November 22, 2006

U.S. Army Corps of Engineers
Attn: CECW-OR/MVD (David B. Olson)
441 G Street NW
Washington, DC 20314-1000

Re: Proposal to Reissue and Modify Nationwide Permits, Docket No. COE-2006-0005

On behalf of Ohio Valley Environmental Council, Coal River Mountain Watch, West Virginia Highlands Conservancy, Kentucky Riverkeeper, and Kentucky Waterways Alliance, we are submitting these comments on the Corps' September 26, 2006 proposal to reissue and modify its Nationwide Permits (NWPs) under § 404(e) of the Clean Water Act. 71 Fed. Reg. 56258. The primary focus of our comments is on NWP 21 and the proposed new NWPs E and F, but our criticism of the Corps' methodology for compensatory mitigation applies to all of the the NWPs.

Section 404(e) requires that NWPs be based on a determination of minimal environmental effects, both individually and cumulatively. Section 404(e) also requires that NWPs be based on the EPA's § 404(b)(1) Guidelines. Those Guidelines require the Corps to analyze the cumulative effects of its permitting decisions. 33 C.F.R § 320.4(a)(1); 40 C.F.R. § 230.10(c). Pursuant to the Guidelines, no permits shall be issued that "will cause or contribute to significant degradation of the waters of the United States." Id. Determinations of the effects of each proposed discharge "shall include ... [c]umulative effects on the aquatic ecosystem." Id., § 230.11(g). "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." Id., § 230.11(g)(1). The Guidelines warn that the cumulative effect of piecemeal changes can result in major impairment of water resources and interfere with existing aquatic ecosystems. Id. Cumulative effects should be predicted to the extent reasonable and practical. Id., § 230.11(g)(2). The Corps may only issue a 404 permit if there is sufficient information to "make a reasonable judgment as to whether the proposed discharge will comply with [the 404(b)] Guidelines." Id., § 230.5(g).

1. The Corps has no reasoned basis or substantial evidence to support its determinations that the individual or cumulative environmental impacts of NWPs 21, E or F will be minimal. To issue an NWP, the Corps must determine that the activities in each NWP category will cause only minimal adverse effects both on an individual and cumulative basis. Those Guidelines require the Corps to "set forth in writing an evaluation of the potential individual and cumulative adverse impacts of the category of activities to be regulated under the General Permit." 40 C.F.R. § 230.7(b). Such evaluations must "include documented information supporting each factual determination in § 230.11 of the Guidelines." Id., § 230.7(b)(1). In addition, under basic principles of administrative law, the Corps must do more than simply make the determinations. It must support those determinations with substantial evidence. Cement Kiln Recycling Coalition v. EPA, 255 F.3d 855, 866 (D.C. Cir. 2001). It must also explain the basis for its decision in a manner that is rational and sufficiently detailed, and must link the evidence to the conclusions drawn from it. Transactive Corp. v. U.S., 91 F.3d

232, 236 (D.C. Cir. 1996); Dickson v. Secretary of Defense, 68 F.3d 1396, 1407 (D.C. Cir. 1995).

1a. In determining whether impacts are minimal and whether significant degradation exists, the Corps has improperly ignored its own Final PEIS on the massive filling of streams by surface coal mining operations in Appalachia. When the Corps last renewed the NWPs in January 2002, it promised that it would consider the results of its pending Mountaintop Mining/Valley Fills in Appalachia Final Programmatic Environmental Impact Statement (PEIS) when that document was completed:

> we are gathering data and, in conjunction with other federal agencies, are preparing a programmatic mountaintop mining/valley fill (MTM/VF) EIS to better understand the environmental effects of mountaintop mining and valley fills, as well as programmatic changes that may be necessary to address those impacts. The Corps will reevaluate NWP21 when the mountain top mining EIS is completed. The Corps intends to use the results of this EIS and all other information that may be available at that time, including information resulting from individual verification of all NWP 21 projects as required under the revised terms and conditions, to make sure that NWP 21 results in no more than minimal impacts (site-specifically and cumulatively) on the aquatic environment.

67 Fed. Reg. at 2039. The final PEIS was issued a year ago in October 2005. Yet there is no indication that the Corps used that document in proposing the renewal of NWP 21, E or F. The Corps' proposal only mentions the PEIS once, and that reference contains no analysis whatsoever. 71 Fed. Reg. at 56268. The Corps has acted as if the PEIS was never issued.

The Corps and other federal agencies spent over $5 million on the environmental studies underlying the PEIS. PEIS, p. 27. The PEIS was supposed to analyze the cumulative environmental impacts of past and future valley filling, as well as alternatives that would reduce those impacts, including stream loss. Id. at 2. As our January 2005 comments on the draft PEIS showed, the alternatives analysis was woefully inadequate. The Corps only considered process alternatives for how to issue NWPs, not alternatives that would reduce environmental harm. Yet even those process alternatives seem to have been ignored by the Corps in its current proposal. There is no sign that there is any connection between the PEIS and this proposal. There is no Record of Decision adopting a PEIS alternative. There is no reference to PEIS studies. The Decision Document on NWP 21 does not cite anything from the PEIS. It is hard to imagine a more dysfunctional and arbitrary process than the one followed here. By completely ignoring the PEIS, the Corps' Decision Documents violate the requirement in the Guidelines for documented information.

1b. The Corps' Decision Documents are not based on reasoned analysis or substantial evidence. The Decision Documents supporting the NWPs do not provide a reasoned basis or substantial evidence supporting a minimal effects determination. They offer boilerplate, conclusory, and unsubstantiated assertions. They make generalized statements that some impacts may occur, but then fail to describe the effect or significance of those impacts on aquatic or terrestrial ecosystems. Instead, the Corps assumes in every case that its procedures will

ensure that the impacts will be insignificant or will mitigate the impacts to insignificance. The impact analyses are so general that they are meaningless. There is no analysis of impacts at any particular geographic location. There is no description of any region, state, or locale where the NWP will be used. There is no reference to the PEIS or its supporting studies. There is no assessment of the effectiveness of compensatory mitigation.

Using the document compare function in Microsoft Word, a comparison of the Decision Documents for NWPs 21, E and F shows that they are virtually identical. The only differences between the environmental impacts of NWP 21, E and F are the following trivial word changes in the 31-page Decision Documents:

1. NWP 21 cannot be used for activities within, or directly affecting, critical resource waters under Special Condition 19, while NWPs E and F can be used in those areas if the District Engineer makes a finding that the effects will be minimal.

2. The calculated number of acres of cumulative impacts to waters of the United States is different for NWPs 21, E and F.

3. NWP 21, NWP E coal remining, and NWP F activities may destroy wetlands, but NWP reclamation activities may result in the restoration, enhancement, or establishment of wetlands.

4. NWP E reclamation activities may establish or restore floodplain values, while NWP 21 or NWP F activities would not.

5. Some NWP 21 surface mining activities may permanently eliminate recreational uses of the area, while NWP E reclamation activities would only interrupt certain recreational activities and allow them to resume thereafter.

6. NWP 21 activities are “unlikely” to affect salinity gradients, while NWP F activities will have “negligible” effects on salinity gradients.

7. NWP E reclamation activities will improve habitat for fish, crustaceans, molluscs, and other aquatic organisms, while NWP 21 and NWP F activities will not.

8. NWP 21 activities will have “minimal” effects on mud flats, while NWP E activities will have “little or no” effects on mud flats, and NWP F activities will have “no” effects on mud flats.

9. NWP 21 activities will have “minimal” effects on coral reefs, while NWP E and F activities will have “no” effects on coral reefs.

Altogether, these differences involve a tiny fraction of the total words in the decision documents. In addition, as a substantive matter, the differences are trivial, and fail completely to address the

specific, actual impacts of these NWPs. The Corps' Decision Documents are copycat forms, not serious analyses of environmental impacts.

2. The available scientific evidence demonstrates that surface coal mining activities authorized by the NWPs are causing cumulatively significant degradation of streams in Appalachia. The cumulative effects of NWP 21 activities are unquestionably more than minimal. That was true at the time the 2002 NWP 21 was issued, and remains true today. In its comments on the proposed 2002 NWP 21, EPA stated that "[n]o other NWP category produces impacts greater than NWP 21" and that coal mining and valley fill operations in Appalachia cause "significant ecological damage to the headwater stream systems." 10/9/01 EPA Letter, Enclosure, p. 8, **Attachment 1**.

The U.S. Fish and Wildlife Service (FWS) similarly stated that it "believes that surface coal mines often adversely affect large areas of upland and wetland habitat, and in general, do not meet the standard of having 'no more than minimal' impacts on the environment." 7/2/01 FWS Letter, pp. 1-2, **Attachment 2**. FWS described the environmental impact of coal mines in Appalachia on aquatic and terrestrial ecosystems as "unmitigatable" and "unprecedented." 9/20/01 FWS Letter, p. 1, **Attachment 3**. FWS said it knew "of no other single type of activity, whether authorized by individual or general permit, with such significant individual and cumulative adverse environmental impacts as those currently authorized by NWP 21." Id., p. 2. FWS described the consensus of scientists working in the field that "small first order streams form the heart and soul of the functional stream ecosystem in . . . every watershed that has been carefully studied. . . . Clearly, any discussion of destroying even one first order stream is out of order. . . ." Id., p. 4. "These experts asserted that stream loss is unacceptable from a biological standpoint, and that there is no scientific basis on which to develop an acceptable loss threshold." Id., p. 5. The FWS described the scientific consensus from meetings on the draft PEIS that small headwater streams are the "heart and soul" of the stream ecosystem and that destroying even one of them was unacceptable.

In addition, 43 "senior aquatic scientists," including "members of the National Academy of Sciences and its scientific Boards," "president[s] of national scientific organizations, and leading authors on the ecology, water quality, and biota of streams and rivers," stated in their comments on the proposed 2002 NWP 21 that:

> The available scientific evidence clearly demonstrates that the length of headwater streams in the landscape has been significantly reduced because of the mining and development activities that have been permitted under this program. . . . This loss of headwater streams has profoundly altered the structure and function of stream networks, just as eliminating fine roots from the root structure of a tree would reduce its chances of survival.

10/5/01 Univ. of Georgia Comments, p. 1, **Attachment 4**. These scientists supported their conclusion by citing and attaching thirty articles in scientific journals. Id. The Corps has never responded to or refuted these comments. In addition, in her recent testimony in OVEC v. Bulen, Civil No. 3:05-784 (S.D.W.Va.), Dr. Margaret Palmer, plaintiffs' expert on stream restoration,

stated that in terms of conservation priorities, headwater streams are "at the top of the list" of areas that need to be preserved. Bulen Trial Transcript (hereafter "Bulen Tr.") 6:102-03, **Attachment 33**. NWP 21, E and F would affect mostly headwater streams, and therefore would have more than minimal effects.

2a. Stream degradation is significant. The PEIS demonstrates that significant degradation of the aquatic and terrestrial ecosystem in Appalachia has likely occurred, and is continuing to occur. According to the PEIS, from 1992 through 2002, mountaintop removal mining and associated valley fills in Appalachian have destroyed 1,208 miles of streams. PEIS, pp. III.D-2, IV.C.1. Mining impacts on the nutrient cycling function of headwaters streams "are of great concern." Id., App. I, p. 74.

The PEIS only analyzed stream impacts up to 2002. Since 2002, those impacts have continued at a rapid pace. In West Virginia alone, just eleven of the NWP 21 authorizations that the Corps has granted since 2002 impacted or destroyed over 140,000 linear feet (over 26 miles) of streams. OVEC v. Bulen, 410 F. Supp.2d 450, 457 (S.D.W.Va. 2004). In Kentucky, 54 NWP 21 authorizations granted by the Corps between 2002 and 2004 cumulatively created 191 valley fills that filled 187,813 linear feet (over 35 miles) of streams, and disturbed 35,073 acres (over 55 square miles) of land. March 11, 2005 Plaintiff's SJ Mem., pp. 7-9 in Kentucky Riverkeeper v. Rowlette, **Attachment 5**. The Corps has no reasonable basis for determining that these effects are insignificant.

Significant stream degradation caused by valley fill and mining activities is best documented for watersheds in West Virginia. In OVEC v. Bulen, Civil No. 3:05-0784 (S.D.W.Va.), expert analysis of GIS data showed that present and pending surface mining permit operations and valley fills conservatively cover the following percentages of streams in these watersheds:

Watershed	**% of total streams covered**	**% first order streams covered**
Upper Guyandotte	7.4	9.5
Dingess Run	19.9	19.5
Coal River	12.0	14.5
Laurel Creek	28.0	37.3
Upper Kanawha	7.9	10.2
Cabin Creek–Headwaters	22.9	32.1

Expert Report of Douglas P. Pflugh, May 16, 2006, Summary, p. 2, **Attachment 6**. The Corps reviewed this data and found it to be "very reliable." Mullins Testimony, Bulen Tr. 3:202. In the headwaters of Spruce Fork in West Virginia, surface mine permits and valley fills cover 35.5% of total stream length and an alarming 44% of first order stream length. FEIS, Spruce

Mine No. 1, p. 2-180 (September 2006). In OVEC v. Bulen, Civil No. 3:05-0784 (S.D.W.Va.), plaintiffs' expert aquatic ecologist, Dr. Bruce Wallace, testified in October 2006 that impacts of this magnitude were "astounding," a "danger signal," and meant lost headwater stream functions in these areas. Wallace Testimony, Bulen Tr. 2:32-34. Plaintiffs' stream restoration expert, Dr. Margaret Palmer, similarly testified that a loss of 29% of the watershed and 18% of the first order streams in a watershed were "incredibly significant." Palmer Testimony, Bulen Tr. 2:134. She said that this loss was so huge that it was questionable whether the stream could ever be restored. Id. at 2:135-36.

If smaller watersheds at the creek level are considered, the cumulative impacts are even more significant. In issuing NWP 21 authorizations, the Huntington District has only considered cumulative impacts in the watershed where the fills are located. In OVEC v. Bulen, Civil No. 3:03-2281, the Corps' decision documents for twelve NWPs show the following:

Mine operator/ Mine Name	Acres disturbed by mine	No. of Fills/ Impoundment	Stream loss in linear feet	Stream loss in acres	Watershed upstream of fills, in acres	Permitted or disturbed acreage in watershed (cumulative)
Kingston Resources, Inc./ Horse Creek	460	4 fills	10,166	0.759	374	not available
Horizon Resources, LLC/ Synergy	1,147	2 fills	5,887	0.38	280	not available
Alex Energy, Inc./ Hardway Branch	634	4 fills	8,500	1.216	678	21% of Twentymile Creek
Mingo Logan Coal Co./ Phoenix No. 3	469	3 fills	5,021	0.56	316	21% of Island Creek
Fola Coal Co./ Fola No. 4a	1,743	0	31,441	8.936	0	60% of Leatherwood Creek
Hobet Mining, Inc./ Westridge	330	2 fills	5,400	3.008	1076	33% of Mullins Branch; 39% of Mud River
Elk Run Coal Co./ West of Stollings	1,087	4 fills	8,101	0.869	482	53% of Robinson Creek; 68% of Stollings Fork
Independence Coal Co./ Edwight	1,847	2 fills	8,390	0.579	516	57.9% of Shumate Creek; 65.5% of Left Fork of Shumate Creek; 87.5% of Right Fork of Shumate Creek
Hobet Mining, Inc./ Hewitt Creek	411	6 fills	8,130	0.86	n/a	41% of Hill Fork; 25% of Hewitt Creek

Independence Coal Co./ Lexerd	730	8 fills	15,811	2.669	1484	71% of Laurel Creek
Green Valley Coal Co./ Blue Branch	n/a	1 impound ment	431	0.044	67	66% of Blue Branch
Cumulative Totals	8858	35 fills 2 impound ments	107278	19.88	5273	

Thus, the majority of several of these smaller creek-level watersheds were filled. The Corps has no reasonable basis for concluding that stream losses of this magnitude are minimal.

2b. Water quality degradation is significant. In its Decision Documents on NWPs 21, E, and F, the Corps states that coal mining operations "will have adverse effects on water quality," but that compensatory mitigation will ensure that these effects are minimal. Decision Documents, § 5.1(o). The Corps has no factual basis for this conclusion.

In its June 16, 2006 comments on the Draft EIS for the Spruce No. 1 mine, EPA stated "existing data from Spruce Fork …indicates MTM/VF activities have degraded streams to the point where they are considered impaired using the West Virginia Stream Condition Index (WVSCI). Considering that water leaving the mined and filled areas in Spruce Fork is degraded additional caution is necessary in future permitting and mitigation requirements. The Final EIS should consider the strong and statistically significant relationships found between biological condition and these water quality parameters as summarized in Table 1 and supporting data. (see Attachment 2)." FEIS, Spruce No. 1 Mine, p. 2-98.

In addition, the PEIS stated that valley fills have the following adverse effects on downstream waters:

> Stream chemistry showed increased mineralization and a shift in macroinvertebrate assemblages from pollution-intolerant to pollution-tolerant species. Water temperatures from valley fill sites exhibited lower daily fluctuations and less seasonal variation than water temperatures from reference sites. . . .
>
> The EPA Water Chemistry Report found elevated concentrations of sulfate, total and dissolved solids, conductivity, selenium and several other analytes in stream water at sampling stations below mined/filled sites.

PEIS, p. IV.B-4. In fact, the EPA Water Chemistry Report found that conductivity was "clearly impacted by MTM/VF [mountaintop/valley fill] mining." PEIS, App. D, EPA 2002b, p. 2. "Conductivity at Filled sites can be 100 times greater than that at Unmined sites." Id. at 45. "Unmined sites have a consistently low conductivity no matter what the flow. Filled sites have a broad range of conductivity much higher than Unmined sites indicating that MTM/VF mining

increases specific conductance in streams." Id. at 46. Conductivity is generally five to nine times greater below valley fills than below unmined sites. Wallace Testimony, Bulen Tr. 2:34-35. Sulfates were 41 times greater; calcium, magnesium and hardnesss were 21 times greater; total dissolved solids were 16 times greater, and selenium was 7.8 times greater. Id. at 2:35. These chemical changes have a significant effect on the aquatic ecosystem. Id. Dr. Wallace called them a "witches' brew." Id. at 2:37, 95. There is no support for the Corps' statement that mitigation reduces conductivity to minimal levels. On the contrary, EPA found that "[t]he highest values are consistently at the Sediment Control Structure (MT-24) which is on a reclaimed MTM/VF mine." PEIS, App. D, EPA 2002b, p. 45.

Coal mining and valley fills in WV are also causing significant degradation of the aquatic environment due to selenium contamination. In its Decision Documents, the Corps does not discuss or mention the adverse effects of selenium contamination on water quality. The PEIS includes a summary of an April 13, 2004 workshop on selenium contamination of WV streams. The studies presented at that workshop show that selenium is highly toxic to aquatic life, it has been detected at elevated levels in many WV streams, and this contamination is associated with surface coal mining activities. PEIS, pdf pages 482-90.

In November 2005, WVDEP began a fish tissue study of the impacts of selenium downstream from areas where high selenium coal is being mined. WVDEP's preliminary findings indicate significant bioaccumulation of selenium in downstream lakes and streams (April 28, 2006 powerpoint presentation: DEP Selenium Study, Background and Progress, available at www.dep.state.wv.us/item.cfm?ssid=11&ss1id=747, **Attachment 7**):

Stream	**Location**	**Avg. Water Column SE (ppb)**	**Average Fish Tissue Se (ppm)**
Beech Creek	Logan County, WV	11.0	10.7
Pond Fork	Near Bob White, WV	1.8	3.8
White Oak Creek	Near Orgas, WV	15.3	5.7
Seng Creek	Garrison, WV	34.0	8.6
Hughes Fork	Near Dixie, WV	5.6	10.1
Upper Mud River Reservoir	Lincoln County, WV	3.9	33.9

The levels found at these sites greatly exceed levels where toxic effects in sensitive species begin to occur, which is 4 ppm. See A. Dennis Lemly, "Selenium in Aquatic Ecosystems: A Guide for Hazard Evaluation and Water Quality Criteria," Springer 2002, p. 31, **Attachment 8**. In fact, the fish tissue selenium level in the Upper Mud River Reservoir, which is a lake downstream from the Hobet 21 mining complex, exceeds this threshold by 850%.

During the spring and summer of 2003, FWS collected fish tissue from Mud River streams. Fish tissue from Sugartree Branch and Stanley Fork contained selenium ranging from 4.13 ppm to 6.85 ppm, which are above Lemly's 4 ppm toxic effect threshold. July 13, 2004 Letter from Chapman to Mullins re: Phoenix No. 4 Surface Mine, p. 11, **Attachment 9**. FWS has also stated that the total number of fish species was dramatically higher in unmined streams than in either streams with valley fills and no selenium or streams with valley fills and detectable selenium. Id.

In general, "[t]he most widespread human-caused sources of selenium mobilization and introduction into aquatic ecosystems in the U.S. today are the extraction and utilization of coal for generation of electric power and the irrigation of high-selenium soils for agricultural production." Bryant, G., McPhilliamy, S., and Childers, H., 2002, A survey of the water quality of streams in the primary region of mountaintop / valley fill coal mining, October 1999 to January 2001, *in* PEIS, App. D, Stream chemistry final report, p. 74. "[I]n the region MTM/VF mining, the coals can contain an average of 4 ppm of selenium, normal soils can average 0.2 ppm, and the allowable limits in the streams are 5 ug/L (0.005 ppm). Disturbing coal and soils during MTM/VF mining could be expected to result in violations of the stream limit for selenium." Id.

FWS states in its comment letter on the Hollow Mountain project, "The Service believes that it is unlikely that toxic materials can be isolated indefinitely from weathering and in the long-term there will likely be leaching of toxic materials." July 9, 2004 FWS Letter to ACOE, p. 3, **Attachment 10**. Further, it is clear that prevention is key in controlling selenium contamination of surface water. Dr. A. Dennis Lemly stated in a January 5, 2004, white paper on selenium issues in West Virginia:

> The lessons from Belews Lake, supported by over two decades of research findings from many other locations throughout North America (Lemly 1997b, 1999, 2002b; Skorupa 1998a, Hamilton 2004), underscores the need to take a preventive approach to selenium pollution rather than attempting to deal with it after contamination has taken place. With respect to coal mining this means pre-mine assessment. Failure to adopt this approach can only worsen the selenium pollution and associated ecological risks that have emerged in West Virginia.

Attachment 11, p. 2. The risk of significant ecological harm from selenium contamination in the West Virginia coal fields is real and has been confirmed not only by the PEIS but also by studies conducted by the FWS. "Our results show that selenium present in surface waters in southern West Virginia is bioavailable, and that violations of the EPA selenium water quality criterion may result in selenium concentrations in fish that could adversely affect fish reproduction. In some cases fish tissue concentrations were near levels believed to pose a risk to fish-eating birds." Id., pp. 2-3.

2c. Degradation of aquatic diversity is significant. The 404(b)(1) Guidelines require the Corps to consider the "adverse effects of the discharge of pollutants on aquatic ecosystem diversity." 40 C.F.R. § 230.10(c)(3). Headwater streams can be responsible for 90

percent of the biodiversity in an entire watershed. Palmer Testimony, p. 170-71. Valley fills reduce biodiversity by favoring pollutant-tolerant macroinvertebrate species over pollution-intolerant species. The coal industry's own water quality expert admitted in OVEC v. Bulen that valley fills cause a dramatic reduction in mayfly taxa in downstream waters, with a shift to more pollution-tolerant taxa. Kirk Testimony, Bulen Tr. 5:88. Dr. Donald Cherry, an expert in aquatic ecotoxicology from Virginia Tech (Bulen Tr. 5:111), testified in OVEC v. Bulen about his research involving water discharges from valley fills in southern West Virginia. Bulen Tr. 5:114-16. His study found a shift in the benthic community to a more tolerant type. Id. at 5:120, 125, 165-66. He agreed that the created streams would not be the functional equivalent of the streams buried by valley fills. Id. at 5:145-46. Indeed, he rated the streams below valley fills as "terrible" with scores well below the score for the reference stream. Id. at 5:152-53. Those streams showed "significant stress." Id. at 5:174. Dr. Wallace stated that there is a well-established correlation between conductivity levels and the loss of sensitive benthic organisms. Wallace Testimony, Bulen Tr. 6:31-36. High conductivity is contributing to major problems with benthic invertebrates. Id. Some of the worst conditions were found below fill sites. Id.

The loss of biodiversity from this loss of benthic taxa is significant. Id. at 6:67-68. Other organisms cannot make up for this loss of biodiversity because they serve different functions. Palmer Testimony, Bulen Tr. 6:103-06. Different species are not necessarily interchangeable. Id. The functions of filled first and second-order headwater streams cannot be replaced in the larger order streams downstream. Wallace Testimony, Bulen Tr. 6:41. Those functions include nutrient retention, water purification, and energy production functions. Id. at 6:43-47; Palmer Testimony, Bulen Tr. 6:101-02.

The only significant vertebrate animal in headwater streams is the salamander. Wallace Testimony, Bulen Tr. 1:258. The Central and Southern Appalachians contain the greatest abundance of species of salamanders in the world. Id. at 1:242, 6:39. Salamanders are being buried by valley fills and not replaced downstream. Id. at 6:40; Cherry testimony, Bulen Tr. 5:166-67. Forest loss associated with mountaintop mining and valley fills has the potential to adversely impact over 1.2 billion salamanders, or 3.4% of the entire four-state population in Appalachia. PEIS, App. I, pp. 92-93. The Corps' compensatory mitigation has no effect on these losses because it does nothing to prevent forest loss.

In its Decision Documents for NWPs 21, E and F, the Corps states that coal mining operations may decrease fish and wildlife habitat, but compensatory mitigation will ensure that these effects are minimal. Decision Documents, § 5.1(g). Again, the Corps has no factual basis for this conclusion. According to the PEIS, from 1992 through 2002, mountaintop removal mining and associated valley fills in Appalachian have destroyed 380,547 acres of forest (an area almost ten times larger than the District of Columbia). PEIS, pp. III.D-2, IV.C.1. If current trends continue, that amount will double by 2012. Accordingly, in its June 16, 2006 comments on Spruce Mine No. 1, EPA stated that, "[o]f the largely forested mountaintop mining study area, the Final PEIS estimated that approximately 761,094 acres have been or may be affected by recent and future (1992-2012) mountaintop mining. To date, these impacts have not been successfully mitigated, resulting in the impairment of significant natural resources at the watershed level." FEIS, Spruce Mine No. 1, pp. 2-64 to 2-65. In addition, the cumulative

effects of past, present and anticipated surface mines in individual watersheds are even greater. For example, in the Coal River watershed, mining activities cumulatively impact 12% of that area, or 72,969 out of 570,713 acres. OVEC v. Bulen, Expert Report of Douglas P. Pflugh, May 16, 2006, Summary, p. 1, **Attachment 6**. When the cumulative impacts of projects in the same watershed affect over 10,000 acres of forested land, those impacts must be deemed significant. Louisiana Wildlife Federation v. York, 761 F.2d 1044, 1052-53 (5th Cir. 1985) (impacts on 8,000 acres of forest are significant enough to require an EIS).

This forest destruction is profound and permanent because "unlike traditional logging activities associated with management of hardwood forest, when mining occurs, the tree, stump, root, and growth medium supporting the forest are disrupted and removed in their entirety." PEIS, p. IV.C-1. Mountaintop mining causes "fundamental changes to the terrestrial environment," and "significantly affect[s] the landscape mosaic," with post-mining conditions "drastically different" from pre-mining conditions. Id., App. I, pp. v, 23, 93. One recent study has found that "[a]t this point in time, reestablishment of forest on these postmining sites appears questionable. Neither mountaintop removal sites nor the contour mines support a vegetation composition or structure that is likely to resemble regional forests." Edmonds and Loucks, "Woody Establishment Patterns Following Mountaintop Removal in the Coal River Valley," available at www.mcrcc.osmre.gov/PDF/Forums/Reforestation/Poster/P-1.pdf, **Attachment 12**.

Mining impacts to habitat of interior forest bird species could have "extreme ecological significance." PEIS, App. I, p. 90. A study of cerulean warbler habitat changes due to mountaintop removal mining stated, "[p]reference for ridges suggests that MTMVF may have a greater impact on Cerulean Warbler populations than other sources of forest fragmentation since ridges are removed in this mining process. Generally, our data indicate that Cerulean Warblers are negatively affected by mountaintop mining from loss of forested habitat, particularly ridgetops, and from degradation of remaining forests (as evidenced by lower territory density in fragmented forests and lower territory density closer to mine edges)." Weakland and Wood, "Cerulean Warbler (Dendroica Cerulea) Microhabitat and Landscape-level Habitat Characteristics in Southern West Virginia in Relation to Mountaintop Mining/Valley Fills," Final Project Report, December 2002, p. 1, **Attachment 13**. Mining could impact 244 terrestrial species. PEIS, App. I, pp. 86. The loss of the genetic diversity of these affected species "would have a disproportionately large impact on the total aquatic genetic diversity of the nation." Id., App. I, p. 78.

2d. Landmoving activities related to mining are significant. The amount of earth moved by mining activities is sufficient by itself to demonstrate that the environmental impacts of mining are significant and require preparation of an EIS. A recent study singles out mountaintop removal mining and valley fills in West Virginia and adjacent states as the greatest contributor to earth moving activity in the United States. Hooke, R.L. 1999, "Spatial distribution of human geomorphic activity in the United States: comparison with rivers," Earth Surface Processes and Landforms 24: 687-692, **Attachment 14**. Thus, surface coal mining activities and valley fills are in a class by themselves in terms of environmental disturbance.

3. The Corps' cumulative impact analyses in its decision documents are grossly deficient. The Corps' Decision Documents contain a perfunctory analysis of cumulative impacts that invariably follows this bare-bones format:

> Using the current trend, approximately [#] activities could be authorized over a five year period until this NWP expires, resulting in impacts to approximately [#] acres of waters of the United States, including jurisdictional wetlands. Approximately [#] acres of compensatory mitigation would be required to offset those impacts. The required compensatory mitigation will attenuate cumulative impacts on the Nation's aquatic resources, so that the net effects on the aquatic environment resulting from the activities authorized by this NWP will be minimal.

The relevant numbers that appear in the [#] position in the decision documents for the 2002 and 2007 NWPs involving coal mining are:

NWP	Number of Activities	Impacted Acres	Mitigated Acres
21	1020	405	355
E	590	1890	1465
F	430	485	455

This type of cumulative analysis is deficient for seven reasons. First, these figures do not represent a true cumulative impact analysis, because they only represent projected future impacts of NWP activities during the next five years. The Corps has excluded past impacts of all NWP 21 activities and individual 404 permits prior to 2007. NEPA regulations define cumulative impacts to include the impacts of past actions. 40 C.F.R. § 1508.7. Those past activities are enormous. The PEIS estimated 1208 miles of stream impacts from 1992-2002. PEIS, p. IV.B-1. This represented 2% of the streams in the region. Id. The Corps must factor these lost stream miles into its cumulative impact analysis.

The Corps must also add in the streams lost during 2002-2007 from individual permits and the 2002 NWP 21. The Corps already has this data. Mullins Testimony, Bulen Tr. 3:198-99. In the Kentucky and West Virginia NWP 21 litigation, the Corps filed affidavits with supporting tables showing how many stream feet had been lost. In West Virginia, the Huntington District verified 65 NWP 21 projects between March 27, 2002 and April 7, 2004, which cumulatively impacted 324,779 linear feet of streams. May 28, 2004 Mullins Declaration, Ex. 1, in OVEC v. Bulen, Civil No. 3:03-2281, **Attachment 15**. In Kentucky, the Corps expressed the stream impacts in Environmental Integrity Units (EIUs) rather than linear feet. It calculated that the total impacts for 59 NWP 21 projects between November 20, 2002 and February 28, 2005 were 91,164 EIUs. April 14, 2006 Chubb Declaration, Ex. 14, in Kentucky Riverkeeper v. Rowlette, Civil No. 05-181-DLB, **Attachment 16**. The Corps has hidden this data from public view and improperly excluded it from the administrative record. The Corps is clearly capable of updating this data to provide a full accounting of the total amount of streams lost from 2002 to the present from NWP 21, and it must do so.

Second, by the Corps' own reckoning, the projected amount of compensatory mitigation under NWPs 21, E and F is less than the projected impacts. This violates the Corps' own policy to achieve at least a one-to-one ratio between the impacted area and the mitigated area. Sudol Testimony, Bulen Tr. 2:261-62. Furthermore, even a one-to-one ratio is inadequate. Given the fact that some permits result in *permanent* loss of streams and wetlands, that it can take decades for a mitigation project to reach maturity, and that mitigation has no proven track record of success, there is no basis for assuming that one-to-one replacement (or less) will ever be sufficient to replace lost functions. Failure to require far greater than one-to-one replacement also guarantees that there will be no mitigation for temporal loss.

Third, stream impacts cannot be measured solely in terms of the amount of surface water acreage represented by a linear stream segment. To measure the environmental impacts of lost streams, the Corps has used the linear length of the stream. Mullins and Chubb Declarations, above; PEIS, pp. ES-3 to ES-4; III.D-1 to III.D-2; IV.B-1 to IV.B-2. The Corps' national and Huntington District regulatory chiefs testified in OVEC v. Bulen that stream impacts are normally measured in linear feet. Sudol Testimony, Bulen Tr. 3:58-59; Mullins Testimony, Bulen Tr. 3:203. First, second, and third order streams are generally less than ten feet wide, while fourth and fifth order streams are generally less than 30 feet wide. FEIS, Spruce Mine No. 1, p. 3-107 (September 2006). An acre is 43560 square feet. A 10-foot wide stream would have to run for 4356 feet, or 0.825 mile, to represent one acre of surface water. The proposed NWPs 21, E and F would impact a total of 2780 acres. If all streams averaged 10 feet wide, this would convert to 2293.5 miles of lost streams.

The eleven West Virginia NWP 21 authorizations listed in the table in Part 2a. above provide another basis for estimating the conversion between stream acreage and stream length. According to the Corps' own calculations, the valley fills associated with those mining projects would cumulatively fill 107,278 feet, or 19.88 acres. By this measure, on average, one acre is equivalent to 5,396 linear feet of stream, or about one mile. Therefore, the estimated loss of 2780 acres from NWPs 21, E and F represents a loss of about 2780 miles of streams. Using either one of these two conversion methods, the total stream loss exceeds 2000 miles. Combined with the at least 1280 miles of past stream losses, the cumulative 3000+ miles of lost streams is enormous and clearly significant.

Fourth, the Corps has only cumulated impacts for each NWP, not for the NWPs as a whole. If all of the separate NWP cumulative analyses are added together, the total impacted acreage is 31,812 acres, or 49.7 square miles. These projected five-year impacts are summarized in the following table:

NWP	Number of Activities	Impacted Acres
27	6275	8390
12	44285	3420
30	965	2060
B	4690	1975
E	590	1890

14	29450	1580
41	3525	1455
29	11355	1220
23	5055	1020
44	2065	880
D	485	870
3	18310	830
33	9975	655
42	3075	620
13	24220	605
40	2375	600
39	4875	535
F	430	485
38	480	440
21	1020	405
18	9895	325
C	1325	320
35	1280	285
A	4500	205
6	3730	150
32	440	105
43	1415	105
7	2035	55
31	120	55
28	445	50
36	1940	45
19	1800	30
37	1055	30
15	135	25
16	205	25
34	185	22
1	195	10
4	55435	10
20	40	10
22	215	5
25	410	5
2	640	1
5	315	1
9	25	1
10	470	1
11	395	1
8	5	0
17	15	0
24	5	0
Totals	262170	31812

The Corps has not explained how a cumulative loss of this magnitude is minimal. Furthermore, this figure does not include past losses.

Fifth, the Corps merely states how many times NWPs 21, E, and F are expected to be used, how many acres of waters would be impacted, and how many acres of offsetting compensatory mitigation would be required. This is nothing more than a bare accounting of the number of acres affected. There is no analysis of the streams buried from past NWP 21 authorizations, or of the wildlife and habitat that was lost as a result. There is no citation or discussion of any scientific studies or reports on cumulative impacts, including the Corps' own studies for its programmatic EIS on mountaintop mining and valley fills in Appalachia. The two paragraphs cited by the Corps are therefore so brief and perfunctory that they do not provide a reasoned analysis of the cumulative impacts of NWP 21, NWP E, or NWP F. Klamath-Siskiyou Wildlands Center v. Bureau of Land Management, 387 F.3d 989, 995 (9th Cir. 2004) ("A calculation of the total number of acres to be harvested in the watershed is a necessary component of a cumulative effects analysis, but it is not a sufficient description of the actual environmental effects that can be expected from logging those acres.").

Sixth, the Corps' regulatory chief for the Huntington District has explained that when her office performs a cumulative impact analysis, it only looks at effects at the watershed level from the mine to the receiving stream. Mullins Testimony, Bulen Tr. 4:183-84. The Corps does not look at downstream impacts to the larger watershed. Id. at 4:191-93. That scope of analysis is too narrow to evaluate all cumulative impacts.

Seventh, the Huntington District did not even begin requiring a one-to-one offset of stream losses by mitigation until about three years ago. Mullins Testimony, Bulen Tr. 3:98, 4:225. The PEIS ended its data evaluation of stream losses in Appalachia in 2002. Those losses therefore contain a sizeable amount of unmitigated stream losses. Consequently, these losses constitute an unaccounted-for deficit in the cumulative impact analysis.

Eighth, the Corps' cumulative impact analysis must include not only all stream losses from past, present, and projected valley fills, but also from stream losses due to longwall and underground mining. One recent study shows that longwall and underground mining has undermined almost 100 miles of headwater streams in two western Pennsylvania counties, resulting in impairment from diminished flow. PaDEP, "The Effects of Subsidence Resulting from Underground Bituminous Coal Mining on Surface Structures and Features and on Water Resources: Second Act 54 Five-Year Report," Executive Summary, pp. 4, 20, 34 (February 4, 2005), **Attachment 17**. Another study shows similar stream impairment from longwall mining in northern West Virginia. Stout, B.W., "Do headwater streams recover from longwall mining impacts in northern West Virginia?" WV Water Resources Institute (Aug. 30, 2004), **Attachment 18**. According to this report, "[l]ongwall mining resulted in a net loss of approximately one-half of all headwater streams in Marshall County, West Virginia" and "[t]here was no indication that the physical, chemical, or biological impacts of longwall mined streams recover over time." Id., p. 30.

4. The Corps' reliance on compensatory mitigation to offset the effects of burying streams with mining waste is irrational and has no scientific basis. The Corps' determination that cumulative effects are minimal or insignificant rests primarily on its assumption that those effects can be mitigated to a minimal or insignificant level. The cumulative impact analyses in the decision documents repeatedly assert that: "The required compensatory mitigation will attenuate cumulative impacts on the Nation's aquatic resources, so that the net effects on the aquatic environment resulting from the activities authorized by this NWP will be minimal." E.g., NWP 21 Decision Document, p. 13.

4a. Corps policy requires compensatory mitigation of filled streams. Corps policy on compensatory mitigation begins with the 404(b)(1) Guidelines. Those guidelines require the Corps to adopt the least environmentally damaging practicable alternative. 40 C.F.R. § 230.10(a). These alternatives include steps to avoid or minimize impacts. Id., §§ 230.10(a)(1), (a)(3), (d). A 1990 Memorandum of Agreement between the Corps and EPA interprets the Guidelines to establish a policy to achieve "no overall net loss" of waters of the U.S. EPA/Corps Memorandum of Agreement (Feb. 6, 1990), Section II. The Corps interprets its policies and guidance to mean that it must achieve no net loss of streams on a linear foot basis. Sudol Testimony, Bulen Tr. 2:261-62. To carry out that policy, "[a]ppropriate and practicable compensatory mitigation is required for unavoidable adverse impacts which remain after all appropriate and practicable minimization has been required." EPA/Corps Memorandum of Agreement (Feb. 6, 1990), Section II.

4b. Corps policy on compensatory mitigation requires analysis of stream functions. In order to decide whether discharges will cause or contribute to significant degradation of the affected streams, the Guidelines require the Corps to 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." 40 C.F.R. § 230.11(e) (emphasis added). "In determining compensatory mitigation, the functional values lost by the resource to be impacted must be considered." EPA/Corps Memorandum of Agreement (Feb. 6, 1990), Section II. This means that functional assessments should be used. Sudol Testimony, Bulen Tr. 3:54. On May 7, 2004, the Corps issued guidance on "Mitigation for Impacts to Aquatic Resources from Surface Coal Mining." That document states that:

> The Clean Water Act, and the Corps implementing regulations and policies, requires that compensatory mitigation projects replace aquatic functions lost as a result of authorized activities. Ideally, stream functions lost as a result of permanent fills are replaced by compensatory mitigation projects that provide equivalent or similar stream functions within the same watershed.

Id. at 3 (emphasis added). This guidance also states that "[t]he amount of mitigation credit should be based on an assessment procedure that identifies the amount of 'ecological lift' provided by compensatory mitigation plans. 'Ecological lift' means an increase in aquatic functions." Id. at 4 (emphasis added). See also Sudol Testimony, Bulen Tr. 3:55.

4c. The Corps does not use a functional analysis to compensate for stream losses. Thus, the Corps' stated policy on mitigation requires an analysis of stream functions and values and a net increase in those aquatic functions and values. However, the Corps has no specific guidelines for stream assessment on a functional *or* structural basis at all. "The Huntington District does not have any specific guidelines for stream assessment." FEIS, Spruce Mine No. 1, p. 2-10 (September 2006). The Corps' regulatory chiefs at both the national office and at the Huntington District testified that the Huntington District does not perform any functional assessment. Sudol Testimony, Bulen Tr. 3:16-17; Mullins Testimony, Bulen Tr. 3:191, 4:196. Instead, "they fall back on the one-to-one replacement either for acres of wetlands or linear feet for streams." Sudol Testimony, Bulen Tr. 3:16-17 Mr. Sudol said it would take one to three years before there is a functional assessment method for West Virginia. Bulen Tr. 3:51. Since 1990, the Corps has devoted "zero" funds to developing such a method. Id. at 3:65.

In the absence of a functional assessment, the Corps uses a functional assessment based on "best professional judgment." As the Corps' regulatory chief explained this:

> Best professional judgment of functional assessment is you go out there as a trained biologist, bachelors, masters, with on-the-job training, determine what you believe with your view, without measuring variables, without measuring attributes at all, measuring function, what you would perceive the value function of that wetland, that stream, is. Then you evaluate the mitigation proposal by the applicant using that best professional judgment to determine if you believe in your role as a regulator does it meet the requirements, in addition if you impact a thousand feet of stream, there's a requirement to either restore or create a thousand feet of stream in -- on a general basis. But in terms of each specific project, there's an ability to enhance or preserve or do other mitigation. And the program basis you restore one-to-one.

Mullins Testimony, Bulen Tr. 3:60-61. According to this methodology, the Corps assesses stream "function" from a regulatory, not a scientific or ecological, perspective. Id. at 3:156-57. The Corps' goal is to obtain a score that indirectly provides a surrogate measure of stream function, without using the scientific method. Id. The Corps must measure stream functions before a permit is issued in order to establish a baseline for future mitigation once those functions are lost. The Corps, however, has no plan to make this assessment. In addition, no measurements of stream functions are planned once mitigation measures are complete.

The Corps has also allowed some permit applicants to use a Stream Habitat Unit (SHU) assessment methodology as a tool to determine how much mitigation is required to achieve at least a one-to-one stream loss/stream mitigation ratio, such as in the recent FEIS for the Spruce No. 1 Mine in West Virginia. Sudol Testimony, Bulen Tr. 3:149-50; Mullins Testimony, Bulen Tr. 3:192; 4:196-97. The SHU method was developed by two coal industry consultants and a coal industry engineer. Kirk Testimony, Bulen Tr. 5:47-48. The SHU was not meant to be scientific, and only measures aquatic habitat, not benthics, water chemistry, or fish. Id. at 5:51, 66.

The U.S. Fish and Wildlife Service explained in its May 30, 2006 comments on the Spruce No. 1 Mine why the SHU methodology is not a functional assessment and therefore cannot achieve the required goal of enhancing aquatic functions:

> The Stream Habitat Unit (SHU) assessment methodology used in the draft EIS only considers the physical characteristics of the stream. It does not include biological or chemical characteristics. Without those attributes, the assessment does not meet the requirements of a "functional" assessment. The Service recommends that the applicant use an assessment method that incorporates biological and chemical, as well as habitat, characteristics to determine the full function of the stream.
>
> Since the applicant applied the SHU methodology to describe the streams, the compensatory mitigation also only addresses the physical component of the streams. Compensatory mitigation must replace the aquatic resource functions lost or adversely affected by authorized activities. Therefore, to conclude that the functions are being replaced, the compensatory mitigation must create streams that are capable of sustaining the same biological, chemical and physical characteristics of the streams that have been eliminated by mining activity. First, it is difficult to replace stream functions when they have not been adequately assessed. Second, creating streams using on-site drainage ditches, enhancement measures that include channel or habitat improvement and changing the classification of a stream from intermittent to perennial are not sufficient to replace the quality of the streams impacted.
>
> We disagree that on-site erosion control structures are equivalent to existing streams. The drainage ditches are designed strictly with a physical component and lack a replacement of stream function. The existing water courses are healthy, biologically functional streams. The erosion control structures are designed to convey water, not replace or restore ecological services. Erosion-control structures lack the groundwater-derived and nutrient-rich base flow, temperature regimes, habitat diversity, natural gradient, floodplains, connectivity to downstream ecosystems and other features of natural streams.
>
> The applicant indicates that the streams will be enhanced by additional flow, changing them from intermittent to perennial. However, many species rely on intermittent streams as part of their life history strategy.
>
> The applicant also proposes to improve channel or habitat on nearby streams. Streams are complex systems whose hydrogeomorphic behavior and biotic recovery are not easily predicted. Extensive, long-term monitoring is required to demonstrate enough ecological benefit to already-functioning streams to offset the proposed losses. Such actions would have to be taken at a ration substantially greater than 1:1 to raise the mitigation areas' functions enough to compensate for the loss of stream functions.
>
> Water quality and biological diversity monitoring is not proposed to occur after completion of the proposed project. Water chemistry and biological diversity should be

> used as indicators of project success. The project will be successful when the function of the restored streams (chemistry and biological diversity), is equivalent to that of the impacted streams. Without a thorough functional assessment prior to the initiation of the project, it is impossible to determine when the mitigation is successful.

FEIS, Spruce No. 1 Mine, pp. 2-9 to 2-10. Plaintiffs' aquatic ecology experts, Drs. Wallace and Palmer, explained in their expert reports in OVEC v. Bulen why the SHU method was unscientific. Dr. Wallace testified that the SHU system has no scientific basis, and if one of his graduate students had proposed such a concept, he would not have received an advanced college degree. Wallace Testimony, Bulen Tr. 2:67-68. Dr. Margaret Palmer, a stream restoration ecologist, had never heard of the SHU concept. Palmer Testimony, Bulen Tr. 2:170. She stated in her expert report that it "is not based any known peer-reviewed article in a credible scientific journal."

In his testimony in OVEC v. Bulen, the Corps' regulatory chief admitted that the SHU method is not an approved functional assessment method. Sudol Testimony, Bulen Tr. 3:16. The Corps has also rejected it as a functional assessment method or as the standard for mitigation in the Huntington District. Mullins Testimony, Bulen Tr. 4:203-04. The Corps' regulatory chief has admitted that the SHU method is not meant to be scientifically defensible. Sudol Testimony, Bulen Tr. 3:77-78.

4d. The Corps relies on compensatory mitigation as the primary basis for its determination that NWPs have minimal effects. In its 2001 draft programmatic EIS on the 2002 NWPs, the Corps stated that "[c]ompensatory mitigation is a critical part of the equation of achieving minimal impacts." Draft NWP PEIS, p. 3-21, **Attachment 19**. "The cumulative effectiveness of compensatory mitigation required by the Corps is critical in determining the long-term cumulative impact on aquatic ecosystem functions and the associated valued natural services." Id. at S-7. "Compensatory mitigation is the most important element remaining in the Corps permit process as a means of reducing or eliminating cumulative impacts from permitted fill." Id. at 4-31. EPA Region 9 stated in its comments on the 2002 NWPs that, "[a]t the heart of the Corps' current proposal is an assumption that compensatory mitigation will always fully offset the acreage and functions that will be lost as a result of discharges authorized under the NWP program." 10/9/01 EPA Letter, Enclosure, p. 2, **Attachment 1**.

Similarly, in its May 12, 2006 Memorandum in Opposition to Plaintiffs' Renewed Motion for Summary Judgment in OVEC v. Bulen, Civil No. 3:03-2281 (S.D.W.Va.), "[t]he Corps agree[d] that, in many instances, projects authorized by NWP 21 may have more than minimal environmental effects in the absence of mitigation." Corps Mem., p. 22, **Attachment 20**. The Corps also admitted that its determination that NWP 21 would not have more than minimal effects "was based, in significant part, on the mitigation required for authorizations under NWP 21." Id. at 35-36. See also Sudol Testimony, Bulen Tr. 3:84, 127 (to avoid significant impacts, "the mitigation has to replace what was lost when the streams were filled"). As a result, the effectiveness or ineffectiveness of mitigation is a critical element in evaluating the reasonableness of the Corps' minimal effects determination.

4e. The Corps does not explain or support its conclusion that compensatory mitigation is effective in achieving minimal impacts. There is no explanation or scientific basis for the Corps' assertion that compensatory mitigation will reduce impacts to a minimal level. It is simply a conclusory assertion without any supporting analysis or evidence. The Corps has not cited a single study or other evidence to support its conclusion that mitigation will achieve the required statutory standard of minimal effects. When the Corps' finding of insignificance relies on mitigation measures, it must provide "substantial evidence to support the efficacy" of the proposed mitigation. See Nat'l Audubon Soc'y v. Hoffman, 132 F.3d 7, 17 (2d Cir. 1997). The Corps cannot "merely recite[] the offsetting mitigation measures without analyzing how those mitigation measures will actually reduce or offset the significant impacts to acceptable levels." O'Reilly v. U.S. Army Corps of Eng'rs, 2004 WL 1794531 (E.D. La. Aug. 10, 2004).

4f. The Corps' reliance on the effectiveness of compensatory mitigation is not supported by scientific evidence. The Corps does not identify in any of the NWPs what method of compensatory mitigation it will use. However, based on other recent NWPs and individual permits issued in West Virginia and Kentucky, the Corps' policy and strategy has become clear. The Corps has generally used three types of compensatory mitigation for surface coal mining activities. First, for temporary stream impacts, such as sediment control structures and in-stream ponds, the Corps has required those features to be removed when mining is completed. Second, for headwater streams that are permanently buried under the footprint of the valley fill, the Corps has required the attempted creation of other headwater streams, often by using new drainage ditches on the mining bench or even running down the face of the valley fill. Third, to replace other permanent stream losses, the Corps has credited the structural enhancement of existing streams (usually perennial) using "Rosgen"-type features. For example, for the recent Spruce No. 1 Mine in West Virginia, the Corps has measured 26,184 feet of intermittent and 10,630 feet of ephemeral stream losses by valley fills. It claims to offset these losses by the enhancement of 8,772 feet of off-site perennial streams and 2,500 feet of intermittent stream, and the creation of 26,361 feet of intermittent and ephemeral streams, mostly in the form of on-site drainage ditches. FEIS/DEIS, Spruce Mine No. 1, pp. 2-198, 3-122 to 3-127 (September 2006).

EPA stated in its 2001 comments on the 2002 NWPs that the Corps' assumption that compensatory mitigation will always fully offset lost aquatic acreage and functions "is dangerously over-optimistic, and it is contrary to most studies we have seen, including the recent National Research Council report." 10/9/01 EPA Letter, Enclosure, p. 2, **Attachment 1**. Similarly, in its comments on NWP 21, the U.S. Fish and Wildlife Service specifically addressed the impossibility of mitigating the loss of headwater streams:

> the stream restoration experts assembled to assist in the development of the [Corps' MTM/VF D]EIS concluded that it is not possible to recreate streams on most mined areas; therefore, the loss of these stream miles and the functions they provide to aquatic ecosystems downstream is indeed a permanent loss, and for the purposes of section 404 impact assessment, the stream losses cannot be adequately compensated for.

9/20/01 FWS Letter, pp. 5-6 (emphasis added), **Attachment 3**. In OVEC v. Bulen, plaintiffs' stream restoration expert, Dr. Palmer, testified that, after reviewing the Corps' mitigation plans and documents, she saw no data, measurements or other indication that mitigation will be effective. Palmer Testimony, Bulen Tr. 2:210. Dr. Palmer testified that the Corps' plan for creating streams was "very naive" and "not credible scientifically" because the Corps "didn't do even the most basic steps one would take to think about how you might go about creating a stream." Id. at 2:155-56. Dr. Palmer has 39,000 stream restoration projects in her database, and has not seen a single example of successful stream creation. Id. at 2:159-60. She found no evidence to support the Corps' claim that stream creation could be accomplished. Id. at 2:160. The Corps' mitigation plans simply assume that if the structure of a stream is created, the stream functions will follow. Those plans rely on the "field of dreams hypothesis" that "if you build it, they will come." Id. at 2:168-70.

There is no evidence in the record that compensatory mitigation will be successful or that it will reduce all cumulative impacts to an insignificant level. In 2002, the Corps refused to require proof that mitigation will work. "[I]t is not practical, nor a responsible expenditure of resources to require absolute proof that the mitigation will offset the impacts." 67 Fed. Reg. at 2065. Instead, the Corps merely said that it "has exceptional biological and ecological expertise in the districts and we trust those professionals to make the proper judgments in each case." Id. at 2064. See also id. at 2065, 2067, 2069-70. Commenters on the 2002 NWPs cited a study by the National Academy of Science that found that "mitigation is not fully successful, and does not compensate for wetlands lost to permitted fills." Id. at 2068. In response, the Corps admitted that it "agrees with the NRC/NAS report and that we must improve the success of mitigation." Id. "The Corps understands that some mitigation projects fail." Id. at 2069. The Corps also admitted in its Draft EIS on the 2002 NWPs that "[s]cientific and other literature generally suggests problems with compensatory mitigation in terms of both permit compliance and ecological success." DEIS, p. S-17, **Attachment 19**. The Corps also admitted that the extent to which mitigation replaces lost wetlands and functions "cannot now be ascertained" and it is likely that "mitigation success has not been high." Id. at pp. 3-21, 4-14.

The Corps cites no evidence subsequent to 2002 that mitigation will work or has been successfully in offsetting the loss of streams. The Corps' regulatory chief testified in OVEC v. Bulen that he did know of a single instance of successful stream creation east of the Mississippi River. Sudol Testimony, Bulen Tr. 3:44, 129-30. The Corps' regulatory chief in its Huntington District similarly did not know of a single successful stream creation project in Appalachia. Mullins Testimony, Bulen Tr. 4:219.

There is also no scientific basis for believing that the burial of a stream can be mitigated or offset by "enhancing" another stream elsewhere. For example, the Corps used this enhancement approach in granting a July 26, 2004 NWP 21 authorization to Leslie Resources, Inc. for surface mining activities in Perry County, Kentucky. Hollow Fill #7 permanently impacted 1,405 feet of perennial and ephemeral streams. To compensate for this loss, the approved mitigation plan would perform 2,670 linear feet of enhancement of a stream in a different watershed, including "removal of invasive vegetative species, debris removal, sediment removal and some in-stream stream placement." Chubb Declaration, Ex. A-48, p. 4, in Kentucky

Riverkeeper v. Rowlette, Civil No. 05-181 (E.D.Ky.), **Attachment 16**. The enhanced stream may be downstream of the buried headwater stream, or in a different watershed. Streams are not fungible. Enhancing a higher order perennial stream does not replace the functions lost from burying a lower-order intermittent or ephemeral stream. The Corps national regulatory chief stated that "[e]nhancement and preservation do not count in the no net loss goal," only "creation and restoration" do. Sudol Testimony, Bulen Tr. 3:98, 106. Consequently, enhancement does not provide enough "ecological lift" to offset streams on a one-for-one linear foot basis. In addition, even the coal industry's own mitigation expert expects that stream enhancements will only last for 20 or 25 years. Kirk Testimony, Bulen Tr. 5:90. Thus, this mitigation at best can only provide some temporary benefit, and therefore cannot offset the permanent burial of a stream.

Without a functional stream analysis, the effectiveness of compensatory mitigation cannot be assessed or assured. In an assessment of a very similar mitigation plan for a nearby mining project, Dr. Bruce Wallace, a stream ecologist, stated in his expert report in OVEC v. Bulen:

> Clearly no functional assessment has been done, nor are any planned for this watershed. So without function assessment, mitigation success cannot be evaluated. Visual assessments do not assess functions. In this SOF the USACE purports to replace stream functions, but no aquatic functions have been measured. There is no scientifically valid protocol for assessing stream functions without direct measure.

May 16, 2006 Expert Report of J. Bruce Wallace, pp. 4-5, **Attachment 21**. Dr. Margaret Palmer, another stream ecologist stated in her expert report in OVEC v. Bulen:

> The CMPs [mitigation plans] fail to make the most fundamental distinction between form and function of stream channels. The mitigation plans address structural aspects of the channels and do not address functional aspects. The CMPs describe manipulations of channel or drainage ditch morphology (channel shape and size). The statement is made that these will 'mimic' natural waters [e.g., Aracoma CMP, bottom of page 17], but these streams will *not* replace natural waters. They are basically ditches that have had curves and bends placed in them and then have been filled with boulders and cobble in order to look like what someone thinks they should. Real streams, however, are the result of hydrologic, geomorphic and biogeochemical *processes.* They have functional attributes that are determined by the natural flow regime (both groundwater and surface flows), the sediment routing, the soil characteristics, the vegetation and the position on the landscape. These functional attributes lead to living systems – systems that are self maintaining and resilient.
>
> The CMPs simply do not address functional attributes. Instead the plans focus on structural issues – removal of interior barriers in the drainage ditches, reconstruction of outlets so water can move, placement of cross-vanes in the ditches, addition of boulders and root wads, etc. (pages 29-30, Aracoma CMP). While structures can be created to look like channels, there is no evidence provided that they will function as healthy streams. In

my opinion, the ditches they plan to sculpt into 'created' streams are about as likely to function like streams as are bowls of plastic fruit (arranged to look real) likely to taste and nourish like real apples and oranges.

It is important to clarify the distinction between form and function because when a stream is destroyed, the ecosystem services those streams provide to people and to wildlife are destroyed. The provision of services is possible because healthy streams are living, functional systems. Essential ecological functions of healthy streams that allow them to provide critical services lost will include: the purification of water, the removal of excessive levels of nutrients and sediments before they reach downstream waters, the processing of organic material (decomposition or biological utilization), and primary and secondary productivity (growth of photosynthetic organisms and consumers) (Baron et al. 2002). These functions are supported by ecological processes including: the normal flux[1] of water, the processing of nutrients at the same rate and form as unimpacted streams, the decomposition of organic matter at rates typical of nearby unimpacted streams, and, microbial, primary and secondary production the same as nearby healthy streams (Palmer et al. 1997a, Naiman et al. 2005). To determine if these processes are brought back to the right levels and direction through restoration or "creation," requires that they be measured in the streams prior to any impact or that measurements be made on nearby reference streams (unimpacted). No data or direct mention of these processes are provided in the CMPs. Thus, while the CMPs address issues of ecological "structure" (habitat, channel form), they do not addresses ecological function.

The reason it is so problematic that the CMPs do not address function is that measurements of ecological functioning evaluate dynamic properties of ecosystems that underlie an ecosystem's ability to provide vital goods and services (Gessner and Chauvet 2002). The basis for analysis is typically a process *rate* and *direction* and it reflects system performance (http://www.epa.gov/eerd/functional.htm). In pragmatic terms, measuring ecological functioning requires appraisal of key ecological processes such as primary production and this should be reflected in the CMP if the plan is to mitigate functions that are lost due to the burial of headwater streams. Saying that because a stream looks like it should, it is fully functional ecologically is like saying that a man with a normal weight and height has no risk of heart disease without having measured his heart rate and pattern. We all know that human health is *best* measured by looking at dynamic factors like blood pressure, respiratory rate, and pulse not just weight, height, or blood chemistry.

[1]By "normal" flux of water is meant a movement rate and direction comparable to nearby healthy streams with all the seasonality and flow variability displayed by the healthy streams. This flux refers to soil infiltration rate, direction, and distance water moves vertically (toward the groundwater) and laterally (toward the stream or hyporheic zone). It also includes movement of water from the stream channel laterally to recharge the groundwater after high flow periods.

> The focus on channel form in the CMP suggests that there is an assumption that function will follow creation of form. Yet there is no scientific proof that stream form leads to function and in fact a number of studies have questioned this assumption (Palmer et al. 1997b, Hilderbrand et al. 2005, Falk et al. 2006). The extensive reference to the Rosgen classification system approach in the documents fails to note that the Rosgen approach is to *restore* streams, not *create* them. Further, channel designs based on a classification system that has not been fully evaluated at the site can lead to serious failures (Smith and Prestegaard 2005). As indicated in (Palmer et al. 2005): "Attempts to develop restoration designs based on application of a single classification system across many environments have led to many failures in North America (e.g., Kondolf, Smeltzer & Railsback 2001), because the specific processes and history of the river under study were not adequately understood." If the mitigation projects fail and channels are unstable, this could cause new environmental degradation. However, even if they are geomorphically stable, this does not address restoration of function.

May 16, 2006 Expert Report of Margaret A. Palmer, pp. 12-14, **Attachment 22**. Dr. Palmer explained that the difference between measuring structure and function is like measuring a person's height and weight, which could be normal, but not their blood pressure, which could be abnormal despite a normal height and weight. Palmer Testimony, Bulen Tr. 2:143.

Widely accepted and readily available scientific procedures exist that can measure what baseline stream functions exist before a project begins, and whether those lost functions are replaced by mitigation after the project ends. According to Dr. Palmer, "functional assessments are now done throughout the country, the methods are fully worked out, and may be reproduced. They are more expensive and time consuming than rapid bioassessments but the costs in supplies and time are trivial compared to the costs associated with losing more than 24,000 linear feet of intact headwater streams." August 17, 2006 Expert Report of Margaret A. Palmer, p. 3, **Attachment 23**; Palmer Testimony, Bulen Tr. 6:87-88, 94-98. Measuring stream function is not difficult. Dr. Palmer testified that she teaches it to her beginning students and in a one-week summer short course. Palmer Testimony, Bulen Tr. 2:143. The scientific devices to take functional measurements are readily available. Id. at 2:145-47. She could analyze the functions of twenty streams in three or four months. Id. at 6:126. The Corps' failure to establish a functional baseline or require a functional assessment after projects are complete fundamentally undermines and invalidates the Corps' reliance on compensatory mitigation.

The deficiencies in the Corps' mitigation analysis are exemplified by its recent FEIS on the Spruce No. 1 mine in West Virginia. The Corps stated that mitigation will create a net gain in waters of the U.S., and that "this gain is attributable to the inadvertent creation of intermittent and ephemeral streams and wetlands within the drainage control structures upon reclaimed mine areas, constructed in accordance with required erosion and sediment control plans, and along mine benches due to discharges within pre-law mined areas. These occurrences have substantially increased the acreage of jurisdictional waters of the U.S., including wetlands, in the cumulative effects area." FEIS/DEIS, Spruce Mine No. 1, p. 3-127 (September 2006). The Corps' claim for this gain has no scientific basis. It is inconsistent with the FWS' analysis quoted above. It conflicts with the PEIS, which says that no one has successfully created a functional

headwater stream on mined or filled areas. PEIS, pp. III.D-19 to III.D-20. Furthermore, EPA has found that channels or drainage ditches in fact cause a severe reduction in aquatic functions: "EPA in the DPEIS sampled a sediment control structure in the Mud River. This structure had WVSCI scores of 21.6, 22.2, 16.2, and 24.4 indicating severe biological impairment. Clearly this sediment ditch has neither the 'structure' nor 'function' of a headwater stream and would provide doubtful mitigation opportunities." FEIS/DEIS, Spruce Mine No. 1, pp. 2-77 to 2-78.

5. The new NWP 21 repeats the same legal flaws as those contained in the existing NWP 21. Aside from some simplification of language, the new NWP 21 would be essentially the same as the existing NWP 21 that has been in effect the last five years. There are two pending cases that challenge the legality of the existing NWP 21. Kentucky Riverkeeper v. Rowlette, Civil No. 05-181 (E.D. Ky.); OVEC v. Bulen, Civil No. 03-2281 (S.D.W.Va.). The new NWP 21 contains the same legal flaws as those contained in the existing NWP21, as explained below.

5a. The Corps' reliance on post-issuance procedures to determine minimal impacts violates § 404(e). As in 2002, the Corps is again deferring its analysis of minimal impacts to post-issuance procedures, rather than making a pre-issuance determination. The Corps relies on the District Engineer to determine minimal impacts after receiving the pre-construction notice from the applicant, and after considering the applicant's compensatory mitigation plan. The public has no right to comment on that determination or mitigation plan. It is impossible for the public to be aware at the NWP-issuance stage of all of the information that the Corps has relied on to determine that an NWP has a minimal effect on the environment, both individually and cumulatively. Instead, the Corps would rely on incomplete information underlying its minimal effect determination at the NWP-issuance stage, and use additional undisclosed information that the Corps develops later at the authorization stage after the public comment period is over. The public must be aware of the full basis for the Corps' minimal effects determination in order to have a meaningful opportunity to comment. The plain language of § 404(e) ties the public participation requirement and the minimal effects determination together and requires that both be made before an NWP is issued. The Fourth Circuit's contrary decision in OVEC v. Bulen, 429 F.3d 493 (4th Cir. 2005), is wrongly decided, for the reasons stated by the three dissenting judges who voted to rehear that decision en banc, 437 F.3d 421 (4th Cir. 2006).

5b. The Corps' limitation of its scope of analysis to the "aquatic environment" violates § 404(e) and NEPA. As it did in 2002, the Corps has again limited the scope of its analysis to the "aquatic environment," not the environment as a whole. 71 Fed. Reg. at 56258 (NWPs must "cause only minimal cumulative adverse effect on the aquatic environment"); NWP 21 Decision Document, p. 5 ("Adverse impacts resulting from activities outside of the Corps scope of review, such as the construction or expansion of upland developments, cannot be considered in the Corps analysis of cumulative adverse effects on the aquatic environment.").

Under § 404(e)(1), the Corps' minimal effects determination must analyze the "cumulative adverse effect on the environment." 33 U.S.C. § 1344(e)(1) (emphasis added). By

limiting its analysis to the aquatic environment, the Corps is evading its statutory duty to determine that NWPs have minimal cumulative effects on the environment as a whole.

The word "environment" is unambiguous. Adding the word "aquatic" clearly limits its meaning by excluding terrestrial impacts such as destruction of forests and elimination of habitat for terrestrial wildlife. This is a huge exclusion. According to the Corps' PEIS, mountaintop mining operations in Appalachia cause "fundamental changes to the region's landscape and terrestrial wildlife habitats," because *a single permit* can "chang[e] thousands of acres of hardwood forests into herbaceous cover." PEIS, p. III.F.12, Pl. Ex. 65. "While the original forested habitat was crossed by flowing streams and was comprised of steep slopes with microhabitats determined by slope, aspect, and moisture regimes, the reclaimed mines are often limited in topographic relief, devoid of flowing water, and most commonly dominated by erosion-controlling, herbaceous communities." Id. The Corps must analyze all of these effects.

Congress knew how to refer to the "aquatic environment" when it wanted to do so. In § 404(f)(1)(E), enacted simultaneously with § 404(e) in 1977, Congress exempted a limited set of agricultural activities from the § 404 permit requirement so long as "any adverse effect on the aquatic environment will be otherwise minimized." 33 U.S.C. § 1344(f)(1)(E). "[I]t is generally presumed that Congress acts intentionally and purposely when it includes particular language in one section of a statute but omits it in another." Chicago v. Environmental Defense Fund, 511 U.S. 328, 338 (1994) (internal quotations omitted). That presumption applies with full force here, where the differing language is in two subsections of the same statutory section. The Corps cannot add "aquatic" to subsection (e), when Congress chose to omit it from that subsection and include it only in subsection (f)(1)(E).

Furthermore, under NEPA, the Corps' scope of analysis must consider the whole environment, not just the aquatic environment. The Corps cannot legally segment upland mining development, including the destruction of forests, from the permitted filling of streams, because the two are interdependent. The purpose of the valley fills is to accommodate the disposal of excess overburden generated by mining and excavation operations. Thus, mining operations are dependent on valley fills and must be considered together, because "the environmental consequences of the larger project are essentially products of the Corps permit action." Arkansas Nature Alliance v. Army Corps of Engineers, 266 F. Supp.2d 876, 891-92 (E.D. Ark. 2003); Friends of the Earth v. U.S. Army Corps of Eng'rs, 109 F. Supp.2d 30, 40 (D.D.C. 2000) (Corps required to consider upland development resulting from and entirely conditional on the permitted activity); 33 C.F.R. § 325 App. B § 7.b.(2).

The interdependency of aquatic and terrestrial effects is demonstrated by the Corps' February 14, 2005 Memorandum of Understanding with OSM, FWS and EPA concerning "Concurrent and Coordinated Review and Processing of Surface Coal Mining Applications Proposing Placement of Dredged and/or Fill Material in Waters of the United States." According to this MOU,

> the Corps District or Division Engineer would collaborate with the SMCRA regulatory authority, combining respective mining/civil engineering, geological, biological,

> hydrologic, water quality and other expertise of each agency to collaborate in considering all practicable alternative to the proposed placement of dredged and/or fill material in waters of the U.S. This joint review would examine alternatives to avoid and minimize impacts, and whether appropriate alternative analyses have been performed. In addition, the joint review could help to determine if the proposed fill sites located in waters of the U.S. have been adequately minimized and characterized and whether practical upland alternatives or less environmentally damaging alternatives to the project proposal exist . .

MOU, pp. 7-8, **Attachment 24**. The Corps therefore admits that its control and responsibility overlaps with the mining permit and includes impacts on upland areas.

For example, for the Spruce Mine, as a result of the Corps' analysis of mine alternatives, "Hobet reduced proposed impacts to waters of the U.S. by 13,809 linear feet (3.89 acres), reduced surface disturbances by 636 acres, reduced coal extraction by 10.62 millions tons, and eliminated the use of a dragline, which would result in a reduced amount of unreclaimed disturbed acres at any given time during mining." FEIS, Spruce Mine No. 1, Abstract, p. 2. These changes saved hundreds of acres of forest and avoided impacts on White Oak Branch, a high quality watershed. Id., pp. 2-6 to 2-7, 2-60 and id., Attachment 1, June 16, 2006 EPA Comments, p. 2. The reduced terrestrial and aquatic impacts are inextricably connected. If the mining area had not been reduced, and forest loss avoided, the stream loss could not have also been reduced. See DEIS, Spruce Mine No. 1, p. 2-1 ("The considerations of cost, technology and logistics are included in the determination of whether some or all of the upland alternatives are practicable, thus demonstrating that the avoidance of fills in waters of the U.S. has been achieved to the maximum extent practicable."). Furthermore, the Corps' "fundamental basis" for comparing alternatives was the ratio of the amount of stream filled and acres disturbed to the amount of coal recovered. Id. at 2-34. The Corps also stated that a "substantial portion" of the mitigation plan depended on "modifying erosion control structures in upland areas." Id. at 2-257 (emphasis added). Thus, stream loss, land disturbance, and coal recovery are inextricably connected and cannot be analyzed in isolation from upland areas.

This interdependency of terrestrial and aquatic effects is also demonstrated by the Corps' proposed new NWP E for remining activities. That NWP "may be used on sites where the ratio of previously mined areas to new coal removal areas is greater than 60 percent, therefore, we are proposing to allow up to 40 percent of the mine site to include unmined areas." 71 Fed. Reg. at 56276. Thus, this NWP would be specifically linked to the amount of terrestrial disturbance at the mine site. It therefore makes no sense to limit the scope of analysis to purely aquatic impacts.

In Wyoming Outdoor Council v. U.S. Army Corps of Engineers, 351 F. Supp.2d 1232, 1242 (D. Wyo. 2005), the court addressed a similar situation. The Corps argued that, because other federal agencies controlled oil and gas development on federal lands, it did not have to consider cumulative impacts to non-aquatic resources when it issued a § 404 permit for that development. The court rejected this argument:

> When a particular oil and gas developer, however, proposes to discharge dredge and fill material into the waters of the United States in conjunction with a project, the Corps, or the relevant surface management agency, becomes the gatekeeper for approval of the project. The project becomes "so interdependent that it would be unwise or irrational to complete [the development] without [a permit to discharge dredge and fill material]." *Utahns for Better Transportation v. U.S. Dep't of Transportation*, 305 F.2d 1152, 1173 (10th Cir. 2002). The Corps is obligated to assess cumulative impacts relating to projects in the which the use of a [§ 404 general permit] is essential to completion of the project to determine whether the impacts of those projects on the human environment will be significant. . . .
>
> Although the Corps' primary function in issuing § 404 permits under the CWA is to protect the integrity of the waters of the United States, 33 U.S.C. § 1251(a), like any other federal agency taking action that could affect the human environment, its NEPA analysis in issuing a § 404 permit must include consideration of cumulative impacts to the "natural and physical environment," 40 C.F.R. § 1508.14, not just impacts to wetlands.

Here, as in Wyoming Outdoor Council, the Corps has violated its duty under NEPA to consider cumulative impacts on the entire natural and physical environment. As in Save Our Sonoran, Inc. v. Flowers, 408 F.3d 1113, 1122 (9th Cir. 2005), here the "jurisdictional waters run throughout the property like capillaries through tissue, [thus] any development the Corps permits would have an effect on the whole property." The interrelationships in the watershed ecosystems affected by the mines challenged here are such that effects on navigable waters cannot be considered without considering upland effects, and vice versa. For example, removing upland forest cover in order to create the valley fills and to fill the streams directly contributes to stream degradation. *See* January 25, 2006 Wallace Aff., Ex. 7 to Pls. P.I. Mot. in OVEC v. Bulen, p. 7, **Attachment 25**; *see also* January 25, 2006 Palmer Aff., Ex. 6 to Pls. P.I. Mot., p. 9, **Attachment 26** ("Removal of the trees will fundamentally alter the hydrology and biogeochemistry of the watershed;" "[W]atersheds act as a unit."). An environmental analysis that ignores the extensive environmental effects that are the direct result of the Corps' § 404 permit, and that would not occur unless the permit had been issued, violates NEPA.

5c. The Corps' failure to include a 300-foot limit on stream filling under NWPs 21, E and F is irrational. The Corps has not proposed any limit on stream filling for NWPs 21, E and F. However, the Corps has proposed to prohibit the filling of more than 300 feet of a perennial stream under NWPs 39, 40, 42 and 43. 71 Fed. Reg. at 56291-92. When it created a 300-foot limit for those NWPs, the Corps specifically found that all perennial streams are worthy of protection and that filling more than 300 feet of any one of them will always be deemed to have more than minimal impacts. 67 Fed. Reg. 2020, 2059 (Jan. 15, 2002); 65 Fed. Reg. 12818, 12856 (Mar. 9, 2000). If so, then it should make no difference whether the perennial stream is filled under NWPs 21, E and F or another NWP. The Corps' failure to protect perennial streams equally under NWPs 21, E and F and four other NWPs is a classic case of arbitrarily treating similar situations differently. "A long line of precedent has established that an agency action is considered arbitrary when the agency has offered insufficient reasons for

treating similar situations differently." Yetman v. Garvey, 261 F.3d 664, 669 (7th Cir. 2001); Transactive Corp. v. United States, 91 F.3d 232, 237 (D.C. Cir.1996). The Corps cannot reasonably use NWPs 21, E and F to allow what other NWPs prohibit as inconsistent with the minimal effect standard.

Furthermore, there is no reason to restrict the 300-foot limit to perennial streams. Ephemeral and intermittent streams should also be including in this limit, and that limit should not be waivable. There is no scientific basis for assigning less value to their protection. Indeed, two prominent stream ecologists, Drs. Wallace and Palmer, testified in OVEC v. Bulen that ephemeral and intermittent headwater streams are more valuable than perennial streams. Dr. Palmer said that headwater streams can contain 90 percent of the biodiversity of the stream watershed. Palmer Testimony, Bulen Tr. 2:176. Nutrient processing is also faster and more efficient in ephemeral and intermittent streams. Id. at 2:218. Treating headwater streams as less important is arbitrary and not supported by any scientific studies. Id. at 2:174-76.

Finally, if the 300-foot limit does apply to NWPs 21, E and F, the Corps must classify perennial streams properly. Currently, the Corps overestimates the length of intermittent streams and underestimates the length of perennial streams impacted by valley fills. FEIS, Spruce No. 1 Mine, pp. 2-56 to 2-57. FWS has stated that it believes "there are significant deficiencies in the WVDEP guidance [for identifying perennial streams] and, therefore, [it] should not be used for stream-point determinations." July 13, 2004 Letter from FWS to Mullins re: Phoenix No. 4 Surface Mine, pp. 13-14, **Attachment 9**.

5d. The Corps is required to prepare an EIS for the NWPs. Under NEPA, the Corps must prepare an EIS on major federal actions, including its permitting decisions, if they have a "significant" environmental impact. 42 U.S.C. § 4332(2)(C). The Corps continues to assert, as it did, in 2002, that the NWPs have no significant impact, and thus that the Corps is not required to prepare an EIS under NEPA. 71 Fed. Reg. at 56260. This determination is arbitrary and capricious. "Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment." 40 C.F.R. § 1508.27(b)(7). Cumulative impact, in turn, is defined as that "which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions ...." 40 C.F.R. § 1508.7. The Corps impermissibly excludes past actions and therefore ignores a relevant factor in its NEPA analysis. Considering all past, present, and future NWP activities, the combined impacts are unquestionably significant. As we have shown above, thousands of miles of streams have been and will be filled. The Corps prohibits the destruction of more 300 feet of a perennial stream under other NWPs because it would have more than minimal effects. 71 Fed. Reg. at 56261. It therefore makes no sense to classify the destruction of miles of perennial streams as minimal. The Corps' determination of insignificance rests entirely on the supposed offsetting effects of compensatory mitigation plans. However, the Corps offers no evidence that such mitigation is effective, or that it has a valid methodology for measuring the functions lost or replacing them.

6. The Corps must establish limits on stream filling for NWPs 21, E and F. The Corps requested comment on limits on stream filling for NWP 21. 71 Fed. Reg. at 56268. On October 20, 2006, the Corps' Huntington District proposed that discharges in West Virginia

would be ineligible for NWPs 21 and E if: (1) the discharges are in perennial streams, unless the perennial nature of the stream results from previous mining activities; (2) the discharges are in intermittent or ephemeral streams scoring greater than 68 on the West Virginia Stream Condition Index; or (3) the discharges are in more than 2,500 linear feet of ephemeral and/or intermittent stream. NWP F would have similar limits, except the maximum 2,500-foot limit could include temporary impacts on perennial streams. The Corps' Louisville, Nashville, and Norfolk Districts have not proposed any similar regional conditions on mining-related NWP activities in Kentucky, Tennessee or Virginia.

We support the concept of limits based on stream condition and fill length, but believe that these limits are too weak. First, valley fills that permanently fill headwater streams will invariably have more than minimal impacts on downstream waters. Thus, NWPs should only be used for mining-related activities with lesser impacts than valley fills, such as road crossings, culverts, temporary sediment ponds, and stream diversions. Second, the Corps is correct that filling perennial streams will have more than minimal effects, and that the limit for those streams should be zero. Third, the 2,500-foot limit for intermittent and ephemeral streams is about half a mile, and is more than eight times higher than the 300-foot stream limit on other NWPs. The individual stream limit should be no higher than 300 feet. Fourth, there should be a cumulative as well as an individual limit. Some watersheds in West Virginia have already been filled to an alarming extent. About 12% of the Coal River watershed and 21% of the Spruce Fork watershed has been filled. FEIS, Spruce Mine No. 1, p. 2-187, 2-189. In Laurel Creek watershed, the figure is 28%. The Corps should establish cumulative limits on the percent of a watershed that can be filled, and prohibit further NWPs once that limit is reached. Dr. Palmer testified that "There is evidence, generally speaking, that when you clear land at a certain level in a watershed, that impacts really do start to show up after something like 10, 12 percent." Palmer Testimony, Bulen Tr. 2:214. Thus, there should be a cumulative limit on filling a certain percentage of a watershed. Finally, at a minimum, the regional conditions proposed by the Huntington District should apply nationwide. If mining activities exceeding these limits have more than minimal impacts in West Virginia, they would also have more than minimal impacts elsewhere in the country. Most surface coal mining activities occur in the four-state Appalachian study area described in the PEIS, and the NWP limits should be uniform throughout that area.

7. Coal mining and valley fills in WV can cause significant flooding. The NWP 21 Decision Document asserts (pp. 16, 23) that NWP 21 activities will not cause flooding. The Decision Documents for NWPs E and F contain the same language. However, according to FWS, studies provided in the PEIS show:

> 1) Peak unit flows during summer storms were greater from a watershed comprised of a mountaintop removal coal mine area with valley fills than from an unmined watershed;
>
> 2) Total unit stream flow from a mined area with valley fills was nearly twice that from an unmined forest stream;
> 3) Daily mean flow was higher from a mined/valley fill watershed than from an unmined forested watershed, with the relative difference being greater at lower flows. . .

> One DEIS study showed a 42% (10-100 YR) increase in water discharge from pre-mining conditions after a valley fill area was reclaimed to post mining conditions. Results from another DEIS study showed that an ongoing valley fill operation will increase water discharge from 25-59% (10-100 YR) from pre-mining conditions. . . .

July 13, 2004 Letter from Chapman to Mullins re Phoenix No. 4 Surface Mine, p. 9, **Attachment 9**. There are several other studies indicating that flooding is a serious issue. "During storms when rainfall intensity exceeded about 1 inch per hour, peak unit runoff from the Unnamed Tributary (surface-mined and filled) Watershed exceeded peak unit runoff from the Spring Branch (unmined) Watershed in the Ballard Fork Watershed in southern West Virginia." USGS, Water Resources Investigations Report 02-4303, "Comparison of Storm Response of Streams in Small, Unmined and Valley-Filled Watersheds, 1999-2001, Ballard Fork, West Virginia," 2003, Abstract, **Attachment 27**. "This suggests that large-scale surface mining is especially likely to increase the severity of flooding during a summer storm when a period of intense rainfall follows several days of continuous rainfall." Id. at 19. "Low-flow measurements at numerous synoptic sites in the mined basins indicate that coal mining has substantially altered the hydrologic system of each basin. The effects of mining on streamflow that were identified are (1) reduced base flow in stream segments underlain by underground mines, (2) increased base flow in streams that are downdip and stratigraphically below the elevation of the mined coal beds, and (3) interbasin transfer of ground water through underground mines." USGS, Water Supply Paper 2298, "Simulation of Rainfall-Runoff Response in Mined and Unmined Watersheds in Coal areas of West Virginia," 1989, p. 1, **Attachment 28**.

Furthermore, the Corps' three Decision Documents for NWPs 21, E and F all assume that the proper framework for analysis is a 100-year storm event. E.g., NWP 21 Decision Document, p. 16 (referring to "the flood-holding capacity of 100-year floodplains"). Yet the Corps' SWROA (surface water runoff analyses) for several recent West Virginia mines (e.g., Camp Branch, Laxare, Republic No. 1) are based on 25-year storm events. The 100-year event produces significantly larger runoff volumes and higher peak flows than does the 25-year event. The Corps' Decision Documents are therefore inconsistent with its actual analysis of individual mines.

8. The Corps has failed to analyze whether valley fills will cause significant degradation to "special aquatic sites," such as riffles and pools. Under the § 404(b)(1) Guidelines, riffle and pool complexes are defined as "special aquatic sites." 40 C.F.R. § 230.45. The destruction or degradation of special aquatic sites "is considered to be among the most severe environmental impacts covered by these Guidelines." Id., Subpart A, § 23.1(d). Valley fills associated with coal mining frequently bury riffle and pool complexes. January 25, 2006 Report of Dr. Ben M. Stout, III, pp. 2-3, **Attachment 29**. Riffle and pool complexes are often present in headwater streams in the southern West Virginia coal fields. Id. at 3. As "special aquatic sites," riffle and pool complexes are protected by stringent restrictions on discharges of fill material into such sites. In particular, significant adverse effects on riffle and pool complexes, considered individually or collectively, are presumptively considered to contribute to

significant degradation of waters of the United States. 40 C.F.R. § 230.10(c)(1). The Corps has entirely failed to analyze riffles and pools in its Decision Documents on NWPs 21, E and F.

Further, practicable alternatives that do not involve burying riffles and pools are "presumed to be available, unless clearly demonstrated otherwise," id. § 230.10(a)(3), and such alternatives are "presumed to have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise." Id. Therefore, the Corps must require NWP applicants to show that there are no available alternatives that do not involve filling riffle and pool complexes, or that those alternatives somehow cause greater adverse impacts to the aquatic ecosystem. Id. The Corps must deny a permit if it lacks "sufficient information" to determine whether the proposed discharge complies with the Guidelines. 40 C.F.R. § 230.12(a)(3)(iv). Since the Corps has not required NWP applicants to provide sufficient information to "clearly demonstrate" that there is no alternative to filling these special sites, NWPs 21, E and F are invalid in their proposed form.

9. Refuse fills and impoundments should not be allowed under NWPs 21 and E, because they are not "similar in nature" to other surface mining activities. Section 404(e) limits NWPs to activities that are "similar in nature." 33 U.S.C. § 1344(e). The 404(b)(1) Guidelines specifically state that the Corps must provide "a precise description of the activities to be permitted under the General permit, explaining why they are sufficiently similar in nature and in environmental impact to warrant regulation under a single General permit." 40 C.F.R. § 230.7(b)(2) (emphasis added). The Corps' Decision Documents on NWPs 21 and E completely fail this test. The entire discussion of the "similar in nature" requirement for NWP 21 is as follows:

> The activities authorized by this NWP are sufficiently similar in nature and environmental impact to warrant authorization by a general permit. The terms of the NWP authorize a specific category of activity (i.e., discharges of dredged or fill material for surface coal mining operations) in a specific category of waters (i.e., waters of the United States). The restrictions imposed by the terms and conditions of this NWP will result in the authorization of activities that have similar impacts on the aquatic environment, namely the replacement or modification of aquatic habitats, with fills associated with surface coal mining operations, such as valley fills, permanent stream diversions, **impoundments**, processing plants, and road crossings.

The entire discussion of the "similar in nature" requirement for NWP E is as follows:

> The activities authorized by this NWP are sufficiently similar in nature and environmental impact to warrant authorization by a general permit. The terms of the NWP authorize a specific category of activity (i.e., discharges of dredged or fill material for coal remining and reclamation activities) in a specific category of waters (i.e., non-tidal waters of the United States). The restrictions imposed by the terms and conditions of this NWP will result in the authorization of activities that have similar impacts on the aquatic environment, namely the restoration, establishment, enhancement, or modification of aquatic habitats as a result of reclamation operations in these previously mined areas. Other impacts to the aquatic environment will result from the replacement

> or modification of aquatic habitats, with fills associated with coal remining activities or the mining new areas, such as permanent stream diversions, **impoundments**, and road crossings.

The Decision Documents for both NWPs 21 and E state that the activities authorized by those NWPs can include "impoundments," and that these activities are similar in nature to other surface mining activities such as valley fills. Decision Documents, p. 22. There is no further mention or analysis of refuse fills or impoundments. The discussion of the "similar in nature" requirement in these two documents is so perfunctory and conclusory as to be meaningless. There is no discussion of any specific environmental impacts. There is no breakdown or comparison of particular mining activities.

Valley fills are not similar in nature to surface impoundments. Valley fills contain only solid materials–dirt and rock. Surface impoundments contain liquid materials like coal slurry. A surface impoundment, unlike a valley fill, can fail and release millions of gallons of liquid mining wastes into downstream watersheds. This has already happened several times:

> On October 24, 1996, a failure in a coal slurry impoundment associated with a coal processing plant owned by LMPI in Lee County, Virginia, resulted in the release of six million gallons of coal slurry to the Powell River watershed. The spill occurred when subsidence in the coal slurry impoundment caused the coal slurry to enter a system of abandoned underground coal mine-works. The coal slurry exited through a mine-works surface portal at Gin Creek, causing the release of the coal slurry into a series of tributaries to the Powell River. "Blackwater,"' a mix of water, coal fines, and clay, and associated contaminants, extended far downstream. The coal slurry spill impacted fish, endangered freshwater mussels, other benthic organisms, supporting aquatic habitat, and designated critical habitat for two federally listed fish. Federally listed bats and migratory birds may have also been affected acutely due to a loss of a food supply, and chronically due to possible accumulation of contaminants through the food chain.

68 Fed. Reg. 41841 (July 15, 2003). An even more catastrophic event occurred in 2000 in Martin County, Kentucky. OSM, Report on October 2000 Breakthrough at the Big Branch Slurry Impoundment (March 4, 2002), available at ,www.osmre.gov/pdf/martincounty030402.pdf, **Attachment 30.** At that time, 306 million gallons of water and coal slurry spilled out of an impoundment and damaged 75 miles of streams in Kentucky and West Virginia. Id., Executive Summary, p. ii. This was the second major breakthrough at this site, with an earlier one occurring in 1994.

The Commonwealth of Kentucky Natural Resources Cabinet, Department for Surface Mining Reclamation and Enforcement (KY DSMRE) is evaluating all 121 "MSHA Class" impoundments in KY. MSHA Class is defined as any structure associated with coal mining operations which is built to impound water and is either 20 feet high, or capable of impounding 20 acre-feet of water. The U.S. Department of Labor and the MSHA have identified approximately 121 impoundments and 60 as "high hazard" structures. This classification suggests that the consequence of an impoundment failure at these locations would be expected to

imperil life, destroy property, and possibly have serious impacts to the environment. KY DSMRE's evaluations includes site visits to each facility, review of underground maps, and field identification of the location of underground mine works. To date, evaluations for about 30 of the 121 structures have been completed, and as a direct result, KY DSMRE has already required certain coal plant operators to draw down the level of water stored in these structures to ensure stability. See "Martin County Coal Corporation, Inez, Kentucky, Task Force Report, October 2001, p. 5, available at www.epa.gov/region4/waste/martincs.pdf., **Attachment 31.**

Underground slurry injection can also contaminate wells used for drinking water, leading to health problems for nearby residents. "Murky Mingo Water at Heart of Hearing," State Journal, Oct. 19, 2006, **Attachment 32**. Davitt McAteer, a vice president of Wheeling Jesuit University and former assistant secretary for the federal Mine, Safety and Health Administration, said coal companies have other methods available to dispose of slurry, including mixing it with a compound to dry it out, then burn or bury it. But he said they abandoned that process because it was more expensive than other methods. Id.

The Corps' Decision Documents do not even recognize that impoundments can cause massive spills or contaminated well water. The Corps' "impact analysis" states that the activities "usually replace the aquatic area with dry land" and makes no mention of past impoundment failures or their consequences. Decision Documents, ¶ 4(c)(iii)(a). The Corps' unexplained lumping of valley fills and surface impoundments into one NWP, without any recognition of their disparate environmental impact, therefore violates the "similar in nature" requirement.

10. The Corps has failed to make the required pre-issuance determination that the environmental effects of NWP E would be minimal. The Corps' proposed NWP E would authorize fill activities at a site with greater than 60% remined area and up to 40% new mined area if the applicant clearly demonstrates that the overall project will result in a net increase in aquatic resource functions. 71 Fed. Reg. at 56276, 56293. This NWP is illegal because the Corps is completely deferring the required minimal effects determination for NWP E until a later demonstration is made by the applicant, and that demonstration is not subject to public notice or opportunity for hearing. Such a complete deferral of the required statutory determination to a later date violates § 404(e). Section 404(e) does not permit the Corps "*completely* to defer the minimal-impact determinations until after issuance of the permit." OVEC v. Bulen, 429 F.3d 493, 502 (4th Cir. 2005) (emphasis in original). If that were the case, "the Corps' 'determinations' would consist of little more than its own promise to obey the law." Id. Absent such a determination, and a supporting basis in the Corps' proposal for NWP E, it is impossible for the public to comment meaningfully on this proposed NWP.

11. The Corps' proposed 1/2 acre limit on filling streams under NWP F will not ensure minimal effects. The Corps has proposed a 1/2 acre limit on filling streams under NWP F. 71 Fed. Reg. at 56293. As we have explained above, a limit on stream-filling must be expressed in linear feet, not acres, in order to measure actual impacts. A half-acre limit would allow the filling of up to about one-half mile of headwater streams. For example, here are some recent underground mine permits that show the relationship between linear feet and acreage of filled stream areas in the Huntington District in West Virginia:

ACOE PN # for IP	Permit number	Impact ft	Impact acre
200500162	U500504, u500704, u501004	3616	0.77
200401485	u300299	1554	0.48
200401315	u500305	988	0.366
200400717	u500204	480	0.22
200400637	u302099	680	0.875

There is no scientific basis for concluding that such an impact will always be minimal, either individually or cumulatively. Headwater streams serve essential functions, such as nutrient retention, water purification, and energy production, that cannot be mitigated or replaced in downstream waters.

12. The Corps' proposed NWP E requires a net increase in stream functions at remining sites, but the Corps has no approved method of assessing those functions. Proposed NWP E assumes that remining projects have minimal effects on aquatic resources if the "newly mined area is less than 40 percent of the area being remined and reclaimed." Decision Document, p. 1. The Corps assumes that projected improvements in water quality due to remining will be sufficient to offset the water quality degradation caused by valley fills, and that the successful permittee will be able to "clearly demonstrate to the district engineer that the reclamation plan will result in a net increase in aquatic resource functions." 71 Fed. Reg. at 56276. However, as we have shown above, the Corps has no approved methodology for assessing stream functions. The Corps therefore has no scientific basis for measuring whether a permittee can meet the "net increase in aquatic resource functions" requirement. The Corps' proposed trading of remining improvements for valley fills impacts also relies on an inappropriately narrow scope of analysis ignoring terrestrial and other impacts.

13. The Corps must consider the indirect effects on NWPs 21, E and F on air pollution and global warming. NEPA requires that federal agencies consider "any adverse environmental effects" of their "major ... actions," 42 U.S.C. § 4332(C), and the CEQ regulations, which are binding on the agencies, explain that "effects" include both "direct effects" and "indirect effects," 40 C.F.R. § 1508.8. Indirect effects are defined as those that "are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable." Id. "Indirect effects may include ... effects on air and water and other natural systems, including ecosystems." Id. This means that degradation in air quality from burning coal from mining projects with authorizations under NWPs 21, E and F must be addressed in an EIS if it is "reasonably foreseeable." It is reasonably foreseeable--indeed, it is almost certainly true--that these mining projects will increase the long-term demand for coal and any adverse effects that result from burning coal, including global warming. Mid States Coalition for Progress v. Surface Transp. Bd., 345 F.3d 520, 549 (8th Cir. 2003). Fossil fuel energy sources—coal is the worst kind of fossil fuel, producing twice as much carbon dioxide as natural gas—are responsible for global warming. Consequently, the Corps must consider and analyze those

effects as part of its determination of the effects of NWPs 21, E and F "on the environment" under § 404(e). At a minimum, this means calculating the estimated amount of additional carbon dioxide that would be produced when the coal from NWP-authorizing mining projects is burned, the extent to which this may contribute to overall atmospheric levels of carbon dioxide and global warming, and alternative energy production sources that could avoid these effects.

14. The Corps' PCN requirements for NWPs 21, E and F are inconsistent and inadequate. General condition 27(a)(2) would allow a prospective permittee to begin the activity if it has not received written notice from the District Engineer within 45 days about the status of the PCN. Thus, if the Corps does not act on the PCN within 45 days, the activity can begin without the review that the Corps says is necessary to ensure that impacts are minimal and that all practicable mitigation of adverse effects is achieved. This undercuts the whole purpose of the PCN and creates a default situation where projects can begin without any review.

The third sentence in 27(a)(2) creates an exception for NWP 21, and provides that, even if 45 days elapse, the Corps still must provide written approval of the PCN before the activity can begin. However, the default situation would apply to NWPs E and F. Since NWP E requires the same written approval as does NWP 21, both NWPs 21 and E should be treated the same and included in the exception in the third sentence of 27(a)(2). Unlike NWPs 21 and E, NWP F requires a PCN but does not require written Corps approval. This is inadequate. According to the Corps' cumulative acreage calculation, NWP F will impact as many acres of streams as does NWP 21. NWP F should therefore require the same written approval as do NWPs E and F, and should also be included in the exception in the third sentence of 27(a)(2).

Sincerely,

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Attachments

1. October 9, 2001 Letter from EPA to ACOE.
2. July 2, 2001 Letter from FWS to ACOE.
3. September 20, 2001 Letter from FWS to ACOE.
4. October 5, 2001 Letter from Univ. of Georgia Institute of Ecology to ACOE.
5. March 11, 2005 Plaintiff's SJ Mem., pp. 7-9 in Kentucky Riverkeeper v. Rowlette.
6. May 16, 2006 Expert Report of Douglas P. Pflugh.
7. April 28, 2006 powerpoint presentation: DEP Selenium Study, Background and Progress.
8. A. Dennis Lemly, "Selenium in Aquatic Ecosystems: A Guide for Hazard Evaluation and Water Quality Criteria," Springer 2002, p. 31.
9. July 13, 2004 Letter from Chapman to Mullins re: Phoenix No. 4 Surface Mine, pp. 1, 9-11, 13-14.
10. July 9, 2004 FWS Letter to ACOE.
11. A. Dennis Lemly, "Recommendations for Pre-Mine Assessment of Selenium Hazards Associated With Coal Mining in West Virginia," January 5, 2004.
12. Edmonds and Loucks, "Woody Establishment Patterns Following Mountaintop Removal in the Coal River Valley."
13. Weakland and Wood, "Cerulean Warbler (Dendroica Cerulea) Microhabitat and Landscape-level Habitat Characteristics in Southern West Virginia in Relation to Mountaintop Mining/Valley Fills," Final Project Report, December 2002, p. 1.
14. Hooke, R.L. 1999, "Spatial distribution of human geomorphic activity in the United States: comparison with rivers," Earth Surface Processes and Landforms 24: 687-692.
15. May 28, 2004 Mullins Declaration, Ex. 1, in OVEC v. Bulen, Civil No. 3:03-2281.
16. April 14, 2006 Chubb Declaration, in Kentucky Riverkeeper v. Rowlette, Civil No. 05-181-DLB, Ex. 14 and A-48.
17. PaDEP, "The Effects of Subsidence Resulting from Underground Bituminous Coal Mining on Surface Structures and Features and on Water Resources: Second Act 54 Five-Year Report," Executive Summary, pp. 4, 20, 34 (February 4, 2005).
18. Ben Stout III, "Do headwater streams recover from longwall mining impacts in northern West Virginia, West Virginia Water Research Institute, Final Report, August 30, 2004.
19. Draft Nationwide Permits Programmatic Environmental Impact Statement, July 2001, pp. S-6, S-7, S-17, 3-21, 4-14, 4-31.
20. May 12, 2006 Memorandum in Opposition to Plaintiffs' Renewed Motion for Summary Judgment in OVEC v. Bulen, Civil No. 3:03-2281 (S.D.W.Va.), pp. 22, 35-36.
21. May 16, 2006 Expert Report of J. Bruce Wallace, pp. 4-5.
22. May 16, 2006 Expert Report of Margaret A. Palmer, pp. 12-14.
23. August 17, 2006 Expert Report of Margaret A. Palmer, p. 3.
24. February 14, 2005 Memorandum of Understanding with OSM, FWS and EPA concerning "Concurrent and Coordinated Review and Processing of Surface Coal Mining Applications Proposing Placement of Dredged and/or Fill Material in Waters of the United States."
25. January 25, 2006 Wallace Aff., Ex. 7 to Pls. P.I. Mot. in OVEC v. Bulen, p. 7.
26. January 25, 2006 Palmer Aff., Ex. 6 to Pls. P.I. Mot., p. 9.

27. USGS, Water Resources Investigations Report 02-4303, "Comparison of Storm Response of Streams in Small, Unmined and Valley-Filled Watersheds, 1999-2001, Ballard Fork, West Virginia," 2003.
28. USGS, Water Supply Paper 2298, "Simulation of Rainfall-Runoff Response in Mined and Unmined Watersheds in Coal areas of West Virginia," 1989, p. 1.
29. January 25, 2006 Report of Dr. Ben M. Stout, III, pp. 2-3.
30. OSM, Report on October 2000 Breakthrough at the Big Branch Slurry Impoundment (March 4, 2002).
31. "Martin County Coal Corporation, Inez, Kentucky, Task Force Report, October 2001, p. 5.
32. "Murky Mingo Water at Heart of Hearing," State Journal, Oct. 19, 2006.
33. Bulen Trial Transcript, Volumes I-VI (excerpts).