# Appendix H

# USFWS DOCUMENTS

# United States Department of the Interior

FISH AND WILDLIFE SERVICE

West Virginia Field Office
694 Beverly Pike
Elkins, West Virginia 26241


February 28, 2017

Ms. Amy K. Frantz
Chief, Planning Branch
U.S. Army Corps of Engineers
502 Eighth Street
Huntington, West Virginia 25701

Dear Ms. Frantz:

This constitutes the U.S. Fish and Wildlife Service's (Service) Final Fish and Wildlife Coordination Act Report and Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*; ESA) section 7 concurrence for the Bluestone Dam Safety Project in Summers County, West Virginia. This Final Fish and Wildlife Coordination Act Report (FWCAR) is being provided under the terms of the August 2015 Scope of Services Agreement between the U.S. Army Corps of Engineers, Huntington District (Corps) and the Service's West Virginia Field Office. The following comments regarding threatened and endangered species are provided pursuant to the ESA.

The Service has determined that one federally endangered species and one threatened species may be affected by the construction and operation of the project. They are the endangered Indiana bat (*Myotis sodalis*) and the threatened northern long-eared bat (*Myotis septentrionalis*) (NLEB).

Federally Listed Bats

The Service previously provided the Corps with information about federally listed species that potentially may be affected by the project in a Planning Aid Letter dated March 28, 2014. Since the Planning Aid Letter was written, the NLEB was listed under the ESA as threatened on April 2, 2015. On January 14, 2016, the Service finalized a 4(d) rule to provide measures that are necessary and advisable to provide for the conservation of the NLEB. The final 4(d) rule went into effect on February 16, 2016.

The Indiana bat may use the project area for foraging and roosting between April 1 and November 15. Indiana bat summer foraging habitats are generally defined as riparian, bottomland, or upland forest, and old fields or pastures with scattered trees. Roosting/maternity habitat consists primarily of live or dead hardwood tree species which have 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. Similar to the Indiana bat, NLEB foraging habitat includes forested hillsides and ridges, and 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, choosing 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. This bat has also occasionally been found roosting in structures like barns and sheds.

Indiana bats and NLEB use caves or mine portals for winter hibernation between November 15 and March 31. These species 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 a summer roosts. There may be other landscape features being used by NLEB during the winter that have yet to be documented.

The Service has determined that this project is not likely to adversely affect the Indiana bat and the NLEB because your project: 1) will affect a minimal amount of foraging or roosting habitat (0.7 acre); 2) is not within any of the Indiana bat or NLEB hibernacula or summer use buffers; and 3) will not affect any potential caves or mines that could be used as hibernacula for these species. Additionally, the Corps has committed to remove trees within the project area between November 15 and March 31, and will prioritize the use of existing landfills or previously disturbed upland disposal sites for excavated material, to further avoid potential impacts to federally listed bats.

Summary

As a result of this information, the Service has concluded that any tree removal associated with this project may affect, but is not likely to adversely affect the Indiana bat and the NLEB. Therefore, no biological assessment or further section 7 consultation under the ESA is required with the Service. Should project plans change or amendments be proposed that we have not considered in your proposed action, or if additional information on listed and proposed species becomes available, or if new species become listed or critical habitat is designated, this determination may be reconsidered. In the event that the Corps cannot utilize an existing landfill, or previously disturbed upland disposal sites for excavated material, they will need to reinitiate consultation and submit site specific plans for their new disposal site to this office for review and approval prior to commencing construction activities.

The Service sincerely appreciates the Corps cooperative efforts in designing the proposed project to ensure that fish and wildlife resources are protected. The Service has coordinated with the West Virginia Division of Natural Resources (WVDNR) in the development of this document, and has submitted the FWCAR to them for final review and concurrence. We are awaiting the WVDNR's response and requested that they copy you on any comments they may provide.

If you have any questions regarding this Final Fish and Wildlife Coordination Act Report or section 7 concurrence, please contact Tiernan Lennon of my staff at (304) 636-6586, Ext. 12, or Tiernan_Lennon@fws.gov.

Sincerely,

John E. Schmidt
Field Supervisor

cc:
USACE – Rebecca Rutherford
USACE – Megan Wilburn
WVNDR - Danny Bennett
Project File
Reader File
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FINAL

# FISH AND WILDLIFE COORDINATION ACT REPORT

# BLUESTONE DAM SAFETY PROJECT

# SUMMERS COUNTY, WEST VIRGINIA

February 2017

Prepared for

U.S. Army Corps of Engineers
Huntington District
Huntington, West Virginia 25701

Prepared by

U.S. Fish and Wildlife Service
West Virginia Field Office
Elkins, West Virginia 26241

## Overview

This constitutes the Final Fish and Wildlife Coordination Act Report (FFWCAR) for the U.S. Army Corps of Engineers, Huntington District (Corps), Bluestone Dam Safety Project in Summers County, West Virginia. This project proposes to modify the structure of the dam to avoid failure of the dam in the event of a Probable Maximum Flood (PMF). The purpose of this FFWCAR is to address fish and wildlife resource impacts associated with implementing the proposed project and provide recommendations for mitigation of impacts to and enhancements of those resources. This FFWCAR has been prepared in accordance with the Fish and Wildlife Coordination Act (16 U.S.C. 661-667e) (FWCA).

The FFWCAR also provides an analysis of the effects of the proposed dam modification measures and project alternatives on high quality, rare, and irreplaceable fish and wildlife resources present in and around the New River. This FFWCAR evaluates the effects of the two alternatives being retained by the Corps in the Final Environmental Impact Statement (FEIS). The No Action alternative is being presented for comparative purposes, but it does not meet the Corps Tolerable Risk Guidelines (Corps 2014). In addition to the No Action Alternative, the effects of the Tentatively Selected Plan (TSP) are being evaluated. The TSP limits permanent adverse impacts to within the existing stilling basin footprint, which is previously altered habitat that has minimal natural resource value. Other alternatives were considered and dismissed as described in the 2016 Draft Supplemental Environmental Impact Statement (SEIS), and will not be further discussed in this FFWCAR.

## Prior Studies

The U.S. Fish and Wildlife Service (Service) previously prepared a Planning Aid Letter (PAL) and a Habitat Evaluation Procedures (HEP) Report for this site to address fish and wildlife resources. The PAL for the Bluestone Dam Safety Project, dated March 28, 2014, was based on preliminary project information provided by the Corps. The PAL provided information on the fish and wildlife resources within the project site and reconnaissance areas, as well as a preliminary assessment of potential biological impacts from the proposed modification of the dam and associated habitats (Appendix B). While preparing the PAL, the Service also conducted a preliminary HEP assessment of existing riverine and riparian resources in the area immediately downstream of the dam (Appendix A). The October 28, 2013, preliminary draft HEP Report was intended to characterize current environmental conditions in the tailwater area immediately below the dam. The information in the HEP Report established the baseline environmental conditions for the project area and was used to formulate alternative risk management plans.

The Service, working as a member of the Bluestone Project Delivery Team, participated in the alternatives evaluation process, and provided technical assistance to the Corps regarding fish and wildlife resources. Based on our comments, the Corps selected the least environmentally damaging alternative, which was the TSP, out of the seven that were previously proposed. We received a summary of the Corps TSP on March 15, 2016. The Service prepared a preliminary mitigation plan on April 19, 2016 (Appendix C), to provide guidance to the Corps early in the planning process so that they could develop more detailed mitigation plans and incorporate them into the Draft SEIS. The Service prepared a Draft Fish and Wildlife Coordination Act Report on June 30, 2016 (Appendix D), which provided a preliminary analysis of effects and mitigation recommendations. The Draft SEIS was released for public and agency review on September 1, 2016.

## Description of the Study Area

Bluestone Dam is located on the New River at the community of Bellepoint, in Summers County, West Virginia, approximately 2.5 miles downstream of the confluence of the New and Bluestone Rivers, and 0.8 miles upstream of the confluence of the New and Greenbrier Rivers (Figure 1). The study area includes the water and adjacent lands of the Bluestone Project (the dam, Bluestone Lake flood control reservoir, and adjacent Federal, State, and private lands), a well as portions of the New River and its tributaries (the Bluestone and Greenbrier Rivers), and the Kanawha River and its tributaries (the Gauley and Elk Rivers). This large study area encompasses a 4,565-square-mile drainage area extending along the New River from Bluff City, Virginia, to the junction of the Kanawha River with the Ohio River at Point Pleasant, West Virginia (Figure 1). Whereas only a small portion of the study area will be directly affected by project construction, the study area is large enough to encompass the area of potential direct, indirect, and cumulative effects of a PMF event.

For planning purposes, the study area is subdivided into four reconnaissance areas: 1) Bluff City to Sandstone; 2) Sandstone to Gauley Bridge; 3) Gauley Bridge to Poca; and 4) Poca to Point Pleasant (Figure 1). For a more detailed description of each reconnaissance area refer to Appendix B.

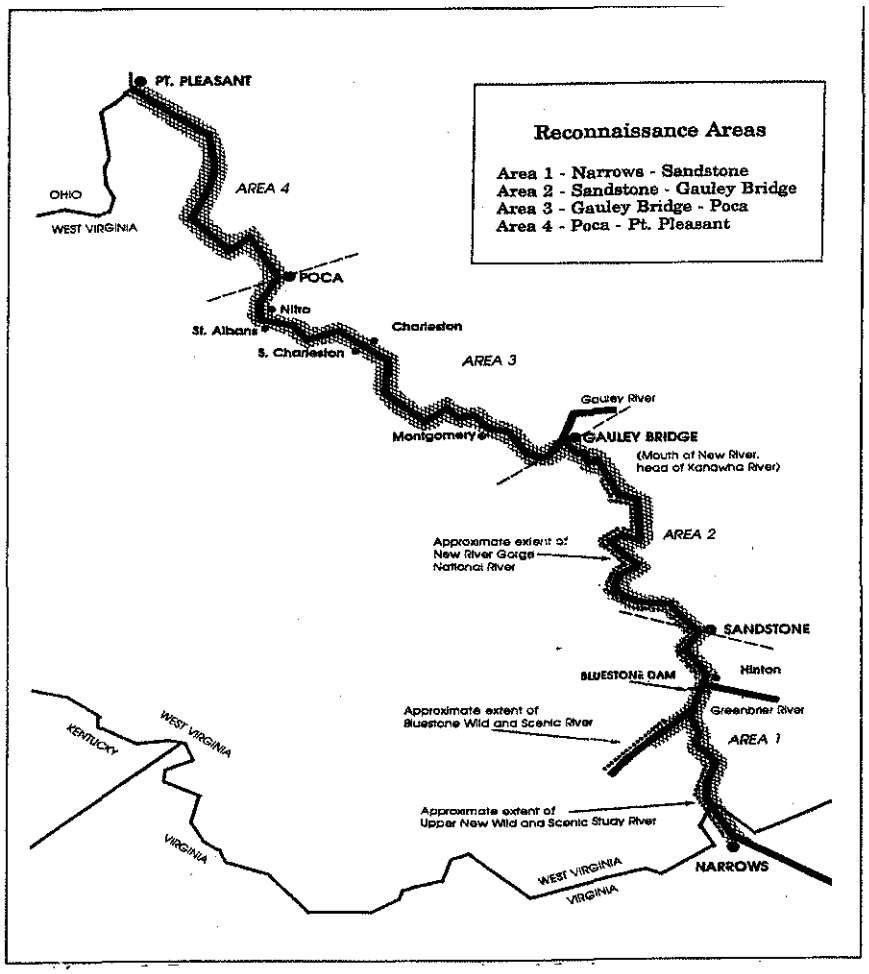


*Figure 1. Map of the entire Bluestone Dam Project study area.*

The Service anticipates that adverse impacts from the TSP would only occur in Reconnaissance Area 1, more specifically the reach immediately above and below Bluestone Dam. Therefore, the rest of this document will only focus on resources in Reconnaissance Area 1 that may be affected as a result of project construction and operation.

Aquatic habitats within the vicinity of Bluestone Dam are of high quality and considered by the Service to be unique and irreplaceable. The free-flowing reaches of the New and Bluestone Rivers above the dam, as well as the tailwaters below the dam, contain a great diversity of excellent quality fish and wildlife habitats.

The habitats in the tailwaters of Bluestone Dam include numerous islands, riverine emergent and aquatic bed wetlands, runs, riffles, and pools. The New River downstream of the dam (66 miles to its confluence with the Gauley) supports one of the best warm water fisheries in West Virginia. It features smallmouth bass, spotted bass, rock bass, flathead catfish, and channel catfish. In regard to smallmouth bass, this reach of New River supports one of the best fisheries for this species in the United States (Service 1998).

The tailwaters have numerous islands and riverine wetlands when compared to the downstream reaches in the New River Gorge National River. The riverine emergent wetlands are dominated by water willow, and are associated with shallow water areas around islands, shorelines, and riffles. The combination of runs, riffles, and pools in this reach of river is near optimum for smallmouth bass habitat (Appendix A). Refer to the PAL (Appendix B), for more information on the quality and value of fish, wildlife, and plant resources in the study area.

The Service's Draft FWCAR classified select habitats in Reconnaissance Area 1 as Resource Category 1 habitat, according to our 1981 Mitigation Policy (Federal Register, Vol. 46, No. 15, 7644-7663, January 23, 1981). The Service's 2016 Mitigation Policy (Federal Register, Vol. 81, No. 224, 83440-83492, November 21, 2016), which supersedes our previous Mitigation Policy, now classifies habitat by suitability and importance (rare habitats that are both highly suitable and important are the equivalent of Resource Category 1 in the 1981 Policy). Therefore, based on our revised Mitigation Policy, the New River and the Bluestone River, and their associated aquatic, wetland, and riparian habitats, will be referred to as high-value habitat (equivalent of Resource Category 1 habitat) throughout the remainder of the FFWCAR. The tailwaters of the Bluestone Dam are also considered to be high-value habitat.

For habitats the Service determines to be of high-value (i.e., scare and of high suitability and high importance), the Mitigation Policy states that we will seek avoidance of all adverse impacts. Because these one-of-a-kind areas cannot be replaced, all losses of existing habitat values should be prevented. Insignificant changes that do not result in adverse impacts may be acceptable.

**Project Description**

At this stage of final project planning, the Corps has discarded a large number of structural and non-structural design measures that would allow Bluestone Dam to operate under increased flood conditions. Initially, Corps staff identified approximately 85 measures (Corps 2013). Since then the Corps has eliminated many measures because they were structurally and/or economically unfeasible. Other measures were incorporated as design elements for larger overall alternatives.

Measures and/or alternatives that have been discarded will not be discussed further in this FFWCAR. The two remaining alternatives are summarized below.

Hydraulic Jump Basin with Supercavitating Baffles Alternative

This alternative has been identified as the TSP and combines various structural and non-structural design measures to ensure stability of the stilling basin and the dam during extreme flood events (Figure 2). Non-structural risk management measures were added that further reduce risk. The following structural measures are included in this alternative.

To reduce risk associated with insufficient spillway capacity, the Corps proposes to modify the existing stilling basin, which consists of a two stage system. Under this alternative, the stilling basin will remain a two stage system within the same footprint, but will include various modifications and features. The existing stilling basin (comprised of natural riverbed) will be excavated and replaced with a protective concrete overlay. The first stage baffle blocks will be demolished and replaced with new larger blocks. In order to stabilize against uplift pressures, both the existing and new concrete slabs (apron) will be anchored and a new drainage gallery (within the dam or first stage) will be constructed. The second stage basin, which consists of the second stage apron, training walls, and baffle blocks, will be reconstructed and anchored into the riverbed to ensure stability and satisfactory performance. Ten-foot high extensions of the existing spillway right and left training walls will also be installed. (Figure 2).

The stilling basin is anticipated to be constructed in two phases. In order to modify the stilling basin, a temporary construction barrier, or cofferdam or causeway, will be put in place to minimize adverse impacts to downstream habitat. A permanent divider wall will be constructed to segregate the basin in two halves so that 8 of the 16 dam sluice gates will be operational at all times during construction.

Non-structural risk management measures include: an enhanced risk communication plan (to regularly educate the downstream public of the flood risk and emergency procedures); and installing equipment that remotely operates the 21 vertical crest lift gates (in order to reduce the risk to project personnel in the event of inflows predicted to exceed top of dam).

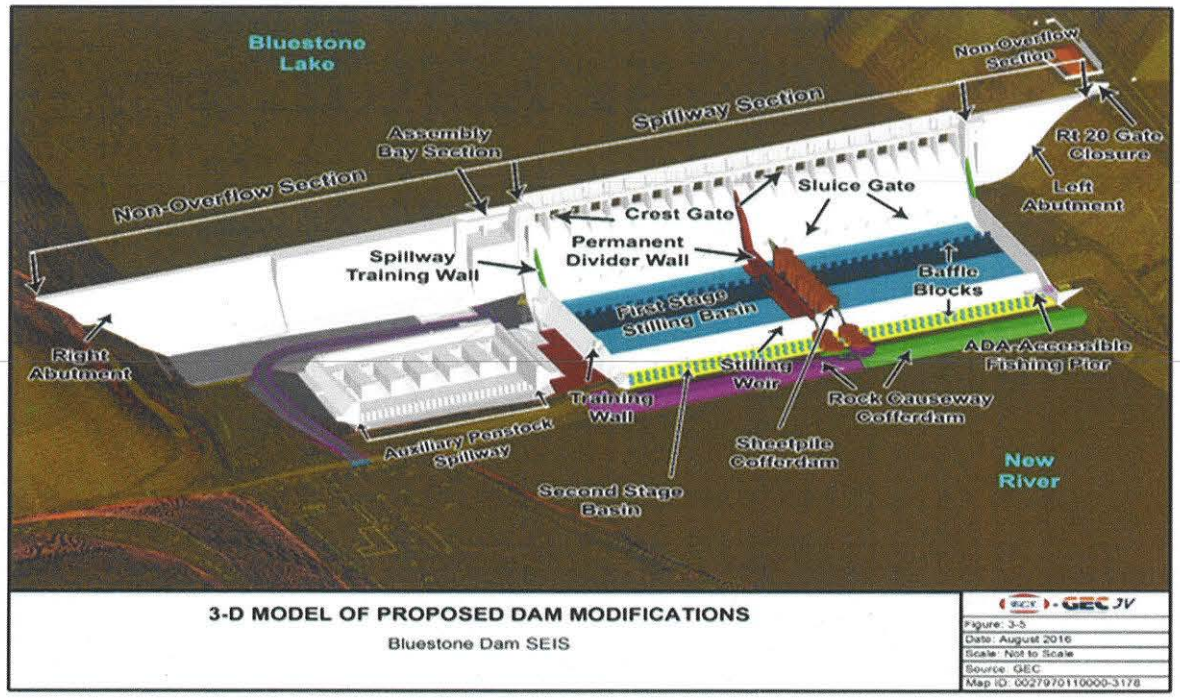


***Figure 2. 3D Diagram of the Hydraulic Jump Basin with Supercavitating Baffles Alternative.***

No Action Alternative

Under this alternative, the dam would be allowed to overtop during flood conditions. However, it is estimated that at a pool elevation of 1532' mean sea level (MSL), the dam could fail resulting in significant property damage and potential loss of life. This alternative does not fulfill the purpose of the project.

**Potential Project Effects**

Current dam operations use flood control capabilities of the dam up to 1520.0' MSL and then pass all the water the dam is able to above that level. Under the proposed action, once construction is complete, the dam would be operated according to the Corps' existing Water Control Manual. Therefore, no long-term changes in dam operations would occur that would result in adverse effects to fish and wildlife resources, and most effects of the project would occur as a result of and during project construction.

Construction impacts are likely to occur and need to be avoided or minimized to the maximum extent appropriate and practicable because of the excellent habitat downstream of the dam. These impacts are discussed in greater detail below. Impacts due to the PMF, regardless of the proposed action, were discussed in greater detail in the PAL (Appendix B).

Hydraulic Jump Basin with Supercavitating Baffles Alternative (TSP)

The Corps has worked closely with the Service to design this alternative to avoid and minimize adverse impacts to the maximum extent appropriate and practicable. The project's permanent adverse impacts to riverine habitats are restricted to the dam tailwater area within the existing

stilling basin footprint. Potential long-term temporary adverse impacts from the TSP include loss of aquatic habitat, loss/fragmentation of riparian habitat, changes to the river bottom, altered flows, increased sedimentation, and changes in water depth and velocity. The Service anticipates that direct and indirect adverse impacts would occur only in Reconnaissance Area 1, more specifically from the tailwaters of Bluestone Dam downstream to the Route 3 Bridge, and along the riparian zone in this stretch of the river. Direct downstream adverse impacts include long-term (8-10 years), though non-permanent, loss of habitat starting at the end of the existing stilling basin and extending approximately 105 feet downstream and temporary adverse impacts to tailwater recreation due to the removal of the fishing pier and access restrictions. Indirect adverse impacts from this alternative include degradation of habitat downstream due to the care and diversion of water (e.g. the use of cofferdam or causeway) and the modification of hydraulic regimes. These direct and indirect adverse impacts could result in loss of velocity shelters for fish and loss of optimal breeding habitat downstream.

During construction the Corps may need to hold additional water back in the lake for three times as many days as currently experienced. The higher pool levels could also occur for longer durations, and could occur at higher elevations more frequently. The retention of a higher pool in the reservoir may inundate recreational areas upstream of the dam for a longer period of time than is normally experienced. Recreational areas that could be affected include the swimming/boating area referred to as "The Pit" and the West Virginia Division of Natural Resources (WVDNR) campgrounds. Additionally, the drift and debris tower (a multi-level intake tower used for passing drift and debris through the dam) will be out of service for the entire length of construction which means that debris will be passed through the sluice gates instead of the tower. This could cause larger amounts of debris to build up behind the dam and potentially settle out on State lands, which may further impede recreational activities during construction and potentially degrade aquatic habitats downstream by reducing dispersal of large, woody material. These adverse impacts will be minimized through the use of barges to assist in ushering debris through the sluice gates. This operational mechanism was successfully used prior to 2005 when the drift and debris tower began operation.

Construction activities that have the potential to disturb terrestrial and aquatic resources in the project area are further described below.

1. Coffer Cells / Causeway
   In order to modify the stilling basin, the Corps will need to install and operate a temporary cofferdam, in the form of either steel coffer cells or a rock causeway, to remove water from the instream construction area and facilitate construction efforts while maintaining flow through the dam. The use of this cofferdam during construction will cause a long-term temporary loss (this is defined in Appendix C) of 2.5 acres of natural river bottom aquatic habitat for approximately 8 to 10 years. Based on the hydrology modeling provided by the Corps on December 20, 2016, the Service also anticipates that within the 75-acre area of influence between the dam and the State Route 3 Bridge, approximately 8.54 acres of indirect temporary and short term adverse impacts may occur downstream of the cofferdam due to altered flows regimes. The presence of the cofferdam and diversion of water during construction, could exacerbate natural low flow conditions resulting in the following adverse impacts on aquatic resources downstream of the dam: loss of aquatic species

habitat including instream and riparian cover including rock outcrops, boulders, and cobble/pebble riffles; loss of emergent water willow; loss of velocity shelters and optimal breeding habitat for fish; decrease in benthic macroinvertebrates, mussels, and fish populations in the project area; and/or degrade water quality by altering turbidity and total organic carbon/biological oxygen demand.

2. Bypass System
In order to minimize potential indirect adverse impacts associated with altered flow regimes, the Corps is designing a bypass system that will transmit water from the left-side (west-side) of the stilling basin to the non-operational side of the stilling basin to evenly disperse water downstream of the non-operational side during the lowest flow allowed through the dam (610 cfs). The bypass system will be utilized to minimize adverse impacts associated with altered flow regimes during the proposed construction timeframe (8-10 years), which during lower flow conditions (610 cfs) could dry portions of the tailwater area that would otherwise not occur. The Corps' numerical hydraulic modeling indicates this is especially a concern when the downstream right-side (east-side) of the primary basin is un-watered for construction and the dam is releasing water from the left-side (west-side) only. In this condition, a bypass system will be installed that will transmit water from the left-side (west-side) of the stilling basin to the non-operational side of the stilling basin to more evenly disperse water downstream of the non-operational side. The pipe for the bypass system will extend downstream of the end sill and will transmit flow downstream of the cofferdam. The numerical hydraulic modeling of this bypass system indicates that it should simulate the existing condition during lower flow conditions. The Corps will use upstream water level data to determine when they would need to implement the bypass system. This design will be further refined during the Pre-construction Engineering and Design (PED) phase. The use of this bypass system during construction will cause a short-term temporary loss (this is defined in Appendix C.) of natural river bottom aquatic habitat, from the small pipe support structures, only during low flows conditions (610 cfs). The amount of habitat that will be impacted by this measure is included in the 2.5 acres proposed for the coffer cells. The direct and indirect adverse impacts associated with this measure are very minimal and this measure will reduce overall aquatic impacts from 37.5 acres to 11 acres.

3. Anchor Placement
Concrete fines which could potentially escape into the river will be created during drilling and cutting of existing concrete to place anchors. Ingestion of these fines could be harmful to aquatic organisms. Therefore, steps should be taken to reduce the amount of slurry created.

4. Staging Areas
Staging areas are proposed to be located on previously developed and disturbed Corps property. The existing recreation access area on the left descending bank of the dam will be used as a construction staging area and will be closed to public access during project construction. The existing fishing pier in this area will be removed during construction. A portion of the recreation area on the right descending bank below the dam will be used as another staging area and for placement of a concrete batch plant. This area provides

important angler access to the tailwaters, particularly the stilling basin. Angler access along the shoreline will be restricted to areas downstream of the cofferdam on both sides of the river for approximately 8-10 years. Stream access would be restricted 200 feet beyond the cofferdam. Since the cofferdam/causeway would be located 105 feet from the stilling basin weir endsill, fishing access would be restricted for a total of 300 feet beyond the stilling basin during construction.

5. Riparian Vegetation
   Limited vegetation clearing on the left descending bank on the downstream side of the dam would take place to construct the temporary, non-permanent cofferdam and access road, causing a minimal, permanent reduction (approximately 0.7 acres) of riparian habitat. This clearing would impact 0.79 Habitat Units (Corps HEP 2016).

6. Spoil Material
   The amount of natural rock that will be excavated from the stilling basin has not been estimated at this time and spoil area(s) have not been identified. Therefore, there is currently insufficient information for the Service to quantify or assess the effects associated with placement of spoil areas. However, the Corps will prioritize the use of landfills or previously disturbed upland disposal sites for excavated material such that effects to significant fish and wildlife resources will be avoided. All potential spoil sites should be reviewed and approved by the Service prior to the finalization of mitigation plans, so that adverse impacts to federally listed species and fish and wildlife resources can be addressed appropriately.

No Action Alternative

This action could result in dam failure when the pool elevation reaches 1532.0' MSL. This would result in decreased upstream inundation times; increased downstream water velocities causing scouring; additional debris; and release of sediment that built up behind the dam over the course of its existence (about 68 years).

The increased water velocity and rushing water from the dam failure would increase the scouring of the river bottom and banks and the amount of sediment washed downstream. Sediment deposition would occur when the water begins to slow down; this would likely occur where the Kanawha River is formed by the Gauley and the New River. Additional deposition would occur in the navigation pools of the Kanawha River. Depending on the amount of sediment left behind the failed dam, chronic sedimentation may continue to occur with each high water event after the PMF until the dam is replaced.

Increased flood heights along the Kanawha River may cause release of hazardous materials into the system. Numerous chemical plants and industries using hazardous materials are found along the Kanawha. In addition, rail cars carrying hazardous materials are likely to be inundated. Materials carried in tanks could be washed downstream into the Ohio River. Intact tanks should not pose a significant danger, but those that rupture would impact fish and wildlife resources. Raw sewage entering the river could be of great concern if sewer lines rupture or if waste water treatment plants become inundated. Under this alternative, significant adverse effects to fish and wildlife resources, throughout all of the reconnaissance areas, could occur if the dam were to fail.

With the No Action alternative no construction impacts will occur.

**Potential Effects of Climate Change**

As part of the Bluestone Lake Dam Safety Modification Study, the Corps evaluated the effects of climate change on water resources in the Kanawha and New River Watershed for their future without action condition (FWAC). Using recent U.S. climate change and hydrology literature and modeling, the Corps has predicted that within the next 80 years we will see increases in mean annual air temperature (ranging from 0.5°F to 1.0°F per decade), increases in precipitation/runoff and stream flow (ranging from 5% to 25% higher in spring and between 5% to 35% higher in fall), and more intense rainfall events (in the 1 in 20 year event range) (Corps 2016).

Potential adverse impacts associated with increased mean annual air temperature include shifts in aquatic and terrestrial species composition, more frequent algae blooms, and introduction of insect pests and diseases. Increased air temperature could result in warmer surface waters. This may cause cold-water species to migrate upstream to colder headwater areas, leaving warm-water species to dominate Bluestone Lake. Warmer water temperatures may also provide opportunities for the introduction of invasive aquatic species, which could lead to increased competition with native species. The combination of warmer water temperatures and increased nutrient input may lead to more frequent algae blooms, which can degrade water quality and shade out aquatic plant species. The lengthened growing season, caused by increased mean annual air temperature, may result in increased vegetation growth and shift in species composition from native species to invasive species. Those factors may also result in the introduction of insect pests and diseases that could be detrimental to the aquatic and terrestrial communities (Corps 2016).

Potential adverse impacts associated with increased precipitation/runoff and stream flow include more frequent flood events, increased probability of dam failure and/or size of the PMF, decreases in recreation, erosion issues, and impacts to water quality. Increased precipitation and resultant runoff can introduce more pollutants into the water, degrading water quality and increasing erosion downstream. The islands within the vicinity of the dam, which provide habitat to various terrestrial and aquatic species, may be significantly impacted or eliminated by erosion. More frequent flood events could preclude recreation if recreational areas remain inundated for longer periods of time (Corps 2016). Additionally, increased flow velocities for longer periods of time may discourage fisherman from wading across the river.

Accelerating climate change is resulting in adverse impacts that pose a significant challenge to conserving species, habitat, and ecosystem functions. Climatic changes can have direct and indirect effects on species abundance and distribution, and may exacerbate the effects of other stressors (USFWS Revised Mitigation Policy, Federal Register, Vol. 81, No. 45, 12380-12403, March 8, 2016). The Appalachian Landscape Conservation Cooperative (LLC) compiled the results of 700 species climate change vulnerability assessments, in the Appalachians, and assigned them climate change vulnerability scores (Appalachian LLC 2016). Based on that compilation of data, the Service selected a few examples of species within the Bluestone study area that the Appalachian LLC considered vulnerable to climate change effects. The following species received vulnerability scores ranging from moderately to extremely vulnerable to climate change effects: the Bluestone sculpin (*Cottus sp.*), eastern hellbender (*Cryptobranchus alleganiensis*), Virginia spiraea (*Spiraea virginiana*), green salamander (*Aneides aeneus*), candy darter (*Etheostoma*

*osburni*), and Alleghany woodrat (*Neotoma magister*). These species were all previously mentioned in our PAL (Appendix B) as species in need of conservation. Virginia spiraea is currently listed under the Endangered Species Act (87 Stat. 884, as amended; 16 U. S. C. 1531 *et seq.*; ESA) as threatened, and the candy darter and eastern hellbender are currently the subjects of status reviews to determine if listing is warranted. If the Appalachian LCC's climate change vulnerability scores are accurate, there is the possibility that within the next 80 years more species will warrant listing under the ESA within the Kanawha and New River watersheds.

In summary, the fish and wildlife resources in the Kanawha and New River watersheds will experience some level of impact due to climate change within the foreseeable future.

**U.S. Fish and Wildlife Service Mitigation Policy**

The Service's mitigation goal is to improve or, at a minimum, maintain the current status of affected resources, as allowed by applicable statutory authority and consistent with the responsibilities of action proponents under such authority. The Service's 2016 Mitigation Policy provides a framework for formulating mitigation means and measures intended to efficiently achieve the mitigation planning goal based upon best available science. The sequential mitigation procedures, as described below, are used by the Service when making recommendations for appropriate mitigation for project impacts.

The first step in the sequence is avoiding the impact. This is accomplished either by not implementing the alternative or modifying it in a way that the impact no longer occurs. In order to fully explore avoidance as a mitigation tool, analysis of feasible alternatives must be thorough. Adverse impacts may be avoided by implementing an alternative plan that accomplishes the same objectives without causing the effects.

If avoidance is not possible and the quality of the habitat permits, the impact can be minimized (includes rectify and reduce over time) by limiting the degree or magnitude of the action and its implementation. Minimizing impacts, together with rectifying and reducing over time, is the second tier of the mitigation hierarchy. Minimizing is reducing the intensity of the impact (e.g., population loss, habitat loss, reduced habitat suitability, reduced habitat connectivity, etc.) to the maximum extent appropriate and practicable. For generalized examples of types of measures to minimize impacts, and for a more detailed breakdown of minimization refer to our 2016 Mitigation Policy.

Compensating for impacts is the third and final tier of the mitigation hierarchy. Compensation is protecting, maintaining, enhancing and/or restoring habitats and ecological functions for an evaluation species, generally in an area outside the action's affected area. Compensation is the last option pursued, because the resource benefits the most if it remains intact and in place.

**Sequential Mitigation Procedures**

In order to minimize adverse impacts, the Corps has discarded all alternatives that propose permanent impacts to high-value aquatic habitat. There are no feasible alternatives that avoid temporary impacts to these habitats. The TSP is the least damaging practicable alternative. It minimizes temporary impacts to high-value habitats and limits the project's permanent impacts in the tailwater area to the existing stilling basin footprint, which is previously altered habitat that has

minimal natural resource value. Unavoidable adverse effects include erosion and sedimentation from upland habitat disturbance, temporary loss of riparian habitat, temporary loss of aquatic habitat, and altered flow regimes.

To minimize adverse downstream impacts to fish, wildlife, and their habitats, the Corps will implement erosion and sedimentation best management practices (BMP's). BMP's include, but are not limited to, the following: installation of sediment and erosion control devices (e.g. silt fences, filter socks, temporary sediment control basins, erosion control matting); adequate and continued maintenance of sediment and erosion control devices to insure their effectiveness; siting equipment staging, fueling, and maintenance areas outside of wetlands, streams, and riparian areas; and preventing sediment debris, and pollutants from entering the New River as much as possible. The Corps has also limited the amount of tree clearing to approximately 0.7 acres to further minimize adverse downstream impacts to fish, wildlife, and their habitats. By incorporating these measures into the final mitigation plan, the Corps should significantly minimize negative fish and wildlife resource impacts resulting from upland disturbance.

Riparian habitat near the dam may be disturbed temporarily to create staging areas for equipment and materials. Aquatic habitat will also be temporarily disturbed due to construction in the stilling basin and use of cofferdams downstream. In order to rectify these adverse impacts, the Corps has agreed to restore the affected riparian and aquatic environment by replanting and/or reseeding the riparian habitat, and restoring disturbed fish habitat. The Corps should coordinate with the WVDNR and the Service to ensure that their restoration plans are adequate prior to finalizing the mitigation plan.

One of the most significant adverse effects that could occur as a result of project construction is altered flow regimes downstream of the dam. As described in the following paragraphs, the Corps has incorporated measures to address these potential adverse effects and minimize impacts to the maximum extent practicable. The Corps plans to use maintenance operations (care and diversion of water) during construction to reduce the impact from altered flow regimes downstream of the project over time. The Corps does not anticipate that flow distribution downstream will be significantly impacted since some flow will be allowed into the stilling basin at all times. Current project plans state that flow will be maintained in half of the stilling basin and that 8 out of the 16 sluices gates will be operational at all times.

On December 20, 2016, the Corps met with Service and the WVDNR to discuss the amount of impacted habitat in the New River. The original impact calculations documented in the draft Mitigation Plan, dated April 2016 (Appendix C), were based off the impacts to half of the survey area, which was defined as the area from Bluestone Dam to the Route 3 Bridge, because that is where the Service predicted that effects from altered flow regimes during low flow conditions could occur. The survey area was measured to be 125 acres, resulting in 62.5 acres that could be impacted by the placement of the cofferdam/causeway and change in water flow regime. At the December 20, 2016, meeting the Corps pointed out that the survey area actually measured 75 acres instead of 125 acres in size, which using the Service's analysis would make the potential impacted area 37.5 acres instead of 62.5 acres. The Service agreed that the area was improperly measured using aerial imagery and that the new survey area size would be 75 acres.

At that same meeting the Corps committed to implement a bypass system during the 8-10 year construction timeframe, to further reduce adverse effects from altered flow regimes. The bypass system will transmit water from the left-side (west-side) of the stilling basin to the non-operational side of the stilling basin to evenly disperse water downstream of the non-operational side during the lowest flow allowed through the dam (610 cfs). The bypass system will be utilized to minimize adverse impacts associated with altered flow regimes, which during lower flow conditions (610 cfs) could dry portions of the tailwater area that would otherwise not occur. This minimization measure has significantly decreased the amount of habitat that could be potentially impacted by altered flow regimes during construction. The Service and WVDNR agreed with the minimization measure and determined that the HEP analysis should be revised to reflect these reduced impacts (Table 1).

In order to evaluate revised effects from the bypass system, the Corps used hydraulic modeling to predict downstream effects during different flow conditions including with the bypass system in place at the 610 cubic feet per second (cfs) flow. They then used the modeling to compare the bypass system to the baseline condition. The Corps presented the results of this new hydraulic modeling in December 2016. The 1,000 cfs flow was considered to have the most impact because at 610 cfs (minimum flow conditions) the bypass system would be deployed and adverse impacts would be reduced. The Corps then calculated the new habitat units using the same habitat suitability index (HSI) score of 0.83 for the smallmouth bass as used by the Service in the mitigation plan for the original impact calculations. The HSI score was multiplied by the affected acreages defined by the hydraulic modeling to calculate the revised number of habitat units indirectly impacted. Total habitat units impacted for both direct and indirect adverse impacts are approximately nine habitat units (Table 1), without the implementation of this measure it would be 31.1 habitat units. Therefore, this minimization measure reduces the number of affected habitat units by 22.1.

**Bluestone Updated HEP Analysis - FEB 2017**

| | | | |
|---|---|---|---|
| **Direct** | | | |
| | HSI | Acres | HU |
| Smallmouth Bass | 0.83 | 2.5 | 2.075 |
| | | | |
| | **Direct Total** | | 2.075 |
| **Indirect** | | | |
| Right 1000 CFS | | | |
| | HSI | Acres | HU |
| Smallmouth Bass | 0.83 | 6.83 | 5.6689 |
| | | | |
| | | | |
| Left 1000 CFS | | | |
| | HSI | Acres | HU |
| Smallmouth Bass | 0.83 | 1.71 | 1.4193 |
| | | | |
| | | | |
| | **Indirect Total** | | 7.0882 |
| | | | |
| | | | |
| | **Total HU** | | 9.1632 |

***Table 1. Habitat Units for the smallmouth bass (impacts to smallmouth bass were greater than common shiner, therefore, only this evaluation species was used for calculating mitigation).***

In conclusion, the Service does not typically support projects that propose adverse impacts to high-value habitat. These areas are rare, irreplaceable, and are highly suitable and important to the conservation of evaluation species. The Service's policy for high-value habitat is to recommend avoidance of all adverse impacts. In this case, action alternatives are not available to avoid these impacts, and the no action alternative could result in adverse effects to fish and wildlife resources if dam failure were to occur. Furthermore, the Corps has avoided and minimized their adverse impacts to maximum extent appropriate and practicable in accordance with our mitigation policy. As a result the Service supports selection of the TSP as the preferred alternative, and makes further recommendations to mitigate for remaining unavoidable adverse effects and create a net gain in conservation as an outcome on this project. This conservation gain should be focused on protecting or enhancing habitats of similar or equal value. It is consistent with the Service's 2016 Mitigation Policy to identify and promote opportunities for resource enhancement during action planning, i.e., to decrease the gap between the current and desired status of a resource. Pursuant to the FWCA, the Corps should be enhancing fish and wildlife habitat in addition to mitigating for the loss of that habitat.

Avoidance, Minimization, and Conservation Recommendations

The Service is providing the following additional avoidance, minimization, and conservation recommendations (for the TSP) so that the Corps can incorporate measures that further minimize adverse impacts and enhance fish and wildlife habitat into the Final SEIS, and into final design plans:

1. Coffer Cells / Causeway
   In order to minimize the potential direct and indirect adverse impacts from the cofferdam or rock causeway, the Corps should modify their water management plan to avoid significantly altering flow downstream and reduce stream bed scour during construction. To further address unavoidable adverse impacts from cofferdams, the Corps should seek additional mitigation opportunities such as armoring the banks of islands to reduce erosion and loss of aquatic breeding habitat, and improving existing breeding habitat and velocity shelters for aquatic organisms by adding riparian and in-stream cover. All measures pertaining to creating or enhancing fish habitat should be coordinated with the WVDNR fisheries biologist.

2. Bypass System
   The Service understands that the Corps is designing a bypass system that will lessen the impact of flow alteration during the lowest flow allowed through the dam (610 cfs). In order to further minimize the potential direct and indirect adverse impacts from the installation of the bypass system the Service recommends the following:

   - The Corps should design the system to have as small of an instream footprint as possible in order to minimize the amount of habitat that will be directly impacted.
   - Place pipe support structures in areas containing low quality habitat such as sand/silt substrate and avoid placing these structures on water willow beds.
   - If feasible, the Service recommends that the Corps design this system to also operate during higher flows (1,000 cfs) to further reduce adverse effects.

3. Anchor Placement
   The Service recommends that steps be taken to reduce the amount of slurry created from drilling and cutting the existing concrete. The anchor holes should be drilled using a dry cutting process so that no slurry will be created during this phase; and the concrete fines should be disposed of at an approved facility. The Corps proposes to minimize the discharge of any concrete fines during concrete cutting or concrete removal and anchor placement by flushing cuts with water and pumping this water to a lined settling basin on one of the downstream banks of the river, most likely the left side where an existing settling basin exists from previous phases of construction, which is an acceptable approach.

4. Staging Areas
   Staging areas should be returned to pre-construction conditions so that they can be utilized for recreation. Recreational mitigation recommendations for the staging areas are discussed later in the FFWCAR.

5. Riparian Areas
   The Corps proposes to replant/reseed the disturbed terrestrial habitat within the construction work limits to restore the 0.79 habitat units lost during construction, which is an acceptable approach. The Service recommends that the Corps replant disturbed riparian areas with native, woody vegetation to create cover for wildlife, reduce erosion (stabilize the river bank), improve water quality, and reduce water temperatures.

6. Spoil Material
   All potential spoil sites should be reviewed and approved by the Service prior to final project designs or before the Corps develops a final mitigation plan, so that impacts to federally listed species and fish and wildlife resources can be addressed appropriately. Additionally, no spoil should be placed in wetlands, aquatic sites, or any high quality riparian or terrestrials habitats, unless the placement is designed to enhance or restore these areas. The Corps has prioritized disposal of all excavated material at commercial landfills or previously disturbed upland sites, which is the Service's preferred approach if the material is clean substrate.

Conservation Measures for Climate Change Impacts:
In addition to addressing construction impacts, the Corps should incorporate conservation measures to increase the abundance or resiliency of sensitive habitats so that the effects of climate change impacts won't be as severe within the project area. The Service recommends the Corps:

- create more islands or protect existing islands from erosion;
- create velocity shelters for fish; and
- develop a plan to address removal of terrestrial and aquatic invasive species. Invasive species management can help increase survival rates for native species.

Potential Mitigation Sites
The Service provided the Corps with preliminary mitigation recommendations in our April 19, 2016, Draft Mitigation Plan (Appendix C). Since then the Service has had the opportunity to meet with the Corps and conduct potential mitigation site visits, review the Corps Conceptual Mitigation Plan (dated January 2017), and discuss all potential mitigation sites with the WVDNR. The Corps Conceptual Mitigation Plan proposed 10 sites as potential mitigation options. The Corps used HEP to evaluate potential ecological lift that would be gained through each of the mitigation options.

After reviewing the Corps Conceptual Mitigation Plan, the Service noted that the sites the Service described as low priority for mitigation produced a higher net HEP gain than the sites that the Service and the WVDNR had agreed were higher priority. This is a prime example of how, in this particular situation, the HEP is not an adequate methodology to determine effective mitigation. For example, the HEP models are not able to adequately capture effects from changes in instream flow that are the primary adverse impacts associated with this project. In addition, this project is unique and it affects a very special high-value resource. No mitigation options are available that would be able to create or replace in-kind the high-value habitat that is being affected. However, there are mitigation options available that could further enhance or protect high-value habitats within or adjacent to the New River, such as protecting or enhancing riparian areas or removing other upland sources of sedimentation. These measures could enhance the water and habitat quality in the river. The HEP also fails to capture the aquatic lift that would occur from preserving riparian areas that are under threat of development and the aquatic lift that would occur due to restoration of degraded riparian buffers or preservation of existing high-value aquatic habitat. The HEP was not designed to compare different habitat types; it was intended to define mitigation for sites of the exact same quality and type. There is no HEP conversion available to calculate how many aquatic habitat units could be generated from restoring/preserving riparian habitat. Although we know that there is a clear benefit from having a good riparian buffer along streams and rivers

(e.g., reduces effects from sedimentation, provided shelter for fish, adds allochthonous organic matter to the system, provides shade that decreases water temperature, acts as a barrier to pollutants from runoff, etc.), the HEP does not have the ability to capture what that value is or how much lift would be generated. Therefore, because the Service does not believe that this tool accurately assesses mitigation sites, we did not rely solely on the Corps habitat unit calculations when we evaluated the 10 potential mitigation sites proposed in the Conceptual Mitigation Plan.

Since the Conceptual Mitigation Plan was developed, the number of proposed sites and the amount of habitat units generated per site has been revised. These revisions were based on comments provided by the Service and the WVDNR during a February 13, 2017, interagency meeting. The Service previously recommended the Wallace Property and the Brant Property, in our Draft Mitigation Plan (Appendix C), and the Corps proposed the Crumps Bottom 1 and 2, Glen Lyn, and Indian Creek sites in the Conceptual Mitigation Plan. After further review and careful consideration, the Service and the Corps decided to discard these potential mitigation sites for the following reasons: the Wallace Property is upstream of the impact area and two tributaries removed from the New River, therefore, any beneficial effects generated from this site would be greatly reduced or negated by the presence of the lake before reaching the high-value habitat below the dam. The Brant property has been discarded because the property is not for sale and the landowner is unwilling to sell. Crumps Bottom 1 and 2 are sites that are currently owned by the Corps and the WVDNR actively manages these areas to provide food plots/wildlife openings. These sites were discarded because the WVDNR was adamantly opposed to all mitigation sites that impact WVDNR food plots and/or actively managed wildlife openings. Conversion of these areas would have negligible effects to the New River and would result in negative effects to WVDNR managed game resources and reduced hunting opportunities. These negative effects would then need to be mitigated elsewhere. The Indian Creek site was discarded because it is a highly used recreation area and the Service is opposed to converting active recreation areas into mitigation sites. The Glen Lyn site was discarded based on comments provided by the Service and the WVDNR after the November 16, 2016, interagency meeting. The Service will not recommend the Glen Lyn site as mitigation because it is too far away from the impacts (site is upstream in Virginia) and because mitigating outside of the state could conflict with the West Virginia Department of Environmental Protection's Water Quality Certification.

Pursuant to our February 13, 2017, interagency meeting, four potential mitigation options were retained. A brief description of each site is provided below. For more detailed information about each site refer to the Corps 2017 Conceptual Mitigation Plan.

1. The Artificial Reef sites are located within Bluestone Lake, approximately 1.2 miles upriver of Bluestone Dam. Previous studies of existing habitat within the lake, particularly within the bounds of the summer pool, have shown that sedimentation within the lake has led to a decrease in cover for fish.

2. Barker's Bottom Island is located approximately 6 miles upstream of Bluestone Dam in Bluestone Lake. The island is approximately one acre, located approximately 400 feet from the left descending bank of the river. The frequent flooding of the island has led to erosion of the island's bank, and sedimentation within the lake has led to a decrease in cover for fish.

3. The Carol Brown Farm is currently for sale and is located on the left descending bank of the New River, approximately 13 river miles downstream of the Bluestone Dam. This tract of land is approximately 123 acres and includes a 1.16 acre island in the New River and the mouth of Farley Creek, which is a perennial stream. This property is also within the service boundary of the New River Gorge National River and was recommended by the NPS. This property is under significant threat of development.

4. The Lovern site is located on the right descending bank of the New River, approximately 21 river miles upstream of the Bluestone Dam. This site is within the Corps fee boundary and is currently managed by the WVDNR as a wildlife opening for hunting in the Bluestone Wildlife Management Area. The Lovern site is not under significant threat of development.

During the February 13, 2017, interagency meeting, the parties also discussed revisions that should be made to the mitigation crediting methodology for the remaining sites. The Service recommended that the Corps use the mink HSI model, instead of the black-capped chickadee, yellow warbler, and mink models combined, to determine the estimated baseline habitat value and estimated mitigation benefit of the possible restoration and/or preservation at each mitigation site. We recommended the mink because that species requires certain riparian features that also benefit the smallmouth bass; benefits associated with increased quality of riparian buffers are assumed to provide aquatic benefits. However, we recognize that riparian enhancements upstream of the dam may not translate to benefits to smallmouth bass downstream in the tailwaters. We also requested that the Corps estimate baseline aquatic habitat units for the smallmouth bass at the terrestrial sites adjacent to the river (Lovern and Carol Brown). The intention of using the mink HSI model, and estimating baseline aquatic habitat at the Lovern and Carol Brown sites, was to demonstrate that terrestrial lift combined with aquatic preservation could benefit the smallmouth bass. The Service stated that whatever models and habitat unit calculations that were used on the impact side should also be used on the mitigation side to maintain consistency. For example, the Service recommended that the Corps not annualize the amount of habitat units generated for all three species because that approach is additive and it generates lift the does not directly correlate with aquatic habitat. The Service instead recommended that the Corps use the habitat unit value that would be generated by year 10, which is based on the duration of project construction, for mink to calculate lift (Corps 2017). Based on these comments the Corps revised the habitat units, calculated new numbers for net gain specific to the mink, and estimated baseline aquatic habitat units for the smallmouth bass for the four retained mitigation options (Table 2).

| **Potential Mitigation Site** | **Baseline HU's** | **With-Project HUs** | **Net Gain HU's** | **Aquatic Baseline HU's** |
|---|---|---|---|---|
| Carol Brown | 2.40 | 13.22 | 10.82 | 9.46 |
| Lovern Site | 2.69 | 14.29 | 11.60 | 38.01 |
| Artificial Reefs | 14.40 | 17.09 | 2.69 | N/A |
| Barker's Bottom | 0.00 | 0.94 | 0.94 | N/A |

***Table 2. Revised Habitat Units for Each Remaining Potential Mitigation Site***

Based on all of the information we have received to date, the Service recommends that out of the remaining 4 sites, or any potential new sites, the Corps should prioritize mitigation sites that:

- Occur within high-value habitat or that directly benefit high-value habitat and evaluation species.
- Occur downstream of the dam or within high-value habitat.
- Provide mitigation within or adjacent to riverine habitat.
- Provide high-value habitat that has a high threat of development.
- Have willing landowners and land managers.
- Have interested long-term stewards with experience managing properties for fish and wildlife conservation purposes.

In addition, the Service recommends that the Corps give lower priority to sites that:

- are located in the lake because this is a completely different habitat type and is not considered to be a high-value resource. Because these sites do not provide improvements to the same types of riverine habitats that are affected, they may be better suited for recreational mitigation; or
- are currently used as recreational areas. If there is an impact to existing recreation values on the mitigation site that impact will need to be mitigated for elsewhere, therefore these types of sites are not recommended; or

- the WVDNR has said they are opposed to using due to negative effects that would occur from loss of existing wildlife management uses. If for some reason the Lovern site is no longer a viable option for this reason, the Service highly recommends that the Corps discard that option and purse a different mitigation option.

After multiple discussions with the WVDNR, the Service has decided that the use of mitigation banks and in-lieu fee programs, to offset adverse impacts in high-value habitat, is unacceptable. Mitigation must directly benefit the high-value habitat being impacted. Mitigation banks and in-lieu fee programs do not provide that opportunity.

In summary, the Corps has proposed a number of mitigation options which could be used as stand-alone features or in combination to provide the nine aquatic habitat units required to offset aquatic impacts. The preliminary evaluations completed by the Corps on these four mitigation sites demonstrate that sufficient, achievable opportunities are available to adequately mitigate for the anticipated adverse impacts to fish and wildlife resources from this proposed project. These mitigation options should be described in the SEIS, demonstrating the capacity of these options to fully compensate for aquatic impacts. Because a final mitigation plan will be selected during the PED phase of the project, after completion of the SEIS, the Service should be consulted throughout the PED phase of the project as final mitigation planning proceeds. The Corps should also demonstrate that they have appropriated an adequate amount of money in the project budget to offset adverse impacts to high-value habitat/achieve the amount of mitigation habitat units necessary.

If the Corps is unable to implement any of the mitigation options listed in Table 2, the Service recommends that the Corps continue to look for suitable mitigation based on the recommendations that we have provided in this FFWCAR.

Additional Mitigation/Potential Alternatives (Non-traditional Options):

- Add sewer infrastructure to campsites downstream that have sanitary issues, which impair water quality in high-value habitat.
- Donate money to the city of Hinton to improve sewer infrastructure and ultimately improve long-term water quality within the New River.
- Add more restrooms to the Sandstone Falls scenic rest area to improve long-term water quality within the New River.

The alternatives listed above would improve overall water quality in the project area and enhance the habitat quality in the river for the affected evaluation species (smallmouth bass).

Recreational Mitigation

On May 23, 2016, the Corps sent us a letter proposing some conceptual recreational mitigation measures that included adding an additional boat access area to accommodate various lake elevations, creating an additional fishing pier/providing water access both up and down stream of the dam, and designing a permanent fishing pier in the same area as the current fishing pier once construction has been completed. All temporary mitigation measures must be in place prior to the removal of the existing structures in order to prevent a delay in recreational access. The Corps should provide the Service and the WVDNR with designs and locations for recreational mitigation prior to final design.

Using concrete from demolition of the stilling basin to create artificial reef features in the lake may serve to provide habitat for fish and reduce and/or eliminate the need for off-site spoil areas.

Final Mitigation Plan

Due to an accelerated timeline, the Service was only able to evaluate the potential mitigation sites proposed by the Corps in their Conceptual Mitigation Plan. In addition, the Service and the Corps were not able to access some privately-owned sites to field validate the HEP assessments. Based on the limited options provided by the Corps, the Service has provided recommendations of which properties the Corps should prioritize. If the Corps cannot implement our recommendations, or if additional mitigation opportunities are found prior to final project implementation, we advise them to evaluate new mitigation options based on the comments provided in this FFWCAR. Prior to the final mitigation plan, the following information should be completed and/or provided to the Service:

- Additional HEP models should be run during the PED phase for selected mitigation options to ground-truth assumptions made in the Conceptual Mitigation Plan.
- Use mink as the only terrestrial species when evaluating potential mitigation sites.
- Calculate habitat units using the 10 year value instead of annualizing habitat units.
- Give credit for preservation of intact riparian buffers on properties that are under threat of development.

- HEP evaluations should be performed on all new potential mitigation sites that meet the site selection criteria described in Appendix C and in this FFWCAR.
- The Corps should demonstrate that they have appropriated an adequate amount of money in the project budget to offset adverse impacts to high-value habitat/achieve the amount of habitat units necessary.

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APPENDIX A

PRELIMINARY HABITAT EVALUATION PROCEDURES REPORT

BLUESTONE DAM SAFETY PROJECT

OCTOBER 2013

APPENDIX B

FINAL PLANNING AID LETTER

BLUESTONE DAM SAFETY PROJECT

MARCH 2014

APPENDIX C

DRAFT MITIGATION PLAN

BLUESTONE DAM SAFETY PROJECT

APRIL 2016

APPENDIX D

DRAFT FISH AND WILDLIFE COORDINATION ACT REPORT

BLUESTONE DAM SAFETY PROJECT

JUNE 2016

# United States Department of the Interior

FISH AND WILDLIFE SERVICE

West Virginia Field Office
694 Beverly Pike
Elkins, West Virginia 26241


March 28, 2014

Ms. Amy K. Frantz
Chief, Planning Branch
U.S. Army Corps of Engineers
Huntington District
502 Eighth Street
Huntington, West Virginia 25701

Re: Fish and Wildlife Coordination Act Planning Aid Letter (PAL) on the Bluestone Dam Safety Project in Summers County, West Virginia

Dear Ms. Frantz:

This constitutes the Fish and Wildlife Coordination Act Planning Aid Letter (PAL) on the Bluestone Dam Safety Project in Summers County, West Virginia. Currently the U.S. Army Corps of Engineers Huntington District (Corps) is studying the feasibility of modifying Bluestone Dam in order to meet U.S. Army Corps of Engineers Tolerable Risk Guidelines. This PAL provides information on the fish and wildlife resources within the project site and reconnaissance areas, as well as a preliminary assessment of potential biological impacts of the proposed modification of the dam and associated habitats. This PAL is intended to assist the Corps in subsequent project planning and has been prepared in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*). This PAL is being provided under the terms of the April 2013 Scope of Services Agreement between the Corps and the West Virginia Field Office of the U.S. Fish and Wildlife Service (Service). The draft PAL was submitted to the Corps on February 6, 2014.

As further detailed in the PAL, the tailwaters of the Bluestone Dam have been designated as Resource Category 1 habitat, which according to the Service's Mitigation Policy are of high value for evaluation species and are unique and irreplaceable on a national basis or in the ecoregion; therefore there should be no loss of existing habitat value (USFWS Mitigation Policy-46 FR 7656). The tailwaters have numerous fish nursery areas in vegetated shallows of water willow, abundant fish food sources, and ample places for fish to seek shelter behind large rocks. Such high value riverine habitats are relatively scarce in the ecoregion. Our analysis of the tailwater area below Bluestone Dam has determined that the area is of high quality for the riverine evaluation species. Because these one-of-a-kind areas cannot be replaced, we recommend avoiding all losses of existing Resource Category 1 habitat from any measures

associated with the proposed modifications of Bluestone Dam and associated lands and waters. The remote conventional stilling basin alternative will have permanent impacts to this Category 1 resource and these adverse impacts are not mitigatable so this alternative should only be considered if all other avoidance alternatives are not practicable. The Service would support the selection of the least environmentally damaging measures, which are those that occur within the original footprint and do not require coffer cells downstream of the stilling basin. The measures that would avoid adverse impacts to Resources Category 1 areas are the flip bucket, parapet wall, concrete overlay of exposed rock in stilling basin, and modifying the existing stilling basin with super baffles (within the original footprint).

We look forward to opportunities for continued involvement as the study progresses into the alternative plan evaluation stage, at which time we will provide more specific recommendations for minimizing and mitigating impacts. If you have any questions regarding this PAL, please contact Tiernan Lennon of my staff at telephone (304) 636-6586, Extension 12, or Tiernan_Lennon@fws.gov.

Sincerely,

John E. Schmidt
Field Supervisor

cc:
Project File
Reader File
WVDNR – Danny Bennett
ES:WVFO:TLennon:skd:3/28/2014
Filename: P:\Finalized Correspondence\Corps of Engineers\Bluestone Dam Safety Project\PAL Transmittal Letter.docx

**FINAL**

# PLANNING AID LETTER

# BLUESTONE DAM SAFETY PROJECT

**March 2014**

U.S. Fish and Wildlife Service
West Virginia Field Office
Elkins, West Virginia

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Appendix C: Study Area Photographs

## I. Overview

The purpose of this PAL is to: 1) describe the current baseline condition of fish, wildlife, and plant resources in the study area; 2) identify high value resources and habitats; 3) provide a preliminary analysis of the effects of the proposed measures to modify the dam; and 4) provide preliminary recommendations on avoidance, minimization, and mitigation measures.

The Service previously prepared planning aid reports for various projects at this site addressing fish and wildlife resources. These include a report completed in April 1978 entitled "Preliminary report of fish and wildlife resources associated with alternative reservoir complex location "G" of the Kanawha authorization study and the Gauley River hydropower authorization study"; a report in August 1979 entitled "Preliminary habitat evaluation report of the proposed Bluestone pumped storage project, location "G" of the Kanawha authorization study"; Fish and Wildlife Coordination Act reports in 1978 and 1998; and a Planning Aid Report for the dam safety project in November 1996. This PAL updates and expands upon previous Fish and Wildlife Coordination Act reports and Planning Aid reports prepared by the Service. These previous reports presented the results of literature searches, field surveys, and habitat evaluation procedures conducted in the study area by the Service, and discussed water quality and important habitat areas.

In preparing this PAL, we also conducted a general site reconnaissance of the planning area, reviewed maps and aerial photos, conducted a literature review, and conducted a preliminary Habitat Evaluation Procedures (HEP) assessment of existing riverine and riparian resources in the area immediately downstream of the dam. Our preliminary HEP report was prepared during October 2013 as a separate document and is incorporated by reference (Service 2013).

## II. Project Description

Bluestone Dam and reservoir were authorized for the purposes of flood control and power development by Executive Order 7183-A in September 1935 and by the Flood Control Acts of 1936 and 1938. The stated project purposes were later expanded to include recreation activities under the Flood Control Act of 1944, and fish and wildlife enhancement under the Fish and Wildlife Coordination Act of 1958. To address the accumulation and disposal of drift at the project, the original project authorization was further modified under the Water Resource Development Act of 1992, as amended in 1996.

Construction of the dam began in January 1942 and continued until March 1944, when it was stopped for the duration of World War II. Construction resumed from 1946 to 1948 and the dam began operation in 1949. While the original plans for Bluestone Dam called for hydropower development, extensive electric power development during the war resulted in a decision to defer hydropower development at the project and use all available storage for flood control. This lowered the summer pool elevation of the lake 80 feet from 1490 to 1410 feet above mean sea level (msl).

The Bluestone Dam is a linear concrete gravity structure with an overall length of 2,060 feet and maximum height of 165 feet above the streambed. Discharge capacity of the existing structure consists of gated sluices and a gated auxiliary spillway. That spillway is 790 feet long and includes 21 bays with vertical lift gates and a stilling basin consisting of natural bedrock .

Operation of the reservoir is by 16 gated sluices with a total capacity of approximately70,000 cubic feet per second (cfs). The total design discharge capacity of the dam is 430,000 cfs. When the dam was planned in the 1930's, this discharge capacity was based upon a hypothetical flood created by shifting the center of the July 1916 hurricane storm to the New River drainage basin.

Following construction of the dam, a subsequent Corps risk assessment showed potential safety hazards in light of more current engineering standards. Consequently the Corps signed a Record of Decision in 1999 to modify Bluestone Dam as described in the Dam Safety Assurance Evaluation Report. The 1999 Record of Decision allowed the Corps to begin detailed design and subsequent construction of the recommended alternative which included: a 13-foot cantilever wall on top of the dam to prevent overtopping; an additional concrete monolith on the east abutment; a floodgate closure across West Virginia Route 20 at the west abutment; extension and retrofit of the existing hydropower penstocks with gates to supplement discharge capacity of the spillway and outlets; scour protection downstream of the penstocks; removable closures at each end of the spillway; and dam stability improvements. When completed, the current modifications under construction will strengthen the dam's stability through use of steel anchors and massive concrete thrust blocks, and allow for increased discharge capacity through the hydropower penstocks, substantially reducing risk during high flow events.

The Corps has determined that even with these most recent modifications, risk of dam failure and downstream scour remains in the event of a Probable Maximum Flood (PMF).Modeling and analysis by the Corps of recent precipitation estimates, coupled with detailed terrain, soil and runoff data, has shown that the PMF possible for the New River Basin has a peak flow of 1,086,000 cfs, which is double the peak of the original design flow (430,000 cfs). The Corps has concluded that under such high flow events, the downstream bedrock is vulnerable to erosion as a result of deficiencies with the current stilling basin configuration. According to the Corps, this potential erosion creates an unacceptable risk of dam failure and downstream scouring of the bedrock (Corps 2013b). While the probability of a flood of this magnitude is small[1], the consequences of dam failure and catastrophic flooding would put lives and property at risk from the dam all the way to the Ohio River, including: the New River Gorge National River; the Greenbrier, Gauley, Kanawha, and Elk Rivers; and the heavily populated and industrialized capital city of Charleston.

To reduce risk to acceptable levels, the Corps is now studying the feasibility of a wide array of additional structural modifications to the dam and river, as well as nonstructural measures (Corps 2013b). Potential structural measures include: modification of the stilling basin; additional modification of the six hydropower penstocks to supplement the discharge capacity; a parapet wall on top of the dam to prevent overtopping (as opposed to the 13-foot wall previously approved); modification of other dam components; construction of an auxiliary stilling basin; construction of an alternative auxiliary spillway; and scour protection of the spillway and downstream areas. Potential nonstructural measures include an improved flood warning and

[1] A PMF of 1,086,000 cfs is approximately equivalent to a 63,000- year flood event (A. Johnson, Corps, personal communication 2013). While such an event could occur in any year, the risk of such a flood happening in any year is one in 63,000 (e.g. an annual probability of 0.001 percent). Smaller floods, such as a 625-year flood event, also pose risk. There is a 1.6 percent annual probability that the dam will reach a pool that threatens the dam's stability (the Imminent Failure Flood elevation) (Corps 2013a).

evacuation system and operational measures to prevent overtopping. Multiple combinations of these measures may be needed. This PAL only addresses these additional structural modifications that are currently being evaluated.

## III. Description of the Study Area

Bluestone Dam is located on the New River at the community of Bellepoint, in Summers County, West Virginia, approximately 2.5 miles downstream of the confluence of the New and Bluestone Rivers, and 0.8 miles upstream of the confluence of the New and Greenbrier Rivers (Figure 1). The study area includes the water and adjacent lands of the Bluestone Project (the dam, Bluestone Lake flood control reservoir, and adjacent Federal, State, and private lands), as well as portions of the New River and its tributaries (the Bluestone and Greenbrier Rivers), and the Kanawha River and its tributaries (the Gauley and Elk Rivers). This large study area encompasses a 4,565-square-mile drainage area extending along the New River from Bluff City, Virginia, to the junction of the Kanawha River with the Ohio River at Point Pleasant, West Virginia (Figure 1). Whereas only a small portion of the study area will be directly affected by project construction, the study area is large enough to encompass the area of potential direct, indirect, and cumulative effects of a Probable Maximum Flood event.

For planning purposes, the study area is subdivided into four reconnaissance areas: 1) Bluff City to Sandstone; 2) Sandstone to Gauley Bridge; 3) Gauley Bridge to Poca; and 4) Poca to Point Pleasant (Figure 1). Photographs of reconnaissance areas are in Appendix C. In this PAL, we discuss areas with comparable resource values together to reduce redundancy. Thus Areas 1 and 2 are discussed together, and Areas 3 and 4 are discussed together. Within Area 1, however, we distinguish resource values separately in the tailwater area directly below the dam because direct impacts of project construction are most likely to occur here.

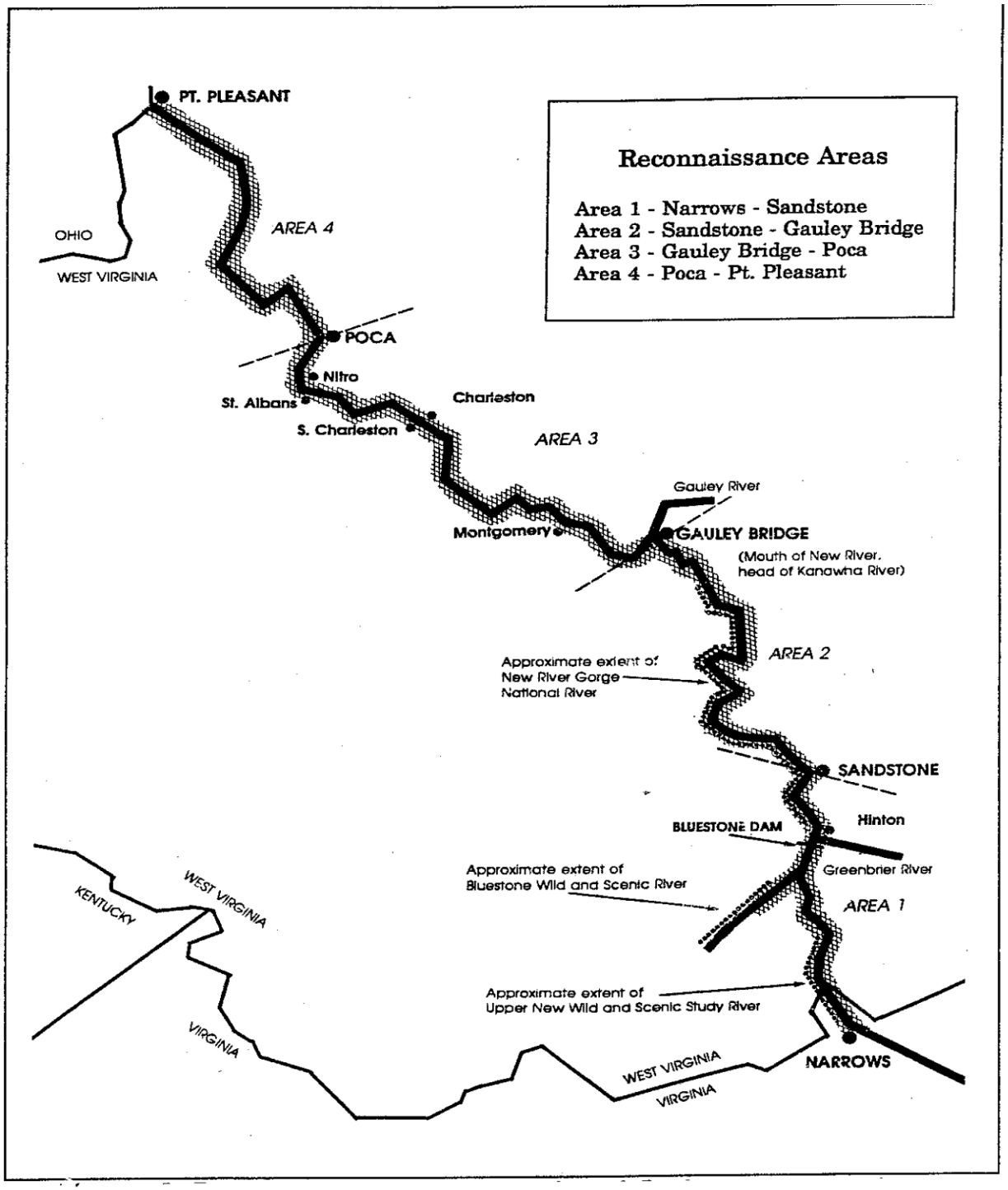


*Figure 1. Map of the entire Bluestone Dam Project study area.*

**Reconnaissance Area 1** extends approximately 48 river miles from Bluff City, Virginia to Sandstone, West Virginia (Figure 1). It includes the Bluestone Dam and reservoir, Bluestone National Scenic River, the Upper New River Wild and Scenic Study River, Bluestone Lake Wildlife Management Area, and portions of Bluestone State Park, Pipestem State Park, and the New River Gorge National River. The communities present in Area 1 are Narrows, Rich Creek and Glen Lyn, Virginia, as well as to Hinton, West Virginia (Corps 1997).

Along the undeveloped 30-mile span of the New River from Glen Lyn, Virginia to the Bluestone Dam, the terrain is rather steep but there are some isolated floodplains. The stretch of the New River, between the dam and Hinton, is mostly developed floodplain with highways located near both rivers (Corps 1997).

**Reconnaissance Area 2** extends approximately 54 river miles from Sandstone to Gauley Bridge, West Virginia (Figure 1). This area along the New River is dominated by steep cliffs and largely uninhabitable lands. The impact zone for Area 2 lies mostly within the floodplain boundaries or valley floor of the New River Gorge National River. Because of the steep terrain in this Reconnaissance Area, the floodplains are limited to narrow river valleys. This area is largely undeveloped and lower portions of the New River Gorge National River, Babcock, and Hawk's Nest State Parks are located in the floodplain (Corps 1997). There are no large communities along the New River in Reconnaissance Area 2, except for a very limited area along the eastern bank at Sandstone. The communities present in Area 2 are Meadow Creek, Ansted, and the historic town of Thurmond (Corps 1997).

**Reconnaissance Area 3** extends 57 river miles from Gauley Bridge to Poca, West Virginia. A large portion of this area is made up of the heavily industrialized Kanawha River Valley (Figure 1). The Kanawha River flows through a narrow valley until it reaches the city of Malden where developed floodplains are present. This reach of the Kanawha River though the narrow valley includes the cities and towns of Glen Ferris, Boomer, Smithers, Montgomery, Cedar Grove, Chelyan, Chesapeake, Belle, and Marmet. Downstream of Marmet, the development becomes denser along the wide floodplains of the river. The towns and cities present in this heavily developed section include Rand, Malden, Charleston, South Charleston, Dunbar, Institute, St. Albans, Nitro, and Poca. The impact zone for Area 3 includes portions of most of these towns and cities. The major type of industry in Area 3 is chemical manufacturing and processing, with more than a dozen chemical plants in the impact zone (Corps 1997).

**Reconnaissance Area 4** extends 39 river miles from Poca to Point Pleasant, West Virginia, where the Kanawha River joins the Ohio River (Figure 1). The valley in Area 4 is not as narrow as in Areas 1 and 2, and this stretch of the river is more rural with development more widely scattered than in Reconnaissance Area 3. The towns in Area 4 partially located in the impact zone are Winfield, Buffalo, and Point Pleasant (Corps 1997).

## IV. Fish and Wildlife Resources in the Study Area

The habitats within many portions of the study area are of high quality. The intricate water system that comprises the Kanawha River Basin and Bluestone River Basin contains a great diversity of quality fish and wildlife habitats (Service 1996). Reports completed by the Service in the late 1970's provide indication of the quality and value of these habitats at that time (Service 1996).

In general, since the 1970s there have been improvements in water quality and a limited increase in development and land uses due to increasing human population. The counties along the New and Bluestone Rivers have sparse development, and are limited by terrain and by their designation within national recreation areas. According to the 2006 National Land Cover Data Set, developed land has increased moderately since 1992 in areas that were already previously developed, when compared to the 2006 data set.

In this PAL we supplement previous PALs with more recent studies of the quality and value of fish, wildlife, and plant resources in the study area.

## A. Reconnaissance Areas 1 and 2

Within Reconnaissance Areas 1 and 2, the Bluestone Lake Wildlife Management Area, Bluestone National Scenic River, and New River Gorge National River are important resources. The Bluestone Lake Wildlife Management Area is the second largest public facility of its kind (18,019 acres) in West Virginia. Along with the excellent warmwater fishery, these State and Federal public lands provide scenic beauty, support diverse and unique plant and animal populations, and provide a variety of high quality boating, white-water rafting and kayaking, sport hunting, trapping, non-game viewing, and other recreation opportunities. Important game and furbearers in the area include black bear (*Ursa americanus*), white-tailed deer (*Odocoileus virginianus*), ruffed grouse (*Bonasa umbellus*), wild turkey (*Meleagris gallopavo*), fox and gray squirrels (*Sciuris niger and S. griseus*) bobcat (*Lynx rufus*), red and gray fox (*Vulpes fulva, Urocyon cinereoargenteus*) mink (*Mustela vison*), muskrat (*Ondatra zibethica*), cottontail rabbit (*Sylvilagus transitionalis*), and raccoon (*Procyon lotor*). Important fish and wildlife resources in Reconnaissance Areas 1 and 2 include riverine, reservoir, riparian, wetland, and upland forest habitats; special status species (includes federally listed species and species proposed for listing as Threatened or Endangered, Candidate, or Species of Concern); and species in greatest need of conservation as identified by the West Virginia Division of Natural Resources (WVDNR) (aquatic and terrestrial wildlife species with small or declining populations or other characteristics that make them vulnerable) (WVDNR 2005).

### 1. Riverine Resources

Portions of the Bluestone, New, and Greenbrier Rivers occur within Reconnaissance Area 1 comprising the New River Basin. The WVDNR lists many of the streams and rivers in the New and Bluestone Rivers, including their tributaries, as high quality streams because of their unique and ecologically valuable aquatic and terrestrial habitats (Service 1996). Within Areas 1 and 2, an approximately 10.5-mile stretch of the Bluestone River, beginning approximately 2 miles upstream of the Summers and Mercer County line and extending downstream to the maximum summer pool elevation (1410 feet) of Bluestone Lake, and a 53-mile stretch of the New River from Hinton to Gauley Bridge are designated as national wild and scenic rivers, having met certain criteria for free-flowing stretches of river and outstandingly remarkable resource values (National

Park Service (NPS) 2009). The wild and scenic river designations are unique in the ecoregion, and provide stretches of river free of impoundments with shorelines or watersheds that are still largely primitive and undeveloped, but accessible. There are no dams on the Bluestone River, whereas the New River is free-flowing between two dams (Bluestone and Hawk's Nest).

Fish

The New River Basin supports one of the largest and most valuable warmwater stream fisheries in West Virginia due to a good pool-riffle geomorphic structure, abundant cover, and adequate water quality (Mahan 2004). The reach of the New River in Reconnaissance Area 1 supports an excellent warmwater fishery of smallmouth bass (*Micropterus dolomieu*), spotted bass (*M. punctulatus*), rock bass (*Ambloplites rupestris*), channel catfish (*Ictalurus punctatus*), and flathead catfish (*Pylodictis olivaris*) (Corps 2004). In particular, the stretch of river from the tailwaters near Hinton to Sandstone Falls is one of the most popular and accessible fishing areas in West Virginia, known locally as the "Miracle Mile" (Buhlmann 1990; Mark Scott, WVDNR, personal communication 2013). Near optimum fish habitat below the reservoir in the New River is created by cool water releases from the bottom of the dam, in combination with run, riffle, and pool habitats, and abundant macro-invertebrate populations. The volume and gradient of the New River Gorge allows for many cross sections of the river to contain all three of these habitat types.

The New River Gorge is over 1,200 feet deep, averages 1.3 miles wide at 7 cross-sections, and has an average stream gradient of about 13 feet per mile over its entire course (Purvis *et al.* 2002, Mahan 2004). The entire river has important fish spawning, rearing, and adult migration habitat due to its size, geomorphic variety, ledge drops, pools, runs, side eddies, islands, backwaters, large woody debris, forested bank cover, and suitable spawning substrate (NPS 2009). Instream wetlands, consisting of numerous emergent water willow (*Justicia americana*), star-grass (*Heteranthera dubia*), and pondweed (*Potamogeton sp.*) populations, also occupy the shallow water areas around forested islands, shorelines, and riffles (NPS 2009). The diversity of living organisms associated with these shallow areas provides excellent feeding, spawning, resting, and nursery habitats for fish.

Different species of fish occupy different microhabitats in the New River. Five habitat-use guilds have been identified for fish in the New River Gorge National River (as summarized by Purvis *et al.* 2002). The edge-pool guild includes bluntnose minnow (*Pimephales notatus*), logperch (*Percina caprodes*), young-of-year (YOY) and juvenile northern hog sucker (*Moxostoma macrolepidotum*), small-sized white and striped shiners (*Luxilus albeolus, L. chrysocephalus*), white crappie (*Pomoxis annularis*), and all sizes of spotted bass and sunfish (*Lepomis sp.*), and mimic, spottail, and spotfin shiner (*Notropis volucellus, N. hudsonius, N. spilopterus*). The middle-pool guild includes common carp (*Cyprinus carpio*), adult flathead catfish, channel catfish, and muskellunge (*Esox masquinongy*). The riffle guild includes adult bigmouth chub (*Nocomis platyrhynchus*), rainbow and sharpnose darters (*Etheostoma caeruleum, Percina oxyrhynchus*), YOY

flathead catfish, telescope shiner (*Notropis telescopus*), rosyface shiner (*N. rubellus*), and large white and striped shiners. The edge-channel guild includes YOY smallmouth bass, greenside and Roanoke darters (*Etheostoma blennioides, Percina roanoka*), central stonerollers (*Campostoma anomalum*), and YOY bigmouth chub (*Nocomis platyrhynchus).*The generalist guild includes juvenile and adult smallmouth bass, and all sizes of rock bass.

Similar to the New River, the Bluestone River Gorge is deeply incised. At three cross sections it averages about 0.9 miles wide and over 760 feet deep (Purvis *et al.* 2002). The average gradient of the Bluestone River over its entire course is 27 feet per mile (Purvis *et al.* 2002). The Bluestone River has similar fish species composition as the New River, including popular game fish such as smallmouth bass, rock bass, bluegill (*Lepomis macrochirus*), and catfish (NPS 2009).

Both the Bluestone and New River drainages have a native fish fauna that is distinct from those of the rest of the Ohio River system (Jenkins and Burkhead 1994). This unique native fauna is composed of relatively few species compared to adjacent rivers, but with a high proportion of the native species being endemic with their native range restricted to a certain geographic area (NPS 2009). The uniqueness of the fauna is attributable to the relative long-term isolation of the New River system from adjacent river systems.

A major factor isolating the New River from other drainages is the 25 feet high Kanawha Falls. These falls are located approximately two miles below the confluence of the New and Gauley Rivers. While the name of the river does not change from New to Kanawha until the confluence, for ecological purposes Kanawha Falls serve as the boundary between the New and Kanawha Rivers. Kanawha Falls have been a significant, although not complete, barrier to upstream migration of fishes since the period of Pleistocene glaciation (Purvis *et al.* 2002).

The native fish fauna of the Bluestone and New Rivers have been adversely affected in more recent times by the introduction of nonnative fishes. Nonnative fishes make up approximately one-half of the New River fish fauna (Welsh *et al.* 2006). Introduced species are successful in the New and Bluestone Rivers because of high resource availability, low species richness, water chemistry, and productivity (Welsh *et al.* 2006). While valuable to the recreational fishery, nonnative species can have various impacts on native species through habitat alterations, disease/parasite introductions, hybridization, trophic alterations, and spatial alterations (Wellman 2004).

An electrofishing survey conducted by the Corps in 2004 immediately downstream of the dam, in the project area, found equal numbers of native and non-native fish species (Corps 2004). The native species found were channel catfish, logperch, sharpnose darter, greenside darter, longnose dace (*Rhinichthys cataractae*), Northern hogsucker (*Hypentelium nigricans*), central stoneroller, rosyface shiner (*Notropis rubellus*), spotfin shiner, white shiner, bigmouth chub, and flathead catfish. The nonnative species found were rock bass, bluegill, smallmouth bass, spotted bass, largemouth bass (*Micropterus*

*salmoides*), white crappie (*Pomoxis annularis*), rainbow darter , brook silverside (*Labidesthes sicculus*), redbreast sunfish (*Lepomis auritus*), telescope shiner, margined madtom (*Noturus insignis*), and Roanoke darter.

Mussels

Native mussels are an important part of the benthic community. Although there are abundant mussel fauna in the New River Gorge National River, the population is relatively low in diversity (eight species) when compared to the diversity of mussels (36 species) found in the Kanawha River (NPS 2009). Some of the same barriers that prevented fish migration also may have prevented mussel migration. Also, mussels require specific fish hosts to complete their life cycle; hence, the relatively low fish species diversity of the New River may contribute to the low diversity of mussels.

Seven species of live mussels, and shells of an eighth, were collected in New River Gorge National River during a 1984-85 study (Jirka and Neves 1987). Mussels were much more common towards the upstream end of the park, decreasing significantly below Glade Creek. No living or dead mussels were found in the lower eight miles of river within the park. The majority of mussel beds sampled were found on gravel, cobble, and sometimes sandy substrates, and often contained aquatic plants (macrophytes).

Mucket (*Actinonaias carinata*) was by far the most common species found by Jirka and Neves (1987). It composed over 90 percent of the individuals collected, and occurred in all areas where mussels were found. Purple wartyback (*Cyclonaias tuberculata*) and spike (*Elliptio dilatata*) were next most common, comprising approximately four and two percent, respectively, of the mussel fauna. These species were also present in all mussel beds. Buckhorn, or pistol-grip, (*Tritogonia verrucosa*) were relatively common (~2 percent of the fauna) above Sandstone Falls, but much less common below this point. Elktoe (*Alasmidonta marginata*), wavy-rayed lampmussel, (*Lampsilis fasciola*), and pocketbook (*Lam. ovata*) were collected in very small numbers. Shells of wavy-rayed lampmussel and pocketbook were collected in many mussel beds where no live individuals of these species were found. Shells of green floater (*Lasmigona subviridis*) were also collected during the survey.

Several other mussels have been collected or reported from the New River Gorge area. Empty valves of giant floater (*Anodonta grandis*) have been found immediately below Bluestone Dam and near the lower end of Brooks Falls (Jirka and Neves 1987). Lilliput (*Toxolasma parvus*) has been collected in the lower New River only near the mouth of the Gauley River (Jirka and Neves 1987). A single specimen of rainbow (*Villosa iris*) was reported from Bluestone River (Tolin 1985). Mapleleaf (*Quadrula quadrula*) was reported from Sandstone Falls in 1970 (Bates 1979). In 2002 a single live mapleleaf was positively identified from the New River in the Stonecliff area and was identified again in 2007 within the New River Gorge National River (Taylor *et al.* 2007).

A recent mussel survey of the tailwaters by the Corps located only two mussel species immediately downstream of Bluestone Dam, the pistolgrip (*Tritogonia verrucosa*) (8

individuals) and purple wartyback (*Cyclonaias tuberculata*) (2 individuals) (Corps 2011). In addition to natural barriers to fish host migration in the New River, altered geomorphic structure in the tailwaters could contribute to the depauperate mussel resources in this area. Since the Bluestone Dam was originally constructed, changes in flow dynamics may have had adverse effects on the physical and biological attributes of the New River. Decreases in the extent and frequency of flood events have altered riparian and instream vegetation, as well as the location and composition of gravel bars in the river. In particular, changes in flow dynamics and important gravel bar habitat may have adversely affected mussel communities (Mahan 2004).

An exotic bivalve mollusk, the Asiatic clam (*Corbicula fluminea*), has become well established in New River since at least 1975 (Rogers *et al.* 1979). Population numbers, biomass, and production of this mollusk probably greatly exceed those of all native mussels. Unlike most native mussels in the family Unionidae, *Corbicula* have ciliated, free-swimming larvae and do not require a specific fish host to complete their life cycle (Pennak 1989).

Another invasive exotic, the zebra mussel (*Dreissena polymorpha*) is known to occur in West Virginia but has not yet been reported in the New River. This exotic species was first found in West Virginia in the Ohio River in 1999 (Purvis *et al.* 2002). Although not yet known from the New River, zebra mussels are now well established in Kanawha River and could easily be introduced to heavily boated Bluestone Lake at any time (Mark Scott, WVDNR, personal communication 2013). Boats that have been anchored more than a day or two in zebra mussel-infested waters may carry "hitchhiking" mussels attached to their hulls, engines, and anchor chains.

Crayfish

Seven species of crayfish are known from the New River Gorge (Purvis *et al.* 2002). Of these, five species are widespread (to differing degrees) in the New River Gorge area, Sanborn's crayfish (*Orconectes s. sanbornii),* Northern crayfish (*O. virilis*), Coosa River spiny crayfish (*O. spinosus*), *Cambarus bartonii carinirostris* (no common name available), and Teays River Crayfish (*C. sciotensis*) (Jezerinac *et al.* 1995). A sixth species, the Allegheny crayfish (*O. obscurus*) has also been collected from New River (Markham *et al.* 1980). *C. b. carinirostris* is known from Bluestone River. The Appalachian brook crayfish (*Cambarus bartonii cavatus*) is listed as rare upstream from Kanawha Falls, and is found primarily above 1500 feet of elevation. The three *Cambarus* species, Sanborn's crayfish, and the Allegheny crayfish are considered native. The Northern crayfish and the Coosa River spiny crayfish are non-native. The New River crayfish (*Cambarus chasmodactylus* ) is found in the same watershed and has the potential to be present in Reconnaissance Area 1.

Historically, Northern crayfish individuals were introduced into Bluestone Lake as forage when the reservoir fishery was newly created after the dam began operation (Swecker 2012). They are now abundant in the New River below the dam and appear to be displacing native crayfish populations (Swecker 2012). Non-native crayfish were likely

introduced below the dam by anglers as discarded or escaped bait. Crayfish are a large part of a significant bait fishery that exists in the New River between Bluestone Dam and Sandstone Falls (Purvis *et al.* 2002).

Crayfish are an important food source for smallmouth bass, aquatic salamanders, as well as many birds, mammals, and reptiles. They are considered a keystone species that play a vital role in breaking down organic matter in lakes, streams, and rivers (Swecker 2012).

Benthic Macroinvertebrates

Monitoring by the NPS for invertebrates in the New River indicates that aquatic invertebrate abundance is highest directly below Bluestone Dam and decreases downstream. The macroinvertebrate community is most diverse at Sandstone Falls.

At least 12 families of invertebrates occur below Bluestone Dam (Purvis *et al.* 2002). Two families, Hydropsychidae (net-spinning caddisflies) and Chironomidae (midges) together accounted for almost 90 percent of the community. The Sandstone Falls community was more balanced with a greater variety of families than at any other site. Usually, seven families accounted for more than one percent of the community. Hydropsychidae (30 percent) were most abundant. Midges (10 percent) were much less abundant than at Bluestone Dam. Three mayfly families (Oligoneuriidae, Baetidae, and Ephemerellidae) together comprised about 40 percent of the community. Also present in substantial numbers were riffle beetles (Elmidae) and gill breathing snails (Pleuroceridae). Fourteen invertebrate families were collected at Thurmond. Baetidae (50 percent), midges (15 percent), and Pleuroceridae (10 percent) were most abundant. Fayette Station had the lowest taxa richness (8 families) of the five sites. Heptageniid mayflies (25 percent), Elmidae (25 percent), and midges (20 percent) were most abundant.

Hellgrammites (*Megaloptera sp.*) are relatively large aquatic macroinvertebrates that provide food for game fish and bait for anglers and support a recreational and commercial bait fishery in and around the New River Gorge National River (NPS 2009).

Black flies (Simuliidae) also are found throughout the New River, with the primary breeding area in the stretch between Hinton and Meadow Creek (NPS 2009). While black flies are an important food source for foraging fish, including smallmouth bass, they are bothersome to people. It is unknown to what degree the current practice in the gorge of aerial application of *Bti*, a bacterial insecticide, to kill black flies, is having on the fish prey base.

Water Quality

The mainstem of the New River in Reconnaissance Areas 1 and 2 is not currently listed as impaired on the State 303(d) list of impaired streams; however, some of its smaller tributary streams are listed as impaired due to poor biological integrity, or have issues with pH, fecal coliform, polychlorinated biphenyls (PCBs), iron, and selenium ((West

Virginia Department of Environmental Protection (WVDEP) 2012)). The Bluestone River is listed as impaired for its entire length for PCBs and has biological integrity issues from river mile 44.9 to the headwaters (WVDEP 2012). Human practices such as coal mining, domestic waste, logging, agriculture, industrial activities, urbanization, and oil/gas extraction have influenced water quality throughout the New River basin (Wellman 2004). The National Park Service's water quality management plan for the Bluestone Scenic River and the New River Gorge National River identified improper sewage disposal within and outside the park as a key concern. Other potential concerns included acid rain, trace metal contamination, and run-off from logging and road construction outside the park (Purvis et al. 2002). During field work in 2013, Service staff noted widespread soil erosion and sedimentation in Reconnaissance Areas 1 and 2 following heavy rains.

Birds, Mammals, Reptiles, and Amphibians

Terrestrial vertebrates are abundant and diverse in or near the Bluestone and New Rivers (Pauley 1993). A 1987 biological survey of New River Gorge documented over 100 species of birds, 30 species of small mammals, and 41 species of amphibians and reptiles (Buhlman *et al.* 1987). The actual number of bird and mammal species in these areas is expected to be about twice what this study found (NPS 2009). Beaver (*Castor canadensis*) and muskrat were found during the survey. Several species of ducks (Anatidae), Canada geese (*Branta canadensis*), great blue and green herons (*Ardea herodias* and *Butorides striatus*), osprey (*Pandion haliaetus*), and kingfishers (*Ceryle alcyon*) are among the birds that spend a substantial amount of time in or near the river. In addition, river otters (*Lutra canadensis*) were re-introduced into the New River area in the late 1990s (Purvis *et al.* 2002).

Several reptiles are generally found in or near water in this Area (Green and Pauley 1987). Watersnakes (*Nerodia sipedon*) and queen snakes (*Regina septemvittata*) frequent streams and are found in New River Gorge. Snapping turtles (*Chelydra serpentina*), map turtles (*Graptemys geographica*), painted turtles (*Chrysemys picta*), eastern river cooter (*Pseudemys c. concinna*), and spiny softshell (*Trionyx spiniferus*) are known from New River Gorge or nearby areas. All four of these turtles spend much or most of their time in or near water, but none of them are abundant.

Several amphibians are also common to abundant in the New River Gorge area (Green and Pauley 1987, Pauley 1993). Among the toads and frogs are spring peeper (*Pseudacris cruciferans*), gray tree frogs (*Hyla versicolor* and *H. chrysoscelis*), green frog (*Rana clamitans melatona*), bullfrog (*Rana catesbeiana*), and American toad (*Bufo a. americana*).

Several permanently aquatic salamanders are found in New River Gorge or surrounding counties (Green and Pauley 1987). The hellbender (*Cryptobranchus alleganiensis*) is a large (up to 20 inches) salamander that prefers cool, clear, mountain streams. Although they are nocturnal and hide during the day, they respond strongly to electric current and are occasionally seen by electrofishing crews. Adult red-spotted newts (*Notopthalmus viridescens*) are common and abundant in New River and nearby streams. Three stream

salamanders of genus *Desmognathus* are found in small streams of New River Gorge: the northern dusky salamander (*D. f. fuscus*), the Appalachian seal salamander (*D. m. monticola*), and the blackbelly salamander (*D. quadramaculatus*) (NPS 2009). Blackbelly salamanders are commonly used as fish bait, and are sometimes harvested by bait dealers. They are thought to be declining in abundance (Pauley 2005). Other stream salamanders of the area include the spring salamander (*Gyrinophilus porphyriticus*), northern red salamander (*Pseudotriton r. ruber*), northern two-lined salamander (*Eurycea bislineata*), and longtail salamander (*Eurycea l. longicauda*), all of which are found in springs or small headwater streams (NPS 2009).

### 2. Reservoir Resources

Bluestone Lake is the third largest body of water in West Virginia. It is a scenic lake surrounded by steep undeveloped upland forests. At normal summer pool (April through October), the dam impounds 2,040 acres and 10.7 miles of the New River and its tributary, the Bluestone River. When the flood control pool is in operation, the dam impounds over 36 miles of river (NPS 2009). In managing water releases from the reservoir, the Corps attempts to maintain relatively constant summer and winter lake pools in Bluestone Lake, 1410 and 1406 feet msl, respectively. However, due to the flood control function of the dam, releases do not correspond perfectly to a run-of-the-river pattern where inflow equals outflow (Purvis *et al.* 2002).

The reservoir provides excellent fishing for bluegill, large and smallmouth bass, hybrid bass, striped bass, crappie, muskellunge, and channel catfish (WVDNR 2006). Similar to the river, aquatic reptiles such as snapping turtles, map turtles, and painted turtles likely occur in the lake. Bones of the eastern river cooter were found at an archeological site near Bluestone Lake, confirming that this species is native (Purvis *et al.* 2002). Mallard duck (*Anas platyrhnchos*), Canada geese, great blue herons and bald eagles (*Haliaeetus lecocephaus*) occur at the lake year-round (Duda 1999). Other water-dependent birds that use the lake and nearby shoreline seasonally include: common goldeneye (*Bucephala clangula*), bufflehead (*B. albeola*), hooded merganser (*Lophodytes cucullatus*), ring-necked duck (*Aythya collaris*), lesser scaup (*A. affinis*), wood duck (*Aix sponsa*), green herons, osprey, and kingfishers (Duda 1999). River otter are occasionally seen in the lake (WVDNR 2006). Beaver, mink, and muskrat are more common in the lake and along the shoreline.

## 3. Riparian Areas and Wetlands

Riparian areas and wetlands occur at the interface between land and water. Collectively these areas represent only a small proportion of the landscape in the study area. However, their hydrologic and ecological importance is very significant. Collectively, these areas provide many critical functions including water supply, maintenance of water quality, flood attenuation, essential habitats for flora and fauna, and maintenance of biodiversity.

Riparian Areas

Natural riparian areas are some of the most diverse, dynamic, and complex biophysical habitats in the terrestrial environment (Naiman *et al.* 1993). The riparian area encompasses the stream channel between low and high water marks, as well as that portion of the terrestrial landscape above the high water mark where vegetation may be influenced by elevated water tables or flooding and by the ability of the soils to hold water (Naiman and Decamps 1997). Thus, riparian areas are ecotones between the aquatic habitat of a river and the surrounding terrestrial habitats. Riparian zones of most large streams are characterized by well-developed but physically complex floodplains with long periods of seasonal flooding, lateral channel migration, oxbow lakes in old river channels, a diverse vegetative community, and moist soils (Malanson 1993). These attributes suggest that riparian zones are key systems for regulating aquatic-terrestrial linkages and that they may be early indicators of environmental change (Decamps 1993).

Buhlmann and Vaughan (1985) and Buhlmann *et al.* (1987) characterized riparian areaswithin New River Gorge National River and developed an extensive list of plants associated with riparian habitats. This summary draws mainly from these descriptions.

Riparian sites in the southern section of New River Gorge, Hinton to Meadow Creek, consist primarily of small floodplain forests with sycamore (*Platanus occidentalis*), river birch (*Betula nigra*), black willow (*Salix nigra*) and silver maple (*Acer saccharinum*) constituting most of the canopy (Buhlmann *et al.* 1987). Much of the floodplain forest has been cleared or altered for farmland, industry, and town and home sites.

A few unusual riparian habitat types occur in the southern section of the Gorge. These include a site dominated by Virginia pine (*Pinus virginiana*) and quaking aspen (*Populustremuloides*), and a talus slope near the I-64 bridge over New River that is dominated by eastern hemlock (*Tsuga canadensis*) and upland hardwoods. An unusual floral community, the Appalachian Rivers Flatrock Community, occurs on flat sandstone ledges at three locations within the park downstream of the dam (Camp Brookside, Sandstone Falls, and Keeney Creek). These areas provide habitat for communities of cedar, pines, locally rare sedges, and other rare plants (Vanderhorst 2007). The Appalachian flatrock community type is globally rare. These communities are dependent on the scouring caused by occasional flooding, which does not occur frequently because of the regulated water flow in the New River (Mahan 2004).

Downstream of Meadow Creek, the river channel narrows, stream gradient increases, and wide floodplain habitats are sparser. Rock rip-rap habitats predominate, with only a narrow band of riparian hardwoods separating the river from the upland forest. Wider floodplains are found at the confluence of major tributaries, such as Glade Creek in Raleigh County. Downstream from Thurmond, large talus blocks of sandstone from the cliffs above become the dominant riparian shoreline.

Tributary riparian areas were characterized primarily by hemlock, yellow birch (*Betula lutea*), red maple (*Acer rubrum*), and buckeye (*Aesculus glabra*). The common understory vegetation in these areas included rhododendron and ferns. Buhlmann *et al.* (1987) classified riparian areas into the following 10 habitat types: mature sycamore; willow; sycamore willow birch; stunted sycamore/willow; hemlock/rip-rap; riparian Virginian pine; rock riprap; boulder; tributary; and developed.

Wetlands

Wetlands are extremely valuable habitats. One third of all U.S. bird species, about 230 out of 686 species, depend on wetlands for one or more of their life requirements (Welsch *et al.* 1985). Approximately 190 species of amphibians, including frogs, toads, and salamanders, require wetlands to reproduce (Welsch *et al.* 1995). On a national level, wetlands comprise only about 5 percent of the land area of the 48 contiguous states (Welsch *et al.* 1995), and in West Virginia alone wetlands make up less than ½ of one percent of the land area (WVDNR 2005). In West Virginia, wetlands are home to 23 percent of its plant species, and thus provide one of the State's most critically important habitat types (WVDNR 2005).

Bluestone Lake comprises most of the open water wetland habitat in Reconnaissance Area 1. The types of wetlands in Areas 1 and 2 include temporarily flooded riverine wetlands on unconsolidated or rocky shores, permanently flooded riverine wetlands, and temporarily flooded, broad-leaved deciduous palustrine wetlands (Mahon 2004). In addition, the WVDNR notes there are at least 92 forest seeps and 28 beaver influenced wetlands in the New River Gorge National River (see WVDNR comment letter in NPS 2011). These wetlands are valuable habitat for a variety of waterfowl, herons, egrets, turtles, salamanders, frogs, muskrat, and mink.

Riverine wetlands are located in the river channel where the water is usually flowing, and bounded on the upland side or channel bank. The emergent water willow below the dam is an example of this type of wetland (NWI). Temporarily flooded wetlands refers to surface water that is present for brief periods during the growing season, but the water table usually lies well below the soil surface for most of the season. Unconsolidated shore includes all wetlands that have: 1) unconsolidated substrates with less than 75 percent areal cover of stones, boulders, or bedrock; and, 2) less than 30 percent areal cover of vegetation. Rocky shore includes wetlands characterized by bedrock, stones, or boulders that singly or in combination have an areal cover of 75 percent or more, and an areal coverage of vegetation of less than 30 percent. Palustrine wetlands are all non-tidal wetlands dominated by trees, shrubs, and persistent emergent vegetation. The palustrine system was developed to group vegetated wetlands traditionally called by such names as marsh, swamp, bog, and fen (Cowardin *et al.* 1979). Broad-leaved deciduous refers to dominant trees such as red maple, American elm (*Ulmus americana*), and ashes (*Fraxius sp.*), among others.

Of particular note, a significantly large bottomland forest wetland is known to occur at Crumps Bottom and the mouth of Indian Creek in Bluestone Lake (Area 1). This area

consists of scattered emergent and scrub/shrub wetlands, but it is predominantly palustrine forest. The forested wetlands contain many of the trees associated with the bottomland hardwood forest such as box elder, silver maple, red maple, slippery elm, black gum, and river birch. The common shrub species associated with these areas include black alder, buttonbush, silky dogwood, black willow, spicebush, and spiraeas. At the head of the dam's normal pool, siltation occurs, which negatively impacts the wetlands in the Crumps Bottom area; upstream the wetlands and bottomland hardwoods are in pristine condition (Service 1996).

Bottomland forest and swamps are essential life support systems for a tremendous array of wildlife species. Only a tiny fraction of bottomland forests and swamp habitat persists in West Virginia today, and this continues to decrease due to development pressure (WVDNR 2005). Because of the drastic decreasing trends of bottomland forests and swamps in West Virginia, these habitats are of high conservation priority (WVDNR 2005).

The NPS conducted a wetland delineation study for the New River between Hinton and the I-64 Bridge (NPS 2009, undated NPS files). Wetlands on National Wetland Inventory (NWI) maps were ground-truthed. For this stretch of New River Gorge, NWI maps showed 49 wetlands representing 11 wetland types. In contrast, the NPS study delineated 76 wetlands representing 21 wetland types. According to the NWI maps, the dominant wetland type was unclassified (53 percent potential wetlands), followed by palustrine wetlands (43.4 percent). For the NPS study, dominant wetland types were the broad leaved deciduous palustrine wetlands (43.4 percent; either temporarily, seasonally or intermittently flooded), followed by riverine wetlands (32.9 percent; either intermittently flooded aquatic beds, rocky bottoms, or unconsolidated bottoms). Two things were striking: 1) the difference in total wetlands identified (76 in the NPS study vs. 49 for the NWI maps); and the difference in the riverine wetlands (32.9 by NPS vs. 3.6 percent by NWI). The differences are probably attributable to the ground-truthing of wetland delineations. The 35.5 percent difference in total wetlands is significant for this reach, suggesting many more wetlands currently exist than shown on NWI maps. Whereas NWI maps are useful for a general understanding of the potential areal extent and types of wetlands that are present, NWI maps in West Virginia are now based on outdated aerial photography, often were not ground-truthed, and the scale (1:24,000) is not adequate to detect subtle changes that may be occurring with respect to habitat boundaries or species composition changes, or to delineate small wetland types such as seeps or springs.

### 4. Upland Forest

Forests surrounding the river in Areas 1 and 2 tend to be large, dense, diverse, and mature. The forests in this area are now over 70 years old, having recovered from widespread clear-cutting practices from the turn of the century through the 1930s and 1940s. Steep cliffs and rock faces exposed along valley slopes of the New River also contain remnant stands of old-growth trees (Purvis *et al.* 2002).

The terrestrial upland habitat surrounding Bluestone Reservoir and upstream of the dam is comprised mostly of forested land. The major forest types are oak-chestnut and mixed mesophytic forest; other forest types in the area include oak-hickory, oak-pine-hickory, and white pine. The remainder of the terrestrial habitat in the surrounding Bluestone Lake area is in old fields and pasture.

The New River Gorge National River is surrounded by a nationally significant large block of forest that contains over 40 plant communities containing at least 1,342 plants species and 54 rare plants, comprising the most diverse flora of any river gorge in central and southern Appalachia, and providing essential habitat for endangered mammals and rare birds and amphibians (NPS 2009). This plant diversity is due to the extremes in moisture gradients available in the gorge (Fortney *et al.* 1995). Terrain along the New River Gorge National River is steep, with a 1,200 foot elevation difference between the river and surrounding plateaus. These steep slopes are dominated by extensive unfragmented deciduous upland forests, smaller areas of conifer-dominated upland forest, and very small areas of specialized communities associated with cliffs (Vanderhorst 2007). The upper steep gorge communities include chestnut oak (*Quercus prinus*), black oak (*Quercus nigra*), and pignut hickory (*Carya glabra*) (Mahan 2004). Habitats are similar at like elevations throughout out all reconnaissance areas (Corps 1997).

Due to these extensive forests, the quality of the terrestrial habitats in the New River Gorge portion of Reconnaissance Area 1 and 2 is optimum for a diverse group of birds, mammals, reptiles, and amphibians (Appendix B). The large forest with a diverse mosaic of habitats over a large elevational gradient supports abundant and diverse breeding populations of birds that spend their lives in the tropics but depend upon the unfragmented forests here for breeding, especially wood warblers, vireos, and thrushes (NPS 2009). A few other bird species that occur in Reconnaissance Areas 1 and 2 are osprey, peregrine falcon (*Falco peregrinus*), bald eagle, red bellied woodpecker (*Melanerpes carolinus*) Cerulean warbler (*Setophaga cerulea*), and scarlet tanager (*Piranga olivacea*) (Service 1978). The most common terrestrial game birds in the area are wild turkey, ruffed grouse, Northern bobwhite (*Colinus virginianus*), various species of waterfowl, mourning dove (*Zenaida aurita*), and American woodcock (*Scolopax minor*) (Service 1978). The Bluestone Lake Wildlife Management Area is renowned for its wild turkey population. A list of bird species which may use the New River Gorge National River are found in Appendix A.

Some mammalian species that could be found in terrestrial forest habitats in Reconnaissance Areas 1 and 2 are bobcat, black bear, longtail weasel (*Mustela frenata*), little brown bat (*Myotis lucifugus*), big brown bat (*Epitesicus fuscus*), eastern red bat (*Lasiurus borealis*), Alleghany wood rat (*Neotoma magister*), pygmy shrew (*Microsorex hoyi*), and white-footed mouse (*Peromyscus leucopus*) (Service 1978, Appendix B). Mammals hunted and trapped in the area include fox and gray squirrel, white-tailed deer, cottontail rabbit, woodchuck (*Marmota monax*), raccoon, and red and gray fox (Service 1978). These mammals use forests and tree cavities for foraging, shelter, and reproduction.

Appendix B lists 6 amphibian and 5 reptile species seen by NPS staff in the New River Gorge National River. A few reptiles and amphibians encountered in the terrestrial and riparian habitat in this area in 1978 by Service staff are snapping turtle, timber rattlesnake (*Crotalus horridus*), and American toad (*Bufo americanus*) (Service 1978). Other amphibian and reptile species potentially occurring in Area 1 and 2 forested uplands include the ravine salamander (*Plethodon richmondi*), eastern box turtle (*Terrapene c. carolina*), and garter snake (*Thamnophis sitalis*) (Pauley and Seidel 2002, Green and Pauley 1987).

## 5. Special Status Species

Special status species which may occur in Reconnaissance Areas 1 and 2 include threatened and endangered species, eagles, osprey and migratory birds. These include four federally listed species: the endangered Indiana bat (*Myotis sodalis*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), and running buffalo clover (*Trifolium stoloniferum*), and the threatened Virginia spiraea (*Spiraea virginiana*).

Indiana bat

Indiana bats hibernate in clusters during the winter in cool humid caves or mines with stable temperatures under 50 °F, but above freezing. After winter they migrate to wooded areas which they use as summer habitat. Indiana bats roost under loose hanging tree bark on dead or dying trees. Females roost in large maternity groups averaging 60 bats, while males may roost alone or in small colonies. Indiana bats forage in or along the edges of forested areas and sources of water (Service 2007).

Winter hibernacula and summer roosting and foraging habitat of the endangered Indiana bat occurs in Reconnaissance Areas 1 and 2. There has been one live capture of an adult male Indiana bat in Reconnaissance Area 2 (Johnson et al 2003). The Indiana bat was captured on September 09, 2002 at Stone Cliff C, one of 47 abandoned mine portals where harp trapping occurred during a fall survey in the New River Gorge National River. The captured Indiana bat was less than 0.5 miles from the river itself. Likely Indiana bat calls were also detected during acoustic surveys conducted during the summers of 2003 and 2004 in the park. They were acoustically detected in Reconnaissance Area 1 (Bluestone Scenic National River) and in Area 2 (New River Gorge National River) (Castleberry *et al.* 2006).

Virginia big-eared bat

Unlike many other bats in West Virginia, Virginia big-eared bats use caves and mine portals year round; although they may use different caves for summer and winter. They also use exposed rock cliff-line habitats during summer. Females form maternity colonies in the warmest parts of caves and mine portals where they rear their young during summer, and hibernate in the colder parts of the cave and portals during the winter

(Service 1984). Virginia big-eared bats forage on moths and other insects in open areas (e.g. pastures and old fields), along forest edges, and in small openings in forests, avoiding clear-cuts.

Endangered Virginia big-eared bats have been captured in the New River Gorge National River in Reconnaissance Area 2. Bats were captured at 37 out of 47 portals that provide suitable bat habitat, and Virginia big-eared bats have been confirmed at 15 portals since 2002 (Johnson *et al.* 2003, Varner 2008; C. Stihler, WVDNR, pers. communication). During the 2002 surveys, a total of 3 Virginia big-eared bats were captured during summer at 2 sites (Area 2) and 25 during fall swarm harp trapping at 12 mine entrances in the New River Gorge National River (Area 2) (Johnson *et al.* 2003). Since 2007, harp trapping at the entrances to these abandoned coal mines in the New River Gorge National River during the late summer and fall swarming period have captured small numbers of Virginia big-eared bats (usually 1 to a few bats per portal on a given night) (Varner 2008). Whereas no large colonies have been discovered in the area, the population is likely larger than 15 to 28 bats because portal entrance surveys underestimate bats, and genetic studies have found that the VBEB in the New River area are genetically distinct from other populations (Piaggio *et al*. 2009).

Running buffalo clover

The federally endangered running buffalo clover requires periodic disturbance and a somewhat open habitat to successfully flourish, but it cannot tolerate full-sun, full-shade, or severe disturbance. Historically running buffalo clover was found in rich soils in the ecotone between open forest and prairie. Those areas were probably maintained by the disturbance caused by bison. Today, the species is found in partially shaded woodlots, mowed areas (lawns, parks, cemeteries), and along streams and trails.

This plant is listed as historically present in the New River Gorge in Reconnaissance Area 1; however, this location is outside of the park boundary (NPS 2009). Suitable habitat exists in Areas 1 and 2, according to a model of suitable habitat developed by the WVDNR with input from species experts. The plant is unlikely to occur in the riparian area immediately below Bluestone Dam due to sun exposure and frequent mowing on the right descending bank and due to full-sun and full shade conditions in areas on the left-descending bank. It may occur in suitable habitat in other parts of Reconnaissance Areas 1 and 2.

Virginia spiraea

The federally threatened Virginia spiraea occurs in riparian and wetland habitat and relies on periodic disturbances, such as high-velocity scouring floods, which eliminate competition from trees and other woody vegetation. However, if the frequency and intensity of these floods is too great, the plant may become dislodged and wash downstream into less suitable habitat. The species is known to occur along parts of the Bluestone National Scenic River in Mercer County (Reconnaissance Area 1) and along portions of the New River Gorge National River in Nicholas County (Reconnaissance Area 2).

A total of 35 locations have been noted for this species in Mercer and Summers Counties along the Bluestone River, including 5 now extirpated locations. One of the sites selected for biennial monitoring has been eroded to bare rock and the population is now extirpated. Another monitored population has been covered with excessive flood debris (logs, trash, etc) and the plants are now submerged. Monitoring has also noted that the populations are threatened by the encroachment of non-native invasive species such as purple loosestrife and severe overgrazing by deer.

There are 24 occurrences of Virginia spiraea along the Meadow River in Nicholas and Fayette Counties. Biennial monitoring indicates that the total extent of the population has increased by 22 percent since 1996, however the percent of Virginia spiraea covered within that area in 2005 has decreased by 29 percent, indicating the species may be stable but more dispersed. Overall, the Meadow River location has been judged as having excellent estimated viability.

There are approximately 50 occurrences of the species along the Gauley River in Nicholas and Fayette Counties. Biennial monitoring since 1996 indicates that the population appears to be stable to increasing. However, recent monitoring has also noted that the populations are threatened by all-terrain vehicle use and the encroachment of non-native invasive species such as Japanese knotweed (WVDNR unpublished data 2006b).

Eagles, Osprey, and Peregrine Falcons

Bald and golden eagles are both protected under the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668c) enacted in 1940. BGEPA prohibits take of eagles without a permit, and defines take to include "pursue, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb," and prohibits take of individuals, and their parts, nests, or eggs. The Service expanded this definition by regulation to include the term "destroy" to ensure that take includes destruction of eagle nests. The term disturb is further defined by regulation as to agitate or bother a bald or golden eagle to a degree that causes or is likely to cause injury to an eagle, a decrease in productivity or nest abandonment (50 CFR 22.3).

The bald eagle is present year-round in Reconnaissance Area 1. Although rare, bald eagles are increasing in numbers statewide. There is currently a nesting pair of bald eagles present on Brooks Island in the middle of the New River, approximately 6 miles downstream of the dam. Bald eagles also are seen foraging near the dam year-round. It is likely the Brooks Island nesting pair forages near the dam and reservoir as they lie within the typical foraging distance of a bald eagle. Golden eagles also migrate through the area and a few may overwinter in the area, based upon sitings during winter eagle surveys by volunteers from the Hanging Rock Observatory (2013). In the past few years both bald and golden eagles have been seen during winter near the Bluestone Dam and along the New River near Hinton.

The osprey is considered a species of concern by the Service and its status is being monitored throughout much of its range. The species occurs sporadically throughout

Reconnaissance Areas 1 and 2. An osprey was seen at Brooks Falls in 2009 by volunteers from the Hanging Rock Observatory (2013). Species of concern do not receive substantive or procedural protection under the Endangered Species Act. The Service does encourage Federal agencies and other appropriate parties to consider this species in the planning process. The peregrine falcon has been observed in the New River Gorge, and potentially nests on the cliff faces. Peregrine falcons have been hacked (raised on an artificial nesting platform in cages several weeks before the young eagles are ready to leave the nest, and are fed and watched over by human caretakers who work from a blind to ensure that the young eagles retain their fear of humans) in the New River Gorge National River but no current or historical nesting records exist for the park (NPS 2009). Previously federally listed, the peregrine was delisted due to recovery in 1999 and its status is being monitored to ensure relisting is not necessary.

Migratory Birds

The New River Gorge offers a great diversity of year-round residents and migrant bird species, over 200 species have been observed by National Park Service employees and visitors (NPS 2009). These birds are protected by the Migratory Bird Treaty Act (MBTA) (16 USC 760c-760g), as amended, which protects all native migratory game and non-game birds with exceptions for the control of species that cause damage to agricultural or other interests. The MBTA prohibits the take of any migratory bird, part, nest, egg, or product. In addition, over 60 migratory bird species have been spotted in the Bluestone National Scenic River and the New River Gorge National River (Reconnaissance Areas 1 and 2) that are considered to be species of concern in West Virginia; this list includes many of the birds of conservation concern (Appendix A).

Under Executive Order 13186, Federal agencies are expected to identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors. In addition, the 1988 amendment to the Fish and Wildlife Conservation Act mandates the Service to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973."

Toward this end, the Service has identified Birds of Conservation Concern (BCC). These migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) represent our highest conservation priorities (Service 2008). BCC lists have been identified for different Bird Conservation Regions (BCRs). BCRs are endorsed by the North American Bird Conservation Initiative as the basic units within which all bird conservation efforts are planned and evaluated (Service 2008).

The study area occurs within BCR 28, corresponding to the Appalachian Mountains. Of the 25 bird species of conservation concern in BCR 28, 16 may occur in Reconnaissance Area 1 and 2 (Appendix A). Many warblers appear on this list. Within Reconnaissance Area 1, the species with the smallest statewide populations and declining trends are

golden winged warbler, Swanson's warbler, red-headed woodpecker *(Melanerpes erthrocephalus*), and yellow bellied sapsucker (*Sphyrapicus varius*). Golden winged warblers are likely to occur in low second-growth forests and open woodlands; Swanson's warblers prefer floodplain and bottomland hardwood forests; red-headed woodpeckers prefer open oak groves; and yellow bellied sapsuckers are found in mixed hardwood forests. All these habitat types are present in Area 1, but are not associated with the tailwater area.

## 6. Species in Greatest Need of Conservation

Several bat species, fish species, an amphibian, crayfish, and a mussel species which potentially occur in Reconnaissance Areas 1 and 2 could be listed in the future as threatened or endangered. These species should be considered by the Corps during project planning.

The Service was petitioned to list the northern long-eared bat (*Myotis septentrionalis*) and eastern small-footed bat (*Myotis leibii*) due to the rapid spread of White-nose Syndrome (WNS), a fungus that that has killed millions of bats. Of these two species, the Service has determined that listing of the eastern small-footed bat is not warranted but listing of the northern long-eared bat is warranted. Hence in October 2013, the Service proposed to list the northern long-eared bat as endangered (78 Federal Register 61046). A final listing decision is due by October 2014. The Service also is evaluating the status of the little brown bat, a once common bat whose populations have been decimated by WNS.

In addition to these bats, the Service also has received petitions to list as endangered or threatened six species that occur or potentially occur in Reconnaissance Areas 1 and 2: Bluestone sculpin (*Cottus sp.*), Eastern hellbender (*Cryptobranchus alleganiensis*), candy darter (*Etheostoma osburni*), popeye shiner (*Notropis ariommus*), New River crayfish (*Cambarus chasmodactylus*), and green floater (*Lasmigona subviridis*).

In addition to petitioned species, other rare species may occur in Area 1 and 2. Nature Serve ranks rare species based on documented occurrences, distributions, habitat, and threats to existing populations. Species are classified as state or globally vulnerable or imperiled because of extreme rarity or because of some factor(s) making them especially vulnerable to extinction or elimination.

The New River Gorge is home to 88 rare plants tracked by the West Virginia Natural Heritage Program. Of these, 88 species, 35 are classified as S-1 (extremely rare and critically imperiled) with 5 or fewer occurrences statewide, and 39 are classified as S-2 with 6 to 20 occurrences statewide (NPS 2009, 2011) (See Appendix B)

In addition, globally imperiled species typically have 6 to 20 occurrences or few remaining individuals (1,000 to 3,000). Species that are globally vulnerable typically have 21 to 100 occurrences or between 3,000 and 10,000 individuals.

The following 5 animals, considered globally vulnerable/ imperiled, are present/likely to occur in Reconnaissance Areas 1 and 2: Green salamander (*Aneides aeneus*), Northern metalmark (*Calephelis borealis*), Eastern big-eared bat (*Corynorhinus rafinesquii*),

Alleghany woodrat (*Neotoma magister*), Kanawha minnow (*Phenacobius teretulus*). The globally vulnerable/ imperiled Diana fritillary (*Speyeria diana*) also likely occurs in Area 2 (Appendix B).

The following 10 plants, considered globally vulnerable/imperiled, are also present/likely to occur in Reconnaissance Areas 1 and 2: spreading rock-cress (*Arabis patens*), American barberry (*Berberis canadensis*), bitter cress (*Cardamine flagellifera*), Appalachian gentian (*Gentiana austromontana*), Torrey's mountain-mint (*Pycnanthemum torrei*), Carey saxifrage (*Saxifraga careyana*), rock skullcap (*Scutellaria saxatilis*), Virginia mallow (*Sida hermaphrodita*), nodding pogonia (*Triphora trianthophora*), and sand grape (*Vitis rupestris*) (WVDNR 2012). Buffalo clover (*Trifolium reflexum*) and nodding onion (*Allium oxyphilum*) are also likely to occur in Area 1 and are ranked globally vulnerable/imperiled (Appendix B).

## B. Reconnaissance Areas 3 and 4

### 1. Riverine Resources

The Kanawha River in Reconnaissance Areas 3 and 4 is a large navigable sixth order stream formed by the junction of the New River and Gauley River in Fayette County, West Virginia. The Kanawha River flows 97 miles in a northwesterly direction and enters the Ohio River at Point Pleasant, West Virginia. The major tributaries of the Kanawha River, in addition to the New and Gauley rivers, are the Coal River (enters the Kanawha River at mile 45.4), and the Elk River (enters the Kanawha River at mile 57.8). The lower 91 miles of the Kanawha River has been impounded by four locks and dams to create a 9-foot navigation channel that is maintained by the Corps through mechanical dredging to allow for the passage of navigable vessels. As a result of the impoundment, much of the lower Kanawha River has lake-like conditions for fish, with the exception of the areas closest downstream to the dam tailwaters. The upper Kanawha, downstream of the falls, is one of the few large rivers in the state that is relatively unaffected by impoundment and still retains approximately 5 miles of free-flowing characteristics including riffles and swift water. It is also above most historic point-sources of water quality degradation and is not affected by dredging, channel maintenance, or barge traffic.

<u>Fish</u>

The Service conducted fish sampling efforts in the Winfield Pool (located between River Miles 31 and 67 on the Kanawha River) between October 1982 and September 1983 (Service 2008). These efforts revealed 66 species of fish present within the Winfield Pool. Gizzard shad (*Dorosoma cepedianum*) dominated the adult fish community at both upper and lower sample sites (63.5 and 60.1 lbs/acre, respectively). Common carp, channel catfish, and smallmouth buffalo (*Ictiobus bubalus*) were secondarily the most abundant species. Other species commonly taken included sauger (*Stizostedion canadense*), freshwater drum (*Apiodinotus grunniens*), spotted bass (*Micropterus punctulatus*), and emerald shiner (*Nicroperterus atherinoides*). Silver, golden, and

shorthead redhorse (*Moxostoma anisurum*, *M. erythrurum*, *M. macolepidotum),* and bluegill were taken at greater frequency at the upper pool reach than at the lower pool reach. When grouped by feeding guilds, herbivore/detritivores and omnivores constituted over two-thirds of the fish community. Production by the herbivore/detritivore group alone represented over half of the total fish community production. These sampling efforts revealed that the fish community in the Winfield Pool was dominated by larger specimens in the invertevore, planktivore, piscivore, and omnivore feeding guilds. Additionally, gizzard shad demonstrated the highest annual production of any species studied.

Current conditions of the fish populations and communities of the Kanawha River are in poor health as compared to other similar river systems in West Virginia (Service 2008). For example, biomass data from fish surveys conducted within the lock chambers of the Monongahela River system ranged from 579-587 lbs/acre, whereas biomass data from fish surveys conducted within lock chambers of the Kanawha River system ranged from 187-306 lbs/acre (Chris O'Bara, WVDNR personal comm., 2007). Investigations conducted by fisheries biologist of the WVDNR found limited numbers of sauger and walleye in the Kanawha River system as compared to both the Ohio and Monongahela River systems (Chris O'Bara, WVDNR personal comm., 2007). In 2003, catch per unit effort (CPUE) for spring investigations in the Ohio River was 746.8 sauger/hour, as compared to 27.2 sauger/hour for the Monongahela River, and 18.0 sauger/hour for the Kanawha River (Chris O'Bara, WVDNR personal comm., 2007). In addition, recent investigations by WVDNR fishery biologists have found depressed populations of littoral inhabiting fish species. Although littoral structural habitat appears to be adequate to support these fish species, abundance of littoral inhabiting fish species still remains low (Chris O'Bara, WVDNR personal comm., 2007). Abundance of all studied fish species still remains depressed in the Kanawha River system (Chris O'Bara, WVDNR personal comm., 2007).

Starting 2003, the State and Federal resource agencies began a restoration program for both sauger and walleye populations in the Kanawha River , and as a result of these efforts, the CPUE for these species increased significantly in the Kanawha River (Chris O'Bara, WVDNR personal comm., 2007). Other large river fish species such as paddlefish, blue catfish, and shovelnose sturgeon were virtually extirpated from the Kanawha River, but have begun to recolonize the Kanawha River ecosystem as a result of restoration efforts by the WVDNR, in partnership with other Federal resource agencies (Chris O'Bara, WVDNR personal comm., 2007).

Mussels

As previously mentioned, Kanawha Falls on the Kanawha River serves as a barrier to many aquatic species including fish and mussels. The Kanawha River is home to 36 native mussel species, but upstream of the falls only 8 species have been found (Taylor 1983; Clayton 2013). The area of the Kanawha River above the head of navigation to the Kanawha Falls, RM 90.57 to RM 95.5, provides outstanding habitat for freshwater mussels, and supports mussel beds that are extremely rich in abundance and diversity.

Thirty-six species, including five federally endangered mussels, the fanshell (*Cyprogenia stegaria*), the pink mucket pearly mussel (*Lampsilis abrupta*), the sheepnose (*Plethobasus cyphyus*), the spectaclecase (*Cumberlandia monodonta*), and the tuberculed blossom (*Epioblasma torulosa torulosa*) have been identified in previous surveys within this reach. Due to the absence of both navigation traffic and the invasive zebra mussel, this area represents a refugia for native mussel species and is a prime recovery area for the federally endangered species that occur there. This reach of the Kanawha River has now been identified as a focus area for freshwater mollusks by the Ohio River Valley Mollusk Group.

The lower 75 miles of the Kanawha River currently is poor habitat for mussels because of navigation dams, chemicals, and industrial, urban, and agricultural development. However, with implementation and compliance with various environmental laws and regulations of the 1970's, water quality within the Lower Kanawha River is increasing. Increased water quality has improved the ability of the Lower Kanawha River to support various freshwater mussel species. Biologists are finding an increased abundance and species richness of freshwater mussel species in the Lower Kanawha River annually during diving surveys (Janet Clayton, WVDNR, personal communication, March 2008).

Crayfish

Swecker (2012) collected 8 species of crayfish from the Kanawha River in 2004 and 2005. Four species of crayfish, rusty crayfish (*O. rusticus)*, northern crayfish *(O. virilis)*, *O. cristavarius* (no common name), and robust crayfish (*C. robustus*), were collected from the Kanawha River mainstem while the Teays River crayfish was collected above Kanawha Falls and Sanborn's crayfish was collected from just upstream in the Elk River. Two additional species, little brown mudbug (*Cambarus thomai*) and the Appalachian brook crayfish, were recorded from one of three seine sites in the Hurricane Creek watershed.

Of these 8 species, the two non-native species dominated the collections (rusty crayfish and northern crayfish). Rusty crayfish comprised 66 percent of all crayfish collections in the Kanawha River. Northern crayfish was the next most abundant, comprising 21 percent of all collections; however, most were found upstream of Kanawha Falls and all were found along the river banks near boat ramps, areas heavily fished, backwater areas, and mouths of tributaries flowing into the Kanawha River. The abundance of northern crayfish in these shallow habitats makes them more likely to be caught as bait and transferred by fisherman. Swecker (2012) concluded that rusty crayfish appeared to be outcompeting northern crayfish, but they remain due to a constant reintroduction of northern crayfish to heavily fished areas.

Benthic Macroinvertebrates

During the Service's sampling in 1982 and 1983, sixty macroinvertebrate taxa were collected in upper Winfield Pool while 38 taxa were collected from the lower reach (Service 2008). Artificial substrates were colonized by a greater density of macroinvertebrates with higher taxonomic diversity than sand/silt substrates.

Macroinvertebrate concentrations on artificial cobble/pebble substrates in the upper pool were greatest in July (1.2 individuals per square inch) and lowest in January (0.005 individuals per square inch). Concentrations on artificial substrates in the lower pool were greatest during November (0.4 individuals per square inch) and lowest in January (0.003 individuals per square inch). Higher macroinvertebrate densities were recorded on artificial substrates placed outside the sailing line (0.79/square inch) than those placed in the sailing line (0.15/square inch). However, greater macroinvertebrate diversity was detected in substrates in the sailing line than those away from mid-channel.

Aquatic insects collected within the Kanawha River System, including the tributaries of the Elk, Pocatalico, and Coal Rivers, include, but are not limited to, the following: flatworms, planarians, segmented worms, leeches, aquatic earthworms, scuds, aquatic sowbugs, beetles, *Elmidae sp.*, *Palponyia sp.*, *Chaoborus sp.*, *Limnophila sp.*, *chironomidae sp*., mayflies, alderflies, dragonflies, stoneflies, caddisflies, snails, clams, and fingernail clams (Kanawha Valley Power Company 1979).

Water Quality

The mainstem of the Kanawha River throughout its length in Reconnaissance Areas 3 and 4 is currently listed as an impaired waterway on the State 303(d) stream list due to PCB contamination; hence advisories against eating fish from the river are in place. Within Reconnaissance Area 4, the entire lower section of the Kanawha River, from the junction of the Elk River to the Ohio River, also is impaired by fecal coliform contamination (WVDEP 2012). In addition, numerous smaller tributary streams are impaired by trace metals and poor biological integrity of aquatic species (WVDEP 2012). Historic and current coal mining has impaired more stream miles in the Kanawha River Basin than any other land use (WVDEP 2012). Coal mining has many negative effects that can continue for decades after mining ceases such as increased sedimentation, landscape-scale changes in geomorphology, and alteration of stream water chemistry. Agricultural practices, logging, chemical manufacturing, and urbanization along the river also contribute to degradation of water quality through pesticide and fertilizer runoff, erosion from heavily grazed fields, and loss of riparian habitat (Chambers and Messinger 2001). Chambers and Messinger (2001) analyzed benthic communities in the Kanawha River and determined that coal mining, more than any other land use, affected instream environment and abundance of pollution intolerant indicator species. Benthic invertebrate communities that were impaired had low number of pollution intolerant species and higher numbers of pollution tolerant species. This is an indication that segments of the Kanawha River, in Reconnaissance Areas 3 and 4 are still impaired because of certain land use practices, predominantly coal mining (Chambers and Messinger 2001).

## 2. Riparian Areas and Wetlands

Because of prior and ongoing disturbances, riparian and wetland habitats in Reconnaissance Areas 3 and 4 are primarily of low to moderate value, supporting a variety of common birds, mammals, fish, and amphibians. Little riparian vegetation remains along the Kanawha River. Where present within Area 3, the lower slopes of the Upper Kanawha River, from Kanawha Falls to Charleston, are predominated by sweet

gum (*Liquidambar styraciflua*), birch (*Betula sp.*), sycamore, and willow (*Salix sp.*). The Lower Kanawha area (Reconnaissance Area 4) has floodplains that are wider with lower slopes dominated by second and third growth forest communities (Corps 1986).

Waves from moving vessels constantly erode the riverbank and littoral areas in the navigation channel. Increased amounts of resuspended sediments have filled in islands, embayments, and backchannels. Pools have replaced natural features such as low-lying swamps and former river meanders. The most dominant wetland types found in Reconnaissance Areas 3 and 4, according to the NWI, are small scattered freshwater emergent wetlands and freshwater forested/shrub wetlands.

### 3. Upland Forest, Pasture, and Old Fields

The dominant upland vegetation types along the Kanawha River are mixed hardwood forests, coniferous forests, old fields, agricultural fields and pasture lands; all of which support a diversity of wildlife. The Upper Kanawha River, from Kanawha Falls to Charleston (Reconnaissance Area 3), is made up of well forested slopes and ridges dominated by basswood, oak, hickory, and American beech. Similar to Reconnaissance Areas 1 and 2, the most common game species in Reconnaissance Areas 3 and 4 are squirrel, deer, grouse, cottontail rabbit, woodchuck, quail, turkey, raccoon, duck, doves, woodcock, and fox (Corps 1986). Other game and furbearer species in these areas include black bear and muskrat. Common non-game mammals found in Reconnaissance Area 3 and 4 are groundhog, opossum, bobcat, skunk and bats (Corps 1986).

The agricultural fields, pasture lands and old fields in Area 4 provide good feeding habitat for raptors and smaller non-game bird species including field sparrow (*Spizella pusilla*), prairie warblers (*Setophaga discolor*) American goldfinch (*Spinus tristis*), Northern cardinal (*Cardinalis cardinalis*) and indigo bunting (*Passerina cyanea*) (Service 1978).

Other non-game species in the study area which depend on the terrestrial habitat include multiple species of turtles, snakes, salamanders, skinks, toads and lizards (Service 1993). Unique salamanders found in upland forests along the Kanawha River include the ravine salamander and Cumberland Plateau salamander (*Plethodon kentucki*) (Pauley 2004).

### 4. Special Status Species

Special status species which may occur in Reconnaissance Areas 3 and 4 include threatened and endangered species, eagles, and migratory birds. These include the same 3 listed species as in Areas 1 and 2: Indiana bat, Virginia big-eared bat, and running buffalo clover. In addition, five endangered mussels are found in the Kanawha River in Areas 3 and 4 in Fayette and Kanawha County: pink mucket (*Lampsilis abrupta*), tubercled-blossom pearly mussel (*Epioblasma torulosa torulosa*), fanshell mussel (*Cyprogenia stegaria*), sheepnose mussel (*Plethobasus cyphyus*), and spectaclecase mussel (*Cumberlandia monodonta*). Most of these mussels are known from the vicinity of

Kanawha Falls in Reconnaissance Area 3. The Diamond darter (*Crystallaria cincotta*), an endangered fish, is found only in the Elk River, a tributary of the Kanawha River. The Elk River joins the Kanawha River in Reconnaissance Area 3.

Indiana Bat

Winter hibernacula and summer roosting and foraging habitat of the endangered Indiana bat occurs in Reconnaissance Areas 3 and 4. During 2003/2004, likely Indiana bat calls were acoustically detected in Reconnaissance Area 3 in the Gauley Unit of the New River National River, but no Indiana bats were captured (Castleberry *et al.* 2006).

Virginia Big-eared Bat

Due to proximity to the Fayette County population in the New River Gorge National River, Virginia big-eared bats may disperse through and occupy suitable habitat in Kanawha County in Area 3. The Kanawha River and surrounding slopes lie within the maximum observed 20-mile known dispersal distance of this species. Virginia big-eared bats move short distances between their winter and summer caves. They also forage in small openings, including forested edges, and old fields and pastures. Suitable foraging habitat and potential cave and mine portal habitat exists in Area 3.

Running buffalo clover

A disjunct population of running buffalo clover is known to occur at the mouth of the New River where it joins the Kanawha River, at the interface between Areas 2 and 3. Suitable habitat does not exist for this plant in Areas 3 and 4, according to a habitat suitability model developed by the WVDNR with input from species experts. This plant species has not been well surveyed in Areas 3 and 4.

Virginia spiraea

No known populations of Virginia spiraea occur in Areas 3 and 4. Suitable habitat for this plant does not exist within these areas according to the WVDNR habitat model for this species.

Endangered Mussels

The pink mucket and fanshell populations within the Kanawha River currently extend over an approximately 20 mile reach of river from Kanawha Falls (RM 95.5) downstream to Watson's Island (RM 75.5). Approximately 36 species are currently known to exist within this reach of the Kanawha River. This includes the pink mucket, fanshell, spectaclecase, and sheepnose. In addition, a freshly dead shell of the federally endangered tuberculed blossom (*Epioblasma torulosa torulosa*) was found downstream of Kanawha Falls in 1969. This is the last known location of this species anywhere throughout its range, and this species may now be extinct (Service 2011).

It is likely that pink mucket, fanshell, spectaclecase, and sheepnose populations historically occurred throughout the entire Kanawha River system, and were contiguous with populations in the Ohio River. Pink mucket, fanshell, and sheepnose shells were all

found during archeological evaluations of Native American mussel middens along the Kanawha River near Buffalo (in the vicinity of RM 22) in Putnam County (Taylor 1983). However, the construction of locks and dams followed by the impoundment and dredging of the river, as well as historical water quality degradation, resulted in the extirpation of many species in the lower Kanawha River, and the restriction of most populations to the upper-most reaches of the river, particularly the 5 miles just below Kanawha Falls.

The Kanawha River is currently serving as a recovery area for the pink mucket, fanshell, spectaclecase, and sheepnose, because the number and distribution of these species, as well as other listed and more common species, has been increasing over time. At the time of listing, the pink mucket and the fanshell were only known to occur in the upper 5 miles of the Kanawha River. By 2000, mussel beds supporting the pink mucket and fanshell were known to extend down to around Wheeler Islands (RM 87.4). The documentation of the pink mucket near RM 80 represents the furthest downstream location of this species in recent record. In 2006, surveys documented individual fanshell at two locations between RM 77.6 and 75.5. In 2002, the spectaclecase was found at RM 78.5 by EnviroScience Inc., representing the first historical or current record in the Kanawha River. In 2005/2006 live or weathered dead specimens were also found by the WVDNR at two locations between RM 78.5 and 75.5. Recent records for the sheepnose in the Kanawha River are still restricted to the upper 5 miles. However, WVDNR surveys have documented evidence of recent recruitment and young mussels less than 5 years old within that area, suggesting that the sheepnose population may be able to expand in the future (WVDNR 2010). The expanding range of these species in the Kanawha River suggests that mussel populations in the river may be recovering given recent water quality improvements and limited direct habitat disturbances in the area. However, records within the Kanawha River outside of the upper 5 miles continue to be limited and typically consist of a few scattered individuals. In order for Kanawha River populations to continue to expand and become viable within the navigable portion of the river, water quality conditions must be maintained and improved, and habitat losses and degradation must be limited.

In 2011 at a permanent monitoring area on the Kanawha River at Kanawha Falls, 5 pink mucket mussels, 103 fanshell mussels, and 4 sheepnose mussels, were collected and tagged within the 25 meter by 25 meter monitoring area (WVDNR 2011).

Diamond Darter

As previously mentioned this species is found only in the Elk River and thus may occur in Reconnaissance Area 3 at the mouth of Elk River where it joins the Kanawha River (Stuart A. Welsh, Professor at WVU, personal communication, 2014). This fish is found mostly in medium to large sized rivers with moderate flows over clean sand, gravel and cobble mix of benthic substrate within the lower sections of riffles or upper parts of pools (Welsh & Wood 2008). The closest known location of diamond darters is approximately 4 miles upstream of the mouth of the Elk River. There is a record of a juvenile diamond darter being collected from near the confluence of the Elk River and the Kanawha River, however, the exact location of this collection is unverified (Barbara Douglas, personal communication, 2014).

Eagles

The bald eagle is present year-round in Reconnaissance Areas 3 and 4. Although rare, bald eagles are increasing in numbers statewide. There is currently a nesting pair of bald eagles present near Winfield City, in Putnum County (Rich Bailey, WVDNR, personal communication, 2014). Bald eagles have been seen in increasing numbers along the Kanawha and Ohio Rivers. Golden eagles also migrate through the area and a few may overwinter in the area, based upon telemetry data (Todd Katzner, Professor at WVU, personal communication, 2014).

Migratory Birds

The table in Appendix A lists 9 migratory bird species of conservation concern potentially present throughout Reconnaissance Areas 3 and 4. These birds are the eastern whip-poor-will (*Caprimulgus vociferous*), red-headed woodpecker, wood thrush (*Hylocichla mustelina*), Swainson's warbler (*Limnothlypis seainsonii*), Kentucky warbler (*Geothlypis formosa*), Canada warbler (C*ardellina canadensis*), prairie warbler, cerulean warbler, and worm-eating warbler (*Helmitheros vermivorum*).

## 5. Species in Greatest Need of Conservation

As previously mentioned, the Service has proposed to list the northern long-eared bat as endangered (78 Federal Register 61046). This species likely occurs in Reconnaissance Areas 3 and 4. Likewise, the Service is evaluating the status of the little brown bat and could propose to list it as endangered or threatened in the future. This species also likely occurs in Areas 3 and 4.
The Gauley River National Recreation Area (Area 3) is home to 37 rare plants tracked by the West Virginia Natural Heritage Program. Of these 37 species, 13 are classified as S-1 (extremely rare and critically imperiled) with 5 or fewer occurrences statewide, and 15 are classified as S-2 with 6 to 20 occurrences statewide (NPS 2009, 2011) (Appendix B).

In addition, globally imperiled species typically have 6 to 20 occurrences or few remaining individuals (1,000 to 3,000). Species that are globally vulnerable typically have 21 to 100 occurrences or between 3,000 and 10,000 individuals.

The following 10 globally vulnerable/imperiled animal species are present or likely to occur in Reconnaissance Areas 3 and 4: green salamander (*Aneides aeneus*), Eastern hellbender[1] (*Cryptobranchus alleganiensis*), Eastern small-footed bat (*Myotis leibii*), Alleghany woodrat (*Neotoma magister*), popeye shiner[~~1~~2] (*Notropis ariommus*), Ohio

[1] Indicates that this species has been petitioned to be listed as threatened or endangered under the ESA, and has the potential to be present in the study area.

[2] Indicates that this species has been petitioned to be listed as threatened or endangered under the ESA, and has the potential to be present in the study area.

lamprey (*Ichthyomyzon bdellium*), yellow lampmussel (*Lampsilis cariosa*), green floater[1] (*Lasmigona subviridis*), northern madtom (*Noturus stigmosus*), Elk River crayfish[1] (*Cambarus elkensi*), and Diana fritillary (*Speyeria diana*).

The following 14 plants are considered globally vulnerable/imperiled; they also are present/likely to occur in Reconnaissance Area 3 and 4: spreading rock-cress (*Arabis patens*), American barberry (*Berberis canadensis*), bitter cress (*Cardamine flagellifera*), Appalachian gentian (*Gentiana austromontana*), Torrey's mountain-mint (*Pycnanthemum torrei*), Carey saxifrage (*Saxifraga careyana*), rock skullcap (*Scutellaria saxatilis*), Virginia mallow (*Sida hermaphrodita*), buffalo clover (*Trifolium reflexum*), turgid gay-feather (*Liatris turgida*), Appalachian blue violet (*Viola appalachiensis*) Barbara's buttons[1] (*Marshallia grandiflora*), nodding pogonia (*Triphora trianthophora*) and sand grape(*Vitis rupestris*).

## V. Preliminary Resource Categories Using the Service's Mitigation Policy

The Service's Mitigation Policy (Federal Register, Vol. 46, No. 15, 7644-7663, January 23, 1981) addresses mitigation for project impacts and is based on the sequential mitigation procedures outlined by the President's Council on Environmental Quality [40 CFR Part 150 . 20 (a-e)]. Since fish and wildlife and their habitats are public resources with clear commercial, recreational, social, and ecological value to the Nation, the Service's policy is to seek to mitigate losses of fish, wildlife, their habitats, and uses thereof from land and water developments. Four Resource Categories are used to ensure that the level of mitigation recommended is consistent with the fish and wildlife resource values impacted by a project. Below we describe each of the four the Resource Categories and provide our rationale for a preliminary determination of resource categories for the tailwater area immediately below Bluestone Dam (Table 1).

Assignment of resource categories is based in part on evaluation species. At this early stage in planning, we have only identified evaluation species for the Bluestone Dam tailwater area, the area most likely to be directly affected by the project and thus in need of mitigation. In coordination with the Corps and WVDNR, we selected 5 evaluation species representative of the Bluestone Dam tailwaters for our HEP. These were the smallmouth bass and common shiner (*Notropis cornutus*) for riverine habitat, the mink, black-capped chickadee (*Poecile atricapillus*), and yellow warbler (*Setophaga petechia*) for riparian habitat. Table 1. shows what resource categories were assigned to the riverine and terrestrial sites where the HEP was performed in Reconnaissance Area1.

*Table 1. Resource Categories for Reconnaissance Areas 1, the tailwater area of Bluestone Dam.*

| Site and Description | Site Size | Evaluation Species and HEP/HSI Scores | USFWS Resource Category |
|---|---|---|---|
| Riverine Site 1 – aquatic habitat immediately downstream of the stilling weir | 125 Acres | Smallmouth bass (0.83), common shiner (0.80) | 1 – high value habitat; unique or irreplaceable on a national or ecoregion basis; no loss of existing habitat value is acceptable |
| Riparian Site 1 – terrestrial habitat immediately below penstock stilling basin area | 1.8 Acres | Mink (0.0), black-capped chickadee (0.48), yellow warbler(0.0) | 4 – low value habitat |
| Riparian Site 2 – riparian corridor extending from current construction area and along Hinton City Park | 1.4 Acres | Mink (0.55), black-capped chickadee (0.86), yellow warbler (0.33) | 4 – low value habitat |
| Riparian Site 3 – terrestrial habitat along the left descending bank downstream of the fishing pier to the end of government property | 2.5 Acres | Mink (1.0), black-capped chickadee (1.0), yellow warbler (0.32) | 3 – medium/high value habitat; relatively abundant on a national or ecoregion basis |

**Resource Category 1** habitats are of high value for evaluation species and are unique and irreplaceable on a national basis or in the ecoregion; therefore there should be no loss of existing habitat value. Examples of Resource Category 1 and 2 habitats are wetlands, natural springs, vegetated shallows, stream riffle areas, sanctuaries, wildlife management areas, fish hatcheries, wildlife refuges, and scenic rivers. Examples of Resource Category 1 habitats in West Virginia are the Canaan Valley wetlands, the islands and mussel beds in the Ohio River, the mussel beds in the upper 5 miles of the Kanawha River, the Bluestone Wildlife Management Area, the Bluestone National Scenic River, the New River Gorge National Scenic River, and the tailwaters of the Ohio River locks and dams.

Consistent with our mitigation policy, we consider the following resources to be Category 1 habitats:

(1) the approximately 10.5-mile long Bluestone National Scenic River (which includes the associated Bluestone Lake Wildlife Management Area managed by the WVDNR) in Reconnaissance Area 1, from a point approximately 2 miles upstream of the Summers and Mercer County line, downstream to the summer pool elevation of Bluestone Lake;

(2) the 19.3-mile long New River wild and scenic river study area[1] in Reconnaissance Area 1, from the Route 460 Bridge in Glen Lyn, Virginia to the summer pool of Bluestone Lake in West Virginia;

[1] The National Park Service (2009) determined the study area met the resource value criteria for inclusion as a wild and scenic river, but the area was not designated due to lack of immediate threats, and lack of public and management agency support at the time.

(3) the 53-mile long (72,186 acre) New River Gorge National River from Hinton, West Virginia, in Reconnaissance Area 1 to Hawks Nest State Park, West Virginia, in Reconnaissance Area 2 (Figure 3).

(4) the tailwaters of the Bluestone Dam near Hinton West Virginia, in Reconnaissance Area 1.

**Figure 2. New River Gorge National River.**

The boundaries described above include the associated riverine, wetland, riparian, and terrestrial habitats adjacent to these rivers within the study area.

These resources are of high value and are unique and irreplaceable in the ecoregion. As further described in section IV.A of this PAL, these river sections and associated lands warrant a Resource Category 1 designation because:

- The New River and its tributary the Bluestone River are among the oldest rivers in the western hemisphere, and continue to sculpt the longest and deepest river gorge in the Appalachian Mountains (Purvis *et al.* 2002).
- The waters of the New and Bluestone River systems contain a mosaic of hydrologic features and aquatic habitats, support a unique aquatic ecosystem, and nourish a riparian zone that supports many rare plants, animals, and communities (NPS 2009).
- The Bluestone Scenic River and New River Gorge National River lie at the core of a nationally significant, expansive unfragmented forest containing the most diverse flora of any river gorge in central and southern Appalachia, and providing essential habitat for endangered mammals and rare birds and amphibians (NPS 2009).
- The habitat in the tailwaters of the dam is unique and irreplaceable, as detailed below.

As reflected in our HEP report, the tailwater area below Bluestone Dam is of high quality for the riverine evaluation species. This site scored a 0.83 and 0.80 Habitat Suitability Index for the smallmouth bass and the common shiner, respectively, out a possible maximum score of 1 (Service 2013). The combination of runs, riffles, and pools in this reach of river is near optimum

for the evaluation species. The tailwaters have numerous fish nursery areas in vegetated shallows of water willow, abundant fish food sources (aquatic insects), and ample places for fish to seek shelter behind large rocks. Such high value riverine habitats below dams are relatively scarce in the ecoregion. Of 10 COE reservoirs in West, the Bluestone tailwaters are renowned as the only wadeable tailwaters with a natural stream bottom and highly productive fishery. As far as habitat, other than just upstream of Sandstone Falls, the tailwaters have the most shallow ledge habitat where anglers can easily wade and any loss of this habitat will have a negative impact on angler opportunities (Mark Scott, WVDNR, personal communication, 2013). Hence the Bluestone tailwaters best fit Resource Category 1. For category 1 resources, because these one-of-a-kind areas cannot be replaced, we recommend avoiding all losses of existing Resource Category 1 habitat from any measures associated with the proposed modifications of Bluestone Dam and associated lands and waters. Insignificant changes that do not result in adverse impacts on habitat value may be acceptable provided they will have no significant cumulative impact.

It should be noted that in the unlikely event of a Probable Maximum Flood, or other high flow event, significant adverse effects to habitats in all reconnaissance areas downstream of Bluestone Dam would likely occur from flooding and streambed scour. Release of toxic chemicals could also occur in Areas 3 and 4 due to flooding of chemical facilities in Charleston. These effects should be fully evaluated as part of the No Action alternative in the Corps' supplemental Environmental Impact Statement.

**Resource Category 2** habitats are of high value for evaluation species and are relatively scarce or becoming scarce on a national basis or in the ecoregion.

**Resource Category 3** habitats are of high to medium value for evaluation species and are relatively abundant on a national basis or in the ecoregion. Some rivers and many upland forests fit this category.

We have classified the upland forest on the steep slopes bordering Bluestone Lake and the tailwater area below the dam as category 3. This second and third growth forest is relatively mature and intact, providing medium to high value habitat for a diverse array of wildlife species. Much of West Virginia is second and third growth forest. Hence this habitat type is relatively abundant in the ecoregion.

Likewise, because habitat values are moderate in riparian site 3 of Area 1 (the left descending bank below the dam), and because riparian habitat is relatively abundant in the ecoregion, we also have placed this site in resource category 3. This site scored a habitat suitability index of 1.0 for black-capped chickadee, 1.0 for mink, and 0.32 for yellow warbler on a scale of 0 to 1 (with 1 being optimum) (Service 2013). Riparian site 3 is not high quality habitat because it is dominated by non-native and invasive vegetation and the river banks are armored with rip rap. We recommend minimizing loss of trees in this area and replacing their value in-kind through replanting and maintenance of native vegetation, control of invasive vegetation, and elimination of the frequent mowing that currently occurs in portions of the area.

The mitigation goal for category 3 habitat is no net loss of habitat value while minimizing loss of in-kind habitat value. In-kind replacement is preferred, but limited substitution of different types of habitat (out-of-kind mitigation) perceived to be of equal or greater value to replace the lost habitat value may be acceptable.

**Resource Category 4** habitats are of medium to low value for evaluation species and the mitigation goal is to minimize loss of habitat value. Agricultural lands and highly disturbed habitats are examples of resource category 4.

As reflected in our HEP report, riparian sites 1 and 2, on the right descending bank below the dam in Area 1, are of low quality due to poor tree canopy cover, the abundance of invasive and nonnative vegetation, habitat fragmentation, and poor species diversity. These sites scored Habitat Suitability Indices for evaluation species of 0.48 (black-capped chickadee), 0.0 (yellow warbler), and 0.0 (mink) at site 1. Site 2 scored a 0.86 (black-capped chickadee), 0.33 (yellow warbler), and 0.55 (mink) (Service 2013). We thus have categorized riparian sites 1 and 2 as resource category 4.

Since these areas possess relatively low habitat values, they likely exhibit the greatest potential for significant habitat improvements. Category 4 resources potentially could be used to mitigate impacts to Resource Category 2 and 3 losses; however, our first priority is to mitigate losses of habitat values within the impact area. Second priority would be to mitigate in proximity to the impact area within the same river. Third priority would be given to a mitigation site within the same river system and ecoregion section.

## VI. Potential Impacts and Preliminary Ranking of Possible Design Measures

At this early stage of project planning, the Corps has identified a large number of possible solutions, including structural design and non-structural measures, to allow Bluestone Dam to operate under increased flood conditions. Initially, Corps staff brainstormed and identified approximately 85 measures (Corps 2013b). Since then the Corps has eliminated many measures as structurally and/or economically unfeasible, or by making certain measures design elements that will be incorporated into plans, leaving approximately 6 measures. Among those structural measures retained for further consideration are: full parapet wall, concrete overlay of exposed rock in stilling basin, modifying the existing stilling basin with super baffles, remote conventional stilling basin, and flip bucket stilling weir. The non-structural measure retained for consideration was to improve risk communication in the areas downstream of the dam.

Although project alternatives have not been identified at this time, potential alternatives are likely to involve the pairing of more than one design measure. Potential adverse impacts from the array of retained proposed measures include loss/fragmentation of riparian habitat, changes to the river bottom, altered flows, increased sedimentation, scour of the river bottom and banks, and changes in water depth and velocity. We anticipate that direct and indirect adverse impacts of the action alternatives would occur only in Reconnaissance Area 1, more specifically: (1) in the tailwaters of Bluestone dam to the Route 3 Bridge, and/or (2) along the riparian zone in this stretch of the river. Direct impacts from any of the alternatives can include permanent loss of habitat a specific distance downstream of the existing footprint, temporary impacts to recreation due to construction schedule and duration, and temporary erosion of the riparian island located river right in the tailwaters. Indirect impacts from the alternatives include alteration of habitat downstream due to the care and diversion of water (e.g. the use of cofferdams) and the alternation of habitat due to the different hydraulic regimes (e.g. the flip bucket, and no weir). Direct and indirect adverse impacts could cause loss of velocity shelters for fish and loss of optimal breeding habitat downstream.

The retained measures can be grouped into categories with similar potential adverse impacts. The least environmentally damaging measures are those that occur within the original footprint and do not require coffer cells downstream of the stilling basin, which includes the flip bucket, parapet wall, concrete overlay of exposed rock in stilling basin, and modifying the existing stilling basin with super baffles (within the original footprint). These measures will only have temporary impacts such as increased erosion and sedimentation, but these impacts are anticipated to be insignificant, or more easily mitigated.

The measures that are the most environmentally damaging are modifying the existing stilling basin with supper baffles (not in the original footprint) and the remote conventional stilling basin. These measures will have permanent aquatic habitat loss approximately 150 – 300 feet downstream of the original stilling basin and will require additional dewatering to set up cofferdams. These measures will require the most time and have the potential to significantly impact the downstream environment.

The preliminary recommendation of the Service is to choose an alternative plan that will have the least environmental impacts and will be temporary, such as the flip bucket or the concrete overlay of exposed rock in stilling basin.

## VII. Recommendations

The sequential mitigation procedures, as described below, are used by the Service when making recommendations for appropriate mitigation for project impacts.

The first step in the sequence is avoiding the impact; this is accomplished either by not implementing the alternative or modifying it in a way that the impact no longer occurs. In order to fully explore avoidance as a mitigation tool, analyses of feasible alternatives must be thorough. Impacts may be avoided by implementing an alternative plan that accomplishes the same objectives without causing the negative environmental effects.

If avoidance is not possible and the quality of the habitat permits, the remaining steps are followed as presented: limit the magnitude or degree of the action to minimize impacts; repair or restore the affected environment to rectify the negative impact; use preservation and maintenance operations during the life of the project to reduce or eliminate the impact over time; and replace or provide substitute resources or environments to compensate for the impact. Compensation is the last option pursued, because the resource benefits the most if it remains intact and in place.

The Service provides the following preliminary mitigation recommendations to avoid, minimize and mitigate potential adverse impacts of the proposed dam and other land and water modifications to fish and wildlife resources and their habitats.

In order to avoid and minimize negative impacts to the aquatic environment of the New River to the maximum extent practicable, the Corps should avoid impacts to high quality habitat areas as classified by the Service's Mitigation Policy. In particular, effects to Resource Category 1 habitats should be avoided because these one-of-a-kind areas cannot be replaced. We recommend avoiding all losses of existing Resource Category 1 habitat from any measures associated with the proposed modifications of Bluestone Dam and associated lands and waters.

Changes to the natural river bottom in the tailwater area should be kept to a minimum as much as possible because it will be very difficult to adequately compensate for loss of aquatic habitat values of this Category 1 resource with high habitat suitability index scores for evaluation species. We recommend selecting an alternative that does not involve permanent or long-term loss of habitat within the tailwaters so that only the short term and temporary negative impacts will need mitigation.

Any alternatives developed by the Corps which involves stopping or redirecting flow should include information on the location, timing, and duration of changes. If flow of the New River must be stopped, construction should be arranged such that flow is disrupted for the minimum time necessary; flows should be resumed after no longer than 24 hours. Loss of fishing opportunity should be eliminated by maintaining access to the shoreline. Anglers should then be able to continue to access the waters below the stilling basin. Instream work should not be done during fish breeding/spawning seasons. Best management practices (BMP's) should be used to minimize erosion and sedimentation. BMPs include, but are not limited to, the following: installation of sediment and erosion control devices (e.g., silt fences, hay bales, temporary sediment control basins, erosion control matting); adequate and continued maintenance of sediment and erosion control devices to insure their effectiveness; location of equipment staging, fueling, and maintenance areas outside of wetlands, streams, and riparian areas; and preventing sediment, debris, and pollutants from entering the New River as much as possible.

Tree cutting should be minimized by clearing in previously disturbed areas. Seasonal restrictions for tree clearing should be followed to prevent taking bird nests, eggs, and young. We recommend that the clearing of natural or semi-natural habitats (e.g., forests, woodlots, reverting fields, fencerows, shrubby areas) be carried out between September 1 and March 31, which is outside the nesting season for most native bird species. Without undertaking specific analysis of breeding species and their respective nesting seasons on the project site, implementation of this seasonal restriction will avoid direct take of most breeding birds, their nests, and their young (*i.e.*, eggs, hatchlings). If eagles are found nesting in the tailwater area different seasonal clearing periods may be recommended. As previously mentioned, the BGEPA prohibits anyone from taking or disturbing bald eagles and their nests. It is critical to ensure that the banks of the river and slopes are revegetated with native trees and shrubs in any areas of the river that are cleared or relocated.

Additional consultation with the Service's West Virginia filed Office in regards to protection of the federally listed Indiana bat will be needed if alternatives involving timber removal are retained for full analysis.

Adverse impacts to aquatic downstream habitats due to accidental spills should be avoided by incorporating appropriate techniques to eliminate or reduce the spill potential. These techniques should be incorporated along transport routes as well as at the construction location. Measures also need to be taken to prevent introduction of concrete cuttings into the waterway.

Incorporation of these measures into the plan formulation should avoid and minimize significant negative fish and wildlife resource impacts from occurring.

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# APPENDIX A

Birds of Conservation Concern in the Study Area of the Bluestone Dam Safety Project

| Common name | Scientific Name | West Virginia Population Estimates | Habitat Type | Diet | Nesting Sites | Reason for Decline | Reconnaissance Area | Tailwater Area | Works Cited |
|---|---|---|---|---|---|---|---|---|---|
| Whip-poor-will | *Caprimulgus vociferous* | 20,000 | Hardwood-hemlock or hardwood white pine forests | Insects | On the ground among dead tree leaves | Loss of open-understory forests | 1,2,3,4 | Not Likely to Occur | (Partners in Flight Science Committee 2013), (Cink 2002) |
| Red-headed Woodpecker | *Melanerpes erythrocephalus* | 300 | Open oak groves with little understory cover | Flying insects, fruit and mast | Dead trees or dead parts of live trees | Loss of nut-producing trees and availability of dead trees in open-forest habitats | 1,2,3,4 | Not Likely to Occur | (Partners in Flight Science Committee 2013),(Buckelew 1994), (WVDNR 2005) |
| Black-capped Chickadee | *Poecile atricapillus* | 110,000 | Mixed deciduous-coniferous and Northern hardwood forests | Insects, seeds and berries | Dead standing trees, fence posts, bird boxes, old woodpecker holes and natural cavities | | 1,2 | Likely to Occur | (Partners in Flight Science Committee 2013), (Buckelew 1994) |
| Wood Thrush | *Hylocichla mustelina* | 920,000 | Mature or near mature deciduous forests | Insects and fruit | Fork or horizontal branch 2 to 15 meters above the ground | Habitat fragmentation in both breeding and wintering grounds | 1,2,3,4 | Not Likely to Occur | (Partners in Flight Science Committee 2013), (Buckelew 1994), (WVDNR 2005), (Roth et al. 1996) |
| Blue-winged Warbler | *Vermivora cyanoptera* | 70,000 | Second-growth woodlands, brushy areas and power line right-of-ways | Insects and spiders | Ground or in a low bush | | 1,2 | Not Likely to Occur | (Partners in Flight Science Committee 2013), (Buckelew 1994), (WVDNR 2005) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Golden-winged Warbler | *Vermivora chrysoptera* | 6,000 | Low second-growth forests, open woodlands and power line right-of-ways | Insects and spiders | Ground or in a low bush | Habitat loss, hybridization, competition with the closely related Blue-winged Warbler, and invasive Phragmites | 1,2 | Not Likely to Occur | (Partners in Flight Science Committee 2013), (Buckelew 1994), (WVDNR 2005), (Confer 1992) |
| Prairie Warbler | *Dendroica discolor* | 50,000 | Young pine forests, young second growth hardwoods, over grown pastures and other brushy scrub areas | Insects and spiders | Shrubs or in the lower branches of pine or cedar trees | Loss of breeding habitat through development and natural change of shrubby habitat to forest | 1,2,3,4 | Not Likely to Occur | (Partners in Flight Science Committee 2013), (Buckelew 1994), (WVDNR 2005), (Nolan 1999) |
| Cerulean Warbler | *Dendroica cerulean* | 200,000 | Mixed mesophytic and Appalachian oak forests | Insects and some plant material | Horizontal limb of a deciduous tree in mid- to upper-canopy | Fragmentation and elimination of habitat | 1,2,3,4 | Not Likely to Occur | (Partners in Flight Science Committee 2013), (Buckelew 1994), (WVDNR 2005), (Hamel 2000) |
| Worming-eating Warbler | *Helmitheros vermivorus* | 80,000 | Areas where deciduous and mixed forests overlap with patches of dense understory shrubs | Caterpillars, spiders and other insects | Ground | Dependence on large forests for nesting make it vulnerable to population decreases | 1,2,3,4 | Not Likely to Occur | (Partners in Flight Science Committee 2013), (Hanners 1998), (WVDNR 2005) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Swainson's Warbler | *Limnothlypis swainsonii* | 3,000 | Associated with swamps, rivers, floodplain forests and bottomlans hardwood forests | Insects and spiders | Build a bulky cup nest a meter or two from the ground in dense understory | Extreme habitat specificity puts species at risk from habitat loss | 1,2,3,4 | Not Likely to Occur | (Partners in Flight Science Committee 2013), (Buckelew 1994), (WVDNR 2005), (Brown and Dickson 1994) |
| Louisiana Waterthrush | *Parkesia motacilla* | 40,000 | Along streams flowing through valleys of heavily wooded deciduous forests | Insects and occassionally small fish and frogs | Cavities on stream banks, under fallen logs, or within roots of an upturned tree. | | 1,2,3,4 | Not Likely to Occur | (Partners in Flight Science Committee 2013), (Buckelew 1994), (WVDNR 2005) |
| Kentucky Warbler | *Oporornis formosus* | 100,000 | Dense understory of mature humid deciduous and Northern hardwood forests | Insects | Ground | Sensitive to habitat fragmentation and cowbird parasitism | 1,2,3,4 | Not Likely to Occur | (Partners in Flight Science Committee 2013), (Buckelew 1994), (WVDNR 2005) |
| Canada Warbler | *Wilsonia canadensis* | 20,000 | Mixed coniferous and deciduous trees with a dense understory | Insects | Ground | | 1,2,3,4 | Not Likely to Occur | (Partners in Flight Science Committee 2013), (Conway 1999), (WVDNR 2005) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Bald Eagle | *Haliaeetus leucocephalus* | | Near estuaries, lakes, rivers and reservoirs | Fish, waterfowl, turtles, rabbits, snakes and carrion | Tall trees or structures | Hunters, collisions with motor vehicles and stationary structures, and destruction of shoreline nesting, perching, roosting and foraging habitats | 1,2 | Likely to Occur | (Buehler 2000) |
| Peregrine Falcon | *Falco peregrinus* | | Along mountain ranges, river valleys and coastlines | Songbirds, shorebirds and ducks | Cliffs or manmade structures | | 1,2,3 | Likely to Occur | (White et al. 2002) |
| Yellow-bellied Sapsucker | *Sphyrapicus varius* | 300 | Mixed hardwood forests, woodlots and orchards | Sap, insects, fruits, berries and tree buds | Cavities | | | Not Likely to Occur | (Partners in Flight Science Committee 2013), (Buckelew 1994), (Walters et al. 2002) |

# APPENDIX B

State Imperiled Species of the Bluestone National Scenic River, New River Gorge National River, and the Gauley River National Recreation Area

| Park Name | Taxa Category | Scientific Name | Common Name | State Rank | Global Rank |
|---|---|---|---|---|---|
| Bluestone National Scenic River | Amphibian | *Ambystoma jeffersonianum* | Jefferson's salamander | S2 | G4 |
| Bluestone National Scenic River | Amphibian | *Aneides aeneus* | green salamander | S3 | G3G4 |
| Bluestone National Scenic River | Amphibian | *Desmognathus quadramaculatus* | black-bellied salamander | S3 | G5 |
| Bluestone National Scenic River | Amphibian | *Eurycea lucifuga* | cave salamander | S3 | G5 |
| Bluestone National Scenic River | Amphibian | *Pseudotriton ruber* | Northern red salamander | S3 | G5 |
| Bluestone National Scenic River | Bird | *Accipiter cooperii* | Cooper's hawk | S3 | G5 |
| Bluestone National Scenic River | Bird | *Accipiter striatus* | sharp-shinned hawk | S3 | G5 |
| Bluestone National Scenic River | Bird | *Actitis macularia* | spotted sandpiper | S3B | G5 |
| Bluestone National Scenic River | Bird | *Ammodramus savannarum* | grasshopper sparrow | S3B | G5 |
| Bluestone National Scenic River | Bird | *Anas crecca* | green-winged teal | S2N | G5 |
| Bluestone National Scenic River | Bird | *Anas rubripes* | American black duck | S2BS4N | G5 |
| Bluestone National Scenic River | Bird | *Ardea herodias* | great blue heron | S3BS4N | G5 |
| Bluestone National Scenic River | Bird | *Botaurus lentiginosus* | American bittern | S1BS1N | G4 |
| Bluestone National Scenic River | Bird | *Catharus ustulatus* | Swainson's thrush | S3B | G5 |
| Bluestone National Scenic River | Bird | *Circus cyaneus* | Northern harrier | S1BS3N | G5 |
| Bluestone National Scenic River | Bird | *Coccyzus erythropthalmus* | black-billed cuckoo | S3 | G5 |
| Bluestone National Scenic River | Bird | *Contopus virens* | Eastern wood peewee | S5B | G5 |
| Bluestone National Scenic River | Bird | *Coragyps atratus* | black vulture | S3BS4N | G5 |
| Bluestone National Scenic River | Bird | *Dendroica cerulea* | cerulean warbler | S4B | G4 |
| Bluestone National Scenic River | Bird | *Dendroica coronata* | yellow-rumped warbler | S3BS3N | G5 |

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|---|---|---|---|---|---|
| Bluestone National Scenic River | Bird | *Dendroica discolor* | prairie warbler | | G5 |
| Bluestone National Scenic River | Bird | *Dendroica fusca* | Blackburnian warbler | S3B | G5 |
| Bluestone National Scenic River | Bird | *Dolichonyx oryzivorus* | bobolink | S3B | G5 |
| Bluestone National Scenic River | Bird | *Empidonax virescens* | Acadian flycatcher | S5B | G5 |
| Bluestone National Scenic River | Bird | *Eremophila alpestris* | horned lark | S2BS3N | G5 |
| Bluestone National Scenic River | Bird | *Falco peregrinus* | peregrine falcon | S1BS2N | G4 |
| Bluestone National Scenic River | Bird | *Fulica americana* | American coot | S1BS3N | G5 |
| Bluestone National Scenic River | Bird | *Haliaeetus leucocephalus* | bald eagle | S2BS3N | G5 |
| Bluestone National Scenic River | Bird | *Helmitheros vermivorus* | worm-eating warbler | S5B | G5 |
| Bluestone National Scenic River | Bird | *Hylocichla mustelina* | wood thrush | S5B | G5 |
| Bluestone National Scenic River | Bird | *Limnothlypis swainsonii* | Swainson's warbler | S3B | G4 |
| Bluestone National Scenic River | Bird | *Lophodytes cucullatus* | hooded merganser | S1BS4N | G5 |
| Bluestone National Scenic River | Bird | *Melanerpes erythrocephalus* | red-headed woodpecker | S2BS3N | G5 |
| Bluestone National Scenic River | Bird | *Pandion haliaetus* | osprey | S2B | G5 |
| Bluestone National Scenic River | Bird | *Petrochelidon pyrrhonota* | cliff swallow | S3B | G5 |
| Bluestone National Scenic River | Bird | *pooecetes gramineus* | vesper sparrow | S3BS2N | G5 |
| Bluestone National Scenic River | Bird | *Protonotaria citrea* | prothonotary warbler | S2B | G5 |
| Bluestone National Scenic River | Bird | *Riparia riparia* | bank swallow | S2B | G5 |
| Bluestone National Scenic River | Bird | *Scopolax minor* | American woodcock | S4BS4N | G5 |
| Bluestone National Scenic River | Bird | *Seiurus motacilla* | Louisiana waterthrush | S5B | G5 |

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| Bluestone National Scenic River | Bird | *Sphyrapicus varius* | yellow-bellied sapsucker | S1BS3N | G5 |
| Bluestone National Scenic River | Bird | *Spiza americana* | dickcissel | S2B | G5 |
| Bluestone National Scenic River | Bird | *Spizella pusilla* | field sparrow | S4BS4N | G5 |
| Bluestone National Scenic River | Bird | *Vermivora chrysoptera* | golden-winged warbler | S2B | G4 |
| Bluestone National Scenic River | Bird | *Vermivora pinus* | blue-winged warbler | S4B | G5 |
| Bluestone National Scenic River | Bird | *Vermivora ruficapilla* | Nashville warbler | S1B | G5 |
| Bluestone National Scenic River | Bird | *Wilsonia canadensis* | Canada warbler | | G5 |
| Bluestone National Scenic River | Invertebrate | *Alasmidonta marginata* | Elk toe | S2 | G4 |
| Bluestone National Scenic River | Invertebrate | *Calephelis borealis* | Northern metalmark | S2 | G3G4 |
| Bluestone National Scenic River | Invertebrate | *Cicindela unipunctata* | a tiger beetle | S3 | G4G5 |
| Bluestone National Scenic River | Invertebrate | *Cyclonaias tuberculata* | Purple wartyback | S1 | G5 |
| Bluestone National Scenic River | Invertebrate | *Hendersonia occulta* | cheerystone drop | S2 | G4 |
| Bluestone National Scenic River | Invertebrate | *Lampsilis fasciola* | Wavy-rayed lampmussel | S1 | G3G4 |
| Bluestone National Scenic River | Invertebrate | *Lampsilis ovata* | Pocketbook | S1 | G5 |
| Bluestone National Scenic River | Invertebrate | *Lasmigona subviridis* | Green floater | S2 | G3 |
| Bluestone National Scenic River | Invertebrate | *Toxolasma parvus* | Lilliput | S2 | G5 |
| Bluestone National Scenic River | Invertebrate | *Tritogonia verrucosa* | pistolgrip | S2 | G4G5 |
| Bluestone National Scenic River | Invertebrate | *Villosa iris* | Rainbow | S2 | G5 |
| Bluestone National Scenic River | Mammal | *Corynorhinus rafinesquii* | Rafinesque's big-eared bat | S1 | G3G4 |
| Bluestone National Scenic River | Mammal | *Cryptotis parva* | least shrew | S2 | G5 |
| Bluestone National Scenic River | Mammal | *Lasionycteris noctivagans* | silver-haired bat | S2 | G5 |
| Bluestone National Scenic River | Mammal | *Lasiurus borealis* | Eastern red bat | | G5 |
| Bluestone National Scenic River | Mammal | *Lasiurus cinereus* | hoary bat | | G5 |

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| Bluestone National Scenic River | Mammal | *Myotis leibii* | Eastern small-footed bat | S1 | G3 |
| Bluestone National Scenic River | Mammal | *Neotoma magister* | Allegheny woodrat | S3 | G3G4 |
| Bluestone National Scenic River | Mammal | *Nycticeius humeralis* | evening bat | S1 | G5 |
| Bluestone National Scenic River | Mammal | *Ochrotomys nuttalli* | golden mouse | S2 | G5 |
| Bluestone National Scenic River | Mammal | *Sorex dispar* | long-tailed shrew | S2S3 | G4 |
| Bluestone National Scenic River | Mammal | *Sorex hoyi* | pygmy shrew | S2S3 | G5 |
| Bluestone National Scenic River | Mammal | *Synaptomys cooperi* | Southern bog lemming | S3 | G5 |
| Bluestone National Scenic River | Mammal | *Zapus hudsonius* | meadow jumping mouse | S3 | G5 |
| Bluestone National Scenic River | Reptile | *Opheodrys aestivus* | rough green snake | S2 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Agrimonia microcarpa* | smallfruit agrimony | S1 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Allium oxyphilum* | Lillydale onion | S2 | G2Q |
| Bluestone National Scenic River | Vascular Plant | *Anemone canadensis* | Canadian anemone | S1 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Anemone quinquefolia var. minima* | nightcaps | S2 | G5T3 |
| Bluestone National Scenic River | Vascular Plant | *Berberis canadensis* | American barberry | S1 | G3 |
| Bluestone National Scenic River | Vascular Plant | *Calycanthus floridus var. glaucus* | eastern sweetshrub | SH | G5T5 |
| Bluestone National Scenic River | Vascular Plant | *Cardamine flagellifera var. flagellifera* | Blue Ridge bittercress | S2 | G3 |
| Bluestone National Scenic River | Vascular Plant | *Carex aggregata* | glomerate sedge | S2 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Carex cumberlandensis* | Cumberland sedge | S2 | GNR |
| Bluestone National Scenic River | Vascular Plant | *Carex emoryi* | Emory's sedge | S2 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Carex hirtifolia* | pubescent sedge | S2 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Carex molesta* | troublesome sedge | S3 | G4 |
| Bluestone National Scenic River | Vascular Plant | *Carex normalis* | greater straw sedge | S3 | G5 |

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| Bluestone National Scenic River | Vascular Plant | *Carex tenera* | quill sedge | S1 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Carex typhina* | cattail sedge | S2 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Carex woodii* | pretty sedge | S2 | G4 |
| Bluestone National Scenic River | Vascular Plant | *Eleocharis palustris* | common spikerush | S3 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Goodyera repens* | lesser rattlesnake plantain | S1S2 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Hasteola suaveolens* | false Indian plaintain | S3 | G3 |
| Bluestone National Scenic River | Vascular Plant | *Helianthus laevigatus* | smooth sunflower | S2 | G4 |
| Bluestone National Scenic River | Vascular Plant | *Heuchera americana var. hispida* | Rough alumroot | S2 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Juglans cinerea* | butternut | S3 | G3G4 |
| Bluestone National Scenic River | Vascular Plant | *Juncus dichotomus* | forked rush | S1 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Lemna valdiviana* | valdivia duckweed | S3 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Lonicera canadensis* | American fly honeysuckle | S2 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Lysimachia tonsa* | southern yellow loosestrife | SH | G4 |
| Bluestone National Scenic River | Vascular Plant | *Monarda fistulosa ssp. brevis* | wild bergamot | S1 | G5T1 |
| Bluestone National Scenic River | Vascular Plant | *Myosotis macrosperma* | largeseed forget-me-not | S2 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Prunus alleghaniensis var. alleghaniensis* | Allegheny plum | S3 | G4T4 |
| Bluestone National Scenic River | Vascular Plant | *Ribes lacustre* | prickly currant | S2 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Scutellaria saxatilis* | smooth rock skullcap | S2 | G3 |
| Bluestone National Scenic River | Vascular Plant | *Spiraea virginiana* | Virginia meadowsweet | S1 | G2 |
| Bluestone National Scenic River | Vascular Plant | *Stachys nuttallii* | heartleaf hedgenettle | S3 | G5? |
| Bluestone National Scenic River | Vascular Plant | *Stachys tenuifolia* | smooth hedgenettle | S3 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Taxus canadensis* | Canada yew | S2S3 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Thuja occidentalis* | White cedar | S2 | G5 |

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| Bluestone National Scenic River | Vascular Plant | *Trifolium reflexum* | buffalo clover | S1 | G3G4 |
| Bluestone National Scenic River | Vascular Plant | *Viburnum rafinesquianum* | downy arrowwood | S2 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Viburnum rufidulum* | rusty blackhaw | S1 | G5 |
| Bluestone National Scenic River | Vascular Plant | *Vitis rupestris* | sand grape | S2 | G3 |
| New River Gorge National River | Amphibian | *Ambystoma jeffersonianum* | Jefferson's salamander | S2 | G4 |
| New River Gorge National River | Amphibian | *Aneides aeneus* | green salamander | S3 | G3G4 |
| New River Gorge National River | Amphibian | *Desmognathus quadramaculatus* | black-bellied salamander | S3 | G5 |
| New River Gorge National River | Amphibian | *Eurycea lucifuga* | cave salamander | S3 | G5 |
| New River Gorge National River | Amphibian | *Pseudotriton montanus diastictus* | Midland mud salamander | S1 | G5 |
| New River Gorge National River | Amphibian | *Pseudotriton ruber* | Northern red salamander | S3 | G5 |
| New River Gorge National River | Bird | *Accipiter cooperii* | Cooper's hawk | S3 | G5 |
| New River Gorge National River | Bird | *Accipiter striatus* | sharp-shinned hawk | S3 | G5 |
| New River Gorge National River | Bird | *Actitis macularia* | spotted sandpiper | S3B | G5 |
| New River Gorge National River | Bird | *Ammodramus savannarum* | grasshopper sparrow | S3B | G5 |
| New River Gorge National River | Bird | *Anas crecca* | green-winged teal | S2N | G5 |
| New River Gorge National River | Bird | *Anas rubripes* | American black duck | S2BS4N | G5 |
| New River Gorge National River | Bird | *Ardea herodias* | great blue heron | S3BS4N | G5 |
| New River Gorge National River | Bird | *Botaurus lentiginosus* | American bittern | S1BS1N | G4 |
| New River Gorge National River | Bird | *Catharus ustulatus* | Swainson's thrush | S3B | G5 |
| New River Gorge National River | Bird | *Circus cyaneus* | Northern harrier | S1BS3N | G5 |
| New River Gorge National River | Bird | *Coccyzus erythropthalmus* | black-billed cuckoo | S3 | G5 |

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|---|---|---|---|---|---|
| New River Gorge National River | Bird | *Contopus virens* | Eastern wood peewee | S5B | G5 |
| New River Gorge National River | Bird | *Coragyps atratus* | black vulture | S3BS4N | G5 |
| New River Gorge National River | Bird | *Dendroica cerulea* | cerulean warbler | S4B | G4 |
| New River Gorge National River | Bird | *Dendroica coronata* | yellow-rumped warbler | S3BS3N | G5 |
| New River Gorge National River | Bird | *Dendroica discolor* | prairie warbler | | G5 |
| New River Gorge National River | Bird | *Dendroica fusca* | Blackburnian warbler | S3B | G5 |
| New River Gorge National River | Bird | *Dolichonyx oryzivorus* | bobolink | S3B | G5 |
| New River Gorge National River | Bird | *Empidonax virescens* | Acadian flycatcher | S5B | G5 |
| New River Gorge National River | Bird | *Eremophila alpestris* | horned lark | S2BS3N | G5 |
| New River Gorge National River | Bird | *Falco peregrinus* | peregrine falcon | S1BS2N | G4 |
| New River Gorge National River | Bird | *Fulica americana* | American coot | S1BS3N | G5 |
| New River Gorge National River | Bird | *Haliaeetus leucocephalus* | bald eagle | S2BS3N | G5 |
| New River Gorge National River | Bird | *Helmitheros vermivorus* | worm-eating warbler | S5B | G5 |
| New River Gorge National River | Bird | *Hylocichla mustelina* | wood thrush | S5B | G5 |
| New River Gorge National River | Bird | *Limnothlypis swainsonii* | Swainson's warbler | S3B | G4 |
| New River Gorge National River | Bird | *Lophodytes cucullatus* | hooded merganser | S1BS4N | G5 |
| New River Gorge National River | Bird | *Melanerpes erythrocephalus* | red-headed woodpecker | S2BS3N | G5 |
| New River Gorge National River | Bird | *Pandion haliaetus* | osprey | S2B | G5 |
| New River Gorge National River | Bird | *Petrochelidon pyrrhonota* | cliff swallow | S3B | G5 |
| New River Gorge National River | Bird | *pooecetes gramineus* | vesper sparrow | S3BS2N | G5 |

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|---|---|---|---|---|---|
| New River Gorge National River | Bird | *Protonotaria citrea* | prothonotary warbler | S2B | G5 |
| New River Gorge National River | Bird | *Riparia riparia* | bank swallow | S2B | G5 |
| New River Gorge National River | Bird | *Scopolax minor* | American woodcock | S4BS4N | G5 |
| New River Gorge National River | Bird | *Seiurus motacilla* | Louisiana waterthrush | S5B | G5 |
| New River Gorge National River | Bird | *Sphyrapicus varius* | yellow-bellied sapsucker | S1BS3N | G5 |
| New River Gorge National River | Bird | *Spiza americana* | dickcissel | S2B | G5 |
| New River Gorge National River | Bird | *Spizella pusilla* | field sparrow | S4BS4N | G5 |
| New River Gorge National River | Bird | *Vermivora chrysoptera* | golden-winged warbler | S2B | G4 |
| New River Gorge National River | Bird | *Vermivora pinus* | blue-winged warbler | S4B | G5 |
| New River Gorge National River | Bird | *Vermivora ruficapilla* | Nashville warbler | S1B | G5 |
| New River Gorge National River | Bird | *Wilsonia canadensis* | Canada warbler | | G5 |
| New River Gorge National River | Invertebrate | *Alasmidonta marginata* | Elk toe | S2 | G4 |
| New River Gorge National River | Invertebrate | *Calephelis borealis* | Northern metalmark | S2 | G3G4 |
| New River Gorge National River | Invertebrate | *Cicindela unipunctata* | a tiger beetle | S3 | G4G5 |
| New River Gorge National River | Invertebrate | *Cyclonaias tuberculata* | Purple wartyback | S1 | G5 |
| New River Gorge National River | Invertebrate | *Lampsilis fasciola* | Wavy-rayed lampmussel | S1 | G3G4 |
| New River Gorge National River | Invertebrate | *Lampsilis ovata* | Pocketbook | S1 | G5 |
| New River Gorge National River | Invertebrate | *Quadrula quadrula* | mapleleaf | S2 | G5 |
| New River Gorge National River | Invertebrate | *Speyeria diana* | Diana fritillary | S2S3 | G3G4 |
| New River Gorge National River | Invertebrate | *Toxolasma parvus* | Lilliput | S2 | G5 |
| New River Gorge National River | Invertebrate | *Tritogonia verrucosa* | pistolgrip | S2 | G4G5 |
| New River Gorge National River | Mammal | *Corynorhinus rafinesquii* | Rafinesque's big-eared bat | S1 | G3G4 |
| New River Gorge National River | Mammal | *Cryptotis parva* | least shrew | S2 | G5 |

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| New River Gorge National River | Mammal | *Lasionycteris noctivagans* | silver-haired bat | S2 | G5 |
| New River Gorge National River | Mammal | *Lasiurus borealis* | Eastern red bat | | G5 |
| New River Gorge National River | Mammal | *Lasiurus cinereus* | hoary bat | | G5 |
| New River Gorge National River | Mammal | *Myotis leibii* | Eastern small-footed bat | S1 | G3 |
| New River Gorge National River | Mammal | *Neotoma magister* | Allegheny woodrat | S3 | G3G4 |
| New River Gorge National River | Mammal | *Nycticeius humeralis* | evening bat | S1 | G5 |
| New River Gorge National River | Mammal | *Ochrotomys nuttalli* | golden mouse | S2 | G5 |
| New River Gorge National River | Mammal | *Sorex dispar* | long-tailed shrew | S2S3 | G4 |
| New River Gorge National River | Mammal | *Sorex hoyi* | pygmy shrew | S2S3 | G5 |
| New River Gorge National River | Mammal | *Synaptomys cooperi* | Southern bog lemming | S3 | G5 |
| New River Gorge National River | Mammal | *Zapus hudsonius* | meadow jumping mouse | S3 | G5 |
| New River Gorge National River | Reptile | *Crotalus horridus* | timber rattlesnake | S3 | G4 |
| New River Gorge National River | Reptile | *Eumeces laticeps* | broad-headed skink | S2 | G5 |
| New River Gorge National River | Reptile | *Glyptemys insculpta* | wood turtle | S3 | G4 |
| New River Gorge National River | Reptile | *Opheodrys aestivus* | rough green snake | S2 | G5 |
| New River Gorge National River | Reptile | *Pseudemys concinna* | river cooter | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Adlumia fungosa* | climbing fumitory | S2? | G4 |
| New River Gorge National River | Vascular Plant | *Anemone quinquefolia var. minima* | dwarf anemone | S2 | G5T3 |
| New River Gorge National River | Vascular Plant | *Arabis hirsuta var. pycnocarpa* | hairy rock-cress | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Arabis patens* | spreading rock-cress | S2 | G3 |
| New River Gorge National River | Vascular Plant | *Aristida purpurascens var. purpurascens* | purple needlegrass | S1 | G5 |

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| New River Gorge National River | Vascular Plant | *Baptisia australis var. australis* | wild false indigo | S3 | G5 |
| New River Gorge National River | Vascular Plant | *Calopogon tuberosus var. tuberosus* | grass pink | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Cardamine flagellifera* | bitter cress | S1S2 | G3 |
| New River Gorge National River | Vascular Plant | *Carex aestivalis* | summer sedge | S2 | G4 |
| New River Gorge National River | Vascular Plant | *Carex appalachia* | Appalachian sedge | S2 | G4 |
| New River Gorge National River | Vascular Plant | *Carex careyana* | Carey's sedge | S1 | G4 |
| New River Gorge National River | Vascular Plant | *Carex comosa* | bearded sedge | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Carex cumberlandensis* | Cumberland's sedge | S1 | GNR |
| New River Gorge National River | Vascular Plant | *Carex emoryi* | Emory's sedge | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Carex interior* | inland sedge | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Carex laxiculmis var. copulata* | spreading sedge | S1 | G5T3T5 |
| New River Gorge National River | Vascular Plant | *Carex mesochorea* | midland sedge | S2 | G4G5 |
| New River Gorge National River | Vascular Plant | *Carex molesta* | troublesome sedge | S3 | G4 |
| New River Gorge National River | Vascular Plant | *Carex nigromarginata* | black-edge sedge | S3 | G5 |
| New River Gorge National River | Vascular Plant | *Carex seorsa* | wesk stellate sedge | S1 | G4 |
| New River Gorge National River | Vascular Plant | *Carex styloflexa* | bent sedge | S1 | G4G5 |
| New River Gorge National River | Vascular Plant | *Carex suberecta* | praire straw sedge | S1 | G4 |
| New River Gorge National River | Vascular Plant | *Carex tonsa var. rugosperma* | shaved sedge | S2S3 | G5 |
| New River Gorge National River | Vascular Plant | *Carex typhina* | cat-tail sedge | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Carex woodii* | pretty sedge | S2 | G4 |
| New River Gorge National River | Vascular Plant | *Commelina erecta var. angustifolia* | slender day-flower | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Corallorhiza wisteriana* | spring coralroot | S1 | G5 |

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| New River Gorge National River | Vascular Plant | *Coreopsis pubescens var. robusta* | star tickseed | S2 | G5?T3T5 |
| New River Gorge National River | Vascular Plant | *Croton glandulosus var. septentrionalis* | northern croton | S3 | G5T5 |
| New River Gorge National River | Vascular Plant | *Cuscuta indecora var. neuropetala* | pretty dodder | S1 | G5T5 |
| New River Gorge National River | Vascular Plant | *Cymophyllus fraserianus* | Fraser's sedge | S3 | G4 |
| New River Gorge National River | Vascular Plant | *Cyperus refractus* | reflexed flatsedge | S3 | G5 |
| New River Gorge National River | Vascular Plant | *Cyperus squarrosus* | awned cyperus | S3 | G5 |
| New River Gorge National River | Vascular Plant | *Danthonia sericea* | downy danthonia | S1 | G5? |
| New River Gorge National River | Vascular Plant | *Desmondium lineatum* | sand tick-trefoil | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Desmodium pauciflorum* | fewflower tick-trefoil | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Dichanthelium acuminatum subsp. columbianum* | American panic grass | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Eleocharis compressa* | flat-stemmed spike-rush | S2 | G4 |
| New River Gorge National River | Vascular Plant | *Eleocharis intermedia* | matted spike-rush | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Eleocharis palustris* | creeping spike-rush | S3 | G5 |
| New River Gorge National River | Vascular Plant | *Eriogonum allenii* | yellow buckwheat | S2 | G4 |
| New River Gorge National River | Vascular Plant | *Eupatorium godfreyanum* | godfrey's boneset | S2S3 | G4 |
| New River Gorge National River | Vascular Plant | *Eupatorium pilosum* | vervain thoroughwort | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Fibristylis annua* | annual fimbry | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Galactia volubilis* | downy milkpea | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Gentiana austromontana* | Appalachian gentian | S1 | G3 |
| New River Gorge National River | Vascular Plant | *Helianthemum canadense* | Canada frostweed | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Helianthus laevigatus* | smooth sunflower | S2 | G4 |

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| New River Gorge National River | Vascular Plant | *Helianthus occidentalis ssp. Occidentalis* | McDowell sunflower | S2 | G5T5 |
| New River Gorge National River | Vascular Plant | *Hibiscus laevis* | halbred-leaved mallow | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Hypericum virgatum* | coppery St. John's-wort | S1 | G4? |
| New River Gorge National River | Vascular Plant | *Juncus dichotomus* | forked rush | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Lythrum alatum var. alatum* | winged-loosestrife | S2 | G5T5 |
| New River Gorge National River | Vascular Plant | *Maianthemum stellatum* | starflower false Solomon's-seal | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Melica mutica* | two-flower melic grass | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Myosotis macrosperma* | largeseed forget-me-not | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Najas gracillima* | slender water nymph | S2 | G5? |
| New River Gorge National River | Vascular Plant | *Oenothera pilosella* | evening-primrose | S2 | G5T5? |
| New River Gorge National River | Vascular Plant | *Pinus resinosa* | red pine | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Piptochaetium avenaceum* | blackseed needlegrass | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Platanthera ciliaris* | yellow fringed orchid | S3 | G5 |
| New River Gorge National River | Vascular Plant | *Platanthera psycodes* | small purple-fringe orchid | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Poa saltuensis* | drooping bluegrass | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Pogonia ophioglossoides* | rose pogonia | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Polygala curtissii* | Curtiss' milkwort | S2 | G5 |
| New River Gorge National River | Vascular Plant | *Polygonum amphibium var. emersum* | water smartweed | S2S3 | G5T5 |
| New River Gorge National River | Vascular Plant | *Pycnanthemum loomisii* | Loomis' mountain-mint | S2 | G4? |
| New River Gorge National River | Vascular Plant | *Pycnanthemum torrei* | Torrey's mountain-mint | S1 | G2 |
| New River Gorge National River | Vascular Plant | *Ranunculus pensylvanicus* | Pennsylvania buttercup | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Ranunculus pusillus var. pusillus* | low spearwort | S1 | G5T4? |

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| New River Gorge National River | Vascular Plant | *Rhynchospora recognita* | globe beaked-rush | S2 | G5? |
| New River Gorge National River | Vascular Plant | *Salix lucida ssp Lucida* | shining willow | S1 | G5T5 |
| New River Gorge National River | Vascular Plant | *Saxifraga careyana* | Carey saxifrage | S3 | G3 |
| New River Gorge National River | Vascular Plant | *Schoenoplectus purshianus* | weakstalk bulrush | S3 | G4G5 |
| New River Gorge National River | Vascular Plant | *Scutellaria saxatilis* | rock skullcap | S2 | G3 |
| New River Gorge National River | Vascular Plant | *Sibara virginica* | Virginia cress | S2? | G5 |
| New River Gorge National River | Vascular Plant | *Sida hermaphrodita* | Virginia mallow | S2 | G3 |
| New River Gorge National River | Vascular Plant | *Silene nivea* | snowy campion | S1 | G4 |
| New River Gorge National River | Vascular Plant | *Silphium perfoliatum var. connatum* | Virginia cup-plant | S1 | G5T3T4 |
| New River Gorge National River | Vascular Plant | *Solidago simplex ssp randii* | Rand's goldenrod | S1 | G5T4T5 |
| New River Gorge National River | Vascular Plant | *Spiranthes ovalis var. erostellata* | oval ladies'-tresses | S1 | G5?T4? |
| New River Gorge National River | Vascular Plant | *Spiranthes tuberosa* | little ladies'-tresses | S3 | G5 |
| New River Gorge National River | Vascular Plant | *Sporobolus clandestinus* | rough dropseed | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Stachys nuttallii* | Nuttall's hedge-nettle | S3 | G5? |
| New River Gorge National River | Vascular Plant | *Stachys tenuifolia var tenuuifoia* | smooth hedge-nettle | S3 | G5 |
| New River Gorge National River | Vascular Plant | *Thalictrum clavatum* | mountain meadow-rue | S1 | G4 |
| New River Gorge National River | Vascular Plant | *Triphora trianthophora* | nodding pogonia | S2 | G4 |
| New River Gorge National River | Vascular Plant | *Viburnum rufidulum* | rusty blackhaw | S1 | G5 |
| New River Gorge National River | Vascular Plant | *Vitis rupestris* | sand grape | S2 | G3 |
| Gauley River National Recreation Area | Amphibian | *Ambystoma jeffersonianum* | Jefferson's salamander | S2 | G4 |
| Gauley River National Recreation Area | Amphibian | *Aneides aeneus* | green salamander | S3 | G3G4 |

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|---|---|---|---|---|---|
| Gauley River National Recreation Area | Amphibian | *Cryptobranchus alleganiensis* | Eastern hellbender | S2 | G4 |
| Gauley River National Recreation Area | Amphibian | *Desmognathus quadramaculatus* | black-bellied salamander | S3 | G5 |
| Gauley River National Recreation Area | Amphibian | *Eurycea lucifuga* | cave salamander | S3 | G5 |
| Gauley River National Recreation Area | Amphibian | *Pseudotriton ruber* | Northern red salamander | S3 | G5 |
| Gauley River National Recreation Area | Bird | *Accipiter cooperii* | Cooper's hawk | S3 | G5 |
| Gauley River National Recreation Area | Bird | *Accipiter striatus* | sharp-shinned hawk | S3 | G5 |
| Gauley River National Recreation Area | Bird | *Actitis macularia* | spotted sandpiper | S3B | G5 |
| Gauley River National Recreation Area | Bird | *Anas crecca* | green-winged teal | S2N | G5 |
| Gauley River National Recreation Area | Bird | *Anas rubripes* | American black duck | S2BS4N | G5 |
| Gauley River National Recreation Area | Bird | *Ardea herodias* | great blue heron | S3BS4N | G5 |
| Gauley River National Recreation Area | Bird | *Botaurus lentiginosus* | American bittern | S1BS1N | G4 |
| Gauley River National Recreation Area | Bird | *Catharus ustulatus* | Swainson's thrush | S3B | G5 |
| Gauley River National Recreation Area | Bird | *Circus cyaneus* | Northern harrier | S1BS3N | G5 |
| Gauley River National Recreation Area | Bird | *Coccyzus erythropthalmus* | black-billed cuckoo | S3 | G5 |
| Gauley River National Recreation Area | Bird | *Contopus virens* | Eastern wood peewee | S5B | G5 |
| Gauley River National Recreation Area | Bird | *Coragyps atratus* | black vulture | S3BS4N | G5 |
| Gauley River National Recreation Area | Bird | *Dendroica cerulea* | cerulean warbler | S4B | G4 |
| Gauley River National Recreation Area | Bird | *Dendroica coronata* | yellow-rumped warbler | S3BS3N | G5 |
| Gauley River National Recreation Area | Bird | *Dendroica discolor* | prairie warbler | | G5 |
| Gauley River National Recreation Area | Bird | *Dendroica fusca* | Blackburnian warbler | S3B | G5 |
| Gauley River National Recreation Area | Bird | *Dolichonyx oryzivorus* | bobolink | S3B | G5 |

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|---|---|---|---|---|---|
| Gauley River National Recreation Area | Bird | *Empidonax virescens* | Acadian flycatcher | S5B | G5 |
| Gauley River National Recreation Area | Bird | *Eremophila alpestris* | horned lark | S2BS3N | G5 |
| Gauley River National Recreation Area | Bird | *Falco peregrinus* | peregrine falcon | S1BS2N | G4 |
| Gauley River National Recreation Area | Bird | *Fulica americana* | American coot | S1BS3N | G5 |
| Gauley River National Recreation Area | Bird | *Haliaeetus leucocephalus* | bald eagle | S2BS3N | G5 |
| Gauley River National Recreation Area | Bird | *Helmitheros vermivorus* | worm-eating warbler | S5B | G5 |
| Gauley River National Recreation Area | Bird | *Hylocichla mustelina* | wood thrush | S5B | G5 |
| Gauley River National Recreation Area | Bird | *Limnothlypis swainsonii* | Swainson's warbler | S3B | G4 |
| Gauley River National Recreation Area | Bird | *Lophodytes cucullatus* | hooded merganser | S1BS4N | G5 |
| Gauley River National Recreation Area | Bird | *Melanerpes erythrocephalus* | red-headed woodpecker | S2BS3N | G5 |
| Gauley River National Recreation Area | Bird | *Petrochelidon pyrrhonota* | cliff swallow | S3B | G5 |
| Gauley River National Recreation Area | Bird | *pooecetes gramineus* | vesper sparrow | S3BS2N | G5 |
| Gauley River National Recreation Area | Bird | *Protonotaria citrea* | prothonotary warbler | S2B | G5 |
| Gauley River National Recreation Area | Bird | *Riparia riparia* | bank swallow | S2B | G5 |
| Gauley River National Recreation Area | Bird | *Scopolax minor* | American woodcock | S4BS4N | G5 |
| Gauley River National Recreation Area | Bird | *Seiurus motacilla* | Louisiana waterthrush | S5B | G5 |
| Gauley River National Recreation Area | Bird | *Sphyrapicus varius* | yellow-bellied sapsucker | S1BS3N | G5 |
| Gauley River National Recreation Area | Bird | *Spizella pusilla* | field sparrow | S4BS4N | G5 |
| Gauley River National Recreation Area | Bird | *Vermivora ruficapilla* | Nashville warbler | S1B | G5 |
| Gauley River National Recreation Area | Bird | *Wilsonia canadensis* | Canada warbler | | G5 |

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| Gauley River National Recreation Area | Invertebrate | *Cambarus elkensi* | Elk River crayfish | S1 | G2 |
| Gauley River National Recreation Area | Invertebrate | *Lampsilis cariosa* | Yellow lampmussel | S1 | G3G4 |
| Gauley River National Recreation Area | Invertebrate | *Lasmigona subviridis* | Green floater | S2 | G3 |
| Gauley River National Recreation Area | Invertebrate | *Speyeria diana* | Diana fritillary | S2S3 | G3G4 |
| Gauley River National Recreation Area | Mammal | *Corynorhinus rafinesquii* | Rafinesque's big-eared bat | S1 | G3G4 |
| Gauley River National Recreation Area | Mammal | *Cryptotis parva* | least shrew | S2 | G5 |
| Gauley River National Recreation Area | Mammal | *Lasionycteris noctivagans* | silver-haired bat | S2 | G5 |
| Gauley River National Recreation Area | Mammal | *Lasiurus borealis* | Eastern red bat | | G5 |
| Gauley River National Recreation Area | Mammal | *Lasiurus cinereus* | hoary bat | | G5 |
| Gauley River National Recreation Area | Mammal | *Myotis leibii* | Eastern small-footed bat | S1 | G3 |
| Gauley River National Recreation Area | Mammal | *Neotoma magister* | Allegheny woodrat | S3 | G3G4 |
| Gauley River National Recreation Area | Mammal | *Nycticeius humeralis* | evening bat | S1 | G5 |
| Gauley River National Recreation Area | Mammal | *Ochrotomys nuttalli* | golden mouse | S2 | G5 |
| Gauley River National Recreation Area | Mammal | *Sorex dispar* | long-tailed shrew | S2S3 | G4 |
| Gauley River National Recreation Area | Mammal | *Sorex hoyi* | pygmy shrew | S2S3 | G5 |
| Gauley River National Recreation Area | Mammal | *Synaptomys cooperi* | Southern bog lemming | S3 | G5 |
| Gauley River National Recreation Area | Mammal | *Zapus hudsonius* | meadow jumping mouse | S3 | G5 |
| Gauley River National Recreation Area | Reptile | *Carphophis amoenus* | Worm snake | S3 | G5 |
| Gauley River National Recreation Area | Reptile | *Crotalus horridus* | timber rattlesnake | S3 | G4 |
| Gauley River National Recreation Area | Reptile | *Eumeces laticeps* | broad-headed skink | S2 | G5 |
| Gauley River National Recreation Area | Reptile | *Glyptemys insculpta* | wood turtle | S3 | G4 |
| Gauley River National Recreation Area | Reptile | *Opheodrys aestivus* | rough green snake | S2 | G5 |

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| Gauley River National Recreation Area | Reptile | *Pseudemys concinna* | river cooter | S2 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Adlumia fungosa* | allegheny vine | S2? | G4 |
| Gauley River National Recreation Area | Vascular Plant | *Andropogon glomeratus* var. *glomeratus* | bushy bluestem | S2 | G5T5 |
| Gauley River National Recreation Area | Vascular Plant | *Aristida purpurascens* var. *purpurascens* | arrowfeather threeawn | S1 | G5T5 |
| Gauley River National Recreation Area | Vascular Plant | *Baptisia australis* var. *australis* | blue wild indigo | S3 | G5TNR |
| Gauley River National Recreation Area | Vascular Plant | *Carex aestivalis* | summer sedge | S2 | G4 |
| Gauley River National Recreation Area | Vascular Plant | *Carex bromoides* ssp. *bromoides* | brome-like sedge | S3 | G5T5 |
| Gauley River National Recreation Area | Vascular Plant | *Carex cumberlandensis* | Cumberland sedge | S2 | GNR |
| Gauley River National Recreation Area | Vascular Plant | *Carex emoryi* | Emory’s sedge | S2 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Carex molesta* | troublesome sedge | S3 | G4 |
| Gauley River National Recreation Area | Vascular Plant | *Carex seorsa* | weak stellate sedge | S1 | G4 |
| Gauley River National Recreation Area | Vascular Plant | *Cymophyllus fraserianus* | Fraser's cymophyllus | S3 | G4 |
| Gauley River National Recreation Area | Vascular Plant | *Desmodium pauciflorum* | fewflower ticktrefoil | S1 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Danthonia sericea* | downy danthonia | S1 | G5? |
| Gauley River National Recreation Area | Vascular Plant | *Dichanthelium acuminatum* ssp. *columbianum* | hemlock rosette grass | S1 | G5T5 |
| Gauley River National Recreation Area | Vascular Plant | *Digitaria filiformis* | slender crabgrass | S1 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Eupatorium godfreyanum* | Godfrey's thoroughwort | S2S3 | G4 |
| Gauley River National Recreation Area | Vascular Plant | *Helianthemum bicknelii* | Bicknell’s forstweed | S1 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Helianthemum propinquum* | low frostweed | S1 | G4 |
| Gauley River National Recreation Area | Vascular Plant | *Helianthuslaevigatus* | Smooth sunflower | S2 | G4 |
| Gauley River National Recreation Area | Vascular Plant | *Helianthus occidentalis* ssp. *occidentalis* | fewleaf sunflower | S2 | G5T5 |

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| Gauley River National Recreation Area | Vascular Plant | *Juglans cinerea* | butternut | S3 | G4 |
| Gauley River National Recreation Area | Vascular Plant | *Lechea tenuifolia* | narrowleaf pinweed | S1 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Liatris scariosa var. nieuwlandii* | Northern blazing star | S1 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Liatris squarrulosa* | Appalachian blazing star | S1 | G4G5 |
| Gauley River National Recreation Area | Vascular Plant | *Liatristurgida* | Turgid gay-feather | S2 | G3 |
| Gauley River National Recreation Area | Vascular Plant | *Lygodium palmatum* | American climbing fern | S3 | G4 |
| Gauley River National Recreation Area | Vascular Plant | *Marshallia grandiflora* | Monongahela Barbara's buttons | S2 | G2 |
| Gauley River National Recreation Area | Vascular Plant | *Monarda fistulosa* ssp. *brevis* | wild bergamot | S1 | G5T1 |
| Gauley River National Recreation Area | Vascular Plant | *Myosotis macrosperma* | largeseed forget-me-not | S2 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Packera paupercula* | balsam groundsel | S2 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Polygala curtissii* | Curtiss' milkwort | S2 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Prunus pumila* var. *depressa* | eastern sandcherry | S1 | G5T5 |
| Gauley River National Recreation Area | Vascular Plant | *Rhynchospora recognita* | globe beaksedge | S2 | G5? |
| Gauley River National Recreation Area | Vascular Plant | *Rosa blanda var. blanda* | Smooth rose | S2 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Rudbeckia fulgida* var. *fulgida* | orange coneflower | S2 | G5T4? |
| Gauley River National Recreation Area | Vascular Plant | *Solidago simplex* ssp. *randii* var. *racemosa* | Rand's goldenrod | S2 | G5T3? |
| Gauley River National Recreation Area | Vascular Plant | *Spiraea virginiana* | Virginia meadowsweet | S1 | G2 |
| Gauley River National Recreation Area | Vascular Plant | *Spiranthes lucida* | shining ladies'-tresses | S1S2 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Spiranthes vernalis* | spring ladies'-tresses | S3 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Stachys nuttallii* | heartleaf hedgenettle | S3 | G5? |
| Gauley River National Recreation Area | Vascular Plant | *Symphyotrichum laeve* var. *concinnum* | smooth blue aster | S2 | G5T4 |
| Gauley River National Recreation Area | Vascular Plant | *Thalictrum clavatum* | mountain meadow-rue | S2 | G4 |

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| Gauley River National Recreation Area | Vascular Plant | *Viburnum lentago* | Nannyberry | S1S2 | G5 |
| Gauley River National Recreation Area | Vascular Plant | *Viola appalachiensis* | Appalachian violet | S3 | G3 |
| Gauley River National Recreation Area | Fish | *Ichthyomyzon bdellium* | Ohio lamprey | S2 | G3G4 |
| Gauley River National Recreation Area | Fish | *Notropis ariommus* | Popeye shiner | S2 | G3 |
| Gauley River National Recreation Area | Fish | *Noturus stigmosus* | Northern madtom | S1 | G3 |

**State Ranks**

State ranks are assigned by the West Virginia Natural Heritage Program and refer to the conservation status within West Virginia.

**Rank Definition**

**S1** Five or fewer documented occurrences, or very few remaining individuals within the state. Extremely rare and critically imperiled; or because of some factor(s) making it especially vulnerable to extirpation.

**S2** Six to 20 documented occurrences, or few remaining individuals within the state. Very rare and imperiled; or because of some factor(s) making it vulnerable to extirpation.

**S3** Twenty-one to 100 documented occurrences. May be somewhat vulnerable to extirpation.

**S4** Common and apparently secure with more than 100 occurrences.

**S5** Very common and demonstrably secure.

**SH** Historical. Species which have not been relocated within the last 20 years. May be rediscovered.

**B** Breeding population

**N** Non breeding population

**Global Ranks**

Global ranks are assigned by NatureServe and refer to the conservation status across the global range of the element.

**Rank Definition**

**G1** Critically Imperiled - At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

**G2** Imperiled - At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

**G3** Vulnerable - At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

**G4** Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.

**G5** Secure - Common; widespread and abundant.

**GNR** Not ranked

# APPENDIX C

Study Area Photographs

**Photograph 1: Bluestone Dam (Reconnaissance Area 1).**

**Photograph 2: Riparian habitat to the left of Bluestone Dam, facing downstream (Reconnaissance Area 1).**

**Photograph 3: Boat ramp in the tailwaters of the dam (Reconnaissance Area 1).**

**Photograph 4: Pool-like habitat in the tailwater area (Reconnaissance Area 1).**

**Photograph 5: The Service measuring tree height with a clinometer (Reconnaissance Area 1).**

**Photograph 6: Overview of Bluestone Dam (Reconnaissance Area 1).**

**Photograph 7: Route 3 Bridge looking downstream from the Dam (Reconnaissance Area 1).**

**Photograph 8: Route 3 Bridge looking upstream, outside of the project area (Reconnaissance Area 1).**

**Photograph 9: The Service recording riparian field data for HEP.**

**Photograph 10: The Service measuring diameter at breast height for HEP (Reconnaissance Area 1).**

**Photograph 11: The Service categorizing substrate type in the tailwaters (Reconnaissance Area 1).**

**Photograph 12: Gravel and rubble substrate from the tailwaters (Reconnaissance Area 1).**

**Photograph 13: Look out at Brooks Island, Bald Eagle nest present (Reconnaissance Area 1).**

**Photograph 14: Taken at McCreery Creek fishing area in the New River Gorge (Reconnaissance Area 2).**

**Photograph 15: Taken at Grandview Sandbar Campground in the New River Gorge (Reconnaissance Area 2).**

**Photograph 16: Taken near Mill Creek in the New River Gorge (Reconnaissance Area 2).**

**Photograph 17: Taken from the New River Gorge Preserve (Reconnaissance Area 2).**

# United States Department of the Interior

FISH AND WILDLIFE SERVICE

West Virginia Field Office
694 Beverly Pike
Elkins, West Virginia 26241

April 19, 2016

Ms. Amy K. Frantz
Chief, Planning Branch
U.S. Army Corps of Engineers
502 Eighth Street
Huntington, West Virginia 25701

Dear Ms. Frantz:

This constitutes the U.S. Fish and Wildlife Service's (Service) Draft Mitigation Plan for the Bluestone Dam Safety Project in Summers County, West Virginia. The purpose of this preliminary mitigation plan is to provide guidance to the U.S. Army Corps of Engineers Huntington District (Corps) early in the planning process so that they can develop more detailed mitigation plans and incorporate them into the draft Environmental Impact Statement (EIS) and the Fish and Wildlife Coordination Act Report (FWCAR). This Draft Mitigation Plan is being provided under the terms of the August 2015 Scope of Services Agreement between the Corps and the Service's West Virginia Field Office.

If you have any questions regarding this Draft Mitigation Plan, please contact Tiernan Lennon of my staff at telephone (304) 636-6586, extension 12, or Tiernan_Lennon@fws.gov.

Sincerely,

John E. Schmidt
Field Supervisor

cc:
USACE – Rebecca Rutherford
USACE – Megan Wilburn
WVNDR - Danny Bennett
ES:WVFO:TLennon:skd:4/19/2016
Filename: P:\Finalized Correspondence\Corps of Engineers\Bluestone Dam Safety Project\Mitigation Plan Transmittal Letter.docx

# DRAFT

# MITIGATION PLAN FOR THE BLUESTONE DAM SAFETY PROJECT

**April 2016**

U.S. Fish and Wildlife Service
West Virginia Field Office
Elkins, West Virginia

## Overview

The purpose of this preliminary mitigation plan is to provide guidance to the U.S. Army Corps of Engineers, Huntington District (Corps), early in the planning process so that they can develop more detailed mitigation plans and incorporate them into the draft Environmental Impact Statement (EIS) and the Fish and Wildlife Coordination Act Report (FWCAR). As stated in the Fish and Wildlife Coordination Act (16 U.S.C. 661–667e) (FWCA), federal action agencies are to include justifiable means and measures for fish and wildlife, and the Service's mitigation and enhancement recommendations are to be given full and equal consideration with other project purposes. The Service's mitigation recommendations may include measures addressing a broad set of habitats beyond the aquatic impacts triggering the FWCA and taxa beyond those covered by other resource laws.

The U.S. Fish and Wildlife Service (Service) previously prepared a Planning Aid Letter (PAL) and a Habitat Evaluation Procedures (HEP) Report for this site to address fish and wildlife resources. The Service provided a PAL for the Bluestone Dam Safety Project on March 28, 2014, based on preliminary project information provided by the Huntington District. The PAL provided information on the fish and wildlife resources within the project site and reconnaissance areas, as well as a preliminary assessment of potential biological impacts of the proposed modification of the dam and associated habitats. While preparing the PAL, the Service also conducted a preliminary HEP assessment of existing riverine and riparian resources in the area immediately downstream of the dam. The HEP Report was intended to characterize current environmental conditions in the tailwater area immediately below the dam; our preliminary HEP Report was prepared in October 2013. The information in the HEP Report establishes the baseline environmental conditions for the project area and was used to formulate alternative risk management plans. The Corps provided us a summary of their tentatively selected alternative on March 15, 2016, and out of all the previously proposed alternatives this one is the least environmentally damaging.

The Service will be developing a more detailed FWCAR that describes the project effects and the appropriateness of the proposed mitigation in more detail.

## U.S. Fish and Wildlife Service Mitigation Policy

The Service Mitigation Policy (Federal Register, Vol. 46, No. 15, 7644-7663, January 23, 1981) addresses mitigation for project impacts and is based on the sequential mitigation procedures outlined by the President's Council on Environmental Quality (40 CFR Part 1508. 20 (a-e). Since fish and wildlife and their habitats are public resources with clear commercial, recreational, social, and ecological value to the Nation, the Service's policy is to seek to mitigate losses of fish, wildlife, their habitats, and uses thereof, from land and water developments. The sequential mitigation procedures, as described below, are used by the Service when making recommendations for appropriate mitigation for project impacts.

The first step in the sequence is avoiding the impact; this is accomplished either by not implementing the alternative or modifying it in a way that the impact no longer occurs. In order to fully explore avoidance as a mitigation tool, analysis of feasible alternatives must be thorough. Impacts may be avoided by implementing an alternative plan that accomplishes the same objectives without causing the effects.

If avoidance is not possible and the quality of the habitat permits, the remaining steps are followed as presented: limit the magnitude or degree of the action to minimize impacts, repair or restore the affected environment to rectify the impact, use preservation and maintenance operations during the life of the project to reduce or eliminate the impact over time, and replace or provide substitute resources or environments to compensate for the impact. Compensation is the last option pursued, because the resource benefits the most if it remains intact and in place.

The New River and the Bluestone River and their associated aquatic, wetland, and riparian habitats have been classified as Resource Category 1 by the Service according to our mitigation policy. The tailwaters of the Bluestone Dam are also considered Resource Category 1 habitats. Resource Category 1 habitats are those habitats that are of high value for evaluation species and are unique and irreplaceable on a national basis or in the ecoregion section. No loss of existing habitat value is allowed for these habitats. Because these one-of-a-kind areas cannot be replaced, all losses of existing habitat values should be prevented. Insignificant changes that do not result in adverse impacts may be acceptable.

**Definitions**

The following terms are not defined in the Service's Mitigation Policy, so the West Virginia Field Office developed the following definitions to categorize types of impacts within the project area:

Long term habitat loss – when impacts result in habitat loss for evaluation species that lasts for more than 1 year.

Short term habitat loss – when impacts result in habitat loss for evaluation species that lasts for less than 1 year.

Temporary impacts – are impacts that are not expected to last or remain indefinitely.

Permanent impacts - are impacts that are expected to last or remain unchanged indefinitely.

**Sequential Mitigation Procedures**

In order to minimize impacts, the Corps has discarded all alternatives that propose permanent impacts to Resource Category 1 aquatic habitat. There are no feasible alternatives that avoid temporary impacts to these habitats. The Corps has also discarded alternatives that do not avoid or minimize these temporary impacts. The remaining alternatives minimize temporary impacts to Resource Category 1 habitats and limit permanent impacts to within the existing stilling basin footprint, which is previously altered habitat that has minimal natural resource value.

To minimize downstream impacts to fish, wildlife, and their habitats, the Corps will implement erosion and sedimentation best management practices (BMP's). BMP's include, but are not limited to, the following: installation of sediment and erosion control devices (e.g. silt fences, filter socks, temporary sediment control basins, erosion control matting); adequate and continued maintenance of sediment and erosion control devices to insure their effectiveness; siting equipment staging, fueling, and maintenance areas outside of wetlands, streams, and riparian areas; and preventing sediment debris, and pollutants from entering the New River as much as

possible. Tree cutting will be minimized by clearing in previously disturbed areas. Seasonal restrictions for tree clearing will be followed to prevent taking bird nests, eggs, and young (between September 1 and March 31, which is outside the nesting season for most native bird species). By incorporating these measures into the mitigation plan, the Corps should significantly avoid and minimize negative fish and wildlife resource impacts resulting from upland disturbance.

Fishing opportunities may be lost during construction because the existing fishing pier will be removed during construction, which is expected to last up to 8 years. Riparian habitat near the dam may be disturbed temporarily to create staging areas for equipment and materials. Aquatic habitat will also be temporarily disturbed due to construction in the stilling basin and use of cofferdams downstream. In order to address these impacts, the Corps has agreed to restore the affected fishing opportunities and riparian and aquatic environment to baseline conditions, or better, after construction has concluded by constructing a new fishing pier at a revised location, replanting the riparian habitat, and restoring disturbed fish habitat. Loss of fishing opportunities during construction will also be mitigated by maintaining access to the shoreline downstream of construction sites so anglers can continue fishing in the tailwaters. The Corps will coordinate with the Service and the West Virginia Division of Natural Resources (WVDNR) to determine where to relocate the existing fishing pier. The Corps should provide the Service with recommended designs and locations prior to development of the Final FWCAR.

The Corps plans to use maintenance operations (care and diversion of water) during construction to reduce the impact from altered flow regimes downstream of the project over time. The Corps does not anticipate that flow distribution downstream will be significantly impacted since some flow will be allowed into the stilling basin at all times. Current project plans state that flow will be maintained in half of the stilling basin and that 8 out of the 16 sluices gates will be operational at all times. The Service strongly recommends that if flow must be stopped, construction should be arranged so that the flow is disrupted for the minimum amount of time necessary; flows should be resumed after no longer than 24 hours.

The Corps has developed an Environmental Hydrologic Analysis tool to model various flow conditions at Bluestone Dam. The terrain data, used by the Corps to generate the models, was a compilation of aerial Light Detection and Ranging (LiDAR), terrestrial based LiDAR, and bathymetric survey sections. The analysis is meant as a relative comparison and does not predict absolute values. The Service focused on the models that predicted low flow conditions, to determine potential direct and indirect impacts from the care and diversion of water. After reviewing the models that predict minimum releases at 610, 1,500, and 2,500 cubic feet/sec (cfs), the Service determined that the care and diversion of water may temporarily impact Resource Category 1 aquatic habitat downstream of the cofferdams (reaching as far as the island near the right descending bank). The modeling predicts that once water reaches the weir it will not distribute flow evenly throughout the tailwater area during low flow conditions; certain sections could experience reduced flows, no flow, or will be dry. The model can also predict the probability of Bluestone Dam undergoing minimal flows and the duration of those flows (refer to Table 1. below). For example to answer the question what is the expected duration that flows will be less than 610 cfs in January over a 3 year construction period, multiply (3 years)(31 days in a month)(0.001 probability below 610 cfs) to obtain an estimate of 0.093 day. The Service

anticipates that if low flow conditions (610, 1,500, and 2,500 cfs) don't persist for more than 24 hours, then the probability that the downstream aquatic habitat will be significantly altered (during the Corps construction timeframe of 6-8 years) is low. However, there may be aquatic impacts due to the cofferdams causing low flow conditions downstream.

**Table 1.**

| Duration Exceedance | Flow (cfs) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| 0.1 | 55,871 | 36,855 | 50,910 | 52,975 | 35,898 | 44,573 | 31,886 | 36,046 | 40,032 | 32,500 | 45,216 | 36,259 |
| 0.2 | 52,771 | 36,075 | 48,890 | 51,539 | 34,146 | 42,944 | 29,872 | 30,820 | 38,909 | 31,526 | 43,054 | 31,768 |
| 0.5 | 46,086 | 33,619 | 46,362 | 45,555 | 31,680 | 33,970 | 25,030 | 23,661 | 34,499 | 24,877 | 36,404 | 28,786 |
| 1 | 39,889 | 31,574 | 42,958 | 38,874 | 29,108 | 28,771 | 19,141 | 16,815 | 31,101 | 20,199 | 28,555 | 23,869 |
| 2 | 32,733 | 27,526 | 37,669 | 33,872 | 25,624 | 22,127 | 11,759 | 10,971 | 21,317 | 14,543 | 21,428 | 20,032 |
| 5 | 21,531 | 21,197 | 28,642 | 24,447 | 17,137 | 13,873 | 6,869 | 6,493 | 7,981 | 9,273 | 11,926 | 14,651 |
| 10 | 14,600 | 16,038 | 19,685 | 16,729 | 12,661 | 9,689 | 5,065 | 4,630 | 4,945 | 6,089 | 8,432 | 10,796 |
| 15 | 11,338 | 12,343 | 15,673 | 12,915 | 10,094 | 7,831 | 4,380 | 3,845 | 3,704 | 4,489 | 6,899 | 8,466 |
| 20 | 9,485 | 10,584 | 13,184 | 10,773 | 8,692 | 6,621 | 3,972 | 3,390 | 3,168 | 3,686 | 5,832 | 6,925 |
| 30 | 7,155 | 8,630 | 9,950 | 8,898 | 7,299 | 5,330 | 3,499 | 2,869 | 2,448 | 2,798 | 4,566 | 5,244 |
| 40 | 5,966 | 7,047 | 8,376 | 7,608 | 6,386 | 4,308 | 3,131 | 2,538 | 2,146 | 2,231 | 3,560 | 4,027 |
| 50 | 4,912 | 5,476 | 7,276 | 6,608 | 5,673 | 3,785 | 2,837 | 2,177 | 1,968 | 1,908 | 2,778 | 3,399 |
| 60 | 3,944 | 4,402 | 6,207 | 5,758 | 5,034 | 3,342 | 2,526 | 1,981 | 1,759 | 1,626 | 2,187 | 2,940 |
| 70 | 3,143 | 3,674 | 5,034 | 4,958 | 4,434 | 2,893 | 2,298 | 1,754 | 1,529 | 1,481 | 1,874 | 2,364 |
| 80 | 2,434 | 3,023 | 4,137 | 4,131 | 3,793 | 2,272 | 2,027 | 1,444 | 1,408 | 1,360 | 1,599 | 1,858 |
| 85 | 2,137 | 2,671 | 3,507 | 3,676 | 3,264 | 2,116 | 1,856 | 1,350 | 1,309 | 1,246 | 1,549 | 1,679 |
| 90 | 1,893 | 2,297 | 2,975 | 3,278 | 2,788 | 1,801 | 1,658 | 1,154 | 1,193 | 1,183 | 1,481 | 1,561 |
| 95 | 1,535 | 1,927 | 2,295 | 2,746 | 2,427 | 1,627 | 1,430 | 1,017 | 1,060 | 1,054 | 1,326 | 1,451 |
| 98 | 1,336 | 1,682 | 1,998 | 2,246 | 1,851 | 1,357 | 924 | 902 | 910 | 833 | 1,222 | 1,302 |
| 99 | 1,169 | 1,579 | 1,756 | 2,045 | 1,788 | 1,216 | 767 | 847 | 845 | 803 | 1,202 | 1,166 |
| 99.5 | 754 | 1,481 | 1,626 | 1,614 | 1,521 | 1,071 | 748 | 836 | 836 | 797 | 1,086 | 1,109 |
| 99.8 | 659 | 1,402 | 1,336 | 1,187 | 1,347 | 1,053 | 742 | 764 | 823 | 610 | 944 | 847 |
| 99.9 | 610 | 1,341 | 1,173 | 610 | 1,324 | 900 | 727 | 745 | 800 | 610 | 810 | 610 |

The Corps has worked closely with the Service to design an alternative that limits the project's permanent impacts in the tailwater area to the existing stilling basin footprint. In order to modify the stilling basin, the Corps will need to install and operate a series of cofferdams to facilitate construction efforts. The use of these cofferdams during construction will cause a long-term loss of natural river bottom aquatic habitat for approximately 6-8 years. These areas will be restored to baseline conditions, or better, by returning flows regimes to baseline conditions and restoring any disturbed aquatic habitat (e.g. rocks, water willow, islands etc.). Because the Corps has avoided and minimized to the maximum extent practicable, the Service has prepared this mitigation plan to address the remaining short and long-term loss of habitat and the temporary impacts in the tailwaters of the dam.

## Habitat Unit Calculations

The results of the HEP were used to calculate mitigation requirements for the proposed project. Mitigation requirements are calculated by overlaying the project impact map with the habitat map, and then calculating the acreage impacted for each habitat area. The acres impacted are then multiplied by the Habitat Suitability Index (HSI) scores (Table 2.) for that habitat area to determine Habitat Units (HU) required for mitigation. Table 3 shows the average HU value for each habitat type in the impact area (62.50 acres). The total study area for aquatic and terrestrial habitat was approximately 125 acres and 5.7 acres, respectively.

**Table 2. Overall HSI Scores**

| Species | HSI Score |
|---|---|
| Smallmouth Bass | 0.83 |
| Common Shiner | 0.80 |
| Mink | 0.52 |
| Yellow Warbler | 0.22 |
| Black-Capped Chickadee | 0.78 |

In determining HU values for mitigation, one HU is equal to one acre of habitat with a HSI rating of 1.0 (i.e., ideal habitat conditions for that species within that one acre of habitat). HU mitigation credit can be gained by creating, enhancing, or restoring existing habitat. Under this approach, credit is given for the improvement of resulting habitat over and above the existing or baseline habitat condition. For example, 10 acres of existing terrestrial habitat with a current HSI rating of 0.5 would provide five HUs. If that area is enhanced by creating snags or improving potential brood cover, then potentially 10 acres of habitat with a maximum HSI of 1.0 would be created, for a total of ten HUs. Thus, five HUs of mitigation credit would be obtained. It should be noted that, since perfect 1.0 HSI scores are difficult to obtain, under normal situations the amount of credit obtained would be less than provided for in this hypothetical example. Credit could also be obtained by preserving existing habitat. Because preservation does not result in an immediate increase in existing habitat values most agencies including the Service, WVDNR, and the Corps typically require more than a 1:1 ratio for this type of mitigation. The amount of credit obtained under this approach would need to be established by consensus of all agencies and would vary based on the quality of habitat preserved.

**Table 3. Overall Habitat Units by site.**

| SPECIES | Aquatic | Terrestrial |
|---|---|---|
| Smallmouth Bass | 51.88 | |
| Common Shiner | 50.00 | |
| Mink | | 2.96 |
| Yellow Warbler | | 1.25 |
| Black-Capped Chickadee | | 4.45 |
| **Average HU Value** | **50.94** | **2.89** |

**Baseline Habitat Units in Impact Area (62.50 acres)

Mitigation credits for enhancement activities are most easily gained by addressing the limiting factors for each habitat area, as described in the aquatic evaluation species and model descriptions section below. Mitigation through creation or preservation should focus on reproducing the conditions that resulted in the highest scored variables. For example, mitigation plans to enhance existing aquatic habitats might focus on providing overhanging woody

vegetation, instream cover, and wide forested buffers. The Service recommends that the Corps mitigate for the potential indirect temporary aquatic impacts (short-term habitat loss) that could occur during low flow conditions (approximately 50.94 HUs), resulting from the presence of cofferdams. This is particularly important because Resource Category 1 aquatic habitat will be adversely affected.

In order to calculate the number of HU's necessary to mitigate for the temporary aquatic impacts, the Service reviewed the hydrology models provided by the Corps. Based on these models, the Service determined that approximately 62.5 acres (half of the 125 acre survey area) could be impacted by altered flow regimes during low flow conditions. Low flow conditions could have the following impacts on aquatic resources downstream of the dam:

- loss of aquatic species habitat – instream and riparian cover such as rock outcrops, boulders, and cobble/pebble riffles;
- loss of emergent water willow;
- decrease in benthic macroinvertebrates, mussels, and fish populations in the project area;
- and/or alter water quality, turbidity, and total organic carbon/biological oxygen demand.

In addition, altered flows regimes could decrease the HEP scores for the smallmouth bass and common shiner (potential impacts are highlighted in red). Evaluation species habitat descriptions and model descriptions are provided in the following section.

An estimate of terrestrial impacts has not yet been provided to the Service, but the Corps has agreed to replant disturbed areas, where possible, with native vegetation.

**Aquatic Evaluation Species and Model Descriptions**

Smallmouth bass commonly occur in large clear lakes and reservoirs with rocky shorelines, as well as in perennial streams with bottoms comprised of gravel beds, large boulders, rubble, or bedrock. These are the preferred substrates for smallmouth bass to build their nests for spawning, and provide shelter to juveniles and adults. Smallmouth bass are sight feeders and choose their prey based on relative abundance and availability. Smallmouth bass typically eat smaller fish, crayfish, insects, and amphibians. Smallmouth bass prefer a water temperature of about 21°C. They also require at least 6 mg/L of dissolved oxygen and a pH range of 5.7-8.6 for optimal growth.

Model variables for the smallmouth bass include:
Cover/Reproduction/Feeding

- Clear (≤ 25 JTU[1]) water – construction activities could cause increased turbidity
- Stream gradient between 0.75 and 4.7 meters/kilometer (m/km) – will remain the same during construction
- At least 25% pools – water may become stagnant during low flow conditions

[1] The Jackson turbidity unit (JTU) is roughly the same as a Nephelometric turbidity unit (NTU): a measure of turbidity in a water sample.

- At least 25% cover and/or > 1m depth in the pools – cofferdams (care and diversion of water) may result in dry areas (loss of cover), decreased depth in pools, reduced flows, and stagnant pools
- Warm summer water temperatures, 21 -29 degrees Celsius (degrees C) – shallow depth during low flows can lead to an increase in temperatures
- Gravel, rubble, or boulder substrate – certain sections of the river will not be accessible to fish during low flow conditions

Common shiners are found in small and medium-sized streams with clear, cool water, and a moderate current. These shiners prefer unvegetated gravel to rubble bottoms; they frequent pools in streams more often than rapids. They excavate depression nests in gravel or sand; most nests are built in riffles 13 to 44 mm deep. Common shiners are omnivorous, feeding on nearly equal amounts of plant and animal matter. The common shiner model was selected to represent the New River shiner (*Notropis scabriceps*), an endemic species in the New River that has similar habitat requirements as the common shiner.

Model variables for the common shiner include:

Water Quality

- Maximum summer water temperature persisting for longer than 1 week (below 25 degrees Celsius is optimal) – if low flow conditions persist for longer than 1 week temperatures could exceed 25 degrees C
- Minimum pH between 6.5 and 8.5 – pH should remain the same during construction, unless there is a chemical spill
- Average turbidity (clear < 30 JTU) - construction activities could cause increased turbidity

Food/Cover

- Percent pools – interspersed with riffle areas for spawning (1:1 pool-riffle ratio is optimum) – low flow conditions would increase pool habitat in the project area, but pools would be shallow and/or stagnant
- Predominant pool class- moderate size and depth, commonly found below falls or riffle-run areas; 5-30% of bottom obscured by depth or turbulence - low flow conditions would increase pool habitat in the project area, but pools would be shallow and/or stagnant

**Service Mitigation Recommendations**

The Corps estimates the long-term habitat loss of approximately 2.25 acres of Resource Category 1 aquatic habitat as a result of cofferdam construction. Based on the hydrology modeling provided by the Corps, the Service also anticipates that approximately 62.50 acres of indirect temporary and short term impacts may occur downstream of the cofferdams, due to altered flows regimes.

The Service does not typically support projects that propose impacts to Resource Category 1 habitat. These areas are rare, irreplaceable, and are highly suitable and important to the conservation of evaluation species. The Service's policy for Category 1 resources is to recommend avoidance of all impacts, but because alternatives are not available to avoid these impacts the Service will seek a net gain in conservation as an outcome on this project. It is

consistent with the Service's mission to identify and promote opportunities for a net gain towards achieving conservation objectives during mitigation planning. A net gain that decreases the gap between the current and desired status of a resource is resource enhancement. As stated in the introductory paragraph pursuant to the FWCA, the Corps should be enhancing fish and wildlife habitat in addition to mitigating for the loss of that habitat.

In order to achieve this objective, the Service recommends off-site mitigation in combination with all of the aforementioned avoidance and minimization practices. The Service worked with the Corps to develop the following off-site mitigation site selection criteria (the selected site should meet at least 3 of the 5 criteria listed below):

1. The site should be adjacent to the New River (river front property). The site can either have intact riparian buffers, and receive mitigation credit for preservation, or lack riparian buffers and receive credit for restoration.
2. The site should contain direct tributaries to the New River that are in need of restoration or enhancement. Restoration work can include, but is not limited to, livestock fencing, stream restoration work, enhancement of riparian buffer to reduce erosion (tree/shrub planting), and/or removal of barriers to fish passage.
3. The site should be significantly forested or have the potential to be replanted to improve riparian buffers.
4. There is the ability to secure the mineral and development rights for the site to ensure that it will not be developed in the future.
5. The site should be adjacent to another conservation area (e.g. Wildlife Management Area, State Park, or federally protected land).

Additional attributes that are not listed as criteria, but would increase the value of a site are: recreational uses/benefits, benefits to threatened and/or endangered species, unique habitats (such as an island on the New River), and/or a land-owner that is willing to sell. [redacted]

**Conclusion**

In an effort to obtain a net gain in conservation for this Resource Category 1 habitat, the Service recommends that the Corps use the mitigation site selection criteria listed above to select a site that adequately mitigates for the 50.94 aquatic HU's that will be temporarily impacted during construction, which could result in short-term habitat loss. The Service will work with the Corps and the WVDNR to select an appropriate mitigation site. The Corps should have acceptable and available mitigation sites identified prior to the completion of a Final FWCAR.

REPLY TO
ATTENTION OF

**DEPARTMENT OF THE ARMY**
**HUNTINGTON DISTRICT, CORPS OF ENGINEERS**
**502 EIGHTH STREET**
**HUNTINGTON, WEST VIRGINIA 25701-2070**

May 23, 2016

Planning Programs and Project Management Division
Planning Branch, Environmental Analysis Section

Ms. Tiernan Lennon
U.S. Fish and Wildlife Service
West Virginia Ecological Services Field Office
694 Beverly Pike
Elkins, WV 26241

Dear Ms. Lennon:

The U.S. Army Corps of Engineers, Huntington District (District) is continuing coordination efforts under the Fish and Wildlife Coordination Act and Section 7 of the Endangered Species Act with regards to the Bluestone Dam Safety Modification Study (DSMS) project. As you are aware, the District is in the process of preparing a Draft Supplemental Environmental Impact Statement (DSEIS). As follow-up to our May 17, 2016 conference call, our office is providing your agency with this letter regarding our conceptual plans for recreational mitigation.

As discussed with you during previous team meetings, the Bluestone DSMS tentatively selected plan involves modifications to the existing stilling basin which would change the flow from the dam during construction by cutting the downstream stilling basin in two halves with a cofferdam, allowing only half of the 16 sluice gates to work at a time while the other half is under construction. Each half of the stilling basin could be closed off for 3-5 years at a time with a projected total construction period of 6-8 years. During high flow events only half of the total flow capacity would be available for release without removing the downstream cofferdam. This reduction in gate use may cause higher pools in the reservoir which would hold the lake for a longer amount of time than what the pool currently experiences.

As part of this study the District is evaluating the potential recreational impacts and identifying possible recreational mitigation measures. Due to known impacts to the downstream recreation area with loss of the Americans with Disabilities Act (ADA) accessible fishing pier due to future construction activities, the District is identifying both temporary and permanent conceptual mitigation for these impacts. Temporary mitigation measures are intended to be in place before any construction begins in order to prevent a gap in recreational access. With the

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help of a District contractor, we are developing mitigation plans that will be analyzed by both the District and agency stakeholders to identify the most appropriate mitigation measures to compensate for these impacts. Some conceptual mitigation measures to date include adding an additional boat access areas to accommodate various lake elevations, placing additional ADA fishing pier/water access both up and down stream of the dam, and designing a permanent fishing pier access in the same area as the current fishing pier once construction has completed.

Please provide us with any concerns or questions your agency has concerning the conceptual mitigation measures and feel free to contact Ms. Megan Wilburn at (304) 399-5797 or by email at Megan.B.Wilburn@usace.army.mil.

Sincerely,

Rebecca Rutherford

Rebecca A. Rutherford
Chief, Environmental Analysis Section

# United States Department of the Interior

FISH AND WILDLIFE SERVICE

West Virginia Field Office
694 Beverly Pike
Elkins, West Virginia 26241

June 30, 2016

Ms. Amy K. Frantz
Chief, Planning Branch
U.S. Army Corps of Engineers
502 Eighth Street
Huntington, West Virginia 25701

Dear Ms. Frantz:

This constitutes the U.S. Fish and Wildlife Service's (Service) Draft Fish and Wildlife Coordination Act Report for the Bluestone Dam Safety Project in Summers County, West Virginia. This Draft Fish and Wildlife Coordination Act Report is being provided under the terms of the August 2015 Scope of Services Agreement between the U.S. Army Corps of Engineers Huntington District and the Service's West Virginia Field Office.

If you have any questions regarding this Draft Fish and Wildlife Coordination Act Report, please contact Tiernan Lennon of my staff at (304) 636-6586, Ext. 12, or Tiernan_Lennon@fws.gov.

Sincerely,

for

John E. Schmidt
Field Supervisor

cc:
USACE – Rebecca Rutherford
USACE – Megan Wilburn
WVNDR - Danny Bennett
ES:WVFO:TLennon:skd:6/30/2016
Filename: P:\Finalized Correspondence\Corps of Engineers\Bluestone Dam Safety Project\Fish and Wildlife Coordination Act Report Transmittal Letter.docx

DRAFT

# FISH AND WLIDLIFE COORDINATION ACT REPORT

# BLUESTONE DAM SAFETY PROJECT

# SUMMERS COUNTY, WEST VIRGINIA

June 2016

Prepared for

U.S. Army Corps of Engineers
Huntington District
Huntington, West Virginia 25701

Prepared by

U.S. Fish and Wildlife Service
West Virginia Field Office
Elkins, West Virginia 26241

## Overview

This constitutes the Draft Fish and Wildlife Coordination Act Report (FWCAR) for the U.S. Army Corps of Engineers, Huntington District (Corps), Bluestone Dam Safety Project in Summers County, West Virginia. This project proposes to modify the existing dam to current design criteria by taking into account probability of dam failure, including all potential structural failure modes, and downstream scour in the event of a Probable Maximum Flood (PMF). The purpose of this Draft FWCAR is to address fish and wildlife resource impacts associated with implementing the proposed project and provide mitigation recommendations for impacts to those resources.

The Draft FWCAR also provides a preliminary analysis of the effects of the proposed dam modification measures and project alternatives on high quality, rare, and irreplaceable fish and wildlife resources (Resource Category 1 habitat). The No Action alternative is being presented for comparative purposes, but it does not meet the Corps Tolerable Risk Guidelines (Corps 2014). In addition to the No Action alternative, the effects of the Tentatively Selected Plan are being evaluated. The Tentatively Selected Plan limits permanent impacts to within the existing stilling basin footprint, which is previously altered habitat that has minimal natural resource value. Other alternatives were considered and dismissed as described in the 2016 Draft Environmental Impact Statement (EIS), and will not be further discussed in this FWCAR.

## Prior Studies

The U.S. Fish and Wildlife Service (Service) previously prepared a Planning Aid Letter (PAL) and a Habitat Evaluation Procedures (HEP) Report for this site to address fish and wildlife resources. The Service provided the PAL for the Bluestone Dam Safety Project on March 28, 2014, based on preliminary project information provided by the Huntington District. The PAL provided information on the fish and wildlife resources within the project site and reconnaissance areas, as well as a preliminary assessment of potential biological impacts from the proposed modification of the dam and associated habitats (Appendix B). While preparing the PAL, the Service also conducted a preliminary HEP assessment of existing riverine and riparian resources in the area immediately downstream of the dam (Appendix A). The October 28, 2013 preliminary draft HEP Report was intended to characterize current environmental conditions in the tailwater area immediately below the dam. The information in the HEP Report establishes the baseline environmental conditions for the project area and was used to formulate alternative risk management plans. The Corps provided us a summary of their Tentatively Selected Plan on March 15, 2016, and out of the seven previously proposed alternatives they selected the least environmentally damaging one. The Service prepared a preliminary mitigation plan on April 19, 2016 (Appendix C), to provide guidance to the Corps early in the planning process so that they could develop more detailed mitigation plans and incorporate them into the Draft EIS. For a complete summary of prior studies refer to the PAL (Appendix B).

## Description of the Study Area

Bluestone Dam is located on the New River at the community of Bellepoint, in Summers County, West Virginia, approximately 2.5 miles downstream of the confluence of the New and Bluestone Rivers, and 0.8 miles upstream of the confluence of the New and Greenbrier Rivers (Figure 1). The study area includes the water and adjacent lands of the Bluestone Project (the dam, Bluestone Lake flood control reservoir, and adjacent Federal, State, and private lands), as

well as portions of the New River and its tributaries (the Bluestone and Greenbrier Rivers), and the Kanawha River and its tributaries (the Gauley and Elk Rivers). This large study area encompasses a 4,565-square-mile drainage area extending along the New River from Bluff City, Virginia, to the junction of the Kanawha River with the Ohio River at Point Pleasant, West Virginia (Figure 1). Whereas only a small portion of the study area will be directly affected by project construction, the study area is large enough to encompass the area of potential direct, indirect, and cumulative effects of a Probable Maximum Flood (PMF) event.

For planning purposes, the study area is subdivided into four reconnaissance areas: 1) Bluff City to Sandstone; 2) Sandstone to Gauley Bridge; 3) Gauley Bridge to Poca; and 4) Poca to Point Pleasant (Figure 1). For a more detailed description of each reconnaissance area refer to Appendix B.

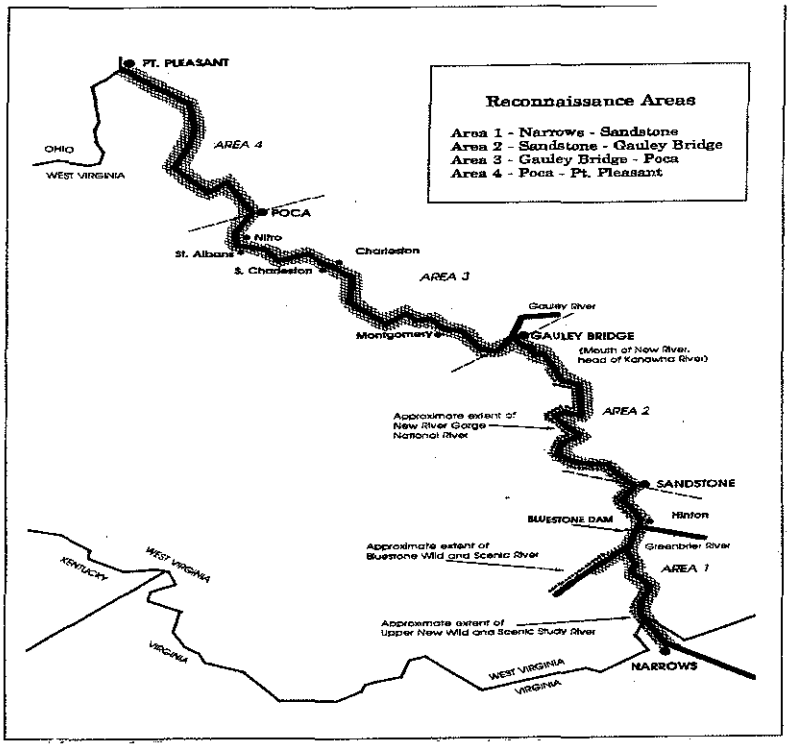


***Figure 1. Map of the entire Bluestone Dam Project study area.***

The Service anticipates that adverse impacts from the Tentatively Selected Plan would only occur in Reconnaissance Area 1, more specifically the reach immediately above and below Bluestone Dam. Therefore, the rest of this document will only focus on resources in Reconnaissance Area 1 that may be affected as a result of project construction and operation.

The New River and the Bluestone River, and their associated aquatic, wetland, and riparian habitats, have been classified as Resource Category 1 by the Service according to our Mitigation Policy (Federal Register, Vol. 46, No. 15, 7644-7663, January 23, 1981). The tailwaters of the Bluestone Dam are also considered Resource Category 1 habitats. Resource Category 1 habitats are those habitats that are of high value for evaluation species and are unique and irreplaceable on a national basis or in the ecoregion section. No loss of existing habitat value is allowed for

these habitats. Because these one-of-a-kind areas cannot be replaced, all losses of existing habitat values should be prevented. Insignificant changes that do not result in adverse impacts may be acceptable.

Aquatic habitats within the vicinity of Bluestone Dam are of high quality and considered by the Service to be unique and irreplaceable on a national basis. The free-flowing reaches of the New and Bluestone Rivers above the dam, as well as the tailwaters below the dam, contain a great diversity of excellent quality fish and wildlife habitats. A brief summary of downstream tailwater habitats is provided below.

The habitats in the tailwaters of Bluestone Dam include numerous islands, riverine emergent and aquatic bed wetlands, runs, riffles, and pools. The New River downstream of the dam (66 miles to its confluence with the Gauley) supports one of the best warm water fisheries in West Virginia. It features smallmouth bass, spotted bass, rock bass, flathead catfish, and channel catfish. In regard to smallmouth bass, this reach of New River supports one of the best fisheries for this species in the United States (Service 1998).

The tailwaters have numerous islands and riverine wetlands when compared to the downstream reaches in the New River Gorge National River. The riverine emergent wetlands are dominated by water willow, and are associated with shallow water areas around islands, shorelines, and riffles. The combination of runs, riffles, and pools in this reach of river is near optimum for smallmouth bass habitat (Appendix A). Refer to the PAL (Appendix B), for more information on the quality and value of fish, wildlife, and plant resources in the study area.

Since the PAL was written, the northern long-eared bat (*Myotis septentrionalis*)(NLEB) was listed under the Endangered Species Act (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) as threatened on April 2, 2015. On January 14, 2016, the Service finalized a 4(d) rule to provide measures that are necessary and advisable to provide for the conservation of the NLEB. The final 4(d) rule went into effect on February 16, 2016.

The NLEB occurs within the range of this proposed project and its study area. This project does not currently propose to clear any trees ≥ 3 inches diameter at breast height (dbh) and it is not located within any known hibernacula or roost trees buffers, therefore the Service does not anticipate that this project will adversely affect the NLEB. The Corps should continue to coordinate with the Service on federally listed species as project plans are finalized.

**Project Description**

At this stage of project planning, the Corps has discarded a large number of structural and non-structural design measures that would allow Bluestone Dam to operate under increased flood conditions. Initially, Corps staff identified approximately 85 measures (Corps 2013). Since then the Corps has eliminated many measures as structurally and/or economically unfeasible, or by making certain measures design elements that will be incorporated into plans for other alternatives. Measures and/or alternatives that have been discarded will not be discussed further in this draft FWCAR. The alternatives being considered are summarized below.

Hydraulic Jump Basin with Supercavitating Baffles Alternative

This alternative has been identified as the Tentatively Selected Plan and combines various structural and non-structural design measures to ensure stability of the stilling basin and the dam during extreme flood events (Figure 2). Non-structural risk management measures are additives that further reduce risk. The following structural measures are included in this alternative.

To reduce risk associated with overtopping, the Corps is considering the installation of the remaining portions of the 8 feet high parapet wall across the non-overflow sections of the dam. The new section of parapet wall would tie into the already constructed sections and the highway gate closure. This parapet wall was an authorized component of the 1998 Dam Safety Assurance Study recommendation.

To reduce risk associated with insufficient spillway capacity, the Corps proposes to modify the existing stilling basin, which consists of a two stage system. The modified stilling basin will remain a two stage system within the same footprint, but will include various modifications and features. The existing stilling basin (comprised of natural riverbed) will be excavated and replaced with a protective concrete overlay. The first stage baffle blocks will be demolished and replaced with new larger blocks. In order to stabilize against uplift pressures, both the existing and new concrete slabs (apron) will be anchored and a new drainage gallery (within the dam or first stage) will be constructed. The second stage basin, which consists of the second stage apron, training walls, and baffle blocks, will be reconstructed and anchored into the riverbed to ensure stability and satisfactory performance. The height and base width of the existing training walls will be increased to contain the hydraulic jump and high velocity flows within the basin (Figure 2).

The stilling basin is anticipated to be constructed in two phases. In order to modify the stilling basin, temporary construction barriers (coffer cells) will be put in place to minimize impacts to downstream habitat. A permanent divider wall will be constructed to segregate the basin in two halves so that 8 of the 16 dam sluice gates will be operational at all times during construction.

Non-structural risk management measures include: an enhanced risk communication plan (to regularly educate the downstream public of the flood risk and emergency procedures) and installing equipment that remotely operates the 21 vertical crest lift gates (in order to reduce the risk to project personnel in the event of inflows predicted to exceed top of dam).

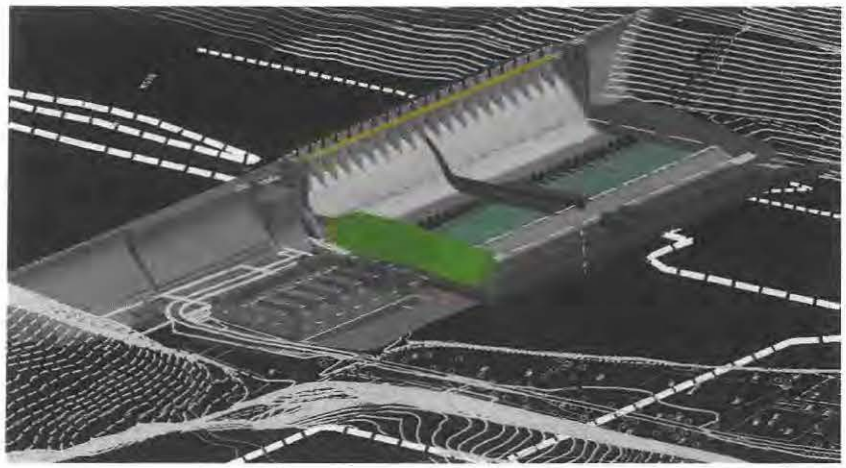

*Figure 2. 3D Diagram of the Hydraulic Jump Basin with Supercavitating Baffles Alternative.*

No Action Alternative

Under this alternative, the dam would be allowed to overtop. However, it is estimated that at a pool elevation of 1532' mean sea level (MSL), the dam would fail resulting in significant property damage and potential loss of life. This alternative does not fulfill the purpose of the project.

**Potential Project Effects**

Current dam operations use flood control capabilities of the dam up to 1520.0' MSL and then pass all the water the dam is able to above that level. Under the proposed action, project operations would only change if a large flood event occurred during construction. In that case the dam would retain more water in the reservoir for a longer period of time. Therefore, no long-term changes in dam operations would occur that would result in adverse effects to fish and wildlife resources, and most effects of the project would occur as a result of and during project construction.

Construction impacts are likely to occur and need to be avoided or minimized to the greatest extent possible because of the excellent habitat downstream of the dam. These are discussed in greater detail below. Impacts due to the PMF were discussed in greater detail in the PAL (Appendix B).

Hydraulic Jump Basin with Supercavitating Baffles Alternative (Tentatively Selected Plan)

The Corps has worked closely with the Service to design this alternative so that it limits the project's permanent impacts in the tailwater area to the existing stilling basin footprint. The Tentatively Selected Plan is likely to involve the pairing of multiple design measures as described in the project description section above. Potential adverse impacts from the proposed measures include loss/fragmentation of riparian habitat, changes to the river bottom, altered flows, increased sedimentation, scour of the river bottom and banks, and changes in water depth and velocity. The Service anticipates that direct and indirect adverse impacts from the Tentatively Selected Plan would occur only in Reconnaissance Area 1, more specifically from the tailwaters of Bluestone Dam downstream to the Route 3 Bridge, and along the riparian zone in this stretch of the river. Direct impacts from the Tentatively Selected Plan include long-term

loss of habitat a specific distance downstream of the existing footprint, temporary impacts to recreation due to construction schedule and duration, and temporary erosion of the riparian island located river right in the tailwaters. Indirect impacts from this alternative include degradation of habitat downstream due to the care and diversion of water (e.g. the use of coffer cells) and the modification of hydraulic regimes. Direct and indirect adverse impacts could result in loss of velocity shelters for fish and loss of optimal breeding habitat downstream.

In the event of a large flood during construction, the retention of a higher pool in the reservoir may inundate recreational areas upstream of the dam for a longer period of time. Recreational areas that could be affected include the swimming/boating area referred to as "The Pit" and the National Park Service's (NPS) camp grounds. Additionally, the drift and debris tower (a multi-level intake tower used for passing drift and debris through the dam) will be out of service for the entire length of construction which means that more debris will be passed through the sluice gates. This could cause larger amounts of debris to settle out on NPS and State lands, which may further impede recreational activities during construction and potentially degrade aquatic habitats downstream.

Construction activities that have the potential to disturb terrestrial and aquatic resources in the project area are further described below.

1. Coffer Cells
   In order to modify the stilling basin, the Corps will need to install and operate a series of coffer cells (36ft x 36ft) to remove water from the instream construction area and facilitate construction efforts. The use of these coffer cells during construction will cause a long-term temporary loss of two acres of natural river bottom aquatic habitat for approximately 8 to10 years. Based on the hydrology modeling provided by the Corps on February 29, 2016, the Service also anticipates that approximately 62.50 acres of indirect temporary and short term impacts may occur downstream of the coffer cells, due to altered flows regimes. Natural low flow conditions, exacerbated by the presence of coffer cells and diversion of water during construction, could have the following impacts on aquatic resources downstream of the dam: loss of aquatic species habitat – instream and riparian cover including as rock outcrops, boulders, and cobble/pebble riffles; loss of emergent water willow; erosion of the riparian island; loss of velocity shelters and optimal breeding habitat for fish; decrease in benthic macroinvertebrates, mussels, and fish populations in the project area; and/or alter water quality, turbidity, and total organic carbon/biological oxygen demand.

2. Anchor Placement
   Concrete fines which could potentially escape into the river will be created during drilling and cutting of existing concrete to place anchors. Ingestion of these fines could be harmful to aquatic organisms. Therefore steps should be taken to reduce the amount of slurry created. The anchor holes should be drilled using a dry cutting process so that no slurry will be created during this phase; and the concrete fines should be disposed of at an approved facility.

3. Staging Areas
   Staging areas are proposed to be located on previously developed and disturbed Corps property. The existing recreation access area on the left descending bank of the dam will be used as a construction staging area and will be closed to public access during project construction. The existing fishing pier in this area will be removed during construction. A portion of the recreation area on the right descending bank below the dam will be used as another staging area and for placement of a concrete batch plant. This area provides important angler access to the tailwaters, particularly the stilling basin. Angler access along the shoreline will be restricted to areas downstream of the coffer cells (distances have yet to be determined), on both sides of the river for approximately 8-10 years.

4. Other
   The amount of natural rock that will be excavated from the stilling basin has not been estimated at this time and spoil area(s) have not been identified. Therefore, there is currently insufficient information for the Service to quantify or assess the effects associated with placement of spoil areas. All potential spoil sites should be reviewed and approved by the Service prior to the finalization of mitigation plans, so that impacts to federally listed species and fish and wildlife resources can be addressed appropriately.

No Action Alternative
This action could result in dam failure when the pool elevation reaches 1532.0' MSL. This would result in decreased upstream inundation times; increased downstream water velocities causing scouring; additional debris; and release of sediment that built up behind the dam over the course of its existence (about 67 years).

The increased water velocity and rushing water from the dam failure would increase the scouring of the river bottom and banks and the amount of sediment washed downstream. Sediment deposition would occur when the water begins to slow down; this would likely occur where the Kanawha River is formed by the Gauley and the New River. Additional deposition would occur in the navigation pools of the Kanawha River. Depending on the amount of sediment left behind the failed dam, chronic sedimentation may continue to occur with each high water event after the PMF until the dam is replaced.

Increased flood heights along the Kanawha River may cause release of hazardous materials into the system. Numerous chemical plants and industries using hazardous materials are found along the Kanawha. In addition, rail cars carrying hazardous materials are likely to be inundated. Materials carried in tanks could be washed downstream into the Ohio River. Intact tanks should not pose a significant danger, but those that rupture would impact fish and wildlife resources. Raw sewage entering the river could be of great concern if sewer lines rupture or if waste water treatment plants become inundated.

With the No Action alternative no construction impacts will occur.

**Potential Effects of Climate Change**

As part of the Bluestone Lake Dam Safety Modification Study, the Corps evaluated the effects of climate change on water resources in the Kanawha and New River Watershed for their future without action condition (FWAC). Using recent U.S. climate change and hydrology literature and modeling, the Corps has predicted that within the next 80 years we will see increases in mean annual air temperature (ranging from 0.5°F to 1.0°F per decade), increases in precipitation/runoff and stream flow (ranging from 5% to 25% higher in spring and between 5% to 35% higher in fall), and more intense rainfall events (in the 1 in 20 year event range) (Corps 2016).

Potential impacts associated with increased mean annual air temperature include shifts in aquatic and terrestrial species composition, more frequent algae blooms, and introduction of insect pests and diseases. Increased air temperature could result in warmer surface waters. This may cause cold-water species to migrate upstream to colder headwater areas, leaving warm-water species to dominate Bluestone Lake. Warmer water temperatures may also provide opportunities for the introduction of invasive aquatic species, which could lead to increased competition with native species. The combination of warmer water temperatures and increased nutrient input may lead to more frequent algae blooms, which can degrade water quality and shade out aquatic plant species. The lengthened growing season, caused by increased mean annual air temperature, may result in increased vegetation growth and shift in species composition from native species to invasive species. Those factors may also result in the introduction of insect pests and diseases that could be detrimental to the aquatic and terrestrial communities (Corps 2016).

Potential impacts associated with increased precipitation/runoff and stream flow include more frequent flood events, increased probability of dam failure and/or size of the PMF, decreases in recreation, erosion issues, and impacts to water quality. Increased precipitation and resultant runoff can introduce more pollutants into the water degrading water quality and increasing erosion downstream. The islands within the vicinity of the dam provide habitat to various terrestrial and aquatic species and may be significantly impacted or eliminated by erosion. More frequent flood events could preclude recreation if recreational areas remain inundated for longer periods of time (Corps 2016). Additionally, increased flow velocities for longer periods of time may discourage fisherman from wading across the river.

Accelerating climate change is resulting in impacts that pose a significant challenge to conserving species, habitat, and ecosystem functions. Climatic changes can have direct and indirect effects on species abundance and distribution, and may exacerbate the effects of other stressors (USFWS Revised Mitigation Policy, Federal Register, Vol. 81, No. 45, 12380-12403, March 8, 2016). The Appalachian Landscape Conservation Cooperative (LLC) compiled the results of 700 species climate change vulnerability assessments, in the Appalachians, and assigned them climate change vulnerability scores (Appalachian LLC 2016). Based on that compilation of data, the Service was able to select a few examples of species within the Bluestone study area that the Appalachian LLC considered vulnerable to climate change effects. The following species received vulnerability scores ranging from moderately to extremely vulnerable to climate change effects: the Bluestone sculpin (*Cottus sp.*), eastern hellbender (*Cryptobranchus alleganiensis*), Virginia spiraea (*Spiraea virginiana*), green salamander (*Aneides aeneus*), candy darter (*Etheostoma osburni*), and Alleghany woodrat (*Neotoma*

*magister*). These species were all previously mentioned in our PAL (Appendix B) as species in need of conservation. If the Appalachian LCC's climate change vulnerability scores are accurate, there is the possibility that within the next 80 years more species will warrant listing under the ESA within the Kanawha and New River watersheds.

In summary, the fish and wildlife resources in the Kanawha and New River watersheds will experience some level of impact due to climate change within the foreseeable future.

**Mitigation Recommendations**

The Service does not typically support projects that propose impacts to Resource Category 1 habitat. These areas are rare, irreplaceable, and are highly suitable and important to the conservation of evaluation species. The Service's policy for Category 1 resources is to recommend avoidance of all impacts. But because alternatives are not available to avoid these impacts, and because the Corps has selected the least damaging practical alternative, the Service will seek a net gain in conservation as an outcome on this project. This conservation gain should be focused on protecting or enhancing habitats of similar or equal value. It is consistent with the Service's mission to identify and promote opportunities for a net gain towards achieving conservation objectives during mitigation planning. A net gain that decreases the gap between the current and desired status of a resource is resource enhancement (USFWS Revised Mitigation Policy). Pursuant to the Fish and Wildlife Coordination Act (16 U.S.C. 661–667e) (FWCA), the Corps should be enhancing fish and wildlife habitat in addition to mitigating for the loss of that habitat.

Avoidance, Minimization, and Conservation Recommendations

The Service is providing the following avoidance, minimization, and conservation recommendations (for the Tentatively Selected Plan) so that the Corps can incorporate measures that further minimize impacts and enhance fish and wildlife habitat into the Draft EIS, and into final design plans:

1. Coffer Cells

   In order to minimize the potential direct and indirect impacts from the coffer cells, the Service recommends the following:

   - The Corps should modify their water management plan to avoid significantly altering flow downstream and reduce stream bed scour during construction.
   - Replant disturbed riparian areas with native, woody vegetation to create cover for wildlife, reduce erosion (stabilize the river bank), improve water quality, and reduce water temperatures.
   - Plant water willow to reduce erosion and enhance breeding habitat for fish.
   - Armor the banks of riparian islands to reduce erosion and loss of aquatic breeding habitat.
   - Improve existing breeding habitat and velocity shelters for aquatic organisms by adding cover – riparian, rock boulder, and water willow.

All measures pertaining to creating or enhancing fish habitat should be coordinated with the West Virginia Division of Natural Resources (WVDNR) fisheries biologist.

2. Anchor Placement
   The Service recommends that steps be taken to reduce the amount of slurry created from drilling and cutting the existing concrete. The anchor holes should be drilled using a dry cutting process so that no slurry will be created during this phase; and the concrete fines should be disposed of at an approved facility.

3. Staging Areas
   Staging areas should be returned to pre-construction conditions so that they can be utilized for recreation. Recreational mitigation recommendations for the staging areas are discussed in the next section.

4. Other
   All potential spoil sites should be reviewed and approved by the Service prior to final project designs or before the Corps develops a Final EIS, so that impacts to federally listed species and fish and wildlife resources can be addressed appropriately. Additionally, no spoil should be placed in wetlands, aquatic sites, or any high quality riparian or terrestrials habitats, unless the placement is designed to enhance or restore these areas.

In addition to addressing construction impacts, the Corps should incorporate conservation measures to increase the abundance or resiliency of sensitive habitats so that the effects of climate change impacts won't be as severe within the project area.

Conservation Measures for Climate Change Impacts:

- Plant water willow to enhance fish breeding habitat;
- create more riparian islands or protect existing islands from erosion;
- create velocity shelters for fish;
- and develop a plan to address removal of terrestrial and aquatic invasive species. Invasive species management can help increase survival rates for native species.

Potential Mitigation Sites

The Service provided the Corps with preliminary mitigation recommendations in our April 19, 2016 Draft Mitigation Plan (Appendix C). Our recommendations have not changed significantly since we have not had the opportunity to access and evaluate potential mitigation sites to determine if our recommended mitigation is achievable and/or adequate to offset impacts to Resource Category 1 habitat. Therefore, at this time, the Service cannot determine whether there are sufficient, achievable opportunities available to adequately mitigate for the anticipated adverse effects to fish and wildlife resources from this proposed project.

Based on discussions with the Corps following the submission of our Draft Mitigation Plan, the Service has the following additional mitigation site selection recommendations/comments that were not previously mentioned in our Draft Mitigation Plan:

- Multiple sites can be selected to reach the mitigation goal, as long as the HU's generated by each site add up to the amount needed to achieve the goal (50.94 aquatic HU's)(Appendix C).
- Mitigation sites should have an interested long-term steward that has experience with successfully managing properties for fish and wildlife conservation purposes. We do not expect the Corps to manage the site(s) in perpetuity.
- The selected site(s) should be able to achieve the mitigation goal within the lifetime of project construction (8 to10 years). For example if the objective is to increase evaluation species scores on the New River by reducing sedimentation, increasing cover for aquatic species, and improving water quality, selecting a mitigation site that is 0% forested may not achieve that mitigation goal. The rationale being that it could take over 10 years for that riparian buffer to generate the ecological lift needed to raise evaluation species scores.

After multiple discussions with the WVDNR, the Service has decided that the use of mitigation banks and in-lieu fee programs, to offset impacts in Resource Category 1 habitat, is unacceptable. Mitigation must directly benefit the Resource Category 1 habitat being impacted. Mitigation banks and in-lieu fee programs do not provide that opportunity.

Recreational Mitigation

On May 23, 2016, the Corps sent us a letter proposing some conceptual mitigation measures that included adding an additional boat access area to accommodate various lake elevations, creating an additional fishing pier/providing water access both up and down stream of the dam, and designing a permanent fishing pier in the same area as the current fishing pier once construction has been completed. All temporary mitigation measures must be in place prior to the removal of the existing structures, in order to prevent a delay in recreational access. The Corps should provide the Service and the WVDNR with designs and locations for recreational mitigation prior to development of the Final FWCAR.

Placement of natural rock into the reservoir from excavation of the stilling basin may serve to provide habitat for fish and reduce and/or eliminate the need for off-site spoil areas. In addition to creating fish habitat, the excavated rock slab could be used to armor eroding islands within the vicinity of the project. The Corps is currently working with the WVDNR to designate potential locations upstream of the dam for these mitigation activities.

**Additional Studies**

Due to an accelerated timeline, the Service was not able to access and evaluate potential mitigation sites/reference sites to determine if our recommended mitigation is achievable. Prior to the Final FWCAR, the following studies/additional information should be completed and/or provided so that Service can develop final mitigation plans:

- HEP evaluations should be performed on all potential mitigation sites that meet the site selection criteria described in Appendix C.
- The Corps should demonstrate that they have appropriated an adequate amount of money to offset impacts to Resource Category 1 habitat/achieve the amount of HU's necessary.

- The Corps should quantify terrestrial impacts so that the Service can calculate HU's and provide mitigation recommendations/complete section 7 consultation.
- The Corps should provide the Service with designs and locations for recreational mitigation.
- The Corps should provide a list of all potential spoil sites so the Service can assess impacts to fish and wildlife resources.

The Corps needs to provide this information to the Service within a suitable timeframe so that the Service can evaluate it and provide recommendations prior to the development of the Final EIS.

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# APPENDIX A

# PRELIMINARY HABITAT EVALUATION PROCEDURES REPORT

# BLUESTONE DAM SAFETY PROJECT

# OCTOBER 2013

APPENDIX B

FINAL PLANNING AID LETTER

BLUESTONE DAM SAFETY PROJECT

MARCH 2014

# APPENDIX C

# DRAFT MITIGATION PLAN

# BLUESTONE DAM SAFETY PROJECT

APRIL 2016