

*The Nature
Conservancy*
NORTH CAROLINA CHAPTER
Saving the Last Great Places

December 18, 2001

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Dear members of the John H. Kerr Study executive committee:

Thank you for this opportunity to provide recommendations for the Draft Project Management Plan for the John H. Kerr Reservoir Section 216 Study.

This Section 216 Study was first proposed to The Nature Conservancy by USAGE Wilmington District planning staff in 1996. Subsequently TNC worked closely with USAGE and NC DENR and NC Congressional staff for over four years before we managed to get the study authorized and funded through a Congressional add-in for FY2000.

TNC's interest in following this difficult course and our strong commitment to continue with it are based on a demonstrated need to evaluate and eventually to reduce and/or mitigate the impacts of Kerr operations on the riparian ecosystems of the coastal plain reaches of the Roanoke River. These ecosystems are a priceless and irreplaceable part of North Carolina's natural heritage. So far, public and private agencies have invested over \$20 million in their conservation, and about 60,000 acres have been acquired or placed in conservation management.

In keeping with the best and most current information about ecosystem management, and in keeping with USAGE ecosystem restoration and management policies, we expect this Section 216 Study to result in an adaptive approach to reservoir

operations within appropriate constraints based on the authorized purposes for the project. We look forward to working with the USACE, the State of North Carolina, the Commonwealth of Virginia, and all the other stakeholders to find a strategy for ensuring the ecological health of the downstream riparian ecosystems of the Roanoke. We fully expect to find a strategy that does not cause significant damage to any other current economic or environmental interest in Kerr, Gaston, or Roanoke Rapids Reservoirs or the Roanoke River downstream.

The Nature Conservancy's recommendations for the Project Management Plan are organized in three sections. In the first, we outline the process we believe will work best for developing alternatives to evaluate. In the second, we provide details for each of the models mentioned in the first section according to the e-mail from Sharon Haggett, John Morris, and David Paylor received on 7 December 2001. In the third, we recommend certain standards for data, models; and process. This letter and its attachments do not address the decision making process for evaluating and selecting among the various alternatives. We assume the opportunity to address those issues will develop at the appropriate time.

We are recommending a fairly arduous and complex process of modeling and analysis. Our recommendations may seem prohibitively expensive to implement. Please keep in mind that most of the models we recommend have already been developed in, whole or in part, more often than not with a significant increment of investment from TNC. Please also keep in mind that we are attempting to restore and manage perhaps the largest, least fragmented, and most productive alluvial river and-bottomland swamp forest system on the Atlantic slope. In the end, it will be worth it.

Sincerely,

A handwritten signature in black ink that reads "Sam". The signature is written in a cursive style and is positioned to the left of the typed name.

Sam Pearsall, Ph.D. Director of Science
Roanoke River Project Director
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**RECOMMENDATIONS FOR THE JOHN H. KERR SECTION 216
PROJECT MANAGEMENT PLAN**

THE NATURE CONSERVANCY, NC CHAPTER 18

December 2001

- I. Recommended process for developing alternatives
 - A. Develop a comprehensive system model of the Roanoke River basin (Section II below details the component models we believe should be included in the system model). This model would include the hydrology of the whole basin plus detailed models of policy inputs relating to the operations of Kerr Dam plus detailed models of ecological and economic outputs.
 - B. With participation of all the stakeholders, vary one input variable at a time while recording and evaluating all changes in the output variables. By this method, determine the most sensitive input variables for each of the output variables.
 - C. With participation of all the stakeholders, develop the no-project (status -quo) alternative and record the values of all output variables. Next, develop a set of alternatives, each of which attempts to maximize the value of one of the output variables. Finally, develop a set of alternatives, each of which is an attempt to balance all of the output variables to arrive at a non-inferior solution.
 - D. Secure stakeholder concurrence (by consensus) that the alternatives developed in I.C. above are the necessary and complete set of alternatives for evaluation. Create or delete alternatives as appropriate to create the consensus set.
- II. Components of the Comprehensive System Model
 - A. Policies Framework for the Operation of John H. Kerr
 - 1. For each of the following policies or sources of policy, detail source(s), purpose(s), how formulated, how amended, how and when renewed, terms and conditions, and how it influences the operation of John H. Kerr.
 - a) SEPA contracts
 - b) Kerr guide curve and stage release policies

- c) USACE informal policies and procedures for adjusting to weather forecasts and other inputs
- d) Interactions with Philpott operations
- e) All storage accounts and their management f) Spawning release strategies
- g) Water quality betterment strategies
- h) Any other policies, procedures, or practices that influence the management of John H. Kerr.

2. Describe the way these policies are implemented. How do they interact? How are they weighted? A list of policies and their individual characteristics will not tell the story. We need to be able to describe their cumulative and net effects.

This policy framework is, in large part, implemented in the Roanoke River Basin Reservoir Operations Model (RRBROM). USACE should contract with HydroLogics to complete (as necessary) and, especially, to document the implementation. USACE should prepare a document explaining this policy framework in layman's terms. SEPA and the private utilities should contribute to the preparation. The policy framework (II.A.1-2.) should be transparent to anyone who reads the document.

B. Roanoke River Basin Reservoir Operations Model

The Executive Committee should select one model to simulate flows at all points in the basin over the full period of record with any given set of policy inputs (modifications to the policy framework in II.A.). Outputs should include, in addition to flows in the system, lake levels and power production. The model should operate on either daily or weekly timesteps.

The Nature Conservancy strongly supports the RRBROM developed by HydroLogics, Inc. with investment from TNC, the State of NC, Dominion Generation, and the City of Virginia Beach. USACE should contract with HydroLogics as appropriate to ensure the RRBROM is adequate for the Section 216 Study.

C. Inundation Model

Using flow outputs from the RRBROM, map inundation for the end of any given day or weekly time-step for any given run of the RRBROM. Inundation should be mapped with a vertical resolution of 1 foot or better. Horizontal resolution (grid cell size) should be 100 feet x 100 feet or better. Inundation data should include depth. For any given run, output should be summarized for every cell detailing the following:

ALL YEAR	GROWING SEASON (I March- 30 June)
Total days of inundation in 1 foot increments	Total days of inundation in 1 foot increments
Number of inundation events	Number of inundation events
Longest inundation event in 1 foot increments	Longest inundation event in 1 foot increments
Mean duration of inundation events in 1 foot increments	Mean duration of inundation events in 1 foot increments

The map of the flood produced for any given time-step of any given run should be classed by depth in 1 foot increments in Arc Info, Arc View, or Arc GIS format to allow overlay and analysis with compatible ecological data (soils and vegetation), land-use, land-ownership, and digital orthophoto quads (DOQs).

The Executive Committee should evaluate candidate models and choose one for the Section 216 Study. The Nature Conservancy is currently contracting with HydroLogics, Inc. and the University of Maryland to develop the inundation model described above. If the Executive Committee chooses the TNC model, USACE should, as appropriate and necessary, contract with TNC to upgrade it for the Section 216 Study. Data that probably should be updated include land-ownership (not currently included), land-cover and DOQs (both now out of date).

D. Water Quality Model

Develop a water quality model that will use flows from the RRBROM plus weather data to calculate and predict Dissolved Oxygen, Biological Oxygen Demand, pH, Temperature, Nitrogen, and Phosphorous for discharges from Kerr, Gaston, and Roanoke Rapids; for each river mile downstream; and for a set of points in the floodplain selected to represent each vegetation type in each river reach.

TNC is not aware of any model currently capable of providing these predictions for the Roanoke. However, some water quality gage data exists and the RRBROM engine for providing flow inputs exists. Duke Energy and the Electric Power Research Institute may have developed a water quality model for the Catawba River system that could be adapted to the Roanoke. TNC is prepared to assist with scoping and supporting the development of the water quality model.

E. Sediment Model

The operation of John H. Kerr is significantly responsible for the movement of sediments in the lower Roanoke River basin. The significance of these sediments is not currently known. The Universities of Maryland and North Carolina and the USGS with support from NSF and The Nature Conservancy are currently engaged in a long-term evaluation of sediment dynamics in the floodplain below Roanoke Rapids. This paragraph is a place holder. If the study indicates that sediment movement (or lack of it) in the floodplain produces impacts on riparian wetland ecosystems, TNC will want to understand and possibly to mitigate the contribution of Kerr operations on those impacts.

F. Terrestrial Ecosystems Model

Develop a model that uses flows, water quality, and possibly sediment dynamics as inputs. For each keystone patch (the largest and the lowest patches of each vegetation type in each river reach) develop response models for the input variables. Outputs should be expressed as likelihood, per patch, for long-term survival of selected indicator species. Long-term survival should be defined for each indicator species (e.g., persistence across 2 generations for canopy tree species n).

The Terrestrial Resources Technical Sub-Committee of the Dominion Generation Relicensing Settlement Committee has developed a draft list of indicator species. The USFWS and Dominion Generation sponsored Cumulative Impacts Analysis Workshop (11/99) may have refined the list. The Executive Committee should evaluate the list and modify as appropriate with input from the organizations and agencies with responsibilities for terrestrial conservation downstream. TNC can provide the vegetation and soils data layers and the selection of the keystone patches.

G. Aquatic Ecosystems (including diadromous fishes) Model

The model should use flows, water quality, and possibly sediment dynamics as inputs. USFWS and NMFS are developing a diadromous fishes management plan for the Roanoke River. Outputs for diadromous fishes should be expressed in goals developed in the plan. Other components of the aquatic ecosystems are also critical, and USACE should find an appropriate contractor to develop models of total aquatic ecosystem responses to the inputs.

The model is confounded by the fact that the dams obstruct the ability of fishes, including but not limited to diadromous fishes, to move up and down stream. We recommend the model include various options for facilitating fish movement around the dams that can be switched on and off to compare their utility.

H. Benefits and Costs

Finally, USACE should develop benefits and costs models that calculate, over any period of any run, the net benefits of any set of policy inputs for the following:

- 1. Lake Levels (in dollars for recreation, real estate values, commercial impacts)**
- 2. Flood Control (in dollars per land-use class and for specific towns, industries, bridges and roads, etc.)**
- 3. Terrestrial Ecosystems (expressed as likelihood of survival for each keystone patch and for each indicator species)**
- 4. Aquatic Ecosystems (expressed as likelihood of meeting management targets for diadromous species and as likelihood of survival for keystone species and habitats)**
- 5. Water Quality (expressed in capacity for water supply, pollution assimilation, and control of salt intrusion)**

6. Power Production (expressed in megawatt hours; expressing this net benefit in dollars will be extraordinarily difficult given the volatile nature of the electricity market)

III. Standards for Data, Models, and Process (through the development of alternatives)

The Nature Conservancy recommends that all models used in the Kerr Section 216 Study be made available without charge to all the stakeholders who are willing to be trained in their use and, if necessary, to acquire and use supporting commercial software (e.g., Arc View for the Terrestrial Ecosystems Model).

Each model used in the Kerr Section 216 Study should be demonstrated to and reviewed by the stakeholders. The Executive Committee should seek expert advice and then make the final choices about which model to use for each of the items in 11. (above).

All models used in the Kerr Section 216 Study should be open (transparent) models with all processes, look-up variables, weights, etc. accessible to the user. All assumptions should be stated and supported.

All data used in the Kerr Section 216 Study should be made available to the stakeholders. Secondary data (data from previously conducted studies) should be referenced (cited). Any gray literature that is cited should be made available to the stakeholders.

All policy documents used in II.A. should be made available to the stakeholders.

All decisions made in the Kerr Section 216 Study by the Executive Committee should be published to the stakeholders.