

2002  
ANNUAL MANAGEMENT PLAN  
PART II

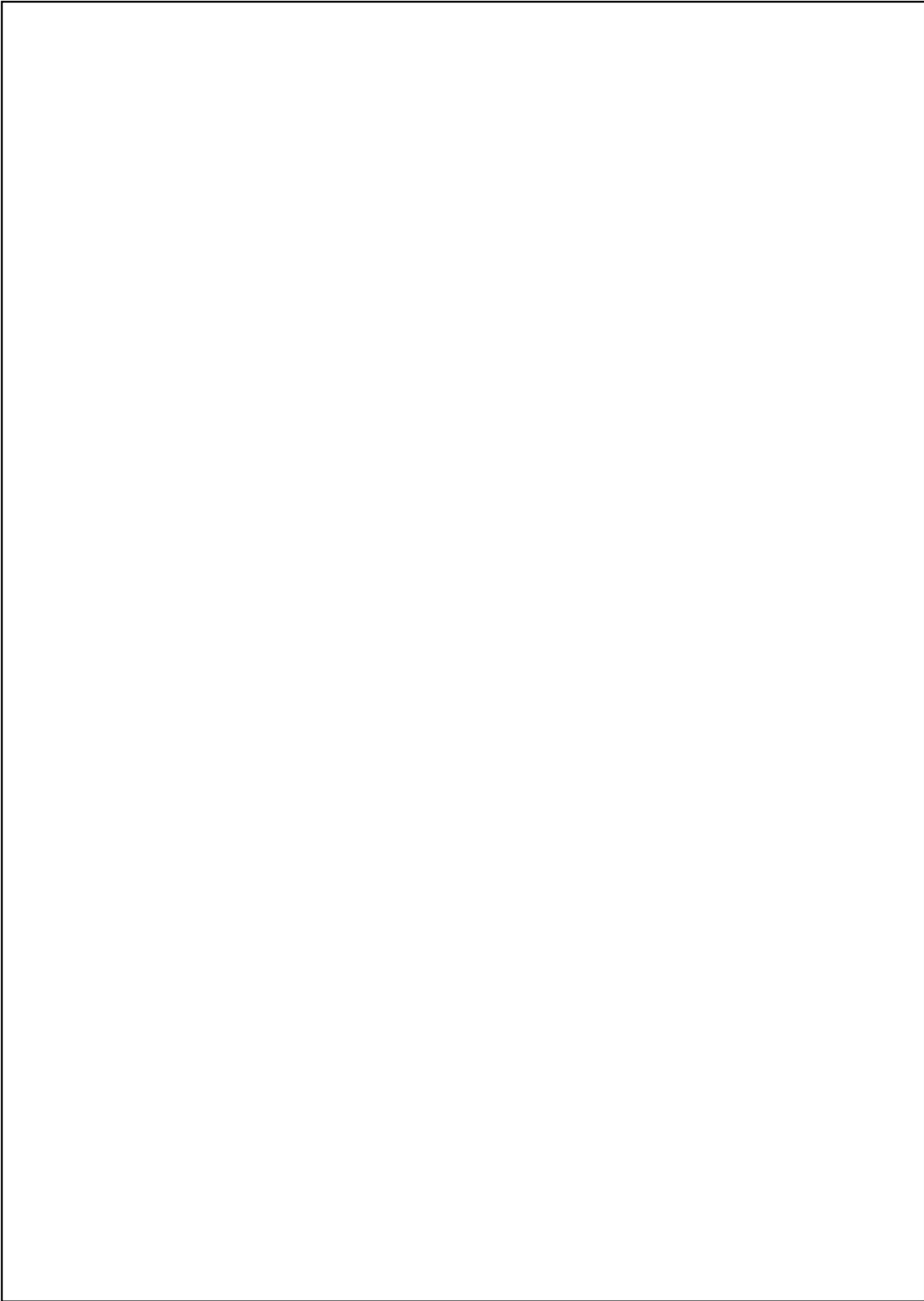


# INTRODUCTION

The Annual Management Plan for 2002 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</i> spp.
Brazilian elodea	<i>Egeria densa</i>
Cowlily	<i>Nuphar luteum macrophyllum</i>
Cattails	<i>Typha</i> spp.
Coontail	<i>Ceratophyllum demersum</i>
Creeping rush	<i>Juncus repens</i>
Curly-leaf pondweed	<i>Potamogeton crispus</i>
Duckweed	<i>Lemna</i> spp.
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Fanwort	<i>Cabomba caroliniana</i>
Filamentous algae	<i>Pithophora</i>
	<i>Lyngbya</i>
	<i>Hydrodictyon</i>
Floating bladderwort	<i>Utricularia inflata</i>
Floating heart	<i>Nymphoides</i> spp.
Giant cutgrass	<i>Zizaniopsis miliacea</i>
Hydrilla	<i>Hydrilla verticillata</i>
Musk-grass	<i>Chara</i>
Pondweed	<i>Potamogeton</i> spp.
Slender naiad	<i>Najas minor</i>
Smartweed	<i>Polygonum densiflorum</i>
Southern naiad	<i>Najas guadalupensis</i>
Spikerush	<i>Eleocharis</i> spp.
Stonewort	<i>Nitella</i>
Variable-leaf pondweed	<i>Potamogeton diversifolius</i>
Waterlily	<i>Nymphaea odorata</i>
Water hyacinth	<i>Eichhornia crassipes</i>
Watermilfoil	<i>Myriophyllum</i> spp.
Water pennywort	<i>Hydrocotyle ranunculoides</i>
Water primrose	<i>Ludwigia hexapetala</i>
Watershield	<i>Brasenia schreberi</i>



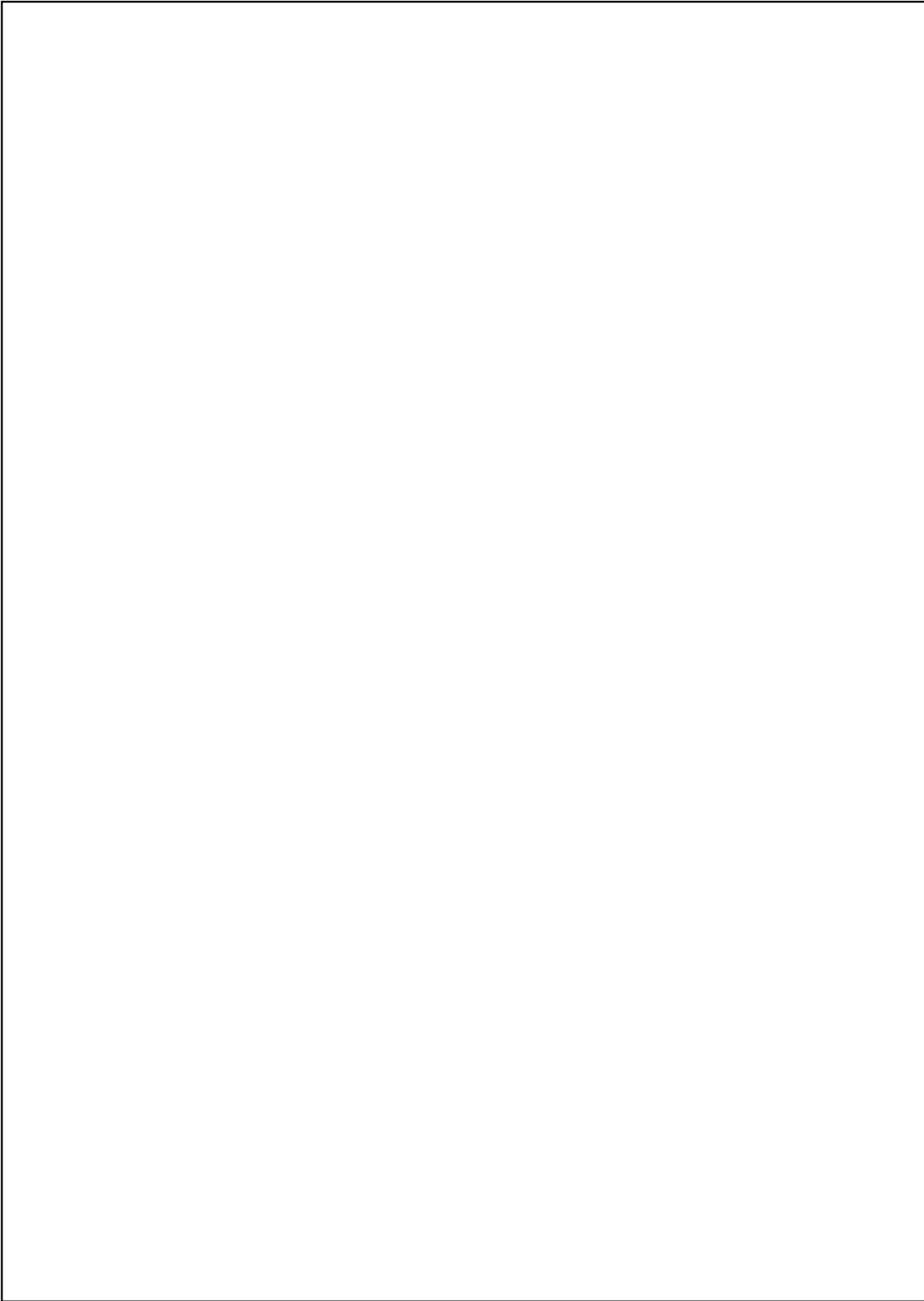
## AQUATIC PLANT PROBLEM AREAS

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 2001.

1. Water body - ***Ashepool River***  
Location - Colleton County  
Surface acres - unknown  
Aquatic plants - Water hyacinth  
Coverage -25 acres  
Impaired activities - Boating, fishing, public access
2. Water body - ***Back River Reservoir***  
Location - Berkeley County  
Surface acres - 850  
Aquatic plants - Brazilian elodea, hydrilla, water hyacinth, water primrose, fanwort  
Coverage - 380 acres  
Impaired activities- Boating, fishing, hunting, swimming, industrial water supply, municipal water supply, electric power generation, public access
3. Water body - ***Cooper River*** (and adjacent ricefields)  
Location - Berkeley County  
Surface acres - Unknown  
Aquatic plants - Hydrilla, water primrose, water hyacinth  
Coverage - approx. 2,000 acres  
Impaired activities - Boating, public access
4. Water body - ***Goose Creek Reservoir***  
Location - Berkeley County  
Surface acres - 500  
Aquatic plants - Water hyacinth, water primrose  
Coverage - 50 acres  
Impaired activities - Boating, public access, industrial water supply, floodway
5. Water body - ***Lake Greenwood***  
Location -Laurens and Greenwood Counties  
Surface acres - 11,400  
Aquatic plants - Slender naiad, Filamentous algae (Pithophora, Hydrodictyon)  
Coverage - 225 acres  
Impaired activities - Boating, swimming, vector control, public access
6. Water body - ***Lake Keowee***  
Location - Pickens and Oconee Counties  
Surface acres - 18,300  
Aquatic plants - Hydrilla  
Coverage - 10 acres  
Impaired activities - Potential impacts to water recreation, public access, electric power generation, municipal water supply

7. 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, giant cutgrass  
 Coverage - 1000 acres  
 Impaired activities - Boating, swimming, public access, potential electric power generation, potential irrigation water withdrawals
  
8. 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, giant cutgrass  
 Coverage - 50 acres  
 Impaired activities - Potential electric power generation, boating, swimming, public access, potential domestic and irrigation water withdrawals
  
9. Water body - ***Lake Murray***  
 Location - Lexington and Richland Counties  
 Surface acres - 50,000  
 Aquatic plants - Hydrilla, Illinois pondweed  
 Coverage - 2800 acres  
 Impaired activities - Boating, swimming, potential domestic and municipal water intakes, public access
  
10. Water body - ***Lake Wateree***  
 Location - Kershaw County  
 Surface acres - 13,710  
 Aquatic plants - Hydrilla  
 Coverage - < 2 acres  
 Impaired activities - Potential boating, swimming, public access
  
11. Water body - ***Pee Dee River***  
 Location - Georgetown County  
 Surface acres - Unknown  
 Aquatic plants - Water hyacinth  
 Coverage - 50 acres  
 Impaired activities - Boating, hunting
  
12. Water body - ***Waccamaw River***  
 Location - Georgetown and Horry Counties  
 Surface acres - Unknown  
 Aquatic plants - Water hyacinth  
 Coverage - 50 acres  
 Impaired activities - Boating, public access
  
13. Water body - ***Charles Towne Landing State Park***  
 Location - Charleston County  
 Surface acres - 5  
 Aquatic plants - Duckweed, alligatorweed  
 Coverage - 4 acres  
 Impaired activities - Fishing, aesthetics

14. Water body - *Huntington Beach State Park*  
Location - Georgetown County  
Surface acres - 100  
Aquatic plants - Cattails, Phragmites  
Coverage - 45 acres  
Impaired activities - Wildlife observation, fishing, environmental education



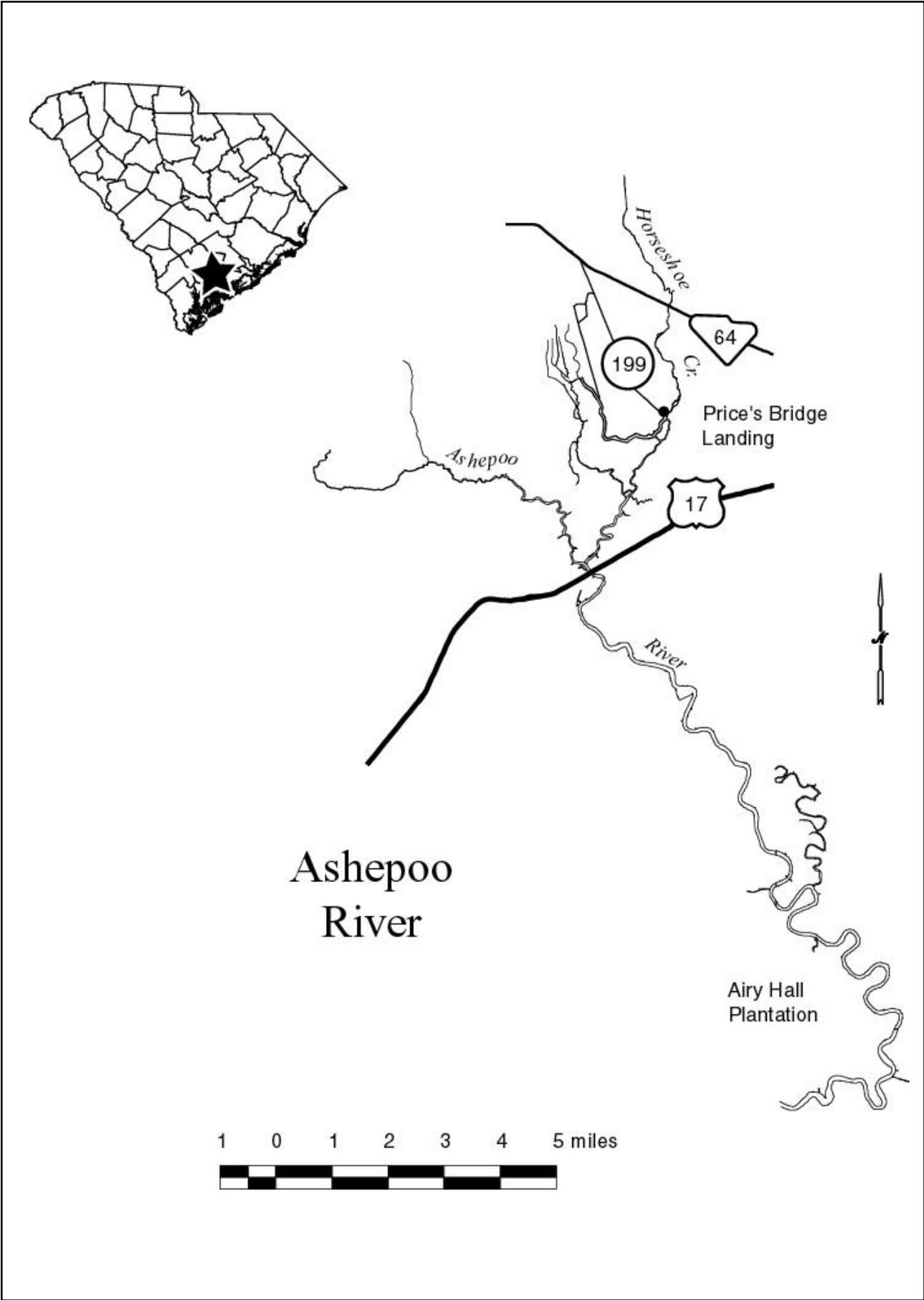
# AQUATIC PLANT MANAGEMENT STRATEGY

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 2002 and a location map of problem water bodies are located at the end of this section.

## 1. Ashepoo River (Colleton County)

1. Problem plant species  
Water hyacinth
2. Management objective  
Reduce water hyacinth populations to the greatest extent possible, throughout the river system.
3. Selected control method  
Reward
4. Area to which control is to be applied  
25 acres of water hyacinth throughout river
5. Rate of control agents to be applied  
0.5 gallon per acre.
6. Method of application of control agents  
Spray on surface of foliage with appropriate surfactant.
7. Timing and sequence of control application  
Reward to be applied periodically to water hyacinth from May through October, as needed.
8. Other control application specifications  
All affected water users will be notified of proposed chemical control activities prior to application.
9. Entity to apply control agents  
Commercial applicator
10. Estimated cost of control operations  
\$2,122

11. Potential sources of funding
  - Colleton County (60%)
  - U.S. Army Corps of Engineers (40%)
  - S.C. Department of Natural Resources (Dependent upon state appropriations for FY02.)
  
12. 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.



## 2. Back River Reservoir

(Berkeley County)

1. Problem plant species

Hydrilla	Water hyacinth
Brazilian elodea	Fanwort
Water primrose	

2. Management objectives

- a. 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.
- b. Reduce hydrilla in upper Foster Creek area to improve water quality, waterflow and navigation.
- c. Reduce hydrilla and fanwort in 60 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.

3. Selected control method

<u>Problem Species</u>	<u>Control Agent</u>
Water hyacinth	Reward
Water primrose	Glyphosate
Hydrilla, Brazilian elodea	Chelated copper*
Fanwort	Hydrothol 191 granular*

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

4. Area to which control is to be applied

Glyphosate - 200 acres of water primrose throughout lake.  
Reward - 200 acres of water hyacinth throughout lake.  
Chelated copper - 240 acres of hydrilla near SCE&G intake(4 treatments of 60 acre area).  
Chelated copper - 18 acres of hydrilla in Back River arm.  
Chelated copper - 4 treatments - 20 acres in Foster Creek arm

5. Rate of control agents to be applied

Glyphosate - 7.5 pints per acre.  
Reward - 0.5 gallon per acre.  
Chelated copper - up to 1 ppm (about 16 gallons per acre).

6. Method of application of control agents

Glyphosate, Reward - spray on surface of foliage with appropriate surfactant.  
Chelated copper, Sonar - subsurface injection from airboat.  
Hydrothol 191 - apply with granular spreader from airboat.

7. Timing and sequence of control application

One hundred (100) acres of water hyacinths to be treated in the spring (April, May) and 100 acres in the fall (September, October). The initial treatments are to be followed in 1-2 days with a cleanup treatment.

Glyphosate to be applied to water primrose after initiation of flowering (June-August).

Hydrilla in Foster Creek to be treated four times (April-June) with Chelated copper.

Hydrilla located near the SCE&G water intake to be treated periodically during the year with Chelated copper (up to four times in the same 60 acre area), treatment area may be expanded as control is realized in target area.

8. Other control application specifications

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

Glyphosate treatments will be conducted at least 1/2 mile from the Charleston CPW water intake and Reward treatments will be conducted at least 1600 feet from the intake.

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

All affected water users will be notified of proposed chemical control activities prior to application. Following the application of Reward, herbicide residue concentrations may be monitored according to a plan agreed to by the S.C. Department of Natural Resources and the Department of Health and Environmental 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.

9. Entity to apply control agents

Commercial applicator

10. Estimated cost of control operations

\$112,954

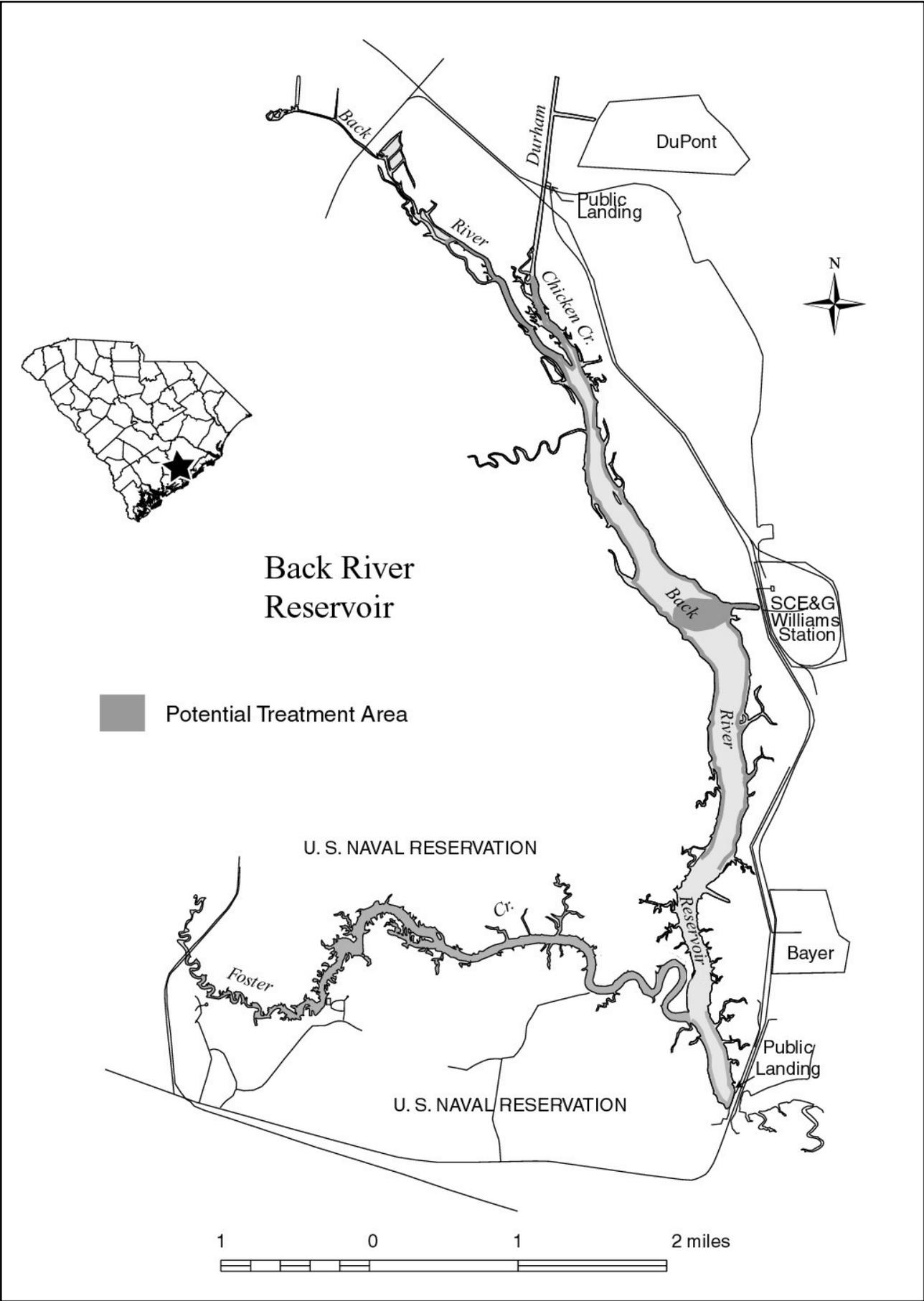
11. Potential sources of funding

Water primrose and water hyacinths -  
Charleston Commissioners of Public Works and S.C. Electric and Gas Co. (60%)  
U.S. Army Corps of Engineers (40%)  
S.C. Department of Natural Resources ( Dependent upon state appropriations for FY02.)

Hydrilla and Cabomba (near SCE&G intake) -  
South Carolina Electric and Gas Co. (60%)  
U.S. Army Corps of Engineers (40%)

Hydrilla (Foster Creek, boat ramp, and Back River) -  
Charleston Commissioners of Public Works and  
U.S. Naval Weapons Station (100%)  
S.C. Department of Natural Resources (Dependent upon state appropriations for  
FY 02)

12. 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.



### 3. Cooper River (Berkeley County)

1. Problem plant species

Hydrilla	Water hyacinth
Water primrose	

2. Management objectives

- a. Reduce water hyacinth populations to the greatest extent possible in the main river and public ricefields.
- b. Reduce water primrose growth along boat channels to maintain navigation.
- c. Open limited boat trails in hydrilla infested ricefields to enhance public access to the river and selected ricefields.

3. Selected control method

<u>Problem Species</u>	<u>Control Agent</u>
Water hyacinth	Reward
Water primrose	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.**

4. Area to which control is to be applied

Reward - 200 acres of water hyacinths throughout river system  
 Glyphosate - 15 acres of water primrose in narrow boat channels in French Quarter Creek, Rice Hope Plantation ricefield, and Berkeley Yacht Club ricefield.  
 Chelated copper - 50 acres to open boat trails in Pimlico, Berkeley Yacht Club and Rice Hope Plantation ricefields.

5. Rate of control agents to be applied

Reward - 0.5 gallon per acre.  
 Glyphosate - 7.5 pints per acre.  
 Chelated copper - up to 1 ppm (about 16 gallons per acre)

6. Method of application of control agent

Glyphosate and Reward - spray on surface of foliage with appropriate surfactant.  
 Chelated copper - subsurface injection from airboat.

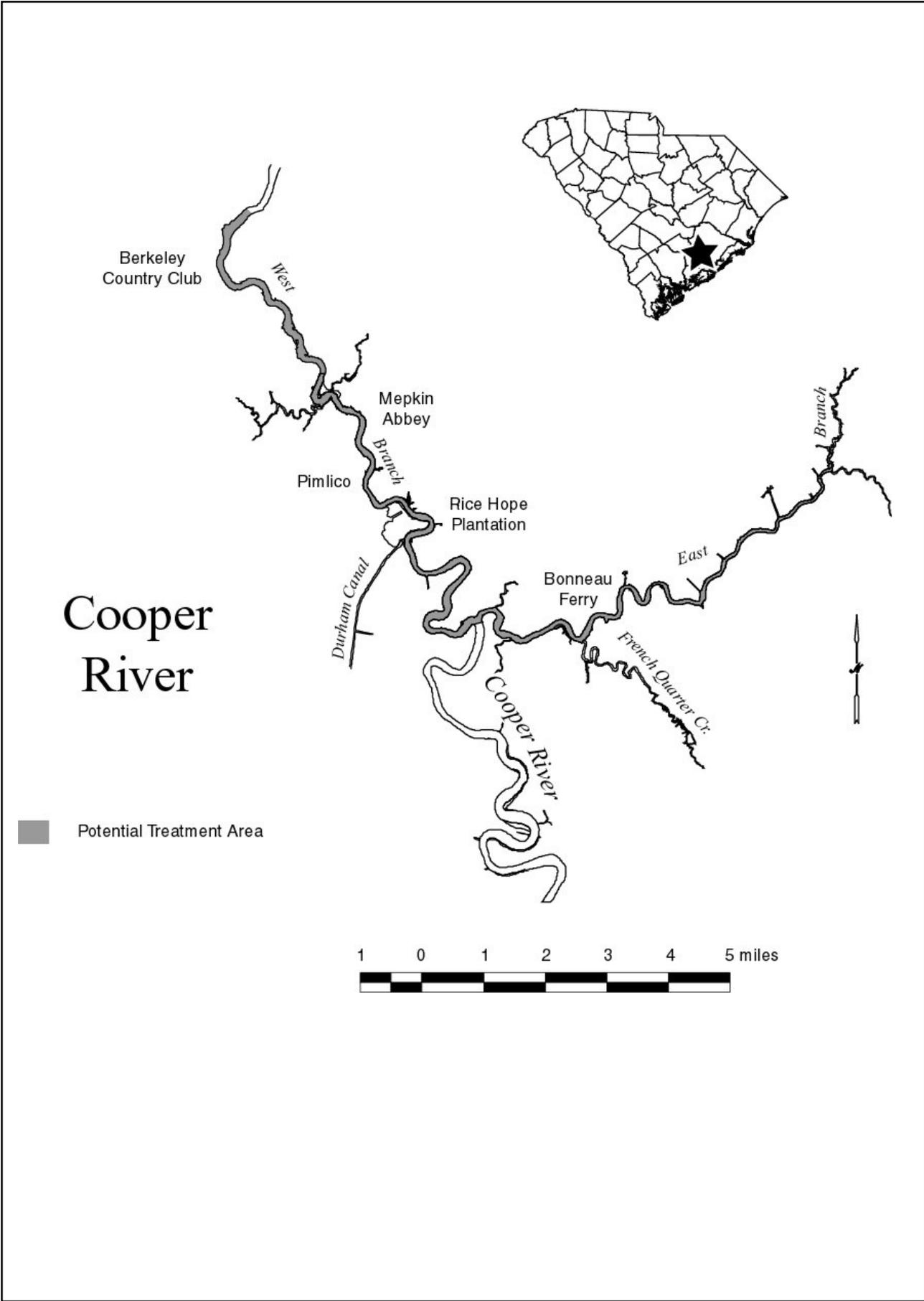
7. Timing and sequence of control application

All agents to be applied when plants are actively growing. Reward treatment to be conducted in early spring with subsequent maintenance treatments throughout the year. Glyphosphate to be applied after plants are in bloom. Chelated copper treatment of boat trails to be conducted as close to low tide as possible to minimize water movement.

8. Other control application specifications

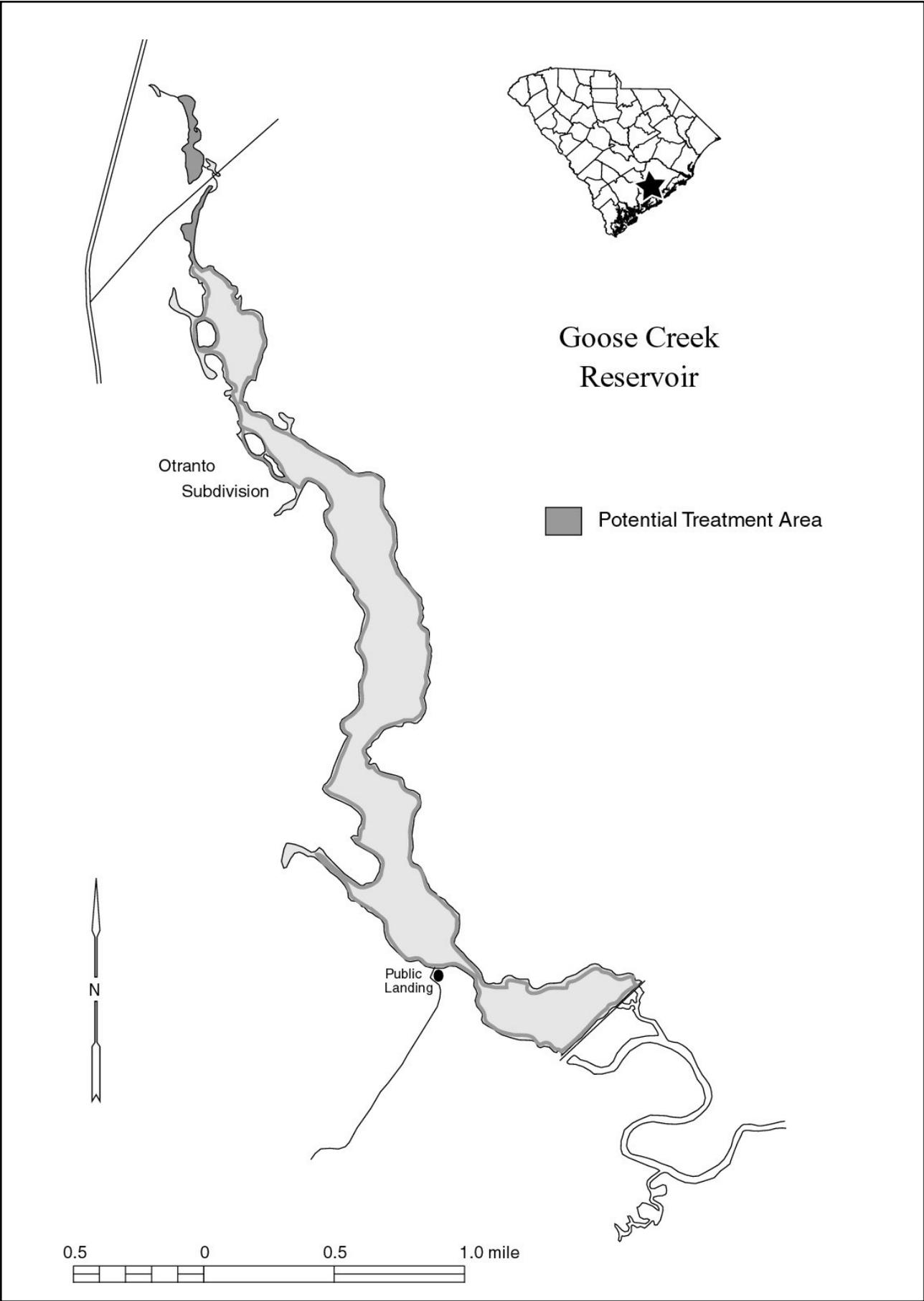
Treatment of water hyacinth is to be conducted in a manner that will not significantly degrade water quality.

9. Entity to apply control agent  
Commercial applicator
10. Estimated cost of control operations  
\$29,638
11. Potential sources of funding  
Berkeley County (60%)  
U.S. Army Corps of Engineers (40%)  
S.C. Department of Natural Resources (Dependent upon state appropriations for  
FY02.)
12. 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 wateruse, 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.





10. Estimated cost of control operations  
\$11,656
11. Potential sources of funding  
Charleston Commissioner of Public Works (60%)  
U.S. Army Corps of Engineers (40%)  
S.C. Department of Natural Resources (Dependent upon state appropriations for FY 03)
12. 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.



# Goose Creek Reservoir

Potential Treatment Area

Otranto Subdivision

Public Landing

0.5 0 0.5 1.0 mile

## 5. Lake Greenwood (Laurens County)

1. Problem plant species  
Slender naiad  
Pithophora  
Hydrodictyon
2. Management objectives
  - a. Reduce slender naiad in developed shoreline areas and areas of high public access and use.
  - b. Minimize the growth of filamentous algae in the Reedy River arm.
3. Selected control method

<u>Problem Species</u>	<u>Control Agent</u>
Slender naiad Pithophora, Hydrodictyon	Aquathol K K-TEA*, Cutrine Plus

**\* Maybe toxic to fish at recommended treatment rates; however, precautions will be implemented to minimize the risk of fish kills.**
4. Area to which control is to be applied

Aquathol K - Up to 75 acres of slender naiad infestation. Cane Creek, 5 acres; Banks Creek, 6 acres; Rabon Creek, 30 acres; Griffin Creek, 13 acres; Coker Cove, 21 acres.  
K-TEA, Cutrine Plus - Approximately 100 acres in upper Reedy River arm.
5. Rate of control agents to be applied

Aquathol K - 0.5 - 1.5 ppm (about 3 gallons per acre depending on depth)  
K-TEA - 0.5-1.0 ppm (approx. 10 gal per acre)  
Cutrine Plus - 60 pounds per acre
6. Method of application of control agents

Aquathol K, K-Tea - Subsurface application by airboat with adjuvant.  
Cutrine Plus - Apply evenly in treatment area with granular spreader.
7. Timing and sequence of control application

Agent to be applied to slender naiad when plants are actively growing but prior to seed production.

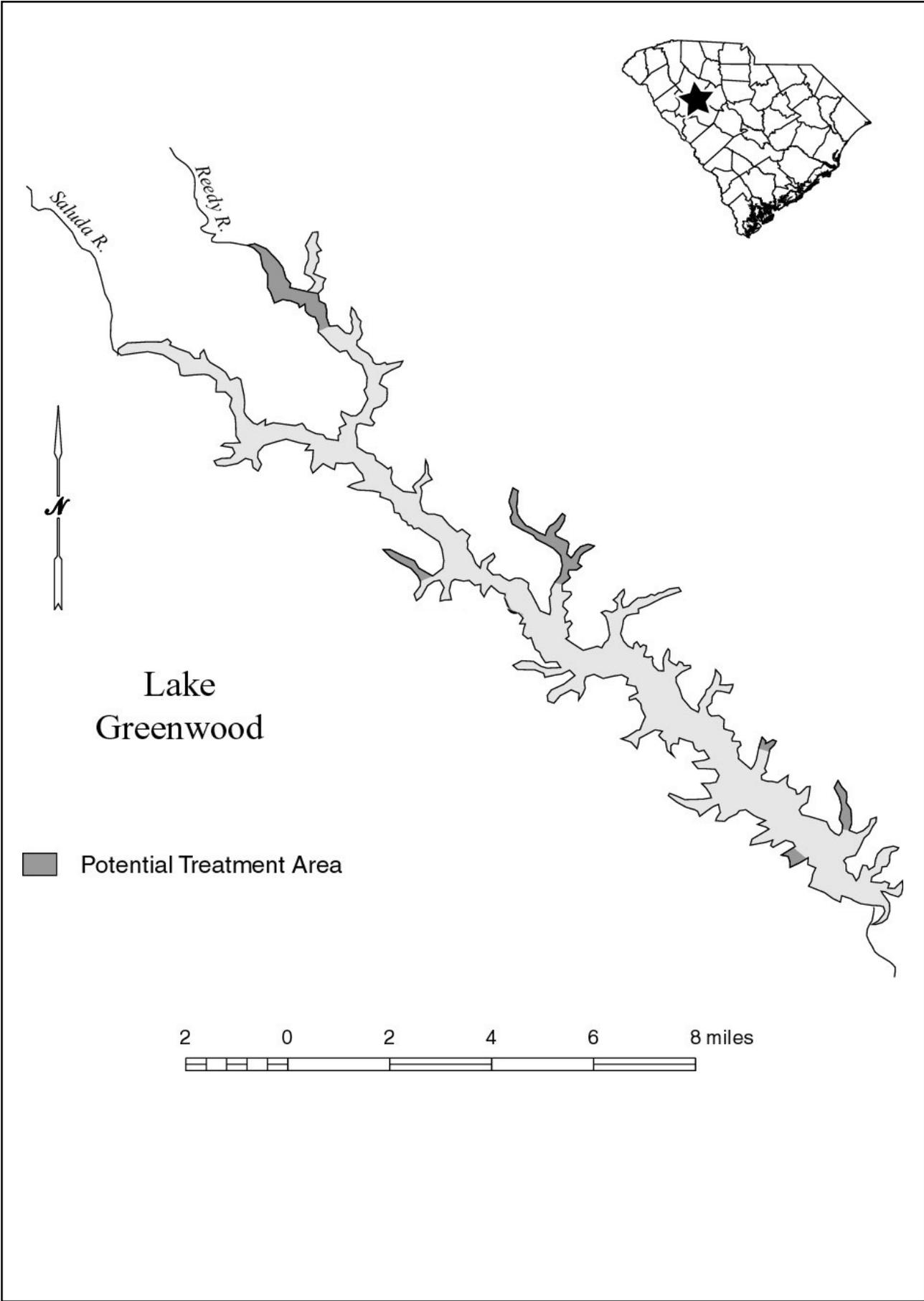
Algae treatments will be conducted at first sign of regrowth to minimize potential coverage; however, treatments will begin after May 15th to avoid peak fish spawning period.
8. Other control application specifications

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.

Pithophora will require multiple treatments.

9. Entity to apply control system  
Commercial applicator and/or Duke Power Company
10. Estimated cost of control operations  
\$39,390
11. Potential sources of funding  
Slender naiad -  
Duke Power Company (60%)  
U.S. Army Corps of Engineers (40%)  
  
Filamentous algae -  
Greenwood County (60%)  
U.S. Army Corps of Engineers (40%)
12. 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.

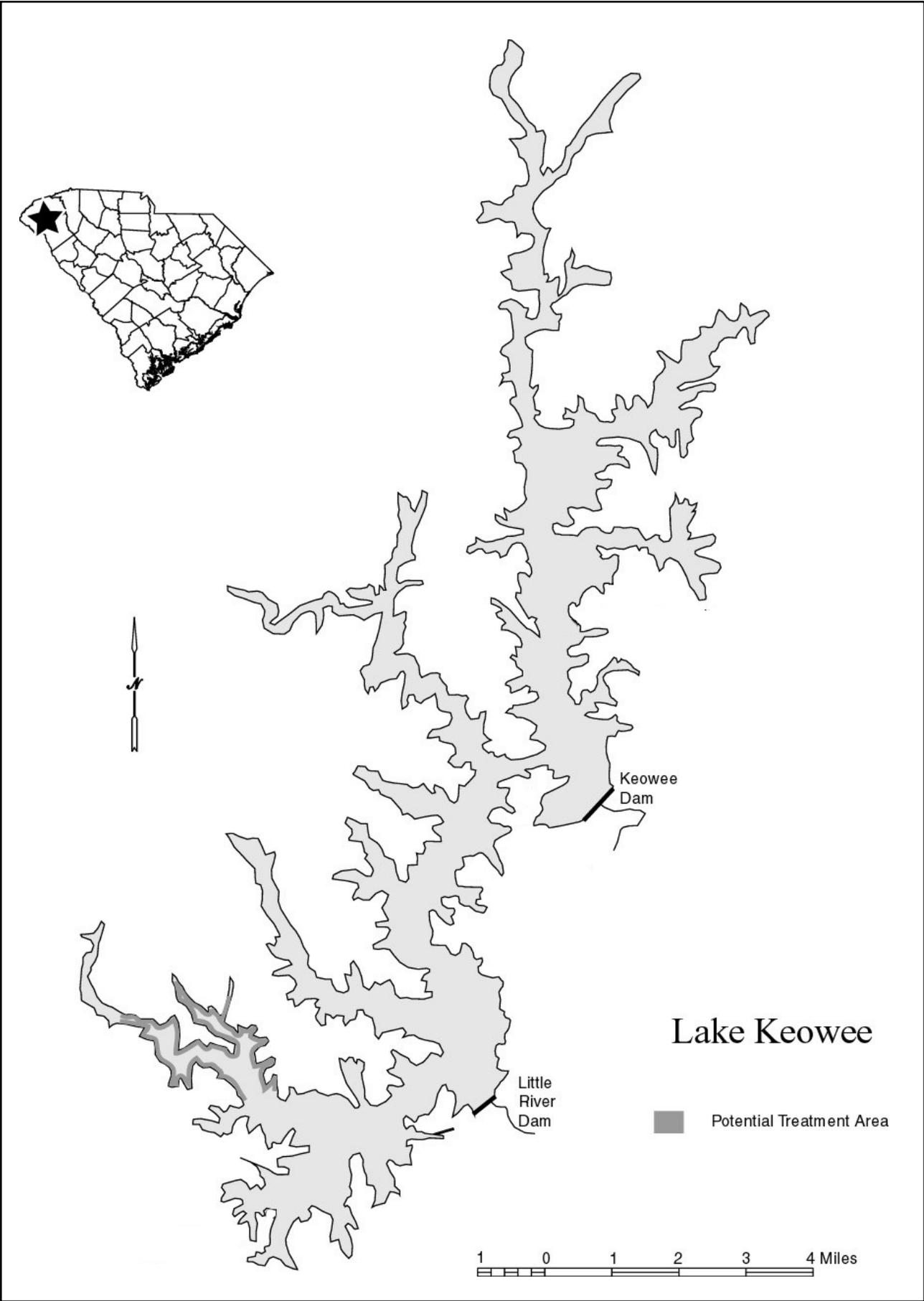


## 6. Lake Keowee

(Pickens and Oconee County)

1. Problem plant species  
Hydrilla
2. 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.
3. 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.**
4. Area to which control is to be applied  
Chelated copper - 10 acres  
Drawdown - entire lake
5. 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.
6. Method of application of control agent  
Chelated copper - subsurface injection by airboat with adjuvant.  
Drawdown - draw lake down.
7. Timing and sequence of control application  
Herbicide application - when plants are actively growing.  
Drawdown - drawdown lake from October through February.
8. 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.
9. Entity to apply control system  
Herbicide application - Commercial applicator or Duke Power Company  
Drawdown - Duke Power Company

10. Estimated cost of control operations
  - Herbicide application - \$2,215
  - Drawdown - Undetermined
  
11. Potential sources of funding
  - Duke Power Company (60%)
  - U.S. Army Corps of Engineers (40%)
  
12. 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.



## 7. Lake Marion

(Calhoun, Clarendon, and Sumter Counties)

1. Problem plant species

Hydrilla Brazilian elodea Water hyacinth Water primrose Coontail	Alligatorweed Fanwort Slender naiad Giant Cutgrass Filamentous algae (Lyngbya)
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2. Management objectives

- a. 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.
- b. 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.
- c. Reduce water hyacinth populations throughout the lake, especially in the area above the I-95 bridge, to enhance boating, fishing, hunting, and public access.
- d. Reduce giant cutgrass populations throughout the lake, especially in the Santee Cooper Wildlife Management Area and upper lake near Lowfalls landing, to enhance waterfowl habitat and hunting opportunities.
- e. 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.

3. Selected control method

<u>Problem Species</u>	<u>Control Agents</u>
Hydrilla	Aquathol K, chelated copper*, Triploid grass carp†
Brazilian elodea, Lyngbya	Reward, chelated copper*, Hydrothol 191*
Water hyacinth	Reward
Fanwort, coontail, slender naiad,	Aquathol K, Sonar, Hydrothol 191*
Water primrose, alligatorweed, giant cutgrass	Glyphosate, Arsenal (Experimental Use Permit)

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

† **Tripliod grass carp stocked in previous years substantially reduced hydrilla coverage in the main bodies of Lakes Marion and Moultrie during 1996-2001. Consequently, no additional grass carp stockings are planned for these areas in 2002. However, hydrilla populations will be carefully monitored and in the event that significant regrowth occurs during the year the Aquatic Plant Management Council may reconsider the need for additional grass carp.**

4. Area to which control is to be applied

Water hyacinth - Approximately 500 acres throughout lake but mostly in the upper lake area above I-95 bridge.

Hydrilla - Approximately 75 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 subimpoundments.

Giant Cutgrass - Approximately 150 acres along shoreline areas throughout lake system depending on availability of appropriate herbicides.

Other target species - Approximately 175 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 subimpoundments.

5. Rate of control agents to be applied

Aquathol K - 6 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  
Arsenal - 2-3 pints per acre  
Sonar - 0.075 to 0.15 ppm  
Chelated Copper- 1 ppm  
Hydrothol 191 - up to 1 ppm  
Glyphosate - up to 7.5 pints per acre.  
Tripliod grass carp - (See † footnote in Section 3 above)

6. Method of application of control agents

Aquathol K, chelated copper, Sonar, Hydrothol 191 - subsurface application by airboat or surface application by helicopter with adjuvant.  
Reward - (water hyacinths) spray on surface of foliage using handgun from airboat or by helicopter with appropriate surfactant;( submersed plants) subsurface application with adjuvant .  
Glyphosate, Arsenal - spray on surface of foliage with appropriate surfactant.  
Tripliod grass carp - (See † footnote in Section 3 above)

7. 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.  
Tripliod grass carp - (See † footnote in Section 3 above)

8. 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.

Water hyacinth 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. Frequent treatments in this area will be necessary to meet management objectives.

Arsenal to be applied under special restrictions and requirements stipulated on the experimental use permit.

9. Entity to apply control agents

S.C. Public Service Authority and/or commercial applicator.

10. 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 2002.

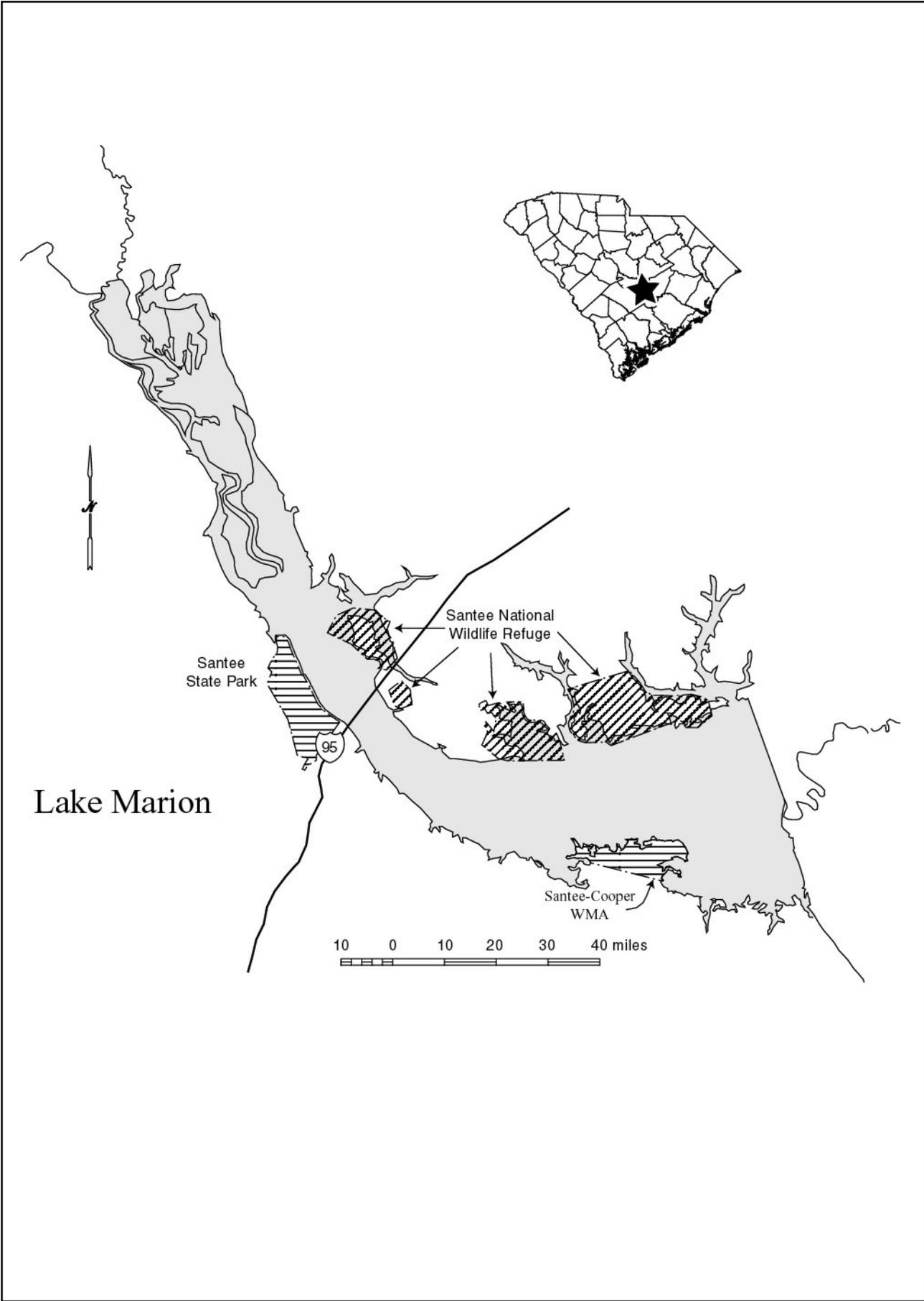
11. Potential sources of funding

S.C. Public Service Authority (60%)  
U.S. Army Corps of Engineers (40%)  
S.C. Department of Natural Resources (Dependent upon state appropriations for FY 02)

12. 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 periodic 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.



## 8. Lake Moultrie

(Berkeley County)

1. Problem plant species

Hydrilla Brazilian elodea Water primrose Fanwort Giant Cutgrass	Slender naiad Watermilfoil Alligatorweed Water hyacinth
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2. Management objectives

- a. 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.
- b. Manage hydrilla growth throughout the main lake to minimize its spread within the lake, help prevent its spread to adjacent public waters, and minimize adverse impacts to electric power generation, municipal water withdrawals, and public use and access.
- c. Reduce water hyacinth populations throughout the lake to enhance boating, fishing, hunting, and public access.
- d. Reduce giant cutgrass populations throughout the lake to enhance waterfowl habitat and hunting opportunities.
- e. 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.

3. Selected control method

<u>Problem Species</u>	<u>Control Agents</u>
Hydrilla	Aquathol K, chelated copper*, Sonar, Triploid grass carp†
Brazilian elodea	Reward, chelated copper*, Sonar,
Water hyacinth	Reward
Fanwort, slender naiad, watermilfoil	Aquathol K, Sonar, Hydrothol 191*
Water primrose, alligatorweed giant cutgrass	Glyphosate, Arsenal (Experimental Use Permit)

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

- † **Triploid grass carp stocked in previous years substantially reduced hydrilla coverage in the main bodies of Lakes Marion and Moultrie during 1996-2001. Consequently, no additional grass carp stockings are planned for these areas in 2002. However, hydrilla populations will be carefully monitored and in the event that significant regrowth occurs during the year the Aquatic Plant Management Council may reconsider the need for additional grass carp.**
4. Area to which control is to be applied
- Hydrilla, fanwort, watermilfoil - Approximately 25 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.
- Giant cutgrass, water primrose, alligatorweed - Approximately 125 acres along shoreline areas throughout the lake.
5. Rate of control agents to be applied
- Aquathol K - 6 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  
 Arsenal - 2-3 pints per acre  
 Sonar - 0.075 to 0.15 ppm in treatment area  
 Chelated copper - 1 ppm  
 Hydrothol 191 - up to 1 ppm  
 Glyphosate- up to 7.5 pints per acre.  
 Other approved aquatic herbicides - as per label instructions.  
 Triploid grass carp - (See † footnote in Section 3 above)
6. Method of application of control agents
- Aquathol K, chelated copper, Sonar, Hydrothol 191 - subsurface application by airboat or surface application by helicopter with adjuvant.  
 Reward - (water hyacinths) spray on surface of foliage using handgun from airboat or by helicopter with appropriate surfactant;( submersed plants) subsurface application with adjuvant .  
 Glyphosate, Arsenal - spray on surface of foliage with appropriate surfactant.  
 Triploid grass carp - (See † footnote in Section 3 above)
7. 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.
- Triploid grass carp - (See † footnote in Section 3 above)
8. 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.

Arsenal to be applied under special restrictions and requirements stipulated on the experimental use permit.

9. Entity to apply control agent  
S.C. Public Service Authority and/or commercial applicator

10. Estimated cost of control operations  
\$22,500

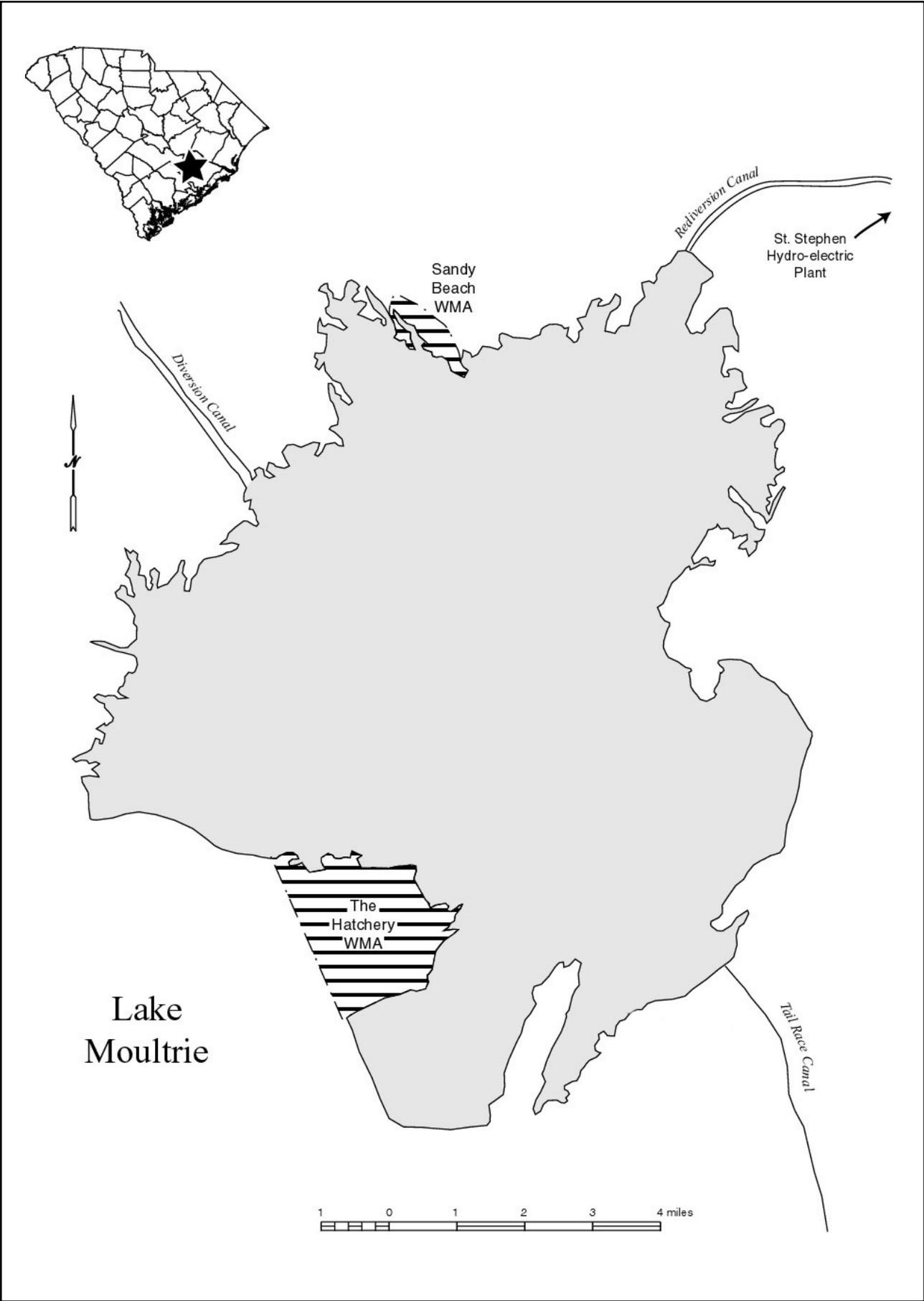
**Note:** The budgeted amount is based on aquatic plant coverage and treatment needs from previous years. Actual expenditures will depend on the extent of noxious aquatic plant growth in 2002.

11. Potential sources of funding  
S.C. Public Service Authority (60%)  
U.S. Army Corps of Engineers (40%)  
S.C. Department of Natural Resources (Dependent upon state appropriations for FY 02)

12. 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 periodic 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.



## 9. Lake Murray

(Lexington, Newberry, Richland and Saluda Counties)

### 1. Problem plant species

Hydrilla

Illinois pondweed

### 2. Management objectives

- a. 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 drinking water withdrawals and public use and access.
- b. Reduce Illinois pondweed around developed shoreline areas.
- c. Foster a diverse aquatic plant community through selective treatment of hydrilla (to avoid impacts to existing non-invasive plant species) and the introduction of desirable native plant species.

### 3. Selected control method

- a. Aquatic herbicide: chelated copper
- b. Drawdown

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

### 4. Area to which control is to be applied

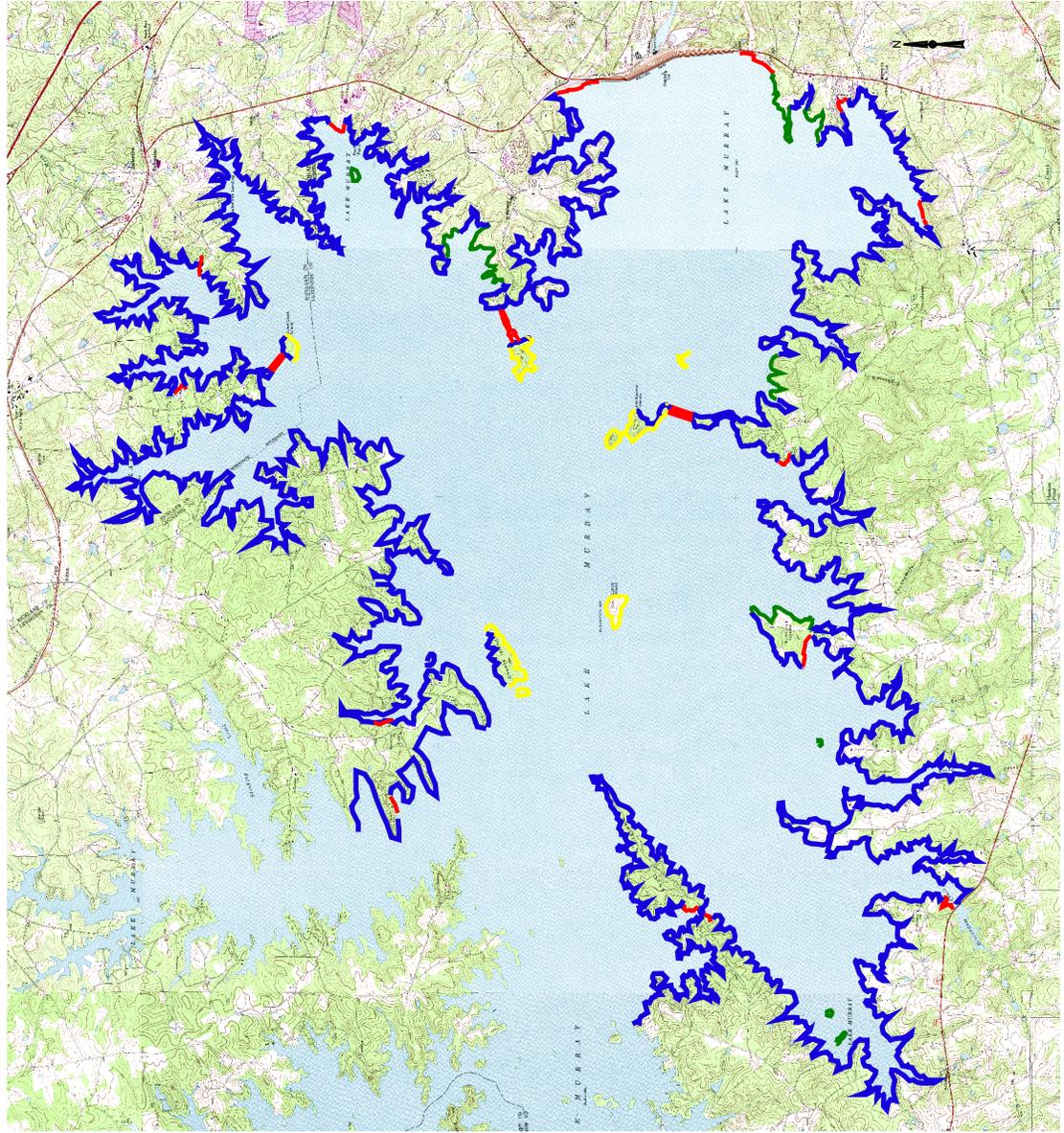
Aquatic herbicide:

Approximately, 1000 acres of hydrilla throughout the lake in order of priority as indicated on the Priority Areas map and the abundance of growth within a priority area. Highest priority areas include public access sites (parks, swimming areas, boat ramps), municipal water intake sites, and commercial landings used by the public. Secondary priority areas include developed shoreline and high recreational use islands. Treatment of undeveloped mainland shorelines and undeveloped islands will be limited to narrow boat access channels and small portions of the islands used for camping. The order of treatment within a priority area will depend on the extent of hydrilla growth and environmental conditions at the time of treatment.

Approximately 200 acres of Illinois pondweed in developed shoreline areas only

Drawdown: Entire lake between 358-foot contour and 345-foot contour.

# Lake Murray Priority Treatment Areas 2001



## Priority

1. Lake Access & Utility Withdrawals
2. Developed Shoreline & High Recreational Use Islands
3. Undeveloped Shoreline
4. Undeveloped Islands

### Note:

The full extent of hydrilla coverage is not known at this time, therefore specific treatment areas cannot be identified. However, if hydrilla is found and is sufficiently close to the surface to treat, the highest priority areas will be treated first followed in turn by lower ranked areas. The location of priority areas will be periodically reviewed and modified as necessary to reflect changes in lake use and development.



Aquatic Nuisance Species Program  
Land, Water & Conservation Division  
March, 2001

5. Rate of control agent to be applied

Aquatic herbicide: Hydrilla - Chelated copper - 0.8 ppm (about 16 gallons per acre).  
Illinois Pondweed - Clearigate - 0.5 - 1.0 ppm (5-8 gallons per acre)

Drawdown: Draw down lake to 345 feet by first week in October, 2002.

6. Method of application of control agent

Aquatic herbicide: Chelated copper - Subsurface injection by airboat with adjuvant.

Drawdown: SCE&G will be requested to lower lake levels.

7. Timing and sequence of control application

Aquatic herbicide: Hydrilla treatments are to be conducted during summer and fall months when plants are actively growing. Summer treatments will be limited to sites with greatest water use impacts. Most treatments are planned for October through November when lake levels are typically lowest and water temperatures are above 60 degrees F. Retreatment of heavily infested areas may be necessary to meet management objectives. Illinois pondweed treatments to be conducted during the spring and summer months before seed production.

Drawdown: The rate of drawdown will be determined by SCE&G based on a variety of factors including inflow, electric power demand, and downstream water quality. In general, lake levels will begin to steadily decline in July and reach 345 feet by the first week in October.

8. Other control application specifications

Aquatic herbicide: Herbicide applications are to be conducted in a manner that will not significantly degrade water quality. This may require partial treatment of target areas at any one time. All applications are to be conducted in coordination with and approval the S.C. Department of Health and Environmental Control.

Drawdown: Lake level drawdown will occur in a manner that will not significantly degrade water quality in the Saluda River downstream of the dam. This may require monitoring intake water and timing releases to optimize dissolved oxygen levels in the lake.

9. Entity to apply control agent

Aquatic herbicide: Commercial applicator

Water level fluctuation: South Carolina Electric and Gas Company

10. Estimated cost of control operations

Aquatic herbicide applications: \$265,774

Drawdown: Undetermined

11. Potential sources of funding

S.C. Electric and Gas Company/Lexington/Richland Counties (60%)

U.S. Army Corps of Engineers (40%)

S.C. Department of Natural Resources (Dependent upon State appropriations for FY 02)

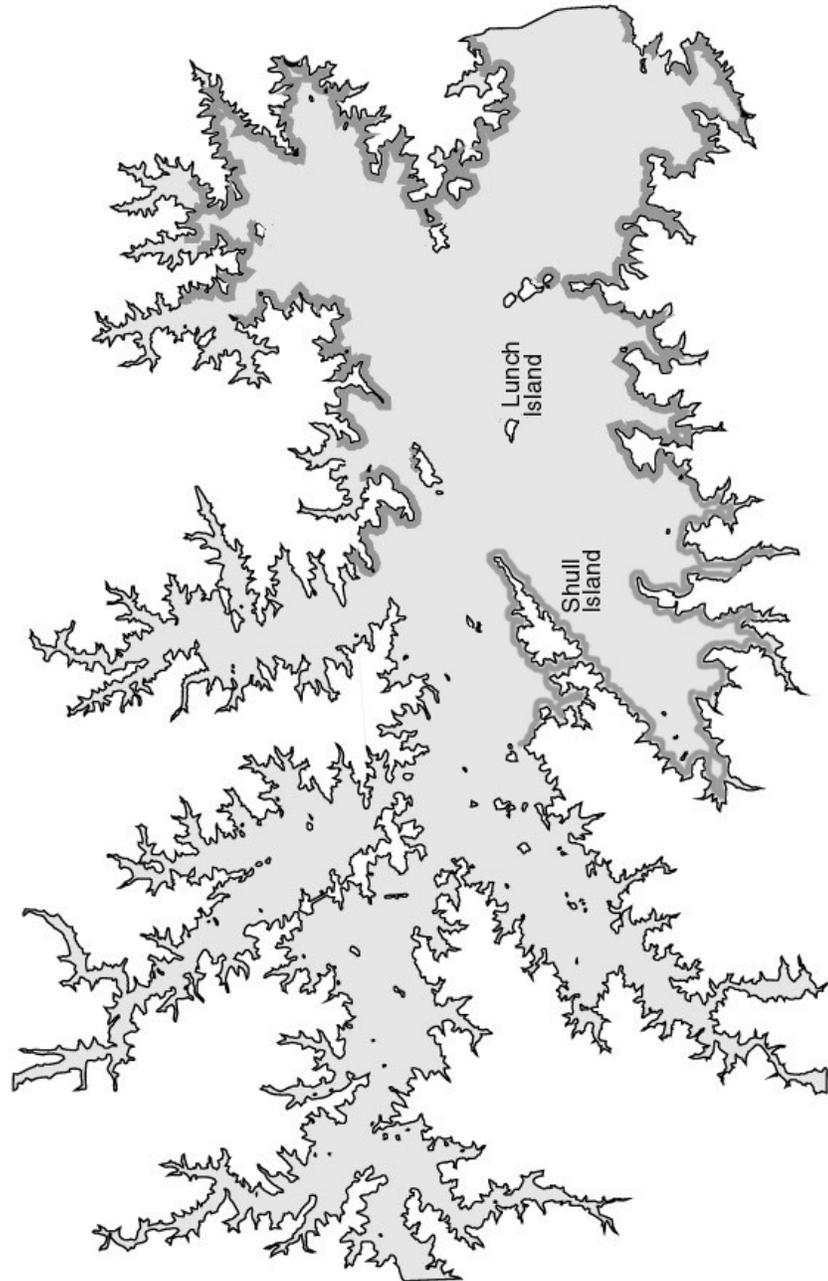
12. Long term management strategy

- 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 development and maintenance of a Lake Murray Aquatic Plant Management web site. The web site would include up-to-date information on annual management plans, dates and locations of current and historical control operations, locations of habitat enhancement activities, and current lake level information.
- e. Periodically revise the management strategy and specific control sites as new environmental data, control agents and techniques, and public use patterns become available.

# Lake Murray



Potential Treatment Areas



## **10. Lake Wateree**

(Fairfield, Kershaw and Lancaster Counties)

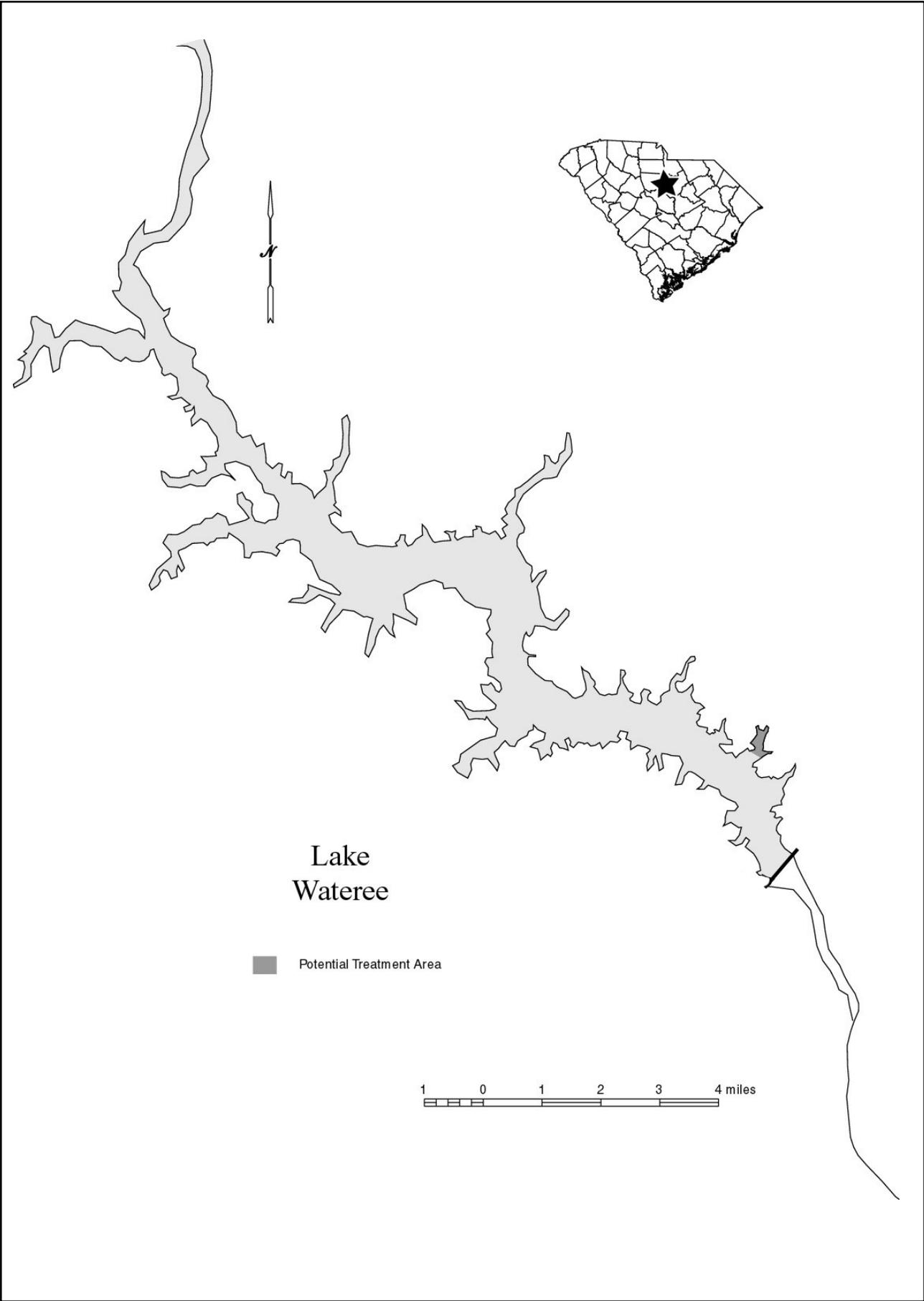
1. Problem plant species  
Hydrilla
2. Management objective  
Keep hydrilla growth suppressed to prevent its spread within the lake, help prevent its spread to adjacent public water, and minimize adverse impacts to water use activities.
3. Selected control method  
Aquathol K  
Fall/winter water level drawdown
4. Area to which control is to be applied  
Aquathol K - At least 2 acres in cove near Lakeside Marina.  
Drawdown - Entire lake
5. 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.
6. Method of application of control agent  
Aquathol K - Subsurface injection from airboat with adjuvant.  
Drawdown - Draw lake down
7. 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.
8. 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.
9. Entity to apply control agent  
Herbicide application - Commercial applicator or Duke Power Company  
Drawdown - Duke Power Company
10. Estimated cost of control operations  
Herbicide application - \$826  
Drawdown - Undetermined

11. Potential sources of funding

Duke Power Company (60%)  
U.S. Army Corps of Engineers (40%)

12. 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.

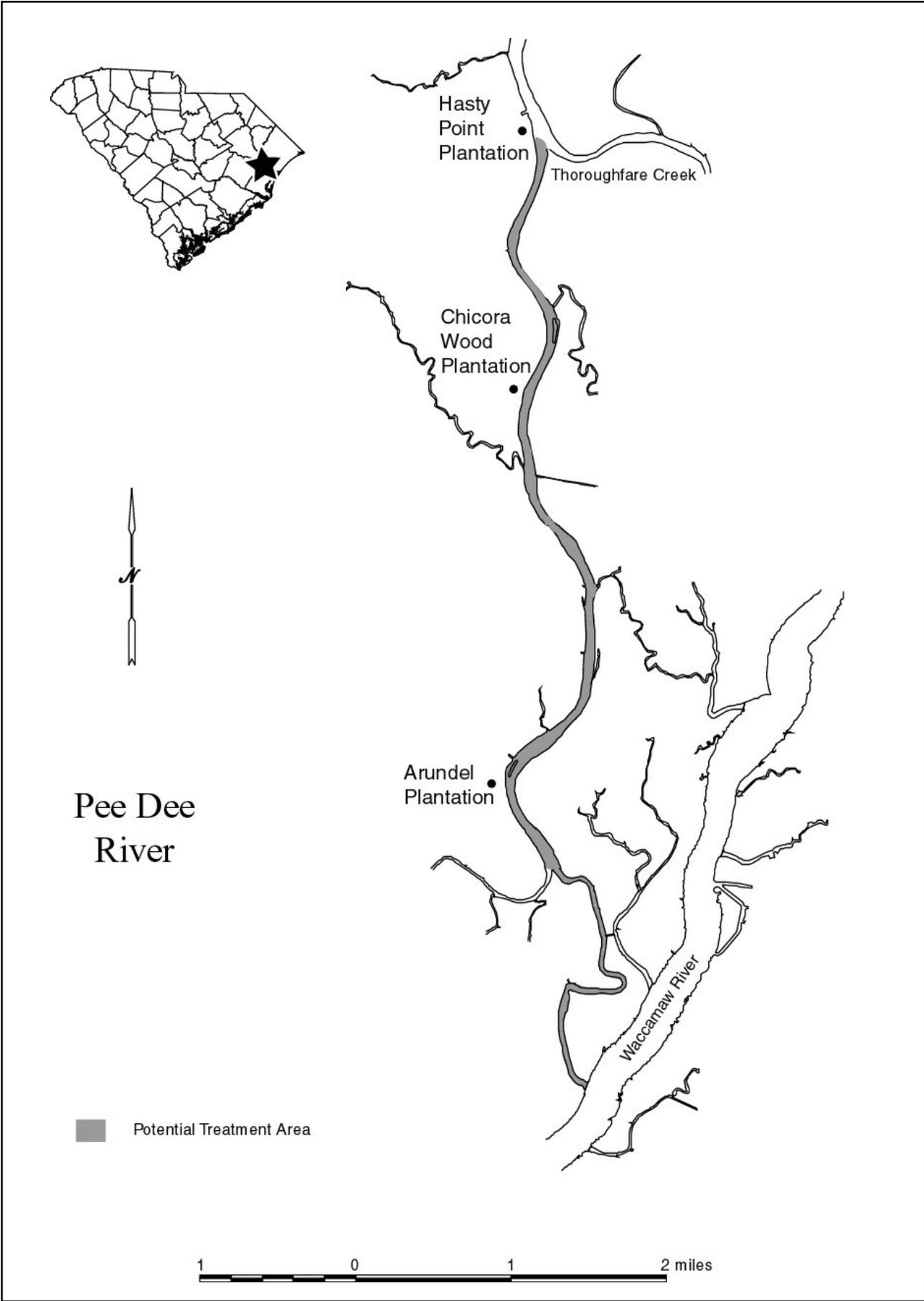


## 11. Pee Dee River

(Georgetown County)

1. Problem plant species  
Water hyacinth
2. Management objective  
Reduce water hyacinth populations to the greatest extent possible throughout river system.
3. Selected control method  
Reward
4. Area to which control is to be applied  
50 acres of water hyacinth throughout river and adjacent public ricefields.
5. Rate of control agent to be applied  
0.5 gallons per acre.
6. Method of application of control agent  
Spray on surface of foliage with appropriate surfactant.
7. Timing and sequence of control application  
Reward to be applied periodically to water hyacinth from May through October.
8. Other control application specifications  
None
9. Entity to apply control agent  
Commercial applicator
10. Estimated cost of control operations  
\$4,245
11. Potential sources of funding  
Georgetown County (60%)  
U.S. Army Corps of Engineers (40%)  
S.C. Department of Natural Resources (Dependent upon state appropriations for FY 02)
12. 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.



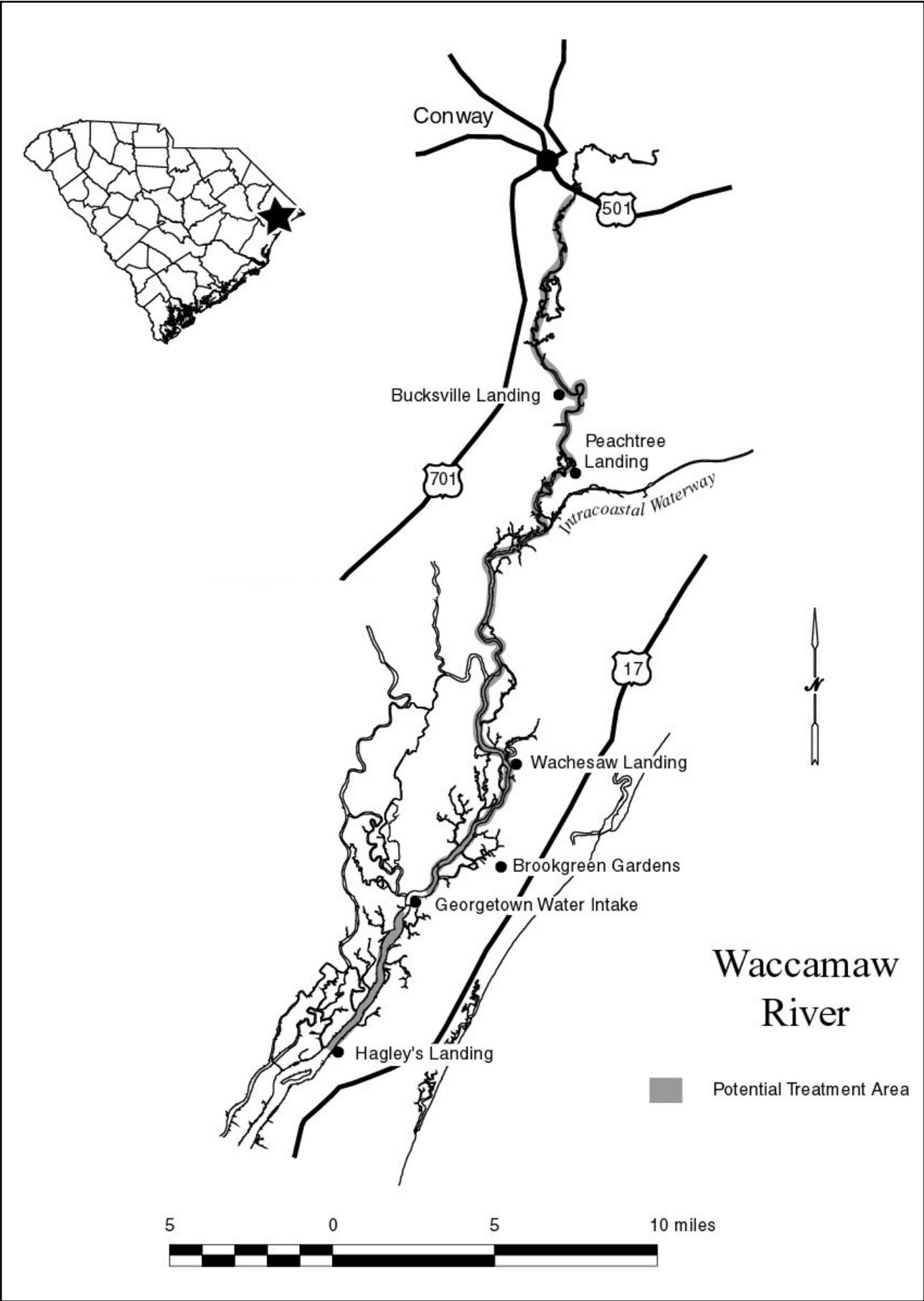
## 12. Waccamaw River

(Horry and Georgetown Counties)

1. Problem plant species  
Water hyacinth
2. Management objective  
Reduce water hyacinth populations to the greatest extent possible throughout the river system.
3. Selected control method  
Reward
4. Area to which control is to be applied  
50 acres throughout river system where needed.
5. Rate of control agent to be applied  
0.5 gallons per acre
6. Method of application of control agent  
Spray on surface of foliage with appropriate surfactant
7. Timing and sequence of control application  
Reward to be applied to water hyacinth periodically from late May through November.
8. Other control application specifications  
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.
9. Entity to apply control agent  
Commercial applicator
10. Estimated cost of control operations  
\$4,245
11. Potential sources of funding  
Horry and Georgetown Counties (60%)  
U.S. Army Corps of Engineers (40%)

12. 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.

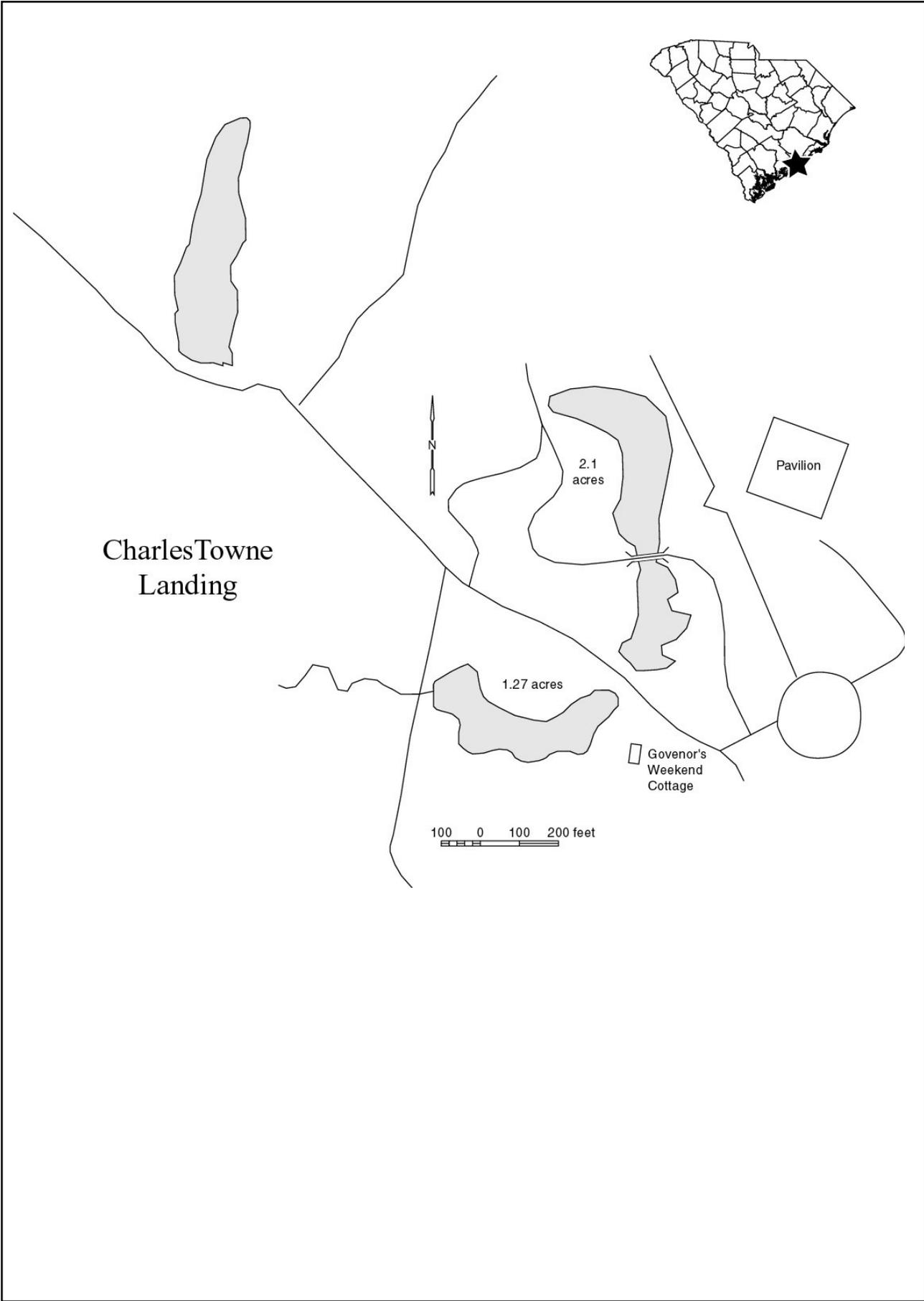


## 13. Charles Towne Landing State Park

(Charleston County)

1. Problem plant species  
Duckweed
2. Management objective  
Reduce or remove problem plants to allow bank fishing and improve aesthetics.
3. Selected control method  
Fluridone
4. Area to which control is to be applied  
5 acres of duckweed
5. Rate of control agents to be applied  
One pint per acre
6. Method of application of control agents  
Apply subsurface throughout lake
7. Timing and sequence of control application.  
Treat when plants are actively growing.
8. Other control application specifications  
None
9. Entity to apply control agent  
Commercial applicator contracted and monitored by SCPRT.
10. Estimated cost of control operations  
\$1,078
11. Potential sources of funding  
S.C. Department of Parks, Recreation and Tourism (100%)
12. 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.

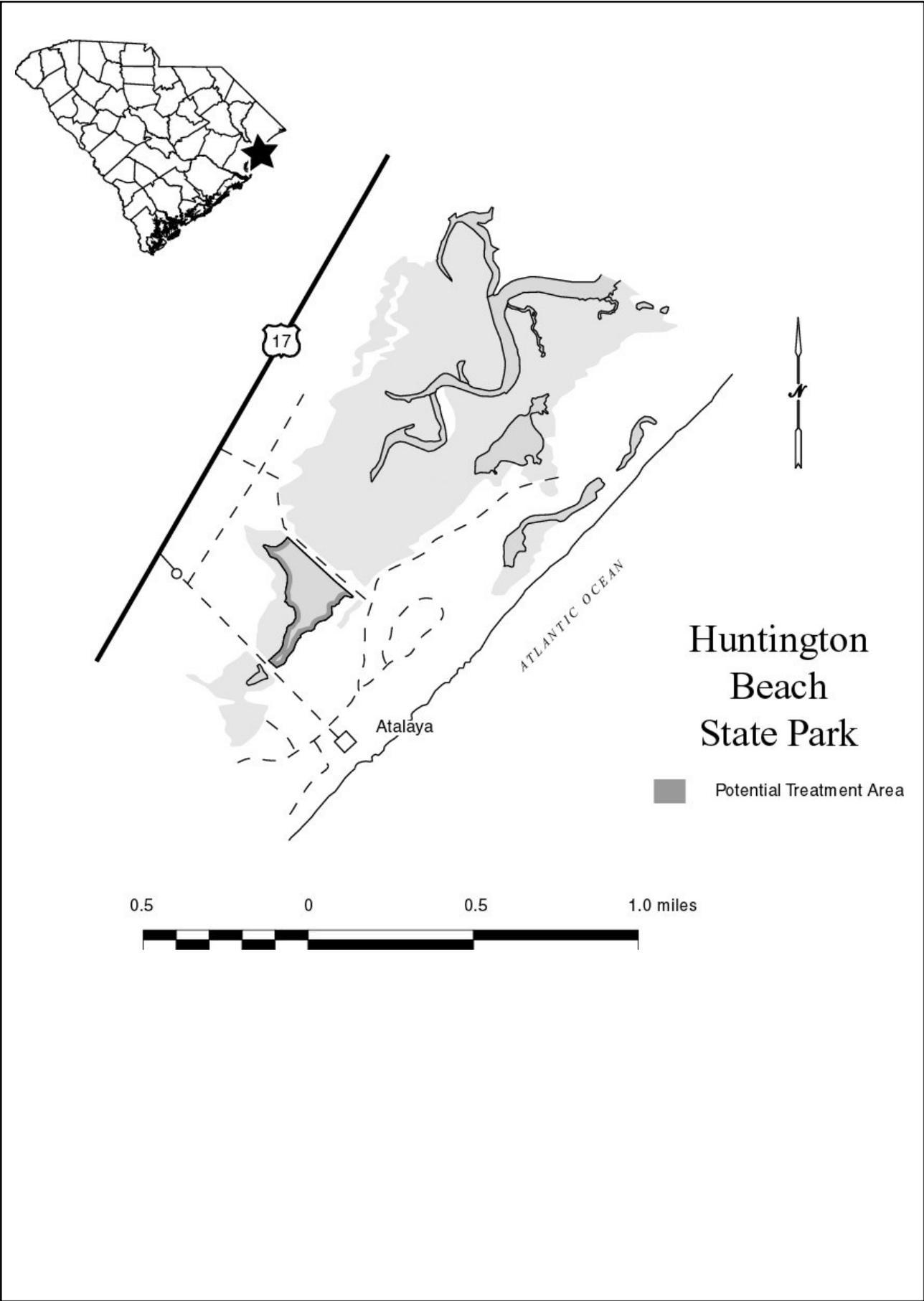


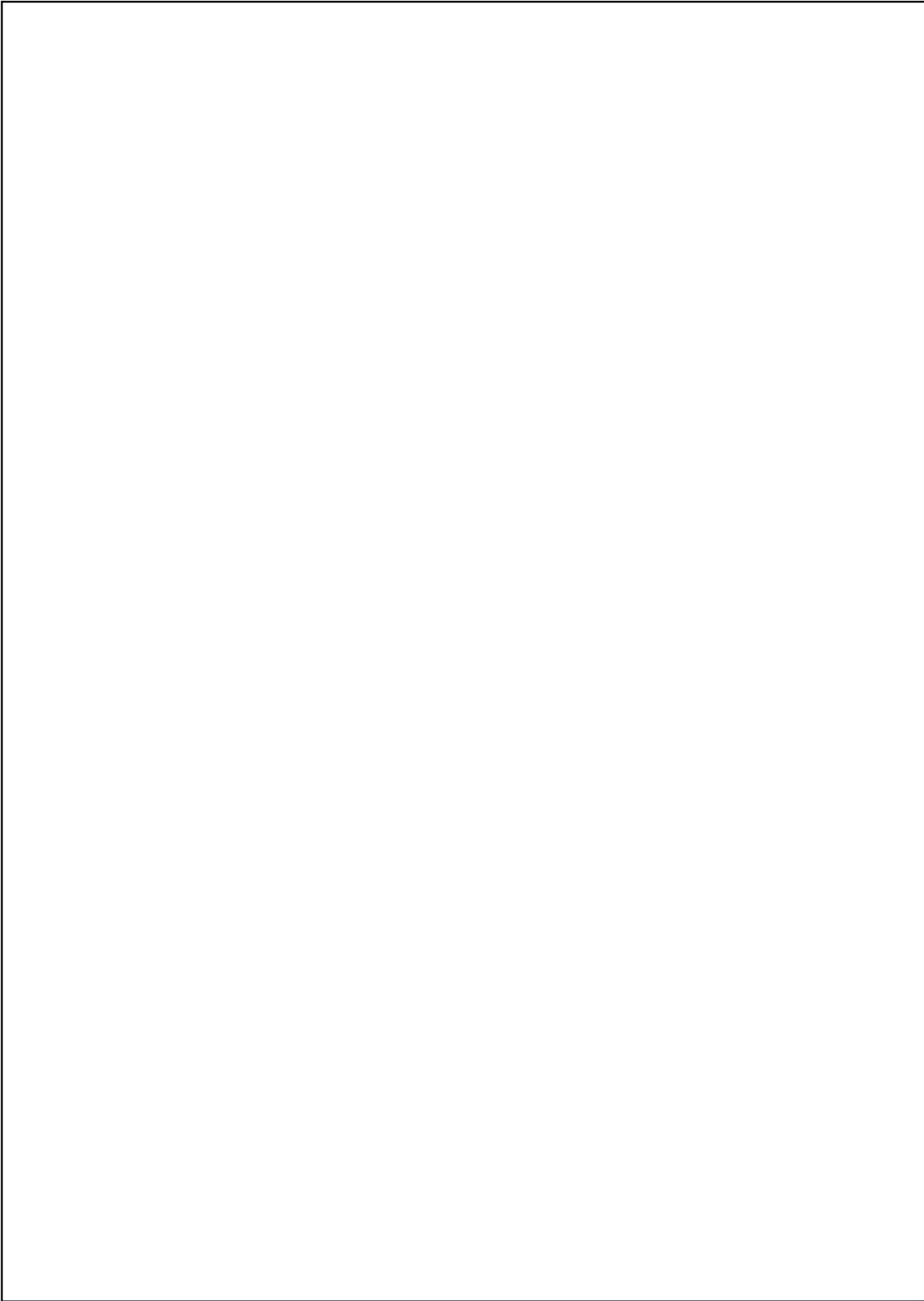
## 14. Huntington Beach State Park

(Georgetown County)

1. Problem plant species
  - Cattails
  - Phragmites
2. Management objective
  - Reduce or remove problem plants to enhance waterfowl use, public wildlife observations, fishing, and outdoor environmental education opportunities.
3. Selected control method
  - Glyphosate
4. Area to which control is to be applied
  - 10 acres
5. Rate of control agents to be applied
  - 7.5 pints per acre.
6. Method of application of control agents
  - Apply herbicide by surface spray.
7. Timing and sequence of control application
  - Apply when plants are actively growing.
8. Other control application specifications
  - None
9. Entity to apply control agent
  - Commercial applicator contracted and monitored by SCPRT.
10. Estimated cost of control operations
  - \$2,028
11. Potential sources of funding
  - S.C. Department of Parks, Recreation and Tourism (100%)
12. 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.





### Summary of Planned Management Operation Expenditures For 2002

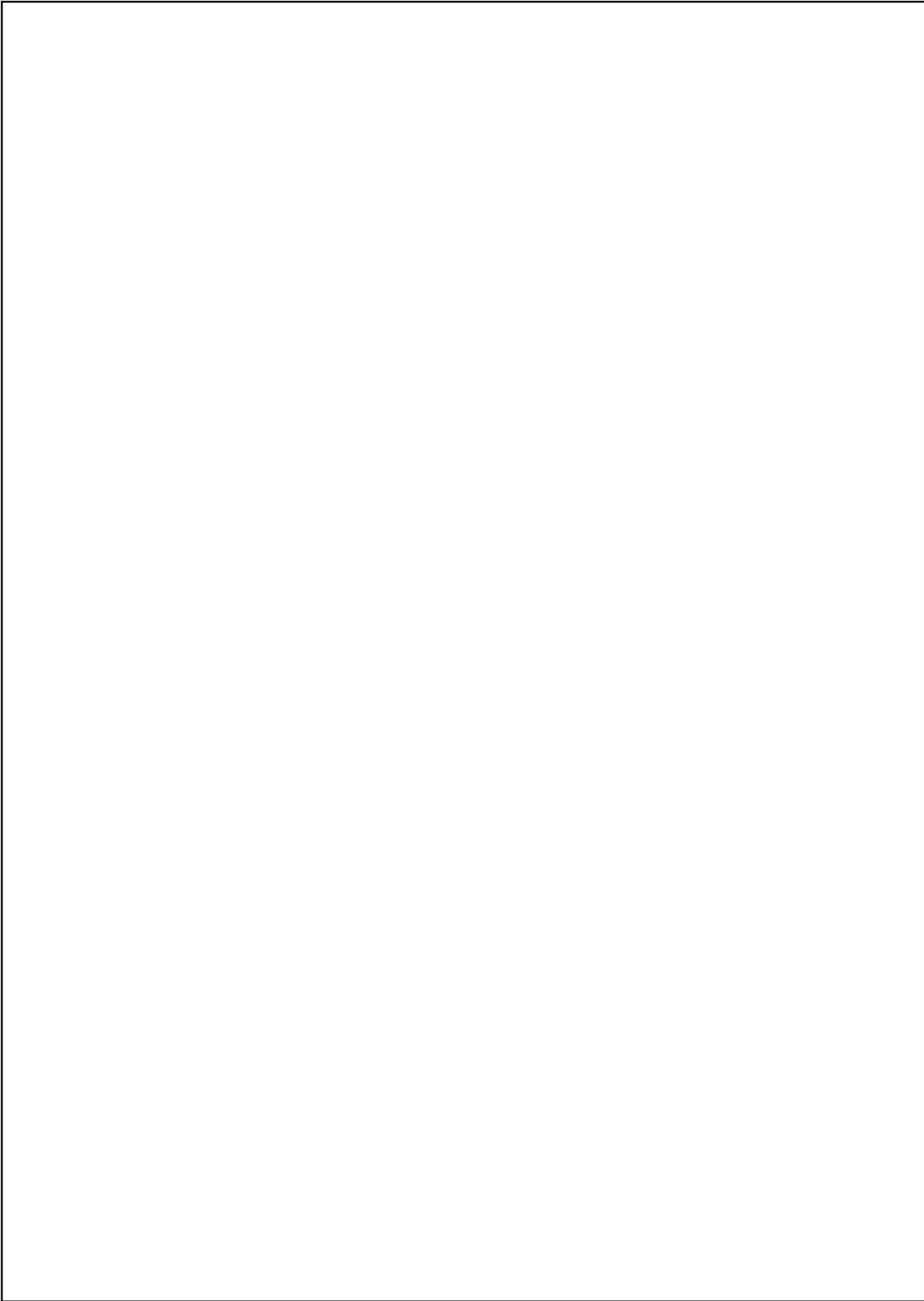
Water Body Name	Total Cost	Federal	State**	Local	Local Sponsor
1 Ashepoo River	\$2,122	\$849	\$0	\$1,273	Colleton Co.
2 Back River Reservoir	\$112,954	\$45,182	\$0	\$67,772	CPW/SCE&G/ USNWB
3 Cooper River	\$29,638	\$11,855	\$0	\$17,783	Berkeley County
4 Goose Creek Reservoir	\$11,656	\$4,662	\$0	\$6,994	CPW
5 Lake Greenwood	\$39,390	\$15,756	\$0	\$23,634	Duke Power/Green wood/Laurens
6 Lake Keowee	\$2,215	\$886	\$0	\$1,329	Duke Power Co.
7 Lake Marion*	\$135,000	\$54,000	\$0	\$81,000	Santee Cooper
8 Lake Moultrie*	\$22,500	\$9,000	\$0	\$13,500	Santee Cooper
9 Lake Murray	\$265,774	\$106,310	\$0	\$159,464	SCE&G/Lexington/ Rich. Co.
10 Lake Wateree	\$826	\$330	\$0	\$496	Duke Power Co.
11 Pee Dee River	\$4,245	\$1,698	\$0	\$2,547	Georgetown Co.
12 Wacamaw River	\$4,245	\$1,698	\$0	\$2,547	Horry Co.
13 Charles Towne Landing St. Pk.	\$1,078	\$0	\$0	\$1,078	SCPRT
14 Huntington Beach St. Pk.	\$2,028	\$0	\$0	\$2,028	SCPRT
<b>TOTAL</b>	<b>\$633,671</b>	<b>\$252,226</b>	<b>\$0</b>	<b>\$381,445</b>	

**NOTE:**

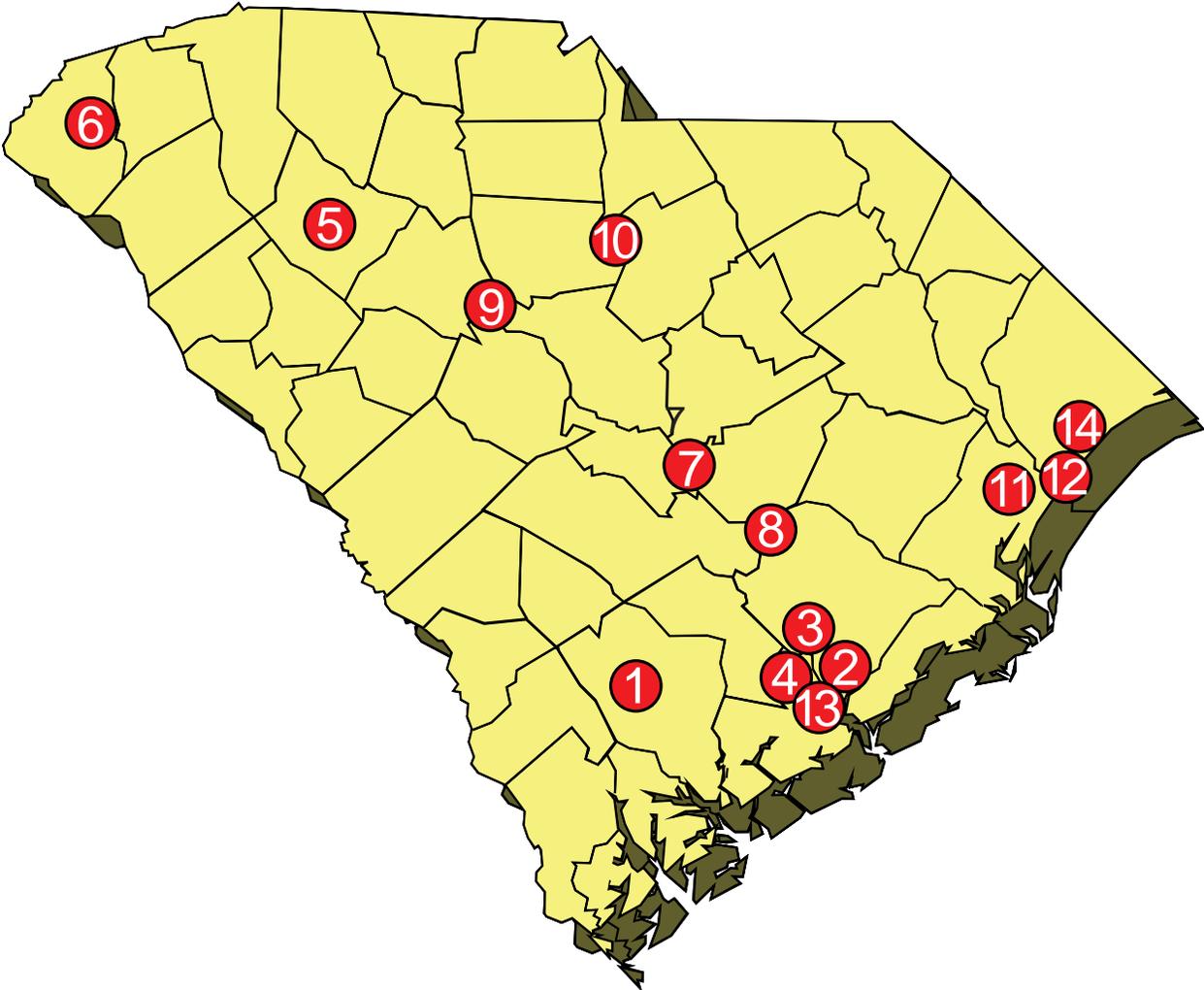
Planned expenditures are based on anticipated aquatic plant problems.  
The extent of proposed management operations will be modified  
depending on actual aquatic plant growth and funding availability in 2002.

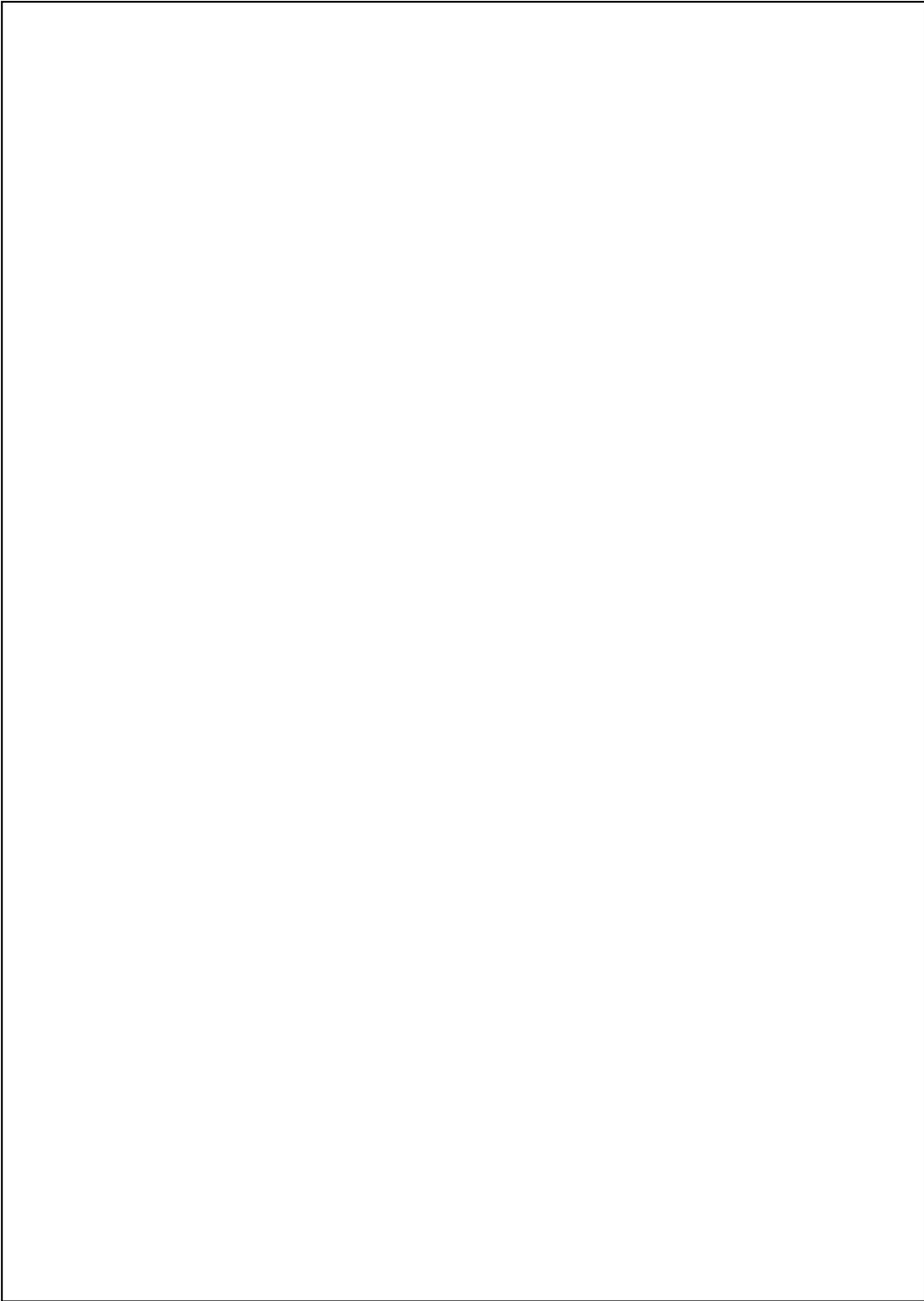
\* Control operations on Lakes Marion and Moultrie may receive federal funds from the Corps of Engineers St. Stephen Plant if control activities are directly related to maintaining operation of the St. Stephen Hydropower Facility. Those funds should be used whenever possible instead of APC cost-share funds from the Charleston District.

\*\* State appropriated funds may be used for operations after July 1 if received in FY 03.

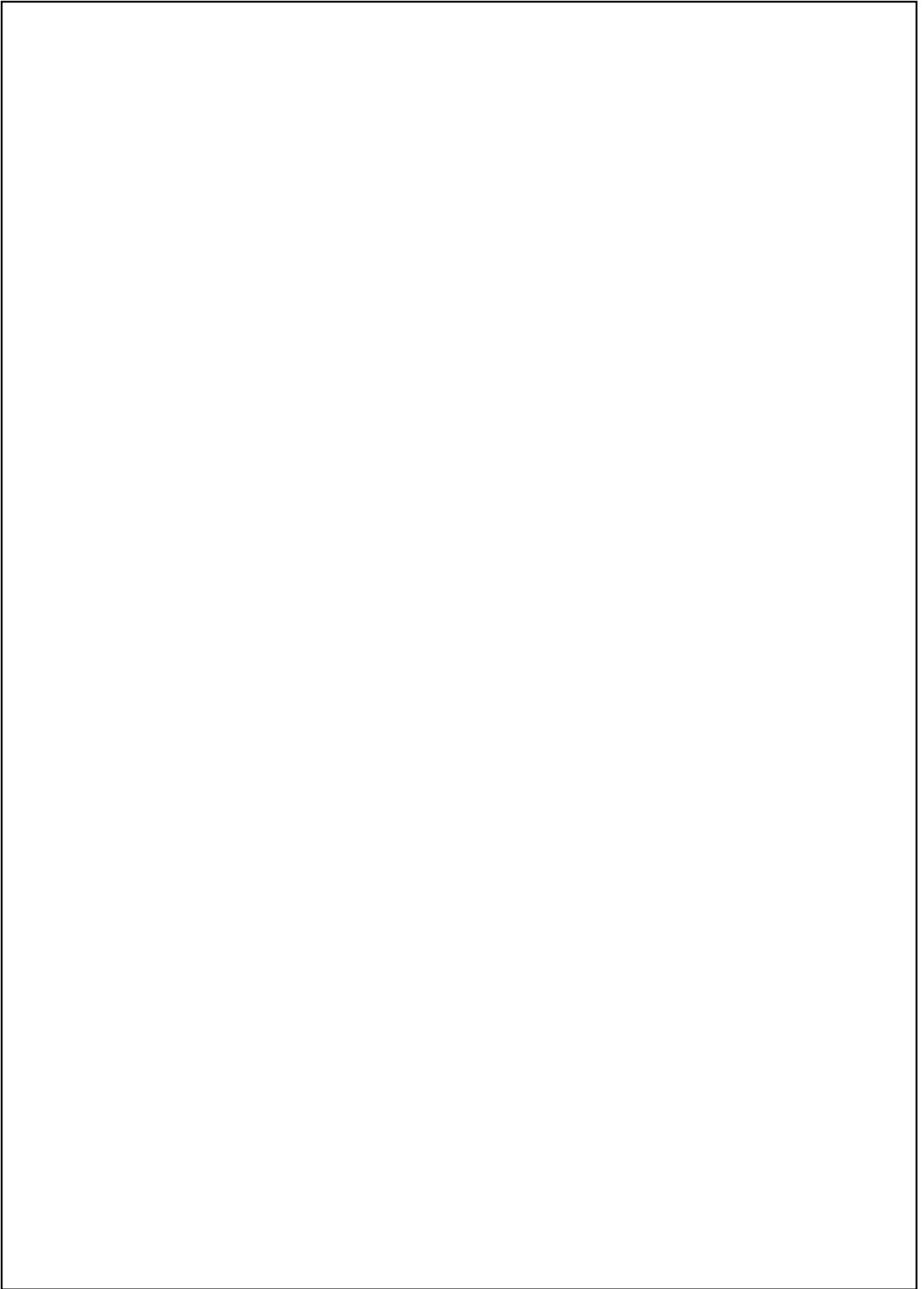


# Location of 2002 Management Sites





# Appendices



**APPENDIX A**

**Major River Basins and Sub-basins**

**in South Carolina**

**APPENDIX B**

**Enabling Legislation**

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

# **Title 49 – Waters, Water Resources and Drainage**

## **CHAPTER 6. AQUATIC PLANT MANAGEMENT**

### **SECTION 49-6-10.** 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:

1. 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.

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

3. 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.

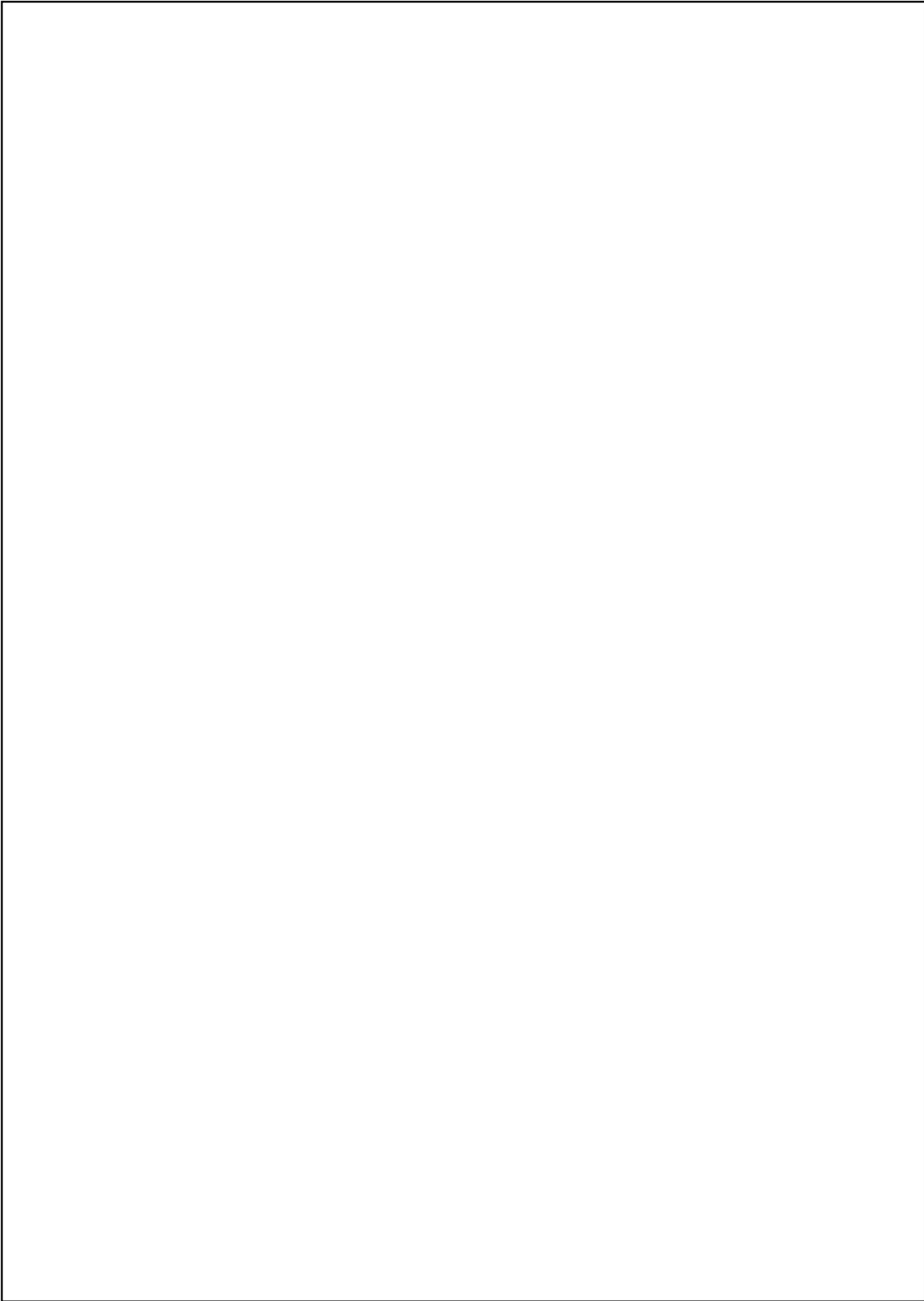
**SECTION 49-6-40.** Aquatic Plant Management Plan.

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.

**APPENDIX C**

**Aquatic Plant Problem Identification Form**



## Aquatic Plant Problem Site Identification

1. Name and location of affected water body \_\_\_\_\_  
\_\_\_\_\_.
2. Public or private water \_\_\_\_\_  
\_\_\_\_\_.
3. Name of problem plant (if known) \_\_\_\_\_  
\_\_\_\_\_.
4. Does the plant grow above or below the surface of the water? \_\_\_\_\_  
\_\_\_\_\_.
5. Approximate area of water covered by the problem plant \_\_\_\_\_  
\_\_\_\_\_.
6. Type of water use(s) affected by the plant \_\_\_\_\_  
\_\_\_\_\_.
7. Length of time problem has existed \_\_\_\_\_  
\_\_\_\_\_.
8. Plant control methods that have been used \_\_\_\_\_  
\_\_\_\_\_.

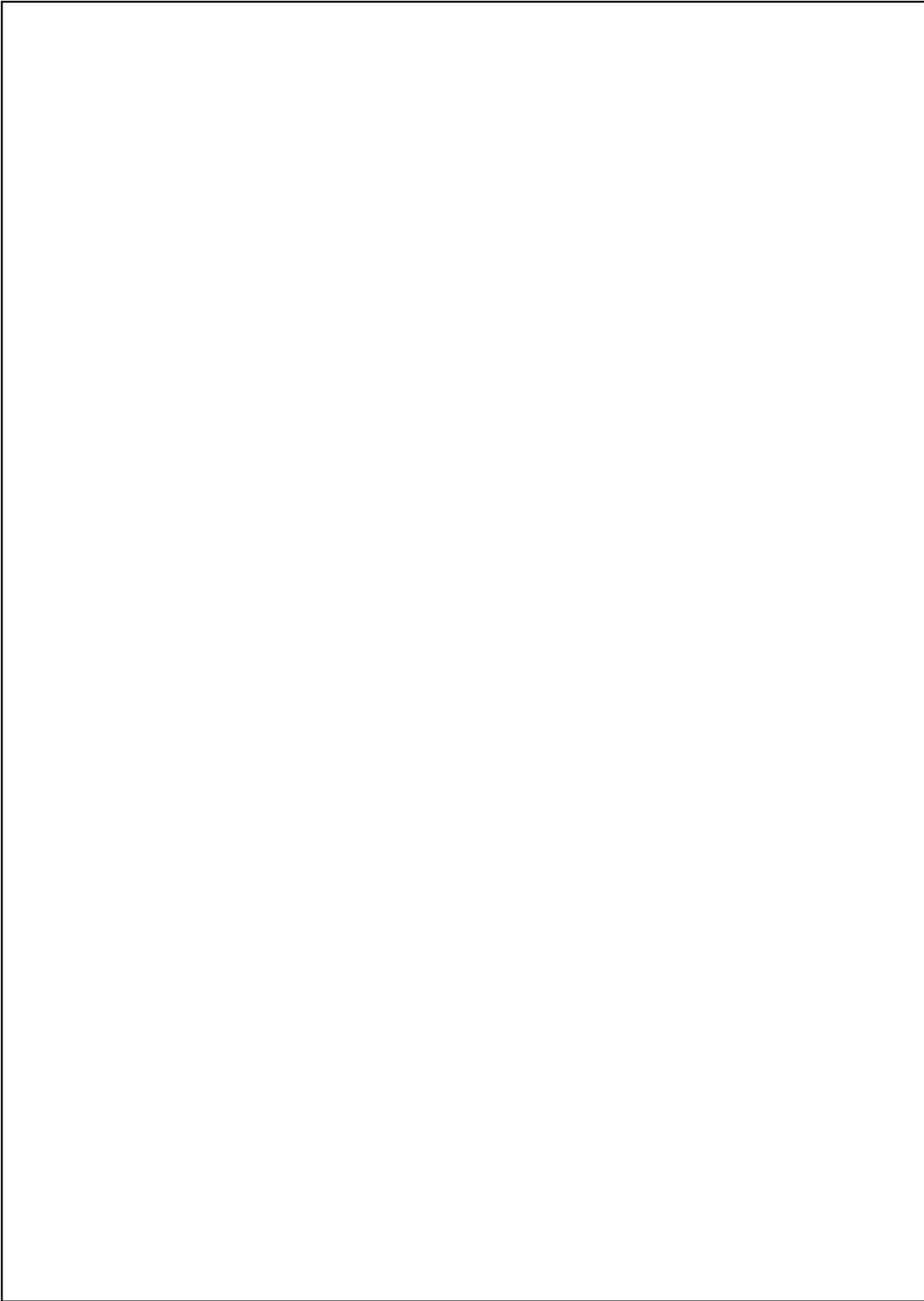
9. Contact for additional information:

Name \_\_\_\_\_

Address \_\_\_\_\_  
\_\_\_\_\_

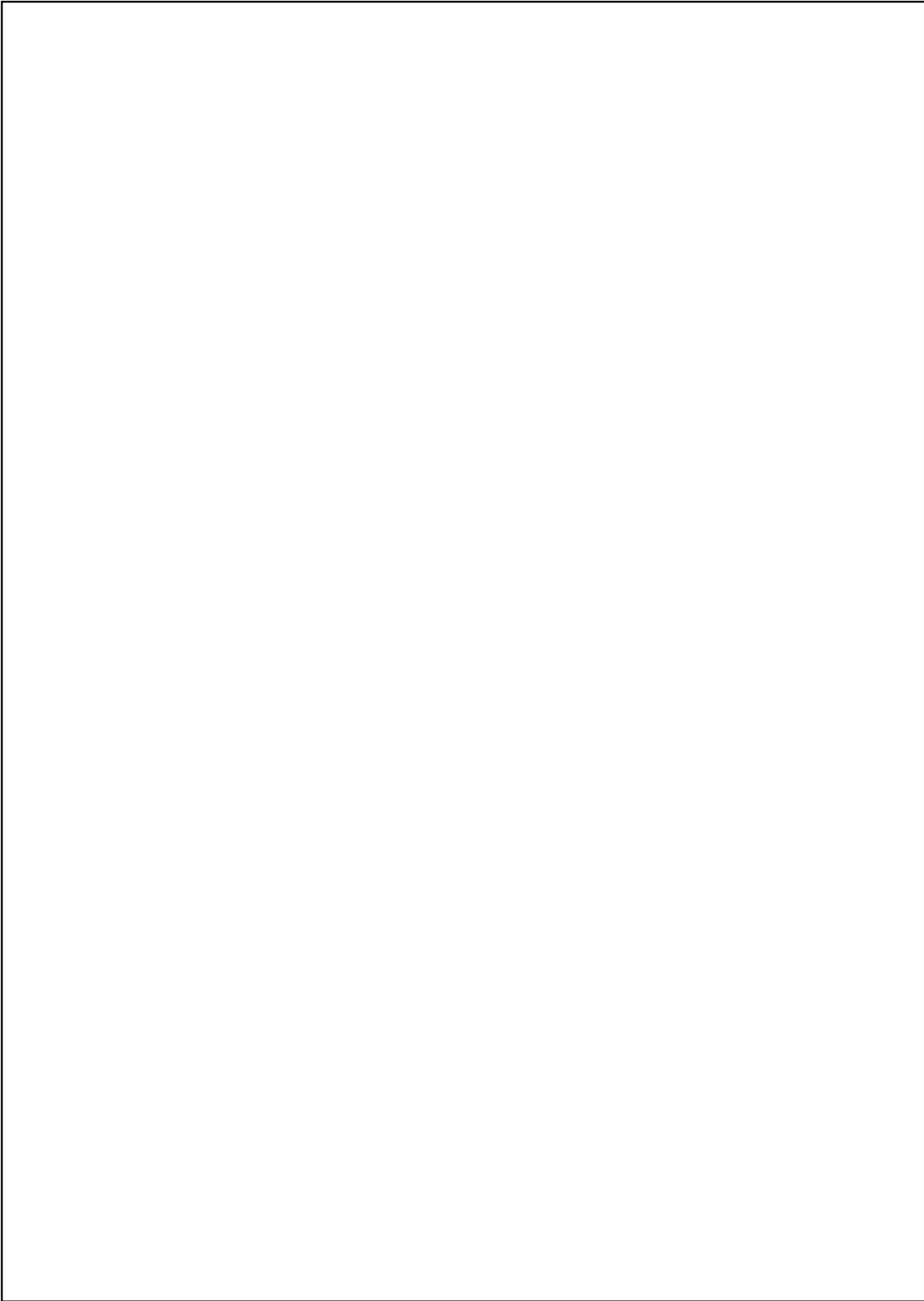
Phone \_\_\_\_\_

**Please Return To:** Steve de Kozlowski  
S.C. Department of Natural Resources  
2221 Devine Street, Suite 222  
Columbia, South Carolina 29205  
(803) 734-9100



**APPENDIX D**

**Aquatic Plant Control Agents**



# 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

### A. Diquat (Reward)

1. Target Plants
  - a. Submersed species - Bladderwort, coontail, elodea, naiad, pondweeds, watermilfoil, and hydrilla.
  - b. Floating species - Pennywort, Salvinia, water hyacinth, water lettuce, and duckweed.
2. Application Rate
  - a. Submersed species - One to two gallons per surface acre.
  - b. Floating species - One half to one gallon per surface acre, depending on target species.
3. Cost - Diquat costs approximately \$92 per gallon. Assuming an application rate of two gallons per acre and an application cost of \$39 per acre, the total cost would be \$223 per acre per application for submersed species. The treatment cost for floating species at one-half gallon per acre rate would be \$85 per acre.
4. 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.
5. 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)

### 1. Target Plants

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

### 2. Application Rate

- a. Granular form (2,4-D BEE) - 150 to 200 pounds per acre depending on target species.
- b. Liquid form - (2,4-D DMA) - 4 3/4 pints in 50 to 100 gallons of water per acre.

### 3. Cost

- a. The granular form of 2,4-D costs about \$2.25 per pound. Assuming an application rate of 150 pounds per acre and an application cost of \$54 per acre, the total cost would be \$392 per application.
- b. The liquid form of 2,4-D costs approximately \$11.50 per gallon. Assuming an application rate of 4 3/4 pints per acre and an application cost of \$39 per acre, the total cost would be \$46 per acre per application.

4. 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.
5. Water use Restrictions - Do not apply to waters used for irrigation, agricultural sprays, watering dairy animals, or domestic water supplies.

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

### 1. Target Plants

- a. Algae - Cutrine Plus, K-TEA, Captain
- b. Submersed species (Hydrilla, Brazilian elodea, pondweed and southern naiad) - Komeen, Nautique, Cutrine Plus, Clearigate, and Captain

### 2. Application Rate

- a. Algae - Treatment concentration of 0.2-0.5 parts per million of copper.
- b. Submersed species - 1.0 part per million of copper (12-16 gallons per acre) or mix two gallons of copper complex and two gallons of diquat per acre.

3. Cost - Copper products cost about \$11.50 per gallon. Assuming an application rate of 16 gallons per acre and an application cost of \$39 per acre, the total cost would be \$223 per acre.

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

5. 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)

1. 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.

2. Application Rate

Aquathol

- a. Liquid form (Aquathol K) - three gallons or more per acre depending on the target species.
- b. 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

- a. Heavy Infestations - Evenly spread 160 - 270 pounds per acre foot of water (3.0 - 5.0 ppm) applied evenly.
- b. Moderate or light infestations - Use 55 - 110 pounds per acre foot (1.0 - 2.0 ppm) applied evenly.

3. Cost

Aquathol

- a. Aquathol K costs approximately \$47 per gallon. Assuming an application rate of 5 gallons per acre and an application cost of \$39 per acre, the total cost would be \$274 per acre.
- b. Aquathol granular costs about \$2.25 per pound. At an application rate of 150 pounds per acre and an application cost of \$54 per acre, the total cost would be \$392 per acre per application.
- c. Aquathol Super K costs about \$13.00 per pound at an application rate of 30 pounds per acre and an application cost of \$54 per acre, the total cost would be \$444 per acre.

### Hydrothol 191

Hydrothol 191 granular costs approximately \$2.25 per pound. Assuming an application rate of 240 pounds per acre and an application cost of \$54, the total cost would be \$594 per acre.

4. 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.
5. 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, Eagle, Aquastar)

1. Target Plants - Emergent broadleaf plants and grasses such as alligatorweed, water primrose, smartweed, and *Phragmites*.
2. Application Rate - Up to 7 1/2 pints per acre, the specific rate depending on the target species.
3. Cost - Glyphosate products range in price from \$55-\$77 per gallon. At an application rate of 7.5 pints per acre and an application cost of \$39 per acre, the total would range from \$91-\$111 per acre per application.
4. 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.
5. 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)

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

2. Application Rate
  - a. Liquid form (Sonar AS, Avast) - 0.12 to 2.44 quarts per acre depending on water depth.
  - b. Pellet forms (Sonar PR, Sonar SRP, Avast SRG) - 15 to 80 pounds per acre depending on water depth.
3. Cost
  - a. The liquid formulation ranges from \$1188-\$1495 per gallon. Assuming an application rate of 2 quarts per acre (2 pounds active ingredient per acre) and an application cost of \$39 per acre, the total cost would be \$633 per acre per application.
  - b. The pellet formulations range in price from \$19.00-\$22.00 per pound. Assuming an application rate of 40 pounds per acre (2 pounds active ingredient per acre) and an application cost of \$54 per acre, the total cost would be \$695 per acre per application.
4. 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.
5. Water Use Restrictions - Do not apply within 1/4 mile of a functioning potable water intake unless concentrations are less than 20 ppb. Water treated with fluridone cannot be used for irrigation for 7-30 days depending on target crop.

G. Arsenal (Experimental Use Permit Only)

1. Target Plants - Phragmites, Alligatorweed, and water primrose.
2. Application Rate - 16-32 oz. per acre depending on target species.
3. Cost - Arsenal costs \$270 per gallon. Assuming the application rate of 16 oz per acre and an application cost of \$39 per acre, the total cost would be \$73 per acre.
4. Use Considerations - Arsenal currently does not have an approved aquatic label so is intended for use by governmental agencies only by Experimental Use Permit.
5. Water Use Restrictions - Do not apply within 1/2 mile of potable water or irrigation water intakes. Do not treat water intended for consumption by humans or livestock. Do not treat water used for commercial production of fish or other aquatic organisms.

## II. Biological Control

- A. Alligatorweed Flea Beetle (*Agasicles hygrophila*)
1. Target Plant - Alligatorweed
  2. Stocking Rate - 600-1,000 per acre.
  3. 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.
  4. 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.
- B. Alligatorweed Stem Borer Moth (*Vogtia malloi*)
1. Target Plant - Alligatorweed
  2. Cost - Approximately the same as for flea beetle.
  3. Use Considerations - Same as for flea beetle.
- C. 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 (*Ctenopharyngodon idella*)
1. Target Plant - Primarily submersed plants including Brazilian elodea, hydrilla, bladderwort, coontail, naiads, pondweeds.
  2. 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.
  3. 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. 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

A. Harvesters, Cutters, Dredges and Draglines

1. Target Plants - All species
2. 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.
3. 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.

B. Fiberglass Bottom Screens

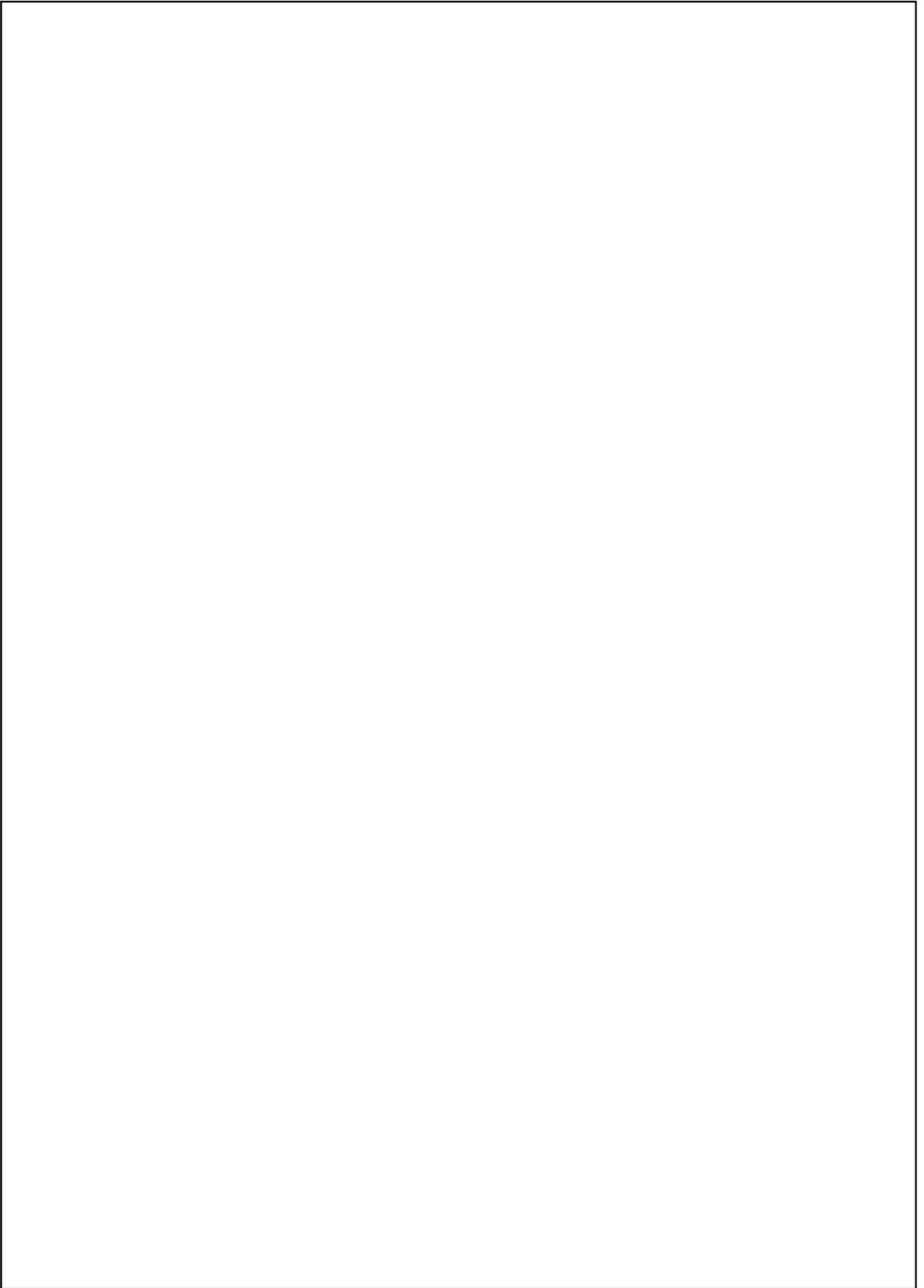
1. Target Plants - All species which root in the bottom.
2. Cost \$10,000 per acre.
3. Use Considerations - Bottom screens may be detrimental to bottom-dwelling aquatic organisms. Due to high cost, use is usually restricted to beaches and other swimming areas where a relatively small area of control is required.

### IV. Environmental Alterations

- A. 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.

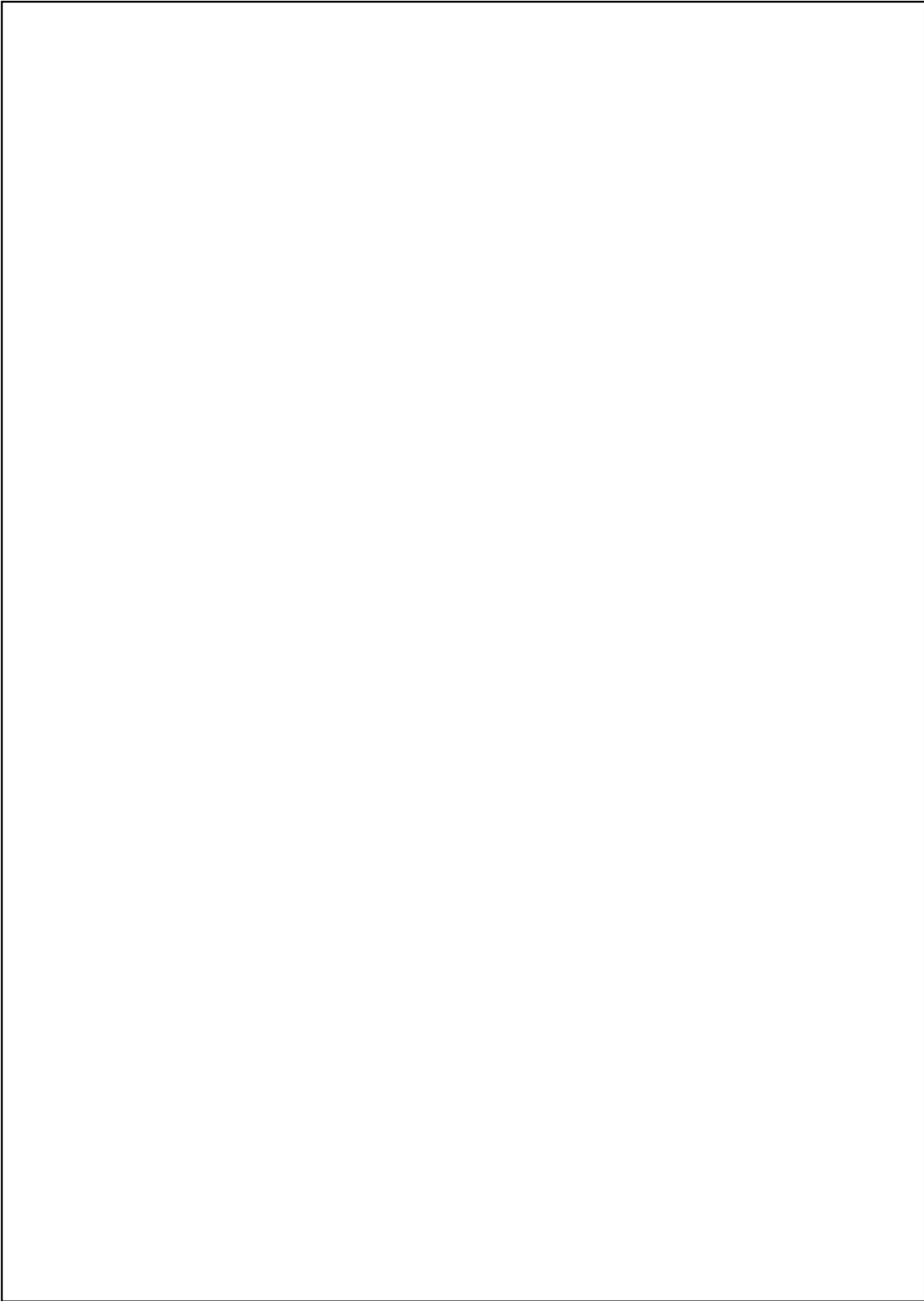
- B. Reduction in Sedimentation and Nutrient Loading - Sedimentation decreases depth of the water body and increased the area where aquatic plants can grow. Nutrient enrichment resulting from man's activities usually does not create aquatic plant

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.



**APPENDIX E**

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



**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:

1. 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.

2. 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.

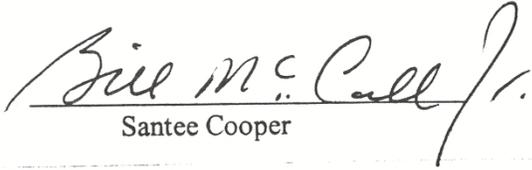
**Fish and Wildlife:** The DNR and Santee Cooper will cooperate in monitoring the health of the fishery and in conducting enhanced monitoring of waterfowl populations. The waterfowl population monitoring will consist of aerial waterfowl censuses. The census will be conducted 10 times each winter. The 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.

3. 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.

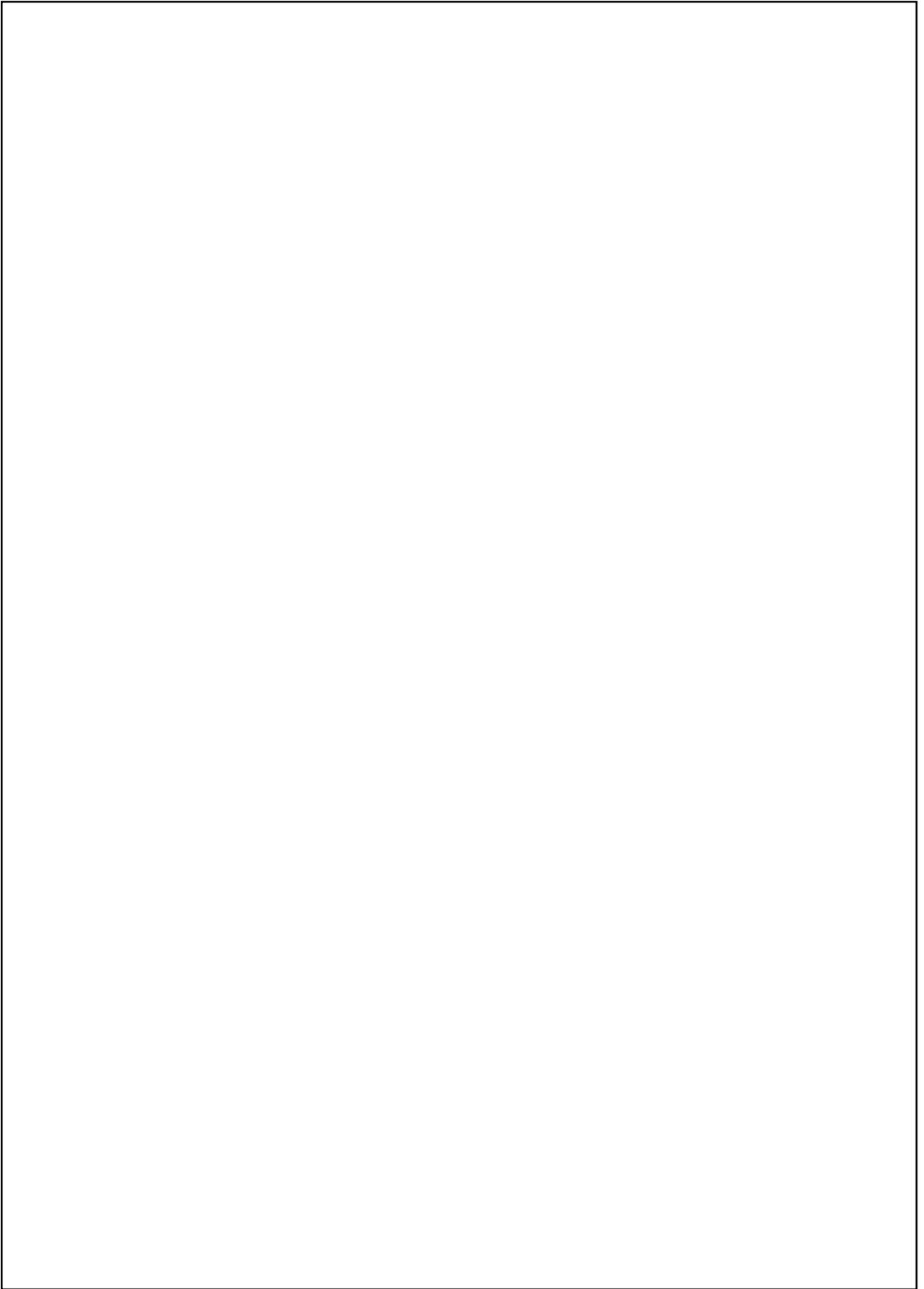
4. Aquatic vegetation will not be controlled in Santee Cooper Project water bodies that are totally isolated from the lakes unless it conflicts with specific water uses or is identified as a state or federal noxious weed and poses a threat to Lakes Marion and Moultrie.

5. 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.

6. 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.

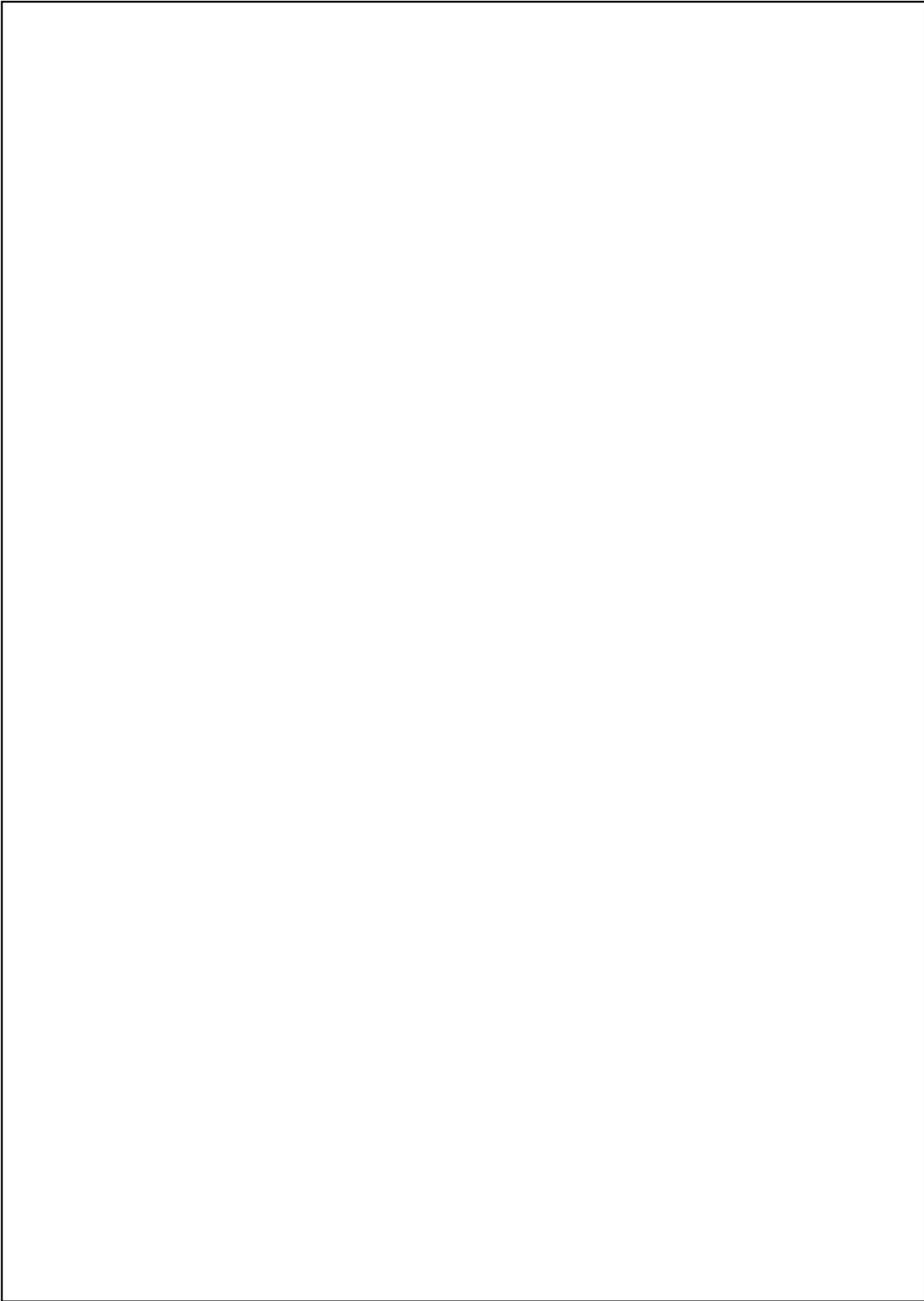
  
Santee Cooper

  
SCDNR



**APPENDIX F**

**Summary of Aquatic Plant  
Control Expenditures**



## **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. A summary of expenditures and control activities are included in Tables 1, 2, and 3.

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 (Table 4). Herbicide applications were made on 33 lakes (4,441 acres) at a cost of \$673,979 (Table 5). Biological controls were implemented on nine water bodies around the State at a cost of \$30,111 (Table 6).

During 1987, a total of \$604,695 in State and Federal funds were expended for aquatic weed control in public waters (Table 7). Chemical control work amounting to \$599,445 was conducted in 26 public water bodies (Table 8). Biological control, including stocking triploid grass carp and alligatorweed flea beetles, was conducted at eight water bodies for a total expenditure of \$5,250 (Table 9).

During 1988, a total of \$631,164 in State, Federal, and local funds were expended for aquatic plant control activities in 25 water bodies (Table 10). 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 (Table 11). Biological controls were implemented on four water bodies at a cost of \$47,400 (Table 12).

During 1989, a total of \$827,630 in Federal, State, and local funds were expended for aquatic plant control operations in 23 water bodies (Table 13). Aquatic herbicides were applied to 2620 acres on 21 water bodies at a cost of \$422,009 (Table 14). 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 (Table 15).

During 1990, a total of \$944,194 were expended for aquatic plant control activities on 24 water bodies (Table 16). Herbicide treatments were made to all water bodies (2850 acres) at a cost of \$524,194 (Table 17). 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 (Table 19).

In 1991, aquatic plant management operations were conducted on 18 public water bodies at a total cost of \$1,965,387 (Table 20). 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 (Table 21). 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 (Table 22). 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 (Table 23). 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 (Table 24). 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 (Table 25). 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 (Table 26). 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 (Table 27). 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 (Table 28). 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 totalling about 9,710 acres at a cost of \$2,367,622 (Table 29). 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 (Table 30); 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 (Table 31); 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 (Table 32). Sterile grass carp were stocked in five lakes to control 292 acres of submersed plants at a cost of \$15,951 (Table 33). 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 (Table 35). 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 (Table 34). 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 (Table 37). Funding support was 34% State (SCDNR), 21% Federal (USCOE), and 45% local match (Table 36). 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 (Table 38). 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%) (Table 39). 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 (Table 41). Due to State budget cuts virtually all control costs were paid for with federal (41%) and local funds (59%) (Table 40). 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.

**Table 40. Summary of Expenditures by Source for Control Operations During 2001.**

<b>Water Body Name</b>	<b>Total Cost</b>	<b>Federal</b>	<b>State</b>	<b>Local</b>	<b>Local Sponsor</b>
Back River Reservoir	\$115,870	\$36,511	\$0	\$79,359	CCPW/SCE&G/NWS
Cooper River	\$11,468	\$5,734	\$0	\$5,734	Berkeley County
Cromer Road Pond	\$827	\$0	\$248	\$579	-
Goose Creek Reservoir	\$9,916	\$4,085	\$0	\$5,831	Charleston CPW
Lake Greenwood	\$14,755	\$0	\$0	\$14,755	Duke Power/ Greenwd Co.
Lake Marion	\$21,837	\$9,682	\$0	\$12,155	Santee Cooper
Lake Moultrie	\$14,582	\$5,957	\$0	\$8,624	Santee Cooper
Church Branch Impoundment	\$4,210	\$1,328	\$0	\$2,883	Santee Cooper
Dean Swamp Impoundment	\$12,804	\$5,184	\$0	\$7,620	Santee Cooper
Fountain Lake	\$2,695	\$1,003	\$0	\$1,692	Santee Cooper
Potato Cr. Impoundment	\$9,023	\$4,511	\$0	\$4,511	Santee Cooper
Taw Caw Cr. Impoundment	\$16,459	\$6,551	\$0	\$9,908	Santee Cooper
Lake Murray	\$245,969	\$122,984	\$0	\$122,984	SCE&G/Lexington Co.
Lake Wateree	\$147	\$0	\$0	\$147	Duke Power Co.
Little Pee Dee River	\$10,162	\$3,356	\$0	\$6,806	Horry & Marion County
Waccamaw River	\$203	\$0	\$102	\$101	Georgetown County
Lake Cherokee	0*	\$0	\$0	\$0	SCDNR Fisheries
Mountain Lake	0*	\$0	\$0	\$0	SCDNR Fisheries
Barnwell State Park	\$4,550	\$0	\$0	\$4,550	SC Parks, Rec, Tourism
Charles Towne Landing St Pk.	\$390	\$0	\$0	\$390	SC Parks, Rec, Tourism
Huntington Beach State Pk	\$1,950	\$0	\$0	\$1,950	SC Parks, Rec, Tourism
Kings Mt. State Park	\$1,260	\$0	\$0	\$1,260	SC Parks, Rec, Tourism
Little Pee Dee State Park	\$5,175	\$0	\$0	\$5,175	SC Parks, Rec, Tourism
Poinsette State Park	\$2,275	\$0	\$0	\$2,275	SC Parks, Rec, Tourism
Santee State Park	\$1,550	\$0	\$0	\$1,550	SC Parks, Rec, Tourism
<i>State Park Lake Total</i>	\$17,150	\$0	\$0	\$17,150	
<i>Non Santee Cooper Total</i>	\$426,466	\$172,670	\$350	\$253,446	
<i>Santee Cooper Total</i>	\$81,609	\$34,215	\$0	\$47,394	
<b>GRAND TOTAL</b>	<b>\$508,075</b>	<b>\$206,885</b>	<b>\$350</b>	<b>\$300,840</b>	

\* received complimentary grass carp from Santee Cooper.

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