

# RESOURCE SENSITIVITY EFFECTS ON NAVIGATION AND WILDLIFE AND PLANNING FOR THE A.C.F. RIVER BASIN

Richard Perritt<sup>1</sup> and Daniel Drennen<sup>2</sup>

---

**AUTHORS:** <sup>1</sup>Associate Professor of Geography, 104-A Tichenor Hall, Auburn University, Auburn, Alabama 36849; <sup>2</sup>Biologist, National Fish and Wildlife Service, Eufaula National Wildlife Refuge, Route 2, Box 97-B, Eufaula, Alabama 36027.

**REFERENCE:** *Proceedings of the 1995 Georgia Water Resources Conference*, held April 11 and 12, 1995, at The University of Georgia, Kathryn J. Hatcher, Editor, Carl Vinson Institute of Government, The University of Georgia, Athens, Georgia.

---

**Abstract.** The purpose of resource sensitivity is to integrate understanding about the stresses on river basin systems into the comprehensive planning and management process. Understanding how fluctuating natural conditions affect water resources and the ability of users to manage them in an economically and ecologically feasible fashion is useful to charting the future course for planning and ultimately managing the whole river basin system. This brief paper outlines the sensitivity affecting navigation windows and the Eufaula wildlife refuge to illustrate the need to consider how key sectors adjust to climate changes in the ACF river basin. The two sectors are further illustrative of how operations to facilitate navigation windows can increase the risks from natural hazards to other sectors like wildlife habitats.

## INTRODUCTION

Heightened public concern over managing the Georgia-Alabama-Florida ACF river basin is a result of increasingly different ideas and concerns over water demands and needs covering varying geographic upstream-middle-downstream portions of the basin. Natural perturbations in the system caused by the cumulative effects from extreme low and high water events have also heightened awareness of differences in the overall vulnerability of the primary uses and sectors located within different geographical areas of the basin region.

## BACKGROUND

Responses to the Corps of Engineers proposal to reallocate water storage in the upper ACF basin have varied widely among political units, resource users and geographic areas of the ACF river basin. Each of the three basin states of Georgia, Alabama and Florida have reacted differently according to their perceived interests in taking charge or coping with a process that will decide river flows, water resource availability and the benefits of river basin development. The basin-wide comprehensive planning process must try to incorporate as many as possible of the water resource concerns from the varied public and private stakeholders in the basin. Not

withstanding the highly charged political interests at stake, it is likely many of the issues among the three states will be adequately answered with the establishment of a workable tri-state basin management and coordination mechanism.

Another goal of the comprehensive study elements is to understand the relationships between and among them and to consider the overall affects or balance of relationships on water quantity, the environment and economics. Whenever possible, such relationships are expected to be quantifiable. Yet planners realize that dealing with such a complex set of social, economic and environmental forces that combine differently in terms of needs and strains on the resource system will require examination of a variety of assessment tools ranging from highly quantifiable computer models, to more adaptive assessment of non-quantifiable relationships.

By combining a number of planning techniques integrating elements that are both quantifiable and others of less direct quantifiable nature, the ACF planning process is best served by a strategy that reflects: (1) the sensitivity of a wide range of economic, social and environmental resource systems to change in relationships which can ripple through the whole or parts of the river basin and; (2) the vulnerability of particular resource systems in terms of capacities to respond to change and; (3) adjustments that are conducive to planning and managing the river basin towards a sustainable development future.

## NATURAL HAZARDS AND RESOURCE SENSITIVITY

Natural Hazards such as extreme fluctuations in drought and flood conditions affecting the ACF river Basin have caused severe impacts on many of the key economic development factors. Prior to the reallocation proposal in 1989, severe droughts in 1981, 1986, 1988 had caused substantial economic losses and prompted widespread reexamination and development of new ideas and practices regarding operations of the ACF system.

The practice of maintaining navigation windows to overcome low water hazards to barge operators was a result of the experience of adjusting to droughts. By looking more closely at navigation windows and related operating procedures

one can identify how risks can inadvertently be shifted to other and unsuspecting environmental areas of water use such as the needs of wildlife.

### **Resource Sensitivity Planning and Vulnerability**

Resource sensitivity planning considers the actual experience of human and environmental systems related to natural changes especially hazardous climatic and weather episodes, the ensuing responses linked with such events and how these might shape the future capacity of the system to plan and manage under uncertain conditions. Resource sensitivity is especially suited to examining the socio-economic and environmental characteristics of a river basin and the adjustments and changes in the operations and natural conditions affecting river basin developments.

A number of approaches have been taken to examine the impacts of climate changes on social and economic resource systems and their ability of adapting to potential or similar like changes in the future. Considering the highly variable needs and demands placed on comprehensive planning and the uncertainties associated with climatic events, no single climate and resource sensitivity approach fits every river basin and institutional arrangement. It is useful to begin building such a approach by using available climate data sources, and knowledge about past adjustments to natural variations and related impacts on elements that are especially at risk or vulnerable to changes in the basin water resource system. Generally, climate change based resource sensitivity analysis seeks to:

- \* identify geographic areas including socio-economic sectors and natural systems that are especially sensitive to climate variation and changes in water resource availability and quality;
- \* measure and assess the effects of specific variations such as changes in stream flow or watershed environmental quality in order to recommend contingency plans or mitigation policies;
- \* improve the basin institutional capacity to sort out which plans will better withstand the negative aspects of future uncertain conditions;
- \* incorporate climate change data and measurements of related impacts on key resources and user groups into overall plan-making and river basin monitoring;
- \* analyze the effectiveness of component adjustments and overall vulnerability/resiliency to adapt to change and reinforce the most effective of these into the comprehensive and long-range river basin planning and management and;
- \* avoid propagating management practices and development planning that inadvertently reduce or eliminate useful adjustment options or blindly shift impacts from one component or geographic area to the disadvantage of another geographic area and sector of resource use.

A key goal in undertaking this kind sensitivity analysis is to build in a kind of social - ecological systems warning approach- which illuminates the possible ill effects of promoting the needs for maintaining one kind of stakeholding interest by diminishing the future health of other equally valid claims and interests to water and other resources.

### **TWO CASES OF RESOURCE SENSITIVITY**

Two widely different sector and area adjustment patterns from the ACF river basin can illustrate the necessity of such an early warning planning system. The cases of water needs for human navigation and environmental habitats of wildlife can serve to illustrate how one uses' seemingly positive adjustment to variable and often crippling climate changes reinforced by the current water storage operations and reservoir management practices can unwittingly undermine the needs of different resource users under the same hazardous condition.

#### **Navigation Windows**

Water resource projects can be adjusted to climate change by allowing management of projects goals to become more flexible by adjusting or accepting lower reliability and by changing operations or physical facilities. River transportation and the navigational requirements associated with river basin management have been historically recognized in the ACF tri-state region as a critical function for government's role in ACF basin water projects and planning. The National Rivers and Harbors Act of 1945 authorized the need to maintain an adequate waterway channel (nine by one hundred foot) to permit intercostal transportation to use the Apalachicola-Flint-Chattahoochee river system. The ACF river system is part of the total Inland Waterway System of the United States and through its navigable lengths and their terminals and docking facilities, the ACF Waterway serves the social and economic needs of business, commerce and populations in western Georgia, eastern Alabama and northern Florida. Some would argue that waterway bulk transportation is a more environmentally friendly mode of large commodity hauling than comparable highway transportation services.

The series of severe droughts and lower than acceptable river channel conditions during the decade of the 1980's significantly impacted transportation by bringing the profitable tonnage using the system to almost a standstill. Transportation waterway users were forced to re-evaluate the feasibility of economically operating on the ACF system. Some haulers suspended operations, terminals were forced to close and most businesses were reluctant to return to water transportation even after the droughts were over. The decline in waterway tonnage as a direct result of the drought lowered national interests and confidence in the historic priority for government to maintain the river channel and navigation works in the future.

The sensitivity of barge companies to water fluctuation and availability was too much for them to adjust for alone. Using

Table 1. Water Level Operations for Refuge Wildlife Habitats

MONTHS	WATER LEVEL, MSL	VEGETATION RESPONSE	WILDLIFE RESPONSE
MARCH	190	SOME RIPARIAN WOODLANDS FLOODS	WOODDUCK BROOD HABITAT. COLONIAL NESTING BIRD ROOKERIES IN FLOODED TIMBER
APRIL	188-187	REVEGETATION OF SHORELINE, SAND BARS AND ISLANDS WITH DESIRABLE PLANTS	SAME AS MARCH. INCREASE MAMMAL USAGE. EAGLES AND OSPREY FEED READILY ON AVAILABLE FISH, MIGRATING SHORE WADING BIRD USE OF EXPOSED AREA. GEESE BEGIN NESTING ON ISLANDS. DECREASE BEAVER DAMAGE IN WOODED AREAS.
MAY	187-186	SAME AS APRIL. SOME WETLAND PLANTS BEGIN TO FLOWER	SAME AS APRIL
JUNE	186-186	SAME AS MAY	SAME AS MAY
JULY	186	SAME AS JUNE. INCREASE FLOWERING OF WETLAND PLANTS	WOOD STORKS FEED IN DRYING POOLS.
AUGUST	186	DESIRABLE PLANTS BEGIN FORMING SEED. MAINTENANCE OF LEVEES BEGINS	SAME AS JULY
SEPTEMBER	186-186	SEED FORMATION AND FLOWERING CONTINUES. CONTROL OF UNDESIRABLE VEGETATION WITH FIRE AND CHEMICALS IS POSSIBLE.	WATERFOWL AND OTHER MIGRANT BIRDS USE EXPOSED SAND VEGETATED AREAS.
OCTOBER	186-187	SEED PRODUCTION OVER, CONTINUE UNWANTED VEGETATION CONTROL	ARRIVING WATERFOWL ACTIVELY CONSUME SUBMERGED SEEDS
NOVEMBER	187	SAME AS OCTOBER, PUMP UP OF IMPOUNDMENTS	SAME AS OCTOBER. INCREASE WATERFOWL USAGE
DECEMBER	187-188	SAME AS NOVEMBER	SAME AS NOVEMBER
JANUARY	188-190	IMPOUNDMENTS AT MAXIMUM LEVEL. VEGETATION FLOODED	MAXIMUM WATERFOWL NUMBERS
FEBRUARY	190	SAME AS JANUARY	WATERFOWL NUMBERS BEGIN TO DECLINE

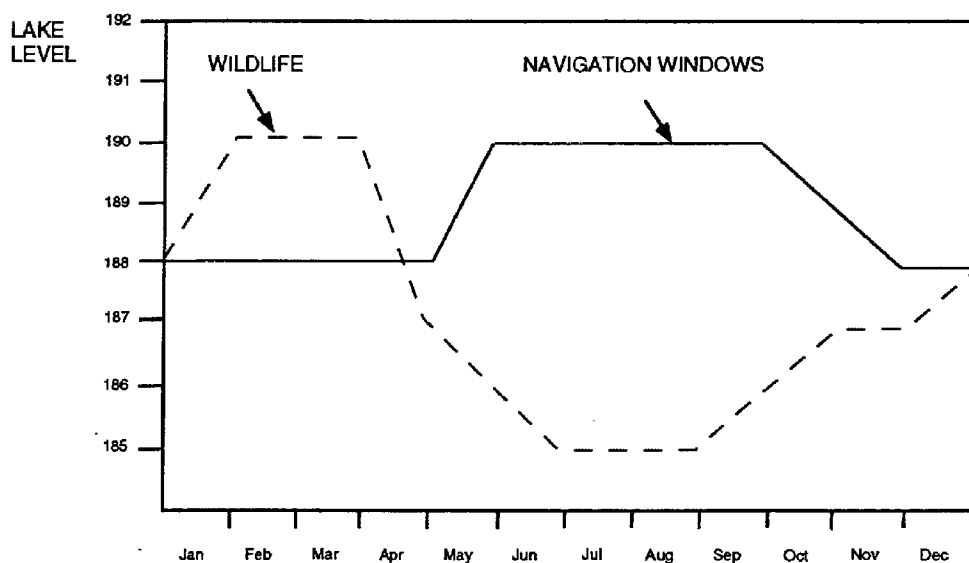


FIGURE 1. Recommended Lake George Operating Levels for Wildlife and Navigation Windows

the forum of the non-governmental Tri-Rivers Development Association, and the expertise of the U.S. Army Corps of Engineers who manage the stream flow requirements, navigation users were effective in developing a drought contingency plan and set of dam-reservoir operating procedures that restored the economic feasibility for transportation business on the ACF system. The response became labeled as the navigation "windows" contingency plan and now is routinely applied on an annual planning cycle basis by the Corp of Engineers. This action conceived under periodic hazard control conditions is now a permanent water variation control process to accommodate the lower than needed water availability experienced during most dry late summer and fall months of the year.

Management for "navigation windows" is low rainfall sensitive and begins under less than average or drought-like rainfall conditions occurring in the drainage basin during the spring and early summer months. The Corps handles coordination and communication with users, establishing needs for movements, time factors, quantities and distances require for carrying specific cargo loads and offhauling. The Corps managers also consider the requirements and priorities of other multiple uses of the system under similar conditions and then initiate a drought sensitive plan. In essence, during the critical low flow summer months, users would be notified that navigation channel requirements would temporarily reduced or ignored. Water would be stored upstream for periods ranging from several days to three weeks, followed by a planned release of storage to create a downstream "window" of river channel use lasting from ten to fourteen days and enough time to allow barge tow operators to reach upstream destinations and customers and return profitable downstream (Hirt, 1992). The navigation "windows" practice over the last four years has improved the economic climate to maintain and encourage new waterway transportation use as part of the region's economic growth.

#### Water Resource Needs of Wildlife

To date, the Tri-state basin-wide comprehensive planning effort has addressed little attention to the water level needs of non-game wildlife. Each year, between 226,000 and 750,000 duck species are estimated to migrate through a corridor from North to South America that covers the watersheds of the ACF basin. The Lake George reservoir and Chattahoochee waterway are a very important aquatic habitat for migrating birds in the fall and spring months of the year. Thousands of waterfowl, shorebirds, wading birds and others depend directly on the watershed environment and can react or are very sensitive to changes in river water flows and ecological conditions of the watershed habitat areas in the Lake George drainage area. Wildlife is directly influenced by the reservoir, drainage area and ACF system planning and management.

For example, part of the ecosystem of the Eufaula National Wildlife Refuge contains numerous mudflats, sand bars and islands that are exposed to some degree during the winter months which coincides with needs of migrating bird

populations. Thousands of species like killdeer, snipe, plovers, yellowlegs, egrets, herons, geese and ducks utilize the availability of important loafing and foraging habitat.

The critical time frame for migrating birds is September-December and late March-April as indicated in Table 1. Making these habitat watersheds available by managing water storage levels according to the needs and schedule in the same table runs counter to the reservoir storage and schedule of downstream releases currently operated for other resource uses and especially for maintaining navigation "windows". The differences between wildlife and navigation sensitivities to water needs and responses in scheduling low and higher water levels for Lake George are highlighted in the diagram of Figure 2. The diagram shows that the wildlife calendar of operations is out of synch with the current operating levels maintained by the Corps of Engineers. A significant difference occurs in the late summer months where lowering water levels for wildlife would jeopardize the ability of the system to meet the "window" for navigation purposes.

#### CONCLUSIONS

By presenting only two cases of resource sensitivity and water management needs it might appear that such an approach could heighten the potential conflicts of interests at stake in developing a Basin Comprehensive Planning process. Much more analysis is needed to evaluate the extent and meaning of the differences that such an exercise begins to identify. The basic value of resource sensitivity especially within a policy making context, is to apply the actual record of adjustments to changes in resource availability and quality and to integrate this information into the broader comprehensive planning and analysis effort.

Deciding where key user interests are located and how they might be impacted by both natural and human-induced changes in operations of stream flows and river basin management should contribute towards creating a useful socio-ecological early warning device. There is a great need for more research about the adjustment capacity of different sectors in the ACF basin and how these can be effectively managed into the whole system without creating new risks.

#### LITERATURE CITED

- Hirt, H. B. Jr.. 1992. "Navigation Windows: A Concept for Success", unpublished report.
- Riebsame, W.E. et. al.. 1986. "The social burden of weather and climate hazards", Bulletin of the American Meteorological Society, 67(11), 1378-1388.
- United States Army Corps of Engineers. (n.d.). "Proposed Scope of Work for Basinwide Management".