Final Determination of the U.S. Environmental Protection Agency
Pursuant to § 404(c) of the Clean Water Act
Concerning the Spruce No. 1 Mine, Logan County, West Virginia

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I. Executive Summary

This document explains the basis for the US Environmental Protection Agency (EPA) Clean Water Act § 404(c) Final Determination to withdraw the specification of Pigeonroost Branch, Oldhouse Branch and their tributaries, all of which are waters of the United States within Logan County, West Virginia, as a disposal site for dredged or fill material in connection with construction of the Spruce No. 1 Surface Mine, as authorized by DA Permit No. 199800436-3 (Section 10: Coal River) (DA Permit).[1] This Final Determination also prohibits the specification of the defined area constituting Pigeonroost Branch, Oldhouse Branch and their tributaries for use as a disposal site associated with future surface coal mining that would be expected to result in a nature and scale of adverse chemical, physical, and biological effects similar to the Spruce No. 1 mine. The DA Permit was issued by the US Army Corps of Engineers, Huntington District (Corps) in January 2007, authorizing the Mingo Logan Coal Company to construct six valley fills, associated sediment structures, and other discharges of fill material to the Right Fork of Seng Camp Creek, Pigeonroost Branch, Oldhouse Branch, and their tributaries. If fully constructed, the project will disturb approximately 2,278 acres (about 3.5 square miles) and bury approximately 7.48 miles of streams beneath 110 million cubic yards of excess spoil. This is among the largest individual surface mines ever authorized in West Virginia.

Under § 404(c) of the Clean Water Act, EPA is authorized to prohibit the specification (including the withdrawal of specification) of any defined area as a disposal site whenever EPA determines that the discharge of such materials into such area will have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas. EPA is taking this action under § 404(c) of the Clean Water Act because the discharges associated with the DA Permit in Pigeonroost Branch, Oldhouse Branch and their tributaries will have unacceptable adverse effects on wildlife. In addition, the impacts downstream due to the destruction of those streams will result in unacceptable adverse impacts to wildlife and also warrant EPA's action under § 404(c).

The project, as permitted, will bury 6.6 miles of Pigeonroost Branch, Oldhouse Branch, and their tributaries under excess spoil generated by surface coal mining operations.[2] These streams represent some of the last remaining least-disturbed, high quality stream and riparian resources within the Headwaters Spruce Fork sub-watershed and the Coal

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[1] While the permit also authorizes construction of valley fills and other discharges to the Right Fork of Seng Camp Creek and its tributaries, EPA is not withdrawing specification of those waters, in part because some of those discharges have already occurred and because the stream resources in Right Fork of Seng Camp Creek were subject to a higher level of historic and ongoing human disturbance than those found in Pigeonroost Branch or Oldhouse Branch. Due to litigation and an agreement with environmental groups, represented by Ohio Valley Environmental Coalition, operations following the issuance of this DA Permit have been limited to the Seng Camp Creek watershed, and as part of that agreement one valley fill is partially constructed.

[2] As noted above, the permit authorizes the filling of approximately 7.48 total miles of stream. For the reasons in footnote 1, EPA's Final Determination only addresses the approximately 6.6 miles of Pigeonroost Branch, Oldhouse Branch and their tributaries subject to the DA Permit.

River sub-basin and contain important wildlife resources and habitat. The quality of these streams is comparable to a West Virginia-designated reference site, and the macroinvertebrate communities found in these streams, which are used as an indicator of quality, rank extremely high in comparison to other streams throughout the Central Appalachia ecoregion and the state of West Virginia. These streams perform critical hydrologic and biological functions, support diverse and productive biological communities, contribute to prevention of further degradation of downstream waters, and play an important role within the context of the overall Headwaters Spruce Fork sub-watershed and Coal River sub-basin.

Unacceptable adverse impacts to Pigeonroost Branch, Oldhouse Branch, and their tributaries include the direct burial of 6.6 miles of high quality stream habitat, including all wildlife in this watershed that utilize these streams for all or part of their life cycles (e.g., macroinvertebrate, amphibian, fish, and water-dependent bird populations). Streams within the Central Appalachian ecoregion have some of the greatest aquatic animal diversity of any area in North America, including one of the richest concentrations of salamander fauna in the world, as well as many endemic and rare species of mayflies, stoneflies and caddisflies. In fact, Pigeonroost Branch and Oldhouse Branch contain extremely high mayfly and stonefly diversity, both within the Central Appalachian ecoregion and within the state of West Virginia. With their adjacent riparian areas, these streams provide important habitat for 84 taxa of macroinvertebrates, up to 46 species of amphibians and reptiles, 4 species of crayfish, and 5 species of fish, as well as birds, bats, and other mammals. As some of the last remaining high quality, least-disturbed headwater stream habitat within the sub-basin, these streams not only support resident wildlife, but also provide ecosystem functions for downstream waters, serve as refugia for aquatic life and potential sources for recolonizing nearby waters, and ultimately serve to maintain the aquatic ecosystem integrity in the sub-basin and the rich animal diversity in the ecoregion.

Burial of Pigeonroost Branch and Oldhouse Branch and their tributaries will also result in unacceptable adverse effects on wildlife downstream through the transformation of the buried areas into sources of pollution that will contribute contaminants to downstream waters and the removal of functions performed by the buried streams. Based on recent peer-reviewed literature, as well as available data from adjacent mine sites and from the active portion of the Spruce No. 1 Surface Mine, EPA has concluded that the full construction of the Spruce No. 1 Surface Mine will transform these headwater streams from high quality habitat into sources of pollutants (particularly total dissolved solids and selenium) that will travel downstream and adversely impact the wildlife communities that utilize these downstream waters. Increased pollutant levels will lead to loss of macroinvertebrate communities and population shifts to more pollution-tolerant taxa, specifically the extirpation of ecologically important macroinvertebrates. Through the loss of stream macroinvertebrate communities, there will be, in turn, substantial effects on fish, amphibian, and bird populations that rely on these communities as a food source.

Furthermore, the increased loading of pollutants to downstream receiving waters increases the potential for harmful golden algal blooms, while increased selenium exposure will result in impaired salamander populations and adverse effects to the reproduction of fish and bird species, thus harming the ability of these local populations to rebound. It is well recognized that the loss of a certain number of individuals of a species in a local ecological community can be tolerated, provided that the species continues to reproduce to replace lost individuals. However, when species are impacted by both acute stressors (e.g., food web changes, algal blooms) and exposure to reproductive toxicants, there is an increased risk of the loss of an entire species within an area. The loss of macroinvertebrate prey populations, increased risk of harmful golden algal blooms, and additional exposure to selenium will have an unacceptable adverse effect on the 26 fish species found in Spruce Fork as well as amphibians, crayfish, and bird species that depend on downstream waters for food or habitat.

The watersheds the project is located in, the Headwaters Spruce Fork sub-watershed and the larger Coal River sub-basin, have been heavily impacted by mining and the streams within this watershed have experienced substantial impairment. Currently, there have been more than 257 past and present surface mining permits issued in the Coal River sub-basin, and the corresponding mines collectively occupy more than 13% of the land area. In the Headwaters Spruce Fork sub-watershed, more than 34 past and present surface mine permits have been issued, and the corresponding mines collectively occupy more than 33% of the land area. If constructed as permitted, the project will occupy an additional 2.8% of the Headwaters Spruce Fork sub-watershed land area, and burial of Pigeonroost Branch, Oldhouse Branch and their tributaries will destroy 5.6% of the streams within the sub-watershed.

As least-disturbed streams in a watershed largely affected by mining, Pigeonroost Branch, Oldhouse Branch and their tributaries represent a high-value resource for the wildlife within the watershed. The Spruce No. 1 Mine will eliminate the entire suite of important physical, chemical and biological functions provided by these streams, including maintenance of biologically diverse wildlife habitat, and will critically degrade the chemical and biological integrity of downstream waters. Because the project will have unacceptable adverse effects on these high quality wildlife resources, EPA believes it is appropriate to withdraw specification to ensure the protection of these resources from discharges of dredged or fill material authorized under this DA permit.

Throughout the history of the Spruce No. 1 Surface Mine DA permit, EPA has raised concerns regarding adverse impacts to the environment. Additional data and information, including peer-reviewed scientific studies of the ecoregion, have become available since permit issuance. The peer-reviewed literature now reflect a growing consensus of the importance of headwater streams; a growing concern about the adverse ecological effects of mountaintop removal mining, specifically with regard to the effects of elevated levels of total dissolved solids discharged by mining operations on downstream aquatic ecosystems; and concerns that impacted streams cannot be easily recreated or replaced. These advances in understanding support EPA's long-standing concerns about this project regarding the potential for unacceptable adverse effects on wildlife, adverse water quality impacts, significant cumulative effects, as well as the shortcomings in avoidance, minimization, and compensatory mitigation measures designed to reduce environmental impacts from the project.

On April 2, 2010, EPA Region III published in the Federal Register a Proposed Determination to prohibit, restrict or deny the specification or the use for specification (including withdrawal of specification) of certain waters at the project site as disposal sites for the discharge of dredged or fill material for the construction of the Spruce No. 1 Surface Mine. EPA Region III took this step because it believed that discharges authorized by the DA Permit would result in a significant loss of wildlife habitat and also cause significant degradation of downstream aquatic ecosystems and therefore could have unacceptable adverse effects on wildlife. A public hearing regarding the Proposed Determination was conducted on May 18, 2010. EPA Region III received more than 100 oral comments and more than 50,000 written comments both supporting and opposing its Proposed Determination.

On September 24, 2010, U.S. Environmental Protection Agency (EPA) Region III submitted to EPA Headquarters its Recommended Determination that the specification embodied in DA Permit No. 199800436-3 (Section 10: Coal River) of Pigeonroost Branch and Oldhouse Branch as disposal sites for discharges of dredged or fill material for construction of the Spruce No. 1 Surface Mine be withdrawn. EPA Region III based this recommendation upon a conclusion that the discharges of dredged or fill material to Pigeonroost Branch and Oldhouse Branch for the purpose of constructing the Spruce No. 1 Surface Mine as authorized would likely have unacceptable adverse effects on wildlife.

The U.S. Fish and Wildlife Service (USFWS), in its comments on both the Proposed and Recommended Determinations, concurred with EPA Region III's conclusion that the project, as authorized, would result in unacceptable adverse effects on wildlife and that this conclusion is supported by the available scientific information. USFWS also notes that it has consistently expressed concerns regarding the loss of headwater streams and adjacent riparian and terrestrial habitats associated with the Spruce No. 1 Surface Mine, as well as its likely impacts on downstream water quality, aquatic organisms, and terrestrial and aquatic wildlife that depend on those resources.

Following review of the public comments received, the past and new scientific data, and EPA Region III's Recommended Determination, EPA Headquarters has concluded that the discharge of dredged or fill material to Pigeonroost Branch, Oldhouse Branch, and their tributaries, in connection with the construction of valley fills and sediment ponds, as authorized by DA Permit No. 199800436-3 (Section 10: Coal River), will result in unacceptable adverse effects on wildlife. The administrative record developed in this case fully supports the conclusion that the Spruce No. 1 Surface Mine will have unacceptable adverse effects to wildlife, due to the filling of Pigeonroost and Oldhouse Branch, and their tributaries. In addition, the administrative record demonstrates that the Spruce No. 1 Surface Mine will have unacceptable adverse effects on wildlife downstream of the project site.

Furthermore, these adverse impacts do not comply with the requirements of the Clean Water Act (CWA) and EPA's implementing regulations under § 404(b)(1). EPA has determined that the Spruce No. 1 Surface Mine fails to adequately evaluate less environmentally damaging alternatives, will cause or contribute to significant degradation of waters of the United States (especially when considered in the context of the significant cumulative losses and impairment of streams across the Central Appalachian ecoregion), and lacks compensatory mitigation to adequately offset the impacts to Pigeonroost Branch and Oldhouse Branch. These failures to comply with the Guidelines serve to strengthen EPA's judgment about the unacceptability of the significant adverse impacts that will occur.

Based on these findings and pursuant to § 404(c) of the CWA, this Final Determination withdraws the specification of Pigeonroost Branch, Oldhouse Branch, and their tributaries, as described in DA Permit No. 199800436-3 (Section 10: Coal River), as a disposal site for the discharge of dredged or fill material for the purpose of construction of the Spruce No. 1 Surface Mine. This Final Determination also prohibits the specification of the defined area constituting Pigeonroost Branch, Oldhouse Branch and their tributaries for use as a disposal site associated with future surface coal mining that would be expected to result in a nature and scale of adverse chemical, physical, and biological effects similar to the Spruce No. 1 mine.

II. Introduction

The purpose of the Clean Water Act is to “restore and maintain the physical, chemical, and biological integrity of the Nation’s waters” (33 U.S.C. 1251(a)). The Act also defines "pollution" as "the man made or man induced alteration of the chemical, physical, biological, and radiological integrity of water" (33 U.S.C. § 1362(19)). The Supreme Court has recognized "[t]his broad conception of pollution--one which expressly evinces Congress' concern with the physical and biological integrity of water" (*PUD No. 1 of Jefferson County v. Washington Dep't of Ecology*, 511 U.S. 700, 719 (1994)). Over the years, various definitions have been given to the term "biological integrity." The working definition that has been in place since 1981 is: "the capability of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat of the region." (http://www.epa.gov/bioindicators/html/biointeg.html). This definition includes protection of macroinvertebrate communities, as well as fish populations. This goes beyond protecting the function performed by various members of the aquatic community and extends to protection of the quality of the aquatic community itself.

The CWA, 33 U.S.C. §§ 1251 et seq., prohibits the discharge of pollutants, including dredged or fill material, into waters of the United States (including wetlands) except in compliance with, among other provisions, § 404 of the CWA, 33 U.S.C. § 1344. Section 404 authorizes the Secretary of the Army (Secretary), acting through the Chief of Engineers, to authorize the discharge of dredged or fill material at specified disposal sites. This authorization is conducted, in part, through the application of environmental guidelines developed by EPA, in conjunction with the Secretary, under § 404(b) of the CWA, 33 U.S.C. § 1344(b) (§ 404(b)(1) Guidelines). Section 404(c) of the CWA, 33 U.S.C. § 1344(c), authorizes the EPA to prohibit the specification (including the withdrawal of specification) of any defined area as a disposal site. EPA is authorized to restrict or deny the use of any defined area for specification (including the withdrawal of specification) as a disposal site, whenever it determines, after notice and opportunity for public hearing, that the discharge of such materials into such area will have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas.

The procedures for implementation of § 404(c) are set forth in 40 CFR Part 231. Under those procedures, if the Regional Administrator has reason to believe that use of a site for the discharge of dredged or fill material may have an unacceptable adverse effect on one or more of the aforementioned resources, he may initiate the § 404(c) process by notifying the U.S. Army Corps of Engineers and the applicant (and/or project proponent) that he intends to issue a Proposed Determination. Each of those parties then has fifteen days to demonstrate to the satisfaction of the Regional Administrator that no unacceptable adverse effects will occur, or that corrective action to prevent an unacceptable adverse effect will be taken. If no such information is provided to the Regional Administrator, or if the Regional Administrator is not satisfied that no unacceptable adverse effect will occur, the Regional Administrator will publish a notice in the Federal Register of his Proposed Determination, soliciting public comment and offering an opportunity for a public hearing.

The procedures provide that the Regional Administrator will decide whether to withdraw the Proposed Determination or prepare a Recommended Determination following the public hearing and the close of the comment period. A decision to withdraw may be reviewed at the discretion of the Assistant Administrator for Water at EPA Headquarters. If the Regional Administrator prepares a Recommended Determination, the recommendation and the administrative record compiled in the Regional Office is forwarded to the Assistant Administrator for Water at EPA Headquarters. The Assistant Administrator for Water makes the Final Determination affirming, modifying, or rescinding the Recommended Determination.[3]

This document explains the basis for the EPA Final Determination to withdraw the specification of Pigeonroost Branch, Oldhouse Branch and their tributaries, all of which are waters of the United States within Logan County, West Virginia, as a disposal site for dredged or fill material in connection with construction of the Spruce No. 1 Surface Mine (hereafter "Spruce No. 1 Mine" or "the project") as authorized by DA Permit No. 199800436-3 (Section 10: Coal River) (hereafter "DA permit").[4] While the permit also authorizes construction of valley fills and other discharges to the Right Fork of Seng Camp Creek and its tributaries, EPA is not withdrawing specification of those waters, in part because some of those discharges have already occurred and because the stream resources in Right Fork of Seng Camp Creek were subject to a higher level of historic and ongoing human disturbance than those found in Pigeonroost Branch or Oldhouse Branch.

EPA is taking this action under § 404(c) of the Clean Water Act because the discharges to Pigeonroost Branch and Oldhouse Branch and their tributaries for the purpose of constructing Spruce No. 1 Mine as authorized by the permit will have unacceptable adverse effects on wildlife. Pigeonroost Branch and Oldhouse Branch and their tributaries are some of the last remaining streams within the Headwaters Spruce Fork sub-watershed and the larger Coal River sub-basin that represent "least-disturbed" conditions.[5] As such, they perform important hydrologic and biological functions, support diverse and productive biological communities, contribute to prevention of further degradation of downstream waters, and play an important role within the context of the overall Headwaters Spruce Fork sub-watershed and Coal River sub-basin. Within the streams and riparian areas of the project area, over 84 taxa of macroinvertebrates are

[3] In 1984, the EPA Administrator delegated the authority to make final decisions under § 404(c) to EPA's national Clean Water Act § 404 program manager, who is the Assistant Administrator for Water. That delegation remains in effect.
[4] As stated in the Section VII, this Final Determination also prohibits the specification of the defined area constituting Pigeonroost Branch, Oldhouse Branch and their tributaries for use as a disposal site associated with future surface coal mining that would be expected to result in a nature and scale of adverse chemical, physical, and biological effects similar to the Spruce No. 1 Mine.
[5] Least-disturbed conditions reflect a type of reference condition, where these sites have less human disturbance than others and represent the best existing condition within a watershed (Stoddard et al. 2006).

documented to exist, as well as up to 46 species of reptiles and amphibians, 4 species of crayfish, 5 species of fish and at least one water-dependent bird species.

The construction of Spruce No. 1 Mine as authorized will bury virtually all of Oldhouse Branch and its tributaries and much of Pigeonroost Branch and its tributaries under excess spoil generated by surface coal mining operations. These discharges will result in the burial of approximately 6.6 miles of high quality Appalachian headwater streams in a watershed that has already experienced substantial impairment. The loss of the 6.6 miles of high quality Appalachian headwater streams in this watershed will result in a significant loss (over 5.6% of the total stream miles in Headwaters Spruce Fork sub-watershed) of valuable wildlife habitat for many species in this watershed. These direct impacts will result in unacceptable adverse impacts to wildlife in this watershed, within the project boundaries.

Beyond the direct burial of wildlife species and loss of high quality habitat in this watershed, EPA has also determined that the project will result in unacceptable adverse impacts on downstream wildlife. If constructed as permitted, the Spruce No. 1 Mine will result in increased pollutant loadings in Spruce Fork and the Little Coal River. Increased salinity levels will lead to loss of macroinvertebrate communities and population shifts to more pollution-tolerant taxa, specifically the extirpation of ecologically important macroinvertebrates. In addition to these unacceptable adverse impacts, loss of macroinvertebrate prey populations, combined with increased potential for harmful golden algal blooms and additional exposure to selenium will have an unacceptable adverse effect on the 26 fish species found in Spruce Fork as well as amphibians, reptiles, crayfish, and bird species that depend on aquatic organisms and downstream waters for food or habitat.

In addition, EPA has given consideration to the project's compliance with the § 404(b)(1) Guidelines. As stated in the Preamble to the § 404(c) regulations, "one of the basic functions of 404(c) is to police the application of the 404(b)(1) Guidelines" (44 FR 58076, 58078 (Oct. 9, 1979)). Accordingly, EPA has determined that the Spruce No. 1 Mine, as permitted,

- fails to adequately evaluate less environmentally damaging alternatives (for a non-water dependent project such as this one, a failure to adequately evaluate alternatives means that the applicant has failed to rebut the presumption that there are less environmentally damaging practicable alternatives available);
- will cause or contribute to significant degradation of waters of the United States (especially when considered in the context of the significant cumulative losses and impairment of streams across the Central Appalachian ecoregion); and
- lacks compensatory mitigation to offset the impacts to Pigeonroost Branch and Oldhouse Branch to below the level of significance.

These inconsistencies with the Guidelines provide additional support for EPA's conclusion that the adverse impacts are unacceptable.

This document is divided into seven sections. The next section, Section III., describes the Spruce No. 1 Mine as authorized and summarizes the history of the project. Section IV.

describes the environmental characteristics of the project area, specifically Pigeonroost Branch and Oldhouse Branch, and the overall Coal River sub-basin. Section V. examines the anticipated impacts from the Spruce No. 1 Mine, as authorized. Consistent with § 404(c), this discussion focuses on unacceptable adverse impacts to wildlife. Section VI. discusses other considerations, including impacts from activities associated with the Spruce No. 1 Mine that do not include direct discharges of dredged or fill material to jurisdictional waters but which may depend upon authorization of such discharges, and that are likely to cause direct, indirect, and cumulative effects to the environment and to local communities. Section VII. contains EPA's Final Determination.

III. Background

III.A. Project Description

According to the Environmental Impact Statement (EIS) prepared by the Corps in 2006 (Spruce No. 1 EIS) for the project, the Spruce No. 1 Mine is a mountaintop mining project targeting bituminous coal seams overlying and including the Middle Coalburg coal seam in the western portion of the project area. In the eastern portion of the project area, mountaintop mining would be limited to those seams including and overlying the Upper Stockton seam, with contour mining in conjunction with auger and/or highwall/thin-seam mining utilized to recover the Middle Coalburg seam.

The project is located in the East District of Logan County, West Virginia at Latitude 38°52'39" and Longitude 81°47'52" depicted on the United States Geological Survey 7.5-minute Clothier and Amherstdale Quadrangles (Figure 1). The mine site is located approximately two miles northeast of the town of Blair in Logan County, West Virginia.

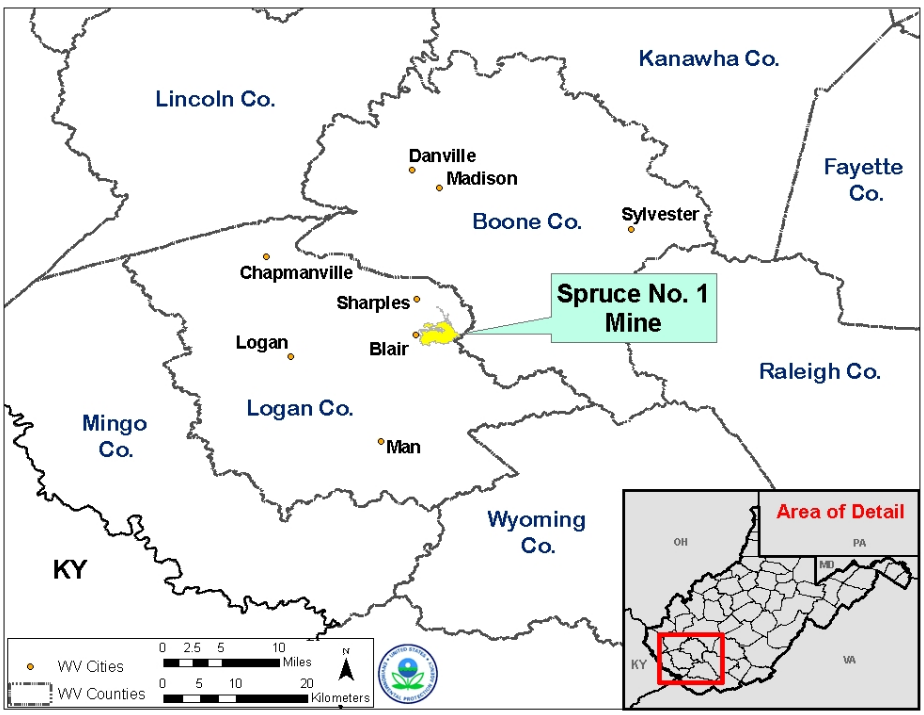

Figure 1. Spruce No. 1 Mine location

The Spruce No. 1 Mine as authorized by DA Permit No. 199800436-3 (Section 10: Coal River), is one of the largest mountaintop mining projects ever authorized in West Virginia. As authorized, it will disturb approximately 2,278 acres (about 3.5 square miles) and bury approximately 7.48 miles of streams. By way of comparison, the project area would take up a sizeable portion of the downtown area of Pittsburgh, PA (Figure 2).

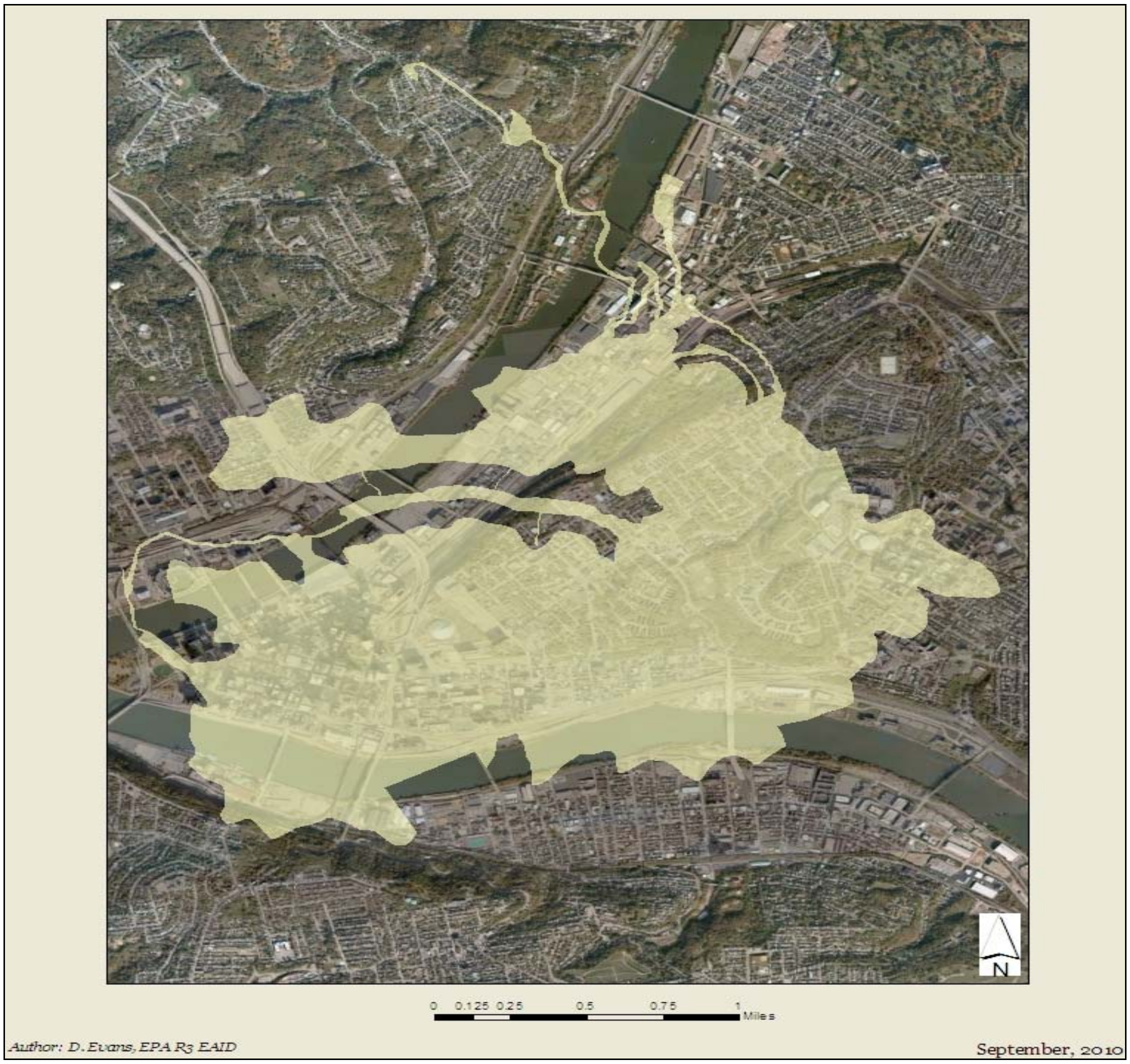

Figure 2. Spruce No. 1 Mine compared to downtown Pittsburgh, PA

Mountaintop mining involves removing the top of a mountain to recover coal seams contained within the mountain. Explosives are used to break apart the mountain's bedrock and earth-moving equipment is used to remove the excess rock, topsoil and debris, called “spoil”, which formerly had composed the portions of the mountain above and immediately below the coal seam. The fractured material is larger in volume than when it was consolidated bedrock within the mountain. The amount of spoil that may be placed back on the mined area is limited by this “swell” in volume, as well as by stability concerns. As a result, mountaintop mining generates large quantities of "excess spoil" that cannot be placed back in the mined area. The “spoil” is then typically deposited in adjacent valleys, thereby burying streams that flow through those valleys.

The Spruce No. 1 Mine EIS describes the project impacts as a disturbance of a total of 2,278 acres to recover seventy-five percent (75%) of the coal reserve targeted for extraction within the project area during fifteen (15) phases. The mining process would remove 400 to 450 vertical feet from the height of the mountain, or approximately 501 million cubic yards of overburden material. Nearly 391 million cubic yards of spoil would be placed within the mined area (i.e., back onto the mountains) and the remaining 110 million cubic yards of excess spoil would be placed in six valley fills, burying all or portions of the Right Fork of Seng Camp Creek, Pigeonroost Branch, and Oldhouse Branch and their tributaries (hereafter, references to Seng Camp Creek, Pigeonroost Branch, and Oldhouse Branch also include all tributaries to those waters that will be impacted by the project as authorized). Specifically, the permit authorizes construction of Valley Fills 1A and 1B in Seng Camp Creek; Valley Fills 2A, 2B, and 3 in Pigeonroost Branch; and Valley Fill 4 in Oldhouse Branch, and numerous sediment ponds, mined-through areas and other fills in waters of the U.S. (Figure 3). A detailed discussion of Spruce No. 1 Mine can be found in the Spruce No. 1 EIS on pages 2-35 through 2-61.

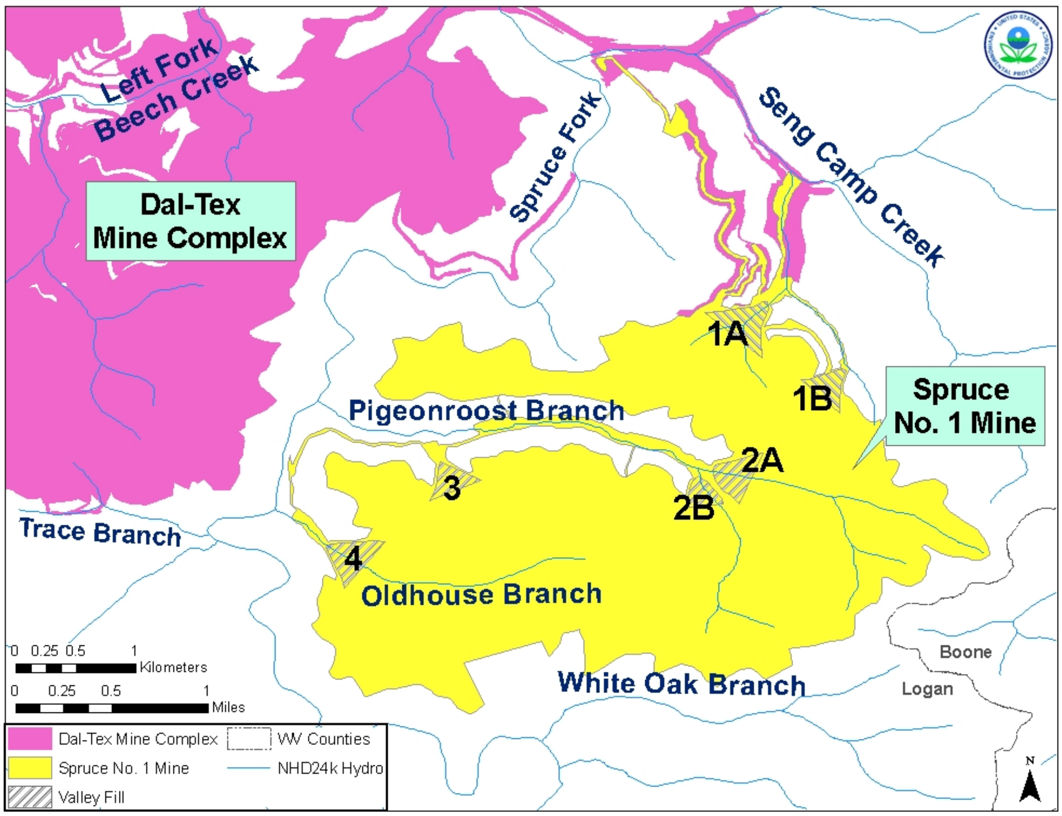

Figure 3. Spruce No. 1 Mine and associated valley fills

The Spruce No.1 Mine Surface Mining Control and Reclamation Act (SMCRA) Permit S-5013-97, Incidental Boundary Revision (IBR4, Modification 11) describes impacts from the project as including placement of dredged and fill material into approximately:

- 0.12 acre of emergent wetlands
- 10,630 linear feet (2.01 miles) of ephemeral stream channels
- 28,698 linear feet (5.44 miles) of intermittent stream channels
- 165 linear feet (0.03 miles) of perennial stream channel

While EPA is providing the foregoing summary from the SMCRA Permit S-5013-97 IBR for descriptive purposes, EPA believes that the description provided in the Spruce No. 1 Mine SMCRA Permit and in the Spruce No. 1 EIS incorrectly characterizes over 5 miles of stream resources that will be impacted, as set forth in more detail in Section V.E.3.b. and in Appendix 3.

III.B. Project History

The Spruce No. 1 Mine has a lengthy and complex regulatory history. The project was originally proposed by Hobet Mining Inc., a subsidiary of Arch Coal, Inc. The project as originally proposed in 1998 was larger than the authorized project and would have directly impacted a total surface area of 3,113 acres and 57,755 linear feet (more than ten miles) of streams. At that time, the Corps tendered and ultimately withdrew a nationwide permit for the project, and Hobet Mining, Inc. advised the Corps it would submit an individual permit application. An EIS was prepared for the Spruce No. 1 Mine by the Army Corps of Engineers Huntington District pursuant to the National Environmental Policy Act, 42 U.S.C. 4332(C). The original project application was also a primary impetus for the Interagency Mountaintop Mining/Valley Fills in Appalachia Programmatic Environmental Impact Statement (PEIS), which was finalized in October 2005. The PEIS is available at www.epa.gov/Region3/mtntop/eis2005.htm.

An initial 2002 Spruce No. 1 Mine Draft EIS considered a proposed project that was similar in scope and size to the original project described above. EPA's review of the 2002 Draft Environmental Impact Statement found gaps in the analyses of the mine and related adverse environmental impacts. EPA was particularly concerned by the lack of information regarding the nature and extent of impacts to the high quality streams that would be buried under valley fills, and recommended additional evaluation to support the analysis of less environmentally damaging alternatives. In a letter dated August 12, 2002, EPA Region III indicated the EIS contained inadequate information for public review and for decision-makers.

Following the transfer of the Spruce No. 1 Mine holdings and responsibilities by Arch Coal, Inc. to its Mingo Logan Coal Company (hereafter Mingo Logan or "permittee") in late 2005, a revised Spruce No. 1 Mine Draft EIS was prepared in 2006. At that time, the project was reconfigured to reduce impacts. The mine plan was revised to eliminate construction of a valley fill in White Oak Branch, a State-designated reference stream (see Section IV.A.) and the project area was reduced from 3,113 to 2,278 acres with direct stream impacts reduced to 7.48 miles.

In EPA's June 16, 2006, comment letter on the 2006 Draft EIS, EPA recognized that impacts from the mine had been reduced and the quality of EIS information had improved. However, the letter also noted that EPA had remaining environmental concerns associated with the Spruce No. 1 Mine. These concerns included potential adverse impacts to water quality (specifically, the potential to discharge selenium and the known association of similar mining operations with degradation of downstream aquatic communities); uncertainties regarding the proposed mitigation; the need for additional analysis of potential environmental justice issues; and the lack of a study related to the cumulative effects of multiple mining operations within the Little Coal River watershed. EPA continued to stress its belief that corrective measures should be required to reduce environmental impacts and that other identified information, data, and analyses should be included in the final EIS.

Concerns regarding the Spruce No. 1 Mine were also raised by the USFWS, Ecological Services West Virginia Field Office in a letter dated May 30, 2006 from the Department of Interior, Philadelphia to the Huntington District Army Corps of Engineers. In that letter, the USFWS expressed concerns over the permittee's compensatory mitigation plan. The USFWS stated there was inadequate compensatory mitigation for the project because the assessment methodology used by the permittee to evaluate stream impacts considered only the physical characteristics of the impacted streams, without considering the equally important biological or chemical characteristics. The USFWS expressed concern the project would impact healthy, biologically functional streams and the mitigation included erosion control structures that were designed to convey water but would not replace the streams' lost ecological services.

The Corps issued the Spruce No. 1 Mine Final EIS on September 22, 2006. On October 23, 2006, EPA commented on the Final EIS, noting that many of EPA's comments had not been adequately addressed. On January 22, 2007, the Corps issued Clean Water Act § 404 Permit, DA Permit No. 199800436-3 (Section 10: Coal River), to Mingo Logan for the Spruce No. 1 Mine. That permit specified the Right Fork of Seng Camp Creek, Pigeonroost Branch and its tributaries, and Oldhouse Branch and its tributaries as disposal sites for the discharge of dredged or fill material from the Spruce No. 1 Mine. In addition to its DA Permit No. 199800436-3 (Section 10: Coal River), the project has received the following authorizations from the West Virginia Department of Environmental Protection (WVDEP): authorization pursuant to the State's surface mining program approved under SMCRA, 30 U.S.C. 1201-1328 (SMCRA permit); a National Pollutant Discharge Elimination System (NPDES) permit for discharges of pollutants pursuant to § 402 of the Clean Water Act (33 U.S.C. 1342); and a Clean Water Act § 401 water quality certification (33 U.S.C. 1341).

On January 30, 2007, a number of environmental groups, represented by Ohio Valley Environmental Coalition, filed a complaint against the Corps in federal district court challenging its decision to issue the permit. In early 2007, Mingo Logan commenced limited operations at Spruce No. 1 Mine pursuant to DA Permit No. 199800436-3 (Section 10: Coal River), subject to an agreement with the environmental groups who are plaintiffs in the litigation. Pursuant to that agreement, Mingo Logan has been operating in a portion of the project site in the Seng Camp Creek drainage area, and has been constructing one valley fill in that area (valley fill 1A). Under the agreement, Mingo Logan must give plaintiffs 20 days' notice before expanding operations beyond the area subject to the agreement, and has done so once without objection from the plaintiffs. Mingo Logan's operations in the Seng Camp Creek watershed have generated data related to impacts from the project as constructed, including discharge monitoring reports submitted to WVDEP. The litigation filed by the environmental groups was stayed for a period of time pending the U.S. Court of Appeals for the Fourth Circuit's decision in *Ohio Valley Environmental Coalition v. Aracoma Coal Co.*, 556 F. 3d 177 (4th Cir. 2009).

During this period, the scientific literature reflected a growing consensus of the importance of headwater streams; a growing concern about the adverse ecological effects of mountaintop removal mining; and concern that impacted streams cannot easily be recreated or replaced. This Final Determination cites to nearly 100 articles and studies developed since the time the Spruce No. 1 Mine DA permit was issued. Many studies now point to the role headwater streams play in the transport of water, sediments, organic matter, nutrients, and organisms to downstream environments; their use by organisms for spawning or refugia; and their contribution to regional biodiversity (Meyer et al. 2007). Additionally, destruction or modification of headwater streams has been shown to affect the integrity of downstream waters, in part through changes in hydrology, chemistry and stream biota (Freeman et al. 2007, Wipfli et al. 2007).

The literature specifically documenting the effects of mountaintop removal mining has also grown, and additional studies have increased EPA's understanding of the effects of elevated levels of total dissolved solids (TDS) discharged through mining operations on downstream aquatic ecosystems (Pond et al. 2008, Simmons et al. 2008, Palmer et al. 2010, Fritz et al. 2010). EPA's understanding of adverse effects from selenium associated with surface coal mining likewise has expanded since issuance of the permit. In February 2009, WVDEP issued out a report entitled: 'Selenium bioaccumulation among select stream and lake fishes in West Virginia.' The WVDEP report confirmed that significant environmental harm due to selenium was a problem in West Virginia. A January 2010 WVDEP report to the West Virginia legislature outlined the issues with selenium in West Virginia watersheds. Other studies that have contributed to a greater understanding of the adverse effects of selenium include additional investigations and discussions have continued increased selenium concerns including: (Chapman et al. 2009, Diehl et al. 2005, Ferreri et al. 2004, Lemly 2009, Palmer et al. 2010, Neuzil et al. 2005, Vesper et al. 2008).

In addition to the growing body of literature documenting the importance of headwater streams and the effects of mountaintop removal mining, additional information on the efficacy of mitigation has also been published. For example, recent research has shown that stream restoration projects based upon channel design can be problematic (Slate et al. 2007, Simon et al. 2007) and are not effective in restoring ecological function and biodiversity (Tullos et al. 2009, Palmer et al. 2009, Fritz et al. 2010). In a study on streams impacted by mountaintop mining and valley fills, Fritz et al. (2010) found that habitat features and aquatic assemblages were very different in constructed channels than natural channels, and suggested that constructed channels should not be used for mitigation on-site. In the 2008 Mitigation Rule, EPA and the Corps acknowledged that headwater streams are a difficult to replace resource and stream creation is among the more difficult and least successful forms of mitigation.

In light of this growing body of scientific data documenting the environmental impacts associated with surface coal mining, EPA and other federal agencies discussed opportunities to reduce those impacts under existing statutory and regulatory authorities. On June 11, 2009, EPA, the Department of the Army, and the Department of the Interior entered into a *Memorandum of Understanding Implementing the Interagency Action Plan on Appalachian Surface Coal Mining,* in which the agencies agreed to take steps to reduce the harmful environmental consequences of Appalachian surface coal mining.

On September 3, 2009, EPA Region III requested that the Corps suspend, modify or revoke DA Permit No. 199800436-3 (Section 10: Coal River) for discharges associated with the Spruce No. 1 Mine. On September 30, 2009, the Corps stated that it would not reconsider the permit authorization. As a result, EPA Region III initiated the Clean Water Act § 404(c) process on October 16, 2009. EPA Region III communicated with representatives of Mingo Logan and the Corps in person, by telephone, and by electronic mail on several occasions to determine whether corrective action would be taken to address EPA Region III's concerns. Earlier in 2009, litigation by the environmental groups had reactivated following the decision in *Ohio Valley Environmental Coalition v. Aracoma Coal Co.*, 556 F. 3d 177 (4th Cir. 2009). The litigation was then stayed until November 3, 2009, a deadline that would be further extended by the Court as EPA's CWA § 404(c) process proceeded.

On April 2, 2010, EPA Region III published in the Federal Register a Proposed Determination to withdraw specification of Pigeonroost Branch and Oldhouse Branch pursuant to CWA § 404(c). EPA Region III solicited public comments on the Proposed Determination and held a public hearing in Charleston, West Virginia on May 18, 2010 that was attended by 520 people, during which 121 oral comments were communicated to EPA. EPA Region III received over 50,000 comments on the Proposed Determination. Of these, approximately 70% of comment letters submitted on the Proposed Determination generally supported EPA's Proposed Determination while 65% of public hearing participants generally opposed EPA's Proposed Determination.

USFWS, in its comments on EPA Region III's Proposed and Recommended Determinations, supported the withdrawal of specification for discharges of dredged or fill material to Pigeonroost Branch and Oldhouse Branch. Its June 2, 2009 comment letter on the Proposed Determination expressed concerns about potential impacts of the project on fish and wildlife resources, including macroinvertebrate genera. In addition, the letter stated

> "[T]he preponderance of available scientific information strongly suggests that construction of the project as authorized would cause or contribute to significant degradation of waters of the United States, both on-site and in receiving waters downstream of the proposed mine."
>
> "Some adverse impacts of the proposed project include:

- the likely loss of macroinvertebrate genera (diversity and abundance) and the cascading biological consequences of that loss on other aquatic and terrestrial wildlife;
- the direct loss of a significant number of salamanders, indirect effects to perhaps as many more, and the effects of these losses on other aquatic and terrestrial wildlife;
- degraded fish communities, including reduced diversity and abundance;
- direct loss of habitat, and direct and indirect loss of food resources for forest interior and riparian-obligate species of migratory birds, including six species the Service considers Birds of Conservation Concern (cerulean, Kentucky, Swainson's, and worm-eating warblers; Louisiana Waterthrush; wood thrush); and
- direct loss of habitat, and direct and indirect loss of food resources, for a variety of bat species, many of which are already threatened by the spread of white-nose syndrome in West Virginia and which may require additional protection in the near future."

EPA's regulations require that the Regional Administrator either withdraw the Proposed Determination or prepare a Recommended Determination within 30 days after the conclusion of the public hearing, in this case by June 16, 2010 (40 CFR 231.5(a)). However, in order to allow full consideration of the extensive record, including the over 50,000 public comments received, EPA Region III extended the time period provided in 40 CFR 231.5(a) for the preparation of the Recommended Determination until no later than September 24, 2010 (75 FR 39691). This time extension was made under authority of 40 CFR 231.8, which allows for such extensions upon a showing of good cause. EPA Region III reviewed the information provided during the public comment period, and completed its review within the extended time period.

The Recommended Determination was signed by the Regional Administrator and submitted to EPA Headquarters along with the complete administrative record on September 24, 2010, concluding EPA Region III's § 404(c) review of the Spruce No. 1 Mine. This action initiated the period for review and final action by EPA's Assistant Administrator for Water.

III.C. EPA Headquarters' Actions

Recognizing the role for EPA Headquarters in taking any final action to withdraw or restrict specification from the project, EPA Headquarters has been engaged in the § 404(c) review since it was initiated on October 16, 2009. Staff from EPA Headquarters attended the public hearing in Charleston, West Virginia, and heard first-hand the testimony provided by those who live and work in the region.

Following receipt of the Recommended Determination, § 404(c) regulations require EPA Headquarters to provide an opportunity for the project's proponents to propose corrective actions intended to prevent the unacceptable adverse environmental impacts presented in the Recommended Determination. EPA Headquarters provided the Region III

Recommended Determination to Arch Coal Inc., the United States Department of the Army, the Corps, WVDEP and four land and mineral rights owners and notified these stakeholders that they would have 15 days to present any corrective actions to EPA Headquarters, consistent with EPA's § 404(c) regulations.

EPA received a response from Hunton & Williams, LLP, on behalf of Arch Coal (i.e., Mingo Logan), Inc. requesting a 30-day extension of this period, to November 29, 2010, in order to review the Recommended Determination. Provided in 40 CFR 231.8, EPA may, upon showing of good cause, extend the time requirements in the § 404(c) regulations. EPA believed it was appropriate to grant the permittee's request for a 30-day extension to the consultation process, and an announcement was published in the Federal Register on November 10, 2010, announcing the deadline for proposing corrective actions was extended to November 29, 2010.

EPA's § 404(c) regulations provide that the Assistant Administrator for Water shall issue a Final Determination within 60 days of receiving the Regional Administrator's Recommended Determination. This 60-day period was scheduled to expire on November 23, 2010. As the consultation period with the permittee was extended to November 29, 2010, EPA believed it was necessary to extend the deadline for issuing a Final Determination until February 22, 2011. This extension was published in the same Federal Register announcement as the extension of the consultation period, and was intended to enable EPA to more carefully consider the Region's Recommended Determination, as well as the public comments received, and information on possible corrective actions presented during the consultation process. In addition, this date was consistent with an order issued by the U.S. District Court for the Southern District of West Virginia on November 2, 2010, granting a continued stay in litigation over the Spruce No. 1 permit until February 22, 2011.

EPA also received a response from one of the land and mineral rights owners, the United Company. In his November 9, 2010 letter to EPA, James McGlothlin, President of the United Company, expressed his opposition to the EPA Region III Recommended Determination and his belief that such an action would represent a "regulatory taking." Mr. McGlothlin's letter included a copy of a May 10, 2010, letter he had submitted to EPA Region III and a request that he be included in any consultation meeting organized by EPA Headquarters regarding EPA Region III's Recommended Determination on the Spruce No. 1 Mine.

On November 16, 2010, a consultation meeting was held at EPA Headquarters in Washington, DC to discuss the Region III Recommended Determination and potential corrective actions that could be undertaken to avoid the unacceptable adverse impacts that were of concern to EPA. Participants at the meeting included the EPA Assistant Administrator for Water, the EPA Region III Regional Administrator and Regional management, Office of Water staff, managers, and legal counsel, representatives from Arch Coal, Inc. and their legal counsel, United Company and their legal counsel, WVDEP, and the Corps' Huntington District.

At the beginning of the meeting, EPA Region III gave an overview of the Recommended Determination, stating that discharges of fill material into Pigeonroost Branch and Oldhouse Branch associated with the Spruce No.1 Mine would likely result in unacceptable adverse effects on wildlife. The EPA Assistant Administrator for Water then stated that a major purpose of the consultation process is to explore corrective actions that might avoid the need for a final § 404(c) action. He noted that while the Agency's regulations make clear that the consultation process is an opportunity for the project's proponents to propose corrective actions, EPA was willing and prepared to discuss potential actions that may effectively reduce anticipated environmental and water quality impacts.

In response, the permittee stated that revisions to the mine plan that Arch Coal, Inc. had previously proposed would be effective in reducing these potential water quality and environmental impacts. These actions included improved best management practices, eliminating two small valley fills at Seng Camp Creek and Pigeonroost Branch, and increased monitoring. The permittee also indicated that other approaches previously discussed, such as "sequencing" or "phasing" of valley fills, remained unacceptable to Arch Coal, Inc., due primarily to economic considerations. In the meeting, the permittee did not propose new or additional corrective actions for EPA's consideration.

As part of the follow-up from the consultation meeting, on November 22, 2010, the Assistant Administrator for Water sent a letter to Arch Coal, Inc. indicating that EPA was prepared to continue discussions regarding corrective actions that effectively reduce anticipated environmental and water quality impacts. The letter noted that EPA's focus in evaluating these alternatives would be on whether they would effectively protect the streams at Pigeonroost Branch and Oldhouse Branch. Noting that the consultation period was set to expire on November 29, 2010, the letter requested a response as soon as possible. On November 29, 2010, EPA received notification via email from Hunton & Williams, LLP, on behalf of Arch Coal, Inc. While this response did not request any further opportunity for consultation, it did include extensive comments, a Technical Evaluation Document and supporting information in response to the Recommended Determination.

EPA reviewed the additional comments, evaluation, and supporting documents provided by Hunton & Williams and, where necessary, clarified the relevant information and analysis in the Final Determination. EPA's detailed responses to the issues raised by Hunton & Williams are contained in Appendix 6. After an EPA Region has submitted a Recommended Determination to the Assistant Administrator for Water, EPA's regulations governing the § 404(c) process allow the company to submit information on corrective actions they intend to take to address the unacceptable adverse effects, but those regulations do not explicitly provide an additional opportunity to submit comments on EPA's action. In addition, EPA's Final Determination is an informal adjudication and unlike the Administrative Procedure Act's (APA) requirements for notice and comment rulemaking to respond to all significant comments, the APA contains no such requirement for adjudications. Nonetheless, consistent with the Agency's transparency goals, EPA has voluntarily chosen to draft responses to many of comments received throughout this process, including those comments received on the Recommended Determination during the consultation process.

In his November 29, 2010 letter to EPA, Colonel Robert Peterson, District Engineer for the Corps' Huntington District, responded on behalf of LTG Robert Van Antwerp, Commanding General for the Corps. Colonel Peterson noted that after reviewing the Recommended Determination, the Corps continued to believe it has no basis to take any corrective actions regarding DA Permit No. 199800436-3 (Section 10: Coal River) and that this position is consistent with the Corps' response to EPA Region III's September 3, 2009 request that Huntington District suspend, modify or revoke this permit.

In a November 29, 2010 letter to EPA, Randy Huffman, the Secretary of WVDEP, provided comments on the Recommended Determination. The letter raised concerns regarding a number of issues in the Recommended Determination including its analysis of the project's potential effects on water chemistry, the project's likely impacts to wildlife and the conclusions drawn regarding the proposed compensatory mitigation. In response to these comments, a number of clarifications have been made to the information and analysis in the Final Determination and detailed responses to Secretary Huffman's comments have been included in Appendix 6.

Finally, on December 16, 2010, the USFWS sent a letter to EPA in support of the Recommended Determination. In the letter, USFWS states that the available scientific information supports the EPA Region III recommendation and that USFWS concurs with EPA Region III's conclusion that construction of the Spruce No. 1 Mine, as authorized, would result in unacceptable adverse effects on wildlife. The letter highlights the fact that the USFWS has consistently expressed concerns regarding the loss of headwater streams and adjacent riparian and terrestrial habitats associated with the Spruce No. 1 Mine, as well as its likely impacts on downstream water quality, aquatic organisms, and terrestrial and aquatic wildlife that depend on those resources.

IV. Site Characteristics and Ecological Functions

The resources that will be impacted by the Spruce No. 1 Mine include Central Appalachian headwater stream ecosystems in Pigeonroost Branch and Oldhouse Branch. These waters connect via surface flow directly to Spruce Fork, which in turn flows to the Little Coal River and eventually to the Coal River. Because of the connectivity between headwater systems and downstream waters, Spruce Fork, the Little Coal River and the Coal River would be adversely impacted by discharges to Pigeonroost Branch and Oldhouse Branch because such discharges would transform these streams into sources that contribute contaminants to these downstream waters. Accordingly, the characteristics and functions of the resources that will be adversely impacted by discharges of dredged or fill material associated with the Spruce No. 1 Mine are best viewed from the perspective of the ecological functions performed by Appalachian headwater stream ecosystems and within the context of the larger Headwaters Spruce Fork sub-watershed and Coal River sub-basin.

Information on the aquatic and terrestrial ecosystem and the predicted impacts of the project comes from several sources. The Final (October 2005) Interagency Mountaintop Mining/Valley Fills in Appalachia PEIS represents important inter-agency efforts designed to inform more environmentally sound decision-making for future permitting of mountaintop mining and associated valley fills. The PEIS had a geographic focus of 12 million acres encompassing most of eastern Kentucky, southern West Virginia, western Virginia, and scattered areas of eastern Tennessee; and included the Spruce No. 1 Mine project area and the Coal River sub-basin. EPA also incorporated information gathered by the WVDEP, including an assessment of the Coal River sub-basin conducted in 1997, data collected to support the 2006 Coal River sub-basin total maximum daily load (TMDL), and WVDEP and nationally available GIS data. EPA also reviewed the 2006 Spruce No.1 EIS, and other sources of site-specific data including studies conducted by EPA scientists and discharge monitoring reports generated by Mingo Logan. In addition, EPA consulted a wide range of peer reviewed studies and literature. EPA Region III also communicated with the US Fish and Wildlife Service Elkins Field Office on impacts to fish and wildlife resources in the project area.

Headwater streams play an important role in the ecosystem far beyond the mere transport of water from one point to another. In many ways, headwater streams are similar to capillaries, the smallest blood vessels within the human circulatory system. In the same way capillaries are critical to the movement of carbon dioxide, oxygen, water and other essential compounds between the blood and surrounding tissues, small headwater streams, which make up over two-thirds of the total stream length in a stream network (Leopold et al. 1964), are critically important to the movement of water, sediments, organic matter, and nutrients from within their watersheds to downstream environments (Ensign and Doyle 2006). And just as a loss of blood flow through capillaries can lead to organ failure, alteration of headwater streams has the potential to affect the ecological integrity of aquatic ecosystems at broad spatial scales (Freeman et al. 2007). Thus, headwater streams, as the early stages of the river continuum, provide the most basic and fundamental building blocks to the remainder of the aquatic environment.

Appalachian headwaters provide habitat for wildlife including a wide variety of macroinvertebrates, amphibians, reptiles, birds, fish and mammals. They also are a significant interface between the river system and the terrestrial environment. Appalachian headwater streams and their wildlife inhabitants, such as macroinvertebrates, convert organic matter (e.g., leaf litter) from the surrounding landscape and transform it into nutrients and energy that can be transported and consumed by downstream ecological communities. They also play an important role in storing, retaining and transporting nutrients, organic matter and sediment. In addition they perform hydrologic functions related to downstream flow regimes, moderating flow rate and temperature (USEPA 2003, Fischenich 2006).

As authorized, the Spruce No. 1 Mine will bury under valley fills or impact through construction of sediment ponds nearly all of Oldhouse Branch and its tributaries and a substantial portion of Pigeonroost Branch and its tributaries. Oldhouse Branch and Pigeonroost Branch support healthy ecosystems consistent with least-disturbed conditions in the Coal River sub-basin. As such, they are valuable in and of themselves and for the functions they perform within the context of the Headwaters Spruce Fork sub-watershed and the Coal River sub-basin.

IV.A. Watershed and Stream Conditions

The Spruce No. 1 Mine is located within the Headwaters Spruce Fork sub-watershed (12-digit hydrologic unit code (HUC)) and the Coal River sub-basin (8-digit HUC) (Figure 4). Pigeonroost Branch and Oldhouse Branch flow to Spruce Fork, which in turn flows into the Little Coal River and then into the Coal River. The Coal River sub-basin encompasses nearly 891 square miles within West Virginia. Major tributaries within the Coal River sub-basin include Marsh Fork, Clear Fork, Pond Fork, Spruce Fork, and Little Coal River. Marsh Fork and Clear Fork join at Whitesville, WV to form the Big Coal River. Pond Fork and Spruce Fork join at Madison, WV to form the Little Coal River. The Little Coal and Big Coal Rivers join to form the Coal River at Forks of the Coal, WV.

The Coal River sub-basin has been impacted by past and present surface mining. Based upon the National Land Cover Database (NLCD) Retrofit Land Cover Change Product for 1992-2001 and the WVDEP's Geographic Information System (GIS) mine permit data, more than 257 past and present surface mining permits have been issued in the Coal River sub-basin, and the corresponding mines collectively occupy more than 13% of the land area. Some sub-watersheds in the Coal River sub-basin have more than 55% of the land occupied by historic, ongoing or permitted surface mines.

Spruce Fork is a fourth order tributary that combines with Pond Fork to form the Little Coal River, which in turn flows into the Coal River. Spruce Fork is located in the southwestern portion of the Coal River sub-basin and drains approximately 126.4 square miles. The dominant land cover in the Headwaters Spruce Fork sub-watershed is forest. Other significant land cover types include urban/residential and barren/mining land.

According to the WVDEP Division of Mining and Reclamation permit maps, more than 34 surface mine permits have been issued within the Headwaters Spruce Fork sub-watershed, and the resulting mines do or will collectively occupy more than 33% of the land area. Assuming full construction of these projects along with projects associated with known future surface mining permits, more than 40% of the land area of the sub-watershed will be occupied by surface mining permits.

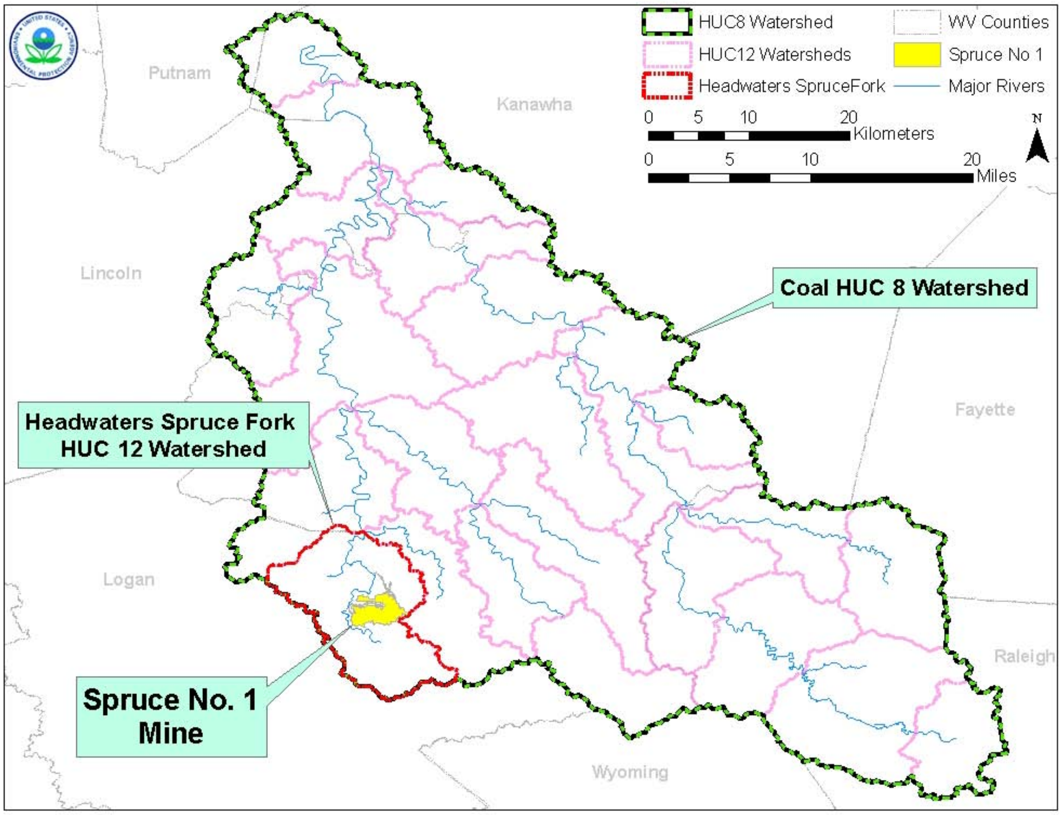

Figure 4. Headwaters Spruce Fork sub-watershed (12-digit hydrologic unit code (HUC)) and the Coal River sub-basin (8-digit HUC)

In 1997, the WVDEP performed its first comprehensive ecological assessment of the Coal River sub-basin.[6] The WVDEP assessed three major aspects of watershed health: water quality, habitat condition, and benthic macroinvertebrate community status. The subsequent report, *An Ecological Assessment of the Coal River Watershed* (1997), indicated that sediments, coal mining and inadequate sewage treatment were the major stressors on streams in this watershed. The WVDEP report also noted the importance and paucity of reference-quality streams in the watershed, stating

> [s]ince reference sites reflect least-disturbed conditions, it is vital that the WVDEP do its part in fulfilling the mission of preserving the high quality of these rare and important streams. It is also important that the agency make a concerted

[6] Report can be found at http://www.dep.wv.gov/WWE/watershed/wqmonitoring/Documents/EcologicalAssessments/EcoAssess_Coal_1997.pdf

> effort to find the apparently few remaining streams within the watershed that have not been significantly impacted by human disturbances.

Further the report indicated that because the sub-basin is becoming increasingly impaired due to stressors such as mining, there is a need to protect the remaining quality resources, highlighting the need to "[l]ocate and protect the few remaining high quality streams in the Coal River watershed…" (WVDEP 1997a).

Out of approximately 250 stations sampled by the WVDEP in the Coal River sub-basin since 1996, only 3 (~1%) are designated as reference sites. One of these three reference sites is White Oak Branch, which flows into Spruce Fork immediately upstream of Oldhouse Branch and Pigeonroost Branch. The WVDEP defines reference conditions as those conditions that "describe the characteristics of waterbody segments least impaired by human activities and are used to define attainable biological and habitat conditions. Final selection of reference sites depends on a determination of minimal disturbance, which is derived from physio-chemical and habitat data collected during the assessment of the stream sites." Reference sites are used to determine the score that represents the threshold between impaired and non-impaired sites. As discussed in detail below, Oldhouse Branch and Pigeonroost Branch are important within the context of the larger Coal River sub-basin and Headwaters Spruce Fork sub-watershed because, like White Oak Branch, they represent some of the few stream systems supporting least-disturbed conditions within those watersheds.

The stream systems that are the subject of this Final Determination, Pigeonroost Branch and Oldhouse Branch, are high quality stream systems supporting diverse aquatic communities, as measured by their benthic macroinvertebrate populations (see Section IV.B.1. and Appendix 2). Macroinvertebrates are used by West Virginia and other states in the Mid-Atlantic region and across the U.S. to assess the quality of their waters and are good indicators of stream health. While Pigeonroost Branch and Oldhouse Branch are not WVDEP-designated reference sites, their quality is comparable to White Oak Branch, a WVDEP-designated reference site, and their macroinvertebrate communities rank highly in comparison to other central Appalachian streams and streams throughout the state of West Virginia (see Section IV.B.1). Accordingly, Oldhouse Branch and Pigeonroost Branch reflect least-disturbed conditions and represent some of the few remaining streams within the Coal River sub-basin that have not been significantly adversely impacted by human disturbances.

Water chemistry data for Pigeonroost Branch and Oldhouse Branch also reflect healthy streams with little human disturbance. Data from the WVDEP indicate that average conductivity values for the unmined streams on the Spruce No. 1 Mine project area are very low.[7] Based on the WVDEP dataset (2002-2003), Oldhouse Branch had an average

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[7] Specific conductance, or conductivity, is a measure of the ability of water to conduct an electrical current. It is highly dependent on the amount of dissolved solids (such as salt) in the water, and typically measured as microsiemens per centimeter (µS/cm). Pure water, such as distilled water, will have a very low specific conductance, and seawater will have a high specific conductance. Conductivity is an important water quality measurement because it gives a good idea of the amount of dissolved material in the water.

conductivity level of 90 µS/cm, which is below that of White Oak Branch, a WVDEP-designated reference site, which had an average conductivity level of 118 µS/cm. Conductivity levels described above in Oldhouse Branch and White Oak Branch indicate excellent water quality, comparable to reference-quality streams for this ecoregion. Sulfate concentrations in these streams are also low (28 mg/l in Oldhouse Branch and 24 mg/l in White Oak Branch). Pigeonroost Branch had a conductivity level of 199 µS/cm and sulfate level of 99 mg/l. The slightly elevated average conductivity and sulfate values reflect the relatively small amount of historical mining land use in the Pigeonroost watershed.

During the December 2008 to March 2010 time frame, monitoring reports submitted by the permittee indicate 15 of the 16 selenium measurements at both Pigeonroost Branch and Oldhouse Branch were below the detection limit of 0.6 µg/L. The single detection of selenium on Oldhouse Branch was 0.9 µg/L during July 2009. The single detection of selenium on Pigeonroost Branch was 1.9 µg/L during August 2009. By way of comparison, these readings are far below 5 µg/L, which is the concentration associated with West Virginia's chronic water quality criterion for selenium.[8] These levels are also significantly lower than levels documented immediately downstream of adjacent mining operations (see Section V.D.1.a.).

The relatively high quality of Oldhouse Branch and Pigeonroost Branch also can be demonstrated by comparison to other streams in the Headwaters Spruce Fork sub-watershed that have been impacted by mining operations similar to the Spruce No. 1 Mine, located directly northwest of the Spruce No. 1 Mine, on the west side of Spruce Fork. These streams, in part, are impacted by the Mingo Logan Dal-Tex Mining Operation (Dal-Tex). Section V.D.2.a. compares the health of the relatively unimpacted macroinvertebrate communities in Pigeonroost Branch and Oldhouse Branch with the macroinvertebrate communities in these streams that have been impacted by mining activity. This comparison demonstrates that Oldhouse Branch and Pigeonroost Branch support a much healthier and more diverse assemblage of benthic macroinvertebrates than do the four comparison streams that are impacted by the Dal-Tex operation.

IV.B. Wildlife

The Spruce No. 1 Mine is located in the Central Appalachian ecoregion, which encompasses most of the central Appalachian coalfields (Bryce et al. 1999) (Figure 5). This ecoregion has some of the greatest aquatic animal diversity of any area in North America, especially for species of amphibians, fishes, mollusks, aquatic insects, and crayfishes. Individual watersheds and peaks in the Appalachian chain, isolated for millions of years with benign environmental conditions, provided a perfect setting for the evolution of many unique species of plants and animals. The Nature Conservancy has identified this region as one of North America's prominent biodiversity hotspots of rarity and richness (Figure 6) (Stein et al. 2000). Salamanders, in particular, reach some of the highest levels of North American diversity in the Central Appalachian ecoregion, and are

[8] The West Virginia numeric chronic water quality criterion for selenium defined as a four-day average concentration not to be exceeded more than once every three years

often abundant enough to account for the greatest vertebrate biomass in a given patch of forest (Stein et al. 2000). It has also been documented that other specialized wildlife such as some neotropical migrant birds and forest amphibians rely on the natural headwater stream conditions and adjacent forest types exhibited by Pigeonroost Branch and Oldhouse Branch for maintenance of their populations (Stein et al., 2000).

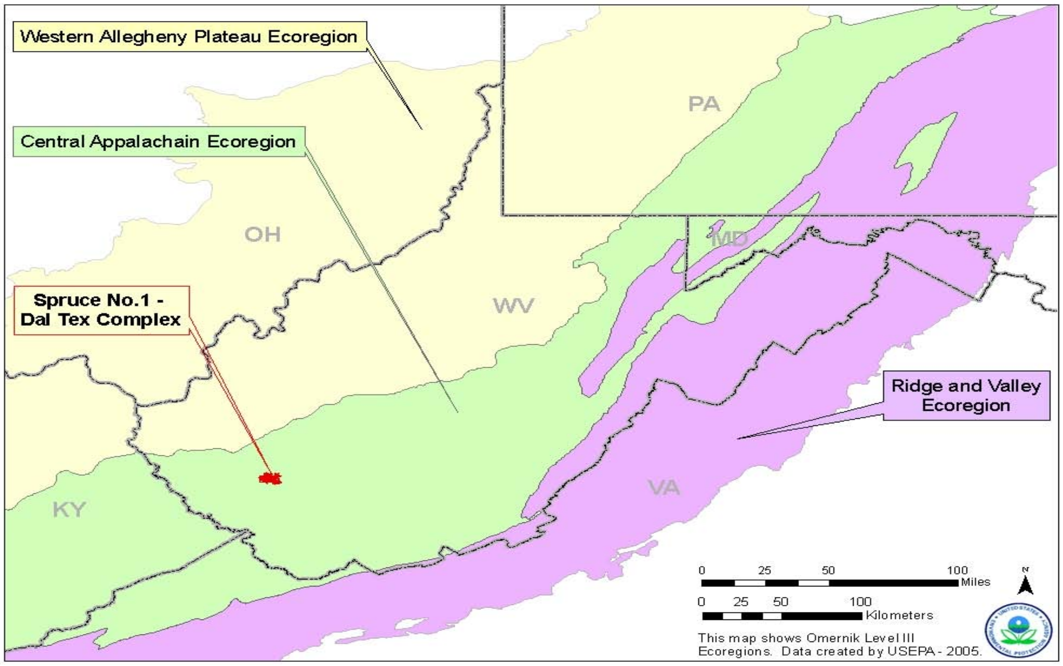

Figure 5. Map of Central Appalachian ecoregion showing Spruce No. 1 Mine location

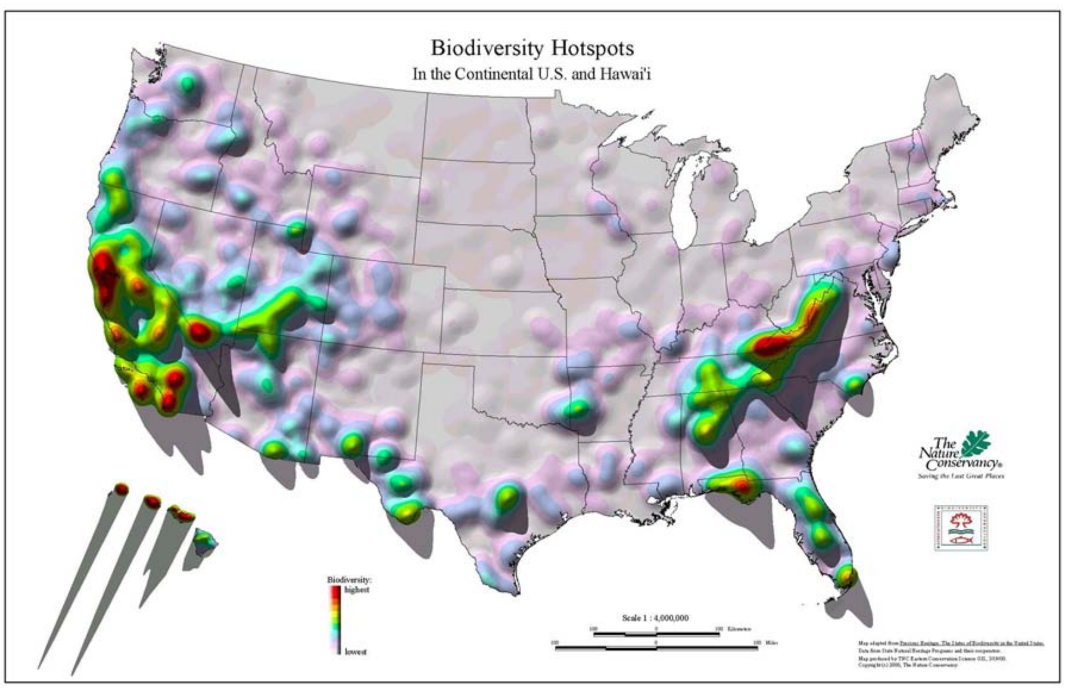

Figure 6. Biodiversity Hotspots in the Continental United States and Hawaii
Map adapted from Precious Heritage: The Status of Biodiversity in the United States.

IV.B.1. Macroinvertebrates

In a body of water, benthic macroinvertebrates are the bottom-dwelling (benthic) organisms that are large enough to be seen without the aid of microscopes (macro), and do not have backbones (invertebrate). As stated in EPA's Wadeable Stream Assessment (EPA 841-B-06-002 December 2006), macroinvertebrates are good indicators of biological integrity "because of their inherent capacity to integrate the effects of the stressors to which they are exposed, in combination and over time. Stream macroinvertebrates generally cannot move very quickly or very far; therefore, they are affected by, and may recover from, a number of changes in physical conditions (e.g., habitat loss), chemical conditions (e.g., excess nutrients), and biological conditions (e.g., the presence of invasive or non-native species). Some types of macroinvertebrates are affected by these conditions more than others." In addition to their role as indicators of biological integrity or ecosystem health, stream macroinvertebrates, which include aquatic insects, mollusks and crayfishes, play a vital role in food webs and in the processing and transfer of energy and nutrients in river systems. Because of these functions, macroinvertebrates are essential wildlife within the food web, supporting the health of the entire aquatic ecosystem (Figure 7).

Freshwater macroinvertebrates are a critical component of aquatic and riparian food webs, and the loss of these taxa can lead to cascading effects on other trophic levels, with implications for downstream stream ecosystems and sport fisheries. Aquatic macroinvertebrates feed on algae and leaf litter, and this consumption not only cleans excess living and nonliving organic material from stream systems, but the processing of this organic matter makes essential nutrients available to organisms downstream. Additionally, conversion of plant material into nutrient-rich biomass, in the form of fats and proteins, makes these invertebrates a major food source for the fish and amphibian populations within the stream ecosystem. In addition to their role in the aquatic food web, emerging adult aquatic insects are important prey for foraging terrestrial vertebrates, including birds, bats, reptiles, amphibians, and small mammals (Baxter et al. 2005). Many of these terrestrial vertebrates, including ducks and water shrews, have also been known to consume aquatic insect larvae from the stream before emergence as adults (Baxter et al. 2005). Macroinvertebrates, therefore, are necessary components of a functioning aquatic and riparian food web; and they fulfill a critical ecological niche by delivering nutrients along the stream continuum to both aquatic and terrestrial members of the food chain.

EPA recognizes macroinvertebrates as wildlife, along with many other organizations, including the USFWS, USDA Forest Service, The Nature Conservancy, State Natural Heritage programs, and the West Virginia Division of Natural Resources (WVDNR). Currently, within the U.S., the USFWS lists 50 species of insects as endangered under the Endangered Species Act (ESA), and another 10 species as threatened under the ESA. The State of West Virginia also includes insects, mollusks and crayfishes on its list of rare, threatened and endangered species, including 12 species of stoneflies, two species of mayflies, and 73 species of dragonflies and damselflies (West Virginia Natural Heritage

Program 2007). Several States, including West Virginia and Virginia, require a permit to collect macroinvertebrates for scientific sampling.

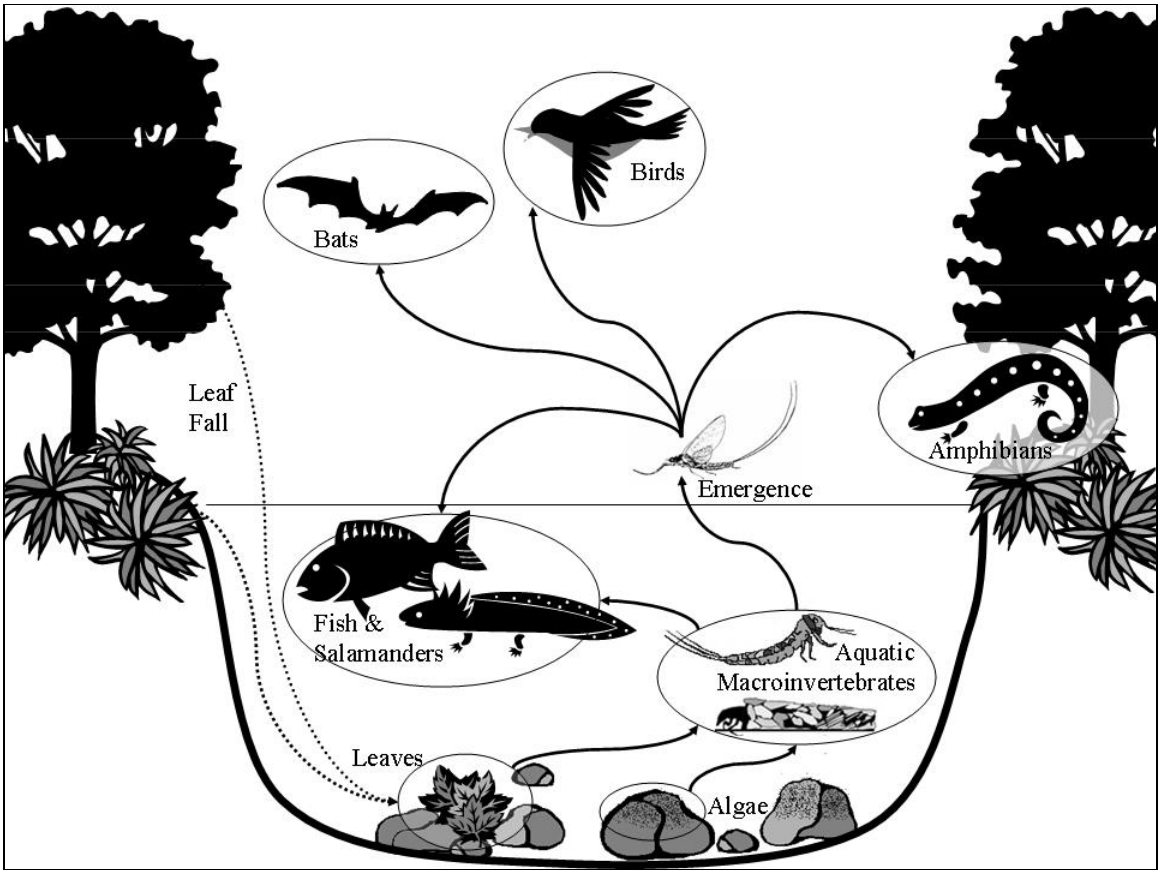

Figure 7: Illustration of a simplified stream food web, highlighting the importance of aquatic macroinvertebrates to other stream and riparian wildlife (adapted from Baxter et al. 2005).

According to Morse et al. (1997), the Central Appalachian ecoregion has many endemic and rare species of benthic macroinvertebrates in the orders Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies).[9] This diversity and unique assemblage has been attributed to the unique geological, climatic, and hydrological characteristics of this region. The Spruce No. 1 Mine project area has been found to be very rich in macroinvertebrate species. Data from the PEIS, the Spruce No. 1 EIS and from the WVDEP monitoring database indicate that high macroinvertebrate diversity exists in Pigeonroost Branch and Oldhouse Branch. Species diversity boosts ecosystem productivity, maintains ecosystem functionality, and is typically seen as an indicator of overall health.

Mayflies are most popularly known among fly-fishermen, where anglers rely on the seasonal hatches of mayflies that coincide with catching trout and other game fish species. Not only do trout rely on mayflies and stoneflies, but a group of colorful benthic fishes known as Darters (Percidae) also feed on mayflies. Darters are an important part of

[9] The orders Ephemeroptera, Plecoptera and Trichoptera (EPT taxa) contain pollution sensitive groups and are used by natural resource agencies such as the WVDEP to assess watershed health.

the fish assemblage and many are hosts for mussel larvae. Five darter species inhabit Spruce Fork in the immediate vicinity of the project area.

Stoneflies also represent an important group of aquatic insects in the structure and functioning of stream ecosystems, filling important trophic roles in stream ecosystems, including detritivory (consumption of dead or decaying organic matter) and predatory functional feeding group designations. As with mayflies, stoneflies are valued and imitated by fly-fishermen and serve as an abundant food source for many salamanders and fishes. Stoneflies are primarily stenothermic, meaning they inhabit cool to cold waters that provide the higher dissolved oxygen concentrations required for their survival.

Pigeonroost Branch and Oldhouse Branch support diverse and healthy communities of benthic macroinvertebrates, which are comparable to WVDEP reference sites. Macroinvertebrate data collected in Oldhouse Branch and Pigeonroost Branch indicate that the quality of the mayfly (Ephemeroptera) and stonefly (Plecoptera) communities in these streams ranks very high in the Central Appalachia ecoregion and statewide. In 1999-2000, EPA collected eighty-four (84) macroinvertebrate genera in riffle complexes of Pigeonroost Branch and Oldhouse Branch (see Table 11 for a complete taxa list by genus).[10] Collectively, Pigeonroost Branch and Oldhouse Branch contain a high number of mayfly and stonefly taxa and individuals (Tables 1 and 2). A total of 19 genera of mayflies and 16 genera of stoneflies have been identified from these headwater streams indicating these systems offer high water quality and optimal habitat.

Based on a comparison of macroinvertebrate communities, Oldhouse Branch and Pigeonroost Branch are of comparable quality to White Oak Branch, a neighboring WVDEP-designated reference site. Using the West Virginia Stream Condition Index (WVSCI), an assessment method developed for use in West Virginia to help evaluate the health of benthic macroinvertebrate communities at the family level in wadeable streams (and used as a measure of the health of stream communities overall), both Oldhouse Branch and White Oak Branch scored comparably well.[11] Oldhouse Branch and White Oak Branch also scored comparably well at the more sensitive genus level (as opposed to family), sharing 55 total genera, many of which are intolerant of pollution, indicating a diverse and healthy aquatic community in Oldhouse Branch similar to the high quality communities of White Oak Branch. The WVSCI assessment of Pigeonroost Branch indicates water quality is relatively good despite the presence of localized historic mining in the watershed. Pigeonroost Branch and White Oak Branch also share many pollution-intolerant macroinvertebrate genera, indicating that the health of Pigeonroost Branch's aquatic community is similar.

Oldhouse Branch and Pigeonroost Branch contain 19 genera of mayflies (Table 1). As many as nine genera of mayflies have been collected in Oldhouse Branch in any one

[10] Riffle and pool complexes are considered special aquatic sites under 40 CFR 230.1(d) and as such the degradation or destruction of these sites is considered to be among the most severe environmental impacts covered by the § 404(b)(1) Guidelines.

[11] For a more detailed discussion of WVSCI, see Section V.B.2.a.iii.

season-specific sample, with an average of seven genera across multiple samples. This observation ranks in the 95th percentile of all samples taken in the Central Appalachian ecoregion (937 samples) by the WVDEP. Out of more than 4000 samples collected statewide in West Virginia, Oldhouse Branch ranks in the 90th percentile. Pigeonroost Branch contained eight mayfly genera in a season-specific sample, ranking it in the 90th percentile in the Central Appalachian ecoregion and 83rd percentile statewide from among more than 4000 single-sample observations.

Table 1. Presence/absence of mayfly (Ephemeroptera) genera in the permit area (Compiled from EPA, WVDEP, and the applicant's consulting firms (Sturm Environmental Services, BMI, Inc.))

Order	Family	Genus	Oldhouse	Pigeonroost
Ephemeroptera	Ameletidae	*Ameletus*	X	X
Ephemeroptera	Baetidae	*Acentrella*	X	X
Ephemeroptera	Baetidae	*Baetis*	X	X
Ephemeroptera	Baetidae	*Diphetor*		X
Ephemeroptera	Baetiscidae	*Baetisca*		X
Ephemeroptera	Ephemerellidae	*Attanella*		X
Ephemeroptera	Ephemerellidae	*Dannella*		X
Ephemeroptera	Ephemerellidae	*Drunella*	X	X
Ephemeroptera	Ephemerellidae	*Ephemerella*	X	X
Ephemeroptera	Ephemerellidae	*Eurylophella*	X	X
Ephemeroptera	Ephemeridae	*Ephemera*	X	X
Ephemeroptera	Heptageniidae	*Cinygmula*	X	X
Ephemeroptera	Heptageniidae	*Epeorus*	X	X
Ephemeroptera	Heptageniidae	*Heptagenia*		X
Ephemeroptera	Heptageniidae	*Maccaffertium*	X	X
Ephemeroptera	Heptageniidae	*Stenacron*	X	
Ephemeroptera	Isonychiidae	*Isonychia*		X
Ephemeroptera	Leptophlebiidae	*Choroterpes*	X	
Ephemeroptera	Leptophlebiidae	*Paraleptophlebia*	X	

Note: Siphlonurus and Pseudocloeon reported by Sturm Environmental Services are likely erroneous identifications. These genera have been excluded from this list.

Oldhouse Branch and Pigeonroost Branch contain 11 genera of stoneflies (Table 2). A single collection in Oldhouse Branch by EPA (Spring 2000) included 9 genera of stoneflies, which ranks greater than the 98th percentile of all Central Appalachian streams sampled by the WVDEP (937 samples). This means that only 2% of stream samples in this ecoregion had more stonefly taxa than Oldhouse Branch within a single sampling event. Pigeonroost Branch had as many as six stonefly genera in any one season-specific sample, ranking it at the 83rd percentile among 937 Central Appalachian streams, and 72nd percentile statewide.

Table 2. Presence/absence of stonefly (Plecoptera) genera in the permit area (Compiled from EPA, WVDEP, and the applicant's consulting firms (Sturm Environmental Services, BMI, Inc.))

Order	Family	Genus	Oldhouse	Pigeonroost
Plecoptera	Capniidae	*Allocapnia*	X	X
Plecoptera	Chloroperlidae	*Alloperla*		X
Plecoptera	Chloroperlidae	*Haploperla*	X	

Plecoptera	Chloroperlidae	*Sweltsa*	X	
Plecoptera	Leuctridae	*Leuctra*	X	X
Plecoptera	Nemouridae	*Amphinemura*	X	X
Plecoptera	Nemouridae	*Ostrocerca*	X	X
Plecoptera	Nemouridae	*Paranemoura*		X
Plecoptera	Peltoperlidae	*Peltoperla*	X	
Plecoptera	Perlidae	*Acroneuria*	X	X
Plecoptera	Perlodidae	*Isoperla*	X	
Plecoptera	Perlodidae	*Remenus*		X
Plecoptera	Perlodidae	*Yugus*	X	
Plecoptera	Pteronarcyidae	*Pteronarcys*	X	X
Plecoptera	Taeniopterygidae	*Taenionema*		X
Plecoptera	Taeniopterygidae	*Taeniopteryx*		X

Note: Podmosta, Paraleuctra, Megaleuctra,and Beloneuria reported by Sturm Environmental Services are likely erroneous identifications. These genera been excluded from this list.

Two Cambarus species of crayfish were collected incidentally during the macroinvertebrate sampling events. Although crayfish were not specifically sampled for, a list of crayfish species potentially present within the Headwaters Spruce Fork sub-watershed can be found in Table 3. Other macroinvertebrates, including mollusks and flatworms (plathyelminthes), are fairly rare in these systems, as aquatic insects make up the majority of the macroinvertebrate taxa in these streams.

Table 3: List of potential crayfish species occurring within permit area

Common Crayfish (*Cambarus bartonii bartonii*)	Upland Burrowing Crayfish (*Cambarus dubius*)
Appalachian Brook Crayfish (*Cambarus b. cavatus*)	Big Water Crayfish (*Cambarus robustus*)

IV.B.2. Salamanders & Other Herpetofauna

There are 46 species of herpetofauna that have been documented as occurring on the project site or in Logan or Boone County, WV, including a wide variety of salamanders (Table 4). The Central Appalachian ecoregion contains one of the richest concentrations of salamander fauna in the world (Petranka 1998, Stein et al. 2000). Nearly ten percent of global salamander diversity is found within streams in the ecoregion (Green and Pauley 1987). Salamanders are a diverse and unique form of Appalachian wildlife that depend on forested headwater habitat and that decline or disappear from surface mined areas. Many species of salamanders are aquatic or semi-aquatic and utilize headwater streams at some point in their life histories. Most of the species found in the project area are water-dependent and belong to the family Plethodontidae, the lungless salamanders, which require high moisture retaining leaf-litter, dense shade, and cool flowing streams to survive and reproduce. Typically, salamanders occupy small, high-gradient headwater streams while fish occur farther downstream.

Salamanders are an important ecological component in the temperate hardwood forests of the ecoregion and are often the most abundant group of vertebrates in both biomass and number (Burton and Lykens 1975, Hairston 1987). Ecologically, salamanders are intimately associated with forest and adjacent aquatic ecosystems acting as predators of small invertebrates and serving as prey to larger aquatic and terrestrial predators, including fish, birds, mammals and reptiles (Pough et al. 1987, Davic and Welsh 2004). Because of their low energy demand, long life span, slow growth rates, and large abundance, salamanders help to maintain long-term ecosystem function and resilience by providing abundant biomass and nutrients for top predators in forest and adjacent aquatic ecosystems (Davic and Welsh 2004). As such, salamanders play a large role in the cycling of nutrients and transfer between terrestrial and aquatic systems via trophic pathways (Davic and Welsh 2004). Some species of salamanders split their lives between forests and headwaters and depend on a close connection to move between the two (Petranka, 1998). The PEIS identified thirty-one species of salamanders in the West Virginia portion of the study area. Of these, twenty-five species are known to occupy mixed mesophytic hardwood forests, like those present within portions of the Spruce No. 1 Mine site.

Table 4: List of documented herpetofauna species occurring in Logan County or Boone County, WV. Source: Spruce EIS and WV Biological Survey, Marshall University, 2010

Eastern hognose snake (*Heterodon platirhinos*)*	Five-lined skink (*Eumeces fasciatus*)*
American toad (*Bufo americanus*)*	Spring peeper (*Hyla crucifer*)*
Spring salamander (*Gyrinophilus porphyriticus*)*	Southern two-lined salamander (*Eurycea cirrigera*)*
Seal salamander (*Desmognathus monticola*)*	Northern dusky salamander (*Desmognathus fuscus*)*
Mountain dusky salamander (*Desmognathus ochrophaeus*)*	Mole salamander (*Ambystoma*)*
Red-spotted newt (*Notophthalmus viridescens*)*	Green salamander (*Aneides aenus*)*
Red salamander (*Pseudotriton ruber*)*	Mountain Chorus Frog (*Pseudacris brachyphona*)
Ring-necked Snake (*Diodophus punctatus*)	Fowler's Toad (*Bufo fowleri*)
Eastern Wormsnake (*Carphophis amoenus*)	Mudpuppy (*Necturus maculosus*)
Box Turtle (*Terrapene carolina*)	Spiny Soft-shelled Turtle (*Apalone spinifera*)
Timber Rattlesnake (*Crotalis horridus*)	Eastern Racer (*Coluber constrictor*)
Northern Slimy Salamander (*Plethodon glutinosus*)	Gray Treefrog (*Hyla versicolor*)
Eastern Fence Lizard (*Sceloporus undulatus*)	Rough Green Snake (*Opheodrys aestivus*)
North American Bullfrog (*Rana catesbeiana*)	Northern Two-lined Salamander (*Eurycea bislineata*)
Painted Turtle (*Chrysemys picta*)	Pickerel Frog (*Rana palustris*)
Snapping Turtle (*Chelydra serpentina*)	Little Brown Skink (*Scincella lateralis*)
Common Garter Snake (*Thamnophis sirtalis*)	Green Frog (*Rana clamitans*)
Northern Water Snake (*Nerodia sipedon*)	Ravine Salamander (*Plethodon richmondi*)
Spotted Salamander (*Ambystoma maculatum*)	Cope's Gray Treefrog (*Hyla chrysoscelis*)
Queen Snake (*Regina septemvittata*)	Coal Skink (*Eumeces anthracinus*)
Black Mountain Salamander (*Desmognathus welteri*)	Marbled Salamander (*Ambystoma opacum*)
Mud Salamander (*Pseudotriton montanus*)	Copperhead (*Agkistrodon contortix*)
Long-tailed Salamander (*Eurycea longicauda*)	Four-toed Salamander (*Hemidactylium scutatum*)
* Documented within the permit area	

With respect to areas in or immediately adjacent to the project area, stream-dwelling salamanders have been surveyed in White Oak Branch (see Appendix B in Patnode et al. 2005). White Oak Branch had good numbers of Northern Dusky (9 adult, 7 larvae), Appalachian Seal (15 adult, 12 larvae), Northern Spring (4 adult), and Two Lined salamanders (1 adult and 15 larvae). These samples were recorded from a 12 square-meter plot that includes dry and wetted portions of the stream channel. Because Oldhouse Branch and Pigeonroost Branch are very close geographically and have similar features as White Oak Branch, salamander populations in Pigeonroost Branch and Oldhouse Branch can be expected to be similar to those in White Oak Branch. Williams (2003) found mean densities within reference reaches of Pigeonroost Branch, Bend Branch (another tributary of Spruce Fork), and Ash Fork (a tributary of the Gauley River) to be more than six salamanders per square meter. In the Williams' study, the majority of the total salamanders were found in Pigeonroost Branch. Using these numbers from White Oak Branch and Pigeonroost Branch, EPA estimates aquatic salamanders are abundant (~5-6 per square meter) along stream channels in Pigeonroost Branch and Oldhouse Branch.

IV.B.3. Fish

Five fish species have been sampled in Pigeonroost Branch, Oldhouse Branch, and White Oak Branch, and the assemblages are typical of small streams in the Coal River sub-basin (Table 5). As fish diversity generally increases with stream order (Meyer et al. 2007), the low diversity in these streams is typical of low order headwater streams. The fish populations are good quality, and are not indicative of impairment. Based upon several sampling efforts, it has been found that Pigeonroost Branch supports a fish assemblage that includes blacknose dace, creek chub mottled sculpin, stonerollers and smallmouth bass; and Oldhouse Branch supports a fish assemblage of blacknose dace and creek chub. The presence of smallmouth bass in Pigeonroost Branch indicates at least seasonal, and possible spawning use of this stream by smallmouth bass.

Fish species collection in Oldhouse Branch, Pigeonroost Branch and White Oak Branch has been variable, likely due to a drought that occurred in 1999. It is likely that perennial reaches of Pigeonroost Branch and Oldhouse Branch were dewatered during this drought period, and thus provided only ephemeral or intermittent habitat at that time. As discussed in Stauffer and Ferreri (2002), drought can act as a major perturbation on fish communities. While fish can recolonize an area after a drought, recolonization rates vary between fish species, and it may take years before the community resembles that which was in place before the drought.

As outlined in the PEIS (Stauffer and Ferreri 2002), a study that was conducted by the U.S. Fish and Wildlife Service in 1998 recorded sculpin (Cottus spp.) in benthic invertebrate samples from White Oak Branch, as well as many fishes in the pools of Oldhouse Branch. Subsequent sampling in May 2000 revealed only blacknose dace (Rhinichthys atratulus) in White Oak Branch, and none in Oldhouse Branch. Stauffer and Ferreri (2002) attributed this to the effects of the drought in 1999. Sampling for the PEIS occurred in 1999, the same year as the drought. When sampled for the PEIS, only blacknose dace and creek chubs were present in Pigeonroost Branch. Similarly, White Oak Branch was also drought-affected and it contained only blacknose dace at the time of sampling. No samples were collected in Oldhouse Branch for the PEIS. Blacknose dace are typically a headwater species that are tolerant of disturbance and can recolonize an area quickly after a drought. Sculpins (Cottus spp.), however, are bottom-dwelling species that typically have a restricted home range, which hinders the dispersal rate and makes it more difficult for them to recolonize an area after a drought.

Additional fish sampling data were collected in 2008 and 2009 by Decota Consulting and revealed a fish assemblage similar to that found by the U.S. Fish and Wildlife Service prior to the drought. Mottled sculpin, as well as sporadic populations of smallmouth bass and stonerollers were collected in Pigeonroost Branch. Similarly, creek chubs and mottled sculpin were collected from White Oak Branch. Data from Oldhouse Branch indicate that blacknose dace and creek chubs are the only species present.

In an analysis of fish community data from Spruce Fork, EPA assessed the small streams impacted by the Spruce No. 1 Mine and three reaches of Spruce Fork: 1) Upstream of Seng Camp Creek, 2) Seng Camp Creek to Spruce Laurel, and 3) Downstream of Spruce Laurel. Other data analyzed included data collected for the PEIS, unpublished data included in the West Virginia Department of Natural Resources (WVDNR) database (including USEPA, WVDNR, and consulting firm data), and data from Decota Consulting supplied to the WVDNR collecting permit program. The data consisted of samples that were intended to assess community composition and were judged to have sufficient numbers of individuals to render a fair assessment.

Table 5: List of fish species occurring within Spruce Fork from samples in 2007 and 2010 (WVDNR unpublished data) (*) represents species also present in Pigeonroost Branch and Oldhouse Branch within the project area

rock bass (Ambloplites rupestris)	striped shiner (Luxilus chrysocephalus)
central stoneroller (Campostoma anomalum)*	smallmouth bass (Micropterus dolomieu)*
mottled sculpin (Cottus bairdii)*	golden redhorse (Moxostoma erythrurum)
greenside darter (Etheostoma blennioides)	silverjaw minnow (Notropis buccatus)
rainbow darter (Etheostoma caeruleum)	silver shiner (Notropis photogenis)
johnny darter (Etheostoma nigrum)	rosyface shiner (Notropis rubellus)
variegate darter (Etheostoma variatum)	sand shiner (Notropis stramineus)
banded darter (Etheostoma zonale)	mimic shiner (Notropis volucellus)
bigeye chub (Hybopsis amblops)	bluntnose minnow (Pimephales notatus)
northern hog sucker (Hypentelium nigricans)	western blacknose dace (Rhinichthys obtusus)
American brook lamprey (Lampetra appendix)	brown trout (Salmo trutta)
green sunfish (Lepomis cyanellus)	creek chub (Semotilus atromaculatus)*
bluegill (Lepomis macrochirus)	blacknose dace (Rhinichthys atratulus)*

For the PEIS, Fulk et al. (2003) used the Mid-Atlantic Highlands (MAHA) Index of Biotic Integrity (IBI), a multi-metric index used to assess biotic health, with some minor modification, to assess the impacts of mountaintop mining and valley fills to fish assemblages. Using this same index, the assemblage upstream of Seng Camp Creek ranged from fair to excellent condition.

The fish assemblage in the main stem of Spruce Fork is in relatively good condition (Table 5) and is made up of 26 species. Spruce Fork is a locally important rock bass and smallmouth bass fishery. Rock Bass and Smallmouth Bass are moderately sensitive gamefish species. While sampling Spruce Fork in 2010, recreational fishing was observed in the lower reaches of the stream and there was evidence of fishing in the upper reaches as well. Species present in Spruce Fork upstream and downstream of Seng Camp Creek are typical of streams of this size within the Coal River sub-basin.

IV.B.4. Birds[12]

Many bird species depend on headwater streams like those of the Spruce Fork for their survival. The ecotone, or transition area, between terrestrial and aquatic habitats results in diverse flora and fauna. This phenomenon is particularly noticeable among bird species. For example, unique avifauna assemblages can be found along the riparian zone of headwater streams, and are often attracted to headwater streams for breeding areas because of the diversity of the habitat and the availability of emergent aquatic insects. Hence Appalachian headwater streams, like Pigeonroost Branch and Oldhouse Branch, support a wide array of sensitive bird species (Table 6) and are an important natural habitat for supporting these species' breeding populations.

Table 6: List of potential bird species occurring within permit area

Ruffed Grouse (*Bonasa umbellus*)	Whip-poor-will (*Caprimulgus vociferous*)
Red-tailed Hawk (*Buteo jamaicensis*)	Hairy Woodpecker (*Picoides villosus*)
Black-billed Cuckoo (*Coccyzus erythropthalmus*)	Pileated Woodpecker (*Dryocopus pileatus*)
Chimney Swift (*Chaetura pelagica*)	Acadian Flycatcher (*Empidonax virescens*)
Belted Kingfisher (*Megaceryle alcyon*)	Yellow-throated Vireo (*Vireo flavifrons*)
Downy Woodpecker (*Picoides pubescens*)	Red-eyed Vireo (*Vireo olivaceus*)
Northern Flicker (*Colaptes auratus*)	American Crow (*Corvus brachyrhynchos*)
Eastern Wood-Pewee (*Contopus virens*)	Carolina Chickadee (*Poecile carolinensis*)
Eastern Phoebe (*Sayornis phoebe*)	White-breasted Nuthatch (*Sitta carolinensis*)
White-eyed Vireo (*Vireo griseus*)	Blue-gray Gnatcatcher (*Polioptila caerulea*)
Blue Jay (*Cyanocitta cristata)*	Wood Thrush (*Hylocichla mustelina*)
Northern Rough-winged Swallow (*Stelgidopteryx serripennis*)	Gray Catbird (*Dumetella carolinensis*)
Tufted Titmouse (*Baeolophus bicolor*)	European Starling (*Sturnus vulgaris*)
Carolina Wren (*Thryothorus ludovicianus*)	Brewster's Warbler (hybrid) (*Vermivora cyanoptera x V. chrysoptera*)
Eastern Bluebird (*Sialia sialis*)	Northern Parula (*Parula Americana*)
American Robin (*Turdus migratorius*)	Yellow-throated Warbler (*Dendroica dominica*)
Blue-winged Warbler (*Vermivora cyanoptera*)	Cerulean Warbler (*Dendroica caerulea*)
Golden-winged Warbler (*Vermivora chrysoptera*)	American Redstart (*Setophaga ruticilla*)
Yellow Warbler (*Dendroica petechia*)	Swainson's Warbler (*Limnothlypis swainsonii*)
Prairie Warbler (*Dendroica discolor*)	Louisiana Waterthrush (*Parkesia motacilla*)
Black-and-white Warbler (*Mniotilta varia*)	Common Yellowthroat (*Geothlypis trichas*)
Worm-eating Warbler (*Helmitheros vermivorum*)	Yellow-breasted Chat (*Icteria virens*)
Ovenbird (*Seiurus aurocapilla*)	Chipping Sparrow (*Spizella passerina*)
Kentucky Warbler (*Oporornis formosus*)	Song Sparrow (*Melospiza melodia*)
Hooded Warbler (*Wilsonia citrina*)	Scarlet Tanager (*Piranga olivacea*)
Eastern Towhee (*Pipilo erythropthalmus*)	Indigo Bunting (*Passerina cyanea*)
Field Sparrow (*Spizella pusilla*)	Brown-headed Cowbird (*Molothrus ater*)
Northern Cardinal (*Cardinalis cardinalis*)	House Sparrow (*Passer domesticus*)
Red-winged Blackbird (*Aegelaius phoeniceus*)	Northern Bobwhite (*Colinus virginianus*)

[12] Much of the discussion related to avian and bat species is based upon communications with the U.S. Fish and Wildlife Service.

American Goldfinch (*Spinus tristis*)	Yellow-billed Cuckoo (*Coccyzus americanus*)
Mourning Dove (*Zenaida macroura*)	Wild Turkey (*Meleagris gallopavo*)
Woodcock (*Scolopax minor*)	Red-bellied Woodpecker (*Melanerpes carolinus*)

Among the many migratory birds likely to breed in the project area, there are six species that the USFWS has designated as Birds of Conservation Concern (BCC) within the Appalachian Mountains Bird Conservation Region (AMBCR). These include the Cerulean Warbler (*Dendroica caerulea*), Kentucky Warbler (*Oporornis formosis*), Swainson's Warbler (*Lymnothlypis swainsonii*), Worm-eating Warbler (*Helmitheros vermivorus*), Wood Thrush (*Hylocichla mustelina*), and the Louisiana Waterthrush (*Seiurus motacilla*). The first five of these are also designated as BCC species within the USFWS's Northeast Region as a whole and nationally (U.S. FWS 2008). The first four are also considered to be among the 100 most at-risk bird species in North America (Wells 2007).

The Louisiana Waterthrush, a neotropical migrant song bird, is considered an obligate headwater riparian songbird (an example of water-dependent wildlife) because its diet is comprised predominantly of immature and adult aquatic macroinvertebrates found in and alongside headwater streams and because it builds its nest in the stream banks. Breeding waterthrushes nest and forage primarily on the ground along medium- to high-gradient, first- to third-order, clear, perennial headwater streams flowing through closed-canopy forest. Good water quality is a key component of the species' breeding habitat. By these criteria, headwater streams like Pigeonroost Branch and Oldhouse Branch that support healthy macroinvertebrate communities provide excellent foraging and breeding habitat for species such as the Louisiana Waterthrush.

The West Virginia population of the Louisiana Waterthrush may serve as a source population within the species' breeding range. The Appalachian Mountain Bird Conservation Region (AMBCR), which extends from southeastern New York south to northern Alabama, is thought to support as much as 45 percent of the Louisiana Waterthrush's breeding population (Mattson and Cooper 2009, Smith, USFWS 2010, personal communication). West Virginia, the only state that lies entirely within the AMBCR, encompasses the largest contiguous area of high relative breeding abundance over the species' entire breeding range, based on North American Breeding Bird Survey (BBS) data from 1994-2003.

The Louisiana Waterthrush is also an area-sensitive species, requiring undisturbed forest tracts of at least 865 acres to sustain a population (Robbins, C.S., J.R. Sauer, R.S. Greenburg**,** and S. Droege. 1989). The most effective management protocol for the Louisiana Waterthrush includes the protection of forest tracts and water systems that it inhabits in its breeding range. The protection of moderate- to high-gradient headwater streams, which compose 75-80% of stream length in a typical watershed, is therefore of particular importance for this species.

Bird species that rely on mature forest habitats and that are on the Audubon watch list as declining species include the Swainson's Warbler, Kentucky Warbler, and Cerulean Warbler. According to the West Virginia Breeding Bird Atlas, all of these species are likely breeders in and around the project area (Buckelew and Hall 1994).

The Cerulean Warbler is considered to be particularly sensitive to landscape-level changes in habitat, more so than most other North American bird species. A canopy-foraging insectivorous neotropical migrant songbird, the Cerulean Warbler breeds in mature deciduous forests with broken, structurally diverse canopies across much of the eastern United States and winters in middle elevations of the Andes Mountains of northern South America. Robbins (1989) noted that Cerulean Warblers prefer large-blocks of mature interior forest habitat with tall trees and a dense upper canopy.

Important among a number of stressors to the Cerulean's breeding populations are the loss of mature deciduous forest, particularly along stream valleys, and the fragmentation and increasing isolation of remaining mature deciduous forest. The USFWS has designated the Cerulean Warbler a Species of Management Concern and a Species of Conservation Concern throughout its range. It has also been preliminarily designated by the Appalachian Mountains Joint Venture as a Species of Highest Conservation Priority within the Appalachian Mountains Bird Conservation Region, which encompasses West Virginia. The AMBCR is thought to support about 80 percent of the Cerulean Warbler's entire breeding population and as a comprehensive four-year study of the species' breeding population shows, West Virginia is an important source population for Cerulean Warblers (Rosenberg et al.2000).

The Acadian Flycatcher (*Empidonax virescens*) is another bird species that is primarily restricted to forested tracts with understory vegetation along small headwater streams. Acadian flycatchers feed primarily on emergent aquatic insects in riparian forest habitat like Spruce Fork and its tributaries. In addition, many other neotropical migrant songbird species are also often attracted to headwater streams for breeding areas because of the diversity of the habitat and the availability of emergent aquatic insects. Hence Appalachian headwater streams, like Pigeonroost Branch and Oldhouse Branch, support a wide array of sensitive bird species and are an important natural habitat for supporting these species' breeding populations.

IV.B.5. Bats & Other Mammals

Thirteen species of bats are found in West Virginia; and all of these species are insectivorous and either capture their prey by foraging in flight, catch flying insects from a perch, or collect insects from plants. Species that have potential to occur in the area of south-Central West Virginia that encompasses the Spruce No. 1 Mine include the Northern Bat (*Myotis septentrionalis*), Big Brown Bat (*Eptesicus fuscus*), Red Bat (*Lasiurus borealis*), Eastern Small-footed Bat (*Myotis leibii*), Virginia Big-eared Bat (*Corynorhinus townsendii virginianus*), Northern Long-eared Bats *(Myotis septentrionalis)* and the Indiana Bat (*Myotis sodalis*) (Table 7).

Both the Indiana Bat and Virginia Big-eared Bat are listed as endangered under the Endangered Species Act (ESA). The USFWS was also recently petitioned to list the Eastern Small-footed Bat and the Northern Long-eared Bat under the ESA. Both of these species have been documented in the Spruce No. 1 Mine project area. In 2004, five Eastern Small-footed Bats and 16 Northern Long-eared Bats were captured during mist net surveys conducted at the Spruce No. 1 Mine site, representing 7.6 and 24.2 percent, respectively, of all bats captured (U.S. Army Corps of Engineers Huntington District 2006, DEIS Spruce No. 1 Mine. Appendix M).

Indiana Bats are found over most of the eastern half of the United States. Between 1960 and 2001, biologists have documented a 56% population decline in Indiana Bats (Clawson 2002). Indiana Bats feed solely on emerged aquatic and terrestrial flying insects. They are habitat generalists and their selection of prey reflects the environment in which they forage. In a study in the Allegheny Mountains, activity in non-riparian upland forest and forests in which timber harvest had occurred was low relative to forested riparian areas (Owen et al. 2004). This evidence suggests that the forested riparian zones of the project area would be more suitable habitats for Indiana Bat populations than active or restored mining sites.

Mist net surveys were conducted in the project area in 2000 and 2004, and no federally listed bats were captured. Although the capture of bats confirms their presence, failure to catch bats does not absolutely confirm their absence (U.S. Fish and Wildlife Service 2007). The project area occurs roughly halfway between known hibernacula (shelters used for hibernation) in northeastern Kentucky and southeastern West Virginia. Since the most recent surveys at the Spruce No. 1 Mine site, maternity roosts have been documented in central and north-central Boone County within 15 miles of the project area (WVDNR 2010, USFWS 2005).

Table 7: List of potential mammal species occurring within permit area

hoary bat (*Lasiurus cinereus*)	Rafinesque's big-eared bat (*Corynorhinus rafinesquii*)
eastern small-footed bat (*Myotis leibii*)	big brown bat (*Eptesicus fuscus*)
little brown bat (*Myotis lucifugus*)	silver-haired bat (*Lasionycteris noctivagans*)
Northern long-eared bat (*Myotis septentrionalis*)	eastern red bat (*Lasiurus borealis*)
Eastern pipistrelle bat (*Pipistrelle subflavus*)	evening bat (*Nycticeius humeralis*)
Indiana bat (*Myotis sodalist*)	Virginia big-eared bat (*Corynorhinus townsendii virginianus*)
tri-colored bat (*Perimyotis subflavus*)	showshoe hare (*Lepus americanus*)
woodland jumping mouse (*Napaeozapus insignis*)	raccoon (*Procyon lotor*)
deer mouse (*Peromyscus maniculatus*)	red fox (*Vulpes vulpes*)
gray fox (*Urocyon cinereoargenteus*)	bobcat (*Lynx rufus*)
mink (*Mustela vison*)	white-tailed deer (*Odocoileus virginianus*)
opossum (*Didelphis virginiana*)	eastern cottontail (*Sylvilagus floridana*)
muskrat (*Ondatra zibethicus*)	Appalachian cottontail (*Sylvilagus obscures*)
black bear (*Ursus americanus*)	white-footed mouse (*Peromyscus leucopus*)
striped skunk (*Mephitis mephitis*)	southern red-backed vole (*Clethrionomys gapperi*)
woodchuck (*Marmota monax*)	meadow vole (*Microtus pennsylvanicus*)

masked shrew (*Sorex cinereus*)	pine vole (*Microtus pinetorum*)
northern short-tailed shrew (*Blarina brevicauda*)	eastern chipmunk (*Tamias striatus*)
hairy-tailed mole (*Parascalops breweri*)	eastern gray squirrel (*Sciurus carolinensis*)
least Weasel (*Mustela nivalis*)	fox squirrel (*Sciurus niger*)
long-tailed weasel (*Mustela frenata*)	red squirrel (*Tamiasciurus hudsonicus*)
wild boar/ feral pig (*Sus scrofa*)	southern flying squirrel (*Glaucomys volans*)
american beaver (*Castor canadensis*)	

IV.C. Summary

Based on the foregoing information, EPA finds that Pigeonroost Branch and Oldhouse Branch contain high quality, important wildlife resources and habitat. EPA bases this conclusion on several factors including the similarity of macroinvertebrate communities in Pigeonroost Branch and Oldhouse Branch to the reference-quality White Oak Branch; the high-ranking mayfly and stonefly diversity, both within the Central Appalachian ecoregion and statewide; and the use of these streams and associated riparian ecotone by numerous salamander, bird, and mammal species. These streams support least-disturbed conditions and represent some of the last remaining high quality stream and riparian resources within the Headwaters Spruce Fork sub-watershed and the Coal River sub-basin.

V. Basis for Final Determination

V.A. Section 404(c) Standards

CWA § 404(c) provides

> The Administrator is authorized to prohibit the specification (including the withdrawal of specification) of any defined area as a disposal site, and he is authorized to deny or restrict the use of any defined area for specification (including the withdrawal of specification) as a disposal site, whenever he determines, after notice and opportunity for public hearings, **that the discharge of such materials into such area will have an unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas**. Before making such determination, the Administrator shall consult with the Secretary. The Administrator shall set forth in writing and make public his findings and his reasons for making any determination under this subsection. [emphasis added]

While EPA strongly prefers to initiate the § 404(c) process prior to issuance of a permit, § 404(c) and EPA's implementing regulations authorize EPA to initiate the § 404(c) process after a permit has been issued by withdrawing specification of a disposal site (See 40 CFR 231.1(a); see also definition of "withdraw specification," 40 CFR 231.2(a)). In this case, Pigeonroost Branch and Oldhouse Branch were specified as disposal sites in DA Permit No. 199800436-3.

§ 404(c) does not define the term "unacceptable adverse effect." EPA's regulations at 40 CFR 231.2(e) define "unacceptable adverse effect" as

> Impact on an aquatic or wetland ecosystem which is likely to result in significant degradation of municipal water supplies or **significant loss of or damage to** fisheries, shellfishing, or **wildlife habitat** or recreation areas. In evaluating the unacceptability of such impacts, consideration should be given to the relevant portions of the § 404(b)(1) Guidelines (40 CFR 230). [emphasis added]

V.B. Evaluation of Impacts

To evaluate the impacts of the Spruce No. 1 Mine, EPA has reviewed the DA Permit No. 199800436-3 (Section 10: Coal River), the Spruce No. 1 Mine EIS, the PEIS, peer-reviewed literature, and available data documenting impacts from similar projects. In addition, EPA communicated with the US Fish and Wildlife Service on impacts to fish and wildlife resources in the project area. EPA also has examined impacts caused by the portion of the Spruce No. 1 Mine that has already been constructed in the Seng Camp Creek watershed (specifically, Valley Fill 1A). In addition, EPA reviewed the nearby Mingo Logan Dal-Tex operation. The data indicate that for the most part, the formations are repeated from the Dal-Tex mine complex to the proposed Spruce No. 1 mine location and all of the formations in the Dal-Tex complex that had in the past showed high selenium levels and have led to environmental releases are present at the Spruce No. 1 Mine. EPA is, therefore, on sound technical footing to use existing data from the Dal-Tex complex as a basis to predict what may happen when mining occurs at Spruce No. 1 Mine. This was acknowledged by the Corps in the Spruce No. 1 EIS, which stated "[t]he past and present impacts to topography, geology, and mineral resources of the previous mining along the western side of Spruce Fork are similar to the anticipated impacts of the Spruce No. 1 Mine, as mining is to occur in the same strata."

EPA completed a review of rock cores and corresponding cross sections for the Dal-Tex mines including the Gut Fork mine, which lies immediately to the west across Spruce Fork from Spruce No.1 (Figure 8) and compared them to those from the Spruce No. 1 Mine. This review, which is set forth in Appendix 4, indicates that the formations are essentially repeated from the Dal-Tex mine complex to the Spruce No. 1 Mine location. According to the EIS, the same coal beds are to be developed for the Spruce No. 1 Mine as for the Dal-Tex mine. These coal bed sequences are also similar to those described in the literature for southern West Virginia coal bed sequences and the geologic column for the Spruce No. 1 Mine.

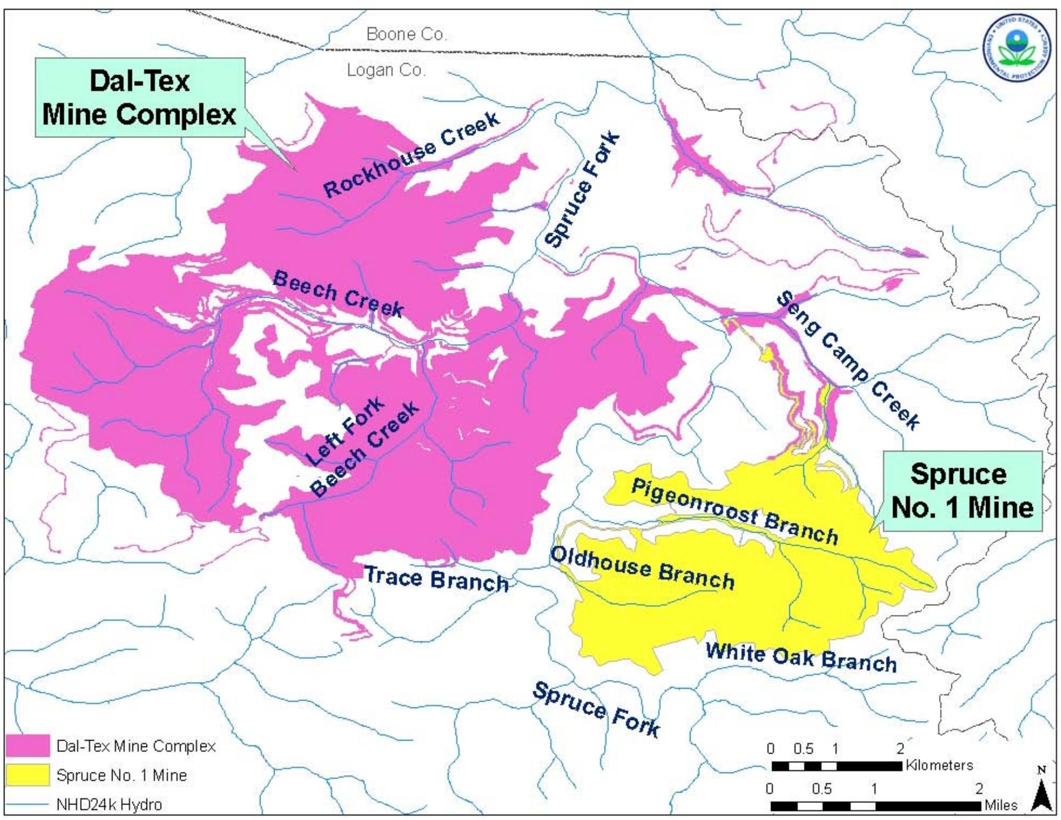

Figure 8. Spruce No. 1 Mine and the Dal-Tex Mine Operation

V.C. Unacceptable Adverse Impacts on Wildlife within the Spruce No. 1 Mine Project Area

The unacceptable adverse impacts from the specification of Pigeonroost Branch and Oldhouse Branch as disposal sites for the discharge of dredged or fill material from the Spruce No. 1 Mine will occur through several different pathways. This section discusses the direct impacts to wildlife and wildlife habitat.

Direct impacts will occur as a result of the discharges of dredged or fill material from the construction of valley fills and sediment ponds that will bury much of Pigeonroost Branch and Oldhouse Branch, including all wildlife living in these streams, their tributaries, and associated riparian areas. Burial of Pigeonroost Branch and Oldhouse Branch also will eliminate habitat for wildlife that depend upon those streams. The loss of these portions of Pigeonroost Branch and Oldhouse Branch will also adversely impact wildlife within this watershed that depend on headwater streams for all or part of their life cycles.

Construction of valley fills and other discharges of dredged or fill material associated with the Spruce No. 1 Mine into Pigeonroost Branch and Oldhouse Branch will result in a significant loss of wildlife habitat. The direct effects of the Spruce No. 1 Mine, as authorized, include permanent placement of fill in approximately 6.6 miles of stream in Pigeonroost Branch and Oldhouse Branch. Based on stream information from the National Hydrography Dataset, this loss represents 5.6% of the total stream length in the Headwaters Spruce Fork sub-watershed. The destruction of 6.6 miles of high quality stream habitat in a watershed where there is little remaining high quality stream habitat, and the subsequent loss of many populations of macroinvertebrates, salamanders, fish and other wildlife dependent upon that aquatic habitat area for survival, including water-dependent birds, will result in a loss of regional biodiversity and the broader ecosystem functions these populations provide.

V.C.1. Macroinvertebrates

Construction of valley fills and other discharges of dredged or fill material authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch will impact the native macroinvertebrate community directly through loss of stream habitat as a result of fill. Because the macroinvertebrate assemblages in these streams represent least-disturbed conditions within the Coal River sub-basin, the loss of these communities and their habitat will adversely impact regional native biodiversity.

As set forth in Section IV.B.1. above, benthic macroinvertebrates are diverse and healthy in the Spruce No. 1 Mine area and represent an important component of the aquatic community in Pigeonroost Branch and Oldhouse Branch. Also, direct burial of these populations will likely affect food webs and the processing and transfer of energy and nutrients downstream. As primary consumers, macroinvertebrates play an important role in the breakdown of organic matter, allowing for the transport of fine particulate organic matter to downstream organisms, and converting algal and terrestrial plant matter into energy (biomass). Invertebrates are at the base of the faunal food web, and thus they also play a critical role in the delivery of energy and nutrients to downstream reaches (in aquatic life stages) as well as to upland terrestrial habitats (in winged adult life stages), most notably through food web pathways.

V.C.2. Salamanders & Other Herpetofauna

As stated in IV.B.2., the Central Appalachian ecoregion has one of the highest concentrations of salamander fauna in the world. Impacts from the activities authorized will have a significant adverse impact on this form of wildlife located within the project area. Based on literature values (Williams 2003) for mean densities within reference reaches of Pigeonroost Branch, Bend Branch (another tributary of Spruce Fork), and Ash Fork (a tributary of Gauley River) and a 2004 USFWS study in White Oak Branch, EPA estimates aquatic salamander density in Pigeonroost Branch and Oldhouse Branch at approximately 5-6 individuals per square meter along stream channels. The loss of this density over 6.6 miles of stream reflects a substantial loss.

It is not expected that stream salamanders will return to the site due to the burial of their existing habitat. Gingerich (2009) found no expected stream salamanders inhabiting 3-20 year-old sedimentation ditches (5 out of 5 mines) in West Virginia mountaintop mining areas. Furthermore the USFWS has indicated that, to its knowledge, it has not been demonstrated that salamanders return to mined areas at densities similar to those that occurred prior to mining. USFWS also indicated that while range-wide populations of common species may not be significantly impacted, the salamander communities in individual headwater systems behave essentially as isolated populations because there is limited interaction (immigration and emigration) with communities in adjacent watersheds (personal communication with Dr. Thomas Pauley, Marshall University and with Jim Zelenak USFWS West Virginia Field Office).

Because salamanders represent the main vertebrate predator in these headwater streams, and will be eradicated under the project, EPA believes that a key component of the aquatic food web will be lost or significantly reduced from the ecosystem within Pigeonroost Branch and Oldhouse Branch portions of the Spruce No. 1 Mine area. Additionally, the loss of these salamanders will have broader food web implications, as they also serve as prey for numerous terrestrial and aquatic species found within the Spruce No. 1 Mine site, including fish, snakes, birds, mammals, turtles, frogs, crayfish and other salamanders (Davic and Welsh 2004).

V.C.3. Fish

Pigeonroost Branch and Oldhouse Branch are considered least-disturbed streams within the Coal River sub-basin, and as such, they have good water quality and support good quality fish assemblages. While these assemblages have a naturally low diversity, consistent with low order headwater streams within the Coal River sub-basin, they are healthy and productive. Construction of valley fills and other discharges of dredged or fill material authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch will lead to the total loss of over six miles of high quality, least-disturbed in-stream habitat and thus the total loss of five naturally occurring fish populations within the project area. Fish species that will be directly impacted include blacknose dace, creek chub mottled sculpin, stonerollers and smallmouth bass. Moreover, the permitted fill will reduce the habitat available for fishes within the watershed that use these streams as refugia and seasonal foraging or spawning habitat, including smallmouth bass. Additionally, species like the mottled sculpin, a bottom-dwelling species that has a restricted home range, have a low dispersal rate, which makes it more difficult for them to recolonize an area following disturbance.

V.C.4. Water-dependent Birds

The Spruce No. 1 Mine will impact the Louisiana Waterthrush, a water-dependent bird that requires forested headwater streams for foraging on insects and nesting, by eliminating the headwater areas associated with Pigeonroost Branch and Oldhouse Branch. The Louisiana Waterthrush has been designated by USFWS as a Bird of Conservation Concern (BCC) within the Appalachian Mountains Bird Conservation Region (AMBCR) because of potential impacts from surface coal mining activities.

According to USFWS, the Louisiana Waterthrush is an area-sensitive riparian-obligate species that nests and forages along headwater streams of intact interior forests. Because it requires riparian woodland habitat to forage for macroinvertebrates along streams, approximately 6.6 miles of Louisiana Waterthrush stream and riparian habitat will be lost due to fill being placed in Pigeonroost Branch and Oldhouse Branch and their tributaries. For water-dependent birds like the Louisiana Waterthrush, preservation of large tracts of forest containing headwater streams is needed for the conservation of this species in the central Appalachians. The Waterthrush is particularly vulnerable to degradation of water quality and aquatic insect communities (Mattsson and Cooper 2006, Mulvihill et al. 2008).

V.C.5. Summary

Pigeonroost Branch and Oldhouse Branch and their tributaries are some of the last remaining streams within the Headwaters Spruce Fork sub-watershed and the larger Coal River sub-basin that represent “least-disturbed” conditions and habitat that is essential for many species in the watershed. As such, they perform critical hydrologic and biological functions, support diverse and productive biological communities, contribute to prevention of further degradation of downstream waters, and play an important role within the context of the overall Headwaters Spruce Fork sub-watershed and Coal River sub-basin. Within the streams and riparian areas of the project area, over 84 taxa of macroinvertebrates are documented to exist, as well as up to 46 species of reptiles and amphibians, 4 species of crayfish, 5 species of fish and at least one water-dependent bird species.

Construction of valley fills, sediment ponds, and other discharges authorized by DA Permit No. 199800436-3 (Section 10: Coal River) will eliminate the headwater stream ecosystems in Pigeonroost Branch and Oldhouse Branch. The direct impacts to these headwater stream systems, through burial of these diverse and healthy wildlife communities and their habitat, will result in unacceptable adverse effects on wildlife, particularly to macroinvertebrate, amphibian, fish, and water-dependent bird populations. Through the loss of stream macroinvertebrate and salamander communities, there will be, in turn, substantial effects to both aquatic and terrestrial vertebrate populations that rely on these communities as a food source.

In the preamble to EPA's final rules implementing § 404(c), EPA stated "[t]he term 'unacceptable' in EPA's view refers to the significance of the adverse effect -- e.g. is it a large impact and is it one the aquatic and wetland ecosystem cannot afford" (44 FR at 58078). The filling in and complete destruction of the 6.6 miles of streams at issue here is a large impact and clearly adverse to the wildlife that will be buried under thousands of tons of excess spoil. These adverse impacts are particularly large in context of the evidence that these streams are some of the last, rare and important high quality streams in the watershed. That context also leads EPA to the conclusion that this adverse impact is one that the aquatic ecosystem cannot afford. Based on this information, EPA has concluded that the discharges of dredged or fill material to Pigeonroost Branch and Oldhouse Branch as authorized by DA Permit No. 199800436-3 (Section 10: Coal River) will have unacceptable adverse effects on wildlife in Pigeonroost Branch and Oldhouse Branch.

V.D. Unacceptable Adverse Impacts on Wildlife Downstream of the Discharge of Dredged or Fill Material from the Spruce No. 1 Mine

Unacceptable adverse impacts will also occur to wildlife downstream of the footprint of the fills and sediment ponds. These unacceptable adverse impacts will be caused by removing Pigeonroost Branch and Oldhouse Branch as sources of freshwater dilution and converting them to sources of pollution. Water quality downstream of valley fills and in sediment ditches in mined areas is typically degraded due to high concentrations of solutes, primarily because it has percolated through mine spoil. Mine spoil, made up of fragmented mine rocks, has higher rates of rock weathering than bedrock because of its exposure to air and water, and percolation of water through these exposed rocks leads to increased concentrations of solutes, including total dissolved solids and selenium, in downstream receiving waters. In turn, this will adversely affect the delivery of headwater stream ecosystem functions to downstream waters. Studies have shown a strong correlation between the construction of valley fills for surface coal mining in Appalachia and significant adverse impact on downstream macroinvertebrate communities.

EPA believes that the discharges authorized by DA Permit No. 199800436-3 (Section 10: Coal River) into Pigeonroost Branch and Oldhouse Branch will transform those areas into sources of contaminants (particularly TDS and selenium) contributing to degradation of downstream waters. The project as authorized also will create areas of pooled water and increased conductivity, both of which are among the conditions known to be necessary to support harmful blooms of golden algae.

V.D.1. Increases in Pollutants Harmful to Wildlife

This section identifies increased loads of selenium and TDS (measured as conductivity) that are expected to occur as a result of the discharges of coal overburden as authorized and the unacceptable adverse impacts to wildlife that will occur as a result of these increases. These impacts to water chemistry are identified because they will adversely affect the native aquatic and water-dependent wildlife communities in the Spruce Fork watershed as discussed further below.

V.D.1.a. Selenium

Discharges from the Spruce No. 1 Mine Complex project are expected to increase selenium loading to the immediate receiving streams and downstream waters. Selenium (Se) is a naturally occurring chemical element that is an essential micronutrient, but can also have toxic effects following exposure to excessive amounts. For aquatic animals, the concentration range between essential nutrient and toxin is very narrow, being only a few micrograms per liter in water. Adverse impact of selenium residues in aquatic food chains results not just from the direct toxicity to the organisms themselves, but also from the dietary source of selenium these organisms contribute to fish and wildlife species in the food web that feed on them.

Selenium toxicity is primarily manifested as reproductive impairment and birth defects due to maternal transfer, resulting in embryotoxicity and teratogenicity in egg laying vertebrates (e.g., fish and ducks). The most sensitive toxicity endpoints in fish larvae are teratogenic deformities such as skeletal, craniofacial, and fin deformities, and various forms of edema. Embryo mortality and severe development abnormalities can result in impaired recruitment of individuals into populations (Chapman et al. 2009). The State of West Virginia has established a numeric chronic water quality criterion for selenium (5 μg/L four-day average not to be exceeded more than once every three years) to protect in-stream aquatic life. EPA's conclusion that the Spruce 1 Mine as authorized would cause unacceptable adverse effects on wildlife is not dependent on a conclusion that West Virginia's water quality standards will be violated at or downstream of the site. Rather, reference to this water quality standard provides information and context.

In West Virginia, coals that contain the highest selenium concentrations are found in a region of south-central West Virginia where the Allegheny and Upper Kanawha Formations of the Middle Pennsylvanian are mined (WVGES 2002). The WVDEP reports that some of the highest coal selenium concentrations are found in the central portion of the Coal River sub-basin in the immediate vicinity of the Spruce No. 1 Mine where significant active mining and selenium impaired streams are located. Selenium is discharged when selenium-bearing material exposed by surface mining activities comes in contact with water and contaminated water drains from the mining area to surface waters. The sediment ponds that are the usual form of water treatment at mining sites generally are not effective at treating selenium before effluent is discharged from ponds to downstream waters. The coal beds to be targeted by the Spruce No. 1 Mine include 5-Block of the Allegheny Group and down to the Upper Stockton coal bed in the eastern portion of the project area. In the western portion of the project area, the mine plan includes extraction of coal through the Middle Coalburg coal bed. These coal beds are rich in Se as evidenced by Se distribution data in the Spruce No. 1 column (DT0417) provided by the applicant for the NPDES permit application.

Total Maximum Daily Loads to address impairment from elevated concentrations of selenium have been developed for six other streams affected by mining in the Coal River sub-basin. These include nearby White Oak Creek, a tributary to the Coal River, the left Fork of White Oak Creek, Seng Creek, also a tributary to the Coal River; and Casey Creek, James Creek, and Beaver Pond Branch, all tributaries to Pond Fork. These elevated levels of selenium demonstrate that the geology in the vicinity of the Spruce No. 1 Mine will release selenium during mining activities. See Appendices 1 and 4 for further details.

To evaluate the impact of discharges into Pigeonroost Branch and Oldhouse Branch as authorized by the DA permit, EPA has compared selenium levels in Pigeonroost Branch and Oldhouse Branch with selenium levels in waters that have been impacted by the nearby Dal-Tex operation.[13] In addition, EPA has reviewed data from a mining outlet that drains, among other things, discharges from a portion of the Spruce No. 1 Mine that has been constructed in the Seng Camp Creek watershed (Figure 9).

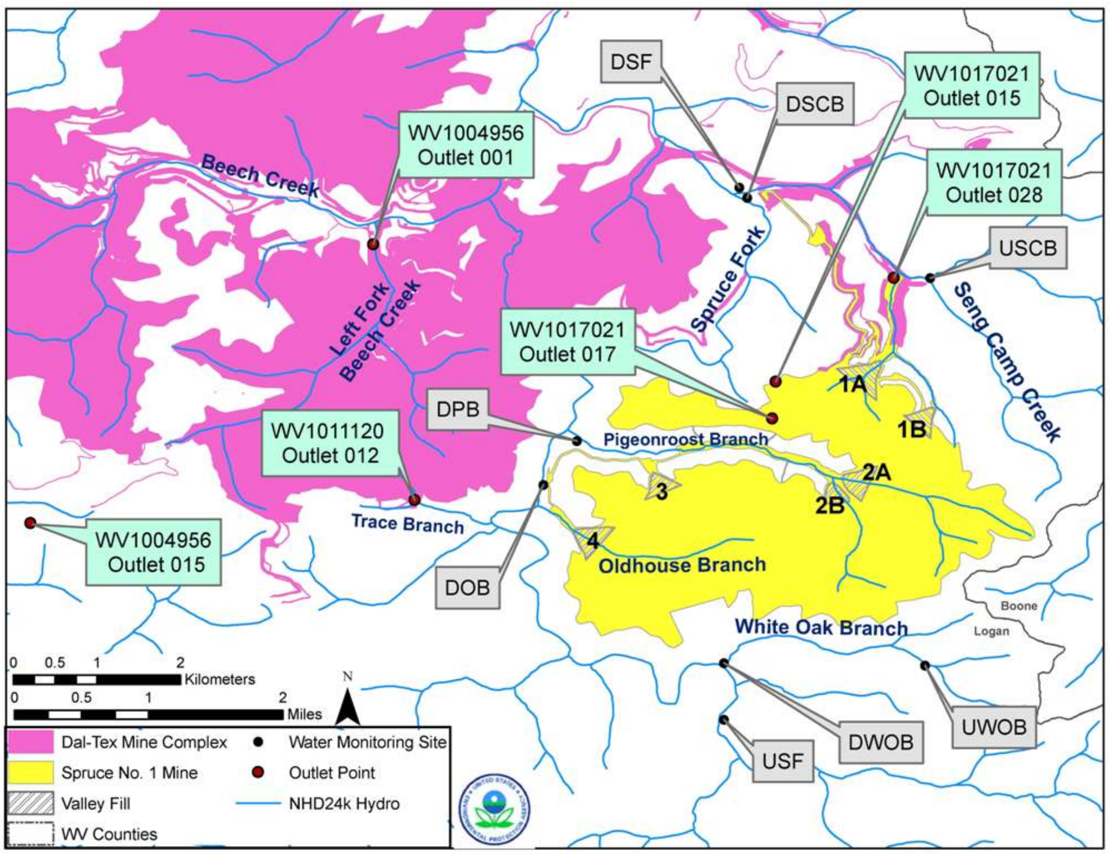

Figure 9. Spruce No. 1 Mine and the Dal-Tex Mine Outlet Locations

[13] Levels of selenium in other nearby waters that have been impacted by surface coal mining activity and generally have similar geology also support a prediction that construction of the Spruce No. 1 Mine as currently authorized will result in elevated levels of selenium in downstream waters.

EPA scientists completed a review of rock cores and corresponding cross sections for the Dal-Tex mines including the Gut Fork mine compared to the Spruce No. 1 Mine. For the most part, the formations are repeated from the Dal-Tex mine complex to the Spruce No. 1 Mine location. Table 8 provides a summary of selenium averages and ranges for Pigeonroost Branch and Oldhouse Branch and streams draining the nearby Dal-Tex operation (Left Fork Beech Creek, Beech Creek, and Trace Branch). The table also contains data for White Oak Branch (upstream of Spruce No. 1 Mine) and Seng Camp Creek (prior to 2007, when the DA permit was issued and filling associated with Spruce No. 1 commenced in that watershed). Summarizing the data in the following table, streams draining the nearby Dal-Tex operation have selenium concentrations in excess of 5 µg/L.

Table 8. Selenium Concentrations (µg/L) near Spruce No. 1 Mine

Stream Name	**Sub-basin**	**Source and time period of data**					
		PEIS (2000-2001)		**WVDEP (2002-2003)**		**WVDEP (2005-2007)**	
		Se (Avg.)	**Se (Range)**	**Se (Avg.)**	**Se (Range)**	**Se (Avg.)**	**Se (Range)**
Average and Range of Se in Tributaries to Spruce Fork that drain Spruce No. 1 Mine area							
White Oak Branch	Spruce Fork	<3 ND		<5 ND		NS	
Oldhouse Branch	Spruce Fork	<3 ND		<5 ND		NS	
Pigeonroost Branch	Spruce Fork	<3 ND		<5 ND		NS	
Seng Camp Creek	Spruce Fork	NS		<5 ND		NS	
Average and Range of Se in Tributaries to Spruce Fork draining Dal-Tex Operation							
Beech Creek[14]	Spruce Fork	7.5	5.6-9.5	6	5.0-9.0	12.3	6.0-22.0
Left Fork of Beech Creek	Spruce Fork	22.7	15.3-31.1	22	5.0-53.0	NS	
Trace Branch	Spruce Fork	NS	NS	7	5.0-10.0	NS	
Rockhouse Branch	Spruce Fork	5.3	3.8-8.0	< 5 ND	< 5 ND	NS	
ND: Se not detected. Detection limit shown. NS: Not sampled. Stream was not sampled for the study shown.							

The data from the Dal-Tex mine complex do not indicate any decrease in selenium concentrations over a period of several years. These data strongly suggest the construction of valley fills and other discharges of dredged or fill material (e.g., associated sediment ponds) from the Spruce No. 1 Mine into Pigeonroost Branch and

[14] In the WVDEP study on selenium bioconcentration factors, selenium was also found in fish tissue in Beech Creek (average 7.55 mg/kg).

Oldhouse Branch will result in elevated levels of selenium in the receiving waters, and lead to degradation of water quality of the receiving and downstream waters. EPA believes such degraded water quality will impact wildlife populations in the receiving and downstream waters, including fish populations.

Graphical trends of selenium concentrations from Discharge Monitoring Report (DMR) records for January 2007 to June 2010 from three outfalls from the Dal-Tex Mine operations demonstrate that the discharges from those outfalls consistently exceed 5 µg/L (Figures 10, 11 and 12).

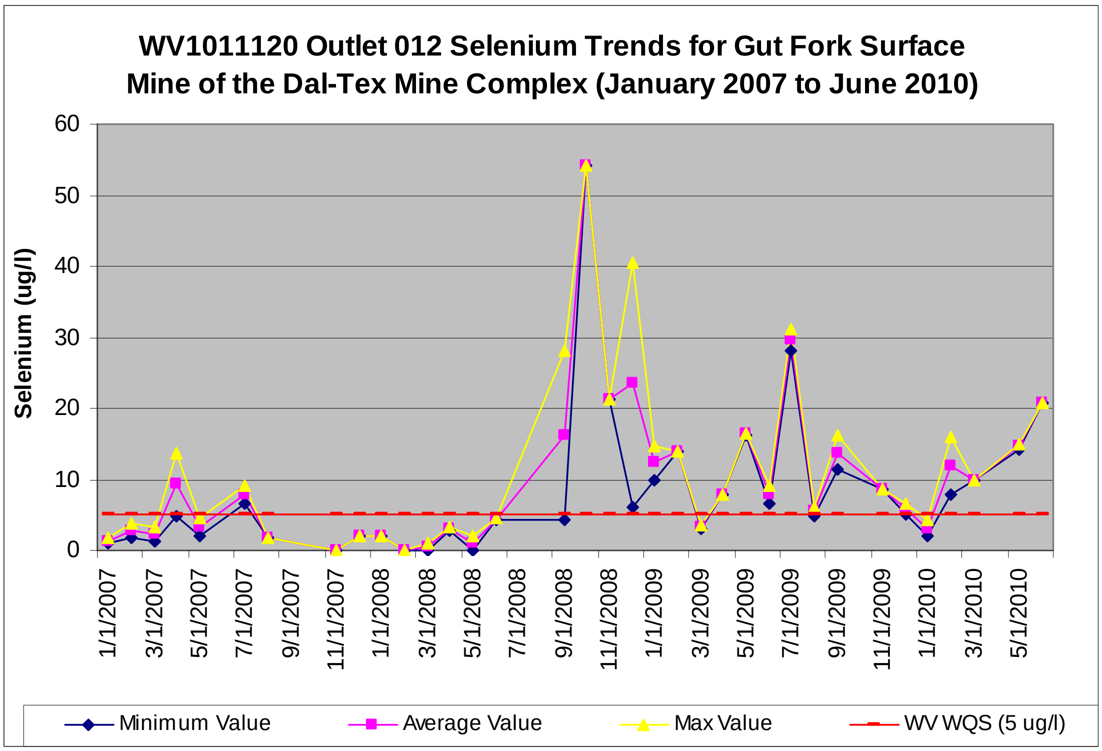

Figure 10. Selenium Trends (January 2007 to June 2010) for NPDES Permit WV1011120 – Outlet 012 (Mingo Logan Coal Company's Gut Fork Surface Mine of the Dal-Tex Mine Complex)

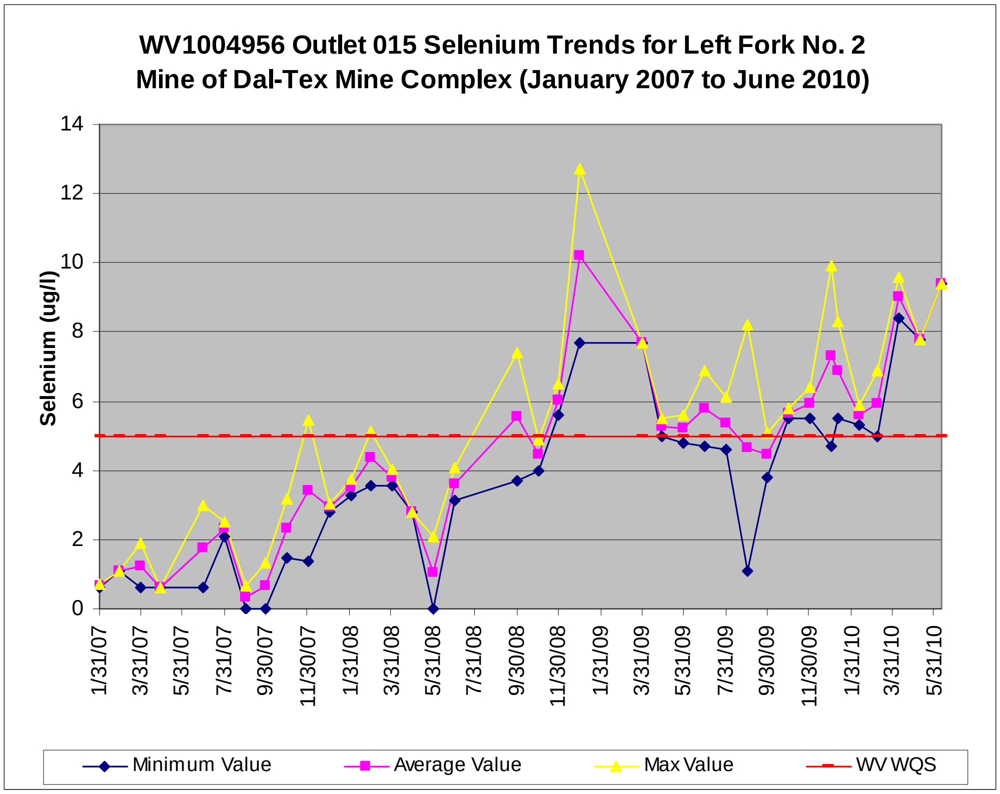

Figure 11. Selenium Trends (January 2007 to June 2010) for NPDES Permit WV1004956 – Outlet 015 (Mingo Logan Coal Company's Left Fork No. 2 Mine of the Dal-Tex Mine Complex)

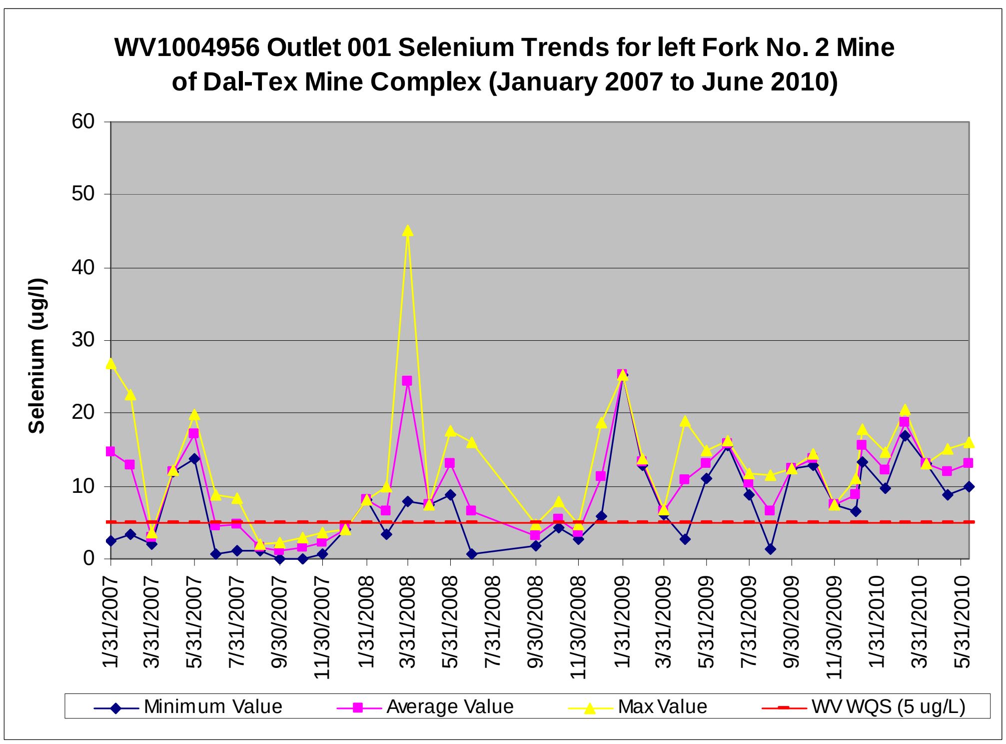

Figure 12. Selenium Trends (January 2007 to June 2010) for NPDES Permit WV1004956 – Outlet 001 (Mingo Logan Coal Company's Left Fork No. 2 Mine of the Dal-Tex Mine Complex)

EPA also reviewed data from the portion of the Spruce No. 1 Mine that is already operational in Seng Camp Creek (Figure 13), including active mining activities in the Right Fork of the Seng Camp Creek sub-watershed. Recent NPDES discharge monitoring reports (DMRs), submitted by the permittee, over a 16-month period (December 2008 to September 2010) show that Outfall 028, which handles, among other things, discharges from Valley Fill 1A, is discharging selenium at average monthly concentrations above 5 µg/L (Table 9, Figure 13).[15] It is also noted that the September 2009 value from Outfall 017 also is elevated. These data support EPA's prediction that construction of valley fills in Pigeonroost Branch and Oldhouse Branch will result in discharges of elevated levels of selenium.

Table 9. Total Recoverable Selenium (µg/L) for Outfalls 015, 017 and 028 for NPDES Permit WV1017021, Mingo Logan Coal Company Spruce No. 1 Mine. Note: Shaded areas indicate selenium concentrations exceeding 5 µg/L.

Site Code	Site Location	Report Date	Min Value	Avg. value	Max value
015	Outlet 015	12/31/2008	0.00	0.00	0.00
017	Outlet 017	12/31/2008	0.00	0.00	0.00
017	Outlet 017	9/30/2009	19.20	19.20	19.20
028	Outlet 028	12/31/2008	5.70	5.70	5.70
028	Outlet 028	1/31/2009	9.80	9.80	9.80
028	Outlet 028	2/28/2009	3.90	3.90	3.90
028	Outlet 028	3/31/2009	0.60	1.00	1.40
028	Outlet 028	4/30/2009	1.70	1.70	1.70
028	Outlet 028	5/31/2009	2.50	2.50	2.50
028	Outlet 028	6/30/2009	3.20	3.30	3.40
028	Outlet 028	8/31/2009	1.25	3.48	5.70
028	Outlet 028	9/30/2009	4.60	6.05	7.50
028	Outlet 028	10/31/2009	3.00	3.00	3.00
028	Outlet 028	11/30/2009	1.40	1.85	2.30
028	Outlet 028	12/31/2009	1.80	1.85	1.90
028	Outlet 028	1/31/2010	3.40	3.80	4.20
028	Outlet 028	2/28/2010	3.80	4.50	5.20
028	Outlet 028	3/31/2010	4.70	6.10	7.50
028	Outlet 028	4/30/2010	3.8	4.40	5.00
028	Outlet 028	5/31/2010	4.70	7.60	10.50
028	Outlet 028	6/30/2010	11.40	11.50	11.60
028	Outlet 028	7/31/2010	6.40	8.50	10.40
028	Outlet 028	8/31/2010	4.80	10.65	14.80
028	Outlet 028	9/30/2010	4.80	9.40	11.00

[15] While Outfall 028 receives discharges from other portions of the site, it handles the discharges from valley fill 1A. EPA notes that WVDEP sampling from 2002-2003 (prior to construction of Spruce No. 1 Mine in Seng Camp Creek) found selenium levels in Seng Camp Creek to be below detection levels.

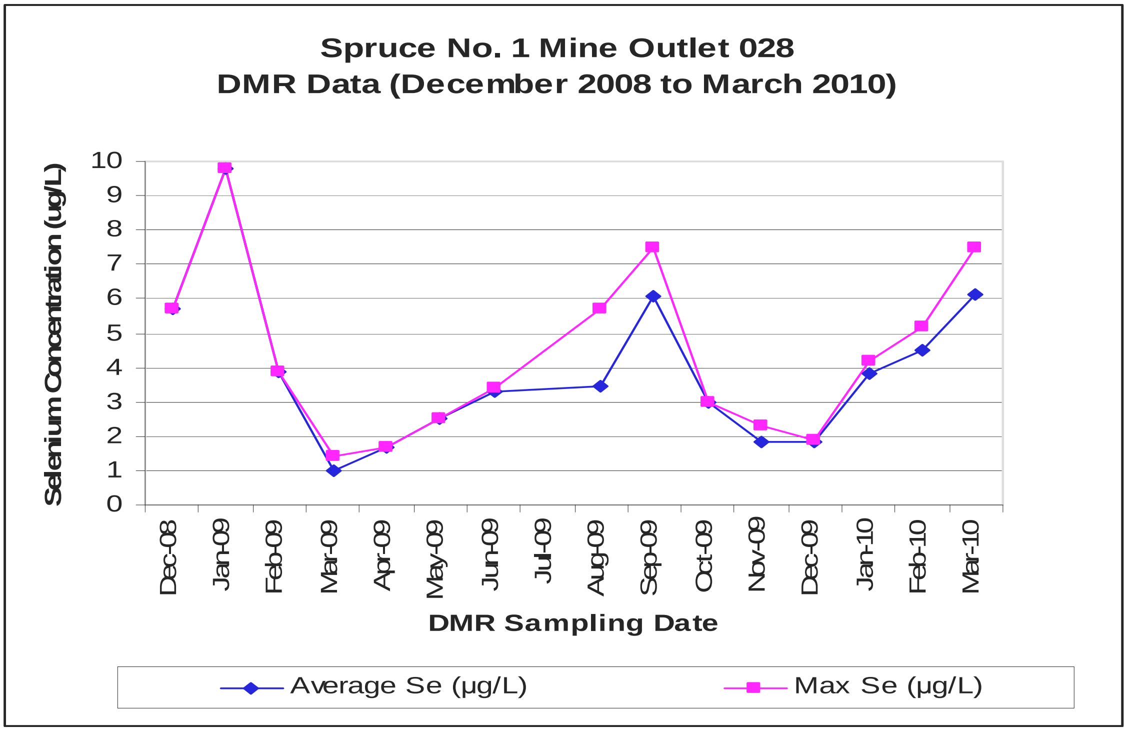

Figure 13. Selenium concentrations in discharge from outlet 028.

In addition to discharges of elevated concentrations of selenium, the project also will have the effect of increasing selenium concentrations in downstream waters by removing Pigeonroost Branch and Oldhouse Branch as sources of dilution that moderate downstream selenium concentrations. EPA evaluated the in-stream DMR monitoring data from December 2008 to March 2010 from several ambient monitoring stations associated with the Spruce No. 1 mine as authorized project: Stations DSCB (Downstream Seng Camp Creek, located at the mouth of Seng Camp Creek), USCB (Upstream Seng Camp Creek), USF (Upstream Spruce Fork), DSF (Downstream Spruce Fork, located downstream of Seng Camp Branch), DPB (downstream Pigeonroost Branch, at mouth of Pigeonroost Branch) and DOB (Downstream Oldhouse Branch, at mouth of Oldhouse Branch). As explained below, this analysis shows that Pigeonroost Branch and Oldhouse Branch are providing dilution that is helping to maintain reduced selenium concentrations in Spruce Fork.

The Spruce Fork watershed upstream of Pigeonroost Branch and Oldhouse Branch (Station USF) has average monthly selenium concentrations ranging from 0.9 µg/L to 10.90 µg/L (August 2010), with nine monthly average concentrations greater than 5 µg/L based on the in-stream DMR data for the December 2008 to September 2010 time period. It should be noted that the last 6 months of available DMR data (April 2010 to September 2010) for USF had monthly selenium concentrations above the 5 µg/L potentially indicating new selenium contamination sources. The downstream Spruce Fork (DSF) site has concentrations that are significantly lower, and does not have any average monthly selenium concentrations above 5 µg/L, with the highest monthly average selenium concentration during the time period (December 2008 to September 2010) being 2.50 µg/L (May 2010). This suggests that Pigeonroost Branch and Oldhouse

Branch (along with other tributaries that enter Spruce Fork between the monitoring stations) provide clean dilution water to the main stem of Spruce Fork. This conclusion is supported by the very low levels of selenium in Pigeonroost Branch and Oldhouse Branch. During the same December 2008 to September 2010 time frame, the DMR reports indicate almost all of the average monthly selenium measurements at both Pigeonroost Branch and Oldhouse Branch were below the detection limit of 0.6 µg/L. The single detection of selenium during the time period in Oldhouse Branch was 0.9 µg/L during July 2009 (a maximum value). All monthly average selenium concentrations in Pigeonroost Branch were below the detection limit from December 2008 through June 2010 except the monthly average in August 2009 which had a value of 1.3 µg/L (maximum value was 1.9 µg/L). However, the monthly average selenium concentrations for the July 2010 to September 2010 time period documented a developing selenium problem in Pigeonroost Branch. The monthly average selenium concentration in July 2010 was 2.7 µg/L, August 2010 was 2.6 µg/L and September 2010 was 1.4 µg/L.

By way of example, the average monthly selenium concentration at the USF monitoring location for the month of April 2010 is reported on the DMR as 10.60 µg/L. The average monthly concentration at the DSF location for April 2010 is reported on the DMR as 0.90 µg/L. For April 2010, the DMR reports average monthly selenium concentrations at Pigeonroost Branch and Oldhouse Branch as below the detection level of 0.60 µg/L. While Pigeonroost Branch and Oldhouse Branch are not the only contributing tributaries between the USF and DSF stations, this data strongly suggests that they are contributing dilution.

In summary, water quality from streams and discharges draining both the Dal-Tex Mine Complex and the current operational portions of the Spruce No. 1 Mine confirm EPA's concern that the Spruce No. 1 Mine, if constructed as authorized, would contribute additional loads of selenium to downstream waters at concentrations that, as a monthly average, will exceed 5 µg/L.

V.D.1.b. Total Dissolved Solids

To understand the water quality impacts from increased total dissolved solids (TDS), it is helpful to understand the relationship between salinity, TDS, and specific conductivity. For purposes of this action, when this document discusses increased conductivity or TDS, it refers to an increase in salinity in otherwise dilute freshwater, an increase that is inconsistent with background levels in central Appalachian streams.

Salinity is the amount of dissolved salt in a given body of water. TDS is a measure of the combined content of all inorganic and organic substances contained in a solution in molecular, ionized or micro-granular (colloidal) suspended form and is normally reported in the unit mg/l. Because the majority of TDS in many waters consist primarily of salts, salinity effectively reflects the amount of TDS in water.

Salinity is often expressed in terms of specific conductivity (hereafter referred to as conductivity). Conductivity is the ability of a solution to carry an electric current at a specific temperature (normally 25º C) and is normally reported as microsiemens per centimeter (µS/cm). Whereas "salinity" refers to the environmental property that is being measured, "conductivity" refers to the *measure* of salinity. Conductivity and TDS both increase as the concentration of ions in a solution increase and are very strongly correlated. Conductivity itself is not a pollutant, but is an excellent indicator of the total concentration of all ions, and is typically reported by state and federal monitoring agencies because it is an instantaneous measurement that can be collected in situ with a meter, does not require a laboratory analysis, and is precise and accurate.

Data from the WVDEP indicate that average conductivity values for Pigeonroost Branch and Oldhouse Branch are very low and are consistent with dilute background conditions in central Appalachian headwater streams. Construction of valley fills and other discharges of dredged or fill material from the Spruce No. 1 Mine into Pigeonroost Branch and Oldhouse Branch will cause an increase in conductivity and TDS in those receiving waters downstream of such discharges. These discharges will have two effects: first, they will eliminate Pigeonroost Branch and Oldhouse Branch as sources of freshwater dilution to downstream waters, including Spruce Fork; and second, they will transform Pigeonroost Branch and Oldhouse Branch into sources of increased conductivity and TDS to downstream waters. Sediment ponds, which are a typical form of water treatment for surface coal mines, appear to be ineffective in removing TDS and decreasing conductivity. For example, average conductivity and sulfate levels are highly elevated in other tributaries to Spruce Fork where historical mining has occurred compared with Pigeonroost Branch and Oldhouse Branch (Table 10) (see Appendix 1).

Table 10. Average conductivity and sulfate values for streams in project area

Stream	**Conductivity Values (µS/cm)**	**Sulfate Values (mg/l)**
Rockhouse Creek	1012	407
Left Fork of Beech Creek	2426	1019
Beech Creek	1432	557
Trace Branch	971	569
Oldhouse Branch	90	28
Pigeonroost Branch	199	99

Average conductivity and sulfate concentrations in the main stem of Spruce Fork into which Pigeonroost Branch and Oldhouse Branch flow are elevated to as much as ten times above natural background levels in Oldhouse Branch. Average conductivity at almost every monitoring site on the main stem Spruce Fork exceeded 500 µS/cm. Only one site had an average conductivity of less than 500 µS/cm, which was located upstream of the project area, upstream of Adkins Fork, and southeast of Blair, WV.

EPA expects that these additional conductivity increases will have significant adverse effects on native aquatic macroinvertebrates and other wildlife that are not tolerant to increased conductivity. Invertebrate health depends upon an organism's ability to maintain certain concentrations of ions in their blood and tissues, which they pull from the water via specialized cells on their gills and body surfaces and lose through defecation/urination and diffusion. Native headwater invertebrates are adapted to streams with low dissolved solids (i.e., conductivity). In Central Appalachian surface coal mining, the ionic mixture emanating from valley fills is fairly predictable, and tends to be alkaline or circumneutral (pH 5.5-7.4), have highly elevated concentrations of four major ions (SO_4, HCO_3, Mg, Ca) and have only slightly elevated concentrations of K, Na, and Cl. Elevated levels of ions can be individually toxic, but mixtures of these ions can be more toxic than the individual ions, since more than one ion is a potential toxicant. Elevated ion concentrations can also create a general osmoregulatory stress on organisms that are adapted to environments with low dissolved solids (i.e., conductivity) (Pond et al. 2008). Elevated conductivity can have a toxic effect because the ions, regardless of type, can overwhelm the respiratory system and other physiological processes leading to impaired breathing, dehydration, and decreased survival or reproduction. Thus, native Appalachian taxa adapted to naturally dilute streams can be harmed by elevated conductivity for these physiological reasons. See Appendix 1 for further detail on water quality and wildlife.

EPA modeled post-mining conductivity levels in Spruce Fork downstream of the project area using a watershed area weighted deterministic model with two post-mining average (500 and 1000 µS/cm) and maximum (1000 and 1500 µS/cm) conductivity values for Oldhouse Branch, Pigeonroost Branch and Seng Camp Creek. These values likely underestimate the post-mining conductivity values. For example, when compared to Left Fork Beech Creek, which is completely mined and filled, the average and maximum conductivity values are 2425 and 3000 µS/cm respectively. In Beech Creek, which is partially mined and filled, the respective average and maximum conductivity values are 1432 and 1776 µS/cm based on 2002-2003 WVDEP data. In every case, since the measured average and maximum conductivity levels in Spruce Fork are currently greater than 500 µS/cm pre-mining, the modeled post-mining conductivity values are also greater than 500 µS/cm. When using the maximum post-mining values identified above, EPA predicts that average conductivity in Spruce Fork downstream of Seng Camp Creek could increase from 552 µS/cm pre-mining to 748 µS/cm post-mining and maximum conductivity could increase from 960 µS/cm pre-mining to 1228 µS/cm post-mining.

Thus, EPA has determined that that the construction of the Spruce No. 1 Mine will cause changes to water quality downstream of the mine site, particularly with regard to selenium and total dissolved solids. The following subsections discuss the adverse impacts on specific fauna caused by these changes in water quality.

V.D.2. Macroinvertebrates

Construction of valley fills and other discharges of dredged or fill material authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch will impact the native macroinvertebrate community downstream of the fill due to adverse changes in water quality. These adverse changes, such as increased selenium and conductivity, will result in subsequent changes in the aquatic community. Sensitive species of mayflies, stoneflies, and caddisflies currently inhabiting downstream waters will be extirpated following increasing chemical loading of contaminants, and the remaining taxa will likely serve as vectors for selenium bioaccumulation in higher trophic levels. Vertebrates dependent upon macroinvertebrates as a food source, including salamanders, fish, birds and bats, will be subsequently affected, not only by the bioaccumulation of selenium, but also by the reduction in prey availability. Additionally, shifts in macroinvertebrate communities will likely affect important stream ecosystem functions, including organic matter breakdown (Fritz et al. 2010).

V.D.2.a. Impacts Due to Changes in Water Chemistry

Construction of valley fills and other discharges of dredged or fill material associated with the Spruce No. 1 Mine into Pigeonroost Branch and Oldhouse Branch will result in altered and degraded macroinvertebrate communities in downstream environments (Appendix 2). The downstream effects of mining on macroinvertebrate communities include non-lethal effects and bioaccumulation of selenium, and extirpation of native, sensitive taxa. These effects can be significant, and are largely influenced by degraded water quality conditions downstream of valley fills. If the Spruce No. 1 Mine is constructed as authorized, these effects will occur in the receiving waters, including the unfilled portions of Pigeonroost Branch and Oldhouse Branch, and also further downstream in Spruce Fork. This conclusion is supported by numerous peer-reviewed studies, as well as empirical data collected and analyzed for the PEIS and permit application and discussed below.

Although there is little research on the direct effects of increased selenium loading on aquatic macroinvertebrates, some studies indicate the potential for macroinvertebrate populations to be adversely affected by selenium, even at concentrations below water quality thresholds established to protect fish and bird populations. For example, a review by Debruyn and Chapman (2007) found that the range of selenium water quality thresholds established to protect higher trophic levels consuming selenium-contaminated invertebrates could, in some cases, have substantial toxic effects on invertebrates, including reduced growth, reduced abundance, and mortality. Similarly, this review estimated that sublethal toxic effects can be associated with a range of water concentrations of 1-30 μg Se/L, which is consistent with experimental studies that found that some macroinvertebrate taxa exhibited approximately 50% reduction in abundance at Se water concentrations in the range of 5-10 μg Se/L. The remaining individuals that do survive accumulate the contaminants, thus exposing higher trophic levels (e.g., fish and amphibians) to concentrations that have the potential to cause population-level effects. Both the lethal and non-lethal effects on macroinvertebrate prey will result in significant impacts to higher trophic level organisms and food webs in the downstream ecosystem.

As outlined in Section V.D.1.b above, construction of valley fills and other discharges from the Spruce No. 1 Mine into Pigeonroost Branch and Oldhouse Branch will cause an increase in salinity and TDS in receiving waters immediately downstream of valley fills. Bryant et al. (2002) found substantially higher average measurements of alkalinity, calcium, sulfate and total dissolved solids in nearby streams affected by mining than in streams unaffected by mining streams in the Spruce No. 1 project area. Increased concentrations of TDS can have significant implications for native wildlife. While many of the elements that comprise mineral salts are essential nutrients, aquatic organisms are adapted to specific ranges of salinity and experience toxic effects from excess salinity.

Due to the sensitivity of native macroinvertebrate wildlife to elevated and increasing levels of conductivity, the predicted levels of these contaminants will have significant adverse effects on these biological communities. While changes in community composition downstream of mined sites are likely due to a combination of factors, it is likely that water quality changes, including water quality degradation from valley fills and in-stream mining impoundments, are the primary cause of aquatic life impacts below valley fills (Appendix 2). EPA's draft report, *A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams* (USEPA 2010a), also recognizes stream aquatic life impacts associated with conductivity, concluding that impacts to the biological community can occur at conductivity levels as low as 300 μS/cm.

The effects of mining on macroinvertebrate communities are evident when comparing the least-disturbed streams in the project area (Oldhouse Branch and Pigeonroost Branch) with nearby streams directly affected by valley fills (Beech Creek and Left Fork Beech Creek). Collectively, Pigeonroost Branch and Oldhouse Branch support 84 unique macroinvertebrate genera, in contrast with Beech Creek and Left Fork Beech Creek, which only support 56 unique macroinvertebrate genera. Additionally, many Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly) genera (collectively known as EPT taxa)[16] were extirpated from these nearby streams affected by mining (Table 11). Pigeonroost Branch and Oldhouse Branch support 42 EPT genera (14 mayfly genera, 12 stonefly genera and 14 caddisfly genera), in contrast with Beech Creek and Left Fork Beech Creek, which only support 12 EPT genera (2 mayfly genera, 3 stonefly genera, and 7 caddisfly genera).

At Beech Fork and Left Fork Beech Fork, in addition to the presence of relatively pollution-tolerant mayfly and stonefly genera, there were also several tolerant taxa that were not found in the Spruce project area. These taxa, which are indicative of altered environmental conditions (i.e., atypical of Appalachian headwater streams), include highly tolerant snails (Lymnaeidae, *Physella*, *Helisoma*), as well as other tolerant beetles and fly larvae (Table 11). Similar patterns of taxonomic loss were observed at 20 other West Virginia sites downstream of valley fills when conductivity was greater than 500 μS/cm (Pond et al. 2008) and in the eastern Kentucky coalfields (Pond 2010), and it is likely that these effects on wildlife taxa and their habitat will occur following the Spruce No. 1 Mine operations (Appendix 2).

[16] EPA focused on genus-level taxa richness (i.e., the number of genera) of Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) taxa (EPT taxa), as it can be used to detect shifts in community composition and extirpation of sensitive taxa (Appendix A2.7).

Table 11. Comparison of macroinvertebrate taxa identified on the Spruce No. 1 Mine site and Dal-Tex site.

			Oldhouse +Pigeonroost	Beech + Left Fork Beech
Order	**Family**	**Genus**	**Spruce No. 1 Mine**	**Dal-Tex Mine**
Oligochaeta	Oligochaeta	Oligochaeta	X	X
Nematoda	Nematoda	Nematoda		X
Proseriataoela	Plagiostomidae	*Hydrolimax*	X	
Tricladida	Planariidae	Planariidae	X	
Basommatophora	Lymnaeidae	Lymnaeidae		X
Basommatophora	Physidae	Physella		X
Basommatophora	Planorbidae	*Helisoma*		X
Coleoptera	Dryopidae	*Helichus*	X	
Coleoptera	Elmidae	*Dubiraphia*		X
Coleoptera	Elmidae	*Macronychus*		X
Coleoptera	Elmidae	*Microcylloepus*		X
Coleoptera	Elmidae	*Optioservus*	X	X
Coleoptera	Elmidae	*Oulimnius*	X	X
Coleoptera	Psephenidae	*Ectopria*	X	
Coleoptera	Psephenidae	*Psephenus*	X	X
Decapoda	Cambaridae	*Cambarus*	X	
Diptera	Ceratopogonidae	*Atrichopogon*		X
Diptera	Ceratopogonidae	*Bezzia/Palpomyia*	X	X
Diptera	Ceratopogonidae	*Dasyhelea*	X	X
Diptera	Chironomidae	*Acricotopus*		X
Diptera	Chironomidae	*Chaetocladius*	X	X
Diptera	Chironomidae	*Corynoneura*	X	X
Diptera	Chironomidae	*Cricotopus*	X	X
Diptera	Chironomidae	*Diamesa*	X	X
Diptera	Chironomidae	*Eukiefferiella*	X	X
Diptera	Chironomidae	*Metriocnemus*		X
Diptera	Chironomidae	*Micropsectra*	X	X
Diptera	Chironomidae	*Microtendipes*	X	
Diptera	Chironomidae	*Orthocladius*	X	X
Diptera	Chironomidae	*Parachaetocladius*	X	
Diptera	Chironomidae	*Parametriocnemus*	X	X
Diptera	Chironomidae	*Paraphaenocladius*		X
Diptera	Chironomidae	*Paratanytarsus*		X
Diptera	Chironomidae	*Polypedilum*	X	X
Diptera	Chironomidae	*Rheotanytarsus*	X	X
Diptera	Chironomidae	*Smittia*		X
Diptera	Chironomidae	*Stempellinella*	X	
Diptera	Chironomidae	*Stenochironomus*		X
Diptera	Chironomidae	*Stilocladius*	X	
Diptera	Chironomidae	*Sympotthastia*	X	
Diptera	Chironomidae	*Tanytarsus*	X	
Diptera	Chironomidae	*Thienemanniella*		X
Diptera	Chironomidae	*Thienemannimyia*	X	X
Diptera	Chironomidae	*Tvetenia*	X	X
Diptera	Chironomidae	*Zavrelimyia*	X	
Diptera	Empididae	*Chelifera/Metachela*	X	X
Diptera	Empididae	*Clinocera*	X	
Diptera	Empididae	*Hemerodromia*		X
Diptera	Simuliidae	*Prosimulium*	X	
Diptera	Simuliidae	*Simulium*	X	X

Diptera	Tabanidae	Tabanidae		X
Diptera	Tipulidae	*Antocha*		X
Diptera	Tipulidae	*Cryptolabis*	X	
Diptera	Tipulidae	*Dicranota*	X	
Diptera	Tipulidae	*Hexatoma*	X	
Diptera	Tipulidae	*Limnophila*	X	
Diptera	Tipulidae	*Limonia*	X	X
Diptera	Tipulidae	*Pseudolimnophila*	X	
Diptera	Tipulidae	*Tipula*	X	X
Ephemeroptera	Ameletidae	*Ameletus*	X	
Ephemeroptera	Baetidae	*Acentrella*	X	
Ephemeroptera	Baetidae	*Baetis*	X	X
Ephemeroptera	Baetiscidae	*Baetisca*	X	
Ephemeroptera	Ephemerellidae	*Drunella*	X	
Ephemeroptera	Ephemerellidae	*Ephemerella*	X	
Ephemeroptera	Ephemerellidae	*Eurylophella*	X	
Ephemeroptera	Ephemeridae	*Ephemera*	X	
Ephemeroptera	Heptageniidae	*Cinygmula*	X	
Ephemeroptera	Heptageniidae	*Epeorus*	X	
Ephemeroptera	Heptageniidae	*Stenacron*	X	
Ephemeroptera	Heptageniidae	*Maccaffertium/ Stenonema*	X	
Ephemeroptera	Isonychiidae	*Isonychia*	X	X
Ephemeroptera	Leptophlebiidae	*Paraleptophlebia*	X	
Megaloptera	Corydalidae	*Corydalus*		X
Megaloptera	Corydalidae	*Nigronia*	X	X
Odonata	Aeshnidae	*Boyeria*		X
Odonata	Gomphidae	*Lanthus*	X	X
Plecoptera	Capniidae	Capniidae	X	
Plecoptera	Chloroperlidae	*Haploperla*	X	
Plecoptera	Leuctridae	*Leuctra*	X	
Plecoptera	Nemouridae	*Amphinemura*	X	X
Plecoptera	Nemouridae	*Ostrocerca*	X	
Plecoptera	Nemouridae	*Prostoia*		X
Plecoptera	Peltoperlidae	*Peltoperla*	X	
Plecoptera	Perlidae	*Acroneuria*	X	
Plecoptera	Perlodidae	*Isoperla*	X	
Plecoptera	Perlodidae	*Remenus*	X	
Plecoptera	Perlodidae	*Yugus*	X	
Plecoptera	Pteronarcyidae	*Pteronarcys*	X	
Plecoptera	Taeniopterygidae	*Taenionema*	X	
Plecoptera	Taeniopterygidae	*Taeniopteryx*	X	X
Trichoptera	Glossosomatidae	*Agapetus*	X	
Trichoptera	Glossosomatidae	*Glossosoma*	X	
Trichoptera	Goeridae	*Goera*	X	
Trichoptera	Hydropsychidae	*Ceratopsyche*	X	
Trichoptera	Hydropsychidae	*Cheumatopsyche*	X	X
Trichoptera	Hydropsychidae	*Diplectrona*	X	X
Trichoptera	Hydropsychidae	*Hydropsyche*	X	X
Trichoptera	Hydroptilidae	*Hydroptila*		X
Trichoptera	Limnephilidae	*Pycnopsyche/ Hydatophylax*	X	
Trichoptera	Philopotamidae	*Chimarra*	X	X
Trichoptera	Philopotamidae	*Dolophilodes*	X	
Trichoptera	Polycentropodidae	*Polycentropus*	X	
Trichoptera	Psychomyiidae	*Psychomyia*	X	X
Trichoptera	Rhyacophilidae	*Rhyacophila*	X	X

Trichoptera	Uenoidae	*Neophylax*	X	
		Total Distinct Taxa	**84**	**56**
		Total EPT Taxa	**42**	**12**

In order to support the determination that unacceptable adverse effects will occur downstream, EPA applied an accepted and peer reviewed approach, called an Observed/Expected index (O/E), where O/E ratios represent the number of the expected taxa that are observed in a sample (O), compared to the number of taxa expected in the sample (E), after predicting the probability that a sample site is a member of one or more fixed sets of reference site types (Hawkins 2006a, Van Sickle 2005) (Figure 14). This method uses a suite of regional reference sites to determine the number of expected taxa; and deviation from this number can be used to identify an degradation threshold (see Appendix 2 for detailed methods and results). A site that is a perfect match to the reference site O/E scores will score 1.0, while downward deviation from 1.0 indicates loss of expected taxa compared to regional reference (e.g., a score of 0.50 indicates a 50% loss of the expected taxa). Upward deviation (greater than 1.0) indicates that more taxa were collected than expected. EPA chose the 5th percentile of reference site O/E scores as a degradation threshold to correspond to the WVDEP's bioassessment threshold for aquatic life use impairment. This O/E 5th percentile was 0.64, indicating a loss of 36% of expected taxa would indicate degradation of the in-stream biota.

Based upon the O/E index, EPA found that the macroinvertebrate assemblages in Pigeonroost Branch, Oldhouse Branch and the upstream White Oak Branch are comparable to the regional reference sites, while nearby streams affected by valley fills (Dal-Tex sites) were well below the degradation threshold (O/E less than 0.64) (Table 12). Mean scores for the Dal-Tex sites were 0.26 in the summer and 0.32 in the spring, indicating they support, on average, 74% and 68% less taxa, respectively, than the regional reference sites. Thus, past mining has led to the estimated extirpation of ~70% of the native expected taxa in the adjacent Dal-Tex Mine operation.

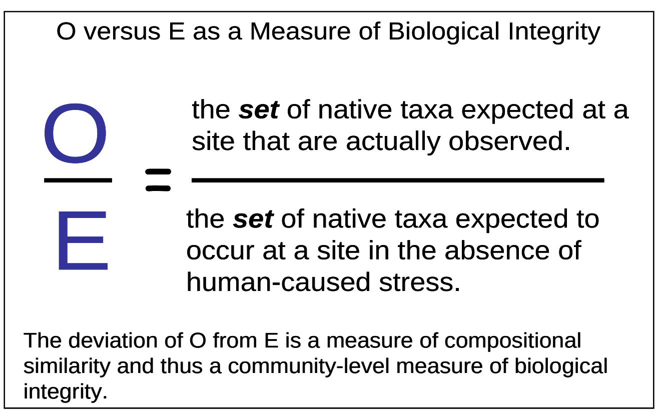

Figure 14. Measure of biological integrity; Observed vs. Expected (C.P. Hawkins, Utah State Univ.)

Extirpation of macroinvertebrate taxa, documented by the O/E index, is largely caused by water quality degradation. Using the regional reference sites and genus-level data from Pond et al. (2008), O/E scores showed a negative correlation with conductivity (R^2=0.63). Water quality degradation caused by elevated conductivity explained more than twice the variance in O/E scores than did Rapid Bioassessment Protocol (RBP) habitat scores (R^2=0.28), confirming that conductivity is an excellent predictor of native taxa loss from Appalachian streams. Sediment deposition, substrate embeddedness, channel alteration, riparian zone width, pH, or temperature had no significant influence on O/E scores (see Appendix 2).

Table 12. Summary of West Virginia O/E null model results for the Spruce No. 1 Mine area. The biological degradation threshold is 0.64 (corresponding to the 5th percentile of WVDEP reference site distributions).

Mean (Standard Deviation) O/E			
	Spruce No. 1 Mine	**Dal-Tex**	
	Pigeonroost Branch, Oldhouse Branch, White Oak Branch	Beech Creek, Left Fork Beech Creek	Rockhouse
Spring	0.98 (0.20); n=9	0.26 (0.06); n=5	0.31 (0.10); n=3
Summer	0.85 (0.15); n=2	0.32 (0.08); n=2	0.38 (0.08); n=2

To provide additional support that aquatic life use degradation occur downstream of valley fills and that these impairments result from water quality degradation, streams that are affected by mining were compared to streams that are not affected by mining using the West Virginia Stream Condition Index (WVSCI), WVDEP's family-level multi metric index (see Appendix 2 for detailed methods and results). Currently, the WVDEP uses WVSCI index scores greater than 68 to indicate streams fully supportive of the aquatic life use.[17] Streams unaffected by mining within and near the project area, including White Oak Branch, Oldhouse Branch and Pigeonroost Branch, generally scored above the 68 threshold index value, indicating they are high quality streams that fully support the aquatic life use (see Appendix 2). The streams located in the historically mountaintop mined areas with valley fills located nearby (Rockhouse Branch, Beech Creek, and the Left Fork of Beech Creek) generally scored below the 68 threshold index value, indicating they do not fully support aquatic life use.

In Pond et al. (2008) elevated conductivity greater than 500 µS/cm caused by alkaline mine effluents was strongly associated with high probability of degradation of native biota, and 17 of the 20 mined study sites (85%) did not fully support aquatic life, based upon the family-level WVSCI index. In addition, WVDEP ambient monitoring macroinvertebrate data from the Cumberland Mountains of the Central Appalachians subecoregion, the subecoregion where the project is located, were analyzed to determine the potential effects of elevated conductivity levels on aquatic life use. When conductivity levels were elevated above 500 µS/cm, the analysis showed that a majority of the sites were not fully supportive of aquatic life use, even when accounting for the possible confounding effects of acidic pH and habitat degradation. For example, after removing low pH sites, only 100 sites out of 417 sites attained WVSCI scores greater than 68 when conductivity levels were greater than 500 µS/cm (76% of the sites reflected WVSCI scores less than 68). When the potential confounding effect of habitat

[17] This score represents the lower 5th percentile of the range of scores of the 107 reference site scores used in the 2000 report (Gerritsen et al. 2000). As noted elsewhere, in its 2008 Section 303(d) List, WVDEP identified a WVSCI score of 68 as the lowest score at which a waterbody was considered to "fully support" aquatic life. A score of less than 68 indicates degradation of the aquatic life use.

degradation was completely removed (this subset includes only sites with Rapid Bioassessment Protocol habitat scores greater than 140, indicating reference quality habitat), 62% of the sites still had WVSCI scores less than 68.

In addition to changes in community structure and loss of sensitive taxa, functional feeding group composition (based on WVDEP group designations) is also significantly altered below mountaintop mining operations with valley fills. An analysis of functional feeding groups revealed categorical dose-response for unmined, low (<500), medium (500-1000), and high (>1000) conductivity (Table 13; data from Pond et al. 2008). Functional feeding group relative abundance of scrapers (herbivorous grazers) and functional feeding group richness for scrapers, shredders, and collector-gatherers was higher at unmined sites and declined with increasing conductivity category, while the relative abundance of collector-filterers increased. In a comparison of sites with conductivity <500 µS/cm (n=17) to sites with conductivity >500 µS/cm (n=20), there were significant alterations of trophic composition, with increased %collector-filterer abundance and declines in genus-level scraper richness, shredder richness, collector-gatherer richness and %scraper abundance at sites with higher conductivity (Table 13). Further, several functional feeding group metrics were strongly correlated to specific conductance (Table 13).

Table 13. Mean richness and relative abundance of functional feeding groups among conductivity categories (data from Pond et al. 2008). Additional comparisons of sites (<500 µS/cm and >500 µS/cm) include P-values for Mann-Whitney U-tests shown. Spearman correlations of FFGs with conductivity are also shown. Bold values are significant (p<0.05).

FFG (Richness)	Unmined	Low	Medium	High	Combined Unmined + Mined (low)	Combined Mined (Medium+ High)	Mann-Whitney U-test	*P*	Correlation to Conductivity: Spearman *r*
# Scraper Genera	**7.4**	**5.0**	**2.1**	**0.9**	**6.4**	**1.4**	**333.5**	**0.000**	**-0.85**
# Shredder Genera	**4.5**	**3.4**	**2.0**	**2.0**	**4.1**	**2.6**	**244.0**	**0.021**	**-0.50**
# Coll-Gatherer Genera	**10.5**	**9.1**	**7.3**	**7.3**	**9.9**	**7.9**	**240.0**	**0.031**	**-0.48**
# Coll-Filterer Genera	3.0	4.7	3.6	3.6	3.7	3.9	143.0	0.389	0.10
# Predator Genera	7.2	4.7	3.7	3.7	6.2	4.3	232.0	0.057	**-0.44**
# Piercer-Herb Genera	0.1	0.0	0.0	0.1	0.1	0.1	171.5	0.907	-0.03

FFG (Rel. Abundance)	Unmined	Low	Medium	High	Combined Unmined +Mined (low)	Combined Mined (Medium+ High)	Mann-Whitney U-test	*P*	Correlation to Conductivity: Spearman *r*
% Scraper	**29.1**	**7.6**	**9.1**	**1.6**	**18.4**	**5.4**	**304.0**	**0.000**	**-0.79**
% Shredder	24.8	43.0	28.8	19.3	33.9	24.1	224.5	0.097	-0.23
% Coll-Gatherer	29.5	28.5	32.3	33.7	29.0	33.0	149.0	0.437	0.04
% Coll-Filterer	**7.7**	**14.6**	**17.5**	**41.2**	**11.2**	**29.4**	**78.5**	**0.005**	**0.60**
% Predator	8.4	6.0	11.9	3.9	7.2	7.9	199.0	0.376	-0.40
% Piercer-Herbivores	0.1	0.0	0.0	0.2	0.1	0.1	167.0	0.920	0.01

Construction of valley fills, sediment ponds, and other discharges of dredged or fill material into Pigeonroost Branch and Oldhouse Branch as authorized by the DA permit will contribute increased loadings of TDS to downstream receiving waters within the Headwaters Spruce Fork sub-watershed and Coal River sub-basin, further exacerbating biological impairments. The WVDEP data from the Spruce Fork, Pond Fork and Little Coal River watersheds indicate that nearby streams affected by mines, as well as the main stem of Spruce Fork, Pond Fork and the Little Coal River currently do not fully support aquatic life use (see Appendix 1). The adverse impacts in the main stem of Spruce Fork, Pond Fork, and the Little Coal are likely due to a combination of stressors, including mining and residential stressors (WVDEP 1997a). Because these downstream waters have existing biological impairments, increased loading of TDS from this project will further reduce the ability of these waters to support aquatic life use.

V.D.2.b. Food Web Effects of Altered Macroinvertebrate Communities

The direct burial of streams and subsequent water quality changes downstream associated with the authorized project will significantly alter macroinvertebrate assemblages, as well as the overall abundance and productivity of macroinvertebrate communities; and thus, through cascading food web effects, likely adversely impact vertebrate species which depend upon the macroinvertebrate community within these streams for nourishment (Figure 7). Project impacts on these aquatic invertebrates will likely alter in-stream functions (e.g., organic matter processing and transport, and nutrient cycling and transport), in part because research has shown that processing rates of terrestrial plant material inputs are reduced in mine-affected streams with altered macroinvertebrate assemblages (Fritz et al. 2010). Also, it is likely that impacts to aquatic invertebrates will have adverse effects on animals dependent on insect larvae and emergent adults as prey, including fish, amphibians, bats, birds, reptiles and small mammals (Baxter et al. 2005). In particular, mayflies (Ephemeroptera) tend to be a preferred prey item for juvenile Smallmouth Bass (Easton et al. 1996), an important sport fish in Spruce Fork, and anticipated declines in mayfly immediately downstream of valley fills will have adverse effects on this sport fishery, as reduced mayfly populations will be present and there will be a reduced pool of colonizers to repopulate areas where populations were impacted.

In addition, research has shown that selenium often has non-lethal effects on macroinvertebrates, allowing them to act as vectors in the movement of selenium to higher levels of the food chain.

V.D.3. Salamanders & Other Herpetofauna

Impacts from the activities authorized will have a significant adverse impact on salamanders and other herpetofauna downstream of the project area due to changes in water chemistry, as well as subsequent food web effects. Adverse impacts to salamanders as a result of construction of valley fills and other discharges authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch will not be localized to the area to be filled. Because construction of the valley fills and other discharges will increase conductivity and selenium levels in the downstream receiving waters (see Section V.D.1.), salamanders that are not directly buried and killed beneath the fills will also be impacted; directly via exposure to these contaminants and indirectly via impacts of contaminants on food sources and reduced prey abundances. Studies have documented elevated selenium levels in salamander tissue downstream of valley fills and that salamander assemblages were more likely to be impaired downstream of valley fills than in other locations (Patnode, et al. 2005). Such impacts will occur as far downstream as elevated conductivity, selenium or other contaminants persist, and to affect any salamanders that spend some part of their life in the aquatic environment or in immediately adjacent riparian terrestrial habitats.

Furthermore, as set forth in Section V.D.4.a., the construction of valley fills, sediment ponds, and other discharges into Pigeonroost Branch and Oldhouse Branch will create conditions considered favorable to the growth of golden algae *(Prymnesium parvum)*, which can produce a toxin that is highly toxic to aquatic life and was associated with an extensive aquatic life kill of both fish and lungless salamanders in Dunkard Creek in West Virginia in September 2009.

V.D.4. Fish

The fish assemblages in Pigeonroost Branch and Oldhouse Branch downstream of the project area, as well as in Spruce Fork, are neither impaired nor representative of pristine or reference condition. Basin size is a particularly important factor when assessing the potential effects of valley fills on streams because small streams (less than 10 square kilometer) have shown effects to the fish assemblage while larger streams have not (e.g., Fulk et al. 2003). Nevertheless, Fulk et al. (2003) found significant differences in total IBI scores between streams that are affected by mines and those that are not. This difference was attributed to changes in cyprinid species richness and the percent of the assemblage composed of benthic invertebrate feeders.

Studies have shown that mountaintop mining for coal and construction of valley fills has had a harmful effect on the composition of stream fish communities (Fulk et al., 2003, Stauffer and Ferreri, 2002). Comparison of streams without mining in the watershed and sites downstream of valley fills in Kentucky and West Virginia indicate that streams affected by mining had significantly fewer total fish species and fewer benthic fish species than streams without mining in the same areas (Stauffer and Ferreri, 2002), likely due to changes in water quality. Surface coal mining and associated increases in conductivity and total dissolved solids and construction of sediment ponds have been shown to create conditions considered favorable to the growth of golden algae (*Prymnesium parvum)*, which has caused large aquatic life kills; and conditions favorable to golden algae growth will occur in Pigeonroost Branch and Oldhouse Branch. Fish also will be exposed to increases in selenium concentrations, which will lead to bioaccumulation in fish tissues and to reproductive effects (see Section V.D.1.a.). Additionally, increases in conductivity and total dissolved solids will have a significant adverse effect on aquatic macroinvertebrates, some of which are preferential prey items for the fish species present in these streams, and, as a result, these fish will likely be similarly adversely affected (see Section V.D.2.b.).

V.D.4.a. Potential to Promote the Growth of Golden Algae

Construction of valley fills and other discharges authorized by DA Permit No. 199800436-3 (Section 10: Coal River) into Pigeonroost Branch and Oldhouse Branch as authorized will create in-stream conditions in or near Spruce Fork favorable to the growth of golden algae (*Prymnesium parvum)*, which releases toxins that kill fish and other gill-breathing aquatic organisms. *P. parvum* is a haptophyte (flagellated) algae now distributed worldwide. This alga has been known to occur in North America since the 1980s (Baker et al., 2007) and has since become established in rivers and reservoirs in several states. *P. parvum* is responsible for harmful algal blooms that have killed millions of fish in Texas and Oklahoma, and has been implicated in kills from North Carolina to Arizona.

P. parvum has also been associated with an extensive and severe aquatic life kill in the central Appalachians, in which thousands of fish, mussels and other aquatic organisms were destroyed in Dunkard Creek in West Virginia and Pennsylvania (Roelke et al.2010, Sager et al.2008). During September 2009, biologists reported observations of thousands of dead fish, mussels and salamanders in Dunkard Creek (Hambright 2010). Mud puppies, an aquatic salamander that lives its entire life underwater, crawled out of the water and onto rocks and the shoreline in an attempt to escape from the toxic water. Field biologists observed numerous individuals as dried up carcasses on rocks and along the shoreline. Fish were observed avoiding the main stem of Dunkard Creek by practically "stacking up" in the mouths of tributaries, subjecting themselves to feeding by blue heron rather than remaining in the toxic water of main stem Dunkard Creek. The identification of *P. parvum* in 2009 in Dunkard Creek was the first identification of this invasive aquatic species in the Mid-Atlantic States (Roelke et al.2010).

The factors that are most closely associated with supporting growth of *P. parvum* are believed to be:

1. Proximity to a known source of *Prymnesium parvum*.
2. TDS in high enough concentrations to support *P. parvum* (estimated to be between 500 and 1000 mg/L (conductivity 714-1428 μS/cm).
3. Nutrients in concentrations high enough to initiate a bloom of *P. parvum* (Baker et al. 2009)
4. pH greater than 6.5. Risk increases with increasing pH (Baker et al. 2009).
5. Areas of habitat that are pooled (large beaver dams, natural residual pools, or manmade ponds)

EPA believes that the Spruce No. 1 Mine will increase the probability that all five factors are met within the Headwaters Spruce Fork sub-watershed, as outlined below.

Proximity to Known Source: P. parvum was identified (in very high numbers) in Cabin Creek of the Kanawha drainage, only 25 miles to the East. Because these algae can easily move with waterfowl, the risk of introducing *P. parvum* in the Spruce Fork drainage is high. Although not currently found in Spruce Fork, the WVDEP has identified Spruce Fork as a "water of concern" because of its potential (due to already high levels of TDS/conductivity) to support *P. parvum* blooms consistent with the factors shown above.

High TDS: The lower TDS limits for the growth of *P. parvum* appears to be ~500 mg/l TDS, or ~700µS/cm conductivity for the ion mixtures typical of alkaline mine drainage (Hambright 2010). Recent data indicate that growth of *P. parvum* increases 200-300% when conductivity increases from 500 µS/cm to 1000 µS/cm (unpublished data, WVDEP, 2010, Hambright 2010). The waters draining the nearby Dal-Tex Mine operation have conductivity levels greater than these values. Many of the sampling sites on the main stem of Spruce Fork, Pond Fork and the Little Coal River also have conductivity levels exceeding these endpoints. Other waters of concern near the Spruce No. 1 Mine include the Little Coal River and West Fork/Pond Fork. As described in SectionV.D.1.b., construction of valley fills and other discharges authorized by DA Permit No. 199800436-3 (Section 10: Coal River) into Pigeonroost Branch and Oldhouse Branch is expected to increase levels of TDS/conductivity in Spruce Fork, thus creating conditions more favorable to *P. parvum*.

Suitable Nutrient Levels: Nutrient levels in the Spruce Fork are very similar to those in Dunkard Creek and other watersheds with *P. parvum* algae present (e.g. Whitely Creek, PA). Phosphorous in Spruce Fork was over 100 µg/L on two sampling occasions during the PEIS.

High pH: Discharges from Spruce No. 1 Mine are likely to be alkaline, consistent with pH of discharges from Dal-Tex and other operations.

Existence of Pooled Habitats: Pooled habitats with little to no flow are common in streams like Spruce Fork in low flow conditions of September and October, when TDS is highest. In addition, DA Permit No. 199800436-3 (Section 10: Coal River) authorizes construction of numerous sediment ponds in Pigeonroost Branch and Oldhouse Branch which will create areas of pooled habitat more favorable to *P. parvum.* During low flows, conductivity is typically highest, increasing the possibility that blooms could occur in very slow moving residual pools within the channel.

V.D.4.b. Increased Exposure to Selenium

The construction of valley fills and other discharges authorized by the DA Permit into Pigeonroost Branch and Oldhouse Branch will result in elevated levels of selenium in the receiving waters. While selenium is a naturally occurring chemical element that is an essential micronutrient, excessive amounts of selenium can have toxic effects on fish. Selenium toxicity is primarily manifested as reproductive impairment and birth defects due to maternal transfer, resulting in embryonic physical mutations and death in egg laying vertebrates such as fish and ducks.

Several nearby streams in the Coal River sub-basin have available data that indicate that construction of the Spruce mine and associated discharges can result in impacts to wildlife. According to the WVDEP's study, "Selenium Bioaccumulation among select stream and lake fishes in West Virginia" (WVDEP 2009), Seng Creek had the highest average water column concentration (27.20 ppb) and a corresponding average fish tissue concentration of 8.16 ppm, while Beech Creek had a water concentration of 12.30 ppb with a corresponding average fish tissue concentration of 7.55 ppm. In Seng Creek, creek chub egg/ovary tissue (mean = 19.9 ppm; range = 16.4 - 23.7 ppm; n= 4) and water measurements (mean = 15.8 ug/L; range = 8-45 ug/L; n = 11) indicate that both fish tissue and water numbers would exceed 5 ug/L and these levels have been documented to resulted in unacceptable tissue concentrations in the reproductive tissue. Similarly, water and fish tissue samples from Mud River also show unacceptable impacts to fish. Creek chub egg ovary (composite measurement of 17.6 in egg/ovary tissue) and water measurements (mean = 9.5 ug/L; range = 4-22 ug/L; n = 21) in Mud River show that selenium concentrations exceed 5 ug/L and has resulted in unacceptably high tissue concentrations in fish.

As discussed in Section V.D.1.a., construction of the Spruce No. 1 Mine will disturb selenium bearing strata consistent with the strata disturbed by the Dal-Tex complex, will remove Pigeonroost Branch and Oldhouse Branch as sources of dilution, and will increase in-stream selenium concentrations to levels comparable with the Dal-Tex complex. The foregoing data supports EPA's view that the increased selenium resulting from the Spruce No. 1 Mine will elevate fish tissue concentrations to levels that will result in unacceptable adverse impacts in wildlife.

V.D.5. Water-dependent Birds

The indirect effects on Louisiana Waterthrush populations are attributable to the loss of aquatic macroinvertebrate food sources and water quality impacts associated with construction of the Spruce No. 1. Mine. As stated in Section IV.B.4. above, the Louisiana Waterthrush is an area-sensitive riparian-obligate species whose breeding success depends on the diverse and productive assemblage of aquatic insects supported by healthy headwater systems (Mattson and Cooper 2009). Birds dependent on aquatic insect larvae and emergent adults as prey, such as the Louisiana Waterthrush, will be adversely affected by the project due to food web effects associated with altered aquatic macroinvertebrate communities (see Section V.D.2.a.).

Studies indicate that breeding territory density and occupancy are reduced along streams where benthic macroinvertebrate communities had been degraded due to anthropogenic land uses including mining (Mulvihill 1999, 2008, Mattsson and Cooper 2009, O'Connell et al. 2003). For example, lower breeding territory densities have occurred along streams impacted by acid mine drainage more so than along circumneutral streams (Mulvihill 1999, 2008). The driver behind these lower densities is decreased food availability, as acid mine drainage has a similar effect on macroinvertebrate populations as alkaline drainage and salinity (Mulvihill 2008). Similarly, some indices of benthic macroinvertebrate integrity are shown to be higher where breeding Louisiana Waterthrushes are present than areas from which they are absent (O'Connell et al.2003). Stream reaches where breeding waterthrushes were present also had a greater proportion of pollution-sensitive benthic macroinvertebrates than reaches where waterthrushes were absent, supporting the concept that good water quality is a key component of the species breeding habitat (Mulvihill 2008).

In addition to impacts resulting from the loss of macroinvertebrate food sources, studies also indicate that the Louisiana Waterthrush will be adversely affected by increased exposure to selenium through prey consumption. Since Waterthrush diet is comprised of aquatic and terrestrial insects, as well as small fish and amphibians, where selenium levels are elevated in macroinvertebrate and salamander populations, Waterthrush will be exposed in a majority of their prey (Patnode et al. 2005) .

As the scientific literature demonstrates, Louisiana Waterthrush populations are vulnerable to impairments in water quality downstream of mining operations. EPA believes that there will be unacceptable adverse impacts to Louisiana Waterthrush populations downstream of the Spruce No. 1 project area as the result of indirect water quality impacts from the filling of Pigeonroost Branch and Oldhouse Branch and their tributaries.

V.D.6. Summary

Construction of valley fills, sediment ponds, and other discharges authorized by DA Permit No. 199800436-3 (Section 10: Coal River) in Pigeonroost Branch and Oldhouse Branch will eliminate headwater stream systems that support some of the last remaining least-disturbed conditions within the Coal River sub-basin and will therefore result in a significant loss of wildlife habitat. The burial of these streams will lead to discharges of TDS and selenium, which will result in unacceptable adverse effects on wildlife in downstream waters. Increased salinity levels will lead to loss of macroinvertebrate communities and population shifts to more pollution-tolerant taxa, specifically the extirpation of ecologically important macroinvertebrates. Through the loss of stream macroinvertebrate and salamander communities, there will be, in turn, substantial effects to both aquatic and terrestrial vertebrate populations that rely on these communities as a food source.

It is well recognized that the loss of a certain number of individuals of a species in a local ecological community can be tolerated, provided that the species continues to reproduce to replace lost individuals. However, when species are impacted by both acute stressors (e.g., food web changes, algal blooms) and exposure to reproductive toxicants, there is an increased risk of the loss of an entire species within an area. The loss of macroinvertebrate prey populations, increased risk of harmful golden algal blooms, and additional exposure to selenium will have an unacceptable adverse effect on the 26 fish species found in Spruce Fork as well as amphibians, reptiles, crayfish, and bird species that depend on downstream waters for food or habitat.

Based on this information, EPA has concluded that the discharges of dredged or fill material to Pigeonroost Branch and Oldhouse Branch as authorized by DA Permit No. 199800436-3 (Section 10: Coal River) will have unacceptable adverse effects on wildlife downstream of the Spruce No. 1 Mine.

V.E Compliance with Relevant Portions of the § 404(b)(1) Guidelines

EPA has broad discretion under § 404(c) in evaluating and determining whether a discharge will result in "unacceptable adverse effects." EPA has concluded, in this case, that burying 6.6 miles of rare and important high quality streams will have an unacceptable adverse impact on the wildlife that rely on those streams for all or part of their life cycles, and that the discharges of TDS and selenium, loss of freshwater dilution from these buried streams, and significant alteration of aquatic macroinvertebrate communities will have an unacceptable adverse effect to aquatic wildlife downstream of the mining operation. Each of these determinations on its own is a sufficient basis to withdraw the specification of these streams as disposal sites and to prohibit the specification of the defined area constituting Pigeonroost Branch, Oldhouse Branch and their tributaries for use as a disposal site associated with future surface coal mining that would be expected to result in a nature and scale of adverse chemical, physical, and biological effects similar to the Spruce No. 1 mine

In addition, EPA's § 404(c) regulations at 40 CFR 231.2(e) provide that in evaluating the "unacceptability" of impacts, consideration should be given to the "relevant portions of the § 404(b)(1) Guidelines." As discussed further below, EPA has identified numerous inconsistencies with the requirements of the § 404(b)(1) Guidelines. In Sections V.C. and V.D., EPA determined that there are unacceptable adverse impacts to wildlife, and the Agency's evaluation of compliance with relevant portions of the Guidelines in this section provides support and confirmation of the conclusion that the impacts are unacceptable.

For purposes of the Spruce No. 1 Mine, the relevant portions of the § 404(b)(1) Guidelines that are particularly important for assessing the unacceptability of environmental impacts include:

- Less environmentally damaging practicable alternatives (40 CFR 230.10(a))
- Significant degradation of waters of the United States (40 CFR 230.10(c))
  - Cumulative effects (40 CFR 230.11(g))
  - Secondary effects (40 CFR 230.11(h))
- Minimization of adverse impacts to aquatic ecosystems (40 CFR 230.10(d))

V.E.1. Less Environmentally Damaging Alternatives/Failure to Minimize Impacts

The § 404(b)(1) Guidelines state at 40 CFR 230.10(a) that no permit may be issued if there is a practicable alternative that would result in less damage to aquatic resources while still meeting the basic project purpose, provided it would not result in other significant adverse environmental impacts. Similarly, 40 CFR 230.10(d) states that steps should be taken to minimize all remaining unavoidable impacts. These two required elements of the Guidelines are typically fulfilled with a thorough analysis of alternatives, including evaluation of alternative project sitings, changes to project design, implementation of best management practices, and adaptive management plans to minimize the risk of adverse impacts. EPA's determination that the Spruce No. 1 Mine will result in unacceptable adverse impacts to wildlife does not depend on the presence or absence of alternatives that would result in less severe environmental impacts to waters of the United States, or on whether there are or are not further opportunities to minimize the impacts from the project. Nonetheless, EPA's evaluation of these portions of the § 404(b)(1) Guidelines serves to strengthen EPA's determination about the unacceptability of the significant impacts that would occur from Spruce No. 1 Mine.

In discussions with the permittee before and during the § 404(c) process, EPA has repeatedly stated its belief that there are alternative mine design and construction practices that would further reduce aquatic resource impacts, while allowing the majority of coal present on site to be mined in a cost effective and technically feasible manner. As referenced in Section III.C., the permittee has presented only limited alterations to the permitted project that it believes would likely result in environmental improvements. These proposals included additional compensatory mitigation projects, new mine construction practices, and increased water quality monitoring.

EPA maintains, however, that there appear to be additional practicable alternative project configurations and practices that would significantly reduce and/or avoid anticipated environmental and water quality impacts to Pigeonroost Branch and Oldhouse Branch. Moreover, § 230.10(a) establishes rebuttable presumptions that, in the case of non-water dependent projects (such as this), practicable, less environmentally damaging alternatives exist. EPA does not believe the permittee has carried its burden to clearly demonstrate that such alternatives do not exist.

EPA is working effectively with mining companies to identify alternative mining configurations and practices to reduce the nature and extent of anticipated adverse environmental and water quality impacts. EPA and mining companies have, for example, coordinated to reduce the volume of excess spoil being placed in valley fills, minimize rainwater and groundwater contact with pollutant-bearing strata, divert stormwater away from streams and other surface waters, phase mining construction to assess the effectiveness of best management practices designed to protect water quality, eliminate and consolidate valley fills, remove treatment ponds from stream beds, compact excess spoil and cant fills to reduce rainwater infiltration, and other cost effective actions for reducing or avoiding environmental and water quality impacts without significantly affecting coal recovery. Mingo Logan Company has expressed a willingness to take some additional steps focusing on best management practices to reduce impacts, but has been consistently unwilling to consider needed actions to further reduce the 35,000 feet of direct impacts of valley fills on headwater streams or to phase valley fill construction in a manner that would allow for effective assessment of, and an adaptive management response to, adverse impacts to wildlife habitat and anticipated water quality problems.

Because the scope of this Final Determination is limited to withdrawal of specification of Pigeonroost Branch and Oldhouse Branch as disposal sites for discharges of dredged or fill material in connection with the Spruce No. 1 Mine, as well as future discharges, within the defined area constituting Pigeonroost Branch, Oldhouse Branch and their tributaries, associated with surface coal mining that would be expected to result in a nature and scale of adverse chemical, physical, and biological effects similar to the Spruce No. 1 mine, EPA takes no position as to whether other, less damaging alternatives would be likely to result in acceptable effects on wildlife or satisfy the § 404(b)(1) Guidelines. However, the facts that such alternatives appear to exist based on extensive experience with other mining operations in Appalachia, and that the permittee has not clearly demonstrated to the contrary, further enhance EPA's assessment of the unacceptability of the impacts that were previously described.

V.E.2. Significant Degradation

The § 404(b)(1) Guidelines direct that no discharge of dredged or fill material shall be permitted if the discharge will cause or contribute to significant degradation of waters of the United States (40 CFR 230.10(c)). Of particular relevance in this instance, the Guidelines state that effects contributing to significant degradation considered individually or collectively, include:

> (1) Significantly adverse effects of the discharge of pollutants on human health or welfare, including but not limited to effects on municipal water supplies, plankton, fish, shellfish, wildlife, and special aquatic sites.
>
> (2) Significantly adverse effects of the discharge of pollutants on life stages of aquatic life and other wildlife dependent on aquatic ecosystems, including the transfer, concentration, and spread of pollutants or their byproducts outside of the disposal site through biological, physical, and chemical processes; and
>
> (3) Significantly adverse effects of the discharge of pollutants on aquatic ecosystem diversity, productivity, and stability. Such effects may include, but are not limited to, loss of fish and wildlife habitat or loss of the capacity of a wetland to assimilate nutrients, purify water, or reduce wave energy

As discussed in Section IV.A. above, Pigeonroost Branch and Oldhouse Branch and their tributaries are some of the last remaining streams within the Headwaters Spruce Fork sub-watershed and the larger Coal River sub-basin that represent "least-disturbed" conditions. As such, they perform important hydrologic and biological functions, support diverse and productive biological communities, contribute to prevention of further degradation of downstream waters, and play an important role with regard to providing necessary habitat for wildlife within the context of the overall Headwaters Spruce Fork sub-watershed and Coal River sub-basin.

The Spruce No. 1 Mine as authorized will bury virtually all of Oldhouse Branch and its tributaries and much of Pigeonroost Branch and its tributaries under excess spoil generated by surface coal mining operations. These discharges will result in the burial of approximately 6.6 miles of high quality Appalachian headwater streams in a watershed that has already experienced substantial impairment. The loss of these portions of Pigeonroost Branch and Oldhouse Branch will result in a significant loss of wildlife habitat and would therefore adversely impact wildlife that depend on those headwater streams for all or part of their life cycles. As detailed in Sections V.C. and V.D., these direct impacts will result in significantly adverse effects on over 84 taxa of macroinvertebrates, as well as up to 46 species of reptiles and amphibians, 4 species of crayfish, 5 species of fish and at least one water-dependent bird species

Beyond the direct burial of wildlife species and loss of habitat, EPA has also determined that the project will result in significantly adverse effects on downstream wildlife. If constructed as permitted, the Spruce No. 1 Mine will result in increased pollutant loadings in Spruce Fork and the Little Coal River. Increased salinity levels will lead to loss of macroinvertebrate communities and population shifts to more pollution-tolerant taxa, specifically the extirpation of ecologically important macroinvertebrates. Further, loss of macroinvertebrate prey populations, increased risk of harmful golden algal blooms, and additional exposure to selenium will result in significantly adverse effects on the 26 fish species found in Spruce Fork as well as amphibians, reptiles, crayfish, and bird species that depend on downstream waters for food or habitat.

The Spruce No. 1 Mine will eliminate the entire suite of important physical, chemical and biological functions provided by the streams of Pigeonroost Branch and Oldhouse Branch including maintenance of biologically diverse wildlife habitat and will critically degrade the chemical and biological integrity of downstream waters. Impacts to these functions at the scale associated with this project will result in significant degradation (40 CFR 230.10(c)) of the Nation's waters, particularly in light of the extensive cumulative stream losses in the Spruce Fork and Coal River watersheds discussed in more detail below.

V.E.2.a Cumulative Effects

Fundamental to the § 404(b)(1) Guidelines "is the precept that dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern." 40 CFR 230.1(c).

The § 404(b)(1) Guidelines (at 40 CFR 230.11(g)) also direct that factual findings be made regarding cumulative effects on the aquatic ecosystem and that those findings be considered in determining whether the discharge complies with the foregoing restriction. To that end, the § 404(b)(1) Guidelines describe the factual finding that must be made with respect to cumulative effects as follows:

> Cumulative impacts are the changes in an aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material. Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous such piecemeal changes can

> result in a major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems.
>
> Cumulative effects attributable to the discharge of dredged or fill material in waters of the United States should be predicted to the extent reasonable and practical. The permitting authority shall collect information and solicit information from other sources about the cumulative impacts on the aquatic ecosystem. This information shall be documented and considered during the decision-making process concerning the evaluation of individual permit applications, the issuance of a general permit, and monitoring and enforcement of existing permits.

As has been described in Section IV.A., the Coal River sub-basin and the Headwaters Spruce Fork sub-watershed are already impacted by mining activity. Based upon the National Land Cover Database (NLCD) change product for 1992-2001 and the WVDEP's GIS mine permit data, more than 257 past and present surface mining permits have been issued in the Coal River sub-basin, and the corresponding mines collectively occupy more than 13% of the land area. In the Spruce Fork watershed, more than 34 past and present surface mine permits have been issued, and the corresponding mines collectively occupy more than 33% of the land area. The project will affect an additional 2,278 acres (3.56 mi^2), which is equivalent to approximately 2.8% of the Spruce Fork watershed. This percentage of land cover affected by surface mines will continue to increase in the Coal River sub-basin, as additional projects are proposed and authorized.

A 1997 WVDEP ecological assessment of the Coal River sub-basin indicated that because the sub-basin is becoming increasingly impaired due to stressors such as mining, there is a need to protect the remaining quality resources, highlighting the need to "[l]ocate and protect the few remaining high quality streams in the Coal River watershed.…" (WVDEP 1997a). Pigeonroost Branch and Oldhouse Branch, two of the streams directly affected by the Spruce No. 1 Mine, are high quality resources that support an exceptionally high number of mayfly taxa, both within the Central Appalachian Region and statewide (see Appendix 2). By directly impacting these streams, which serve as refugia for aquatic life and potential sources for recolonizing nearby waters, the action will have a significant adverse effect on the aquatic ecosystem integrity in the sub-basin.

For purposes of this analysis, EPA considered cumulative effects to the Coal River sub-basin (891 square miles) and the Headwaters Spruce Fork sub-watershed (126.4 square miles) if the Spruce No. 1 Mine is constructed as authorized by DA Permit No. 199800436-3 (Section 10: Coal River) and other reasonably foreseeable (proposed and/or authorized but not constructed) surface mining projects within the Coal River sub-basin are constructed. This cumulative effects analysis also takes into consideration the past and present mining projects within the sub-basin and sub-watershed, and the extent to which they have affected the current baseline conditions within the sub-basin and sub-watershed (Figure 15).

EPA is aware of at least 11 additional mining operations either proposed or authorized but not constructed in addition to Spruce No.1 in the Coal River sub-basin. Construction of valley fills and other discharges authorized by DA Permit No. 199800436-3 (Section 10: Coal River) along with these additional projects in the Coal River sub-basin, if constructed, would directly impact approximately 29.4 miles of stream channels, and will have significant secondary and cumulative effects on downstream waters in the Coal River sub-basin. Downstream impacts from these projects can be expected to include reduced freshwater dilution, reduced headwater stream functional inputs, increased discharges of pollutants, including TDS and selenium, and the potential to contribute to existing water quality impairments within the Spruce Fork watershed and the Coal River sub-basin.

The Coal River sub-basin contains 743 miles of impaired streams, 33% of the total stream length in the sub-basin (WVDEP 2010b). The WVDEP has listed certain of these stream segments for selenium and biological impairment, among other pollutants. The additional fills associated with the Spruce No. 1 Mine, in combination with past and present mining by the applicant and other mining in the sub-basin, will cause or contribute to significant cumulative adverse impacts to the stream resources in the Coal River sub-basin, and will contribute to current water quality impairments within the sub-basin, and result in unacceptable adverse effects on wildlife and their habitat.

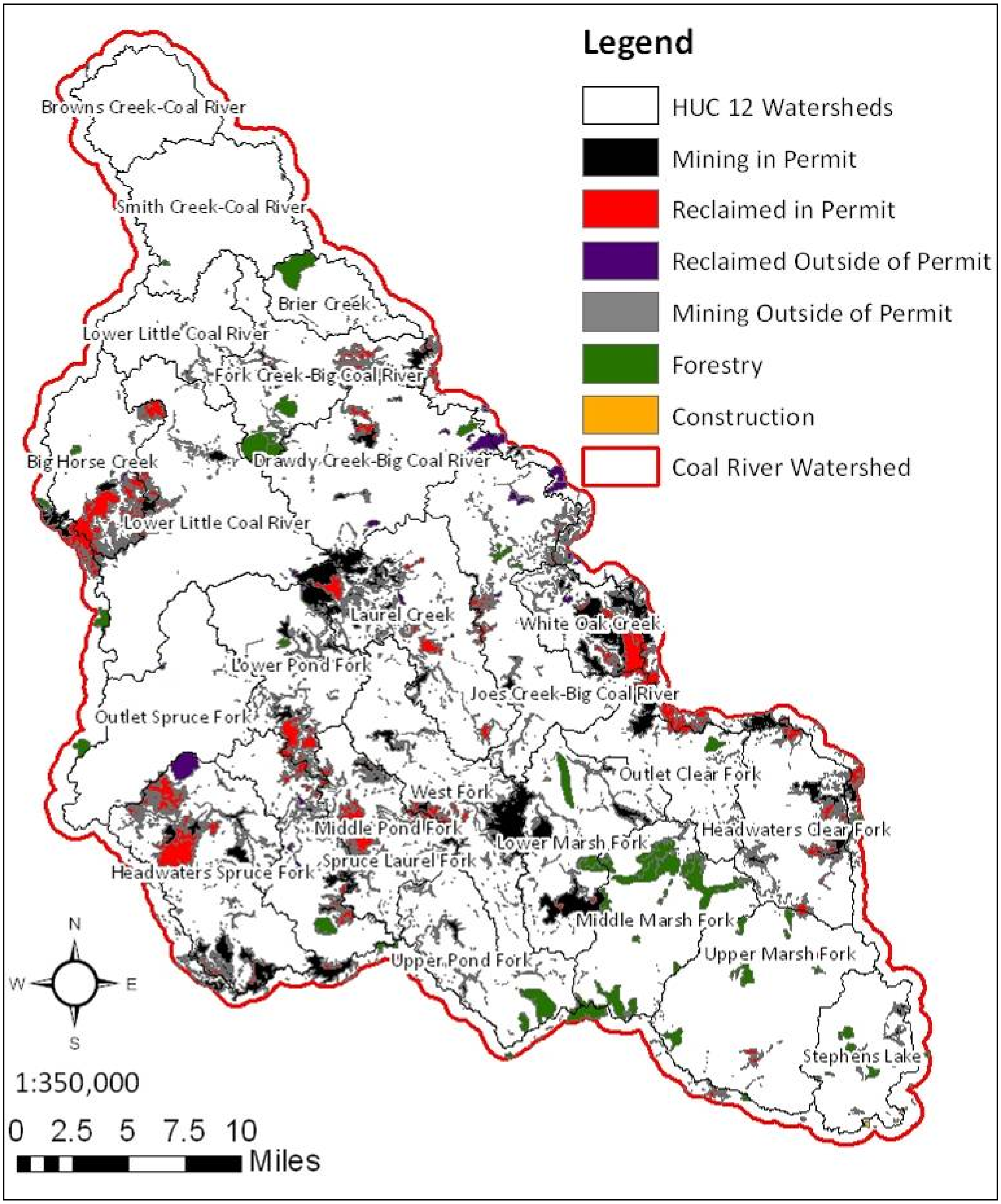

Figure 15. Illustration of the types of disturbance currently found in the Coal River sub-basin

In order to predict cumulative effects from the Spruce No. 1 Mine in conjunction with historic activities, as well as these foreseeable surface mining projects, EPA used mapped landscape data generated from remote sensing techniques and site-specific stream data generated from field sampling techniques to determine the relationship between mining activity and downstream conductivity. This analysis was then used to develop levels of mining activity, measured as percent mining in a watershed, associated with increasing levels of conductivity that reflect increasing extirpation of aquatic life communities (see Appendix 5 for detailed methods and results).

Results of this analysis indicate that there are significant and strong quantitative relationships between mining activities in a watershed and downstream conductivity condition (See also USEPA 2010a, Appendix A and F). The majority of development-only sites had stream conductivity less than 500 µS/cm, with no development-only sites measuring higher than 800 µS/cm (Figure 16). The two regression curves based on the combined mining/development and mining-only sites were similar to each other. The mining-only regression was used to identify percent mining levels related to increasing conductivity conditions.

Using these calculations, a watershed network modeling system was constructed to estimate downstream chemical response to mining activities upstream within the Coal River sub-basin. The calculated percent mining levels were embedded in an alternative futures analysis and used to quantify changes in stream conductivity conditions under three development scenarios; current condition, full construction of the Spruce No. 1 Mine, and full construction of the Spruce No. 1 Mine plus full construction of currently WVDEP-permitted surface mines.[18] For each scenario, the number of stream segments and length of stream were calculated and classified into conductivity ranges.

Based on the results of this model, EPA estimates that summer conductivity is currently below 300 µS/cm in 5.3% (4.6 miles) of the 86.7 miles of stream segments within or downstream of the Spruce No. 1 Mine site to the mouth of the Coal River. If the Spruce No. 1 Mine is constructed as permitted, this analysis shows that there will be no stream segments with conductivity less than 300 µS/cm downstream of the mine site in the Coal River sub-basin. Currently, 2.2% (1.9 mi) of the stream segments within or downstream of the Spruce No. 1 Mine site are calculated to have conductivity greater than 1000 µS/cm. Following full construction of the permitted area, 21.7% (18.8 mi) are projected to have conductivity greater than 1000 µS/cm. As this demonstrates, conductivity is predicted to significantly increase in Spruce Fork as the Spruce No. 1 Mine is constructed.

If other permitted mine areas, in addition to Spruce No. 1, are included in the analyses, the cumulative effects are predicted to result in higher conductivities in both the Little Coal and Coal Rivers. Within the Headwaters Spruce Fork sub-watershed, percent mining is predicted to increase by 15.8% over current conditions under this scenario, which will elevate conductivity from less than 750 µS/cm to greater than 1000 µS/cm at the mouth of Spruce Fork. Similarly, within the Little Coal River watershed, the calculation of full construction of all permitted mines results in percent mining increasing by 11.2% over current conditions, which results in predicted conductivity elevating from less than 750 µS/cm to as much as 1000 µS/cm within the Little Coal River. At the broadest scale analyzed, percent mining is predicted to increase by 9.3% in the Coal

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[18] EPA makes no determination at this time regarding whether these other mines comply with the § 404(b)(1) Guidelines or may result in unacceptable adverse impact under § 404(c).

River sub-basin with full construction of all permitted mines. This also resulted in conductivity increasing from less than 750 µS/cm to as much as 1000 µS/cm within the Coal River.

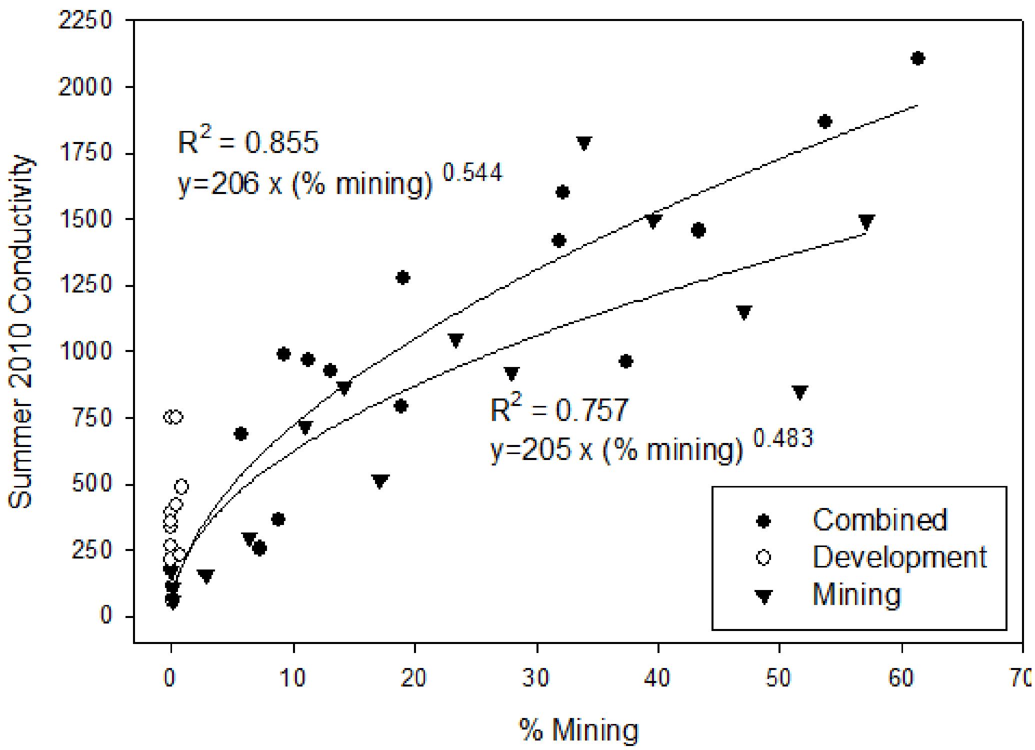

Figure 16. Model of the relationship between percent mining within a watershed and conductivity. The lower regression line is for mining-only sites, and the upper line is for combined mining/development sites.

As detailed in Section V.D.2.a., these conductivity levels have been associated with the impairment and extirpation of macroinvertebrate aquatic life. At this watershed scale, shifts in macroinvertebrate communities, and the loss of the primary food sources that these communities represent for higher trophic levels, will result in cascading ecosystem changes downstream.[19] Combined with increased levels of selenium and other mining-related pollutants, EPA believes these adverse effects will cause or contribute to significant degradation within the Coal River sub-basin. The severity of the cumulative impacts further strengthens EPA's conclusion that this project will result in unacceptable adverse impacts to wildlife and its habitat.

V.E.2.b. Secondary Effects

The § 404(b)(1) Guidelines (at 40 CFR 230.11(h)) also direct that factual findings be made regarding secondary effects on the aquatic ecosystem and that those findings be

[19] In the 2008 West Virginia Integrated Water Quality Monitoring And Assessment Report, WVDEP stated "A "shift" in the benthic macroinvertebrate community of a stream can constitute biological impairment pursuant to 47CSR2 – 3.2.i, and the WVSCI (recognized as a "best science method" in the PEIS) provides a sound scientific basis for assessment."

considered in determining whether the discharge will cause or contribute to significant degradation of the Nation's waters. To that end, the § 404(b)(1) Guidelines describe the factual finding that must be made with respect to secondary effects as follows:

> Secondary effects are effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material. Information about secondary effects on aquatic ecosystems shall be considered prior to the time final section 404 action is taken by permitting authorities.
>
> Some examples of secondary effects on an aquatic ecosystem are fluctuating water levels in an impoundment and downstream associated with the operation of a dam, septic tank leaching and surface runoff from residential or commercial developments on fill, and leachate and runoff from a sanitary landfill located in waters of the U.S.

Section V.D. includes a discussion and analysis of the secondary effects of the Spruce No. 1 Mine including the degradation of downstream water quality by 1) removing streams that currently provide sources of freshwater dilution and 2) transforming those stream areas into sources of contaminants (particularly TDS and selenium). The downstream water quality changes associated with the authorized project would significantly reduce the functional diversity, as well as the overall abundance and productivity of macroinvertebrate communities, thus, through cascading food web effects, adversely impact an extensive list of vertebrate species which depend upon the macroinvertebrate community within these streams for nourishment.

The adverse secondary effects discussed in Section V.D. include substantial changes in aquatic communities, such as loss of fish and salamander diversity and sensitive mayfly and stonefly taxa, as well as shifts to more pollution-tolerant taxa. Through the loss of stream macroinvertebrate and salamander communities, there will be, in turn, substantial effects to both aquatic and terrestrial vertebrate populations that rely on these communities as a food source. In addition, the discharges will increase loading of pollutants to downstream receiving waters, increasing the risk of harmful golden algal blooms and causing or contributing to fish and bird impairments due to selenium exposure.

V.E.3. Mitigation Will Not Adequately Offset Anticipated Impacts

If constructed as authorized the Spruce No. 1 Mine will result in direct impacts through discharge of dredged or fill material to approximately 6.6 miles of stream in Pigeonroost Branch and Oldhouse Branch. The impacts from these discharges are discussed in Sections V.C. While recognizing that the project includes mitigation efforts (including stream creation and enhancement of existing streams) to compensate for unavoidable adverse impacts, EPA believes that known compensatory mitigation techniques will not replace the high quality resources of Pigeonroost Branch and Oldhouse Branch that will be impacted by the project. Additionally, EPA believes that the current mitigation plan does not adequately account for the quality and function of the impacted resources.

Under § 404(c), EPA has discretionary authority to prohibit or withdraw the specification of a defined area as a disposal site whenever the Administrator determines that the discharge will have an unacceptable adverse effect on a number of identified categories. Therefore, as a legal matter, EPA can make a determination that a discharge of dredged or fill material will cause unacceptable adverse effects without consideration of compensatory mitigation. The statutory standard does not mention mitigation directly and authorizes EPA to determine what constitutes an unacceptable adverse effect. In other words, EPA does not need to determine that mitigation is somehow flawed or insufficient in order to conclude that a proposed or authorized discharge would have unacceptable adverse effects. EPA's conclusion that there is noncompliance with the Guidelines with respect to mitigation confirms the unacceptability of the adverse impacts on wildlife within the project area and downstream.

The Compensatory Mitigation Plan (CMP) submitted by Mingo Logan describes on-site and off-site, in-kind mitigation. On-site compensation would include the restoration of 7,132 linear feet of stream segments temporarily impacted by the sediment ponds, and the creation of 43,565 linear feet of on-bench stream channel within the project area. On-bench sedimentation ditches are SMCRA-required Best Management Practices (BMPs) to control runoff. Off-site compensation includes stream enhancements to Spruce Fork and Rockhouse Creek through a combination of physical, aquatic habitat, and stream stabilization improvements. The CMP also proposes to direct surface water flow from the project area in existing drainage ways to promote the development of more defined channels, thus creating 26,625 linear feet of streams.

Both EPA and the USFWS have repeatedly identified problems with the mitigation techniques that are part of the CMP for the Spruce No. 1 Mine. EPA Region III's comments on the 2006 draft and final EISs for the Spruce No. 1 Mine expressed concerns that the compensatory mitigation plan did not adequately mitigate all adverse impacts and was inadequate in terms of its lack of functional assessment, as well as whether proposed headwater stream creation would in fact replace the functions of impacted resources. EPA Region III emphasized the importance of headwater stream functions that would be lost and likely not replaced, particularly by the conversion of existing drainage channels to streams as described in the CMP. In its December 4, 2001, letter the USFWS expressed similar concerns that the proposed mitigation was unlikely "to provide sufficient mitigation for permanent stream and riparian habitat loss and for the losses of the functions and values of the stream to aquatic species in the fill footprint and to the downstream ecosystem." These concerns were reiterated by the USFWS in its June 2, 2010, and December 16, 2010, letters commenting on the EPA Region III Proposed Determination and Recommended Determinations, respectively.

As discussed below and in Appendix 3, the project fails to include all appropriate and practicable steps to minimize and compensate for the project's adverse impacts on the aquatic ecosystem as required by 40 CFR 230.10(d). Further, EPA believes that the anticipated level of adverse impacts associated with the Spruce No. 1 Mine will not be offset by the required compensatory mitigation to the extent necessary to prevent significant and unacceptable effects on wildlife and their habitat.

V.E.3.a. Proposed Mitigation Will Not Replace High Quality Resources in Pigeonroost Branch and Oldhouse Branch

There is no evidence in the peer-reviewed literature that the type of stream creation included in the CMP will successfully replace lost biological function and comparable stream chemistry to high quality stream resources, such as Pigeonroost Branch and Oldhouse Branch. Scientific research has demonstrated that replacement of streams is among the most difficult and frequently unsuccessful forms of mitigation (Bernhardt et al.2007). Even if stream structure and hydrology can be replaced, it is not clear that replacing structure and hydrology will result in true replacement of functions, especially the native aquatic community and headwater functions. Based upon this research, the Corps and EPA stated in the response to comments on the 2008 Compensatory Mitigation for Losses of Aquatic Resources Final Rule:

> We recognize that the scientific literature regarding the issue of stream establishment and re-establishment is limited and that some past projects have had limited success (Bernhardt et al.2007). Accordingly, we have added a new paragraph at 33 CFR 332.3(e)(3) [40 CFR 230.93(e)(3)] that specifically notes that there are some aquatic resources types that are difficult to replace and streams are included among these. It emphasizes the need to avoid and minimize impacts to these 'difficult-to-replace' resources and requires that any compensation be provided by in-kind preservation, rehabilitation, or enhancement to the extent practicable. This language is intended to discourage stream establishment and re-establishment projects while still requiring compensation for unavoidable stream impacts in the form of stream corridor restoration (via rehabilitation), enhancement, and preservation projects, where practicable.[20]

An additional 26,625 feet of high gradient stream credit is sought for connectivity channels. Connectivity channels are areas where surface water flows from the on-bench ditches, passes through NPDES outfalls, and runs downhill to eventually "form a hydrological connection to a surface tributary of a navigable water" (USACE 2007). The premise is that, if properly placed, connectivity channels will enable mine runoff water to travel down natural, steep hill slopes and ephemeral channels and into naturally non-flowing receiving segments. However, based on the changes to water quality discussed in Section V.D.1., they will receive selenium and dissolved solids from the mined area, resulting in degraded water quality and an inability of these channels to provide meaningful ecological functions and values to replace the affected streams. In addition,

[20] EPA recognizes that the effective date of the regulations governing compensatory mitigation that were promulgated at 73 Fed. Reg. 19594 (April 10, 2008) is June 9, 2008, and therefore were not in effect when the Corps of Engineers issued DA Permit No. 199800436-3 (Section 10: Coal River). Nevertheless, the above-quoted statement, taken from the preamble to those regulations, represents the most recent regulatory statement by the agencies regarding types and effectiveness of mitigation and summarizes scientific research and literature that is applicable to consideration of the likely efficacy of the compensatory mitigation proposed for the Spruce No. 1 Mine.

these channels will function as sources of pollutants, delivering additional selenium and total dissolved solids to downstream headwater streams.

As discussed in this document, the streams of Pigeonroost Branch and Oldhouse Branch have been shown to exhibit high water quality and high functional capacity. Given the difficulty of stream re-establishment to mitigate for impacts to streams in general, EPA believes it is extremely unlikely that high-value streams such as these can be replaced by on-site stream creation techniques involving conversion of sedimentation ditches fed by mine spoil runoff and seepage. As explained further in Appendix 3, EPA believes that the mitigation for the Spruce No. 1 Mine will not offset the anticipated impacts to an acceptable level.

V.E.3.b. The Compensatory Mitigation Plan is Based upon a Misclassification of the Impacted Resources

The starting point for an adequate compensatory mitigation plan is accurate characterization of the impacted resources. EPA believes that the Spruce No. 1 Mine CMP is based upon a misclassification of impacts to perennial and intermittent streams, thereby resulting in an insufficient baseline from which to design adequate stream compensation.

The USGS documented the flow origin, drainage areas and hydrologic characteristics of perennial and intermittent streams in this region in 2000 and 2001 (Paybins 2003). A field reconnaissance by EPA during dry conditions in September 1998 (Green and Passmore 1999) found distinct perennial benthic communities (i.e., long-lived taxa representative of perennial conditions) in the upper reaches of Pigeonroost Branch and Oldhouse Branch. Through these onsite visits and biological data collection, combined with USGS drainage estimates, EPA estimates that, within the mine footprints of Pigeonroost Branch, and Oldhouse Branch, approximately four miles of stream (~20,000 feet) are perennial. In this case, “perennial” refers to streams that have either 1) perennial flow and indicator biota requiring at least a 6 month life cycle, or 2) non-contiguous surface flow during drought conditions but indicator biota requiring at least a 6 month life cycle.

This is in contrast to the DA Permit estimation of 165 feet of perennial waters within the entire project area. This misclassification has a critical impact upon the type of mitigation that would be required to offset these impacts. The resource type plays an important role in the types of expected aquatic communities, the degree in which each resource provides structure and function, and the amount of organic matter and nutrients (and contaminants) ultimately retained or loaded to receiving streams. This misclassification means that the compensatory mitigation plan does not properly account for, and therefore will not offset, the full range of adverse impacts related to the project. A more detailed description of EPA’s analysis of stream type is described in Appendix 3.

V.E.3.c. The Compensatory Mitigation Plan Lacks an Adequate Functional Assessment

In addition to being based on a misclassification of resource type, the CMP also is based upon an inadequate functional assessment of the impacted resources. The goal of compensatory mitigation is to replace the aquatic resource function lost or adversely affected by authorized activities. Therefore, to ensure that the functions are being replaced, the compensatory mitigation must create or restore streams that sustain comparable biological communities and chemical and physical characteristics and provide comparable physical, chemical and biological functions to the streams that have been eliminated. The § 404(b)(1) Guidelines require the permitting authority to make certain factual determinations addressing the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment. See, 40 CFR 230.11. Among the factual determinations required of the permitting authority is the following:

> *(e) Aquatic ecosystem and organism determinations*. Determine the nature and degree of effect that the proposed discharge will have, both individually and cumulatively, on the structure and function of the aquatic ecosystem and organisms.

This provision of the Guidelines requires the permitting authority to determine the nature and degree of effect that the proposed discharge will have on both the structure and function of the aquatic ecosystem and organisms. This principal from the Guidelines was reiterated and clarified in a joint Department of the Army/EPA guidance memo, focused specifically on the review of permit applications for Appalachian surface coal mining.[21]

In order to ensure adequate replacement of both structure and function, the impacted streams must be accurately assessed and the proposed compensation must be evaluated using comparable standards for assessment. As discussed above, the baseline assessment of the existing and impacted streams on the site missed and misclassified well over twenty thousand linear feet of headwater streams, which prevented the USACE from identifying the appropriate compensation needs of this project.

In addition, the assessment method used by the permittee was inadequate and led to an improper valuation of compensation needs and proposals. The CMP utilized an assessment method referred to as the Stream Habitat Unit (SHU) method to calculate mitigation debits and credits. This assessment entails a combination of linear lengths of impact, habitat assessment scores, and stream hydrological status.[22] The limitations of the

[21] EPA recognizes that the effective date of this memorandum is July 30, 2010, and therefore was not in effect at the time the Corps issued DA Permit No. 199800436-3 (Section 10: Coal River). Nevertheless, the requirement in the Guidelines regarding the factual determination of the impact to the structure and function of the aquatic ecosystem is applicable and relevant to EPA's evaluation of the Spruce No. 1 compensatory mitigation plan, and the July 30, 2010 memorandum reflects the agencies most recent statement about the meaning of that requirement.

[22] Even though the Corps did not finally rely solely on the SHU for mitigation requirements, the Corps did not categorically prevent the permittee from using this approach as a basis for its mitigation plan, and thereby allowed Mingo Logan to use this approach to help justify their mitigation performance and success criteria.

SHU and need for an adequate functional assessment are further explained in Appendix 3. The SHU as presented in the CMP only accounts for the physical aspects of stream condition and fails to account for the interrelationship of water chemistry and biological resources in stream functioning.

As a result of this EPA believes the current CMP does not adequately account for or replace the structure and function of the lost streams. EPA does not believe that increased ratios of intermittent or ephemeral streams offset this inadequacy. While DA Permit No. 199800436-3 (Section 10: Coal River) refers to biological success criteria and the use of a yet-to-be developed functional assessment method for mitigation monitoring, the permit conditions do not clearly require the replacement of lost biological function and comparable stream chemistry or adequate compensatory mitigation success criteria.

V.E.3.d. Conversion of Erosion Control Channels Will Not Successfully Replace the Impacted Resources

Based on observations of other on-bench SMCRA drainage or erosion control ditches (Kirk 1999a, Green et al. 2000, and Gingerich 2009), EPA believes the CMP's proposed conversion of these ditches will not successfully replace the impacted resources, alone or in concert with other mitigation contained in the CMP. Over 50% of the linear stream length in the Spruce mitigation plan relies on conversion of on-bench SMCRA drainage or control ditches. Data show that water quality in these types of sedimentation ditches in the Appalachian region is typically highly degraded, as a result of the water in these ditches percolating through mine spoil (Gingerich 2009). Even when the sedimentation ditches are enhanced for benthic substrata and riparian vegetation, such as by adding boulder clusters, the resulting water quality will be so degraded that the ditches will not meet pre-mining water chemistry baselines, especially in the case of high quality streams such as Pigeonroost Branch and Oldhouse Branch.

As described previously, degraded water chemistry caused by the addition of TDS and selenium typically leads to degraded biological communities. The proposed constructed stream channels will not meaningfully reduce the concentrations of these ions in the water flowing through them. Because of this degraded water chemistry, any created waterbodies would not support the healthy and diverse biological communities that they are intended to replace. Moreover, the water quality (e.g., salinity) would be so degraded that it will foster conditions favorable to the establishment of toxic Golden Algae.

A comparison of family-level macroinvertebrate data between sediment ditches and Pigeonroost Branch and Oldhouse Branch reveals marked differences in species richness and very little taxonomic overlap. Based upon Kirk (1999a) and EPA data, total familial richness in sediment ditches ranged between 4 to 11 taxa, with 0 to 3 families of Ephemeroptera, Plecoptera or Trichoptera (EPT) taxa present. In contrast, total familial richness at Oldhouse Branch and Pigeonroost Branch was 40, with 26 families of EPT taxa present.

Of the taxa collected in the sediment ditches, only seven were also present in Oldhouse Branch and Pigeonroost Branch. With regards to the taxa present in the sediment ditches that were not found in Oldhouse Branch and Pigeonroost Branch, Pond et al. (2008) found that these taxa do not generally occur at sites unaffected by mining. These data demonstrate that taxonomic assemblages in sediment ditches are not only less diverse than streams unaffected by mining, but include a suite of organisms not found in high quality headwater streams unaffected by mining, such as Oldhouse Branch and Pigeonroost Branch.

EPA believes these created streams converted from erosion control channels would be considered degraded and will not successfully replace Pigeonroost Branch and Oldhouse Branch as sources of freshwater dilution with healthy biological communities and water quality, either alone or in concert with other mitigation contained in the CMP.

A more detailed discussion of the limitations of on-bench sedimentation ditches for mitigation is provided in Appendix 3.

V.E.3.e. The Compensatory Mitigation Plan Does Not Account for the Loss of Ecological Services Provided by Headwater Streams

EPA is also concerned with the separation of the ecological elements into single, separate aspects of the ecology in the Spruce No. 1 Mine CMP, with limited consideration for the interconnectedness of the entire ecosystem. The forested slopes and coves located within the Spruce No. 1 Mine area are drained by a dendritic mosaic of ephemeral, intermittent and perennial headwater streams and watercourses. The watershed is inextricably linked with the stream system that drains it. The overwhelming bulk of the organic matter that sustains the stream biota in Spruce Fork is a function of the upstream environment. While compensatory mitigation is required for the impacts to waters of the United States under the § 404 program, EPA believes that a well-designed compensatory mitigation plan should take into account this terrestrial-aquatic linkage and ensure that restored or created channels provide greater functions than simply service as water conveyance structures.

In a pre-mined condition, these headwater streams are recipients of allochthonous material (i.e., material originating from outside of the stream system) and water inputs (i.e., surface, subsurface, and groundwater) from the surrounding forested communities. The post-mined environment, however, creates severely altered conditions in stream courses that are not destroyed by valley fills. Those alterations include:

a. Elimination of water and processed organic material from former upstream tributaries that will be under valley fills.

b. Altered contributions of water and allochthonous material from the surrounding upland watershed, due to the altered character of the soil and vegetation communities in a post-mine environment.

c. Altered hydrograph with new flow regimes that markedly depart from that under which the streams have evolved.

d. Altered timing, temperature and chemical composition of post-mine discharges of water to receiving streams.

The permittee proposes to restore or create 71 acres of riparian forest as part of its reclamation and stream creation and restoration activities. While EPA agrees that planting trees along any newly created stream channels better recreates pre-mining riparian conditions than no riparian vegetation, EPA has not seen evidence that such practices can effectively replace lost natural riparian ecosystems. The current riparian zone consists largely of basswood, beech, tulip poplar, buckeye, sugar maple, white oak and red oak, yet out of the 11 tree species listed in the Compensatory Mitigation Plan, only two are found within or near the project area. Riparian systems created through this plan are likely to function differently from buried streams because their vegetation communities will differ from those present on the project site.

The Spruce No. 1 Mine will profoundly alter the contributing watershed. Effectively the new landscape widely departs from that within which the stream network has evolved. The subsequent ecosystem is an entirely new system. Based on available information, the mitigation will not replace the structure and function of the pre-mined conditions including those elements that are dependent on contributions from the surrounding watershed. These concerns regarding the mitigation are shared by the USFWS whose comment letter to EPA regarding the Recommended Determination states "…the currently-proposed mitigation for these impacts is unlikely to adequately compensate for the loss and degradation of these streams, their biological productivity and diversity, or their ecological integrity."

V.E.4. Summary

The Spruce No. 1 Mine will eliminate the entire suite of important physical, chemical and biological functions provided by the streams of Pigeonroost Branch and Oldhouse Branch including maintenance of biologically diverse wildlife habitat and profoundly alter the contributing watershed. EPA maintains that impacts to these functions at the scale associated with this project will result in significant degradation (40 CFR 230.10(c)) of the Nation's waters, particularly in light of the extensive cumulative stream losses in the Spruce Fork and Coal River watersheds, and that such degradation will result in unacceptable adverse impacts on wildlife and wildlife habitat. EPA does not believe these impacts can be adequately mitigated to reduce the impacts to an acceptable level by the compensatory mitigation described in the CMP. Finally, the possibility that additional practicable alternative project configurations and practices exist that would significantly reduce and/or avoid much of the discharges to Pigeonroost Branch and Oldhouse Branch further enhances EPA's assessment of the unacceptability of the impacts that were previously described.

VI. Other Considerations

As set forth above, EPA has determined that the impacts from the discharges to Pigeonroost Branch and Oldhouse Branch as authorized by DA Permit No. 199800436-3 (Section 10: Coal River) described in Section V. will have an unacceptable adverse effect on wildlife both within the project area and downstream of the project area, and that the project does not comply with the requirements of the § 404(b)(1) Guidelines. This section identifies other, additional considerations that are of concern to EPA but are not part of the basis for EPA's conclusion that the impacts will have an unacceptable adverse effect on wildlife.

EPA includes this discussion to recognize additional significant environmental, public health, and environmental justice impacts associated with the Spruce No. 1 Mine that are relevant to EPA's and the Corps' broader responsibilities in reaching permit decisions under the Clean Water Act and other statutes and policies, including the National Environmental Policy Act and the Environmental Justice Executive Order (E.O. 12898). EPA understands that the impacts identified in Section VI are not directly relevant to the Agency's determination under § 404(c). However, EPA includes this section to emphasize for the public the broader impacts of the project as they relate to EPA's legal responsibilities. EPA takes seriously each of its responsibilities to assure effective protection for coalfield communities from environmental, human health, and water quality impacts associated with surface coal mining activities.

VI.A. Impacts from Activities Dependent upon Specification of Pigeonroost Branch and Oldhouse Branch as Disposal Sites for the Discharge of Dredged or Fill Material for the Spruce No. 1 Mine

The following sections discuss impacts that depend upon specification of Pigeonroost Branch and Oldhouse Branch for construction of valley fills and sediment ponds for the Spruce No. 1 Mine, but occur as a result of discharges of excess spoil to areas outside of jurisdictional waters, or occur as a result of other mining-related activities, such as deforestation.

VI.A.1. Migratory Birds

The Spruce No. 1 Mine will destroy approximately 2,278 acres of deciduous forests. Among the many migratory birds likely to breed in the project area, there are six species that the USFWS has designated as Birds of Conservation Concern within the Appalachian Mountains Bird Conservation Region that may be impacted. These include the Cerulean, Kentucky, Swainson's and Worm-eating Warblers, the Wood Thrush, and the Louisiana Waterthrush. The water-dependent Louisiana Waterthrush was discussed in Sections V.C.4. and V.D.5. above. The other five avian species are also designated as BCC species within the USFWS's Northeast Region as a whole and nationally (U.S. Fish and Wildlife Service 2008). The first four are also considered to be among the 100 most at-risk bird species in North America (Wells 2007).

Cerulean and Worm-eating Warblers are also both area-sensitive species that rely on large blocks of intact, mature, interior forest habitats to support productive breeding populations. The Cerulean Warbler breeding population is thought to have declined by about 75% over the past 45 years – the most dramatic decline of any North American warbler monitored by the Breeding Bird Survey (Sauer et al. 2005). Both species are threatened by the loss and fragmentation of these habitats (U.S. Fish and Wildlife Service 2007, Wells 2007). Deforestation associated with the Spruce No. 1 Mine can be expected to adversely impact their breeding populations (Weakland and Wood 2005, Wells 2007).

The project also will impact other bird species that rely on mature forest habitats. Bird species that rely on mature forest habitats that are abundant in the Appalachian region are Kentucky warblers in the understory; and Wood Thrush, Swainson's Warbler, Acadian Flycatcher, and Ovenbirds in mesic hardwoods. These and many other avian species are all impacted by forest fragmentation and habitat loss, such as that which would occur in connection with the Spruce No. 1 Mine. Spatial analyses of the effect of Appalachian mountaintop mining on interior forest indicate that interior forest is lost at a rate 1.75-5.0 times greater than the direct rate of loss of overall forest cover due to mountaintop mining (Wickham et al. 2007).

The Spruce No. 1 Mine will impact mature forested habitat, over a substantial timeframe, replacing the impacted areas with reclaimed areas dominated by grasses and herbaceous species. Many reclaimed areas such as those expected at Spruce No. 1 Mine show little or no regrowth of woody vegetation even after 15 years. The PEIS found significant differences in bird populations between forested and reclaimed sites, namely the loss of the above-mentioned species, and subsequent replacement by more opportunistic grassland species. Also, the loss of the healthy headwater areas of Spruce Fork will reduce the feeding and foraging areas available to specialist bird species in this ecoregion. This reduction in available habitat could potentially impact their long-term viability in the Spruce Fork watershed and the larger ecoregion.

The USFWS evaluated the terrestrial habitats of the project area and concluded that construction of the mine was likely to impact migratory birds via the loss and fragmentation of forest habitat, decreasing habitat heterogeneity, increasing isolation of populations, and increasing exposure to nest predators and parasites (USFWS 1998). The USFWS also expressed concerns specific to bird populations within the Coal River sub-basin related to adverse impacts of the Spruce No. 1 Mine. These concerns included the direct loss of habitat and direct and indirect loss of food resources, for forest interior and riparian-obligate species of migratory birds, including six species the Service considers Birds of Conservation Concern (i.e., Cerulean, Kentucky, Swainson's, and Worm-eating Warblers; Louisiana Waterthrush; Wood Thrush) (USFWS, 2008).

The USFWS continues to believe that construction of the Spruce No. 1 Mine will adversely impact these and other forest-breeding migratory birds. The valley fills will result in the permanent loss of headwater streams that may be used by Louisiana Waterthrushes. The USFWS indicates they are unaware of peer-reviewed research that suggests that these birds will simply relocate to an adjacent, unimpacted watershed and have comparable survival and reproductive success. The downstream increases in conductivity, selenium and perhaps other contaminants are also likely to adversely affect those waterthrushes not excluded by the direct impacts of the fill via impacts to their food base. In some freshwater food webs, selenium has bioaccumulated to four times the level considered toxic, which can expose birds to reproductive failure when they eat fish or insects with high selenium levels.

While the work of the Appalachian Regional Reforestation Initiative (ARRI) shows substantial promise for better reclamation of mined lands, it has not been demonstrated that these reclaimed areas will generate and sustain forests that provide habitat characteristics and qualities comparable to those of native forest. For these reasons, the construction of the Spruce No. 1 Mine will result in permanent and/or long-term loss of breeding habitats important to several migratory bird species of conservation concern.

VI.A.2. Bats & Other Mammals

Large-scale mountaintop mining has been identified among the threats to bat species in the region according to the USFWS. Loss of the bat’s habitat, foraging areas, and food sources, in conjunction with recently identified concerns related to white-nose syndrome, may result in adverse impacts to these wildlife resources. Similarly, habitat loss from land clearing will also affect numerous other mammal species within the project area that rely on forested landscapes for shelter and foraging.

As set forth in Section IV.B.5., the habitat in the project area is quite suitable for federally endangered Indiana Bats, which have been documented in adjacent counties. It is therefore quite possible that Indiana Bats occur within the project area, and that they could be impacted by the loss of forest habitat associated with the Spruce No. 1 Mine and by the loss of headwater streams, riparian areas and associated aquatic and terrestrial insects, as well as by the downstream degradation of these resources likely to be caused by the project.

In addition to Indiana Bats, the USFWS was recently petitioned to list two other bat species, the Eastern Small-footed Bat and Northern Long-eared Bat, under the Endangered Species Act (Center for Biological Diversity 2010). Both species occur in the vicinity of the Spruce No. 1 Mine, and both were captured during mist net surveys at the project site. Like Indiana Bats, these two species are susceptible to population-level impacts from White Nose Syndrome (WNS), which has devastated some populations of eastern bats. If WNS affects West Virginia bats as it has bats in other states, and if large die-offs occur, it will further complicate the already complex challenge of conserving bat species. Previous mining and logging activities and forest loss have also been identified as having adverse affects on bat populations. Traditionally used reclamation techniques, many of which are designed to minimize erosion and provide backfill stability, are incompatible with re-establishment of trees necessary for successful roosting by bats. Such reclamation techniques have the potential to further stress bat populations.

In addition to bats, forest habitat loss associated with the project could have substantial effects on other mammals that depend upon forest resources. While some mammal species are habitat generalists and will not be greatly affected by conversion to a grassland environment, others require forest habitats for protection from predation, foraging and specific habitat needs. These species will likely be adversely affected by the project. Additionally, healthy forested riparian areas can be important habitat for small mammals that feed on insects and small amphibians, as they are proximate to aquatic food sources. As such, insectivorous small mammals that feed on larval aquatic insects, emergent adult aquatic insects, and salamanders will likely be adversely affected by reduced aquatic macroinvertebrate abundances and increased levels of selenium in their prey.

VI.B. Environmental Justice

Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA has this goal for all communities and persons across this Nation. Executive Order 12898 directs: "To the greatest extent practicable…each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…"

According to the 2000 United States Census, Spruce No. 1 Mine is located in a census block group that contains 335 people. A census block group is a geographical unit used by the U.S. Census Bureau (Bureau) that is between a census tract and a census block in size and scale. It is the smallest geographical unit for which the Bureau publishes data. Census block groups generally contain between 600 and 3,000 people, with a target size of 1,500 people.

Spruce No. 1 Mine is located in a census block group where the average per capita income is $15,411. This is more than $6,000 less than the national average of $21,587 and more than $1,000 less than the West Virginia state average of $16,477. The average median family income is also almost $13,000 less than the national average of $52,029. Moreover, 24% of the residents of Logan County live below the poverty line, which also exceeds state and national averages. Studies have highlighted that, despite the economic benefits provided by coal extraction, coal-producing counties in Central Appalachia continue to have some of the highest poverty and unemployment rates in the region (McIlmoil and Hansen 2010).

The Corps included a discussion of environmental justice in the Spruce No. 1 EIS. However, as noted in comment letters in June and October 2006, EPA's environmental justice analysis indicates that there may be a disproportionately high and adverse impact on the low-income population affected by the mining activity. Additionally, EPA remains concerned that the local community did not have the necessary information, or the opportunity, to meaningfully participate in the EIS process. Specifically, EPA is concerned the community was not informed when changes were made to different aspects of the mine project during the permitting and EIS process and therefore was not able to meaningfully comment on the final aspects of the mine.

The mountains affected by Spruce No. 1 Mine are an important cultural resource for many residents. In many cases the mountains have helped define their culture, and they are an integral part of their daily lives. For example, the mountain ridges of southern West Virginia have for over two centuries been viewed largely as a “commons”, where local residents have gathered wild medicinal herbs such as American Ginseng (*Panax quinquefolius*) and Goldenseal (*Hydrastis canadensis*) (Hufford 2003). In many cases, collection of these wild herbs provides much needed extra income to local communities during times of unemployment or economic hardship (Bailey 1999). Removing these mountains may have profound cultural changes on the residents in the area, and so it is important that cultural impacts be considered as well.

EPA considers action pursuant to § 404(c) to be within the scope of the policy directive of Executive Order 12898. A § 404(c) action has the potential to affect human health or the environment of low-income or minority populations. Accordingly, EPA evaluates environmental justice concerns when undertaking an action pursuant to § 404(c). In this case, EPA Region III conducted a public hearing on May 18, 2010 and received comments both orally and in writing. EPA has considered that members of the community expressed concern about loss of jobs and tax revenue (supporting local communities and schools) in the event that EPA's § 404(c) action would preclude any activities authorized at the Spruce No. 1 Mine. At the same time, EPA also has considered that members of the community have expressed concern regarding the adverse environmental and cultural aspects of the project described above. EPA also has received a petition from a variety of stakeholders raising concerns related to environmental justice issues associated with mountaintop mining.

In order to satisfy Executive Order 12898, EPA has considered whether there would be “…disproportionately high and adverse human health or environmental effects…” from its regulatory action. The scope of the inquiry for purposes of EPA's environmental justice analysis is directly tied to the scope of the regulatory action that EPA is taking. In the context of a Clean Water Act § 404(c) action, EPA is authorized to prohibit, restrict, or deny specification (or withdraw specification) of the discharge of dredged or fill material at defined sites in waters of the United States whenever it determines that use of such sites for disposal would have an unacceptable adverse impact on “municipal water supplies, shellfish beds, fishery areas (including spawning and breeding areas), wildlife, or recreational areas.”

Accordingly, EPA has considered the potential effects on municipal water supplies, shellfish beds, fishery areas, wildlife and recreational areas (all § 404(c) resources) of the project site in its environmental justice analysis within the context of this Final Determination under § 404(c). EPA has also considered whether the effects, if any, of EPA’s § 404(c) action on the § 404(c) resources will have a “disproportionately high and adverse human health or environmental [effect]" on "minority populations and low-income populations" of the project area.

EPA concludes, after performing the EJ analysis contemplated in Executive Order 12898 to the greatest extent practicable, and incorporating public comment, that this Final Determination under § 404(c) will not have a disproportionately high and adverse human health or environmental effect on the low-income and minority populations of the project area. EPA notes that the scope of this Final Determination is limited to withdrawal of specification of Pigeonroost Branch and Oldhouse Branch as disposal sites for the discharge of dredged or fill material for the construction of valley fills and sediment ponds associated with the Spruce No. 1 Mine as authorized, as well as the prohibition of future discharges, within the defined area constituting Pigeonroost Branch, Oldhouse Branch and their tributaries, associated with surface coal mining that would be expected to result in a nature and scale of adverse chemical, physical, and biological effects similar to the Spruce No. 1 mine. This action neither prohibits nor authorizes coal mining.

VI.C. Public Health

Interest in the overall environmental and human health effects from mountain top mining has been increasing during recent years. A growing body of research suggests that health disparities are not uniformly distributed across the Appalachian region, but instead are concentrated in areas where surface coal mining activity takes place (Hendryx et al. 2007, 2008, Hendryx 2008, Hitt and Hendryx 2010, Hendryx and Zullig 2009). This body of research examined study areas that include the Spruce No. 1 Mine project area. EPA has reviewed these studies, which sought to evaluate whether associations between surface coal mining and health exist. These studies do not provide direct assessments of environmental air and water quality in mining areas in relation to individual exposures and health outcomes. More comprehensive research to develop these direct assessments, including environmental chemical analyses and biological monitoring, would require significantly greater study than is appropriate for this Final Determination.

However, the authors of these studies identify significant associations between surface coal mining activity and a variety of health disparities. They indicate that mortality rates in Appalachian coal mining regions for chronic respiratory, cardiovascular, and kidney disease, and for some forms of cancer including lung cancer are disproportionately elevated when compared to other regions (Hendryx 2008, Hendryx et al. 2007, 2008, Hendryx and Zullig 2009). One study also demonstrates that higher cancer mortality rates are strongly associated with lower WVSCI scores even after accounting for smoking, poverty, and urbanization (Hitt and Hendryx 2010). Another study spatially autocorrolates cancer mortality with surface mining intensity as measured by West Virginia permit boundaries after accounting for the same factors (Hendryx et al. 2010). These studies by their nature could not and do not establish any causal linkage between surface coal mining and these elevated rates of adverse health effects, but because they point to significant associations between surface coal mining and elevated rates of adverse health impacts, the results warrant more research using rigorous epidemiological methods. The existing body of literature suggests that various negative health outcomes are not the result of a single exposure, but may reflect chronic exposures to multiple environmental contaminants, both air and/or water, which will vary for each individual.

VII. Conclusions and Final Determination

Based on the foregoing analyses, EPA Region III's Recommended Determination, and upon consideration of the public comments received in response to EPA Region III's Proposed and Recommended Determinations, EPA has determined that discharges of dredged or fill material to Pigeonroost Branch and Oldhouse Branch and their tributaries for the purposes of construction, operation, and reclamation of the Spruce No. 1 Mine as authorized by DA Permit No. 199800436-3 (Section 10: Coal River) will have unacceptable adverse effects on wildlife. DA Permit No. 199800436-3 (Section 10: Coal River) authorizes construction of valley fills and sediment ponds and other discharges into Pigeonroost Branch and Oldhouse Branch and their tributaries that will bury approximately 6.6 miles of high quality headwater streams. Pigeonroost Branch and Oldhouse Branch support diverse and healthy biological communities comparable to nearby White Oak Branch, recognized by the WVDEP as supporting least-disturbed, reference quality conditions. Pigeonroost Branch and Oldhouse Branch represent streams within the larger Headwaters Spruce Fork sub-watershed and Coal River sub-basin that remain relatively free of water quality degradation. As such, Pigeonroost Branch and Oldhouse Branch are valuable in and of themselves and provide essential habitat for wildlife species within the Headwaters Spruce Fork sub-watershed and Coal River sub-basin.

As authorized by the DA Permit, discharges to Pigeonroost Branch and Oldhouse Branch will bury wildlife that live in those streams or within the footprint of the valley fills. Other wildlife will lose important headwater stream habitat on which they depend for all or part of their life cycles. EPA has determined that those impacts alone are unacceptable adverse impacts because of the miles of stream destroyed, the rarity of those streams, and the importance of those streams and their wildlife to the watershed. Unacceptable adverse effects on wildlife from the activities authorized by the permit will not be limited to direct burial of wildlife and significant loss of wildlife habitat. Burial of Pigeonroost Branch and Oldhouse Branch would also result in unacceptable adverse effects on wildlife downstream caused by the removal of functions performed by the buried resources and by transformation of the buried areas into sources that contribute contaminants to downstream waters. In addition, authorized discharges to Pigeonroost Branch and Oldhouse Branch would contribute to conditions that would support blooms of golden algae that release toxins that kill fish and other aquatic life. Thus, EPA has also determined that these adverse impacts on downstream wildlife by themselves are unacceptable.

In addition, these adverse impacts are not in compliance with the requirements of the Clean Water Act (CWA) and EPA's implementing regulations under § 404(b)(1). EPA has determined that the impacts described above may be avoidable and the permittee has failed to demonstrate that there are no less environmentally damaging alternatives; the discharges associated with the Spruce No. 1 Mine will cause or contribute to significant degradation of waters of the United States (especially when considered in the context of the significant cumulative losses and impairment of streams across the Central Appalachian ecoregion); and the compensatory mitigation will not adequately offset the impacts to Pigeonroost Branch and Oldhouse Branch. These failures to comply with the Guidelines serve to strengthen EPA's judgment about the unacceptability of the significant adverse impacts that will occur.

EPA also notes that USFWS, in its comments on both the Proposed and Recommended Determinations, concurred with EPA Region III's conclusion that the project, as authorized, would result in unacceptable adverse effects on wildlife and that this conclusion is supported by the available scientific information. USFWS also notes that it has consistently expressed concerns regarding the loss of headwater streams and adjacent riparian and terrestrial habitats associated with the Spruce No. 1 Mine, as well as its likely impacts on downstream water quality, aquatic organisms, and terrestrial and aquatic wildlife that depend on those resources.

Finally, EPA notes that this Final Determination is a case-specific determination based on the facts and circumstances presented here. EPA's § 404(c) authority does not require a finding that the particular circumstances are unique, rather it requires a finding of unacceptable adverse impacts to protected resources. EPA's authority is discretionary, and the agency evaluates unacceptability based on the context of the adverse impacts, including their relative size and whether or not it is an impact the aquatic resource can incur without significant adverse environmental effects. Similarly, EPA's decision to undertake a § 404(c) action after a permit had been issued is also a case-specific one and does not threaten the tens of thousands of permits and authorizations that are issued by the U.S. Corps of Engineers every year. This determination was initiated based on the substantial number of project-specific considerations focusing on important headwater stream miles impacted in a stressed watershed where a vast majority of the impacts authorized by the permit had not occurred because of third-party litigation. This is a rare circumstance and the fact that this is only the second final determination following permit issuance in the past 40 years demonstrates that EPA does not undertake such an action lightly.

Accordingly, pursuant to § 404(c) of the Clean Water Act and its implementing regulations at 40 CFR Part 231 and for the reasons set forth herein, it is my determination that the specification embodied in DA Permit No. 199800436-3 (Section 10: Coal River) of Pigeonroost Branch and Oldhouse Branch, and their tributaries, as disposal sites for discharges of dredged or fill material for construction, operation, and reclamation of the Spruce No. 1 Mine be withdrawn. This Final Determination also prohibits the specification of the defined area constituting Pigeonroost Branch, Oldhouse Branch and their tributaries for use as a disposal site associated with future surface coal mining that would be expected to result in a nature and scale of adverse chemical, physical, and biological effects similar to the Spruce No. 1 mine.

Date: 1/13/11

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