PROCEDURAL MANAGEMENT PLAN

AQUATIC PLANT MANAGEMENT

Prepared by the
Aquatic Nuisance Species Program
South Carolina Department of Natural Resources
and Approved by the
South Carolina Aquatic Plant Management Council
2019

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AQUATIC PLANT MANAGEMENT COUNCIL

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PROCEDURAL MANAGEMENT PLAN

INTRODUCTION

Surface Water Resources

South Carolina has an abundance of surface water resources which are distributed throughout the State. Four major river basins, the Savannah, ACE (Ashley, Combahee, and Edisto), Santee, and Pee Dee include over 11,000 miles of rivers and streams which have an average daily flow of about 33 billion gallons (Appendix A). These river basins contain approximately 1,400 impoundments of 10 acres of more in size with a total surface area of over 492,000 acres. Additionally, there are approximately 50,000 smaller impoundments, primarily farm ponds, located throughout the State.

These water bodies support a variety of uses, and the rate of use is increasing with growth in population and economy. Currently, about 8 billion gallons are withdrawn daily from the State's surface waters to supply municipal, industrial, agricultural, and thermoelectric power generation needs. About six percent of this water is used consumptively and not returned to the resource. The surface water resource also supports many instream uses such as hydroelectric power production, wastewater assimilation, navigation, and recreational activities including boating, swimming, fishing, and hunting. Nearly all of these withdrawal and instream water uses require the availability of a clean, unobstructed water supply.

Importance of Aquatic Plants

Aquatic plants are an important part of the surface water environment. These plants provide food, shelter, and reproductive habitat for numerous fish, wildlife, and other animal species. When present in limited populations, aquatic plants can act to improve water quality and enhance the aesthetic appeal of surface water. Natural controls such as foraging by animals, disease, and competition with other plants maintain most native aquatic plant populations at levels that are compatible with man's use of the water resource.

Non-native plant species are frequently not vulnerable to the same natural population controls as are native species. As a result, when an exotic plant is introduced to a new area, this plant is often able to compete successfully with native species, and become very abundant. It is these invasive populations of non-native plants that are the source of most major aquatic plant problems in South Carolina. These invasive species may become so numerous that they interfere with virtually every withdrawal and instream use of our surface waters. They can obstruct navigable waterways, restrict water flow, clog water intakes, degrade water quality, provide breeding habitat for mosquitoes and other pests, interfere with recreation, and may upset the balance of desirable fish populations. Left unchecked, these nuisance plants can seriously impair or eliminate beneficial use of infested waters.

History of Aquatic Plant Problems and Management

During the past century, non-native aquatic plants have been introduced to the United States from Asia, Africa, South America, and Europe. These plants have thrived and developed to nuisance

levels in some areas of this country. Due to a favorable climate and the presence of numerous shallow, nutrient-rich water bodies, several southeastern states, including South Carolina, have been especially affected by the proliferation of non-native aquatic plants.

While aquatic weeds occur throughout South Carolina, nuisance plant populations and associated water use problems have been most prevalent in the coastal plain region. Large areas of the Santee Cooper Lakes, Cooper River, Back River Reservoir, Edisto River, and other low country streams and lakes are infested with aquatic weeds. Some of the most troublesome species have been alligatorweed (*Alternanthera philoxeroides*), water primrose (*Ludwigia uruguayensis*), Brazilian elodea (*Egeria densa*), and common reed (*Phragmites australis*). Additionally, hydrilla *(Hydrilla verticillata*) was discovered in Lake Marion in July 1982 and Back River Reservoir in July 1984, and this plant has since become the most problematic aquatic weed in the State.

Large-scale aquatic plant management in South Carolina began in the 1940's with the S.C. Public Service Authority's efforts to control alligatorweed in Lake Marion. The U.S. Rivers and Harbors Act of 1958 gave the U.S. Army Corps of Engineers authority to administer a 30% state/70% federal cost sharing program to assist states with the control of nuisance aquatic plants in public waters. Under this program, the Corps of Engineers and S.C. Public Service Authority participated in a cooperative program for Lake Marion from 1960 to 1967. Subsequently, the Public Service Authority has continued in its efforts to control alligatorweed, as well as, Brazilian elodea, water primrose, and hydrilla in the Santee Cooper lakes.

In 1967, the emphasis of the state/federal cooperative program in South Carolina was shifted from the Santee Cooper Lakes to other alligatorweed infested waters of the State. At that time, the S.C. Department of Agriculture entered a cooperative agreement with the Corps of Engineers for the control of alligatorweed in portions of Black River, Black Mingo Creek, Congaree River, Little Pee Dee River, and the North Fork Edisto River. This agreement continued until 1975 when new regulations which prevented the use of some herbicides in flowing waters were developed. More recently, these regulations have been modified to permit certain uses of herbicides in flowing waters.

Management of aquatic plants in private waters has been primarily the responsibility of the owner. Assistance, in the form of advice regarding plant control agents and methods, is available to owners of private waters through the S.C. Department of Natural Resources, Division of Wildlife and Freshwater Fisheries, the Clemson University Agricultural Extension Service, and the Soil Conservation Service of the U.S. Department of Agriculture. Owners may choose to implement control methods themselves or arrange for a commercial lake management firm to do so. Public funds have generally not been available to assist private lake owners in implementing aquatic plant control.

The S.C. Aquatic Plant Management Society, a non-profit organization, was formed in 1978 to promote the management of noxious aquatic plants. The Society's membership includes individuals from the private, public and academic sectors with interests in all aspects of aquatic plant management. The Society was largely responsible for generating interest in the development of a statewide program for aquatic plant management.

Aquatic Plant Management Program and Council

During 1980, Governor Richard W. Riley was informed of the severity and importance of South Carolina's aquatic plant problem by a number of State Agencies and the S.C. Aquatic Plant Management Society. In response to this information, Governor Riley issued Executive Order 80-38 on October 10, 1980 (later amended by Executive Order 82-40) which created the S.C. Aquatic Plant Management Council for the purpose of providing statewide coordination of aquatic plant management efforts in public waters. On May 29, 1990 Governor Carroll Campbell, Jr. approved legislation (Act 498) which established for the first time by law the South Carolina Aquatic Plant Management Program, South Carolina Aquatic Plant Management Council, and the South Carolina Aquatic Plant Management Trust Fund for the statewide management of nuisance aquatic plants in public waters (Appendix B).

The Water Resources Commission was originally designated as the state agency to administer the Aquatic Plant Management Program. Following restructuring of State government in 1994, the Program is now administered by the Land, Water, and Conservation Division of the S.C. Department of Natural Resources. The Department is responsible for developing an annual Aquatic Plant Management Plan which describes the procedures for problem site identification and analysis, selection of control methods, operation program development, and implementation of operational strategies. The Plan also identifies problem areas, prescribes management practices, and sets management priorities.

The Aquatic Plant Management Council is composed of one representative from each of the following agencies: S.C. Department of Natural Resources, Land, Water, and Conservation Division; S.C. Department of Health and Environmental Control, Bureau of Environmental Quality Control; S.C. Department of Natural Resources, Division of Wildlife and Freshwater Fisheries; S.C. Department of Agriculture; S.C. Department of Health and Environmental Control, Office of Coastal Resources Management; S.C. Public Service Authority; S.C. Department of Natural Resources, Land, Water, and Conservation Division, Conservation Program; S.C. Department of Parks, Recreation and Tourism; Clemson University Department of Fertilizer and Pesticide Control; and the Governor's Office. The representative from the Land, Water, and Conservation Division; Aquatic Nuisance Species Program of the S.C. Department of Natural Resources serves as Chairman of the Council. The Council provides valuable interagency coordination and serves as the principal advisory body to the Department on all aspects of aquatic plant management and research. Furthermore, the Council establishes management policies, approves all management plans, and advises the Department on research priorities.

The Aquatic Plant Management Trust Fund was created to receive and expend funds for the prevention, management, and research of aquatic plant problems in public waters of the State. The fund is eligible to receive State appropriations, federal and local government funds, and funds from private sources. The S.C. Department of Natural Resources, Land, Water, and Conservation Division administers the Trust Fund which must be kept separate from other funds of the State.

The Federal Aquatic Plant Control Cost-Sharing Program

The U.S. Rivers and Harbors Act of 1958 established the Federal Aquatic Plant Control Program to assist states with the control of nuisance aquatic plants in public waters. The cost-sharing program is administered by the U.S. Army Corps of Engineers and, up until 1988, provided reimbursement to the states for 70 percent of aquatic plant control costs. However, passage of the Water Resources Development Act of 1986 reduced the federal portion of the cost-sharing formula from 70 percent to 50 percent, and further required the states to reimburse the Corps of Engineers for 50 percent of their administrative expenses. These changes were initiated in Federal fiscal year 1988. In response to the reduction in Federal support, the S.C. Aquatic Plant Management Council in 1988 required local sponsors to provide at least 15 percent of total control costs in the form of cash or in-kind services. In recent years the local match was increased to 50 percent of total control costs with a cap on the total amount of cost share available from State funding sources.

PURPOSE AND OBJECTIVES

Purpose and Function of the Management Plan

The overall purpose of the Aquatic Plant Management Plan is to establish the basis for a management program which will minimize adverse impacts of aquatic plant populations on the use of South Carolina's public waters. The Plan consists of two parts:

1) A procedural plan
2) An annual operational management plan.

The Procedural Management Plan describes procedures used by the Department of Natural Resources and Aquatic Plant Management Council to perform the following functions:

1. Identify existing and potential aquatic plant problem areas;
2. Determine the most appropriate control system for each problem area identified;
3. Develop an operational strategy that describes how each control system would be applied;
4. Seek funding for implementation of the operational strategy; and
5. Monitor results and effects of the program and determine the need for modification.

Using the procedures described in the Procedural Management Plan, the Department will develop an Annual Management Plan that describes problem areas and control systems that are approved by the Council for available State and Federal funding. An Annual Management Plan will be prepared and will describe activities to be conducted during that year as funding permits.

Objectives of the Management Program

1. The short-term objective of the management program is to reduce the abundance of aquatic plants at specific sites where these plants are currently interfering with the use of public waters.
2. The long-term objectives of the management program are the following:
3. Reduce the Statewide distribution and abundance of invasive aquatic plants in public waters;
4. Prevent water use impairment by aquatic plants in currently unimpaired waters;
5. Maintain aquatic plant populations at levels that are beneficial to water use, water quality protection, and to fish and wildlife populations;

3) Prevent the introduction and distribution of invasive exotic plant species through enforcement of existing laws and regulations;
4) Promote the use of environmentally sound aquatic plant management practices;
5) Promote the development of improved aquatic plant management methods;
6) Promote public education in aquatic plant management matters; and
7) Inform owners of private waters of currently available sources of aquatic plant management advice and assistance (State and Federal funding would be provided for management of private waters only if plant populations in these waters were a threat to public waters).

PROBLEM IDENTIFICATION AND ANALYSIS

Identification of Aquatic Plant Problem Areas

The first step in the development of each Annual Management Plan is the identification of areas throughout the State where existing and potential aquatic plant problems occur. The mere presence of aquatic plants may not constitute a problem. The occurrence of limited populations of some species is highly desirable in some situations. Plants must interfere with at least one intended water use before a problem can be considered to exist. Potential problem areas are water bodies or portions of water bodies where use impairment is not currently occurring, but given existing circumstances, could be expected to occur in the near future. Eligible water bodies include all public lakes and navigable waters as determined by the Department of Natural Resources according to the State definition.

Aquatic plant problem areas will be identified by the following methods:

1. To the extent that resources are available, Department staff will conduct field surveys to estimate the abundance and distribution of aquatic plant species in public waters.
2. Whenever deemed appropriate by the Department, a survey will be conducted of surface water users and other interested parties throughout the State. This survey will be in the form of a questionnaire (Appendix C) mailed to municipal, industrial, and agricultural water users; electric power generating companies; representatives of fishing, wildlife, and boating interests; members of the academic community; and the S.C. Aquatic Plant Management Society. Results of this survey will identify areas where water users feel that aquatic plant problems occur.
3. Several agency members of the Aquatic Plant Management Council and other local, State, and Federal agencies obtain aquatic plant information in the course of other operations. This information will be compiled and evaluated annually to aid in the documentation of water use problems.
4. Following completion of a draft Annual Management Plan, the plan will be made available for public review. Based on the information obtained during this review, the Department with approval by the Council may make revisions to the draft Annual Management Plan.
   An Early Detection Rapid Response (EDRR) protocol will also be in effect for new problem areas and species. Early detection and rapid response are the most effective and cost-efficient responses to invasive species, after prevention.

Analysis of Aquatic Plant Problem Areas

For each identified aquatic plant problem area, pertinent information concerning the problem plant species, water use impacts, and the affected water body will be collected and analyzed to aid in the selection of appropriate control methods. Information to be considered in the analysis will include:

1. Identification of the problem plant species and an estimate of their general abundance and distribution.
2. Life history and ecological information for each problem species.
3. Identification of adverse water use impacts due to aquatic plant infestations.
4. Identification of water users and their use requirements.
5. Important environmental characteristics of the affected water body.

SELECTION OF CONTROL METHODS

Determination of Desired Level of Control

For each problem area identified, the desired level of both short-term and long-term plant control will be established. Depending on the nature of the problem species and its effect on water use, the desired level of control may range from total eradication to removal from only a small area of the affected water body. In cases where dense populations of prolific species occur in large water bodies, total eradication is not possible with available control technology. Under such conditions, control would be limited to certain areas where use is most affected. In other situations, complete removal may be possible and desirable.

The desired level of control will be determined using information obtained in problem identification and system description and with input from affected water users.

Identification of Potential Control Techniques

Information on effectiveness, environmental and other constraints, treatment rates, and cost will be compiled for all aquatic plant control techniques available for use in South Carolina (Appendix D). This information will be reviewed and updated at regular intervals.

From the list of all available control techniques, those capable of controlling the target plant at the desired level in each problem area will be identified using an integrated management approach.

Determination of Environmental and Water Use Constraints

All environmental and water use constraints that may affect selection of control agents will be identified. Environmental constraints would prevent the use of control agents which would cause significant or long-term violations of the State water quality standards or adversely affect aquatic ecosystems. Water user constraints would preclude use of agents that would cause significant interference with designated use of the water body being treated.

Also identified will be any constraints associated with specific funding programs. Some Federal cooperative aquatic plant management programs require the use of certain control techniques.

Ranking of Control Techniques

Based on effectiveness in controlling problem plant species and on all identified constraints, control techniques will be prioritized for each problem are Combinations of control techniques that would result in more effective control than single techniques will be identified.

Selection of Best Control Method

Utilizing information obtained from steps outlined above, the best control method will be selected for each identified problem. The best control method will be the technique or combination of techniques utilizing an integrated management approach which will result in the highest degree of control of the problem species while resulting in the least detrimental effects on the aquatic ecosystem.

The selected control method will be included in the Annual Management Plan and approved by the Council for available funding. The Plan will remain flexible so that new and more favorable control techniques that become available during the course of the program may be used to replace those designated in the Plan.

OPERATIONAL PROGRAM DEVELOPMENT

Application of the Control Method

After the best control method has been selected, a strategy will be developed for application of this method to the problem are This strategy will be based on information obtained on the control agents and techniques to be used, the nature of the problem, and the characteristics of the affected water body. The operational strategy will include the following specifications:

1. The area to which each control agent is to be applied;
2. The amount and rate of application of each control agent;
3. The method of application of each control agent;
4. The timing and sequence of application of each control agent; and
5. Any other instructions that may be required.

The Council will also determine the most appropriate entity to apply the control agents and techniques. This entity may be an agency member of the Council, some other local, State, or Federal agency, an individual water user or a commercial contractor. Determination of appropriate entities will be based on interest in the specific problem area, willingness of the entity to perform the operational function, and availability of resources to perform the required function.

In cases where an agency or other entity requests State or Federal funding from the Department, the requesting agency or entity will be responsible for developing an operational strategy acceptable to the Department and Council.

Determination of Cost of the Operational Program

When specifications for application of control agents and techniques have been finalized, the estimated cost of these operations will be determined and local sponsors identified. An estimate of

costs for each water body and the identification of local sponsors will be included in the Annual Management Plan.

All possible sources of funding for each problem area will be identified. These sources may include local governments, State appropriations, other State funding programs that may be developed, Federal grants and cost-sharing programs, private sources such as individual water users, or any combination of these sources.

Priority Ranking of Problem Areas

When the estimated costs of annual control operations exceed available public funding, each identified problem area will be assigned a priority rank by the Department. In ranking problem areas, the Department will use the following criteria:

1. The number and relative importance of water uses affected by the plant problem;
2. The extent and intensity of water use for the affected area;
3. The severity of the plant problem, including consideration of the area of coverage, percentage of the total area of the water body affected, the characteristics of the problem plant species, and the potential for infestation of adjacent areas;
4. The possible control methods that may be used on the affected area without interfering with designated uses;
5. The potential for management success given the plant problem and the capabilities of available control methods;
6. The extent of potential benefit to the general public;
7. The reasonableness of management costs relative to potential benefits;
8. The environmental effects of the proposed management program; and
9. The availability of funding for implementation of the management program.

On the basis of this ranking, the Department, with approval from the Council, will determine what portion of available funds is to be allocated for management of each problem area.

Review of the Annual Management Plan

After completion of the Annual Management Plan containing priority problem areas and associated control and operational strategies, the Plan will be made available to the public and relevant governmental agencies for review and comment. Based on results of this review process the Council may make modifications to the Plan.

Request for Funding

Funding for aquatic plant management operation will be sought from all appropriate sources.

IMPLEMENTATION OF THE ANNUALMANAGEMENT PLAN

Implementation of the Operational Strategy

All entities, either public or private, designated to apply control agents will make applications (or releases) according to specifications in the Annual Management Plan. The application of all approved aquatic herbicides shall be in accordance with label requirements and Material Safety Data Sheets. Public entities can participate in a cost share program for a designated portion of operational expenses upon availability of funds. A daily log of control operations shall be maintained and reported on forms provided by the Department.

All applications of aquatic herbicides must be supervised by applicators certified in Category 5 (Aquatic Pest Control) by the Clemson University, Department of Fertilizer and Pesticide Control and present at the job site and conform to SCDHEC-NPDES general permit requirements.

All aquatic herbicide applications involving public potable water supplies must have prior approval of the water supplier and the S.C. Department of Health and Environmental Control, Bureau of Drinking Water Protection.

Limitations on Implementation

Many water bodies provide multiple water use opportunities, some of which are of greater importance to the general public than others. For waters approved for control operations, but where funds are limited to the extent that all problem areas within the water body cannot be treated, program funds will be used to treat areas of greatest benefit to the general public. To ensure the best use of program funds, areas of highest priority should be effectively treated prior to areas of lower ranking. The priority ranking of potential treatment areas (highest to lowest priority) based on public benefit is as follows:

1. Waters adjacent to and impacting public electric and water utility intakes.
2. Waters in which public health and safety interests are impaired (i.e. flood control, vector control, etc.)
3. Waters in and around public access sites, such as public boat ramps, swimming areas, and fishing piers.
4. Waters that receive high use by the public for recreational activities.
5. Waters in and around commercial boating (marinas), swimming, and camping areas.
6. Open water areas adjacent to private residential developments.
7. Canals associated with private residential developments.
8. Any area with problematic plants that pose an immediate threat to the main water body may be assigned a high priority.

Monitoring the Effects of the Program

At appropriate intervals following application of control agents and techniques, effects of the program on the distribution and abundance of target plants will be monitored by field inspection. Water users may also be surveyed to determine effects of the program on use impairment.

The need for evaluation of environmental effects of the program will be determined by the S.C. Department of Health and Environmental Control. The Department of Health and Environmental

Control may require that the entity applying the control agent conduct routine water quality monitoring during and after the control application. The entity responsible for control application shall notify the Department of Health and Environmental Control immediately of any indication of adverse environmental impact resulting from the control operation. The Department of Health and Environmental Control will notify the Department of Natural Resources of such adverse impacts.

Long-range management strategies for specific problem areas may be updated and modified on the basis of results of these post-implementation monitoring activities.

All work will be done in accordance with SC Department of Health and Environmental Control's National Pollutant Discharge Elimination System Permit requirements.

APPROVAL OF THE AQUATIC PLANT MANAGEMENT PLAN

All portions of both this Procedural Management Plan and each Annual Management Plan must be approved and may be amended by a two thirds vote of a quorum of the members of the S.C. Aquatic Plant Management Council. The department shall have final approval authority over those sections which do not receive two-thirds approval of the council.

The South Carolina Department of Natural Resources prohibits discrimination on the basis of race, color, national origin, disability, age, sex, or religion. Direct all inquiries to the

Office of Human Resources,

P.O. Box 167, Columbia, SC 2920

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