

**DAN RIVER COAL ASH RELEASE  
NATURAL RESOURCE DAMAGE ASSESSMENT  
AND RESTORATION**

**Scoping Document for Restoration Planning  
For Public Review and Comment**

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Prepared by

Dan River Coal Ash Release Natural Resource Trustee Council:

United States Fish and Wildlife Service  
North Carolina Department of Environment and Natural Resources  
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Virginia Department of Game and Inland Fisheries

## **Dan River Coal Ash Release Scoping Document For Restoration Planning**

### **I. INTRODUCTION**

This scoping document was prepared by federal and state agency representatives and summarizes restoration project concepts for natural resources impacted by the Dan River Coal Ash Release (hereafter Release or Dan River Release).

At approximately 1500 hours on February 2, 2014, security officials at the Duke Energy Dan River Facility located in Eden, North Carolina, noticed water and coal ash leaking from a buried storm sewer into the Dan River. A sinkhole had formed just inside the primary ash pond which appeared to be the result of the collapse of a portion of a 48-inch diameter stormwater pipe. Ash material and ash pond water within the reservoir leaked through the break in the pipe, flowing out into the Dan River. The sinkhole was in close proximity to the embankment adjacent to South Edgewood Road and precipitated a slope failure in the upstream face of the embankment. Initial efforts by Duke Energy were not fully successful in stopping the Release. The North Carolina Department of Environment and Natural Resources (NCDENR) was notified of the Release by Duke Energy on February 3, 2014, and investigated the facility. Once a release of coal ash and ash pond water was confirmed, the United States Environmental Protection Agency (USEPA) was notified and requested to assist. USEPA<sup>1</sup> estimated that 39,000 tons of ash and 27 million gallons of ash pond water were released into the Dan River.

The Department of the Interior (DOI) through the U.S. Fish and Wildlife Service (USFWS), the Commonwealth of Virginia through the Department of Environmental Quality (VADEQ), and the State of North Carolina through the NCDENR are the Trustees for the natural resources injured by releases of hazardous substances. The Trustees are authorized by federal and state law to assess and quantify the injuries caused by the releases and the subsequent loss of resource services, to recover damages (monetary compensation for the injuries), and to use the damages recovered to restore, rehabilitate, replace, or acquire the equivalent of the affected natural resources.

As part of the Natural Resource Damage Assessment and Restoration (NRDAR) process, the Trustees are assessing the impacts of the coal ash pond release to natural resources, focusing on injuries to habitat, surface water and sediment, aquatic biota, migratory birds, and human uses. The Responsible Party (RP), Duke Energy, may be liable for injuries to natural resources and the services provided by those natural resources. Accordingly, the RP has entered a Funding and Participation Agreement with the Trustees to conduct a cooperative NRDAR process and has expressed interest in exploring and implementing restoration actions prior to completion of the NRDAR injury assessment and damage determination phases. The Trustees are coordinating a NRDAR injury assessment concurrent with an ongoing interagency process focused on removal and long term monitoring needs. Coordinated response and restoration activities are intended to provide sufficient data to assess past, present, and

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<sup>1</sup> USEPA On Scene Coordinator Kevin Eichinger (2/20/2014 email to T. Augspurger, USFWS)

future potential natural resource injuries and lost natural resource uses and services. The ultimate outcome of the NRDAR process is to develop and implement restoration that will compensate the public for lost natural resources and services.

The Trustees are currently scoping potential restoration projects to identify existing restoration opportunities in the Dan River watershed area<sup>2</sup>, develop partnerships with stakeholders (e.g., conservation organizations and river users), engage the public, and identify potential concerns. This scoping document includes information on the Release, the potential natural resource injuries resulting from the Release, restoration project concepts for the resources that the Release most likely impacted, and an explanation of the restoration planning process. Review of the projects described in this scoping document is intended to promote public and stakeholder engagement in the restoration planning process.

### 1. Purpose of the Restoration Scoping Document

The purpose of this scoping document is to (a) present the Trustee's restoration project eligibility and evaluation criteria and preliminary restoration project concepts that have been identified to date for review and comment, and (b) solicit input from members of the public and interested stakeholders on additional restoration activities with potential to meet the Trustee's objective of restoring resources affected by the Release. The Trustees seek public input on the merits of the preliminary restoration project concepts described herein (including the potential effectiveness of the projects in addressing the natural resource injuries potentially arising from the Release). The proposed project concepts described in this scoping document address the following types of natural resources and associated services likely impacted by the Release: habitat, surface water and sediment, aquatic biota, migratory birds, and human uses.

### 2. Background

*The Facility.* Named for its proximity to the Dan River, construction of Duke Energy's Dan River coal-fired power generation facility commenced in 1948. Units 1 and 2 came online in 1949 and 1950 respectively, and by 1955, a third unit was added. By 2008, Duke Energy announced plans to retire the station's three units, along with three natural gas combustion turbines that had been in operation since 1968. When the three units were retired on April 1, 2012, the company was already nearing completion of a new natural gas facility just a few hundred yards away. At the time of the Release on February 2, 2014, the facility was permitted to discharge low volume wastes, boiler cleaning wastewater, ash disposal, stormwater, boiler blowdown and metal washing wastewater from the ash basin (NCDWQ 2013).

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<sup>2</sup> The trustees will consider restoration options in areas beyond the Dan River watershed if necessary to offset potential natural resource injuries.

*The Release.* The Release occurred on or around Feb 2, 2014, from the collapse of a stormwater pipe beneath a coal ash slurry impoundment. Ash material and ash pond water within the reservoir was released into the Dan River as a result of catastrophic failure of a 48-inch diameter stormwater pipe comprised of concrete and corrugated metal. According to EPA, up to 39,000 tons of ash and 27 million gallons of ash pond water were released into the Dan River. Coal ash is a gray, powdery byproduct of burning coal to produce energy. Coal ash is composed of materials remaining after coal is burned, including fine sand (called silica), unburned carbon and various trace metals such as arsenic, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc; compounds that have potential to be chemicals of concern associated with the Dan River Release. The site is less than 10 river miles from Virginia, and FWS reconnaissance documented ash or ash-like material co-mingled with native sediment as far as 70 river miles downstream in the days immediately following the Release.

In total, three removal actions have been conducted related to the Release. On February 8, a coal ash bar about 75 feet long and 15 feet wide which had as much as five feet of ash or ash/sand mix over the natural stream bottom was identified and was subsequently removed (February 11-13, 2014), resulting in the recovery of 15 tons of coal ash and native sediment. On July 7, Duke Energy announced completion of the removal of a coal ash deposit (258 tons of a coal ash and river sediment mixture) at a site approximately two miles downstream from the Facility on a native sandbar delta at the mouth of Town Creek. Removal of 2,500 tons of coal ash comingled with native sediment in a larger deposit near the Schoolfield Dam in Danville, VA began on May 6, 2014 and was also completed in early July 2014 (though the Abreu Grogan Park, where cleanup equipment was mobilized, was closed to public use to support cleanup activities between April 1 and August 1, 2014). In addition to these removal actions, a total of about 466 cubic yards of solids (ash/sediment mix) was removed from the water treatment plants at Danville and South Boston and properly disposed of along with dredged material from the Dan River.

The Trustees sent a notice of intent to initiate a NRDAR to Duke Energy on March 4, 2014 and finalized a Pre-assessment Screen Determination on March 19, 2014, which provided the basis for the Trustees' determination that further investigation was warranted based on a review of the readily available information on hazardous substance releases and the potential impacts of those releases on natural resources under the trusteeship of Federal and State authorities.

*The Trustee's Memorandum of Understanding.* The Trustees executed a Memorandum of Understanding (MOU) on May 5, 2014 creating a Trustee Council (TC) comprised of agency representatives to ensure the coordination and cooperation among the Trustees during the NRDAR process.

*The Funding and Participation Agreement between the Trustees and Duke Energy.* The Trustees entered into an agreement with Duke Energy on June 9, 2014, intended to provide an expedited, focused framework for cooperative NRDAR activities and to facilitate the resolution of claims for natural resource damages arising from the releases of hazardous substances. The agreement outlines procedures for (a) coordinating data collection and assessment activities to determine the extent of natural resource injuries; (b) expediting restoration of injured natural resource and/or the services

provided by those resources; and (c) paying assessment and restoration costs incurred and to be incurred by the Trustees.

### 3. Summary of Potential Injuries to Natural Resources and Services

The Trustees have not completed injury assessments which will determine and quantify injuries to natural resources impacted by the Release; however, existing information demonstrates that releases of hazardous substances associated with coal ash have or potentially have affected natural resources and services including, but not limited to the following, all of which fall within the jurisdiction of the Trustees:

- a. Surface water and sediments
- b. Aquatic fish and wildlife
- c. Migratory birds
- d. Stream and wetland habitats
- e. Recreational uses

A summary of Release injury categories and known or suspected impacts is presented below.

#### a. Surface waters and sediments

*Surface Water.* Following the Release, surface water samples were collected by Duke Energy, EPA, NCDENR, and VADEQ. Sampling locations include the Release source, several downstream locations, and potable water intakes in Virginia at the Danville and South Boston water treatment plants (WTP). In addition, at a subset of sediment sampling locations an EPA team collected water column samples and sediment/water interface grab samples were also collected by EPA and Duke Energy. Drinking water sampling (including raw and finished water) was also conducted by Duke Energy, Virginia Department of Health, and EPA. Screening these results against NC Water Quality standards for aquatic life, EPA ambient water quality criteria (CMC and CCC adjusted to river-specific hardness of 30 mg/L as CaCO<sub>3</sub>), and VA water quality standards for aquatic life indicates collectively that standards were exceeded for turbidity, copper, selenium, iron, zinc, and lead<sup>3</sup>. These exceedances of standards constitute a “de facto” injury to surface water under the federal regulations for NRDAR in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 43 CFR Part 11.

*Sediment.* During the weeks immediately following the Release, sediment samples were collected from the river by USEPA at one mile intervals along the Dan River in areas immediately downstream (including through Danville, VA) and then at greater spatial intervals throughout the remaining riverine portion of the Dan River system to Kerr Reservoir. Beginning on March 31, 2014, sediment grab samples were collected at stations (targeted to depositional areas) on ash deposition monitoring transects.

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<sup>3</sup> Based on screening of available dataset at time the Pre-Assessment Screen Determination was completed (March 2014).

These samples were screened using the probable and threshold effects concentrations to benthic invertebrates (MacDonald 2000), and guidelines for interpreting biological effects of metals (U.S. Bureau of Reclamation 1998). Initial screening<sup>4</sup> indicates arsenic and selenium are contaminants of potential concern for sediment based on exceedance of the effects levels cited.

b. Fish and Aquatic-Dependent Wildlife

Freshwater fish, including sport fish and non-game species of fish, freshwater mussels, mammals, amphibians, reptiles, aquatic plants, invertebrates, and microorganisms living in water or dependent on the Dan River system have been affected or potentially affected by the Release.

In addition to common aquatic species, there are two federally listed endangered species, the Roanoke logperch (*Percina rex*) and the James spinymussel (*Pleurobema collina*) in the Dan River system in North Carolina and Virginia. The Dan River system supports another freshwater mussel and fish species (the green floater (*Lasmigona subviridis*) and orangefin madtom (*Noturus gilberti*), respectively), which the USFWS is currently evaluating to determine if protection under the federal Endangered Species Act is warranted. Records for these species are found either upstream or downstream of the area affected by the Release.

Possible pathways resulting in exposure of aquatic biota to ash-related hazardous substances include direct contact with suspended or dissolved contaminants in the water column, direct contact with contaminated sediments, direct contact with contaminated sediment interstitial pore water, exposure by re-suspended, pre-contaminated sediments, ingestion of contaminated sediment during foraging or feeding, and/or indirect contact through ingestion of contaminated prey species, including bioaccumulation. The concentrations of hazardous substances in surface water and sediment have been sufficient to cause injury to fish and other aquatic biota, as evidenced by exceedances of freshwater aquatic life criteria and consensus-based probable effects concentrations for freshwater ecosystems.

c. Migratory birds

Migratory birds protected by the Migratory Bird Treaty Act (16 U.S.C. 703-712), as amended, occur at the Site and in affected downstream areas of the Dan River watershed including songbirds, waterfowl, raptors, colonial waterbirds (including rookeries between the Release site and Danville) and others. Selenium effects related to the Release include potential impacts to egg-laying vertebrates (fish, turtles and birds). Selenium in coal ash is predominantly selenite (Huggins et al. 2007, Bednar et al. 2010, Liu et al. 2013), which is highly bioaccumulative (Presser and Luoma 2010, Conley et al. 2009, 2013) and can amplify in higher trophic levels of food chains through ingestion of contaminated prey items. Given that ash and affected sediment exceed ecological risk thresholds (Van Derveer and Canton 1997, Bureau of Reclamation 1998, and others) as summarized above, there is potential for toxicological impacts of selenium to birds that will be evaluated during the injury assessment phase of the NRDAR.

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<sup>4</sup> Based on screening of available dataset at time the Pre-Assessment Screen Determination was completed (March 2014).

d. Stream and wetland habitats

There are two mechanisms by which coal ash released in to the aquatic environment can result in injury: through burial of native habitats and through destruction of habitat during removal actions to address larger depositional areas. The ash can coat the bottom in depositional areas, burying animals and their food; accordingly, there is potential for physical burying of habitat that is important for fish, mussels, and other aquatic life. In the period immediately following the Release, reconnaissance of depositional areas identified visually during boat-based surveys between the Release site and Kerr Lake headwaters indicated ash deposits of sufficient depth overlying native sediments to potentially impact stream habitats. Since March, 2014, ash deposition transect monitoring has occurred and indicates burial of ash deposits by native sediment is occurring at many of the survey transects. Results of continued transect monitoring will likely inform the extent and duration of habitat impacts due to ash deposition in aquatic habitats. A total of three removal actions (e.g., sediment dredging) have occurred in stream and wetland habitats affected by the Release, resulting in habitat impacts at a minimum within the footprint of those actions (a de facto injury under NRDAR regulations). In the three areas where removal actions have been completed, the temporal and spatial habitat impacts will also be assessed.

e. Recreational Uses

In addition to injuries to the natural resources, the releases of hazardous substances from the Release have had an impact on recreational uses and opportunities in the Dan River watershed such as sport fishing, water-contact recreation, boating, canoeing, hiking, nature observation, hunting, and other activities. Public use and access has been restricted at the Abreu Grogan Park in Danville, NC, which provides the only public boat access point on the Dan River between the Dan River Steam Station dam in Eden, NC and the Schoolfield Dam in Danville. The Abreu Grogan Park was closed to public use during the removal of a coal ash deposit in the river in the vicinity of the Schoolfield Dam (starting April 1, 2014 and with the park re-opening to the public on August 1, 2014). Closures, regulatory advisories and other warnings occurring as a result of the Release of coal ash from the Site affect human use of trust resources and constitute de facto injuries under NRDAR regulations.

North Carolina Recreational Advisories (NCDHHS 2014):

- Recreational Water Advisory. On February 12, the North Carolina Department of Health and Human Services (NCDHHS) advisory was issued stating “DHHS Division of Public Health recommends that people avoid recreational contact with water and sediment in the Dan River in North Carolina downstream of the Duke Power-Eden spill site. DHHS also recommends that people do not contact submerged or floating coal ash, or ash washed up on the riverbank. Direct contact with the water or sediment may cause skin irritation. Wash skin that has been exposed to the water or sediment with soap and water. The Department will continue to monitor data as it becomes available to identify when health risks are no longer a concern” (NCDHHS 2014a).

On July 22, 2014, the recreational contact advisory was lifted by NCDHHS stating “DHHS is recommending lifting the recreational water advisory after evaluating the most recent available

surface water and sediment data from the Dan River downstream from the coal ash spill. The large coal ash deposit that remained in North Carolina was removed June 30, 2014. DHHS has evaluated sediment and surface water data collected after the work was completed that confirms that no incidental ingestion or skin contact risk exists for the sediment or the river water. Contaminants associated with the coal ash spill are at levels that should not pose a health risk during recreational use of the river. The Department will continue to monitor data as it becomes available to identify potential health risks” (NCDHHS 2014b).

- Fish and Shellfish Consumption. On February 12, NCDHHS issued an advisory for fish consumption as follows: “Because the Duke Power-Eden coal ash spill is located in North Carolina's portion of the Dan River , a potential hazard exists immediately downstream of the release. The DHHS Division of Public Health recommends that people not consume any fish or shellfish collected from the Dan River in North Carolina downstream of the Duke Power-Eden spill site. DHHS is working with other agencies to collect fish downstream of the spill and will evaluate the data from fish samples as it becomes available to identify when health risks associated with eating the fish are no longer a concern” (NCDHHS 2014a). In a July 2014 update, NCDHHS concluded the advisory was still warranted (and it remains in effect at present): “A potential fish and shellfish consumption hazard still exists immediately downstream of the release. DHHS recommends that people not consume any fish or shellfish collected from the Dan River in North Carolina downstream of the Duke Power-Eden spill site. DHHS will evaluate the data from fish samples as it becomes available to identify when health risks associated with eating the fish are no longer a concern” (NCDHHS 2014b).

Commonwealth of Virginia Recreational Advisories (VDH 2014):

In Virginia, no formal advisories were issued; however, the Virginia Department of Health issued the following recommendation to the public: “VDH recommends exercising caution when using the Dan River for primary contact purposes (swimming, boating, kayaking, etc)”. A fish advisory specific to the Release was not issued in Virginia waters because one was already in place (due to historical activities not related to the coal ash spill), extending from Danville to the Kerr Reservoir (Virginia side).

## II. THE DAMAGE ASSESSMENT PROCESS

The Trustees have initiated the damage assessment planning process. The Trustees intend to release a Damage Assessment Plan for public review within six months that documents the Trustees’ basis for conducting a NRDAR, and provides additional detail regarding the proposed approach for determining and quantifying natural resource injuries and calculating the damages associated with injuries related to the Release. The Damage Assessment Plan is intended to (a) ensure that the NRDAR will be completed at a reasonable cost relative to the magnitude of damages sought and (b) communicate proposed assessment methodologies to Duke Energy, the responsible party (RP), and to the public in a manner that encourages productive participation in the assessment process. The damage assessment process is proceeding concurrent with the restoration planning. In the event that early restoration is pursued by the RP, it is the Trustees’ intent that any projects implemented satisfy the restoration criteria detailed



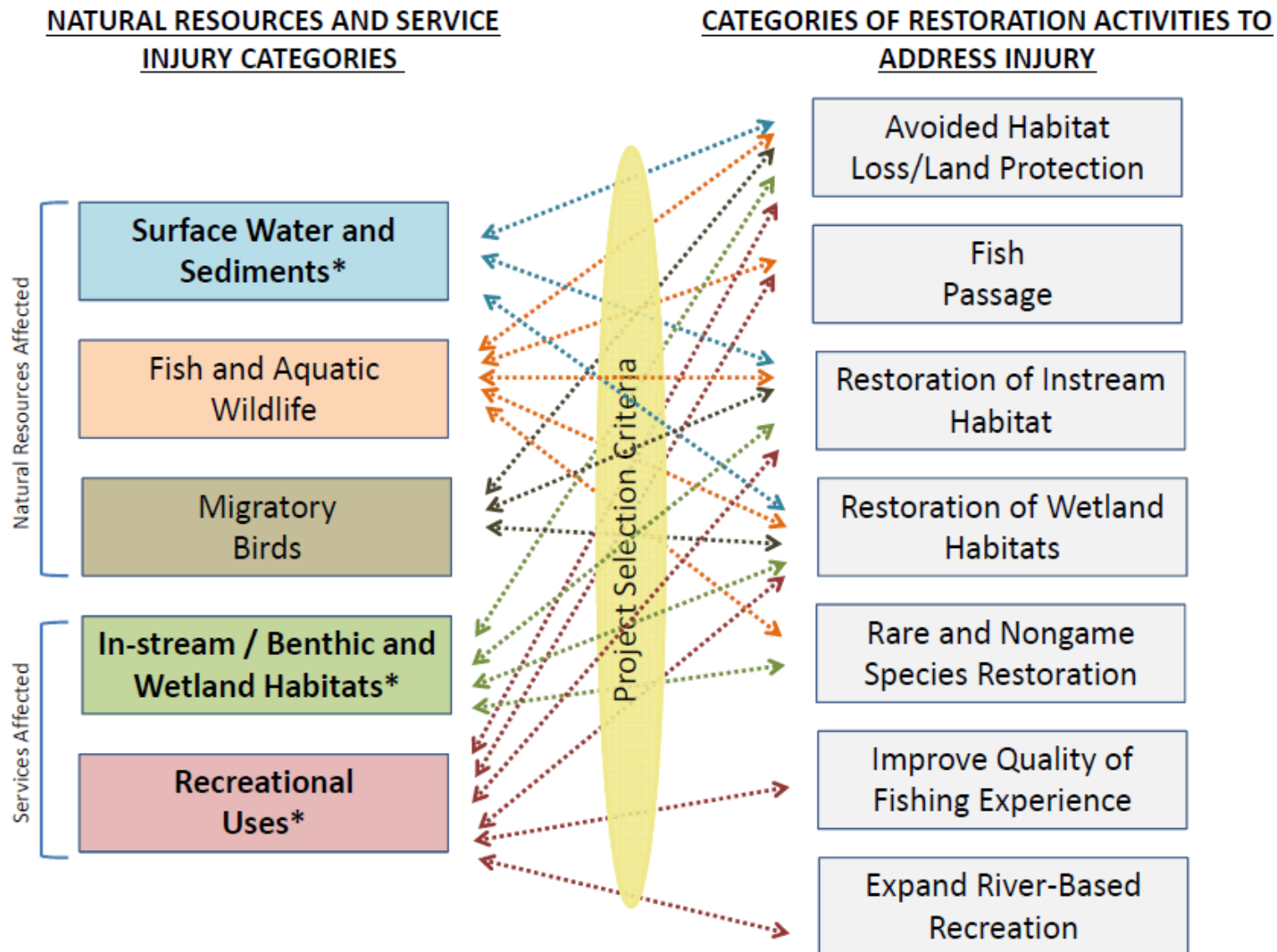
herein; however, the ultimate determination of whether any early restoration projects implemented are sufficient to offset injury is contingent upon completion of the injury assessment. Comprising both injury determination and injury quantification, the injury assessment informs the Trustees' ultimate damage claim for natural resource restoration costs and, if warranted, "compensable values," or compensation for losses incurred prior to the completion of restoration activities.

### **III. THE RESTORATION PLANNING PROCESS**

The restoration planning process is aimed at developing a strategy for restoring habitats, species, and natural resource services that were lost or impaired as a result of the Release. This scoping phase is one of the first steps in the restoration planning process. The purpose of scoping is to involve the public at an early stage in restoration planning. The Trustees are seeking public input on the merits of potential restoration project concepts included in this document (described in Section IV). In addition, the Trustees are hereby soliciting additional project concepts not included in Section IV that members of the public believe might also meet the project selection criteria set forth below (a description of the public participation and project proposal requirements is found in Section V).

The restoration planning process is moving forward concurrent with the injury assessment and damage determination phases of the NRDAR. Public input on this scoping document, the proposed project concepts described herein, and any alternative projects that the public may propose, will allow the Trustees (and the RP) to evaluate potential early restoration opportunities. If/when early restoration is pursued by the RP, the Trustees generally have preference for project concepts that satisfy the project selection criteria detailed below; likewise, if more than one early restoration activity is being considered, the project concepts that address multiple categories of natural resource and service injuries described above are desirable. Figure 1 presents a conceptual diagram linking the types of injury to the categories of restoration activities regarded by the Trustees as potentially appropriate to offset Release-related natural resource and service injuries. Implementation of early restoration by the RP prior to the Trustees' completion of the injury assessment and damage determination phases of the NRDAR does not necessarily constitute resolution of NRDAR liability for the Release; rather, the Trustees will assess the adequacy of restoration implemented to compensate the public for natural resource and resource service losses when the damage assessment concludes.

Figure 1. Injury categories and associated restoration activities regarded by the Trustees as potentially appropriate to offset Release related impacts to public trust natural resources and services.



## Project Selection Criteria

The CERCLA NRDAR regulations (43 CFR Part 11), and other applicable laws, require the Trustees to use Natural Resource Damage monies recovered for restoring, replacing, rehabilitating, and/or acquiring the equivalent of natural resources injured, and services lost, as a result of the release of hazardous substances. Given that NRDAR recoveries have not yet been secured (a cooperative NRDAR process was initiated on June 9, 2014 and the injury assessment and damage determination are incomplete), the Trustees compiled the following set of criteria for analyzing potential restoration projects to facilitate assessment of early restoration opportunities. When the NRDAR process concludes, the Trustees may also use these project concepts and selection criteria (and any additional projects proposed during restoration scoping) to identify a reasonable range of restoration alternatives (and ultimately preferred alternative(s)) to be implemented with any Natural Resource Damage monies recovered.

**ELIGIBILITY CRITERIA:** In accordance with the NRDAR regulations, the following criteria are used to evaluate restoration alternatives and identify the types of projects consistent with the restoration alternative(s) that may be selected for implementation. A potential restoration project or activity will only be considered by the Trustees as eligible for further consideration and evaluation if the project:

- Demonstrates a significant nexus to the restoration, rehabilitation, replacement, and/or acquisition of the equivalent of the injured natural resources or, if natural resource restoration is not possible or feasible, the project results in restoration of natural resource services that were injured by the Dan River coal ash Release. Factors that demonstrate a strong nexus include, but are not limited to, similar habitat type(s), geographic proximity, timing that allows benefits to be realized in short term, and capacity to offset Release-related injury.
- Can effectively meet the Trustees' restoration goals and objectives. The primary goal of any compensatory restoration project is to provide the same quantity and quality of resources and services as those lost. That goal is met through the stated restoration objective: to offset the natural resource injuries and service losses attributed to hazardous substance releases at the Site through restoration and/or conservation actions in the area in close proximity to the Site, the Dan River Basin, or other areas as deemed appropriate based on the nexus to the resource injury. The Trustees consider the potential relative productivity of restored or conserved habitat and whether the habitat is being created or enhanced. Future management of the restoration site is also a consideration because management issues can influence the extent to which a restoration action meets its objective.
- Delivers benefits cost effectively. The benefits of a project relative to its cost are a major factor in evaluating restoration alternatives. The process will strive to seek the least costly approach to deliver an equivalent or greater amount and type of benefits. Additionally, the Trustees consider the total cost of the project and the availability of matching funds if any. Although a monitoring program does increase the cost of an alternative, the inclusion of an adequate monitoring component is necessary to insure that the public is made whole to the extent possible and that project success criteria are met.

- Provides measurable results. A project must deliver tangible and specific resource restoration results that are identifiable and measurable, and will be capable of being assessed and evaluated using quantitative methods, so that changes to the targeted resource and/or resource use can be documented and evaluated.
- Has a high likelihood of success. The Trustees consider factors (technical considerations, implementation experience of the project team, etc.) that support successful project construction, project function, and long-term viability of the restored habitat. The Trustees also consider whether difficulties in project implementation are likely and whether long-term maintenance of project features is likely to be necessary and feasible. Sustainability of a given restoration action is a measure of the vulnerability of a given restoration action to natural or human-induced stresses following implementation and the need for future maintenance actions to achieve restoration objectives.
- Ensures protection of human health and safety, and/or is not prohibited by federal, state, or local laws, regulations, or policies addressing public health and safety. Projects that would negatively affect public health or safety are not appropriate.
- Avoids collateral injury to natural resources as a result of implementing the alternative. Restoration actions should not result in additional significant losses of natural resources and should minimize the potential to affect surrounding resources during implementation. Projects with less potential to adversely impact surrounding resources are generally viewed more favorably. Compatibility of the project with the surrounding land use and potential conflicts with any endangered species are also considered.
- Is not subject to an independent, prior obligation to perform the action or activity pursuant to statute, regulation, ordinance, consent decree, judgment, court order, permit condition, memorandum of agreement, or contract. The project must not otherwise be required by federal, state, or local law, including but not limited to enforcement actions or regulatory compensatory mitigation requirements.
- Is consistent with, or will not be negatively impacted by any future remediation activities, nor would the project adversely affect any ongoing or anticipated remedial actions in the resource injury area.

The evaluation of restoration alternatives according to the criteria involves a balancing of interests in order to determine the best way to meet the restoration objective. The Trustees approach restoration planning with the view that the injured natural resources/lost services are part of an integrated ecological system and that the Dan River watershed area represents the relevant geographical area for site restoration actions. Areas outside of this are considered less geographically relevant for implementation of restoration alternatives, though they are not excluded entirely from consideration in the event that restoration beyond this area would be necessary to offset a particular natural resource or natural resource service injury. This helps to ensure the benefits of restoration actions are related, or have an appropriate nexus, to the natural resource injuries and losses at the Site. The Trustees also

recognize the importance of public participation in the restoration planning process, as well as the acceptance of the project concepts by the community. Alternatives are considered more favorably if complementary with other community development or management plans/goals.

Through consideration of the eligibility criteria described above, consultation and contact with appropriate agencies, NGOs, and other entities, the Trustees identified categories of potential restoration alternatives in Table 1 along with examples of potential concepts that may be consistent with each alternative for further screening (see Evaluation Criteria below).

Table 1. Restoration alternatives identified during preliminary restoration scoping

Restoration Alternative	General Description and Examples of Potential Project Concepts
Avoided Habitat Loss via Land Acquisition / Protection	Acquire environmentally sensitive land vulnerable to conversion for public use or benefit <ul style="list-style-type: none"> <li>• Fee simple property purchase of environmentally sensitive land</li> <li>• Purchase of conservation easements on priority lands vulnerable to development</li> </ul>
Fish Passage	Create or enhance opportunities for migratory fish to reach priority upstream habitats and restore genetic flow between populations <ul style="list-style-type: none"> <li>• Rock rapids creation</li> <li>• Dam removal</li> <li>• Fish ladders</li> </ul>
Restoration of In-stream Habitats	Create, restore, or enhance in-stream habitats within the Dan River watershed area to address existing water quality impairment and habitat degradation (e.g., reduce sediment load and transport) <ul style="list-style-type: none"> <li>• Implement actions to provide functional uplift to historically degraded riverine systems</li> <li>• Emergent and submergent vegetation or substrate restoration</li> <li>• In-stream restoration (bank stabilization, removal of hardened crossings and in-stream structures)</li> <li>• Dam/impediment removal (includes dams, concrete encased utilities, low water crossings)</li> </ul>
Restoration of Riparian and Wetland Habitats	Create, restore, or enhance wetlands and riparian areas within the Dan River watershed area to address existing water quality impairment and/or habitat degradation (e.g., reduce sediment load and transport) <ul style="list-style-type: none"> <li>• Freshwater marsh restoration</li> <li>• Riparian buffer and floodplain habitat creation or restoration (fencing, tree/shrub planting, alternative watering systems, sectional fencing)</li> </ul>
Rare and Nongame Species Restoration	For targeted species of conservation and recovery significance, actions to improve integrity of populations and habitat <ul style="list-style-type: none"> <li>• Demographic restoration</li> <li>• Genetic restoration</li> <li>• Targeted land habitat conservation</li> <li>• Water quality and habitat improvements</li> </ul>
Improve quality of fishing experience	Improve or create boating and fishing access <ul style="list-style-type: none"> <li>• New boat ramps in areas without sufficient existing access</li> <li>• Canoe launch and portage infrastructure</li> <li>• Game fish propagation and stocking</li> </ul>
Expand river-centered opportunities for public recreation and wildlife viewing	Establish or expand recreational infrastructure at high priority recreational areas <ul style="list-style-type: none"> <li>• New boat ramps in areas without sufficient existing access</li> <li>• trail expansion and hiking opportunities</li> <li>• wildlife viewing areas</li> <li>• river-based pedestrian access (river walks, etc)</li> <li>• improve quality of other aquatic recreational experiences</li> </ul>

**EVALUATION CRITERIA.** The Trustees have discretion to prioritize project selection criteria and to use additional evaluation criteria as appropriate. To narrow the list of potential restoration activities identified the Trustee's identified additional evaluation criteria, beyond the eligibility criteria outlined above to facilitate prioritization of restoration project concepts identified during the restoration scoping:

- *Preference for projects that benefit more than one natural resource and/or service. (e.g., interrelated natural resource service benefits, greater net service benefit or uplift).*
- *Preference for projects with conservation significance (e.g., high degree of land use conversion threat, high value to conservation partnerships based on consensus rankings)*
- *Preference for projects that could be implemented in the short term (e.g., willing sellers, permits secured, project implementation plan in place).*
- *Preference for projects where similar habitat or human use functions are benefited (e.g., benthic productivity, water quality/nutrient cycling, benthic diversity and abundance, quality of fishing or other aquatic recreational experiences)*
- *Preference for projects with a high degree of resource benefit (e.g., avoided loss of significant resources, benefits to historically degraded riverine systems, uplift of resource and habitat function and values, long term benefits)*
- *Preference for restoration projects that limit disruption to existing resources (e.g., compatible with surrounding land use, limits impact to endangered and other rare species or habitats, no significant short term habitat damage)*

#### **IV. POTENTIAL RESTORATION PROJECT CONCEPTS**

Examples of potential restoration project concepts are presented in Table 1 and are being considered by the Trustees as the NRDAR process progresses. To canvass potential restoration opportunities in the Dan River watershed area, the Trustees reviewed existing watershed and restoration plans (Appendix A) and project proposals and contacted representatives of various agencies, non-governmental organizations, and others (Appendix B) to identify activities with potential to meet the eligibility criteria outlined above. Restoration concepts may be added or deleted at any time during the restoration planning process, until the NRDAR process concludes and a restoration plan is finalized. Additional detail regarding the potential project concepts in the Dan River watershed area follows:

##### *Avoided Habitat Loss via Land Acquisition / Protection*

Current and historical pressures in the Dan River watershed area have resulted in habitat destruction, decreased water quality, channelization, encroachment into the floodplain and introduction of non-native species. Land acquisition involves the purchase of lands or conservation easements with an accompanying change in land management to ensure that future use of such lands are compatible with preservation and conservation of its environmental functions and with public land management

objectives. Land Acquisition/Conservation Easements combined with restoration and enhancement has the capacity to improve water quality, provide improved habitat for a diversity of wildlife, and enhance the recovery of endangered and rare species.

Lands/wetlands targeted for acquisition from willing landowners should be under threat of development, display sensitive or unique attributes, provide habitat for State or federally protected species, positively influence on stream ecosystems, and increase public access or water-based recreation opportunities for the public. One of the benefits of land acquisition/protection and enhancement of lands vulnerable to conversion is the potential to buffer impacts (e.g., excess sedimentation, increased amounts of impervious cover, road run-off, and toxicant deposition; reduced groundwater recharge; loss of wildlife habitat) within the watershed that lead to poor water quality. Land conservation could also protect important natural resources and resource services associated with the Dan River watershed, its shoreline, and wetland habitats supporting freshwater fish and mussels, including state and federally protected species; provide public access to the Dan River for recreational activities including bird watching, nature photography, hiking, fishing, kayaking, picnicking and other uses; and create a link between local walking/biking trails and the nearby local or state parks.

#### *Fish Passage*

Fish passage projects in watershed have the potential to provide aquatic resource and socioeconomic benefits by enhancing opportunities for migratory fish to reach priority upstream habitats and restore genetic flow between populations. Potential project concepts include dam removal, rock arch construction, removal of other barriers (e.g., culverts, etc.) and fish ladder construction. Dams can negatively affect natural river systems through disruption of ecosystem connectivity, wildlife habitat inundation, slowed and/or altered timing of stream flow, disruption of aquatic biota movement, altered water temperature and quality condition, retention of silt, woody debris, and nutrients, altered aesthetics, and hindered recreational opportunities on river. Accordingly, removing dams provides important benefits including restoring river habitat, improving water quality, re-establishing fish movement, restoring free-flowing river conditions, reducing upstream flooding, rehabilitating threatened and endangered species, eliminating dam safety and liability concerns, improving river aesthetics, enhancing fishing opportunities, improving recreational boating opportunities, improving public river access, and revitalizing communities (American Rivers and Trout Unlimited. August 2002; Pennsylvania Organization for Watersheds and Rivers). Specifically, targeted dam removal can help to promote recovery of rare species (including the federally listed endangered Roanoke logperch) and movement and dispersion of other aquatic species by directly restoring lotic habitats of the dam-impounded reach to free-flowing lentic environments.

#### *Restoration of In-stream Habitats*

Historic land use in the Dan River drainage has resulted in excessive loadings of fine sediments and nutrients to receiving waters. The perpetual overabundance of fine sediments has deleterious effects on the natural biologic communities of the river system. Many documents also identify coliform bacteria as a major impairment of ecosystem function. Physically, an approximate 39,000 tons of coal



ash (which behaves similarly to fine sediment) was released during the Release; accordingly, the Release represents additional delivery of an identified source of impairment with the potential to stress to in-stream habitats. In-stream restoration has become a somewhat generic term for a broad range of practices that improve the physical, chemical and biological function of stream systems. In-stream restoration typically focuses on hydraulic geometry to address historic channelization or active instability from hydrologic alterations in a watershed, hoof shear and other forcing mechanisms. By arresting erosion, in-stream restoration reduces fine sediment loadings, and thus addresses sedimentation. Fine sediment is also a water quality issue adversely impacting multiple aquatic animals, so reducing sediment loads has the potential to benefit fish and other aquatic biota. Increased water quality improvement can be emphasized by integrating wide riparian buffers and structural best management practices (BMPs) into stream restoration projects. As mentioned above, fecal coliform bacteria are a known stressor in the Dan system, with agricultural operations and inadequate sanitary sewer infrastructure identified as leading sources. Reducing bacteria loadings has the capacity to improve both biologic function and recreational uses.

#### *Restoration of Wetlands and Riparian Habitats*

Intact riparian ecosystems provide many functions, including nutrient uptake, filtering runoff, canopy and shade, bank stability, allochthonous input for aquatic food webs. These functions are essential to maintaining water quality, aquatic species survival, and biological productivity. Additionally, riparian buffers provide fish and wildlife habitat and flood mitigation. Riparian buffer establishment and restoration is an efficient and cost-effective approach to protect and maintain water quality. Restoration of wetlands and riparian habitats may be accomplished by fencing livestock from streams, tree/shrub/herbaceous plant establishment, installation of alternative watering systems, converting non-native uplands (e.g., agricultural lands or filled historic riverine habitat) into freshwater floodplain wetlands, or returning disturbed vegetative communities (i.e., nuisance or exotic species dominated) back to an original or more desirable wetland community structure. Restoration and management actions to benefit riparian conditions and water quality recommended in the *Eden Area Watershed Restoration Plan* include logging site management, cattle exclusion/fencing, riparian buffer establishment, wetland restoration, farm pond removal or repair, and stormwater BMPs. Priority watersheds identified for these riparian habitat improvements include Matrimony Creek, Town Creek, Dry Creek (includes Eden, NC) based on existing sediment and bacteria sources and opportunities for enhancement (Stober 2013). The 2009 Ecosystem Enhancement Program *Roanoke River Basin Restoration Priorities* (RBRP) identified several Targeted Local Watersheds (TLWs) within the upper Dan River sub-basin above Danville, VA (Cataloging Unit 03010103). The TLW identified as "Dan River - Middle" (03010103230040) includes an approximately 8-mile stretch of the mainstem Dan River that overlaps with areas directly affected by the Release (from near the mouth of Town Creek to the VA border). This 62-square mile TLW includes turbidity- and fecal coliform-impaired reaches of the Dan River, and is a priority for water quality and habitat improvement actions (Breeding and Herman 2009). It also includes two priority subwatersheds (Town Creek and Dry Creek) within the Eden Area Watershed Plan. Another TLW in close proximity to (upstream of) the Release-affected area is Big Beaver Island Creek (03010103220010), where actions to improve riparian habitat and streambank conditions are

recommended in the RBRP (Breeding and Hermann 2009). These restoration and enhancement opportunities can result in intact riparian areas with the capacity to benefit instream water quality and sedimentation conditions, as well as aquatic biota and their habitats -- resources and services that were potentially injured during the Release.

#### *Rare and Nongame Species Restoration*

As described above, the area affected by the Release provides habitat for two federally listed endangered species, the Roanoke logperch and the James spiny mussel, as well as two species which have been petitioned for listing under the federal Endangered Species Act, the green floater and orange-fin madtom. In addition, the area affected by the Release provides habitat for several nongame and state-listed aquatic species of conservation significance including the notched rainbow, yellow lamp mussel, Atlantic pigtoe, the Chowanoke crayfish, the NC spiny crayfish, the Roanoke bass, the quillback, the Roanoke hogsucker, the Blue Ridge sculpin, the V-lip redhorse, and the cutlips minnow.

For the Roanoke logperch in particular, it is presumed that the species utilizes habitat in the mainstem of the Dan River downstream of the DRSS to the City of Danville in Virginia and may have suffered adverse impacts from the Release. Roanoke logperch restoration opportunities were already being considered and data collection to support such efforts in North Carolina has been underway since 2009. In April of this year, a group of species experts (i.e., agency, university, and private biologists who have detailed knowledge of Roanoke logperch biology and ecology) convened to examine restoration opportunities for the Roanoke logperch and identified two primary approaches: demographic (i.e., achieve population targets over time through captively propagating and releasing sufficient numbers to achieve desired population levels over time) and genetic (i.e., improve genetic diversity through translocation of small number of individuals to a given population) restoration. These approaches could be achieved via expansion and/or augmentation within the current or historic range of the species. Other restoration activities that could extend resource benefits for Roanoke logperch include habitat improvement projects such as dam removal or water quality enhancements also described in this section.

#### *Improve quality of fishing experience*

Recreational fishing access in the Dan River watershed, particularly in areas affected by the Release, is currently limited. Approximately 100 miles of the Dan River are currently only accessible from four public boat access areas (NC Wildlife Resource Commission access points in Eden, NC above the dam at the Facility and Milton, NC and Community access points in Danville, VA at the Abreu Grogan Park and South Boston, VA) and two informal small boat launches. Improvements to existing access points and/or construction of new access points may increase the ability for recreational fishermen to access the Dan River and surrounding areas. The candidate areas for additional small boat launches where public access is presently limited include locations above Eden upstream to Madison, NC on the Dan River mainstem and on the Mayo River above the confluence with the Dan River; areas on the Dan River between Eden, NC and Danville, VA; and, areas on the Dan River between Danville, VA and Kerr Reservoir. In addition to added boat access points, expanded opportunities for bank fishing (and

associated infrastructure) and expanded game fish propagation/stocking programs (where appropriate) could also provide benefits to offset any impacts to the fishing public. Given the de facto injury to public use of the fishery, improved access to quality fishing opportunities has the capacity to benefit the fishing public affected by the consumption advisory.

*Expand river-centered opportunities for public recreation and wildlife viewing*

Loss of services resulting from the Release may include the diminished opportunity for human use or enjoyment of a resource (e.g., limited opportunity to participate in river-centered recreation). The recreational water advisory may have dissuaded recreational trips to the river for canoeing, hiking, birding, tubing, nature observation, hunting and other river-centered opportunities. Consequently, enhancement or creation of additional infrastructure or access opportunities for river-based recreation has the potential to benefit the public affected by the advisory and/or temporary closure of existing recreational areas (e.g., Abreu Grogan Park). Examples of such projects include hiking or walking trails (e.g., along the river corridor or expanding on existing trail systems), river/wetland/wildlife observation areas, park or recreation area improvements or establishment, canoe access or portage improvements, and other public facilities intended to facilitate recreational use and enjoyment of the Dan River watershed.

## **V. PUBLIC PARTICIPATION**

Public participation in the restoration planning process is both desirable and necessary, and regular communication with the public is an important part of preparing and implementing the restoration plan. The goals of this public scoping process are to:

- Involve the public in restoration scoping and planning,
- Solicit the public's review of proposed restoration project concepts in this scoping document,
- Identify additional restoration project concepts that best restore the resources injured by the Release (note, project concepts become public property once they are submitted to the Trustees),
- Identify issues of concern to the public related to restoration scoping and planning, and
- Keep the public informed of restoration developments and progress

*Written Comments/ Project Proposals.* Written comments are encouraged. Comments on this scoping document and proposed restoration project concepts described in this document and/or any additional restoration proposals or project suggestions are requested to be submitted to the Trustees by November 14, 2014. Please include the following information in restoration project proposals (if available):

- a) name of group or individual submitting the proposal including proposal contact information (mailing address, telephone number, and e-mail address);
- b) proposed project title;
- c) location of the proposed restoration project (e.g., town, river or tributary reach);
- d) restoration project category (see Table 1 under "Restoration Alternative");

- e) details about the proposed project's nexus to potential natural resource or natural resource services injuries (as identified in Section I.3);
- f) estimated cost (including implementation and performance monitoring);
- g) anticipated natural resource or resource service benefits ("uplift");
- h) timing (duration relative to implementation, "shovel-readiness", etc.); and
- i) potential to benefit more than one natural resource/service.

Comments and project proposals received will be considered a matter of public record and releasable under the Freedom of Information Act. Please send comments and/or project proposals to the agency contacts below.

Sara Ward, U.S. Fish and Wildlife Service  
Raleigh Ecological Services Field Office  
Phone: 919/856 4520 Ext. 30  
Email: [Sara\\_Ward@fws.gov](mailto:Sara_Ward@fws.gov),

or

Susan Lingenfelter, U.S. Fish and Wildlife Service  
Virginia Ecological Services Field Office  
Phone: 804-824-2415  
Email: [Susan\\_Lingenfelter@fws.gov](mailto:Susan_Lingenfelter@fws.gov)

## VI. REFERENCES

- American Rivers and Trout Unlimited. 2002. Exploring Dam Removal: A Decision Making Guide. Available [http://www.americanrivers.org/assets/pdfs/dam-removal-docs/Exploring\\_Dam\\_Removal-A\\_Decision-Making\\_Guide6fdc.pdf?7f5598](http://www.americanrivers.org/assets/pdfs/dam-removal-docs/Exploring_Dam_Removal-A_Decision-Making_Guide6fdc.pdf?7f5598). (Accessed: August 27, 2014).
- Bednar AJ, Chappell MA, Seiter JM, Stanley JK, Averett DE, Jones WT, Pettway BA, Kennedy AJ, Hendrix SH, Steevens JA. 2010. Geochemical investigations of metals release from submerged coal fly ash using extended elutriate tests. *Chemosphere* 81: 1393–1400.
- Conley JM, Funk DH, Buchwalter DB. 2009. Selenium bioaccumulation and maternal transfer in the mayfly *Centroptilum triangulifer* in a life-cycle, periphyton-biofilm trophic assay. *Environ Sci Technol* 43: 7952-7957.
- Conley JM, Funk DH, Hesterberg D, Hsu LC, Kan J, Liu Y-T, Buchwalter DB. 2013. Bioconcentration and biotransformation of selenite versus selenate exposed periphyton and subsequent toxicity to the mayfly *Centroptilum triangulifer*. *Environmental Science and Technology* 47:7965-7973.
- Breeding, R. and M. Hermann. 2009. Roanoke River Basin Restoration Priorities. North Carolina Ecosystem Enhancement Program. October. Raleigh, NC. 43 pgs. Available [http://www.nceep.net/services/restplans/FINAL\\_RBRP\\_Roanoke\\_2009.pdf](http://www.nceep.net/services/restplans/FINAL_RBRP_Roanoke_2009.pdf). (Accessed: 4/14/2014).
- Bureau of Reclamation, National Irrigation Water Quality Program. 1998. Guidelines for Interpretation of the Biological Effects of Selected Constituents in Biota, Water, and Sediment. Issue 3 of National irrigation water quality program information report, U.S. Department of the Interior, Bureau of Reclamation.
- Liu YT, Chen TY, Mackeebe WG, Ruhl L, Vengosh A, Hsu-Kim H. 2013. Selenium speciation in coal ash spilled at the Tennessee valley authority Kingston site. *Environ Sci Technol* 47: 14001-14009.
- MacDonald, D.D., C.G. Ingersoll and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. *Arch Environ Contam Toxicol* 39: 20-31.
- NC Division of Water Quality. 2014. Permit to Discharge Wastewater Under the NPDES, NC0003468. NC Department of Environment and Natural Resources, Raleigh, NC.
- North Carolina Department of Health and Human Services. 2014. Current Fish Consumption Advisories for North Carolina. Available <http://epi.publichealth.nc.gov/oeefish/advisories.html#D>. (Accessed August 22, 2014).
- Pennsylvania Organization for Water and Rivers. 2009. Small Dam Removal in Pennsylvania: Free Flowing Watershed Restoration. Available <http://pawatersheds.org/wp-content/uploads/2009/04/damremoval.pdf>. (Accessed August 27, 2014).
- Presser TS, Luoma SN. 2010. A methodology for ecosystem-scale modeling of selenium. *Integrated Environmental Assessment and Management* 6: 685–710.

Stober, C et al. 2013. Eden Area Watershed Restoration Plan. Piedmont Triad Regional Council. December. Available <http://www.ptrc.org/modules/showdocument.aspx?documentid=3178>. Accessed: 4/14/2014.

Virginia Department of Health. 2014. Coal Ash Release Fact Sheet. Available <http://www.vdh.virginia.gov/CoalAsh.pdf> . (Accessed: August 27, 2014).

## APPENDIX A

**Restoration information sources: Dan River watershed and other areas supporting natural resources or services potentially affected by the Dan River Coal Ash Release**

Bass, K., Blackwell, J., Maxwell, B., and G. Squires. Eden Area Watershed Study, Presentation. NCSU BAE/Water Quality Group. Available <http://www.nwpcog.dst.nc.us/modules/showdocument.aspx?documentid=3179>. Accessed: 4/14/2014.

Brekheimer, I. 2006. Dan River Watershed Protection Plan. Piedmont Land Conservancy. 133 pgs.

Bridle, K and K. Hoover. 2007. Dan River Tributaries Total Suspended Sediment (TSS) Study. Stokes County, NC. 2006 Data Summary. EcoLogic Associates P.C. February.

Bridle, K. 2009. Dan River Water Quality Sampling, May 2008-January 2009. Dan River Basin Association.

Breeding, R. and M. Hermann. 2009. Roanoke River Basin Restoration Priorities. North Carolina Ecosystem Enhancement Program. October. Raleigh, NC. 43 pgs. Available [http://www.nceep.net/services/restplans/FINAL\\_RBRP\\_Roanoke\\_2009.pdf](http://www.nceep.net/services/restplans/FINAL_RBRP_Roanoke_2009.pdf). Accessed: 4/14/2014.

Dan River Basin Association. 2009. Dan River, NC Watershed Assessment and Water Quality Study, Project No. CWMTF 2007-805, Final Report Narrative. 22 pgs. Available [http://www.danriver.org/content/File/danwatershedassmtfinalreport\\_feb09.pdf](http://www.danriver.org/content/File/danwatershedassmtfinalreport_feb09.pdf). Accessed: 4/14/2014.

Hoover, K. 2006. Riparian Corridor Conservation Design Study for the Dan, Mayo and Smith Rivers in Rockingham County, NC. Internship Project proposal for the Applied Masters Program at University of North Carolina at Greensboro, Department of Geography. 61 pgs.

North Carolina Division of Health and Human Services. 2014a. DHHS Issues Health Advisories for Dan River Area. Available <http://us4.campaign-archive1.com/?u=58ec19aeea4630b1baad0e5e4&id=07bee4e8ae>. (Accessed: 8/29/2014).

North Carolina Division of Health and Human Services. 2014b. DHHS Revises Health Advisories for the Dan River Area, Media Advisory. Available [http://www.ncdhhs.gov/pressrel/2014/2014-07-22\\_revised\\_dan\\_river.htm](http://www.ncdhhs.gov/pressrel/2014/2014-07-22_revised_dan_river.htm). (Accessed: 8/29/2014).

North Carolina Division of Water Quality. 2000. Basinwide Assessment Report: Roanoke River Basin. Raleigh, NC. 152 pgs.

North Carolina Division of Water Quality. 2005. Basinwide Assessment Report: Roanoke River Basin. Raleigh, NC. 166 pgs.

North Carolina Division of Water Quality. 2005. Total Maximum Daily Load for Turbidity and Fecal Coliform for Haw River, Deep River, Third Fork Creek, and Dan River in North Carolina. Raleigh, NC. 95 pgs.

North Carolina Division of Water Quality. 2009. North Carolina Addendum Total Maximum Daily Load (TMDL) for Impaired Segments in the Dan River Watershed to Virginia TMDLs Approved by EPA Region 3. Raleigh, NC. 7 pgs.

North Carolina Division of Water Quality. 2010. Basinwide Assessment Report: Roanoke River Basin. Raleigh, NC. 52 pgs.

North Carolina Division of Water Quality. 2010. Roanoke River Basin Ambient Monitoring System Report. Raleigh, NC. 57 pgs.

North Carolina Wetlands Restoration Program. 2001. Watershed Restoration Plan for the Roanoke River Basin. Raleigh, NC. 61 pgs. Available <http://www.nceep.net/services/restplans/roanoke%20plan%202001.pdf>. Accessed: 4/14/2014.

Rosenberger, A.E., 2007. An update to the Roanoke Logperch Recovery Plan. For U.S. Fish and Wildlife Service. 90 pgs. Available [https://www.sfos.uaf.edu/directory/faculty/rosenberger/LRP\\_RecoveryPlanUpdate.pdf](https://www.sfos.uaf.edu/directory/faculty/rosenberger/LRP_RecoveryPlanUpdate.pdf). Accessed: 4/14/2014.

Stober, C. et al. 2012. Eden Area Watershed Assessment. Piedmont Triad Regional Council. December. Available <http://www.ptrc.org/modules/showdocument.aspx?documentid=1778>. Accessed: 4/14/2014.

Stober, C et al. 2013. Eden Area Watershed Restoration Plan. Piedmont Triad Regional Council. December. Available <http://www.ptrc.org/modules/showdocument.aspx?documentid=3178>. Accessed: 4/14/2014.

Stober, C. The Eden Area Local Watershed Plan, presentation. <http://www.nwpcog.dst.nc.us/modules/showdocument.aspx?documentid=1058>. Accessed: 4/14/2014.

U.S. Fish and Wildlife Service. 1990. James spiny mussel (*Pleurobema collina*). Recovery Plan. 39 pgs. Available <http://www.fws.gov/northeast/fisheries/pdf/jamesspiny mussel plan.pdf>. Accessed: 4/14/2014.

U.S. Fish and Wildlife Service. 1992. Roanoke Logperch (*Percina rex*) Recovery Plan. 35 pgs. Available <http://www.fws.gov/northeast/fisheries/pdf/roanokelogperchrecoveryplan.pdf>. Accessed: 4/14/2014.

Virginia Department of Health. 2014. Coal Ash Release Fact Sheet. Available <http://www.vdh.virginia.gov/CoalAsh.pdf> (Accessed: 8/29/2014)

Wright, R. and T. Hill. 2012. Dan River Watershed Restoration Plan For Agricultural Non-Point Sources of Pollution. For NC Division of Water Quality and NC Department of Agriculture. May. 36 pgs.



Available [http://portal.ncdenr.org/c/document\\_library/get\\_file?uuid=6ac0ac65-6101-4f10-b25e-8b3f242b9816&groupId=38364](http://portal.ncdenr.org/c/document_library/get_file?uuid=6ac0ac65-6101-4f10-b25e-8b3f242b9816&groupId=38364). Accessed: 4/14/2014.

## APPENDIX B

### **Agencies/organizations providing input<sup>5</sup> during preliminary canvassing of Dan River watershed area restoration opportunities**

City of Danville

City of Martinsville

Conservation Fisheries

Conservation Fund

Dan River Basin Association

Piedmont Land Conservancy

The Nature Conservancy

North Carolina Department of the Environment and Natural Resources

- NC Natural Heritage Program
- NC Division of Parks and Recreation
- NC Division of Water Resources
- NC Ecosystem Enhancement Program

North Carolina Wildlife Resources Commission

United States Fish and Wildlife Service

- Raleigh Field Office
- Virginia Field Office

Virginia Department of Conservation and Recreation

Virginia Department of Environmental Quality

Virginia Department of Game and Inland Fisheries

Virginia Outdoors Foundation

Virginia Tech Cooperative Research Unit

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<sup>5</sup> Agencies/organizations were either consulted by the Trustees or contacted the Trustees directly.