



Ocean and Coastal  
Resource Management

## *Upper Cooper Natural Resource Management Plan:*

*The Product of a Stakeholder Dialogue*

*Prepared for the Steering Committee  
for the  
Upper Cooper River Special Area Management Plan*

*Presented by*  
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## Table of Contents

Consensus Agreement.....	vii
Foreword.....	viii
Acknowledgements.....	x
Executive Summary.....	xi
Introduction and Organization of this Report.....	xii
<b>Chapter 1 – The SAMP and the Evolution of the Stakeholder Group.....</b>	<b>1</b>
The SAMP.....	1
NRMP Goals for the Cooper River Corridor SAMP.....	3
Participants in the Stakeholder Group.....	5
The Charge.....	6
The Road Map to a Natural Resource Management Plan.....	6
<i>Educating the Participants.....</i>	<i>6</i>
<i>Negotiating the Elements of the Plan.....</i>	<i>7</i>
Outside the Scope of Deliberations.....	7
<b>Chapter 2 - A Systematic Look at Natural Resource Planning in the Upper Cooper River.....</b>	<b>9</b>
The Role of the Government.....	9
<i>Federal Government.....</i>	<i>9</i>
<i>State Government.....</i>	<i>14</i>
<i>Local Government.....</i>	<i>16</i>
Public Involvement.....	17
<b>SAMP Outcomes / Types of Recommended Actions.....</b>	<b>18</b>
<b>Chapter 3 - The Nexus of Economy and Environment in the Upper Cooper.....</b>	<b>20</b>
The Cooper River: Economic Engine of the Lowcountry.....	20
An Historic Perspective – How Water Flows Affect the River.....	20
History’s Impact on the River.....	21
The River Defines the Community.....	22
Through the Years.....	23
Santee Cooper: Another Catalyst for Industrial Development.....	24
A Natural Place for Growth.....	24
Bold Greenspace Initiative.....	26
The River Tomorrow.....	27
<b>Chapter 4 - Water Quality: Crucial to the Future of the Region.....</b>	<b>31</b>
<i>Mercury Impairment.....</i>	<i>32</i>
<i>Fecal Coliform Impairment.....</i>	<i>34</i>
<i>Dissolved Oxygen (DO) Impairment.....</i>	<i>35</i>
Point Source Discharges.....	36

Nonpoint Source Policies.....	38
Urbanization and Growth.....	40
Vegetation .....	40
Sediment.....	41
Nutrients.....	42
Further Research .....	42
<b>Chapter 5 – Fish, Wildlife Resources and Wildlife Habitat.....</b>	<b>45</b>
Tidal Fresh and Brackish Marsh Habitats.....	45
<i>Non-Tidal Emergent Wetlands.....</i>	<i>46</i>
<i>Freshwater Riverine, Open Water Habitats.....</i>	<i>46</i>
Freshwater Wetlands and Aquatic Habitats.....	47
<i>Freshwater Wetland Functions.....</i>	<i>47</i>
Conservation Strategies.....	48
<b>Chapter 6 - Land Use Management and Rice Impoundments .....</b>	<b>52</b>
Transparency in Public Policy .....	57
<b>Chapter 7 – The Demonstration Project .....</b>	<b>58</b>
The Cooper River Corridor SAMP Area – Today’s Laboratory .....	58
Beyond the Demonstration Project.....	61
<b>Chapter 8 - Conclusion .....</b>	<b>64</b>
<b>Chapter 8 - Conclusion .....</b>	<b>65</b>
<b>Afterword .....</b>	<b>67</b>
<b>Appendix I – Catalogue of Recommendations .....</b>	<b>69</b>
<b>Appendix II - Glossary of Acronyms and Key Phrases.....</b>	<b>78</b>
<b>Appendix III – Participants in the Development of this NRMP.....</b>	<b>88</b>
Compendium of Bios.....	90
Self-Employed Copy-Editor/Technical Writer .....	91
<b>Tommy Evans.....</b>	<b>96</b>
<b>Erwin J. Krull .....</b>	<b>100</b>
Facilitator for Process and President of Consensus Solutions, Incorporated ..	108
<b>Appendix IV – Resource People and Their Organizations .....</b>	<b>110</b>
<b>Appendix V – The Charge to the Stakeholder Group.....</b>	<b>111</b>
<b>Appendix VI - Historical Discussion of Water Quantity .....</b>	<b>114</b>
The Cooper River.....	114
The Santee River .....	115
Cooper River Rediversion Project .....	116
<b>Appendix VII - Discussion of the Legal Requirements for Reimpounding .....</b>	<b>118</b>
Demonstration of Ownership.....	118

Impacts on Submerged Lands.....	118
Blockage of Navigable Waterways.....	118
Compliance with SC DHEC/OCRM Statutes and Regulations .....	119
State Water Quality Standards and the Federal Clean Water Act .....	120
<b>Appendix VIII – Characterizations of the Cooper River System Rice fields .....</b>	<b>121</b>
<b>Appendix IX – Additional Water Quality Efforts.....</b>	<b>132</b>
<b>Appendix X – The Science of Water Quality .....</b>	<b>133</b>
Dissolved Oxygen.....	134
Point Source Dischargers.....	136
<i>Municipal Point Sources .....</i>	<i>136</i>
<i>Industrial and Commercial Sources .....</i>	<i>136</i>
<i>TMDLs and Waste Load Allocations .....</i>	<i>137</i>
Nonpoint Source Pollutants of Concern .....	138
<i>Sediment .....</i>	<i>138</i>
<i>Bacteria .....</i>	<i>138</i>
<i>Nutrients.....</i>	<i>139</i>
<i>Metals .....</i>	<i>139</i>
<i>Petroleum Hydrocarbons.....</i>	<i>139</i>
<i>Hazardous Chemicals.....</i>	<i>139</i>
<b>Appendix XI – The Ecology of Wildlife and Wildlife Habitat .....</b>	<b>140</b>
Upland Habitats.....	140
<i>Old Field Communities.....</i>	<i>140</i>
<i>Pine-Mixed Hardwood Communities.....</i>	<i>140</i>
<i>Pine Forest Communities .....</i>	<i>140</i>
<i>Mixed Hardwoods Communities .....</i>	<i>140</i>
Upland Wildlife .....	141
<i>Invertebrates.....</i>	<i>141</i>
<i>Vertebrates - Amphibians and Reptiles.....</i>	<i>142</i>
<i>Birds .....</i>	<i>142</i>
<i>Mammals .....</i>	<i>143</i>
Essential Fish Habitats.....	144
Wetland Associated Wildlife.....	145
<i>Foraging Wading Birds.....</i>	<i>145</i>
<i>Waterfowl.....</i>	<i>145</i>
<i>Shorebirds.....</i>	<i>146</i>
<i>Neotropical Migrant Songbirds .....</i>	<i>146</i>
<i>Mammals .....</i>	<i>146</i>
<i>Freshwater Fishes.....</i>	<i>146</i>
<i>Rare, Threatened and Endangered Species .....</i>	<i>147</i>
<i>Additional Reptiles &amp; Amphibians Considered Imperiled or Potentially Imperiled .....</i>	<i>150</i>
<b>Appendix XII – Supplemental Opinions.....</b>	<b>151</b>



## Consensus Agreement

The participants in this dialogue have crafted the Natural Resource Management Plan (NRMP) that follows. All of the counsel contained herein was developed with an eye toward consensus and with three or fewer people indicating that they “could not live” with the counsel and recommendations. The majority of the NRMP’s content is presented with universal (100 percent) consensus.

Each person named below has negotiated in good faith with the other participants and confirms that the contents of this report reflect the group consensus. Though individual participants may take issue with one or more elements, each participant supports forwarding this report to the Steering Committee of the Special Area Management Plan for further consideration and implementation.

*A check in the box beside the named individual indicates the inclusion of a supplemental opinion appearing in Appendix XII.*

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> Jason Ayers           | <input type="checkbox"/> Charlie Glover       | <input type="checkbox"/> Steve Moore      |
| <input type="checkbox"/> John Bolton           | <input type="checkbox"/> Marty Healy          | <input type="checkbox"/> Steve Pendley    |
| <input type="checkbox"/> Liz Bourgeois         | <input type="checkbox"/> Barry Jurs           | <input type="checkbox"/> John Scarborough |
| <input checked="" type="checkbox"/> Andy Brack | <input type="checkbox"/> Al Kennedy           | <input type="checkbox"/> Alan Shirey      |
| <input type="checkbox"/> Jimmy Chandler        | <input type="checkbox"/> Father Francis Kline | <input type="checkbox"/> Ray Sims         |
| <input type="checkbox"/> William Crymes        | <input type="checkbox"/> Erv Krull            | <input type="checkbox"/> Tony Thomas      |
| <input type="checkbox"/> John Dulude           | <input type="checkbox"/> Dwayne Magnum        | <input type="checkbox"/> Gene Warner      |
| <input type="checkbox"/> Tommy Evans           | <input type="checkbox"/> Bobby Mead           | <input type="checkbox"/> Miller White     |
|  | <input type="checkbox"/> Andy Miller          |   |

## Foreword

When one speaks of Berkeley County, one must also speak of the Cooper River in the same breath. The Cooper River has been the life-blood of culture, commerce and history that flows through Berkeley County from a time prior to written history to the present. There is a passion for this venerable river system shared by those who live within its influence and quickly gained by those who are new to the river. This passion comes from the understanding that it sustains us today as it has sustained generations past. This passion and understanding has spurred this comprehensive study of the Cooper River as a natural ecosystem through the Cooper River Special Area Management Plan.

For the past decade, the Cooper River has received much discussion regarding its continued health and viability, particularly in the face of increasing geopolitical changes. Recent studies have documented that this river system is also undergoing a process of natural succession that, within a relatively short time period, will radically change its features and function.

With these considerations sharply in mind, landowners, conservationists, corporate managers, scientists and public servants have come together within the framework of the Cooper River SAMP to gain as much knowledge as is available in their task to develop an ecosystem-based natural resources management plan. These individuals contributed their unique and well-suited expertise, experience, professionalism and dedication to this process. It is to their credit that this document offers such in-depth understanding of the Cooper River System and well-considered vision for its future.

We recognize with much gratitude the services of Adam Saslow, President of Consensus Solutions. His ability to bridge the gaps between differing communities of thought ensured the fullest discussion possible. Mr. Saslow's unique skills in facilitation have proven invaluable in guiding us through this complex and often difficult process.

Equally deserving of recognition are the efforts of James Hackett, Environmental Planner for the SCDHEC Office of Coastal Resources Management. Mr. Hackett has relentlessly coordinated the many meetings, addressed committee member and resource personnel needs, scheduled appropriate speakers and acquired critical information. Mr. Hackett's efforts ensured the substance and circumstances supporting this process were never lacking.

It has been a richly rewarding experience to be a part of this process and observe committed people working with such dedication toward a common goal. Their service in creating the Cooper River Natural Resources Management Plan stands as a testament to the resourcefulness of community-based initiatives in addressing

local challenges and self-determination for their future. It is for the future of the Cooper River and for the benefit of future generations that this endeavor has been undertaken.

Barry H. Jurs  
Chairman,  
Natural Resources Committee  
November, 2004

## Acknowledgements

This process was convened by the South Carolina Department of Health and Environmental Control's Office of Ocean and Coastal Resource Management under award number NA16FL2735 from the National Oceanic and Atmospheric Administration, US Department of Commerce. The statements, findings, conclusions and recommendations are those of the author(s) and do not necessarily reflect the views of the National Oceanic and Atmospheric Administration or the Department of Commerce.

A large team representing many, many interested parties affecting South Carolina's natural resource programs was assembled to develop this Natural Resource Management Plan (NRMP).

*Appendix III lists the members of the Stakeholder Group.*

These people came into this process with a wide variety of experiences and backgrounds. Significant time was spent educating the participants on matters of natural resources, water quality and existing state programs. The group gratefully acknowledges the many experts who attended the meetings to present their knowledge, work and expertise.

*All of these individuals are also listed in Appendix IV as "Resource People."*

The stakeholder group would especially like to thank Dr. Joe Kelley of the Citadel and Dr. Dan Tufford of the University of South Carolina for their tireless contributions.

Additionally, several staff members from the South Carolina Office of Ocean and Coastal Resource Management (SC DHEC/OCRM) primarily assigned to other duties, generously committed their time and energy to ensure that our meetings went smoothly. Among them were James Hackett and Gail Phipps. Without their support, this process would not have come close to reaching the success that it did. For similar reasons, the group is indebted to Ms. Candice Shrewsbury of Consensus Solutions, Incorporated.

Finally, we would like to thank our supporters from Mepkin Abbey, Cypress Gardens and Captain Bo Gator's Boat Tours all of whom graciously allowed us to use their facilities in this process. These organizations provided gracious and hospitable environments for the stakeholders to work through the many difficult issues faced along the way.

## Executive Summary

The Cooper River's value to the area economy is often overlooked and underestimated. Many take the river for granted. If the river is to continue to be a vital part of the county's economic, cultural and recreational future, decision-makers must take solid steps now to plan for the future of the river. Decisions and activities must be grounded in science. Failure to do so will jeopardize that future.

Growth projections indicate a trend toward urbanization in much of Berkeley County, including the SAMP area. If this change in land use occurs without the attentiveness of leading officials, adverse water quality impacts can be expected over time. These impacts might include further bacterial contamination of tributaries, eutrophication of small lakes and wetlands, and the loss of aquatic insect habitat due to sedimentation. To that end, the participants in this process offered counsel on how to best manage projected growth in ways that maximize environmental, economic and community level benefits.

Water quality issues dominated the dialogue for much of the early stages of the process. Participants discussed options for policy makers to address mercury concerns, elevations in fecal coliform levels and stormwater management. Recommendations designed to address each should assist local and state policy makers to be proactive in protecting water quality for future generations.

A central goal for the SAMP process was to promote biodiversity. The stakeholder group found active management of rice fields presented a potential management tool to achieve a higher degree of biodiversity. Doing so could allow for greater control over invasive species, for example. To preserve the character and quality of the upper portion of the Cooper River, the unmanaged open rice fields should be handled as part of a unified landscape rather than as individual fields. Policymakers must recognize, understand and be attentive to the role the open fields play as hydrologic and water quality features in the river and the possible effect(s) of management options.

To that end, the stakeholder group strongly recommended that the breached dikes at Small Bonneau Ferry be repaired. Baseline data has already been collected and current conditions are well understood. By re-diking the rice field and measuring the changes in the ecosystem (along many different scales), policy makers could develop that critically important understanding of the systemic contributions of the rice fields to water quality, wildlife and wildlife habitat.

## Introduction and Organization of this Report

This Natural Resource Plan is best viewed as having three discrete sections.

- Chapter 1 provides rich context for why Berkeley County and other government agencies in South Carolina are undertaking the challenge to change the tenets of natural resource management in this unique part of the state. The rationale is defined along with the road map used by the stakeholder group convened to provide sage counsel to the SAMP Steering Committee. Chapter 2 provides the Strategic Vision for Natural Resource Management in the Upper Cooper River – and the broad linkages between state and local efforts.
- Chapters 3, 4 and 5 offer insights into the complicated relations between community, economics and environment in the Upper Cooper River. Chapter 3 explains the economic dynamics that exist and affect natural resource management. Chapter 4 goes into some detail on the water quality issues from historic and current perspectives. Chapter 5 considers the diversity of both wildlife and wildlife habitat.
- Chapters 6 and 7 offer great insight into how the stakeholders consider the active management of the Cooper River Rice fields a potentially critical element in the preservation of habitat diversity and the maintenance of water quality. Chapter 6 addresses all rice fields in the SAMP area – upland, inland and tidal – in a generic sense. Chapter 7 lays out the content and structure of a demonstration project that should yield very important results and a critical scientific grounding for future management of this unique region.
- Chapter 8 provides concluding remarks.

Of course, there is significant reference material that may be of use to the reader as supplemental to the work relayed in the main text. This reference material is presented in the various appendices.

## Chapter 1 – The SAMP and the Evolution of the Stakeholder Group

Governmental entities in Berkeley County and South Carolina recognize the value of aligning natural resource issues with regulatory decision-making in the Cooper River system and promoting natural resource management to protect habitat diversity and water quality.

Systematic natural resource planning allows for comprehensive consideration of all potential impacts to water quality, wildlife and wildlife habitat. It enables interested parties to identify generic and specific actions to prevent degradation of high-quality waterbodies and even to restore the quality of impaired waterbodies through existing voluntary and, occasionally, regulatory protections or the development of innovative alternatives.

The movement to natural resource planning and management in Berkeley County and South Carolina is driven by several additional factors, including:

1. The unique cultural and environmental features of the Upper Cooper River;
2. A movement toward “good governmental” practices including efficiency in delivery systems and the optimization of resources; and
3. Recognition of the relationships among growth, infrastructure development (e.g., roads and sewers) and natural resources, particularly in Berkeley County.

The various drivers listed above led the Berkeley Conservation District, Berkeley County and SC DHEC/OCRM to develop a Special Area Management Plan (SAMP), parts of which would be developed by a facilitated multi-stakeholder dialogue. This process, designed and guided by a neutral party, offered the greatest potential for success.

### *The SAMP*

A Special Area Management Plan is defined in a 1980 amendment to the SC Coastal Zone Management Act (SC CZMA) as a “comprehensive plan for providing for natural resource protection and reasonable coastal dependent economic growth containing:

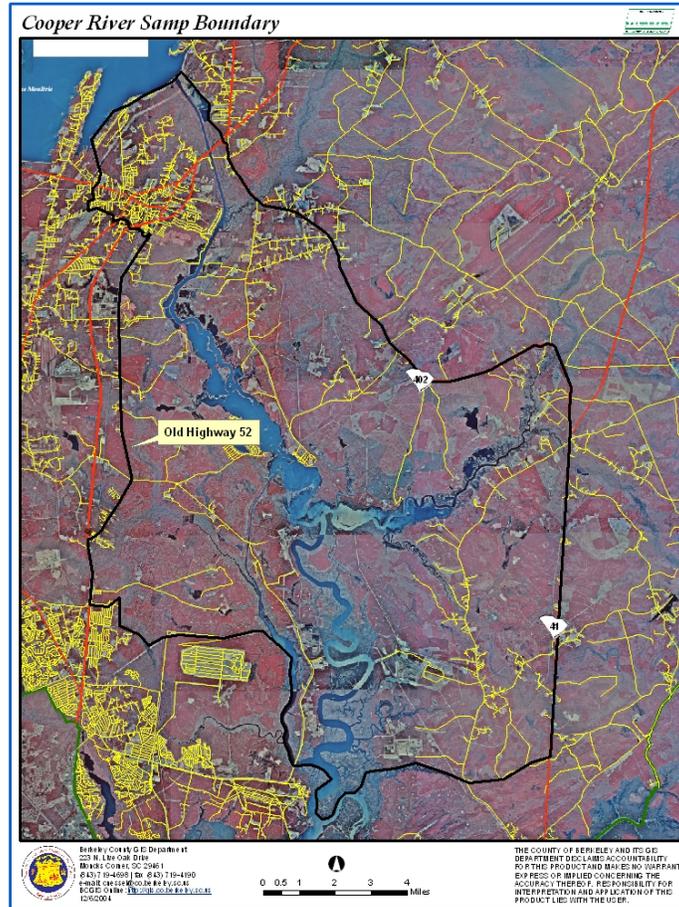
- A detailed and comprehensive statement of policies;
- Standards and criteria to guide public and private uses of lands and waters; and
- Mechanisms for timely implementation in specific geographic areas within the coastal zone.”

Benefits of SAMPs typically include better resource protection, tailored regulatory and voluntary programs, more predictability and transparency in government decision-making, as well as improved relationships among all interested parties.

SC DHEC/OCRM initiates SAMP processes at a state, local or federal entity's request, or if the agency sees opportunities to address specific problems. Berkeley County and the Berkeley Conservation District specifically requested the work undertaken in this particular effort.

In 2001, a National Register District for Historic Places nomination was developed for a large portion of the Cooper River. Berkeley County Government and the Berkeley Conservation District had concerns regarding how such a status might affect the regulatory process for state agencies. The county and Conservation District asked SC DHEC/OCRM to develop a memorandum of agreement with the SC Department of Archives and History to explain and define the permitting process. During the discussion between the County, Conservation District and SC DHEC/OCRM, other issues were identified as being a concern for the river system. Leaders within Berkeley County Government felt the time had come to evaluate the Cooper River area carefully and to plan for the proper management of its resources to meet the numerous demands growth would place on the Cooper River.

Berkeley County's Cooper River Corridor is a uniquely important area from the perspectives of natural resources, history and economics. Berkeley County officials, local landowners and other stakeholders in the area determined there was a need to balance the multiple uses of this area and limit potential conflict. The Cooper River Corridor SAMP designation presents an opportunity for stakeholders to develop recommendations for cultural resources management, water-based recreation, and land and habitat management. Subgroups appointed by the Steering Committee specifically address each of the above.



The SAMP boundary lies below Pinopolis Dam and roughly between S.C. Highway 41/402 and Old US Highway 52 in the lower portion of Berkeley County. Borders may also be viewed as the town of Moncks Corner and Thornley Forest Subdivision on the west and approximately 1,000 feet east of the mouth of the Tail Race Canal at the Jefferies Generating Station on the east.

The SAMP area encompasses approximately 53 miles or 4,000 acres of riverine habitat, including the Tailrace Canal, East and West Branches of the Cooper River, a portion of Wadboo Creek, Durham Canal, Back River and numerous tributary streams.

***NRMP Goals for the Cooper River Corridor SAMP***

SAMPs in South Carolina’s coastal zone address particular issues such as revitalizing waterfronts, protecting cultural and natural resources, and providing research for future

management decisions. The goals of this piece of the Cooper River Corridor SAMP are to:

- ❑ Determine if active management of water flows in the system can slow the rate of vegetative succession;
- ❑ Preserve the integrity of the existing rice fields;
- ❑ Assess the effects of impoundments on habitat for a variety of waterbirds;
- ❑ Verify the extent to which impoundments provide refuge for certain species, including endangered species;
- ❑ Explore strategies to control non-indigenous aquatic plants within impoundments or in open water systems;
- ❑ Assess the comparative (before and after) volume of the diversity and populations of benthic fauna relative to natural wetlands;
- ❑ Observe the migratory patterns of certain resident species and the patterns over their life cycles;
- ❑ Determine the effects of reimpounding on levels of dissolved oxygen;
- ❑ Assess the effects of reimpounding on the filtration capacity of open marsh;
- ❑ Evaluate the change in the export of nutrients that would normally occur from an open marsh; and
- ❑ Investigate whether innovative trunk design, planned bathymetry and water exchange practices that emphasize good connections with the river can improve water quality, fishery productivity and habitat diversity.

The Cooper River is unique in that it flows in two directions. Water released from the Pinopolis Dam flows down the river, while tidal cycles send water up the river. The county is home to former rice fields which provide diverse habitats for birds and fish. Many of these rice fields are in various stages of succession; many are in the process of reverting to forested wetlands, thereby altering many critical habitats.

The Cooper River system has a long history of water level manipulations. Additionally, diversion and rediversion accelerated vegetative succession.<sup>1</sup> The Cooper River

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<sup>1</sup> Please see Chapter 3 and the various appendices for richer descriptions of these issues.

system also contains critically important Submerged Aquatic Vegetation (SAV) in tidal fields. SAV communities provide valuable and diverse habitat within the overall ecological system. The increase in the rate of succession has placed serious threats on the continued existence of these fields. Overall, these unique features of the Cooper River system make it an ideal laboratory for testing the effects of active rice field management.

### *Participants in the Stakeholder Group*

The SAMP Steering Committee carefully selected participants from among several affected communities or “stakeholder groups.” In choosing the specific individuals, the Steering Committee sought to gain the perspectives from:

- Developers;
- Land and timber managers;
- Industry representatives;
- Landowners;
- Environmental advocates;
- Community leaders;
- Local government officials;
- State agency staff; and
- Federal government representatives.

The Steering Committee determined who would best represent those interests. Efforts were made to ensure there was a sufficient mass of participants from throughout the SAMP area and beyond. Once convened, the participants were asked whether any legitimate stakeholder interests were not represented. The stakeholders present endorsed their own composition.

The participants recognized there were many individuals who had unique expertise that needed to be brought into the dialogue. For that reason, a second tier of involvement was created. Resource People provided technical support to the participants as informal members of the stakeholder group itself. These individuals were afforded limited ability to participate in the dialogue but had no voting privileges.

- ☑ *The stakeholder participants are listed in Appendix III along with their biographies.*
- ☑ *The resource people are listed in Appendix IV.*

## *The Charge*

The SAMP Steering Committee asked the Stakeholder Group to work collaboratively and develop the best possible natural resource management plan for the Cooper River Corridor. The Steering Committee's vision was provided to the stakeholder group through a "Charge" (*please reference Appendix V*) that directed the group to:

- Identify a group of technical advisors who may be consulted to provide accepted ecological, hydrologic, economic and other data needed to support the discussions of this group;
- Develop a Natural Resource Management Plan (NRMP) that would be delivered to the SAMP Steering Committee.<sup>2</sup> This NRMP would include:
  - A natural resource assessment
  - Goals for maintaining or enhancing the natural resource base
  - Recommendations that address:
    - Wildlife habitat and diversity
    - Fisheries management
    - Botanical diversity
    - Water quality
      - Point source issues
      - Nonpoint source issues
    - Recreation and tourism
    - Land use and conservation
  - Actions to stabilize Cooper River water flows
  - A timeline for implementation; and
- Develop a drainage basin-level plan to address rice field succession and the stewardship and access issues concerning rice field impoundments.

## *The Road Map to a Natural Resource Management Plan*

### Educating the Participants

The stakeholder group's first responsibility was to develop a familiarity with the science behind natural resource management and the range of state and other

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<sup>2</sup> Expansion of the tasks at hand ultimately delayed the issuance of this NRMP by approximately six months. After the presentation and approval by the Steering Committee, the recommendations would presumably be implemented by the SC Board of Health and Environmental Control, Berkeley County Government and other participating agencies.

natural resource planning and protection programs. The stakeholder group was offered many presentations and descriptive materials. Throughout the dialogue, the participants were afforded opportunities to understand the complex human and environmental dynamics in the system. Most participants spent one half day on a guided tour of the Upper Cooper with leading researchers and policy makers.

### [Negotiating the Elements of the Plan](#)

The participants in this process debated each of the elements in this plan. The agreements forged were the product of interest-based negotiation. In some cases, participants conceded smaller points in order to make progress in more highly valued areas. The differing comparative values in this process are what yielded a truly “win-win” plan.

### *Outside the Scope of Deliberations*

There were three areas of discussion that were viewed as being outside the scope of this dialogue:

- **Water Quality Modeling:** Discussions concerning the water quality modeling for the Cooper River are highly charged and mired in a great history of rancor and emotion. The stakeholder group spent an inordinate amount of time debating the predictive accuracy of the water quality models employed in the state – and found little common ground in doing so. As the water quality models do little more than characterize the past history and possible future of water quality in the system, the facilitator chose to terminate discussions of total maximum daily loading, point source permitting, and the effects of existing and future industrial development. These discussions are important to the river system and require far more analysis and discussion than were available in this forum.
- **Water Quantity:** The issue of water quantity as impacted or regulated by the operation of the Pinopolis Dam was largely tabled. Issues concerning water flows are being reviewed by Santee Cooper and many of the participants for this SAMP in the Federal Energy Regulatory Commission (FERC) re-licensing process which is currently under way for the Santee Cooper project. Flows on the Cooper River have been established by the federal government through the US Army Corps of Engineers as part of the St. Stephen Rediversion Project goal ostensibly to reduce shoaling in Charleston Harbor.
- **Economic Feasibility:** Finally, as the process unfolded, the stakeholder group was encouraged to develop recommendations regardless of the immediate

availability of financial resources. Stakeholders thought it was more important to develop a plan and ideas to improve the quality of the natural resource than it was to associate a refined cost estimate and funding sources. Participants considered programs and other resources that might ultimately support these recommendations, but complete assurance of the availability of these resources was not an overriding concern. No recommendations were removed from consideration simply because of the lack of immediate funding. The future funding of various state and local programs is a matter for legislative and local debate.

## Chapter 2 - A Systematic Look at Natural Resource Planning in the Upper Cooper River

### *The Role of the Government*

#### Federal Government

##### *US Environmental Protection Agency (US EPA)*

Nonpoint source (NPS) pollution addressed via a patchwork of programs authorized by the Clean Water Act.

Section 319 established EPA's NPS Program, which provides grants to states so that they can develop and promote nonpoint source management plans and other programs. EPA also provides program guidance and technical support under the program. The states' deadline for developing and implementing nonpoint source management plans passed in 1995. Under the Clean Lakes Program (§314), EPA provides grants to states for various activities, including projects to restore and protect lakes. The National Estuary Program (§320) helps states develop and implement basin wide comprehensive programs to conserve and manage their estuary resources. The Coastal Zone Management Act Reauthorization Amendments (CZARA) are the first federally mandated program requiring specific measures to deal with agricultural nonpoint sources (16 USC. §§ 1455(d)(16), 1455b). CZARA requires each state with an approved coastal zone management program to submit a program to "implement management measures for NPS pollution to restore and protect coastal waters" (cited in USDA, ERS, 1997). States can first try voluntary incentive mechanisms, but must be able to enforce management measures if voluntary approaches fail.

Several of these and other US EPA programs appear below:

**Section 319:** Congress amended the Clean Water Act (CWA) in 1987 to establish the Section 319 Nonpoint Source Management Program because it recognized the need for greater federal leadership to help focus state and local nonpoint source efforts. Under Section 319, states, territories and Indian tribes receive grant money that supports a wide variety of activities, including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring to assess the success of specific nonpoint source implementation projects

**Section 404:** Section 404 of the CWA established a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Activities in waters of the United States that are regulated under this

program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and conversion of wetlands to uplands for farming and forestry.

**Marine and Ocean Discharges:** Two sections of the CWA deal specifically with discharges to marine and ocean waters. Under CWA section 403, any discharge to the territorial seas or beyond also must comply with the Ocean Discharge Criteria established under CWA §403. CWA §301(h), added to the CWA in 1977, provides for a publicly owned treatment works (POTWs) that discharge to marine waters to apply for a waiver of the Act's secondary treatment requirements, provided they can show compliance with stringent criteria intended to assure their discharge will not adversely affect the marine environment.

**Ocean Dumping:** The Marine Protection, Research, and Sanctuaries Act (MPRSA, also known as the Ocean Dumping Act) prohibits the dumping of material into the ocean that would unreasonably degrade or endanger human health or the marine environment. Virtually all material dumped into the ocean today is dredged material (sediments) removed from the bottom of waterbodies in order to maintain navigation channels and berthing areas. Other materials that are currently ocean disposed include fish wastes, human remains, and vessels.

**Wastewater Permits:** Water pollution degrades surface waters making them unsafe for drinking, fishing, swimming and other activities. As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

**TMDLs and Water Quality Standards:** Water quality standards are set by states, territories, and tribes. They identify the uses for each waterbody – for example, drinking water supply, contact recreation (swimming) and aquatic life support (fishing) – and the scientific criteria to support that use. A TMDL or Total Maximum Daily Load is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards and an allocation of that amount to the pollutant's sources. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the state has designated. The calculation must also account for seasonal variation in water quality. The Clean Water Act, §303, establishes the water quality standards and TMDL programs.

**The Five Star Restoration Program:** The Five Star Restoration Program was established to enable the US EPA to work with its partners for education through community-based wetlands restoration projects in watersheds across the United States. The National Association of Counties, the National Fish and Wildlife

Foundation, and the Wildlife Habitat Council have joined together with EPA for this effort. Funding for the program is provided by US EPA's Office of Wetlands, Oceans and Watersheds, and by the National Marine Fisheries Service's Community-based Restoration Program for selected projects in coastal areas.

**National Estuary Program:** US EPA's National Estuary Program was established by Congress in 1987 to improve the quality of estuaries of national importance. The Clean Water Act §320 directs EPA to develop plans for attaining or maintaining water quality in an estuary. This includes protection of public water supplies and the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife, allows recreational activities – in and on water – and requires control of point and nonpoint sources of pollution to supplement existing controls of pollution. In several cases, more than one state is participating in a National Estuary Program. Each program establishes a Comprehensive Conservation and Management Plan to meet the goals of §320. The National Estuary Program establishes partnerships with state, local, and academic interests to improve the quality of estuaries of national importance. The National Estuary Program is comprised of 28 estuaries in the United States.

**305 (b) Reports:** The National Water Quality Inventory Report to Congress [305(b) report] is the primary vehicle for informing Congress and the public about general water quality conditions in the United States. This document characterizes our water quality, identifies widespread water quality problems of national significance, and describes various programs implemented to restore and protect our waters. Clean Water Act §§106(e)(1) requires EPA, prior to awarding a §106 grant to a state, to determine that the state is monitoring the quality of navigable waters, compiling and analyzing data on the water quality, and including those data in the state's §305(b) report. Historically, EPA has relied on submission of the 305(b) report to determine that states have satisfied the §106(e) eligibility requirement for the award of §106 grant funds. As explained in the FY2001 Clean Water Act Section 106 Grant Guidance, Regions have begun conducting reviews of state monitoring programs and are working with states to strengthen these programs over time.

**Targeted Watersheds:** The Targeted Watersheds Grant Program is a relatively new EPA program designed to encourage successful community-based approaches and management techniques to protect and restore the nation's waters. The watershed organizations receiving grants exhibit strong partnerships with a wide variety of support; creative, socio-economic approaches to water restoration and protection; and explicit monitoring and environmentally-based performance measures.

### *US Army Corps of Engineers (US CoE)*

The US CoE has three main roles in the SAMP area of the upper Cooper River:

1. Regulatory (i.e., permitting);
2. Restrictions on water releases from the Jefferies Hydroelectric facility, and
3. Ecosystem restoration of abandoned rice fields.

The Corps' regulatory role is performed under the authority of Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. A Corps permit is required (1) for any work performed in or over navigable waters of the United States, (2) for any work which affects the course, location, condition, or capacity of navigable waters of the United States, or (3) when fill material is placed in waters of the United States <sup>3</sup>

Restrictions on water releases from the Jefferies Hydroelectric facility result from problems caused by significant shoaling in Charleston Harbor and the subsequent construction of the Cooper River Re-diversion project. As a result of the Cooper River Re-diversion project, the Corps and Santee Cooper entered into a formal agreement that restricts the releases from Jefferies.

*Please see Appendix VI for additional information.*

The Corps aquatic ecosystem restoration program was authorized in Section 206 of the Water Resources Development Act of 1986. Under this authority, the Corps is evaluating possible ecosystem restoration alternatives in four abandoned rice fields in the SAMP area of the upper Cooper River: Mulberry Plantation, Bonneau Ferry Plantation, Cedar Hill Plantation, and Quinby Plantation.

*Please see Appendix VIII for additional information.*

### *US Fish and Wildlife Service (US FWS)*

The mission of the US FWS is "working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people." In South Carolina, the Service has four distinct divisions: refuges, fisheries, law enforcement, and ecological services. Throughout the state, there are six wildlife refuges, one fish hatchery, several special agents, and one ecological services office. The Ecological Services office, located in Charleston, is active in fulfilling the goals of the Service's mission within the SAMP area. Programs within ecological services fulfill these goals in different ways. Service biologists in the contaminants program work with partners to prevent contamination, identify contamination that adversely affects the health of fish, wildlife, and their

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<sup>3</sup> Please see the Corps of Engineers, Charleston District web page for additional information <http://www.sac.usace.army.mil/newinternet/org/regulatory/index.html#permit>.

ecosystems, and act as federal trustees for fish and wildlife injured by contamination, negotiating settlements from polluters to restore lost resources and their benefits to local citizens. Under the Federal Power Act, Service biologists are involved in the licensing and re-licensing of non-federal hydropower projects by the Federal Energy Regulatory Commission (FERC). With projects such as Santee Cooper, the Service provides technical evaluations on issues such as water quality, instream flows, reservoir water level fluctuations, fish entrainment and impingement at turbine intakes, fish passage, endangered species, and fish and wildlife recreation.

Under the authority of the Fish and Wildlife Coordination Act, Service biologists evaluate the impacts of proposed water development projects on the Nation's waters and wetlands. The Fish and Wildlife Coordination Act ensures that fish and wildlife resources are given equal consideration to other project features and that full consideration is given to Service recommendations. Within the SAMP area, typical water development projects include wetland fill for roads and development, the creation of Greentree Reservoirs, and the manipulation of rice fields. The Services' Partners for Fish and Wildlife and Coastal Program provide technical and financial assistance for wetland enhancement and restoration within the SAMP. These programs are also used to restore important upland habitats, such as longleaf pine forests.

Through the Endangered Species Act, the Service works with others to protect and recover federally listed species (threatened and endangered) and their habitat. In the SAMP area, the Service evaluates water development and federally funded projects to ensure listed species are not negatively affected. On private land, the Service provides technical and financial assistance for enhancement/restoration projects that benefit listed species. The Service's Safe Harbor Program promotes voluntary conservation actions by private landowners for listed species; and, in turn, the Service provides assurances that no additional future regulatory restrictions will be imposed for their efforts. In the SAMP area, several landowners have enrolled several thousand acres into the Safe Harbor Program for the endangered red-cockaded woodpecker.

### *U.S. National Marine Fisheries Service (NMFS)*

NMFS participation in these activities is consistent with Federal Public Trust fishery resource management responsibilities. Their responsibilities are established under a number of congressional mandates including the Fish and Wildlife Coordination Act, Anadromous Fish Conservation Act, Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act, and the Coastal Zone Management Act.

NMFS exists to further the protection, enhancement, and restoration of the Santee-Cooper Basin aquatic ecosystem, including living marine resources, diadromous fish populations, and essential fish habitats. The Service identifies resource management problems and opportunities, and develops potential management actions to protect, enhance, or restore living marine resources and habitats.

Specific considerations to be addressed by the National Marine Fisheries Service include but are not limited to:

- Instream flows and water quality problems in the Cooper River Corridor;
- Potential management actions to benefit fishery resources;
- Opportunities to enhance recreational and commercial use of fishery resources consistent with interagency management objectives;
- Recovery of the federally listed endangered shortnose sturgeon, and the Atlantic sturgeon: a species of federal concern; and
- Protection and management of essential fish habitats in the Cooper River SAMP Area.

## State Government

### *SC DHEC/Bureau of Water*

The South Carolina Department of Health and Environmental Control (SC DHEC) is the designated water pollution control authority in South Carolina. This includes the provision of potable water and the treatment and disposal of waste water, as well as the quality of other surface waters such as lakes and rivers. Through its Bureau of Water (SC DHEC/BoW) and its Office of Ocean and Coastal Resource Management (SC DHEC/OCRM), the agency addresses water quality issues under both federal and state authorities. The Federal Water Pollution Control Act of 1972 (the Clean Water Act) directed states to develop comprehensive water quality planning, standards, permitting and enforcement programs primarily directed at municipal and industrial point sources. Later amendments incorporated runoff pollution programs. The South Carolina Pollution Control Act of 1974 provided enabling legislation of the required federal regulations, as well a broad authority to penalize adverse impacts to waters of the state. Other water quality regulations are authorized for South Carolina's coastal counties under the federal Coastal Zone Re-authorization Act and implementing state regulations.

State Regulations R.61-9 detail the requirements of the industrial and municipal permitting program required by the Federal Clean Water Act. These regulations specify the detailed technical requirements for all classes of potential dischargers. They also incorporate new requirements for the prevention of municipal, industrial

and large agricultural stormwater pollution. These regulations also specify the penalties for non-compliance with the permit requirements. State regulations 61-101 also implement a section of the federal act known as section 401. Section 401 of the Act requires that the state issue a water quality certification for any desired water related federal permits prior to their being granted. Examples of federal permits requiring state water quality certification are 404 wetlands dredge and fill permits that the US Corps of Engineers might permit or Federal Energy Regulatory Commission hydroelectric project re-authorizations. The SC DHEC has the ability to apply any conditions to these permits that it deems necessary to ensure the activity doesn't contravene water quality standards or to mitigate any other environmental impacts that are unavoidable.

There are other water quality-related regulations that are not directly related to federal legislation. The S.C. Stormwater and Sediment Reduction Act (R. 72-300) requires water quantity and erosion control measures for most land disturbing activities such as construction sites. Additionally, The South Carolina Swine Feeding Operations Act (R.61-43) enacted strict requirements for larger scale confined animal feeding operations. Most other agricultural operations, and all silvicultural regulations, are exempt from regulations except when acute water quality impacts are prosecutable under the South Carolina Pollution Control Act.

Various state and federal agencies operate programs to assist in the voluntary implementation of measures to combat those water quality related problems that aren't regulated, such as those from forestry, farm and urban runoff.

DHEC also monitors the operation of the Berkeley County landfill, ensuring that the disposal of solid waste protects human health and the environment. DHEC works with Berkeley County as well as the Corps of Engineers and SC DHEC/OCRM on issues such stormwater runoff and wetlands mitigation.

### *SC Office of Ocean and Coastal Resource Management (SC DHEC/OCRM)*

The SC DHEC Office of Ocean and Coastal Resource Management (SC DHEC/OCRM) is responsible for the implementation of the state's coastal zone management act. South Carolina's coastal zone includes Jasper, Beaufort, Colleton, Charleston, Dorchester, Berkeley, Georgetown and Horry counties. Implementation occurs primarily through the regulatory process. SC DHEC/OCRM issues direct permits for activities which will alter the critical areas (saltwater marshes, rivers, beaches and dunes). There are no critical areas within the SAMP Boundary. Throughout the coastal zone, SC DHEC/OCRM also issues stormwater permits, which deal with projects two acres or larger in size (subdivisions, commercial enterprises, etc.) or within ½ mile of a receiving waterbody, and coastal zone consistency certifications. These certifications are issued in conjunction with state activities,

federal actions, and federally funded activities. Development projects, wetland management and road construction are among the activities covered by SC DHEC/OCRM regulations.

SC DHEC/OCRM also has a planning function which has helped to develop this planning process. As referenced earlier, Special Area Management Plans allow SC DHEC/OCRM to work with local governments and interested parties in addressing specific issues in particular areas.

### *SC Department of Natural Resources (SC DNR)*

The South Carolina Department of Natural Resources (SC DNR), as organized on July 1, 1994 under the S.C. Restructuring Act is composed of the former Wildlife and Marine Resources Department, Water Resources Commission, Land Resources Commission, State Geological Survey, and SC Migratory Waterfowl Committee. The agency is the advocate for and steward of the state's natural resources, its water, land, air, minerals, plants, and animals. The state's natural resources provide an enviable quality of life for our citizens, attracting and sustaining the businesses and tourism that translate into economic wealth. The role of steward requires pursuing a reasonable balance between conserving our resources for future generations, sustaining traditional uses, increasing support for other user demands, and accommodating economic development.

A focus of the SC DNR is to facilitate the public's enjoyment of natural resources through programs that support hunting, fishing, recreational boating, wildlife watching, soil and water conservation and management, public access, and technical assistance. Habitat protection and management and long-term conservation of natural resources are vital goals of the Department. An integral component of the Department's approach is the education of the public about natural resources and involvement of the public in resources management issues.

Department has developed a strategic plan to guide the agency in its mission and provide the public with a clear understanding of its plan to preserve South Carolina's natural wealth.

### Local Government

#### *Berkeley County*

Berkeley County's greatest influence is exerted through their authority over land use. Yet Berkeley County cooperates well with other federal, state and local regulatory agencies to ensure that as development occurs, our natural resources are

unharmful. The majority of these cooperative efforts involve issues concerning water – potable water, waste water, stormwater, navigable waters and wetlands. The Berkeley-Charleston-Dorchester Council of Governments (BCD COG) is the lead agency in many environmental issues, particularly those involving water quality. Some of the other agencies and groups involved in the protection of our natural resources are the US Navy, US Coast Guard, US Forest Service, US CoE, US EPA, the SC Department of Transportation (DOT), SC DNR, SC DHEC, SC DHEC/OCRM, Parks Recreation and Tourism, the State Ports Authority, SC Department of Archives and History, Clemson University, the Berkeley Conservation District, the Lord Berkeley Land Trust, the SC Coastal Conservation League, all of the municipalities in Berkeley County, the Goose Creek Parks and Playgrounds Commission, Charleston County Parks and Recreation Commission, Charleston and Dorchester counties. There is also a coalition of eight coastal counties that collaborates on boat landing issues.

Berkeley County government is attuned to the natural resources that are so abundant throughout the county and is actively involved in protecting and preserving those resources. By working with landowners, public and private, county government has created a "Green and Blue Space" program that protects well over 40 percent of the total area of the county. County officials understand that the region's natural beauty is a strong draw for development. Without a concerted effort to preserve these resources, the county could become a victim of its own wealth.

County government and the Lord Berkeley Land Trust have worked with industries such as Nucor Steel, E.I. duPont and Santee Cooper, and with other private landowners to create conservation easements to protect the pristine qualities of thousands of acres surrounding the Cooper River and its tributaries. BP Chemical, Lanxess Corporation and Alcoa have received awards for their wildlife management programs. Local industries have contributed thousands of dollars to support educational programs for adults and youth at Cypress Gardens to help promote the importance of protecting natural resources. The county is working with the Berkeley Conservation District and the US Forest Service to develop paddle trails to encourage low-impact access to waterways.

The SAMP effort is an example of Berkeley County Government's willingness to work with other entities, to ensure that the natural resources and the quality of life in Berkeley County are preserved not only for current benefit but for the benefit of all future generations.

### ***Public Involvement***

Typical public involvement in a SAMP process yields any one or all of the elements below:

## SAMP Outcomes / Types of Recommended Actions

1. Partnerships
2. Research and Monitoring
3. Education and Technology Transfer
4. Incentives and Voluntary Actions
5. Regulation\* and Administrative Actions

\*Includes statutes, regulations and local ordinances

### **1. Partnerships**

- Recommend actions to improve cooperation, leverage resources, and reduce redundancy;
- Promote cooperation between non-traditional partners or improving and formalizing ongoing partnering efforts; and
- Establish governing boards to oversee implementation of recommended actions and initiate citizen monitoring efforts.

### **2. Research and Monitoring**

- Close gaps in knowledge;
- Improve understanding of “problems” and “solutions;” and
- Track implementation and effectiveness of recommended actions.

### **3. Education and Technology Transfer**

- Raise public awareness, change behavior or solicit participation through creation of brochures, public service announcements or speakers bureaus;
- Address building capacity at local governments or other targeted audiences through the transfer of new technologies and practices; and
- Seek to inform decision makers so they support other elements of the SAMP such as directing funding to identified priorities and supporting regulatory actions.

### **4. Incentives and Voluntary Actions**

- Encourage desired behavior by providing public recognition via awards and other publicity or through streamlined / easier / quicker permitting of encouraged activities; and
- Provide tax breaks or other financial incentives as appropriate.

### **5. Regulations and Administrative Actions**

- Propose changes to statute, state regulation or local ordinances to allow or disallow activities. Formal administrative processes that require public notice govern these types of changes; and

- Change administrative policies or procedures, such as amending Memorandums of Agreement between state agencies to implement actions.

## Chapter 3 - The Nexus of Economy and Environment in the Upper Cooper

### *The Cooper River: Economic Engine of the Lowcountry*

The 107,499 acres in the Cooper River Corridor SAMP are steeped in a past that can be used to predict a vibrant, diverse future. From the time the first European settlers came to the region in the late 17<sup>th</sup> century, the Cooper River has been one of the Lowcountry's most reliable, steadfast economic engines.

In the 20<sup>th</sup> century, the river's agrarian roots experienced a transformation. As in much of Berkeley County, the upper part of the SAMP continued to mirror its pastoral heritage, including the County's important economic link to forest resources industries. But the lower part of the river became an industrial powerhouse fueled by major industrial facilities.

In the future, the diversification of the river and its surroundings will continue. Because of the SAMP area's beauty and history, ecotourism likely will increase. As the area experiences population growth, there will be more pressure for commercial and residential development.

This chapter addresses the Cooper River's history and its potential impact on future economic uses of the river and discuss challenges for the future.

### *An Historic Perspective – How Water Flows Affect the River*

Rich in beauty and history, the Cooper River epitomizes the South Carolina Lowcountry. It provides breathtaking views and diverse habitats as it meanders through sturdy forests, old plantations and tidal marshes.

Due to the diversion of water from the Santee River several generations ago, the Cooper River today carries large volumes of freshwater in its 48 miles from the tailrace of Pinopolis Dam to the Customs House wharf in Charleston Harbor. The Cooper and Santee rivers are starkly different in many ways, yet they literally have been intertwined and interconnected for more than 200 years. The Santee finds its origin on the eastern slopes of the Blue Ridge Mountains, while the Cooper River was once a slow-moving coastal plain stream whose most northerly extent was the backwaters of Wadboo and Broughton Hall Creek in Berkeley County.

Over the years, water flows along the rivers have characterized the uses and habitats surrounding them:

- **Cooper River.** In its original form, the Cooper River was a relatively small coastal plain stream with an inflow of about 74 cubic feet per second (cfs) at its west branch. A 19<sup>th</sup>-century diversion of water from the Santee River into the Cooper River, known today as the Old Santee Canal, was built to aid the transportation of goods from the upper part of the state to the coast. In the last century, the modern-day Santee Cooper project modified flows in the Cooper River by diverting a large portion of the Santee River into the Cooper River for the primary purpose of hydro-generation.
- **Santee River.** This river originally saw average flows of up to 15,500 cfs, with highs up to 300,000 cfs during spring floods. Following construction of the Santee Cooper lakes, much of the water was diverted into the lakes; a continuous flow requirement of 550 cfs was retained in the Santee River.
- **Cooper River Rediversion.** In 1947, the federal government began to seek a way to reduce dredging of Charleston harbor and decided to construct a rediversion project for the Cooper River. The project, completed in 1985, rediverted approximately 80 percent of the original Santee River flow back into that river. This has resulted in an 8,000 cfs to 12,000 cfs flow into the Santee River and a 4,500 cfs average flow into the Cooper River. In large part, the rediversion has increased the tidal influence of the upper Cooper River in the SAMP area.

Stakeholders noted one of the larger misconceptions here -- that the rice fields can't be operated effectively unless there's more water flowing in the Cooper. In reality, the rice fields were built and operated without the magnitude of flows that the river sees today.

- ☑ *For a more detailed discussion on river flows and water quantity, please see Appendix VI.*

### ***History's Impact on the River***

England's King granted much of the land in the study area in huge tracts to the era's aristocracy – the Lords Proprietors of the 17<sup>th</sup> century – who developed the area into large plantations. Today, to a great degree, the area is marked by land in large tracts held by single owners, families or corporations. This has led to three interesting trends:

- **Protection of large tracts:** Relatively few owners hold land inside the SAMP area. A considerable amount of the acreage currently is protected through an intertwined collection of conservation easements and land management

plans. The proliferation of current protections makes it easier for a SAMP to be considered and implemented.

- **Low residential population:** Currently, there are only three residential subdivisions within the SAMP: Berkeley Country Club, Pimlico and Fairlawn Barony. A fourth, Spring Grove Plantation, is currently under development. Nevertheless, the population is expected to remain relatively low because much of the area is not suitable for development, due to a high proportion of wetlands and the difficulty of obtaining large tracts for development. According to 2004 Census projections, about 13,800 people live in the SAMP area.
- **Attractive to industry:** As in the past, today's Cooper River is a great source of water for processing and cooling and for human consumption. It is a deep-water route to the Port of Charleston. Over the years, the Cooper River Basin has been attractive to industries because companies were able to purchase large tracts of land in an area of low population. These industries, however, generally are located south of the separation of the river at what is referred to as the "T," the point at which the East Branch of the Cooper joins the river.

### *The River Defines the Community*

Were it not for the presence of the Cooper River, the economy and total complexion of the region would be very different. The river, in fact, defines the region.

The Cooper River has played a vital role in the economy of Berkeley and Charleston counties since well before the arrival of Europeans. The river and its basin provided resources for Native Americans through an abundance of animal and plant species used for subsistence and for trade.

The river also provided a route of transportation with the terminus of the Cherokee Trail at the point where the Cooper began. With the arrival of Europeans, the river took on an even greater role. When the first settlers arrived at what is now Charles Towne Landing, they ventured up the Ashley and Cooper rivers to establish settlements. They found the same abundance of resources that natives had enjoyed for centuries. The fertile land was conducive to the development of large plantations on which the settlers raised crops and livestock.

As these plantations developed into large commercial enterprises, the port at Charles Towne became more important. Goods were brought down the Cooper to the port to be shipped back to Europe.

A look at maps of this region during colonial times shows the centralization of civilization around the rivers, the Cooper being the most prevalent. The Santee River and the port at Georgetown formed another powerful economic system in the South Carolina Lowcountry. The port at Georgetown, however, was not as large as Charles Towne, and goods bound for Europe had to be taken to Charles Towne along the coast. In 1793, construction began on a canal to connect the Santee River to the Cooper River. The canal allowed goods to be taken from plantations on the Santee to Charles Towne via the Cooper River and connected Columbia to the coast. This was America's first canal to connect two separate bodies of water – an indicator of the economic importance of the Cooper River to the region.

### *Through the Years*

The Cooper River has maintained its status as “the engine that drives our economy.” As the area became more settled, it relied primarily on an agricultural and a timber-based economy. The Cooper continued to be a trade route, giving the area exposure to the rest of the world, particularly the northeastern United States and Europe.

The waters of the Cooper also provided a source for irrigation for the many crops that were grown along the river. Colonial-era rice fields, many of which are still intact, seldom are used for rice production today. But they continue to provide important habitat and recreational opportunities – such as fishing and waterfowl hunting – that contribute greatly to the region's economy today.

Through the years, Charleston, as a port city, has developed more aggressively along the Cooper and Wando rivers. The Cooper River's deeper and more navigable waters have attracted a large economic presence. For example, the US Navy has had a presence on the Cooper River that predates the birth of the United States. Throughout the 20<sup>th</sup> century, the Charleston Naval Base and Shipyard, located on the Cooper, were huge contributors to the local economy.

As South Carolina became more industrialized and as the Upstate became more involved in the production of textiles, Lowcountry governmental and business leaders began looking at the possibility of connecting the Cooper River to the Congaree River through a system of lakes and canals. The project was supposed to provide a navigable route to Columbia and, eventually, to the Upstate region.

In 1939, construction began on the Santee Cooper hydroelectric and navigation project. In 1942, Santee Cooper began delivering power generated at the Jeffries generation facility on Lake Moultrie to a Charleston firm that was a vital element in the nation's war effort. Santee Cooper, a project created to connect the Cooper River and the Port of Charleston to the rest of the state, now provides electric power

throughout all 46 counties of the state through a statewide electric cooperative system. It is the nation's third-largest non-investor-owned utility.

### ***Santee Cooper: Another Catalyst for Industrial Development***

The evolution of Santee Cooper was the catalyst that brought industry to Berkeley County in the area south of the SAMP. Attracted by low-cost electric power, large industries found the Cooper River an inviting atmosphere in which to do business. The Bushy Park industrial area was developed along the river in the late 1950s and 1960s. It is home to companies such as E.I. duPont, Lanxess Corporation, Jacobs Engineering, and South Carolina Electric and Gas.

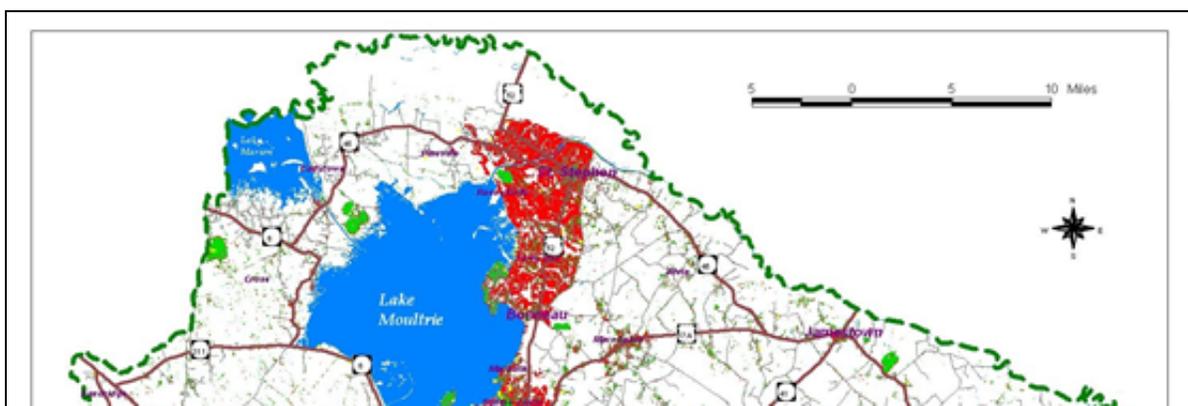
Amoco Chemical, now BP Chemical, has a large facility on the Cooper River. In 1995, Nucor Steel built a new mill to recycle scrap steel to produce roll steel. These companies, similar to the plantations of colonial times, are the area's major economic players today, providing employment for hundreds of workers and bringing millions of dollars into the local economy.

The Cooper River is the major reason these industrial giants are in the Lowcountry today. The river provides a good source of water to support their operations and deep-water access to the port and global marketplace.

### ***A Natural Place for Growth***

With Berkeley County's high quality of life and natural resources, such as the Cooper River, it is a natural place for growth. Over the last 20 years, two major events contributed to a growing diversification of the county's economic base. In 1989, Hurricane Hugo devastated the Lowcountry's timber industry. A few years later, the closure of the Charleston Naval Base and Shipyard rocked Berkeley and neighboring counties as thousands of residents lost jobs. But because the county was able to work with existing industrial partners, expansion of operations and the attraction of new players in the area led to growth that helped overcome the base closure.

Population, growth estimates and other demographics highlight how Berkeley County is one of the state's major growth areas:



- **Steadily growing population.** According to the South Carolina Employment Security Commission (ESC), 144,078 people lived in Berkeley County in 2001. The county's population is expected to grow to 171,900 by 2005, although more conservative US Census projections predict it will take until about 2015 to reach 175,810 residents. In general, the county's population can be characterized as fairly young, with a median age of 32, according to ESC figures.<sup>4</sup>
- **Low unemployment.** The County's good economic health is reflected in its stable and low unemployment rate. In November 2003, Berkeley County had a 4.1 percent unemployment rate – the third lowest in the state (state average was 6.9 percent). At that time, the county's labor force was 70,370 workers, up from 67,600 the previous year.<sup>5</sup>
- **Steady anchor in Moncks Corner.** Anchoring the north end of the SAMP is the town of Moncks Corner, a powerful economic player in the region. Although it is home to only 4 percent of Berkeley County's residents, it has an average

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<sup>4</sup> Source: <http://www.sces.org/Imi/Spotlights/Berkeley.pdf>

<sup>5</sup> Source: <http://www.sces.org/Imi/Spotlights/Berkeley.pdf>

of 45 percent of the county's retail sales over the last three years. Moncks Corner is also home to Santee Cooper, Berkeley Electric Cooperative, and Home Telephone Company, as well as the county's government seat.<sup>6</sup>

- **Urban expansion.** A recent Clemson University study highlighted the challenges created by growth. The study reviewed satellite images of areas of urban expansion in the Charleston region from 1973 to 1994 and made projections through 2030. The map for Berkeley County, shown above, highlights how unchecked growth will impact the county.

According to the study for the three-county Charleston metropolitan area:

"The change data confirmed that urban expansion in the region increased 255 percent over the two decades of the study (or 6.2 times faster than population growth, which occurred at 41 percent), increasing from 45,150 to 160,232 acres. While the persons per urban acre decreased 60 percent, the total urban acres per person increased 152 percent, emphasizing the land-consumptive nature of current development. Primary growth occurred in residential neighborhoods, near major transportation corridors, and along the prominent river systems in close proximity to fragile estuarine marshes."<sup>7</sup>

### ***Bold Greenspace Initiative***

In the 1990s, Berkeley County experienced tremendous industrial growth with more than \$5 billion in capital investment. City and county leaders realized the area's successes would create changes, such as urban expansion into rural areas at a pace that exceeded population growth.

In 1999, county political and conservation leaders came together to work on a bold plan to manage the coming change. The result of their efforts was the Berkeley Cooperative Greenspace Initiative, a practical document that made eleven recommendations to protect the county's unmatched natural splendor. Six recommendations addressed specific, high-quality areas, including:

"The Cooper River basin is among the most sensitive and historic parts of the Lowcountry. A great deal of success has been achieved using private conservation to balance growth and protection within this watershed. This success should be continued by following the Nucor Steel easement model."<sup>8</sup>

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<sup>6</sup> Source: Town of Moncks Corner

<sup>7</sup> Source: (<http://www.esri.com/news/arcnews/winter9900/articles/38-urbangrowth.html>)

<sup>8</sup> Source: Berkeley Cooperative Greenspace Initiative, p. 3

Furthermore, the plan outlined a priority for the Cooper River Basin:

“Large industrial developments and private landowners should place conservation easements on their property to protect sensitive features and continue traditional land uses.”<sup>9</sup>

Since the Greenspace plan was developed, duPont has put a 1,200-acre portion of its Cooper River site into a conservation easement with the Lord Berkeley Land Trust.

### **Berkeley Cooperative Greenspace Initiative**

The NRMP Stakeholder Group fully endorses the recommendations and substance of the Berkeley Cooperative Greenspace Initiative and encourages all government entities to implement the recommendations included with immediacy and efficiency.

### ***The River Tomorrow***

Just as the Cooper River has been the economic driver of Berkeley County’s economy for the past three centuries, it’s fair to assume it will be an integral part of the county’s future. The people of Berkeley County will continue to want the good quality of life offered near the Cooper River. Therefore, Berkeley County will continue to grow, just as many coastal counties in Sunbelt states will experience large infusions of migrating people.

People will move here for jobs, many of which will have roots in the successful existing and future plants along the lower part of the river. Others will start small businesses to serve neighbors. All will need new places to live, learn and worship. Over time, Berkeley County’s traditional rural communities could become sprawling suburbs indistinguishable from those outside of Atlanta, Dallas or Denver.

But it doesn’t have to be this way. Good planning for the growth that is bound to come can create a balance that respects the county’s traditional pastoral heritage and fuels modern, next-generation economic uses of the county’s resources.

Good planning can direct new development into economic clusters, multi-use areas and, perhaps, no-development areas by:

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<sup>9</sup> Source: Berkeley Cooperative Greenspace Initiative, p. 3

- **Channeling growth into distinct areas:** Local governments can achieve economies of scale for infrastructure – from roads and water lines to schools and fire stations. Efficient infrastructure and consolidated developments results in lower taxes for residents and businesses.
- **Providing multi-use areas:** Leaders can provide flexibility for economic, recreational and cultural uses of land.
- **Exempting some areas from development:** Berkeley County can respect the need for future generations to see and live near the beauty of South Carolina for centuries.

These three elements (among others) must be considered collectively by policymakers and all within the context of equity to landowners.

### Growth I

Local government entities should develop plans to foster low-impact economic growth, such as ecotourism, for the SAMP and surrounding region. These plans should be separate and distinct from industrial development efforts and should recognize the strengths, opportunities and impacts of growth.

In many regions of the US, particularly those facing significant growth pressures, the management of stormwater run-off (sometimes referred to as “non point source pollution” or “NPS runoff”) is a costly and politically charged issue. Berkeley County’s significant volume of protected open space offers great hope for preventing these issues from arising in the future, provided that the county develops and adheres to plans that accommodate future growth while maintaining a healthy environment.

### Growth II

In order to foster balanced industrial/commercial growth and residential development, policymakers need to plan, predict and, where possible, reduce stormwater impacts so that assimilative capacity is optimized for strategic economic growth

Currently, Berkeley County’s Comprehensive Land Use Plan does not specifically address the upper Cooper River Basin for “special management” consideration. The area is, however, restricted for residential use. In large part, that restriction limits development because of the high cost of installing water and sewer infrastructure.

The County's Economic Development Department reviewed the SAMP area. The Department concluded that areas within the SAMP already zoned for industrial use above the "T" are not suited for heavy industrial use.<sup>10</sup>

### **Growth III**

Since the Cooper River Basin is considered "among the most sensitive and historic" parts of the Lowcountry and county economic planners do not foresee a need for additional industrial zoning designations above the "T" and below the Highway 52 crossing, Berkeley county government should adopt specific long-term policies that recommend no industrial growth above the "T."

A big challenge for policymakers for the next decade is to find the fragile balance between economy and environment for the SAMP. If Berkeley County is to keep its high quality of life, it must maintain its economic responsibilities to provide jobs and infrastructure and embrace a stewardship that respects the past. For Berkeley County to keep its character and remain a special place, it has to balance growth with needs for conservation, recreation and tourism to maintain the integrity of the Cooper River.

Another key challenge for the future is to ensure that decision-makers consider the economic implications of public policy when making decisions that affect future land, water and air uses of the county, including the area covered by this report. It may not, for example, be economically feasible to create no-development areas throughout the county. Rather, it may be more feasible to cluster no-development areas in special protection areas of the SAMP region. It may, however, make economic and environmental sense to award incentives to businesses, landowners or organizations to restrict uses that would have an adverse effect on the SAMP area. Leaders need to discuss these issues seriously and develop policies that positively impact the county over the long-term.

For leaders to be stewards for current and future generations, they must consider who will pay for and who will benefit from decisions made about the region's natural resources. They also need to view all decisions through the veil of common sense that takes into consideration a respect for what the county will be in years to come.

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<sup>10</sup> Source: *Interview with Economic Development Department, Berkeley County.*

The Cooper River's value to the area economy is often overlooked and underestimated. Many take the river for granted. If the river is to continue to be a vital part of the county's economic, cultural and recreational future, decision-makers must take solid steps now to plan for the future of the river. If they take it for granted, more could be lost than could be imagined.

## Chapter 4 - Water Quality: Crucial to the Future of the Region

According to SC DHEC/BoW and other academic sources, water quality,<sup>11</sup> is generally good in the main stem of the Cooper River in the SAMP area. Smaller tributaries to the river meet most water quality standards. Depressed dissolved oxygen (DO) levels sometimes stress areas of the Cooper River system. The upper portion of the Cooper River system has the potential for low dissolved oxygen stress due to natural conditions, mainly during summertime. This portion of the river also contains three fish species that have mercury levels higher than the FDA standard for unlimited consumption.



SC DHEC is the designated water pollution control authority in South Carolina. Under authority of the federal Clean Water Act, the Department has developed water quality standards with which to assess the suitability of state waters, such as the upper Cooper River, for fishing<sup>12</sup> and swimming. These standards are updated periodically using the best available science and are approved by the South Carolina

General Assembly as regulations R.61-68 and R.61-69. These standards are applied to measure the extent to which a waterbody meets classified uses.

The Upper Cooper above the "T" is classified as **FW** (Freshwater). The FW classification states that the river is considered to be "suitable for:

- primary and secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the requirements of the department;
- fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora; and
- industrial and agricultural use."

The area below the "T" is classified as **SB** (salt waters "Class B" – as opposed to salt waters "Class A"). This applies to tidal saltwaters and also includes protection for the uses of crabbing and fishing, but not drinking water, agricultural or industrial supply.

SC DHEC and Santee Cooper Public Service Authority have water quality monitoring stations in the Upper Cooper River at six locations in the Upper Cooper

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<sup>11</sup> Generally defined here as "suitable for aquatic life and human recreation."

<sup>12</sup> Photo of Cooper River sourced from: [http://www.bcoc.com/visitors/enjoy\\_nature/index.htm](http://www.bcoc.com/visitors/enjoy_nature/index.htm)

SAMP area. Each is sampled monthly. Waterbodies that do not meet one or more water quality standards over a period of time are considered to be impaired. Streams are considered impaired if they are unable to meet classified uses for aquatic life, recreation or fish consumption based on the corresponding standards. Regulators assess the degree to which aquatic life is protected (aquatic life use support) by comparing important water quality characteristics and the concentrations of potentially toxic pollutants with numeric standards.

Station	Agency	Location	303(d) Impairment <sup>13</sup> Status
<b>CSTL-062</b>	SC DHEC	Tailrace Canal at US 52 & 17A	Fish tissue Hg
<b>SC-033</b>	SC Public Service Authority	Tailrace Canal at Dock Restaurant	Fish tissue Hg (same location as CSTL-062)
<b>CSTL-113</b>	SC DHEC	Wadboo Creek at SC 402	Fish tissue Hg, fecal coliform
<b>CSTL-085</b>	SC DHEC	West Branch Cooper at Rice Mill Road	Meets standards. Sampling continues.
<b>CSTL-123</b>	SC DHEC	East Branch Cooper River at Bonneau Ferry	Sampling occurs. Not listed for DO since area is in domain of existing TMDL
<b>RS-02483</b>	SC DHEC	Turkey Creek at SC 402	Fecal coliform

**Table 1. SC DHEC/SC Public Service Authority Monitoring Stations**

To meet Clean Water Act requirements, SC DHEC assesses water quality every two years and compiles a listing of all waters in the state that do not meet standards. The list is known as the 303(d) list. The 2004 list includes five of the six monitored stations in the Upper Cooper SAMP area

*Please reference Appendix 10.*

The various impairments listed above are clearly pollutants of concern to the SAMP NRMP participants. The recommendations that follow are designed to address them.

### Mercury Impairment

As indicated above, the most common reason for impairment is because of the elevated levels of mercury found in fish tissue.

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<sup>13</sup> Based on SC DHEC Draft 2004 303(d) list. Fish tissue-Hg=Mercury in Fish Tissue, Fecal Coliform=Fecal Coliform Bacteria, DO=Dissolved Oxygen

Mercury in fish tissue has become common throughout the US. It is a particular problem in areas like the Lowcountry where naturally acidic waters with low dissolved oxygen and high organic carbon content promote the transformation of trace amounts of mercury into methyl mercury. Methyl mercury is much more highly bio-available than elemental mercury and over time becomes concentrated in the food chain.

The consumption advisories in effect for the Cooper River Corridor SAMP area apply only to certain fish species:

- Bowfin in the West Branch of the Cooper;
- Largemouth Bass, Bowfin, and Chain Pickerel in the East Fork of the Cooper River; and
- Largemouth Bass and Bowfin in Wadboo Creek.

SC DHEC advises that individuals eat no more than one meal per week of the identified fish from these area waterways. Only one meal per month is advised for Bowfin taken from Wadboo Creek. Pregnant women and small children are advised not to consume any of the named fish from this area.

There is some evidence to suggest that the trace amounts of mercury are mainly attributed to atmospheric deposition from decades of coal-fired power plant emissions. The mercury is rarely detected in water column samples and typically only becomes apparent in larger sized fish where bioaccumulation has allowed

### **Mercury Outreach and Education**

The Medical University of South Carolina (MUSC) should enlist a team of cooperators that includes (but is not limited to) local health departments, SC DHEC, the SC Wildlife Federation, industrial landowners, local outdoor sporting clubs as well as churches and other community organizations. Efforts should be made to leverage work undertaken by a partnership currently being formed between SC DNR and SC DHEC's Outreach and Education Section. The participants, led by MUSC, should develop a special mercury education program, locally focused and targeted for subsistence fishermen. Based on existing information obtained through monitoring data, permitting processes and other sources, this group should develop an outreach campaign that provides for multiple forms of communication including one-on-one interaction, signage and broadcast media for communicating fish consumption advisories to targeted populations.

Additional research should be formally requested of US EPA and the Quicksilver Caucus. The research effort should identify and evaluate potential local

mercury to become concentrated.<sup>14</sup>

### Fecal Coliform Impairment

Fecal coliform bacteria are cause for impairment at the Wadboo Creek and Turkey Creek sampling stations in the SAMP area. The presence of elevated fecal coliform levels indicates an increased risk of illness among those who may swim in or otherwise ingest these waters. Elevated levels of fecal coliform bacteria reduce the suitability of a waterbody for swimming. Sources for these fecal coliform bacteria are unknown. Both watersheds are largely rural with some pockets of developed areas occurring near Moncks Corner and Bonneau. Possible sources of fecal bacteria include domestic pets, livestock, wildlife, poorly located privies and failing septic systems.

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<sup>14</sup> Please reference [www.mercurypolicy.org/](http://www.mercurypolicy.org/) and <http://www.scwf.org/articles/index.php?view=16> for somewhat basic information. More detailed information can be found at [www.epa.gov/oar/mercury.html](http://www.epa.gov/oar/mercury.html). Still, the data is not conclusive and the collection of additional information may point to other more localized sources.

## Fecal Coliform and Septic Systems

Fecal coliform within the SAMP area (specifically Turkey Creek – East Branch and Wadboo Creek) may originate from a variety of sources. Differentiation of the bacteria sources is advisable for optimal targeting of BMPs. A special study for source identification should be conducted using antibiotic resistance, bacterial DNA typing techniques or other such technologies as they are perfected.

- OCRM should develop a proposal for source typing of fecal coliform;
- Monitoring should occur at various locations within the watershed;
- State, federal and local funding sources should be sought in order to accomplish the goals of the aforementioned. A final report should be made available to state, local and federal agencies with interests in the area;
- If fecal coliform is derived from animal origins, strategies for containment should be developed by SC DHEC/OCRM as appropriate;
- If human sources are identified, SC DHEC should establish a septic tank maintenance education program:
  - Perform homeowner survey of residents in selected 14 digit watersheds. This survey will be designed to determine the frequency of septic tank pump-outs and septic tank failures. Use statistical processes to extrapolate habits of the larger population;
  - Record newly installed septic systems within the SC DHEC Geographic Information System (GIS); and
  - Based on results of surveys and source identification studies, form a partnership of interested organizations such as the Berkeley

## Dissolved Oxygen (DO) Impairment

The SC DHEC monitoring station at Bonneau Ferry in the East Branch of the Cooper shows impairment for dissolved oxygen (DO). Adequate DO is critical to the survival and reproduction of aquatic organisms. While naturally low dissolved oxygen should be expected in the area, additional dissolved oxygen suppression is likely due to discharged biochemical oxygen demanding (BOD) material from both Upper and Lower Cooper dischargers mixed by the tides. Also, the largest oxygen sags are may be occurring as part of a natural diurnal cycle in the rice fields.<sup>15</sup> Some of those fields may become anoxic at times given the amount of submerged

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<sup>15</sup> Conrads, P., Roehl, E., and Cook, J. (2002). Estimation of tidal marsh loading effects in a complex estuary. AWRA Spring Specialty Conference on Coastal Water Resources, New Orleans, LA.

and emergent aquatic vegetation they contain. During a tidal cycle associated with such a condition, there are opportunities for low DO levels to occur in the river adjacent to these fields due to mixing.

SC DHEC did not list the Upper Cooper on its 2004 303(d) list because the ambient monitoring stations (SC DHEC and USGS) are not considered to be impaired under criteria of Section 303(d) of the Clean Water Act. The Cooper River is listed as impaired (for DO) in the Turkey Creek tributary of the West Branch. This low DO in conjunction with low pH seems to be consistent with a naturally low DO aquatic ecosystem and was deemed so due to natural causes.

A recent SC DHEC assessment revealed that station CSTL-062 in the Tailrace Canal had a decreasing trend in DO. However, DO standards are currently still met in this area. Based on monthly samples, all other water chemistry/bacteriological quality standards are currently met at that location.

#### **Tradable UOD Permit**

The BCD COG, with support from SC DHEC/BoW and US EPA should evaluate an effluent tradable permits program as a tool for guiding permitted discharges into the Cooper River.

This program may ultimately be expanded to include other parameters and

#### ***Point Source Discharges***

According to EPA, a point source is defined as "any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff."

For regulatory purposes, these sources are categorized as either point sources or nonpoint sources. It is important to note that rice impoundments in and of themselves are not point sources because they are not discrete sources of pollutants; they are diffuse conveyances of riverine matter as well as waters of the state.

Point source discharges include discharges from publicly owned treatment works (POTWs), discharges from industrial facilities and permitted discharges from urban runoff known as Municipal Separate Storm Sewer Systems (MS4s). Point sources are further categorized as either direct or indirect sources. Direct sources discharge treated wastewater directly into a waterbody; indirect sources discharge wastewater to a POTW for treatment. The POTW discharges the treated wastewater into the receiving waterbody. Under the national program, National Pollution Discharge Elimination System (NPDES) permits are issued only to direct point source discharges.

- ☑ *Further information on Municipal Point Sources, Industrial and Commercial Sources and TMDL's/Wasteload Allocations are presented in Appendix X.*

There are a number of public and private entities permitted to discharge wastewater to the Cooper River and Charleston Harbor system under the NPDES. These permits regulate the discharge of industrial and domestic wastewater, stormwater and cooling water.

The Berkeley-Charleston-Dorchester Council of Governments (BCD COG) is the designated water quality planning agency for the Metropolitan Charleston area. The BCD COG is responsible for allocating TMDL loadings among existing and proposed discharges. Approximately 23 percent of the Ultimate Oxygen Demand (UOD) loading is allocated to point sources within the SAMP area. The BCD COG further recommended appropriate schedules of compliance be incorporated into NPDES permits implementing the TMDL loadings and agreed to coordinate on the development of a 3-D model for the system to verify Phase 2 reductions. Implementation of the final limits will have the following impact on point sources along the Cooper River:

- Sewer and water rates for public utilities may increase significantly to fund plant upgrades;
- Existing industry along the Cooper River will find it difficult to expand;
- Overall economic development along the Cooper River may be impacted; and
- No NPDES permits can be modified or new NPDES permits issued except to reflect trading of UOD between current dischargers.

Stakeholders also noted the NPDES program reduced pollutant loads to the Cooper River. It provides assurance that BOD pollutant loads are more predictably managed to ensure the Cooper River will maintain its ability to support water quality uses. Costs associated with various treatment plant upgrades have been estimated at \$100 million.

## ***Nonpoint Source Policies***

Nonpoint source (NPS) water pollution (sometimes called “runoff pollution” or “polluted runoff”) does not result from a discharge at a specific, single location (or point), but generally comes from numerous diffuse sources. Adverse effects of NPS pollution can include physical destruction of aquatic habitat, toxic impacts on biota, interference with or elimination of recreational uses of a waterbody (particularly lakes), closure of shellfish beds, reduction of water supply or taste and odor problems in drinking water, and increased potential for flooding because waterbodies become choked with sediment.

Moncks Corner represents the Cooper River Corridor SAMP 's only significant urbanized area. Most of the SAMP area consists of small rural neighborhoods, farmsteads and estates. Much of the remaining SAMP area does not have sewerage and, thus, there is some potential for bacterial runoff from malfunctioning septic tanks and privies. This area also has some small farms and horse stables. These areas can also impact water quality, especially if stables and animal enclosures are located immediately adjacent to waterways. Improper manure management can impact water quality as well. Current residential and commercial development is relatively sparse and water quality impacts from those sources are most likely localized.

### **Reductions in NPS Loading**

SC DHEC should identify existing cases of untreated stormwater runoff within the watershed (ie., the 14 digit HUC including tributaries flowing into the SAMP area and including Monck's Corner presented in Appendix X.). In order to enhance water quality and optimize biological productivity, significant cases of non-point source pollutant loading should be reduced. Where significant inputs of sediment, nutrients, organic matter or toxic substances are found, SC DHEC should work with local government entities to implement a system for removal of pollutants of concern before water reaches the river.

- For a listing of nonpoint source pollutants of concern, please see Appendix X.*

Using proper best management practices can minimize most of these pollutants.

## Best Management Practices

### Low Impact Development Forum Series

OCRM should partner with the Homebuilders of South Carolina to sponsor periodic low impact development practices forums geared toward developers, builders, local government and regulators. Participants would present the various possibilities for alternative building site techniques that have lowered impacts to water quality. Information presented should be posted on the SC DHEC/OCRM website and promoted accordingly.

### Targeted BMPs

Various voluntary and regulatory best management practices (BMPs) and programs should be employed to prevent water quality problems from occurring including:

#### Institutional Stormwater Programs

- Local governments should form a close partnership with SC DHEC/OCRM to avoid duplication and, at the same time, ensure close monitoring of design, execution and enforcement of regulated sediment and erosion control measures. This may include an application by the county/city for delegation of inspection and enforcement authority;
- Berkeley County should periodically review local stormwater related ordinances and amend them as necessary to enhance water quality protections. Where new BMPs conflict with development codes unnecessarily, codes should be amended to accommodate them; and
- OCRM should provide incentives (e.g., subsidized training, expedited permitting or reduced permit fees) for area construction contractors who complete NRCS or similar sediment and erosion control certification programs.

#### Local BMPs

- As above, contractors should be encouraged to explore innovative site-specific water quality BMPs (e.g., wetlands and water quality inlets for specific sites especially those near sensitive areas such as perennial streams, old rice fields and tidal inlets);
- As appropriate, the Town of Moncks Corner and Berkeley County should work with developers to investigate the feasibility and efficacy of cooperative stormwater detention facilities to treat impervious surface runoff that drain to Cooper River tributaries. Ideally, these may

## *Urbanization and Growth*

A greater NPS concern lies in growth projections that indicate urbanization in much of Berkeley County, including the SAMP area. If this change in land use occurs without adequate controls and best management practices, adverse water quality impacts can be expected over time. These impacts might include further bacterial contamination of tributaries, eutrophication of small lakes and wetlands, and loss of aquatic insect habitat due to sedimentation.

Berkeley County may eventually be covered under an US EPA stormwater program known as NPDES MS4 Phase II. This program will require that the county implement measures to control stormwater pollution in the urbanized areas. Among the US EPA's minimum measures are public education, sediment and erosion control, control of pollutants due to public works, runoff from new developments, detection of illegal hookups to storm drains and a public participation program.

Funding of MS4 Phase II permits can be accomplished through a variety of means. Creation of a stormwater utility is a source of revenue commonly employed. Much like a conventional sewer system utility, each household and business is billed on a monthly basis for services. The services in a stormwater utility would be for actions that make possible cleaner runoff. Flood control is often also included in stormwater utility services. Some communities choose to issue bonds to fund the initial MS4 program development. Sometimes real estate transfer fees are used. Additionally, various combinations of grants and government loans can be used for funding certain portions of the program (e.g., the State [Clean Water] Revolving Fund (SRF) loan (currently 2 percent interest), Transportation Equity Act grants, Federal Emergency Management Agency (FEMA) flood mitigation assistance and US EPA watershed assistance grants<sup>16</sup>).

## *Vegetation*

Aquatic vegetation and its control can affect water quality in a variety of ways. Significant quantities of large plants (macrophytes) located in portions of the upper Cooper River both produce DO through photosynthesis, consume DO during respiration, and contribute to the BOD load when they die, settle and undergo microbial decomposition. Extreme growths of floating aquatic plants can result in low DO due to interference with re-aeration at the air/water interface.

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<sup>16</sup> Further information can be found at:

- <http://stormwaterfinance.urbancenter.iupui.edu/>
- [www.nypirg.org/enviro/water/stormwaterreport.pdf](http://www.nypirg.org/enviro/water/stormwaterreport.pdf)
- [www.epa.gov/ORD/NRMRL/Pubs/625R03003/29Reese.pdf](http://www.epa.gov/ORD/NRMRL/Pubs/625R03003/29Reese.pdf)

☑ For additional information on vegetation and DO please refer to Appendix X.

Unmanaged former rice field impoundments occur in a successional continuum from open water to swamp forest. Those that still exchange water with the river can be classified according to dominant macrophyte community type, which is controlled by variations in maximum and minimum water depth. Subtidal areas are always inundated and support submerged aquatic vegetation (SAV) in the deepest areas and floating leaf vegetation (FLV) in shallower areas. Intertidal areas are subject to periodic drying and support Intertidal Emergent (ITEM) communities. Over time, dominant macrophyte communities at a given location change from deep water to intertidal as sediment and organic matter accumulate and reduce water depths.

### **Invasive Species**

SC DNR should continue efforts to control non-native invasive aquatic vegetation and fauna including researching new control methodologies and the prevention of the introduction of new species.

Within the SAMP designation, the SC Aquatic Plant Management Council should prioritize control efforts along the Upper Cooper River Corridor and associated rice fields and direct SC DNR in their efforts to control these species.

### **Sediment**

Impoundments with open exchange with the Cooper River undergo succession from subtidal to intertidal habitat, indicating they may act as traps for particulate material (both mineral and organic). This material may be imported from the Cooper River, originate within the impoundment, or both. Some models offer explanation and confirmation of this inference, and fieldwork is currently underway to test and quantify the effect.

The current understanding is that, on a unit area basis, the subtidal areas trap the most particulate material. Within subtidal areas, the FLV communities likely trap more sediment than the SAV communities. The intertidal areas trap the least amount of sediment. If sediment trapping is a desired ecosystem service provided by the impoundments, there is justification for managing some old rice fields at subtidal depths.

## *Nutrients*

Research results so far indicate that each impoundment community type has differing characteristics with respect to nutrients. All three types appear to be importers of oxidized nitrogen (nitrate, nitrite). With respect to a specific nitrate, ammonium, the SAV communities export, ITEM communities import, and results are inconclusive for FLV. All three community types may be exporters of dissolved organic nitrogen. Less is known about phosphate dynamics, but results again suggest net imports.

Taken together, these nutrient results suggest that, in general, the impoundments import oxidized inorganic nitrogen and phosphorus both of which is used for plant growth. They export organic nutrients and, to a lesser extent, other reduced forms. Some of the specific nutrient results exhibit seasonality that is consistent with biological expectations. Import of inorganic nutrients tends to peak in the main part of the growing season, and export of dissolved organic forms tends to peak during autumn when senescence is greatest. The net effect of nutrient exchanges on the overall nutrient budget of the Cooper River is still unexamined. Aside from basic ecological considerations, these nutrient dynamics can impact the presence or absence of invasive aquatic plants and noxious algal blooms.

## *Further Research*

To preserve the character and quality of the upper portion of the Cooper River, the unmanaged open rice fields should be handled as part of a unified landscape rather than as individual fields. Policymakers must recognize, understand and be attentive to the role the open fields play as hydrologic and water quality features in the river and the possible effect(s) of management options.

For example, open fields are a source of organic matter to the downstream estuary. In the absence of natural riverine wetlands and hydrology that includes flood pulses, the rice fields are probably the dominant, therefore essential, source of organic matter to the estuary. Landscape planning needs to address the functional elements of these fields.

Effective system-wide management of the rice fields must be grounded in science. Currently, however, there is very little data on the water quality contributions (positive and negative) of the rice fields in different successional stages. During the past decade, there has been a significant increase in our knowledge of the role of the former rice fields in water quality functions on the Cooper River. Significant knowledge gaps still exist, however, and with continually increasing interest in active

management of the fields, more work is needed. A highly focused project can accomplish a great deal in a relatively short period of time.

A comprehensive hydrologic and water quality assessment, monitoring and modeling program is needed to both help guide landscape management planning and track the effects of significant changes. Data needs include: spatial (within fields and along the river) and temporal assessments of exchanges of DO, BOD, inorganic and organic nutrients, sediment, and dissolved and total organic carbon. Process needs include: primary production, sediment chemistry and exchange, field hydrology, and sediment accumulation. The design for this work will benefit from past and current research that addresses a portion of these issues. An existing simulation model of rice field succession should be enhanced based on the results of this work so that the effects of proposed management actions can be forecast as an aid in selecting from among alternatives. This assessment should include some fields that are closed so that the effect of periodic exchanges (rather than continuous exchanges) can be included in the planning process. Post-implementation monitoring of significant impoundment modifications is also necessary to assess the effects.

As with other wetlands, the Cooper River rice fields serve as habitat for important vertebrate and invertebrate species that are critical to a balanced aquatic community both in the SAMP area and downstream. Former rice field wetlands in this area are known to be important nursery areas for juvenile freshwater and marine fishes, as well as important providers of life forms that comprise the base of the food chain. Former rice fields are an especially diverse type of wetland, with changing and complex biophysical relationships. The relationships between the various types and stages of rice fields and the vertebrate and invertebrate organisms that make use of them need to be better described by appropriate research projects.

## Research Agenda

Through the SAMP process, stakeholders identified several research needs that should be considered both independently and to the extent possible, in a rice field reimpoundment pilot project:

- Developing and implementing a comprehensive hydrologic and water quality assessment and bioenergetics simulation model;
- Inventory of significant organisms in impounded former rice fields versus unimpounded former rice fields (in the SAMP area);
- The presence of commercial and recreational species present in the rice fields;
- The importance of base food supply species (macro- and micro-invertebrates) in the rice fields;
- The most important predator-prey relationships between indigenous aquatic species;
- The factors influencing movement between former rice fields and the Cooper River for important groups of organisms;
- The existence of invasive species (flora and fauna) in the former rice fields;
- The effects these organisms are having on biogeochemical, community, and ecosystem functions;
- The projected effects if expansion of invasive species continues;
- Management options that exist to control or prevent expansion of invasive species;

High altitude aerial photos and satellite imagery to inventory the existing

Local land conservation organizations, government entities, and SC universities should form a partnership in order to obtain grant monies for pursuing this research agenda. This plan should be developed using outputs from the SAMP and all existing research products.

## Chapter 5 – Fish, Wildlife Resources and Wildlife Habitat

### *Tidal Fresh and Brackish Marsh Habitats*

The Cooper River Corridor SAMP study area includes extremely diverse estuarine and tidal freshwater marsh and open water tidal creek and riverine habitats. Estuarine habitats, both marsh and open water, differ from their freshwater counterparts by the presence of salty water. Moving inland from the sea, the limit of estuarine waters is determined by the influence of salt water. In the Cooper River, salt water influence may be detected at times well into the SAMP study area, varying with seasonal rainfall, tidal cycles and releases of Santee River water from the Pinopolis Dam. The presence of salt water determines marsh vegetation, with characteristic plant communities adapted exclusively to freshwater, less saline brackish water, and more salty conditions in the lower estuary. Prior to European settlement and extensive rice culture, the Cooper was a small, coastal estuarine river and marsh system. The large expanses of tidal freshwater and brackish marsh seen today result from the effects of intensive rice culture from 1700 to 1880, and the diversion of the Santee River into the Cooper River during the 1940s. With rediversion of approximately 80 to 90 percent of the Santee River beginning in 1985, the tidal estuarine and freshwater marshes are again adapting to change and gradually returning to a more brackish estuarine system.

On the Cooper River, the dominant expression of tidal freshwater and brackish marsh wetlands is in former rice fields with dikes in varying stages of erosion, allowing free exchange of water. Approximately 5,816 acres of this habitat exist. The plant community within rice fields is largely a function of water depth, with deeper areas dominated by open water with submerged vegetation and the shallowest areas by emergent species. Various plant species function differently as habitat, and are preferred by different wildlife species.

Lower water levels following rediversion produced an accelerated rate of plant succession within rice fields, resulting in less open water or submerged vegetation and more emergent vegetation and inter-tidal marsh. The rate of succession has slowed in recent years; however, succession is expected to continue, as siltation continually creates shallower water and conditions that favor a later successional stage. If succession progresses to its end point, the climax plant community in individual fields may be emergent marsh, inter-tidal marsh or forested wetland.

The rate at which succession will progress and the composition of the final plant community are influenced by several factors, including the rate of siltation, water depth, water flow patterns, bottom contours and existing vegetation type. It appears that siltation occurs at the highest rate where submerged or floating leaf

vegetation dominates and is slowest in inter-tidal marshlands. It may be possible to slow succession by controlling floating leaf vegetation. It also may be possible to reduce silt deposition by altering water flow patterns and improving water exchange with the river within some fields. This might be accomplished by removing sections of dikes or digging channels within the field.

In addition to old rice fields, tidal marsh habitat also occurs along riverbanks, where various aquatic plants abound. Extensive areas of this habitat exist, particularly downstream of the "T" and along Back River, where rice culture was not prevalent.

Tidal marsh habitats tend to be the most productive and richest in species diversity of any aquatic habitat within the SAMP area. With abundant food organisms and cover for larval fishes, this is an important spawning and nursery ground, providing stock for the mainstream fish community. Except for striped bass, all of the species of freshwater fish that are recreationally important within the river system areas depend to some degree on marsh habitats during spawning and early life and, during older life stages, for foraging on smaller fish, insects or invertebrates. Additionally, these densely vegetated habitats harbor a large number of species that seldom occur in open water. In a recent study of two open rice fields, 38 species of fish were collected.<sup>17</sup>

### Non-Tidal Emergent Wetlands

This category includes ponds, Carolina bays, depressions, bogs, savannahs, ditches, forested wetlands and old rice fields with intact dikes that are isolated from the river. The value of these wetlands as fish habitat varies greatly depending on the inherent features of the area and how the land is being used. In cases where there is little or infrequent water exchange with the river, movement of aquatic organisms is also limited, and the wetlands may contribute little to the river ecosystem and the fisheries resources available to the public.

### Freshwater Riverine, Open Water Habitats

All freshwater wetland and deepwater habitats contained within a channel are defined as riverine ecosystems. Except for small tributary streams, all riverine waters in the Cooper River Corridor SAMP area are tidally influenced, with a range of about three feet at Pinopolis Dam, the SAMP's upstream boundary. Except for the

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<sup>17</sup> Morris, James T., et.al. 2002. Structure and Function of Tidal Freshwater Wetlands on the Cooper River, SC: Effects of Water Management on Succession, Nutrient Cycling, and Fish Habitat. Final Report Project No. R/ER-16, SC Sea Grant Consortium, Charleston.

man-made Tailrace Canal and Durham Canal, these habitats are in a relatively natural condition. The greatest alteration of conditions within the riverine habitats is in the volume and pattern of water inflows. Releases through Pinopolis Dam now average 4,500 cfs, compared to 140 cfs prior to the Santee Cooper Project. Releases range from zero, for periods as long as two days, to a maximum of 20,000 cfs during times of peak power generation. Salinities in all areas upstream of the "T" are generally less than 0.5 parts per thousand (ppt), the salinity defining the separation between fresh and estuarine waters. Downstream of the "T," salinities gradually increase and at Flag Creek range from 0 to 15 ppt<sup>18</sup> depending on tide stage, water releases from Pinopolis Dam and recent rainfall.

### *Freshwater Wetlands and Aquatic Habitats*

#### Freshwater Wetland Functions

Wetlands are characterized as areas where at least periodic saturation with water is the dominant feature. This presence of water defines the soil processes, the vegetation and the wildlife present. Criteria for classification as wetlands include a combination of hydric soils, vegetation adapted to life in flooded or saturated conditions and wetland hydrology. There are different types of wetlands found within the SAMP area:

- Riverine floodplain wetlands are distributed along the river and streams of the watershed;
- Tidal marsh wetlands are connected to the river and influenced by tides; and
- Isolated depressions, such as Carolina bays, are lowlands in upland areas characterized by long periods of flooding or saturated soils. They are usually vegetated with herbaceous plants, but some are forested or have shrubs and small trees.

The wetlands within the SAMP boundary are an important resource for maintaining and enhancing the quality of life for people in the area. Typical wetlands functions include:

- **Water Quality Enhancement:** Wetlands are capable of improving the quality of water entering the river by removing suspended material and contaminants. Contaminants are transformed by chemical and biochemical processes into non-harmful substances. This function is particularly helpful in reducing nonpoint sources of pollution, such as runoff from agricultural or urban areas.

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<sup>18</sup> Verbal presentation, SC DNR.

- **Floodwater Storage and Reduction of Floodwater Velocity:** The ability of wetlands to reduce the velocity of water flow over the landscape and hold water for a period of time is integral to many wetland functions. Longer residence time allows for increased deposition of suspended material, transformation of contaminants, and recharge of groundwater. This function also reduces erosion.
- **Provide Highly Productive and Diverse Habitats for Fish and Wildlife:** Wetlands provide specific habitat needs for a wide range of fauna, both directly and through the export of nutrients, detritus and other food items.
- **Support Estuarine and Coastal Marine Food Webs:** Freshwater wetland systems export water laden with dissolved organic carbon and nutrients that form a major component of the productivity of estuarine and coastal marine food webs. This rich source of organic carbon is a major contributor to estuarine marsh building processes.

In some areas of Cooper River, low DO levels limit biological productivity. In open rice fields, siltation speeds the process of vegetative succession. Nonpoint sources of pollution are a major contributor to these problems. Sites developed prior to modern requirements for stormwater treatment may be significant in terms of their harmful discharge, in which case treatment measures would be appropriate. If the treatment system incorporated wetlands filtration, the wetlands would serve the secondary function of providing habitat.

The Cooper River Corridor SAMP area offers diverse upland and aquatic wildlife habitats.

- ☑ *For a more detailed discussion of upland habitats, wildlife, wetland habitats as well as birds, mammals and endangered species, please reference Appendix XI.*

### **Conservation Strategies**

Private conservation easements, state wildlife management areas and the Francis Marion National Forest protect some areas of ecological importance. Core areas are sometimes known as greenbelts or greenways. They typically join protected lands and important resources. They also are relatively undisturbed, diverse habitats that provide food, cover and water resources for a variety of wildlife species. These areas may include fire-maintained longleaf pine forests, mature upland hardwood sites, cypress-tupelo dominated wetlands and those habitats interspersed with isolated wetlands. Any properties supporting significant populations of threatened or endangered species should also be considered for protection as core areas. To maintain and enhance biodiversity within the SAMP area, watershed-level conservation strategies should be developed to create corridors which

systematically address protected areas, core areas and currently privately owned lands.

Corridors include undisturbed linkages between protected core areas. Riparian buffers along the Cooper River as well as tributaries of the Cooper River should be included as key corridor areas. Voluntary conservation easements will likely provide landowners in these areas the incentive they need for the perpetual protection of their property.

### **Local Government Involvement**

Local government entities should include options for conserving wildlife habitat in their land development approval process.

SC DNR should help evaluate the Berkeley County Greenspace plan and work collaboratively with the County and the Town of Moncks Corner to identify critical habitats, unprotected core areas and corridors, and systematically prioritize them for conservation. Protection of intact freshwater wetland systems with appropriate upland buffers should be considered a primary overarching objective in protection of wildlife habitat.

For each designated area, a local entity should accept stewardship for the care of the area in keeping with a prescribed set of objectives for habitat management. Responsible entities may be landowners, land trusts or government entities and will vary on each parcel of land. The Town and the

Establishing wetland mitigation banks within the SAMP is another strategy for land protection. Section 404 of the Clean Water Act requires that a US Army Corps of Engineers permit be obtained before impacting wetlands. As part of the permit process, compensatory mitigation is provided to offset the lost values and functions of any wetlands proposed for impact. If appropriate mitigation is not available on a project site, mitigation credit can be purchased from a commercial mitigation bank. Typically, mitigation banks consist of wetland preservation, enhancement, and restoration. Pigeon Pond is the only mitigation bank in Berkeley County, and it is outside the SAMP boundary. Potential mitigation bank sites within the SAMP include historic wetland areas that have been drained, ditched, converted or otherwise altered. Headwater tributaries of the Cooper River that have been impacted for timber production or agriculture would potentially be appropriate locations. Wetlands preserved or restored are typically buffered with significant, undisturbed uplands areas that are maintained in native vegetation.

Conservation easements represent the surest way to conserve significant tracts of habitat permanently. Furthermore, there can be a great collective benefit from the voluntary conservation of privately held lands in ways that are favorable to wildlife. To encourage this type of management, technical assistance, financial assistance and other forms of incentives are available. However, landowners may not be well-informed of these opportunities. Consequently, these programs are underutilized. To pursue conservation easements and land management practices that are favorable to wildlife, a full-time position is recommended.

### **Increase Protected Acreage and Maintain the Diversity of Upland and Aquatic Habitats in the SAMP Area**

Berkeley County should work with SC DHEC/OCRM and the local land trusts and others to acquire the resources needed to hire an individual to further the following goals:

- Complete an inventory of properties that are especially desirable for long-term protection;
- Educate landowners about available cost sharing programs and other economic incentives designed to enhance and protect quality habitat. Education efforts might include mailing information, making personal contacts and organizing workshops;
- Plan for when cost sharing is not available and encourage voluntary land conservation and habitat enhancement activities. This would be accomplished by educating landowners of their options and the benefits of such activities;
- Identify areas suitable for wetland mitigation banking and facilitate conversations between landowners and the Mitigation Bank Review

Characteristics of the properties that are considered highly desirable include: riparian buffers, the presence of significant wetlands, wetland corridors between other tracts of quality habitat, habitat for species that are endangered or of special concern, significant areas of native plant communities, areas adjacent to other properties already under conservation easements and any large tracts of land. Government cost-sharing programs are available through the US FWS, Natural Resources Conservation Service (NRCS), SC DNR and the SC Forestry Commission. US FWS programs target longleaf pine restoration, native warm season grassland establishment, shallow water wetland restoration, and habitat enhancement practices that will benefit endangered species. Through NRCS's Wetlands Restoration Program, wetlands can be fully restored and permanently protected. Their Wildlife Habitat Improvement Program offers financial incentives for the

prescribed burning of pine forests, successional disking of wildlife openings and establishment of agricultural buffers.

## Chapter 6 - Land Use Management and Rice Impoundments

A central goal for the SAMP process was to promote biodiversity. The stakeholder group found active management of rice fields presented a potential management tool to achieve a higher degree of biodiversity.

South Carolina has around 70,000 acres of functioning impoundments, and a comparable acreage of areas that were formerly impounded. Rice production was the primary reason for constructing impoundments, and some were used for that purpose until the early twentieth century. Since that time they have largely been used for waterfowl hunting. For a number of reasons, many of these areas have been allowed to return to open water systems.

There have been several attempts to reimpond some of the formerly impounded areas over the last 20 to 30 years. Most have not been successful in obtaining the necessary permits, and all have been controversial. Proponents of impoundments cite that they provide needed habitat for waterfowl, various shorebirds, and several endangered and threatened species. Opponents contend that they block the flow of navigable waters, interrupt the lifecycles of fish and invertebrates, and reduce the overall productivity of tidelands. There is merit to both arguments, and in attempting to weigh the pros and cons of reimponding on the Cooper River, both sides must be given consideration.

Reimpoundment is a controversial issue with potential legal and environmental challenges. The stakeholders recognized that the Cooper River was not a pristine system as it has been diverted, re-diverted and managed since its settlement by non-indigenous peoples some 300 years ago. This management continues today through the manipulation of water flows associated with hydroelectric production and the management by private landowners whose former rice fields still have dike integrity. The underlying impetus, nonetheless, requires consideration and evaluation of re-establishing breached impoundments.



Recent studies show that these open rice fields are actively and aggressively converting back to bottomland hardwood. Failure to arrest this process will result in

the eventual loss of this habitat. As each successional stage is lost, the ecological functions and human uses associated with those functions will also be lost.

Three distinct categories of impoundments exist within the SAMP, each with varying degrees of regulatory oversight. All are primarily managed for waterfowl but most have benefits for non-game species as well. Upland impoundments, as the name implies, are typically created completely within upland agricultural fields. Dikes two to six feet tall are constructed around the perimeter of a field. Cereal grains such as corn, sorghum, millet, or rice are planted as a food source for waterfowl. A well is then used to pump ground water into the field to flood it. Because there are typically no wetland impacts involved, upland impoundments usually can be created without obtaining any regulatory permits. Inland impoundments are typically created within freshwater wetlands with no tidal influence. Most often these impoundments consist of greentree reservoirs. Sites appropriate for greentree reservoirs should be dominated most producing hardwood trees that provide a sufficient forage base for waterfowl. Topography should be relatively flat so that a large area can be flooded with a low dike ( $\leq$  three feet). Flashboard risers installed in the dike should be set so that a majority of the site is flooded with 12 to 18 inches of water. Unlike upland impoundments, greentree impoundments are normally flooded with the natural hydrology of the site. To ensure tree vigor, flashboard risers should remain completely open during the growing season to provide the natural site hydrology and prevent any unnatural flooding. Greentree reservoirs are usually created with only minor wetland impacts most often associated with the construction of dike. Therefore, the permit process for greentree reservoirs proposed in appropriate locations is relatively simple and efficient. The third category of impoundments includes former rice fields created in tidally influenced areas. Tidal influence can range from inches to over 6 ft. and vary in salinity from completely fresh to completely saline. These tidal impoundments can be further broken down into two subcategories:

1. Those with intact dikes and functional water control structures; and
2. Those that have been non-functional for one or more years.

Functional impoundments can be drawdown during the growing season and managed for naturally occurring aquatic plants, cereal grains, or a combination of both or remain permanently flooded throughout the year. Little or no management capabilities exist with non-functional impoundments and they therefore are subject to daily tidal influences.

All of the impoundments described above contribute to the overall diversity of the SAMP area. Wildlife use of upland impoundments is more or less limited to waterfowl if they are managed strictly for cereal grains. Shorebird and wading bird use can be enhanced within upland impoundments if management for naturally occurring wetland plants is also incorporated. In addition to waterfowl, greentree reservoirs

can provide habitat for songbirds and wading birds. The diversity of a greentree reservoir will depend on vegetative structure and the depth and duration of flooding. Generally speaking, tidal impoundments are the most diverse of the three categories of impoundments. Diversity within tidal impoundments depends upon degree of management, degree of vegetative succession, degree of tidal exchange, and the degree of salinity.

Reimpoundment of the breached open water fields will alter the dynamics of succession that are now under way by improving feasibility of active chemical, biological and mechanical management within the fields. Reimpoundment may also reduce sedimentation along with other negative impacts associated with reverse tidal flows. Furthermore, the continued exchange of water from these fields through breached dikes in their present and/or further degraded state may adversely impact the water quality of the main body of the Cooper River.<sup>19</sup>

Improvement of water quality and sustainability of the present open rice field habitat is clearly desirable and beneficial to the public welfare for several reasons. For tidally influenced rice fields, replacement of dikes breached long ago may be an obstacle to public access in these areas and to the freedom of navigation that is held in public trust by state governmental powers and supported by legal precedent. Any hope of achieving a feasible plan to reestablish breached rice field impoundments must include clearly stated and justifiable goals supporting their specific benefit to the Cooper River ecosystem and to the public welfare in general. Furthermore, a well-defined and documented methodology must be established guiding the selection of rice field(s) for restoration, the technical "how to" issues and any other associated criteria.

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<sup>19</sup> DO levels in the rice fields are affected by fluctuations in Biochemical Oxygen Demanding (BOD) materials (in some successional stages, rice fields may act as either sink or source for DO). The export of water from the rice fields to the broader system will elevate or reduce DO levels accordingly.

### Management of the Rice Fields System

The rice fields on the Upper Cooper River should be viewed as a unified landscape rather than as individual fields. A principle objective for this systematic approach should be the maximization of beneficial water quality (including indigenous flora and fauna) within the rice fields and the interactions between the upland, inland and tidal fields and the downstream river system.

The Berkeley Conservation District should convene a Standing Technical Committee that will address rice field policy and planning for the Upper Cooper River. The composition of this group should be drawn in large part or entirely from the stakeholder and resource groups responsible for this NRMP. All relevant public and academic sources should provide *ex officio* resource support. This multi-stakeholder group will meet annually or as needed, review the most current science and make policy recommendations to SC DHEC/OCRM, the US Army Corps of Engineers, SC DNR and Berkeley County.

This committee would be asked to incorporate the most current science into public policy as it is developed. They might also accept additional "charges" that the County Council finds relevant to the river system. The committee would provide an annual report to the County Council that would catalogue

Altering the current trends would require active management of breached impoundments. At present, this can only happen under exacting circumstances and within a complicated state legal framework. If additional science suggests that reimpounding yields environmental benefits, then the public interest may be served in some cases by changes to the legal framework. Landowners in particular firmly believe that "one size does not fit all" and that there is a need to use different public policy tools for upland impoundments, inland impoundments and tidal impoundments.

### **Impoundment Types and Creating a Regulatory Regime That Respects the Distinctions**

OCRM should immediately convene a regulator's summit designed to develop a classification scheme for addressing the permitting process. The summit's output would be a classification scheme that clearly labels the various types of impoundments, the NRCS guidance and other requirements that must be fulfilled to reimpond.

Participants must include USDA's NRCS, US CoE, US FWS, NMFS, US EPA, SC DNR and SC DHEC. Permitting requirements for the active management of inland and tidal fields and/or more generic wetlands can then be tailored to the

The classification of impoundments will allow landowners and regulators to be "on the same sheet of music" when applications are reviewed. One such process is the use of the interagency Greentree Guidance document. This document, although in need of revisiting, provides proof that regulatory and non-regulatory agencies can work together to create a process that avoids an Individual Permit (or lengthy paperwork).

### **Managing Greentree Reservoirs**

OCRM should continue the aforementioned regulator's summit for the purposes of developing a General Permit (GP) or expedited process for actively managing GreenTree Reservoirs within the SAMP area. This GP or any identified process should utilize the "Interagency Guidance Concerning the Authorization, Siting, Construction and Management of Greentree Reservoirs" (dateline 1997) as the point of departure. During the course of this process, this group should further refine or enhance this document to provide for new understandings and better science. This guidance might be developed in such

Overall, the challenge of system-wide rice field management is that three discrete "communities" have a unique claim to the resources: the landowner, the public and the flora/fauna.

Regardless of classification, as rice fields are evaluated and prioritized for potential restoration, proceeding with actual work will require certain obligations and

conditions by the landowner. These conditions must be clearly identified with standards explained for their satisfaction.

### ***Transparency in Public Policy***

As with many areas of public policy, the jurisdictions of government entities and the regulations that they govern are a complex weave of law and relationships. Coastal policy is no exception and is complicated.

The stakeholders in this process believe that the SAMP designation offers great hope for clarifying the regulatory framework, simplifying and streamlining procedures – particularly those related to the permitting of reimpoundments.

#### **Citizens Guide to Impoundment Policy**

As an outcome and product, summit regulators should develop, print and disseminate a “Citizens Guide to Rice field Policy” to landowners. This Guide should also appear on the SC DHEC website.

#### **Rice Impoundment Research**

A university should conduct a separate and voluntary research project in a breached rice field. The goal would be to determine if it is possible and practical to significantly increase DO, decrease siltation, and increase biological productivity in open rice fields by physical modifications to the field. Such a study would be conducted in a single (or more) rice field(s) and would include:

- Measurements of DO, siltation rate, and some index of biological productivity at various locations in the field prior to modifications;
- Hydrological study of water movement patterns within the field;
- Modifications, such as additional breaches in the dike or ditching within the field, to achieve more favorable water movement; and

## Chapter 7 – The Demonstration Project

As former South Carolina Assistant Attorney General Ken Woodington has stated,<sup>20</sup> the restoration or new construction of an impoundment or wetlands is a complex undertaking from both legal and environmental standpoints.

To obtain a permit to impound wetlands, one must satisfy several precisely-defined legal requirements, including:

- A demonstration of ownership of the tidelands to be impounded must be traced to a King's grant or a state grant clearly granting the owner title to the tidelands;<sup>21</sup>
- Evidence of little or no impacts on submerged lands (lands below the mean low water mark);
- Continued access to public navigable waters (access must not be blocked) or the applicant must demonstrate that the project serves an overriding public interest;
- Compliance with all South Carolina statutes and regulations; and
- Compliance with state water quality standards and the federal Clean Water Act.

*These requirements are more specifically addressed in Appendix VI.*

### ***The Cooper River Corridor SAMP Area – Today's Laboratory***

The authors of this NRMP believe the re-establishment of inland and tidal rice field impoundments may be a tool for improving water quality, slowing vegetative succession, and maintaining the diversity of wildlife and wildlife habitat that exists today.

While there is interest in repairing breached dikes as a tool to improve habitat and environmental conditions of the Cooper River, it is mostly based on experience and professional analysis of studies documenting current conditions and trends. The

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<sup>20</sup> **Formal reference to Woodington Paper pending.**

<sup>21</sup> In discussions held during the course of the development of this NRMP, the landowning community stated that the current proof of ownership requirements place an unacceptably high hurdle for a landowner to cross in order to manage his or her own land.

stakeholder group determined there is a lack of confirmed data on the effect a re-established impoundment may have on water quality, sedimentation and other conditions. As such, there is much support for a well-designed study to improve understandings on the impacts of reimpoundment. Selection of a rice field, either public or privately owned, would serve this purpose.

A two- or three-year "Demonstration Project" or "Pilot Project" could provide critical data that would allow researchers to develop accurate models for anticipating the effects of broader policy changes on the system – before those changes are made on the basis of less reliable information. The SAMP designation likely provides adequate legal latitude to complete this project.

### **A Demonstration Project**

OCRM should convene a Reimpoundment Pilot Project Evaluation Committee (the "RIPPEC") comprising permitting authorities from SC DHEC/OCRM, SC DNR, SC DHEC, US CoE, NMFS and USFWS as well as a member of the research community. Non-voting *ex officio* membership may be drawn from affected interests. The RIPPEC should convene no later than December 31, 2004. This seven member Committee should refine and, if deemed potentially "permissible," ultimately promote the Demonstration Project briefly described below. This group must also develop a communications plan for broadcasting the results of a demonstration project to the public and private landowning communities.

By June 30, 2005, the RIPPEC should promote a project which:

- Gains water level control so that draining and re-contouring is possible;
- Re-contours portions of the field so that SAV habitat has sufficient critical mass to support fish production and also produce sufficient volumes of dissolved oxygen and other water quality benefits. SAV is the fastest disappearing community type on the Cooper and the rarest type statewide, found as a dominant cover type on other river systems only on impoundments; and
- Uses an improved water control structure (the Citadel has expressed an interest in completing this work) that exchanges, as feasible, a significant amount of water on each tidal cycle, allows flora and fauna as well as fish passage and retains enough water to support the SAV community.

- ☑ *Characteristics of each of the 74 tidal rice impoundments located on the Cooper River System are included within Appendix VIII.*

Among the first tasks of the RIPPEC will be the formal selection of a publicly-owned or privately-owned rice field used for the reimpoundment pilot project. The public field advantages include public domain interests and public perception. Privately-owned fields may be easier to work with because of the immediate availability of funding and the willingness and ability to move forward aggressively.

Detailed discussions among participants resulted in the “nomination” of two potential sites for the Demonstration Project: the privately-held rice field of Mulberry Plantation or the SC DNR-owned rice field of Small Bonneau Ferry (SBF).<sup>22</sup>

### **Selection of a Site and Administrative Responsibilities**

The participants in this process view Small Bonneau Ferry (“SBF”) as the most promising site for a Demonstration Project. The RIPPEC would become the body responsible for ensuring that the Demonstration Project was completed according to predetermined guidelines and the design of the Demonstration Project. SC DNR should complete the application so the Demonstration Project can move forward. Should SC DNR choose not to pursue this Demonstration Project, the owners of Mulberry Plantation should be contacted to gauge

Reimpoundment would be a limited use tool governed by a larger basin-wide management plan. Advantages of using SBF include the:

- Manageable size of the breach;
- Comparatively small acreage of the rice field (and thus, the minimization of any deleterious effects);
- Severely-choked condition of the field, due in large part to the preponderance of invasive species, which makes navigation and public access virtually impossible;
- Significant amount of existing data for this and proximal fields;<sup>23</sup> and



<sup>22</sup> Aerial photograph of Small Bonneau Ferry supplied by

<sup>23</sup> Key statistics pertaining to SBF (as of 1999):

- Total area - 40.8 acres
- FLV area - 21.7 acres (almost entirely Ludwigia & Water Hyacinth)
- ITEM area - 8.5 acres

- The ownership issue is unquestionable as it is already part of public domain and owned by SC DNR.<sup>24</sup>

On a parallel track, the RIPPEC must refine and endorse the policy questions that must be answered by the study as well as the metrics for evaluation.

The results of the above monitoring during the pilot project will determine whether establishing a reimpoundment policy is a viable tool for future management of the Cooper River. On balance, should this experiment prove to have detrimental (instead of beneficial) environmental effects, the RIPPEC and the permitting agencies must preserve the right to alter elements of the project. They may specify actions to mitigate the adverse effects of reimpoundments at the end of the study. Allowing waterflows on a seasonal basis may be considered as such an action. Restoring free tidal exchange to the impoundment would be an action of last resort for this Demonstration Project.

### ***Beyond the Demonstration Project***

With some optimism that the demonstration project will highlight adequate environmental benefits to the Cooper River ecosystem, the authors viewed their charge as requiring:

1. The design of a system for evaluating the candidacy of future reimpoundment projects (should a broader policy be adopted by the regulating community); and
2. The delineation of some broad requirements that landowners would agree to in exchange for a permit to reimpound.

As rice fields are evaluated and prioritized for potential restoration, proceeding with actual work will require the commitment of the landowner to certain obligations and conditions. An applicant should be given further favorable consideration if the

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- Treed areas - 0.9 acres

SC DNR data showed SBF was a DO, ammonia and nitrate sink. Bathymetry maps exist for the field. There is fish data available for "Large Bonneau Ferry," the adjacent rice field. There is community production and plant diversity data for nearby Dean Hall field (pre- & post - redirection). There is sediment chemistry data for Dean Hall. By the time the project is underway, BOD and new DO data for SBF, Dean Hall and Mulberry should be available as well. There may also be applicable bird data from SCDNR (Yawkey, Bear Island, et al.).

<sup>24</sup> There is considerable feeling that, as the property is already owned by the state of South Carolina, a King's Grant proof of ownership will not be required. The absence of a King's Grant creates a presumptive ownership by the state.

landowner were willing to meet certain critically important requirements that would increase the probability of meeting the goals articulated in Chapter 1.<sup>25</sup>

After evaluating an application, the members of the Standing Technical Committee (see earlier recommendation) members would deliver a sum total score to the Chair of that committee. Sum total scores exceeding a certain clearly specified threshold would be endorsed by the Committee as a whole as candidates for reimpoundment while those that fall below the specified benchmark would not be endorsed. The permitting authorities would, presumably, be more favorable to permitting projects receiving such an endorsement.

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<sup>25</sup> Determine how active management of water flows in the system can slow the rate of vegetative succession;

- ❑ Assess the effects of impoundments on habitat for a variety of waterbirds;
- ❑ Verify the extent to which impoundments provide refuge for certain species, including endangered species;
- ❑ Explore strategies to control non-indigenous aquatic plants within impoundments or in open water systems;
- ❑ Assess the comparative (before and after) volume of the diversity and populations of benthic fauna relative to natural wetlands;
- ❑ Observe the migratory patterns of certain resident species and the patterns over their life cycles;
- ❑ Determine the effects of reimpounding on levels of dissolved oxygen;
- ❑ Assess the effects of reimpounding on the filtration capacity of open marsh;
- ❑ Evaluate the change in the export of nutrients that would normally occur from an open marsh; and
- ❑ Investigate whether innovative trunk design, planned bathymetry and water exchange practices that emphasize good connections with the river can improve water quality, fishery productivity and habitat diversity.

## The Berkeley Conservation District Standing Technical Committee Scorecard

The Berkeley Soil and Water Conservation District's Standing Technical Committee should develop an independent landowner "scorecard" to evaluate whether an inland or tidal reimpoundment project satisfies the requirements of:

1. Ownership
2. Overriding public interest as characterized by:
  - Impacts on submerged lands;
  - Blockage of navigable waterways;
  - Management Plan quality and other environmental criteria ;
  - Use of upland conservation easements; and
  - "Other Environmental Criteria" as necessary.

The Standing Technical Committee should adopt a conventional rating system along a numeric scale of one to five. Standing Committee members would independently rate the project along each of several specific criteria. At a minimum the criteria should question whether the project will:

- Interrupt the effects of accelerated rice field succession;
- Allow for periodic public access;
- Maintain and enhance diversity of habitats and wildlife;
- Maintain or improve DO levels of river;
- Protect property integrity of uplands through conservation easements on contiguous rice fields; and,
- Preserve the existence of rice fields as significant cultural structures to the river basin;

On balance, should any reimpoundment effort prove to have detrimental (instead of beneficial) environmental effects, the permitting agencies must preserve the right to alter elements of the project. They may specify actions to mitigate the adverse effects of reimpoundments at the end of any reimpoundment effort. Construction of the dike and the restoration of tidal exchange, if necessary, are expenses to be borne by the landowner. This does not, however, limit the ability for the landowner to leverage public monies through cost shares, grants and other sources to assist with the above costs. However, it should be clear that it is the landowner's responsibility to initiate the financial assistance process involving local, state and federal agencies.

Again, landowners must understand that these and any future developments for reimpounding rice fields are wholly limited to the Cooper River within the boundaries

of this study area and should solely be allowed through a process based on specific criteria.

### **Recommended Elements of a Rice Field Management Plan**

Before applying for a permit to reimpound a tidal rice field, landowners should consider developing a Management Plan which includes:

- A monitoring system designed to measure the efficacy of the reimpoundment in contributing to the objectives of the RIPPEC. Environmental monitoring prior to the reimpoundment and for a period after construction should be consistent to develop objective data;
- Meeting the litmus test of achieving an "over-riding public interest;"
- A written commitment to work with SC DHEC/OCRM and the US CoE to ultimately retrofit water-control structures or otherwise "mitigate" adverse impacts if reimpounding fails to provide the desired benefits within a three-year period. The cost of the mitigation should not exceed the cost of the dike. Seasonal impounding may be considered; and
- Public/private cost sharing mechanisms for structural mitigation.

A conservation easement may be offered on adjacent uplands after the three-year period has expired.

The Berkeley Conservation District's Standing Technical Committee may ultimately be an advocate for those landowners that meet a certain threshold. This information should be covered in depth in the "*Citizens' Guide to*

## Chapter 8 - Conclusion

The participants in this collaborative dialogue dedicated nearly 14 months to the creation of this meaningful plan. In that spirit, it is the sincere hope that those who were identified as critical to the implementation of the recommendations might adhere to the “flow” of future events as suggested below:

- All named entities should adopt the recommendations in this NRMP and take steps to implement its counsel as soon as practicable;
- The members of the RIPPEC should be named by December 31, 2004;
- DNR and the members of the RIPPEC should work to identify the elements and resources needed for a public/private partnership that could support the reimpounding of Small Bonneau Ferry rice field. Consideration should be given to resources that might be available from the Marine Fisheries Programs and also the SC Comprehensive Wildlife Conservation Strategy currently under development;
- SC DNR should immediately begin the process for acquiring a permit to reimpound Small Bonneau Ferry
- The members of the RIPPEC should work to formally define and endorse the metrics for evaluating the “success” of the pilot project.

Certainly the aforementioned is in no way stated so that these activities supercede all other recommendations in priority. The above is only mentioned so as to shine a bright light upon those activities that are on the critical path for the holistic implementation of this plan.

Finally:

### **Reconvening the Stakeholder Group**

Berkeley County should reconvene the stakeholder group for this NRMP during the 4<sup>th</sup> quarter of 2005 and annually thereafter.

This last recommendation is truly integral to achieving the letter and the spirit of this NRMP.

The participants in this process devoted enormous volumes of time and energy developing the words contained in this Plan. While those responsible for implementing the recommendations may do so with remarkable attentiveness to the “letter” of this NRMP, there is a “spirit” that goes along with it. The people responsible for developing this NRMP believe that the spirit is critically important. As such, they requested a formal gathering once each year to receive updates, answer questions of intent and ensure that the Plan is being implemented as it was conceived.

## Afterword

As the facilitator for the dialogue that produced this Natural Resource Management Plan, I was pleased to present and endorse this report to the Steering Committee of the Special Area Management Plan (SAMP).

“Facilitators” are the guardians of fair and open processes. We are neutral. We don’t provide the answers but rather create and maintain the environment for others to find their own solutions. In this role, I have seen firsthand the immense commitment and the high-quality of work offered by many of the participants in this process – and others affected by it. They have donated their time and energy and have put numerous priorities on hold as they embraced their charge with a surprising passion.

This “stakeholder” effort or “collaborative process” is a highly productive way of doing business on both local and statewide levels in South Carolina. It is based on the principle that government gets its best results when it brings the top minds from the most directly affected communities to bear on important policy issues.

The counsel contained in this report will contribute to the conservation and effective management of the Cooper River’s SAMP area as well as the development of a “Demonstration Project” which will collect highly valuable data for the future handling of the culturally and environmentally important rice fields of the Upper Cooper River. This Demonstration Project will seek to gain valuable scientific data that will help policymakers to evaluate the impact of reimpounding on wildlife habitat as well as water quality. In doing so, it will seek to determine if there is an overriding public interest that might be realized through the development of a broad based but prudently implemented reimpoundment policy. As such, future reimpoundment policy will be grounded in sound science, common sense, and an appreciation for the cause and effect relationships that exist at the nexus of environment and human impacts.

I applaud the stakeholders for their overall efforts and particularly the concessions they made relative to their own philosophical beliefs in order to reach agreement. I encourage all the citizens of Berkeley County and, more broadly, the state of South Carolina to do the same.

Adam R. Saslow  
President  
Consensus Solutions, Incorporated  
Atlanta, GA

November, 2004

## Appendix I – Catalogue of Recommendations

Page No.	Title of Recommendation	Task/Activity
22	<b>Berkeley Cooperative Greenspace Initiative</b>	The NRMP Stakeholder Group fully endorses the recommendations and substance of the Berkeley Cooperative Greenspace Initiative and encourages all government entities to implement the recommendations included with immediacy and efficiency.
23	<b>Growth I</b>	Local government entities should develop plans to foster low-impact economic growth, such as ecotourism, for the SAMP and surrounding region. These plans should be separate and distinct from industrial development efforts and should recognize the strengths, opportunities and impacts of growth.
23	<b>Growth II</b>	In order to foster balanced industrial/commercial growth and residential development, policymakers need to plan, predict and, where possible, reduce stormwater impacts so that assimilative capacity is optimized for strategic economic growth.
24	<b>Growth III</b>	Since the Cooper River Basin is considered “among the most sensitive and historic” parts of the Lowcountry and county economic planners do not foresee a need for additional industrial zoning designations above the “T” and below the Highway 52 crossing, Berkeley county government should adopt specific long-term policies that recommend no industrial growth above the “T.”
27	<b>Mercury Outreach and Education</b>	<p>The Medical University of South Carolina (MUSC) should enlist a team of cooperators that includes (but is not limited to) local health departments, SC DHEC, the SC Wildlife Federation, industrial landowners, local outdoor sporting clubs as well as churches and other community organizations. Efforts should be made to leverage work undertaken by a partnership currently being formed between SC DNR and SC DHEC’s Outreach and Education Section. The participants, led by MUSC, should develop a special mercury education program, locally focused and targeted for subsistence fishermen. Based on existing information obtained through monitoring data, permitting processes and other sources, this group should develop an outreach campaign that provides for multiple forms of communication including one-on-one interaction, signage and broadcast media for communicating fish consumption advisories to targeted populations.</p> <p>Additional research should be formally requested of US EPA and the Quicksilver Caucus. The research effort should identify and evaluate potential local sources of mercury and provide more data on mercury levels in local fish. Beyond understanding the sources and source chain, these two parties should sponsor research that identifies the movement of mercury in the local ecosystem.</p>

Page No.	Title of Recommendation	Task/Activity
28	<b>Fecal Coliform and Septic Systems</b>	<p>Fecal coliform within the SAMP area (specifically Turkey Creek – East Branch and Wadboo Creek) may originate from a variety of sources. Differentiation of the bacteria sources is advisable for optimal targeting of BMPs. A special study for source identification should be conducted using antibiotic resistance, bacterial DNA typing techniques or other such technologies as they are perfected.</p> <ul style="list-style-type: none"> <li>• OCRM should develop a proposal for source typing of fecal coliform;</li> <li>• Monitoring should occur at various locations within the watershed;</li> <li>• State, federal and local funding sources should be sought in order to accomplish the goals of the aforementioned. A final report should be made available to state, local and federal agencies with interests in the area;</li> <li>• If fecal coliform is derived from animal origins, strategies for containment should be developed by SC DHEC/OCRM as appropriate;</li> <li>• If human sources are identified, SC DHEC should establish a septic tank maintenance education program: <ul style="list-style-type: none"> <li>○ Perform homeowner survey of residents in selected 14 digit watersheds. This survey will be designed to determine the frequency of septic tank pump-outs and septic tank failures. Use statistical processes to extrapolate habits of the larger population;</li> <li>○ Record newly installed septic systems within the SC DHEC Geographic Information System (GIS); and</li> <li>○ Based on results of surveys and source identification studies, form a partnership of interested organizations such as the Berkeley Conservation District, SC DHEC/OCRM and Sea Grant Consortium to apply for a grant to conduct a maintenance education program. Include in the grant some cost share funds to allow voluntary septic upgrades.</li> </ul> </li> </ul>
29	<b>Tradable UOD Permit</b>	<p>The BCD COG, with support from SC DHEC/BoW and US EPA should evaluate an effluent tradable permits program as a tool for guiding permitted discharges into the Cooper River.</p> <p>This program may ultimately be expanded to include other parameters and pollutants of concern as appropriate.</p>
31	<b>Reductions in NPS Loading</b>	<p>SC DHEC should identify existing cases of untreated stormwater runoff within the watershed (ie., the 14 digit HUC including tributaries flowing into the SAMP area and including Monck's Corner presented in Appendix X.). In order to enhance water quality and optimize biological productivity, significant cases of non-point source pollutant</p>

Page No.	Title of Recommendation	Task/Activity
		loading should be reduced. Where significant inputs of sediment, nutrients, organic matter or toxic substances are found, SC DHEC should work with local government entities to implement a system for removal of pollutants of concern before water reaches the river.
32	<b>Best Management Practices</b>	<p><b>Low Impact Development Forum Series</b>  OCRMs should partner with the Homebuilders of South Carolina to sponsor periodic low impact development practices forums geared toward developers, builders, local government and regulators. Participants would present the various possibilities for alternative building site techniques that have lowered impacts to water quality. Information presented should be posted on the SC DHEC/OCRM website and promoted accordingly.</p> <p><b>Targeted BMPs</b>  Various voluntary and regulatory best management practices (BMPs) and programs should be employed to prevent water quality problems from occurring including:</p> <p><u>Institutional Stormwater Programs</u></p> <ul style="list-style-type: none"> <li>Local governments should form a close partnership with SC DHEC/OCRM to avoid duplication and, at the same time, ensure close monitoring of design, execution and enforcement of regulated sediment and erosion control measures. This may include an application by the county/city for delegation of inspection and enforcement authority;</li> <li>Berkeley County should periodically review local stormwater related ordinances and amend them as necessary to enhance water quality protections. Where new BMPs conflict with development codes unnecessarily, codes should be amended to accommodate them; and</li> <li>OCRM should provide incentives (e.g., subsidized training, expedited permitting or reduced permit fees) for area construction contractors who complete NRCS or similar sediment and erosion control certification programs.</li> </ul> <p><u>Local BMPs</u></p> <ul style="list-style-type: none"> <li>As above, contractors should be encouraged to explore innovative site-specific water quality BMPs (e.g., wetlands and water quality inlets for specific sites especially those near sensitive areas such as perennial streams, old rice fields and tidal inlets);</li> <li>As appropriate, the Town of Moncks Corner and Berkeley County should work with developers to investigate the feasibility and efficacy of cooperative stormwater detention facilities to treat impervious surface runoff that drain to Cooper River tributaries. Ideally, these may incorporate vegetative treatment and aesthetic enhancements;</li> </ul>

Page No.	Title of Recommendation	Task/Activity
		<ul style="list-style-type: none"> <li>• OCRM should use existing guidance materials to develop a tailored BMP manual for use by engineers, government staff and developers that provides specific design guidance with emphasis on preventive low impact methods; and</li> <li>• Where appropriate, methods such as riparian buffers, wetlands filtration and filter strips should be incorporated in the removal system.</li> </ul>
34	<b>Invasive Species</b>	<p>SC DNR should continue efforts to control non-native invasive aquatic vegetation and fauna including researching new control methodologies and the prevention of the introduction of new species.</p> <p>Within the SAMP designation, the SC Aquatic Plant Management Council should prioritize control efforts along the Upper Cooper River Corridor and associated rice fields and direct SC DNR in their efforts to control these species.</p>
36	<b>Research Agenda</b>	<p>Through the SAMP process, stakeholders identified several research needs that should be considered both independently and to the extent possible, in a rice field reimpoundment pilot project:</p> <ul style="list-style-type: none"> <li>• Developing and implementing a comprehensive hydrologic and water quality assessment and bioenergetics simulation model;</li> <li>• Inventory of significant organisms in impounded former rice fields versus unimpounded former rice fields (in the SAMP area);</li> <li>• The presence of commercial and recreational species present in the rice fields;</li> <li>• The importance of base food supply species (macro- and micro-invertebrates) in the rice fields;</li> <li>• The most important predator-prey relationships between indigenous aquatic species;</li> <li>• The factors influencing movement between former rice fields and the Cooper River for important groups of organisms;</li> <li>• The existence of invasive species (flora and fauna) in the former rice fields;</li> <li>• The effects these organisms are having on biogeochemical, community, and ecosystem functions;</li> <li>• The projected effects if expansion of invasive species continues;</li> <li>• Management options that exist to control or prevent expansion of invasive species;</li> <li>• High-altitude aerial photos and satellite imagery to inventory the existing riparian zones; and</li> <li>• GIS maps of conserved areas and areas where riparian zones are most threatened.</li> </ul>

Page No.	Title of Recommendation	Task/Activity
		<p>Additionally, “seasonal reimpoundments” should be evaluated as a tool for interrupting the pace of successional evolution on an independent research track.</p>
40	<p><b>Local Government Involvement</b></p>	<p>Local government entities should include options for conserving wildlife habitat in their land development approval process.</p> <p>SC DNR should help evaluate the Berkeley County Greenspace plan and work collaboratively with the County and the Town of Moncks Corner to identify critical habitats, unprotected core areas and corridors, and systematically prioritize them for conservation. Protection of intact freshwater wetland systems with appropriate upland buffers should be considered a primary overarching objective in protection of wildlife habitat.</p> <p>For each designated area, a local entity should accept stewardship for the care of the area in keeping with a prescribed set of objectives for habitat management. Responsible entities may be landowners, land trusts or government entities and will vary on each parcel of land. The Town and the County should identify incentives for parties to manage these properties in keeping with these objectives.</p>
41	<p><b>Increase Protected Acreage and Maintain the Diversity of Upland and Aquatic Habitats in the SAMP Area</b></p>	<p>Berkeley County should work with SC DHEC/OCRM and the local land trusts and others to acquire the resources needed to hire an individual to further the following goals:</p> <ul style="list-style-type: none"> <li>• Complete an inventory of properties that are especially desirable for long-term protection;</li> <li>• Educate landowners about available cost sharing programs and other economic incentives designed to enhance and protect quality habitat. Education efforts might include mailing information, making personal contacts and organizing workshops;</li> <li>• Plan for when cost sharing is not available and encourage voluntary land conservation and habitat enhancement activities. This would be accomplished by educating landowners of their options and the benefits of such activities;</li> <li>• Identify areas suitable for wetland mitigation banking and facilitate conversations between landowners and the Mitigation Bank Review Team;</li> <li>• Work closely with the Berkeley Conservation District and other government agencies to accomplish all of the named tasks; and</li> <li>• Assist landowners in acquiring conservation easements on desirable properties.</li> </ul>
45	<p><b>Management of the Rice Fields System</b></p>	<p>The rice fields on the Upper Cooper River should be viewed as a unified landscape rather than as individual fields. A principle objective for this systematic approach should be the maximization of</p>

Page No.	Title of Recommendation	Task/Activity
		<p>beneficial water quality (including indigenous flora and fauna) within the rice fields and the interactions between the upland, inland and tidal fields and the downstream river system.</p> <p>The Berkeley Conservation District should convene a Standing Technical Committee that will address rice field policy and planning for the Upper Cooper River. The composition of this group should be drawn in large part or entirely from the stakeholder and resource groups responsible for this NRMP. All relevant public and academic sources should provide ex officio resource support. This multi-stakeholder group will meet annually or as needed, review the most current science and make policy recommendations to SC DHEC/OCRM, the US Army Corps of Engineers, SC DNR and Berkeley County.</p> <p>This committee would be asked to incorporate the most current science into public policy as it is developed. They might also accept additional “charges” that the County Council finds relevant to the river system. The committee would provide an annual report to the County Council that would catalogue the newest available information and how it might be used in local policy.</p>
46	<p><b>Impoundment Types and Creating a Regulatory Regime That Respects the Distinctions</b></p>	<p>OCRM should immediately convene a regulator’s summit designed to develop a classification scheme for addressing the permitting process. The summit’s output would be a classification scheme that clearly labels the various types of impoundments, the NRCS guidance and other requirements that must be fulfilled to reimpond.</p> <p>Participants must include USDA’s NRCS, US CoE, US FWS, NMFS, US EPA, SC DNR and SC DHEC. Permitting requirements for the active management of inland and tidal fields and/or more generic wetlands can then be tailored to the unique type so that landowners can easily determine requirements and limitations for these properties.</p>
46	<p><b>Managing Greentree Reservoirs</b></p>	<p>OCRM should continue the aforementioned regulator’s summit for the purposes of developing a General Permit (GP) or expedited process for actively managing GreenTree Reservoirs within the SAMP area. This GP or any identified process should utilize the “Interagency Guidance Concerning the Authorization, Siting, Construction and Management of Greentree Reservoirs” (dateline 1997) as the point of departure. During the course of this process, this group should further refine or enhance this document to provide for new understandings and better science. This guidance might be developed in such a way as to use Best Management Practices rather than more prescriptive requirements that might need to be better adapted over time.</p>
56	<p><b>Citizens Guide to Impoundment Policy</b></p>	<p>As an outcome and product, summit regulators should develop, print and disseminate a “Citizens Guide to Rice field Policy” to landowners. This Guide should also appear on the SC DHEC website.</p>

Page No.	Title of Recommendation	Task/Activity
47	<b>Rice Impoundment Research</b>	<p>A university should conduct a separate and voluntary research project in a breached rice field. The goal would be to determine if it is possible and practical to significantly increase DO, decrease siltation, and increase biological productivity <u>in open rice fields</u> by physical modifications to the field. Such a study would be conducted <u>in a single (or more) rice field(s)</u> and would include:</p> <ul style="list-style-type: none"> <li>• Measurements of DO, siltation rate, and some index of biological productivity at various locations in the field prior to modifications;</li> <li>• Hydrological study of water movement patterns within the field;</li> <li>• Modifications, such as additional breaches in the dike or ditching within the field, to achieve more favorable water movement; and</li> <li>• Post-modification measurements of DO, siltation rates and biological productivity.</li> </ul>
49	<b>A Demonstration Project</b>	<p>OCRM should convene a Reimpoundment Pilot Project Evaluation Committee (the "RIPPEC") comprising permitting authorities from SC DHEC/OCRM, SC DNR, SC DHEC, US CoE, NMFS and USFWS as well as a member of the research community. Non-voting ex officio membership may be drawn from affected interests. The RIPPEC should convene no later than December 31, 2004. This seven member Committee should refine and, if deemed potentially "permissible," ultimately promote the Demonstration Project briefly described below. This group must also develop a communications plan for broadcasting the results of a demonstration project to the public and private landowning communities.</p> <p>By June 30, 2005, the RIPPEC should promote a project which:</p> <ul style="list-style-type: none"> <li>• Gains water level control so that draining and re-contouring is possible;</li> <li>• Re-contours portions of the field so that SAV habitat has sufficient critical mass to support fish production and also produce sufficient volumes of dissolved oxygen and other water quality benefits. SAV is the fastest disappearing community type on the Cooper and the rarest type statewide, found as a dominant cover type on other river systems only on impoundments; and</li> <li>• Uses an improved water control structure (the Citadel has expressed an interest in completing this work) that exchanges, as feasible, a significant amount of water on each tidal cycle, allows flora and fauna as well as fish passage and retains enough water to support the SAV community.</li> </ul> <p>At a minimum, the RIPPEC should develop a "study plan" that allows data to be collected in accordance with the goals articulated in Chapter 1 and provides for monitoring the impacts against those</p>

Page No.	Title of Recommendation	Task/Activity
		predetermined criteria.
50	<b>Selection of a Site and Administrative Responsibilities</b>	The participants in this process view Small Bonneau Ferry (“SBF”) as the most promising site for a Demonstration Project. The RIPPEC would become the body responsible for ensuring that the Demonstration Project was completed according to predetermined guidelines and the design of the Demonstration Project. SC DNR should complete the application so the Demonstration Project can move forward. Should SC DNR choose not to pursue this Demonstration Project, the owners of Mulberry Plantation should be contacted to gauge interest in pursuing the reimpoundment of a rice field.
52	<b>The Berkeley Conservation District Standing Technical Committee Scorecard</b>	<p>The Berkeley Soil and Water Conservation District’s Standing Technical Committee should develop an independent “scorecard” for the landowner to evaluate whether an inland or tidal reimpoundment project satisfies the requirements of:</p> <ol style="list-style-type: none"> <li>1. Ownership</li> <li>2. Overriding public interest as characterized by: <ul style="list-style-type: none"> <li>• Impacts on submerged lands;</li> <li>• Blockage of navigable waterways;</li> <li>• Management Plan quality and other environmental criteria ;</li> <li>• Use of upland conservation easements; and</li> <li>• “Other Environmental Criteria” as necessary.</li> </ul> </li> </ol> <p>The Standing Technical Committee should adopt a conventional rating system along a numeric scale of one to five. Standing Committee members would independently rate the project along each of several specific criteria. At a minimum the criteria should question whether the project will:</p> <ul style="list-style-type: none"> <li>○ Interrupt the effects of accelerated rice field succession;</li> <li>○ Allow for periodic public access;</li> <li>○ Maintain and enhance diversity of habitats and wildlife;</li> <li>○ Maintain or improve DO levels of river;</li> <li>○ Protect property integrity of uplands through conservation easements on contiguous rice fields; and,</li> <li>○ Preserve the existence of rice fields as significant cultural structures to the river basin;</li> </ul> <p>If the Berkeley Conservation District Standing Technical Committee determines there is a need for a simpler scorecard for inland rice fields and other non-tidal freshwater wetland systems, it should be adapted accordingly.</p>
53	<b>Recommended Elements of a Rice Field Management Plan</b>	Before applying for a permit to reimpound a tidal rice field, landowners should consider developing a Management Plan which includes:

Page No.	Title of Recommendation	Task/Activity
		<ul style="list-style-type: none"> <li>• A monitoring system designed to measure the efficacy of the reimpoundment in contributing to the objectives of the RIPPEC. Environmental monitoring prior to the reimpoundment and for a period after construction should be consistent to develop objective data;</li> <li>• Meeting the litmus test of achieving an “over-riding public interest;”</li> <li>• A written commitment to work with SC DHEC/OCRM and the US CoE to ultimately retrofit water-control structures or otherwise “mitigate” adverse impacts if reimpounding fails to provide the desired benefits within a three-year period. The cost of the mitigation should not exceed the cost of the dike. Seasonal impounding may be considered; and</li> <li>• Public/private cost sharing mechanisms for structural mitigation.</li> </ul> <p>A conservation easement may be offered on adjacent uplands after the three-year period has expired.</p> <p>The Berkeley Conservation District’s Standing Technical Committee may ultimately be an advocate for those landowners that meet a certain threshold. This information should be covered in depth in the “Citizens’ Guide to Reimpounding.”</p>
54	<b>Reconvening the Stakeholder Group</b>	Berkeley County should reconvene the stakeholder group for this NRMP during the 4 <sup>th</sup> quarter of 2005 and annually thereafter.

## Appendix II - Glossary of Acronyms and Key Phrases

TERM	DEFINITION
303(d) water	A monitored water body that is impaired, all water quality standards not met.
Anti-degradation Regulations	Regulations that are designed to protect existing water quality and provide a method of assessing activities so that no degradation of water quality can occur
Basin	A region drained by one single river system; a large watershed (see below)
BCD COG	Berkeley-Charleston-Dorchester Council of Governments
Best Management Practice	Methods, measures or practices determined to be a reasonable and cost effective means to reduce NPS pollutants.
BOD	Biochemical Oxygen Demand: the unit of O <sub>2</sub> consumed by bacteria and other micro-organisms under aerobic conditions
cfs	Cubic feet per second (a water quantity measure)
Channelization	The process of taking a stream from its natural meandering state to a straight and direct flowing route
Combined Sewer Overflow (“CSO”)	Discharge of a mixture of stormwater and domestic wastewater when the flow capacity of a sewer system is exceeded during storm events
Core Areas	Areas containing high densities of priority habitats for conservation, management and protection.
CZARA	Coastal Zone Act Re-authorization Amendments
Degradation	The process when pollutants enter a waterbody causing contravention of water quality standards
Delivery System	The means of getting information out to appropriate stakeholders
Designated Use	Those uses specified in water quality standards for each waterbody or segment whether or not they are being attained
Diadromous Fish	Fish that live in the ocean and return to freshwater to spawn
Ecosystem	A biotic community and its abiotic environment
Eco-tourism	Purposeful travel to natural areas to understand the culture and natural history of the environment, taking care not to alter the integrity of the ecosystem while producing economic opportunities that make the conservation of natural resources beneficial to local people.
EQIP	Environmental Quality Incentives Program administered by the Natural Resource Conservation Service
Environmentally Sensitive Area	An area that, based on its location or special ecology, has the increased possibility of being harmed by pollutants
Eutrophication	A condition in which excessive nutrients cause an overgrowth of vegetation that can cause low dissolved oxygen when the plant material decomposes.
Excursion	A water quality sample result that does not meet water quality standards
Extension Service	The nationwide network of Extension programs began in 1914 as a means of presenting land-grant university research in understandable and useful ways to farmers and rural families. Today, Extension serves both urban and rural areas.
Fee Waiver	Elimination or reduction of a permitting fee
FLV	Floating Leaf Vegetation



<b>GIS</b>	Geographic Information System
<b>Hydrological Boundary</b>	Watershed divisions
<b>Impaired (Waterbody)</b>	Water quality limited waters (any segment where it is known that water quality does not meet certain applicable water quality standards).
<b>Industry</b>	As referenced here, this references large commercial facilities that trigger the need for "Heavy Industry" (HI) zoning approval in Berkeley County
<b>Infrastructure</b>	Transportation systems, public water supplies and water treatment systems.
<b>Invasive Species</b>	Non-native plant or animal species
<b>ITEM</b>	Intertidal Emergent Vegetation (e.g.,)
<b>Land Disturbance</b>	Construction activities such as grubbing, excavation and grading. This does not include agricultural production.
<b>LUST</b>	Leaking Underground Storage Tank
<b>Monitoring</b>	For purposes of the NRMP - water quality data collection by the EPA and the state agencies of South Carolina as well as other designates.
<b>MS4</b>	Municipal Separate Storm Sewer System
<b>Navigable Waters</b>	Defined as all streams which have been rendered or can be rendered capable of being navigated by rafts of lumber or timber by the removal of accidental obstructions and all navigable watercourses and cuts.
<b>Nine Minimum Elements</b>	Criteria developed by USEPA to support Section 319 watershed-based planning
<b>No-discharge System</b>	Treatment process which does not release effluent directly to a water of the state
<b>NOAA</b>	U.S. Department of Commerce – National Oceanic and Atmospheric Administration
<b>NPDES</b>	National Pollutant Discharge Elimination System
<b>NPS</b>	Nonpoint Source Pollution
<b>NRCS</b>	Natural Resource Conservation Service
<b>Nonpoint Source Pollution</b>	Runoff occurring after a rain event moves the pollutants across the land to the nearest waterbody or storm drain where they may impact the water quality in creeks, rivers, lakes, estuaries or wetlands. NPS pollution may also impact groundwater when it is allowed to seep or percolate into aquifers.
<b>Nonpoint Source Pollution Control</b>	Cultural and structural best management practices installed to reduce or eliminate nonpoint source pollution (see BMP).
<b>Numeric Limits</b>	Considers the magnitude, duration and frequency of exposure to specific pollutants. Acute or Chronic. Concentration of chemicals.
<b>Outstanding (National) Resource Waters</b>	A surface waterbody or waterbody segment that is of exceptional ecological or recreational significance, must be approved by regulation by the SC General Assembly.
<b>Pervious</b>	Permeable material, such as a grass, soil, sand, etc.
<b>Phase 1 and Phase II Permitting</b>	Clean Water Act Amendments of 1987 established the NPDES Stormwater Program. The Act called for implementation in two phases measures designed to reduce, to the maximum extent practicable, the pollutants that are discharged from town and city storm sewers.
<b>Point Source</b>	A source of water effluent coming from an easily identified opening, such as a discharge pipe
<b>PPT</b>	Parts per thousand <sup>81</sup>



<b>Purchase Of Development Right</b>	The acquisition of property development rights through voluntary sale by the landowner to a government agency or land trust. The government agency or land trust acquiring development rights typically restricts future uses of the land to farming or open space.
<b>Quicksilver Caucus</b>	The Quicksilver Caucus was formed in May 2001 by a coalition of state environmental association leaders to collaboratively develop holistic approaches for reducing mercury in the environment.
<b>RIPPEC</b>	Reimpoundment Pilot Program Evaluation Committee
<b>SAMP</b>	Special Area Management Plan
<b>SAV</b>	Submerged Aquatic Vegetation (e.g., )
<b>SC DHEC</b>	South Carolina Department of Health and Environmental Control
<b>SC DHEC/OCRM</b>	South Carolina Department of Health and Environmental Control/Ocean and Coastal Resource Management
<b>SC DNR</b>	South Carolina Department of Natural Resources
<b>SC DOT</b>	South Carolina Department of Transportation
<b>Section 303(d) List</b>	A list of impaired waters prepared by the EPA to fulfill the requirements set forth in Section 303(d) of the Clean Water Act and the Water Quality Planning and Management regulation at 40 CFR Part 130. Section 303(d) of the Clean Water Act requires states to identify water quality limited waters, establish a priority ranking for such waters, and target watersheds for the development of Total Maximum Daily Loads (TMDLs).
<b>Section 319</b>	Section 319 of the federal Clean Water Act required that the State Water Quality Management Planning Agency develop a State Assessment report and a State Management Program report to identify type and location of nonpoint source pollution impairing designated uses of state lakes, rivers and groundwater resources, as well as to describe statewide program efforts towards the reduction of nonpoint source pollution. Under Section 319, the EPA receives federal funds to implement nonpoint source pollution control projects in cooperation with local units of government and other organizations
<b>Small Package Treatment Plant</b>	Describes an aerobic wastewater treatment unit serving multiple dwellings or an educational, health care or other large facility
<b>SMZ</b>	Streamside Management Zone – 40 feet from the water’s edge. Land and vegetated areas next to lakes and streams where management practices are modified to protect water quality.
<b>Soil And Water Conservation District (SWCD)</b>	Local units of government established in 1937 under the South Carolina Soil and Water Conservation District Act. The Act gives SWCDs the responsibility of providing technical information to individuals and groups on methods of soil and water conservation and provides natural resource inventory information on properties slated for zoning changes.
<b>Source Water</b>	Source water includes groundwater, lakes, rivers and streams that serve as sources of drinking water for local communities.
<b>Sources</b>	Categories of potential sources as known or suspected activities, facilities or conditions that may be contributing to impairment of designated uses.
<b>SRF</b>	State Revolving Funds
<b>Stakeholder</b>	Those individuals or entities that are most affected by policy decisions.



<b>State Revolving Fund</b>	The federal Clean Water State Revolving Fund (CWSRF) provides funding to states to finance water quality protection projects for wastewater treatment, nonpoint source pollution control and watershed and estuary management through the issuance of low-interest loans.
<b>Stormwater Management</b>	The best practical and economically achievable measures to control the addition of pollutants to waterbodies through the application of nonpoint pollution control practices for stormwater runoff
<b>Stream Segments</b>	A linear section of a stream identified by the EPA for the purposes of reporting water quality data specific to that section.
<b>Sub-Watersheds</b>	A defined land area within a watershed drained by a river, stream or drainage way, or system of connecting rivers, streams, or drainage ways such that all surface water within the area flows through a specific point.
<b>TMDL</b>	Total Maximum Daily Load-For impaired waters, it is a calculation of the amount of pollutants a waterbody can receive and meet standards. It includes an amount of pollution that needs to be reduced.
<b>Trading Scheme</b>	Trading programs allow facilities facing higher pollution control costs to meet their regulatory obligations by purchasing environmentally equivalent (or superior) pollution reductions from another source at lower cost, thus achieving the same water quality improvement at lower overall cost.
<b>Urban Runoff</b>	Stormwater from city streets and gutters that usually contains a great deal of litter, nutrients, metals, hydrocarbons, bacteria, and sediment.
<b>Urbanization</b>	The process by which rural areas and open space are converted into more intensely developed land uses with an associated increase in human population, roads, buildings, parking lots and related infrastructure. The conversion of natural ground cover to paved and other impervious surfaces generally decreases infiltration and increases the volume and rate of runoff, providing a larger capacity to transport pollutants.
<b>US CoE</b>	United States (Army) Corps of Engineers
<b>USEPA</b>	United States Environmental Protection Agency
<b>US FWS</b>	United States Fish and Wildlife Service
<b>UOD</b>	Ultimate oxygen demand. A calculation of the total amount of oxygen that a load of BOD will consume when discharged to a waterbody.
<b>Use Support Assessment</b>	A use support assessment is an evaluation to determine the degree to which a waterbody supports its designated uses (fish and aquatic wildlife, fish consumption, swimming and drinking water supply). This determination is made through an analysis of all available data including biological, physical/chemical, habitat and toxicity.
<b>Wastewater</b>	Water that has been used in homes, industries and businesses that is not for reuse unless it is treated and assimilated.
<b>Waterbody</b>	Any river, stream, lake, reservoir, estuary or wetland.
<b>Water Quality</b>	The biological, chemical and physical conditions of a waterbody, often measured by its ability to support aquatic life or public health.
<b>Watershed</b>	The geographic region within which water drains into a particular river, stream or waterbody. Watershed boundaries are defined and separated by topographic ridges.
<b>Watershed Approach</b>	An integrated, holistic process to protect, enhance and restore the physical, chemical and biological integrity of a water resource within a defined hydrologic area.
<b>Watershed Plan</b>	A document that identifies all of the water resources, identifies the sources and causes of pollution, and specifies the implementation strategies for the protection and restoration of the water resources within the specific watershed.



<b>Watershed Planning</b>	A process to identify all of the water resources, identify the sources and causes of pollution, and specify the implementation strategies for the protection and restoration of the water resources within the specific watershed.
<b>Waters of the United States</b>	Waters of the United States includes essentially all surface waters such as all navigable waters and their tributaries, all interstate waters and their tributaries, all wetlands adjacent to these waters, and all impoundments of these waters.
<b>Wildlife</b>	Embraces all species of upland and aquatic fauna: including mammals, birds, fish, and invertebrates, inhabiting the study area.
<b>Wildlife Habitat Incentives Program And Wetlands Reserve Program</b>	This cost share program is administered by NRCS in consultation with the US Fish and Wildlife Service and other federal agencies to restore and protect wetlands through permanent easements, 30-year easements, and restoration agreements. Based on a certified land appraisal, the NRCS offers the landowner a payment for an easement and the landowner then files the easement and restores the wetland. NRCS reimburses the landowner for part of the restoration cost, depending on the type of easement.

## Appendix III – Participants in the Development of this NRMP

LAST NAME	FIRST	TITLE	ORGANIZATION	ATTENDANCE						
				Oct	Nov	Dec	Jan	Feb	Mar	Apr
Saslow	Adam R.	President	Consensus Solutions, Incorporated	√	√	√	√	√	√	√
Shrewsbury	Candice	Analyst	Consensus Solutions, Incorporated							
Ayers	Jason		US Fish & Wildlife Service	√	√	√	√		√	√
Bolton	John	Town Planner	Town of Moncks Corner		√	√	√	√	√	√
Bourgeois	Liz	Forester	MeadWestvaco					√	√	√
Brack	Andy	Past president	SC Wildlife Federation		√	√	√	√		√
Brownell	Prescott		NOAA/National Marine Fisheries Service Southeast Regional Office			√		√		
Chandler	Jimmy		SC Environmental Law Project	√		√	√		√	√
Crymes	William		Saltpoint Plantation				√		√	√
Dulude	John		Santee Cooper	√	√	√	√		√	
Evans	Tommy		Whitehall Plantation	√	√		√		√	
Glover	Charlie		Glover & Associates		√	√	√	√	√	√
Healy	Marty	Environmental Manager	Lanxess Corporation		√	√	√	√	√	√
Jurs	Barry	Director	Berkeley County Department of Farm and Land Services	√	√	√	√	√	√	√
Kennedy	Al	Economic Development Project Mgr.	Berkeley County		√	√	√	√		
Kline	Francis	Abbott	Mepkin Abbey	√				√		
Krull	Erv		Dupont		√	√				√
Mangum	Dwayne		USDA-NRCS	√	√	√			√	√
Mead	Bobby		Wappaoolah Plantation	√	√	√	√		√	√
Miller	Andy	Watershed Manager-Saluda/Santee	SC DHEC (Bureau of Water)		√	√		√	√	
Moore	Steve		SC DHEC/OCRM	√		√	√	√	√	
Pendley	Steve	Development Consultant	Pendley Homes	√	√	√	√	√	√	√
Scarborough	John	Economic Development Director	Berkeley County	√	√	√	√		√	√
Shirey	Alan	Lead Environmental Engineer	US Army Corp of Engineers			√	√	√	√	√
Sims	Ray	Environmental Manager	Nucor Steel-Berkeley		√		√			
Thomas	Tony	President	Carolina Land & Timber	√	√		√	√	√	√
Warner	Gene	Site Manager - Environmental Health	SC DHEC		√	√	√	√		√
White	Miller		Dept. of Natural Resources	√	√	√	√	√	√	√

LAST NAME	FIRST	TITLE	ORGANIZATION	ATTENDANCE						
				May	June	July	Aug	Sept	Oct	Nov
Saslow	Adam R.	President	Consensus Solutions, Incorporated	√	√	√	√	√	√	√
Shrewsbury	Candice	Analyst	Consensus Solutions, Incorporated		√	√	√		√	√
Ayers	Jason		US Fish & Wildlife Service	√	√	√	√	√	√	√
Bolton	John	Town Planner	Town of Moncks Corner	√	√				√	
Bourgeois	Liz	Forester	MeadWestvaco	√	√			√	√	√
Brack	Andy	President	SC Wildlife Federation	√	√	√		√	√	√
Brownell	Prescott		NOAA/National Marine Fisheries Service Southeast Regional Office	√	√					√
Chandler	Jimmy		SC Environmental Law Project	√	√					
Crymes	William		Saltpoint Plantation	√	√	√	√	√	√	√
Driggers	Ken	Executive Director	Palmetto Conservation Foundation							
Dulude	John		Santee Cooper				√	√	√	√
Evans	Tommy		Whitehall Plantation	√					√	
Glover	Charlie		Glover & Associates	√	√	√	√	√	√	√
Healy	Marty	Environmental Manager	Lanxess Corporation	√	√	√	√	√	√	√
Jurs	Barry	Director	Department of Berkeley County Farm and Land Services	√	√	√	√	√	√	√
Kennedy	Al	Economic Development Project Mgr.	Berkeley County	√	√	√	√	√	√	√
Kline	Francis	Abbott	Mepkin Abbey							
Krull	Erv		Dupont	√	√	√	√	√		√
Mangum	Dwayne		USDA-NRCS						√	
Mead	Bobby		Wappaolah Plantation	√	√	√	√	√	√	
Miller	Andy	Watershed Manager-Saluda/Santee	SC DHEC (Bureau of Water)	√	√	√	√	√	√	√
Moore	Steve		SC DHEC/OCRM	√	√	√	√	√	√	√
Pendley	Steve	Development Consultant	Pendley Homes	√	√		√	√	√	
Scarborough	John	Economic Development Director	Berkeley County							
Shirey	Alan	Lead Environmental Engineer	US Army Corp of Engineers	√	√	√	√		√	
Sims	Ray	Environmental Manager	Nucor Steel-Berkeley	√					√	
Thomas	Tony	President	Carolina Land & Timber	√	√	√	√	√	√	√
Warner	Gene	Site Manager - Environmental Health	SC DHEC	√	√	√		√	√	√
White	Miller		SC Dept. of Natural Resources	√	√	√		√	√	√

## *Compendium of Bios*

### **Jason T. Ayers**

#### *Wildlife Biologist – U.S. Fish & Wildlife Service*

Graduated from Clemson University in 1996 with a Bachelors Degree in Wildlife Biology and the University of Georgia in 1999 with a Masters Degree in Wildlife Management. Thesis was entitled "Pothole Blasting in Tidal, Freshwater Wetlands (abandoned ricefields) to Enhance Waterfowl and Waterbird Habitat." While working towards my Masters Degree, I was employed as a manager on a private plantation along the Pee Dee River in Georgetown County. I have been with the U.S. Fish & Wildlife Service in Charleston for approximately 4 years. Responsibilities include reviewing wetland permit applications, providing technical and financial assistance to private landowners for wildlife enhancement projects, and evaluating activities that involve red-cockaded woodpeckers on private lands.

Along the upper Cooper River, I have worked with both governmental organizations and the private sector on a variety of wildlife and wetland related projects. Over the years, I have also had the opportunity to experience many memorable hunting, fishing, and boating excursions along this section of the Cooper River and surrounding environs.

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Charleston, SC 29407  
(843) 727-4707 x 14 □ (843) 727-4218  
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### **John Bolton**

#### *Town Planner – Town of Moncks's Corner*

[Town of Moncks Corner](#)  
[118 Carolina Avenue](#)  
[Moncks Corner, SC 29461](#)  
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[jboltonmc@homexpressway.net](mailto:jboltonmc@homexpressway.net)

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## Elizabeth (Liz) T. Bourgeois

### *Self-Employed Copy-Editor/Technical Writer*

#### **Education**

B. S. – Forest Resource Management – Virginia Tech

M.S. – Forest Biology – Virginia Tech

#### **Membership**

Society of American Foresters

Certified Forester

SC Registered Forester

#### **Experience on the Cooper or with Natural Resource Planning**

Experience as a forester with MeadWestvaco in water quality monitoring and ecosystem-based forestry.

#### **Community Activities**

- ☑ Dorchester County Library Board of Trustees (1999-2001)
- ☑ Rotary International Group Study Exchange Team Member to Lyon, France (May 2001)
- ☑ HOSTS (Help One Student to Succeed) for Summerville Elementary School (2001-2002, 2002-2003, 2003-2004)

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Summerville, SC 29485  
843.873.4823

[ETBourgeois@yahoo.com](mailto:ETBourgeois@yahoo.com)

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## Andrew C. Brack

*Past President – South Carolina Wildlife Federation (<http://www.scwf.org>)*

*Board Member – National Wildlife Federation*

#### **Career Summary**

Andy Brack, a graduate of Duke University and the University of North Carolina, is a communications strategist. He is editor and publisher of a daily news service called SC Clips (<http://www.scclips.com>) and of a weekly legislative forecast called S.C. Statehouse Report (<http://www.statehousereport.com>). Brack also works on long-term information technology projects for government and non-profit clients. In 2001, he served on the Southern

Governors Association's Research and Development Advisory Committee. He and his family live in Charleston. More information: <http://www.brack.net>

### **Cooper River experience**

Brack has a longtime association with Middleburg Plantation, a historic plantation along the Cooper River. He also is a partner in a growth planning consortium known as the Growth Driver Network (<http://www.growthdriver.net>).

### **Community roots/activities**

Brack, a 2000 candidate for U.S. Congress, is a former chairman of the Charleston County Democratic Party. He served as press secretary to U.S. Sen. Fritz Hollings from 1992 to 1996. Prior to that, he was a reporter with The Post and Courier.

Brack, a board member of the S.C. Wildlife Federation since 1997, is a member of the vestry of St. Stephen's Episcopal Church in Charleston and recently chaired its Search Committee.

Andrew C. Brack  
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Charleston, S.C. 29403  
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## **Prescott Huntley Brownell**

*Title – Fishery Biologist, U.S. Department of Commerce, National Marine Fisheries Service, Southeast Region*

Specialist in freshwater and marine ecology, natural resource management, and federal/state environmental programs.

25 years experience in coastal zone natural resource management in South Carolina, with a major focus on the Santee-Cooper River Basin.

Charleston Field Office  
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217 Fort Johnson Road  
Charleston, South Carolina, 29412  
843-953-7204 □  
<http://sero.nmfs.noaa.gov/> □ [Prescott.brownell@noaa.gov](mailto:Prescott.brownell@noaa.gov)

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## James S. Chandler, Jr.

*President/Director/General Counsel – South Carolina Environmental Law Project, Inc.*

Jimmy Chandler is an attorney and Director of the South Carolina Environmental Law Project, which he founded in 1987. The SC Environmental Law Project is a non-profit organization that provides legal services to South Carolina environmental groups. Chandler represents national, state, and local organizations in environmental cases before state and federal courts and agencies. The majority of his work has involved wetlands and coastal development issues, but his cases have also involved a variety of other issues, including water quality, air quality, land use regulation, solid and hazardous waste landfills and incinerators, and mining. Prior to forming the SC Environmental Law Project, Chandler practiced law in Columbia for 11 years. He received a B.A. in Economics from Davidson College in 1972, a Masters Degree in business administration from the University of South Carolina in 1973, and a law degree from the University of South Carolina School of Law in 1977.

Chandler has no experience specifically related to the Cooper River. His work for over 20 years has involved all aspects of environmental and natural resources law, including natural resources planning and problem-solving. From 1981 through 1987 he was involved in a series of cases involving proposals to re-impound old ricefields along coastal SC rivers.

Chandler has no particular roots in the Cooper River area. In his work he represents environmental groups such as the SC Coastal Conservation League and this work has included a variety of issues relating to rivers and water law.

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## William Burke Crymes, M.D.

*Retired Pathologist*

### **Career Summary:**

Graduated Furman University, B.S., 1963; Graduated MUSC, M.D., 1967; Pathology Residency at MUSC 1967 – 1972; Army Medical Corps 1968-1970 with one year in Viet Nam; Pathologist, Richalnd Memorial Hospital, Columbia S.C., 1972-1976; Pathologist, St. Francis

Xavier Hosp. ,Charleston, S.C 1976-1977; Pathologist, Conway Hospital, 1977-1978; Chief of Pathology and Laboratory Services, Roper Hospital, 1979- 2001; RETIRED 2001- Present.

**Experience on the Cooper River:**

Part owner and Managing Partner Salt Point Plantation since 1988 (Salt Point Timber Partnership).

**Community Roots or Activities:**

Active in many medical societies, including past President of the Medical Society of South Carolina, past President of the South Carolina Society of Pathologists, and many others.

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## John C. Dulude

*Manager, FERC Relicenisng – Santee Cooper*

**Education**

B.S. Civil Engineering - The Citadel  
Master Business Administration - Charleston Southern University  
Registered Professional Engineer - South Carolina  
Registered Residential Home Builder - South Carolina

**Membership**

American Society of Civil Engineers  
United States Committee on Large Dams  
Earthquake Engineering Research Institute

**Experience on the Cooper or with Natural Resource Planning**

Cooper River Forum – Involved in multiple environmental, hydrological, and biological studies and research efforts, including fisheries, water quality, and hydrology/hydro-dynamics associated with the Cooper River, Santee River, and the Santee Cooper project. Over 20 years of studying the behavior, characteristics, habitat, and function of the Santee and Cooper River systems.

**Community Involvement and other activities**

Married with two children. Resides in Moncks Corner. Past member Moncks Corner City Council for 8 years and Mayor Pro Tem for 2 years. Past President Moncks Corner Exchange Club, Past President Moncks Corner Lions Club, Past President and present board member

Santee Cooper Credit Union, Past Chairman Berkeley Elementary School Improvement Council, Past Chairman, High Performance Partnership for Berkeley Middle School, Past President Berkeley High School Athletic Booster Club. Graduate of Leadership Berkeley and Leadership South Carolina. Avid fisherman, hunter, and admirer of the outdoors especially in the low country. Devoted interest in understanding and protecting local history.

Santee Cooper  
1 Riverwood Drive  
Moncks Corner, South Carolina 29461  
Phone number 843-761-4046 Fax Number 843-761-4010  
[jcdulude@santeecooper.com](mailto:jcdulude@santeecooper.com)

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## **Tommy Evans**

*Whitehall Plantation*

PO Box 1088  
Moncks Corner, SC 29461

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## **Charles E. Glover**

*Glover & Associates*

Charles E. Glover, Jr. is a retired District Conservationist with the USDA Soil Conservation Service. Mr. Glover comes with 30 years of professional experience in soil, water and other natural resource conservation planning with 22 years being provided to Berkeley County.

Mr. Glover is the president of Glover and Associates Environmental Consulting. He is presently serving on the Board of Directors for the Lord Berkeley Conservation Trust, is an associate commissioner with Berkeley Soil and Water Conservation District and is a past president of the South Carolina Chapter of the Soil and Water Conservation Society of America.

Mr. Glover is known for his support and involvement in the local community having served in many organizations. He and his wife, Judy reside in Pinopolis.

Glover & Associates  
1627 Pinopolis Rd.  
Moncks Corner, SC 29461  
Ph: 843.899-6231 □ Fax: 843.899.6231

## Alice E. Hannon<sup>26</sup>

*Title – MeadWestvaco Corporation*

*Society of American Forester Member*

*South Carolina Forestry Association Member*

*SC Registered Forester, SAF Certified Forester*

BSF from the University of Missouri-Columbia in 1984, MBA from West Virginia University in 1992. Employed for 19.5 years by Westvaco Corporation, now MeadWestvaco Corporation. Have held various forest management positions of increasing responsibilities. Current position is Senior Land Management Forester, Santee District (Berkeley County) and Sustainable Forestry Initiative internal lead auditor.

Provide assistance to private landowners along the Cooper River in forest management planning, activities and conservation easement acquisition. Participated in the development of Berkeley County's Comprehensive Plan and Land Use.

Resident of Goose Creek since 1994. Leadership Berkeley graduate, class of 2001. Member of Therapy Dogs International.

MeadWestvaco Corporation  
1226 Cooper Road  
Moncks Corner, SC 29461  
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<sup>26</sup> Ms. Hannon served in this process for the first four months of effort.

## **Martin F. Healy**

*Title – Head of Technical Services /Lanxess Corporation – Bushy Park, SC*

*Cooper River Water Users Association*

*BCD Council of Governments Environmental Committee*

*South Carolina Energy Users Association*

A graduate of West Liberty State College in West Virginia with more than 30 years experience in environmental affairs. Experienced in several environmental areas including wastewater treatment, air quality, solid waste management, safety and regulatory affairs. Has held various positions in the health, safety and environmental groups within Bayer and Lanxess Corporations at both the New Martinsville, West Virginia and Berkeley County, South Carolina sites. Currently responsible for activities associated with health, safety, environmental, engineering, maintenance and other technical support programs for the Lanxess site in Berkeley County. The Lanxess site in Berkeley County is a multi-company industrial complex covering 1,649 acres. The site represents an investment of nearly \$1 billion in assets with a total workforce of nearly 1,000. Employees have maintained a wildlife management program, certified by the Wildlife Habitat Council, on the site since 1994.

Active with the Cooper River modeling efforts since the early 1990's. Active with Natural Resources planning as a member of the BCD Council of Governments Environmental Committee.

Active with *Making Science Make Sense* program and Community Advisory Panel activities.

Lanxess Corporation  
1588 Bushy Park Road  
Goose Creek, SC, 29445  
Phone - 843-820-6291 □ Fax - 843-820-6313  
[marty.healy@lanxess.com](mailto:marty.healy@lanxess.com)

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## **Barry H. Jurs – Chairman, Cooper River SAMP Nat'l Res. Comm.**

*Farm and Land Services Director – Berkeley County*

Barry H. Jurs is the Director for the Farm and Land Services Department with Berkeley County and serves the Berkeley Soil and Water Conservation District as the manager of office and operations. During the course of his representation with this project, Mr. Jurs accepted this new position after 20 years of experience as a Program Coordinator with the Land, Water and Conservation Section of the SC Department of Natural Resources. Barry is active in natural resources conservation and management through service on numerous

committees and programs. He has been instrumental in the development of the Berkeley Cooperative Greenspace Initiative and the Berkeley GIS Consortium. Barry serves as the Secretary on the Board of Directors for the Lord Berkeley Conservation Trust and chairs the trust's Conservation Committee. He is a member of the Cooper River Forum and member of the Cooper River Focus Area Task Force. He is an avid outdoorsman and is president of the Hagen Hunt Club. Barry is a graduate of the College of Charleston with a B.S. in Biology and a graduate of the Physician's Assistant Program at the Medical University of South Carolina in Charleston. Barry and his family live on a small family farm in the MacBeth community of Berkeley County.

Berkeley County  
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[berkconsdist@homexpressway.net](mailto:berkconsdist@homexpressway.net)

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## Al Kennedy

### *Economic Development Project Mgr. – Berkeley County*

Al Kennedy has been the Project Manager for Existing Industry for the Berkeley County Economic Development Department since 1992. Prior to that he was Berkeley County's EMS Director and Health Care Coordinator. He has been with Berkeley County since 1975. Raised in Moncks Corner, he is a 1964 graduate of Berkeley High School. He attended Wofford College and the University of South Carolina. He worked for South Carolina National Bank, the SC Employment Security Commission and as a health planner for the Lowcountry Region prior to coming to work for the County. During his career he has served on many boards and been associated with many professional and service organizations.

Al currently lives in Pinopolis with his wife, son, niece and nephew. He has a grown daughter living in Charleston. In his leisure time he enjoys boating and kayaking on Lake Moultrie and the tributaries of the Cooper River. He is involved with an effort to establish paddle trails in the Berkeley County waterways.

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## Father Francis Kline

*Abbott*

Mepkin Abbey  
Mepkin Abbey Road  
Moncks Corner, SC 29461

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## Erwin J. Krull

*E. I. Dupont de Nemours and Company*

Mr. Krull has held a variety of positions from laboratory activities through environmental resource within Dupont over the last 30 years.

Initial experience with the Cooper River came with activities for the Cooper River Water Users Assn.

Dupont Engineering Polymers  
Cooper River Hytrel®  
3300 Cypress Garden Road  
Moncks Corner, South Carolina 29461  
843-797-9743

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## Dwayne Mangum

*District Conservationist, USDA Natural Resources Conservation Service (NRCS)*

*Member of the Soil and Water Conservation Society*

I have been employed with NRCS (formerly the Soil Conservation Service) for the past 25 years. I have worked in 5 different locations in South Carolina in several positions. My primary responsibility is conservation planning with landowners and landusers or units of government. I work with individuals to identify natural resource concerns and then develop plans to address these concerns. I served on a technical sub-committee of the Natural Resources Committee during the development of the Charleston County Comprehensive Plan.

I enjoy working with natural resources and spend most of my free time pursuing some outdoor interest or activity.

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4045 Bridge View Dr., Su. C-204  
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Phone: 843-727-4160 Ext. 3 □ Fax: 843-727-4541  
[Dwayne.mangum@sc.usda.gov](mailto:Dwayne.mangum@sc.usda.gov)

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## Bobby Mead

Wappaolah Plantation  
PO Box 545  
Moncks Corner, S.C., 2461  
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## Andy Miller

*Watershed Manager-Saluda-Santee Basins – SC Department of Health and Environmental Control*

B.S. in Biology College of Charleston 1982.

11 years in various aspects of food products manufacturing for the Kroger Corporation.

MPH Environmental Health Science U. South Carolina 1994.

9 years at SC DHEC coordinating nonpoint source pollution control projects, developing TMDLs, developing water quality assessment documents, serving interested public on variety of water quality issues, serving on basin specific works groups and committees, administering water quality control grants.

Work team develops Santee River Basin Watershed Water Quality Assessment Document every five years. Involves water quality assessment and analysis of various potential sources of water quality impacts for each 11 digit HUC within the Santee River Basin. Watershed workshops are conducted for stakeholder input. Also involved in Reedy River Restoration Task Force, Reedy River mitigation trust fund implementation committee, The East Cooper Watershed Project, the Gills Creek Watershed Project and the Midlands Conservation Committee. Was original steering committee member of the Southeastern Watersheds Forum.

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## Steve Moore

### *Director of Planning - SC Department of Health and Environmental Control*

Head of SCDHEC-OCRM planning department since March of 1998. Prior to that was the Permit Administrator for SCDHEC-OCRM (and the SC Coastal Council) since July of 1984. As the permit administrator directed a staff of 13 in the implementation of the direct permitting authority of the state's coastal zone management act. Prior to becoming permit administrator, worked in the permitting department as the first point of contact for the majority of the public who dealt with the agency.

Have worked for over 24 years in resource management, and have gained some knowledge of most of the issues that will come before the committee at some time in my career.

Native of Georgetown, SC. Former duck hunter and fisherman. As a native South Carolinian am vitally interested in the preservation of the natural resources of South Carolina.

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## Steve Pendley

### *President and CEO - Pendley Homes*

General Contractor and Owner of Pendley Construction which has been in business since 1972, specializing in residential home building. Steve attributes the company's superior reputation to complete customer satisfaction, attention to detail and high quality standards he places on his team of professionals. Steve's mentor is his father, Lem Pendley, who started the business in 1972. He got interested in building in his teens and has followed his father's footsteps to make the business what it is today.

- Tarmic which is a new company started to expand into commercial building. Presently building the first of ten executive office buildings in Goose Creek.

- Carolina Land Developers, which does land development, was formed about 3 years ago.
- Has developed two subdivisions, one which is completed, Chatfield, and the other Friar's Grove , both in Crowfield Plantation in Goose Creek. Is now developing a master planned community called Spring Grove Plantation, which includes a balance of 13 residential subdivisions, recreation areas, greenspaces, and associated commercial complexes.
- Worked on the Berkeley County Greenspace Board in 2000.
- Graduate of the Berkeley Leadership Program

Was not born in Charleston, but has lived here since about 1967 when his father retired from the Air Force and made Goose Creek their home. Presently lives in Summerville with his wife, Denise and their two children, Tara, 12 and Michael, 9 and their yellow lab, Cotton.

Professional Organizations: Charleston Trident Association of Realtors  
 Charleston Trident Home Builders Association  
 Masters Custom Builders Council  
 NAHB  
 CTHBA Board of Directors  
 South Carolina Association of Realtors  
 National Association of Realtors

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## John Scarborough

### *Economic Development Project Mgr. – Berkeley County*

Born 2-12-47 in Charleston, SC. Attended Berkeley County Public Schools and graduated from Berkeley HS in 1965

Graduated from Charleston Southern University in 1970 with a Bachelor of Science Degree in Marketing.

Post Graduate Certificate the University of South Carolina School of and Banking School of the South at Louisiana State University.

From 1970 to 1986, I was employed by Citizens and Southern National Bank of South Carolina. During my tenure with Citizens and Southern, I was Vice President and City Executive of the Moncks Corner office.

From 1986 to 1991 I was a financial advisor and registered investment representative for a major stock brokerage firm – Edward D. Jones & Company.

In 1991 I began working for Berkeley County as Administrative Director and I was assigned responsibility of Economic Development Director in 1995 where I still serve today as Berkeley County's liaison with the Charleston Economic Development Alliance

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## Alan Shirey

*Lead Environmental Engineer  
U.S. Army Corps of Engineers,  
Charleston District*

*Adjunct Professor, College of Charleston*

*State of South Carolina Non-point Source  
Pollution Task Force*

Career Summary: B.S. Chemical Engineering, M.S. Environmental Studies  
11½ years experience at Charleston Naval Shipyard with radioactive waste processing/disposal. 5 years experience at U.S. Army Corps of Engineers, Savannah District with investigation and remediation of hazardous waste sites. 4½ years experience at U.S. Army Corps of Engineers, Charleston District with NEPA compliance and ecological restoration.

Cooper River/Natural Resource Experience: Participated in several preliminary studies evaluating ecological restoration of successional rice fields. Participated in other studies evaluating ecological restoration of numerous sites throughout the State of South Carolina including urban stream restoration, impaired wetland restoration, and sea turtle nesting habitat restoration.

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## Ray Sims

### *Environmental Manager - Nucor Steel-Berkeley*

Ray Sims received an undergraduate science degree from the College of Charleston, South Carolina and a Master of Science degree from the University of Akron, Ohio. His main emphasis of study included hydrogeology and environmental engineering. Mr Sims has over 17 years of experience working for large corporations including E.I. DuPont de Nemours, Inc., Westinghouse Corporation, and Nucor Corporation. Since 1995, Mr. Sims has been instrumental in the permitting, engineering, start up and operation of Nucor Steel-Berkeley in Huger, South Carolina. The 8000 acre site adjacent to the Cooper River reflects well over a billion dollar investment by Nucor to produce flat rolled sheet products and structural products for domestic and international consumers, Over 900 skilled workers are employed to keep the 24 hours a day/ 7 days a week operation running smoothly. Mr. Sims primary responsibilities include operation and maintenance of contact/noncontact process water systems, potable water systems, waste water treatment systems, gas capture systems and environmental engineering. Mr. Sims currently serves as Chairman of the Environmental Engineering Division with the Association of Iron and Steel Engineers.

Born in Florence, South Carolina and raised in the Lowcountry, Mr Sims has an avid interest in preserving the local ecology and environment from which he enjoys spending his free time. In 1998, Mr. Sims was instrumental in negotiating a 5000 acre Conservation Easement on the Nucor Steel-Berkely site. The property, known as the Hagan Plantation Tract, is comprised of six former plantations and contains over 850 acres of interior fresh water wetlands with over 8 miles of protected waterfront on the Cooper River and French Quarter Creek. In addition, Mr. Sims serves as a board member on the Lord Berkeley Conservation Trust., an organization devoted to the preservation of strategic properties.

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## Tony Thomas

*President - Carolina Land & Timber - & - Board Member of the South Carolina Landowners' Association*

*President & Owner of Carolina Land & Timber, Inc.*

Mr. Thomas graduated Magna Cum Laude from Clemson University in Forest Management in 1989. Other designations include: SC Registered Forester #1302, SC Certified General Real Estate Appraiser #GC689, & SC Real Estate Broker. After graduation, he became a partner in land management firm of Henry Stuckey & Associates. He later founded a real estate and appraisal firm in 1992, Fort Thomas & Associates, where he specialized in the sale and appraisal of farms, timberland, and commercial properties until the business was sold in 1995 in order to concentrate on the newly founded Carolina Land & Timber, Inc., which is a land & timber brokerage firm.

Mr. Thomas grew up duck hunting, fishing, and water skiing on the Cooper River. He has appraised properties, practiced land management, wildlife management, sold properties, assisted landowners with conservation easements, and harvested timber all along the Cooper River. Also, he currently owns property near the Cooper River on Dr. Evans Drive. This gives him a unique perspective of having acted as a real estate broker, appraiser, forester, conservationist, hunter, fisherman, and property owner.

Mr. Thomas was born, raised, and currently lives in Berkeley County. He was a Founding Board Member of the S.C. Landowners' Association, Founding Board Member of the Berkeley County Family YMCA, and First Citizens Bank Advisory Board Member.

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## Gene Warner

*SC DHEC*

Lifelong resident of the Moncks Corner area.  
Graduated from Berkeley High School in 1975  
Graduated from U. of Georgia in 1980 with a BS in Biology

I went to work with DHEC/Environmental Health in Berkeley Co. in 1983. I became the Berkeley County Env. Health Supervisor in 2000 and currently hold this position.

I grew up fishing and hunting deer, ducks and turkeys on the Cooper River. I have a strong interest in preserving the integrity of this area. I think it's important that future generations have the same recreational opportunities that I have enjoyed so much over the years.

I am currently a member of the Cross Hunt Club, the Willson Hunt Club and the Baydam Hunt Club.

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## **Miller G. White**

*District Fisheries Biologist, SCDNR*

*Member American Fisheries Society, past president SC chapter American Fisheries Society*

*Member and past president South Carolina Fisheries Workers Association*

*Member SC Aquatic Plant Management Council*

B.S. in Wildlife Management from U. Maine, M.A. in Biology from Citadel. Has worked as a fisheries biologist for SCDNR for 36 years, having responsibility for the Santee-Cooper system for 33 years. Career has been spent working with freshwater fish and fish habitats in the lakes and streams of the Lowcountry.

Worked on Cooper River with issues relating to water flows, rice field management, fish community assessment, Corps of Engineers Rediversion, water quality, vegetation management, sport and commercial fisheries, and FERC relicensing. Personally, I hunt, fish, and boat extensively on Cooper River.

Attends First Presbyterian Church of Moncks Corner. Member of the Lions Club. Wife has taught in Berkeley County schools over 30 years and three children graduated from Berkeley High School.

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## Adam R. Saslow

### *Facilitator for Process and President of Consensus Solutions, Incorporated*

Mr. Saslow creates the environments in which participants in collaborative dialogue make their own best decisions. He builds foundations for long lasting communication, bridges for crossing chasms in perspectives and agreements that stand the test of time. Mr. Saslow is both a corporate strategist and a public policy expert with over ten years of experience working with a variety of environmental laws and regulations. Mr. Saslow has multi-sector expertise and training in managing controversy within and across public, private and not-for-profit organizations. This has given Mr. Saslow the unique capacity to understand the drivers and barriers that exist across the sectors – and find common ground.

In 1998, Mr. Saslow founded Consensus Solutions, Incorporated – a full service dispute resolution firm. During his tenure as President of Consensus Solutions, Mr. Saslow has managed federal and state-driven policy dialogues on issues involving Water Quality and Quantity, Brownfields Redevelopment, Smart Growth, and Air Quality. Mr. Saslow has convened and facilitated a variety of short-term dialogues, long-term dialogues, workshops, conferences and other collaborative efforts. He managed these efforts with the benefit of a wealth of academic, personal and professional experiences already behind him.

Mr. Saslow received an undergraduate degree from New York University's School of Business and Public Administration where he double majored in Management and International Finance. Following a three-year stint on Wall Street during which he learned the "art of the deal," he attended Yale University and received a Master's Degree in Public and Private Management from the School of Organization and Management. Mr. Saslow sought a career in negotiating environmental policy and so pursued studies in Negotiation and Competitive Decision Making - studies that left him well prepared for a career in his chosen field.

Following his experience at Yale, Mr. Saslow was employed by the United States Environmental Protection Agency where he gained an intimate familiarity with the full range of media-based environmental statutes, rules and regulations. Throughout the 1990's, Mr. Saslow was actively engaged in the Agency's efforts to apply creative, multi-sector approaches to collaborative dialogue. Mr. Saslow worked on innovative federal government programs including Sustainable Industries, Project XL, Performance Track and Community Based Environmental Protection, as well as

Transportation Partners, Climate Wise, and the Smart Growth Network. He's helped to make collaborative dialogue work – and yield far better outcomes than decisions made in homogenous environments where all decision makers share the same views.

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## Appendix IV – Resource People and Their Organizations

LAST NAME	FIRST NAME	TITLE	ORGANIZATION
Brooks	Chris		SC DHEC/OCRM
Buckles	Oliver		Palmetto Conservation Foundation
Bulak	Jim		SC DNR
Cantrell	Wade	Project Manager	SC DHEC/BoW
de Kozlowski	Steve	Chief - Environmental Conservation Section	SC DNR
Duncan	Ed		SC DNR
DuPre	John		US Forest Service - Awendaw
Folk III	Robert		
Hackett	James	Project Manager	SC DHEC/OCRM
Hernandez	Debra	Director - Program & Policy Development	SC DHEC/OCRM
Kelley	Joe	Professor	The Citadel
Mahan	Bill	Regional Wildlife Biologist	SC DNR
McKellar	Hank		SC DNR
Murphy	Tom	Wildlife Biologist	SC DNR
Page	Marian		SC DHEC/OCRM
Phipps	Gail		SC DHEC/OCRM
Porcher	Richard	Professor	The Citadel
Rackley	David	Area Office Supervisor	NOAA/National Marine Fisheries Service Southeast Regional Office
Rimer	Linda		US EPA Region IV
Tufford	Dan	Research Assistant Professor	University of South Carolina Department of Biological Sciences
Woodington	Ken	Attorney	Davidson, Morrison & Lindemann, P.A.

## Appendix V – The Charge to the Stakeholder Group

### Background

The Cooper River flows from the Pinopolis Dam at Lake Moultrie to Charleston Harbor and has been greatly altered over the last 300 years. The tidally influenced, freshwater marshes and swamps were modified in the 18<sup>th</sup> and 19<sup>th</sup> centuries for the cultivation of rice with dikes and ditches controlling water levels. The rice fields were largely abandoned at the beginning of the 20<sup>th</sup> century. Breaches in the dikes allowed renewed tidal flow that initiated aquatic succession. In 1941, further manmade alterations came to this system with the completion of the Santee-Cooper Hydroelectric Project, which had a great long-term effect on the Charleston Harbor Estuary. When it was found that the Santee-Cooper Project significantly increased siltation in Charleston Harbor, approximately 80 percent of the Santee-Cooper drainage water was redirected into the Santee. Completed in 1985, the Cooper River Rediversion Project reduced water flow into the Cooper and had a significant impact to it. Today, the old rice fields vary in their successional states due to differences in cultivation history, management practices, time since abandonment, water depth and duration of inundation, salinity and other factors. Research has found that lower water levels have accelerated vegetative succession in remnant rice fields of the upper Cooper River. Marsh and shallow open water areas are changing to a tree-covered climax ecosystem, resulting in an increase in river swamp functions and values and a decrease in other functions associated with earlier successional stages. Early succession functions may be critical to the health and value of the Cooper River drainage basin. Therefore, succession toward climax tree species in the rice fields may result in a loss of habitat diversity to the watershed.

The need to balance the multiple uses of this area and limit potential conflict is important to local and state government officials, local landowners and other stakeholders in the area. It is within this context that Berkeley County government, the Berkeley Conservation District and the South Carolina Department of Health and Environmental Control's Office of Ocean and Coastal Resource Management (SC DHEC/OCRM) are sponsoring a Special Area Management Plan (SAMP) to address the multitude of issues that affect the Cooper River and its immediate surroundings. The SAMP boundary lies below Pinopolis Dam and roughly between S.C. Highway 41/402 and Old US Highway 52 in the lower portion of Berkeley County. Borders may also be viewed as the town of Moncks Corner and Thornley Forest Subdivision on the west and approximately 1,000 feet east of the mouth of the Tail Race Canal at the Jefferies Generating Station on the east. Within the SAMP boundary, the Cooper River is mostly tidally-influenced freshwater. Most of the area surrounding the river is used for single-family residences, forest

management or industrial activity. Many sportsmen also enjoy fishing and hunting in the area and contribute to the local economy. The Cooper River Corridor is an economic asset to the county, region and state because the river provides opportunities for industrial growth and expansion. The Cooper River and adjacent Back River provide the water supply for many major industries. Water flow rates from the Pinopolis dam at the top of the Cooper River also affect many marine resources within the county. Agreement must be reached on these management issues to ensure long-term biological diversity and the overall health of the system.

### The Charge

To address the goals of the Cooper River Corridor SAMP, the Natural Resources Subgroup is hereby charged to:

- Identify a group of technical advisors who may be consulted to provide accepted ecological, hydrologic, economic and other data needed to support the discussions of this group.
- Develop a Natural Resource Management Plan (NRMP) that would be delivered to the Board Health and Environmental Control before June 30, 2004.<sup>27</sup> This NRMP would include:
  - A natural resource assessment;
  - Goals for maintaining or even enhancing the natural resource base;
  - Recommendations that address:
    - Wildlife habitat and diversity
    - Fisheries management
    - Botanical diversity
    - Water quality
      - Point source issues
      - Nonpoint source issues
    - Recreation and tourism
    - Land use and conservation
    - Stabilization of the Cooper River water flows
  - A timeline for implementation
- Develop a drainage basin-level plan to address rice field succession and the stewardship and access issues concerning rice field impoundments.

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<sup>27</sup> The reader should note that the scope of this effort was expanded to include a review of buffers, greenspaces and greenways, and the date of completion was extended to November 2004

Because of the rich natural resource base and its cultural and historical significance in the upper portion of the Cooper River, the work of this group will be limited to the region between Pinopolis Dam and the area just below the "T."

### Developing Consensus

Uses of coastal resources are not always mutually compatible and conflicts of use can occur. Where these conflicts are widespread, a SAMP is used to collect and examine data, identify potential development trends and highlight anticipated conflicts between different uses. SAMPs can be used to develop strategies to protect and manage resources in order to ensure the goals of the various users of the resource are compatible. During the preparation of a SAMP, the stakeholder group will explore alternatives that will address and manage conflicts, and identify policies that will implement the chosen alternatives.

Every effort should be made to ensure the total range of recommendations and characterizations are consensus-based, although SC DHEC/OCRM recognizes elements of these agreements may not be universally subscribed. The facilitator is responsible for deciding when the costs of seeking complete consensus outweigh the benefits. When the balance does not serve the greater good, the facilitator may move the group along to other discussions, recording for the SAMP Steering Committee the points of contention. However, the stakeholder group is charged with trying to reach consensus on as many of the identified preferred policy recommendations and characterizations as possible.

## Appendix VI - Historical Discussion of Water Quantity

### *The Cooper River*

In its original state, the Cooper River was a relatively small coastal plain stream with an inflow of approximately 74 cfs at its headwaters on the West Branch. The upper Cooper River consists of two primary branches: the West Branch near Moncks Corner and the East Branch extending to Huger in Berkeley County. These two branches come together above present-day Cypress Gardens to form the area commonly referred to as the "T."

Prior to diversion of the Santee River into the Cooper River, brackish water extended to almost the northern terminus near Stoney Landing. The Cooper River is tidally influenced, from a maximum of six feet in the harbor to two feet to three feet in the upper reaches of the river. The Cooper River and both upper branches were extensively modified for rice production beginning in the mid-18<sup>th</sup> century and ending in the early 20<sup>th</sup> century. Large areas of bottomland hardwoods were removed from the floodplain for rice production. During the time between the abandonment of these fields at the beginning of the 20<sup>th</sup> century and the construction of the Santee Cooper project, the highest rate of plant succession occurred. Presently, the Cooper River is dotted with abandoned rice fields, although some remain impounded today and are primarily used for waterfowl hunting.

In 1913, a company called the Columbia Railway and Navigation Company investigated the possibility of re-opening navigation between the Santee and Cooper Rivers and constructing a hydroelectric facility. A 50-year license was finalized in 1926. The same interests also acquired the rights to the Lake Murray development on the Saluda River and began construction on the Saluda project first.

Following the economic crash of 1929, the state of South Carolina petitioned the federal government to fund a public works project to build the stalled hydroelectric and navigation project between the Santee and Cooper rivers. The public works project resulted in the publicly-held Santee Cooper project. The most recent diversion project of the Santee River into the Cooper River began in 1938 and was completed in 1942.

As part of the modern-day Santee Cooper hydroelectric generation project, substantial construction occurred along the Cooper River. First, a hydroelectric generating plant capable of passing a maximum of 28,000 cfs and generating 130 Megawatts (MW) of electricity was constructed above Moncks Corner. The normal elevation of the lake relative to the river level below the dam is approximately 75

feet. A 4.5 mile tailrace was also constructed to connect the discharge from that plant into the headwaters of the Cooper River. Additionally, the river was widened and deepened to a point just below present-day Pimlico to accept the substantial increase in flow from the project. After diversion, spring flows into the Cooper River would average over 20,000 cfs from January through March and during a wet year, might continue until May or June, substantially altering the original flow patterns of the Cooper River. During this period in the Cooper River's history, the upper reaches from the powerhouse to approximately Pimlico saw substantial dampening of the tidal influence and a substantially reduced impact on plant succession within the abandoned rice fields.

The amount of flow seen by the Cooper River during this time was established by a rule curve for the Santee Cooper project to optimize hydroelectric production. The rule curve that is applied to Lake Marion specifies an optimum elevation at which the project should be operated to maximize generation and minimize the amount of spilling through the Santee spillway. The basis for development of the rule curve is historic inflows for the Santee River.

### ***The Santee River***

Depending on which reference one may choose, the Santee River watershed has been identified as being between the fourth and second largest watershed east of the Mississippi and south of the St. Lawrence, covering approximately 15,000 square miles. The Santee, in its original form, had an average annual flow of approximately 15,500 cubic feet per second (cfs), with spring floods or freshets, as referred to in historical accounts, in excess of 300,000 cfs. Monthly median flows ranged from a high of approximately 25,000 cfs in March to a low of 9,000 cfs in October. Flows during drought conditions have been recorded below 3,000 cfs.

The original diversion of the Santee River into the Cooper River occurred in 1786. At that time, a group of investors, including historical figures such as Moultrie, Sumter, and Marion, created one of this country's first canals, referred to today as the Old Santee Canal. Completed in 1800, the canal was 22 miles long and contained 13 navigation locks. Four of the locks were used to raise boats from the Santee to the summit between the two rivers, and then nine more locks were used to lower the boats into the Cooper River. The canal functioned until 1850, after which it was abandoned due to the competition from railroads.

Subsequent to the construction of the present-day Santee-Cooper hydroelectric project, all waters from the Santee River were diverted to the Cooper River, except for a continuous flow requirement of 500 cfs into the Santee. The US Army Corps of Engineers Rediversion Project changed that condition (*see discussion below*). When flows exceed the capability of the hydro-facilities on the project, they are

passed through the spillway located on the Santee River. The spillway has the ability to pass more than 1.4 million cfs; however, no more than 150,000 cfs has been released at one time at the spillway since its construction. Waters diverted by the Santee Dam are impounded in Lake Marion and then passed through a diversion canal into the lower reservoir known as Lake Moultrie. The lakes are hydraulically connected but may vary by as much as one foot to two feet in elevation, depending on inflow and generation. The diversion canal has a hydraulic capacity of approximately 30,000 cfs during normal operations. Lake Marion has a surface area of approximately 100,500 acres, and Lake Moultrie has an area of approximately 60,000 acres. They contain approximately 2.3 million acre-feet of water, with a usable storage of approximately 1.1 million acre-feet. Though large in area, the lakes are relatively shallow, having an average depth of less than 20 feet.

### *Cooper River Rediversion Project*

Beginning in 1947, just five years after the Santee Cooper project was completed, the federal government, through the US Army Corps of Engineers (US CoE) and others, began a series of studies to investigate the considerable increase in dredging occurring in Charleston Harbor. They concluded the increased dredging was primarily caused by the substantial increase of freshwater containing colloidal particles that would flocculate when brought into contact with salt water. In 1968, the federal government authorized the US CoE, through the Rivers and Harbors Act - 1968, to develop a concept to mitigate the dredging increase by reducing flows into the harbor.

Several alternatives were identified, but the selected approach that was eventually implemented has become known as the Cooper River Rediversion Project. The concept consists of reducing the flow into the Cooper River through Jefferies Hydroelectric facility and re-diverting approximately 80 percent of the original Santee River flow back into that river. The eventual reduced flow selected for the Cooper River is a weekly average not to exceed 4,500 cfs. The original design flow was 3,000 cfs, but subsequent tests after construction indicated that substantial salt-water intrusion would occur in the Bushy Park industrial area if flows were reduced to that level. The federal government entered into a contract with the South Carolina Public Service Authority (Santee Cooper) to mitigate the lost generation at Jefferies by constructing a separate generating facility for the rediverted flows. The contract makes clear the need to maximize the use of the two-plant system to ensure the benefits of the project to the federal government.

The project was completed in 1985 and consists of an 84 MW hydro-generating facility located just above St. Stephen. Depending on the water year, the St. Stephen project passes an average flow of approximately 8,000 to 12,000 cfs into the Santee River. The Jefferies Hydroelectric facility now averages approximately

4,500 cfs weekly and subsequent addendums to the aforementioned contract place limitations on average daily flow and no flow periods, and address emergency flow needs for salt-water intrusion in the Bushy Park area. The modifications to the flows through Jefferies have substantially reduced the dampening effect on tides within the Cooper River.

Tidal influence is now more evident in areas of the upper Cooper River. Although the conditions are not natural, the present ambient flow conditions are more in line with natural conditions than the highly modified flow conditions of the original Santee Cooper project. The rate of vegetative succession and transition in the rice fields may currently exceed the previous high flow period of the original Santee Cooper project; however, it is substantially less than what occurred during the period following rice field abandonment and prior to the construction of the Santee Cooper project.

## Appendix VII - Discussion of the Legal Requirements for Reimpounding

### *Demonstration of Ownership*

Under South Carolina law, the state presumably owns all tidelands (the lands that lie between the mean high water mark and the mean low water mark along tidal rivers and streams). In order to overcome the presumption of state ownership, a person claiming ownership must show that the King of England (during colonial times) or the state gave a deed to the land that contains language, either in the deed or in a plat referred to in the deed, showing an intent to convey lands below the mean high water mark. A deed that describes property as "abounding on the East on the Cooper River" will not suffice. South Carolina courts have interpreted such deeds as only conveying lands to the mean high water mark. Usually the South Carolina Attorney General requires a person claiming title to tidelands to file a lawsuit and obtain a court order recognizing the person's title to tidelands before the state will give the title official recognition. It is nearly impossible for a person to establish private title to lands below the mean low water mark.

### *Impacts on Submerged Lands*

Submerged lands are those lands that lie below the mean low water mark and are therefore always under water at all stages of normal tides. The only way that title to submerged lands can be granted is through a special act of the legislature. In the context of impoundments, this very strict rule means that if a person hopes to complete an impoundment, as a practical matter he will have to do it in such a manner that makes it unnecessary for him to own the submerged lands. Of course, it is recognized in South Carolina that not every private activity in submerged lands requires private ownership; a common example is the typical boat ramp, which normally occupies submerged lands to some extent, with no suggestion on the part of anyone that the individual has any property rights in the submerged lands.

### *Blockage of Navigable Waterways*

Both the South Carolina Constitution and a state statute declare that all navigable waters "shall be common highways and forever free." In a 1986 ruling, the SC Supreme Court made it clear that "navigability" should be given the broadest possible definition and said the use of waterways "by the general public for boating, hunting and fishing is a legitimate and beneficial use" will be legally protected. Manmade waterways are public navigable waters if they have been allowed to be used by the public. Waterways that are otherwise navigable may be considered non-navigable above the point where they become too shallow and

narrow for navigation. The legal issue of whether a navigable stream may be blocked in order to serve an overriding public interest has not been addressed by the state's courts.

### *Compliance with SC DHEC/OCRM Statutes and Regulations*

The SC Coastal Zone Management Act sets forth a number of general environmental considerations that would be applied to any proposed impoundment in the coastal zone. The specific SC DHEC/OCRM regulation applicable to impoundments is regulation 30-12.K. In addition, the SC DHEC/OCRM regulations applicable to dredging and filling (30-12.G), navigation channels and access canals (30-12.H), and drainage canals or ditches (30-12.L) may be applicable to impoundments. These regulations include technical standards as well as fairly stringent narrative standards, such as requirements that a permit applicant demonstrate an overriding public interest and/or a lack of feasible alternatives. The specific impoundment regulations (30-12.K) are as follows:

#### *K. Marsh Impoundments for Recreational and Commercial Activities:*

(1) Marsh impoundments totaling nearly 69,000 acres comprise a significant portion (approximately 16 percent) of South Carolina's coastal wetlands. An additional acreage, perhaps equaling this figure, has been impounded in the past but consists today of tidally influenced areas where embankments are no longer maintained. Once important rice-growing areas, the majority of these impoundments are managed primarily for recreational waterfowl hunting, wildlife sanctuaries, and other commercial, agricultural and preservation uses.

(2) Proposals will be reviewed on a case-by-case basis according to the following standards:

(a) Permit applications to impound previously un-impounded wetlands or areas inundated by Outstanding Resource Waters shall be denied unless an overriding public interest is clearly demonstrated.

(b) The following factors will be considered in the review of permit applications for the impoundment of wetlands:

(i) Condition of existing dikes. Projects should require a minimum of new bank construction in wetlands.

(ii) Amount of wetlands proposed to be impounded.

(iii) The extent to which the project would block waters presently used for recreation or navigation by the public.

(iv) Degree of salinity of waters impacted by the proposed project.

- (v) Quality of waters affected by the proposed project.
- (vi) Primary purpose of the impoundment.

(c) All applications for the impoundment of wetlands must be accompanied by a detailed management plan setting forth the intent and method of managing the impounded areas. The management plan must be approved by the Department prior to permit issuance and shall become a condition of the permit. This plan must contain, but not necessarily be limited to, the following information:

- (i) Applicant's objective(s) for the impoundment.
- (ii) Schedule of water level manipulations.
- (iii) Methods of pest and predator control (e.g., use of pesticides, prescribed burning, etc.).
- (iv) Water quality management plan.

### ***State Water Quality Standards and the Federal Clean Water Act***

Reimpoundment of tidelands would probably trigger the requirement of a permit under Section 404 of the Federal Clean Water Act. The US CoE, with the oversight of the US Environmental Protection Agency (EPA), administers this permit program. Before the Corps can issue a Section 404 permit, the South Carolina Department of Health and Environmental Control (SC DHEC) must issue a certification, as required by Section 401 of the Clean Water Act, that the project will comply with all state water quality standards.

In the 1980s and 1990s, two proposed South Carolina reimpoundment projects were denied permits due to failure to demonstrate compliance with the standards of Sections 401 and 404. The EPA vetoed the first of those projects, a proposed 900-acre impoundment on the Edisto River. EPA based its decision on findings that the project would "have an unacceptable adverse effect upon the waters of the United States," by impairing the nursery value of the area, by eliminating the biological benefits of frequent tidal flushing, by reducing water quality (low dissolved oxygen), by loss of public recreational benefits and by direct wetland losses. In the other case, a proposed 29-acre impoundment on Cooter Creek off the Waccamaw River, DHEC denied the 401 water quality certification, basing its decision on findings that the impoundment would fail to maintain a "balanced indigenous aquatic community of flora and fauna" as required by state standards, and would cause violations of dissolved oxygen requirements.

## Appendix VIII – Characterizations of the Cooper River System Rice fields

This table characterizes the various tidal rice fields found along the Cooper River. Please note that this table does not contain information on greentree reservoirs or other inland rice fields. Abbreviated terms may be found in the Glossary of Appendix 1.

<u>Field #</u>	<u>Name</u>	<u>Owner</u>	<u>TMS#</u>	<u>Total Area (Acres)</u>	<u>Major Vegetative Cover Type</u>	<u>Major Vegetative Cover (Acres)</u>	<u>Breaches as a % of Dike Length</u>	<u>Navigability*</u>	<u>Expressed Interest In Reimpounding</u>
<b>Kitt # 1</b>	<b>Dean Hall</b>	E I Dupont	212000100 9	161	ITEM	139	3	2	
<b>Kitt # 2</b>	<b>Comingtee</b>	Conservation Fund	200000000 8	242	SAV	102	12	3	
<b>Kitt # 3A</b>	<b>Fish Pond</b>	Conservation Fund	200000000 8	450	SAV	273	18	3	
<b>Kitt # 3B</b>	<b>Bonneau's</b>	Conservation Fund	200000000 8	41	FLV	22	6	1	Yes
<b>Kitt # 4</b>	<b>Bonneau's</b>	Conservation Fund	200000000 8	9	ITEM	7	32	1	
<b>Kitt # 5</b>	<b>Richmond</b>	Conservation Fund	200000000 8	15	ITEM	8	2	1	
<b>Kitt # 6</b>	<b>The Blessing</b>	Mary Gilbreth	228000000 1	531	SAV	408	27	2	Yes
<b>Kitt # 7</b>	<b>Cedar Hill</b>	Wayland of SC LLC	227000000 1	38	ITEM	34	20	1	
<b>Kitt # 8</b>	<b>The Hagan</b>	Berkeley Co.	238000012 5	84	ITEM	41	60	1	
<b>Kitt # 9 &amp; Huger # 32</b>	<b>The Blessing</b>	Northern Trust Co.	227000001 4	68	ITEM	39	25	1	
<b>Kitt # 10</b>	<b>The Hagan</b>	Berkeley Co.	238000012 5	38	ITEM	20	30	1	
<b>Kitt # 11</b>	<b>The Hagan</b>	Berkeley Co.	238000012 5	151	ITEM	142	80	2	
<b>Kitt # 12</b>	<b>Dean Hall</b>	E I Dupont	212000100 9	382	ITEM	203	23	3	

<u>Field #</u>	<u>Name</u>	<u>Owner</u>	<u>TMS#</u>	<u>Total Area (Acres)</u>	<u>Major Vegetative Cover Type</u>	<u>Major Vegetative Cover (Acres)</u>	<u>Breaches as a % of Dike Length</u>	<u>Navigability*</u>	<u>Expressed Interest In Reimpounding</u>
Kitt # 13	Comingtee	Conservation Fund	2000000008	8	ITEM	7	24	1	
Kitt # 14	Rice Hope	Rice Hope Plantation	2130003044	311	SAV	287	58	3	Yes
Kitt # 15	Dean Hall	E. I. Dupont	2120001009	43	ITEM	25	60	1	
Kitt # 16	The Bluff	Bluff Plt on Cooper	2120001010	139	SAV	78	25	3	
Kitt # 17	The Bluff	Bluff Plt on Cooper	2120001010	31	SAV	11	19	3	
Kitt # 18	Clermont	Mepkin Abbey	1980001001	41	ITEM	18	11	2	
Kitt # 19	Elwood	Mepkin Abbey	1980001001	209	SAV	183	35	3	
Kitt # 20	Mepkin	Mepkin Abbey	1980001001	127	SAV	103	53	3	
Kitt # 21	Pimlico	Mead Family, Lake Dennis Prop.	2110001001 & 1980000001	376	SAV	336	63	3	
Kitt # 23	Wappaola	Mead Family Ltd Part	2110001001	93	SAV	49	23	3	
Kitt # 24	Wappaola	Mead Family Ltd Part	2110001001	11	FLV	6	10	2	
Kitt # 26	The Farm	Mead Family Ltd Part	2110001001	51	ITEM	35	2	2	
Kitt # 25	Harry Hill	R & B Mead	2110001001	36	ITEM	14	2	2	
Kitt # 22	South Mulberry	Mead Family Ltd Part	1810002065	220	SAV	167	13	3	
Kitt # 27	Dean Hall	E.I. Dupont	2120001009	27	ITEM	25	50	1	
Kitt # 28A	Dean Hall	E.I. Dupont	2120001009	18	ITEM	16	70	1	
Kitt # 28B	The Bluff	Bluff Plt on Cooper	2120001010	24	ITEM	15	20	1	

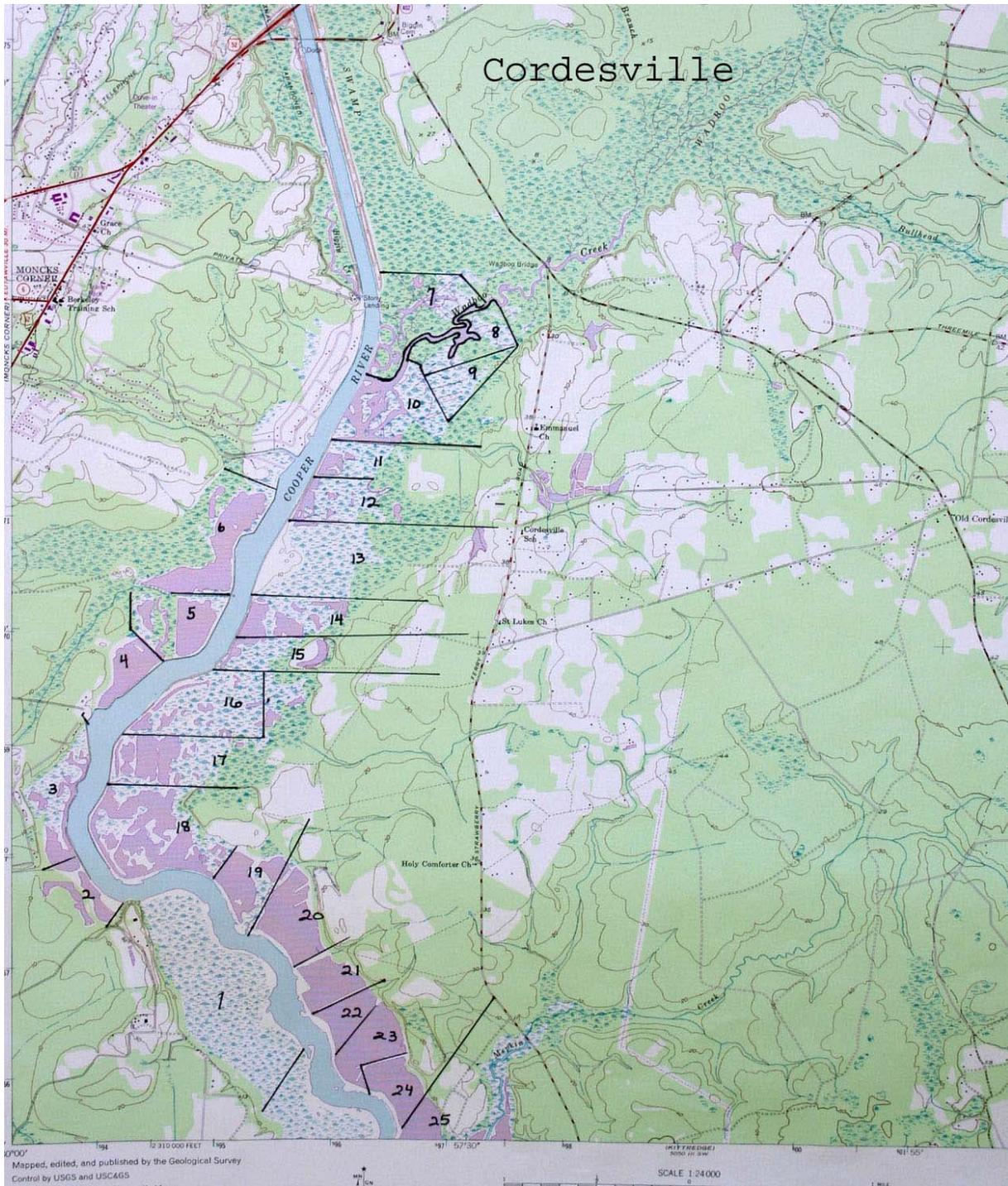
<u>Field #</u>	<u>Name</u>	<u>Owner</u>	<u>TMS#</u>	<u>Total Area (Acres)</u>	<u>Major Vegetative Cover Type</u>	<u>Major Vegetative Cover (Acres)</u>	<u>Breaches as a % of Dike Length</u>	<u>Navigability*</u>	<u>Expressed Interest In Reimpounding</u>
<b>Kitt # 29A</b>	<b>Dean Hall</b>	E.I. Dupont	226000000 2	47	ITEM	29	70	1	
<b>Kitt # 29B</b>	<b>The Bluff</b>	Bluff Pit on Cooper	212000101 0	15	ITEM	12	50	1	
<b>Kitt # 30A</b>	<b>Dean Hall</b>	E. I. Dupont	226000000 1	58	Trees	46	40	1	
<b>Kitt # 30B</b>	<b>The Bluff</b>	Bluff Pit on Cooper	212000101 0	11	ITEM	8	70	1	
<b>Kitt # 31</b>	<b>Dean Hall</b>	State of SC	none	67	Trees	42	80	1	
<b>Kitt # 32</b>	<b>Dean Hall</b>	State of SC	none	44	Trees	39	80	1	
<b>Kitt # 33</b>	<b>Dean Hall</b>	SCE&G	237000000 2	55	ITEM	37	80	1	
<b>Kitt # 34</b>	<b>Medway</b>	Legendre B.as Trustee	236000000 2	81	Trees	58	80	1	
<b>Kitt # 35</b>	<b>Medway</b>	Legendre B.as Trustee	236000000 2	32	ITEM	18	80	1	
<b>Kitt # 36</b>	<b>Medway</b>	Legendre B.as Trustee	236000000 2	37	Trees	19	80	1	
<b>Kitt # 37</b>	<b>Medway</b>	Legendre B.as Trustee	236000000 2	50	Trees	29	80	1	
<b>Kitt # 38</b>	<b>Medway</b>	Legendre B.as Trustee	236000000 2	47	Trees	40	30	1	
<b>Kitt # 39</b>	<b>Medway</b>	Legendre B.as Trustee	225000001 4	31	ITEM	22	80	1	
<b>Kitt # 40</b>	<b>Medway</b>	Medway Environ. Trust	225000001 4	63	ITEM	39	50	1	
<b>Kitt # 41</b>	<b>Medway</b>	Legendre B.as Trustee	236000000 2	93	ITEM	65	20	1	
<b>Kitt # 42</b>	<b>Medway</b>	Legendre B.as Trustee	236000000 2	49	ITEM	37	0	Impounded	
<b>Kitt # 43</b>	<b>The Hagan</b>	Nucor Corp.	238000012 5	119	ITEM	103	80	2	
<b>Huger # 1</b>	<b>Richmond</b>	Conservation Fund	200000000 8	110	FLV	61	29	2	

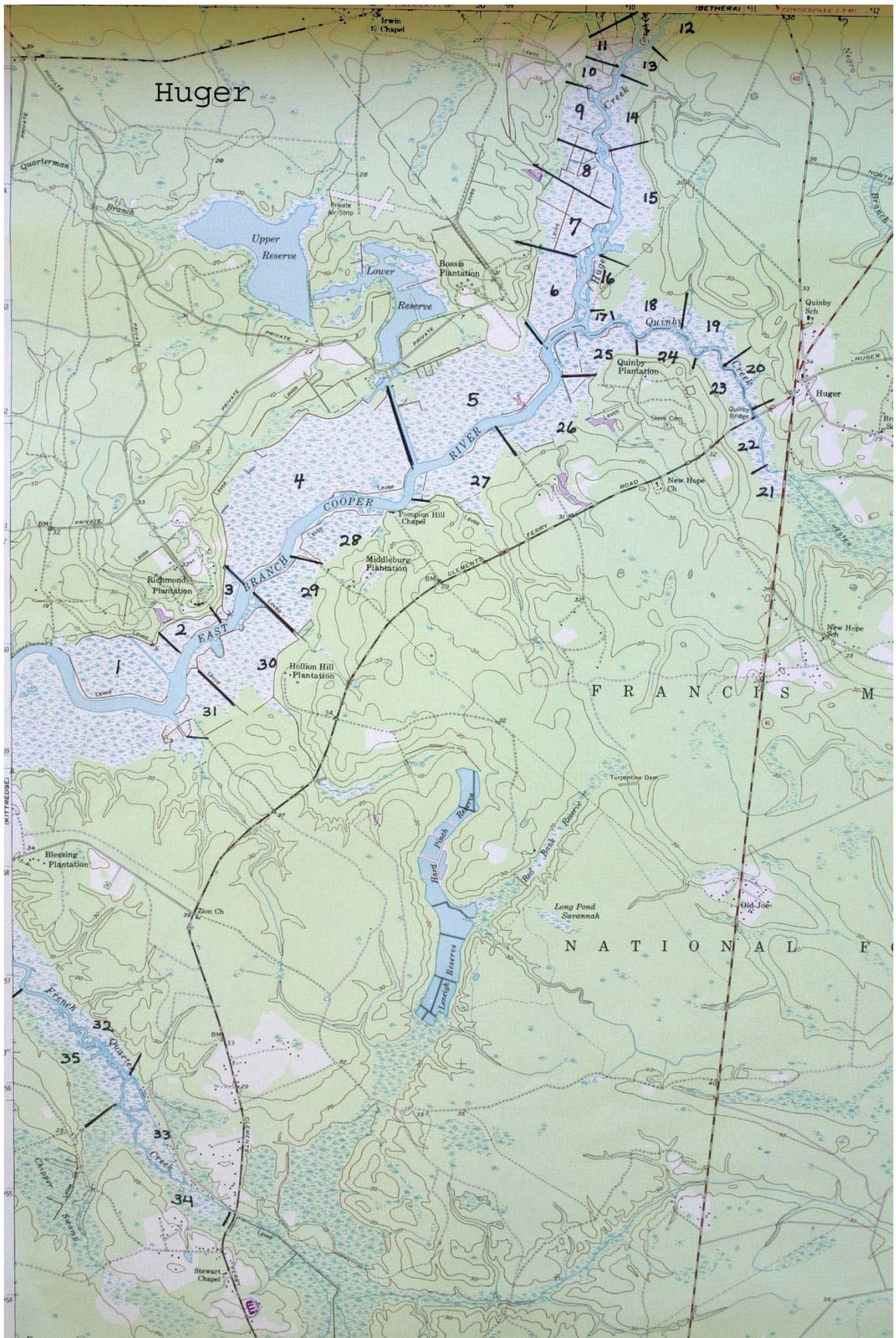
<u>Field #</u>	<u>Name</u>	<u>Owner</u>	<u>TMS#</u>	<u>Total Area (Acres)</u>	<u>Major Vegetative Cover Type</u>	<u>Major Vegetative Cover (Acres)</u>	<u>Breaches as a % of Dike Length</u>	<u>Navigability*</u>	<u>Expressed Interest In Reimpounding</u>
Huger # 2	Richmond	Girl Scouts	214000000 1	17	FLV	9	53	2	
Huger # 3	Richmond	Girl Scouts	214000000 1	11	ITEM	6	6	1	
Huger # 4	Farmfield	Conservation Fund	200000000 8	329	SAV	166	5	3	
Huger # 5	Bossis	Conservation Fund	200000000 8	186	ITEM	97	15	2	
Huger # 6	Hyde Park	Hyde Park	201000000 1	55	FLV	26	15	2	
Huger # 7	Hyde Park	Hyde Park	201000000 1	62	FLV	31	6	2	
Huger # 8	Kensington	Jane Stoney	185000100 4	46	ITEM	36	23	1	
Huger # 9	Kensington	Jane Stoney	185000100 6	22	ITEM	13	0	Impounded	
Huger # 10	Kensington	T Stoney and Smith	185000100 6	9	FLV	4	3	1	
Huger # 11	Kensington	R Stoney	185000104 6	18	ITEM	12	5	1	
Huger # 12	Silk Hope	R Royall	202000006 4	2	Trees	1	5	1	
Huger # 13	Silk Hope	R Royall	202000006 4	6	ITEM	4	4	1	
Huger # 14	Silk Hope	R Royall	202000003 8	24	ITEM	22	6	1	
Huger # 15	Silk Hope	R Royall	202000006 4	49	ITEM	41	7	1	
Huger # 16	Silk Hope	R Royall	202000006 4	6	ITEM	6	5	1	
Huger # 17	Silk Hope	Martinache	201000000 3	5	ITEM	5	9	1	
Huger # 18	Silk Hope	R Royall	202000006 4	28	ITEM	25	5	1	
Huger # 19	Silk Hope	R Royall	202000006 4	23	ITEM	20	3	1	

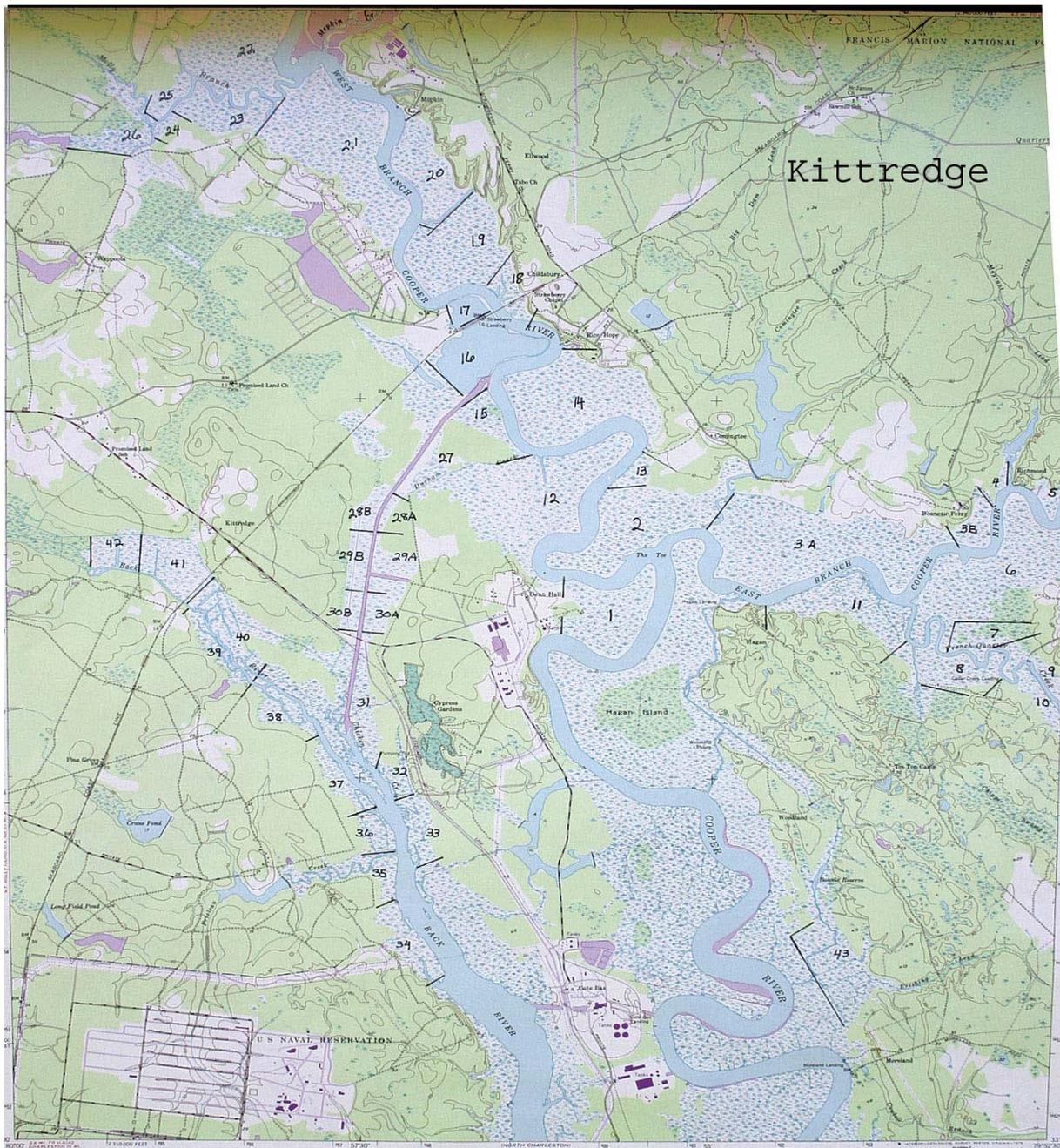
<u>Field #</u>	<u>Name</u>	<u>Owner</u>	<u>TMS#</u>	<u>Total Area (Acres)</u>	<u>Major Vegetative Cover Type</u>	<u>Major Vegetative Cover (Acres)</u>	<u>Breaches as a % of Dike Length</u>	<u>Navigability*</u>	<u>Expressed Interest In Reimpounding</u>
Huger # 20	Silk Hope	R Royall	2020000038	13	ITEM	9	5	1	
Huger# 21	Quinby	Tibwin	2150000007	5	ITEM	3	5	1	
Huger # 22	Quinby	Tibwin	2150000007	15	ITEM	12	5	1	
Huger # 23	Quinby	Tibwin	2150000007	21	ITEM	16	10	1	
Huger # 24	Quinby	Tibwin	2150000007	17	ITEM	14	0	Impounded	
Huger # 25	Quinby	Tibwin	2150000007	56	ITEM	32	19	1	Yes
Huger # 26	Longwood	Robert Lockwood	2150000005	36	FLV	19	10	2	
Huger # 27	Longwood	Robert Lockwood	2150000005	59	ITEM	25	46	2	
Huger # 28	Middleburg	Hill Family Ltd Part	2150000002	45	FLV	23	23	1	
Huger # 29	Hollidon Hill	VH Coen	2150000001	53	FLV	32	8	2	
Huger # 30	Hollidon Hill	VH Coen	2150000001	110	FLV	63	0	Impounded	
Huger # 31	Camp Vere	Mary Gilbreth	2280000001	27	FLV	16	17	2	
Huger # 32 & Kitt # 9	The Blessing	Northern Trust Co.	2270000004	68	ITEM	39	25	1	
Huger # 33	The Hagan	Berkeley Co.	23800000125	34	ITEM	23	14	1	
Huger # 34	The Hagan	Berkeley Co.	23800000125	14	ITEM	11	10	2	
Huger # 35	The Hagan	Berkeley Co.	23800000125	58	ITEM	28	30	2	
Cordes # 1	Mulberry	P & G Gilbert	1810002067	334	SAV	262	6	3	
Cordes # 2	Exeter	Amer Mtg & Invest	1620003007	23	SAV	16	0	Impounded	

<u>Field #</u>	<u>Name</u>	<u>Owner</u>	<u>TMS#</u>	<u>Total Area (Acres)</u>	<u>Major Vegetative Cover Type</u>	<u>Major Vegetative Cover (Acres)</u>	<u>Breaches as a % of Dike Length</u>	<u>Navigability*</u>	<u>Expressed Interest In Reimponding</u>
<b>Cordes # 3</b>	<b>Exeter</b>	Amer Mtg & Invest	1620003007	83	SAV	44	1	3	
<b>Cordes # 4</b>	<b>Lewis Field</b>	Rembert Dennis	1620002011	43	SAV	24	0	Impounded	
<b>Cordes # 5</b>	<b>Lewis Field</b>	Rembert Dennis	1620002011	86	SAV	38	0	Impounded	
<b>Cordes # 6</b>	<b>Gippy</b>	John Cumbie	1620002020	115	SAV	53	0	Impounded	
<b>Cordes # 7</b>	<b>Wadboo</b>	SCPSA	none	111	ITEM	62	8	1	
<b>Cordes # 8</b>	<b>Wadboo</b>	SCPSA	none	92	Trees	45	9	1	
<b>Cordes # 9</b>	<b>Wadboo</b>	SCPSA	none	23	ITEM	16	4	1	
<b>Cordes # 10</b>	<b>Wadboo</b>	SCPSA	none	66	ITEM	36	7	2	
<b>Cordes # 11</b>	<b>Umbria</b>	H & M Allen	14300000015	38	Fields	22	0	Impounded	
<b>Cordes # 12</b>	<b>Umbria</b>	H & M Allen	14300000015	46	ITEM	22	0	Impounded	
<b>Cordes # 13</b>	<b>Willow Grove</b>	NJ Murphy	14300001005	201	Trees	114	0	Impounded	
<b>Cordes # 14 &amp; 15</b>	<b>Willow Grove &amp; Brickhouse</b>	NJ Murphy & N. Dennis	16300001005	100	ITEM	43	0	Impounded	
<b>Cordes # 16</b>	<b>Salt Point</b>	Salt Point Timber LLC	16300001007	154	Trees	117	0	Impounded	
<b>Cordes # 17</b>	<b>Salt Point</b>	Salt Point Timber LLC	16300001007	106	Trees	46	0	Impounded	
<b>Cordes # 18</b>	<b>Salt Point</b>	Salt Point Timber LLC	16300001007	170	ITEM	76	0	Impounded	
<b>Cordes # 19</b>	<b>Salt Point</b>	Salt Point Timber LLC	16300001007	56	SAV	26	0	Impounded	
<b>Cordes # 20</b>	<b>Buck Hall</b>	Buck Hall Real Est Dev Corp	18200000002	78	SAV	52	0	Impounded	
<b>Cordes # 21</b>	<b>Buck Hall</b>	Buck Hall Real Est Dev Corp	18200000002	56	FLV	34	0	Impounded	
<b>Cordes # 22</b>	<b>Buck Hall</b>	Buck Hall Real Est Dev Corp	18200000002	44	SAV	28	0	Impounded	

<u>Field #</u>	<u>Name</u>	<u>Owner</u>	<u>TMS#</u>	<u>Total Area (Acres)</u>	<u>Major Vegetative Cover Type</u>	<u>Major Vegetative Cover (Acres)</u>	<u>Breaches as a % of Dike Length</u>	<u>Navigability*</u>	<u>Expressed Interest In Reimpounding</u>
<b>Cordes # 23</b>	<b>Buck Hall</b>	Buck Hall Real Est Dev Corp	1820000002	62	SAV	29	0	Impounded	
<b>Cordes # 24</b>	<b>Buck Hall</b>	Buck Hall Real Est Dev Corp	1820000002	53	ITEM	25	0	Impounded	
<b>Cordes # 25</b>	<b>Mepkin</b>	Mepkin Abbey	1980000101	60	SAV	43	0	Impounded	







The U.S. Army Corps of Engineers, Charleston District has four rice field restoration projects within the boundaries of the SAMP. These projects are: Mulberry Plantation, Bonneau Ferry Plantation (i.e., Small Bonneau Ferry rice field), Quinby Plantation, and Cedar Hill Plantation. All of these projects are being conducted under the authority of the Corps' aquatic ecosystem restoration (a.k.a., Section 206) Continuing Authorities Program. The overall goal of the Section 206 program is the restoration and/or protection of impaired or threatened aquatic habitat.

Section 206 projects require a local cost-share sponsor who contributes 35% of the total cost either in cash, in-kind services, or a combination thereof.

A Preliminary Restoration Plan (PRP) has been prepared for each of these projects. A PRP is a short report based on a limited evaluation of the problem. The role of a PRP is to identify if there is federal interest in performing a detailed study of the problem. The general content of a PRP is (1) the determination of whether the aquatic habitat is impaired or threatened, (2) if yes, the determination of whether the habitat is of significant importance (e.g., rare or unique habitat, habitat that supports listed species, habitat that supports other significant species, etc.) to warrant the expenditure of federal money, (3) development of a preliminary list of possible solutions, and (4) identification of one of these possible solutions as a feasible solution that is further supported by a cost analysis. The identification of a possible solution in the PRP does not mean that this will be the ultimate solution; all possible alternatives are fully evaluated during the detailed study.

The PRP's for each of the rice field projects identified re-impoundment as the possible solution; however, as previously noted, this solution was based on a limited evaluation, and it, and other possible solutions will be further evaluated during the detailed study.

All four rice field projects have been placed on hold pending the results of the SAMP process. Also, there presently are insufficient funds in the Corps nationwide Section 206 budget to resume study of these projects in the short-term (i.e., throughout fiscal year 2005 and possibly extending into fiscal year 2006).

## Appendix IX – Additional Water Quality Efforts

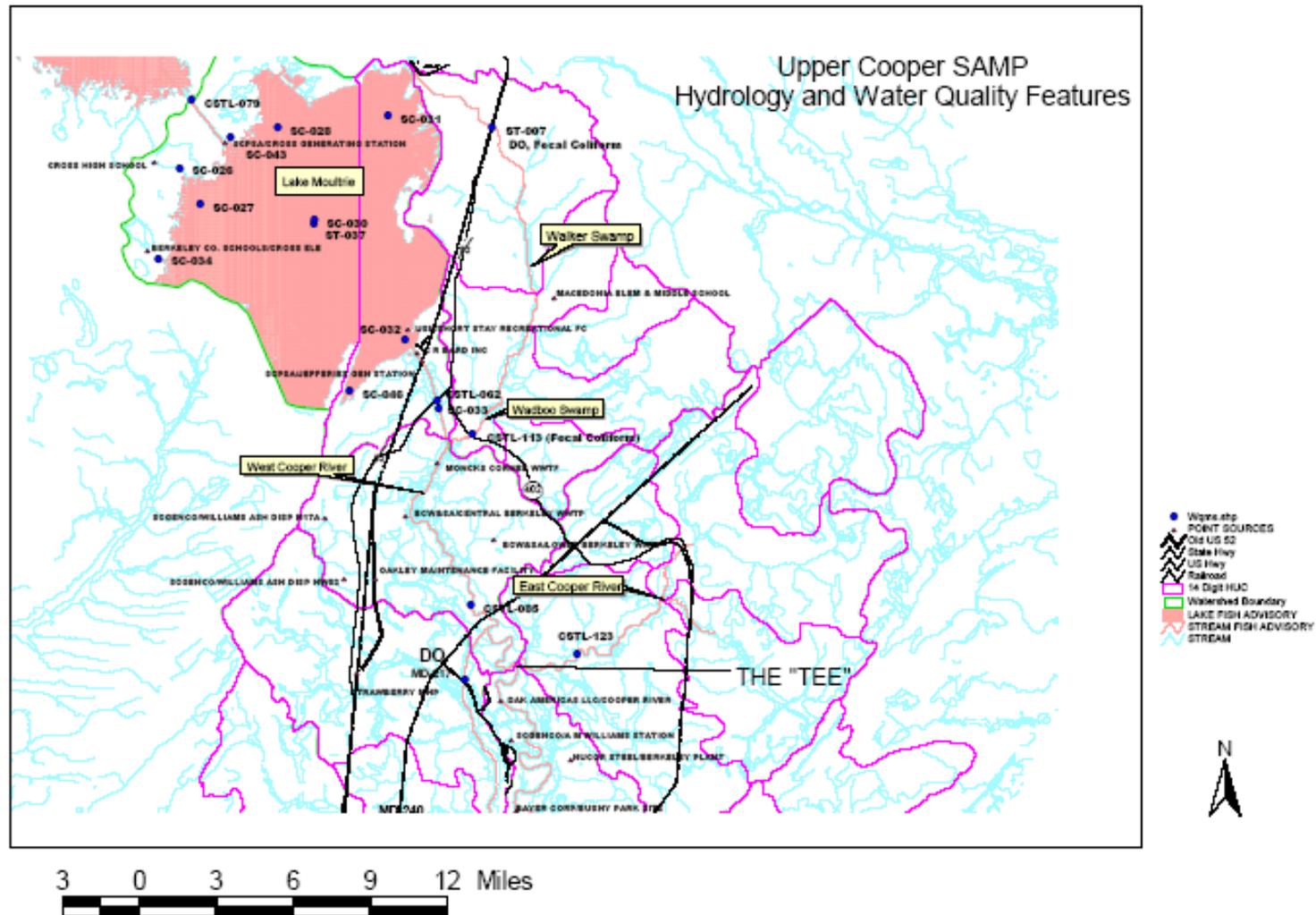
Considerable information about water quality issues in the Upper Cooper Watershed is derived from studies and reports conducted as a part of the Charleston Harbor Project (CHP). Initially funded through NOAA, The Charleston Harbor Project was conducted from 1992 to 1998 and provided a comprehensive analysis of issues confronting the Charleston Harbor area, including water quality and pollution. While much of the CHP research was broadly focused on the downstream marine areas, many projects addressed issues pertinent to the Upper Cooper SAMP area. Please reference

<http://www.SC DHEC.gov/eqc/ocrm/HTML/plan.html#CHARLESTON>

The US Army Corps of Engineers (US CoE) conducted another large-scale study, known as *Reconnaissance Report: Santee / Cooper / Congaree River Basins*, published in 1997. While even broader in scope than the Charleston Harbor Project, this report provided a water quality evaluation and a list of recommendations for the Santee/Cooper portion of the Santee River basin. The issue of industrial use of water is discussed in this report. The Back River Reservoir runs roughly parallel with the Upper Cooper River in part of the SAMP area. This reservoir is used to supply water to several downstream industrial users. Freshwater is supplied to the reservoir through Durham canal near Cypress Gardens. A significant threat to industrial use is excess salinity in the Cooper River at this location during times of extreme high tide. Current arrangements with Santee Cooper and US CoE have resulted in a system that releases extra freshwater from the Pinopolis dam during these times at flows sufficient to impede the advancement of brackish water upstream.

This stakeholder group firmly embraces several of the recommendations derived from both of these processes.

## Appendix X – The Science of Water Quality



## *Dissolved Oxygen*

SC DHEC/BoW has set a dissolved oxygen (DO) criterion of a minimum of 4 mg/liter Saltwater, Class B (Class SB) and a daily average of 5 mg/liter for freshwater (FW) and Saltwater, Class A (SA). The exception is for Trout Natural (TN) and Trout Put, Grow, and Take (TPGT), which has a minimum standard of 6 mg/liter. An excursion is an occurrence of a DO concentration less than the stated criterion. For pH, there are several acceptable ranges, depending on the Class of water. (*Please refer to the Water Quality Standards regulation for Class specific standards.*) For DO and pH, if 90 percent or more of the samples are within the appropriate standard, then the standards are said to be “fully supported.” If between 11 percent and 25 percent of the samples do not meet the standards, then the waterbody is considered in partial support of the standard. If greater than 25 percent of the samples do not meet the standards, the waterbody represents “nonsupport” of the standard, unless excursions are due to natural conditions pursuant to R.61-68.C.6.

According to US Geological Survey (USGS) monitoring of the Cooper River during the Charleston Harbor Project, DO levels in the Upper Cooper River Corridor SAMP area often do not meet water quality standards during the critical warm weather months. USGS sampled water at a greater frequency (up to every 15 minutes) in comparison to SC DHEC’s monthly regime. However, the USGS and DHEC ambient monitoring stations in the Charleston Harbor system are not considered to be impaired under criteria of Section 303(d) of the Clean Water Act. South Carolina DHEC submitted 303(d) lists to EPA Region 4 in 1996, 1998, 2000 and 2002. A draft 303(d) list has been developed for 2004. None of the lists identify the main stem of the Cooper River as impaired for Dissolved Oxygen (DO). SC DHEC/BoW has received approval for a Total Maximum Daily Load (TMDL) for dissolved oxygen, although the Cooper River is not impaired with respect to DO for 303(d) listing purposes. The Cooper River is likely not experiencing water quality problems related to DO depletion under non-critical conditions. Further USGS monitoring is currently underway as a part of the ongoing Cooper River TMDL development.

The extent of current knowledge about DO suggests that the Floating Leaf Vegetation (FLV) and Intertidal Emergent (ITEM) vegetation communities consume oxygen. The results in the Sub-Aquatic Vegetation (SAV) community are less clear, although it appears that they may export DO when ebb tide occurs late in the day. This is consistent with the biological expectation of DO production by photosynthesis, as well as of plants that are fully submerged. All of the DO released into the water column has the opportunity to dissolve into the water.

Whether a given community type is a source or sink for DO and under what conditions this occurs is only part of the DO balance equation. There is also an

exchange of organic material that consumes DO during microbial degradation, known as biochemical oxygen demand (BOD). As with nutrients and sediments, some of the BOD enters the Cooper River during flood tide conditions and some is produced in the impoundments themselves. The impoundment is increasing DO demand on the river if there is a net export of BOD; it is decreasing DO demand if there is a net import.

The quantity and net DO-effect of impoundment on BOD exchanges with the Cooper River is an important missing piece in our understanding of the water quality in the river. The issue is currently under study. It is worth noting that from the nutrient work already described, it appears likely some community types under some conditions are net exporters of BOD. Thus, they are placing a DO demand on the river.

According to the *2004 SC Aquatic Plant Management Plan (Draft)*, Hydrilla, Water Primrose, and Water Hyacinth are considered "problem plant species." The SC Aquatic Plant Management Council proposes three main objectives for control of those species in the Cooper River:

- Reduce water hyacinth to the greatest extent possible in the main river and public rice fields;
- Reduce water primrose growth along boat channels for navigation; and
- Open limited boat trails in selected hydrilla infested rice fields to aid public access.

The Council proposes that treatment of these infestations be conducted using the herbicides Renovate 3, Reward and Chelated Copper. Specific areas noted for treatment included French Quarter Creek, Rice Hope Plantation and Berkeley Yacht Club.

The Council recommended several long-term management measures, including maintenance, enhancement and, where feasible and appropriate, re-introduction of native plant species. Public education at boat ramps and elsewhere could encourage behaviors that reduce propagation of nuisance plant species. Enforcement of existing laws and regulations may control water hyacinth in privately owned rice fields.

Vegetated buffer zones can be critical for optimal water quality, especially in the immediate riparian areas along riverbanks and headwater streams. They are a significant factor in maintaining water quality and can filter runoff pollutants, especially nutrients and sediment. Buffers are also important in enhancing DO by helping to maintain lower water temperatures, which improves the ability of water to retain oxygen. The input of organic debris provides an additional ecological

benefit by acting as an energy supply and providing habitat for species that form the base of the food chain.

## *Point Source Dischargers*

### Municipal Point Sources

Municipal sources are typically Publicly Owned Treatment Works (POTWs) that primarily receive domestic sewage from residential and commercial customers. Large POTWs also may receive and treat wastewater from industrial facilities (indirect dischargers). A POTW treats conventional pollutants and may treat non-conventional pollutants and toxic pollutants, depending on the characteristics of the commercial and industrial sources discharging to the POTW. The treatment provided by POTWs normally includes physical separation and settling (screening, grit removal, primary settling), biological treatment (trickling filters, activated sludge) and disinfection (chlorination, UV, ozone). These processes produce the treated effluent (wastewater) and biosolids residual managed under the Municipal Sewage Sludge Program. All SC municipalities have municipal separate storm sewer systems (MS4's) that are also subject to NPDES requirements. Specific NPDES program areas applicable to municipal sources are:

1. National Pretreatment Program;
2. Municipal Sewage Sludge Program;
3. Combined Sewer Overflows (CSOs);
4. Office of Wastewater Management - Water Permitting; and
5. Municipal Stormwater Program.

### Industrial and Commercial Sources

Industrial and commercial facilities are unique with respect to the products and processes present at the facility. At industrial facilities, the types of raw materials, production processes, treatment technologies utilized and pollutants discharged vary widely and depend on the type of industry and specific facility characteristics. Typically, industrial facilities require a higher level of treatment than POTWs. Since operations at industrial facilities are carried out within a clearly defined plant area, the collection systems are not as complex as those within municipalities. Industrial facilities may have stormwater discharges contaminated by manufacturing activities, contact with raw materials or product storage activities and may have non-process wastewater discharges such as non-contact cooling water. The NPDES Program addresses all of these potential wastewater sources for industrial facilities. Specific NPDES program areas applicable to industrial sources are:

1. Process Wastewater Discharges
2. Non-process Wastewater Discharges
3. Industrial Stormwater Program

### TMDLs and Waste Load Allocations

Section 303(d) of the Clean Water Act establishes a process for states to identify waters within its boundaries where implementing technology-based controls are inadequate to achieve water quality standards. States establish a priority ranking of these waters and, for the priority waters, develop total maximum daily loads (TMDLs). A TMDL identifies the amount of a specific pollutant or property of a pollutant, from point sources, nonpoint sources and natural background sources, including a margin of safety that may be discharged into a waterbody and still ensure that the waterbody attains water quality standards. The allocations of pollutant loadings to point sources are called waste load allocations (WLAs). Effluent limits in NPDES permits must be consistent with such waste load allocations.

Data collected at the DHEC ambient monitoring stations (referenced by the code CSTL in Table #1) and the USGS monitoring stations suggests that the Charleston Harbor system likely does not meet the applicable water quality standard for dissolved oxygen during critical conditions. As a result, the system is considered “water quality limited” for the purposes of waste load allocation (WLA) development. The pollutant of concern for DO depletion can be expressed as ultimate oxygen demand (UOD). The loading can be estimated based on the loading of BOD<sub>5</sub> and ammonia nitrogen using the following formula:

$$\text{UOD lbs.} = (\text{lbs. carbonaceous BOD}_5 * \text{factor}) + (\text{lbs. NH}_3\text{N} * 4.57)$$

DHEC decided to use the TMDL process to develop waste load allocations for the following UOD dischargers to the Charleston Harbor system:

Discharger	Classification	Cooper River Location
Moncks Corner WWTF	Municipal	Main Stem – Above “T”
Central BCW&SA	Municipal	Main Stem – Above “T”
DAK Americas	Industrial	Main Stem – Below “T”
Sun Chemicals	Industrial	Main Stem – Below “T”
BP Amoco	Industrial	Main Stem – Below “T”
Lower BCW&SA	Municipal	Main Stem – Below “T”
MeadWestvaco	Industrial	Main Stem – Below “T”
Daniel Island	Municipal	Main Stem – Below “T”
North Charleston Sewer District	Municipal	Main Stem - Below “T”

Discharger	Classification	Cooper River Location
Plum Island WWTP	Municipal	Harbor
Mt. Pleasant Rifle Range	Municipal	Harbor
Mt. Pleasant Center Street	Municipal	Harbor

**Table 2. NPDES Permitted Discharges Included in the TMDL Allocation (by location)**

A water quality model was developed to predict the impact of point source discharges on DO concentrations in the system. Based on the results, DHEC indicates the need to reduce ultimate oxygen demand (UOD) from 186,053 lbs/day to 57,521 lbs/day. This is equivalent to an approximate 70 percent decrease from existing permitted loadings. A phased approach to achieving the reductions has been proposed with an initial Phase 1 reduction to 78,125 lbs/day, or approximately 60 percent. The TMDL allows for additional study and modeling during Phase 1 to further refine the allowable load to the system prior to implementation of final limits.

Several NPDES permittees along the Cooper were not included in the TMDL waste load allocation process due to their insignificant impact on DO. The remaining twelve dischargers were considered significant contributors of oxygen demanding substances and were included in the TMDL calculator and TMDL allocation (Table 1).

### ***Nonpoint Source Pollutants of Concern***

The more important NPS pollutants are sediment, bacteria, heavy metals, petroleum hydrocarbons, hazardous chemicals and nutrients – such as phosphorus and nitrogen. No runoff water quality samples are known to have been tested in the Upper Cooper SAMP area. However, there are potential nonpoint sources typical in areas with land use similar to that in the Cooper River Corridor SAMP Area:

#### Sediment

- Plowed agricultural fields
- Logging operations
- Building construction
- Road construction
- Dirt roads

#### Bacteria

- Malfunctioning septic systems
- Domestic pet waste
- Agricultural livestock waste
- Sewer line leakage

- Illegal disposal
- Wildlife

### Nutrients

- Agricultural fertilizers
- Residential lawn and garden fertilizers
- Atmospheric deposition of combustion products
- Natural inputs (e.g., leaf litter)

### Metals

- Weathering of outdoor metals (guardrails, signs, some roofs)
- Automobile break pads and engine wear
- Improper disposal of appliances

### Petroleum Hydrocarbons

- Automobile exhaust products
- Improper disposal of motor oil
- Underground storage tanks
- Two cycle outboard motors

### Hazardous Chemicals

- Excess residential pesticide/herbicide use
- Excess agricultural pesticide/herbicide use
- Illegal dumping

## Appendix XI – The Ecology of Wildlife and Wildlife Habitat

### *Upland Habitats*

#### Old Field Communities

Old fields are classified into two major soil groups, upland (well-drained) and lowland (poorly drained). Well-drained sandy fields tend to develop into longleaf pine-turkey oak communities. Poorly drained, loamy soils ultimately produce loblolly pine and mixed hardwoods.

#### Pine-Mixed Hardwood Communities

Pine-Mixed Hardwood communities are very common in the upland ecosystem. The two major groups are mesic (moist) and xeric (dry). Mesic pine-mixed hardwoods are common in upland habitats. Predominant species include loblolly and slash pine, water oak, laurel oak, sweet gum and live oak. Longleaf pine and turkey oak are dominant species in the xeric communities.

#### Pine Forest Communities

The original upland forest communities prior to colonial settlement were largely dominated by extensive open stands of longleaf pine adapted to periodic natural fires. Mixed hardwood communities dominated moist slopes and wetland margins where fires were less frequent. After settlement in the early 18<sup>th</sup> century, control of fires, logging and clearing for agriculture altered upland communities. Today, mixed-age stands of loblolly pine dominate much of the remaining forested upland area. Some small stands of longleaf pine remain, and slash pine is present in some areas. Some landowners actively manage pine stands with prescribed fire to improve wildlife habitat, decrease the risk of wildfire and increase pine production. A managed pine stand may contain loblolly or longleaf pine, with an open understory of bracken fern, goat's rue, bitter gallberry and huckleberry.

#### Mixed Hardwoods Communities

As many as 20 different mixed hardwoods community types have been described in the Sea Islands Coastal Region. In the Cooper River watershed, a characteristic community type is the moist slope, or "mesic" forest community. The moist slope community is a multi-layered forest with relatively high species diversity in the canopy, sub-canopy, shrub and herbaceous layers. Dominant tree species include white oak, swamp chestnut oak, beech, mockernut hickory, tulip tree (yellow-poplar), pignut hickory, southern red oak, live oak, red maple, sweetgum, laurel oak and water oak. The sub-canopy often includes American holly, bull bay magnolia, sweet bay and red bay. Shrub and herb layer species include dwarf

palmetto, blueberry, American beauty berry, viburnum and smilax. The upland mixed hardwood forest is particularly important habitat for wildlife by virtue of the diversity of food sources, including oak and hickory mast and a variety of fruit producing trees, shrubs and herbaceous plant species. Upland mixed hardwood forest species also provide a diversity of structural habitat needs, including den sites for large and small mammals and nest sites for resident and migratory birds. The mixed hardwood forest is an especially threatened habitat because of its suitability for development sites, historical conversion to agriculture and upland pine forest management.

## *Upland Wildlife*

### Invertebrates

**Soil:** Soil Invertebrates are most significant in their role of breaking down detritus and overall mineral recycling. Six traits of soil invertebrates contribute to their importance. They:

- Disintegrate plant and animal tissues and make them more easily invaded by microorganisms;
- Selectively decompose and chemically change parts of organic residue;
- Transform plant residues into humic substances;
- Increase the surface area available for bacterial and fungal action;
- Form complex aggregates of organic matter with the mineral part of the soil; and
- Mix the organic matter thoroughly into the upper layers of the soil.

Major factors that influence soil fauna include topography, concentration of organic matter, electrolyte content, pH, light, temperature, moisture content, relative humidity, air composition in pore spaces, and soil structure, texture and color.

**Aerial and Crawling:** The next largest and most diverse group is the aerial and crawling insects. While they play an important role in the food chain, some species can be very destructive. In particular, southern pine, Ips<sup>28</sup> and black turpentine beetles can wreak havoc in pine-dominated forests. Damage control, where desired, should focus on the two main causes of infestation: damage from lightning strikes (fell and remove or fell and spray damaged trees) and damage from mechanical operation activity (minimize where possible). However, insect invasion is a naturally-induced habitat change and provides benefits to stands

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<sup>28</sup> Ips is not a typographical error. It is a type of pine beetle



that are not managed for timber. Infestation benefits include providing wildlife feeding and reproductive areas by opening canopies, which allows for growth of understory browsing habitat.

Another major pest insect is the imported fire ant. The fire ant not only has a negative effect on other insects, but it also preys on juvenile birds and mammals. Several studies and experiments have been conducted with no definitive measure for control. Much debate has been over the effectiveness and potential harm of certain insecticides. Early use of dieldrin and heptachlor yielded ineffective control and had an adverse effect on livestock. Mirex was successful in controlling fire ants, but it was not selective and led to indirect adverse effects on other wildlife. The debate on fire ant control continues, but for the purpose of this plan, it is worth noting its existence and context.

### Vertebrates - Amphibians and Reptiles

This group includes salamanders, frogs and toads, lizards and snakes. Many amphibians and reptiles spend much of their existence in uplands, although they require the presence of water or wetlands to complete their life cycle. These animals often use wet "microhabitats," such as accumulated forest litter, spring seeps, bogs, pond edges and areas under decaying logs. Temporary pools and semi-permanent ponds are also important in reproduction of many species.

Human activities, such as clearcutting, land clearing, site preparation for planting, and elimination of hardwoods, greatly impact amphibians and reptiles. Many are killed on roads during spring and fall when movement associated with breeding increases. Deliberate snake killing and removal from the wild by the pet trade have caused declines in some species such as the Eastern Diamondback rattlesnake.

### Birds

#### *Grassland and Edge*

Edge communities occur at the intersection between two communities, such as field and forest. Some of the highest concentrations of birds are seen in the grasslands and edges. Fifty-four species commonly occur in this habitat (23 in a dominant role and 31 in moderate to minor roles). Edges enable easy access to feeding as well as quick escape from predators. Representative species that use edges are the red tailed hawk, sparrow hawk, Carolina wren, mockingbird, mourning dove, bobwhite quail and various sparrows.

## *Pine Forest*



Upland pine forests contain relatively low densities of birds with only 13 dominant species and 16 moderate to minor role species. This is primarily due to lack of habitat diversity found in these communities. Bird populations in pine forests are greatly determined by the makeup of the understory. Each bird is best suited to a particular stage of succession and/or combination of stages. Natural and man-made succession provides constant changes in niches and habitats. Variables affecting diversity are food availability, manner of feeding, nesting requirements and physical characteristics.

Typical breeding birds (in order of greatest to least abundance) include the pine warbler, brown-headed nuthatch and red-cockaded woodpecker. Understory species include Bachman's sparrow and the eastern bobwhite. Other dominant species include the red-bellied woodpecker, common crow, eastern bluebird, Carolina chickadee, yellow-throated warbler and summer tanager. Moderate to minor role species include various hawks, owls and vultures.

## *Pine-Mixed Hardwood*

With a more developed hardwood understory and sub-canopy, this habitat has a greater diversity than the pine forest. Greatest diversity is normally achieved around the 60th year. The foliage density in the three main layers (herbs, shrubs and trees over 25 feet) increases its diversity. When the amount of foliage is equal among all three layers, the diversity has been found to be higher.

The pine-mixed hardwood forest is home to 32 dominant bird species and 20 moderate to minor role species. Three behaviors governing bird species diversity in this habitat include: 1) feeding height; 2) nesting altitude; and 3) the elevation at which they seek refuge for protection.

## Mammals

It is difficult to assign mammals to one particular habitat type. Mammals have relatively higher mobility and generalized habitat requirements. Old field and forest will be the general divisions for the purposes of this discussion.

### *Old Field*

Old fields are dominated by smaller mammals, particularly rodents and lagomorphs (rabbits). Representatives include the cottontail rabbit, marsh rabbit, marsh rice rat, old-field mouse, cotton rat, pine mouse and house mouse. Progressively larger species that utilize old-field habitat include the opossum, various shrews, moles, red and gray foxes, the long-tailed weasel and striped skunk.

Impacts to this habitat include conversion back to farmland and burning. While burning may temporarily disrupt nests and juvenile habitat, long-term effects can be positive by stimulating growth of herbaceous plants and grasses.

### *Forest Communities*

Forest community mammals can be separated into three groups: herbivores (the largest group), omnivores and predators. Representative species include white-tailed deer, various squirrels and rodents, gophers, opossums, raccoons, striped skunk, feral hog, black bear (on the Francis Marion National Forest), shrews, bobcats, foxes and weasels.

### *Essential Fish Habitats*

In 1996, in response to sharply declining marine and estuarine fish and shellfish resources, the U.S. Congress enacted special amendments to the Magnuson-Stevens Fishery Conservation and Management Act to protect essential fish habitats. The new Magnuson Act directed the National Marine Fishery Service, of the U.S. Department of Commerce, to coordinate with the regional fishery management councils and the states to identify and protect those habitats determined to be essential for long term restoration and maintenance of sustainable fisheries. In response to the new Magnuson Act, the South Atlantic Fishery Management Council, the Mid-Atlantic Fishery Management Council, and the Service designated all tidal waters of the Cooper River as essential fish habitat for federally managed species including white shrimp and brown shrimp, red drum, bluefish, and summer flounder, and others. Table (xx) identifies species of federal management interest in the Cooper River, including those for which essential fish habitat is designated. As fishery management plans for other species are developed, additional essential fish habitats will be identified. Specific examples of essential fish habitats include estuarine tidal marsh, including impounded marsh, the estuarine water column, intertidal and subtidal bottom habitats, and mud flats.

What does the Magnuson Act's essential fish habitat program actually do?  
Federal action agencies which fund, permit, or carry out activities that may

adversely affect essential fish habitat are required to consult with the Service to identify conservation measures to assure their protection. In addition, the Service and fishery management councils may comment on and make recommendations to any state agency on their activities when essential fish habitat may be affected. Measures recommended by the Service or a fishery management council are advisory, not proscriptive.

### ***Wetland Associated Wildlife***

#### Foraging Wading Birds

In a study of habits of foraging wading birds (FWB), Dodd and Murphy<sup>29</sup> reported evidence of great egret, great blue heron, little blue heron, snowy egret, tricolor heron, yellow-crowned night heron, black-crowned night heron, wood stork, glossy ibis and white ibis in the SAMP area. Fourteen nesting colonies were documented along the East and West branches of the Cooper River and on Back River. These birds used formerly impounded rice fields more frequently than the other freshwater habitats available, including impounded wetlands, riverine shoreline and small creeks. FWB abundance was directly related to the total fish biomass in the area. Human activities were a major source of disturbance for foraging birds and nesting colonies. In order to limit such disturbance, Dodd and Murphy recommended minimizing human disturbance, enhancing vegetative buffers, and preserving mature trees and dead snags that provide roosting and nesting habitat.

#### Waterfowl

The Cooper River's large areas of marsh and wetlands have historically been an important wintering area for migratory waterfowl. Berkeley County consistently has one of the highest waterfowl harvest rates in the state. The predominant species during recent years are ring-necked ducks, widgeons, wood ducks, green winged teals and coots. The highest waterfowl use occurs in some of the impounded rice fields that are actively managed for ducks; management generally entails draining and planting wildlife foods, then flooding the fields during the fall and winter. Unimpounded rice fields provide excellent habitat with an abundance of natural foods, but constant disturbance from duck hunters and other human activity reduces fields' attractiveness to waterfowl.

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<sup>29</sup> Source:

### Shorebirds

The tidal wetlands of the Cooper River provide important habitat for migrating shorebirds, including sandpipers, plovers, willets, yellowlegs and dowitchers. Shorebirds are likely to use these wetlands during two migrating periods: (1) later winter/early spring and (2) late summer/early fall. Shore birds need exposed mudflats or shallow water areas (1 to 4 inches) in which to forage for their invertebrate prey. Impoundments/rice fields managed for waterfowl can be co-managed for shorebirds. By utilizing moist soil management techniques, seasonal drawdowns can be timed for peak shorebird migrations. Along the Cooper River, threats to shorebirds include inadequate habitat, human disturbances, and discharges of pollutants and contaminants.

### Neotropical Migrant Songbirds

Neotropical migrants likely found in the SAMP area include warblers, vireos, tanagers, buntings, orioles and parulas. Neotropical migrants migrate each year between tropical wintering areas and temperate breeding areas. Populations of neotropical migrants have been declining for some time, most likely due to alteration or loss of habitat in wintering, breeding and stopover areas. Mature forested wetlands, as well as riparian areas adjacent to the Cooper River, provide important habitat for neotropical migrants in the SAMP area and should be preserved and enhanced.

### Mammals

A variety of mammals can be found along the Cooper River and wetlands of the SAMP. River otters, marsh rabbits, muskrats, marsh rice rats, beavers and mink depend on the aquatic environments of the Cooper River for foraging, cover and/or nesting resources. Although other mammals such as raccoons, bobcats, gray squirrels and deer do not depend on aquatic habitats, some portion of their home ranges may consist of wetland or riparian areas. Even though marine mammals, such as dolphins and manatees, are typically found in estuarine habitats, they are occasional transients within the Cooper River Corridor SAMP area. As urban areas continue to expand, the wetland and riparian areas of the SAMP area will likely become an important source of refuge for all mammals, both aquatic and terrestrial. Therefore, efforts to minimize human disturbances within these areas are encouraged.

### Freshwater Fishes

The river system harbors a complex community of more than 60 species of freshwater fish. Resident fish species important to recreational anglers include largemouth bass, blue catfish, flathead catfish, channel catfish, redear sunfish,

bluegill, redbreast sunfish, black crappie, white crappie and striped bass. Diadromous species, those that migrate between fresh and saltwater for the purpose of spawning, that use the river for part of their life cycle include American shad, hickory shad, blueback herring, Atlantic sturgeon, shortnose sturgeon and American eel. A very popular sport fishery exists for American shad in the Tailrace Canal.

### Rare, Threatened and Endangered Species

Current populations of threatened and endangered species are indicative of historic occurrences, past and current management practices, and land ethics. The threatened and endangered species discussed below have been extirpated in many areas but remain in the SAMP area because habitats have been protected and enhanced by private, state and federal landowners. All twenty-seven federal species of concern listed in Berkeley County are likely to occur in the SAMP area. Federal species of concern are species that are rare or limited in distribution but are not currently protected under the Endangered Species Act.

Common Name	Scientific Name	Status**
West Indian manatee	<i>Trichechus manatus</i>	E
Bald eagle	<i>Haliaeetus leucocephalus</i>	T
Wood stork	<i>Mycteria americana</i>	E
Red-cockaded woodpecker	<i>Picoides borealis</i>	E
Loggerhead sea turtle*	<i>Caretta caretta</i>	T
Flatwoods salamander	<i>Ambystoma cingulatum</i>	T
Shortnose sturgeon	<i>Acipenser brevirostrum*</i>	E
Pondberry	<i>Lindera melissifolia</i>	E
Canby's dropwort	<i>Oxypolis canbyi</i>	E
American chaffseed	<i>Schwalbea americana</i>	E

**Figure IX-1: Threatened and Endangered Species Listed in Berkeley County**

\* Most likely not found in the Upper Cooper SAMP area.

\*\* E = federally endangered; T = federally threatened.

**Bald Eagle:** The bald eagle was originally listed as endangered in 1967 due to population declines associated primarily with pesticide use (DDT). After the ban of DDT, the bald eagle made a significant comeback and was down-listed to threatened in 1995. Efforts are currently underway to evaluate the potential for de-listing the species. Within the SAMP area, bald eagles nest adjacent to impoundments on the Cooper River as well as near lakes and ponds. Nests, occupied during the winter months, are up to 6 feet in diameter and are typically

found in large pine trees. Bald eagles forage on fish and waterfowl, particularly in managed impoundments.

Threats to the bald eagle within the SAMP area include loss of suitable nesting habitat from development, barbiturate poisoning, trauma, and Avian Vacuolar Myelinopathy (AVM). AVM, a neuralgic brain disease, has killed dozens of bald eagles on inland reservoirs in South Carolina. Occurrence of AVM has been associated with a blue-green algae found on hydrilla. Although not identified along the Cooper River, AVM could potentially impact this population as well.

**Wood Stork:** Wood storks are colonial wading birds that nest in forested wetlands (mostly dominated by cypress) during the spring and summer. They are tactile feeders, typically feeding in shallow water ponds (6 inches to 10 inches), managed and unmanaged wetlands, and marshes where fish prey become concentrated. The wood stork has declined mostly from the loss of suitable feeding habitat due to wetland alteration and conversion. Predation and human disturbance have also contributed to its demise.

Wood storks probably do not nest in the SAMP area. However, this area does provide important foraging habitat. Numbers of wood storks in the SAMP area may increase after they leave nesting sites in Florida to forage in South Carolina. Shallow water wetlands and impoundments in the SAMP area should be preserved, enhanced or restored to continue to provide this forage base. Impoundments that are managed with seasonal drawdowns may be of particular importance given their ability to concentrate large numbers of prey.

**Red-Cockaded Woodpecker:** Red-cockaded woodpeckers (RCWs) live in family groups within mature southern pine forests. Foraging habitat consists of fire-maintained stands of 30+-year-old pine trees with little or no mid-story. Nesting occurs in cavities that have been excavated in living pine trees. The minimum age required for cavity trees is 60 years, due to the RCWs' need for sufficient heartwood for cavity excavation. Although longleaf pine is preferred for cavity excavation due to its high resin production, cavities can be found in any southern pine species.

The SAMP area currently supports several dozen groups of RCWs on private land. The Francis Marion National Forest also supports approximately 350 RCW groups. The RCW groups within the SAMP serve as important support populations for the Francis Marion National Forest through immigration and subsequent genetic variation. The greatest threats to RCW groups on private lands within the SAMP include fire suppression, shorter timber rotations and forest fragmentation. If the RCW is to recover, populations on private lands such as those in the SAMP must be maintained and expanded.

Many landowners within the SAMP are enrolled the South Carolina Safe Harbor Program. These landowners agree to perform certain management practices that will benefit the RCW: prescribed burning, timber thinning, longleaf pine restoration, etc. If additional RCW groups become established as a result of this type of management, landowners are only responsible for their original (baseline) number of RCW groups. Properties enrolled in Safe Harbor often receive funds from financial incentive programs to conduct these management practices.

**West Indian Manatee:** West Indian manatees are marine mammals that feed primarily on aquatic vegetation. Typically, adult manatees average 10 feet in length and weigh approximately 1,000 pounds. Manatees inhabit estuarine as well as freshwater riverine habitats that are at least five feet deep. The greatest threats to these mammals include collisions with recreational and commercial watercraft, canal lock operations, becoming landlocked within the lakes, and habitat degradation resulting from industrial and residential development. Manatees have been well-documented in the SAMP area all the way up to Pinopolis Dam. Some have even made their way into the lakes.

**Flatwoods Salamander:** As with the RCW, optimal habitat for the flatwoods salamander consists of open, fire-maintained southern pine forests (historically longleaf). Breeding occurs in isolated wetlands dominated by herbaceous understory and a scattered canopy of pond cypress, gum or pine. Isolated wetlands used for breeding must go dry at some point during the year in order to prevent colonization by predatory fish. Breeding occurs from October through December, in correlation with fall rains.

The flatwoods salamander, given its habitat requirements, potentially occurs in the SAMP area. Since 1990, only four populations have been found in South Carolina, two of which were found on the Francis Marion National Forest. However, surveying for the flatwoods salamander is difficult and is typically conducted only at breeding sites. The greatest threats to the flatwoods salamander in the SAMP include habitat alteration and population isolation resulting from development and some silvicultural practices.

**Shortnose Sturgeon:** The shortnose sturgeon is an anadromous species that ascends freshwater rivers to spawn, often as far as 150 miles or more from the sea. Adults and juveniles often congregate in downstream river reaches near the freshwater/saltwater interface, but may move to and from upstream habitats in the summer and fall. In South Carolina, shortnose sturgeon mature at about seven years of age and may live 60 years or more. The construction of dams across major river systems in South Carolina likely resulted in the loss of substantial spawning habitat located at or above the fall line on major Piedmont rivers. One of the largest populations of shortnose sturgeon exists in the Cooper River below the Pinopolis Dam. A "dam-locked" remnant population exists in Lake Marion and

the Congaree and Wateree Rivers. This population is likely to be the primary spawning population of shortnose sturgeon in the Santee River Basin, as has been found to be the case with a similar dam-locked population in the Connecticut River above Holyoke Dam. Blockage of normal upstream and downstream riverine migrations by dams, dredging, low dissolved oxygen levels in combination with elevated temperatures (especially in summer months) and pollution from industrial/municipal discharges threaten the shortnose sturgeon within the SAMP.

**Pondberry, Canby's Dropwort, & American Chaffseed:** These endangered plants are limited to the Coastal Plain of South Carolina. In the SAMP area, they are all found on the Francis Marion National Forest and may occur on private land where suitable habitat exists. These three plants are all associated with isolated wetlands such as pond cypress depressions that are seasonally flooded. Chaffseed can also be found on the margins of pine savannas that are frequently burned. Pondberry can also occur in shaded bottomland hardwood forests. Canby's dropwort seems to prefer wetlands with little canopy cover and acidic soils. Development, ditching, forest operations, and fire suppression potentially threaten these species. Threatened and endangered plants are only protected on private lands if an action is proposed that involves some form of federal involvement (US Corps of Engineers' permit, federal funding, etc.).

#### Additional Reptiles & Amphibians Considered Imperiled or Potentially Imperiled

Harrison<sup>30</sup> documented species occurring in the SAMP area that are considered to be imperiled or potentially imperiled at the state and/or federal level. These included six salamanders, five frogs, one turtle, seven snakes and three lizards. Although the specific habitat needs of these animals varied, all but one required wetlands of diverse types for foraging and/or breeding. Many species of frogs and salamanders that reproduce in wetland sites also require contiguous upland habitats. The greatest threat to these imperiled species is habitat destruction, particularly the practice of clear-cutting for development, agriculture or reforestation. The most vulnerable sites were small, isolated wetlands such as pond cypress ponds, swamp tupelo ponds and borrow pits, which had high habitat value but are not protected under the 404 nationwide permit system[etb12]. Furthermore, protection of wetland sites without leaving an adequate upland buffer may in many cases be futile.

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 <sup>30</sup> Source:

## Appendix XII – Supplemental Opinions

As a matter of process, any individual who voted against a recommendation more broadly accepted by the group, preserved the right to craft a supplemental opinion for inclusion in the NRMP. Only one individual offered such a supplemental opinion. It appears below.

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### **Supplemental opinion: Tradable UOD Permits**

By Andy Brack  
Past president  
South Carolina Wildlife Federation  
November 2004

The concept of tradable effluent permits is one of those things that sounds good to many at first glance. But if you examine its philosophical core, the tool may pose real dangers streams and rivers such as the Cooper River.

Throughout the Cooper River Corridor SAMP process, most participants seemed to share the common value that the river's health should be improved. In other words, they believed policymakers should take active steps to make the river better, not keep it the same or make it worse.

But at best, the concept of tradable effluent permits appears to be the value of keeping water quality in the river the same. Regulators currently allow up to a certain level of discharges into streams. They have, therefore, determined a maximum load or capacity of pollution that the water body can accept.

Under the concept of tradable effluent permits, dischargers can trade discharge capacity. For example, if one discharger (Discharger A) has excess permitted capacity – either because it isn't using it or it has created efficiencies that diminished its discharges and made more capacity available – the discharger can trade the excess to another discharger. That discharger (Discharger B), then, can increase its discharges into the river. In turn, that yields two scenarios:

- First, Discharger A continues discharges at current levels, but sells any unused extra capacity to Discharger B. Then B adds more discharges into the river by using A's extra capacity. In other words, more overall contaminants are put into the river and the river becomes more polluted –

even though all of the discharges are within permitted levels established by regulators.

- Or second, if Discharger A generates efficiencies and discharges less, it can sell extra capacity to Discharger B. But B then turns around and uses up the savings achieved by A by discharging more into the river. In other words, the overall system accepts the same amount of pollution as it did before A generated the efficiencies.

Bottom line: tradable permits seem to seek the status quo, or worse – more pollution. Therefore, tradable permits appear to stem from a philosophy of maintaining or increasing pollution, not improving water quality. Instead of striving to make the river cleaner, tradable permits could cause a situation where we actually are polluting as much as possible.

Policymakers who are considering tradable effluent permits also should keep in mind that increasing discharges in some areas will require more vigorous monitoring by regulatory agencies (which costs money) to ensure projected pollution reductions are achieved. There are also equity and environmental justice concerns with tradable permits as many argue increased discharges in one location often shift burdens from wealthy to poorer communities. Finally, tradable permit programs also can lead to “hot spots,” or highly degraded localized conditions in a watershed, if poorly designed.

In the valuable SAMP area of the Cooper River, tradable effluent permits pose more of a risk than a benefit. We would be far better off creating incentives for industries and municipalities to recycle their water and waste residuals for beneficial re-use in society and maintaining the hard-earned incremental improvements in water quality achieved since the passage of the Clean Water Act in 1972.

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