

2010

SOUTH CAROLINA AQUATIC PLANT MANAGEMENT PLAN

Part II

Total costs are not included as the state contract is not finalized as of this date.



Prepared by the
Aquatic Nuisance Species Program
South Carolina Department of Natural Resources
and Approved by the
South Carolina Aquatic Plant Management Council
2010

PART II - 2010 ANNUAL MANAGEMENT PLAN	15
INTRODUCTION	15
Aquatic Plant Problem Areas	16
AQUATIC PLANT MANAGEMENT STRATEGY.....	25
Public Waters	25
Santee Cooper Lakes	114
South Carolina Department of Parks, Recreation and Tourism State Park Lakes.....	127
South Carolina Department of Natural Resources State Lakes	154
South Carolina Border Lakes	169
Summary of Planned Management Operation Expenditures For 2010.....	172
Location of 2010 Management Sites	173
APPENDIX A Major River Basins in South Carolina.....	175
APPENDIX B Enabling Legislation	177
APPENDIX C Aquatic Plant Problem Identification Form	182
APPENDIX D Aquatic Plant Control Agents	184
APPENDIX E SCDNR and Santee Cooper Aquatic Plant and Habitat Management Goals for the Santee Cooper Lakes.....	194
APPENDIX F Summary of Aquatic Plant Control Expenditures	197

PART II - 2010 ANNUAL MANAGEMENT PLAN

INTRODUCTION

The Annual Management Plan for 2010 was developed by application of the procedures described in the Aquatic Plant Management Plan, Part I (Procedural Management Plan). The phases of development of the Annual Management Plan include 1) identification of areas where aquatic plants interfere with water use, 2) development of a description of each problem area, 3) development of a management strategy for each problem area, and 4) determination of the distribution of available funding among problem areas.

Common and Scientific Names of Aquatic Plants Referenced in the Plan

Alligatorweed	<i>Alternanthera philoxeroides</i>
Bladderwort	<i>Utricularia spp.</i>
Brazilian elodea	<i>Egeria densa</i>
Bur Marigold	<i>Bidens spp.</i>
Cowlily	<i>Nuphar luteum macrophyllum</i>
Cattails	<i>Typha spp.</i>
Coontail	<i>Ceratophyllum demersum</i>
Creeping rush	<i>Juncus repens</i>
Curly-leaf pondweed	<i>Potamogeton crispus</i>
Duckweed	<i>Lemna spp.</i>
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Fanwort	<i>Cabomba caroliniana</i>
Filamentous algae	<i>Pithophora, Lyngbya, Hydrodictyon</i>
Floating bladderwort	<i>Utricularia inflata</i>
Floating heart	<i>Nymphoides spp.</i>
Frog's bit	<i>Limnobium spongia</i>
Giant cutgrass	<i>Zizaniopsis miliacea</i>
Hydrilla	<i>Hydrilla verticillata</i>
Lotus	<i>Nelumbo lutea</i>
Musk-grass	<i>Chara</i>
Pondweed	<i>Potamogeton spp.</i>
Common reed	<i>Phragmites australis</i>
Slender naiad	<i>Najas minor</i>
Smartweed	<i>Polygonum densiflorum</i>
Southern naiad	<i>Najas guadalupensis</i>
Spikerush	<i>Eleocharis spp.</i>
Stonewort	<i>Nitella</i>
Variable-leaf pondweed	<i>Potamogeton diversifolius</i>
Waterlily	<i>Nymphaea odorata</i>
Water hyacinth	<i>Eichhornia crassipes</i>
Water lettuce	<i>Pistia stratiotes</i>
Watermilfoil	<i>Myriophyllum spp.</i>
Water pennywort	<i>Hydrocotyle ranunculoides</i>
Water primrose	<i>Ludwigia hexapetala</i>
Watershield	<i>Brasenia schreberi</i>

Aquatic Plant Problem Areas

Areas where aquatic plants interfere with water use were identified from information provided by S.C. Aquatic Plant Management Council members, an aquatic plant survey conducted by the S.C. Department of Natural Resources staff and public input. The identified problem areas listed below are open to access and use by the public and are therefore considered by the Council as eligible for some type of public funding. Acres of infestation (coverage) are approximations based on observations made in 2009

SPECIAL NOTE: Due to 2010 budget problems and in an effort to continue to serve all of the areas around the state; each water body will only be eligible for up to \$40,000 of cost share money from the SCDNR.

- 1) Water body - Back River Reservoir
Location - Berkeley County
Surface acres - 850
Aquatic plants - Hydrilla, Water hyacinth, Water primrose, Fanwort
Coverage - 255 acres
Impaired activities- Boating, fishing, hunting, swimming, industrial water supply, municipal water supply, electric power generation, public access
- 2) Water body - Baruch Institute
Location - Georgetown County
Surface acres - Unknown, adjacent to Winyah Bay
Aquatic plants - Phragmites
Coverage - 25+ acres
Impaired activities - Boating, hunting, fishing, public access
- 3) Water body - Black Mingo Creek
Location - Georgetown County
Surface acres -Unknown
Aquatic plants - Alligatorweed, Parrot feather
Coverage - 3 acres
Impaired activities - Boating, hunting, fishing, public access
- 4) Water body - Black River
Location - Georgetown County
Surface acres -Unknown
Aquatic plants - Alligatorweed
Coverage – 7 acres
Impaired activities - Boating, hunting, fishing, public access
- 5) Water body - Bonneau Ferry
Location - Berkeley County
Surface acres -Unknown - Multiple Reserves and impoundments

- Aquatic plants - Water hyacinth, Water primrose, Frog's bit, Lotus, Cat-tails, Cutgrass, Pennywort, Parrotfeather, Fanwort, Coontail
Coverage - 40 acres
Impaired activities - Boating, hunting, fishing, public access
- 6) Water body – Boyd Pond
Location - Aiken County
Surface acres -21 acres
Aquatic plants – Bladderwort, watermilfoil, water primrose
Coverage - 15 acres
Impaired activities - Boating, hunting, fishing, public access
- 7) Water Body – Caw Caw Interpretative Center
Location – Charleston County
Surface acres – unknown
Aquatic plants - Hydrilla, Water primrose, Water hyacinth
Coverage - 8 acres
Impaired activities – Recreational and public access
- 8) Water body - Combahee River (Borrow pit)
Location - Colleton County
Surface acres - approx. 5 acres
Aquatic plants - Hydrilla, Water primrose, Water hyacinth
Coverage - 4 acres
Impaired activities - Boating, hunting, fishing, public access
- 9) Water body - Cooper River (and adjacent ricefields)
Location - Berkeley County
Surface acres - Unknown
Aquatic plants - Hydrilla, Water primrose, Water hyacinth
Coverage - approx. 3,000 acres
Impaired activities - Boating, hunting, fishing, public access
- 10) Water body - Donnelley/Bear Island WMA
Location - Colleton County
Surface acres - Multiple impoundments and rivers
Aquatic plants - Cutgrass, Frog's bit, Cattails, Phragmites
Coverage - 40 acres
Impaired activities - Hunting, public access
- 11) Water body - Dungannon Plantation Heritage Preserve
Location - Charleston County
Surface acres - Unknown
Aquatic plants - Cutgrass, Frog's bit, Cattails, Water primrose, Swamp loosestrife
Coverage - 15 acres
Impaired activities - Wood stork nesting site, public access
- 12) Water body - Goose Creek Reservoir
Location - Berkeley County

- Surface acres - 600
Aquatic plants - Water hyacinth, Water lettuce, Water primrose, Hydrilla, Salvinia(Salvinia minima)
Coverage - 200 acres
Impaired activities - Boating, public access, industrial water supply, floodway
- 13) Water body – Lake Cunningham
Location - Greenville County
Surface acres -160 acres
Aquatic plants – Brazilian elodea, Water primrose, Waterlily spatterdock
Coverage – 20 acres
Impaired activities - Boating, hunting, fishing, public access
- 14) Water body - Lake Darpo
Location - Darlington County
Surface acres – 17.5 acres
Aquatic plants - Water lily, milfoil
Coverage - 12 acres
Impaired activities - Boating, swimming, fishing, vector control, public access
- 15) Water body - Lake Greenwood
Location -Laurens and Greenwood Counties
Surface acres - 11,400
Aquatic plants - Hydrilla, Slender naiad
Coverage - 400 acres
Impaired activities – Potential impacts to electric power generation, boating, swimming, vector control, public access
- 16) Water body - Lake Keowee
Location – Pickens and Oconee Counties
Surface acres – 18,300 acres
Aquatic plants - Hydrilla
Coverage - 10 acres
Impaired activities - Potential impacts to electric power generation, municipal water supply, boating, swimming, vector control, public access
- 17) Water body - Lake Murray
Location - Lexington and Richland Counties
Surface acres - 50,000
Aquatic plants - Hydrilla, Illinois pondweed, Water primrose, Alligatorweed
Coverage - 75 acres
Impaired activities - Boating, swimming, domestic and municipal water intakes, public access
- 18) Water body - Lake Wateree
Location – Kershaw County
Surface acres – 13,710 acres
Aquatic plants – Hydrilla, cutgrass
Coverage - 5 acres

- 19) Impaired activities - Potential impacts to boating, swimming, vector control, public access
Water body - Little Pee Dee River
Location - Marion and Horry Counties
Surface acres - Unknown
Aquatic plants - Alligatorweed
Coverage - 30 acres
Impaired activities - Boating, hunting, fishing, public access
- 20) Water body - Lumber River
Location - Marion and Horry Counties
Surface acres - Unknown
Aquatic plants - Alligatorweed
Coverage - 5 acres
Impaired activities - Boating, hunting, fishing, public access
- 21) Water body - Pee Dee River
Location - Georgetown County
Surface acres - Unknown
Aquatic plants - Water hyacinth, Phragmites
Coverage - 40 acres
Impaired activities - Boating, hunting
- 22) Water body - Samworth WMA
Location - Georgetown County
Surface acres - Unknown
Aquatic plants - Phragmites, Water hyacinth
Coverage - 50 acres
Impaired activities - Hunting, public access
- 23) Water body - Santee Coastal Reserve
Location - Georgetown County
Surface acres - Unknown
Aquatic plants - Phragmites
Coverage - 300 acres
Impaired activities - Hunting, public access
- 24) Water body - Santee Delta WMA
Location - Georgetown County
Surface acres - Unknown
Aquatic plants - Phragmites
Coverage - 25+ acres
Impaired activities - Hunting, public access
- 25) Water body - US Army Corps of Engineers - Charleston Harbor/Intracoastal Waterway
Location - Charleston County
Surface acres - Unknown
Aquatic plants - Phragmites
Coverage - 200+ acres

- Impaired activities - Boating, hunting, fishing, public access
- 26) Water body - US Naval Weapons Station
Location - Charleston and Berkeley Counties
Surface acres - Unknown
Aquatic plants - Frog's-bit, Water primrose, Water hyacinth, Phragmites
Coverage - 75 acres
Impaired activities - Boating, hunting, fishing, public access
- 27) Water body - Waccamaw River
Location - Georgetown and Horry Counties
Surface acres - Unknown
Aquatic plants - Water hyacinth, Phragmites
Coverage - 50 acres
Impaired activities - Boating, hunting, fishing, public access
- 28) Water body - Yawkey Wildlife Center
Location - Georgetown County
Surface acres - Unknown
Aquatic plants - Phragmites
Coverage - 25+ acres
Impaired activities - Hunting, public access

Santee Cooper Lakes

- 29) Water body - Lake Marion
Location - Sumter, Clarendon, Calhoun, Berkeley, and Orangeburg Counties.
Surface acres - 110,000
Aquatic plants - Alligatorweed, Brazilian elodea, Hydrilla, Water primrose, Slender naiad, Coontail, Water hyacinth, Filamentous algae, Fanwort, Cutgrass, Crested floating Heart
Coverage - 1000 acres
Impaired activities - Boating, swimming, public access, potential electric power generation, potential irrigation water withdrawals
- 30) Water body - Lake Moultrie
Location - Berkeley County
Surface acres - 60,400
Aquatic plants - Alligatorweed, Water primrose, Brazilian elodea, Hydrilla, Slender naiad, Water hyacinth, Watermilfoil, Fanwort, Cutgrass
Coverage - 150 acres
Impaired activities - Potential electric power generation, boating, swimming, public access, potential domestic and irrigation water withdrawals

SC Parks, Recreation and Tourism - State Park Lakes

- 31) Water body - Barnwell State Park
 - Location - Barnwell County
 - Surface acres - 12
 - Aquatic plants – Waterlily, Cattails
 - Coverage - 3 acres
 - Impaired activities - Fishing, swimming, aesthetics
- 32) Water body - Charles Towne Landing State Park
 - Location - Charleston County
 - Surface acres - 5
 - Aquatic plants - Duckweed, Alligatorweed, Pennywort, Cyanobacteria, Algae
 - Coverage - 4 acres
 - Impaired activities - Fishing, tourism, aesthetics
- 33) Water body - H. Cooper Black Recreation Area
 - Location - Chesterfield County
 - Surface acres - 2 acres
 - Aquatic plants - Spatterdock
 - Coverage - 1 acres
 - Impaired activities - Recreational activities
- 34) Water body - Huntington Beach SP
 - Location - Horry County
 - Surface acres - 15 acres
 - Aquatic plants - Cutgrass, Phragmites, Cattails
 - Coverage - 15 acres
 - Impaired activities - Recreational activities
- 35) Water body - Kings Mountain State Park - Crawford Lake
 - Location - York County
 - Surface acres - 9
 - Aquatic plants - Slender naiad
 - Coverage - 4 acres
 - Impaired activities - Swimming, boating
- 36) Water body - Little Pee Dee State Park
 - Location - Dillon County
 - Surface acres - 75
 - Aquatic plants - Spikerush, Cowlily
 - Coverage - 15 acres
 - Impaired activities - Fishing, boating
- 37) Water body - N.R. Goodale State Park
 - Location - Kershaw County
 - Surface acres - 160 acres
 - Aquatic plants - Waterlily, Watershield

Coverage - 60 acres

Impaired activities - Swimming, recreational activities

38) Water body - Poinsett State Park

Location - Sumter County

Surface acres - 10 acres

Aquatic plants - Spatterdock, Watershield

Coverage - 5 acres

Impaired activities - Swimming, fishing

39) Water body - Sesquicentennial State Park

Location - Richland County

Surface acres - 25 acres

Aquatic plants - Waterlily, Watershield

Coverage - 15 acres

Impaired activities - Swimming, fishing

SC Department of Natural Resources - State Lakes

40) Water body - Lake Cherokee

Location - Cherokee County

Surface acres - 50 acres

Aquatic plants - Water primrose

Coverage - 5 acres

Impaired activities - Boating, fishing

41) Water body - Lake Edwin Johnson

Location - Spartanburg County

Surface acres - 40 acres

Aquatic plants - Water primrose, Hydrilla, Pondweed

Coverage - 10 acres

Impaired activities - Boating, fishing

42) Water body - Jonesville Reservoir

Location - Union County

Surface acres - 25 acres

Aquatic plants - Water primrose, Pondweed

Coverage - 10 acres

Impaired activities - Boating, fishing

43) Water body - Mountain Lakes

Location - Chester County

Surface acres - 70 acres

Aquatic plants - Water primrose, Alligatorweed, Parrotfeather

Coverage - 5 acres

Impaired activities - Boating, fishing

44) Water body - Lancaster Reservoir

- Location - Lancaster County
Surface acres - 61 acres
Aquatic plants - Water primrose, Alligatorweed
Coverage - 8 acres
Impaired activities - Boating, fishing, hunting
- 45) Water body - Sunrise Lake
Location - Lancaster County
Surface acres - 25 acres
Aquatic plants - Pondweed
Coverage - 15 acres
Impaired activities - Boating, fishing
- 46) Water body - Lake Ashwood
Location - Lee County
Surface acres - 75 acres
Aquatic plants - Waterlily
Coverage - spotty
Impaired activities - Boating, fishing
- 47) Water body - Lake Edgar Brown
Location - Barnwell County
Surface acres - 100 acres
Aquatic plants - Water primrose, Coontail
Coverage - 60 acres
Impaired activities - Boating, fishing
- 48) Water body - Lake George Warren
Location - Hampton County
Surface acres - 400 acres
Aquatic plants - Cattails, Water primrose, Coontail
Coverage - 20 acres
Impaired activities - Boating, fishing
- 49) Water body - Lake Thicketty
Location - Cherokee County
Surface acres - 100 acres
Aquatic plants - Hydrilla
Coverage - 5 acres
Impaired activities - Boating, fishing

South Carolina Border Lakes

50) Water body - Lake Wylie

Location – York County, SC; Gaston and Mecklenburg County, NC

Surface acres – 13,443 acres

Aquatic plants - Hydrilla

Coverage - 90 acres(all in NC waters)

Impaired activities - Potential impacts include electric power generation, boating, swimming, public access, domestic and irrigation water withdrawals

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AQUATIC PLANT MANAGEMENT STRATEGY

The following management strategies were developed for each identified problem area considered eligible for public funding. Planned expenditures are based on known available federal funds, estimated state funds and anticipated local support as of the date of this plan. For water bodies in which final funding is inadequate to conduct all proposed control operations, the extent of control will be reduced and priority areas and target plants will be determined by the Department of Natural Resources in cooperation with the local sponsor. A summary of proposed expenditures for 2010 and a location map of problem water bodies are located at the end of this section.

SPECIAL NOTE: Due to 2010 budget problems (in an effort to serve all of the areas around the state) each water body will only be eligible for up to \$40,000 of cost share money from the SCDNR.

Public Waters

Back River Reservoir (Berkeley County)

Problem plant species

Hydrilla, Water hyacinth, Fanwort, Water primrose, Frog's bit, Cutgrass

Management objectives

Reduce water hyacinth and water primrose populations throughout the lake to enhance public access, navigation, water flow and minimize impacts to water intakes from floating islands.

Reduce hydrilla in upper Foster Creek area to improve water quality, water flow and navigation.

Reduce hydrilla and fanwort in 62.50 acre area adjacent to SCE&G Williams Station intake to enhance water flow, minimize clogging of water intake, and enhance public boating and fishing use in this area.

Reduce hydrilla and fanwort in a 2 acre area at Bushy Park Landing to enhance public boating and fishing use in this area.

Selected control method

Problem Species	Control Agent
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Water hyacinth Glyphosate	Renovate 3, Reward, Clearcast, Galleon SC, Habitat,
Water primrose, Cutgrass	Renovate 3, Reward, Habitat, Clearcast, Glyphosate
Hydrilla	Chelated copper*, Chelated copper*/Reward, Galleon SC

May be toxic to fish at recommended treatment rates; however, precautions will be implemented to minimize the risk of fish kills.

Area to which control is to be applied

Renovate 3, Reward, Clearcast, and Galleon SC - 200 acres of water hyacinth throughout the lake.

Habitat, Clearcast, Glyphosate - 100 acres of water primrose and cutgrass throughout the lake.

Chelated copper*/Reward, Galleon SC - 154 acres of hydrilla; 2 treatments of 62.50 acre area near SCE&G intake, 2 acres of hydrilla adjacent to Bushy Park Landing, 25 acres of hydrilla in Foster Creek arm (2 treatments-12.50 acres each).

Rate of control agents to be applied

Renovate 3 - 0.500 to 0.750 gallons per acre

Reward - 0.500 gallon per acre.

Clearcast - 0.250 gallons per acre/up to 0.500 gallons per acre.

Glyphosate - up to 0.750 gallons per acre.

Chelated copper - up to 1 ppm (about 10- 16 gallons per acre).

Chelated copper*/Reward - 4 gallons/2 gallons per acre

Habitat – 0.250 gallons per acre/up to 0.750 gallons per acre.

Galleon SC - Submersed 0.174 fl oz/acre foot to achieve minimum effective concentration of 25 to 75 ppb, Floating species – 2 to 6 fl oz/acre as foliar application.

Method of application of control agents

Renovate 3, Reward, Habitat, Clearcast, Glyphosate - spray on surface of foliage with appropriate surfactant.

Chelated copper, Chelated copper*/Reward - subsurface injection from airboat.

Timing and sequence of control application

Two hundred (200) acres of water hyacinths treated with Renovate 3, Clearcast, Habitat, Glyphosate, Galleon SC (May-September), Reward (October, November). The initial treatments are to be followed in 1-2 days with a cleanup treatment.

One hundred (100) acres of water primrose and cutgrass treated with Habitat, Clearcast, and Glyphosate during the growing season (May-October).

12.50 acres of hydrilla in Foster Creek to be treated 2 times (April-October) with Galleon SC.

Hydrilla and fanwort located adjacent to public boat ramp to be treated with chelated copper, Galleon SC.

Hydrilla located near the SCE&G water intake to be treated periodically during the year with Chelated copper, Chelated copper*/Reward (up to three times in the same 62.50 acre area), treatment area may be expanded as control is realized in target are

Other control application specifications

Herbicide used only upon approval by the S.C. Department of Health and Environmental Control.

All herbicide treatments conducted within 1600 feet of the CPW water intake will use Renovate 3 at a rate of 0.5 gallons per acre or less or Galleon SC at a rate of 2 to 6 oz/acre. Reward treatments will be conducted at least 1600 feet from the intake. Following any application of Reward within 1600 feet of the CPW water intake, herbicide residue concentrations may be monitored according to a plan agreed to by the S.C. Department of Natural Resources, Charleston Commissioners of Public Works(CPW), and the Department of Health and Environmental Control.

If filamentous algae are present on submersed macrophytes, an algaecide, such as K-TEA, will be used in addition to selected herbicides to assist in control.

Control is to be applied in a manner that will not significantly degrade water quality in the treatment area. This may involve treating only a portion of the area at any one time.

Entity to apply control agents

Commercial applicator

Estimated cost of control operations

\$????

Potential sources of funding

Water primrose and water hyacinths -

Charleston Commissioners of Public Works 30%

S.C. Electric and Gas Co. 20%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Hydrilla and Cabomba (near SCE&G intake) -

S.C. Electric and Gas Co. 50%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Hydrilla (Foster Creek, boat ramp, and Back River) -

Charleston Commissioners of Public Works 30%

S.C. Electric and Gas Co. 20%

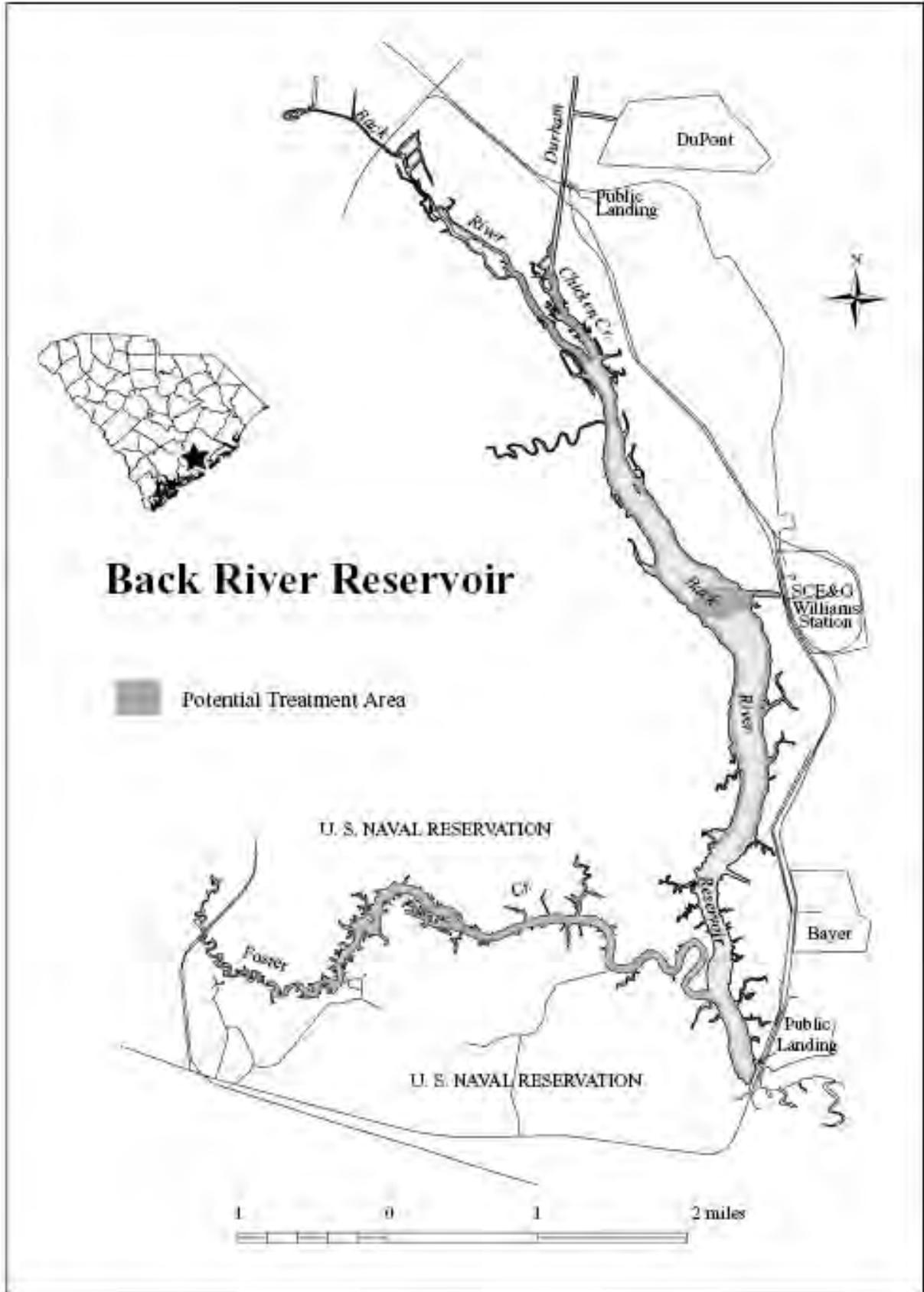
U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- d) Effective long term control of water hyacinth in the reservoir must also include control of this species in the Cooper River to which the reservoir is connected.



**Baruch Institute
(Georgetown County)**

Problem plant species

Phragmites

Management objective

Through a comprehensive, multi-year approach; reduce Phragmites populations to the greatest extent possible

Selected control method

Problem Species	Control Agent
Phragmites	Habitat, Clearcast

Area to which control is to be applied

50 acres of phragmites throughout area

Rate of control agent to be applied

Habitat - 2 to 6 pints per acre.
Clearcast - up to 5 % solution for spot spray.

Method of application of control agent

Helicopter - 50 acres of Habitat, Clearcast applied to phragmites.
Other applications - Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Apply when plants are actively growing (July - Oct.).

Other control application specifications

None

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$????

Potential sources of funding

Baruch Institute 50%
U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)
(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- d) Continue to coordinate treatment areas with local conservation groups.

Black Mingo Creek (Georgetown County)

Problem plant species

Alligatorweed, Parrot feather, Frog's bit, Pennywort

Management objective

Reduce or remove nuisance weed infestation at public access points, the main river channel, and connecting lakes to improve water quality and navigation.

Selected control method

Problem Species	Control Agent
Alligatorweed, Pennywort	Renovate 3, Habitat, Clearcast, Glyphosate
Frog's bit, Parrot feather	Reward, Galleon SC

Area to which control is to be applied

10 acres of problematic plants throughout river

Rate of control agent to be applied

Reward - 0.5 gallon per acre.

Renovate 3 - 0.5 to 0.75 gallons per acre.

Habitat - 2 to 6 pints per acre.

Clearcast - 1 to 4 pints per acre.

Glyphosate - up to 6 pints per acre.

Method of application of control agent

Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Apply when plants are actively growing (May - Oct.).

Other control application specifications

None

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$?????

Potential sources of funding

Georgetown County 50%

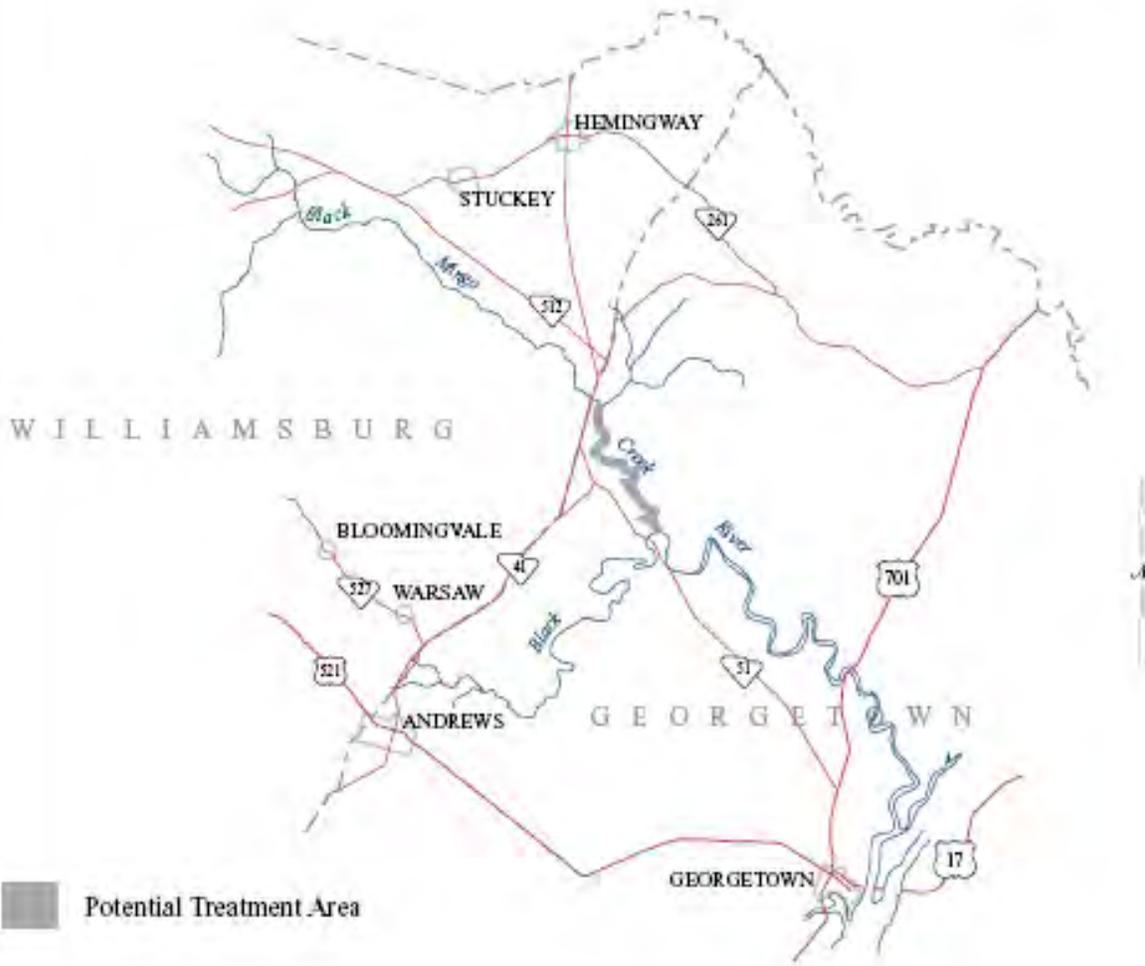
U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)
(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- d) Continue to coordinate treatment areas with local conservation groups.

Black Mingo Creek



Black River (Georgetown County)

Problem plant species

Alligatorweed, Parrot feather, Frog's bit, Pennywort, Phragmites

Management objective

Reduce or remove nuisance weed infestation at public access points, the main river channel, and connecting lakes to improve water quality and navigation.

Selected control method

Problem Species	Control Agent
Alligatorweed, Pennywort	Renovate 3, Habitat, Clearcast, Glyphosate
Frog's bit, Parrot feather	Reward, Galleon SC
Phragmites	Habitat, Clearcast

Area to which control is to be applied

15 acres of problematic plants throughout river

Rate of control agent to be applied

Reward - 0.5 gallon per acre.

Renovate 3 - 0.5 to 0.75 gallons per acre.

Habitat - 2 to 6 pints per acre.

Clearcast - 1 to 4 pints per acre.

Glyphosate - up to 6 pints per acre.

Galleon SC - Floating species – 2 to 6 fl oz/acre as foliar application.

Method of application of control agent

Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Apply when plants are actively growing (May - Oct.).

Other control application specifications

None

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$????

Potential sources of funding

Georgetown County 50%

U.S. Army Corps of Engineers 0%

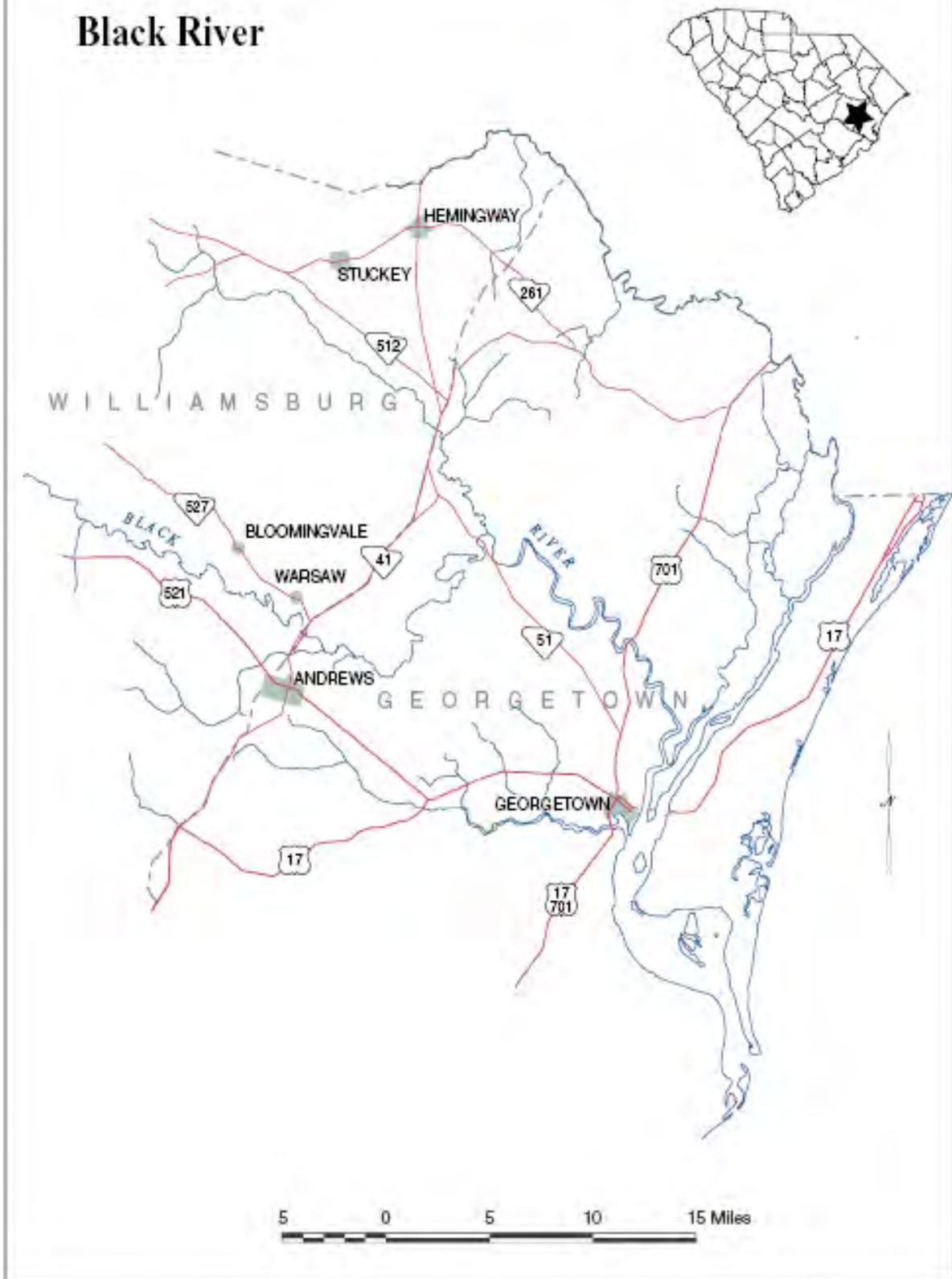
S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- d) Continue to coordinate treatment areas with local conservation groups and State Scenic Rivers Coordinator.

Black River



Bonneau Ferry (Berkeley County)

Problem plant species

Water Primrose, Water hyacinth, Cattails, Lotus, Cutgrass, Pennywort, Frog's bit, Parrotfeather

Management objective

Reduce nuisance plant populations to the greatest extent possible throughout Bonneau Ferry impoundments to enhance water quality, water flow, waterfowl habitat, fishing, and hunting opportunities.

Selected control method

Problem Species	Control Agent
Water primrose, Pennywort	Renovate 3, Habitat, Clearcast, Glyphosate
Cattails, Cutgrass, Parrotfeather	Habitat, Clearcast, Glyphosate
Water hyacinth, Frog's bit	Renovate 3, Reward, Clearcast, and Galleon SC

Area to which control is to be applied

50 acres of problematic plants throughout the reserves and impoundments of Bonneau Ferry.

Rate of control agent to be applied

Reward - 0.5 gallon per acre.

Renovate 3 - 0.5 to 0.75 gallons per acre.

Habitat - 2 to 6 pints per acre.

Clearcast - up to a 5% solution for spot spray.

Glyphosate - up to 6 pints per acre.

Galleon SC - Floating species – 2 to 6 fl oz/acre as foliar application, submersed approximately 0.174 gallons/acre foot.

Method of application of control agent

Helicopter - 20 acres of Habitat, Clearcast with appropriate surfactant.

Other applications - Spray on surface of foliage with appropriate surfactant from boat.

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

None

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$?????

Potential sources of funding

S.C. Department of Natural Resources 100%

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.

Bonneau Ferry



Boyd Pond (Aiken County)

Problem plant species

Water milfoil, Bladderwort, Water primrose, Emergent grasses

Management objective

Reduce nuisance plant populations to the greatest extent possible throughout lake to enhance water quality, water flow, waterfowl habitat, fishing, and hunting opportunities.

Selected control method

<u>Problem Species</u>	<u>Control Agent</u>
Water milfoil, Bladderwort	Hardball, Clearcast, Reward
Water primrose,	Renovate 3, Habitat, Clearcast
Emergent grasses	Renovate 3, Habitat, Clearcast,

Area to which control is to be applied

21 acres of problematic plants throughout Boyd Pond.

Rate of control agent to be applied

Renovate 3 - 0.5 to 0.75 gallons per acre.
Habitat - 2 to 3 pints per acre.
Clearcast - up to 5% solution for spot spray. -
Hardball - up to 5 gallons per acre
Reward - up to 2 gallons per acre

Method of application of control agent

Herbicides spray on surface of foliage with appropriate surfactant from boat or subsurface injection from airboat.

Timing and sequence of control application

Herbicide - Apply when plants are actively growing.

Other control application specifications

All herbicide applications are to be conducted in a manner that will not significantly degrade water quality. This may require that only a portion of the control area be treated at any one time. The submersed treatments will be divided into 2 or 3 different applications to avoid a Dissolved Oxygen problem.

Milfoil may require multiple treatments.

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$?????

Potential sources of funding

Aiken County 50%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

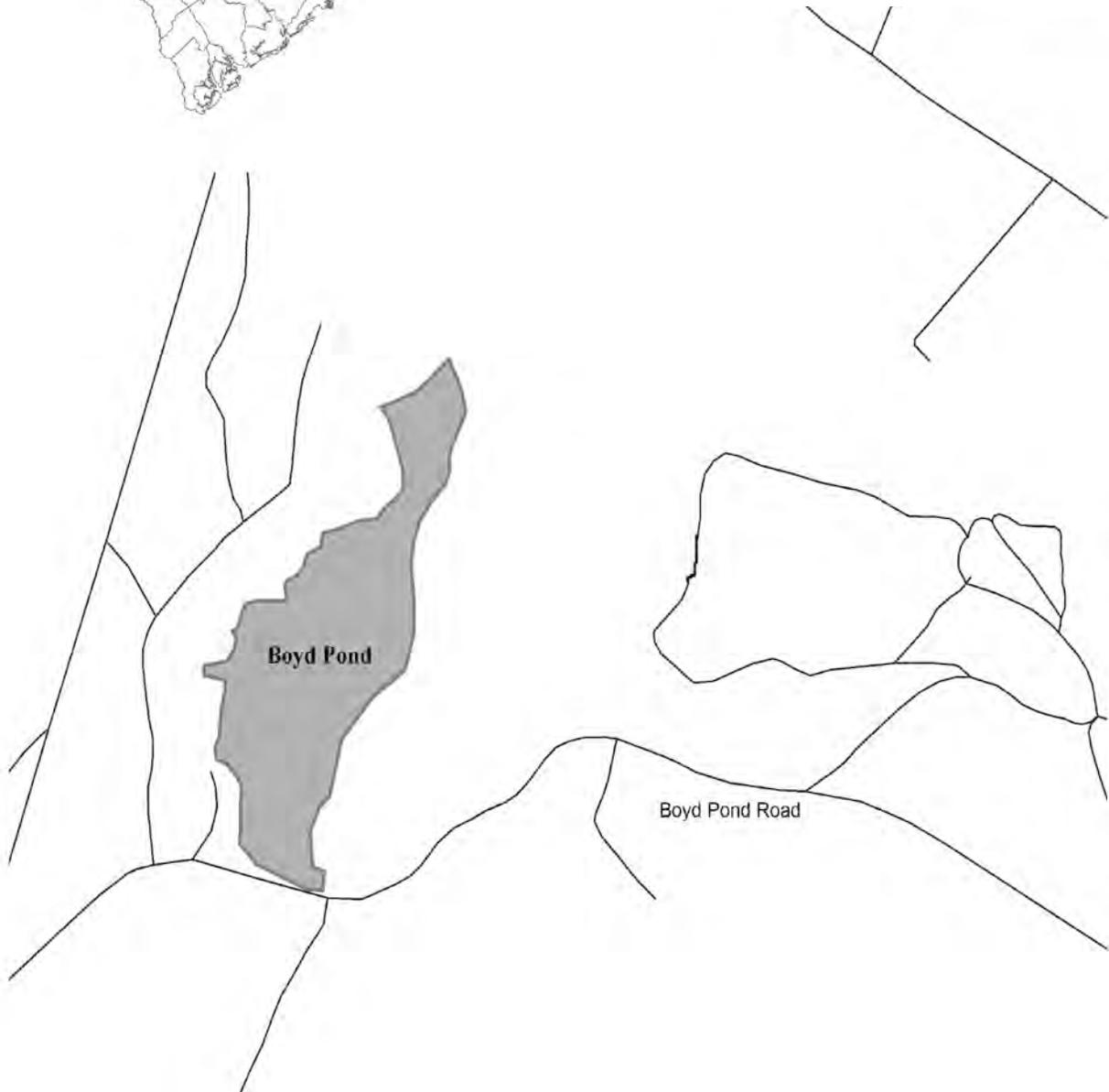
(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- d) Periodically revise the management strategy and specific control sites as new environmental data, management agents and techniques, and public use patterns become available.



Boyd Pond



**Caw Caw Interpretative Center
(Charleston County)**

Problem plant species

Phragmites, milfoil, waterlily

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Problem Species	Control Agent
Water milfoil	Hardball, Clearcast
Waterlily,	Hardball, Habitat, Clearcast
Phragmites	Habitat, Clearcast,

Area to which control is to be applied

8 acres

Rate of control agent to be applied

Habitat - 2 to 3 pints per acre.
Clearcast - up to 5% solution for spot spray. -
Hardball - up to 5 gallons per acre

Method of application of control agent

Spray on surface of foliage with appropriate surfactant and subsurface injection from airboat.

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

Commercial applicator.

Estimated cost of control operations

\$????????

Potential sources of funding

Caw Caw Interpretative Center (Charleston Co. Parks) 50%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

Combahee River (Borrow pit) (Colleton County)

Problem plant species

Alligatorweed, Parrot feather, Frog's bit

Management objective

Reduce or remove alligatorweed infestation at public access points, the main river channel, and connecting lakes.

Selected control method

Problem Species	Control Agent
Alligatorweed	Renovate 3, Habitat, Clearcast, Glyphosate
Frog's bit, Parrot feather	Reward, Galleon SC

Area to which control is to be applied

5 acres of problematic plants to be treated 2 times during the growing season.

Rate of control agent to be applied

Reward - 0.5 gallon per acre.

Renovate 3 - 0.5 to 0.75 gallons per acre.

Habitat - 2 to 3 pints per acre.

Clearcast - 1 to 4 pints per acre.

Glyphosate - up to 6 pints per acre.

Galleon SC - Floating species – 2 to 6 fl oz/acre as foliar application.

Method of application of control agent

Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Apply when plants are actively growing (May - Oct.).

Other control application specifications

None

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

?????

Potential sources of funding

Colleton County 50%

U.S. Army Corps of Engineers 0%

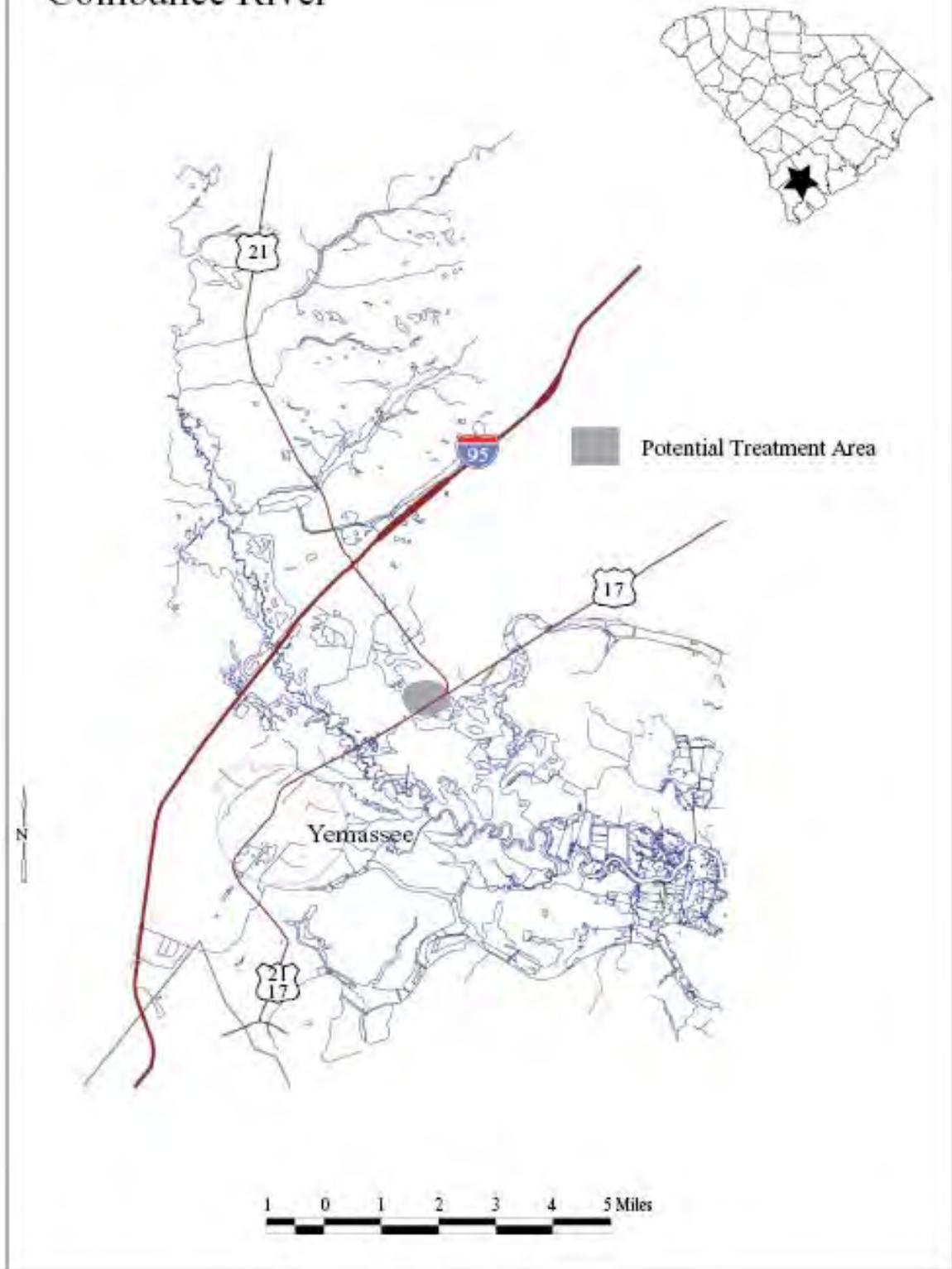
S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- d) Continue to coordinate treatment areas with local conservation groups.

Combahee River



Cooper River (Berkeley County)

Problem plant species

Hydrilla, Water hyacinth, Water primrose

Management objectives

Reduce water hyacinth populations to the greatest extent possible in the Main River and public ricefields.

Reduce water primrose growth along boat channels to maintain navigation.

Open limited boat trails in hydrilla infested ricefields to enhance public access to the river and selected ricefields.

Selected control method

Problem Species	Control Agent
Water hyacinth	Renovate 3, Reward, Clearcast, Glyphosate, Galleon SC
Water primrose	Renovate 3, Reward, Habitat, Clearcast, Glyphosate
Hydrilla	Chelated copper*

* May be toxic to fish at recommended treatment rates; however, precautions will be implemented to minimize the risk of fish kills.

Area to which control is to be applied

Renovate 3, Reward, Habitat, Clearcast, Glyphosate, Galleon SC - 300 acres of water hyacinth and water primrose throughout river system and in narrow boat channels in French Quarter Creek, Rice Hope Plantation ricefield, and Berkeley Country Club ricefield.

Chelated copper - 48 acres (16 acres treated 3 times yearly, spring and fall) to open boat trails in Pimlico, Berkeley Yacht Club and Rice Hope Plantation ricefields and French Quarter Creek canal.

Rate of control agents to be applied

Habitat - 2 to 4 pints per acre.

Reward - 2 quarts per acre.

Renovate 3 - up to 4 quarts per acre

Clearcast - 1 to 4 pints per acre.

Glyphosate - up to 6 pints per acre.

Chelated copper - up to 1 ppm (about 16 gallons per acre).

Galleon SC - Floating species – 2 to 6 fl oz/acre as foliar application.

Method of application of control agent

Renovate 3, Reward, Habitat, Galleon SC - spray on surface of foliage with appropriate surfactant.

Chelated copper - subsurface injection from airboat.

Timing and sequence of control application

All agents to be applied when plants are actively growing. Chelated copper treatment of boat trails to be conducted as close to low tide as possible to minimize water movement.

Other control application specifications

None

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$?????

Potential sources of funding

Berkeley County 50%

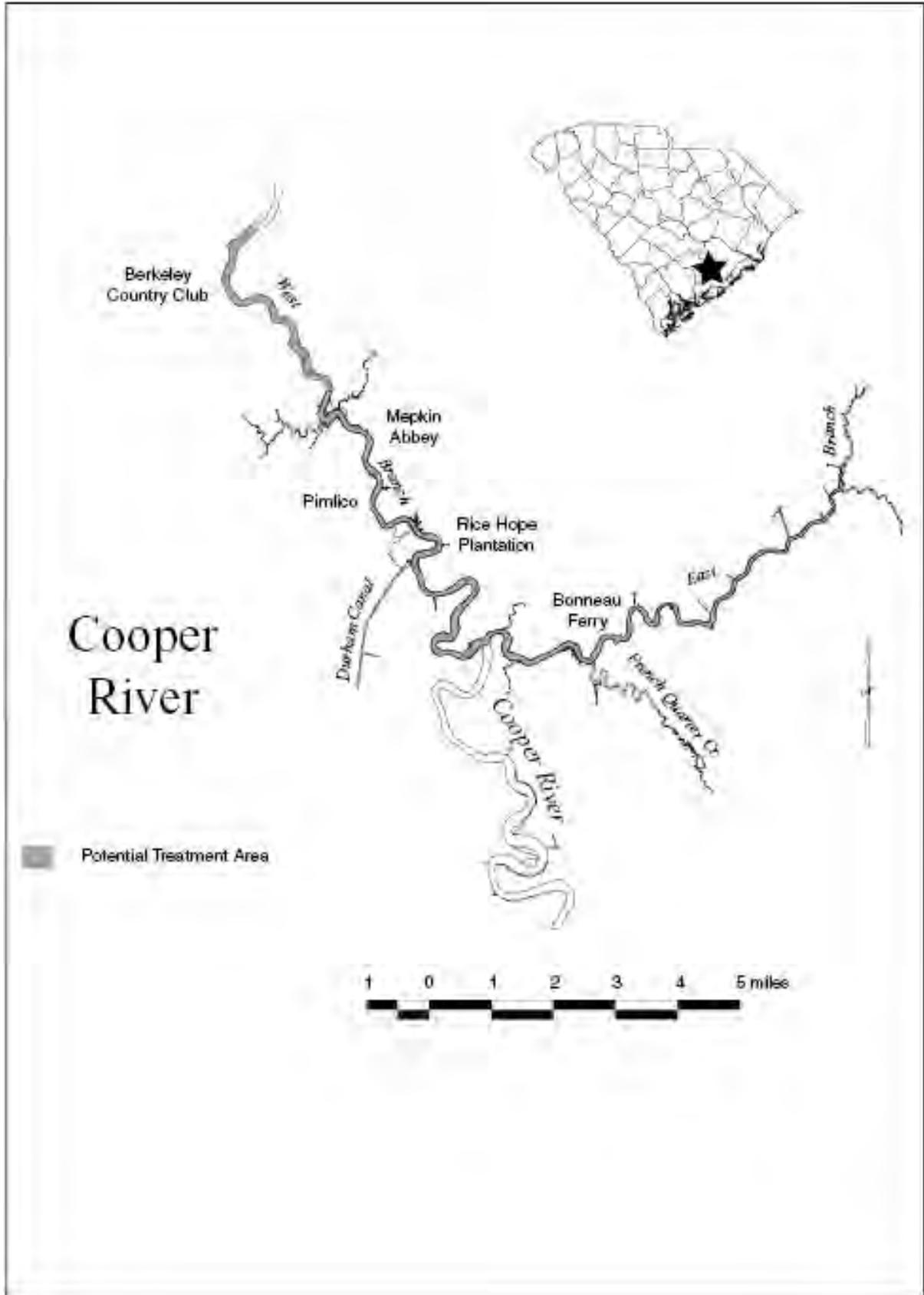
U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- d) Long term management must include consideration of water hyacinth control in many privately owned ricefields to which the public does not have boat access. Water hyacinth from these ricefields can reinfest public areas.



Donnelley WMA/Bear Island WMA/ACE Basin (Colleton County)

Problem plant species

Frog's bit, Cattails, Cutgrass, Phragmites, Swamp loosestrife

Management objective

Reduce problem plant populations to enhance waterfowl habitat, public access and use.

Selected control method

Problem Species	Control Agent
Frog's bit	Renovate 3, Galleon SC
Phragmites, Cattails	Habitat, Clearcast, Glyphosate
Cutgrass, Swamp loosestrife	Habitat, Clearcast, Glyphosate

Area to which control is to be applied

45 acres of Frog's bit, Phragmites, Cattails, Cutgrass, and Swamp loosestrife throughout the area.

Rate of control agent to be applied

Renovate 3 - 0.5 to 0.75 gallons per acre

Habitat - 2 to 3 pints per acre.

Clearcast - 1 to 4 pints per acre.

Glyphosate - up to 6 pints per acre.

Galleon SC - Floating species – 2 to 6 fl oz/acre as foliar application.

Method of application of control agent

Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Apply when plants are actively growing (May - Oct.).

Other control application specifications

Application to be conducted by airboat and helicopter.

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$?????

Potential sources of funding

Donnelley WMA/USF&W 50%

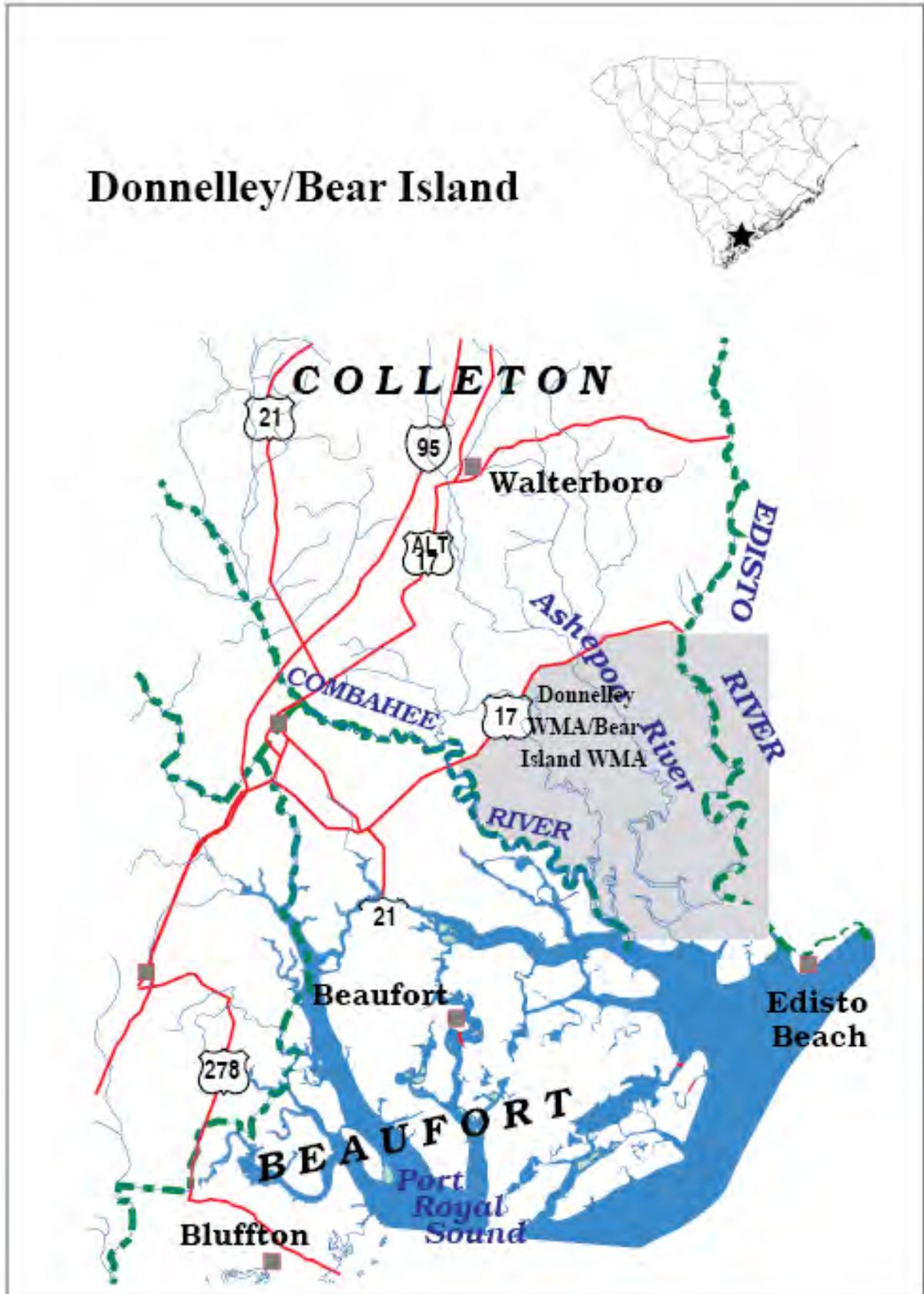
S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.

Donnelley/Bear Island



Dungannon Plantation Heritage Preserve (Charleston County)

Problem plant species

Frog's bit, Cattails, Bur Marigold, Cutgrass, Water Primrose, Swamp loosestrife

Management objective

Reduce problem plant populations to enhance Wood stork nesting habitat, public access and use.

Selected control method

Problem Species	Control Agent
Frog's bit, Water primrose, Bur marigold	Renovate 3, Habitat, Clearcast, Glyphosate
Cattails	Habitat, Clearcast, Glyphosate
Cutgrass, Swamp loosestrife	Habitat, Clearcast, Glyphosate

Area to which control is to be applied

12 acres of Frog's bit, Water primroses, and Bur marigold

12 acres of Cattails, Cutgrass, and Swamp loosestrife throughout the area.

Rate of control agent to be applied

Renovate 3 - 0.5 to 0.75 gallons per acre

Habitat - 2 to 3 pints per acre.

Clearcast - 1 to 4 pints per acre.

Glyphosate - up to 6 pints per acre.

Method of application of control agent

Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Apply when plants are actively growing (May - Oct.).

Other control application specifications

Application to be conducted by airboat and Jon-boat.

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$?????

Potential sources of funding

Donnelley WMA/USF&W 50%

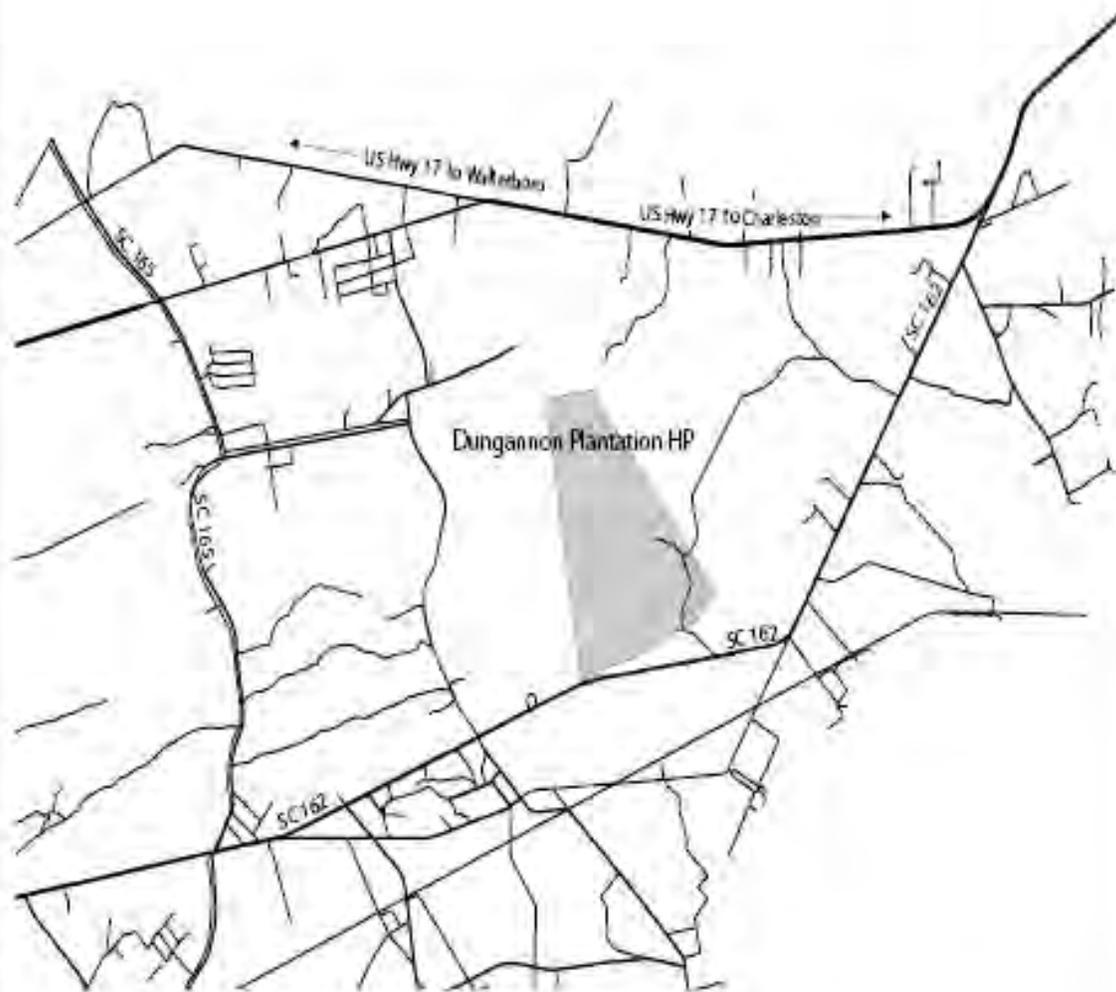
S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Enhance aquatic plant communities to benefit waterfowl and to increase nesting activities of Wood storks and other waterfowl.

Dungannon Plantation HP



Goose Creek Reservoir (Berkeley County)

Problem plant species

Hygrophila, Water hyacinth, Water primrose, Water lettuce, Hydrilla, Watermilfoil, Fanwort, Salvinia minima, Duckweed

Management objective

Reduce water hyacinth and water lettuce populations to the greatest extent possible throughout the lake.

Reduce water primrose, water lettuce and water hyacinth in the upper portion of the lake to enhance water flow and public access.

Reduce hydrilla growth throughout the lake to minimize its spread within the lake, help prevent its spread to adjacent public waters, and minimize adverse impacts to public use and access.

Reduce duckweed growth throughout populated portions of the lake to minimize adverse impacts to public use and access.

Reduce filamentous algae growth throughout populated portions of the lake to minimize adverse impacts to public use and access.

Maintain diverse aquatic plant community through selective application of control methods.

Selected control method

Problem Species	Control Agent
Water primrose, Hygrophila	Renovate 3, Habitat, Clearcast, Glyphosate
Water hyacinth, Water lettuce	Renovate 3, Reward, Galleon SC
Watermilfoil, fanwort	Reward, Hardball, Clearcast
Hydrilla, Hygrophila	Aquathol K, chelated copper, triploid grass carp
Duckweed	Sonar, Reward, Galleon SC
Filamentous Algae	Nautique

Area to which control is to be applied

Renovate 3, Habitat, Clearcast, Glyphosate- 100 acres water primrose in upper reservoir and boat ramp.

Reward - 50 acres of water hyacinth and water lettuce throughout reservoir.

Renovate 3, Reward, Galleon SC - 100 acres of water hyacinth and water lettuce throughout the reservoir.

Reward, Hardball, Stingray - 20 acres of submersed growth throughout the reservoir.

Renovate 3, Habitat, Clearcast, Glyphosate, Aquathol – up to 30 acres of *Hygrophila* throughout the reservoir.

Release triploid grass carp in areas of the lake with greatest hydrilla growth. Grass carp will be released in selected areas, such as boat ramps and park sites, around the reservoir to achieve as even a distribution as practicable.

Sonar, Reward, Galleon SC – 50 acres of duckweed near populated areas of the reservoir.

Nautique – 50 acres of filamentous algae near populated areas of the reservoir.

Rate of control agents to be applied

Reward - 0.5 gallon per acre.

Renovate 3 - 0.50 to 0.75 gallons per acre.

Habitat - up to 4 pints per acre.

Clearcast - 1 to 4 pints per acre.

Glyphosate - up to 6 pints per acre.

Hardball - up to 5 gallons per acre.

Stingray - up to 12 ounces per acre.

Galleon SC - Submersed 0.174 fl oz/acre foot to achieve minimum effective concentration of 25 to 75 ppb Floating species – 2 to 6 fl oz/acre as foliar application.

*Triploid Grass Carp - 870 fish in the entire reservoir

*Based on a 32%(720) mortality to maintain existing population and adding 150 additional carp to compensate for an increase in the population of *Hygrophila polysperma* which requires a higher stocking density of carp for control.

Method of application of control agents

Renovate 3, Habitat, Glyphosate, Reward, Galleon SC - spray on surface of foliage with appropriate surfactant.

Reward, Hardball, Stingray, Galleon SC - subsurface injection from airboat.

Triploid grass carp – Using standard techniques to minimize loss, stock sterile grass carp in areas of the lake with the greatest hydrilla growth.

Timing and sequence of control application

All agents to be applied when plants are actively growing.

Triploid grass carp to be released as soon as possible in the spring of 2010 (March-May).

RESULTS FROM GRASS CARP MAY NOT BE EVIDENT FOR TWO OR MORE YEARS.

Other control application specifications

Treatment of the control area is to be conducted in a manner that will not significantly degrade water quality. This may require that only a portion of the control area be treated

at any one time. Coordinate all control operations with Charleston Commissioners of Public Works and Goose Creek Reservoir Watershed Task Force.

If available, all sterile grass carp will be a minimum of 12 inches in length. Sterile grass carp shipments for Goose Creek Reservoir will be certified by the SCDNR for sterility and checked for size and condition prior to stocking in the lake.

Hydrilla is slowly increasing in acreage along with other submerged species. Hydrilla populations will be carefully monitored and in the event that significant regrowth occurs during the year the Aquatic Plant Management Council may consider the need for additional grass carp or treat with herbicides to give short-term control as needed.

Entity to apply control agents

Herbicides - Commercial Applicator

Triploid Grass Carp - S.C. Public Service Authority and/or a commercial supplier with supervision by the SCDNR.

Estimated cost of control operations

\$????

Potential sources of funding

Charleston Commissioner of Public Works 50%

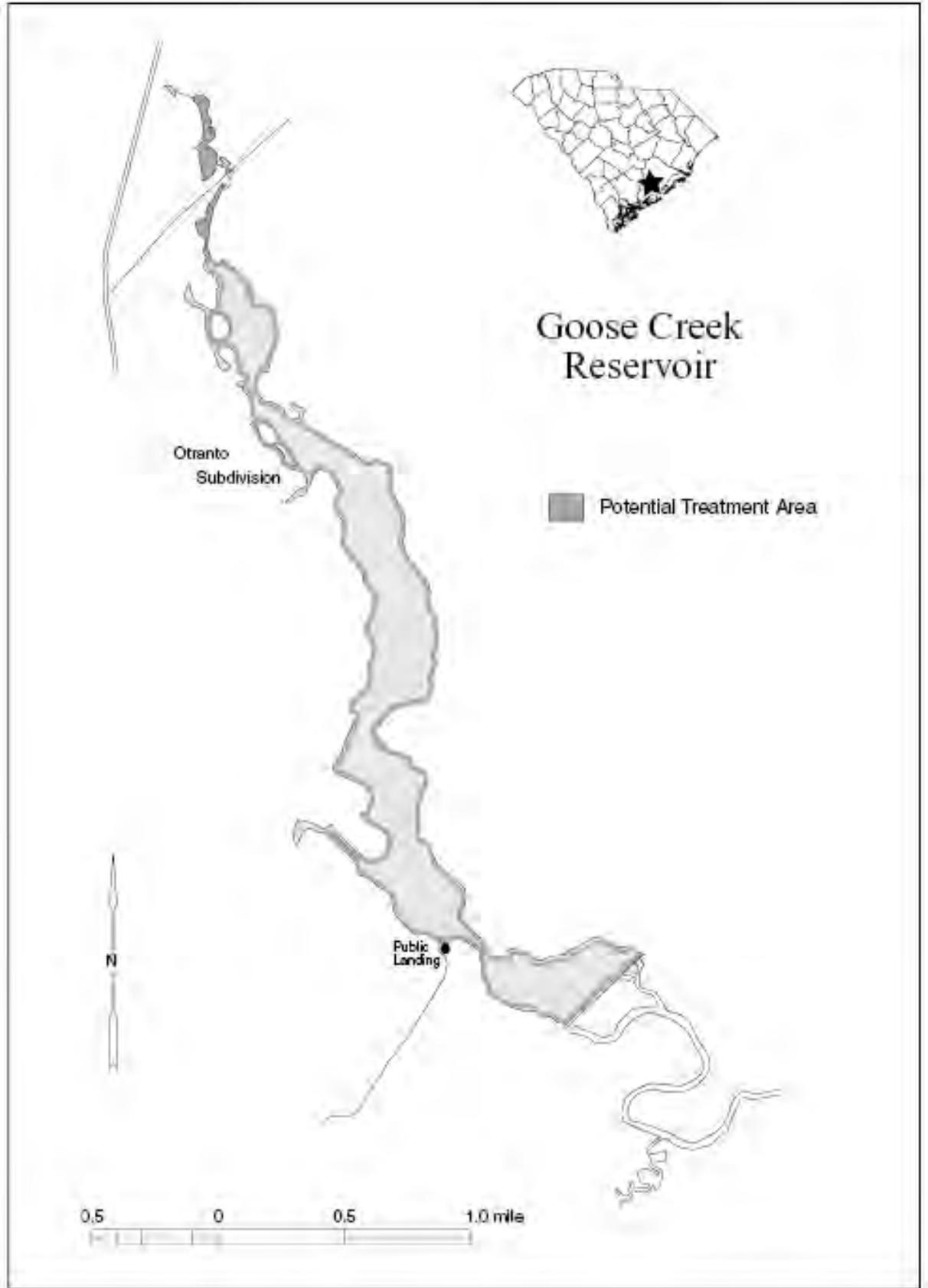
U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species



d)

Lake Cunningham (Greenville County)

Problem plant species

Brazilian elodea, Fragrant water-lily, Water primrose, Spatterdock

Management objective

Reduce nuisance plant populations to the greatest extent possible throughout lake to enhance water quality, water flow, waterfowl habitat, fishing, and hunting opportunities.

Selected control method

<u>Problem Species</u>	<u>Control Agent</u>
Brazilian elodea	Chelated copper, triploid grass carp
Water primrose,	Renovate 3, Habitat, Clearcast,
Fragrant waterlily, spatterdock	Renovate 3, Habitat, Clearcast,

Area to which control is to be applied

20 acres of problematic plants throughout Lake Cunningham.

Rate of control agent to be applied

Renovate 3 - 0.5 to 0.75 gallons per acre.

Habitat - 2 to 3 pints per acre.

Clearcast - 1 to 4 pints per acre. –

Chelated copper – up to 1 ppm.

Triploid grass carp – 216 total fish (32% mortality rate)

Method of application of control agent

Herbicides spray on surface of foliage with appropriate surfactant from boat or subsurface injection from airboat

Triploid grass carp – Using standard techniques to minimize loss, stock sterile grass carp in areas of the lake with the greatest Brazilian elodea growth.

Timing and sequence of control application

Herbicide - Apply when plants are actively growing.

Triploid grass carp to be released as soon as possible in the spring of 2010 (March-May).

RESULTS FROM GRASS CARP MAY NOT BE EVIDENT FOR TWO OR MORE YEARS.

Other control application specifications

If available, all sterile grass carp will be a minimum of 12 inches in length. Sterile grass carp shipments for Lake Cunningham will be certified by the SCDNR for sterility and checked for

size and condition prior to stocking in the lake and additional incremental stockings may be necessary based on the possibility of escape via the outflow at the dam

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$????

Potential sources of funding

Greer CPW 50%

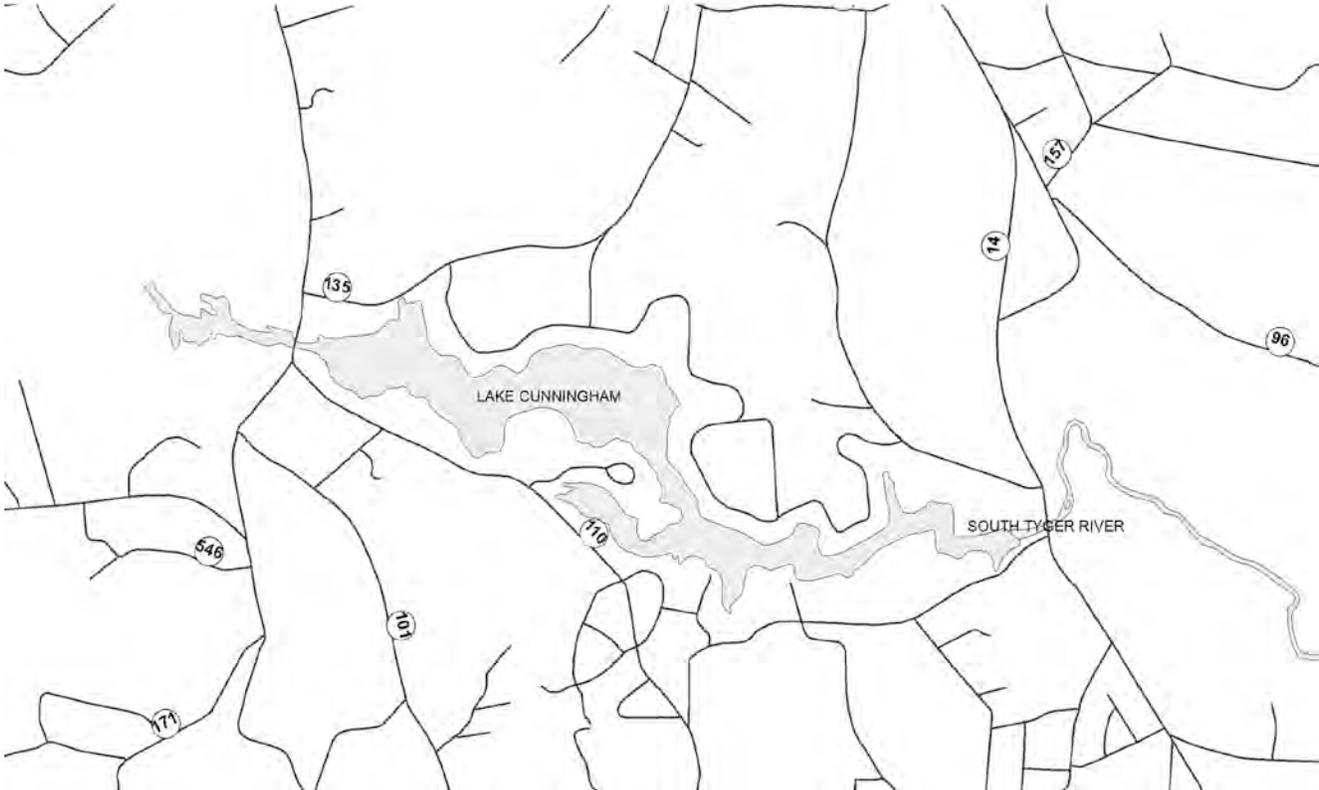
S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) A long-term integrated management strategy has been implemented to control Brazilian elodea. Triploid grass carp have been stocked to control Brazilian elodea growth lake-wide and approved aquatic herbicides are used to control localized growth in priority use areas. Future plans include annual maintenance stocking of grass carp to maintain the population at a level that is sufficient to maintain control of Brazilian elodea but to minimize impacts on desirable native plant populations.
- d) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- e) Periodically revise the management strategy and specific control sites as new environmental data, management agents and techniques, and public use patterns become available.

Lake Cunningham



Lake Darpo (Darlington County)

Problem plant species

Water lily, Milfoil

Management objectives

Reduce problem plant populations to enhance waterfowl habitat, public access and use.

Selected control method

Problem Species	Control Agent
Water lily, milfoil	Hardball, Stingray

Area to which control is to be applied

Hardball, Stingray - 10 acres of Milfoil infestation.

Rate of control agents to be applied

Hardball - up to 5 gallons per acre
Clearcast - up to 0.50 gallons per acre per acre

Method of application of control agents

Hardball - subsurface injection from airboat. Clearcast application to exposed seed heads above the waterline. Application by airboat with adjuvant two (2) times per year.

Timing and sequence of control application

Agent to be applied when plants are actively growing.

Other control application specifications

Treatment of control area is to be conducted in a manner that will not significantly degrade water quality.

Milfoil may require multiple treatments.

Entity to apply control system

Commercial applicator

Estimated cost of control operations

\$2,339

Potential sources of funding

Darlington County 50%

U.S. Army Corps of Engineers 0%

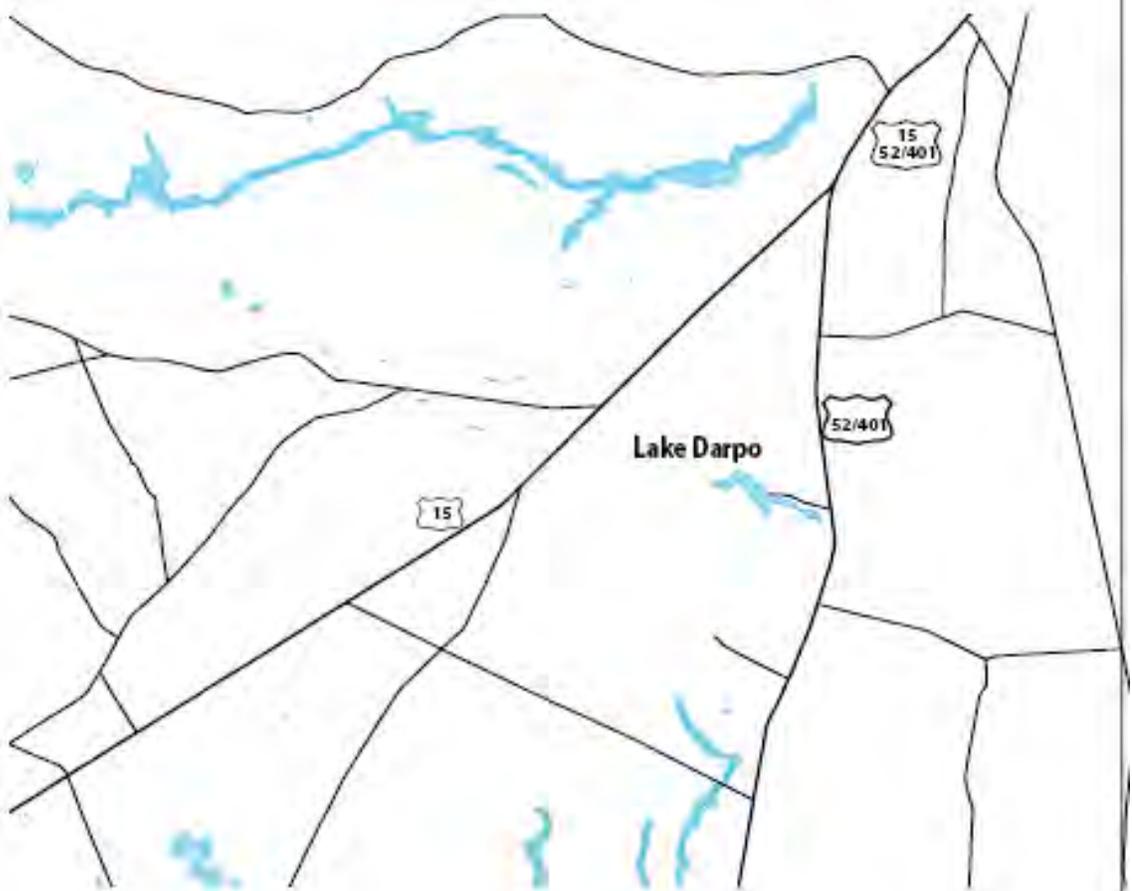
S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

Lake Darpo



Lake Greenwood (Greenwood and Laurens County)

Problem plant species

Slender naiad, Hydrilla, Water primrose

Management objectives

Reduce slender naiad and water primrose in developed shoreline areas and areas of high public access and use.

Manage hydrilla growth throughout the lake to minimize its spread within the lake, help prevent its spread to adjacent public waters, and minimize adverse impacts to agricultural irrigation withdrawals, and public use and access.

Selected control method

Problem Species

Slender naiad, Hydrilla

Water primrose

Control Agent

Aquathol K, Sonar, Triploid Grass Carp, chelated copper*

Renovate 3, Glyphosate, Habitat, Clearcast

Area to which control is to be applied

Slender naiad – Approximately 30 acres in priority areas such as public and commercial access sites and residential shoreline areas throughout the lake.

Water primrose – Approximately 30 acres in priority areas such as public and commercial access sites and residential shoreline areas throughout the lake.

Hydrilla - Approximately 400 acres in public and commercial access sites (boat ramps, piers, swimming areas, marinas) and residential shoreline areas in the lake and use herbicide applications to provide immediate short-term control of localized growth in approximately 25 acres of hydrilla infestation in upper Rabon Creek arm, 25 acres in the Reedy River Arm, 40 acres around Greenwood State Park, 10 acres in Lick Creek Branch, and 50 acres in the lower half of the lake.

Rate of control agents to be applied

Aquathol K - 0.5 to 4 ppm (about 3 to 8 gallons per acre depending on depth)

Habitat – 0.250 – 0.750 gallons per acre

Clearcast - -up to 5% spot spray

Sonar - 0.075 to 0.25 ppm

Chelated Copper- up to 1 ppm

Sonar Q, Sonar PR - up to .40 ppm (approx 10 pounds/acre)

Tripliod Grass Carp – 3,756 total fish (15 fish per vegetated acre for additional 180 acres plus 32% of initial stocking rate(1,056) of hydrilla for mortality)

Method of application of control agents

Aquathol K, Sonar, chelated copper* - Subsurface application by airboat with adjuvant.

Renovate 3, Glyphosate, Habitat, Clearcast - spray on surface of foliage with appropriate surfactant.

Tripliod grass carp – Using standard techniques to minimize loss, stock sterile grass carp in areas of the lake with the greatest hydrilla growth.

Timing and sequence of control application

Agent to be applied to slender naiad when plants are actively growing.

Agent to be applied to hydrilla when plants are actively growing but prior to tuber production.

Tripliod grass carp to be released as soon as possible in the spring of 2010 (March-May).
RESULTS FROM GRASS CARP MAY NOT BE EVIDENT FOR TWO OR MORE YEARS.

Other control application specifications

Herbicide used only upon approval by the S.C. Department of Health and Environmental Control.

Treatment of control area is to be conducted in a manner that will not significantly degrade water quality. Survey and final determination of treatment areas to be conducted in conjunction with the South Carolina Department of Natural Resources district fisheries biologist. In general, treatment will be limited to developed shoreline areas, public access sites, and areas of high public use.

Hydrilla may require multiple treatments.

Entity to apply control system

Commercial applicator

Estimated cost of control operations

\$????

Potential sources of funding

Greenwood County 50%

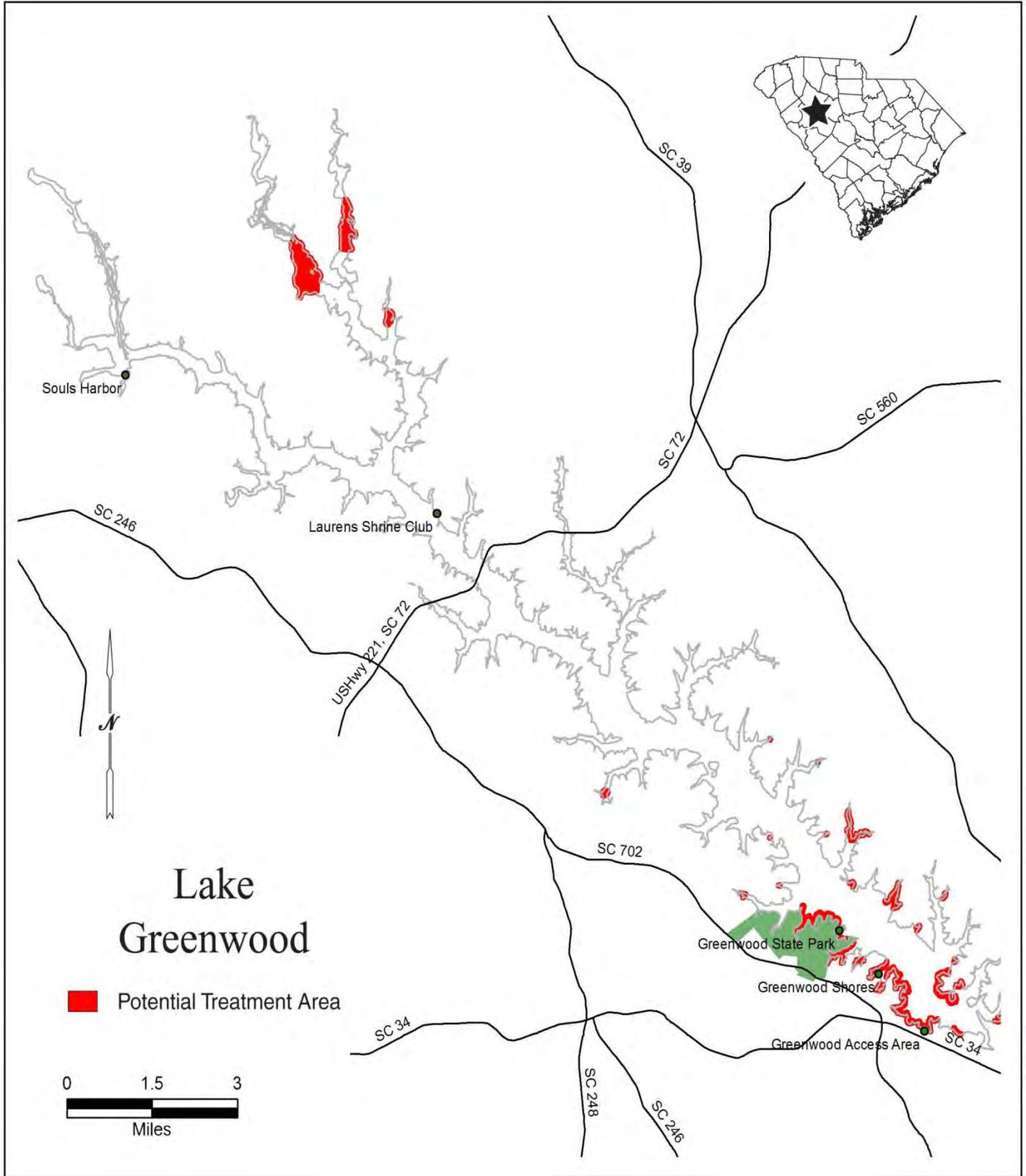
U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.



Lake Keowee (Pickens and Oconee County)

Problem plant species

Hydrilla

Management objectives

Keep hydrilla growth suppressed to minimize its spread within the lake, help prevent its spread to adjacent public waters and minimize adverse impacts to water use activities.

Selected control method

Chelated copper *

Fall/winter water level drawdown

* May be toxic to fish at recommended treatment rates; however, precautions will be implemented to minimize the risk of fish kills.

Area to which control is to be applied

Chelated copper - 10 acres

Drawdown - entire lake

Rate of control agent to be applied

Chelated copper - up to 1 ppm (about 16 gallons per acre)

Drawdown - to the greatest extent possible within project limits.

Method of application of control agent

Chelated copper - subsurface injection by airboat with adjuvant.

Drawdown - draw lake down.

Timing and sequence of control application

Herbicide application - when plants are actively growing.

Drawdown - Drawdown Lake from October through February.

Other control application specifications

Herbicide application - Herbicide used only upon notification of all local potable water supply authorities and approval by S.C. Department of Health and Environmental Control. Treatment of control area will be conducted in a manner that will not significantly degrade water quality.

Drawdown - Extent and duration of drawdown is dependent on operational limits of hydroelectric project, Federal regulations, electric demand, precipitation, and inflow.

Entity to apply control system

Herbicide application - Commercial applicator or Duke Power Company

Drawdown - Duke Power Company

Estimated cost of control operations

Herbicide application - \$????

Drawdown - Undetermined

Potential sources of funding

Duke Power Company 50%

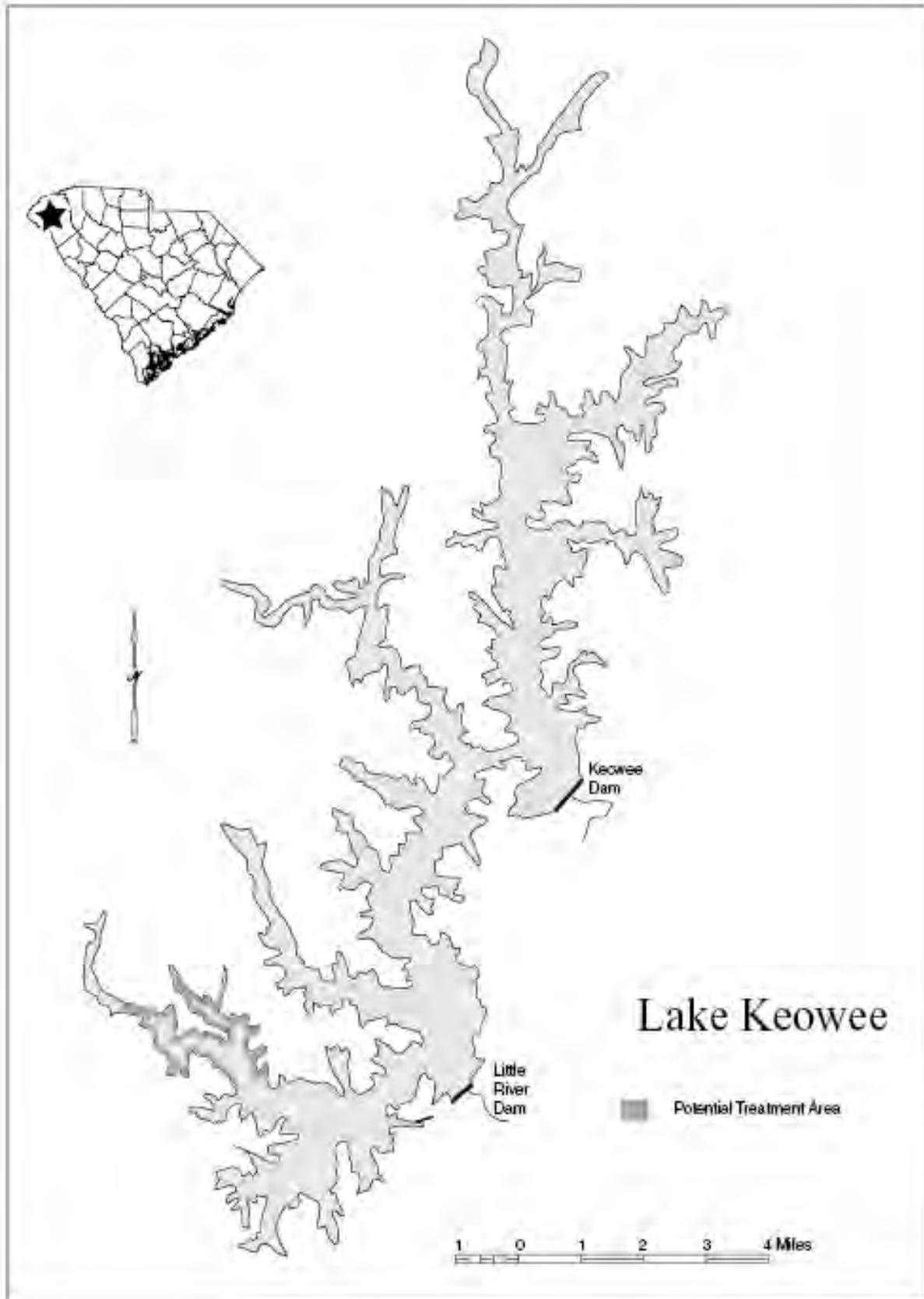
U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.



Lake Murray (Lexington, Newberry, Richland and Saluda Counties)

Problem plant species

Hydrilla, Illinois pondweed, Water Primrose

Management objectives

Maintain reduced hydrilla and Illinois pondweed growth throughout the lake to minimize its spread within the lake, help prevent its spread to adjacent public waters, and minimize adverse impacts to drinking water withdrawals and public use and access.

Monitor water primrose growth and consider control options if impacts are greater than anticipated.

Maintain diverse aquatic plant community through selective application of control methods and introduction of desirable native plant species.

Selected control method

Triploid grass carp stocked in 2003 substantially reduced hydrilla coverage in Lake Murray during 2003-2009. Consequently, no additional grass carp stockings are planned for these areas in 2010. However, hydrilla populations and potential regrowth will be carefully monitored and in the event that survey results and regrowth warrant, the Aquatic Plant Management Council may reconsider the need for additional grass carp.

Mechanical harvester – short-term control in selected areas to provide public access and clear areas around municipal water intakes.

Aquatic herbicides - short-term control in selected areas to provide public access and clear areas around municipal water intakes.

Problem Species	Control Agents
Hydrilla	Chelated copper (Nautique)
Water primrose	Renovate 3, Habitat, Clearcast

Area to which control is to be applied

If needed, release triploid grass carp in areas of the lake with greatest hydrilla growth.

Use mechanical harvesters or aquatic herbicides to provide immediate short-term control at high priority public access points, such as boat ramps and park sites, and municipal water intakes (75 acres of water primrose).

Rate of control agent to be applied

If hydrilla acreage in 2010 warrants, additional grass carp may be stocked at the rate of 15 fish per vegetated acre following Council approval.

Harvest acreage as needed to provide public use, access and clear areas around municipal water intakes.

Apply aquatic herbicides to provide immediate short-term control at high priority public access points and municipal water intakes.

Chelated copper - up to 1 ppm

Renovate 3 - 0.50 to 0.75 gallons per acre.

Habitat - 2 to 4 pints per acre.

Clearcast - 1 to 4 pints per acre.

Method of application of control agent

Tripliod grass carp - See section 3 above.

Use mechanical harvester as designed.

All agents to be applied when plants are actively growing.

Timing and sequence of control application

If hydrilla acreage in 2010 warrants, additional grass carp may be stocked following Council approval.

Harvest aquatic growth as it becomes problematic; multiple applications are likely.

Apply herbicides to aquatic vegetation as it becomes problematic.

Other control application specifications

If needed, all sterile grass carp will be a minimum of 12 inches in length. All sterile grass carp shipments for Lake Murray will be examined by the SCDNR for sterility, size, and condition at the Campbell Fish Hatchery in Columbia prior to stocking in the lake.

Harvested vegetation must be removed from the lake and deposited on high ground. The harvesting process must minimize adverse impacts to fish.

Control by Residential/Commercial Interests:

This plan is designed to provide relief from noxious aquatic vegetation for the public at large. Private entities such as lake-front residents and commercial interests may have site specific concerns not addressed immediately by the use of grass carp or mechanical harvesters at public access areas. Residential and commercial interests may remove nuisance aquatic vegetation manually or by use of mechanical harvesting devices. Of the three major control methods the following conditions apply.

1) Mechanical harvesters – Commercial aquatic plant harvesting services may be hired to remove hydrilla and Illinois pondweed from areas adjacent to residential and commercial property after notification of SCE&G. Harvesting precautions as stated in item above must be adhered to.

2) Aquatic herbicides – SCE&G opposes regular or general application of herbicides in Lake Murray, therefore, aquatic herbicides may not be applied in the lake by lake front property owners.

3) Sterile grass carp - A sufficient number of grass carp are being stocked by SCDNR to control nuisance aquatic vegetation. Stocking additional grass carp in Lake Murray without written consent by the SCDNR is prohibited.

Entity to apply control agent

Triploid grass carp - Commercial supplier with supervision by the SCDNR.

Mechanical harvester – Commercial harvester under supervision of SCE&G at park sites and public boat ramps; private marina operators to contract for application at commercial boat ramps.

Aquatic herbicides - Commercial applicator under supervision by the SCDNR.

Estimated cost of control operations

Triploid grass carp - None anticipated

Mechanical harvester - \$500-1000/acre

Aquatic herbicides - \$0

Potential sources of funding

Triploid grass carp if needed.

S.C. Electric and Gas Company, Lexington and Richland Counties 50%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

Mechanical harvester, S.C. Electric and Gas Company, Commercial marina operators, and residential property owners.

Aquatic herbicides

S.C. Electric and Gas Company, Lexington and Richland Counties 50%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

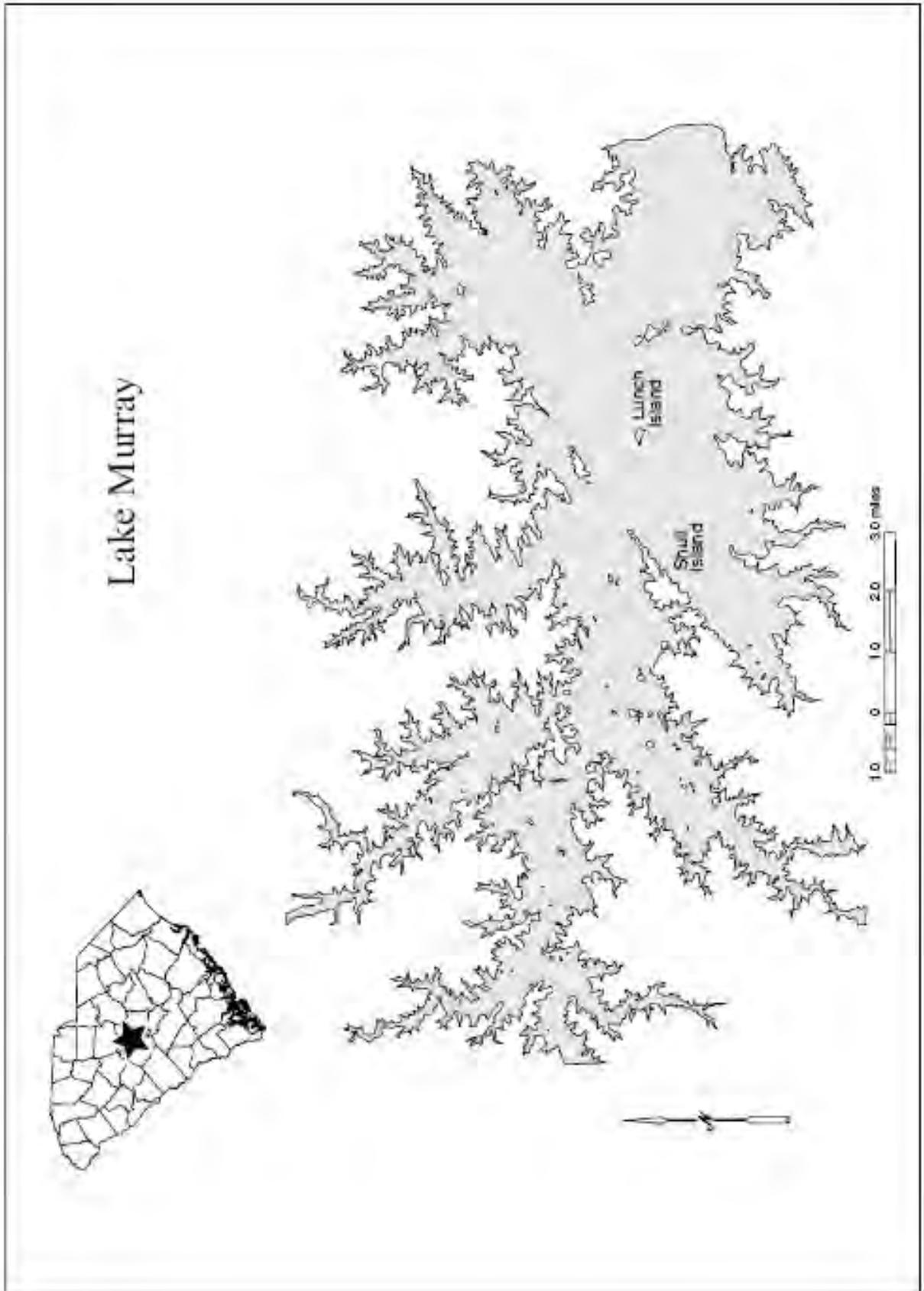
Long term management strategy

a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.

b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant

populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.

- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- d) Improve public awareness and understanding of aquatic plant management activities through the maintenance of the Lake Murray Aquatic Plant Management web site. The web site includes up-to-date information on annual management plans, dates and locations of current and historical control operations, locations of habitat enhancement activities, and other pertinent information.
- e) Periodically revise the management strategy and specific control sites as new environmental data and control agents and techniques become available and public use patterns change.
- f) Water primrose - Water primrose, a shoreline plant, became problematic in the upper portion of the lake last year. The two-year drawdown exposed a lot of unvegetated shoreline where water primrose quickly spread and re-established at the 345-348 foot contour level. While this plant can be invasive and cause localized problems, it has been in the lake for decades and is typically not a threat to general public access and use of the waterway. Based on past experience, it is expected that most of the plants that are rooted in deep water will not survive after the lake level returns to full pool. Therefore, there are no plans to control its growth this year. However, the SCDNR and SCE&G will monitor water primrose growth and consider control options if impacts are greater than anticipated.



Lake Wateree (Fairfield, Kershaw and Lancaster Counties)

Problem plant species

Hydrilla

Management objective

Keep hydrilla growth suppressed to prevent its spread within the lake, help prevent its spread to adjacent public water, and minimize adverse impacts to water use activities.

Selected control method

Aquathol K

Fall/winter water level drawdown

Area to which control is to be applied

Aquathol K - At least 2 acres in cove near Lakeside Marina.

Drawdown - Entire Lake

Rate of control agent to be applied

Aquathol K - 4 ppm (about 8 gallons per acre depending on depth)

Drawdown - To the greatest extent possible within project limits.

Method of application of control agent

Aquathol K - Subsurface injection from airboat with adjuvant.

Drawdown - Draw lake down

Timing and sequence of control application

Aquathol K - 2 acres treated twice in June and again in fall of year.

Drawdown - Drawdown lake from October through February.

Other control application specifications

Aquathol K - Herbicide used only upon notification of all local potable water supply authorities and approval by S.C. Department of Health and Environmental Control. Treatment of control area will be conducted in a manner that will not significantly degrade water quality.

Drawdown - Extent and duration of drawdown is dependent on operational limits of hydroelectric project, Federal regulations, electric demand, precipitation, and inflow.

Entity to apply control agent

Herbicide application - Commercial applicator or Duke Power Company

Drawdown - Duke Power Company

Estimated cost of control operations

Herbicide application - \$????

Drawdown - Undetermined

Potential sources of funding

Duke Power Company 50%

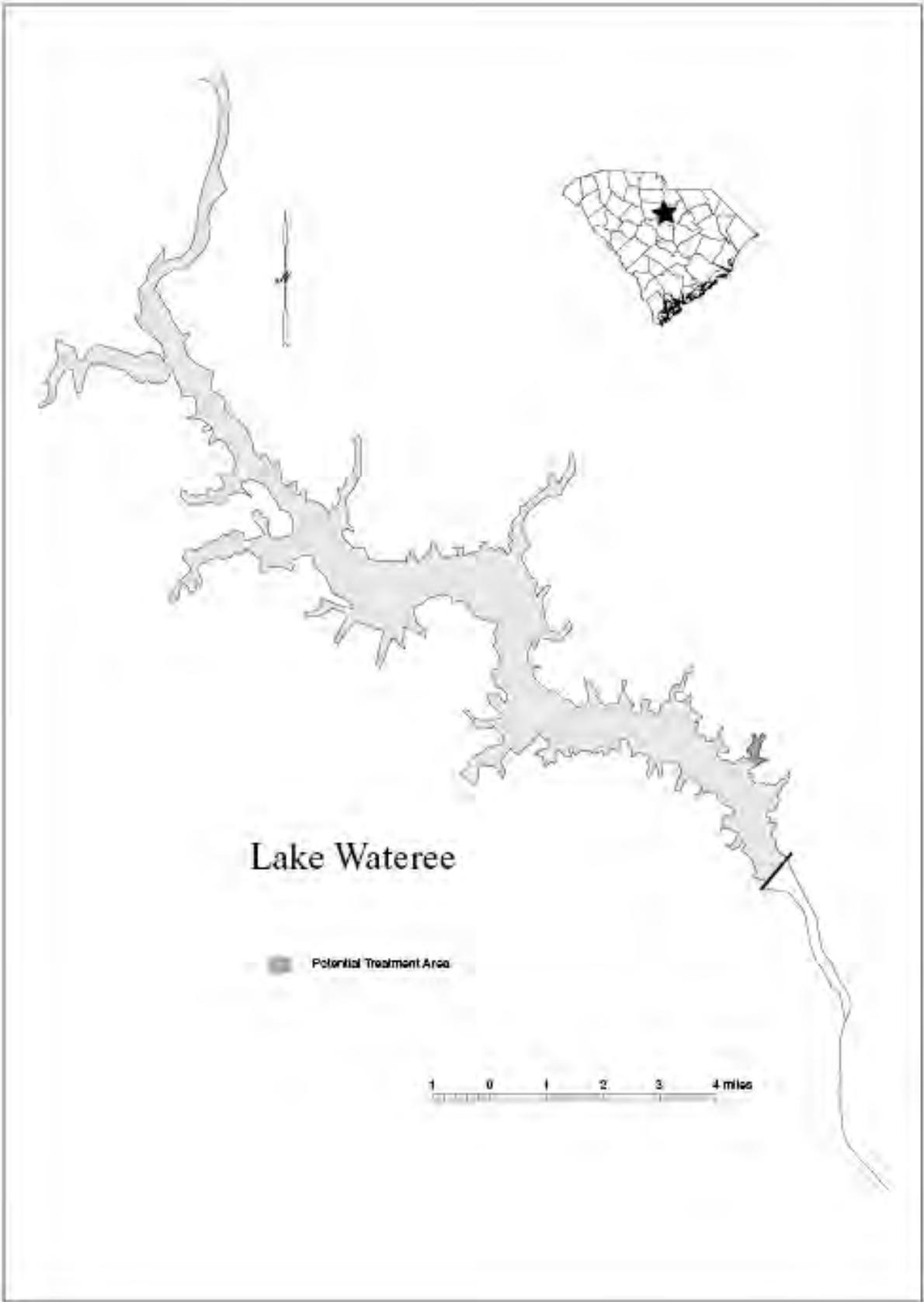
U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.



Little Pee Dee River (Marion and Horry Counties)

Problem plant species

Alligatorweed, Water hyacinth

Management objective

Through a comprehensive, multi-year approach; reduce water hyacinth and alligatorweed populations to the greatest extent possible

Selected control method

Problem Species	Control Agent
Water hyacinth	Renovate 3, Reward, Clearcast, Galleon SC
Alligatorweed	Renovate 3, Reward, Habitat, Clearcast, Glyphosate
Biological Control -	Alligatorweed flea beetles, Agasicles hygrophila

Area to which control is to be applied

50 acres of alligatorweed and water hyacinth throughout river

Rate of control agent to be applied

Habitat - 0.25 to 0.75 gallons per acre.

Reward - 0.50 gallons per acre.

Renovate 3 - 0.25 to 0.75 gallons per acre

Clearcast - 0.125 to 0.75 gallons per acre.

Glyphosate - 0.25 to 0.9375 gallons per acre.

Galleon SC - 2 to 6 fluid ounces per acre as foliar application.

Method of application of control agent

Herbicide - Spray on surface of foliage with appropriate surfactant.

Biological Control - Release in the vicinity of alligatorweed populations to supplement existing populations of alligatorweed flea beetles

Timing and sequence of control application

Apply after plants are actively growing (May - Oct.).

Other control application specifications

None

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$????

Potential sources of funding

Horry and Marion Counties 50%

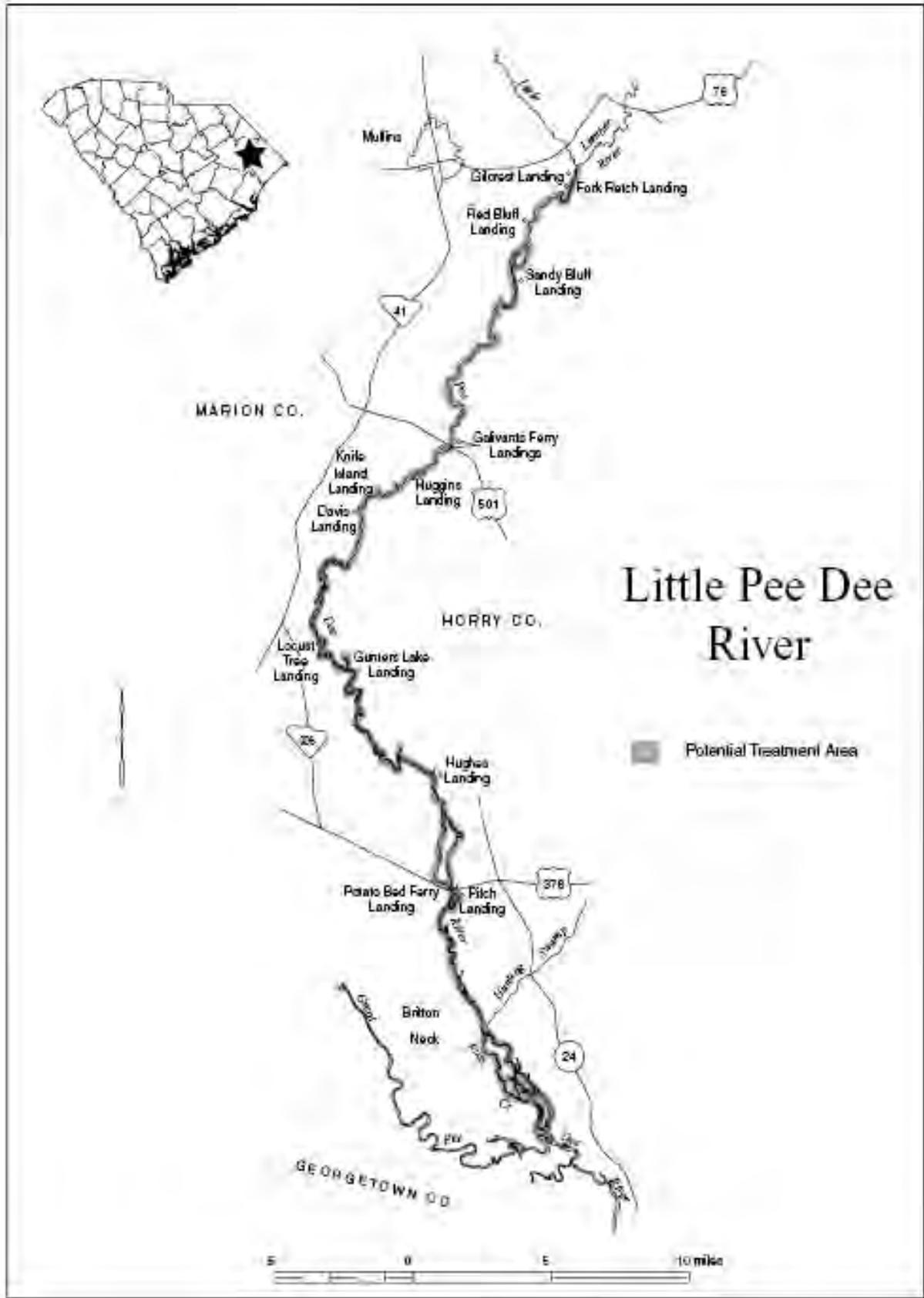
U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- d) Continue to coordinate treatment areas with local conservation groups and State Scenic Rivers Coordinator.



Lumber River (Marion and Horry Counties)

Problem plant species

Alligatorweed

Management objective

Reduce or remove alligatorweed infestation at public access points, the main river channel, and connecting lakes.

Selected control method

Herbicides - Renovate 3, Habitat, Clearcast, Glyphosate, Galleon SC
Biological Control - Alligatorweed flea beetles, Agasicles hygrophila

Area to which control is to be applied

20 acres of problematic plants throughout river

Rate of control agent to be applied

Renovate 3 - 0.50 to 0.75 gallons per acre.
Habitat - 0.25 to 0.75 gallons per acre.
Clearcast - 0.25 to 0.75 gallons per acre.
Glyphosate - 0.25 to 0.9375 gallons per acre.
Galleon SC - 2 to 6 fluid ounces per acre as foliar application.

Method of application of control agent

Herbicide - Spray on surface of foliage with appropriate surfactant.
Biological Control - Release in the vicinity of alligatorweed populations to supplement existing populations of alligatorweed flea beetles

Timing and sequence of control application

Apply after plants are actively growing (May - Oct.).

Other control application specifications

None

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$1,535

Potential sources of funding

Horry and Marion Counties 50%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- d) Continue to coordinate treatment areas with local conservation groups and State Scenic Rivers Coordinator.

Lumber River



Pee Dee River (Georgetown County)

Problem plant species

Water hyacinth, Phragmites

Management objective

Through a comprehensive, multi-year approach; reduce water hyacinth and Phragmites populations to the greatest extent possible

Selected control method

Problem Species	Control Agents
Water hyacinth	Reward, Renovate 3, Clearcast, Habitat, Galleon SC
Phragmites	Habitat, Clearcast

Area to which control is to be applied

75 acres of water hyacinth throughout river and adjacent public ricefields.

15 acres of phragmites in the Sandy Island area and Samworth WMA.

Rate of control agent to be applied

Reward - 0.50 gallons per acre.

Renovate 3 - 0.50 to 0.75 gallons per acre.

Habitat - 0.25 to 0.75 gallons per acre.

Clearcast - 0.25 to 0.75 gallons per acre.

Galleon SC - 2 to 6 fluid ounces per acre as foliar application.

Method of application of control agent

Helicopter, airboat - 75 acres of herbicide applied to water hyacinth (Sandy Island Area 10 acres). 12 acres of Habitat applied to phragmites (Sandy Island Area 2 acres).

Other applications - 50 acres of water hyacinth applied by airboat. Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Reward, Renovate 3, Clearcast, Habitat, Galleon SC - to be applied periodically to water hyacinth from May through October.

Habitat, Clearcast - Apply when plants are actively growing.

Other control application specifications

None

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$\$\$\$\$

Potential sources of funding

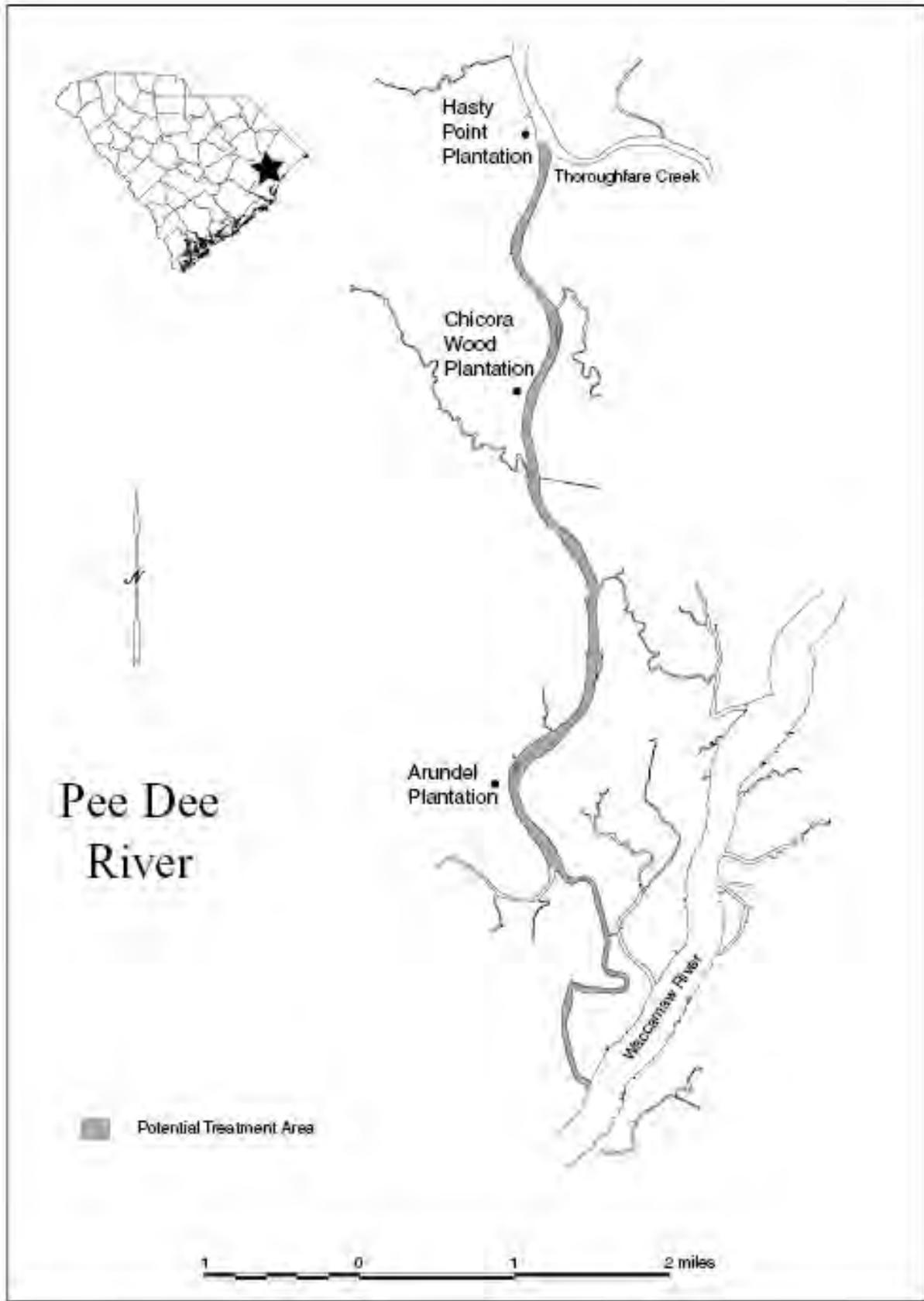
Georgetown County 50%

U.S. Army Corps of Engineers 0% S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.



**Samworth WMA
(Georgetown County)**

Problem plant species

Water hyacinth, Phragmites

Management objective

Through a comprehensive, multi-year approach; reduce water hyacinth and Phragmites populations to the greatest extent possible

Selected control method

Problem Species	Control Agents
Water hyacinth	Reward, Renovate 3, Clearcast, Habitat, Galleon SC
Phragmites	Habitat, Clearcast

Area to which control is to be applied

75 acres of water hyacinth throughout river and adjacent public ricefields.
10 acres of phragmites in the Sandy Island area and Samworth WMA.

Rate of control agent to be applied

- Reward - 0.50 gallons per acre.
- Renovate 3 - 0.50 to 0.75 gallons per acre.
- Habitat - 0.25 to 0.75 gallons per acre.
- Clearcast - 0.25 to 0.75 gallons per acre.
- Galleon SC - 2 to 6 fluid ounces per acre as foliar application.

Method of application of control agent

Helicopter, airboat - 25 acres of herbicide applied to water hyacinth. 10 acres of Habitat applied to phragmites.

Timing and sequence of control application

- Reward, Renovate 3, Clearcast, Habitat, Galleon SC - to be applied periodically to water hyacinth from May through October.
- Habitat, Clearcast - Apply when plants are actively growing.

Other control application specifications

None

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$????

Potential sources of funding

Samworth WMA 50%

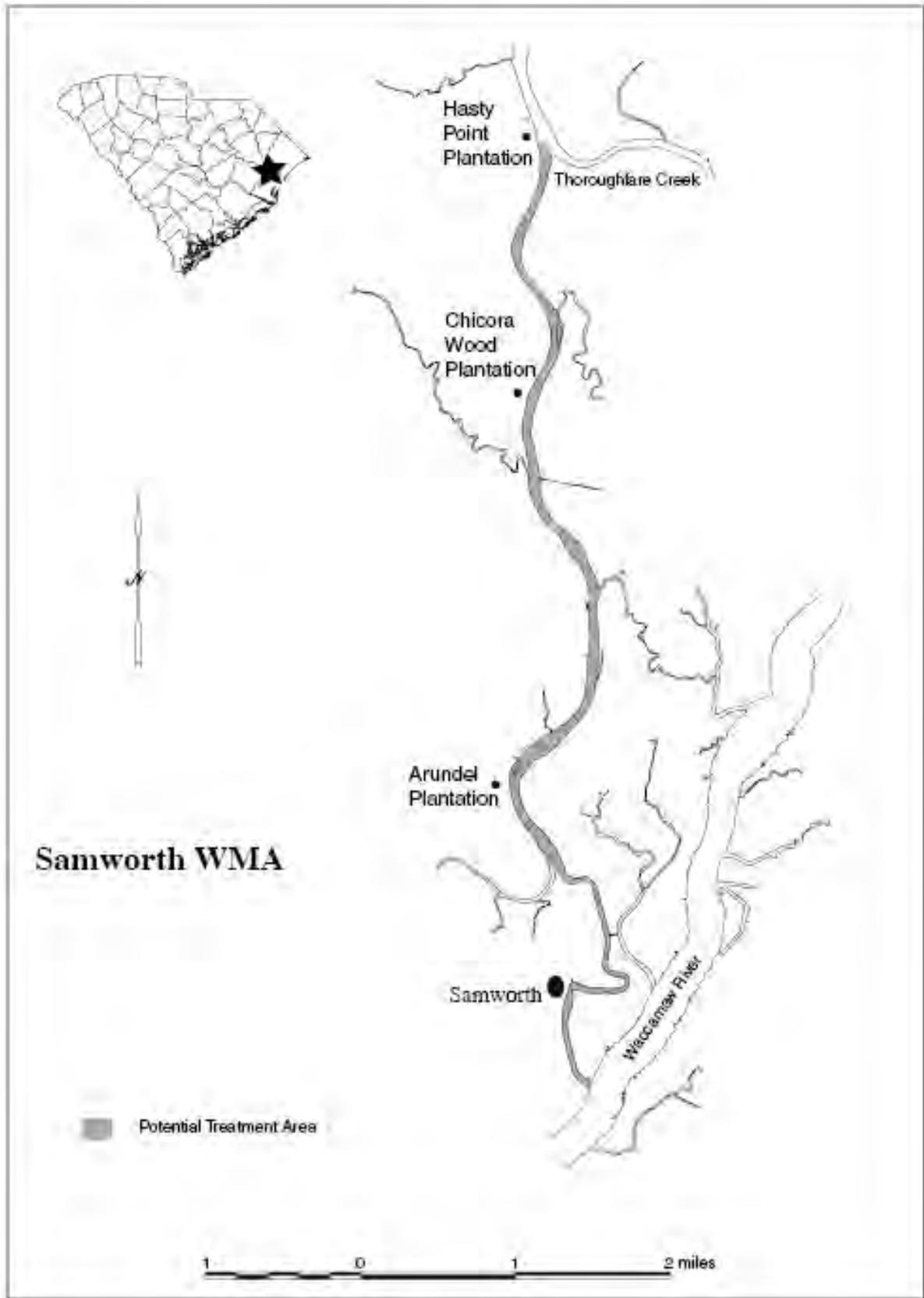
U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.



**Santee Coastal Reserve
(Charleston and Georgetown Counties)**

Problem plant species

Phragmites

Management objective

Through a comprehensive, multi-year approach; reduce Phragmites populations to the greatest extent possible throughout the Santee Coastal Reserve.

Selected control method

Habitat, Clearcast

Area to which control is to be applied

200 acres of phragmites throughout the ricefields.

Rate of control agent to be applied

Habitat - 0.50 to 0.75 gallons per acre.

Clearcast - 0.50 to 0.75 gallons per acre.

Method of application of control agent

Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Apply after plants are actively growing (May - Oct.).

Other control application specifications

Application to be conducted by ground application or airboat. Helicopter applications should be utilized at a minimum of every 3 years or when substantial regrowth occurs.

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$????

Potential sources of funding

Santee Coastal Reserve 50%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

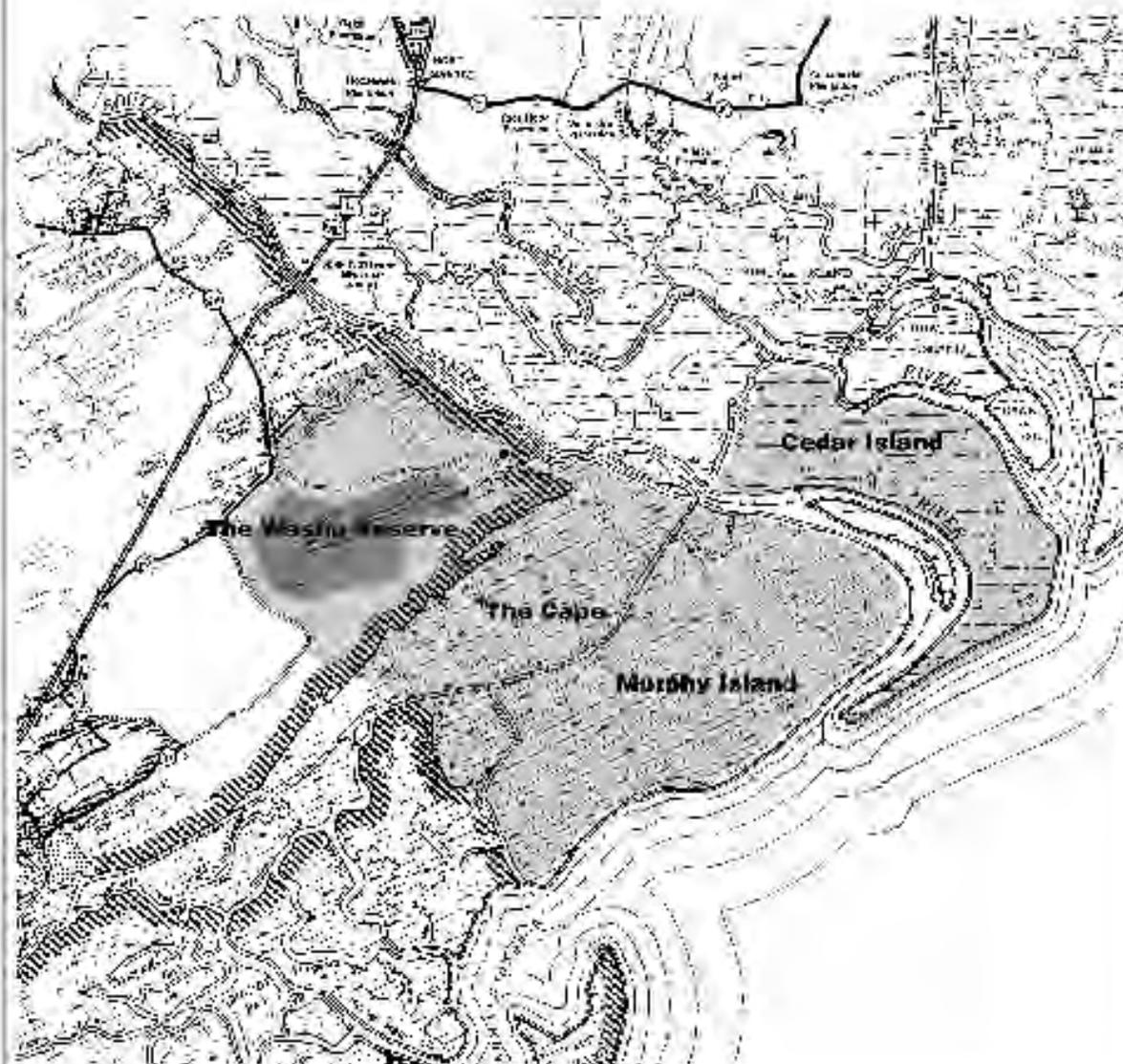
(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.

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Santee Coastal Reserve



**Santee Delta WMA
(Georgetown County)**

Problem plant species

Phragmites

Management objective

Through a comprehensive, multi-year approach; reduce Phragmites populations to the greatest extent possible.

Selected control method

Habitat, Clearcast

Area to which control is to be applied

20 acres of Phragmites throughout the ricefields.

Rate of control agent to be applied

Habitat - 0.50 to 0.75 gallons per acre.

Clearcast - 0.50 to 0.75 gallons per acre.

Method of application of control agent

Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Apply after plants are actively growing (May - Oct.).

Other control application specifications

Application to be conducted by ground application or airboat. Helicopter applications should be utilized at a minimum of every 3 years or when substantial regrowth occurs.

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$????

Potential sources of funding

Santee Coastal Reserve 50%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.

Santee Delta WMA



**U.S. Army Corps of Engineers
Charleston Harbor/Intracoastal Waterway
(Charleston County)**

Problem plant species

Phragmites

Management objective

Through a comprehensive, multi-year approach; reduce Phragmites populations to the greatest extent possible

Selected control method

Problem Species	Control Agent
Phragmites	Habitat

Area to which control is to be applied

250 acres of phragmites throughout area

Rate of control agent to be applied

Habitat - 0.50 to 0.75 gallons per acre.

Method of application of control agent

Helicopter - 200 acres of Habitat applied to phragmites.

Other applications - Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Apply when plants are actively growing (July - Oct.).

Entity to apply control agent

Commercial applicator

Other control application specifications

None

Estimated cost of control operations

\$????

Potential sources of funding

U.S. Army Corps of Engineers (Charleston Harbor Funds) 100%

S.C. Department of Natural Resources 0%

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- d) Continue to coordinate treatment areas with local conservation groups.

Charleston Harbor Dredge Spoil Areas



**US Navy, Naval Weapons Station
(Charleston, Berkeley County)**

Problem plant species

Phragmites

Management objective

Through a comprehensive, multi-year approach; reduce Phragmites populations to the greatest extent possible in spoil areas and control invasives.

Selected control method

Problem Species	Control Agent
Phragmites	Habitat, Clearcast, Glyphosate

Area to which control is to be applied

25 acres of Phragmites populations in dredge spoil areas.

Rate of control agent to be applied

- Habitat - 0.50 to 0.75 gallons per acre.
- Clearcast - 0.50 to 0.75 gallons per acre
- Glyphosate - 0.50 to 0.75 gallons per acre

Method of application of control agent

Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Apply after plants are actively growing (May - Oct.).

Other control application specifications

Application to be conducted by helicopter, airboat and jon-boat.

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$????

Potential sources of funding

- US Naval Weapons Station 50%
- S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.

US Navy Naval Weapons Station



NO MAP AVAILABLE

Waccamaw River (Horry County)

Problem plant species

Water hyacinth, Phragmites

Management objective

Through a comprehensive, multi-year approach; reduce water hyacinth and Phragmites populations to the greatest extent possible

Selected control method

Problem Species	Control Agents
Water hyacinth	Reward, Renovate 3, Clearcast, Galleon SC
Phragmites	Habitat, Clearcast

Area to which control is to be applied

75 acres throughout river system where needed.

Rate of control agent to be applied

Reward - 0.50 gallons per acre.

Renovate 3 - 0.50 to 0.75 gallons per acre.

Habitat - 0.50 to 0.75 gallons per acre.

Clearcast - 0.50 to 0.75 gallons per acre.

Galleon SC - 2 to 6 fluid ounces per acre as foliar application.

Method of application of control agent

Spray on surface of foliage with appropriate surfactant

Timing and sequence of control application

Herbicide to be applied to water hyacinth periodically from late May through November.

Other control application specifications

Herbicide used only upon approval by S.C. Department of Health and Environmental Control. Treatment of control area will be conducted in a manner that will not significantly degrade water quality.

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$????

Potential sources of funding

Horry County 25%

Brookgreen Gardens 25%

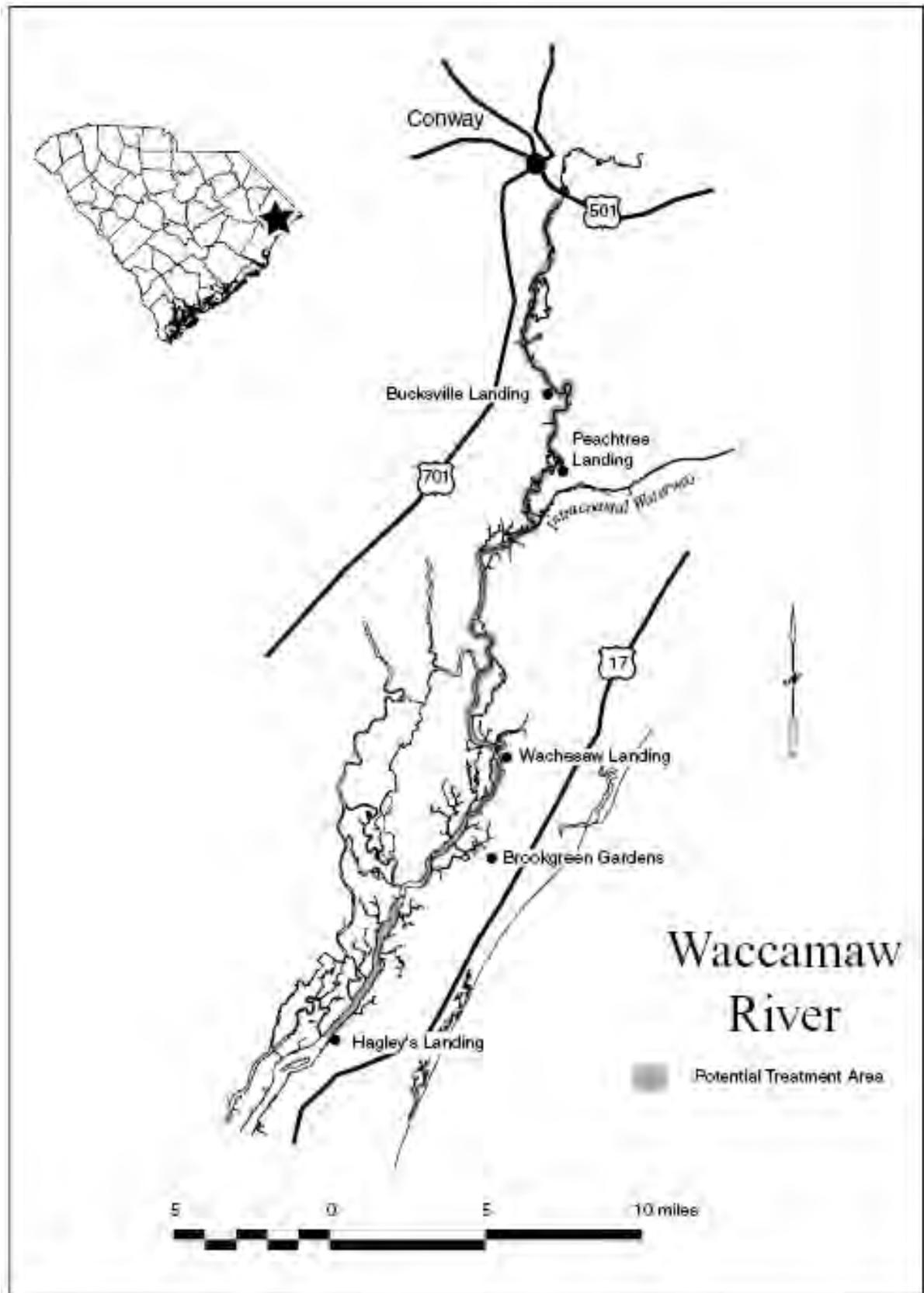
U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.



**Yawkey Wildlife Center
(Georgetown County)**

Problem plant species

Phragmites, Cattails, Cutgrass

Management objective

Through a comprehensive, multi-year approach; reduce Phragmites populations to the greatest extent possible.

Selected control method

Habitat, Clearcast, Glyphosate

Area to which control is to be applied

25 acres of Phragmites, cattails, and cutgrass throughout the ricefields.

Rate of control agent to be applied

Habitat - 0.50 to 0.75 gallons pints per acre.

Clearcast - 0.50 to 0.75 gallons per acre

Glyphosate - 0.50 to 0.75 gallons per acre

Method of application of control agent

Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Apply after plants are actively growing (May - Oct.).

Other control application specifications

Application to be conducted by airboat, ground, or helicopter. Phragmites control in impounded areas should only occur where drainage has left areas moderately dry

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$????

Potential sources of funding

Yawkey Foundation 50%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)
(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.

Yawkey Wildlife Center



Santee Cooper Lakes

Lake Marion

(Calhoun, Clarendon, Orangeburg, Berkeley, and Sumter Counties)

Problem plant species

Hydrilla, Alligatorweed, Fanwort, Water willow, Water hyacinth, Slender naiad, Water primrose, Giant Cutgrass, Coontail, Filamentous algae (Lyngbya), Slender Pondweed, Crested floating Heart, Fragrant waterlily

Management objectives

Foster a diverse aquatic plant community through selective treatment of nuisance aquatic vegetation (to avoid adverse impacts to existing non-invasive plant species) and the introduction of desirable native plant species.

Manage hydrilla growth throughout the main lake and subimpoundments to minimize its spread within the lake, help prevent its spread to adjacent public waters, and minimize adverse impacts to electric power generation, agricultural irrigation withdrawals, and public use and access.

Reduce water hyacinth populations throughout the lake to enhance boating, fishing, hunting, public access and prevent spread to other areas of the lake.

Reduce Crested Floating Heart populations throughout the lake to enhance boating, fishing, hunting, public access and prevent spread to other areas of the lake.

Reduce giant cutgrass populations throughout the lake, especially in the Hickory Top Wildlife Management Area and upper lake near Lowfalls landing, to enhance wildlife habitat and hunting opportunities.

Reduce fragrant waterlily and alligatorweed populations throughout the Santee Cooper Wildlife Management Area to enhance wildlife habitat and hunting opportunities.

Reduce other nuisance aquatic vegetation in priority use areas, such as electric power generation facilities, public and commercial access sites (boat ramps, piers, swimming areas, marinas) and residential shoreline areas in the main lake and subimpoundments.

Selected control method

Problem Species	Control Agents
Hydrilla	Aquathol K, Sonar, chelated copper*, Triploid grass carp
Lyngbya	chelated copper*
Water hyacinth	Reward, Renovate 3, Clearcast
Fanwort, coontail, slender naiad, slender pondweed	Aquathol K, Sonar, Reward

Water primrose, alligatorweed, Glyphosate, Habitat, Renovate 3, Clearcast
giant cutgrass

Crested Floating Heart Aquathol K, Clearcast / Glyphosate

* May be toxic to fish at recommended treatment rates; however, precautions will be implemented to minimize the risk of fish kills.

Area to which control is to be applied

Water hyacinth - Approximately 750 acres throughout lake but mostly in the upper lake area above I-95 bridge.

Hydrilla - Approximately 500 acres in priority areas such as electric power generation facilities, public and commercial access sites (boat ramps, piers, swimming areas, marinas) and residential shoreline areas in the main lake and sub-impoundments. If conditions warrant, release triploid grass carp in close proximity to areas of the lake with the greatest hydrilla growth and use herbicide applications to provide immediate short-term control of localized growth in those areas.

Crested Floating Heart - Approximately 1000 acres in priority areas such as public and commercial access sites (boat ramps, piers, swimming areas, marinas, and residential shoreline areas in the main lake), and State and Federal wildlife management areas.

Giant Cutgrass - Approximately 100 acres along shoreline areas throughout lake system, as well as within State and Federal wildlife management areas.

Other target species - Approximately 100 acres in priority areas such as electric power generation facilities, public and commercial access sites (boat ramps, piers, swimming areas, marinas) and residential shoreline areas in the main lake and sub-impoundments.

Sub-Impoundments -

Dean's Swamp Impoundment, Potato Creek Impoundment, Church Branch Impoundment, Taw Caw Impoundment

The general management strategy is to transition from hydrilla dominant plant communities to ones dominated by native plant species, which are beneficial to wildlife, by use of aquatic herbicides. Specific control methods for the sub-impoundments will be determined cooperatively between Santee Cooper and SCDNR staffs which are consistent with both groups' interests for control of invasive plant species such as hydrilla while promoting vegetation beneficial to wildlife and waterfowl through other habitat enhancement projects.

Rate of control agents to be applied

Aquathol K - 5 up to 10 gallons per acre (dependent on water depth)

Reward - 0.5 gallon per acre for floating plants; two gallons per acre for submersed plants

Renovate 3 - 0.5 to 0.75 gallons per acre for emergent species, per label for submersed plants.

Habitat - 0.25 to 0.75 gallons per acre

Sonar AS - 0.075 to 0.15 ppm

Chelated Copper- up to 1 ppm

Glyphosate - up to 1.25 gallons per acre.

Sonar Q, Sonar PR - up to 40 ppb (approx 10 pounds/acre)

Clearcast - 0.25 to 0.75 gallons per acre

Triploid grass carp – The Aquatic Plant Management Council is committed to maintenance stocking of triploid grass carp in the Santee Cooper Lakes to provide long-term control of hydrilla. A maintenance stocking plan approved in 1999 provided for stocking a small number of grass carp to control hydrilla while encouraging the expansion of a diverse, native aquatic plant community.

The plan was first implemented in 2007 following a year of substantial increases in hydrilla and overall aquatic plant populations system-wide. The maintenance stocking plan called for increasing the grass carp population to the level at which hydrilla was last under control, which appeared to be in 2005, and maintaining that level in subsequent years. Drought conditions resulted in a decrease in lake levels to near historic lows in early 2008, so no grass carp were stocked that year. However, supplemental stocking was resumed in 2009 bringing the estimated total grass carp population to 12,074. Year end surveys in 2009 indicated another substantial increase in hydrilla regrowth (800 acres) in Lake Marion and Moultrie.

Concerned about the rate of hydrilla spread in the past three years using the current maintenance stocking plan, DNR and Santee Cooper biologists reviewed approaches in other lakes. Recent experience gained in several North Carolina lakes indicates that a maintenance stocking rate of one fish for every eight surface acres appears to keep hydrilla regrowth suppressed following initial control. If applied to Lakes Marion and Moultrie, this rate would amount to about 20,000 grass carp for both lakes combined. This target stocking rate is higher than calculated by the original stocking plan developed in 1999 but it reflects research and experience not available at that time.

Based on this new information, the Aquatic Plant Management Council, with recommendations from DNR and Santee Cooper staff, is revising the maintenance stocking plan to maintain a grass carp population of one fish per eight total surface acres (160,000 acres). This equates to 20,000 grass carp system-wide. Establishing this level will require stocking approximately 12,000 fish in 2010. Fish will be released in carefully selected locations based on the presence of hydrilla. In order to compensate for an estimated 32% annual mortality, 6,400 grass carp will be stocked each subsequent year in order to maintain the target population of 20,000.

Lake Marion and Lake Moultrie will be carefully monitored for additional increases in hydrilla acreage. Herbicide treatments will be used to provide temporary control until results from grass carp feeding become apparent. Changes to the maintenance stocking strategy will be considered if survey results and regrowth warrant.

Method of application of control agents

Aquathol K, chelated copper, Sonar - subsurface application by airboat or surface application by helicopter.

Reward - (water hyacinth) spray on surface of foliage using handgun from airboat or by helicopter with appropriate surfactant ;(submersed plants) subsurface application.

Renovate 3, Glyphosate, Habitat, Clearcast - spray on surface of foliage with appropriate surfactant.

Triploid grass carp – Using standard techniques to minimize loss, stock sterile grass carp in areas of the lake with the greatest hydrilla growth.

Timing and sequence of control application

Herbicide applications - All herbicide applications to be applied when plants are actively growing. Water hyacinth treatments should be initiated in early spring when plant growth begins and continued regularly during the year as needed.

Triploid grass carp to be released as soon as possible in the spring of 2010 (March-May).
RESULTS FROM GRASS CARP MAY NOT BE EVIDENT FOR TWO OR MORE YEARS.

Other control application specifications

Treatment of the control area is to be conducted in a manner that will not significantly degrade water quality. This may require that only a portion of the control area be treated at any one time.

Hydrilla, Water hyacinth and Crested Floating Heart treatments should be considered a high priority to minimize spread to other areas of the lake system. Treatments should be conducted wherever the plants occur and access by boat is feasible. Areas inaccessible by boat or large acreages will be treated aerially. Frequent treatments in these areas will be necessary to meet management objectives.

If available, all sterile grass carp will be a minimum of 12 inches in length. Sterile grass carp shipments for Lake Marion will be certified by the SCDNR for sterility and checked for size and condition prior to stocking in the lake.

Entity to apply control agents

Herbicide application - S.C. Public Service Authority and/or commercial applicator.

Triploid Grass Carp - S.C. Public Service Authority and/or a commercial supplier with supervision by the SCDNR.

Estimated cost of control operations

\$595,000.00

Note: The budgeted amount is based on aquatic plant coverage and treatment needs from previous years. Actual expenditures will depend on the extent of noxious aquatic plant growth in 2010

Potential sources of funding

S.C. Public Service Authority cost share balance above \$40,000

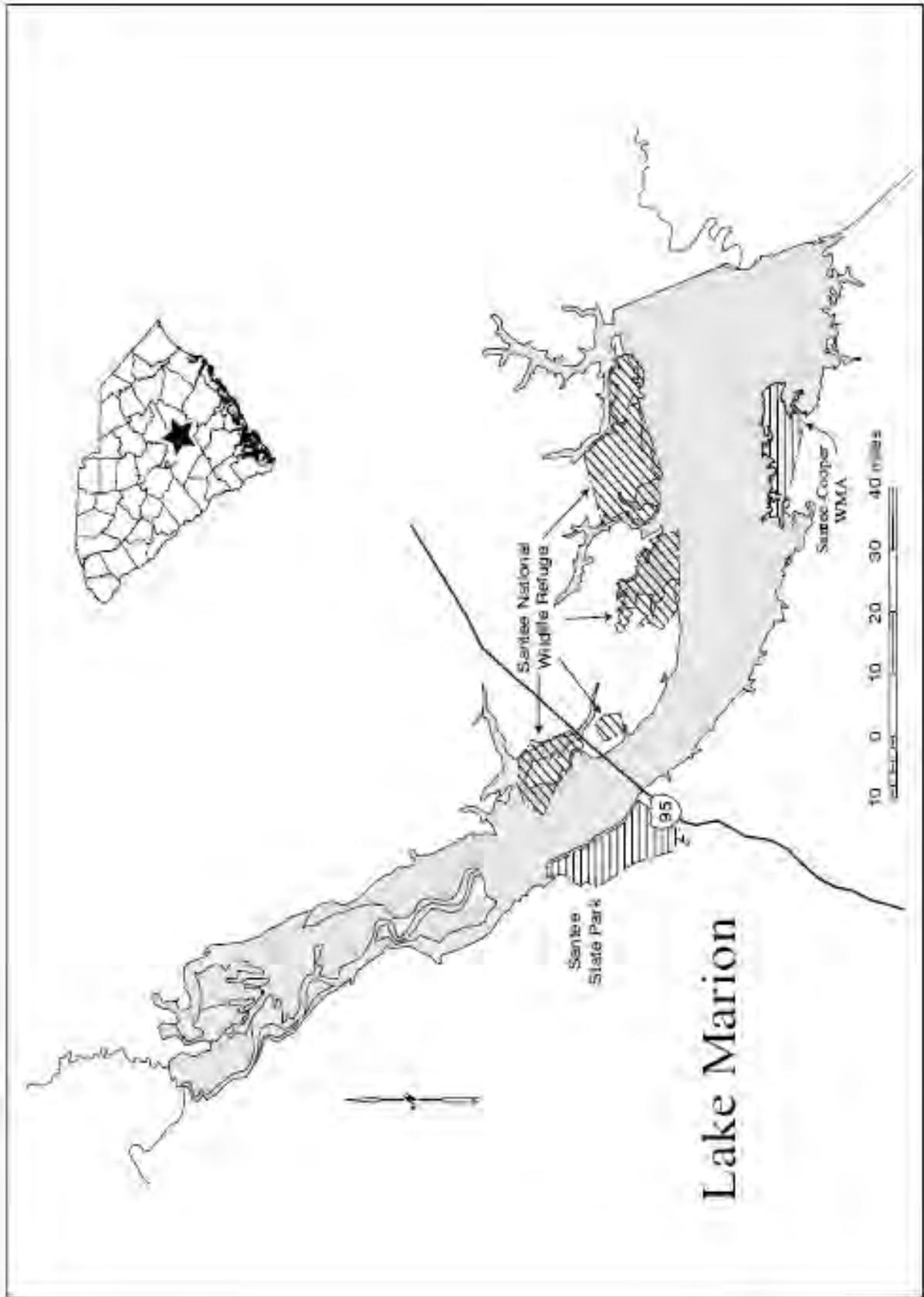
U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Support the management goals established by the DNR and Santee Cooper (Appendix E) which attempts to achieve a diverse assemblage of native aquatic vegetation in 10% of the total surface area of the lake and to effectively control non-native invasive species.
- b) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- c) A long-term integrated management strategy has been implemented to control hydrilla. Triploid grass carp have been stocked to control hydrilla growth lake-wide and approved aquatic herbicides are used to control localized growth in priority use areas. Future plans include annual maintenance stocking of grass carp to maintain the population at a level that is sufficient to maintain control of hydrilla but to minimize impacts on desirable native plant populations.
- d) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- e) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.
- f) Periodically revise the management strategy and specific control sites as new environmental data, management agents and techniques, and public use patterns become available.



Lake Moultrie (Berkeley County)

Problem plant species

Hydrilla, Slender naiad, Watermilfoil, Water willow, Water primrose, Alligatorweed, Fanwort, Water hyacinth, Crested Floating Heart, Giant Cutgrass

Management objectives

Foster a diverse aquatic plant community through selective treatment of nuisance aquatic vegetation (to avoid adverse impacts to existing non-invasive plant species) and the introduction of desirable native plant species.

Manage hydrilla growth throughout the main lake and subimpoundments to minimize its spread within the lake, help prevent its spread to adjacent public waters, and minimize adverse impacts to electric power generation, agricultural irrigation withdrawals, and public use and access.

Reduce water hyacinth and Crested Floating Heart populations throughout the lake to enhance boating, fishing, hunting, public access and prevent spread to other areas of the lake.

Reduce giant cutgrass populations throughout the lake to enhance wildlife habitat and hunting opportunities.

Reduce other nuisance aquatic vegetation in priority use areas, such as electric power generation facilities, public and commercial access sites (boat ramps, piers, swimming areas, marinas) and residential shoreline areas.

Selected control method

Problem Species	Control Agents
Hydrilla	Aquathol K, Sonar, Triploid grass carp, Chelated Copper*
Water hyacinth	Reward, Renovate 3
Fanwort, slender naiad, watermilfoil	Aquathol K, Sonar, Reward, Renovate 3
Water primrose, alligatorweed, giant cutgrass	Glyphosate, Habitat, Renovate 3
Crested Floating Heart	Aquathol K, Clearcast / Glyphosate

* May be toxic to fish at recommended treatment rates; however, precautions will be implemented to minimize the risk of fish kills.

Area to which control is to be applied

Hydrilla, fanwort, watermilfoil - Approximately 300 acres in priority areas such as electric power generation facilities, public and commercial access sites (boat ramps, piers, swimming areas, marinas) and residential shoreline areas and sub-impoundments. If conditions warrant, release triploid grass carp in close proximity to areas of the lake with the greatest hydrilla growth and use herbicide applications to provide immediate short-term control of localized growth in those areas.

Giant cutgrass, water primrose, alligatorweed - Approximately 100 acres along shoreline areas throughout the lake.

Sub -Impoundments - Stoney Bay Impoundment - The general management strategy is to transition from hydrilla dominant plant communities to ones dominated by native plant species, which are beneficial to wildlife, by use of aquatic herbicides. Specific control methods for the sub-impoundments will be determined cooperatively between Santee Cooper and SCD-NR staffs which are consistent with both groups' interests for control of invasive plant species such as hydrilla while promoting vegetation beneficial to wildlife and waterfowl through other habitat enhancement projects.

Rate of control agents to be applied

Aquathol K 5 up to 10 gallons per acre (dependent on water depth)

Reward - 0.50 gallon per acre for floating plants; two gallons per acre for submersed plants

Renovate 3 - 0.50 to 0.75 gallons per acre for emergent species, per label for submersed plants.

Habitat - 0.25 to 0.75 gallons per acre

Sonar AS - 0.075 to 0.15 ppm in treatment area

Chelated copper - up to 1 ppm Glyphosate- up to 1.25 gallons per acre.

Sonar Q, Sonar PR - up to 40 ppb (approx 10 pounds/acre) Clearcast - 0.25 to 0.75 gallons per acre

Other approved aquatic herbicides - as per label instructions.

Triploid grass carp – The Aquatic Plant Management Council is committed to maintenance stocking of triploid grass carp in the Santee Cooper Lakes to provide long-term control of hydrilla. A maintenance stocking plan approved in 1999 provided for stocking a small number of grass carp to control hydrilla while encouraging the expansion of a diverse, native aquatic plant community.

The plan was first implemented in 2007 following a year of substantial increases in hydrilla and overall aquatic plant populations system-wide. The maintenance stocking plan called for increasing the grass carp population to the level at which hydrilla was last under control, which appeared to be in 2005, and maintaining that level in subsequent years. Drought conditions resulted in a decrease in lake levels to near historic lows in early 2008, so no grass carp were stocked that year. However, supplemental stocking was resumed in 2009 bringing the estimated total grass carp population to 12,074. Year end surveys in 2009 indicated another substantial increase in hydrilla regrowth (800 acres) in Lake Marion and Moultrie.

Concerned about the rate of hydrilla spread in the past three years using the current maintenance stocking plan, DNR and Santee Cooper biologists reviewed approaches in other lakes. Recent experience gained in several North Carolina lakes indicates that a maintenance stocking rate of one fish for every eight surface acres appears to keep hydrilla regrowth suppressed following initial control. If applied to Lakes Marion and Moultrie, this rate would amount to about 20,000 grass carp for both lakes combined. This target stocking rate is higher than calculated by the original stocking plan developed in 1999 but it reflects research and experience not available at that time.

Based on this new information, the Aquatic Plant Management Council, with recommendations from DNR and Santee Cooper staff, is revising the maintenance stocking plan to maintain a grass carp population of one fish per eight total surface acres (160,000 acres). This equates to 20,000 grass carp system-wide. Establishing this level will require stocking approximately 12,000 fish in 2010. Fish will be released in carefully selected locations based on the presence of hydrilla. In order to compensate for an estimated 32% annual mortality, 6,400 grass carp will be stocked each subsequent year in order to maintain the target population of 20,000.

Lake Marion and Lake Moultrie will be carefully monitored for additional increases in hydrilla acreage. Herbicide treatments will be used to provide temporary control until results from grass carp feeding become apparent. Changes to the maintenance stocking strategy will be considered if survey results and regrowth warrant.

Method of application of control agents

Aquathol K, chelated copper, Sonar, - subsurface application by airboat or surface application by helicopter.

Reward - (water hyacinth) spray on surface of foliage using handgun from airboat or by helicopter with appropriate surfactant; (submersed plants) subsurface application.

Renovate 3, Glyphosate, Habitat, Clearcast - spray on surface of foliage with appropriate surfactant.

Triplod grass carp – Using standard techniques to minimize loss, stock sterile grass carp in areas of the lake with the greatest hydrilla growth.

Timing and sequence of control application

All herbicides to be applied when plants are actively growing. If needed, aerial treatment of hydrilla adjacent to the Rediversion Canal entrance should be performed as early as possible to prevent excessive plant growth and avoid impacts to the St. Stephen Hydropower Plant.

Triplod grass carp – If conditions warrant, triplod grass carp to be released as soon as possible.

Other control application specifications

Herbicide used only upon approval by the S.C. Department of Health and Environmental Control.

Treatment of the control area is to be conducted in a manner that will not significantly degrade water quality. This may require that only a portion of the control area be treated at any one time.

Treatment of lake, especially near the Rediversion Canal, should be coordinated with hydropower production to avoid excessive flows and maximize herbicide contact time.

If available, all sterile grass carp will be a minimum of 12 inches in length. Sterile grass carp shipments for Lake Moultrie will be certified by the SCDNR for sterility and checked for size and condition prior to stocking in the lake.

Entity to apply control agent

Herbicide application - S.C. Public Service Authority and/or commercial applicator.

Triploid Grass Carp - S.C. Public Service Authority and/or a commercial supplier with supervision by the SCDNR.

Estimated cost of control operations

\$135,000

Note: The budgeted amount is based on aquatic plant coverage and treatment needs from previous years. Actual expenditures will depend on the extent of noxious aquatic plant growth in 2010

Potential sources of funding

S.C. Public Service Authority cost share balance above \$40,000

U.S. Army Corps of Engineers 0%

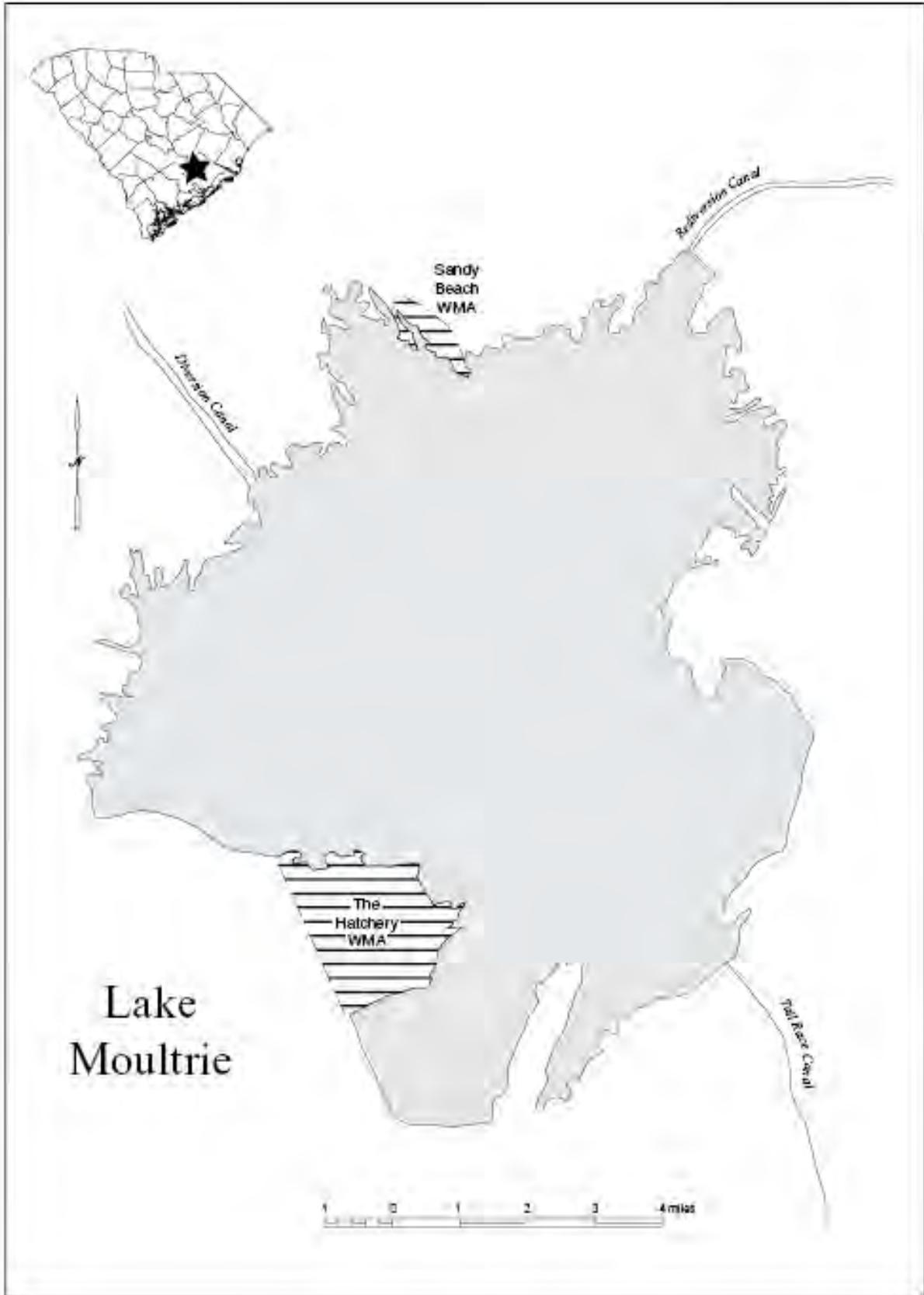
S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Support the management goals established by the DNR and Santee Cooper (Appendix E) which attempts to achieve a diverse assemblage of native aquatic vegetation in 10% of the total surface area of the lake and to effectively control non-native invasive species.
- b) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- c) A long-term integrated management strategy has been implemented to control hydrilla. Triploid grass carp have been stocked to control hydrilla growth lake-wide and approved aquatic herbicides are used to control localized growth in priority use areas. Future plans include annual maintenance stocking of grass carp to maintain the population at a level that is sufficient to maintain control of hydrilla but to minimize impacts on desirable native plant populations.

- d) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- e) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the waterbody, and enforcement of existing laws and regulations.
- f) Periodically revise the management strategy and specific control sites as new environmental data, management agents and techniques, and public use patterns become available.



DRAFT

**South Carolina Department of Parks, Recreation and Tourism
State Park Lakes**

**Barnwell State Park (Swimming Lake)
(Barnwell County)**

Problem plant species

Waterlily

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Hardball

Area to which control is to be applied

3 acres in swimming lake.

Rate of control agent to be applied

Up to 5 gallons per acre

Method of application of control agent

Subsurface injection from airboat.

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

Commercial applicator contracted and monitored by SCPRT.

Estimated cost of control operations

\$????

Potential sources of funding

S.C. Department of Parks, Recreation and Tourism 50%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

Barnwell State Park Swimming Lake



**Charles Towne Landing State Park
(Charleston County)**

Problem plant species

Duckweed, Alligatorweed, Pennywort

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Problems species	Control Agent
Duckweed	Fluridone, Galleon SC
Alligatorweed	Renovate 3
Pennywort	Glyphosate

Area to which control is to be applied

Fluridone, Galleon SC - 3 acres

Glyphosate - 2 acres

Renovate - 1 acre

Rate of control agents to be applied

Fluridone - 1 pint per acre

Glyphosate - 5 pints per acre

Renovate - 0.50 to 0.75 gals/acre

Galleon SC - 2 to 12 fl oz/acre.

Method of application of control agents

Fluridone, Galleon SC - Apply subsurface throughout lake

Glyphosate, Renovate - Spray on surface of foliage with appropriate surfactant

Timing and sequence of control application.

Herbicides to be applied when plants are actively growing

Other control application specifications

None

Entity to apply control agent

Commercial applicator contracted and monitored by SCPRT.

Estimated cost of control operations

\$????

Potential sources of funding

S.C. Department of Parks, Recreation and Tourism 50%

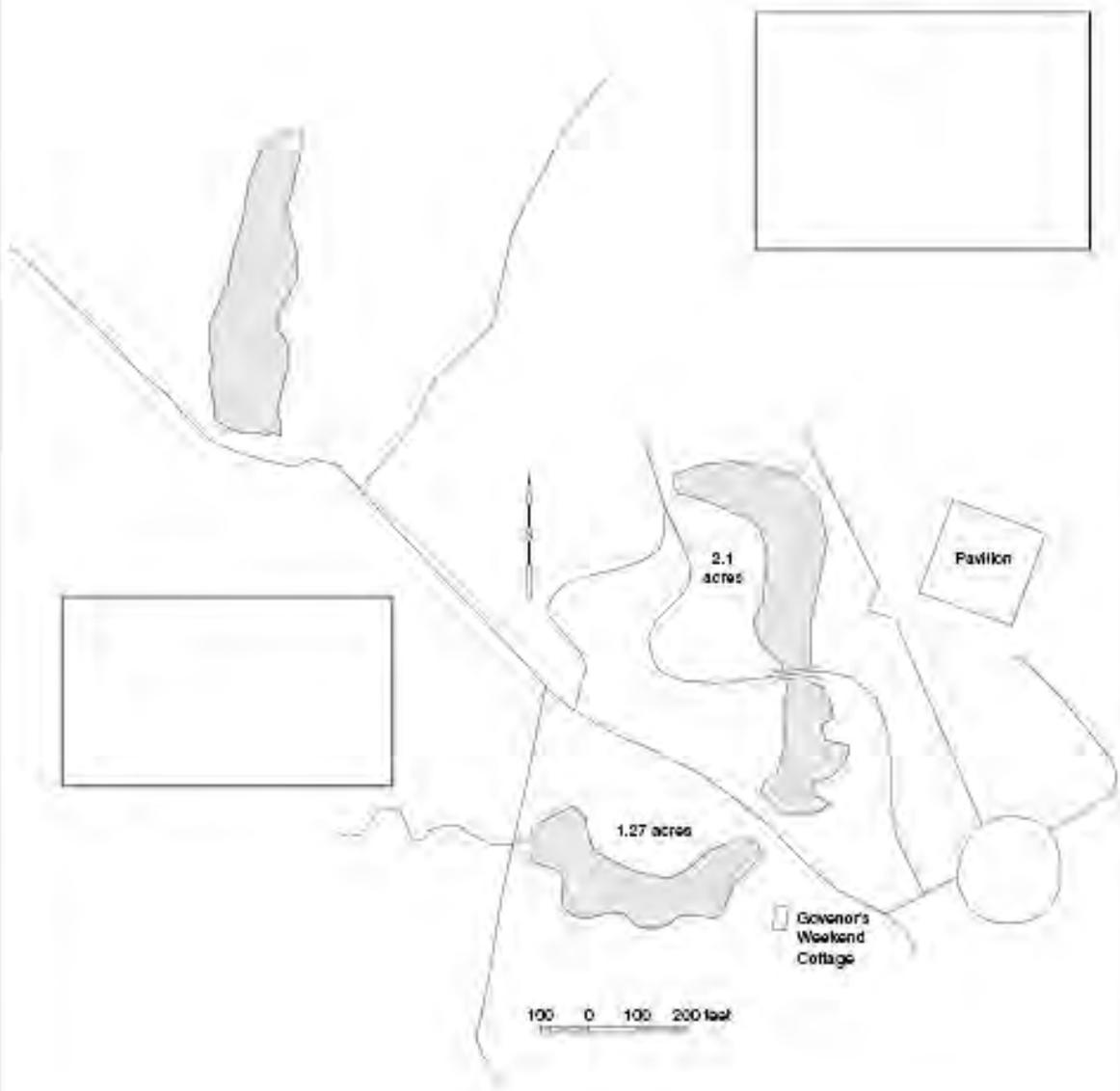
S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

Charles Towne Landing State Park



H. Cooper Black State Recreation Area (Chesterfield County)

Problem plant species

Waterlily, Watershield

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Hardball

Area to which control is to be applied

2 acres in lake.

Rate of control agent to be applied

Up to 5 gallons per acre

Method of application of control agent

Subsurface injection from airboat.

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

Commercial applicator contracted and monitored by SCPRT.

Estimated cost of control operations

\$????

Potential sources of funding

S.C. Department of Parks, Recreation and Tourism 50%

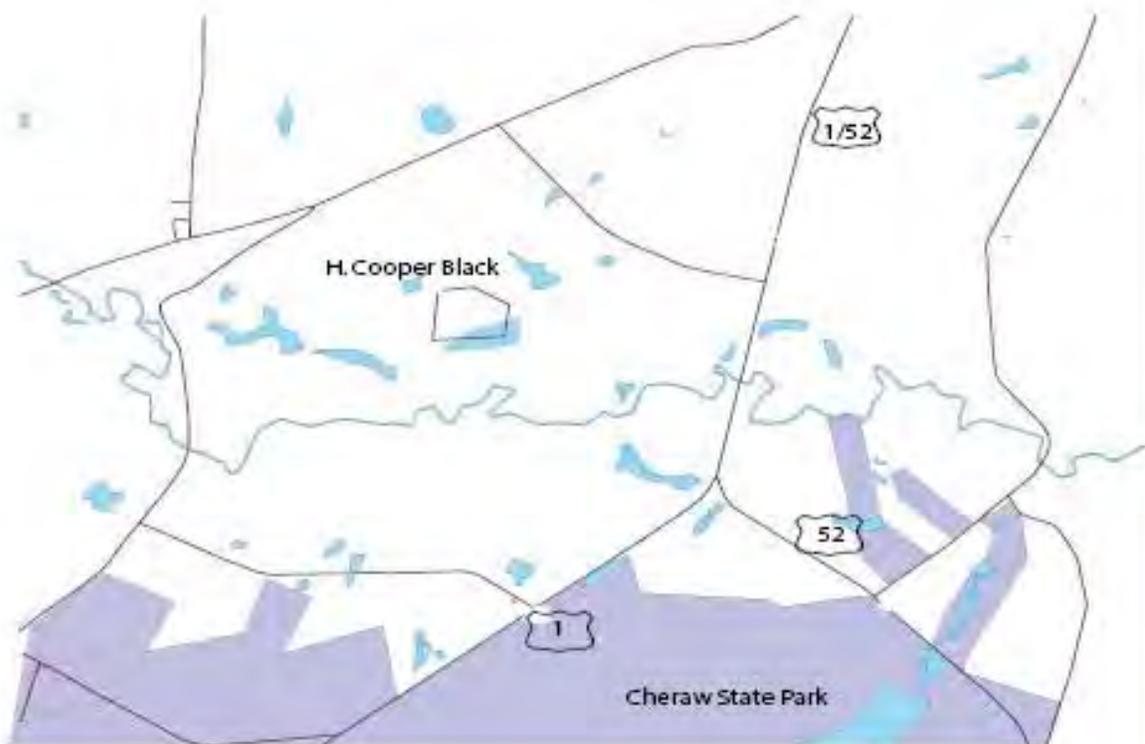
S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

H. Cooper Black Recreation Area



Huntington Beach State Park (Georgetown County)

Problem plant species

Phragmites, Cutgrass, Cattails

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Habitat, Clearcast

Area to which control is to be applied

15 acres in 3 different lakes.

Rate of control agent to be applied

Habitat - up to 4 pints per acre.

Clearcast - 1 to 4 pints per acre.

Galleon SC - 2 to 6 fl oz/acre as foliar application.

Method of application of control agent

Spray on surface of foliage with appropriate surfactant.

Timing and sequence of control application

Apply after plants are actively growing (May - Oct.).

Other control application specifications

Application to be conducted by airboat, ground, or helicopter. Phragmites control in impounded areas should only occur where drainage has left areas moderately dry

Entity to apply control agent

Commercial applicator

Estimated cost of control operations

\$????

1Potential sources of funding

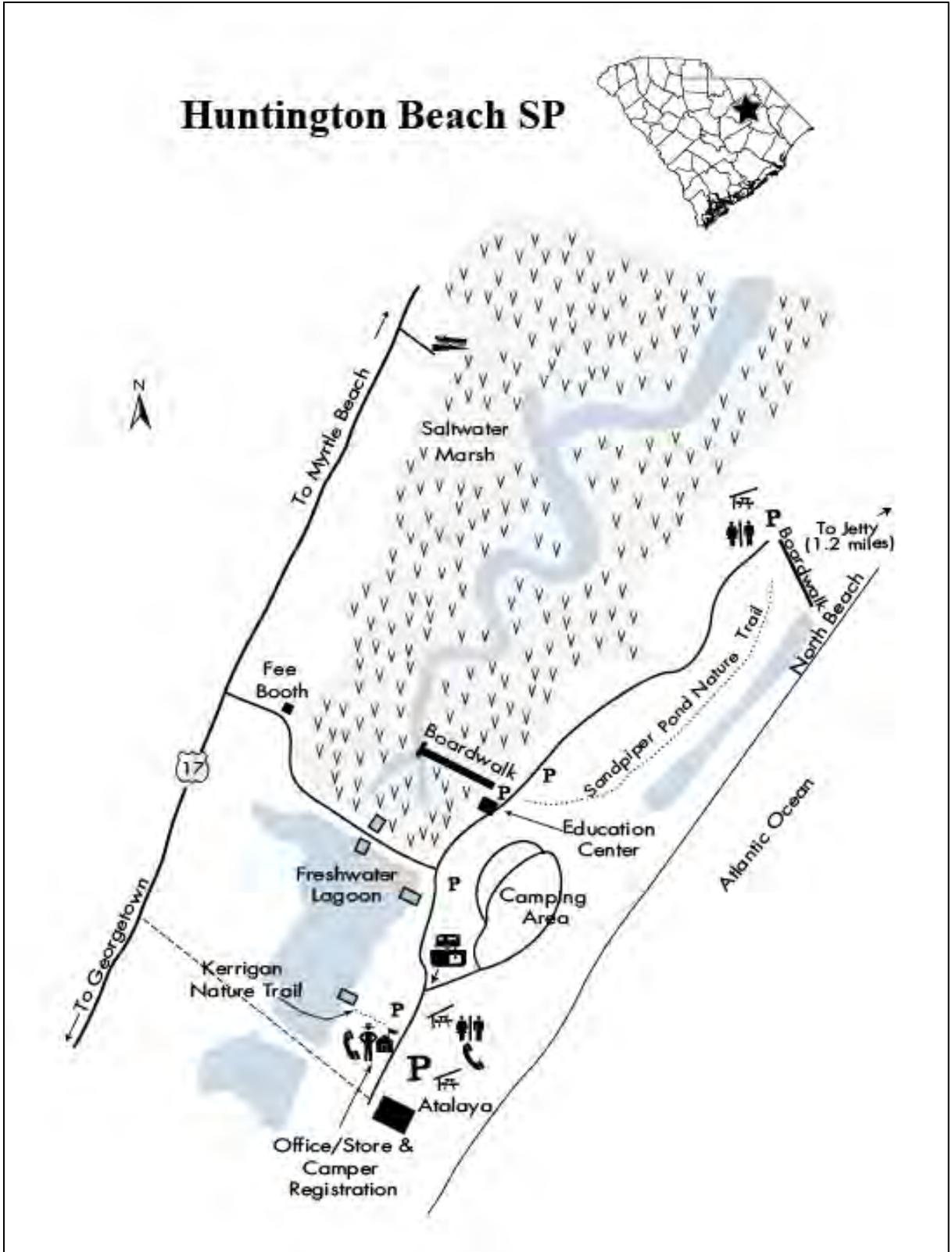
S.C. Department of Parks, Recreation and Tourism 50%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

Huntington Beach SP



Kings Mountain State Park - Crawford Lake (York County)

Problem plant species

Slender naiad

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Aquathol K

Area to which control is to be applied

4 acres in swimming and paddle boat area

Rate of control agent to be applied

Four gallons per acre.

Method of application of control agent

Apply subsurface throughout lake

Timing and sequence of control application

Apply in May or June when naiad growth is initiated.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

Commercial applicator contracted and monitored by SCPRT.

Estimated cost of control operations

\$????

Potential sources of funding

S.C. Department of Parks, Recreation and Tourism 50%

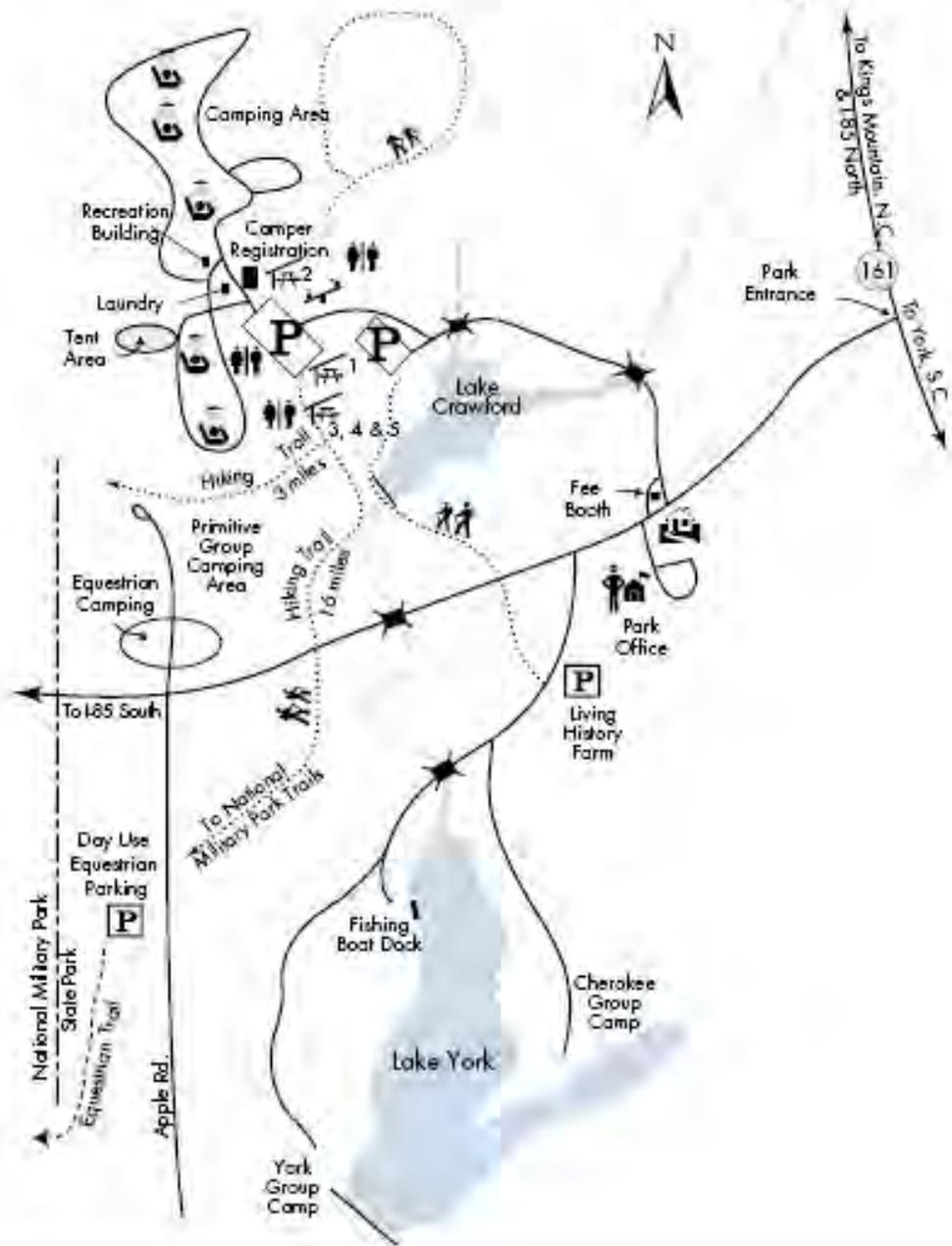
S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

Kings Mountain SP Lake Crawford



Little Pee Dee State Park (Dillon County)

Problem plant species

Spikerush, Cowlily

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Hardball

Area to which control is to be applied

10 acres adjacent to the parks day use area, along the park dam and adjacent to the campground

Rate of control agent to be applied

Up to 5 gallons per acre.

Method of application of control agent

Subsurface injection from airboat.

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

Commercial applicator contracted and monitored by SCPRT.

Estimated cost of control operations

\$????

Potential sources of funding

S.C. Department of Parks, Recreation and Tourism 50%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

Little Pee Dee SP Lake Norton



**N.R. Goodale State Park
(Kershaw County)**

Problem plant species

Waterlily, Watershield

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Hardball

Area to which control is to be applied

2 acres in lake.

Rate of control agent to be applied

Up to 5 gallons per acre

Method of application of control agent

Subsurface injection from airboat.

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

Commercial applicator contracted and monitored by SCPRT.

Estimated cost of control operations

\$????

Potential sources of funding

S.C. Department of Parks, Recreation and Tourism 50%

S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

N.R. Goodale State Park



Santee State Park - Swimming Lake (Orangeburg County)

Problem plant species

Coontail

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Reward (diquat)

Area to which control is to be applied

10 acres

Rate of control agent to be applied

2 gallons per acre

Method of application of control agent

Subsurface injection from airboat.

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

Commercial applicator contracted and monitored by SCPRT.

Estimated cost of control operations

\$????

Potential sources of funding

S.C. Department of Parks, Recreation and Tourism 50%

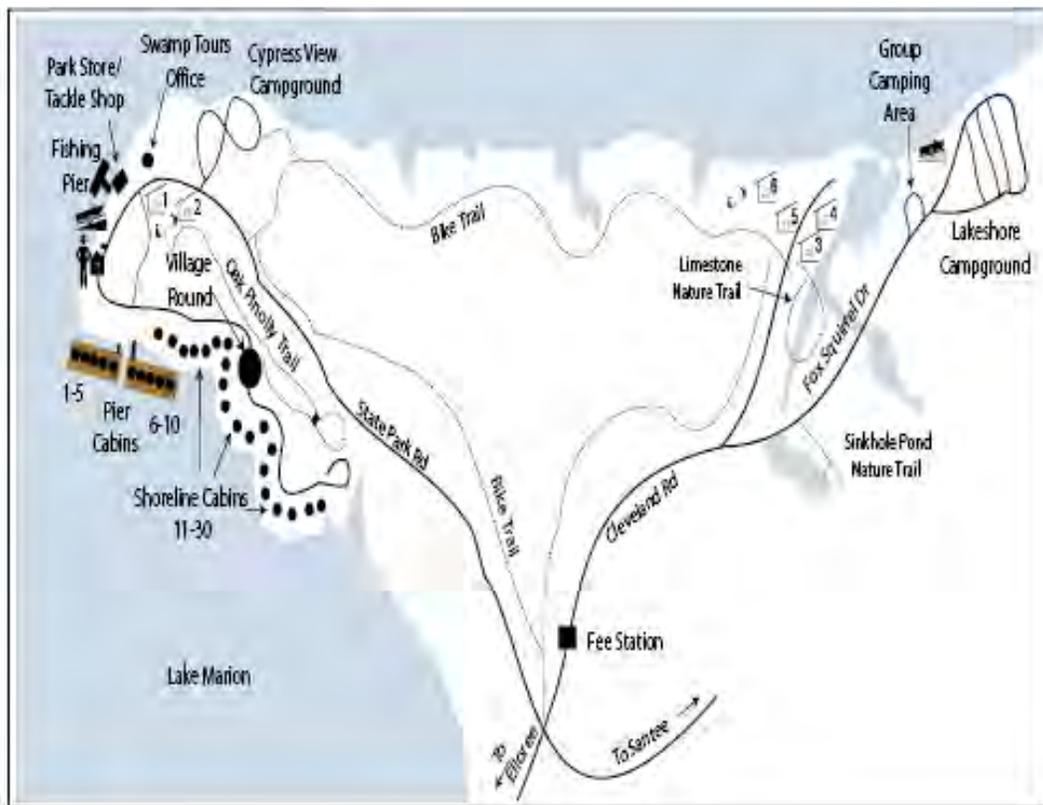
S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- d) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- e) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- f) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

Santee State Park Swimming Lake



Sesquicentennial State Park (Richland County)

Problem plant species

Waterlily, Watershield

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Hardball

Area to which control is to be applied

5 acres in swimming and bank fishing portions of the lake.

Rate of control agent to be applied

Up to 5 gallons per acre

Method of application of control agent

Subsurface injection from airboat.

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

Commercial applicator contracted and monitored by SCPRT.

Estimated cost of control operations

\$????

Potential sources of funding

S.C. Department of Parks, Recreation and Tourism 50%

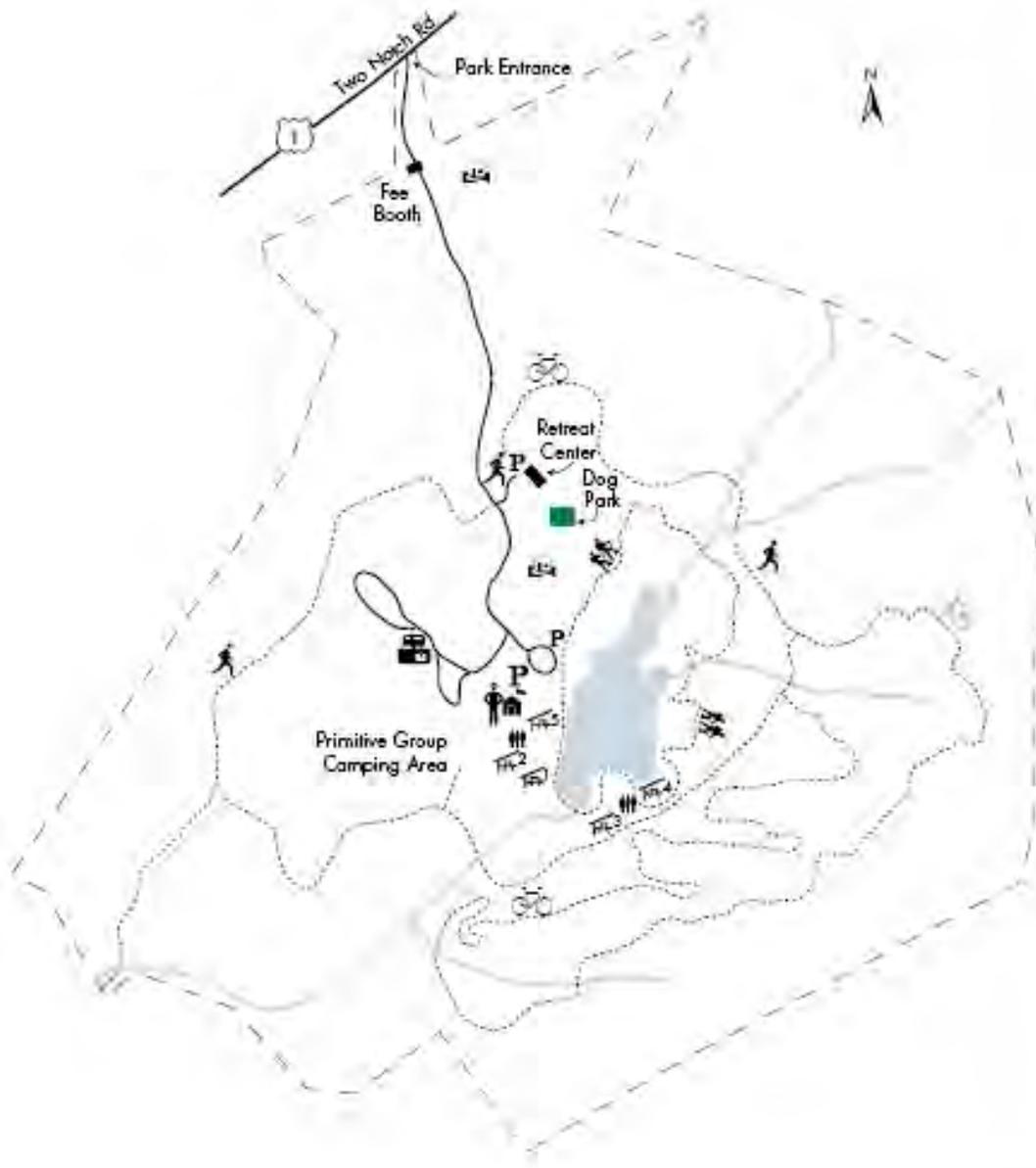
S.C. Department of Natural Resources 50% (up to \$40,000 cost share per waterbody)

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

Sesquicentennial State Park



South Carolina Department of Natural Resources
State Lakes

*Total price and cost share is for herbicide costs only based on state contract costs. Freshwater Fisheries staff will apply based on label rates.

Lake Cherokee
(Cherokee County)

Problem plant species

Water primrose

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Renovate 3

Area to which control is to be applied

5 acres in lake, two (2) times per year.

Rate of control agent to be applied

Renovate 3 - 0.5- 0 gals/acre

Method of application of control agent

Spray on surface of foliage with appropriate surfactant

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

SCDNR-Wildlife and Freshwater Fisheries Division, Lake Management staff.

Estimated cost of control operations

\$????*

Potential sources of funding

S.C. Department of Natural Resources (WFF division) 100%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 0%

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

**Lake Edwin Johnson
(Spartanburg County)**

Problem plant species

Water primrose, Hydrilla, Pondweed

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Problems species	Control Agent
Water Primrose	Renovate 3
Pondweed	Komeen/Reward
Hydrilla	Komeen/Reward

Area to which control is to be applied

Primrose - 7 acres in lake two (2) times per year.

Hydrilla/Pondweed - 3 acres in lake two (2) times per year.

Rate of control agent to be applied

Renovate 3 - 0.50 - 0 gals/acre

Komeen/Reward - 4 gals/acre / 2 gals/acre

Method of application of control agent

Hydrilla, Pondweed -Apply subsurface throughout lake

Water primrose - Spray on surface of foliage with appropriate surfactant

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

SCDNR-Wildlife and Freshwater Fisheries Division, Lake Management staff.

Estimated cost of control operations

\$????*

Potential sources of funding

S.C. Department of Natural Resources (WFF division) 100%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 0%

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

**Jonesville Reservoir
(Union County)**

Problem plant species

Water primrose, Pondweed

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Renovate 3, Glyphosate

Area to which control is to be applied

10 acres in lake.

Rate of control agent to be applied

Renovate 3 - 0.50 - 0 gals/acre

Glyphosate - 6 - 5 pints/acre

Method of application of control agent

Spray on surface of foliage with appropriate surfactant

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

SCDNR-Wildlife and Freshwater Fisheries Division, Lake Management staff.

Estimated cost of control operations

\$????*

Potential sources of funding

S.C. Department of Natural Resources (WFF division) 100%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 0%

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

Mountain Lakes (Chester County)

Problem plant species

Water primrose, Alligatorweed, Parrotfeather

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Renovate 3, Glyphosate

Area to which control is to be applied

5 acres in lake.

Rate of control agent to be applied

Renovate 3 - 0.50 - 0 gals/acre

Glyphosate - 6 - 5 pints/acre

Method of application of control agent

Spray on surface of foliage with appropriate surfactant

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

SCDNR-Wildlife and Freshwater Fisheries Division, Lake Management staff.

Estimated cost of control operations

\$????*

Potential sources of funding

S.C. Department of Natural Resources (WFF division) 100%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 0%

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
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- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

**Lancaster Reservoir
(Lancaster County)**

Problem plant species

Water primrose, Alligatorweed

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Renovate 3, Glyphosate

Area to which control is to be applied

8 acres in lake.

Rate of control agent to be applied

Renovate 3 - 0.50 - 0 gals/acre

Glyphosate - 6 - 5 pints/acre

Method of application of control agent

Spray on surface of foliage with appropriate surfactant

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

SCDNR-Wildlife and Freshwater Fisheries Division, Lake Management staff.

Estimated cost of control operations

\$????*

Potential sources of funding

S.C. Department of Natural Resources (WFF division) 100%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 0%

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.

- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

Sunrise Lake (Lancaster County)

Problem plant species

Pondweed

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Glyphosate

Area to which control is to be applied

15 acres in lake.

Rate of control agent to be applied

Glyphosate - 6 - 5 pints/acre

Method of application of control agent

Spray on surface of foliage with appropriate surfactant

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

SCDNR-Wildlife and Freshwater Fisheries Division, Lake Management staff.

Estimated cost of control operations

\$????*

Potential sources of funding

S.C. Department of Natural Resources (WFF division) 100%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 0%

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

**Lake Ashwood
(Lee County)**

Problem plant species

Waterlily

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

2,4-d BEE granular

Area to which control is to be applied

<5 acres of spotty coverage

Rate of control agent to be applied

200 pounds per acre

Method of application of control agent

Spray on surface of foliage with appropriate surfactant

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

SCDNR-Wildlife and Freshwater Fisheries Division, Lake Management staff.

Estimated cost of control operations

\$????*

Potential sources of funding

S.C. Department of Natural Resources (WFF division) 100%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 0%

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

**Lake Edgar Brown
(Barnwell County)****Problem plant species**

Water primrose, Coontail

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Glyphosate

Area to which control is to be applied

60 acres in lake.

Rate of control agent to be applied

Glyphosate - 6 - 5 pints/acre

Method of application of control agent

Spray on surface of foliage with appropriate surfactant

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

SCDNR-Wildlife and Freshwater Fisheries Division, Lake Management staff.

Estimated cost of control operations

\$????*

Potential sources of funding

S.C. Department of Natural Resources (WFF division) 100%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 0%

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.

- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

Lake George Warren (Hampton County)

Problem plant species

Water primrose, Cattails, Coontail

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Glyphosate, Habitat

Area to which control is to be applied

20 acres in lake.

Rate of control agent to be applied

Glyphosate - 6 - 5 pints/acre

Habitat - 0.25 - 0.50 gals/ac

Method of application of control agent

Spray on surface of foliage with appropriate surfactant

Timing and sequence of control application

Apply when plants are actively growing.

Other control application specifications

Monitor plant growth prior to treatment.

Entity to apply control agent

SCDNR-Wildlife and Freshwater Fisheries Division, Lake Management staff.

Estimated cost of control operations

\$????*

Potential sources of funding

S.C. Department of Natural Resources (WFF division) 100%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 0%

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.
- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

**Lake Thicketty
(Cherokee County)**

Problem plant species

Hydrilla

Management objective

Reduce or remove problem plants to the extent they do not interfere with recreational opportunities.

Selected control method

Hydrilla Triploid grass carp, chelated copper

Area to which control is to be applied

5 acres in lake.

Rate of control agent to be applied

Approximately 5 acres in priority areas such as, public access sites (boat ramps, piers, swimming areas, marinas) and residential shoreline areas. If conditions warrant, release triploid grass carp in close proximity to areas of the lake with the greatest hydrilla growth

and use herbicide applications to provide immediate short-term control of localized growth in those areas. 20 fish per vegetated acre.

Chelated copper - up to 1 ppm Glyphosate- up to 1 gallon per acre.

Method of application of control agents

Chelated copper- subsurface application by airboat.

Triploid grass carp – Using standard techniques to minimize loss, stock sterile grass carp in areas of the lake with the greatest hydrilla growth.

Timing and sequence of control application

All herbicides to be applied when plants are actively growing.

Triploid grass carp – If conditions warrant, triploid grass carp to be released as soon as possible.

Other control application specifications

Treatment of the control area is to be conducted in a manner that will not significantly degrade water quality. This may require that only a portion of the control area be treated at any one time.

If available, all sterile grass carp will be a minimum of 12 inches in length. Sterile grass carp shipments will be certified by the SCDNR for sterility and checked for size and condition prior to stocking in the lake.

Entity to apply control agent

Herbicide application – SCDNR Wildlife and Freshwater Fisheries Division, Lake Management staff and/or commercial applicator.

Triploid Grass Carp - SCDNR Wildlife and Freshwater Fisheries Division, Lake Management staff and/or a commercial supplier with supervision by the SCDNR.

Estimated cost of control operations

\$?????*

Potential sources of funding

S.C. Department of Natural Resources (WFF division) 100%

U.S. Army Corps of Engineers 0%

S.C. Department of Natural Resources 0%

(Percentage of match subject to change based on availability of Federal and State funding.)

Long term management strategy

- a) Manage the distribution and abundance of nuisance aquatic plant populations at levels that minimize adverse impacts to water use activities and the environment through the use of federal and state approved control methods.

- b) Maintain or enhance native aquatic plant populations at levels beneficial to water use, water quality, and fish and wildlife populations through selective control of nuisance plant populations where feasible, introduction of native plant species where appropriate, and public education of the benefits of aquatic vegetation in general.
- c) Seek to prevent further introduction and distribution of problem species through public education, posting signs at boat ramps, regular surveys of the water body, and enforcement of existing laws and regulations.

DRAFT

South Carolina Border Lakes

Approval for Lake Wylie was accomplished by SCDNR staff in conjunction with staff from North Carolina Natural Resource agencies, Duke Energy staff, and the Lake Wylie Marine Commission.

Lake Wylie

(York County, SC; Gaston and Mecklenburg County, NC)

Problem plant species

Hydrilla

Management objective

Reduce hydrilla growth lake-wide and prevent the spread of hydrilla to other systems.

Achieve measurable reduction of hydrilla within two or three years and once hydrilla has been controlled, prevent it from reestablishing.

Control hydrilla by using a low enough density of triploid grass carp that potentially other forms of native vegetation can become established.

Selected control method

Triploid (sterile) grass carp used lake wide for long-term control.

Registered and properly applied herbicides should be used for initial suppression and by home owners for spot treatments.

Area to which control is to be applied

Triploid grass carp will be released from boat ramps near the greatest concentration of hydrilla.

Rate of control agent to be applied

Recommendation for supplemental grass carp stocking in the spring of 2010. Because of the loss of sterile grass carp to mortality (disease, predation, fishing, bow hunting, etc.) we recommend 576 grass carp, be stocked in the lake during the spring of 2010. This is a supplemental stocking of 32% (average of national grass carp annual mortality curves, Phil Kirk pers com) of the original 1800 grass carp introduced in 2009. Duke Energy will continue to monitor the effectiveness of the introduced fish.

Triploid grass carp – Using standard techniques to minimize loss, stock sterile grass carp in areas of the lake with the greatest hydrilla growth.

Method of application of control agents

Herbicide- subsurface application by airboat.

Triploid grass carp – Using standard techniques to minimize loss, stock sterile grass carp in areas of the lake with the greatest hydrilla growth.

Timing and sequence of control application

Herbicide applications - To be applied when plants are actively growing.

Triploid grass carp to be released as soon as possible in the spring of 2010 (March-May) and yearly at the same time for at least the next three years. RESULTS FROM GRASS CARP MAY NOT BE EVIDENT FOR TWO OR MORE YEARS. After hydrilla has been controlled, follow up stocking, currently estimated at maintaining triploid grass carp stocking densities of approximately 1 fish per every 8 surface acres of Lake Wylie will be continued using mortality estimates derived from the population and population models.

Other control application specifications

Treatment of the control area is to be conducted in a manner that will not significantly degrade water quality. This may require that only a portion of the control area be treated at any one time.

Triploid grass carp will be a minimum of 12 inches total length. All shipments will be examined for condition and length specified in the contract with the vendor.

Estimated cost of control operations

All work to be done in North Carolina Section of the lake.

Entity to apply control agent

Herbicide application - Commercial applicator or Duke Power Company

Drawdown - Duke Power Company

Potential sources of funding

Duke Power Company 100% - All control work at present time is in North Carolina.

Long term management strategy

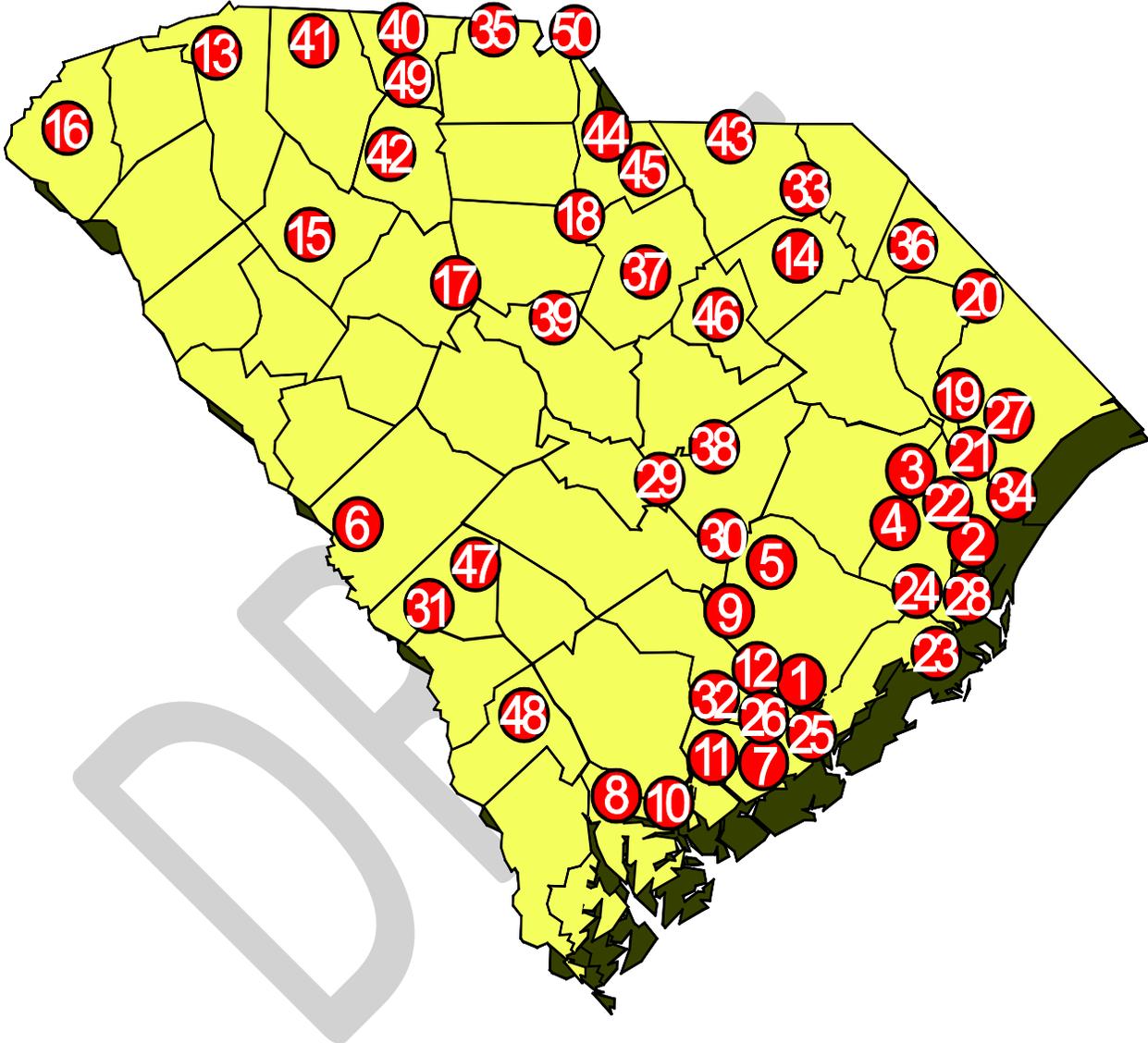
- a) Manage hydrilla's potential adverse impacts to the Lake Wylie ecosystem using primarily triploid grass carp after initial suppression using approved herbicides.
- b) Maintain or enhance native aquatic vegetation by maintaining the lowest possible stocking rates of triploid grass carp, especially once major stands of hydrilla have been controlled.
- c) Seek to prevent further introduction and distribution of problem aquatic species through public education and enforcement of existing laws and regulations.
- d) Periodically revise management plans and strategy as new environmental data becomes available.
- e) Plan for long-term control of hydrilla, once control has been achieved, by maintaining very low densities of triploid grass carp. Stockings will be determined from mortality estimates generated from triploid grass carp collected on Lake Wylie and the use of age-structure population models developed for fisheries.

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Summary of Planned Management Operation Expenditures For 2010

NOTE: Planned expenditures are based on anticipated aquatic plant problems. The extent of proposed management operations will be modified depending on actual aquatic plant growth and funding availability in 2010 (Percentage of match subject to change based on availability of Federal and State funding.) * Control operations on Lakes Marion and Moultrie may receive federal funds from the Corps of Engineers St. Stephen Plant if control activities are directly related to maintaining operation of the St. Stephen Hydropower Facility. Those funds should be used whenever possible instead of APC cost-share funds from the Charleston District.

Location of 2010 Management Sites



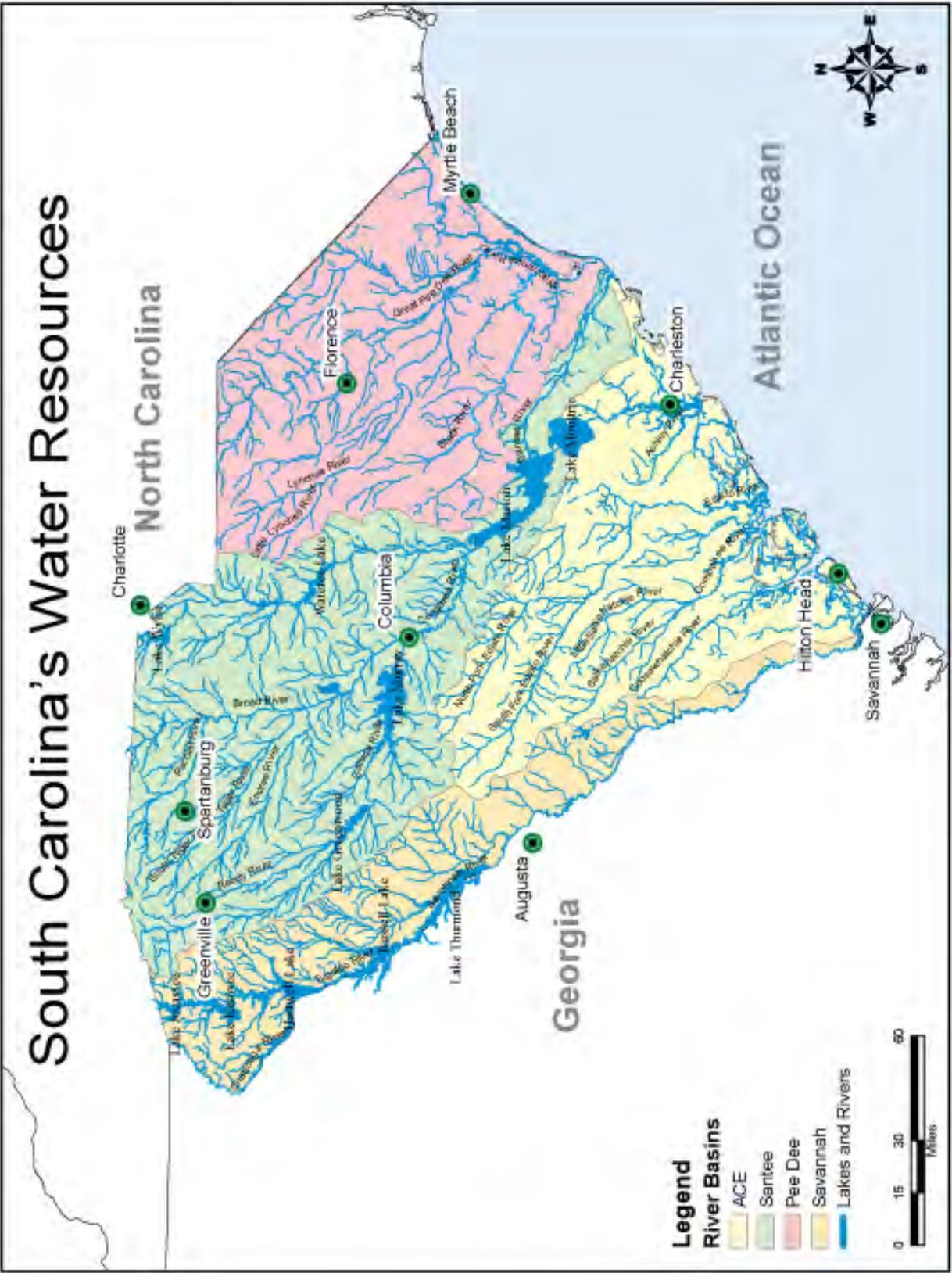
Appendices

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APPENDIX A

Major River Basins in South Carolina

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APPENDIX B

Enabling Legislation

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South Carolina Code of Laws Section 49-6-10/40

Title 49 – Waters, Water Resources and Drainage

CHAPTER AQUATIC PLANT MANAGEMENT

SECTION 49-6- Purpose; administering agency.

There is hereby created the South Carolina Aquatic Plant Management Program for the purpose of preventing, identifying, investigating, managing, and monitoring aquatic plant problems in public waters of South Carolina. The program will coordinate the receipt and distribution of available federal, state, and local funds for aquatic plant management activities and research in public waters.

The Department of Natural Resources (department) is designated as the state agency to administer the Aquatic Plant Management Program and to apply for and receive grants and loans from the federal government or such other public and private sources as may be available for the Aquatic Plant Management Program and to coordinate the expenditure of such funds.

SECTION 49-6-20. Aquatic Plant Management Trust Fund.

There is created the South Carolina Aquatic Plant Management Trust Fund which must be kept separate from other funds of the State. The fund must be administered by the department for the purpose of receiving and expending funds for the prevention, management, and research of aquatic plant problems in public waters of South Carolina. Unexpended balances, including interest derived from the fund, must be carried forward each year and used for the purposes specified above. The fund shall be subject to annual audit by the Office of the State Auditor.

The fund is eligible to receive appropriations of state general funds, federal funds, local government funds, and funds from private entities including donations, grants, loans, gifts, bond issues, receipts, securities, and other monetary instruments of value. All reimbursements for monies expended from this fund must be deposited in this fund.

SECTION 49-6-30. Aquatic Plant Management Council; membership; duties.

There is hereby established the South Carolina Aquatic Plant Management Council, hereinafter referred to as the council, which shall be composed of ten members as follows:

The council shall include one representative from each of the following agencies, to be appointed by the chief executive officer of each agency:

- (a) Water Resources Division of the Department of Natural Resources;
- (b) South Carolina Department of Health and Environmental Control;
- (c) Wildlife and Freshwater Fish Division of the Department of Natural Resources;
- (d) South Carolina Department of Agriculture;

- (e) Coastal Division of the Department of Health and Environmental Control;
- (f) South Carolina Public Service Authority;
- (g) Land Resources and Conservation Districts Division of the Department of Natural Resources;
- (h) South Carolina Department of Parks, Recreation and Tourism;
- (i) Clemson University, Department of Fertilizer and Pesticide Control.

The council shall include one representative from the Governor's Office, to be appointed by the Governor.

The representative of the Water Resources Division of the Department of Natural Resources shall serve as chairman of the council and shall be a voting member of the council.

The council shall provide interagency coordination and serve as the principal advisory body to the department on all aspects of aquatic plant management and research. The council shall establish management policies, approve all management plans, and advise the department on research priorities.

SECTION 49-6-40. Aquatic Plant Management Plan.

The department, with advice and assistance from the council, shall develop an Aquatic Plant Management Plan for the State of South Carolina. The plan shall describe the procedures for problem site identification and analysis, selection of control methods, operational program development, and implementation of operational strategies. The plan shall also identify problem areas, prescribe management practices, and set management priorities. The plan shall be updated and amended at appropriate intervals as necessary; provided, however, problem site identification and allocation of funding shall be conducted annually. In addition, the department shall establish procedures for public input into the plan and its amendments and priorities. The public review procedures shall be an integral part of the plan development process. When deemed appropriate, the department may seek the advice and counsel of persons and organizations from the private, public, or academic sectors.

The council shall review and approve all plans and amendments. Approval shall consist of a two-thirds vote of the members present. The department shall have final approval authority over those sections which do not receive two-thirds approval of the council.

Some of the Specific State Laws which pertain to Illegal, Noxious, or Nuisance Species:

Title 46, Chapter 9 - State Crop Pest Act

The State Crop Pest Commission is authorized by law (Section 46-9-40) to promulgate and enforce reasonable regulations to eradicate or prevent the introduction, spread or dissemination of plant pests. Plant pests are by definition (Section 46-9-15(5)) any living state of insects, mites, nematodes,

slugs, animals, protozoa, snails or other invertebrate animals, bacteria, weeds, fungi, other parasitic plants...which directly or indirectly may injure or cause disease or damage in plants...and which may be a serious agricultural threat to the State, as determined by the Director.

The State Crop Pest Commission is responsible for control of plant pests which constitute a threat to production agriculture. In so doing, the Commission is the primary contact point for cooperation with the Animal and Plant Health Inspection Service (APHIS), U. S. Department of Agriculture.

The Commission has designated certain organisms as plant pests. These organisms are already designated as noxious weeds by state and/or federal authorities or are under domestic federal quarantine. Once a plant pest has been designated, the Commission has the authority to impose control measures, up to and including, quarantine of the premises. However, the Director, as the Commission's designee, retains the discretion to determine that a plant pest has become so widespread that further control measures are not warranted.

Title 46, Chapter 23 - South Carolina Noxious Weed Act

Provides far reaching powers to seize, quarantine, treat, destroy, apply other remedial measures, to export, return to shipping point, or otherwise dispose of in such a manner as (it) deems appropriate, any noxious weed or any product or article of any character whatsoever or any means of conveyance which (it) has reason to believe contains or is contaminated with any noxious weed, offered for movement, moving, or has moved into or through the state or intrastate. To further deter persons from spreading nuisance aquatic weeds the law includes fines not exceeding \$500 and/or imprisonment not exceeding one year.

SECTION 50-13-1415 - Importation, possession, or placing water hyacinth and hydrilla in waters of the state.

No person shall possess, sell, offer for sale, import, bring, or cause to be brought or imported into this State or release or place into any waters of this State any of the following plants:

(1) Water Hyacinth

(2) Hydrilla

Provided, however, that the department may issue special import permits to qualified persons for research purposes only.

The department shall prescribe the methods, control, and restrictions which are to be adhered to by any person or his agent to whom a special permit under the provisions of this section is issued. The department is authorized to promulgate such regulations as may be necessary to effectuate the provisions of this section and the department, by regulation, is specifically authorized to prohibit additional species of plants from being imported, possessed, or sold in this State when, in the discretion of the department, such species of plants are potentially dangerous.

SECTION 50-13-1630. Importing, possessing or selling certain fish unlawful; special permits for research; Department shall issue rules and regulations.

(A) No person may possess, sell, offer for sale, import, bring or cause to be brought or imported into this State or release into the waters of this State the following fish:

- (1) carnero or candiru catfish (*Vandellia cirrhosa*);
- (2) freshwater electric eel (*Electrophorus electricus*);
- (3) white amur or grass carp (*Ctenopharyngodon idella*);
- (4) walking catfish or a member of the clariidae family (Clarias, Heteropneustea, Gymnallabes, Channallabes, or Heterobranchus genera);
- (5) piranha (all members of Serrasalmus, Rooseveltiella, and Pygocentrus genera);
- (6) stickleback;
- (7) Mexican banded tetra;
- (8) sea lamprey;
- (9) rudd (*Scardinius erythrophthalmus*-Linnaeus).

(B) The department may issue special import permits to qualified persons for research and education only.

(C) The department may issue special permits for the stocking of non-reproducing white amur or grass carp hybrids in the waters of this State.

(D) It is unlawful to take grass carp from waters stocked as permitted by this section. Grass carp caught must be returned to the water from which it was taken immediately.

(E) The department must prescribe the qualifications, methods, controls, and restrictions required of a person or his agent to whom a special permit is issued. The department must condition all permits issued under this section to safeguard public safety and welfare and prevent the introduction into the wild or release of nonnative species of fish or other organisms into the waters of this State. The department may promulgate regulations necessary to effectuate this section and specifically to prohibit additional species of fish from being imported, possessed, or sold in this State when the department determines the species of fish are potentially dangerous.

APPENDIX C

Aquatic Plant Problem Identification Form

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Aquatic Plant Problem Site Identification Form

Name and location of affected water body

GPS Location (LAT/LONG or UTM. specify projection)

Public or private water

Name of problem plant (if known)

Does the plant grow above or below the surface of the water?

Approximate area of water covered by the problem plant

Type of water use(s) affected by the plant

Length of time problem has existed

Plant control methods that have been used

Contact for additional information: _____

Name _____

Address _____

Phone _____

Please Return To: Chris Page

S.C. Department of Natural Resources

2730 Fish Hatchery Road, West Columbia, South Carolina 29170

(803) 755-2836

** Please include a sample of the plant if possible. Wrap the plant in a moist towel and place in a "baggie". The sample should include flowers, if visible, along with leaf structure and stem.

APPENDIX D

Aquatic Plant Control Agents

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Aquatic Plant Control Agents

Listed below are the major aquatic plant control agents which are currently available for use in South Carolina. While the list is not all inclusive, it does contain those agents considered most useful for aquatic plant management. Costs for the agents are approximations and will vary somewhat depending on the source and amount purchased. Application costs are approximations of commercial applicator rates.

I. Chemical Control

Diquat (Reward)

Target Plants

Submersed species - Bladderwort, coontail, elodea, naiad, pondweeds, watermilfoil, and hydrilla.

Floating species - Pennywort, Salvinia, water hyacinth, water lettuce, and duckweed.

Application Rate

Submersed species - One to two gallons per surface acre. Floating species - One half to one gallon per surface acre, depending on target species.

Cost - Diquat costs approximately \$99 per gallon. Assuming an application rate of two gallons per acre and an application cost of \$41 per acre, the total cost would be \$239 per acre per application for submersed species. The treatment cost for floating species at one-half gallon per acre rate would be \$90 per acre.

Use Considerations - Diquat is not toxic to fish or wildlife at normal use concentrations. It is non-volatile and nonflammable, but can cause irritation to eyes and skin upon contact. Its effectiveness is greatly reduced at temperatures below 50-60°F, by overcast conditions, and by turbid waters.

Water Use Restrictions - Water treated with Diquat cannot be used for drinking for up to 3 days, livestock consumption for one day, irrigation of food crops for 5 days, and irrigation of turf and ornamentals for up to 3 days depending on application rate or until approved analysis indicates that diquat ion concentrations are less than 0.02 ppm. There are no fishing or swimming restrictions. Do not apply this product within 1600 feet upstream of an operating water intake in flowing water bodies (rivers, streams, canals) or within 400 feet of an operating water intake in standing water bodies (lakes, reservoirs). To make applications within these restricted areas, the intake must be turned off for the time periods specified on the Federal label for the appropriate use category (Drinking, Livestock consumption, Irrigation) or until the treated area contains less than 0.02 ppm of diquat dibromide.

B.2,4-D (Aqua-Kleen, Navigate, Hardball, Sinkerball)

Target Plants

Emergent species - Broadleaf species such as water primrose, waterlily, cowlily, watershield, smartweed, pondweeds, and floating heart. Submersed species - Watermilfoil, bladderwort, and coontail. Floating species - Water hyacinth.

Application Rate

Granular form (2,4-D BEE) - 150 to 200 pounds per acre depending on target species. Liquid form - (2,4-D DMA) - 5 gallons per acre.

Cost

The granular form of 2,4-D costs about \$36 per pound. Assuming an application rate of 200 pounds per acre and an application cost of \$47 per acre, the total cost would be \$519 per application. The liquid form of 2,4-D costs approximately \$31 per gallon. Assuming an application rate of 5 gallons per acre and an application cost of \$41 per acre, the total cost would be \$196 per application.

Use Considerations - The recommended formulations of 2,4-D are not toxic to fish or wildlife at normal use concentrations. This chemical is nonflammable and noncorrosive.

Water use Restrictions - Do not apply to waters used for irrigation, agricultural sprays, watering dairy animals, or domestic water supplies.

Chelated Copper (Cutrine Plus, Clearigate, Komeen, K-TEA, Nautique, Captain)

Target Plants

Algae - Cutrine Plus, K-TEA, Captain

Submersed species (Hydrilla, Brazilian elodea, pondweed and southern naiad) - Komeen, Nautique, Cutrine Plus, Clearigate, and Captain

Application Rate

Algae - Treatment concentration of 0.2-0.5 parts per million of copper. Submersed species - 0 part per million of copper (12-16 gallons per acre) or mix two gallons of copper complex and two gallons of Diquat per acre.

Cost - Copper products cost about \$17 per gallon. Assuming an application rate of 16 gallons per acre and an application cost of \$41 per acre, the total cost would be \$313 per acre.

Use Considerations - Copper may be toxic to fish and aquatic invertebrates at recommended application rates, especially in soft water. Copper-based product should be carefully applied and monitored to minimize the risk of fish kills.

Water Use Restrictions - Copper complexes may be used in domestic and irrigation water supplies without water use restrictions.

D. Endothall - (Aquathol, Aquathol K, Aquathol Super K granular, Hydrothol 191 granular and liquid)

Target Plants

Aquathol products are effective for submersed species such as naiads, bladderwort, coontail, watermilfoil, pondweed, hydrilla, and cabomba

Hydrothol 191 is effective on the species listed above as well as filamentous and macrophytic algae.

Application Rate

Aquathol

Liquid form (Aquathol K) - three gallons or more per acre depending on the target species. Granular form - Aquathol: 54-323 pounds per acre depending on water depth and the target species.

Aquathol Super K: 22-66 pounds per acre depending on the water depth and the target species.

Hydrothol 191

Heavy Infestations - Evenly spread 160 - 270 pounds per acre foot of water (0 - 0 ppm) applied evenly. Moderate or light infestations - Use 55 - 110 pounds per acre foot (0 - 0 ppm) applied evenly.

Cost

Aquathol

Aquathol K costs approximately \$57 per gallon. Assuming an application rate of 5 gallons per acre and an application cost of \$41 per acre, the total cost would be \$326 per acre. Aquathol Super K costs about \$15 per pound at an application rate of 30 pounds per acre and an application cost of \$47 per acre, the total cost would be \$510 per acre.

Hydrothol 191

Hydrothol 191 costs approximately \$64 per gallon. Assuming an application rate of 7 gallons per acre and an application cost of \$41, the total cost would be \$492 per acre.

Hydrothol 191 granular costs approximately \$78 per pound. Assuming an application rate of 240 pounds per acre and an application cost of \$47, the total cost would be \$714 per acre.

Use Considerations - Concentrated endothall formulations are toxic to man if ingested or absorbed through the skin. They are also irritating to the skin and eyes. Avoid contact with or drift to other crops or plants as injury may result. Generally not toxic to fish at normal use concentrations, however, fish may be killed by dosages of Hydrothol 191 in excess of 0.3 ppm.

Water Use Restrictions - Water treated with endothall cannot be used for watering livestock, preparing agricultural sprays for food crops, for irrigation or domestic purposes for 7 to 25 days after treatment (depending on treatment concentration) or until such time that the water does not contain more than 0.2 ppm of endothall. Do not use fish from treated areas for feed or food for three days after treatment.

E. Glyphosate (Rodeo, Aquastar, Touchdown Pro)

Target Plants - Emergent broadleaf plants and grasses such as alligatorweed, water primrose, smartweed, and Phragmites.

Application Rate - Up to 7 1/2 pints per acre, the specific rate depending on the target species.

Cost - Glyphosate products range in price from \$21-\$39 per gallon. At an application rate of 5 pints per acre and an application cost of \$41 per acre, the total would range from \$63-\$78 per acre per application.

Use Considerations - Glyphosate is not toxic to mammals, birds or fish at recommended use concentrations. Glyphosate products with aquatic labels can be used in and around aquatic sites, including all bodies of fresh and brackish water which may be flowing or nonflowing.

Water Use Restrictions - Do not apply within 0.5 miles upstream of potable water intakes unless water intake is shut off for 48 hours. There are no restrictions on water use for irrigation or recreation after treatment.

F. Fluridone (Sonar, Avast)

Target Plants - Primarily submersed plants, such as hydrilla, Brazilian elodea, watermilfoil, pondweeds, duckweeds and naiads; also effective on lilies and some grasses.

Application Rate Liquid form (Sonar AS, Avast) - 1-4 pints per acre depending on water depth. Pellet forms (Sonar PR, Sonar SRP, Avast SRG) - 15 to 80 pounds per acre depending on water depth.

Cost - The liquid formulation ranges from \$1468-\$1650 per gallon. Assuming an application rate of 5 pints per acre (2 pounds active ingredient per acre) and an application cost of \$40 per acre, the total cost would be \$349 per acre per application. The pellet formulations range in price from \$200-\$200 per pound. Assuming an application rate of 20 pounds per acre (2 pounds active ingredient per acre) and an application cost of \$47 per acre, the total cost would be \$567 per acre per application.

Use Considerations - In large lakes and reservoirs fluridone should be applied to areas greater than five acres. This herbicide requires a long contact time and is not effective in sites with significant water movement or rapid dilution. Fluridone is slow acting and may require 30 to 90 days to achieve desired control under optimal conditions. Unlike other aquatic herbicides, fluridone has proven effective in inhibiting viable hydrilla tuber production.

Water Use Restrictions - Do not apply within 1/4 mile of a functioning potable water intake unless concentrations are less than 20 ppm. Water treated with fluridone cannot be used for irrigation for 7-30 days depending on target crop.

G. Imazapyr (Habitat)

Target Plants - Phragmites, Alligatorweed, Water primrose, and Cutgrass.

Application Rate - 1 to 6 pints per acre depending on target species.

Cost - Habitat (Imazapyr) costs \$245 per gallon. Assuming the application rate of 16 oz. per acre and an application cost of \$41 per acre, the total cost would be \$78 per acre.

Use Considerations - Applications to public waters can only be made by federal, state, or local agencies or those applicators which are licensed or certified as aquatic pest control applicators and are authorized by state or local agencies. Do not use in close proximity to hardwoods.

Water Use Restrictions - Do not apply within 1/2 mile of potable water intakes. For applications within 1/2 mile of a potable water intake, the intake must be turned off for a minimum of 48 hours. Do not apply within 1 mile of active irrigation intakes on still or slow moving waters. Irrigation water usage may be continued 120 days after application or when Habitat (Imazapyr) residue levels are determined by laboratory analysis to be 0 ppb or less.

Aerial Applications may only be made by helicopter.

H. Imazamox (Clearcast)

Target Plants - Phragmites, Alligatorweed, Water primrose, and Cutgrass.

Application Rate - 1 to 6 pints per acre depending on target species.

Cost - Clearcast (Imazamox) costs \$175 per gallon. Assuming the application rate of 16 oz. per acre and an application cost of \$41 per acre, the total cost would be \$63 per acre.

Use Considerations - Applications to public waters can only be made by federal, state, or local agencies or those applicators which are licensed or certified as aquatic pest control applicators and are authorized by state or local agencies. Can be used in close proximity to hardwoods

Water Use Restrictions - Do not apply within 1/2 mile of potable water intakes. For applications within 1/2 mile of a potable water intake, the intake must be turned off for a minimum of 48 hours. Do not apply within 1 mile of active irrigation intakes on still or slow moving waters. Irrigation water usage may be continued 120 days after application or when Habitat (Imazapyr) residue levels are determined by laboratory analysis to be 0 ppb or less.

Aerial Applications may only be made by helicopter.

I. Triclopyr (Renovate 3, Tahoe)

Target Plants - Alligatorweed, Eurasian watermilfoil, water hyacinth, parrotfeather, and water primrose.

Application Rate - 2-8 qts. per acre depending on target species.

Cost - Triclopyr products cost \$96 per gallon. Assuming the application rate of 2 qts per acre and an application cost of \$41 per acre, the total cost would be \$89 per acre.

Use Considerations - Triclopyr is not toxic to fish or wildlife at normal use concentrations. It can cause severe irritation to eyes and skin upon contact. It is suggested that it is used in a manner to reduce the possibility of drift. The proper personal protective equipment should be used as prescribed by the Federal label.

Water Use Restrictions - For floating and emergent applications do not apply within 200 feet of operating potable water intakes when using 4 - 8 qts per acre. There are no setback restrictions for potable water intakes when 2 qts. per acre or less is applied to emergent vegetation. To make applications within these restricted areas, follow the label directions. There are no restrictions on the use of treated water for recreational purposes or for livestock consumption.

J. Penoxsulam (Galleon SC)

Target Plants

Submersed species – Hydrilla, Cabomba, Egeria, Eurasian watermilfoil

Floating species – Floating species – Water hyacinth, Water lettuce, Water fern, Duckweed, Frog's bit, Mosquito fern

Application Rates

0.174 fl oz per acre foot to achieve minimum effective concentration of 25 – 75 ppb.

Floating species – 2- 6 fl oz per acre as foliar application.

Cost – Penoxsulam costs approximately \$1650 per gallon. Assuming an application rate of 11 fl oz per acre and an application cost of \$41 per acre, total cost would be \$183 per acre for submersed plants. Assuming an application rate of 6 fl oz per acre, and an application cost of \$41 per acre, total cost would be \$113 per acre for emergent plants.

Use considerations – Penoxsulam has no potable water restrictions or irrigation restrictions except for irrigation of food crops. It must have prolonged contact times similar to fluridone (>21 days).

Water Use Restrictions - Food crop irrigation waters cannot be used if penoxsulam concentrations are above 1ppb

II. Biological Control

Alligatorweed Flea Beetle (*Agasicles hygrophila*)

Target Plant - Alligatorweed

Stocking Rate - 600-1,000 per acre.

Cost - The U.S. Army Corps of Engineers office in Palatka, Florida will provide lots of 6,000 flea beetles for the cost of shipping which is about \$50 per shipment. Flea beetles may also be obtained from the U.S. Department of Agriculture.

Use Considerations - Flea beetles feed only on alligatorweed and pose no threat to desirable plant species. They produce no adverse impact on the aquatic environment. As with all biological control agents, flea beetles may not remain in the area where stocked but may migrate to other areas of alligatorweed infestation. These insects are not able to survive severe winters and may require occasional restocking. The effectiveness of these insects may be enhanced by use with an aquatic herbicide such as 2, 4-D, or Rodeo.

Alligatorweed Stem Borer Moth (*Vogtia malloi*)

Target Plant - Alligatorweed

Cost - Approximately the same as for flea beetle.

Use Considerations - Same as for flea beetle.

Alligatorweed Thrip (*Amylothrips andersonii*) - This insect feeds on alligatorweed and has been stocked in South Carolina. It has failed to become established in the State and is considered less desirable than flea beetles or stem borers for control of alligatorweed.

D. Triploid White Amur or grass carp (*Ctenopharygodon idella*)

Target Plant - Primarily submersed plants including Brazilian elodea, hydrilla, bladderwort, coontail, naiads, pondweeds.

Cost - Triploid white amur cost \$4 to \$7 each. At a stocking rate of 15 to 25 fish per vegetated acre, the total cost could range from \$60 to \$175 per acre.

Use Considerations - Only the triploid (sterile) white amur may be stocked in South Carolina for aquatic weed control. Introduction and stocking of this fish is regulated by the S.C. Department of Natural Resources and requires a permit. Escapement over some dams may occur during high flow periods. Use of barriers in some lakes should prevent fish loss. While grass carp are effective on a wide variety of submersed plants, they generally do not provide effective control of watermilfoil species. Plants should be carefully identified prior to stocking to ensure proper stocking rates and potential efficacy.

E. Tilapia (*Tilapia* sp.) - Several species of this herbivorous fish have been used to control filamentous algae and submersed macrophytes. Tilapia cannot overwinter in South Carolina. Introduction of fish is regulated by the S.C. Department of Natural Resources.

III. Mechanical Control

Harvesters, Cutters, Dredges and Draglines

Target Plants - All species

Cost - Harvesters range in cost from \$5,000 to over \$150,000 for the initial investment. Operating cost range from \$300 to \$700 per acre.

Use Consideration - Harvesters can be used in irrigation and drinking water supplies without water use restrictions. They may actually spread some plants such as Brazilian elodea and hydrilla by dispersing plant fragments which form new colonies. Harvesting requires the availability of a land disposal site for harvested plants. These devices cannot be used on water bodies which have debris and obstructions which interfere with operation. Harvesters are slow, with a maximum coverage of about five acres per day.

Fiberglass Bottom Screens

Target Plants - All species which root in the bottom.

Cost \$10,000 per acre.

Use Considerations - Bottom screens may be detrimental to bottom-dwelling aquatic organisms. Due to high cost, use is usually restricted to beaches and other swimming areas where a relatively small area of control is required.

IV. Environmental Alterations

Water Level Manipulation - Some species of aquatic plants can be controlled by a periodic raising or lowering of water level. Shoreline grasses, cattails, and Phragmites can be controlled, to some extent, by maintaining higher than normal water levels during the plant growing season. Periodic lowering of water and drying of the bottom can reduce abundance of a number of submersed and emersed species. Disadvantages are that water level fluctuation can adversely affect water uses such as recreation, hydroelectric power production, wildlife protection, and others. Also, some plant species may actually be favored by water level variations. Many factors must be considered before using this method for aquatic plant control.

Reduction in Sedimentation and Nutrient Loading - Sedimentation decreases depth of the water body and increased the area where aquatic plants can grow. Nutrient enrichment resulting from man's activities usually does not create aquatic plant problems, but does contribute to existing problems. Reduction in these two environmental factors can assist in aquatic plant management, but is not a sufficient control method by itself. The mechanism for control of these factors is through

implementation of Best Management Practices for Control of Non-Point Source Pollution developed by the S.C. Department of Health and Environmental Control, and through the wastewater discharge permitting program (NPDES) also administered by the S.C. Department of Health and Environmental Control.

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APPENDIX E

**SCDNR and Santee Cooper
Aquatic Plant and Habitat Management Goals for the Santee Cooper Lakes**

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S.C. Department of Natural Resources and Santee Cooper Aquatic Plant and Habitat Management Goals for the Santee Cooper Lakes

Santee Cooper (S-C) and the S.C. Department of Natural Resources (DNR) recognize the Santee Cooper Lakes as a significant natural resource of the State. In order to provide balanced benefits to natural resources and the multiple uses of the lakes, the DNR and S-C (the parties) agree to cooperate in the management of aquatic vegetation and the habitat that it provides. The parties' goal is to maintain 10 % of the lakes' surface area as beneficial vegetated habitat for waterfowl, wildlife, fish and other aquatic organisms. In order to achieve this goal, the parties agree to the following:

The aquatic plant management goal for the Santee Cooper Lakes is to achieve a diverse assemblage of native aquatic vegetation in 10% of the total surface area of the lake and to effectively control non-native invasive species. The aquatic plant coverage should include a combination of submersed, floating leaf, and emergent plant species that provide habitat and food to game and non-game fish and wildlife species. At least 75% of the vegetation should be composed of species that are beneficial to waterfowl. This vegetation should be distributed throughout the lake system. However, localized control using chemical or mechanical methods may be necessary in areas where vegetation interferes with hydroelectric power production or other legitimate lake uses regardless of plant coverage and distribution.

Monitoring

Aquatic Plants: S-C will annually monitor the vegetative community and extent of coverage. This monitoring may include aerial photography, visual surveys, hydro-acoustic transects and other appropriate measures - as deemed necessary by the parties in the annual work plan - to map the plant species and coverage. An annual report of the monitoring results will be completed at the end of each growing season and provided to the parties prior to preparation of the following year's work plan.

Fish and Wildlife: The DNR and Santee Cooper will cooperate in monitoring the health of the fishery and in conducting enhanced monitoring of waterfowl populations. The waterfowl population monitoring will consist of aerial waterfowl censuses. The census will be conducted 10 times each winter. The DNR will provide personnel and prepare an annual report to be distributed to both agencies. S-C will provide the flight time, approximately 30 hours each year.

Sterile grass carp will continue to be a major component of the long-term management strategy in controlling hydrilla. The DNR and S-C will meet at least annually to review the monitoring data and to develop recommendations for maintenance stocking levels and other control strategies. These recommendations will be jointly presented to the Aquatic Plant Management Council for consideration. The implementation of these recommendations will be subject to approval by the Council.

Aquatic vegetation will not be controlled in Santee Cooper Project water bodies that are totally isolated from the lakes unless it conflicts with specific water uses or is identified as a state or federal noxious weed and poses a threat to Lakes Marion and Moultrie.

In order to enhance native plant growth and habitat throughout the lake system, S-C and the DNR will cooperate in implementing innovative management techniques. These techniques could include such measures as constructing grass carp barriers, introducing desirable native plant species, enhancing wildlife/waterfowl management areas, and implementing strategic lake level management measures.

The DNR and S-C will meet annually to review the results of the monitoring and treatment programs to determine the effectiveness of the programs, and to develop annual work plans. Every five years the parties will meet to conduct a comprehensive review of the programs and to determine the success in meeting the overall management goals. Based upon this review, the provisions of this agreement may be modified, as deemed appropriate, by the mutual consent of the parties.

APPENDIX F

Summary of Aquatic Plant Control Expenditures

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SUMMARY OF AQUATIC PLANT CONTROL EXPENDITURES

During 1981, the Council received \$60,000 in Federal matching funds through the U.S. Army Corps of Engineers. The Council allocated \$57,000 of these funds to the S.C. Public Service Authority for plant management at Lake Marion. The Authority used these funds to chemically treat approximately 500 acres of the area uplake of the Rimini railroad trestle. The herbicide diquat was used to treat for Brazilian elodea and other submersed weed species. The remainder of the Federal funds were used to assist in development of the Council's management program.

During 1982, \$30,000 in Federal funds were allocated to the S.C. Public Service Authority for control of hydrilla and other nuisance plants at Lake Marion. An additional \$13,500 were allocated to Berkeley County for control of water hyacinths at Goose Creek Reservoir.

During 1983, \$155,000 in Federal matching funds were allocated to the S.C. Public Service Authority for plant control at Lake Marion. These funds were used to treat approximately 1,400 acres of upper Lake Marion with diquat, endothall and fluridone for control of Brazilian elodea, hydrilla and other submersed plants. The Council also provided \$4,500 in Federal matching funds to Berkeley County for maintenance control of water hyacinths at Goose Creek Reservoir.

During 1984, \$249,500 in Federal funds and \$40,500 in State funds were allocated to the S.C. Public Service Authority for aquatic weed control at Lake Marion. The S.C. Electric and Gas Company was allocated \$25,000 for control of hydrilla and other submersed aquatic weeds at Back River Reservoir. Berkeley County was allocated \$5,000 for maintenance control of water hyacinth at Goose Creek Reservoir.

Calendar year 1985 represented the first year of significant funding for aquatic plant management in South Carolina since the establishment of the Aquatic Plant Management Program in 1980. Funding was available from State and Federal sources over separate fiscal years. A total expenditure of \$701,349 was used to control nuisance aquatic plant populations on 29 water bodies around the State. Of this expenditure, \$98,377 was used for biological control by triploid grass carp and \$602,972 was used for chemical control operations.

During 1986, a mild winter coupled with low lake levels and clear water due to a severe drought resulted in an abundance of submersed aquatic plants. Hydrilla populations in Lake Marion and Back River Reservoir increased in coverage and new populations were discovered in the Cooper River ricefields. A total of 38 water bodies (4,925 acres) were managed for aquatic weeds at a cost of \$704,090. Herbicide applications were made on 33 lakes (4,441 acres) at a cost of \$673,979. Biological controls were implemented on nine water bodies around the State at a cost of \$30,111.

During 1987, a total of \$604,695 in State and Federal funds were expended for aquatic weed control in public waters. Chemical control work amounting to \$599,445 was conducted in 26 public water

bodies. Biological control, including stocking triploid grass carp and alligatorweed flea beetles, was conducted at eight water bodies for a total expenditure of \$5,250.

During 1988, a total of \$631,164 in State, Federal, and local funds were expended for aquatic plant control activities in 25 water bodies. Because of reductions in the amount of Federal match from 70 percent to 50 percent of total control cost, local sponsors were for the first time required to provide at least 15 percent of control costs. Approved aquatic herbicides were applied to 3,258 acres on 21 water bodies at a total cost of \$583,764. Biological controls were implemented on four water bodies at a cost of \$47,400.

During 1989, a total of \$827,630 in Federal, State, and local funds were expended for aquatic plant control operations in 23 water bodies. Aquatic herbicides were applied to 2620 acres on 21 water bodies at a cost of \$422,009. A three year triploid grass carp stocking project was initiated on Lake Marion with the release of 100,000 sterile grass carp. Because this represents the largest such stocking in the country to date, biological control expenditures were substantially higher than in previous years, totaling \$405,621.

During 1990, a total of \$944,194 were expended for aquatic plant control activities on 24 water bodies. Herbicide treatments were made to all water bodies (2850 acres) at a cost of \$524,194. Lake Marion received its second installment of 100,000 triploid grass carp at a cost of \$420,000. Because of limited federal funds and a substantial increase in local funds (primarily from Santee Cooper), this was the first year that there were insufficient federal funds available to match all planned control operations. The Corps of Engineers provided 47 percent of total funding, while state and local entities provided 16 percent and 37 percent, respectively.

In 1991, aquatic plant management operations were conducted on 18 public water bodies at a total cost of \$1,965,387. The exceptionally large expenditure was a result of emergency control operations to alleviate blockage of the St. Stephen Hydroelectric facility on Lake Moultrie by hydrilla. A record high 6838 acres was treated with aquatic herbicides at a cost of \$1,505,771. Biological control agents were used on five lakes at a cost of \$459,615. Most of this included the third stocking of triploid grass carp in upper Lake Marion. While 50 percent of program funding was provided by the U.S. Army Corps of Engineers, 9 percent was provided by the State and 41 percent by local entities.

In 1992, 22 water bodies received control operations at a total cost of \$1,859,709. While last year's expenditures were higher, over 1,000 acres were treated by Santee Cooper at a cost of over \$200,000 but were not cost shared through the State program. Fifty percent of funding was provided by the U.S. Army Corps of Engineers, 8 percent by the State, and 42 percent by local entities. About 6,888 acres were treated with aquatic herbicide at a cost of \$1,447,864. Biological control agents (sterile grass carp and Tilapia) were introduced to six water bodies at a cost of \$411,845. This was the first year in which widespread hydrilla control was evident in upper Lake Marion from the grass carp. Hydrilla was controlled in over 6,500 acres in Stumphole, Low Falls,

Elliotts Flats, and tree line areas. Compared to 1990 coverage, this represents an 80 percent reduction.

During 1993, a total of \$2,050,736 were expended for aquatic plant control activities on 27 water bodies. Forty-six percent of the funding was provided by the U.S. Army Corps of Engineers, 5 percent by the Department of Natural Resources, and 49 percent by various local sponsors. Aquatic herbicide treatments were made on 23 water bodies (8,125 acres) at a total cost of \$1,828,335. Biological control agents (grass carp and tilapia) were used on 11 lakes at a cost of \$222,400. Grass carp stocked in upper Lake Marion in 1989-92 provided control (over 9,000 acres) for the second consecutive year. As a result of this success, stocking efforts were initiated in Lake Moultrie with the release of 50,000 grass carp. Hydrilla was discovered in Lake Murray this year resulting in unplanned treatment operations at several boat ramps and swimming beaches.

During 1994, aquatic plant management operations were conducted on 28 water bodies at a total cost of \$2,876,763. The U.S. Army Corps of Engineers provided 50 percent of all funds, while the State provided 7 percent and local entities provided 43 percent. Aquatic herbicide treatments were conducted on all water bodies (9,090 acres) at a cost of \$2,370,025. Grass carp were stocked in five lakes to control 10,242 acres at a cost of \$506,738. Lake Moultrie received the most grass carp (150,000 fish) to help increase the number of fish to target levels. Grass carp continue to control over 9,000 acres in upper Lake Marion for the third straight year. This year hydrilla was found in Lake Wateree for the first time resulting in unplanned treatments to attempt to eliminate it.

In 1995, a total of \$2,804,206 were expended for aquatic plant control activities on 30 water bodies. Fifty percent of the funding was provided by the U.S. Army Corps of Engineers, 44 percent was provided by local sponsors, and the state contributed 6 percent. Some level of herbicide treatment occurred on all the water bodies totaling about 9,710 acres at a cost of \$2,367,622. A total of 97,526 grass carp were stocked in five lakes at a total cost of \$435,084. Most of these were stocked in the Santee Cooper lakes (91,000) and Goose Creek Reservoir (6,000). Hydrilla was found in Lake Keowee for the first time this year which resulted in an unplanned treatment. Also *Salvinia molesta*, a federal noxious weed, was discovered in a private pond in Colleton County. Efforts were made to eradicate the infestation with treatments by the landowner and the state. Grass carp continue to provide excellent control in over 9,000 acres in upper Lake Marion; however, floating water hyacinths now infest much of this area impacting primarily shoreline and swamp areas.

Control expenditures in 1996 were about one-half of those in 1995 due in part to successful results from control efforts in previous years and in part to reductions in federal funding. A total of 19 water bodies were managed for nuisance species at a total cost of \$1,151,501; the Corps of Engineers provided 31%, the State provided 10%, and local entities provided 59%. Herbicide treatments were conducted in 4,920 acres at a cost of \$888,685; biocontrol agents were used in four lakes at a cost of \$262,816. Hydrilla coverage on the Santee Cooper lakes (Lakes Marion and Moultrie) declined by almost 80% due apparently to the successful stocking of sterile grass carp. As a result, herbicide treatments of hydrilla were reduced by a comparable amount. Hydrilla coverage has been essentially eliminated on Lake Wateree and substantially reduced on Lake Keowee through

a combination of herbicide treatments and drawdowns. A large drawdown and treatment on Lake Murray this year is hoped to have similar results.

During 1997, aquatic plant management operations were conducted on 21 water bodies at a total cost of \$459,783. This represents a 60% reduction from control costs in 1996 due to very successful hydrilla management efforts on the Santee Cooper lakes and Lake Murray coupled with limited Federal matching funds. Matching funds from the Corps of Engineers composed only 2 percent of total costs, while State and Local funds made up 38 percent and 60 percent, respectively. Sterile grass carp were stocked in five lakes to control 292 acres of submersed plants at a cost of \$15,951. Aquatic herbicides were used to treat 3,762 acres at a total cost of \$443,832. Most herbicide treatments (58%, 2,181 acres) were focused on water hyacinth which has expanded its range and now is found on six major water bodies. Water hyacinth treatments on the Ashepoo River were greater than originally planned and treatments on the Waccamaw River were unanticipated. Hydrilla coverage on the Santee Cooper lakes continued to decline in 1997 due to successful control by sterile grass carp resulting in sharp reductions in management expenditures. The drawdown and herbicide treatment on Lake Murray in 1996 resulted in better than anticipated hydrilla control this year. Hydrilla acreage was reduced 88 percent with a 45 percent reduction in shoreline miles.

Limited hydrilla coverage on the Santee Cooper Lakes, Lake Murray and Goose Creek Reservoir during 1998 helped reduce overall control expenditures for the third consecutive year. Total control cost for 1998 were 40% less than in 1997. A total of 1,862 acres on 17 water bodies were managed at a cost of \$273,223. The Department of Natural Resources provided 47% of total funding, while 25% was provided by the Corps of Engineers, and 28% by various local entities. Sterile grass carp are effectively controlling hydrilla growth in the Santee Cooper Lakes and Goose Creek Reservoir. About one-half of all herbicide treatments (940 ac.) were focused on water hyacinth control on coastal rivers and impoundments.

A total of 3,259 acres on 19 water bodies were managed in 1999 at a total cost of \$453,071. Funding support was 34% State (SCDNR), 21% Federal (USACOE), and 45% local match. Most herbicide treatments (1506 acres, 46%) were directed at controlling the growth of water hyacinth in seven water bodies. Hydrilla growth remains limited statewide due to control operations in previous years. Grass carp in the Santee Cooper Lakes (Lakes Marion and Moultrie) and Goose Creek Reservoir are effectively controlling hydrilla growth in those lakes. Hydrilla regrowth was evident in Lake Murray at the end of the year; however, higher than normal lake levels restricted herbicide treatments. Therefore, significant regrowth is expected next year.

During 2000, aquatic plant management operations were conducted on 21 water bodies at a total cost of \$483,236. State budget cuts at the end of the calendar year reduced control efforts by 21% of planned expenditures and shifted costs to local sponsors. Seventy percent of total costs were borne by local entities with the state paying the rest. Most of the control effort was focused on water hyacinth (31%), followed by hydrilla (25%) and Pithophora (19%). Hydrilla regrowth was significant on Lake Murray as predicted. Grass carp continue to control hydrilla on Goose Creek Reservoir and Lake Marion and Lake Moultrie.

During 2001, aquatic plant management operations were conducted on 2,775 acres on 25 water bodies at a total cost of \$508,075. Due to State budget cuts virtually all control costs were paid for with federal (41%) and local funds (59%). Hydrilla treatments were up this year (1,550 acres) because of a resurgence of hydrilla growth on Lake Murray; however, water hyacinth treatments were especially low (186 acres) due to a very cold period in December. Grass carp continue to provide effective control of hydrilla on Goose Creek Reservoir and the Santee Cooper Lakes.

During 2002, aquatic plant management operations were conducted on 2,239 acres on 17 water bodies at a total cost of \$297,236. Due to State budget cuts virtually all control costs were paid for with federal (37%) and local funds (63%). Water hyacinth treatments were up this year (1,186 acres) because of a milder than normal winter; however, hydrilla treatments were especially low (390 acres) due to the inability to treat Lake Murray. Grass carp continue to provide effective control of hydrilla on Goose Creek Reservoir and the Santee Cooper Lakes.

In 2003, aquatic plant management operations were conducted on 61340 acres in 12 water bodies at a total cost of \$639,328. Due to state budget cuts all control costs were paid for with federal (38%) and local funds (62%). Included in this total are the stocking of 64,500 sterile grass carp in Lake Murray to control 4300 acres of hydrilla at a cost of \$369,529. About 57% of all herbicide treatments (1005 ac.) were focused on water hyacinth control on coastal rivers and impoundments. Grass carp continue to provide effective control of hydrilla on Goose Creek Reservoir and the Santee Cooper Lakes.

A total of 2764 acres were treated in 2004 at a total cost of \$470,815. Local sponsors provided 41% of the cost, while the Corps of Engineers provided 30%. Funds from the State's Water Recreational Resource Fund (boat gas tax) paid for 29% of all control costs. The focus of most control was on water hyacinth (931 acres) and Phragmites (710 acres). Grass carp continue to provide effective control of hydrilla on Goose Creek Reservoir and the Santee Cooper Lakes. Preliminary surveys of Lake Murray indicate that grass carp stocked in 2003 are beginning to provide some control of hydrilla. The drawdown on Lake Murray over the past two years is also providing good hydrilla control in the drawdown zone.

In 2005 the focus of the Aquatic Nuisance Species Program was Phragmites control in coastal South Carolina, 1983 acres were treated at a cost of \$349,174. In all, a total of \$655,535 was spent on 3,935 acres of control of invasive plants. Local sponsors provided 32% of the cost, while the Corps of Engineers provided 35%. Funds from the State's Water Recreational Resource Fund (boat gas tax) paid for 33% of all control costs. Grass carp continue to provide effective control of hydrilla on the Santee Cooper Lakes and have provided excellent control on Lake Murray.

For 2006, Phragmites control was center stage and once again led the control efforts with 1950 acres treated at a cost of \$352,804. This is second only to last year's acreage of phragmites treated. In total 3983 acres of invasive species were treated at a cost of \$722,316. Funding from the Corps of Engineers was not available this year and the costs were almost evenly split between the local cost share monies and Water Recreation funds. Additional funding was used from the U.S. Navy, Naval

Weapons Station in Goose Creek. Included in that total was 242 acres of Phragmites and about 70 acres of pond work in the Marrington Recreation area. Findings in Goose Creek Reservoir and the Santee Cooper Lakes indicate that additional stockings of triploid grass carp may need to be reconsidered in 2007.

Increasing hydrilla and the abundance of native submersed vegetation in 2007 brought about maintenance stocking of Triploid Grass Carp in Lake Marion, Lake Moultrie, and Goose Creek Reservoir. A total of 2620 sterile carp were stocked in the Santee Cooper Lakes with an additional 185 fish stocked into Goose Creek Reservoir. In total 4208 acres of invasive species were treated at a cost of \$773,263. Costs were almost evenly split between the local cost share monies and Water Recreation funds. Additional funding was used from the U.S. Navy, Naval Weapons Station in Goose Creek and U. S. Army Corps of Engineers for treatment of phragmites on spoil areas in Charleston Harbor and the Intracoastal Waterway. Santee coastal WMA managers should now have gained the upper hand with an additional 714 acres treated on Santee Coastal. Yawkey continued treatment of phragmites (120 acres) with several problem areas which remain persistent throughout treatment. Additionally 904 acres of phragmites have been treated from Colleton County through Georgetown County.

2008 showed a rebound of hydrilla across the state. Hydrilla was discovered in several new sites and at some old sites this highly invasive species increased abundantly. Triploid grass carp maintenance stocking plans are being reconsidered because of the increased levels of hydrilla in the Santee Cooper Lakes and Goose Creek Reservoir. Cooperative efforts with Duke Energy, Lake Wylie Marine Commission, South Carolina DNR, and North Carolina wildlife agencies produced a management plan for the border lake, Lake Wylie. 3335 acres of invasive species were treated at a cost of \$641,791. Costs were split approximately 44% local cost share monies and 56% Water Recreation funds. Phragmites sites continued to decline in acreage and new cooperative agreements were put in place for water hyacinth control on public and private areas along the Pee Dee and Waccamaw Rivers. This agreement includes SCDNR, the U.S. Fish and Wildlife Service, the Nature Conservancy, and private landowners. New problems tackled by the ANS program include a highly invasive snail species in the Socastee area of Horry County (111 acres at \$3,671) and a toxic algae problem in Hopeland Gardens in Aiken, S.C.

Budget problems in 2009 limited state level cost-share. In all 65% of total costs for control in South Carolina was absorbed by the local entities, along with 35% State Water Recreational Resource funds and 2% Federal funds. Through innovative control measures and perseverance by ANS staff, control efforts were not severely hampered. Triploid grass carp were stocked for the first time in Lake Greenwood to control an ever increasing hydrilla population. This stocking had limited success as hydrilla numbers grew throughout the summer months. Maintenance stocking of the Santee Cooper Lakes and Goose Creek Reservoir was accomplished. In 2009 2,867 acres of control work was done at a total cost of \$572,588. Santee Cooper control was about 38% of the total acreage treated. Phragmites control was a key component of habitat restoration for waterfowl and other species and resulted in 424 acres of control efforts which is down from previous years because of efficacy of previous control efforts.

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