspace and would not be susceptible to direct harm from construction and machinery. Depletion fish surveys

would be performed by approved and permitted biologists via electrofishing techniques and seining within an isolated area between the upstream and downstream limits of construction. All collected fishes would be translocated downstream of the construction area.

Depletion fish survey efforts would be conducted within isolated areas until no fishes are collected for several consecutive passes. All collected fishes would be temporarily held in aerated containers until transported and released downstream (minimum of 50 feet) of the Project footprint (per VADGIF recommendation). Harm estimates assume proper fish handling techniques and careful vigilance by collectors of the ambient weather and water conditions that exist at the time of depletion fish surveys.

All Roanoke logperch encountered during depletion fish surveys are considered harassed per the definition of take under the ESA, and a fraction of individuals encountered could sustain harm (i.e., injury or mortality). Fishes are harassed by the physical act of collections, handling, temporary holding, translocating to alternative habitat(s), and subsequent isolation from previously occupied habitat. Harm rates caused by electrofishing surveys, a permitted activity under scientific collection permits, have been known to vary widely accordingly to species and the specific aquatic environment. Harm rates of electrofishing for Roanoke logperch are unknown; however, Cooke et al. (1998) documented an 8 percent harm rate (e.g., direct mortality or internal hemorrhaging) in benthic stream fishes as a result of standard electrofishing techniques.

Seining poses an inherent risk of crushing individuals by the collectors or the grinding movement of large substrates as a seine is hauled across the substrata; however, this harm rate is likely less than the electrofishing rate noted above. During fish collections, darters are often observed seeking shelter under larger substrates. Any physical disturbance of sheltering rocks could inadvertently harm individuals via crushing.

Roanoke logperch are mobile organisms and are expected to survive translocations without significant adverse effects. Roanoke logperch have exhibited movements greater than 1.9 miles, and individuals often make intra-site movements of 49.2 feet or more (Roberts et al., 2008). Translocated individuals would be returned to areas within the same waterbody in adjacent areas that demonstrate similar habitat qualities as where they were captured. All translocated individuals would be moved downstream of the Project crossing to prevent individuals washing via currents into the construction footprint.

To calculate harm and harassment due to the fish removal, Mountain Valley estimated abundances of Roanoke logperch within the 75-foot construction right-of-way at crossings of known-occupied habitats (i.e., North Fork Roanoke, Roanoke, and Pigg Rivers) and potentially occupied habitats that are proposed to be crossed by the Project (i.e., Bradshaw Creek1, Bradshaw Creek AR [MN-276], North Fork Blackwater River, Blackwater River3, Maggodee Creek1, Teels Creek4, Little Creek1.5, Little Creek2, and Harpen Creek1). Note the following pertinent information regarding four of the Project crossings:

- North Fork Roanoke River AR1 (MN-0268.01) occurs at an existing, private, access road traversing the river via a ford crossing. The existing access road ford crossing is located approximately 361 feet upstream of the Project crossing of the North Fork Roanoke River and is included as part of the Project construction workspace . MVP would make upgrades to the access road and would improve the stream crossing installing a temporary, single-span bridge thereby eliminating instream construction

activities at the crossing location beyond installation of the bridge. A 40-foot construction right-of-way is applied at this stream crossing.

- The Project Area includes Reese Mountain Road as an access road during construction efforts. Reese Mountain Road traverses North Fork Roanoke River (AR2, MN-276.03) via an existing bridge that spans the river. No instream construction activities are proposed, and consequently, no site-specific impacts on Roanoke logperch would be anticipated.
- Bradshaw Creek AR (MN-0276) is composed of two existing stream crossings within a 92-foot stream reach. A single access road approaches Bradshaw Creek, splits near the stream crossing, and then rejoins after the crossing. The upstream crossing is composed of a multi-box, concrete culvert. The downstream crossing of Bradshaw Creek occurs downstream of the scour pool from the culvert (where the streambed aggrades) and is an existing ford crossing that would be upgraded to a single-span bridge.
- Based on in-situ habitat delineations conducted for mussel surveys for the Project, the proposed crossing of the Roanoke River is completely contained within a suitable patch for adult and subadult Roanoke logperch.

Because the proposed crossing of the Roanoke River is completely contained within a suitable patch for adult and subadult Roanoke logperch, an estimate of the expected abundance is used for take estimates rather than the expected density estimate. According to the site occupancy model (see appendix C), 181.57 individuals are expected in the suitable patch which is 3,692 square feet (0.32 acre) in size. The construction right-of-way for the crossing is estimated at 14,111 square feet (0.09 ac). Thus, an estimate of the number of adult and subadult individuals within the Action Area is made by multiplying the expected abundance by the proportion of the area of the patch that intersects the Action Area (i.e., 181.57 × [3,692/14,111] = 47.51).

For all other crossings, estimates of the number of adult or subadult Roanoke logperch within the Action Area are calculated as follows:

Eq. 6 $$N_{Adult} = D_{Adult} \times 0.0142$$

In this equation D_{Adult} is the density estimate for the specific waterbody (table 8.5.1.1-1) and 0.0142 is the width (75 feet), in miles,) of the Action Area at stream crossings.

Individuals may be harassed by the physical act of collections, handling, temporary holding, translocating to alternative habitat(s), and subsequent isolation from previously occupied habitat. Individuals may be harmed by sustaining injury (e.g., internal hemorrhaging) or direct mortality as a result of electrofishing during depletion surveys. It is assumed that 8 percent of individuals occupying the construction right-of-way are harmed (Cooke et al. 1998), and the remaining number of individuals are harassed. Because it is impossible to harm a portion of an individual, all estimates were rounded up to the nearest integer. Thus, total harm and harassment for the 13 stream crossings where logperch are assumed present and instream activities are proposed to occur is estimated at 16 and 55 adult individuals, respectively (table 8.5.1.1-1).

Other potential effects within the construction workspace include blasting, noise, water use, artificial lights, water use, and leaks and spills. The potential effects for each mechanism are discussed further below.

TABLE 8.5.1.1-1

Estimated Densities, Expected Number of Individuals, and Respective Harassment and Harm Estimates Within the Action Area at Stream Crossings for Adult and Young-Of-The-Year (YOY) Roanoke Logperch

Stream Name	County a/	Adult Density (fish /mile) b/	YOY Density (fish /mile) b/	Expected Adults in Construction Right-of-Way c/	Expected YOY in Construction Right-of-Way c/	Adult Harassment c/	Adult Harm c/	YOY Harassment c/	YOY Harm c/
North Fork Roanoke River	Montgomery	96.8	69.8	1.4	1.0	1	1	0	1
North Fork Roanoke River AR1 (MN-268.01) d/	Montgomery	96.8	69.8	0.7	0.5	0	1	0	1
Bradshaw Creek AR (MN-276) e/	Montgomery	85.6	61.6	1.5	1.1	1	1	1	1
Bradshaw Creek1	Montgomery	89.9	64.8	1.3	0.9	1	1	0	1
Roanoke River	Montgomery	680.7	490.4	47.5	7.0	44	4	6	1
North Fork Blackwater River	Franklin	31.3	22.5	0.4	0.3	0	1	0	1
Teels Creek4	Franklin	31.6	22.8	0.5	0.3	0	1	0	1
Little Creek1.5	Franklin	38.5	27.7	0.6	0.4	0	1	0	1
Little Creek2	Franklin	39.6	28.6	0.6	0.4	0	1	0	1
Maggodee Creek1	Franklin	50.9	36.7	0.7	0.5	0	1	0	1
Blackwater River3	Franklin	240.2	173.1	3.4	2.5	3	1	2	1
Pigg River	Pittsylvania	412.7	297.3	5.9	4.2	5	1	4	1
Harpen Creek1	Pittsylvania	6.9	5.0	0.1	0.1	0	1	0	1
					Total	**55**	**16**	**13**	**13**

a/ All counties listed are within Virginia.

b/ Density estimates were derived using the methods summarized in section 7.5.4 and detailed in appendix C.

c/ Expected number of adults and YOY within the construction right-of-way were calculated using Eq. 2, except for the Roanoke River and access roads. Harassment and harm estimates were rounded up to the next integer for each crossing.

d/ The construction right-of-way of North Fork Roanoke River AR1 (MN-268.01) is 40 feet).

e/ The construction right-of-way of Bradshaw Creek AR (MN-276) is 92 feet).

Effects from Blasting

Although Mountain Valley has yet to determine whether blasting would be necessary at any of the occupied or assumed occupied streams (blasting would be a last resort after mechanical attempts to dislodge rock prove to be unsuccessful), impacts from its use are possible if the proper preventative measures are not employed. Impacts on fisheries from blasting vary by species (Yelverton et al., 1975), and documented injuries incurred by fish exposed to blasting include eye distension, multiple hemorrhages, hematuria (blood in the urine), and damage to a variety of systems (Hastings and Popper, 2005; Godard et al., 2008; Carlson et al., 2011; Martinez et al., 2011). Higher mortality has been found in fish that are smaller, closer to the blast, and at increased water depths (Yelverton et al., 1975; Munday et al., 1986). Should blasting be necessary, it would be conducted according to an approved Project blasting plan and would only be conducted at waterbody crossings once the trench corridor has been isolated from the waterbody and all Roanoke logperch have been translocated from the Project footprint. Thus, there is no potential for direct impacts on individuals within the construction right-of-way from blasting.

Noise Impacts

Noise may have potential impacts on individuals as well. A comprehensive review of studies performed on the effects of anthropogenic noises on fishes was completed by Popper and Hastings (2009) and concluded that the effects of anthropogenic sound on fishes cannot be extrapolated between species, specific conditions, or sound emissions. The majority of research performed on the effects of submerged anthropogenic noise includes explosions, airguns, and pile driving. The former is addressed in the context of blasting activities, and the latter two noise emissions are not applicable to the Project activities. Existing data do not provide adequate evidence to show that noise associated with Project activities would adversely affect Roanoke logperch.

Impacts from Artificial Lighting

In addition to noise, artificial light could also be a disturbing factor for individuals. However, the use of artificial lighting would be localized at the Project crossing and temporarily used at the time of instream construction. Although the Roanoke logperch is a benthic riverine species, it is a diurnal forager, and therefore is not likely subject to significant impacts from the temporary presence of artificial lighting.

Impacts from Leaks and Spills

Equipment and vehicles would be transporting or operating with diesel fuel and oil, thereby posing risks of an accidental spill of compounds that could inadvertently enter nearby waterways. These risks are minimal, but omnipresent, within the limits of Project activities and beyond. Mountain Valley has developed a Project-specific SPCC Plan and Unanticipated Discovery of Contamination Plan for Construction Activities to minimize the risk of spills and would implement procedures to minimize any adverse effect, in the event a spill occurs. Potential impacts associated with spills and leaks would be insignificant and discountable.

Effects Downstream of the Construction Workspaces from Instream Construction Activities

Anthropogenic sedimentation can be introduced to streams via upland land disturbances that enter waterways as well as direct instream construction activities. Although upland disturbances can be accounted for by a hydrological analysis of sedimentation (discussed in the following section), such an approach is designed to estimate sedimentation from water runoff across a landscape and thus cannot be used in isolation to accurately understand sedimentation and hydrological impacts from instream construction activities. Sedimentation would likely increase in the immediate vicinity of each pipeline crossing as a direct result of instream substrate disturbances (e.g., trenching), primarily once the water is returned to the construction right-of-way The spatial extent of the sedimentation from stream crossings is currently unknown and is likely dependent on the geological composition and river velocities. To account for sedimentation and hydrologic alteration at each stream crossing as a result of direct instream construction, it is assumed that a 2,625-foot downstream buffer would receive elevated levels of sedimentation that could result in harassment of individuals. This spatial extent is derived from preliminary informal consultation between Mountain Valley and the FWS in Virginia.

To calculate the number of individuals present within this area, the same approach used to calculate effects within the construction right-of-way is applied. Density estimates specific to the each stream length within the drainage based on the 1:24,000 NHD are used to calculate the number of individuals present within each 2,625-foot reach downstream of the construction right-of-way. A 2,625-foot downstream buffer was added to all stream crossings regardless of the suitability for Roanoke logperch at the crossing. However, harassment was only calculated in areas of known or assumed occupancy. If a buffer of a crossing with unsuitable habitat extended downstream into suitable habitat, harassment estimates were made for the portion of the buffer that was suitable. When information was lacking from in-situ field assessments of habitat suitability, the screening model developed by Lahey and Angermeier (2007) was used to remotely assess the potential for Roanoke logperch occurrence (see section 7.5.4 and appendix C). An existing access road ford crossing (i.e., North Fork Roanoke River AR) is located approximately 361 feet upstream of the MVP crossing of the North Fork Roanoke River and included in the Project Area disturbed. Consequently, the downstream effects of the construction right-of-way at the access road overlap the proposed pipeline and are therefore truncated accordingly (i.e., 285.8 feet).

In total, 1,177 Age-1+ individuals would be expected to be harassed directly downstream of the Project stream crossings (table 8.5.1.1-2). This estimate includes individuals from 11 separate waterbodies with varying densities and a total stream length of 8.07 miles. Note that only 11 streams are listed because harassment estimates at multiple crossings of streams (i.e., North Fork Roanoke River, Bradshaw Creek) and buffers that extend into these streams are aggregated.

TABLE 8.5.1.1-2

Estimated Harassment for Adult and Young-Of-The-Year (YOY) Roanoke Logperch From Impacts Immediately Downstream of Pipeline and Access Road Crossings

Stream Name	Counties a/	Stream Length (mi)	Expected Adult Harassment	Expected YOY Harassment
North Fork Roanoke River	Montgomery	1.15	69.60	50.14
Bradshaw Creek	Montgomery	1.99	109.02	78.55
Roanoke River	Montgomery and Roanoke	1.00	431.54	310.93
North Fork Blackwater River	Franklin	0.80	15.79	11.38
Teels Creek	Franklin	0.35	6.96	5.02
Little Creek	Franklin	1.38	33.07	23.83
Blackwater River	Franklin	2.76	263.54	189.88
Maggodee Creek	Franklin	1.07	34.01	24.51
Jonnikin Creek	Pittsylvania	0.35	1.43	1.03
Pigg River	Pittsylvania	0.80	205.86	148.32
Harpen Creek	Pittsylvania	1.32	5.64	4.06
	Total	**12.98**	**1,177 b/**	**848 b/**

a/ All counties listed are within Virginia.
b/ Cumulative harassment estimates were rounded up to the next integer.

Effects of Sedimentation from Catchments (Upland Disturbance)

Sedimentation caused by anthropogenic activities can settle and become deposited within streams or remain suspended in the water column, increasing turbidity within the water. Increased and sustained levels of sediment load can alter fish community structure, diversity, density, biomass, growth; decrease reproduction; and cause mortality of individuals. Although most fish species can tolerate a moderate amount of variation in turbidity, higher levels of turbidity can adversely affect fish swimming abilities, reduce growth, promote disease intolerance, reduce the quality of spawning habitats, reduce food availability, and increase the rate of mortality (Robertson et al., 2006). Likewise, increased water turbidity also inhibits the amount of sunlight that penetrates the water column, which can interfere with trophic interactions (e.g., increase susceptibility to predation) and behaviors (e.g., feeding and reproduction; Henley et al., 2000).

Lower dissolved oxygen levels brought on by sedimentation have been documented to negatively affect some species of darters and other stream fish, interfering with fishes' respiratory functions and causing them to decrease in abundance or causing fish extirpation. Although some species are able to tolerate moderate fluctuation in dissolved oxygen levels, fish in small streams and tributaries often have difficulty acclimating to lower levels of oxygen and thrive in rapidly flowing, silt-free streams (Dowling and Wiley, 1986).

Siltation and sedimentation are hypothesized to be contributing factors to the reduction of the Roanoke logperch distributional range and respective population sizes (Moser, 1992). Logperch, of all age classes, are particularly susceptible to siltation impacts due to their specialized feeding strategy, unique to species within the subgenus *Percina*, which requires ample interstitial

spaces between small substrates such as gravel and pebbles. Roanoke logperch are invertivorous feeders that search for invertebrates residing beneath and on the undersides of small rounded stones. Roanoke logperch have conical snouts that allow them to grab a pebble or gravel stone with their mouths, dislodge it from the stream bottom, and flip it to search for any exposed invertebrate that may be attached to the underside of the stone or substrate beneath the stone (Rosenberger and Angermeier, 2002). This specialized feeding strategy requires that stones are available to be dislodged and flipped, exposed, unembedded, and free of silt. Roanoke logperch are typically found in mesohabitats with loose, silt-free substrates (Rosenberger and Angermeier, 2003). Siltation and sedimentation reduce the availability of interstitial spaces between substrate, compact substrates, and reduce the ability to dislodge stones, the frequency of encountering stones capable of dislodging, the exposed surface area of stones, the available foraging area within a stream, and/or space available for invertebrates to occupy. Due to this smothering of the foraging areas on the stream bottom, deposited sediment interferes with the Roanoke logperch's ability to forage (Robertson et al., 2006).

As a result of the aforementioned potential effects to normal feeding behaviors and an individual's reduced ability to find food, sedimentation and siltation from actions within the Project Area are likely to have an adverse effect on Roanoke logperch, in the form of reduced feeding efficiency and increased energy expenditures (i.e., harassment). To identify the extent of sedimentation effects, a hydrologic analysis of sedimentation was performed using the RUSLE (Renard et al., 1997). Results from the RUSLE yield generalized annual estimates of erosion rates and sediment loads based on climate, topography, and land use/management factors (section 3.2). These estimates are used to identify streams that are likely to have higher construction and post-construction sediment loads as compared to baseline, pre-construction levels.

Unfortunately, a national standard for the permissible amount of sediment to enter waterways is not available or established. Although the metrics used to assess impacts vary widely among states, tribes, and organizations, a common threshold identified is one that increases sedimentation metrics by 10 percent or more above baseline (EPA, 2003). Given that the mechanisms behind impacts of sediment can be due to either deposition or suspension (or both), total sediment load provides a reasonable metric because it addresses both suspended and deposited sediments within a stream channel. Thus, for the purposes of this analysis, stream areas with potential for impacts due to sedimentation were defined as any stream reach that increases existing total sediment load by more than 10 percent.

After accounting for sediment and erosion controls, it is expected that 22.6 stream miles with potential to support Roanoke logperch would be temporarily affected from increased sedimentation from upland Project construction. The majority (74.7 percent) of these impacts are within tributaries to the North Fork Roanoke, Roanoke, Blackwater, and Pigg Rivers; however, 5.7 miles of the North Fork Blackwater River are predicted to be affected directly. Beyond those established within the 2,625-foot buffer immediately downstream of Project crossings, no sedimentation increases in excess of 10 percent are expected within waterbodies with documented occurrences of Roanoke logperch (i.e., North Fork Roanoke, Roanoke, and Pigg Rivers). All impact reaches are areas where suitable habitat exists for the species and therefore have the potential to host the species. Using the density estimates from section 7.5.4 (see appendix C for derivation), expected harassment of adult and subadult Roanoke logperch from upland Project construction is 886 individuals (table 8.5.1.1-3).

TABLE 8.5.1.1-3

Estimated Harassment for Adult and Young-Of-The-Year (YOY) Roanoke Logperch From Impacts From Increased Sediment Loads From Upland Construction

Stream Name	Counties a/	Stream Length (mi)	Expected Adult Harassment	Expected YOY Harassment
Flatwoods Branch	Montgomery	1.44	68.78	49.55
North Fork Blackwater River	Franklin	9.21	202.06	145.59
Little Creek	Franklin	11.38	243.76	175.63
Foul Ground Creek	Franklin	5.33	109.44	78.85
Unnamed Tributary to Blackwater River	Franklin	0.68	13.77	9.92
Jacks Creek	Franklin	0.16	19.03	13.71
Parrot Branch	Franklin	1.74	201.84	145.43
Jonnikin Creek	Pittsylvania	3.65	15.01	10.81
Harpen Creek	Pittsylvania	2.77	11.96	8.62
	Total	**36.36**	**886 b/**	**639 b/**

a/ All counties listed are within Virginia.
b/ Cumulative harassment estimates were rounded up to the next integer.

8.5.1.2 Young-of-the-Year

Potential impacts are divided up by effects within the construction right-of-way, effects downstream of the construction right-of-way, and effects from sedimentation within upstream catchments just as for adults and subadults. However, because many of the mechanisms are the same as those discussed for the adults and subadults above (section 8.5.1.1); this section will focus on any differences within the types of impacts as well as calculations for estimating harm and harassment to YOY.

Effects within the Construction Workspaces

Installation of the proposed pipeline across waterbodies is limited to an instream construction footprint not to exceed 75 feet in stream length (unless specifically identified). YOY individuals would be removed from the construction right-of-way to the extent possible prior to instream construction. Similar to the approach taken with adults, it is assumed that 8 percent of individuals have potential to be harmed during this process, and the remainder are considered to be harassed via the same mechanisms discussed in section 8.5.1.1. Thus, it estimated that 13 YOY would be harmed and 13 YOY would be harassed from fish translocation measures (table 8.5.1.1-1). As with adults and subadults, no harm or harassment of YOY would be expected as a result of blasting, noise, artificial lights, water use, or leaks and spills.

Effects Downstream of the Construction Workspaces

To calculate the number of YOY present within the 2,625-foot downstream buffer of Project crossings, the same approach used to calculate effects within the construction right-of-way

was employed. Density estimates of YOY were used that were specific to a stream segment based on the 1:24,000 NHD, and the number of individuals present within each 2,625 foot reach downstream of the pipeline crossing was calculated. Cumulatively, 848 YOY are expected to be harassed directly downstream of pipeline and access road crossings (see table 8.5.1.1-2).

Effects of Sedimentation from Catchments (Upland Disturbance)

As noted in section 8.5.1, impacts on known, occupied streams from sedimentation within catchments were predicted to be largely confined to tributaries to the mainstem of the North Fork Roanoke, Roanoke, Blackwater, and Pigg Rivers. Based on the output from the RUSLE and the respective density estimates from Mountain Valley (section 7.5.4), it is expected that 639 YOY would be harassed by increased sediment loads that occur as a result of upland construction (table 8.5.1.1-3).

8.5.2 Direct Effects on Habitat

Habitats may potentially be directly affected by construction activities at varying Roanoke logperch life stages. In addition to known-occupied habitats (i.e., North Fork Roanoke, Roanoke, and Pigg Rivers), potential habitat may occur at Bradshaw Creek, North Fork Blackwater River, Teels Creek 4, Little Creek 1.5, Little Creek 2, Maggodee Creek 1, Blackwater River 3, and Harpen Creek (see section 7.5.2).

Roanoke logperch exhibits ontogenetic habitat shifts (Rosenberger and Angermeier, 2003); therefore, all available mesohabitats (i.e., riffle, run, pools) are potentially suitable for occupation at one point of its life cycle. Any significant alteration to instream habitats could potentially impact the species. Because all available habitats are potentially used by Roanoke logperch, direct effects to adults and YOY habitats are addressed; however, MVP would restore all stream contours and substrates following installation of the pipeline.

Rosenberger and Angermeier (2002) completed reach-wide habitat assessments in the upper Roanoke River to estimate the availability of mesohabitats. It is estimated that riffles (19.3 percent) and run (22.0 percent) mesohabitats comprise approximately 41.3 percent of stream reaches and pool mesohabitats comprise 58.7 percent of stream reaches. Age-1+ Roanoke logperch are likely to occupy riffle and run habitats whereas YOY are likely to occupy areas of reduced water velocities such as pool mesohabitats. Reach-wide habitat assessments were not completed in the Pigg River and Blackwater River drainages; therefore, the aforementioned mesohabitat frequencies derived in the upper Roanoke River are applied.

8.5.2.1 Adults

Habitats within the construction right-of-way of each Project crossing would be significantly, but temporarily, altered by the direct removal of substrates for installation of the pipeline. Fishes would be temporarily isolated from the construction footprint (following translocation efforts) and free to recolonize the post-construction habitats. The construction footprint would be back-filled with native materials and is anticipated to recover over time and then approximate pre-construction conditions. Alternative backfill materials would not be used because these materials may provide inhospitable habitats for Roanoke logperch. It is not likely

that habitats and substrates are a limiting resource in these waterbodies and such a limitation is not likely to result in harm as a result of direct impact to localized Project crossing locations.

Effects within the Construction Workspaces

Age-1+ Roanoke logperch are considered mesohabitat generalists and substrate specialists (Rosenberger and Angermeier, 2002). Significant alterations to habitats (i.e., substrate compositions and stability) would occur in the construction right-of-way as a result of instream construction activities (e.g., trenching, blasting, etc.). Known, occupied habitats would be significantly altered via instream construction activities at the proposed crossings of the North Fork Roanoke River, Roanoke River, and (for the purposes of this BA) Pigg River. Potential habitats would also be altered at the proposed crossings of Bradshaw Creek (right-of-way and access road), North Fork Blackwater River, Teels Creek4, Little Creek1.5, Little Creek2, Maggodee Creek1, Blackwater River3, and Harpen Creek (table 7.5.3-1). The extent of impacts would occur along 75 feet of stream reach at each of the 11 pipeline crossings, 40 feet at the North Fork Roanoke River access road, and 92 feet at the Bradshaw Creek access road. The total length of habitats occupied or potentially occupied by Roanoke logperch that would likely be affected is about 957.0 feet of stream reach. It is assumed that Age1+ suitable habitats (i.e., riffles and runs) occur at a frequency of 41.3 percent of stream reaches (Rosenberger and Angermeier, 2002); therefore, it is expected that 395.2 feet of Age-1+ habitat is projected to be affected. Habitat and substrates are likely not a limiting resource within these waterbodies; therefore, it is unlikely that the temporary disturbance of this amount of habitat would significantly alter any biological patterns of the species (e.g., feeding, sheltering, or reproduction) and therefore would not result in individuals harmed.

Effects Downstream of the Construction Workspaces

Adult Roanoke logperch require un-silted, exposed, and unembedded gravel and pebble substrates for feeding. The MVP has the potential to degrade habitat quality through increased sedimentation that could occur within 2,625 feet downstream of Project stream crossings. Affected stream reaches include North Fork Roanoke River, Bradshaw Creek, Roanoke River, North Fork Blackwater River, Teels Creek, Little Creek, Blackwater River, Maggodee Creek, Jonnikin Creek (crossing is proximal to mouth with Pigg River), Pigg River, and Harpen Creek. Sedimentation from stream crossings may affect a total of 8.1 miles of stream reaches occurring in occupied habitats or potentially suitable habitats. It is assumed that Age-1+ suitable habitats (i.e., riffles and runs) occur at a frequency of 41.3 percent of stream reaches (Rosenberger and Angermeier, 2002); therefore, 3.3 miles of Age-1+ habitat could potentially be affected. However, the sediment additions are unlikely to rise to a level where habitats would be significantly altered; therefore, we would not expect this to result in individuals harmed.

Effects of Sedimentation from Catchment

Increased sedimentation from upland disturbances may adversely affect stream reaches occurring in occupied habitats or potentially suitable habitats within the upper Roanoke, Blackwater, and Pigg River drainages. In total, it is expected that 36.4 stream miles with the potential to host Roanoke logperch would be temporarily affected (i.e., 10 percent increase in sediment load) from increased sedimentation from Project construction. Assuming the frequency

of suitable habitat is 41.3 percent within stream reaches (Rosenberger and Angermeier, 2002), about 9.3 stream miles of suitable habitat may occur within the area where increased sediment loads would be expected. These elevated sediment loads in occupied and potentially occupied habitats would be only expected to occur during the construction phase of the Project. Sediment loads after restoration would be generally expected to be similar to pre-construction loads. The expected mean sediment load after restoration is 1.1 percent over baseline for those occupied and potentially occupied stream segments identified as having elevated sediment loads during construction. It is unlikely that habitat for the species would be significantly altered by this temporary sediment influx. It is therefore also unlikely the sediment influx would lead to harm of individuals.

8.5.2.2 Young-of-the-Year

Habitats within the construction right-of-way of each Project crossing may be significantly altered by the direct but temporary removal of substrates for installation of the pipeline. Fishes would be temporarily isolated from the construction footprint (following translocation efforts) and free to recolonize the post-construction habitats. The construction footprint would be back-filled with native materials and is anticipated to recover over time and then approximate pre-construction conditions. Alternative backfill materials would not be used because these materials would provide inhospitable habitats for Roanoke logperch. It is unlikely that habitats and substrates are a limiting resource in these waterbodies. The MVP is therefore unlikely to result in harm to Roanoke logperch YOY through direct impact at Project crossing locations.

Effects within the Construction Workspaces

YOY Roanoke logperch are likely to occupy pool mesohabitats with proximal access to riffle and run habitats (Rosenberger and Angermeier, 2002). Significant alterations to habitats (i.e., substrate compositions and stability) would occur in the construction right-of-way as a result of instream construction activities (e.g., trenching, blasting, ford crossings, etc.). Occupied (or presumed occupied) habitats would be significantly altered via instream construction activities at 13 proposed crossings (table 7.5.3-1). The extent of impacts at pipeline crossings would occur along 75 feet of stream reach at each of the crossings. Access roads would affect about 132.0 feet of habitat in the North Fork Roanoke River and Bradshaw Creek. The total length of habitats occupied or potentially occupied by Roanoke logperch that could be affected is 957.0 feet of stream reach. It is assumed that YOY suitable habitats (i.e., pools) occur at a frequency of 58.7 percent of stream reaches (Rosenberger and Angermeier, 2002) therefore, 561.8 feet of YOY habitat are projected to be affected. Habitats and substrates are not likely a limiting resource within these waterbodies; therefore, it is unlikely that the temporary disturbance of this habitat would significantly alter any biological patterns of YOY individuals (i.e., feeding and sheltering) and therefore would not result in individuals harmed.

Effects Downstream of the Disturbed Area

Research has identified that YOY are more vulnerable to anthropogenic sedimentation than adults (Rosenberger, 2002); however, physical harm to individuals as a result of habitat degradation has not been documented for the species. The degradation of YOY habitat quality could occur as a result of sediment that occurs within 2,625 feet downstream of Project stream

crossings from instream construction activities. These areas include the North Fork Roanoke, Roanoke, and Pigg Rivers. These downstream impacts could adversely affect a total of 8.1 miles of stream reaches occurring in occupied habitats. It is assumed that YOY suitable habitats (i.e., pools) occur at a frequency of 58.7 percent of stream reaches (Rosenberger and Angermeier, 2002); therefore, 4.7 stream miles of YOY habitat are projected to occur within this area. However, the sediment additions are unlikely to rise to a level where habitats would be significantly altered; therefore, we would not expect this to result in individuals harmed.

Effects of Sedimentation from Catchment

Suitable habitats are potentially affected as a result of upland construction activities that introduce substantial sediment loading rates into affected stream reaches. Substantial sediment loading rates from upland disturbance are anticipated to extend into nine different waterbodies for a total of 22.6 stream miles with the potential to support YOY Roanoke logperch. It is assumed that YOY suitable habitats (i.e., pools) occur at a frequency of 58.7 percent of stream reaches (Rosenberger and Angermeier, 2002); therefore, 13.3 miles of YOY habitat could be affected. As discussed above, sediment loads after restoration are generally expected to be similar to pre-construction loads, and the mean sediment load after restoration is 1.1 percent over baseline for those occupied and potentially occupied stream segments identified as having elevated sediment loads during construction. It is unlikely that habitat for the species would be significantly altered by this temporary sediment influx. It is therefore also unlikely the sediment influx would lead to harm of individuals.

8.5.3 Indirect Effects on Individuals and Habitat

Roanoke logperch have the potential to experience lasting effects from sedimentation after construction of the Project is complete. Removal of riparian vegetation decreases bank stability, increases erosion rates, and subjects individuals to augmented turbidity and suspended sediments. Sedimentation can alter food web interactions for fishes, such as the Roanoke logperch, that rely on interstitial spaces for foraging (Henley et al., 2000). Allowing more sunlight to reach the stream may also expose fishes, including Roanoke logperch, to increased predation rates via predators such as birds. Additionally, increased sun exposure may alter the instream primary productivity. This, in combination with potential influx of nutrients via sediments, can encourage algal growth on substrates. These alterations can have cascading effects that modify food web dynamics, trophic interactions, and aquatic community structure. For example, the combined effects of an influx of nutrients via overland runoff and increase in direct sunlight can cause increased primary productivity, alteration of the aquatic species assemblage, which could increase natural competitive interactions and predation rates. Examples of this include alteration of the macroinvertebrate assemblage (i.e., prey availability), alteration of the fish assemblage (e.g., more silt-tolerant or generalist species), and facilitation of colonization and/or proliferation of aquatic invasive species (e.g., Asian clam, zebra mussels).

Sediments would primarily enter streams at a short temporal scale limited to the relatively short construction duration. High water events would likely flush out most sediments or transport them downstream. However, introduced sediment, and any associated contaminants or nutrients, can be sequestered in streams and impart a legacy effect to future generations in the form of altered aquatic community assemblages and/or reduced sheltering, feeding, or breeding habitats. All of

these effects would likely occur at a localized scale and reducing the right-of-way width to 75 feet would minimize the spatial extent and overall potential of effects. To minimize the potential adverse effects along riparian corridors in perpetuity, Mountain Valley would allow revegetation along a 10-foot-wide strip of herbaceous cover centered on the pipeline (for potential maintenance purposes) and trees would be allowed to grow within 15 feet of the pipeline (although they may be selectively removed if root systems could affect the pipeline). Sedimentation modeling conducted for the Project demonstrates that sediment loads after restoration is complete would generally be expected to be similar to those during pre-construction. Furthermore, Project activities are not anticipated to introduce aquatic invasive species nor augment existing populations of aquatic invasive species within occupied streams, as Mountain Valley would implement its *Exotic and Invasive Species Control Plan*, including washing of equipment.

8.5.4 Determination of Effects and Rationale

Table 8.5.4-1 summarizes the effects determinations that are explained more fully in sections that follow.

TABLE 8.5.4-1

Summary of Effects and Effects Determinations for Roanoke Logperch

Description	Expected Harassed	Expected Harmed	Streams Affected (miles)	Effect Determination
Direct Effects on Individuals				
Adults	2,118	16	-	Likely to Adversely Affect
Young-of-the-Year	1,500	13	-	Likely to Adversely Affect
Direct Effects on Habitat				
Adults	-	-	12.7	Not Likely to Adversely Affect
Young-of-the-Year	-	-	18.1	Not Likely to Adversely Affect
Indirect Effects on Individuals	**-**	**-**	**-**	Likely to Adversely Affect
Indirect Effects on Habitat	**-**	**-**	**-**	Not Likely to Adversely Affect
Collective Take/Determination	**3,618**	**29**	**30.8**	**Likely to Adversely Affect**

8.5.4.1 Direct Effects on Individuals

Collectively throughout the Roanoke River basin, Project activities could potentially harass an estimated 3,618 individuals and harm an estimated 29 individuals of all age classes (YOY and Age 1+ individuals). Harm estimates are calculated at 13 crossings (see table 8.5.4-1), with expected harm rates for YOY and Age-1+ Roanoke logperch of 1 individual for each age class at each crossing with the exception of the Roanoke River where 4 adult individuals are expected to be harmed. Thus, the combined number of YOY and Age-1+ individuals that may be harmed is 29 Roanoke logperch. Based on these estimates, a determination of ***Likely to Adversely Affect*** is made, as further detailed in the two following subsections.

Adults

Based on the estimated number of Age-1+ Roanoke logperch in, occupied streams within the Project's Action Area, an estimated 2,118 Roanoke logperch could be disturbed by sedimentation and an additional 16 Age-1+ Roanoke logperch could be harmed during depletion fish surveys at 13 stream crossings with assumed presence. Thus, a determination of ***Likely to Adversely Affect*** is appropriate.

Young-of-the-Year

An estimated 1,500 YOY Roanoke logperch could be disturbed by sedimentation and an additional 13 YOY Roanoke logperch could be harmed during depletion fish surveys. A determination of ***Likely to Adversely Affect*** is appropriate.

8.5.4.2 Direct Effects on Habitat

Roanoke logperch occupy all available mesohabitats (i.e., riffle, run, pools; Rosenberger and Angermeier, 2003) at varying life stages. Instream and upland construction activities could temporarily and cumulatively affect 30.8 miles of occupied or suitable Roanoke logperch habitats. Critical habitat has not been designated for the species.

Adults

Direct, instream construction activities within the construction right-of-way could temporarily impact 395.3 feet of Age-1+ occupied or suitable habitats at 13 stream crossings. Construction and associated sedimentation would be likely to temporarily affect 12.7 miles of stream reaches occurring in Age-1+ occupied or suitable habitats. This estimate combines the 3.27 miles designated within 2,624.7-foot downstream buffers of the construction right-of-way with the 9.3 miles expected to be affected from upland disturbances. However, temporary destruction or degradation of habitats would not be likely to harm individuals. Further, given that no critical habitat has been designated, no impacts on critical habitat are possible. Based on this information, a determination of ***Not Likely to Adversely Affect*** is appropriate.

Young-of-the-Year

Direct, instream construction activities within the construction right-of-way could temporarily impact 561.7 feet of occupied or suitable YOY habitats at 13 stream crossings. Construction and associated sedimentation would be likely to temporarily affect 18.1 miles of stream reaches occurring in occupied habitats or suitable YOY habitats. This estimate combines the 4.7 miles designated within the 2,624.7-foot downstream buffers of the construction right-of-way with the 13.3 miles expected to be affected from upland disturbances. However, temporary habitat destruction or degradation is unlikely to harm individuals. Further, given that no critical habitat has been designated, no impacts on critical habitat are possible. A determination of ***May Affect—Not Likely to Adversely Affect*** based on impacts on habitat used by YOY is appropriate.