

**STUDIES NEEDED TO DETERMINE IMPACTS (INCLUDING CUMULATIVE IMPACTS)
OF ALTERED HYDRO-REGIME ON TERRESTRIAL ECOSYSTEMS AND ORGANISMS.**

Produced by the Terrestrial Working Group on July 6, 2000.
Based on previous work of the TWG and the Cumulative Impacts Workshop (Raleigh 1999).

**REVIEWERS PLEASE REVIEW FOR COMPLETENESS (REPRESENTATIVENESS, NOT INCLUSIVENESS)
AND ACCURACY. PLEASE ALSO RESPOND AGGRESSIVELY TO BLANK CELLS.**

NEEDED FOR:	ESSENTIAL Cause → Effect Directly tied to Mitigation	DESIRABLE Hydro/Eco-System Modeling
NCP LICENSE	N1	N2
CORPS §216 STUDY	C1	C2
LONGTERM AM PARTNERSHIP	P1	P2

Notes: The term “flood” is used throughout to mean inundation of habitat within the floodplain of the Roanoke and its tributaries. The term does not refer to flows that extend out of the floodplain and cause damage to human infrastructure. This table does not include any impacts not related to altered hydro-regime, e.g., fire suppression impacts on cane, while of concern, are not listed here. An assumption in the preparation of this table was that NCP’s peaking does not increase the frequency or duration of floods. Another assumption was that NCP’s influence on releases from Kerr Dam would be covered by the Corps §216 study. If either of these assumptions proves false, most or all of the items with C-codes will acquire an N-code as well. Finally, it is important to note that species and natural communities that prefer mainly wet or mainly dry environments are mainly benefiting from the regulated hydrology of the system, but species and natural communities that require or are adapted mainly to periodic but short inundations have lost habitat as a result of the regulated hydrology of the river (Townsend 97).

BIOLOGICAL ELEMENT	IND VARIABLE(S)	DEP VARIABLE(S)	CODE(S) ¹	COMMENTS
Water Hickory	Freq & Duration of Growing Season Floods	Germination and Survival Growth Mast Production	C1 C2 (N2) C1	Identified by Hochman (99) as a keystone species in bottomland hardwood types. Flood response data collected from the literature.
Overcup Oak	Freq & Duration of Growing Season Floods	Germination and Survival Growth Mast Production	C1 C2 (N2) C1	Identified by Hochman (99) as a keystone species in bottomland hardwood types. Flood response data collected from the literature.
Green Ash	Freq & Duration of Growing Season Floods	Germination and Survival Growth	C1 C2 (N2)	Identified by Hochman (99) as a keystone species in bottomland hardwood types. Flood response data collected from the literature.
Laurel Oak	Freq & Duration of Growing Season Floods	Germination and Survival Growth Mast Production	C1 C2 (N2) C1	Identified by Hochman (99) as a keystone species in bottomland hardwood types. Flood response data collected from the literature.
American Elm	Freq & Duration of Growing Season Floods	Germination and Survival Growth	C1 C2 (N2)	Identified by Hochman (99) as a keystone species in bottomland hardwood types. Flood response data collected from the literature.
Swamp Chestnut Oak	Freq & Duration of Growing Season Floods	Germination and Survival Growth Mast Production	C1 C2 (N2) C1	Identified by Hochman (99) as a keystone species in bottomland hardwood types. Flood response data collected from the literature.
Bald Cypress	Water Quality during Growing Season Floods	Germination and Survival Growth Mast Production	C1 C1 C1	Extended growing season floods and associated water quality may reduce bald cypress seedling survival and growth.
Cane	Scouring Flows Sediment Deposition Freq & Duration of Growing Season Floods	Germination Germination Survival and growth	C1 C1 P2	Scouring flows and/or sediment deposits are required as seed bed for cane. Impacts of growing season floods are not known.

¹ Codes in parentheses are conditional, e.g., (N2) in the first few rows means N2 if NC Power's peaking operations are shown to contribute to the frequency and/or duration of growing season floods.

Sedges and rushes	Altered hydro-regime – specific variables not known	Soft mast production	P2	These are critical producers of wildlife food. Impacts of altered hydro-regime are not known.
Microstegium	Altered hydro-regime – specific variables not known	Germination and survival	C1	Microstegium is a very serious invasive species that is distributed mainly by water. Impacts of altered hydro-regime are not known.
Soil Invertebrates -- the entire fauna in the floodplain sorted by feeding guilds	Altered hydro-regime – specific variables not known	Distribution and abundance	C1	These little known and difficult to monitor species are critical to soil process and are important prey for waterfowl and fish. Impacts of altered hydro-regime are not known.
Lepidoptera distinguished by guild: Hawthorne specialists Cane specialists Cypress specialists	Freq & Duration of Floods	Survival of ground stages Distribution	C1 C1	Hawthorne and cane specialist guilds include rare species. Cypress specialist guild chosen as an indicator of cypress health.
Forest Tent Caterpillar	Freq & Duration of Floods	Survival of ground stages of controlling parasites (flies and wasps). FTC has no ground stage. Impacts of floods on disease organisms (bacteria and fungi) not known.	C1	Annual outbreaks of this species are believed to be encouraged by hydro-regime-related mortality of controlling parasites. During outbreaks, tupelo are largely defoliated, with damage extending to hardwoods. The canopy is opened, exposing flood waters to sunlight, increasing temperature. Large quantities of frasse are deposited into flood waters, presumably impacting water quality. Jim Harper (NCSU) has studied elsewhere in the SE.
Gypsy Moth (European)	Altered hydro-regime – specific variables not known	Distribution and abundance. No ground stage.	P2	Gypsy moth is a serious invasive species believed to be just arriving in the Roanoke floodplain. Now at Devil's Gut. Impacts of hydro-regime (if any) are not known.

Chimney building (mainly terrestrial) crayfish (Cambarus spp.)	Altered hydro-regime – specific variables not known, but proplonged submergence is suspected	Distribution and abundance Large-scale kills	C1 C1	Crayfish are important prey species as well as important macro-detritovres. They also physically alter swamp forest substrates. Frequent, large-scale kills have been observed.
Stream crayfish (Orconectes spp.)	Altered hydro-regime – specific variables not known, but WQ (anoxia) is suspected	Distribution and abundance	C1	Crayfish are important prey species.
Aquatic turtles, esp. Yellow-bellied sliders	Alteration of banks by peaking and/or prolonged flooding.	Bank nesting sites Bank vegetation	N1, C1	Steve Hall believes important habitat along the banks has been lost.
Turkey	Floods during nesting season	Successful brood production	C1	
	Frequency and duration of growing season floods	Increased predation based on concentration	C1	
		Survival of critical shrub and forb habitat	C1	
Kentucky Warbler	Floods during nesting season	Successful brood production	C1	
		Increased predation based on concentration	C1	
	Frequency and duration of growing season floods	Survival of critical shrub and forb habitat	C1	
Northern Parula				
Cerulean Warbler				
Swainson's Warbler				
Passerines -- Canopy Nesting and Feeding Guilds	Hydrological impacts not known	Populations are declining in the Roanoke for unknown reasons	C2	Per Steve Hall
Wood Duck	Frequency and duration of growing season floods	Survival of critical shrub and forb brood habitat	C1	
Rafenesque's Big-Eared Bat	Water Quality	Distribution and abundance of insect prey	C1	
	Frequency and duration of floods during breeding season	Submergence of access to breeding roosts	C2, P1	

Southeastern Myotis	Water Quality Frequency and duration of floods during breeding season	Distribution and abundance of insect prey Submergence of access to breeding roosts	C1 C2, P1	
Black Bear	Frequency and duration of growing season floods	Survival of critical shrub (and forb?) forage	C1	
Nutria				Is hydro-regime helping them?
Other mammals?				
River bank communities	Peaking strategy Frequency and duration of growing season floods	Survival of gramminoids, forbs, and shrubs; degradation of burrow habitat	N1, C1, P1	Peaking and/or inundation may be destroying bank vegetation (impacting fish and herp high-water foraging habitat) and/or eliminating burrowing opportunities for animals. Comparison of the Roanoke with a reference river is seen as a plausible first test to determine if any of these impacts exists. The Hatchie River in TN and the Altamaha in GA are possibilities.
Pocosin communities at the river's mouth	Altered hydro-regime (variables?)	Salt deposition in peat soils	C2, P1	Not clear if the altered hydro-regime is producing salt-related impacts in peat soils. It was considered by the CIA workshop as a possibility to be evaluated.
Bottomland hardwood forests above cypress-tupelo and pocosin types and currently subject to flooding	Frequency and duration of growing season floods	Distribution and abundance	C1, P1	Growing season is being defined as the period between 2 weeks before bud-burst to the end of chlorophyll increase as determined from several years of AVHRR data (Townsend in prep). Rooting depth (the lower edge of flood definition) is semi-arbitrarily set at 2 feet below surface.

PHYSICAL INPUTS

Background: Vegetation has been mapped. 25 cm DEM in production. Baseline inventories completed for neotropical migrant birds. Preliminary inventories developed for herps, leps, and bats. River and swamp stage data is now available for ? months.

Flow Model: Reservoir Operations Model in Beta version. Corrected and accepted version required for License and §216 Study.

Erosion Evaluation: NCP and USFWS will measure bank erosion due to peaking. Required for license.

Flood Models: Static model (TNC) will be available in stages between August 31, 2000 and December 31, 2001. Minimum requirement for License negotiations and §216 Study.

Dynamic model (USGS and NCP) will be complete as 1D to Scotland Neck by August 15, 2000. No plans as yet for 2D to the Sound (Corps and USGS?). Highly desirable for License negotiations and §216 Study.

NCP needs to determine if peaking is contributing to flooding at Coniott Creek as soon as possible. Jerry Holloman believes that it did during the 6/19-29/2000 flows. The Terrestrial Committee needs to evaluate Jerry's evidence, and a stage-gage may be needed for that location ASAP.

Water Quality: NCP will determine the approximate rate at which growing season floods contribute to water quality degradation in the swamps (main channel effects are already documented).

A water quality model for the entire system below Roanoke Rapids Dam is essential for the §216 Study.

Sediments: Townsend et al. continue to pursue funding for research on sediment deposition and movement in the floodplain. Impacts on terrestrial communities, if any, are not yet hypothesized.

Compiled: Sam Pearsall and John Cannon / July - August 2000