UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

NOV 22 1994

OFFICE OF
WATER

Honorable John H. Zirschky
Acting Assistant Secretary (Civil Works)
Department of the Army
Washington, DC 20310-0130

Dear Dr. Zirschky:

In accordance with the provisions of the 1992 Memorandum of Agreement (MOA) between the U.S. Environmental Protection Agency (EPA) and the Department of the Army under Section 404(q) of the Clean Water Act (CWA), I am requesting your review of a decision by Colonel Richard W. Jemiola, U.S. Army Corps of Engineers (Corps), Huntington District, to issue a Section 404 permit to the Little Kanawha Soil Conservation District for the North Fork of the Hughes River Dam and Reservoir Project in Ritchie and Doddridge Counties, West Virginia. The proposed permit would authorize the construction of an 86 foot high and 505 foot long roller compacted concrete dam, water treatment plant and transmission system, and recreational facilities. The dam would create a 305 acre permanent pool, permanently inundating 8.1 miles of the North Fork of the Hughes River. After a thorough review of the available information, EPA has determined that this case warrants elevation in accordance with the criteria under Part IV of the MOA, Elevation of Individual Permit Decisions.

The primary purposes of the dam and impoundment are to provide improved flood control for the town of Cairo and North Bend State Park; to supply water to Harrisville, Cairo, Ellenboro, Pennsboro, and North Bend State Park; and to enhance recreational opportunities in the region. We also recognize the critical economic development objectives associated with the project. I would emphasize from the outset EPA's support for realizing these project objectives, most importantly, the goal of improving flood protection for the citizens of Cairo. It is our serious concern, however, that practicable alternatives are available that would satisfy these important project objectives while significantly reducing adverse effects to the area's valuable aquatic resources. In such circumstances, the Section 404(b)(1) Guidelines contemplate selection of the least damaging practicable alternative in order to minimize environmental impacts.

The proposed project would convert high quality riverine aquatic habitat to a lacustrine system. The North Fork of the Hughes River, which is listed on the National Rivers Inventory recognizing nationally or regionally significant resources, is relatively undisturbed and provides extensive and virtually irreplaceable aquatic and riparian habitat. While the river supports a warmwater fishery, species typical of cooler aquatic environments such as smallmouth bass can

also be found. The North Fork has a highly diverse mussel population, providing habitat for at least 22 species of freshwater mussels. Freshwater mussels as a group are one of the most endangered fauna in the world. More than half of all freshwater mollusk species occur in the rivers and streams of eastern North America. Further, this type of riverine ecosystem with its diverse mussel population is becoming scarce in its ecoregion. The impoundment of this aquatic ecosystem, which would permanently inundate 8.1 miles of stream and periodically inundate an additional 5.1 miles of stream, including as much as 8.8 acres of wetlands, vegetated shallows, and submerged aquatic vegetation, would result in significant direct and secondary adverse impacts to this valuable aquatic resource.

Concerns regarding the nature of project impacts are heightened by information indicating that the most significant direct and secondary effects are avoidable. The Huntington District appears to have made its permit decision in this case without considering the availability of less damaging practicable alternatives. Information in the Corps record for this project documents the incorrect assertion made by the National Resources Conservation Service-West Virginia, that the scope of alternatives considered under the National Environmental Policy Act (NEPA) and subsequently the Section 404(b)(1) Guidelines, may be constrained by limits imposed by Congressional appropriation. As a result, only the applicant's preferred alternative and the "no build" alternative were substantively evaluated. Neither the analyses required under the Clean Water Act Section 404(b)(1) Guidelines nor NEPA may be appropriately constrained in this way (see 46 Federal Register 18026). Had the scope of evaluation been expanded to consider the full extent of practicable alternatives, we are confident that a less environmentally damaging alternative would have been identified to meet the project's important objectives. A detailed discussion of these issues is enclosed.

Because of the existing inadequacies of the record in examining a more complete range of potential alternatives, we can not reach the ultimate conclusion required by the Guidelines regarding selection of the least damaging practicable alternative, and subsequently, therefore, regarding the permitability of this project. However, it is for this very reason we are concerned that the Huntington District was able to rely on an inadequate record to establish the basis for its decision to issue a permit in this case. It is our strong recommendation that the Corps convene a group which includes EPA, U.S. Fish and Wildlife Service, Natural Resources Conservation Service, and State representatives to supplement the record focusing on consideration of potential practicable alternatives that would provide the basis for a more informed permit decision. We agree that a reasonable schedule should be established to complete the record so that a timely permit decision could be made.

I hope that you will carefully review the record associated with this proposed permit decision, and look forward to your response. If my staff can provide any assistance during your evaluation of this request, please direct questions to Mr. Gregory E. Peck, of the Wetlands Division, at (202) 260-8794.

Sincerely,

Bob Perciasepe

Robert Perciasepe
Assistant Administrator

Enclosure

ASSISTANT ADMINISTRATOR'S EVALUATION FOR
SECTION 404(q) ELEVATION
NORTH FORK OF THE HUGHES RIVER DAM AND RESERVOIR

INTRODUCTION

This referral meets the criteria in Part IV of the 1992 EPA/Army Section 404(q) MOA. EPA finds that the proposed discharge of fill material would result in substantial and unacceptable impacts to the aquatic ecosystem of the North Fork of the Hughes River in West Virginia, an aquatic resource of national importance. Our concerns regarding the adverse impacts to the aquatic resources in this proposal are further heightened because it appears that the impacts are avoidable.

The lead Federal agency for the review of this proposal is the U.S. Natural Resources Conservation Service (formerly the U.S. Soil Conservation Service) acting through their office in Morgantown, West Virginia (NRCS-WV). The NRCS-WV is acting as an agent for the Little Kanawha Soil Conservation District, the project sponsor. The project, as proposed, would involve the construction of an 86-foot high and 505-foot long roller compacted concrete dam on the North Fork of the Hughes River, water treatment plant and transmission system, and recreation facilities. The dam would create a 305-acre permanent pool, inundating 8.1 miles of the North Fork of the Hughes River in Ritchie and Doddridge Counties. The purposes of the dam are to provide additional flood control for the Town of Cairo and North Bend State Park; to supply water to Harrisville, Cairo, Ellenboro, Pennsboro, and North Bend State Park; and to provide additional recreational opportunities in the region. An additional project purpose discussed in the Environmental Impact Statement (EIS) is to enhance economic development.

There are potential significant adverse impacts associated with the proposed project that have not been adequately assessed as part of the permit review, including conversion of the riverine system to a lacustrine system and the loss of a highly diverse freshwater mussel community. Moreover, the proposal lacks an adequate investigation of alternatives in the context of developing the practicable alternative that is least damaging to the environment. The NRCS-WV has maintained that all the project purposes can best be met by undertaking one action, that of building a multi-purpose reservoir. The alternatives analysis was included in the EIS and provided a detailed evaluation of only two alternatives, the multi-purpose reservoir and the no-action alternative, while alternatives that may have had lesser environmental impacts were summarily dismissed from full review or not examined at all.

AQUATIC RESOURCES OF NATIONAL IMPORTANCE

Riverine Ecosystem

The North Fork of the Hughes River is a riverine ecosystem of high quality habitat. The river is characterized by extensive heterogenous habitats including

riffle/run/pool complexes, shallow and deep pools, in-stream refugia, gravel bars, submerged aquatic beds, and prolific riparian vegetation including deciduous and coniferous trees, shrubs, herbaceous undergrowth, overhanging vegetation and bank refugia. At least 25 sites in the project area of the North Fork of the Hughes River have various combinations of riffles and runs. Submerged aquatic vegetation and vegetated shallows, composed primarily of water willow (Justicia americana), are found in at least 102 beds totalling 3.4 acres in the reach of river that would be inundated by the proposed permanent pool. Bottomland hardwoods are found in the watershed and along the North Fork of the Hughes with many trees in the mature stands that are larger than 16 inches in diameter at breast height.

The river is known to support a fishery that includes 27 species of finfish including smallmouth bass (Micropterus dolomieu), spotted bass (M. punctualatus), and muskellunge (Esox masquinongy) (Table 1), and to provide habitat for at least 22 species of freshwater mussels (Table 2). This riverine ecosystem also provides excellent habitat for a significant community of neotropical migratory birds, waterfowl, shorebirds, mammals, reptiles, and amphibians. More than 80 species of migratory birds are known to breed in the drainage of the project area (Table 3). The forested habitats in the project area attract many passerine birds such as the yellow warbler (Dendroica petechia) and the Louisiana waterthrush (Seiurus motacilla) during the breeding season, as well as others such as the belted kingfisher (Megaceryle alcyon) and the wood duck (Aix sponsa). At least 53 species of amphibians and reptiles, such as the eastern hellbender (Cryptobranchus alleganiensis), gray treefrog (Hyla chrysoscelis), and northern water snake (Nerodia sipedon), are known to occur in the area of the North Fork of the Hughes River (Table 4). Mammals such as mink (Mustela vison) and raccoon (Procyon lotor) are also known to occur in the area (Table 5).

The North Fork of the Hughes River is listed as a High Quality Stream by the West Virginia Division of Natural Resources. Of 8,000 streams in West Virginia, only 947 are classified as high quality. Streams are designated as high quality because they are stocked with trout or have native trout populations, or are warmwater streams over five miles long with desirable fish populations that are utilized by the public. The North Fork of the Hughes River qualifies based on the latter criterion. In its letter of July 21, 1994, the U.S. Fish and Wildlife Service (FWS) cite this designation, indicating that the relatively undisturbed nature of the River and its excellent riparian habitat supported "large and smallmouth bass, spotted bass, and sunfish, and 22 species of mussels (5000+ individuals)." The considerable aquatic and riparian habitat provided by the river and its relatively undisturbed nature make this system a high value habitat that is becoming scarce in its region.

Special Aquatic Sites

The reach of river that would be inundated by the permanent pool includes three types of special aquatic sites as defined by the Section 404(b)(1) Guidelines: wetlands,

vegetated shallows, and riffle/pool complexes. According to the Guidelines, special aquatic sites are recognized as significantly influencing or positively contributing to the general, overall environmental health or vitality of the entire ecosystem of a region. These three habitat types together with the shellfish beds represent critical components of the aquatic ecosystem of the North Fork of the Hughes River and a unique natural resource. The Section 404(b)(1) Guidelines state that "From a national perspective, the degradation or destruction of special aquatic sites, such as filling operations in wetlands, is considered to be among the most severe environmental impacts covered by these Guidelines. The guiding principle should be that degradation or destruction of special sites may represent an irreversible loss of valuable aquatic resources." The likelihood is small that these components can be effectively mitigated or compensated in-kind.

National Rivers Inventory

Approximately eight miles of the North Fork of the Hughes River are included in the National Rivers Inventory (NRI), 3.4 miles of which would be inundated by the proposed impoundment. The NRI, issued in 1981, is a listing of rivers and river segments that have the potential for study and/or inclusion into the National Wild and Scenic Rivers System. These rivers have in common with rivers already in the national system the recognition of having nationally or regionally significant resources. Approximately 10,000 river miles are protected under the National Wild and Scenic Rivers System. In contrast, there are approximately 600,000 river miles in the United States impounded by dams (American Rivers, 1994).

Consideration must be given to river values for those rivers listed on the NRI in accordance with Section 5(d) of the National Wild and Scenic Rivers Act. This section requires that in planning for the use and development of water and related land resources, consideration must be given by involved Federal agencies to potential national wild, scenic, and recreational river areas, and all river basin and project plan reports submitted to the Congress must consider and discuss any such potential. The Preapplication report prepared by NRCS-WV in May, 1991 and submitted to Congress for funding of the proposal did not include a discussion of the NRI or the comprehensive qualities that resulted in the North Fork of the Hughes being listed on the NRI.

Freshwater Mussels

North America has the highest diversity of freshwater mussels in the world (Williams, et al., 1993). Over half of the species of river mollusks known on earth are found only in the rivers and streams of eastern North America (Stansbery, 1973). Of the 297 recognized taxa of freshwater mussels in North America, 213 taxa or 72% of the total are considered endangered, threatened, or of special concern (Williams et al., 1993). The Nature Conservancy listed 55% of North America's mussels as extinct or imperiled (Master, 1990). The single most important reason cited as a cause for the

decline of freshwater mussels is habitat destruction. Foremost among the causes of habitat destruction is construction of impoundments and the inundation of riffle habitat (Bates, 1962; Bogan, 1993; Stansbery, 1973; Stansbery, 1974; Williams, et al., 1992; Williams, et al., 1993; Wilson, 1992).

The North Fork of the Hughes provides excellent habitat for a very diverse freshwater mussel community (Table 2). Twenty-two species of mussels were found in the latest survey of the river in sample sites that total approximately 3.2 miles of the North Fork of the Hughes River. This survey was conducted in 1993 (Ecological Specialists, 1993). The mussels found represent six more species than were found in previous historical surveys in the North Fork of the Hughes River. Such an assemblage of species indicates a healthy community of mussels (National Biological Survey, 1994b), which ranks fifth in the State in terms of mussel species diversity.

The mussel communities in the project areas have also received attention from the U.S. Fish and Wildlife Service's Ohio River Ecosystem Team. This team has as its first priority the reversal of the decline of native aquatic mollusks in the ecosystem. The Hughes River, including the North Fork, is one of six focus areas for this team in West Virginia. The team is charged with analyzing existing and potential threats to riverine habitats and addressing declines in their quantity and quality. Another emphasis of this team is on endangered, threatened and candidate species and species of concern.

Two Federal category 2 species (evidence of vulnerability or threat to continued existence but more data is needed), Epioblasma triquetra and Simposonaias ambiqua, which are currently under consideration for endangered status, have been found in the North Fork of the Hughes River. E. triquetra were found in the 1993 survey and in a survey reported in 1982 (Schmidt, et al., 1982). Gravid females of E. triquetra were found in the 1993 survey, verifying that this category 2 species is reproducing in the study area. This population of E. triquetra represents the largest reproducing population in West Virginia (WV Natural Heritage Program, 1994).

S. ambiqua were found in a survey conducted in 1978 (U.S. Fish and Wildlife Service, 1991). The absence of S. ambiqua in the 1993 survey may not necessarily indicate that this species is no longer present within the project area. According to Dr. Richard Neves, Leader of the Virginia Cooperative Fish and Wildlife Research Unit of the National Biological Survey and a noted authority on freshwater mussels, surveying for rare mussels with viewing buckets as was done in the 1993 survey is not the most effective method of locating these rare mussels (National Biological Survey, 1994b). Using such a method exclusively may have resulted in some species being missed in the survey. In addition, the sampling effort was considered to be inadequate in terms of attaining a reasonable level of certainty that an endangered or threatened species does not exist on the site (National Biological Survey, 1994b). Rare species are typically not found in general surveys unless a concerted effort is made to obtain a nearly complete list of all mussels at diverse sites, which was not done in the mussel survey for this

proposal. Consequently, the possibility exists that other mussel species, such as the endangered Pleurobema clava, may exist in the North Fork of the Hughes River.

SUBSTANTIAL AND UNACCEPTABLE IMPACTS

40 CFR 230.10(c): Significant Degradation

EPA is concerned that compliance with the requirements of Section 230.10(c) of the Section 404(b)(1) Guidelines has not been clearly demonstrated. Section 230.10(c) requires that no discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States. The Guidelines explicitly require evaluation of all direct, secondary, and cumulative impacts reasonably associated with the proposed discharge in determining compliance with Section 230.10(c). In accordance with the Guidelines, determining significant degradation requires the direct consideration of effects on such functions and values as wildlife habitat, aquatic ecosystem diversity, stability and productivity, recreation, aesthetic, and economic values.

Adverse Environmental Impacts

The impacts from the proposed multi-purpose reservoir include loss of 8.1 miles of riverine habitat (with periodic inundation of another 5.1 miles); bottomland hardwoods; habitat for neotropical migrants; habitat for waterfowl and shorebirds; a highly diverse mussel community (22 species); and wetlands, submerged aquatic beds, and riffle/run/pool complexes, each of which is a special aquatic site under the 404(b)(1) Guidelines. The habitat that would be inundated by the reservoir includes 23 acres of mature bottomland hardwood and 38 acres of immature bottomland hardwood in islands and overflow areas. In a letter dated September 8, 1994, the FWS indicated that they "determined that substantial or unacceptable adverse impacts will occur if the project is implemented."

The proposed project will result in the removal of at least 3.4 miles of the river from National Rivers Inventory classification. Moreover, should the reservoir be constructed, the likelihood of the remaining NRI-classified river becoming designated as a National Wild and Scenic River would be diminished, which was not considered in the Huntington District's Statement of Findings.

According to the EIS, nine wetland sites of up to 0.5 acre each and totalling 1.2 acres would be inundated by the normal pool. Eleven additional sites totalling 4.2 acres would be impacted by the flood pool. The wetlands within the area of the normal pool are primarily palustrine emergent with some palustrine open water (farm ponds) present. In addition, the numerous riffle/run/pool complexes and water willow beds in the reach of the proposed pool would be lost.

The construction of the North Fork of the Hughes Reservoir will change the riverine habitat upstream from a shallow swift stream to a deeper, slower-moving reservoir. All the mussel species within the reservoir pool that typically inhabit riffles, runs, chutes and shallow pools and depend on fish hosts that inhabit this same habitat will eventually die out (Virginia Polytechnic Institute, 1994; Ecological Specialists, 1993).

Anticipated secondary impacts that would result from the proposal include habitat fragmentation, which significantly impacts aquatic species upstream and downstream of the impoundment, especially the mussel community which would suffer from impacts to host fish and the change from a riverine system to a lacustrine system which would likely result in the loss of most of the 22 mussel species within the permanent pool. Additional impacts include reduced diversity, particularly as a result of the loss of riparian habitat; broad-scale ecosystem and economic impacts associated with the infestation of zebra mussels downstream of the reservoir; and the anticipated loss of the downstream community of Category 2 species of mussel, Epioblasma triquetra, as a result of the change of the hydrologic regime imposed by the dam and the infestation of the zebra mussel downstream.

Impounding the North Fork of the Hughes would result in significant impacts to the mussels that may remain in the upper reaches of the river and downstream of the dam. The most tenuous portion of the life cycle of freshwater mussels is the need for an obligate fish host (Bogan, 1993). Consequently, one of the significant effects of constructing dams in rivers inhabited by freshwater mussels, such as is proposed for the North Fork of the Hughes, is the adverse effects on populations of host fish. When the host fish disappear from existing populations, the mussels dependent upon them as hosts are destroyed (Williams, et al., 1993) and when their movements are restricted, the distributions of dependent mussels are similarly restricted and populations of mussels can become isolated (Watters, 1994). As a consequence, the category 2 mussel Epioblasma triquetra below the North Fork dam will likely be negatively impacted (National Biological Survey, 1994b).

The water discharges from the proposed dam may significantly alter the natural hydrology downstream of the dam, thus affecting the aquatic ecology downstream. There were no assessments of how the proposed 1 cubic foot per second (cfs) minimum flow release differs from natural seasonal flows downstream, particularly relative to hydroperiod. The average annual flow of the River is 109.4 cfs (EPA Region III, personal communication) and especially low project flows may result in impacts to aquatic species which may suffer from the resultant loss of aquatic habitat and impacts to downstream wetlands. The proposed flow release during the filling of the reservoir should be clearly defined, including mechanisms to protect downstream areas from effects of prolonged low flows. These impacts were inadequately assessed.

In addition to habitat destruction as a major threat to mussel species, populations of nonindigenous mollusks such as the Asian clam (Corbicula fluminea) and the zebra

mussel (Dreissena polymorpha) have begun to decimate remaining native mussel populations. Nonindigenous aquatic species continue to be a source of socio-economic costs to American society (e.g., fouling water intake structures) and threat to biological diversity. The proposed reservoir would create suitable habitat for the zebra mussel (Virginia Polytechnic Institute, 1994). One of the principal means by which zebra mussels infest new areas is from watercraft that are used in infested waters, such as the Ohio River, and subsequently used in suitable zebra mussel habitat, such as the proposed North Fork reservoir. Once the North Fork of the Hughes reservoir is infested with zebra mussels, the reservoir can infest the downstream reaches of the River. The conclusion drawn from several available studies indicate that the North Fork of the Hughes River would not become heavily infested by zebra mussels, contrary to the Huntington District's Statement of Findings, unless there were frequent inoculations of adult zebra mussels by recreational boaters, or there was an upstream reservoir that became infested and continually released viligers downstream (Virginia Polytechnic Institute, 1994).

Section 2(a) of Executive Order 11987 requires that agencies "shall, to the extent permitted by law, restrict the introduction of exotic species into the natural ecosystems on lands and waters which they own, lease, or hold for the purposes of administration; and, shall encourage the States, local governments, and private citizens to prevent the introduction of exotic species into natural ecosystems of the United States." Consideration should be given to this Executive Order in light of the suitable habitat for zebra mussels that would be created by the proposed reservoir and the recognition, prior to the issuance of the Department of the Army permit, that zebra mussels are very likely to infest the reservoir.

Cumulative Impacts

Dams have already significantly altered riverine systems throughout West Virginia. Approximately 450 dams, including low head dams, already exist on streams and rivers of West Virginia. This number does not include coal slurry impoundments. The NRCS-WV has 191 dams constructed, under construction, or planned in the State. Of these, 160 have already been constructed, four are under construction, and 27 are planned. Fifteen of these dams are multi-purpose dams with the remainder being small single-purpose flood control dams. In addition, the Corps of Engineers has 10 existing impoundments throughout the State and approximately 13 locks and dams on such rivers as the Kanawha, the Monongahela, and the Ohio. EPA is concerned about the impacts of an additional impoundment in an area which has already had many impoundments constructed.

Contrary to the requirements of Section 230.10(c), the proposed permit decision does not adequately reflect consideration of all direct, secondary, and cumulative impacts to the functions and values of the North Fork of the Hughes River aquatic ecosystem.

40 CFR 230.10(a): Alternatives

Evaluation of Alternatives

Section 230.10(a) of the Section 404(b)(1) Guidelines (Guidelines) requires that no permit shall be issued if there is a practicable alternative to the proposed discharge that would have less adverse impact to the aquatic environment. EPA is concerned that, based on information in the record, it has not been demonstrated that the proposed project is the least environmentally damaging practicable alternative.

A. Project Purpose

The basic project purpose is to provide flood protection for Cairo and the North Bend State Park; municipal water supply to Ellenboro, Cairo, Pennsboro, Harrisville, and North Bend State Park; and recreational opportunities for the region. EPA understands the need to meet these objectives, particularly the goal of improved flood protection, and is interested in identifying practicable alternatives that would also minimize impacts to valuable aquatic resources.

B. Scope of Review of Practicable Alternatives

EPA is concerned that, in reliance on the applicant's alternatives analysis, the District has unjustifiably constrained the scope of potential practicable alternatives to meet the project purpose. The District has accepted the NRCS-WV's inappropriately constrained evaluation of alternatives that fully considered only the "preferred" and "no build" alternatives, while failing to completely evaluate many other alternatives in the "formulation of alternatives" section of the EIS. These alternatives, and perhaps others not considered at all, should have been more thoroughly examined for practicability. EPA is concerned that had a more comprehensive analysis been conducted, consistent with the provisions of the Guidelines, practicable alternatives would have been identified that satisfy the project's objectives while reducing impacts to the environment.

The District in its Statement of Findings, referenced one of the NRCS-WV letters stating that an alternatives analysis is not required for this project since it was Congressionally authorized and funded but offered no challenge to the NRCS-WV on its position. A similar statement was included in a NRCS-WV memorandum dated August 3, 1994, signed by Rollin N. Swank, NRCS-WV State Conservationist, which stated "Our position is that Congress in FY-93 authorized and partially funded through the Appalachian Regional Commission a multi-purpose water resource project for flood protection, water supply, and recreation. The project consisted of a multi-purpose dam located near North Bend State Park which would create a 300-acre permanent lake." Without any further statement, the District referenced specifically the declaration by

NRCS-WV that it is only required by law to address the environmental impacts of the authorized project. As indicated in NEPA questions and answers (46 Federal Register 18026), question number 2b asks "Must the EIS analyze alternatives outside the jurisdiction or capability of the agency or beyond what Congress has authorized?" The stated answer in total is that "An alternative that is outside the legal jurisdiction of the lead agency must still be analyzed in the EIS if it is reasonable. A potential conflict with local or federal law does not necessarily render an alternative unreasonable, although such conflicts must be considered." Section 1506.2(d). Congressional authorization and funding for a particular project does not eliminate the requirement for a thorough alternatives analysis, as evidenced by those completed for other Congressionally authorized projects (e.g., Nibbs Creek, VA - SCS impoundment; Wheeling Creek, PA - SCS impoundment; Great Egg Harbor Inlet, NJ - Corps dredging; Port Jervis Ice Jam Study, NJ - Corps ice jam study). The District considered the alternatives analysis to be "adequate for the Corps 404(b)(1) guidelines analysis" and that "the least environmentally damaging practicable alternative has been selected."

EPA is concerned that the District has inappropriately accepted NRCS-WV's argument dismissing the need for examination of alternatives without an independent review. The District has reached conclusions about availability of practicable alternatives without requiring a thorough investigation. EPA is particularly concerned that applying this approach in evaluating potential alternatives as they did in this case to future cases, would as a general matter, lead almost inevitably to the selection of alternatives that involve the loss or degradation of wetlands and other special aquatic sites. The Corps must independently determine the adequacy of an alternatives analysis, rather than simply accepting the applicant's position. EPA is concerned that the record for this case does not indicate that the least environmentally damaging practicable alternative has been selected and is concerned that the project does not comply with Section 230.10(a) of the Guidelines. Below is an evaluation of each of the components of project purpose:

Flood Control

Flood control makes up 4.7% of the total projected benefits of the project. These benefits are derived primarily from the Town of Cairo, which has a population of approximately 290 people, and from North Bend State Park. Of the average annual flood damage costs, school disruptions represent the largest percentage at 34.8% of the total. Cairo commercial damages and Cairo residential damage represent 23.4% and 14.5%, respectively, of the total.

The District did not consider that flood control may be attained in a variety of ways. Other structural measures, such as dry dams and improved levees/embankments may be as effective as a large impoundment without its related environmental impacts. The NRCS-WV indicated that relocating homes for reasons of flooding would be too socially disruptive, yet 25 homes are being relocated for the creation of the reservoir without an assessment of social disruption. We do not advocate moving families and

businesses against their will, but in circumstances like those experienced recently in the midwest where people are eager to relocate, this alternative should be explored. In addition, flooding of businesses and homes in Cairo may be alleviated through a combination of flood proofing, floodplain relocation, implementing a management plan that specifies that damageable items be located above flood waters, and other measures, including those outlined in NRCS-WV's field examination report (Soil Conservation Service, 1975). The Corps of Engineers should require that NRCS-WV fully examine these alternatives for practicability.

Average annual flood damages to the North Bend State Park comprise 11.5% of total damages. A park representative indicated that when flooding occurs in areas of the park, particularly at the Jughandle Campground, they usually occur during the early spring season when these areas receive little use by park visitors. These areas receive their heaviest use in the summer, when water flows are normally low and flooding occurs less frequently.

Facilities at North Bend State Park frequently operate at full capacity during the peak summer season, to the point that visitors are turned away. This current level of park use occurs without the presence of a 300-acre impoundment. Alternatives such as enhancing and expanding the park facilities outside of the floodplain to accommodate these additional visitors were not considered.

Water Supply

The need for additional water supply is based principally on a period of extended drought in 1988 during which rationing had to be implemented for the three existing water treatment plants in Ritchie County. The rationing during this period was due to low flow conditions in the North Fork of the Hughes River, from which all three existing plants draw their raw water supply. In addition, the study of potable water supply in the area contracted by the NRCS-WV included a projected growth of 25% over the next 20 years for the region (Chapman Technical Group, undated).

While this study included a discussion of alternative water supply sources, the stated purpose of the study indicated that the decision of a source of water and type of supply had already been made. As stated in the report, "the purpose of this study was defined to examine the current feasibility of utilizing a multi-purpose impoundment on the North Fork of the Hughes River as a raw water source for a singular water treatment plant capable of initially supplying potable water to the Towns of Harrisville, Cairo, Ellenboro, the City of Pennsboro, North Bend State Park, as well as the balance of Ritchie County sometime in the future" (Chapman Technical Group, undated).

This study and the information evaluated by the District gave cursory consideration to other water supply alternatives. According to the 1990 Census of Population and Housing for Ritchie County, 54% of the reporting population obtain its

drinking water from wells (Chapman Technical Group, undated). The justification for not utilizing groundwater sources to meet, at least in part, water supply needs are not effectively examined. For example, the study and EIS suggest that potential groundwater contamination and quantities are potentially problematic. However, no data regarding groundwater quality and quantity is presented to document this claim. According to the report, "the only groundwater data discovered was a descriptive listing of a drilled, unused 6 inch diameter artisan well compiled by the USGS at Harrisville, West Virginia." In the municipality of St. Mary's, which is located 15 miles from the project site, groundwater is used as the primary raw water source. Not only were various combinations of water supplies not considered as alternatives, other alternatives such as piping water from the Ohio River, which is only 15 miles from the project area, or a small (15 acre) offstream impoundment, were not considered. The Corps of Engineers should require NRCS-WV to fully examine these water supply alternatives for practicability.

Recreation

The NRCS-WV characterizes recreation in the project area as deficient. The existing North Bend State Park, which operates at or near full capacity in the summer season, has facilities that include camping, hiking, picnicking, and fishing. Developed recreational facilities provide for activities such as tennis, swimming, and miniature golf. The park has a lodge with 29 rooms, meeting rooms, restaurant, and gift shop.

West Virginia University, Division of Resource Management (WVU) was retained by the NRCS-WV to conduct the recreation study for the project. However, WVU was asked only to consider the recreational benefits of 100-acre, 200-acre, and 300-acre impoundments on the North Fork of the Hughes (Fletcher and Phipps, 1991). The investigation of recreational opportunities to meet the project purposes included only one alternative, the construction of a reservoir. This fact is important given that recreation (31.6%) together with "regional benefits" (48.3%) make up 80% of the projected benefits of the proposal. In addition, the discussion of recreational "demand" and need for flatwater recreation in the recreational study included existing impoundments only within a 30 mile radius of the project site. However, a radius of up to 80 miles was used to determine the recreational draw the proposed reservoir would have in the region. If this same 80-mile radius were used in assessing flatwater recreation opportunities, seven large impoundments with recreational facilities as well as the Ohio River exist within this area (Table 6).

Significant opportunities exist to improve and expand North Bend State Park to achieve meaningful recreational benefits without constructing a multi-purpose reservoir. J.J. Fletcher, one of the authors of the recreation report prepared for the project, indicated that expanding the park and constructing additional swimming facilities would allow the area to attain significant recreational benefits (EPA Region III, personal communication). In addition, many of the recreational amenities proposed, such as

campgrounds, recreation areas, shooting facilities, and natural education areas can be implemented without the need for an impoundment. Demand for these types of facilities currently exist and exceed the capacity of the proposed project facilities. Construction of facilities to address this demand may provide practicable recreation alternatives to the construction of a 300 acre reservoir. These alternatives should be fully examined.

40 CFR 230.10(d): Minimization of Impacts

Evaluation of Proposed Mitigation

The proposed mitigation does not adequately compensate for the loss of 8.1 miles of high-quality riverine habitat. The Huntington District's Statement of Findings declared that "enough mitigation has been required from the applicant for the loss of the 8.1 miles of riverine habitat" but did not include an assessment of mitigation or the factual basis on which this position was derived.

The proposal to stabilize 16 miles of streambank somewhere in the Little Kanawha River Basin through the voluntary conservation program is optimistic. Since inception of the conservation program in West Virginia, experience has clearly demonstrated that there have been few participants, which has resulted in conservation measures that have fallen far short of projections. The 103 acres of standing timber which would remain within the reservoir pool, could represent a significant water quality problem, potential debris accumulation problem at outlet structures, hazard to recreational use, and habitat enhancement for zebra mussels by providing abundant attachment sites (Virginia Polytechnic Institute, 1994).

The longevity of the 25 acres of wetland plantings in the shallow areas of the pool are in doubt. We concur with the concern of the NRCS's National Technical Center that the fluctuating pool could prevent the permanent establishment of planted wetlands vegetation. Moreover, the creation of lacustrine wetlands does not provide adequate compensation for the impacts to the riverine ecosystem, including the riverine wetlands.

Numerous studies and data demonstrate that mussel relocation efforts have extremely poor success records (Table 7) and there is nothing to indicate that the proposed effort for this project will experience better success. There is no proposed mitigation for potential zebra mussel infestations, both within the pool and downstream reaches. Moreover, the category 2 species, Simposonaias ambiqua, may still be in the North Fork of the Hughes River, and the endangered Pleurobema clava could exist there as well, which would represent potential impacts from the project that are not accounted for in the environmental impact analysis.

REFERENCES

American Rivers. 1994. Dam Facts. 801 Pennsylvania Ave., Washington, D.C.
Aquatic Nuisance Species Task Force. March 1994. Findings, Conclusions, and Recommendations of the International Introductions Policy Review. Report to Congress.

Bates, J.M. 1962. Impact of impoundments on the mussel fauna of Kentucky Reservoir, Tennessee River. American Midland Naturalist 68:232-236.

Bogan, A.E. 1993. Freshwater Bivalve Extinctions (Mollusca: Unionoida): A Search for Causes. American Zoology 33:599-609.

Chapman Technical Group. Undated. Feasibility Study for the North Fork of the Hughes River Watershed Potable Water Supply. Chapman Technical Group, St. Albans, WV for the SCS, Morgantown.

Ecological Specialists, Inc. September 1993. Final Report: North Fork Hughes River Unionid Survey near Proposed Dam 21C, Ritchie County, West Virginia.

Fletcher, J.J. and T.T. Phipps. 1991. Potential Recreation Benefits of Proposed Water Projects for the North Fork of the Hughes River and the South Fork of the Cherry River Watersheds. West Virginia University, Division of Resource Management report to SCS; Morgantown, WV.

Master, L. 1990. The imperiled status of North American aquatic animals. Biodiversity Network News 3:1-2, 7-8.

National Biological Survey. September 20, 1994a. Zebra Mussel Distribution in the United States Data Base. Southeastern Biological Science Center, Gainesville, Florida.

National Biological Survey. October 5, 1994b. Letter from Dr. Richard Neves to U.S. Fish and Wildlife Service regarding the North Fork of the Hughes.

Schmidt, J.W., M.A. Zeto, and R.W. Taylor. 1982. A survey of the freshwater mussel fauna of the Little Kanawha River Basin. pp.131-196 in: U.S. Army Engineer Waterways Experiment Station, CE 1983. Report of Freshwater mussels workshop: October 26-27, 1982. Vicksburg, MS.

Stansbery, D.H. 1973. Dams and the Extinction of Aquatic Life. The Ohio State University, Museum of Zoology. Garden Club of America Bulletin Vol 61(1):43-46.

Stansbery, D. H. 1974. Why Preserve Rivers? The Ohio State University, Museum of Zoology. Canoe Vol 2(2):29-45.

Tennessee Valley Authority. June 1994. Tennessee Valley: Vulnerability to Zebra Mussels. Resource Group Water Management. TVA/WM-94/004. Chattanooga, Tennessee.

U.S. Fish and Wildlife Service. 1991. Endangered and threatened wildlife and plants; animal candidate review for listing as endangered or threatened species. 50 CFR 17. Federal Register 56(225): 58804-58836.

U.S. Soil Conservation Service, Morgantown, WV. August 3, 1994. Memorandum from Mr. Rollin Swank to SCS Washington, D.C. Office.

U.S. Soil Conservation Service, Morgantown, WV. August 12, 1994. Letter from Mr. Rollin Swank to EPA Region III and U.S. Fish and Wildlife Service.

U.S. Soil Conservation Service, Morgantown, WV. July 1992. Plan of Work: North Fork of Hughes River Watershed, Doddridge and Ritchie Counties, WV

U.S. Soil Conservation Service, Morgantown, WV. August 1975. North Fork of Hughes River Watershed Field Examination Report; Doddridge and Ritchie Counties, WV.

Virginia Polytechnic Institute. October 21, 1994. Letter from Dr. Richard Neves, Professor of Fisheries, to EPA Region III regarding North Fork of Hughes.

Watters, G. T. 1994. Small dams as barriers to freshwater mussels (Bivalvia, Unionoids) and their hosts. Aquatic Ecology Laboratory. The Ohio State University.

West Virginia Division of Natural Resources. September 11, 1992. West Virginia Stream Survey Data: WVDNR data base. Elkins, WV.

West Virginia Natural Heritage Program. 1994. WV Natural Heritage Program Data Base: Rare species of Doddridge and Ritchie Counties. Elkins, WV.

Williams, J.D., S.L.H. Fuller, and R. Grace. 1992. Effects of impoundments on freshwater mussels (Mollusca Bivalvia Unionidae) in the main channel of the Black Warrior and Tombigbee Rivers in western Alabama. Bulletin of the Alabama Museum of Natural History (13):1-10.

Williams, J.D., M.L. Warren Jr., K.S. Cummings, J.L. Harris, and R.J. Neves. 1993. Conservation Status of Freshwater Mussels of the United States and Canada. Fisheries: Vol. 18, No. 9: 6-22.

Wilson, E.O. 1992. The Diversity of Life. Harvard Univ. Press. Cambridge, MA. pp. 256-257.

Table 1. Fish species found in the North Fork of the Hughes River in the area of the proposed North Fork of the Hughes Reservoir, Ritchie County, WV (WV Division of Natural Resources 1992).

FISH	
Suckers	
Catostomus commersoni	White sucker
Hypentelium nigricans	Northern hog sucker
Minytrema melanops	Spotted sucker
Moxostoma duquesnei	Black redhorse
Moxostoma erythrurum	Golden redhorse
Moxostoma spp.	
Minnows	
Campostoma anomalum	Stoneroller
Cyrinus carpio	Carp
Ericymba buccata	Silverjaw minnow
Notropis atherinoides	Emerald shiner
Notropis chrysocephalus	Common shiner
Notropis photogenis	Silver shiner
Notropis rubellus	Rosyface shiner
Notropis stramineus	Sand shiner
Pimephales notatus	Bluntnose minnow
Semotilus atromaculatus	Creek chub
Game Fish	
Ambloplites rupestris	Rock bass
Ictalurus natalis	Yellow bullhead
Lepomis cyanellus	Green sunfish
Lepomis machrochirus	Bluegill
Lepomis megalotis	Longear sunfish
Lepomis hybrid	Hybrid
Micropterus dolomieui	Smallmouth bass
Micropterus punctulatus	Spotted bass
Micropterus salmoides	Largemouth bass

Table 1 continued. Fish species found in the North Fork of the Hughes River in the area of the proposed North Fork of the Hughes Reservoir, Ritchie County, WV (WV Division of Natural Resources 1992).

Darters and Others	
Labidesthes sicculus	Brook silverside
Percina caprodes	Log perch
Percopsis omiscomaycus	Trout perch

Table 2. Freshwater mussels found in the North Fork of the Hughes River in the area of the proposed North Fork of the Hughes Reservoir, Ritchie County, WV as reported in 1978, 1982, & 1993 (Ecological Specialists 1993).

MUSSELS
Amblema plicata
Anodonta grandis
Elliptio dilatata
Epioblasma triquetra
Fusconaia flava
Lampsilis cardium
Lampsilis siliquoidea
Lasmigona costata
Leptodea fragilis
Obovaria subrotunda
Pleurobema coccineum
Potamilus alatus
Ptychobranchus fasciolaris
Simpsonaias ambigua
Strophitus undulatus
Tritogonia verrucosa
Villosa iris
Epioblasma triquetra
Anodonata imbecillis
Anodontoides ferussacianus
Fusconaia subrotunda
Quadrula pustulosa
Quadrula quadrula
Toxolasma parva

Table 3. Birds known to breed in the area of the proposed North Fork of the Hughes Reservoir, Ritchie County, WV (The Redstart, 1974; Tom Fox, pers. comm.; Bill Armstrong, pers. comm., and West Virginia Breeding Bird Atlas data, currently unpublished). ,

BIRDS	
Wood duck	Aix sponsa
Turkey Vulture	Cathartes aura
Broad-winged hawk	Buteo platypterus platyterus
American kestrel	Falco sparverius
Ruffed grouse	Bonasa umbellus
Bobwhite	Colinus viginianus
Killdeer	Charadrius vociferus vociferus
Mourning dove	Zenaidura macroura
Yellow-billed cuckoo	Coccyzus americanus americanus
Black-billed cuckoo	Coccyzus erythrophthalmus
Whip-poor-will	Caprimulgus vociferus
Ruby-throated hummingbird	Archilochus colubris
Belted kingfisher	Megaceryle alcyon alcyon
Northern flicker	Colaptes luteus
Pileated woodpecker	Hylatomus pileatus
Red-bellied woodpecker	Centurus carolinus
Hairy woodpecker	Dendrocopos villosus
Downy woodpecker	Dendrocopos pubescens
Eastern kingbird	Tyrannus tyrannus
Great-crested flycatcher	Myiarchus crinitus
Eastern phoebe	Sayornis pheobe
Acadian flycatcher	Empidonax virescens
Eastern wood peewee	Contopus virens
Rough-winged swallow	Stelgidopteryx ruficollis serripennis
Barn swallow	Hirundo rustica erythrogaster
Purple martin	Pronge subis subis
Blue jay	Cyanocitta cristata
American crow	Corvus brachyrhynchos

Table 3 continued. Birds known to breed in the area of the proposed North Fork of the Hughes Reservoir, Ritchie County, WV (The Redstart, 1974; Tom Fox, pers. comm.; Bill Armstrong, pers. comm.; and West Virginia Breeding Bird Atlas data, currently unpublished.

BIRDS	
Carolina chickadee	Parus carolinensis
Tufted titmouse	Parus bicolor
White-breasted nuthatch	Sitta carolinensis
House wren	Troglodytes aedon
Carolina wren	Thryothorus ludovicianus
Northern mockingbird	Mimus polyglottos polyglottos
Gray catbird	Dumetella carolinensis
Brown thrasher	Toxostoma rufum rufum
American robin	Turdus migratorius
Wood thrush	Hylocichla mustelina
Eastern bluebird	Sialina sialis
Blue-gray gnatcatcher	Polioptila coerulea coerulea
Cedar waxwing	Bombycilla cedrorum
European starling	Sturnus vulgaris vulgaris
White-eyed vireo	Vireo griseus
Yellow-throated vireo	Vireo flavifrons
Red-eyed vireo	Vireo olivaceus
Warbling vireo	Vireo gilvus gilvus
Black-and-white warbler	Mniotilta varia
Worm-eating warbler	Helmitheros vermivorus
Golden-winged warbler	Vermivora chrysoptera
Blue-winged warbler	Vermivora pinus
Northern parula	Parula americana
Yellow warbler	Dendroica petechia
Cerulean warbler	Dendroica cerulea
Pine warbler	Dendroica pinus
Prairie warbler	Dendroica discolor

Table 3 continued. Birds known to breed in the area of the proposed North Fork of the Hughes Reservoir, Ritchie County, WV (The Redstart, 1974; Tom Fox, pers. comm.; Bill Armstrong, pers. comm.; and West Virginia Breeding Bird Atlas data, currently unpublished.

BIRDS	
Ovenbird	Seiurus aurocapillus
Louisianna waterthrush	Seiurus motacilla
Kentucky warbler	Oporornis formosus
Yellow-breasted chat	Icteria virens virens
Common yellowthroat	Geothlypis trichas
Hooded warbler	Wilsonia citrina
American redstart	Setophaga ruticilla
House sparrow	Passer domesticus domesticus
Eastern meadowlark	Sturnella magna
Red-winged blackbird	Agelaius phoeniceus
Orchard oriole	Icterus spurius
Northern oriole	Icterus galbula
Common grackle	Quiscalus quiscula
Brown-headed cowbird	Molothrus ater ater
Scarlet tanager	Pringa olivacea
Summer tanager	Piranga rubra rubra
Northern cardinal	Richmondena cardinalis
Indigo bunting	Passerina cyanea
American goldfinch	Spinus tristis tistis
Rufous-sided towhee	Pipilo erythrophthalmus
Grasshopper sparrow	Ammodramus savannarum
Chipping sparrow	Spizella passerina passerina
Field sparrow	Spizella pusilla pusilla
Song sparrow	Melospiza melodia
American woodcock	Philohela minor
Green-backed heron	Butorides virescens virescens
Wild turkey	Meleagris gallopavo

Table 3 continued. Birds known to breed in the area of the proposed North Fork of the Hughes Reservoir, Ritchie County, WV (The Redstart, 1974; Tom Fox, pers. comm.; Bill Armstrong, pers. comm.; and West Virginia Breeding Bird Atlas data, currently unpublished.

BIRDS	
Rock dove	Columba livia
Cooper's hawk	Accipiter cooperii
Red-tailed hawk	Buteo jamaicensis
Barn owl	Tyto alba pratincola
Barred owl	Strix varia
Eastern screech owl	Otus asio
Chimney swift	Choetura pelagica
house finch	Carpodacus mexicanus
Yellow-throated warbler	Dendroica dominica

Table 4. Amphibians and reptiles known to occur and likely to occur (*) in the area of the proposed North Fork of the Hughes Reservoir, Ritchie County, WV (Dr. Thomas Pauley, 1994, Marshall University, WV).

FROGS AND TOADS	
Bufo a. americanus	Eastern American toad
Hyla chrysoscelis	Gray treefrog
Hyla c. crucifer	Northern spring peeper
Pseudacris brachyphona	Mountain chorus frog
Rana clamitans melanota	Green frog
Rana palustris	Pickerel frog
Rana pipiens	Northern leopard frog
* Bufo woodhouseii fowleri	Fowler's toad
* Rana catesbeiana	Bullfrog
* Rana sylvatica	Woodfrog
TURTLES	
Chrysemys picta marginata	Midland painted turtle
Terrapene c. carolina	Eastern box turtle
* Chelydra s. serpentina	Common snapping turtle
* Graptemys geographica	Map turtle
* Gratemys pseudogeographica ouachitensi	Ouachita map turtle
* Trachemys scripta elegans	Red-eared slider
* Sternotherus odoratus	Stinkpot
* Apalone s. spinifera	Eastern spiny softshell
LIZARDS	
Eumeces fasciatus	Fire-lined skink
Sceloporus undulatus hyacinthinus	Northern fence lizard

Table 4 continued. Amphibians and reptiles known to occur and likely to occur (*) in the area of the proposed North Fork of the Hughes Reservoir, Ritchie County, WV (Dr. Thomas Pauley, 1994, Marshall University, WV).

SALAMANDERS	
Cryptobranchus a. alleganiensis	Eastern hellbender
Necturus m. maculosus	Mudpuppy
Ambystoma maculatum	Spotted salamander
Desmognathus fuscus	Northern dusky salamander
Desmognathus monticola	Appalachian seal salamander
Eurycea bislineata	Northern two-lined salamander
Eurycea longicauda	Longtail salamander
Gyrinophilus p. porphyriticus	Northern spring salamander
Notophthalmus v. viridescens	Red spotted newt, eft
Plethodon glutinosus	Slimy salamander
Plethodon richmondi	Ravine salamander
Plethodon wehrlei	Wehrle's salamander
* Ambystoma jeffersonianum	Jefferson salamander
* Ambystoma opacum	Marbled salamander
* Hemidactylium scutatum	4-toed salamander
* Pseudotriton montanus diastictus	Midland mud salamander
* Pseudotriton r. ruber	Northern red salamander
* Aneides aeneus	Green salamander

Table 4 continued. Amphibians and reptiles known to occur and likely to occur (*) in the area of the proposed North Fork of the Hughes Reservoir, Ritchie County, WV (Dr. Thomas Pauley, 1994, Marshall University, WV).

SNAKES	
Coluber c. constrictor	Northern black racer
Elaphe o. obsoleta	Black rat snake
Nerodia s. sipedon	Northern water snake
Thamnophis s. sirtalis	Eastern garter snake
Virginia v. valeriae	Eastern earth snake
Regina septemvittata	Queen snake
Storeria d. dekayi	Northern brown snake
Storeria o. occipitomaculata	Northern redbelly snake
Heterodon platirhinos	Eastern hognose snake
Diadophis punctatus edwardsii	Northern ringneck snake
Carphophis a. amoenus	Eastern worm snake
Opheodrys aestivus	Rough green snake
Lampropeltis t. triangulum	Eastern milk snake
Agkistrodon contortrix mokasen	Northern copperhead
Crotalus horridus	Timber rattlesnake

Table 5. Mammals known to occur and likely to occur (*) in the area of the proposed North Fork of the Hughes Reservoir, Ritchie County, WV (Dr. M.E. Hight, Marshall Univesity, Huntington, WV).

	MAMMALS	
	Didelphis virginiana	Opossum
	Blarina brevicauda	Short-tailed shrew
	Sciurus carolinensis	Eastern gray squirrel
	Sciurus niger	Eastern fox squirrel
	Mus musculus	House mouse
	Peromyscus leucopus	White-footed mouse
	Microtus ochrogaster	Prairie vole
	Vulpes vulpes	Red fox
	Canis latrans	Coyote
	Procyon lotor	Raccoon
	Mustela vison	Mink
	Odocoileus virginianus	White-tailed deer
*	Sorex fumeus	Smoky shrew
*	S. hoyi	Pygmy shrew
*	Parascalops breweri	Hairy-tailed mole
*	Scalopus aquaticus	Eastern mole
*	Sylvilagus floridanus	Eastern cottontail
*	Tamias striatus	Eastern chipmunk
*	Marmota monax	Woodchuck
*	Glaucomys volans	Southern flying squirrel
*	Castor canadensis	Beaver
*	Peromyscus maniculatus bairdii	Deer mouse
*	Microtus pennsylvanicus	Meadow vole
*	M. pinetorum	Pine vole
*	Ondatra zibethicus	Muskrat
*	Synaptomys cooperi	Southern bog lemming
*	Napaeozapus insignis	Woodland jumping mouse
*	Mustela nivalis	Least weasel
*	Mephitis mephitis	Striped skunk
*	Lutra canadensis	River otter

Table 6. Recreational impoundments in West Virginia that are within 80 miles of the proposed North Fork of the Hughes Reservoir, Ritchie County, WV, and large enough to be displayed on the 1994-1996 Official State Highway Map. This list does not include the Ohio River or impoundments located in the State of Ohio.

RECREATIONAL IMPOUNDMENT	DISTANCE FROM PROPOSED PROJECT
Cheat Lake	75 miles
Tygart Lake 7 State Park	60 miles
Stonecoal Lake 7 Public Hunting/Fishing Area	45 miles
Stonewall Jackson Lake	35 miles
Burnsville Lake & Public Hunting and Fishing Area	35 miles
Sutton Lake and Public Recreation Area	45 miles
Summersville Lake & Public Hunting & Fishing Area	65 miles

Table 7. Estimates of success in relocations of freshwater mussels in the United States and Canada. Data provided by Dr. Richard Neves, National Biological Survey, Blacksburg, VA.

RELOCATION SITE	TOTAL NO. RELOCATED	TIME OF YEAR	MONITORED/FREQUENCY	ESTIMATE OF SUCCESS	REFERENCES
St. Croix River Prescott, WI	7,976	November 9-22, 1988	Yes, September 16, 1991	90% mortality	Heath, 1989 Burke, 1991
St. Francis River Madison, AR	7,825	August 4-27, 1986	No	No Estimate	Harris, 1986
St. Francis River Madison, AR	2,321	September 7-29, 1988	Yes, November 1988	53% mortality	Jenkinson, 1989
Saline River Saline, AR	310	September 28-29, 1989	No	No Estimate	Arkansas Highway and Transportation Department, 1989
Spring River Ravenden, AR	3,372	May 28-June 22, 1984	No.	No Estimate	Arkansas Highway and Transportation Department, 1984
Duachita River Mount Ida, AR	44	May 5-6, 1992	Yes, June 19, 1992	No Estimate	Harris, et.al., 1992
Mississippi River Moline, IL	7,096	September 12-15, 1978	Yes, September 8, 1979	20-69% recovery	Oblad, 1980 Nelson, 1982
Kankakee River, Kankakee, IL	3,800	August-September 1987	Yes, Summer 1988	24-63% recovery	Berlocher and Wetzel, Berlocher and Wetzel
unidentified river OH	5,158	May 4-12, 1987	Yes, October 1987, August 1988, August 1989, August 1990	60% mortality	Dunn, 1991 Ecological Specialists, Dunn 1993
unidentified river WI	8,120	August 17-26, 1992	No	No Estimate	Havlik, 1992

Table 7 Continued. Estimates of success in relocations of mussels in the United States and Canada. Data provided by Dr. Richard Neves, National Biological Survey, Blacksburg, VA.

RELOCATION SITE	TOTAL NO. RELOCATED	TIME OF YEAR	MONITORED/FREQUENCY	ESTIMATE OF SUCCESS	REFERENCES
Tennessee River	18,300	June 1993	No	No Estimate	Jenkinson, 1994a
Tennessee River	7,300	October, 1993	No	No Estimate	Jenkinson, 1994b
Appalachicola River	320	July 29-30, 1993	Yes, November 1993	15% mortality	Hamilton *et.al.*,1993
unidentified river MI	7,877	July-August, 1988	Yes, annually thorugh 1992	100% mortality	Trdan and Hoeh, 1993
unidentified river MI	2,113	October 1-4, 1992	Yes	No Estimate	
unidentified river	523	October 16-17, 1991	Yes, annually through 1993	5% mortality and 85% recovery	Miller, 1994
Duck River, TN	4,000	Fall, 1982	Yes, semiannyally through 1990	90% mortality	Jenkinson, 1985, Hubbs, et.al., 199?
Duck River, TN	1,213	May 16-June 1, 1988	Yes, annually thourgh 1991	80% mortality	Layzer and Gordon
Clinch River, VA and TN North Fork Holston, VA	3,872	Late summer, early fall, 1981; others added in 1984 and 1985	Yes, annually through 1985	87-100% mortality; 51% mortality of mussels moved in 1984	Sheehan et.al.
Clinch River, VA	281	October, 1975	No	No Estimate	Ahlstedt, 1979
Detroit River, MI	110	October 20, 1992	No	No Estimate	Ogawa and Schloesse
Mississippi River, MO	2,301	September 1989	Yes, annually through 1992	90% mortality	Koch, 1993

Table 7 Continued. Estimates of success in relocations of mussels in the United States and Canada. Data provided by Dr. Richard Neves, National Biological Survey, Blacksburg, VA.

RELOCATION SITE	TOTAL NO. RELOCATED	TIME OF YEAR	MONITORED/FREQUENCY	ESTIMATE OF SUCCESS	REFERENCES
Salt Creek, IL	134 178	June 5-6,1992 October 15-16, 1991	Yes, September 22, 1992 Yes, September 24, 1992	65% recovery 71% recovery	Schanzle and Kruse
Inner Long Point Bay Lake Erie	183	June 4, 1984	Yes, September 21, 1984	58% recovery	Hinch et.al., 1986
South-central Ontario Lakes, Canada	150	August, 1985	Yes, August, 1986	80% recovery	Hinch and Green, 1985
Mississippi River, Trempeleau, WI	300 865 825	November 1991 June 1992 October 1992	Yes, 6 months Yes, 6 months and 1 year Yes, 6 months	3% mortality, 97% recovery 11% mortality, 89% recovery 11% mortality, 91% recovery	Waller et.al., in rev.