

September 30, 2005
Rev 0

DOMINION VIRGINIA POWER / NORTH CAROLINA
POWER

BYPASSED REACH BIOLOGICAL MONITORING
PLAN

LICENSE ARTICLE 413

FERC PROJECT NUMBER 2009

September 2005

Roanoke Rapids and Gaston Hydropower Project
FERC No. 2009

Biological Monitoring Plan for Roanoke Rapids Bypass Reach

Article 413

September 30, 2005

Sections 1-3 - Anadromous Fish Spawning

Dominion will fund the anadromous fish studies, not to exceed \$30,000 per survey, plus one-third of costs exceeding \$30,000 if matched by other entities.

With the approval of the Diadromous Fish Restoration Technical Advisory Committee and the Cooperative Management Team for bypass studies, in 2005 Dominion initiated funding a two-year study of means to monitor adult anadromous fishes and the spawning of anadromous fishes in the bypass, and the movement of anadromous fishes into the bypass relative to movement into the Roanoke Rapids Power Station tailrace and farther downstream (Attachment 1). The study is being conducted by researchers at North Carolina State University with the eventual goals of providing information that can be used to design a long-term monitoring program applicable to the anadromous fish spawning flows required by Article 407 of the project license, and to help define anadromous fish spawning success criteria. Following completion of the two-year study, a monitoring program that can be used to gauge spawning success in different years will be developed. With experience and repeated sampling, results of the monitoring program will be used to determine how to best optimize anadromous fish spawning flows while recognizing the impact of lost generation.

Section 4 - Species Composition and Relative Abundance of Resident Fish and Mollusks

Resident Fish

Dominion will fund the resident fish studies, not to exceed \$20,000 per survey, plus one-third of costs exceeding \$20,000 if matched by other entities.

The biological monitoring approach suggested in this plan is adapted from Moyle et al. (1998) and the result of discussions with natural resource agencies. Sampling of fishes will be conducted during the summer (June - August) of each sampling year. The first sampling will occur in summer of 2006, and thereafter sampling will occur at five year intervals. All sampling will be conducted during periods of base flow (minimum flow of 325 cfs). Temperature and oxygen will be measured and recorded at each sampling site during all surveys. Results of the monitoring program will be used to track the long-term recolonization of the bypass by riverine fish, and provide information that may be used to help optimize fishery management strategies.

Sampling of the bypass fish assemblage will make use of backpack electrofishing because the equipment is portable and suited to a variety of habitat types prevalent in the bypass reach. In cooperation with the NCWRC and other interested parties, four channels will be identified for sampling by viewing aerial videography of the bypass reach obtained in February 2005. Each channel used for sampling will possess at least two complete riffle-pool sequences. The total stream length of each channel to be sampled will be determined from average channel width as recommended by Lyons (1992) or Angermeier and Smogor (1995). Based on the fish fauna expected to be present in the bypass and for consistency for North Carolina's Index of Biotic Integrity sampling, 1/8 " mesh dip nets will be used. Sampling time in seconds will be recorded for all electrofishing runs.

Three levels of fish health will be addressed through the summer sampling; individual, population, and community.

Individual – Collected fish will be identified to species, and appropriate length and mass measures recorded. Deformities, lesions, or other obvious health problems

will be recorded when encountered. Relative weight of select target species will be examined as the primary indicator of individual health. Target species proposed are redbreast sunfish *Lepomis auritus*, bluegill *L. macrochirus*, largemouth bass *Micropterus salmoides*, and channel catfish *Ictalurus punctatus*.

Population - Evidence of self-sustaining, viable populations will be sought by examining stock structures and distributions of abundant species. A reproducing, viable population should exhibit multiple year classes with all life stages well distributed throughout the bypass.

Community –Measures such as species richness, species abundance rankings, and how well different functional guilds (trophic or morphometric) are represented will be used to assess community functionality.

Data will be compiled and analyzed each survey year. Trends in individual, population, and community indices will be examined with each successive survey.

Mollusks

Dominion will fund the mussel studies, not to exceed \$10,000 per survey, plus one-third of costs exceeding \$10,000 if matched by other entities.

A survey of mussels inhabiting the bypass will be conducted in 2007, and repeated on a 7-year cycle thereafter. Methods will be developed by the Cooperative Management Team, but likely be similar to those employed by the North Carolina Wildlife Resources Commission during 2004 in a baseline survey of mussels, crayfish and snails in the bypass reach (Attachment 2). In brief, mussels were located by visual and tactile means by groups of trained biologists surveying different channels within the bypass. GPS coordinates were obtained at regular intervals to track each groups course. Live mussels were preserved in 95% ethyl alcohol. Shells that were collected were cleaned and kept separate from preserved specimens. Identification was performed in the laboratory with assistance from regional experts. Results of future surveys will be used to track the long-term recolonization of the bypass by mollusks, and provide information that may be used to help optimize mollusk management strategies.

Literature Cited

Angermeier, P.L., and R.A. Smogor. 1995. Estimating number of species and relative abundances in stream-fish communities: effects of sampling effort and discontinuous spatial distributions. *Canadian Journal of Fisheries and Aquatic Sciences* 52: 936-949.

Lyons, J. 1992. The length of stream to sample with a towed electrofishing unit when fish species richness is estimated. *North American Journal of Fisheries Management* 12: 198-203.

Moyle, P.B., M.P. Marchetti, J. Baldrige, and T.L. Taylor. 1998. Fish health and diversity: justifying flows for a California stream. *Fisheries* 23(7):6-15.

Section 5 - Schedule for Implementation

See Attachment 3.

Section 6 – Consultation

This plan was developed in consultation with the Diadromous Fish Restoration Technical Advisory Committee and the Cooperative Management Team for bypass studies. Minutes from the meetings are included as Appendix 1.

ATTACHMENT 1

PROPOSAL TO SAMPLE ANADROMOUS FISH WITHIN THE BYPASS

Relative abundance of migratory fishes within a restored braided-channel habitat and within the tailrace below the Roanoke Rapids Dam

Background - One of the provisions of the FERC license for the Roanoke Rapids and Gaston dams is a requirement to provide continuous flows into the “bypass reach” below the Roanoke Rapids dam (Dominion 2003). This reach was part of the original river channel but was dewatered when a separate tailrace was constructed downstream of the turbines. The license includes requirements for monitoring fish use of this restored habitat, and for determining optimum anadromous fish spawning flows for the bypass reach. One of the unknowns related to fish use of this habitat is whether species will locate and move into the bypass reach, given the substantially higher flows in the tailrace. For that reason, it would be advantageous to conduct sampling within both the tailrace and bypass reach in order to determine which species are present in each area and if spawning occurs within the bypass.

The restored habitat in the bypass reach is considered to be of greatest importance to diadromous fishes including hickory shad and American shad. Those species spawn in springtime (mostly March for hickory shad, April-May for American shad) which would be the period proposed for monitoring.

Methods - Pilot work will need to be done during February to determine the most effective gear(s) for sampling adult fish within the pools and braided channels of the bypass reach. These channels vary considerably in depth, substrate and accessibility. Prior efforts have included use of short gill nets, backpack electrofishers, and seines. Visual surveys have also been conducted (primarily for molluscs). It may also be possible to sample within the channels using trap or hoop nets, which would provide information about direction of movement. Sampling during March-May of 2005 and 2006 will be standardized to the extent possible but may in reality serve as a more thorough pilot study that will guide sampling in subsequent years. The goal of bypass reach sampling will be to estimate species composition and relative abundance of adult fishes.

In addition to estimating relative abundance of adults, it will also be important to determine which species are spawning and under what conditions (e.g. discharge, temperatures, current velocities). Pilot work will need to be done during February to determine suitable (and accessible) sites for sampling with plankton nets and spawning mats for collecting adhesive eggs. Plankton net sampling during March-May of 2005 and 2006 will be standardized to the extent possible. As in the adult sampling, results from the first two field seasons can be viewed as a pilot study for the longer term monitoring. Egg and larval densities should be useful for mapping the temporal and spatial extent of spawning and determining densities of eggs and larvae for key anadromous species (e.g. Burdick and Hightower 2004). Plankton sampling would be conducted at least 3 days per week during March-May of 2005 and 2006 at a minimum of four sites.

One key issue to be considered during the 2005-2006 bypass reach sampling is whether the field methods will be suitable at higher discharge levels. The new FERC license includes a schedule for evaluating different levels of discharge into the bypass reach (Dominion 2003, Appendix B, Technical Settlement, Article FL1). In years 1-2, the discharge level during the anadromous season (assumed here to be March-May) will be 325 cfs except for scheduled 24-hour releases of 500 cfs (to mimic natural freshets). Seventeen 24-hour freshets per year will be scheduled during years 1-2. In years 3-5, the discharge level increases to 500 cfs for 30 days during the anadromous season, with the same number of annual freshet days. In the second study cycle (up to five years, beginning in year 6), the discharge level

will be held at 500 cfs for 90 days during the anadromous season, with 13 freshet days. It will be important for the sampling methods developed in years 1-2 to remain effective at higher flows. Therefore, it is proposed that the Cooperative Management Team (CMT) consider aggregating freshet days to allow for a block of continuous flow at 500 cfs (e.g. five days at 500 cfs, using freshet days from November-March). This proposed block of 500 cfs discharge could be scheduled for late March of years 1-2.

Information on the relative abundance of adult fishes within the tailrace will be obtained through operation of a fishwheel. This sampling gear was operated for three spring field seasons (2000-2002) in the Scotland Neck area. It will be deployed (by Dominion or contracted personnel) prior to March 2005, and checked daily by the NCSU field crew during March-May of 2005 and 2006. All captured fish will be identified to species and counted. If catches are large, at least 200 individuals per species per day will be measured prior to release. Physical habitat variables to be recorded will include depth at each of the four corners of the fishwheel platform, water temperature, current velocity at the front of the platform, Secchi disk depth (a measure of water clarity), and the time required for three revolutions of the baskets (used to calculate RPMs). These variables can affect fishwheel catch (Hewitt and Hightower 2004), so correlation analyses will be done to assess fishwheel performance under different environmental conditions. The timing of fishwheel catches can also be compared to results from an ongoing hydroacoustics survey, in order to examine the timing of migration into different sections of the river. Fishwheel catches would not be directly comparable to samples of adult fish from the bypass reach, but are expected to provide useful information about species presence and movement in the tailrace.

Schedule

Field work will be conducted in March-May of 2005 and 2006. A draft annual report will be prepared by December 2005 and a draft final report by December 2006. The final report would be completed by June 2007. The reports will contain recommendations regarding survey design, including sample size recommendations (e.g. the level of sampling needed to achieve a coefficient of variation of 10 or 25% for mean egg density during March).

Budget

The projected total cost for a 2-year project supporting a graduate student is \$74,251. The projected cost by year is \$38,581 and \$35,670. The budget includes \$44,944 for student support (research assistantship for 2 years, plus benefits and tuition) with the remainder of the cost spread between field gear and operating costs such as vehicle and boat use. The cost also includes a three-month housing allowance for each field season to allow the field crew to be located in the Roanoke Rapids area. The budget does not include any funding for rebuilding the fishwheel or repairing it while in operation, which will be the responsibility of Dominion.

References

- Burdick, S. M., and J. E. Hightower. 2004. Distribution of spawning activity by migratory fishes in the upper Neuse River drainage. Annual Report to U. S. Fish and Wildlife Service. North Carolina Cooperative Fish and Wildlife Research Unit, NC State University, Raleigh.
- Dominion. 2003. Comprehensive relicensing settlement agreement for the Roanoke Rapids and Gaston Dam Project, FERC Project No. P-2009. Glen Allen, Virginia.

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Hewitt, D. A., and J. E. Hightower. 2004. Use of fishwheels for sampling anadromous fishes in southeastern coastal rivers. Final report to the U. S. Fish and Wildlife Service and Dominion Generation. North Carolina Cooperative Fish and Wildlife Research Unit, NC State University, Raleigh.

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ATTACHMENT 2

**Aquatic Nongame Survey of the Roanoke Rapids Bypass Reach, Roanoke
River, North Carolina**

Final Report

Aquatic Nongame Program

State Wildlife Grants

Period Covered: June 2004

by

Angeline J. Rodgers and Nolan P. Banish

North Carolina Wildlife Resources Commission
Division of Inland Fisheries

Raleigh, North Carolina

March 2005

Abstract

Previously free flowing, the Roanoke River was impounded in the last century to control flooding. Constructed in 1963, the Roanoke Rapids dam altered flow of the Roanoke River. The original river channel, or bypass reach, was de-watered after dam construction, but has recently received water releases as part of a Federal Energy Regulatory Commission (FERC) re-licensing process. Few data exist on the aquatic nongame species in the bypass reach. We completed a survey of freshwater mussels, crayfish, and snails in the bypass reach on 9 June 2004 to obtain baseline data on species' presence and abundance. We used visual (i.e., snorkeling and batiscope) and tactile methods to sample aquatic nongame fauna. All freshwater mussels, crayfish, and a representative sample of snails encountered during our survey were collected. We documented nine freshwater mussel species, five snail species, two crayfish species, and an exotic clam from the bypass reach. Only three individual live native mussels (15%) were collected from the portion of the bypass reach located above the hydrological influence of the mainstem Roanoke River. The majority of mussel species collected were located in backwaters of the mainstem Roanoke River in the lower bypass reach near the NC 48 Bridge. The presence of aquatic fauna coupled with continual water flow suggests the potential for recolonization of aquatic nongame species to the bypass from downstream reaches.

Introduction

The Roanoke River traces its source to tributary streams draining western Virginia and North Carolina. The mainstem Roanoke River enters North Carolina via Kerr Reservoir and, subsequently, Lake Gaston and Roanoke Rapids Lake before emptying into Albemarle Sound (NC DENR 2000). The Roanoke River flowed largely uninterrupted until the late nineteenth and early twentieth centuries when several diversion dams were created near Roanoke Rapids, NC, to alter river flows (Hightower et al. 1996; Bob Graham, *personal communication*). Although the specific date of construction is unknown, an 18-ha reservoir was created at the site presently occupied by the Roanoke Rapids dam (Hightower et al. 1996 and references therein). A large flood in 1940 inundated many homes and businesses in the coastal plain, which further stimulated interest in controlling water flow to downstream areas (Bass 1999). Hence, Kerr dam was created by the U.S. Army Corps of Engineers in 1953 followed by Gaston and Roanoke Rapids dams in 1955 and 1963, respectively (Bass 1999).

Construction of Roanoke Rapids dam, a Dominion North Carolina Power project, included crafting a narrow, deeply incised channel adjacent to the mainstem of the Roanoke River near Roanoke Rapids, NC. Flow from the Roanoke River was diverted into this newly created tailrace, bypassing the original river channel. The dam prevented water flow into the original river channel (hereafter, bypass reach) most of the time. Releases from occasional high precipitation events or test releases from the dam were the only times water was provided to the bypass reach. Today, however, water is being released continuously by Dominion into the bypass reach at a rate of 9.20-m³/s as part of the Federal Energy Regulatory Commission (FERC) re-licensing process. The settlement agreement (FERC 2005) states that mollusks will be monitored at seven to ten year intervals to document possible recolonization of the bypass reach; however baseline data on the current status of mollusks were needed to provide a basis for comparisons with future monitoring efforts.

Water releases from Roanoke Rapids dam into the bypass reach enter an intricate network of braided channels. In several areas, numerous channels converge to form large, pool habitats. The network of braiding continues downstream to a well-defined gradient break, where channels converge with, and functionally become part of, the backwaters of the mainstem Roanoke River near the NC 48 Bridge.

Previous investigations by the North Carolina Wildlife Resources Commission (NCWRC) have revealed a variety of mussel, crayfish, and snail species inhabiting the Roanoke River downstream of Roanoke Rapids. However, most of these surveys were completed at or downstream of Interstate 95 along the Northhampton/Halifax county line. The only two documented NCWRC surveys near the bypass reach occurred at the NC 48 Bridge on 5 July 1983 and 18 July 1991. These investigations revealed the presence of two common mussel species, *Elliptio complanata* and *E. icterina*, as well as a state threatened mussel, *Anodonta implicata*, and the exotic Asian clam, *Corbicula fluminea*.

Despite the information gathered in these previous surveys there was little information on the aquatic nongame species within the bypass reach, particularly the crayfish and snail assemblage. The purpose of this study was to assess presence and abundance of mussel, crayfish, and snail species within the bypass reach.

Methods

We conducted the survey of the Roanoke Rapids bypass reach (Figure 1) on 9 June 2004. All sampling was completed between 1045 and 1730 h to maximize underwater visibility. Sampling began at the upstream portion of the bypass reach adjacent to the base of Roanoke Rapids dam (36.4813° N, 77.6715° W) and proceeded in a downstream direction. The bypass reach exhibits extensive channel braiding, so we chose to survey several different channels in an effort to obtain a more complete sample. Our survey team was split into four groups (i.e., three groups of three people and one group of two people) and each sampled separate channels within the bypass reach (Figure 2). We used visual (i.e., snorkeling and batiscope) and tactile methods to collect nongame species observed during our survey. Organisms were picked up as encountered by each team member while moving downstream. All live native mussels and their shell material were placed in mesh dive bags to prevent desiccation. All crayfish and a representative sample of snails were collected and placed in plastic sample jars containing river water. At regular intervals, we gathered GPS coordinates to delineate paths of travel in the bypass reach. All sampling terminated once we reached the NC 48 Bridge (36.4842° N, 77.6487° W). We report the data as the number of species and individuals collected within the distance traveled and sampling time spent surveying summed over all survey participants.

We preserved all live mussels, crayfish, and snails in 95% ethyl alcohol. Mussel and snail shells were cleaned and kept separate from preserved collections. Samples were later counted and identified to the lowest possible taxonomic level. Mussel and snail identifications were verified by Dr. Arthur Bogan, curator of aquatic invertebrates at the North Carolina Museum of Natural Sciences. Dr. John Cooper, curator of crustaceans at the North Carolina Museum of Natural Sciences, identified crayfish specimens.

Results

Eleven people spent a total of 62.25 man-hours surveying as they walked a combined 18,916 linear meters in four separate channels of the bypass reach (Figure 2). We found nine different species of mussels present in the bypass reach, including several listed as state threatened or endangered (Table 1). The bypass reach above the gradient break appeared mostly depauperate of native mussels. Only three live mussels (two *Elliptio* spp. and one *Utterbackia imbecillis*) and six relic shells (five *Elliptio* spp. and one *U. imbecillis*) comprising 15% and 8% of the total number of live individuals and relic shell material, respectively, were found above the gradient break. The exotic Asian clam *C. fluminea* was encountered throughout the course of the survey. A representative sample of preserved freshwater mussels and shell material (including two shells of *C. fluminea*) were donated to the North Carolina Museum of Natural Sciences reference collection.

Two species of crayfish, *Procambarus acutus* and *Orconectes virginienis*, were collected from the bypass reach (Table 2). *O. virginienis*, a State species of special concern, is uncommon in the Roanoke and Meherrin-Chowan basins (J. Cooper, *personal communication*). Preserved crayfish were donated to the North Carolina Museum of Natural Sciences reference collection.

We collected five species of snails from the bypass reach: *Pseudosuccinea columella*, *Physella* spp., *Planorbella trivolvis*, *Sphaerium* spp., and *Campeloma limum*. We did not perform a count of each species of snails gathered during our survey. However, a representative sample of preserved snails and shell material was donated to the North Carolina Museum of Natural Sciences reference collection.

Discussion

Our survey was the first investigation of aquatic nongame species within the Roanoke Rapids bypass reach. Results of our survey corroborate those of previous surveys documenting the presence of *E. complanata*, *E. icterina*, *A. implicata*, and *C. fluminea* near the NC 48 Bridge. We collected six additional mussel species upstream of the NC

48 Bridge. Due to the habitat complexity of the bypass reach, it is possible that we did not detect all mussel species present. For instance, during a pre-survey scouting trip, we found *Pyganodon cataracta* (Eastern floater) shell material near the base of the dam (authors, *personal observation*), which was not encountered during our survey. Consequently, the possibility exists that other mussels, including *E. roanokensis*, a State threatened species whose type locality is from the Roanoke River (Bogan 2002), inhabit the bypass reach.

Most of the live mussels and shell material we encountered were found in close proximity to the NC 48 Bridge. We found only shell material of some mussel species, including *A. implicata*, *E. icterina*, *Lampsilis cariosa*, *L. radiata*, and *Leptodea ochracea*. These shells were encountered in backwater areas in close proximity to the NC 48 Bridge, suggesting these species currently exist in the main channel of the Roanoke River. During our survey, we noted a gradient change toward the downstream portion of the bypass reach. In this area, the braided channels ceased and converged into large pool areas (see Figure 1). This section of the bypass reach appeared to have high connectivity to the main channel of the Roanoke River and may have existed as a backwater of the Roanoke River. Hence, this area was likely unaffected by historic dewatering of the bypass reach, which suggests aquatic fauna present here would be species typical of the main channel Roanoke River. Species encountered in this area may be able to recolonize the bypass reach with continual water releases from Roanoke Rapids dam. Conversely, the near absence of native mussels from our sample above the gradient break relative to below the gradient break suggests that the old flow regime within the bypass reach was detrimental to those species.

Unlike most mussels collected during our survey, crayfish and snails were encountered throughout the entire Roanoke River bypass reach. Although not collected during our survey, *Cambarus (Lacunicambarus) diogenes* (devil crayfish) previously had been found during NCWRC surveys of the Roanoke River Wetlands near Williamston. Additionally, several snail species not collected in our survey were recorded from previous NCWRC surveys including: *Hydrobiidae spp.*, *Micromentetus dilatatus*, *Musculium partumeium*, *Pisidium casertanum*, *Planorbula armigera*, and *Promenetus exacuus*. NCWRC recorded these species from the Batchelor Bay Game Land and, therefore, may not be representative of the snail assemblage within the Roanoke Rapids bypass reach. However, we cannot discount the possibility that these species exist within the bypass reach, but were not encountered during our survey.

Recommendations

We recommend continual monitoring of the Roanoke Rapids bypass reach every five to seven years. In doing so, it may be possible to document recolonization of the bypass reach by mussels, crayfish, and snails. Additionally, monitoring of this area may allow us to document the presence of other species not collected during this survey. Of particular interest will be determining the distribution of and rate at which mussels recolonize. For instance, certain fish hosts may be able to access the entire bypass reach with additional flows, which may allow some mussels to recolonize faster and over a broader range than others. Establishing sampling transects and mapping where we encounter each mussel within the bypass may enable us to document trends in spatial and temporal recolonization.

Acknowledgments

We thank, S. Fraley, R. Heise, L. Lawson, J. Meador, R. Nichols, and S. Van Horn of the North Carolina Wildlife Resources Commission for survey assistance. J. Mays of the North Carolina Department of Transportation and S. Burdick of North Carolina State University also assisted with the survey. A. Bogan and J. Cooper of the North Carolina Museum of Natural Sciences helped with mollusk and crayfish identification, respectively.

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Hightower, J. E., A. M. Wicker, and K. M. Endres. 1996. Historical trends in abundance of American shad and river herring in Albemarle Sound, North Carolina. North American Journal of Fisheries Management 16: 257-271.

NCDENR. 2000. Division of Water Quality, Basinwide Assessment Report, Roanoke River Basin.

Table 1. Species list, quantity of live and relic individuals, and conservation status of freshwater mussel species encountered during the aquatic nongame survey of the Roanoke Rapids bypass reach on 9 June 2004. *Elliptio complanata* (group) includes several different morphological forms.

Mussel Species	Live	Shell	Status*
<i>Anodonta implicata</i> (Alewife floater)	0	12	ST
<i>Elliptio complanata</i> group (Eastern elliptio)	11	22	Stable
<i>Elliptio emmonsi</i> (n/a)	6	11	Stable
<i>Elliptio icterina</i> (Variable spike)	0	2	Stable
<i>Lampsilis cariosa</i> (Yellow lampmussel)	0	3	SE
<i>Lampsilis radiata</i> (Eastern lampmussel)	0	10	ST
<i>Leptodea ochracea</i> (Tidewater mucket)	0	2	ST
<i>Ligumia nasuta</i> (Eastern pondmussel)	2	3	ST
<i>Utterbackia imbecillis</i> (Paper pondshell)	<u>1</u>	<u>10</u>	Stable
<i>Total</i>	20	75	

*ST=State Threatened, SE=State Endangered, Stable=currently stable (Bogan 2002)

Table 2. Quantity, sex, and conservation status of crayfish species encountered during the aquatic nongame survey of the Roanoke Rapids bypass reach on 9 June 2004.

Crayfish Species	Sex *	Live	Status **
<i>Procambarus (Ortmannicus) acutus</i> (White river crayfish)	Male I	2	Stable
	Male II	1	
	Female	3	
<i>Orconectes (Crockerinus) virginianus</i> (Chowanoke crayfish)	Male I	0	SC
	Male II	1	
	Female	<u>2</u>	
<i>Total</i>		9	

* Male I=First Form Male, Male II=Second Form Male

**SC=Special Concern, Stable=currently stable (J. Cooper, *personal communication*)

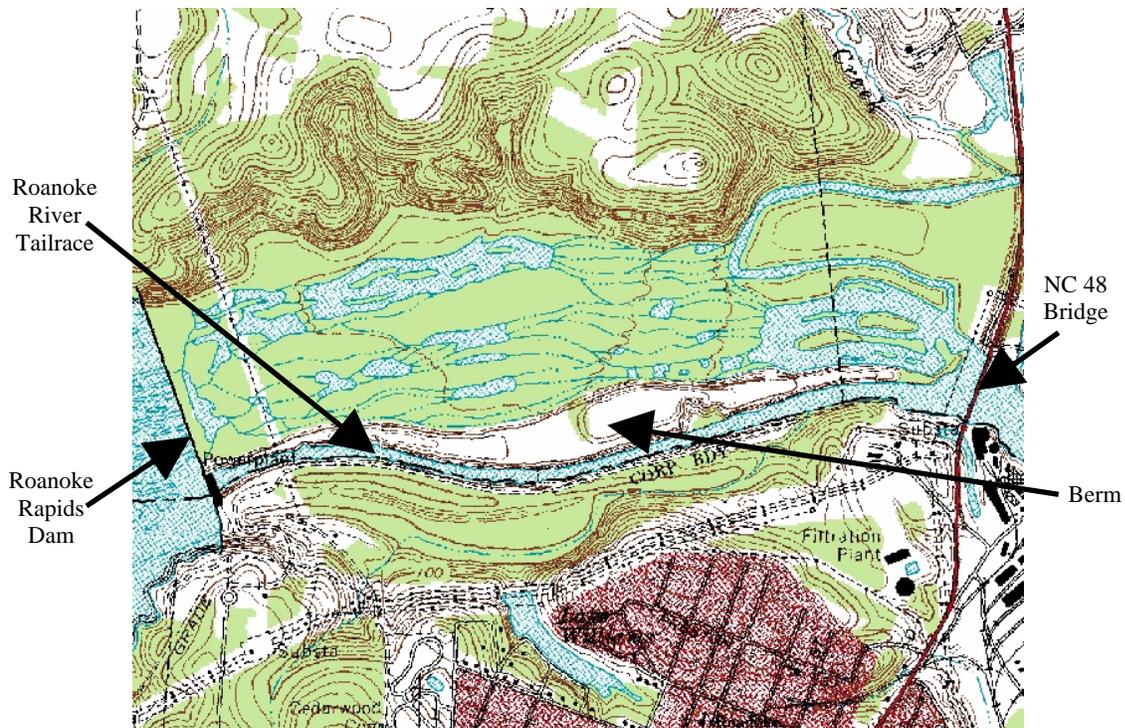


Figure 1. Location of the Roanoke Rapids bypass reach between Roanoke Rapids Dam and the NC 48 Bridge sampled 9 June 2004.

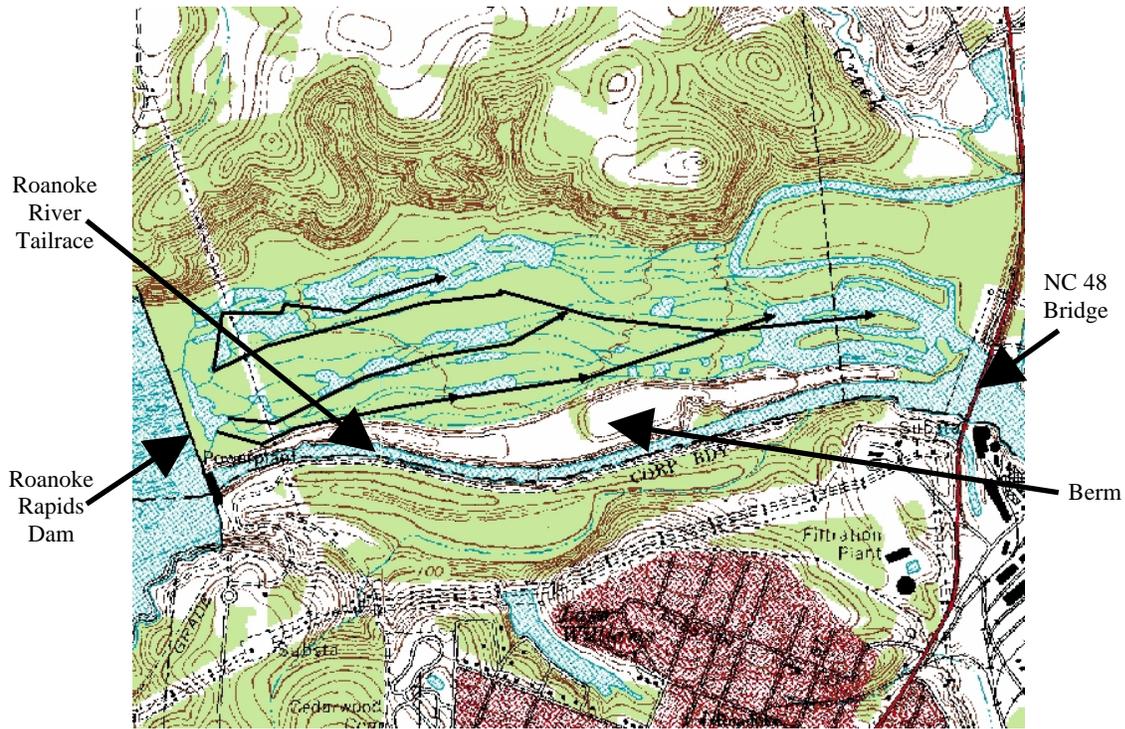


Figure 2. Locations of the four survey paths traversed through the Roanoke Rapids bypass reach between Roanoke Rapids Dam and the NC 48 Bridge sampled 9 June 2004.

ATTACHMENT 3

FERC Project No. 2009-018
Virginia Electric and Power Company, dba
Dominion Virginia Power/Dominion North Carolina Power

¹ of the monitoring provisions
² with the Commission

License Article 413. *Bypass Reach Biological Monitoring Plan*
(5) Schedule for
Implementation

<u>Study</u>	<u>Implementation¹</u>	<u>Filing²</u>
Anadromous Fish Monitoring	Annually - 2005-2044. Baseline flows during 2005-2006; 500 cfs for 30 days during 2007-2009; 500 cfs for 90 days during 2010-2014 or as modified by mutual agreement of the Cooperative Management Team; 750 cfs for 90 days during 2015-2019 if determined necessary by the CMT; 1,000 cfs for 90 days during 2020-2024 if determined necessary by the CMT. Determination of final flow plan to be determined by the CMT.	June 30, 2007 for 2005-2006 studies; June 30, 2010 for 2007-2009 studies; June 30, 2015 for 2010-2014 studies; June 30, 2020 for 2015-2019 studies; June 30, 2025 for 2020-2024 studies. Final flow plan filing date to be determined by the CMT.
Resident Fish Monitoring	At 5-year intervals - 2006, 2011, 2016, 2021, 2026, 2031, 2036, 2041.	June 30, 2007 for 2006 studies; June 30, 2012 for 2011 studies; June 30, 2017 for 2016 studies; June 30, 2022 for 2021 studies; June 30, 2027 for 2026 studies; June 30, 2032 for 2031 studies; June 30, 2037 for 2036 studies; June 30, 2042 for 2041 studies.
Mussel Monitoring	At 7-year intervals - 2007, 2014, 2021, 2028, 2035, 2042.	June 30, 2008 for 2007 studies; June 30, 2015 for 2014 studies; June 30, 2022 for 2021 studies; June 30, 2029 for 2028 studies; June 30, 2036 for 2035 studies; June 30, 2043 for 2042 studies.

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Biological Monitoring Plan for Roanoke Rapids Bypass Reach

APPENDIX 1
CONSULTATION

E-mail approval of plan received from NMFS

"Prescott Brownell"
<press_brownell@hotmail.com>

09/13/2005 09:01 AM
Please respond to
press_brownell

To: <Bob_Graham@dom.com>

cc:

Subject: Bypass Reach Monitoring Plan 9/9/05 draft

Hello Bob,
I do not have any further comments on the September 9 draft plan.

Regards
P Brownell

E-mail approval of plan received from NCWRC

"Nolan Banish"
<nolan.banish@earthlink.net>

09/12/2005 08:33 AM

To: <Bob_Graham@dom.com>

cc:

Subject: RE: revised Roanoke Rapids bypass monitoring plan

Bob-
I had a chance to review the resident fish and mollusk portion of the monitoring plan this morning. Looks good to me. Thanks for passing that along.

Nolan Banish
North Carolina Wildlife Resources Commission
Eastern Aquatic Nongame Biologist
1212 Norris Street
Raleigh, NC 27604

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DFRTAC and FL1 Cooperative Management Team Meeting

Dominion Generation Power Station, Roanoke Rapids, NC
March 15, 2004

Present: Jim Thornton (Dominion), Bob Graham (Dominion), John Ellis (USFWS-ES), Wilson Laney (USFWS-Fisheries), Kent Nelson (NCWRC), Wayne Jones (NCWRC), Pete Kornegay (NCWRC), John Olney (College of William and Mary, VIMS, Gloucester Point, VA), Joe Hightower (USGS, NCSU), Roger Rulifson (ECU), Angie Rodgers (NCWRC), Prescott Brownell (NOAA Fisheries, via telephone), Bud LaRoche (VDGIF), Nolan Banish (NCWRC), Jim Mead (NCDWR).

10:07 AM–Bob Graham convened the meeting. Bud dialed Prescott’s number and got him on the line. We did introductions for the benefit of Prescott.

Bob indicated that he had sent out a draft agenda, and proposed that we discuss the anadromous considerations first, so those who needed to could leave early.

Bob called our attention to item number 5, lunch and asked how many wanted to order pizza. He counted about 10 folks who wanted pizza.

10:11 AM–Jim updated us on the license status. He noted that Dominion has worked out their concerns with regard to bald eagle, and FWS, and the NOAA Fisheries modified prescription, which Pres explained is a final document. He noted it could be modified in the future, should additional information be forthcoming. Jim noted that the issues they discussed regarded some text they thought might be in conflict with the settlement agreement. Prescott noted that NOAA Fisheries understanding is their document does not conflict with the settlement agreement. Jim noted that there still was no word from the Tuscarora Nation. FERC has indicated to Jim that they will be contacting BIA if they don’t hear anything soon.

10:15 AM–Angie and Nolan joined the group and were introduced to Pres. Nolan has been with the WRC only two weeks.

There was some discussion of Wilson’s thoroughness in taking notes. Suggestions were made that he refrain from capturing some discussion of lesser import, such as the herring-pickling discussions at the last meeting.

We had a brief discussion of the availability of techniques videos and/or instructions for filleting American shad. Wilson had seen the videos of the techniques used by the guides at Santee-Cooper, on Franc White’s Southern Sportsman television show. Bob Graham suggested that the woofish.com web site might have some information. Pete noted that some of the restaurants around Raleigh had employees who knew how to filet shad. John Olney noted that there is a moratorium on shad in Virginia. Kent and Roger noted that other techniques entailed cooking the shad for long periods of time.

Bob noted that everyone appeared to be pleased with the minutes. Pete noted that he had requested comments by a certain deadline, and would finalize them after that date.

Bob noted that Wilson had, at the team’s request, invited Drs. Hightower, Olney and Rulifson to participate in our discussion of approaches for sampling the bypass reach. He expressed appreciation for showing up today. He noted that not everyone had seen the bypass reach, and provided some digital images of the reach for those who haven’t been in the reach. Bob briefly reviewed some statistics on the reach. It is about 7,800 feet in length. It is located on the fall zone. Much of the reach (6,500 feet) has generally been dewatered, although there is some dam seepage and groundwater upwelling. Periodic flood flows during flood releases did result in use by anadromous fish, and subsequent stranding. These events resulted in the development of a ramp-down process which has largely rectified

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the stranding problems. Pete explained the ramping process, as well as the flow releases negotiated as part of the settlement agreement. There are existing wetlands and some resident fishes in the reach.

Pete explained what our goal and objectives are for the bypass reach anadromous flows. He noted we have to consider economics, as well as biology. We want to know what the best flows are for anadromous fish spawning.

Kent asked if we were going to augment spring flows to 500 cfs in year one, or stay at 325. Jim and Bob indicated that we would stay at 325 cfs for the first two years, to get baseline data, then ramp up to 500 cfs for the next three years, for 30-day periods.

Bob continued with his presentation to our Technical Advisory Committee guests (Hightower, Olney and Rulifson). Bob presented a detailed description and map of the bypass reach and stressed the hazards associated with working there. Bob noted the potholes downstream of the dam. Bob noted that further downstream, the bypass was a mix of wetlands and channels. Bob noted there would undoubtedly change in the vegetation over time as the area is rehydrated. We noted that we had sampled the pools below the dam, following flood flow events, to qualitatively sample fish stranded in the pools. We noted that a helicopter rescue of striped bass had been conducted in 1993. Bob noted that IFIM data had been collected in the bypass reach as well. Joe asked that Bob point out on the bypass reach map where the IFIM transects were located. Jim noted they had sited the downstream transect to stay out of the backwater areas. Jim noted there are roughly up to 12 braided channels across each of the four transects. Pete indicated there may be as many as 20 channels in some areas. Pete noted he has data from some of the work done in 1998. Jim noted that there were some deeper channels close to the depth of chest waders.

John Olney asked for a thumbnail historical sketch of the background. John noted that he understood industry didn't want to give up water, and asked what their motivation was to provide water. Jim noted the people in this room were responsible, and Pete noted the company was motivated by a desire for a new license. Pete and Jim described the flow regime, base flow and freshets, as well as test flows for the anadromous spawning period. This committee is to design the studies.

John asked about the target species. He thought striped bass for sure, but didn't see the habitat as American shad habitat. Wilson noted we were interested in the whole suite of species. Pete noted that there is good habitat for American shad in the reach. Roger and Pete agreed it was a hazardous, shin-busting place to work.

Prescott suggested that the extension to the PHABSIM analytical techniques would be appropriate for application in the bypass reach. Using this would allow us to really analyze microhabitat changes. It is called MESOHABSIM. You can also establish one-meter grids as well, and establish a baseline fish community as a target. Prescott thought we should consider using that as an extension of the work already done.

Bob projected Table FL1-2 on the screen. He noted that it is here where we really get in to evaluating how to assess differences in use between the various flow regimes. He reviewed the flow regime in detail for the technical advisors. Bob reviewed each of the cycles, one through four. He noted the period of consideration would be March 15 through June 15. There is no firm commitment on when the 30 and 90-day flows would be provided within that window.

Bob indicated that hickory shad, and river herrings we believed would use the area. American shad and striped bass use is less certain. Wilson noted that Atlantic sturgeon are present in the system, and age 0 and 1 fish are taken downstream in Albemarle Sound, but we are uncertain as to where they might be spawning.

Pete indicated that the spawning window should start on March 15, with a sliding scale dependant on temperature. Bob noted that mid-March was usually when the hickory shad appeared.

Pete voiced the bottom-line question. We have to come up with a sampling scheme that will allow us to evaluate these flows. Factors to consider are the relative numbers of adults entering the reach, at varying flows. Annual variability from year to year. Issues associated with eggs and larvae emanating from the reach is an issue as well. Pete noted we would like assistance in dealing with how to best sample the reach. Kent noted down the road, we

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would have to decide whether there was any benefit of 1,000 cfs, relative to 750 cfs. There will have to be a hard-line comparison down the road, at which point a decision will be made to provide some.

John Olney suggested we would have some comparison problems, unless we divided the area into zones of comparison.

11:00 AM—Prescott was cut off the line and we had to call him back.

Wilson summarized what he felt the essential issues are: to sample the use of the bypass reach in a statistically reliable manner, giving us the best precision possible, at the lowest cost. We need to tie the ultimate decision to the data.

Roger Rulifson suggested a hierarchical approach. Are fish present, or not? Did they spawn or not? Once they are successful in spawning, then we have to decide where to measure. He had noted that we could have larval output, with no survival downstream. He noted that variable flows could alter the survival. He indicated that we might want to shift our measure to the DMF JAI surveys, and assess any change in those measurements. He noted that ultimately, we could look at the adults.

Pete felt that once the larvae are offsite, there are so many variables involved that he questioned our ability to establish a link between putting water here, and the impact on the population. He noted that right now, there is no habitat. If we put water there, they will come and use it. His idea is that we have to determine the level of activity in the bypass reach. John Ellis noted that putting water there is not only to improve the stock, but also serves as mitigation for taking the water out. Wayne Jones indicated that he agreed with both sets of comments. He wondered how you can tell that you are increasing the actual amount of fish spawning, and not just redistributing fish from the tailrace to the bypass reach.

John Olney asked how much habitat there is in the bypass reach. John noted that in the Chesapeake Bay, theyJohn noted that the numbers of acres was relatively small, so we would be trying to measure something that wasn't very large anyway.

Pete agreed it was a small amount of habitat, but he and Kent noted that this was a large percentage of this type of habitat left in the river. Wilson noted that a rough estimate was 183.7 acres, which included all the islands as well.

Bob noted from their perspective, a key element was how their flow could be optimized. Bob noted the funding constraints from Dominion's point of view was \$30,000 per year. Prescott noted if you used the Susquehanna rule, that amount of habitat would support about 8,900 fish (at the 50 fish/acre rate). Bob asked Joe to describe how this originated. Joe and John Olney noted it came from the estimates of fish in the Connecticut River. Bob asked how you would calculate the run size. It would be for the entire run during a given year. Joe noted that if you consider Albemarle Sound, which gets input from many different systems, any increase from this habitat restoration would be difficult to detect. He felt that focusing on demonstrating the use of the bypass reach was the way to go.

Wilson noted that we had discussed sampling of adults, as well as eggs and larvae, in the bypass reach. We had agreed we could sample....adults, using gill nets, and we had discussed sampling of eggs and larvae, at the downstream end....

John Olney noted that there was another approach we could use, which would be a non-survey assessment of how well the fry survive.

Wayne Jones indicated that he felt that hickory shad would use the reach and spawn, but he was more concerned about the river herring and American shad use of the system.

Jim Thornton indicated that Dominion was more concerned about detecting the difference between 500 and 750, for example. He noted it would require some quantitative technique to measure the difference.

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Wilson noted that he was beginning to sense several objectives on which we should focus. One is adult use, the other is egg/larvae production.....

Prescott suggested that we should look at habitat changes, as well as population changes. He felt that we could get both of those, without spending a whole lot of money.

Roger agreed with Prescott. He noted that the criteria from the HSI models could be used to assess habitat use by bluebacks, alewife and American shad. He suggested that we could measure the percent increase in the perceived important habitats, then look to see if the fish will move in and use those habitats. If the fish use other habitats, then we can quantify what those habitats are. Some of those will change over time, and may require annual assessments. Unfortunately, the flow regime will also change in a couple of years, so the rules will change. That will require reassessment to see how much of the habitat is being used. The presence of adults and eggs will constitute your success measure.

John Olney felt the problem with that was that you are measuring biological changes in a changing system. You really need to make your measurements in a stable system. He suggested that we might want to mow down all the vegetation, initially. He noted the comparison to a clear-cut forest, which regenerates different communities during regeneration. He noted this will be a problem with this iterative approach.

Bob Graham noted that the area is very resilient in terms of vegetation. He noted that the last ten years has produced several very wet and very dry years, and yet the vegetation has stayed fairly stable. It may not be as big a problem as we think, although we are going to have to address it somehow. Bob noted that we also don't know when we will be spilling water during flood flows, up to 15,000 cfs.

Joe Hightower noted that some of the suggestions brought up he had not thought about before. He liked John's suggestion about putting marked larvae in the bypass reach. If you do that in a given year, you have a good starting point from which to make comparisons. Then you can compare the bypass reach to a control site. John felt that you would have an answer within a year then, if you looked at juveniles. Roger thought it was a viable option, but he wasn't sure how viable it would be to release fry in the river. Pete, Wayne, and Wilson all noted that this is the commonly-accepted practice. John noted the approach was appealing to him, because it avoided the vagaries of surveying and monitoring the bypass reach larval production.

Bob Graham felt that we should explore all these ideas. He did find Roger's stepwise approach useful. He liked the idea of determining presence/absence. Pete felt that within a few years, we would be confident that the fish are there and spawning, but would still face the ultimate issue of how to tell the difference. Wilson felt that if we could agree on some protocol, then we could worry about the quantitative issues later. Pete felt that was just deferring the issue once again. Bob agreed with Wilson that there was merit to his suggestion.

John Olney asked how much of a concern was it that fish using the bypass reach were being diverted from some other site. Bob noted that Joe's work had demonstrated that American shad would enter the tailrace and then go back downstream, so they could possibly enter the bypass reach.

Roger asked Joe and the WRC staff if we had a good idea of what habitats the fish are using now. Pete and Kent indicated they knew where the fish are congregating now, but don't have data on spawning condition.

Roger noted it is possible that the habitat we have now is marginal, and the habitat in the bypass reach will be optimal. He was glad that Wayne had brought that issue to the table. Roger suggested we had to determine what the spawning habitat was now, and what would be the case in the future. He felt that could be determined. Jim asked, is that still an issue? He felt it wasn't an issue if 500 fish move from below the 48 bridge, to the bypass reach, but rather whether they spawn more successfully at 500, than 325. Another issue, he felt, is how to differentiate between the success of the transportation program, and the bypass reach restoration.

Wilson believed that we can measure the output of the various sections.

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Jim stressed that they were still more concerned about whether the fish from the bypass reach were going to make a meaningful contribution.

Bob agreed, and noted again that Dominion's contribution was going to be limited to \$30,000 with the presumption that would be matched by other parties.

Pete asked about the merits of using Prescott's suggestion and quantifying the habitat using MESOHABSIM, then going from there. The biological portion may be so complex that we don't arrive at either the accuracy or precision we want.

Roger agreed with Pete. He felt that if we use the HSI models, we wouldn't find the habitat present in the river now, either in the tailrace, or downstream. He felt that if we can demonstrate provision of optimal habitat in the bypass reach, that is a measure of success. Measuring production is certainly doable. Assessing the contribution to the population downstream is more difficult. Roger indicated that to him, if we demonstrate moving fish into more optimal habitat, we have succeeded.

Kent noted that the HSI models were problematic. He felt that the budget is limited, and that it would take a large sum of money to model the bypass reach. He felt the biological output was a better variable on which to focus. With regard to marking fry, he felt our chances of using this as a decision-making criterion would be minimal. He agreed we should look at the habitat to some degree, but focus on the biological sampling. Wilson asked Prescott to comment about updating the American shad HSI model. Prescott noted they have done a PHABSIM modeling effort on the Savannah, and have revised the American shad model. It is being used on the Neuse River as well. They are team revisions and not published revisions. Wilson noted that his point in asking the question was to determine if there was a revised model available. Prescott advised it is available, and has been used in Swift Creek and on the Savannah River.

Pete noted that the complexity of solving the biological side of this equation was daunting, and he wasn't sure that we could differentiate. Wayne noted that he agreed with Kent that any assessment had to be compared with an assessment of the stocks downstream.

Wilson noted that the imminent reauthorization hearings for the Striped Bass Conservation Act could possibly serve as a vehicle for Dominion or other interested parties to recommend to Congress that funding be provided to the federal fishery management agencies for implementation of the settlement agreement.

Bob Graham suggested that we try to cull all the discussed options from Wilson's notes, and try to pursue them as appropriate. Wilson asked, regarding new aerial photography of the bypass reach, if Bob had any additional information on cost. He has a call in to John Crutchfield.

Pete asked Jim Mead to comment on the merits of MESOHABSIM, versus PHABSIM. Jim noted that MESOHABSIM was so new, that its interpretation is somewhat uncertain.

Prescott suggested that we could build on the PHABSIM data we already have. Prescott suggested that we could use the NHAP photography from 1994, stereoscopic coverage, in the beginning. We could then fly the reach at the higher flows and reclassify the habitats as the flow changes. Some of the work could be done by the agencies.

Jim Mead explained his understanding of how MESOHABSIM works. He explained the categories you could use. MESOHABSIM is essentially a color-coded map that shows you the square footage of the habitat types, at each flow, and how the habitat types redistribute themselves. Jim was not sure you could get by with just aerial photography. He noted that Piotr's field crew has GPS instrumentation built into their field sampling gear that allows them to take detailed data on flow, velocity, and so forth.

Bob suggested that we might want to avoid the use of the MESOHABSIM terminology, and just do a less rigorous study, GPS-based, but with cover mapping. Jim noted he was glad that Bob had mentioned that approach. Jim noted that other consultants used a helicopter, with video and GPS running simultaneously, flying at a low altitude.

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Flights are conducted when glare is at a minimum. An initial scan allows qualitative mapping. Pete asked how much this cost. Jim indicated the helicopter alone was a thousand dollars per hour. Data analysis would be added. John Ellis noted that multiple sweeps might be required. Jim noted the consultant who did the work on the Pee Dee was Divine-Tarbell and Associates. Bob thought Dominion couldn't hire them. Jim thought they had hired them for prior projects.

12:07 PM--The group broke for lunch.

12:40 PM--Bob reconvened the group. Jim Mead noted he wanted to discuss the pros and cons of collecting baseline data before the 325 cfs release begins. He noted that decision would be upon us before the other decisions have to be made. Bob asked that we hold that discussion for a while, but agree to discuss it today.

Bob noted we have had a lot of discussion about different approaches to take. He noted the discussion about habitat data needs. He noted that John had suggested some non survey approaches. He suggested we could have some further discussion, and then Bob and Pete could distill the essentials from Wilson's notes. Perhaps they could point out the advantages of different approaches, and then we could assign different folks to explore the merits and/or disadvantages of each.

Pete noted with regard to baseline data, things took a different tack once Angie entered the discussion. She had convinced him that baseline (no flow) data are desirable. Angie noted that she had discussed this with a number of folks, and they all advised that changes would not be instantaneous. She felt that the sampling could be done this summer, to get the baseline data. The data would still be considered baseline. Bob reminded us again that we are going to defer that discussion.

Bob noted again that we had some discussion of approaches. We need to write something up, and help decide where our focus should be. He suggested that if anyone wanted to propose any sampling approaches, that would be beneficial. Joe noted he had felt that quantitative egg and larval sampling, in the main channels, would be desirable. He wasn't sure how to interpret changes in density that might be observed over time. Joe had talked to Bob during the break about changing the flow release design, as opposed to gradually increasing the flows during the entire 20-year time frame. Jim noted Dominion might not be opposed to alternating 325 and 500 cfs flows every other year, or providing more flows in a given year if flows are high. John Olney asked about varying the flow within a year. Bob thought that would be doable. Joe noted that might be difficult to assess, given the temporal nature of anadromous spawning. Joe suggested that placing a weir in channels might allow you to perform comparisons between channels with greater and lesser flows. That would allow you to perform within-year experiments without varying flows. Bob noted that it might be costly to put structures in different channels, but we might be able to provide flows from different outlets, which might accomplish the same purpose. Jim and Bob noted that releasing flow on the south side, might control the amount of flow going to the north side. Jim agreed this might have some possibilities of comparing what was happening in two different channels, with different flows, at the same time.

Bob noted that Joe had asked about moving up the schedule for release of the 1,000 cfs. Bob thought there was little likelihood of moving it up, and Jim concurred. Wilson asked if it might not be possible to release 1,000, during some wetter year. It was a possibility, but flows downstream under such conditions would be confounded by Corps of Engineer flood release.

Wilson thought the idea of trying alternating flows in alternate years, or varying flows in different channels in the same years, would be a good strategy. He felt that might avoid problems inherent in the population changing. Population changes would be minimal, in all likelihood, in two consecutive years, versus over a five-year period.

Roger noted that was true, but that there will be habitat changes associated with the provision of 325 cfs, during the first two to three years. You should try to assess that somehow. Wilson suggested that if we consulted with some botanists, and determined for example that vegetation changes would be complete after three years, that we could run 325 for the first three years, and then alternate flow regimes.

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John Olney thought that a within-year approach would still be better. He noted that this would reduce inter-annual variability. John noted that the American shad spawning season should be long enough to allow for some experimentation. Pete was concerned that alterations would cause confounding changes in fish behavior. Joe suggested that his idea, varying flow in paired channels, changing channels from year-to-year, had merit. You could measure egg and larval production downstream of certain points.

Bob asked that he summarize the issues: successional changes in habitat over time; inter-annual variation in stock size; determined flow release (as distinct from flood flows); water temperature changes within a season; species (are alewife, blueback and hickories our primary concern; he noted that the bypass may provide a refuge for striped bass and American shad juveniles from predation, therefore may be preferred habitat). John Ellis noted that it sounded as though we still were discussing simple use, initially, and then having to do some more refined study.

John Olney asked if we were just brainstorming, and none of us would be thrown from the table for broaching stupid ideas. We all concurred that was correct. He noted this problem provided a wonderful opportunity for studying the validity of habitat use predictions. We could make some predictions, then do the experiments to confirm or reject our hypothesis. He asked if there wasn't some way we could manipulate the habitat in advance in some fashion, perhaps using a bulldozer. Wilson suggested that an Abrams tank with a blade might be a more appropriate piece of heavy equipment. Kent noted again that the changes might not be as dramatic as John is envisioning. John asked Bob what the depth changes would be, between 325 and 1,000 cfs. Bob thought that the change would be only about a foot and a half. Pete noted even this small change would make a difference in terms of pool connectivity. John noted it would make less difference in terms of vegetation. Bob indicated he would try to find the summary statistics for the analysis of the bypass reach data.

Kent noted, with regard to the stock enhancement issue, that sampling downstream as well as in or below the bypass reach. Bob noted he had originally been considering some index of adult abundance, as well as egg/larval abundance. Bob noted that he liked Roger's concept of using multiple metrics. Jim Mead suggested that we might want to discuss the use of dye studies to help ascertain where the water is going. This might give us a better idea, a diagram if you will, of what the habitat changes would be.

Kent noted that it would be simpler if Dominion would just buy into using a model to document the habitat changes. Pete suggested that this would save us time and money.

John Ellis referred us to the agreement, and noted that our objective was to optimize the value of habitat within the bypass. How the bypass relates to downstream is less important, in his view.

Pete noted the bypass reach habitat mapping, and verification of the habitat use by the fish, was the most logical suggestion he had heard to date. Bob noted that fish biomass doesn't necessarily correlate with habitat. Roger agreed there would have to be some measurement, some ground-truthing. Bob noted we had talked about doing habitat-mapping, and assessing whether the fish are doing what we project they will do. Kent and Pete noted this would have to be done at the different flow rates. Roger noted that we would have to have some sort of quantitative data. Kent noted that we would have to have a significant set of sample sites. Bob noted that Dominion was in it for the long term, and was not expecting decisions in a year or so. Roger noted there would have to be some detailed data collection. He noted the helicopter sounded good for initial mapping, with follow-up ground-truthing. The ground-truthing would have to likely be repeated several times to capture different flow regimes and conditions.

John Olney noted the presence/absence idea was appealing to him, because comparisons of numeric abundance were notoriously difficult to interpret. Larval fish surveys are less problematic in that regard. Wilson asked John O. about the potential for detecting differences between channels, and/or flows, using static gear and sampling larval fish or eggs. Wilson also asked if it would be possible to generate a number, in terms of density, that would represent what we should expect in terms of density of eggs and/or larvae being produced from "optimal" spawning habitats. Roger noted some of the problems associated with Dr. W.W. Hassler's egg sampling during the 1950s-1970s. He noted that the striped bass population was depressed during that time period. Roger noted that he had done some work in Canada, using egg production to assess the population size. John O. noted that the egg production method Roger has used is easier to employ than using larval. You can use ichthyoplankton data to infer

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centers of spawning. John felt it would be dangerous to establish some sort of threshold against which to measure production in terms of absolute numbers, but the concept is good. Joe noted that John O. has generated lots of numbers from Virginia rivers, and you could at least tell if you are in the ballpark. John O. noted that there is a long time series from the Hudson River as well, and he has data from the Neuse as well. Kent noted that we might have some idea relatively speaking of how we might compare to other rivers, but we still would have a problem detecting the difference between 325 and 500.

Roger noted that you would also have to consider the time of day issues, relative to catching the spawning activity. John O. noted that there are all sorts of new technology, such as video plankton counters. This technology was much costlier than \$30,000 per year. Wilson asked Joe if Summer's work was yielding significant differences between stations, and whether her techniques could be applied to the bypass reach. Joe indicated they are detecting differences, and he felt the technique was applicable to the bypass reach. We discussed particulars of detecting differences.

John Olney noted there may be catchability issues as well, of certain life stages between species. Adhesive eggs might wind up in higher numbers in nets at higher flows, for example. Bob agreed that could be the case. John O. noted that these are typical sampling problems that are encountered.

Joe asked us what percent increase would convince us to go with 1,000 versus 325. Wilson noted we had no clue. We had left that issue to resolution until after the license was issued. That is why we asked the experts. Roger felt we would have to sample for the entire spawning season, and also take day/night differences into account, and possibly sample around the clock. Wilson asked if there wasn't some sort of passive gear we could use that would catch all the eggs for us. Roger noted that wouldn't work, because the eggs impinged on Nitex mesh would rupture. Bob asked about light traps. John asked if we couldn't just measure production at the end of the reach. Roger noted that if we weren't interested in the habitat changes, that would be appropriate.

John Olney asked if we were interested in the relative abundance of adults in pools versus riffles, microhabitat issues, or the overall effect? Pete felt we were interested in the net effect. John O. noted that the microhabitat changes could be dramatic, with changes in flow.

John asked again what our objective was for anadromous fish. Wilson stated that he felt it was appropriate to have some measure of habitat at baseline conditions, and how it changes at the various flow levels. Microhabitat use by anadromous fish was of academic interest, but not necessary to our needs. We need to document the level of egg/larval production out of the bypass reach. John O. felt that all we needed then was a measure of juvenile output. Wayne Jones felt that all we needed to do is to show that more adults in spawning condition are in the bypass reach at one flow, than another. We should just presume they are spawning. Bob indicated that isn't good enough.

Joe asked, if we have 20 years of data, measuring egg production for all anadromous fish in the bypass reach, and we demonstrate that there is more production at 1,000, then will Dominion provide that flow? Bob wasn't sure that would convince them. Joe noted we had to have some idea of what they want us to measure, otherwise we won't ever get past this point. Bob stated that there might be some increase in production at some point along the curve. Bob noted that they didn't have any questions about recruitment downstream.

Wayne felt that we couldn't agree on an experimental design, until we agreed on a threshold level. Pete felt that we were likely to collect 20 years of data, and still have a hard time making the decision.

Kent asked if we couldn't focus on a subset of the spawning period, and focus on that interval. He suggested that we could pick a temperature range for a given species, maybe for several species, for a couple of years, and sample that intensively. At least that way we could limit our sampling.

Bob noted we have an upper limit, of 1,000 cfs for 90 days. The IFIM indicated that is unlikely to provide any sturgeon habitat. Bob suggested that we might want to eliminate striped bass from consideration. He noted that the agencies had the call regarding where the management focus needed to be. John O. noted he didn't have any feel for what optimal flow rates should be for spawning. John O. asked about the flow rates in the existing tailrace. He was

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told what they are. Roger noted that we did have a window of flow here, enough to attract fish, but not so much that they are excluded, so John O. does have a good point. Perhaps we should identify for the three target species the flows that would attract them, and exclude them, and then measure the flows at 325. We can do the same at 1,000 and see if that excludes them. If we don't exceed the maximum, then we should be assured that production should increase as flows increase.

Bob Graham projected the curves for the bypass reach, with four transects for the mile-long reach, generated by the IFIM study. Wetted Useable Area shows an increase for all life stages that gradually increases from 0 to 1,022 cfs. Wilson noted that in theory, if you believe the curves, there should be a large increase in production at around 1,000 cfs. The question was asked as to how we arrived at the 325 base flow. We really didn't want to delve into the history of the numbers, but Jim gave a brief synopsis for our technical advisors.

Bob stated to Roger that we really don't need to address the upper flow limit, since we have constrained the upper limit at 1,000. Bob noted that the mean annual flow is 8,500 and we aren't going to get close to that, although the bypass reach shallower on the shore opposite shore from the power house.

John Ellis asked if Dominion didn't have to define what the limit would be, for us to have met success. He stated that for FWS, the presence of fish, and the production of eggs/larvae, would likely be sufficient, he thought. Wilson noted that he would like to at least know what numbers would be in the ball park. John E. stressed that Dominion would have to tell us how finely to slice this project.

Jim Mead indicated that the aerial videography strikes a resonant chord with him, because it could be used to quantify the habitat to the level we wished. We could then determine what areas are preferred for spawning, by actual observations. This can all be done at flow level one. You would have a square foot or acreage of preferred spawning habitat at that flow. You could then repeat the experiment at different flows to get the change. Using this approach, we could target egg sampling and not have to sample the entire bypass reach. We could focus on preferred critical areas. If you did intensive sampling in a few spots, couldn't we extrapolate to those areas with similar physical characteristics, and then repeat for differing flow regimes. Bob thought you could, but would also have to look at some suboptimal areas. Jim was seeking a way to combine a habitat approach with biological sampling.

John Ellis asked what that would give us that other approaches wouldn't? He asked if we could detect the depth differences between the flows we are constrained to use here. Wayne thought that the habitat data was not as important as the fishes response. Wayne noted that with American shad, we would have to sample at night. Bob thought that night sampling would be productive for American shad, using a simplistic approach. Bob noted that he liked what Jim was describing, and it would yield valuable information. Roger noted that when he attended the AFS meeting in Arizona, they were looking at suckers, and they mapped all the habitat. It is basically what we are talking about here. Roger liked Jim Mead's proposed mapping approach. If you change the flows, and map the habitat, then you could assess differences in use by measuring egg production. You would still have to define what is an acceptable percentage increase. Jim noted that we are also talking about a longer or shorter period of flow. He thought that was one of our potential tweaks to the experiment. Bob noted that provision is built in at only one point in the process. Kent noted we know that at some point, we will go to 90 days. Jim noted that Dominion would consider altering the regime, if the energy losses are about the same.

2:13 PM--Bob noted that some of our group have to leave today at 3:45. He felt that it would be good to discuss the value of baseline sampling at this point.

Kent wanted to make one last point. He asked how much the habitat work would cost, if we decide to do the work. Wayne noted that he felt that Dominion would have to give us some idea of what level of change Dominion feels would justify going to a higher level of flow. Bob and Jim felt that they couldn't give us a number. Bob asked, what if blueback were up 10 percent, and American shad were up 20 percent, then what? Jim suggested that we had to consider what our focus would be in the future.

Wilson made three points: 1) we were all under deadline constraints when we agreed to the level of funding allocated to these studies; 2) we all want a study that will allow us to detect differences between flows with an appropriate level of significance; and 3) once we agree on a study that will give us that, we will have to find the funding to implement it, otherwise we are at an insurmountable impasse.

John Ellis....

John Olney suggested that if the anadromous fish populations were not at high levels, we might never see a signal that we could measure. He asked what we did know about the existing stock status. Wilson, Pete and Joe summarized available information. Pete noted that we knew generally, but had no quantitative data. John O. noted gathering those data was to him an essential first step. Pete noted that the annual spawning stock surveys, using electrofishing, would continue. Pete noted that we don't know if the spawning stock survey correlates with abundance or not. John O. asked about juveniles. Pete noted that WRC has begun sampling juveniles, and that will be formalized. John O. noted that we needed some sort of benchmark against which to measure any habitat changes. Bob noted that Joe was beginning this year an assessment of the American shad stock. Bob asked where striped bass are, relative to historic levels. We noted that the numbers are probably back to historic levels, but not necessarily the age structure. Someone noted that hickory shad were likely at historic high levels.

Joe stressed that we should measure all anadromous species use of the bypass reach, not just the three discussed target species. John O. noted that the Chesapeake Bay restoration plan was employing the use of stocking in newly-opened habitats, using hatchery production. He noted that there is a lot of pressure to use Potomac fish in the Rappahanock, despite the fact that the Rappahanock is one of the only wild stocks left around. American shad is the only species for which stocking is being done.

Pete noted that we have been stocking American shad in the Roanoke since 1998. Pete noted that the state and federal hatcheries are being upgraded to produce more fry for use. John O. noted that he would really consider some hatchery supplementation in this newly-restored habitat, to experimentally measure success.

2:30 PM—John Ellis asked again how we would measure more fish moving in the habitat at the higher flow rate. Pete noted that there are some new marking techniques coming along that will allow us to detect stocked fish without killing them.

Bob indicated that we should have a discussion of the need for baseline sampling, prior to the provision of the 325 base flows. He noted that Angie mentioned that the immediacy of need for sampling mussels could be postponed to summer. She noted that it was a different issue for the mussels, since it would take a while for them to colonize previously dry areas. The reason for this is that the mussels, and snails, take longer than a single growing season to respond to restored habitat. Wilson asked Angie to provide us with a written justification for that rationale. Jim Thornton asked again if there was any particular to delay providing water to the bypass reach, in order to sample any other taxa? He noted that the rabbits would be run out, for example. Kent noted that he wasn't too concerned about the rabbits. He would rather see water there sooner rather than later. Pete shared from the 1998 data what we had seen in terms of resident fish. Bob noted that both of the 1998 samples were done in March and April, when flood flow releases were made to the bypass, and we had tried the ramping. Dominion and WRC had gone in and done some backpack electrofishing and gill netting. Wayne noted he also wanted to see water in the reach as soon as possible, but also wanted to be able to say with certainty that we are benefitting the target resources. John Ellis also stated he would like us to be able to document beneficial changes.

Pete noted that what we had at present was a population of resident stranded fish. He asked if Joe, John O. and Roger felt there was any utility to doing any baseline sampling. Roger asked if we had any baseline data that document the absence of anadromous fish under present conditions. We don't. Roger suggested that we really should have some data documenting the absence of anadromous fish in the reach at present. Bob indicated he felt that river herring couldn't make it up the reach at present. The only species that could be there is American eel.

John E. asked why Roger was asking the question. Roger indicated what he was thinking is that if we have no pre-study data, it could come back to haunt us. The applicant could contend that there were fish present at no flow, and

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we couldn't contest that position. Roger noted that Hassler never found any zero data points at the beginning of the season, because he always waited for spawning to start before he sent his crews up the river. Roger noted that it wouldn't cost much money, or much effort to collect some information over a several day period. Pete noted it was hard to prove a negative. John O. asked if you could at least begin the habitat mapping exercise in no-flow conditions. John noted unless you do what Roger is doing, you have to make the assumption that no use is occurring. If you don't sample the fish, you at least have to show that the habitats are dry land.

John O. asked if it was important to know what the use of the tailrace is, in comparison to the bypass reach. John E. noted that the only reason he could see might be to help in establishing the site for a future trap. John O. suggested if the tailrace was the source of recruitment to the tailrace, we might want to know that. Joe felt there wasn't a snowball's chance in hell of determining whether that was the case. Wilson felt that you would have to tag a lot of fish. John E. noted that Joe's previous study showed that the American shad would come to the dam and then return downstream. There was discussion about how difficult it is to sample the American shad in comparison to striped bass. John O. noted that they used gill nets in VA. Pete noted that they could use those, but they caught bazillions of gizzard shad as well. Joe noted that you could electroshock American shad in the tailrace, and mark a bunch of them, to see if any turned up in the bypass reach. Bob noted that at a minimum, there would be eight times as much flow in the tailrace as in the bypass reach. Roger noted that 325 might prove unacceptable, if the fish don't show up. Wilson noted that sampling for presence/absence would certainly reveal if the flows were appropriate. If no fish show up until the bypass reach is provided with 1,000 cfs, then no other sampling is required, and the issue becomes moot. Bob indicated that Dominion would concur that is the case.

2:50 PM—Bob turned again to the issue of sampling under baseline conditions. Bud asked if the system had ever been sampled. Bob noted again that Pete had the 1998 data, but they were collected after flood flows. Bob noted the question again was whether down the road, we would wish we would have some data pre-flow, even if it wasn't consistent with whatever long-term sampling regime we might agree is appropriate. Bob noted that he had sent out a proposed sampling regime that could be used. Pete noted in 1998, we employed several crews, one in the big pool with gill nets, and another backpack crew with electroshockers. That he felt is the way to go.

Pete and Kent indicated that we should do any sampling this year. Wilson felt that we should definitely do the sampling. Pete indicated that Roger would be welcome to come, and bring graduate students. Wilson noted that we should extend the same invitation to Drs. Hightower and Olney. Joe noted their graduate students would be busy in the field.

Roger Rulifson noted that there should be some up-front expenditures of funding, to make sampling areas accessible, especially since we are going to be sampling for a 20 year period. Bob noted they could work on that issue.

2:56 PM—We turned to discussion of fishwheel use. Jim noted that they could probably free up some funding for use, given that they are at least 30 days, and probably more, from a license. He wanted to know if it would still be useful this season. Jim delegated that discussion to Bob, who was out of the room.

Wilson was uncertain as to whether the remaining time would allow thorough discussion of the revised American eel and American shad trap and transport sampling protocols. Pete noted that Bob had revised the proposals based on comments received. He wanted Bob to lead that discussion.

3:01 PM—We continued discussions about the fact that it should be a rather simple process to design a study to assess the use of the bypass reach. We also discussed the fact that if we see nothing until we reach 1,000 cfs, and then American shad appear, that will be the flow we provide. Jim asked about striped bass, and how we would perceive any increase in their use of the area, since they are already recovered. We indicated that would be icing on the cake.

3:10 PM—Bob returned and we asked about the fishwheel use again. Bob indicated that it would be beneficial to have the fishwheel here, for possible use next year, even if it was not used this year. Jim Thornton will contact the Roanoke Rapids Power Station about us storing the fishwheel at the station. If they respond in the affirmative,

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Wilson and John will pursue getting our refuge personnel to move the wheel to Roanoke Rapids, if there is an affirmative response from Dominion. If Refuges prefers, we can also try to get WRC to provide a backhoe to load the parts on a flatbed.

3:17 PM–Roger had to depart. He noted that he would be glad to bring some students up to sample the bypass reach. John O. also departed.

Bob provided us with copies of eel length-frequency data, pertinent to some of the questions Alex Haro had asked. He also provided a copy of a 1981 paper by Bill Tarplee and Willard Partin, indicating that they had captured elvers on the Neuse River during studies conducted by Carolina Power and Light.

With regard to the two revised sampling protocol drafts, Pete indicated that he was concerned about the numbers of times the text read “efforts will be made to” do something. Bob will address that issue. Bob noted that the American shad plan had not changed much. He addressed Alex Haro’s comments on the eel draft. He has doubled the proposed sampling effort for American eel, and scaled back sampling during other times of the year, with a proposal to curtail further, should late fall and winter sampling prove negative. Bob corrected one small typo in the shad draft. Bob referred us to a study by Wendy E. Morrison and David H. Secor (2003): Can. J. Fish. Aquat. Sci. 60:1487-1501.

Pete noted that some cave-divers in FL had discovered many eels in underwater caverns.

3:30 PM–Joe provided us with an update on the hydroacoustic project. Jeff Buckel and Ken Pollock will be the other two advisors on Warren Mitchell’s committee. Joe noted the committee has met, and focused on the species identification component. Their proposed design entails sampling a five-day time block, sampling every other day, covering each four-hour time period in each block of days. There would be complete coverage within each five-day block. Within each four hour period, there would be two drifts of varying mesh sizes designed to capture all the anadromous species present. Each drift would cover 100-m reaches. Every other week, electrofishing will be conducted on each bank and down the center of the river. Hydroacoustic sampling will be continuous. That will not be on a five-day cycle. The drift-netting will constitute the main approach. The electrofishing will be a back up. Joe noted that drifting the shores, a large variety of fish is encountered. In the channel, only hickory shad and a few suckers were encountered. It will be tough to interpret the fish data. Joe suggested we would have to think about resident fish and how to treat them. Pete indicated he felt that resident fish would not be moving around much, so wouldn’t be of much concern. Joe noted that hickory shad were 10-20 percent of what was caught along the shore, but 90 percent of what was caught in the channel and in the drift nets. Consideration will have to be given to how to classify fish.

Bob felt in terms of separating the resident fish from anadromous, the only species of concern might be the suckers. Also, the gizzard shad might have to be included. Joe felt they would be classed as a resident-migratory species, along with the suckers. They would really have to wait and see how the sampling proceeds. Joe felt this would provide pretty good coverage.

3:43 PM–The meeting adjourned.

DFRTAC and FL1 Cooperative Management Team Meeting

September 13, 2004

Roanoke Rapids, North Carolina

Dominion Generation Power Station

Present: Jim Thornton (Dominion), Bob Graham (Dominion), Wilson Laney (FWS), Mark Bowers (FWS), Kent Nelson (WRC), Pete Kornegay (WRC), Joe Hightower (USGS), Wayne Jones (WRC), Ron Sechler (NMFS), Angie Rodgers (WRC), Bud LaRoche (VDGIF), Nolan Banish (WRC).

9:08 AM: Bob Graham convened the meeting. Bob expressed appreciation to Wilson for distributing the notes from the last meeting.

Bob indicated he thought it would be good for us to have an update on where things stand regarding the license, and also the sampling schedule.

Bob asked about Prescott's attendance. Wilson called him and determined that Ron Sechler was supposed to attend today.

There was some discussion of the fact that Dominion is having difficulty managing their lakes this year, due to the fact that SEPA has taken over dispatching power from Kerr, and the wet year. Jim and Bob noted that it has been a real management challenge. Bob noted that there are going to be further changes, under PJM (Pennsylvania, New Jersey, Maryland Regional Transmission Operator). Pete Kornegay noted that none of these changes were considered during the negotiations for the terms of the new license. Jim noted that some of the terms were different. Pete felt that a lot of the major assumptions we all made were different. Jim felt that they would still be responsible for everything on the lower river, but not necessarily in the lakes. Wayne noted that it really impacts Roanoke Rapids, because of the efforts to maintain lake levels in Gaston.

Jim noted that SEPA was doing more of a daily peaking once a day mode. This is causing more fluctuations in Lake Gaston, and Wayne felt that it was causing more shoreline erosion. Jim noted that they were staying within the license requirements at Roanoke Rapids, where they can fluctuate the level as much as five feet. Bob noted there have been some high inflow events. Jim noted that Kathy Curtis, Director of this station, had mandated that the station should do everything possible to keep Gaston at 199 – 200 msl as agreed to in the settlement, but things were complicated by going into a flood control mode. Pete noted that they watched the gages all Labor Day weekend, hoping to avoid a fish kill. Bob asked what the oxygen levels were doing at Jamesville now. Pete advised that they were in the high threes, up to four.

Jim briefed us on the license status. FERC has reviewed everything and sent it to their staff for further review. Jim noted it will come back to us, and there will be some sort of signing of a new legal document. He indicated that Don Clark had referred to it as a "mini-settlement." Jim wasn't certain who would have to sign the document. The new license should be issued sometime in October.

Jim noted that he had a new schedule, with new due dates, which he will provide everyone. Bob reviewed the changes. Bob noted that under Article 401 we will have to provide FERC with a schedule of all fish-passage-related activities. That is due to FERC March 31, 2005. Bob noted that would probably only contain major milestones without details. Under Article 411, Dominion has to put together a Bypass Flow Release Plan by June 30, 2005. That will be Dominion's responsibility, and will contain the engineering specifications. Under Article 413, the Bypass Monitoring Plan will have to be provided September 30, 2005. Pete noted all those dates were on a chart that Bob sent out in July.

Pete wanted to discuss what it would take to meet the deadlines. He presumed that the first order of business would be the eel passage facilities. Bob noted that he would have to look at the

license, since it was somewhat different than what we had agreed to in the technical settlement. Pete indicated that in the next couple of months, some engineer will have to design a set of structures to submit to FERC. Bob didn't believe that we had to do that. The license article says that a schedule for submittal of study plans and designs has to be submitted, not the designs themselves. Bob noted that we would have to provide schedules for a list of items including the American eel distribution studies, and so forth. When they are submitted is when detailed design drawings will have to be provided, along with details of consultation, and so forth. But, we will have to set up a schedule of other deadlines. Jim noted that Article 411 (not 407 as Bob indicated) is the one that requires an engineering design, so he wants to try to fast track that one. He would like to discuss it today. 9:35 AM: Pete asked if there had been any deviations in flows provided to the Bypass Reach. Jim noted that as long as they had been following his e-mails, they had been providing the 500 cfs freshets as well. Angie noted that she had found nine species of freshwater mussels, most of them just above the NC 48 bridge. One of the two crayfish species found was a rare one. She found five species of snails as well. The sampling effort was pretty intensive, using 11 people. Pete asked how long it might take to see mussels recolonizing the upper portion of the reach. Angie thought it might take as long as five years. Joe asked about moving some upstream. Angie noted the Commission has been doing some relocation in the Piedmont, so has some expertise in doing so. Angie noted the numbers of mussels they found above the NC 48 bridge were not in high abundance, so they were reluctant to move them and disrupt what was going on down there. Someone asked about mussels from elsewhere. Angie said that mussels from further downstream might be an option. Pete noted that it might be of great interest just to see how long it would take to recolonize the bypass reach. Wilson noted that might be a more valuable piece of information to have. Angie noted that they did collect five state-listed species of interest. They found four stable species. Angie noted that they have an electronic copy of their draft report, as well as some hard copies. We all asked that Angie provide the final report electronically to Bob, who will distribute it to the group. 9:44 AM: Bob asked if we felt pretty good about the license requirements. He asked if everyone was okay about the status of the license. The hope is that FERC will have a new license to Dominion in October.

Agenda Item 2) Bob turned to review of the minutes from the last meeting. He noted Wilson had provided the draft notes from the last meeting. He noted that they had helped refresh his mind, but he didn't get all the way through them. He asked if there were any comments or questions on the notes. Wilson suggested we give everyone more time to review them. Bob noted that meeting was more of a brainstorming session with John Olney, Roger Rulifson and Joe. He noted that we could talk more about the major points from that meeting later today.

We moved on to the Bypass Reach work. Jim noted flows in the Bypass Reach began May 11, 2004. He noted that there was once case when 3,000 cfs was put into the reach, during June, when the station was out for a couple of hours. The duration of the flow event was about 16 or so hours. Jim noted that they had to run a fisherman out of the reach, so they could put flows into the BR to maintain the required minimum flow downstream. Kent asked if that counted as a freshet. Pete said no because the license hadn't been issued. Jim noted it was a freshet, alright, but it hadn't crossed his mind to use it because it didn't last 24 hours. Other than that, they have been doing freshets every three weeks. Bob noted that he has been in the BR doing eel work, and things look really good coming out at NC 48. Pete and Kent felt that it was really good fish habitat. Bob asked Angie and Nolan if they wanted to give us any more information about their work in the BR. Nolan noted it was really an intricate network of channels that occasionally

merged to form pools. They wore wet suits and snorkeling gear. They found a distinct gradient reach about three quarters of the way down, at the point where the backwater effect from the main channel is evident. Bob noted that the backwater area is where anadromous fish stack up as well. He felt they just piled up there because there is a plunge pool effect present. Angie noted that there is a lot of vegetation in the BR right now. There is a lot of hydrilla. She noted it would be interesting to see how it all changes. Pete asked if they had a lot of leeches. Angie indicated they did. She noted that she had about 50 baby leeches on her hand at one time Nolan noted that there were some snails in some of the big pools, and he guessed crayfish as well. They attempted to pick up examples of all the species of snails they saw. They picked up all the mussels and crayfish. There were nine mussel species and two crayfish species, and the five snail species. Voucher specimens were deposited with the NC Museum of Natural Sciences, and some were retained by the Commission.

Jim noted that he had visited Conowingo during the spring shad run, and was interested to learn that the flows could be adjusted to allow passage of American shad, and prevent hickory shad from moving upstream. Jim noted that he had wanted to see what the end result was. He noted that there are three more stages to the agreement.

Wilson asked about any observations of fish. Angie and Nolan noted that they had been in the BR before with Bob for fish sampling. Bob indicated they went in on April 15, specifically for fish. They ran some gill nets immediately below the dam, and did backpack electrofishing downstream, and tried to go all the way across. Bob noted he sent out preliminary results April 30, and provided corrections later on some of the identifications that Wayne Starnes did for some of the voucher specimens. He sent revised information out May 19th. Results were similar to what we had seen in the past. One big change was the identification of notchlip redhorse, which Bob had misidentified as golden redhorse. The notchlip is a race of the silver redhorse. Bob noted most species present were what you would expect in a river, although there are some “washover” species such as the largemouth. Wilson asked about anadromous fish. None were observed in April. Nolan noted that he saw a dead striped bass in the BR during their sampling. Pete felt this one could have been either a resident, or one from the lake that resulted from the spillage. It also could have come up, since the release occurred in May. Bob felt the April 15 sampling, plus the previous data provided by Pete, should give a pretty good snapshot of what is there. Pete felt that would allow us to have a good picture and move on. Bob noted that we could calculate CPUE.

10:10 AM: Bob noted the only other BR work done this year was on eels, and he will discuss that later.

Bob asked Jim to discuss what needed to be done for the plan for provision of water in the BR. Jim noted that he has put together a draft plan, that Wayne Dyok has reviewed, and will be provided to us for review. It is basically a scope of work. It would provide for control valves for releases into the BR, one in a gate on either end of the BR. The capacity should provide for flows up to the maximum possible. Jim indicated the capabilities that should be included. He indicated that he would ask for capability for half the flow discharge provided from each side (i.e., 150 from each side for 300 cfs; 500 from each side for 1000 cfs). He especially wants our review of the provisions for minimizing entrainment. Bob indicated he was expecting a review of the generally accepted technologies that could be used with the kind of valve employed. Joe noted the reason he was asking was that if it was screened, it would be good to have the capability for removing the screen and pass juvenile American shad downstream by spilling them. Pete agreed. Bob noted the best way to address that would be in the wording of the

document. Joe noted that any passage through the structure wouldn't likely apply to American eel. Wayne noted his understand was that the outmigrating eels traveled on the bottom. Bob indicated that it might be possible to remove the screen seasonally to provide for American shad juvenile passage. Pete and Bob thought it might be possible to crack open a gate. Jim noted that would be pulling water from as much as 18 feet down and wondered if that would be effective for American shad juvenile passage. Pete didn't realize that the gates were that deep. Jim noted he wasn't sure that was exact, but it was close. He noted the gates have to be pretty large to pass the design flows. Bob noted it was good to bring that up and get that in to the specifications. Jim noted he would have Bob look at it before sending it out to the whole group. Bob indicated that he would take a shot at putting in some language to address our concerns. Kent asked that Bob refresh his memory regarding what the license requires for downstream passage of American shad. Kent thought it might specify low-cost alternatives. Kent asked what type of gate would be cracked, and whether more water would be passed down the BR. Wilson noted his perception was that it would be either/or, not both methods. Bob read the language relevant to downstream passage, and that indicated only "minor adjustments in operations" would be made, and no spill during Phase 2. Exact methodology has been left up to the DFRTAC. Bob noted that the FERC left all this language out, and just included NOAA's Fishway Prescription, which refers to the Technical Settlement Agreed. Jim noted Dominion basically agreed to do studies, and that ultimately a prescription or some study agreement would be required. There is a seven percent criterion that is a threshold. Jim felt if mortality was less than seven percent, it isn't an issue. If it is over seven percent, then we have to reach agreement on what to do. Bob read the pertinent language from 4.3.12, on page TS 38. The licensee agreed to make "minor adjustments" to facilitate downstream passage, including lighting and changes in the operational regime of the project. Pete noted that cracking gates was discussed. Bob read the rest of the language. Any spillage would require exercise of reserved authorities by the agencies. Bob noted that if according to the literature-based review, and the configuration of their powerhouse and facilities, if mortality of post-spawned adults exceeds 20 percent, minor adjustments would have to be implemented. Bob noted that Phase II is when they are transporting adults upstream. Pete noted that we stocked almost 2 million fry upstream this spring. The WRC staff has been collecting juvenile American shad already, so the outmigration has begun. Joe asked if the 2 million was split between upper and lower Roanoke River, with different marks. That was correct. The ones below the dam had a single mark, and the ones stocked at Altavista had a double mark. The otoliths haven't been checked yet. Pete wondered if some of the shad fry we are stocking were being entrained by the Dominion facilities upstream. Bob confirmed that Jim would need a two-week turnaround on review of the design scope by this group. Jim indicated that would be good.

10:34 AM: Bob suggested that we take a 5-10 minute break, then he would brief us on the eel work he had done.

11:00 AM: Wilson asked Bob to brief us on the concern in Virginia with regard to the potential introduction of the exotic nematode parasite of the American eel to areas where it hasn't previously been introduced. Bob noted the issue was raised at a meeting of the Governor's Task Force on Invasive Species in Virginia. The issue was raised by a scientist from the Virginia Institute of Marine Sciences. Bob noted that he and Wilson had discussed the fact that the parasite likely has already been introduced in Smith Mountain Lake, due to the use of American eels as bait for striped bass. Bob noted that we don't know what level of introduction would be required to establish a population. Wilson and Pete asked that the actual text, to the extent

possible, of the presentation by the VIMS scientist be provided to the group. Bob indicated that his understanding is that the discussion wasn't formal, that it was just a brainstorming session (Note: later discussion with Bill Bolin indicated the concern was included in a list of concerns presented by VIMS). We all indicated that more information will be desirable (Note: Bill agreed to provide). Wilson noted he had been unable to document any adverse impacts of the parasite on species other than American eel. Joe noted that no population level effects have been documented on American eel populations in the U.S. Wilson noted that Mary Moser had done a study of the infection rate in NC waters. Bob noted Dominion had documented the percentage of infestation in the Roanoke. Wilson and Joe noted that Mary had data on the Roanoke in her report. Bob indicated that he would provide a copy of his report to Angie electronically. Bob turned to the design of the eel sampling devices for the BR. He noted there are complications using pumps, especially in places that are accessible to the public. He noted they did tests with ramps using siphons. They put the ramps out with siphons, and left them out for five days. They put eels in the collection bucket and left them, to assess retention. Bob noted that the larger eels had escaped and the buckets would have to be modified to retain them. Wilson suggested just adding a funnel to the bucket. They tested two different ramp sizes. The bucket on the larger ramp had a hole punched in it. Bob didn't know what kind of organism might have produced the hole.

We speculated about otter, herons, muskrats, etc. Some of the smaller eels were still present. It appeared that at least one or two more elvers had appeared in the trap. With the hole in the bucket, there is no way to be sure about the catch in the larger ramp. The 100 mm elver came from the smaller bucket, which didn't have a hole, so there is no doubt about that one. Bob noted the particulars of the design, and how the flow is maintained. Wilson supported the use of the siphons as a design less subject to vandalism and less costly. Bob noted there are some types of pumps that might be useable, if ultimately required. He noted that even battery supplied pumps would be logistically more difficult in the BR.

Joe raised a concern about the ramp position. He felt that locating them parallel to the apron wall would be more effective than locating them perpendicular to the wall. He also stressed the need to make sure the attractant flow was sufficient. Bob agreed that the attractant flow coming over the ogee was a concern. Pete indicated that he had seen elvers piling up before at the base of the ogee. He noted that only a very small attractant flow was required, and noted Roger Rulifson had been successful in obtaining elvers at Lake Mattamuskeet.

Bob agreed that the concerns raised by Pete and Joe were legitimate. He agreed that experimentation would have to be conducted to refine the sites for the traps. Mark suggested that locating them the way Joe had suggested would be more effective. Bob agreed that more work was needed. He noted that work might have to be done with sledgehammers, to modify the bedrock so that the traps could be emplaced.

We talked about how to do more tests and place traps so as to avoid bias. We discussed a variety of possible techniques to employ. Pete noted that the important objective was to find the point at which eels could be effectively captured, and have a trap that could be moved appropriately. Bob noted that another objective was to determine the seasonal schedule of eel abundance. Bob noted that he had revised the schedule of proposed work, and would provide those to us before lunch.

Bob indicated that he had seen the largest cottonmouth he had ever seen, in the BR, and wondered if it might have been attracted to the elver trap bucket. We discussed some more

possibilities for the hole in the screen of the bucket. Wilson noted that raccoon should be added to the list. Mark suggested snapping turtle should be considered as a candidate as well.

Bob asked Joe to brief us on relevant work by his graduate students. Joe noted he had sent out the abstracts of their AFS presentations. He indicated that Alesia Read's work was more germane to the Roanoke. He briefly summarized her work in assessing potential American shad spawning habitat in the upper Roanoke.

Pete asked Bud if there was a good place to stock shad fry in the Big Otter. Bud indicated that access was a problem, but that one place might be near VA 460, where there is a spot people pull off the road. Bud advised that two Roanoke logperch were collected from a tributary, Goose Creek, the first tributary that comes in to the River below Leesville. Bud advised they were eight-ten miles above the stream mouth confluence with the river. He felt certain that a site could be located for shad fry stocking in the Big Otter. Pete noted if they could develop a discrete mark, they would consider stocking. Alternatively, they could stock it in an alternate year and not stock the Stanton.

11:38 AM: Ron Sechler asked how big the river was at the locations Alesia sampled. Joe noted the Big Otter was one of the smaller ones, and they had cut off sampling for any reach below 30 meters in width. Jim advised the mean flow today on the Big Otter was 170 cfs. Wilson indicated that he had heard the presentations by both Summer Burdick and Alesia Read, and hoped that we could get them to make their presentations to this group.

Pete noted the WRC was continuing to sample juvenile American shad one night every other week. They caught ninety on one night.

Bob asked Joe for anything further. Joe gave a report on the hydroacoustic survey of this spring's spawning run. Joe briefly summarized the work that had been done. They were doing electrofishing and drift gill netting to try and get samples of the proportions of anadromous fish. There are 500 gill net and 24 electrofishing samples. The hydroacoustic data are high in volume, but some of it is noise. They have processed a small subsample of the data, and sent it to Don Degan for review. They are now processing a larger subset of the data. Once all the hydroacoustics data are processed, you get the up- and downstream movement, and have to couple that with the other sampling to determine the proportion of species. Joe indicated their take on the process so far is the supplemental sampling for species composition. Especially when the flows are up, the drift gill netting doesn't appear very effective. There are times when you don't catch much in the nets, but there are fish showing up on the hydroacoustic gear. Joe noted that on the handout he provided for our review, different-colored dots depict the different species. He indicated the data aren't great.

Kent asked Joe how many American shad were collected with the supplemental sampling gear. Joe advised they comprised 3-5 percent of the fish collected during the run. They missed part of the run, however. Perhaps five percent of what passed might be American shad. That is, five percent of what was captured in the gill nets. This will be converted to numbers, once the hydroacoustic data are analyzed.

Bob asked if they would be able to break out the percentages for discrete weeks, i.e., the supplemental data will be used to determine the proportion of dots that were likely American shad. Joe indicated that the sample size of American shad was so low that using the supplemental data to determine proportion was unlikely. Bob asked about the electrofishing results. Joe indicated he hadn't seen the processed data yet, but because there was less effort, he was doubtful that there would be enough data. He noted they had sampled each shoreline and the center of the channel, but the central channel sampling was effective only at low flows. He

noted that the shoreline samples were more diverse. Pete noted that the drift gill netters from the Jamesville area really loaded up with hickory shad. Joe agreed that they caught a lot of hickory shad. Bob asked if Joe was saying they weren't very effective with American shad, or in general. Joe indicated that their sampling was less effective in general. Bob asked if the drift samples were better correlated when the hydroacoustic data indicated larger numbers of fish. Pete noted that the drift netters he has watched drift a quarter to half-mile downstream. He suggested increasing the soak time might be better. Joe indicated they were nervous about drifting too far. He indicated they wanted to find sites where hang-ups were not an issue.

11:57 AM: Joe indicated they had tried using an underwater camera for a day, but the water wasn't clear enough to allow any assessment. He indicated he had rented the camera for a day from someone in Weldon. Kent asked how many American shad Chad had collected this year. Pete advised it was 300-400, about normal for the Roanoke. Bob indicated they had caught 221 during their sampling efforts. Wilson asked if there were any alewives captured. Joe noted there were none on the plot. He wasn't sure that any had been captured during the drift netting. Pete indicated that he couldn't recall having seen alewives that far up the river.

Joe mentioned that he was considering using a DIDSON apparatus next year to compare its data with the hydroacoustic data. He explained how the DIDSON works. It can display fish as they actually swim past. Joe indicated they would like to rent it for five days. Pete indicated they might have to consider regulating use of the device by anglers. Joe didn't believe that was an issue, since the device costs \$80,000.

12:04 PM: Bob reviewed Dominion's experimental American shad electrofishing. He had provided that to the group in an e-mail message last Wednesday. They had put in a few hours on several evenings. The last three weeks, they did day versus night samples to get some idea of their effectiveness. He questioned needing to review all the results. He noted the CPUE indicated that they were doing better at night, a lot so in one case. Towards the end of the season, all of a sudden they were getting big females and there were no males around. He also plotted reproductive condition. They didn't get out until April 29, and Bob noted they wanted to go for another week in June as well. Initially, they were getting mostly ripe males. Joe noted there wasn't much of a trend in the CPUE. Bob noted it did change to mostly females, near the end of the run. Bob noted that he had talked to Normandeau, and they indicated that the presence of the larger females signaled the end of the run. Bob noted to Joe that it was pretty consistent, 30-50 fish per night. He noted they weren't out there to pound the fish, in part due to concerns expressed by Wayne and Pete. Bob noted that the areas in which they found American shad, weren't the areas being fished for stripers. Pete indicated that on higher flows, the striped bass and American shad would be in the same place. Joe noted that he had seen a fair amount of striper anglers fishing the bank nearest the holding ponds. Wayne asked about the depth of sampling. Did you just not get fish in shallower depths, or just not sample them. Bob felt there were fish there, but they may have been running from the boat. In terms of consistently getting fish, the 4-7 foot depth range seemed to provide the most luck. Pete asked if they had one or two dip-netters. Bob indicated there were two. Jim indicated there were three, when he was along. Bob indicated that Jim was rather far back in the boat, and that his selection ability for American shad was more limited than other personnel. Bob noted the females were about 100 mm longer than the males, on average. Jim noted that he was providing quality control on the length data for Bob.

Pete asked Bob, based on what he observed, what was his conclusion regarding filling up a hauling trailer. Wayne noted the text indicated there are substantial numbers of American shad

available for transport. Bob indicated that he felt getting enough for telemetry wasn't going to be a problem. Jim indicated he wondered how many were needed for a "school." Bob noted that the Susquehanna folks wanted at least 60. He felt, given that they captured 40-60 in a limited period of time, that catching the desired numbers wouldn't be a problem. Bob noted a key would be how often they could sample. Wayne indicated that hauling them at night reduced survival. He indicated they tried to spawn at night in the tanks as they were being transported. Pete had suggested trying it at three or four AM. . Pete noted that the literature suggested that activity began near dusk and continued up to 10:30 at night. Pete noted another reason to sample at night was to avoid the public. Wayne indicted they really beat each other up badly in the tanks at night, trying to spawn.

Bob indicated that in May, they went out at night on one occasion, and got a lot of ripe males and females. The next day, they went out with Kevin to try to get fish for the hatchery, and found many spent fish. Pete indicated that he felt with three or four boats, a lot of fish could be captured. He felt that trap and transport numbers could be generated. Bob indicated he felt it was promising and it should be tried. Kent indicated that he felt we should be trying to catch fish early, for implanting transmitters. He noted that we couldn't really hold them for a long time, in tanks. Joe noted for the shad, you just have to stick the transmitter in the stomachs. He recommended release immediately after transmitter transplantation. We discussed having to double-handle the fish. Joe noted you could put the transmitters in the fish when they were caught, and if they die during transit, you could at least get the transmitter back. It was noted that the trip to the hatchery was as long as the trip upstream would be. Kent noted the fish in the hatchery may be held up to thirty days. Pete asked Bob if he was convinced that electrofishing could be used to gather enough numbers to supply a trap-and-transport operation. Bob noted that the license language regarding transport numbers for the first experimental years had undergone an evolution of sorts. The current settlement and license language calls for Dominion to have the capability to transport a minimum of 2000 fish, but during the relicensing discussions the 2000 number had originally been brought up as an annual transport goal, dependent on the numbers of adults in the river. In the license language, there isn't an established goal. Instead, it was left up to the DFRTAC to determine an annual number. Pete noted there was a trigger point for below the dam, that would trigger trap-transport. Jim and Bob noted that there is a two-year window that allows Dominion to move up to 2,000 a year, initially. Bob noted there are three triggers for moving into the higher numbers for Phase 2. Wilson noted that when Joe and Warren finish processing the hydroacoustic data, we will have an initial indication of the population size. Pete noted that one thing we will have to decide in the future, is when we want to put wild adults upstream, because we won't be able to tell wild fish spawned upstream from wild ones spawned below. Bob indicated he didn't quite understand the concern. Pete noted the only way to determine any reproductive success from the adults upstream would be to sample the lakes for juveniles, prior to their outmigration. Jim asked how they would be sampled. Bob indicated at Conowingo, they were capturing them off the screens of a nearby nuclear station, and also using a lift (umbrella) net to sample juvenile shad when they are observed under lights at night. Jim noted that Gaston doesn't run all the time, as they do here. He noted that might provide a sampling opportunity. He wondered if plankton nets might be a sampling technique. Pete noted the resource agencies were going to have to determine an effective method of sampling juvenile shad in the lakes, before we began to put spawning adults upstream. Bob noted they might be able to add a program to sample the juveniles. Wayne indicated that if we want to eliminate the concern, we could just put males upstream. Pete asked about the lighting on the dam. Bob

indicated it is well-lighted at night. Joe noted that it would be good to sample for a year on the marked fry, prior to putting adults upstream. Pete asked Bob to contact Scott Ault about the lift nets they are using to sample outmigrating juveniles. Kent indicated that we have a few years to do this work. He indicated that he felt that any production resulting from the fish used in the telemetry work would be likely close to undetectable. Jim noted that there was a 450-fish number specified. Jim noted that the DFRTAC was to determine whether any fish at all would be stocked into the lakes. Bob noted there was interest, he felt, in putting some adults in the lake to see if they would spawn in the upper end of Gaston. Joe noted that the eggs hatched there with no problem.

12:33 PM: The group broke for lunch.

1:45 PM: Bob reconvened the group. He indicated that he would revise the proposed bypass sampling scheme for resident fish, based on feedback he had received from the group.

With regard to the anadromous fish, he noted we had discussed that a lot at the last meeting, when Olney and Rulifson were present. Bob noted the meeting notes captured that discussion pretty well. There were a lot of ideas, and we discussed a lot of the confounding factors. One of the action items was for Pete and Bob to distill the ideas into a list and send that out for review. That was mostly for the biological sampling.

We had also talked about taking a habitat-based approach, and assessing the changes that occurred with different flows. He noted that Prescott had talked about taking a mesohabsim approach. Jim Mead had noted that would be pretty complex at our last meeting. We had also discussed Progress Energy's use of the helicopter fly-over, to assess the habitat changes. Bob had contacted John Crutchfield, and indicated that John was pretty excited about the technique. John had indicated that habitat could easily be differentiated, as could the bottom type. Pete asked if habitat could be quantified using the technique, and if any of us had seen the video for the Pee Dee. Mark advised he had seen it and it was very good. He noted that the latitude and longitude are on the screen with the imagery. Bob noted John advised that Progress would be flying more imagery this winter, and he thought that it would be fairly cost-effective for Dominion to contract to have this done. Kent asked, what kind of change would Dominion have to see, before they would be willing to go to a higher flow. Bob indicated that quantification of the habitat present at the different flows would be just one step, one piece of useful information. They would also want to know what the fish were doing when they were in the BR. Bob noted that the cost begins to accrue pretty fast as you add all the additional steps need to tie habitat changes to changes in fish. He noted that we had discussed an egg or larval production sampling, in association with some adult sampling. In his mind, that was the simplest approach you could take. If you could develop some sort of index of young produced, per spawning adult, that would provide a useful index and eliminate bias from annual changes in spawning stock biomass. Kent noted that would require accurate counts of adults. Joe noted that we wouldn't likely be able to determine recruitment in terms of juveniles. Wilson agreed and suggested that we should use the terminology production, or output. We discussed the hypothesis that if habitat becomes more suitable with increases in flow, we should be able to measure some variable that would definitively demonstrate the relationship. We decided that we would have to either measure the number of adults entering the area, or the production coming out of the area. The latter could be determined by egg/larval density times flow times time. Consensus was that we couldn't just look at the independent estimates of population derived from the hydroacoustic data, but would have to assess the numbers of anadromous fish using the BR. Jim asked, do we need to measure the habitat suitability? Bob's preference was to measure an actual biological

variable, in addition to doing the video flyover. We discussed how to translate the videography to quantitative data. Mark described how the video was displayed and could be viewed concurrently with topographic mapping. Jim Thornton will talk to Phil Lucas about the contract they have and who could quantify the data.

Bob indicated that he and Pete would take a shot at drafting something, using Wilson's notes. Pete thought that the easy part would be getting the numbers of adults and the egg/larval densities. Wilson noted that Summer Burdick had compiled some of that information, in addition to having her own data. Joe indicated that densities from the Neuse or other systems may not necessarily be relevant. Wilson agreed they weren't, but indicated he just wanted to know what the sideboards should be, so we could tell if we were even in the ballpark.

Kent asked how much funding we had allocated for these studies. He felt that we needed to consider what could be realistically done for the funding available. Bob indicated that anadromous fish funding from Dominion was limited to \$30,000 per year. For resident fish, the limit is \$20,000 and for mollusks, \$10,000 per survey. We noted that Summer was sampling 13 stations, twice a week, and also was having to travel a lot. We discussed the fact that we should have a sampling design, prior to attempting to estimate cost. Wilson felt that the design should be nailed down first. Wilson noted that if the cost estimate exceeded the \$30,000, then the ball would be in the agencies' courts to find additional funding. He noted he hoped to have future Atlantic Coastal Fisheries Cooperative Management Act funding. Bob noted that he had submitted a proposal for NOAA funding through the Albemarle-Pamlico Sound National Estuary Program, for doing some of the work in the BR.

Pete asked if it would make more sense to begin our studies with a higher flow, to measure a response. Bob noted it would be hard to convince Dominion of that approach. He could see the utility of the approach. He noted the low flows in the beginning was advantageous to the company. Pete indicated he was just trying to find a way to measure changes, quickly. Bob noted that there are supposed to be two years of baseline data. Jim indicated the first 500 cfs releases are only for 30 days, so we might be able to select our days to correspond to the anadromous fish spawning window. Jim noted that the way the license was designed was to not make the decision to go to a higher flow, until the lower ones were shown to be inadequate. Bob noted that the lower flows would also give us an opportunity to work out the bugs in the sampling design. Kent noted that the best approach might be a randomized approach. Pete indicated that we might have water to play with during a high-flow year. Jim noted that we might have a lot of water on March first, but then have little a month later, so we couldn't depend on that approach. Pete noted that there would be a lot of variability. Bob noted that we could use a proportional index, to tie to production or whatever variable we wanted to examine. 2:25 PM: Pete noted that Sam Pearsall had suggested bifurcation of flows, and it might be useful to begin with the high flow and go down from there.

Wilson suggested that we have had this conversation at least three times now, and the time has come for us (Pete and Bob) to write something down, and then have it reviewed by the experts. Bob will take a shot at revising the prior resident/mussel proposal, and he and Pete will draft something for the anadromous fish. Bob noted that we had to decide when year 1 would actually begin.

Bob indicated that based on the last meeting, he had drafted a new American shad study plan. He provided copies to everyone. He also provided a copy of the revised American eel draft. We skipped to the last page of the American shad proposal for 2005. Everyone took time to read the draft text. Pete noted that what is proposed is pretty much what was done this year, except this

spring it would be done throughout the season. Bob noted no transport would be proposed during 2005. They are just trying to get a feel for the biology of the stock.

We talked a little about night sampling. Jim noted Wayne had expressed some concerns about transporting fish at night. Pete noted that it should at least be attempted, for experimental purposes. Bob noted they found some differences, but not as great as expected. The group felt it was generally acceptable, but Bob noted that we could all take it back and review it.

Wilson noted to the group that the ASMFC would be doing a new shad stock assessment. Pete indicated that the tentative date for the southern region workshop was January, in Charleston, SC. Wilson noted that Kathy Hattala was coordinating that effort, and had gotten a good response from the utility biologists. Bob indicated that he hadn't been contacted. Wilson will get his name added to the list. Wayne suggested that Bob remove the statement about collecting shad scale samples. Wilson suggested that change should be run by the NC Division of Marine Fisheries prior to making it.

With regard to the revised eel protocol, Bob noted that he had incorporated some comments from Alex Haro, with regard to measuring flows, and also checking eels for marks or CWT to measure fallback. Bob indicated that he would prefer that year one be stipulated to be 2005, to give time to design the tailrace sampling approach and pair that sampling with the bypass sampling, and for consistency with the year 1 sampling for American shad. He asked if anyone had a pressing need for Dominion to begin sampling this year. Pete and Wayne indicated that was okay with them. Pete asked if they intended to do additional testing this year. Bob indicated they did intend to do so. Bob noted the logistical difficulty of getting the sampling gear into the BR. Wayne noted there was access to the other side of the dam, by land. Bob noted the higher flows that were present now. Wayne indicated that was a pittance in terms of flow.

Bob noted the last item was the use of the fishwheel in the tailrace. He felt that should be tried. Wilson concurred. Pete asked who would staff it. Bob noted it was Joe's fishwheel. Pete indicated that a sampling design should be developed first. Bob noted that he would plan to go to company management once the license was accepted. Joe noted that the effort required was usually just one or two hours per day, once the wheel was set up. If there are already staff present, they could do that in addition to other work. Wayne noted that provision of security would be an issue. Bob noted that anchoring the wheel would be another issue. Joe noted that it was commonly done on the west coast. Bob/Joe discussed putting it in the tailrace where the old hydro station was located, where the water is shallower. Bob indicated he would like to have some new sonar data. Pete asked if Bob wasn't thinking of anchoring it against the tailrace walls. Bob thought the shallow end of the tailrace was downstream of the vertical walls. Joe noted it would be desirable to be able to move it up and down. Wilson described the mobile anchoring system used for the Sea Grant elver traps he operated in 1980, and suggested that might work if scaled up to the fishwheel. Bob noted any sort of permanent structure would likely require a permit from the Corps of Engineers. Joe noted they had to get one and obtained it without difficulty. We all agreed that an engineer would have to be involved. Bob agreed that would be especially appropriate for safety purposes as well.

Bob asked about the duration of sampling. He wondered about cutting off the hickory shad season, for example. We talked about potential options for staffing the fishwheel, including graduate students and consultants. We also discussed the possibility of remotely monitoring catches, using live video, infrared lighting and lasers to measure the fish. Bob will ask the engineers to look into the anchoring issue.

3:02 PM: Bob noted their primary emphasis is American shad, so videoing the wheel could be more cost effective. Wilson noted that Ted Simons had great success with a volunteer who designed and built a remote receiver for bird songs. Wilson indicated there was a good chance, he felt, that someone had already designed equipment to do just this. He indicated there was a NC Herpetological Society member who installs security systems that might be willing to help. Joe indicated that motion-sensing capability could be built into the system, so that only frames with fish in them would be saved. Joe felt that for the first year, it would be better to have a real person on the wheel. Bob asked Joe to write up a proposal. Joe indicated that he would write it up for two years, so he could have a graduate student on the project. Wilson indicated that he would contact Mary Moser, Kate Benkert, Don Degan and others to see if there was any available video technology for monitoring fishwheel catches.

Joe asked about license issuance. Bob noted that what Jim indicated, October, was his understanding. Bob explained that we had to take what FERC had done, and try to get the language back to what was in the Settlement Agreement. Wilson noted that he and Kent were at the Technical Settlement Conference, and most of the inconsistencies were the result of misunderstandings or errors in interpretation by FERC's staff. Kent asked about the FERC insistence that no cost caps be included. Bob thought that there would be a provision that if the job simply could not be done with the allocated funding, the agencies and Dominion would have to go back to FERC for further discussion.

3:17 PM: The meeting adjourned.

Joint FL1CMT and DFRTAC Meeting
Roanoke Rapids, NC
January 7, 2005

Present: Jim Thornton, Bob Graham, Sara Winslow, Wilson Laney, Warren Mitchell, Pete Kornegay, Wayne Jones, and Bud LaRoche.

9:10 AM: Bob Graham convened the meeting. He noted he had sent out a draft agenda.

1) **License Status Update:** Dominion is still operating under the license issued in March, 2004. Bob asked Jim to give us an update. Jim noted that everyone had signed the amended agreement except for the Fish and Wildlife Service. Once that happens, Don Clark will get it to FERC and approval should follow rapidly. Jim noted his direction was not to spend any money until the license was issued, but he plans to discuss that with management. He noted that he had already started work on cultural resources and some other things on which he needed to spend money. He will meet with his management on Monday. He doesn't see any holdup on getting a revised license.

2) **Review of September 13 meeting:** Bob led us through a review of the last meeting. He reviewed the minutes and highlighted action items, and noted that Angie hasn't yet provided a final report of the bypass reach work for distribution. **Action Item:** Bob will touch base with Angie on that issue. Bob noted the scope of work for providing flows to the bypass was provided for review and has gone out for bids. With regard to the American eel air bladder parasite concerns in Virginia, Bill was supposed to provide more information, and hasn't. **Action Item:** Bob will pursue that who the VIMS representative was. Bob provided a copy of the eel report to Angie. Joe Hightower had proposed moving the eel sampling ramps to the base of the dam, and Bob has been working with their engineers for approval. Bob noted he went down yesterday and surveyed, and has found at least six places where water is spilling over the apron. We will discuss that more when we get to the eel item on the agenda.

Bob noted with regard to outmigrating juvenile American shad, he was to discuss sampling gear. Pete advised that they have gotten some returns of American shad stocked below Weldon. Bob indicated he had held off asking Scott for more information on lift netting, because when Dominion does its purchase agreements, they have to avoid preferential treatment to any one vendor. Bob indicated that he has talked to a number of potential contractors. **Action Item:** Bob will continue to pursue obtaining information on lift nets. Bob was to revise the proposed sampling approach for resident fish, and hasn't yet done that. Pete and Bob were to have reviewed proposed sampling measures in the bypass reach, but because Joe's sampling proposal was approved and essentially will test the sampling measures, it is no longer needed. We discussed whether any change in the amount of water released in the bypass reach could lead to further changes. Wayne indicated that the 325 cfs value was in part selected because that is what Dominion indicated they were willing to spill, without capturing any energy, so if they decided to release more, we would have to take a new look at that issue. Pete noted the point was that at the beginning of the negotiations, if everyone had known that revenue could be derived from the bypass reach releases, things would have proceeded differently. It was Bob's understanding that providing flow to the bypass via a hydro unit was an open option all along.

Bob indicated Jim was to talk with Phil Lucas, of Progress Energy Carolinas, about videography, and Jim had done so and Bob had information from Devine, Tarbell and Associates. Wilson was to get Bob Graham's name added to the list for the ASMFC Southeastern American shad data workshop. **Action Item:** Wilson will do so (and has). Bob was to check with Sara and Pete about obtaining scales for aging for American shad

this spring. Sara and Pete indicated those wouldn't be needed. Bob advised that he and Joe Hightower are exploring the set-up of the fishwheel in the tailrace. They were initially considering placing the fish wheel near the end of the tailrace, where the bottom shoals up to 17 feet, from the 41-foot depth in the tailrace. However, anchoring the wheel will be a challenge, since cabling it to the bank doesn't appear to be an option. It may be better to secure the fishwheel to the tailrace walls in deeper water. Bob will be consulting with LGL about anchoring/securing the fishwheel. Bob is concerned because they will only be here for a limited amount of time, and they will have to have any needed materials on hand. Bob plans further discussions with Joe Hightower and Jason Smith of LGL. Pete noted that one year when they were sampling striped bass eggs, they decided to anchor striped bass half-meter nets, and found that an engine block was insufficient to hold the nets. Wayne noted that safety issues would be a consideration. We noted that lighting would likely have to be employed, and that the U.S. Army Corps of Engineers and U.S. Coast Guard would have to be consulted regarding regulatory requirements. **Action Item:** Wilson was to talk to Mary Moser, Kate Benkert and others about the possibility of using video technology to document fish wheel catches. Wilson had talked to Stuart Welsh about using such technology on the eel ladder on the Susquehanna, and he indicated they were very interested, but hadn't been able to do anything due to lack of funding.

3) **Spillway gate modifications:** Jim issued a request for quotes on Monday 1/3/05. There is a deadline of April 15 for the plan to be back from the contractor. The plan has to be to FERC by June 30. The agencies should have it for review by the end of April, although there may be some delay. We noted that the climate was ripe for a push by the new administration to further energy development. This may make installation of hydro units in the bypass more attractive to Dominion. Wilson briefed the group on the letter from Representative Pombo to the Secretary of Interior, regarding placing a moratorium on the use of the Service guidelines for siting wind turbines. Jim noted that a Dominion wind turbine project in West Virginia was dropped, due to endangered species concerns. Bob Graham thought the northern flying squirrel was the species in question. Pete noted that any changes to the discharge design would require us to take a new look at the proposal.

4) **Update on Anadromous Fish Surveys for 2005:** Bob asked Pete to do an update. Pete indicated they would be doing the same studies they routinely do, most of them for compliance with the ASMFC plan. They will continue to sample juvenile American shad, beginning at the end of August. Bud asked about otolith sampling. Pete indicated that Kevin was to finish those up today, and had found some marks from the fry released in the lower river. They were to finish looking at the last 50 or so prepared otoliths yesterday, at the Falls Lake Center. They would also be looking at otoliths from adults as well. Sara indicated that she was unaware if any of the fish they had provided had been examined. Pete noted they had decided not to look at any of the fish from outside the river, so as not to bias their numbers. Wilson asked if any of the fish from offshore had been examined. Pete indicated they were still in the freezer. Bob asked about the American shad JAI. Sara indicated that the 2003 value was the highest on record. She indicated that 2004 was lower. She noted the 30-year average was below one, and the

high 2004 value was probably around four. Bob asked how the survey was conducted. It is done by seine. The striped bass JAI is done by trawl, and will reach 50 years, this year. Sara noted that clupeid numbers in the trawls are even lower than in the seine. Pete indicated they had collected close to 300 this year, with electrofishing. He felt pretty good about the sample size. Sara advised the 2003 commercial American shad harvest was the highest it had been in years. She indicated that was primarily from the sound. There is little or no commercial harvest from the rivers. Alesia Read has finished her work on the upper river.

Wayne Jones indicated that the infection rate of striped bass with parasitic copepods increased from 20 percent last year to 100 percent this year, based on their gill net sampling.

10:00-10:05: The teams took a short break.

10:07: Warren Mitchell gave us an update on his work. He had an eight-slide Power Point presentation on a flash drive. Warren noted his presentation was pretty short. Warren indicated that he would not present an American shad run estimate today, but they are in the process of developing one. They plan to present a number at the NC American Fisheries Society Chapter meeting in Greensboro, in February. Warren reviewed how the acoustic data are processed. He noted the graphical depiction was a two-dimensional representation of three-dimensional data, which is an important point to keep in mind. He reviewed the location of the transducer, which is at Sycamore, owned by Bill Johnson. The power was provided by AC from Bill's cabin, which is much better than running them with batteries. They have been invited back for this spring. A subset of acoustic data files have been evaluated by Warren, by hand. Warren noted that a WRC employee could easily be trained to do this. Until the analysis software has been programmed, this initial analysis had to be performed. Don Degan helped to establish the initial settings. Warren had edited in a tight context what comprised the fish, in the dataset. This is done to preclude the computer combining fish. Results have been sent to Don. Joe and Warren will be analyzing the bulk data. Warren noted the field of view changes with river depth. The maximum range is 35 meters, but useable data will come from less. The width of the river is about 78 meters at the transect location. The transducer is located 6 meters channelward of the average water line. Warren noted the choice of the location for the transducer is actually as important as all the settings used in analyzing the data. Warren noted the fact that they will be at the same site again this spring eliminated a lot of variability from the dataset. Warren shared the equation used to analyze the data. He reviewed each of the variables in the equation. The spatial sampling fraction changes daily with river stage. Last year it varied from 2.5 to 7.5 meters in depth. Warren noted the value was originally reasonable, but got much larger when the river was high in April. Warren explained how Joe and Dave Hewitt had done their initial work. The computer program they had used is now out of date, and the recent software comes from Tasmania. The computer detected 87 percent of what was detected by hand, in Dave's study. The equipment arrived late last year, and this year, they plan to have the equipment on site much earlier, at the beginning of the run. Bob asked about the variability of the beta-hat value, as a consequence of other targets in the river, such as

algae. Warren noted another issue is how much of the bulk data can be analyzed. Pete indicated the WRC can help with determining the beginning and end of runs for the various species. Bob indicated they could help with the American shad, as a consequence of their electrofishing. Wilson asked if there might be some consideration of partitioning the data, given that fish species targets are very different sizes, and to the extent that their runs are temporally separated. Warren indicated that was a consideration. He did note that the equipment could differentiate from downstream and upstream moving targets, and the downstream moving ones would be eliminated from the analysis.

Warren briefly reviewed the relationship between the log of observations and log range. The relationship from last year's data is very good, better than in the preliminary studies done by Dave Hewitt. The relationship deteriorates, the further out you go. Joe and Warren plan to cut the data at 20-25 meters. One assumption is that striped bass are randomly distributed across the river channel, and that is supported by this analysis. Bud asked if multiple transducers can be employed, and Warren advised they could be, and that was better, but the cost per transducer is about \$25,000, so it costs a lot more.

Warren reviewed four files from April 8, 2004. He explained how the data are interpreted. The hand count of the data yielded 284 fish, about half of which were moving upstream. Bud noted in the case of the graph, the bottom points were moving upstream, and the top layer was moving downstream. Warren noted that the later data show most movement in one direction, downstream. Wilson asked if the "as" term would be adjusted to reflect the area of channel not covered. Bob asked about boats passing. Warren indicated that such events are really evident from the data. Warren noted there is a boat ramp within a couple hundred yards, and they made sure that there were no boats routinely idling in the area.

Warren reviewed the gill net data. It appears from these data that the species' runs are very distinct. He did note that he was concerned about the reliability of net sampling. In some weeks, the entire water column was not covered. He couldn't say why things appeared to "turn on" on May 8th. Warren indicated that he had sampled in a systematic fashion. Length-frequency comparisons from gill-netting and electroshocking were very similar. Warren noted he was gratified that the length data appear normally distributed, and there is no difference between the two gears used. This meets statistical assumptions. Sara asked if Warren caught few alewife, or none. Warren indicated that some may have slipped past him, but they did check the peritoneums of all fish caught. Warren noted the mean lengths from the two gear types were not significantly related. He is getting pretty close to the same answer from both gear types. Warren noted that he would like to have a larger sample size, at least up to 1,500 fish. He noted they did catch a lot of resident species. Bob asked what species he was catching. Warren noted the electroshocking was done consistently, and when the banks were sampled they caught lots of suckers, sunfish, carps and gizzard shad. Bob asked if a lot of gizzard shad were caught in the drift nets. He didn't. Warren also noted that he caught few white perch, of which he had expected to catch a lot during their run. Warren noted that he had bounced his nets off the bottom, so had expected to get them. He stated the mesh sizes he had used. He asked for any suggestions on what to do for next year. Sara and Pete suggested that Warren might be

sampling too high up in the Roanoke River system to catch the white perch. Pete indicated that most of the white perch fishermen were further downstream, in the vicinity of Scotland Neck, Hamilton and Williamston. Warren indicated the four-inch mesh was the most productive in terms of fish. He could use more of that mesh, but wasn't sure that would catch any more fish. Sara indicated that 2.75 was considered the optimum mesh for herring. Warren is considering longer mesh, and also monofilament mesh. Warren noted he had standardized the length, to enable calculating the volume of water, but was willing to try any mesh suggestions. Wayne indicated he had some experimental nets he was willing to loan. Bob asked Warren if he had tried lengthening the electrodes on his electrofishing gear. He had not done so. He noted his unit was the same as the WRC uses. Bob noted they had tried doing so for increasing the effectiveness of sampling catfish. Wayne indicated they had tried it for catfish also, but found it wasn't effective in the river. Pete indicated that lowering the voltage and pulse width, and having a chase boat, was the best way to get the catfish. Warren indicated he would have a technician, as well as a second boat this year. Warren noted the local residents were very interested in the shocking boat. Warren noted the CPUE for shocking was much higher than for the drift nets. Bob asked Warren if he had gotten the results of the American shad shocking last year. Bob noted the results didn't go out until June. He will provide a copy to Warren. Bob thanked Warren for his report. Pete noted that Bob could save it to Warren's flash drive, and this was done.

10:47 AM: Bob indicated that we were also going to talk about the work that Joe is intending to do for the bypass. He indicated he thought that everyone was pretty well aware of that work. Joe has a student coming in to do that work. We also will be setting up the fish wheel in the tailrace, to get an idea of what species of anadromous fish will be coming in to the area. Egg and larval work will also be done. The real thrust of Joe's student's work will be to develop techniques for long-term sampling use. Bob indicated that for most of the time, 325 cfs will be released, but for two 5-day periods, the 500 cfs freshets that would be used in the winter will be used during spring to see if any difference in fish abundance and gear performance will occur. Bob indicated we would discuss the eel work in the bypass later. He indicated that the fish wheel will also be placed in the tailrace. It is scheduled to be reassembled and placed in the tailrace the week of February 20th, concurrent with the planned work in the bypass. The LGL personnel are supposed to get here on the 20th, and hopefully the wheel will be assembled and operational by the end of the week. Bud asked who the LGL folks were. Bob explained they build and operate fish wheels for use in British Columbia. Jim hadn't realized that this was an "off-the-shelf" fish wheel. Bob indicated the American shad shocking also would be done again this year.

5) Videography of Habitat in the Bypass: Bob noted that Prescott Brownell had also brought up the idea of using the mesohabsim approach for assessing the habitat in the bypass reach. We had all agreed that some measure of habitat change at the different flows would be desirable. Bob noted he had contacted Ty Ziegler of DTA, who is doing a lot of the work for Progress Energy, about using videography to assess habitat changes. Bob had provided a suggested general approach to Ty for his review. He read the description to us, which included distinguishing between habitat types, as well as

potential special spawning types. Two-day periods of each test flow would likely be required. The request would be for identification of habitat types, and potential blockages to anadromous fish passage. Bob indicated that he felt the ideal approach would be to run the test flows, fly the videography, have the contractors meet with the DFRTAC to specify what comprised the different habitat types, and then have the contractor quantify the videography. Bud asked at what elevation the flying was done. Bob and Wilson thought it was about 400 feet. Wilson noted that the quality is very good. Bob noted you could even observe turbulence. Bob noted that he thought initially that one flyover would work, but after discussions with Ty, believes that two flyovers will be necessary at each flow. Bob indicated the estimate was \$35,000 for the entire study. This was for two passes at each flow. With GPS coordinates, all the imagery can be matched up. Bob indicated it sounds as though it would provide some valuable information. The cost is more than they had initially thought. In terms of the relicensing budget for the next two years, it is pretty much taken up by the work for Joe's student. Bob indicated he would like some discussion of whether this should be put on the back burner, or alternative funding should be sought. Pete indicated it was so important, he felt Dominion should do it. Wayne said alternative funding could be sought, if Dominion couldn't do it. Pete noted that we could tie this into the Corps 216 study. Wilson noted that he might have some discretionary funding, through the Atlantic Coastal Fisheries Cooperative Management Act, but he wouldn't know until later in the year. Wilson suggested that we all should solicit NMFS to ante up some funding, since they hadn't ever contributed anything for these studies. Bob indicated that he had applied through the APNEP for some NMFS funding for habitat restoration of the bypass reach, but hadn't heard anything yet. Pete asked for what amount he had applied. Bob indicated there was no dollar figure included in his proposal to APNEP. Jim indicated that for the videography, he would like to see each entity share in a third of the cost. Wayne indicated that if Bob would provide a firm cost estimate to us, we could seek funding. Bob indicated that the agency folk might have more success talking to NMFS than Dominion doing so. Jim asked about FWS. Wilson noted that he was prepared, along with Jean Richter and John Ellis, as well as TNC, to go back to the Regional Director and emphasize the needs. He also indicated that Congressional interests could be made aware of the needs by the state partners. We all noted that the next four years would pose a fiscal challenge for us all.

7) American Eel Work for 2005: Bob noted this is basically the proposal that we all have reviewed. The ramps will be put in the bypass. We still need to determine what to do when we know flood flows are coming. We also need to decide where to put eels in above the dam, and how to mark them. Bob would like to come back to those issues. For the tailrace, they plan to get a contractor on board to help design a similar ramp, using two different sizes of ramp material, and help to design a sampling regime that can accommodate the water level and turbulence changes in the tailrace. They have a scope of work ready to go for that work, and are trying to determine whether biological or engineering will handle the work, since it involves engineering. Basically, Bob indicated he had proposed something along the lines of what Alex Haro had conceptually designed for Holyoke, in CT. Bob showed us a picture of the conceptual design, which was basically a staircase design. They have no idea how much it will cost. Bud asked if this

was for sampling, or passage. Bob indicated they would consider using it for both, but more engineering would be required for using it for passage. Conversion would be required. Bob discussed the design changes that would be required. We discussed limitations to eel use. A ramp height of 60 feet was thought by Bob and Wilson to be a limitation, but they weren't sure whether that was overall height, or for just one ramp. Bud and Bob shared with us that they have discovered American eels well up the James, and are talking about eel passage there as well. No one is sure how they get that far upstream, but Jim noted that all the downstream facilities are run-of-river facilities. Bud noted that at high flows, the flows were pretty flat. Jim thought that some of the facilities became like big rapids during high flows. Bob noted that they had just got approval to put the ramps in the bypass. He would like to get them in by the end of February, but it may take until the end of March. He would like to have the tailrace design work done by the end of March. Jim was skeptical about that schedule. Jim noted they were moving forward as though they would have the money.

We returned to the issues of where we should put the eels, and how to mark them. Bob indicated it was up to us as to where we should put them. He noted that sampling upstream of the dam would begin in the tributaries. He suggested that we might want to confine distribution to one or two tributaries. Bob suggested, with Wayne's concurrence, that Deep Creek might be an acceptable site. Wilson asked two questions. If there is any possibility that a passive system might be developed for use in the long term, wouldn't it be better to just put them above the dam? Also, if we place them in a single tributary, do we preclude them dispersing into other tributaries. Bob indicated that in the long term, the likelihood is that trap/transport would be the preferred alternative for use. Wayne noted that it would be good for us to have large numbers stocked in the same site, so when we begin sampling in the future, we can assess the effectiveness of our work. We discussed the merits of placing the yellow eels and elvers in more than one site. It was noted that we would definitely be looking for them upstream at Gaston Dam. Wilson suggested putting them at two locations, one in Deep Creek and the other in the middle of the lake. Wayne asked how frequently the traps would be checked. Bob said every 48-72 hours, depending upon conditions. Bob noted that he thought that at least in one case, a predator had been trying to prey on the eels in the experimental traps. Consensus was to have at least two release sites, one in Deep Creek, and one in the lake.

We discussed marking of the eels. Bob was considering use of coded wire tags. Bud asked what the cost was. Pete indicated the cost was cheap for the tags, but the equipment and logistics of marking were the issue. Wilson noted the elvers would have to be narcotized with clove oil. Bob indicated the use of clove oil was problematic. Wilson indicated he was willing to pursue obtaining an INAD for clove oil. We continued to further discuss marking. We noted that use of marked and unmarked eels would provide two groups for comparison. Bob raised the question of whether we needed to mark any at all, at least initially. Wilson indicated he felt the reason we decided to mark all of them initially was to determine efficiency. Bob noted the agreement specified marking all the eels caught. We all agreed that marking at least some fraction of the eels would be beneficial, at least as far as detecting eels coming back through the turbines. Wayne indicated that both their sampling and Dominion's indicated

there are no eels above the dam. Bob indicated he did seem to remember that marking all the eels was proposed for detecting eels coming back down, once the eelway is installed. When that sampling is done, we would be able to detect fallback. Bob noted he had never worked with CWTs, and asked Pete how the tags were manufactured. Pete explained how the wire could be ordered, either plain, or with a binary code. Bob wanted to know costs. We explained that the tag wire was cheap, but the tagging equipment and tag detectors were costly, about \$4,000. Wilson noted those were one-time expenditures. Wilson noted that he was flexible on the percentage tagged. Pete noted that there was a good reason for us having put that provision in the settlement agreement. Wilson concurred. He noted the bottom line for him was that we must be able to obtain the data we require to document the success of the program. If there is consensus that no tagging is required to obtain those data, not only by the DFRTAC but also by independent experts, Wilson would be satisfied. There was some discussion of ways the expense of tagging could be reduced during year one of the study. Bob thought they might be able to get a wire spool for every year, and if the numbers are such that the task becomes burdensome, we can consider altering the protocol. We all agreed that tagging each individual was more important in the early years, and that at some point, tagging wouldn't be necessary. Wayne noted that it was important for us to have them marked to assess eels moving downstream. Bob finally recalled the conversations we had about needing to check eels trapped below the dam for tags, to assess fallback. Jim asked about tag retention. We indicated that for most species, CWT retention was very high. We began to discuss outmigration of eels and whether tagging would prove beneficial. Pete read what was required in the settlement. Bob noted we really didn't say when the tagging could cease.

Action Item: Bob will look more into the use of CWT for tagging the eels. **Action Item:** Wilson will pursue what is involved in getting an INAD for using clove oil as an anaesthetic. **Action Item:** Wayne, Pete and Bud will check into the availability of CWT equipment for Dominion's temporary use during part of 2005.

Wilson briefed the group on the status of the listing petition served on the FWS and NMFS with regard to the American eel. The 90-day decision will be issued, and it is likely that a Status Review will be conducted.

Bob asked if everyone was satisfied with the proposed eel work. Bud asked if thousands appeared, all would be tagged. Bob indicated the DFRTAC would discuss option when that occurs. Wayne indicated that they might be able to help. Bob indicated they were planning to hire consultants to do the eel sampling and tagging. Their staff resources are limited. Wilson asked if graduate student involvement had been considered. Bob indicated they really hadn't thought about it at this time. Wilson and Wayne saw the possibilities for multiple Master's theses derived from the work.

12:14 PM: The group adjourned for lunch.

12:51 PM: The group reconvened.

8) **American Shad Work for 2005:** Bob noted the plan for American shad this year is to continue investigation of use of electrofishing. Wilson clarified that 2005 will be considered Year 1 for the purpose of the license and settlement agreement. Dominion plans to electrofish weekly in April, May and June. They want to work more with the technique, which seemed to show promise last year. They have not decided yet whether to employ one or two-night shocking, but plan to use the same area, around NC 48, or further downriver at higher flows. Pete asked that close coordination be undertaken with Chad and Kevin. There is no marking proposed. A hauling tank will be either purchased or constructed this year, so it will be available in 2007. That is pretty well it, in terms of what Dominion is planning. Bob indicated the fish wheel will also be used. Pete asked if the fish wheel would be checked daily. Bob confirmed that is the case. Pete indicated he was concerned about potential PR problems if the wheel really loaded up with fish, so it would have to be closely watched. Bob indicated that a comprehensive monitoring plan for the American shad population in the Roanoke River Basin was required in Year 1. Pete and Bob were to work on that together. Jim wanted to refer to the revised license. He felt that the comprehensive plan should not apply to the company. Pete noted that the Settlement Agreement still read the same. Jim concurred, but noted that the FERC may not require them to perform this task, at least not under any deadline. The new license did not contain a provision for such a plan. Wilson clarified that Pete and Bob would work on such a plan, and that it would contain any provisions required by ASMFC that pertain to American shad and are conducted by WRC, DMF, NMFS or FWS. Bob indicated there was a similar provision for American eel, for the preparation of an implementation and operations plan. **Action Item:** Bob volunteered to draft the eel plan, if Pete would do the American shad one. Pete agreed. A deadline of July 31st was established for completion of draft plans. Pete indicated he would delegate it to Wayne. Wayne noted he was retiring July 31st.

Action Item: Bob and Jim indicated that they needed a copy of Alesia's final report, which is essentially her thesis. Pete indicated that Joe's students usually publish their thesis results fairly rapidly. Jim noted that the study didn't include the reach below Kerr Dam. Wilson agreed that habitat still needs assessment. Bob thought her report did address that habitat in some respect. Pete agreed there was some reason that area wasn't included. Wilson thought it was deleted for logistical reasons. Bob thought it might have been due to intermittent flow. Bud noted the environment below Kerr was pretty hostile (low DO and water temperatures) and wondered how that might affect shad. Pete noted that was why it was part of the study. Bob indicated they would look into that issue. Pete noted we could ask Joe, once he returned to work.

Bob noted the plan for initial trap and transport was also due this year, and that would be done after the experimental work is done. They have a request for the turbine passage study drafted and will be sending that out for bids. Pete asked about the telemetry work. Bob noted it isn't scheduled until Year 3, but the wording is "...if, then..." Bob indicated that everything else is pretty much covered. He asked Pete if the 216 Fisheries Group had only put out two potential pieces of work. Those were the economics of American shad restoration, and the proposed woody debris study. Bob asked what else was likely to emerge. We noted The Nature Conservancy is proposing to accelerate the 216 process.

Jim noted to Pete that he shouldn't get upset when he sees the Dominion response. Pete noted that somehow, the 216 needs to address fish passage around Kerr. We briefly discussed the issues regarding the progress, or lack thereof, of the 216 studies, not only on the Roanoke, but also on Currituck, Tar River and Neuse River. We discussed the water quality issues downstream of Kerr, and whether those were being addressed in the 216. Jim noted that he was trying to get DWQ to understand the issue. He doesn't believe they understand the issue. Dominion is supposed to notify DWQ whenever Kerr goes below standards, but he noted it doesn't make sense for him to have to do so each time Kerr goes below 5 ppm. He indicated that essentially, once they go below 5 ppm, they pretty much stay there. Pete asked once it goes below, how long does it stay there? Bud indicated it could be from July through September, but it was flow-dependent. Pete suggested that Dominion develop a boiler-plate e-mail that could be sent on a daily basis. He further suggested that direct discussions with DWQ would be beneficial in explaining the issue clearly. Bob showed us a graph which showed the oxygen levels below 5 from late June through late October, for 2004, at the USGS monitoring station in Lake Gaston. Bob indicated that all the other requirements for American shad are pretty well covered.

9) **Review of Draft Fish Passage Schedule:** Bob turned to the draft that he had provided for Article 401. Pete indicated he was glad Bob had done this. Bob noted it was one of those things that had to be done, and it is due at the end of March. Bob noted what he tried to do was to go through all the requirements, and based on the language in Article 401 of the new license, prepare a schedule that includes implementation, consultation, filing and methodology to be used. Bob noted he had assumed 2005 as Year 1, and tried to decide what made sense in terms of when the work would be completed, and so forth. Things could be passed on to FERC in the quarter following our discussions. Bob noted that you have to sit down with the Technical Settlement Agreement and pick out the qualifiers. Bob suggested that a subgroup of us be charged with reviewing the details of this document. Bob indicated his understanding is that FERC wants something they can use as a checklist. Jim confirmed that was his understanding from Wayne Dyok. Jim noted they want to be able to check the documentation for all the items and check them off. Bob indicated he felt FERC would just look at the filing dates, but the product should be very useful for us in keeping on schedule. Jim noted they liked the fish stocking plan, but there wasn't much to it. This was the lake fishery plan. They had a lot of editorial comments on the paddling plan, but they generally liked the layout of the plan. Wilson and Pete liked the sub-group idea. Pete suggested Bob, Wilson and him, and Sara. Sara said she wanted to wait until the group's work was done. Wilson indicated his assumption was that this would be just reviewing the details in Bob's draft, and cross-checking the dates with the Settlement Agreement, and the license. **Action Item:** Pete asked Wilson to e-mail Prescott, and invite him to participate with the other three members of the sub-group. We discussed whether Ron Sechler or Prescott would be the NMFS representative. Jim thought the work had been delegated to Ron. Wilson and Pete thought the invitation should go to Prescott, since he was the principal negotiator. Bob asked Wilson to make sure that Prescott understood the FERC deadline was March 31st. Bob asked Pete and Wilson if what he had provided was adequate. They thought so. Bob asked if we needed to get together, or work independently. We decided to get together. Jim suggested that we at least check all required elements,

before we meet. Bob noted that several items were not required. We decided that since the required list of items came directly from the license, we didn't need to do that after all. Jim concurred that his comment really didn't apply. We decided to meet on February 15 to conduct the review (later changed to February 23).

Wilson briefed the group on the American eel workshop to be held in March at Virginia Tech. He will keep the group posted. Someone asked if the person from VIMS who raised the parasite issue was coming. Wilson noted he still didn't have that name from Bill Bolin. Bob indicated he would send a message to Bill.

10) Study Plan for Resident Fish Sampling: Bob indicated that he had not revised the plan yet. He noted there is a lot going on. The requirement is to do this every five years, and he proposed to postpone this until 2006. He felt it would be more interesting after a year or two of flows. Bob noted he wonders how choked the area will become with Hydrilla. Pete had no problem with postponing the work. Bob indicated he would try to revise the resident fish plan this year, so we would be ready to go, next year. We briefly discussed the freshwater mussel sampling, and the fact that Angie Rodgers would be tracking mussel abundance. Warren asked what the response had been from the local residents. Pete indicated he hadn't heard anything yet.

11) Action Items for Next Meeting: Bob and Pete have added these in, as they edited and reviewed the notes.

1:54 PM: We decided to wait on establishing a date for the next meeting, until Pete, Bob and Wilson had met. The meeting adjourned.

Gaston-Roanoke Rapids Hydropower
Diadromous Fish Restoration Technical Advisory Committee and
FL1 Cooperative Management Team
May 16, 2005

Present: Bob Graham (Dominion), Jim Thornton (Dominion), Wilson Laney (USFWS-Fisheries), Julie Harris (NCSU), Warren Mitchell (NCSU), Bennett Wynne (NCWRC), Pete Kornegay (NCWRC), John Ellis (USFWS-Ecological Services), Steve Meyer (NCSU), Ty Ziegler (DTA), Michael Barclay (DTA), Joe Hightower (USGS), Jenny Winters (NCSU).

9:12 AM: Bob convened the meeting. He noted the only two agencies not represented are the NCDMF and the NMFS, who may show up eventually.

Bob asked us to do introductions. We did so.

Jim indicated he would like to give us an update on the release mechanism engineering for the Bypass Reach Flows. Bob noted that the mandated release is 325 cfs base flow, with 500 cfs freshet flows, as requested by the NC Wildlife Resources Commission.

Jim reviewed the options explored for the permanent releases. The company had explored using a turbine, but that hasn't worked out. The engineering firm has given them some conceptual ideas. The first is gates modified with valves. These could be generally sized for full opening, with one or two control valves, in several different gates. The other option is to use the skimmer gate and emergency spillways. The

skimmer gate could auto operate for control, and a pipe could be placed through the emergency spillway. There are a number of combinations of these options as well. Bob clarified that the pipe through the emergency spillway would be a pipe through concrete. Jim drew a schematic diagram for us to illustrate the latter option. Jim noted that some sort of screening would be required. They may have to modify up to five gates, which will drive up the cost. Vibration is also a concern, given emplacement of additional valves. Jim noted the more openings you add, the more complicated things become. These are some of the things at which they are looking. With regard to screens, the desired concept is to have a long screen coming out into the water, to permit adequate flow. However, because the gates open and close, flat screens are required, so that is why they are having to look at multiple gates. Jim reviewed the issues: Emergency spillway/Skimmer gates: at low lake level 125 cfs will be released through skimmer gate; any unbalanced flow distribution would need to be addressed; costs of civil work on emergency spillway; accuracy of flow measurement is better, if the skimmer gate could be used. Jim showed us a photograph and indicated where the water would be flowing, with options at the skimmer gate, and at Gate 1 on the east end of the dam. Valves on the spillway gates would probably be located near the bottom of the gates. Bob asked how the operation of the gates would be affected by valve emplacement. Jim noted that FERC will require the gates to open fully.

Jim noted that downstream passage was also a topic of discussion. He had discussed this with Harza engineers. For American shad, juveniles would likely pass through the turbines. It would be possible to use the skimmer gate. North side attractant flow is likely too small. For adult American shad, some usage of the skimmer gate is possible. Neither adults or juveniles are likely to use any valves through the gates, as they are too far away from the turbine flow. American eels are unlikely to use either alternative.

We had some discussion about screening. Bob noted that Wayne Jones was the one who had raised the issue initially, expressing concern about juvenile striped bass leaving the reservoir and going downstream.

Jim noted that he hadn't finished his screen discussion yet.

John Ellis indicated that he thought we had some discussion about juvenile American shad and where and when they were likely to move. There was some indication they would move at night. Joe indicated that at some northern dams, he thought they observed large numbers of juveniles, and subsequently cracked a gate to pass them through. Bob noted at Conowingo, his understanding is they observe the fish at night near the surface, and use lift nets to sample them. Joe indicated that he was surprised at the negative assessment from the engineer with whom Jim had consulted. **Action Item:** Bob noted he could check with the Conowingo staff and get details of how they operate.

Jim noted that downstream passage was to be discussed during implementation, but American shad were to be considered. Pete noted that we did need to monitor and learn from our experiences. Joe expressed surprise again that this would not be a viable option here. Bob recommended that we touch bases with others with experiences with the species. Jim noted that he was trying to meet a FERC deadline here, and was under some time restraints. Bob noted this shouldn't have an impact on Jim's timeliness. Jim noted that any screens would have to be removable for cleaning purposes. He noted that American eels were felt unlikely to use any surface releases.

With regard to screens, Jim noted the target species was striped bass, per Wayne Jones concerns. Jim indicated that he felt the stocking fees in the license were to compensate for any such loss. Alternatives considered for certain times of year included 2-inch bar racks, which would keep out large fish, and could be mounted for ease of cleaning; the other option would be a smaller mesh screen. These interfere with gate opening, pose a cleaning issue and restrict flow.

Bob noted that maintenance is a real issue here, due to Hydrilla and milfoil problems. Bob noted the issue with adult striped bass really has been at Kerr Dam, and not here at Roanoke Rapids. Joe noted when they tracked stripers in Gaston, for those fish in the lake at least a month, the only time they observed downstream migration was in the spring, during high flow events.

Jim's question, particularly in view of the stocking they are doing, was whether the screens are still viewed

as a necessity, and if they are, what sort of device. Pete indicated that he had talked to his reservoir biologists, and they indicated they would like to have 2-inch bar racks. John asked about mounting them horizontally, rather than vertically. Jim noted that could be done.

Pete noted that will all the floating vegetation, it might not be hard to block a significant portion of the 325 cfs base flow. Jim noted they are trying to design for that condition. Pete noted that ten percent of the flow going into the Bypass Reach was a significant amount.

Bob and Jim noted the vegetation issue was a seasonal event, usually December through February. Bob noted that is a period of year when fish movement would be expected to be minimal anyway. He suggested that elimination of screens during that interval wouldn't be problematic. Jim indicated that he would take the bar screen option back to the engineers. He asked if we had any issues with using the skimmer gate, versus the spillway gates. Pete asked about removing concrete. Jim noted they are still deciding on the final option/approach.

Pete asked about the flow distribution. Jim noted they are trying to maintain flow on both ends of the dam. On the skimmer gate end, Jim noted that the flow into the Bypass Reach would not be direct.

Joe clarified that the skimmer gate had a surface opening, and the spillway gates were below the surface, approximately 18 feet down. He felt the surface opening would be better.

Bob thought the bulk of the juvenile American shad were likely to go through the turbines, based on the research done previously on other systems.

Joe indicated he couldn't help but believe that a surface release was more likely to be used. Pete concurred, noting that the schools at the surface would be more likely to use the skimmer gate.

Bob asked Jim to send him his presentation, which he will forward to the Kleinschmidt personnel, and to Prescott Brownell, for their review. **Action Item:** Bob is to check with Kleinschmidt Associates regarding their thoughts about shad and eel passage, and send Pres the presentation Jim gave. (*Kleinschmidt communication summary distributed to DFRTAC via email 5/18. Presentation sent to Pres on 5/31*).

9:53 AM: Bob turned to the meeting minutes and action items. Pete and Bob had edited Wilson's notes. Bob reviewed the action items. He had touched base with Angie Rodgers, and she indicated they are putting the finishing touches on the mussel report, but haven't finished it yet. **Action Item:** Bob to distribute final report when received. (*Distributed via email 5/18*). With regard to the invasive Japanese air bladder parasite issue, Bob was to determine who it was from VIMS that raised that concern. Bob had consulted with Bill Bolin, but still hasn't determined who it was. **Action Item:** Bob to identify VIMS concern. (*Dr. Carl Hershner - email query sent 5/17*). **Action Item:** Bob will pursue obtaining information on lift nets used on the Susquehanna. (*Information received from Scott Ault and distributed via email 5/18*). Wilson was to add Bob's name the group of participants for the southeast American shad data workshop. Bob wasn't able to attend, and asked Bennett and Joe to give a report. Bennett indicated that the workshop went well. He noted that Kevin Dockendorf has pulled together all the data for the Commission. Wilson noted that these workshops are the first step in the Atlantic States Marine Fisheries Commission stock assessment process. He noted it is hoped that some level of stock assessment will be conducted for every river on the entire east coast. We briefly discussed the shifting paradigm issue, which Prescott refers to as "scientific amnesia." Joe noted skepticism regarding whether the assessments would be very meaningful, but indicated that some useful age information would be forthcoming.

Pete gave a short report on American shad production for fry this year. He noted that despite the fact that Watha is essentially down, they have produced fry this year. Wilson and Pete noted that Edenton has also produced a good number of fry this year, thanks in part to NCWRC hiring Andrew Chapman from Maine to come down and do the work. The fish used as brood stock came from the Tar and Cape Fear Rivers. Joe indicated that he and Summer Burdick have been doing some experimental work, determining the hatching success of American shad eggs on various substrates, in static systems. Bob indicated that they may be

getting some American shad from the Roanoke, and asked if they would be needed for brood stock. **Action Item:** Wilson will check with Edenton, to see what Andrew's status is, and whether the hatchery will have the capability or interest to do any more work. (*Edenton and Watha unable to raise any more American shad this year 6/7*).

Bob noted that Wilson was to check on the use of video technology to monitor the fish wheel. Wilson noted the table of contents from the latest issue of the N. American Journal of Fisheries Management has a paper on the use of video cameras to monitor fish wheels on the west coast. Bob reminded us that our concern was having large numbers of fish in the wheel, which hasn't really happened. We decided that we would review the paper, and just stay informed about what was available.

Action Item: Wilson was to check with the Warm Springs Fish Technology Center about doing an INAD for clove oil. Wilson hasn't checked with Vince Mudrak, but will do so. He noted that work with American eel is likely to become more and more common, so he is confident that someone is probably doing this already.

Bob noted he was supposed to explore the use of CWT for American eel, and will discuss that during the American eel discussions.

Bob noted that he and Pete were supposed to draft a monitoring plan, which is due this year. They haven't done any work on it yet. Bob wasn't sure what was required for American eel. **Action Item: Bob** and Pete will continue to pursue development of the American shad and American eel management plans required by the Settlement Agreement (but not the new license). John noted that Bennett was the contact person for this now.

Joe indicated that Alesia's thesis is now online.

http://www4.ncsu.edu/unity/users/j/jhncsu/public/DraftFinalRpt_Read&Hightower.pdf

He is in the process of converting her thesis into the final report for the study, and this should take a couple of weeks. Bob asked if Alesia had provided much descriptive habitat information in her thesis, i.e., how much beyond the water chemistry aspect of habitat did she look. Joe indicated they had just used the HSI model and applied it to the five rivers they examined. Joe indicated that substrate was not in the standard HSI model, because the Delphi outcome was that substrates didn't matter. Joe noted substrate was in the IFIM model, and they did use that one, along with a modification based on work they had done in the Neuse River. If you use the Stier and Crance HSI model, it says that all five rivers constituted acceptable American shad habitat. Use of the IFIM model says that silt is not good, but sand and cobble are good, so all five rivers come out as acceptable. The Big Otter and Staunton Rivers come out on top, using the modified model, because they have higher substrate variability. Joe indicated there is one chapter that includes all the field habitat surveys, with all the modeling results. The second chapter contains the egg hatching results. Joe indicated they got good hatching results everywhere.

10:19 AM: **Action Item:** Wilson needs to follow up with encouraging higher participation by NMFS staff.

Bob asked if everyone found the meeting minutes acceptable. No one indicated otherwise.

Wilson briefly updated the group on the status of the American eel and Atlantic sturgeon under the Endangered Species Act. He noted the draft 90-day finding for American eel is in FWS headquarters, and the Department requested a month for review. Regardless of the outcome of the review, Wilson noted that the Service is doing a Status Review because they have committed to the ASMFC to do one. States and utilities will be getting letters from the Service, requesting their input for the Status Review on American eel. For the Atlantic sturgeon, Kim Damon-Randall has the lead. Wilson knows nothing about any timeline, or Status Review Team, but understands that NMFS is planning to do a Status Review for Atlantic sturgeon. Wilson noted also that Kelly Place, a waterman from VA who is also a Commissioner to the ASMFC, is doing a sturgeon reward program on the James River in VA, and has been finding lots of

sturgeon. Wilson noted that he understood that Albert Spells also has a very small, six-inch fish, in an aquarium at Harrison Lake NFH. Wilson noted the Commission also had approved Addendum II to the ASMFC Atlantic Sturgeon FMP. This approved the importation of Canadian Atlantic sturgeon fingerlings for use in an aquaculture operation in the North Carolina mountains.

Bob asked about the experimental work ongoing with shortnose sturgeon in the Roanoke. Joe and Pete explained that Tom Kwak and Mike Holliman were conducting that work, using captive-reared fish. The purpose of the experiment is to look at contaminate uptake and survival. Controls are being held at Edenton NFH, and fathead minnows are also being used as controls.

10:29 AM: The group took a break.

Wilson had talked to Edenton NFH staff during the break about the possibility of producing Roanoke brood stock American shad fry. He reported that today is Andrew Chapman's last day. Hatchery personnel are interested in the possibility of producing more fry from Roanoke brood stock. They will check with Watha on the availability of hormones. Glenn Green, Assistant Manager, advised they would need a minimum of 40 female, and 60 male, American shad, and could handle up to 200 of each sex. Wilson was to check with Bob Graham about the timing and availability of fish captured by Dominion staff. **Action Item:** Pete indicated that he, Wilson and Bob should discuss the advisability of using Roanoke River American shad for production purposes and make a final decision. (*Decision could not be done for 2005 finalized 6/7*).

Joe Hightower and Julie Harris gave a brief report on the sampling effort in the Bypass Reach. Julie showed us an aerial of the Bypass Reach and discussed their sampling locations and schedule. They are electrofishing, and also checking buffer pads for eggs. The fish wheel is also being used in the tailrace. Plankton nets are being used to sample for eggs. Julie hasn't yet worked up any of the eggs from the samples. Julie has looked at some of the samples, about half she guessed. She showed us the data from the fish wheel, through May 8th. Most of the catch has been gizzard shad, but hickory shad and blueback herring have been caught as well. Resident species such as white catfish are also being caught. In the Lower Bypass Reach, hickory shad and blueback herring have been caught. Blueback herring density was about 6 fish per five-minute transect. Some of the fish were running ripe males. Joe noted that sampling in the Lower Bypass Reach was complicated by backflow from the river, during high discharge from the tailrace. Resident species such as notchlip redhorse have also been caught. Julie noted that the high water really affects sampling, making it much more difficult. Bob asked if much difference was noted during the freshet release. Julie noted the depths and flows did increase, but observations were confounded by high river flows. Julie noted that fewer gizzard shad were encountered. Bob noted that it was interesting to him that fewer shorthead redhorse were in the catches, since in previous years they were the dominant species downstream.

Julie noted that in the Upper Bypass Reach, no anadromous species were encountered. More gizzard shad were captured. Bowfin were captured, as were notchlip redhorse. Hickory shad were seen in the reach prior to the initiation of sampling. Wilson asked about the bowfins, if there was any evidence of their spawning. Julie indicated there were plenty of bowfin there, but the halos supposedly on the males were not in evidence. Warren noted that Steve had found a bowfin with a bright turquoise mouth, which according to the literature is indicative of the fish being in breeding condition. We discussed the desirability of noting American eels in the samples, despite the fact that they can't be quantified. Jenny noted that they go right through the dip nets, or aren't captured at all, just seen. Wilson asked when sampling would terminate. Joe advised it would be completed the end of May. Wilson asked about the cottonmouth population. Julie and Bob advised they were encountered, but not always. John reminded Wilson to ask about the lampreys. Julie hasn't seen any. Steve and Warren had seen them, mostly on hickory shad.

Pete asked about recreational fishing in the Bypass Reach. Julie and Jenny advised that fishermen were there, more on days when the weather is good. They see fishermen using four-wheelers. Wilson asked what we had decided about obtaining any creel data from the Bypass Reach. We recalled that we had discussed doing so, but decided that we would wait for a few years to see what sort of fishing pressure developed.

Warren Mitchell gave a brief report on the hydroacoustic, electroshocking and drift gill net sampling regime. He described the modifications to the program. They are doing drift gill netting and electrofishing five days a week. They are catching a pretty steady stream of resident, and anadromous fish. They are using 6 amps of current, in the middle of the river. They got their first spent striped bass Tuesday of last week. Joe indicated that going to intensive electrofishing has been a good idea. He indicated they are still struggling about what fish are present where the transducer is located, as opposed to where the drift netting and electrofishing is being conducted. Joe noted that the higher flows also interfere with this sampling. Warren noted that catches have picked up, as of May 12th. Warren noted that use of the drift gill net is to catch fish in transit. However, Joe noted that the catch of fish in the drift nets doesn't coincide with the striped bass run. Warren noted that anything over 10,000-12,000 cfs renders the gill nets difficult to use. He indicated that they had modified the gear to sample the higher flows, creating 28-foot deep nets with heavier weights. Michael asked what portion of the channel they are fishing. Warren advised about 60 percent of the river. They believe the striped bass are mostly on the bottom. Warren indicated most of the fish this year had been caught in the bottom meter of the net, which they have delineated. Bob asked about the time of drift. Last year, they had sampled around the clock with drift nets. Michael asked about sampling during freshets, or long stable flow. Warren noted they had sampled during some peaking events. Warren noted that the freshet releases are not very notable, downstream.

Steve asked Pete about the proportion of immature females in the striped bass catch. Pete indicated this was one of the strangest years he had ever seen. This year, he guessed that 60 percent of the catch was 3-4 year-old females. He has never seen anything like this. Bob asked about big females. Pete indicated they had seen some, toward the end of the season. Pete noted the harvest is usually focused on young males. Warren indicated that they had cut open one 350 mm female and found immature eggs. Pete noted the young females don't usually migrate.

With regard to the hydroacoustics, Warren noted they have had five hiccups thus far, as a result of power outages. Two of these were 24 hours, the others shorter. Warren noted that Julie had caught one of these for him, because the battery was squawking. Warren indicated they were seeing a lot of upstream moving fish now. He noted the biggest issue was sand moving down the channel, obscuring the beam volume. The fish didn't start until late March, presumably the hickory shad.

11:25 AM: Bob noted that we could shift the agenda around, to accommodate Julie who has to leave early for sampling purposes. Bob suggested that we move the DTA presentation up to now, so everyone could see the video of the Bypass Reach and participate in the discussion before they have to leave.

Ty and Michael provided aerial video index photographs for everyone to orient us to the Bypass Reach. We discussed whether the aerial videography captured any of the IFIM transects. Joe and Bob noted there are four transects, concentrated in the upper end of the reach.

Michael showed us the video. He indicated they made several low elevation flight passes. Michael provided us a handout we could keep. The reach was flown three times, at high, mid and low elevation flights. Michael noted they even got lost in the helicopter, during the low elevation flights. The flights were flown on February 27th. Michael explained the use of the video material, which he noted was addressed on the handout he provided. Michael demonstrated the use of the software. He noted the time stamps on the aerial photo were selected to help orientation with notable locations or objects. Michael noted we could use the video on a home DVD player, and the flight line information remains on the screen. For some unknown reason, the information is lost from the screen if using a computer. The material was edited to remove turn arounds and non-river views. The track lines provided on the aerial are just for the low-elevation runs. WINDVD software is used to run the data. Michael indicated he thought the most useful data would come from the low-elevation runs. Michael noted that you could slow down the presentation, and also reverse course, using the software. Discharge during the flight was 325 cfs. Jim noted it appeared to be a lot of water to him. Wilson and Pete noted they were just getting ready to remark that it appeared low, and there was a lot of land showing.

Jim noted that which gates were open is an issue that should be discussed. He noted that for dam safety (head pressure) reasons, adjacent gates couldn't be opened.

Julie showed us on the aerial where her sampling is taking place. It is depicted at time step 28:15:26, at the site of a hydraulic control. The right side channel is where the primary flow occurs. Julie noted the control is stepped, and the greatest step is about six inches, in a total head of a couple of feet. Joe noted that part of the motivation for placing buffer pads is to assess variable sites with different flows and substrates. Julie showed us on the aerial where the electrofishing transects are located. Some areas are difficult to access. Michael asked about the whitewater, and if it disappeared when the water levels increase. Julie advised it did disappear, when tailrace flows were at 20,000 cfs. The backwater flow reaches as far up the Bypass Reach as this site, but no farther, due to the hydraulic control. Jim asked if you could zoom in on a given frame. Michael indicated you could zoom in, but the image would begin pixellating. Michael indicated the WINDVD software costs about \$80. Michael noted it sure beats tromping around in the reach to determine where you are located. There was total consensus from the group on that point. Michael noted that to correlate GPS readings on the ground, with the aerial footage, you should compensate by about 300 feet, due to the angle of the photography and speed of the helicopter. Pete asked, if the reach was to be flown at another flow level, would there be enough visual resolution to tell the difference. Michael indicated they told Bob they didn't know if that was feasible or not. They did indicate to Bob that this would be a highly valuable tool. Michael suggested that selected points be chosen, for actual empirical measurements on the ground, which could be supplemented with video. Michael noted that it would be difficult to detect differences in only a few hundred cfs. Ty noted the medium was more valuable, when flow changes were greater. Wilson asked about using the footage to assess substrate type. He noted you could see boulders, but not cobble, gravel or sand. Michael noted that if you picked the time of year with least phytoplankton bloom, and time of day, you might be able to see more. Bob suggested that it would be necessary to do ground-truthing visually, once you had selected sites from the aerial. Michael noted that the distribution and volume of water releases could be assessed using the videography. Sites could be located using the video material. Michael indicated that we could discuss these issues further after lunch.

Bob asked Julie if she had any particular questions at this time. She didn't have any. Joe asked, if you are trying to determine where the bulk of the flow is, i.e., routes that hickory shad might follow, could you do that? Ty indicated that you could put out a string of level augers, and capture all the data you need, through time. If you had particular criteria, you could assess that. Joe indicated he was wondering specifically about the 325 cfs, and wondering if you could trace the principle migration route. Bob noted that you might be more easily able to spot blockages. Michael noted the area was extremely complex, but you might be able to spot some areas. Pete indicated it would be cool to do a dye study, and track it from the air. Michael indicated they would show us some tools used on other rivers, after lunch. Bob suggested we continue the video discussion, after lunch, and then finish up with the American eel and shad updates. We will also take a tour of the dam and continue our discussion of the release points.

12:03 PM: The group broke for lunch.

NOTE To WILSON: Send mycobacterial handbook to Warren Mitchell. Contacted Lydia Munger at ASMFC, and she is checking on availability. Wilson should also contact Clif Tipton and consult with him.

12:30-1:15 PM: The group went on a tour of the Roanoke Rapids Dam to examine the skimmer gate, and emergency spillway gates, and discuss the options available for permanent release of flows into the Bypass Reach. Jim Mead was called on the speaker phone, to discuss flow release options. Jim indicated that there would be some limit set, so that no more than 125 would be released from each side. Jim indicated that for higher flows, they would still crack a gate, or multiple gates. Jim Mead asked if there is any problem with the seals, when they crack the gates. Jim Thornton noted that Gate 1 has a leakage problem right now, due to being opened so much while apron drains are being cleaned, for the last year or so. Pete noted that Jim T. was amenable to breaching the tainter wall to enable water to flow out into the big pool. Jim Mead indicated that he was amenable to having flows in the range of 125, to 165 cfs, as long as two widely-separated gates are open. Jim Mead noted that we might want to leave the wall alone, until we see what sort of patterns are observed. He noted that the water tends to migrate toward the south end of the dam. Jim T. noted that the gate being used at present is Number 17, which is right in front of the big pothole below the dam. Pete asked if the company could set up an experiment, and let us look at the patterns with the skimmer and Gate 1 or 2 open. Jim T. indicated that he could do so, but he needed an

answer on use of the skimmer gate, today. Jim M. Indicated that he was amendable to use of the skimmer gate, with the understanding that a minimum release of 125 cfs would be performed. Pete noted that he was looking at the skimmer gate location, and the wall goes all the way out to the woods almost. Jim M. indicated that he was comfortable agreeing with the use of the skimmer gate now, with or without holes in the wall, as long as minimum and maximum discharge values were assigned. Jim M. noted that a little bit of variability wouldn't hurt things, anyway.

Pete noted to Jim M. that he understood Weyerhaeuser was talking to USGS about funding the water quality monitoring at the NC 45 bridge. Jim M. indicated the two parties were talking directly and it appeared something may work out. Weyerhaeuser is working with USGS to reduce the cost of maintaining the gage, through providing a boat and technical assistance.

1:29 PM: Jim advised the group that as of May 1, Dominion has taken over the dispatching of power from Kerr. Pete noted he understood that Dominion was now part of PJM (Pennsylvania-New Jersey-Maryland). He asked how they got back the dispatch authority. Jim wasn't sure. He noted that since hydropower was cheap, it is the first source of energy dispatched. Jim noted that SEPA didn't think much of the arrangement, but the contract wasn't long term. The contract is between Dominion and SEPA. The way it works is that Dominion dispatches Kerr the way they want to do. If a North Carolina EMC needs power, it is dispatched from other parts of the Dominion system.

1:33 PM: Bob indicated that Joe had put the IFIM coordinates into an aerial photo, and they were really crude. He showed the photo to us. He and John noted that you could almost see the transects, from the clearing that was done, on the aerial photo that DTA had provided. Bob noted that they would be able to go back, with newer GPS units, and find the head pins and take new readings. Joe asked if there are GPS units that will accurately measure elevation. Michael indicated that survey-grade units were available, costing \$30,000. Michael indicated they could be rented if need be. He indicated the accuracy on these was 2 centimeters. Bob indicated that Phil Townsend and his group are developing a digital elevation model for the lower Roanoke anyway, so he might be willing to generate the data. **Action Item:** Bob indicated he would try to remember to ask Sam Pearsall what data are available. Joe Hightower noted the question he has is, where are the main channels, and what is the elevation grade along the channels? Ty noted that a backpack GPS unit could be used, with a repeater, to get the locality data. There might be problems from interfering overhead vegetation. Michael noted that determining continuity between channels should be the first step. If you determine continuity between certain pools, at certain elevations, then you can presume that continuity elsewhere exists.

Michael noted he and Ty had discussed how to measure habitat, in the Bypass Reach. They came down to the fact that it was much too complicated and very expensive. LIDAR could be used to generate a digital elevation model of the entire reach. They have done this at another site, using infrared technology. The data can be used to generate images of flow, at different discharge levels, but you don't know what the depth is where water is present. Bob and Michael had discussed the fact the best approach might be to pick a representative zone, and study that section, presuming it is representative of other sections. After several years of study, you should be able to select 8-10 locations and install staff gages or level augers to determine water levels. This enables a clearer picture of the hydraulics in a given reach. Ty noted these are automated and require only data downloading. Michael noted the flow down the Bypass Reach is not dynamic. He noted that 7-10 locations could be selected, to contain representative reaches, and determine continuity/discharge relationships. If 2-3 representative reaches are studied the assumption can be made that the rest of the reach will respond in the same manner.

Bob noted that using available information and Julie's sampling, we should be able to select some areas of interest, such as potential barriers to passage. Pete suggested that we might want to select areas from which we were missing data. Ty indicated there is a give-and-take between studying everything broadly, versus a few sites intensively.

Pete asked the DTA folks if they were familiar with water elevation work done on the lower Roanoke. He wasn't. Pete described the work as it has been completed to this point.

Michael noted that some of that work was similar. Bob noted that some of the relationships were based on presumed river stages at which flooding would begin to occur. John asked if some of the studies hadn't been done in the mid-1990's. Bob indicated it was, and he had some problems using flooding and drainage triggers determined from these data.

Bennett asked if there were control points in the Bypass Reach, historically, where fish were unable to pass. He asked how to accommodate those data. Pete indicated that it could be difficult. John noted that it was hard to assess how much data you would have to gather.

Bob indicated that he didn't understand how LIDAR could be used to advantage. Ty explained, and indicated that he could display a LIDAR image, from his screen.. Ty indicated that the resolution was close to that of other mediums.

1:52 AM: Ty showed us the reach of the Catawba passing Landsford Canal State Park, SC. They selected the upper third of that reach of the river. The area contains one island and some side channels. Duke had the reach flown for their shoreline management planning, with high-elevation aerial photography. DTA had LIDAR flown for the entire Catawba Basin. They produced 2-foot vertical contour data. Ty noted the LIDAR data were really abundant, but processing was expensive. They used a camera that took LIDAR much more accurately, for the shorter study reach. Ty showed us the LIDAR image, which Pete described as the ultimate fishing map. The resolution is down to a couple of centimeters accuracy. Ty noted that you wore three-dimensional glasses and used a large flat-screen monitor to do the work. The work is very costly. Bob suggested this approach would yield the data Joe wants to have. Wilson asked how much it would cost to produce such a map. Ty noted that they could run that down, if needed. Wilson noted this was the sort of project the agencies should be partnering with Dominion to conduct.

Ty showed us another bypassed reach on the Wateree River, and showed us what water level auger data could be used to produce. He showed that water level response to the addition of generating units can easily be measured graphically. The points can be surveyed in, and the recorders used to gather the data. Bob asked about the cost of water level augers. Michael advised they are \$900 each. Michael noted that DTA has about 80 of them they aren't using at present. Joe noted if we had them out, at different flows, we could have learned some things. Michael agreed that would have been the case. He noted the data can be downloaded every six months. They are automated and can just be put out to record. Ty noted he had assessed the full operating range on the Wateree, in a week's time. Bob noted that one potential use would be for us to evaluate changes in water depths at select locations during the ramping down process we use during flood control mode. This could give us an idea of how habitats like barriers to migration change at the different test flows to be evaluated in the bypass during a compressed time period, without causing Dominion to spill when they didn't need to.. Bob noted if we saw flood releases coming, and knew where we wanted to install water level augers, we could get some good data at stable flows, during the ramp-down process, by holding flows constant for a while. Michael suggested the devices could be installed so they are essentially permanent, except for a 100,000 cfs discharge. Michael indicated the battery life is ten years. Ty noted the database fills up, with a 15 minute interval, in six months. They can be programmed to take data at longer intervals. Michael noted there are really effective ways to gather data, for relatively low cost. Michael indicated that if you know the sites, more than just water level, the augers can be left out there to gather the data during maintenance events, and wet weather events and so forth. Pete indicated it would be good to just make them a part of the landscape. He asked what it takes to survey them in. Ty indicated if gradient level change was important, you would tie them to geodetic elevation. Michael indicated that doesn't have to be done, right away. You can use a nail in a tree as a reference point. You can also survey in the single point, and survey other points later. The units that DTA uses are made by Solinst. Onset makes a unit, but they aren't as accurate. Ty noted those units are deepwater units that aren't as accurate. Michael noted they have been really pleased with the Solinst units. Ty indicated they have permanently installed units on the Catawba. Michael noted that 1 in 100 units may go bad. Bennett asked what the field life was. Michael indicated that the battery life was ten years, and the units are very durable. Wilson asked if they could be camouflaged to look like a natural object, to preclude theft. Michael noted that was one downside, which is that the units had to be installed in pipes, but they could be locked. Ty noted that placing level augers at a surveyed cross section could yield good data on water surface elevations, if you had one on each side of the transect. Michael noted that trying to study an entire

cross-section with one level auger was difficult. Michael noted that he and Ty had deployed these things in about every kind of channel, except one like this one.

Pete asked Bob if he had wheels turning. Bob indicated he was considering possibilities. He suggested that we all spend some time reviewing the videography first, and examine connectivity between channels and pools. In terms of assessing habitat, he felt that we could distinguish pools from running water. We could all go and look at the reach under 325 cfs.

Wilson suggested if funding wasn't an issue, the ideal would be to have a LIDAR-derived three-dimensional map of the system, and a system of water level augers to detect changes in water surface elevation at different flow regimes, and receivers to track the location of a large number of radio transmitted fish.

Bob asked how the best way for us was to approach using the data. **Action Item:** Michael suggested that we all should individually review the CD, using the aerial photo he had provided, and mark sites of interest to us on the map, with a view toward discussing our observations later. Bob asked that this be identified as an ACTION ITEM.

Pete asked about use of the videography for identifying woody debris. Michael provided us with an example. Pete asked who was hanging out the window. That is Michael. Ty indicated he was the co-pilot, the one trying to figure out where they are.

Pete asked why substrate could be determined on the Pee Dee River, and not on the Roanoke. Michael indicated they do a frequency analysis, using the freeze-frame feature. They had visited the river before, so determined in advance that they could do substrate discrimination. Michael noted when the water is clear, you can see a long way down, with a polarizing filter.

2:24 PM: Michael and Ty gave us an example of using the videography. Michael described the classifications commonly used in characterizing woody debris. Michael described the technique they would use. They would divide the river into mile segments. They could then partition the river by reaches, or subsample selected reaches randomly, to yield an estimate of the total amount of woody debris. Both banks would have to be surveyed. Michael noted the work would have to be done when the leaves are absent. Locations for ground-truthing would be selected. Ground-truthing should be done soon (within a week) of the flight, and at the same flow level. All woody debris would be measured and classified. A laser rangefinder could be used to keep the helicopter at the same distance from the banks. The ground-truthing would be used as an aid in classifying the woody debris. This technique would be easily repeatable to allow measurement of changes. John noted that is one purpose we would want to achieve. Pete noted that we could assess changes due to Kerr flood control operations as well. Ty noted that once the video is obtained, the work could be changed without having to fly the whole channel again, if desired. The reach they showed us is the reach below Weldon. Bob asked how they had defined the active channel. Michael explained.

Michael asked us if there was a concern that woody debris in the system was deficient. Wilson noted we hypothesized it was, due to Corps of Engineers flood control operations. Wilson noted that part of the group had gone out and examined the Neuse and Cape Fear rivers, and found more woody debris, especially on the Cape Fear. Pete noted that the age distribution of the woody debris on the Roanoke was also different, with younger debris than on the Cape Fear, where older trees were present. Michael asked if it appeared this would be feasible. John and Pete felt it was. Bob asked Pete to give a general overview of the Corps 216 study on the Roanoke River. Pete explained that the Corps really controls the river, during flood flows. He noted when the Corps runs 20,000 cfs for six weeks to get Kerr back down to the Guide Curve, we don't know what the differences might be between that regime and an alternative one. John noted that most such flood events occurred during the summer. Pete and John also noted that vegetation develops on the banks, during drought years. Such growth doesn't occur under prolonged flooding regimes. Pete noted the Corps is doing the 216 study of Kerr, and this is an issue for us, how to quantify woody debris. He noted that once we were able to quantify the wood, we weren't sure where to go from there. Wilson asked Michael if any sort of similar study had been done on the west coast, in association with salmon. Michael noted that the salmon streams were much smaller, and the habitat units as well, so

the work was typically done on the ground. Bob noted the advantage here would be to have a permanent video record.

Michael indicated he had brought two copies of the CD. Pete indicated that he would give one of them to Chuck Wilson. Joe noted that he very much liked the idea of permanent record. Bob noted that we are having to think in a much longer term than most biologists do.

Wilson noted that he had a couple of whacky ideas again. He noted that the Smithsonian Institution used to have an Institute of Short-Lived Phenomena, and the woody debris present before and after a flood might qualify as being of interest. Also, he noted that the National Science Foundation might have an interest in the large woody debris dynamics issue. Wilson noted these were non-traditional sources of funding for these sorts of studies.

Pete noted there are about 125 river miles of interest. Michael thought the corridor could be flown in a couple of days. The cost of the flights would be about \$10,000. Cost of analysis would be additional.

Bob noted we were heading into the end of our meeting time. Joe indicated he had to leave by four at the latest.

Bob provided us with copies of the DVD. He indicated it was no problem to make copies, as long as the DTA logo showed at the top. John took a copy for FWS. Joe received a copy for USGS. Pete took three copies and will send one to the Corps of Engineers.

Pete noted there seemed to be a linear distribution of woody debris along the river. Pete noted even if we did a good study, we still might not be sure about what was causing the observed distribution. Bob noted the dams would be having an effect on the input of wood into the system. Michael noted also that land use along the river was a factor. He noted the Catawba and the Pee Dee both had lots of forested land adjacent. John and Pete noted the Roanoke was also fairly heavily forested, at least next to the river. Michael noted there were people a lot more knowledgeable about woody debris sources and distribution, and the beauty of the video was that we could send it to the experts for review. They could help to decide if it was a source problem, or a flushing problem. Pete noted we still had a problem with Corps of Engineers systematic removal of woody debris, for such purposes as navigation and water skiing.

Joe asked Michael how he put the reference points on the aerial photograph. Michael explained. The selected points are on the flight lines.

2:57 PM: Bob noted there are three other items on the agenda. Item number 9, the plan for resident fish sampling in the bypass reach, has had no progress. Bob hopes to work on that in June. He indicated that he plans to just modify the earlier draft plan.

Joe asked if the jpg file sent to him was the same as the aerial photo Michael provided us today. Michael indicated he could send that file to Joe. The photo is not georeferenced, but Joe indicated he would like to have them.

Joe asked Bob for the 30-second version of the proposed resident sampling plan. Bob indicated it was basically a backpack electrofishing approach, using the IFIM transects, going across and hitting several channels. Wayne Jones had suggested that some efforts be applied to depletion sampling, maybe in two pools and two channels, to get an idea of what is present and what changes occur over time. There had also been discussion of radio-tagging some largemouth bass, and seeing what they do, during the freshets. He indicated he would prefer to drop that work and concentrate on the other aspects of the study. We had also discussed temperature monitoring, and mussel surveys on a seven-year basis.

Bob turned to American shad sampling. Four weekly surveys have been conducted to date. The first one was April 19th. Chad Thomas had been out the week before and seen no shad, but the day before Bob first went out, Chad collected 80 with little effort. Bob and crew collected 40, most of which were green males. Since then, flows have been in the 7,000-8,000 cfs range, with temperatures 14-17 C, and they are seeing

10-14 shad for ten minutes of effort. Most of the fish remain green males. Hopefully the females will begin to show up soon. Some of the males in the last two weeks have been ripe. They will continue through the end of June. Bob asked for questions. Joe asked if Chad was picking up American shad during the striped bass tagging. Pete indicated they did collect shad during sampling of the upstream stations. Bob noted the hickory shad had fallen out of the samples about the same time Julie saw them disappear from the fish wheel. They are sampling from NC 48 down to the International Paper Company bridges. They have not been marking fish. Joe noted the fish they had implanted transmitters in stayed in the same area for several weeks. With fin-clipping, they got few recaptures. Bob noted they had clipped fish last year, and got only two recaptures the entire time. Joe noted they had only captured a few last year, and so had Chad. Bob noted they did get a couple of top caudal clips, possibly from last year. They are getting length, sex and condition on all the fish. Bob indicated that on a given night, a fair number of fish could be collected. He wasn't sure yet how they would initiate a trap-transport effort. He guessed we would wait until all the information comes in this year.

Joe noted that something he and Bob had discussed is moving the fish wheel, to a site below the NC 48 bridge, on the IP side. The consultants felt the site would be perfect, and didn't particularly care for the site currently being used. Joe noted he was pleased with the present catches, but felt it would do dramatically better, downstream. He indicated he would like to try it there next year. Joe noted the live boxes could be locked down, if needed. Bob noted he was reluctant to do it this year, from a logistical perspective. Bob noted that the lead bridle cable would have to go a ways upstream, to put it where the consultants suggested. Pete noted the current was fast there. Bob suggested a post would have to be installed to provide a secure anchor point. Bob noted trying to take the wheel through the NC 48 bridge would be difficult, unless we attached an outboard engine on the fishwheel platform. Joe advised this was something to consider for next year. He didn't believe it would ever do much better than this year, at the present site. Joe noted the American shad catch was low, as was the striped bass catch. Bob agreed it seemed it would be a better location. Joe suggested if the goal was either to catch fish as an index of abundance, or to transport, we would have to go someplace different. Bob noted he just didn't have the time to devote to the relocation issue, this year. Pete noted that putting the barge between the two bridge pilings is an issue because that is a main thoroughfare for recreational boating traffic. Bob noted that is not the proposed site. It is lower on the river.

Wilson asked if there was an estimated time of completion for analysis of the hydroacoustic data from last year. Joe felt it would likely be sometime this summer, before the analysis is completed. He indicated the work was taking a lot longer than anticipated. Wilson asked if Joe had seen the new paper on target strength of striped bass, and Joe had seen it. Michael asked how the data are being analyzed. Joe explained. Bob asked if we would get some population estimates for American shad with which we could be comfortable. Joe noted the weak link was the species composition. He noted the drift gill netting did better last year, than this year, but it is in the right area. He said it depends how much trust you want to put in the gill netting. Bob noted the population estimation is the thing we will have to do, year after year, so if there is a problem with the hydroacoustic, we should consider doing some mark-recapture experiments, concurrent with hydroacoustic sampling, and do some comparisons. Joe noted the field crew was getting a lot more fish this year, and the proportion of American shad was really low. You can use that to apply to the number of upstream-migrating fish, and generate an estimate. Pete noted that all the estimates generated thus far have been low, and any hydroacoustic ones are likely to be as well. Bob noted that we really need to assess whether we want to do hydroacoustic estimates year after year, or something else. Joe noted that we might be able to do an intensive sampling program on the spawning grounds, and see if the fish marked are leaving. Bob noted this isn't something we have to decide now. Wilson noted that this is something that the two federal agencies, and NCDMF, should be putting funding into. Joe noted that funding wasn't necessarily a limiting factor now. Wilson noted that he was thinking that additional transducers, or hiring additional technicians to analyze the data, would be beneficial, to reduce sources of bias. Joe agreed that having additional transducers would be beneficial. Joe noted another factor was the low number of American shad present on the river currently. He indicated that they would be getting a good estimate of striped bass, and hickory shad. Bob asked about other population estimates being done. The only other one of which we are aware is the NCDMF population estimate from the VPA model.

3:24 PM: Bob suggested we move on to American eel. He showed us a photo of two of the state-of-the-art

eel samplers. Bob noted the traps were placed near areas of spillage from the dam apron, generally at notches that have appeared in the apron, over time.

Pete raised the issue of miscommunication with the dam operators, and noted that Dominion is responsible for doing these studies. He stated that it was very important that the operators not take unannounced actions that may affect critical experiments. Jim agreed it was an important issue. He noted the operators have communicated with Bob during the apron-cleaning. Joe noted they were also doing work, specifically with the spawning pads, that is affected by flow as well. He asked that they be kept in the loop. Bob noted that he didn't realize the apron-cleaning would be happening today, until today. He noted that communication was an important issue. Jim Thornton noted they are spending about \$50,000 dollars on a lake-level model, working with Brian McCrodden, to reduce these sorts of operational problems.

Bob noted that up until now, they have caught over 9,000 American eels, in the 100-200 mm range. They had two slugs of eels. The second one collected over 8,237 eels in two nights of sampling. That event occurred during a full moon. The other slug was in the dark of the moon. He indicated he felt temperature was a factor as well. Bob noted the largest catch also corresponded to the 500 cfs freshet flow. For the last two weeks, they have been catching 100-150 eels, for the ten traps. In terms of length-frequency, the bulk of the fish have been between 100-150 mm. He guessed these eels are maybe from the spawn of 2003-2004, and are just now making it to the dam. He noted that he and Wilson had discussed looking at daily growth rings. Bob noted it may not have been verified that eels have daily growth rings on the otoliths. Bennett asked how the eels were being released. Bob noted the caudal fins are being clipped and the eels released at the base of the dam. (*Note: all of the caudal-clipped eels have been released about 50-75 m downstream of the lower edge of the large pool directly below the dam, into the main southside (Halifax Co.) channel where there is significant flow and water velocity.*) He noted that they have had only two recaptures. They did visual surveys on April 12 and 26. They saw a couple of hundred eels. Bob noted the eels are photophobic and scoot away from any light rapidly. They were concentrated at areas of the dam where milfoil was piled up. They also saw a concentration of eels near the apron drain, on a night when the water level was higher, and the drain was submerged. On a second night, the pipe was exposed, and milfoil had drifted away, so that the dam face was much cleaner.

Pete noted Jeff Horton and Jean Richter had canoed the lower Roanoke, a couple of weeks ago, and camped on one of the canoe platform. They had shone a light in the water and observed lots of migrating small eels.

Bob noted he did want to go over some points with us, regarding the work done thus far. He indicated that one thing he had promised was to put temperature recorders in the Bypass Reach. He noted that they are taking temperature data from the dam releases, and asked if that was beneficial. He noted these data are being collected in anticipation of the future operation of passage operations for American eel. Wilson asked that some temperature loggers be placed in the Bypass Reach, and correlated with the tailrace data that Dominion is measuring, to show us what the correlation is. **Action Item:** Dominion is to install temperature recording instruments in the bypass, and compare bypass and tailrace measurements. (*Onsets installed 5/26, and bypass temperature data collected to date plotted against tailrace temps and distributed via email 5/31*).

Michael asked about the factors of interest to us. Wilson noted that we would be interested in lunar phase, temperature, discharge and any other factors that might affect eel migration and distribution across the face of the dam. He noted our concept is to be able to narrow the window for sampling, over time, once we determine the longitudinal and seasonal distribution patterns.

Bob noted it was hard to say why they had so few recaptures. Wilson requested we discuss potential reasons. One hypothesis is that there is a huge number of eels present. Michael concurred. We noted they could be going back downstream and up side channels. Or, predators could be removing them from the population. Potential predators include rainbow snake, largemouth bass, bowfin, cormorants, sea gulls, otters, cottonmouths and other water snakes, snapping turtles. Bob indicated that the marked eels are being released near the outflow of the big pool below the dam. (*See related note on page 17*). Joe suggested that might be one factor for the low observed recaptures. We explained to Michael that there are no eels

coming from upstream, due to the historic blockages. We discussed the possibility for doing some diet studies to see if there is a high predation rate on the migrating elvers.

With regard to marking/tagging, Bob noted that he and Wilson had discussed the need to do some studies about the use of CWT on elvers. Bob noted that we would likely need to do some studies of placement, retention and so forth. Pete asked if Bob had determined the best site for emplacement of CWTs. Bob indicated that he had found only one article thus far, from Europe.

Action Item: Wilson will call Jim McCleave, Paul Angermeir, and Ken Able to ask them for references.

Joe thought it should be easy to detect a coded wire tag implanted in an eel's snout. He suggested that the tag would never get too deep to detect.

Bob provided the paper, from Denmark, to Joe. The CWTs were being implanted in the dorsal musculature of 135 mm elvers. Joe read to us from the paper that there were no other CWT studies on American eels. He noted that a month later, there was three percent tag loss.

3:59 PM: Bob noted they have series of questions. **Action Item:** For right now, they will look into the use of coded wire tags. He noted the eel work would continue on a weekly basis, through the summer, and then go to biweekly in the fall. Pete indicated he would be willing to get one of the CWT units down to test on the eels. Joe asked where the eels could be tagged with the unit. Pete and Wilson indicated they thought anywhere. Joe noted the European authors Thomassen et al. 2000) had made a special cradle for tagging the eels. We discussed the possibility of using radio tags. We felt that generally, the eels being captured are too small for use of radio tags.

The meeting adjourned at 4:03 PM.

Action Item: Wilson is to e-mail his notes from the American eel workshop held in Blacksburg. (*Done 5/17*).

Joe Hightower and Warren Mitchell provided the following comments/clarification on the draft notes to our 5/16/05 meeting.

1. Pg 6: Blueback herring density was about 6 fish per five-minute transect (**six was the highest, most often it was about two fish per transect when they were in the bypass**).
2. Pg 6: Hickory shad were seen in the reach prior to the initiation of sampling (**This is not correct for the upper site, as no anadromous fish were seen or collected. Hickory shad were seen and collected at the lower site.**).
3. Pg 6: Wilson asked about the bowfins, if there was any evidence of their spawning. Julie indicated there were plenty of bowfin there, but the halos supposedly on the males were not in evidence. Warren noted that Steve had found a bowfin with a bright turquoise mouth, which according to the literature is indicative of the fish being in breeding condition. (**There is some confusion about this part, which does not seem very critical to me. I'd suggest just deleting the whole discussion about bowfin and halos**).
4. Pg. 6: John reminded Wilson to ask about the lampreys. Julie hasn't seen any. Steve and Warren had seen them, mostly on hickory shad. **All the lampreys that Warren saw were on hickory shad.**
5. Pg 7: They see fishermen using four-wheelers (**some are coming in on trucks, as well**).
6. Pg. 7: They are using 6 amps of current, in the middle of the river. **This is correct, but note that they use 4 amps for the shoreline shocking for consistency with last year's sampling.**

7. Pg 7: He indicated that they had modified the gear to sample the higher flows, creating 28-foot deep nets with heavier weights. **Actually they combined 16' and 8' nets to get a total net depth of about 25'.**

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**Diadromous Fish Restoration Technical Advisory Committee (DFRTAC)
and FL1 Cooperative Management Team Meeting
Roanoke Rapids, North Carolina
July 21, 2005**

Present: Pete Kornegay (NCWRC, Coastal Region Fisheries Supervisor), Wayne Jones (NCWRC, District 3 Fishery Biologist), Bennett Wynne (NCWRC, Anadromous Fish Coordinator), Christian Waters (NCWRC, Piedmont Region Fisheries Research Coordinator), Kirk Rundle (NCWRC, District 2 Fishery Biologist), Prescott Brownell (NMFS, Habitat Conservation, SE Anadromous Fish Coordinator), Wilson Laney (USFWS-Fisheries, South Atlantic Fisheries Coordinator), Joe Hightower (USGS, NC Cooperative Fish and Wildlife Research Unit, Assistant Leader-Fisheries), Bob Graham (Dominion Generation), Jim Thornton (Dominion Generation), Jim Mead (NC Division of Water Resources).

9:10 AM: Bob convened the meeting and asked for introductions. Everyone did so. Bob reviewed the agenda. No one had any changes.

1. Review of 5/16/05 FL1CMT and DFRTAC meeting minutes: Bob Graham

Bob noted that he had received comments on the minutes from Ty Ziegler, Joe Hightower and Warren Mitchell. He reminded us what their comments were. **Action Item:** Jim asked Bob to send them to him again, so he could add those changes to the minutes and post the revisions on the web site.

Bob reviewed the action items from the May meeting. He noted that he had received some information regarding spilling water from dams on the Susquehanna, in the fall, for passage of juvenile American shad. Bob indicated that he had taken some notes, during a telephone conversation with Scott Ault, of Kleinschmidt Associates, about the process employed. Pete indicated that he would like additional information on the details of how far the fish have to fall, and what the surface is on which they land. (*Sent via email 7/29*).

Bob noted that he had provided information to the DFRTAC members, as requested, including a copy of a presentation to Prescott, and also the final freshwater mussel report for the Bypass Reach, from Angie. Bob noted that he had talked to Scott about the lift nets used for sampling on the Susquehanna. They sample schools of shad they see swimming under lights. Scott advised that it was an unusual combination of lights and hydraulics that enabled them to catch the juvenile shad there. Bennett asked how they removed the fish. Bob advised they could just swing the net up onto the dam. They use this technique just for sampling outmigrating juvenile shad, to examine the otoliths for marks. Bob indicated that Scott had visited Roanoke Rapids Dam, and indicated that a different set-up would have to be used here. Bob noted he had provided the information in a message sent out May 18. Pete asked if it was because of the height of the dam that a different technique would have to be employed at Roanoke Rapids. Bob indicated it was. Joe noted that other techniques should be easily employed here. Bob noted that when we anticipate large numbers arriving, we could walk the dam at night to see them, and perhaps try to capture some with cast nets. Bob noted that we had decided not to use any American shad from the Roanoke, for the hatchery production this year.

Wilson was supposed to check with Warm Springs Fish Tech Center about an INAD for clove oil, and hasn't yet done so. **[NOTE: Wilson did check with Vincent Mudrak, Director of the U.S. Fish and Wildlife Service's Warm Springs Fish Technical Center. Vince advised via e-mail on August 16 that he, Norm Heil and Robert Bakal are engaged in the INAD/NADA process for clove-oil related compounds. He indicated that while some investigators are using clove oil, other compounds appear preferred. He indicated that the withdrawal periods after treatment may be an issue.]**

Pete and Bob were to check on the development of a plan for American shad monitoring and restoration. Bob has written a draft and sent it to Pete, who sent it to Bennett.

Bob noted that he has also drafted a plan for restoration of the American eel. Both of these are due to FERC September 30th. Pete noted that they need to set a deadline for having these done, since the DFRTAC has to review them as well.

Bob suggested that for the American eel review, it should only take an hour or so. Bob will incorporate any comments from Pete and Bennett and then send to the DFRTAC for their review. (*Sent via email 8/9*) This is the American Eel Restoration Plan. Bob asked that Pete and Bennett respond to his draft by the middle of next week, then he will send it out to the DFRTAC. Pete indicated that he thought Wilson should be the lead person for this species. Wilson indicated that he would attempt to play that role. He gave a brief synopsis to the group about the 90-day finding, which was published July 6, 2005, in the Federal Register. Wilson noted that Heather Bell, of the Service's Northeast Regional Office, is the lead staff person, and Kelly Bibb in the Southeast Region Office will have the lead for that region.

A date of August 12 was set as the target for Pete and Bennett to have an American Shad Restoration Plan completed. They will send it out to the DFRTAC for review by August 15th. (*Sent via email 8/28*)

Wilson was to have contacted NMFS to encourage their attendance. That was successful as evidenced by Prescott's presence at the meeting.

Bob, Pete and Wilson had discussed the use of American shad from the Dominion sampling efforts on the Roanoke for further fry production for Roanoke River stocking. The decision was made not to do so this year.

Bob noted that the aerial videography was discussed at the last meeting. He asked Jim Mead if TNC's elevation data cover the Bypass Reach. Jim will contact Sam Pearsall to determine if they have those data. Bob noted that an index map, and compact disks, for the Bypass Reach aerial videography, have been provided to DFRTAC members. Jim Mead and Kirk Rundle still need one. Bob will provide these products to them. (*provided to Mead on 8/2*) Pete noted that an apparent Native American fish weir is very evident on the aerial photography.

Dominion was to install temperature monitors in the Bypass Reach and compare the data with the tailrace. Two temperature loggers have been installed in the bypass reach, as of May 26th, but Bob hasn't downloaded the data yet.

Action Item: Wilson was to call Ken Able, Paul Angermeir and/or Jim MacCleave, about methods for tagging eels. Wilson has not made those calls.

Bob has analyzed the eel data from the Bypass Reach with a view toward using coded wire tags. Bob noted that two grams was the lower limit that was recommended, in one paper, below which CWTs should not be used. Bob noted that about 50-70 percent of the eels from the Bypass Reach fell below that threshold, based on length, and the length-weight relationship.

Wilson had mailed out the notes from the American eel workshop to all DFRTAC members.

There was no further discussion of the action items from the minutes.

2. Update on spillway gate modifications: Jim Thornton

Jim Thornton noted the preferred option would be to use the skimmer gate, and the radial flood gate on the far side. For determination of flow in the bypass, they proposed to install a gage and monitor the water level below the dam, to derive the flow via calculation. Jim Mead asked if the approach was to put in level loggers, one on the south and one on the north. Jim Thornton confirmed that was the case. Jim Mead noted the batteries last a long time. Jim Mead noted that these would provide real-time data. Pete asked about controls. Jim T. noted they are working on the method. They are trying to decide if it makes more sense to have it operator-controlled, or use some other approach. Jim noted they are concerned that they don't want to have too much water, and therefore loose energy generation, and are also concerned that operators will be sufficiently attentive at all times. Jim Mead asked about possible interference, from beavers or other factors. Jim Thornton noted the control would be on the skimmer gate, not on the flood gate. Jim noted that the operators were pretty good at manual control of the flood gates, and the freshet release controls would be manually done. Bob asked why a gate just couldn't be adjusted. Jim T. noted that one issue was obstruction of the gate by debris. Another issue with which they are dealing is to make sure that the flows are low enough. Prescott asked about measures taken to prevent downstream fish escapement. Jim Thornton noted that Dominion was not required to address those issues at this time. Prescott suggested that it would be good for the engineers working on this to coordinate the design with FWS and NMFS.

Action Item: Jim Thornton will make sure that the release mechanism design is coordinated with appropriate FWS and NMFS personnel, including the fishway engineers. (*done via conference call 8/22, minutes sent via email 8/29*) Bob will provide contact information to Jim.

Wayne Jones noted that if the means used to prevent escapement of fish from the reservoir was not deemed adequate, the WRC had indicated that the dollar amount agreed upon to mitigate for impingement/entrainment impacts of the project might not be sufficient.

There was an extensive discussion at this point during the meeting about the means for monitoring the water discharge into the Bypass Reach, and Jim Thornton briefed the group on the issues surrounding the actual design for water release on a permanent basis. [Much of the detailed discussion on that subject is not captured in these minutes, because Wilson's computer locked up temporarily.]

Pete noted the NC Wildlife Resources Commission did not have the expertise, in their engineering section, to conduct an adequate review of the designs. Jim Mead asked Pete what their interests would be. Pete and Bennett noted that intake velocities, and the adequacy of screening, were of concern. Prescott and Wilson noted that a review by the federal agency fishway engineers would be beneficial.

Wayne elaborated that his concern is that there be no increase in the escapement of fish, or entrainment of fish, from the reservoir, with attendant impacts on the stocking rates they might have to use. Bob noted that the company has to balance the engineering to keep fish out, with the long-term costs of the modifications. Bob noted that they don't want to over-engineer the project for every contingency, if they don't have to do so. Jim Thornton noted they have tried to engineer the design, based on feedback from this group. Velocity was considered as a factor. Jim Thornton noted that the 2 fps threshold was considered, and Harza is using the 2-inch bar, and 2 fps criterion, in their design. Pete noted that the velocity gradient changes rapidly in front of an intake, thus the need for distance to reduce the risk of entrainment and impingement.

Bob asked Jim Thornton if Wayne Dyok has looked for any other techniques to try to reduce impingement/entrainment. Pete noted that in the latest issue of Fisheries, strobe lighting is advertised. This could be used to supplement the screening. Prescott noted they had tried a lot of things at Santee-Cooper. He noted that it appears that the use of lighting is highly site-specific. They were trying to get fish to leave the exit channel of the fishway there. They wanted to scare away juvenile fish, to keep them from being there at the same time the adults were coming up. Wayne Jones noted that some of the literature he has reviewed, suggests that lights may work on a temporary basis, but the fish may change their behavior. Bob noted that an electrical barrier might work. Pete noted that Wayne Dyok might be a good source for information on lighting technology. Jim Thornton noted that he would like to avoid the testing mode, since that wouldn't be cost-effective, unless there was some method that we would accept, up-front. Prescott noted again that it would be beneficial to contact Curt Orvis and Al Blott, and solicit their input. Pete suggested that those of us that receive Fisheries take a look at the advertisement in the most recent issue. Bob noted the only reason he brought up the strobe lighting was for the shad and herring, since they seem to respond more than other species.

Joe asked if grates would be around both release openings, and how deep they would be. Jim Thornton explained how the grates would be configured. The skimmer gate grate could be lowered and raised for clearing debris. For the radial gates, if they put grate bars for the entire 27-foot depth, that would create maintenance issues, so they are looking at another option, to try to avoid problems. Joe asked if it was an option to have some sort of floating curtain, such as he has seen used on some dams, where they try to divert fish from opening. Jim Mead asked if this would be a floating device, away from the gate. Joe advised it would be, and wouldn't at all be close to the dam. He had seen one in the northeast. Jim Thornton asked what they do when the hydrilla arrives. Bob noted it was a solid curtain, so the hydrilla just floats off. will pass the idea on to Harza.

Pete noted that for larval fish, a screening device known as the Gunderboom can be used. It can be extended away from the intake, and have no velocity issues. It does have to be cleaned with air from time to time.

Jim Thornton asked, how deep does it have to extend? Bob noted that stratification might become an issue as well. Pete felt that it would have to be deep enough to preclude fish entry. Jim noted the depth was 70 feet, so that would be problematic if it had to go all the way to the bottom. Wayne suggested we just wait until the engineers weigh in on the subject.

Action Item: Wilson confirmed that the only action item was for Jim to provide the fish avoidance information to the fishway engineers. That was correct.

Joe Hightower asked again about the proportion of the flow, going through the two openings, versus the turbines, and asked about the threat for increasing the risk of entrainment/impingement. He noted that there are fish going through already. Wayne and Bob noted the WRC has already been compensated for those losses.

10:28 AM: The group took a ten-minute break.

3. Update on 2005 bypass and fishwheel sampling: Joe Hightower

Bob called on Joe to update us on the bypass and fishwheel sampling. Julie Harris is sorting all the samples. There are 140 samples that had eggs. Joe indicated this was plankton net and buffer pads collectively. Joe noted the pads were placed at the upper and lower sites. The plankton sampling was conducted at both lower and upper sites, at the NC 48 bridge and just upstream of the International Paper Co. bridge. The results are yet to come. Julie is working on the staging of eggs, classifying them into categories. Joe noted this was done on the Neuse River project by Summer Burdick. Aging the eggs provides a means of estimating the distance they traveled and determining where they were fertilized. He noted that is not so critical here as it was on the Neuse. Jim Thornton asked Joe if he could say what most of the eggs were at this point. Joe indicated that the bypass lower end had blueback herring and hickory shad eggs. There were no anadromous eggs from the upper end. From the mainstem, there were American shad eggs and Joe wasn't sure what else. He feels the data will show the timing of spawning for hickory shad, blueback herring and American shad, and that American shad are not yet spawning in the bypass reach. The goal is to have a draft report by the time school starts in the fall. Bob Graham asked if any larvae were captured. Joe wasn't sure. He indicated he hadn't asked the question of Julie. Bob noted that some darters, and redhorse suckers should be spawning during the same time interval, at least toward the end of the interval.

Joe indicated that he didn't have much news on the other project, which is the hydroacoustic assessment of the spawning runs. Warren Mitchell is continuing to process the acoustic data files. Their goal is to have a draft 2004 report by the end of the summer. Pete asked about the electrofishing and gill net sampling. Joe noted the gill net sampling was less successful than last year. The electrofishing was very successful, and Warren has a lot of data from that sampling. Joe noted the electrofishing doesn't necessarily sample the fish from the part of the water column where they are migrating. The fish wheel caught a lot of fish, but most of them were gizzard shad. Only about a dozen American shad were caught. Jim Thornton asked about the timing of those catches. Joe thought they were lumped together. He noted he had sent out a report electronically. Wilson noted that he had that on his computer and could pull it out later. Bob noted that Joe had sent it out near the end of April, and pulled it up for us on the screen. Joe noted most of the catch was gizzard shad. He noted that he would like to see the fish wheel deployed in a different spot, next year.

Pete asked, in view of the cool spring this year, if there was any plan to shift the sampling next year. Joe noted that could be considered. He noted that if you are less interested in hickory shad, the season could be shifted to mid-March, and you would get better coverage for American shad.

Bob noted the fish wheel is out of the water, and the Corps of Engineers has been notified. They have also been notified that the location will be changed next year, and they will be notified of the new location. Bob noted that we would have to pursue with International Paper locating it offshore of their property, and placing a post to which to secure it. Their permission will have to be secured. Bob asked Joe about a final attachment scheme. He and Joe suggested that going to the site and trying to develop a plan would be the best approach.

Bob noted to the group that the company had started peaking again, the last week of fish wheel use, and the steel pin that was placed in rock, split the rock. The remaining lines were effective in securing the wheel. .

Wilson asked if there was a biologist at IP who could run interference for us. Bob indicated the power station personnel know some of the IP staff, so they can provide some contacts. Bennett asked about trees on the bank. Joe and Bob noted there are none of which to speak. There was some discussion of exactly where the wheel would be put.

Action Item: Joe and Bob will decide on a date and meet to discuss fishwheel location options.

Pete asked about assembling the wheel here at the station and then floating it downstream. Bob noted that was doable, although he was nervous about floating it downstream. Joe was comfortable with that aspect.

Joe asked if there was any site within the braided reach, where the fish wheel could be deployed. Wayne Jones was uncertain whether there would be any land access. Bob noted the critical thing would be to find a site deep enough for the wheel to operate. Pete indicated there was such a site, just above the gap, but getting to it by boat would be a challenge.

4. Update on 2005 American shad sampling: Bob Graham

Bob Graham reported on the American shad sampling. He noted they are still sampling. All through May and the first half of June, they had pretty high catch rates. This year they have extended the sampling, to try to get a better handle on how long the fish are here. He noted that the numbers of females has risen toward the end of the season. Wayne noted that things started later on the Tar this year. Bob noted the river temperature is still 26-27 C, which is not outrageously hot, and is really below average for this time of year. Spent females didn't show up in the catches until June. All females in the July 14 samples were spent. A total of 611 shad were captured thus far. Pete indicated that Chad Thomas and his crew had captured around 300, he thought. Wilson noted that the total numbers were still pretty low. Bob noted they didn't know how many fish might have been recaptures. He noted that last year, they had moved around a lot, but this year he had asked the crew to try and concentrate more on getting an estimate of relative abundance, and using the same sites. The catch rates in general this year were a lot higher. Joe noted that Julie's egg sampling, based on Bob's American shad data, probably missed the peak of American shad spawning. Bob thought it occurred when the temperature was around 25.

Last year Bob noted that the sampling had ceased in the first week of June. Pete noted that we may have preconceived notions about American shad spawning windows on the Roanoke, and they may not be correct. Based on other observations, the fish appear to be here from early March, until well into July. The juveniles, he noted, really have a protracted outmigration.

Bob noted that all the sampling has been pretty informative for them. He noted that it would have been quite a combination of fin clips, if they had clipped during the entire season. Christian noted that they did that on the Neuse. Bob noted they caught two fish that they believed were clipped last year, because they had lower caudal clips. Prescott noted that we have a lot more to learn, over the coming years.

Bob noted his agreement. He noted they are scheduled to begin moving fish, next year. They are looking into getting a trailer and transporting tank. Wayne asked for a reminder of what the purpose was for the moving of fish. Wilson indicated it was for the telemetry work. Wayne asked if the fish would be moved above Kerr. Bob noted that hadn't yet been determined. He asked Joe if he was interested in submitting a proposal to do the work. Joe indicated he was interested.

Joe asked about two options. We could do lake-by-lake work, or put them above Kerr initially. Pete indicated that we had considered the former approach. Wilson noted that one unresolved question was the value of potential spawning habitat in the Gaston headwaters. He noted that it was hoped that the Kerr 216 study would result in the Corps partnering with us in provision of American shad passage.

Bob reminded us of the language in the license. The license isn't specific about where the work will be done. A lot is left to the DFRTAC. Pete noted that up to 150 fish per year will be tagged, per the license. Bob noted that in the table, the telemetry work isn't scheduled until year 3. We discussed why that was. Wilson thought that we had built in time to allow the bugs to be worked out of the downstream sampling.

Pete suggested that we had two options, which would be to move fish next year, or postpone the work until 2007. He shared his concern about the fry we are putting upstream, relative to any spawners that we might put upstream. There are some confounding issues that he would like to hear us discuss.

Wilson noted that if we sampled outmigrating juveniles from above Roanoke Rapids Dam, then we could tell if any were spawned by the fish we moved upstream. Wayne noted that we could just move males upstream.

Wilson suggested that an intensive sampling program for the Roanoke River, for all diadromous species during a one-year period, would be desirable. He noted that a lot of sampling was already occurring, and such a project could be done, without a whole lot of additional effort. He noted this should be a collaborative effort, not something done solely by Dominion. Pete noted that the WRC staff was pretty much already maxed out.

We discussed at some length the timing, and the rationale behind the requirement that telemetry work be done. Wilson noted that our reasoning for including the requirement in the first place, was that at some point, we need to make a decision regarding a recommendation for a long term passage technique. We discussed the merits of various experiments. Joe noted that Julie would likely be more interested in assessing the behavior of fish introduced into the Staunton or Dan rivers, versus placing them in Roanoke Rapids and Gaston. Wilson concurred, but noted that getting the answer to Wayne Dyok's question about whether the shad would have the cues they need to get through the reservoirs was a biological question.

Bob briefed the group on the instream flow studies that are being planned in conjunction with the relicensing of Leesville-Smith Mountain hydropower facilities. He was not sure that the American shad has been included as an evaluation species. He suggested that we contact Bud LaRoche and consult with him on that issue. If there are concerns about the flow regime, we should touch bases with him.

Bob recapped the discussions. Electrofishing will be continued in 2006. They will look at the possibility of doing some transport mortality studies, using cages, but WRC had indicated that they felt that wasn't essential. Pete noted that Joe's suggestion was for caging them for later release as a group. Bob hadn't understood that was the point. Pete noted this was done with turkeys by the WRC, to release them as a flock during restoration efforts. Joe noted he didn't advocate releasing any fish unless they had transmitters. Joe noted if every one was comfortable the fish would survive, the cage holding experimentation might not be necessary. Jim Thornton asked if anyone had discussed this with Dilip Mather, who does the work on the Susquehanna. Pete noted they haul them in a tank, and had to do some experimentation with the flow rate in the tank, so the fish would be acclimated to the proper flow.

Wayne Jones asked how long it would take, based on the CPUE last year, to obtain 100 fish to move up together? Bob indicated this year, they could have done so in an hour and a half when catch rates were highest. Pete asked if that was only on a couple of days. Bob thought that there were more such days than just a couple. Bob showed us the data, and it appeared the average catch was around 15 fish per 10 minutes electrofishing effort, so he felt they could have obtained all the needed fish in a couple of hours. He noted that the total catch this year included only 84 females. Wilson asked what the ratio of males to females was that was preferred by the hatchery staffs. Wayne Jones advised Jeff Evans liked 60:40, males to females. Andrew, on the other hand, liked a 50:50 ratio. Bob noted this wasn't likely the case in the wild, in terms of males arriving on the spawning grounds prior to females. The ratio from this year's sampling was 6:1, male to female, for all weeks combined.

Joe felt it would be useful to do the experiment next year. Pete noted it would be critical to have a flowing water situation. We discussed various techniques for temporarily holding the fish until they were ready for release. Bob will talk to the Pennsylvania folks.

Bob continued the summary. They will continue sampling. They will try different approaches for hauling and holding fish in 2006. In 2007, they will begin actually moving fish and doing the telemetry work.

Wayne asked if we were going to do both reservoirs at the same time? Bob noted there is \$76,000 allocated for doing up to a maximum of 450 fish. He noted that the funds are budgeted as shown in the table contained in Article FS-2 of the Settlement Agreement. Pete noted that the work could be done either way. Bob reiterated that the budget was set. Wayne Jones asked if the money could go to something else. Bob indicated it would, but necessarily fish-related.

Joe expressed concern that if both reservoirs were done at once, it would stretch a field crew pretty thin. Wilson noted that robust redhorse on the Pee Dee were being tracked from the air. Joe noted the river was narrow, and also a confined channel. Wilson concurred that was the case.

12:15 PM: The group broke for lunch.

1:00 PM: Bob reconvened the group.

Wayne recommended that the initial telemetry work on American shad should be done upstream of Kerr, because we needed to demonstrate that they would spawn, before we work on determining the migration routes through Roanoke Rapids and Gaston. Joe suggested that we put them in the free-flowing portion of the Staunton. Pete noted that if you put them up there, and they didn't spawn, that didn't necessarily tell you that the habitat wasn't adequate. Wayne indicated that given only three years of funding, he would hate to see us use it all up in the reservoirs, and not wind up knowing anything. Bob also questioned how successful spawning would be determined. Wilson and Bob noted that before the work begins, we would have to work out the details, so there would be more opportunity for ample discussions of where and when to release fish with transmitters.

5. Update on 2005 American eel sampling: Bob Graham

Bob Graham updated us on the work Dominion and their contractors have done. Bob briefly reviewed the items to be discussed. He noted that calling the VIMS scientists was something we all wanted to do. He noted that Wolf Vogelbein was apparently a parasitologist, but that Marcel Montane was apparently a fishery biologist, doing some elver sampling in Chesapeake Bay.

- bypass sampling:

Bob noted they are still catching eels, at the rate of a couple hundred a week. The length-frequency hasn't changed much. There is a trend for the smaller ramp material to catch slightly more eels, but Bob is not sure it is significant. Bob did plot a length-weight graph for our review. He noted the 2-gram weight (limit for CWT) would have eliminated 46 percent of the eels. Looking at lengths of 120-130 mm, then 50-70 percent of the eels would have been below the threshold.

Joe asked if the size of the eels is increasing through the season. Bob indicated the size was about the same, and may have even decreased a bit. He noted that some of the larger eels were caught earlier. As the season has progressed, they are mostly running in the 110-125 mm size class, which Bob suggested may indicate the current year's recruitment. Bob noted that he is going to spend some more time on the length-frequency data. Bennett asked if spawning was seasonally limited. Wilson and Joe advised it was. Joe noted the glass eels recruit during the late winter, during February. Wilson noted that is when he had found them in the lower Cape Fear River.

Bob noted that he hadn't updated the data to reflect the past month's work and apologized for not having done so. Bob noted that our preconceived notion that there might be a relatively narrow window of eel movement had not proved correct. He noted they had done one more night observation, and found only one eel on a ramp. He noted that the large amount of vegetative growth below the dam in the Bypass Reach made it difficult to make observations.

Bob noted that sampling would continue weekly through October, after which sampling would drop to biweekly (every two weeks). Bob noted that after he adds the July data, he will send the new graphs out to everyone. Kirk noted that there is a lot of American eel work ongoing in Virginia.

Bob asked for any questions. Joe asked if there were any more recaptures. Bob said they had only one more. He indicated that Chad has kept some caudal-clipped eels for over three weeks now, and the survival rate is good. The fins are not regenerating. Wilson and Bob noted it was rather baffling that the recapture

rate is so low. Pete didn't find it surprising at all. His hypothesis is that the eel numbers are just very large. Wilson noted that is one hypothesis.

- marking and transport:

Pete asked if Dominion was considering recommending the use of caudal fin clips, in place of CWTs as a mark. Bob indicated that was not the case because eventual regeneration was likely. For assessing upstream movement, CWTs may have an advantage over PIT tags, since you can use them on smaller eels. Pete indicated that he would try to get one of the hand-held units to Dominion, for experimental use.

Action Item: Bob noted that he was going to contact someone about a cradle that could be used to hold eels during CWT implantation. Bennett indicated that he had heard from fishermen that if you turn an eel upside down in a trench in the ground, they won't move. He indicated he hadn't tried it. Bob noted that chlorbutanol was used by one group to anesthetize eels. No one in the group was familiar with that compound.

Joe noted that there are multiple options for tagging eels. An individual tag would return the most information. Batch marks would allow identification of individual release sites. If we mark none of them, we aren't going to learn much. Bob asked, if we could distinguish different release sites using CWTs. Wilson advised you could do so. Joe thought that there are individually numbered coded wire tags available now. He later verified that. **Action Item:** Bob indicated he would contact Northwest Marine Technology for details. Joe noted the advertisement in Fisheries that showed the new elastomer tags being used on squid. Bob indicated that he had been discussing tagging technology with Chris Tomachek, and would continue that discussion.

Joe recommended that we at least ought to batch mark, so we can differentiate between locations. That way we should learn some things about the different sites. Wilson noted that we could consider using a combination of PIT and coded wire tags, using the former for larger eels. Bob noted that he was going to investigate cold-branding as well. Joe stated he had tried that, and the marks fade rather rapidly. Wilson noted that individual marks could be applied via tattooing, but that would probably be a slow process.

We decided that we should call Marcel Montane to discuss the parasite issue. Bob reviewed the information that we had received from the VIMS scientists. He noted the information that they had provided was for our consideration. Bob noted Dominion's license had eel passage requirements they intend to meet. Pete noted that ultimately, it is our call. Pete noted that if we discover something that is a threat, we will do whatever it takes. For right now, Pete isn't convinced that we have a problem. Wayne Jones wasn't convinced, either. He noted that eels were being sold as bait already, and are already getting into the system. He asked if we planned to look at the infection rates below Roanoke Rapids, and the infection rates of other species. Pete noted his question is, "what contribution is the parasite making toward the demise of the eel?".

Joe noted that he and Wilson had spent some time investigating the parasite issue. He noted there are a lot of studies on the European eel. Those studies indicated that the parasites can cause thickening of the air bladder wall, and loss of volume, and these changes might impact the ability of the eels to migrate to the Sargasso Sea. Some effects were found that appeared to be correlated with the degree of infestation. Bob noted that migrating silver eels have been found at depths of 400 feet, so air bladder function impairment would be an issue.

Wilson shared the information that had been provided by Dr. Ed Pendleton, from his colleagues, with their opinions. Ed had a conversation with three colleagues at the health lab about nonlethal assays. They don't know of any off the tops of their heads. They concurred it was a good point that if the parasite is already present, it makes little sense to treat or assay migrating eels because 1) you won't catch them all, 2) the probability of reinfection is high, and 3) costs of testing in manpower alone are high. They felt perhaps the key questions are 1) what other species are susceptible to infection? 2) is infection lethal to these species? 3) if effects are sublethal are there other impacts to the species like reduced condition, fecundity, susceptibility to predation, or susceptibility to disease? Ed's colleagues agreed that if the parasite is not a problem for other species, and infected eels are likely to distribute through the system anyway, then no

further action (i.e., continue with eel passage) is as good an option as any, provided infected eels are a benefit to the system (and historically they are part of the native species assemblage).

Wilson shared the five hypothetical statements he felt we should test (see below). There was general agreement that the approach he had laid out was a good strategy. The group remained generally unconvinced that a problem had been demonstrated.

1:56 PM: Bob called Marcel Montane so we could consult with him. Marcel answered and Bob told him that we had about ten people in the room. Bob asked Marcel to provide us with a quick overview of the life cycle of the parasite, especially the intermediate hosts. Marcel noted he was not a parasitologist, Wolf was, and unfortunately Wolf was on vacation. Marcel wasn't aware if secondary hosts have been identified in North America. Marcel noted that quite a few possible hosts have been identified in Europe, including snails, amphibians, and other fish.

Wilson asked, what happens to the secondary life stages, if they infect a secondary host and are not consumed by an American eel. Marcel didn't know.

Marcel indicated that their big concern was that there isn't any recent data regarding what is going on below the dam, regarding the level of infection. Also, there didn't seem to be any hard data regarding the presence of infected American eels above the dam. Wilson noted we had discussed that before calling him, and asked Wayne Jones to address that topic. Wayne noted that American eels are being sold and used as bait for striped bass, above the Dominion dams. We know they are being sold in Altavista, Virginia, which is in the upper basin. Bob noted to Marcel that it is well documented that eels were eliminated from the upper Roanoke River system, after the construction of John H. Kerr Reservoir in the 1940s.

Marcel noted that literature he has read suggests that the level of infectivity increases in fresh, warmer waters. Wilson asked Marcel if his concerns would be allayed, if it could be shown that the parasite was already present. He indicated that he felt the probability of infection would be likely higher, because of the introduction of more infective stages of the parasite.

Wilson walked Marcel through the discussions that we had already had, and the reason that we had decided it wasn't an issue that should halt eel passage.

Marcel agreed that it is a tough question. He noted he and Wolf had discussed this a lot. They feel there is a greater potential for establishment in this environment where the parasite isn't apparently already well-established.

Joe asked if Marcel was aware of any studies that documented impacts on other species. Marcel didn't know. Pete asked why there were so few studies on the intermediate hosts. Marcel didn't know. He noted that it has been present in Europe since the 1980's, so a lot more work has been done there. He wasn't sure why so little has been done on it in the US. He noted that it had only been here for about ten years. Marcel asked if we were going to sample the eels captured below the dam, prior to release, to determine the percent infection. Bob stated they weren't planning to do so. Wilson noted that we could easily do so.

Wilson noted that he had suggested a five-step process for documenting the level of parasitic infestation above the reservoirs. Wilson read those to Marcel. The hypotheses proposed for field testing were as follows:

- 1) Live American eels are being sold as bait in the upper Roanoke River Basin, above the dams (Pete Kornegay already verified this one; but a survey of all live bait dealers we can locate would be educational and informative, i.e., where are eels being sold in the basin, and how many of them?).
- 2) Live American eels are being used as bait for striped bass (and other species??) in (all?, only some?) Roanoke River Basin reservoirs (we're pretty sure this is the case as well; but, again, a survey would provide useful information).

- 3) Live American eels being used as bait in the Roanoke River Basin reservoirs are infected with *Anguillicola crassus* (this one is easily doable; Wilson proposes to just go up there and buy a bunch of eels (20 from each dealer?), and bring them back to the NC State Museum of Natural Sciences in Raleigh, where they will be preserved and dissected to determine the percentage and degree of infection).
- 4) Live American eels being used as bait in the Roanoke River Basin reservoirs have either escaped, or are being released (bait bucket releases) at the end of fishing trips (Pete Kornegay and Wilson suspect this is the case; angler survey is needed to confirm).
- 5) Finally, *Anguillicola crassus* is already present in the upper Roanoke River Basin, above the dams (this one is the unknown, at present; determining whether it is true, or not, is going to take some work, although, if 1-4 prove valid, Wilson indicated he is betting this one is a given; confirming the presence will require taking samples of likely host species and looking for the parasite).

If 1-5 prove correct and the parasite is already there, then Wilson indicated he will contend (at least until convinced otherwise) that the benefits of reintroducing the American eel to the majority of a watershed from which it has been absent for decades, outweigh the risks of introducing a new parasite. What would convince him otherwise? The answer is, incontrovertible evidence that the new parasite has produced significant and undesirable ecological impacts in other systems after it has been introduced, and that increasing its population size through additional introductions would be extremely undesirable. It may be that the European literature will document such effects, but we don't yet know that for sure. Everything Wilson had read to date doesn't clearly say that the parasite even results in mortality of American eels, although it must certainly reduce their fitness.

Finally, what do we do if significant adverse impacts to other species, or to ecosystems, from *Anguillicola* are or have been documented? Then Wilson proposed that we follow Vogelbein and colleague's suggestion and begin seeking a way to pass uninfected American eels upstream. We would also have to take some action to curtail the use of any potentially infected, wild-caught American eels as bait. To my knowledge, there is no source of parasite-free eels. Wild-caught eels would have to be held and treated to kill the parasites, prior to being passed upstream, in all systems (US East and Gulf Coasts) which we could document as presently parasite-free. Wilson indicated he was thinking this would be a daunting task, especially in view of the fact that even after eels are treated, they could be potentially reinfected either prior to or after release.

Marcel agreed those were good steps, but felt that we should assess the data we gathered during that process, and evaluate them. Marcel apologized for Wolf not being present. He noted that Wolf was the expert on paratenic hosts.

Marcel asked that we provide him with a summary of our discussions today. We indicated that we would provide him with the meeting minutes. He noted that they have a tendency to be more conservative with regard to moving organisms around, given the potential of introducing a non-native parasite. Wilson asked Marcel, in view of their conservative approach, if they had considered asking the Virginia Department of Game and Inland Fisheries to ban all sales of American eels for use as bait, in inland waters of Virginia above dams? Marcel indicated they had not considered that recommendation.

2:18 PM: **Action Item:** Bob noted that he would provide the notes to Marcel. Bob agreed with Wilson that the dialog was a productive one, and we would continue it in the future.

The group discussed the issue. Wilson noted that he didn't perceive that there was a bona fide reason for us to halt the plans to initiate passage upstream. He did believe that we should do the studies that he had proposed. Pete didn't see a smoking gun. Wayne Jones felt that anglers, moving catfish and other species around, would ultimately introduce the parasite anyway. He felt that the first three of Wilson's steps should be done, and the next ones were not really necessary. Wilson noted that some anglers may not be releasing eels, but keeping them, due to the high cost of eels for bait.

Bob noted that a significant question is, are we applying a different standard to ourselves, than we would to someone else proposing to introduce an exotic parasite? Wilson agreed that was a legitimate question, and that is why we should vigorously pursue getting answers to these questions.

Bob walked us through the steps and we discussed sources of data and information, such as using striper fishing clubs to gain some insight about the release of bait eels. Bob expressed concerns about answering the fifth hypothesis. Wilson noted that he felt Wolf could provide some insight on that one. Wilson will contact Wolf about that question.

Wayne noted that there is a mill pond above Wake Forest, off NC 96, that has a lot of large American eels, and would provide a good site for us to attempt to collect secondary hosts and try to locate intermediate stages of the parasite.

2:36 PM: Bob noted that we have two more issues to review.

- tailrace American eel trap design:

Bob noted that he had sent the design to everyone via e-mail. Joe asked if there wasn't some smaller step that could be taken first, before this design was implemented. Bob noted that had been discussed with Kleinschmidt. He noted they hadn't been able to come up with any other reliable alternative, such as electrofishing, or some other type of trap, that would yield results. Bob noted this is what is used elsewhere on the east coast. He noted it is costly, and they have concerns about that, but this is apparently the only effective method. He asked Joe for any other ideas. Joe noted that the scale of the bypass reach sampling was more what he felt we should be doing.

Jim indicated that he wasn't convinced it was worth doing. Pete noted that was no way to know the abundance of eels in the tailrace versus the bypass reach unless both areas were sampled. Even though the numbers of eels captured in the bypass reach so far appears large, it is possible that the tailrace may hold more eels and most of the DFRTAC members were convinced that the tailrace sampling needed to be done. Wilson indicated he perceived that Joe was just seeking some less costly type of gear to establish the presence and magnitude of eels in the tailrace. Joe agreed that he was looking for more of a pilot approach.

Bob indicated that they had to meet both engineering and safety concerns, and that was constraining the design. Jim noted that he would have preferred plywood, hoses and a bucket at the end. Joe noted that was what he was thinking. Bob noted that any structure used has to last and be safe. Jim Thornton noted that if we could come up with a better, less costly concept, they would run it past their engineers.

Pete asked Prescott and Wilson to contact their engineers and push them for a response. Bob asked for the same thing. They are ready to move forward with the plan, once approval is forthcoming. Wilson noted that FWS and Corps engineering divisions both tended to develop high-end designs. Prescott noted that we definitely need to have our engineers talking to Dominion engineers. He suggested that we get the Kleinschmidt and agency engineers on a conference call. They should be able to reach consensus on what would be the best design.

Bob suggested that should happen after we are aware that Curt and Al have looked at the design. He advised the engineer from Kleinschmidt is Jesse Waldrip. Bob indicated that he would send out an e-mail, recommending a date for a conference call. Prescott indicated that we should discuss the next steps and any other things that needed to be done. Joe indicated he remembered us having a presentation on various design options. Bob confirmed that had taken place, and the simplest ramp design was selected, one conforming to FWS recommendations.

Wilson noted that he didn't have any expertise to contribute to any conference call. Prescott wanted to be included. Prescott noted that he had heard that Sue Cielinski had secured some funding for engineering services, and we needed to notify her of our need. *(Conference call occurred 8/1 and the design was approved with minor modification)*

Bob noted that they had spent a lot of time on the design. He noted that a good bit of time was spent on the attraction flow issues. Pete asked where similar designs have been used. Bob indicated they are used throughout the northeast. (*a list of facilities with similar ramps was provided by Jesse Waldrup the week of 7/22*)

- American eel restoration plan

This item had already been discussed (see above).

2:53 PM: 6. Discussion on bypass reach biological monitoring plan: Bob Graham

Bob Graham reviewed the proposed plan. He noted that Joe's proposal for the present two-year anadromous fish use study was included and asked if that was okay. Everyone felt it was. Bob noted that for resident fish, the proposal was to reduce to one sampling period per 5-year study cycle. Pete noted there were some problems with the proposed use of IBI metrics. He questioned if we would miss something, by only sampling once. Christian noted that there were a lot of factors that should be considered. Pete noted that if we don't sample in August, for example, we might miss young-of-year American shad.

Bob noted that he didn't stay too wedded to the IBI protocol, but he wanted the data to be comparable, if desired. Christian noted they use the IBI when they want to mesh their work with the NC Division of Water Quality. He noted that sometimes they will use the same gear, but have no intention of calculating the metrics.

Bob noted he had tried to keep it compatible with the IBI. He noted that his basis was a paper on monitoring in California streams. He felt that we wouldn't have to necessarily plug the metrics into any formula, but many of the metrics were good general indices of fish or assemblage health. Bob noted they would only be doing the sampling every five years or so. He felt the most interesting thing would be to see how the Bypass Reach was colonized. He also didn't address the impact of flood releases on the Bypass Reach, which could substantially affect fishes. Pete noted if that happens in year 5, perhaps we should consider delaying sampling. **Action Item:** Bob will add language to the plan that will give the CMT flexibility to respond to flood events. Bob noted that the biggest change he had made was to delete the proposed radiotelemetry work, due to costs. Christian indicated he wasn't sure what the WRC Nongame group does for their sampling. Pete and Bob noted that Angie had really good baseline data on the mussels and the fish community that was present. Wayne noted the anglers extensively using the newly rewatered reach.

3:09 PM: Wilson asked about a deadline for comments on the proposal. Bob had sent the draft out on July 14th. Bob asked for comments by August 15th. Christian will coordinate with Kirk and Scott. Pete asked if Jim Thornton or Bob had any extra copies of the license and the settlement agreement. Bob will send copies to Kirk and Christian (*done vial email 7/21*). Jim Thornton noted the documents are on the Dominion web site as well.

7. Action Items and next meeting:

Action items were not reviewed, and no date was set for the next meeting, pending the completion of some of the action items.

3:20 PM: The meeting adjourned.