Aquatic Weed Management: Overview and Regulations

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General Perception of Stormwater Ponds

Multiple Uses

Why Do We Have to Manage Aquatic Weeds in South Carolina?

- Irrigation
- Drainage
- Flood control
- Water supplies
- Power generation
- Aesthetics
- Aquaculture
- Transportation
- Mosquito control
- Fishing/Recreation

Importance of Aquatic Plants

- Food, shelter, resting, and breeding habitat for fish, waterfowl, and other wildlife
- Protection against shoreline erosion
- Oxygenation of water
- Aesthetics

Why Do Aquatic Plants Become Weeds?

- Presence of large areas of clear, shallow water
- Presence of nutrients, particularly N and P
- Lack of natural enemies (introduced weeds)
- Metabolic characteristics which make them more competitive than native plants

How Do Aquatic Weeds Get Into a Pond or Lake?

- Intentional or accidental results of human activities (wildlife plantings, boating, fishing enhancement, aquarium dumping, water gardens, dredging, mechanical harvesting)
- Animals (wading birds, aquatic mammals)
- Water movement (tides, currents, waves)
- Transport by wind and rain (seeds, spores)

Prevention

Preventing the establishment and growth of unwanted aquatic vegetation requires a combination of proper pond location and design, regular pond care and maintenance, and avoidance of intentional or accidental weed introductions.

Importance of Aquatic Plant Identification

- Distinguish between desirable and undesirable species
- Assure that the proper management options are selected for the target species
- Adjust management strategy to impact the target weeds at most critical points in their life cycles and to minimize adverse impacts on non-target species

Characteristics Used in Identification of Aquatic Plants

- Growth habit - submersed, emergent, etc.
- Leaf shape, size, arrangement
- Stem shape, woody, solid, hollow, pithy?
- Presence or absence of hairs
- Presence or absence of roots
- Floral or fruit characteristics
- Presence of rhizomes and/or vegetative propagation structures (tubers, turions)

General Groups of Aquatic Plants

- Algae
- Mosses
- Ferns
- Vascular plants

Aquatic Plants Classified According to Growth Habit

- Submersed
- Free-floating
- Floating-leaved
- Emergent

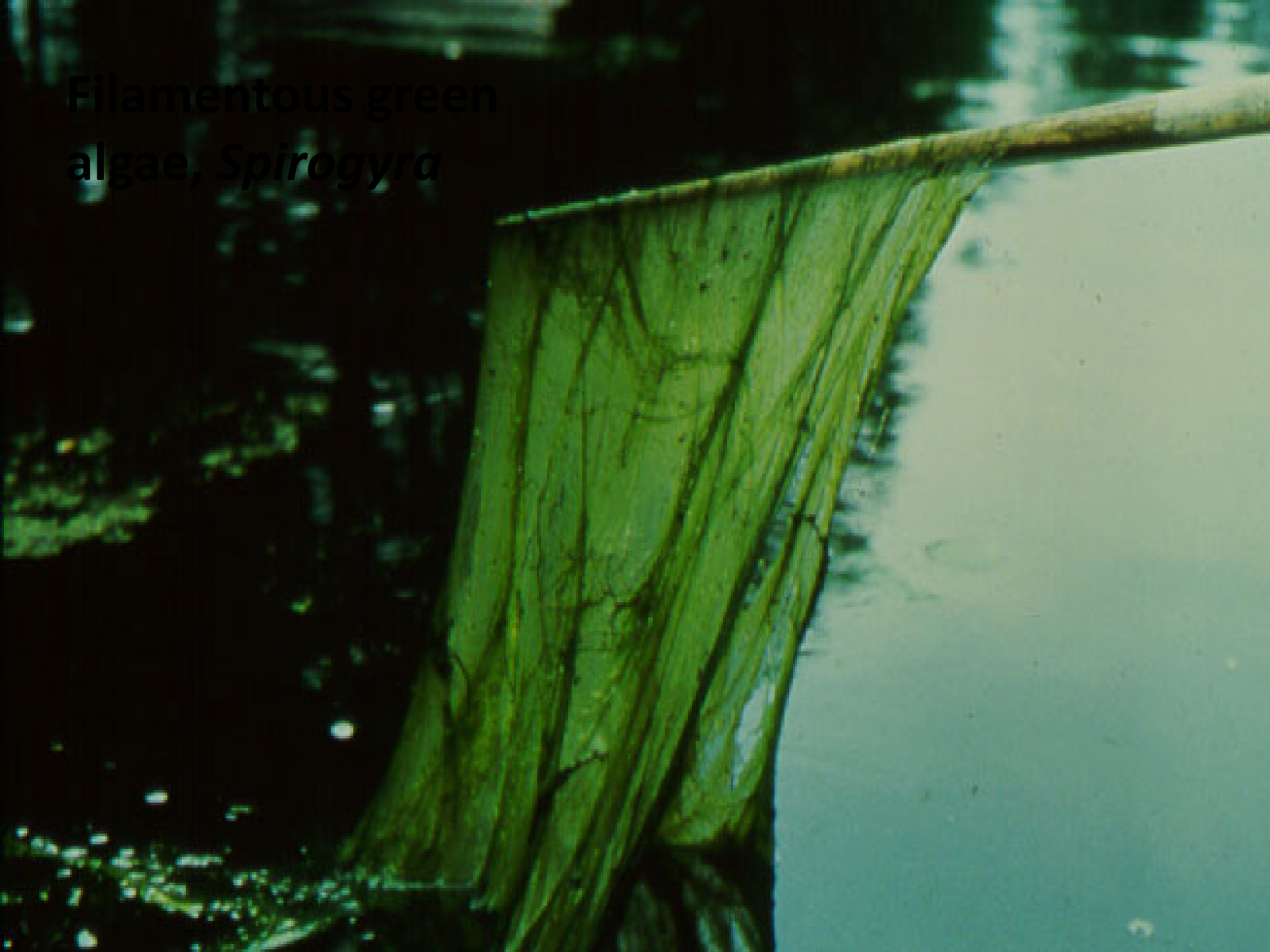
Characteristics of Algae

- Microscopic or macroscopic in size
- No vascular conductive tissues
- May be attached or unattached, often growing mixed among vascular plants
- May be mobile or non-mobile
- Single celled or multicellular colonies or filaments

Types of Algae

- Planktonic
- Filamentous
- Macroalgae

Planktonic bluegreen algae

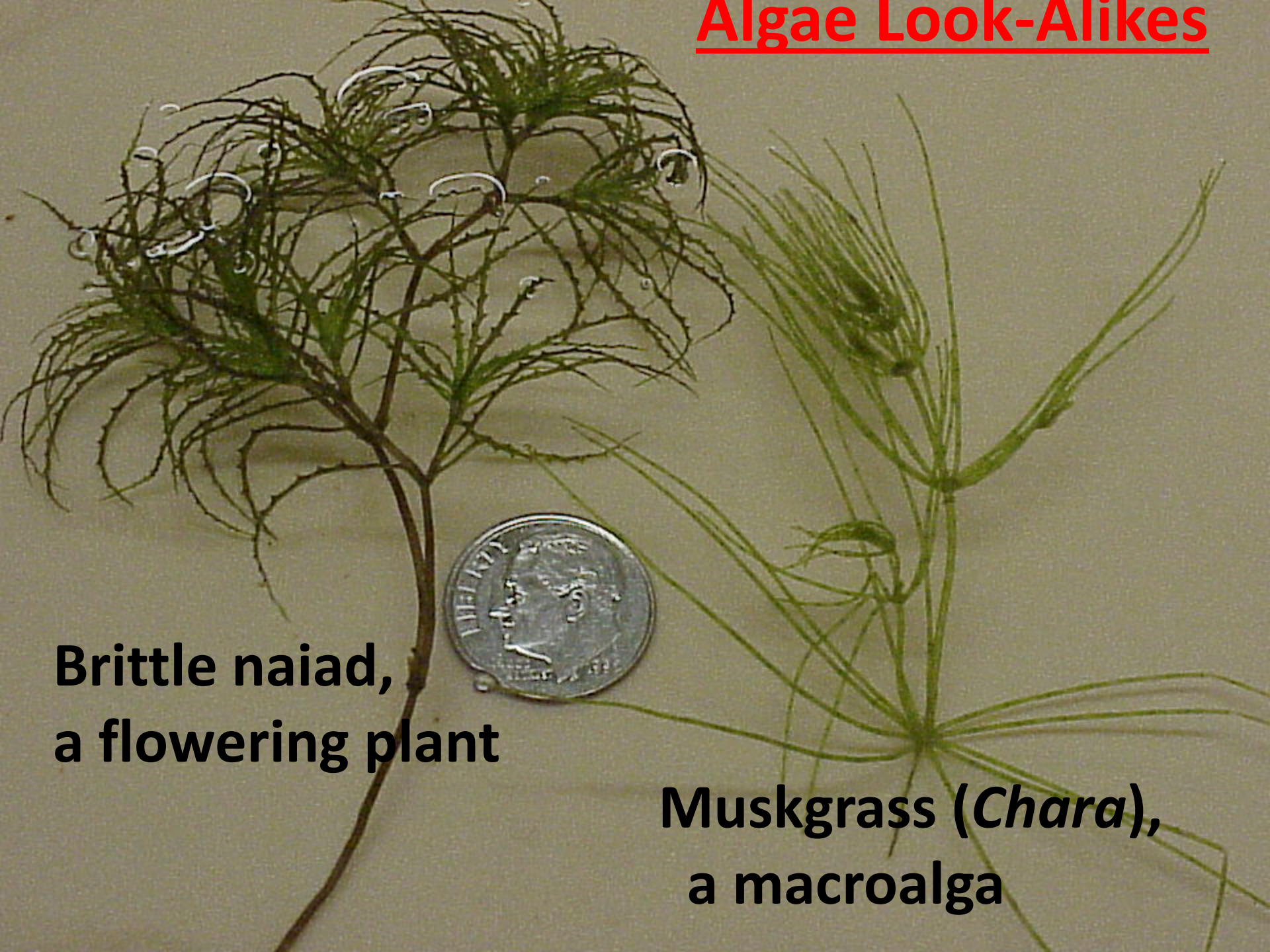

Filamentous green
algae, *Spirogyra*

Submersed Plants

- Biomass entirely or largely beneath the water's surface at peak of season
- Flower or floral spike may extend above water's surface
- May be rooted or unrooted
- Often form dense surface mats

Examples: coontail, bladderwort, hydrilla, naiads, pondweed, watermilfoils

Algae Look-Alikes



Free-Floating Plants

- Plants not rooted in the soil, often are blown about by the wind
- Biomass floating on, above, or just below the water's surface
- May or may not have roots
- Often form dense surface mats

Floating-Leaved Plants

- Leaves usually floating on surface, but occasionally raised above water in mid-summer
- Roots and rhizome systems in soil
- Flowers may float directly on surface or be raised above surface on a stem

Examples: watershield, fragrant waterlily, spatterdock, American lotus

Watershield, *Brasenia schreberi*

Emergent Plants

- Biomass largely above the water's surface at peak of season
- Flower or floral spike extends well above water's surface
- Usually confined to very shallow water

Examples: pickerelweed, alligatorweed, creeping waterprimrose, rushes, bulrush, spikerush, cattail

Alligatorweed

Weed Management Decisions

- Plant identification
- Budget and Equipment
- Control Period - Speed and Duration
- Use of the body of water (irrigation, potable water, livestock, fishing, etc.)
- Physical, environmental & economic constraints
- Water quality
- Fish and wildlife populations (including threatened and endangered species)
- Licensing and Regulations

Aquatic Weed Management Techniques

- Hand removal
- Cultural (physical)
- Mechanical
- Biological
- Chemical
- Revegetation

The most cost-effective approach is a combination of two or more tactics into an integrated management effort.

Prevention

- Proper pond location
- Pond design
- Regular Maintenance
- Avoidance of weed introductions

Attributes of Cultural (Physical) Management Techniques

- Cultural management techniques (sometimes called“physical control”) modify the environment so that conditions are less suitable for the growth of undesirable vegetation.
- Cultural techniques usually are easy and pose little threat to the environment.
- Cultural management techniques include:

Fertilization	Benthic barriers
Pond dyes	Water level manipulation

Hand Removal

- Pros
  - Chemical free
  - Provides fast results
  - Generally doesn't require permitting or licensing
- Cons
  - Can spread weeds
  - Time and labor intensive
  - Can be very expensive

Mechanical Removal

- Harvesters
  - Expensive
  - Rental?
  - What will you do with harvested weeds

Biological Control

- Species Available
  - Tilapia
  - Triploid Grass Carp
- Pros
  - Chemical free
  - Cost efficient
  - Fishery supplement
- Cons
  - Not effective on all weeds
  - Slow results
  - Permits required
  - Restocking required
  - Potential for fishery imbalance

Biological Control

- Tilapia
  - Blue (*Oreochromis aureus*)
  - Nile (*Oreochromis niloticus*)
  - Red-Bellied (*Tilapia zillii*)
- Stocking
  - April-May @ 200-400/acre
- Cold Tolerance
  - Lethal Limit ≈ 50˚F

Biological Control

Triploid Grass Carp

Ctenopharyngodon idella

- Overwinter well
- 5 years of quality service
- May live 20 years and reach weights in excess of 30lbs
- Primarily feed on aquatic macrophytes
- Preferred plants include: Spikerush, Chara, Pondweeds, and Naiads

Chemical Control

- NPDES Requirements
- Pesticide Licensing
- Herbicide Labeling
- Effective Chemistries
- Water Use Restrictions
- Selecting the Right Herbicide
- Herbicide Additives
- Tank Mixes
- Application Techniques

Questions

- Applicator License?
- Water Use Restrictions?
- Downstream Uses?
- Ownership?
- Local Ordinances?
- SC DHEC Buffers?
- Read and Follow The Label?

Chemical Control

Application Rates and Cautions

- Labels provide information on amount of herbicide to apply based on either SURFACE ACRES or WATER ACRES/ACRE FEET.
  - **Surface Acres** – 2 dimensional measurement, depth not considered. Area of pond.
  - **Water Acres/Acre Feet** – 3 dimensional measurement, depth included. Area of pond x average depth.
- Alkalinity and Hardness concerns
  - Certain chemistries may be toxic to fish or ineffective on plants in relation to water alkalinity or hardness. Labels will provide information on concerns pertaining to alkalinity and hardness.

Chemical Control

Water Use Restrictions

- Herbicides may require a waiting period before treated waters may be used for various activities.
  - Irrigation
  - Fish Consumption
  - Watering Livestock
  - Swimming

The label is the law!

Land Management Practices

- Pond Borders
- Slope Management
- Effective Fertility
- Livestock and Wildlife Management

Land Management Practices

Pond Borders

Land Management Practices

Slope Management

Land Management Practices

Livestock and Wildlife Management

Land Management Practices

Effective Fertility

- Fertilize lawns and ornamental landscaping in accordance with soil samples.
- Never over fertilize
- Do not add nutrients that aren’t needed.

Available Resources

Online Sources of Aquatic Weed ID and Control Information

Aquaplant

http://aquaplant.tamu.edu/

Aquaplant is an excellent website that provides information on aquatic plant identification, control recommendations, and herbicide specific information. While visiting this site, users can identify the plant they are having trouble with, determine which control methods would be most effective, and print the label for any herbicide they choose to use.

Available Resources

Online Sources of Pond Management and Control Information

Clemson Home and Garden Information Center

http://www.clemson.edu/extension/hgic/

The Clemson Home and Garden Information Center offers easily understood factsheets on almost any home and garden information. The pond series includes factsheets on:

Fertilizing Recreational Fish Ponds

Liming Recreational Ponds

Stocking & Harvesting Recreational Fish Ponds

Use of Rotenone for Management of Fish Populations

Aquatic Weed Control Overview

Biological Control of Aquatic Weeds

Chemical Control of Aquatic Weeds

Available Resources

Online Sources of Aquatic Weed ID and Control Information

Center for Aquatic and Invasive Plants

http://plants.ifas.ufl.edu/

- This website provides information on aquatic weed identification for hundreds of species. Numerous images can be found for each species contained in the database. The site is not as user friendly as Aquaplant, but it does contain species that are not found on Aquaplant. It is an excellent identification source when Aquaplant fails.

Available Resources

Online Sources of Aquatic Weed ID and Control Information

South Carolina Department of Natural Resources

http://www.dnr.sc.gov/water/aquaff/

- The SCDNR site contains identification information for some of the most commonly occurring aquatic weeds found in the state. The site offers detailed identification information on these plants including descriptions and photographs.

Available Resources

Mobile Apps

Clemson University
“Calibrate My Sprayer”

- Improperly calibrated pesticide spraying equipment may cause either too little or too much pesticide to be applied. This free mobile app was created to aid in the proper calibration of spraying equipment. Simply select the type of sprayer you want to calibrate (Broadcast or Banded), insert values in each input box, select what you want the app to calculate (Volume/Area or Catch/Nozzle), and tap 'Calculate'. Each input's units can be customized by tapping the units. Sprayers can be saved with user-defined names.
- This free mobile smartphone app is designed for iPhone, iPod Touch, iPad and Android devices

http://www.clemson.edu/extension/mobile-apps/

Available Resources

Mobile Apps

Clemson University
"Mix My Sprayer"

- Mix My Sprayer was created to aid with quick, accurate calculations of product mixes to be applied with spraying equipment. Users can create custom lists of favorite products by category. Simply add or select a product, insert values in each input box, and the app automatically calculates the amount of product to include in the user-defined mix size. Units for each input can be customized by tapping the unit buttons. Products are saved with the user settings last used.
- This free mobile smartphone app is designed for iPhone, iPod Touch, iPad and Android devices.

http://www.clemson.edu/extension/mobile-apps/

Available Resources

Mobile Apps

Texas A&M
"Pondcalc"

- **PondCalc** is a comprehensive tool for recreational pond users as well as aquaculture producers. One of the most common problems in pond management is over-estimation of pond size. This tool allows the user to quickly and easily calculate the surface area of any shaped pond and then calculate the number of acre feet, all without having to do any math. These calculations allow the user to determine accurate pond area and volume for the application of chemical treatments and herbicides

http://aquaplant.tamu.edu/useful-apps/

Available Resources

Mobile Apps

Texas A&M
"AquaRef"

http://aquaplant.tamu.edu/useful-apps/

- **AquaRef** – The aquaculture and pond manager quick reference guide is an inclusive set of tables and conversion factors for aquaculture professionals. Conversion factors range from the weight of chemical units that must be added to water to achieve particular concentrations to temperature conversion to volumetric water conversion factors to metric-English conversion for chemicals. This guide is packed full of useful information including pond filling time, pumping rate equivalents, discharge rates from standpipes, net mesh sizes for grading fish, length/weight relationships for fish, oxygen saturation points, pounds of fish that can be hauled at temperature, egg development stages, stocking guides, fertilization rates, and much more. Texas A&M AgriLfe Extension's AquaRef is credited in large part to Larry Dorman with the University of Arkansas at Pine Bluff, as he developed many of these materials for the quintessential Aquaculture Producer's Quick Reference Handbook. Tables were reproduced with permission.

Available Resources

Mobile Apps

http://aquaplant.tamu.edu/useful-apps/

Texas A&M
"Aquaplant"

- **AquaPlant** is designed to help pond owners and their advisors in the identification and management of aquatic vegetation. Aquatic vegetation management can be a perplexing problem. The first part of that problem is proper identification. Management of most aquatic plant species depends on properly identifying the desirable or nuisance plant. After identification of the aquatic plant is achieved with the visual index and description pages of AquaPlant, the user can then use the management section for each species to learn the correct treatment options including biological, mechanical, and herbicide controls.

Available Resources

Mobile Apps

http://aquaplant.tamu.edu/useful-apps/

Texas A&M
"Aquacide"

- **Aquacide** – The Aquatic herbicide selection, effectiveness, and restriction guide is a tool for recreational pond managers as well as aquaculture professionals. This comprehensive visual guide helps you select the most effective herbicides for all aquatic vegetation classes, including the most common North American algae and floating, submerged, and emergent aquatic vegetation. Only herbicides that provide good or excellent control are provided for each species. AquaCide provides the environmental restrictions of all aquatically labeled herbicides, such as restrictions for human use (drinking, swimming, and fish consumption), livestock watering, irrigation (turf and crops), and other general comments pertaining to restrictions and differences in formulation

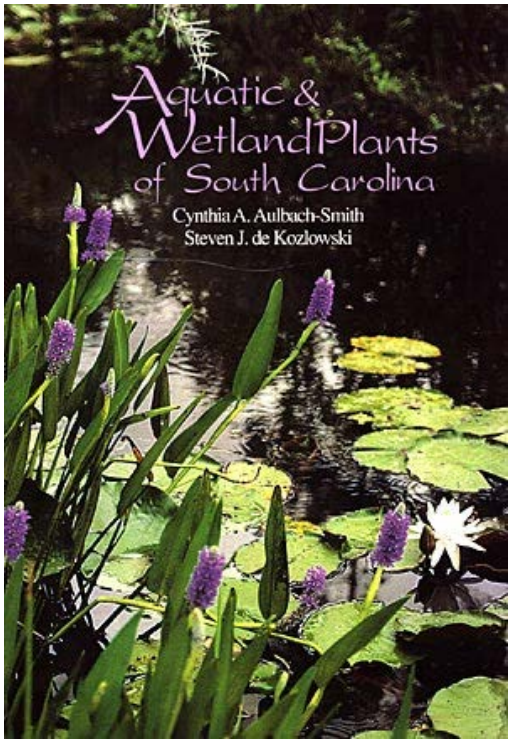
Available Resources

Books

Aquatic and Wetland Plants of South Carolina

Written by
Cynthia A. Aulbach-Smith and Steven J. de Kozlowski

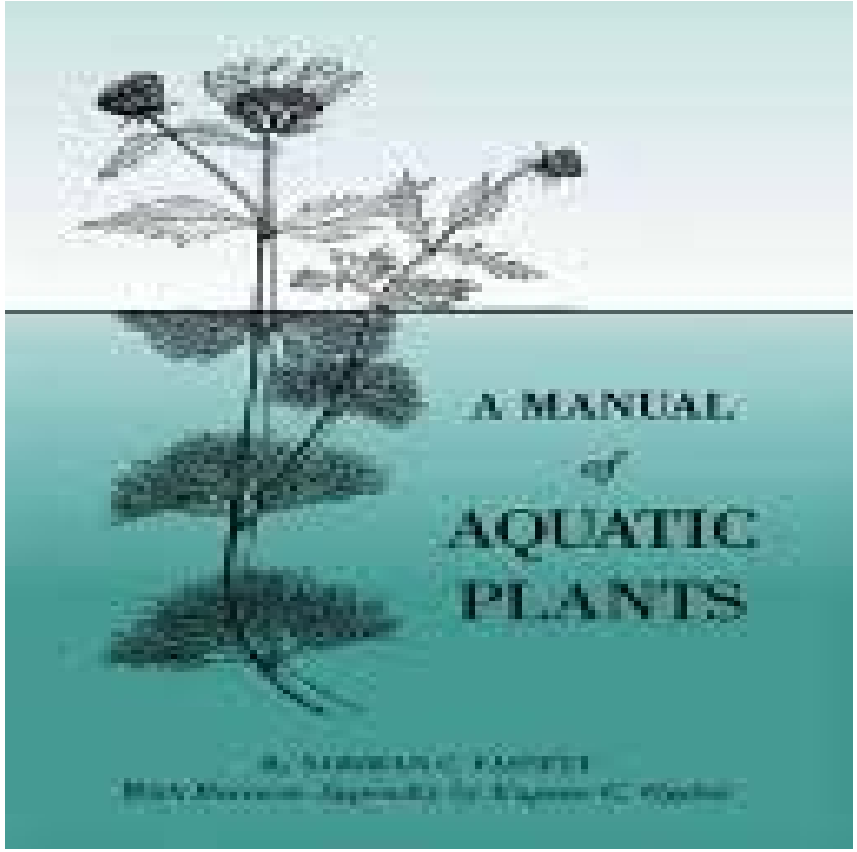
- This book provides detailed information on aquatic plants found in South Carolina including; descriptions of plants, distributions, and photographs. It is a wonderful resource and field guide to South Carolina's aquatic plants.



Available Resources

Books

A Manual of Aquatic Plants

- Fassett prepared the data to make the identification of aquatic plants as simple as possible, not only when they are flowering or fruiting, but also in sterile condition. The Manual covers a region from Minnesota to Missouri and eastward to the Gulf of St. Lawrence and Virginia. Originally published in 1940, the Manual was reissued in 1957 with revised nomenclature and other updates by Eugene C. Ogden

Written by
Norman C. Fassett