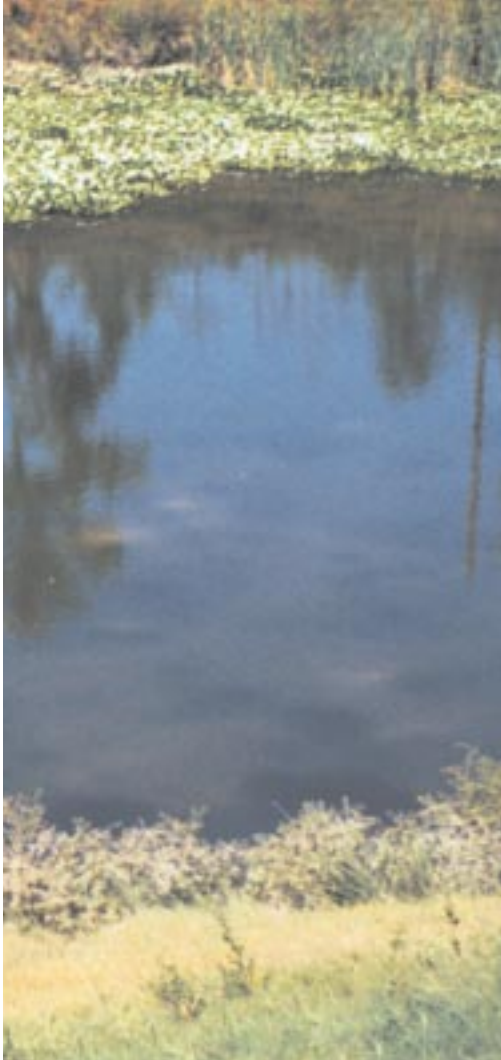


A citizen's guide to

Stormwater Pond Maintenance

i n S o u t h C a r o l i n a





This booklet is intended as a guide for homeowners associations and other interested individuals on the proper maintenance of stormwater ponds. Photos and descriptions of nuisance aquatic plant species are also presented to aid in the identification and removal of these species.

Introduction



Why Stormwater Ponds are Important

Stormwater ponds are a common sight in urban and suburban areas. They are constructed during the development process to safeguard water quality by collecting and treating stormwater runoff and to protect against flooding. Both state and local authorities require most new developments to manage stormwater runoff.

As land is developed, vegetative cover is replaced by impervious surfaces such as buildings, roads, parking lots, and driveways. Instead of soaking into the ground, rainwater (i.e., stormwater) runs off the impervious surfaces, sometimes resulting in flooding that can scour streambanks and cause erosion. In addition, as the runoff washes across lawns, roads, and parking lots, it picks up sediment and pollutants such as fertilizers, pesticides, bacteria, and oil and deposits them into creeks and rivers. This polluted runoff is called “nonpoint source” (NPS) pollution because it does not originate from a single point, such as a discharge pipe. It is a growing concern in coastal areas, where it can impair water quality, reduce fishery production, and close shellfish beds.

How Stormwater Ponds Work

Stormwater ponds detain runoff and allow the pollutants carried by runoff to settle out. First, runoff is conveyed to stormwater ponds by a combination of overland flow, ditches, swales, and underground pipes. Once runoff reaches a stormwater pond, the sediment settles to the bottom. The water that entered as polluted runoff leaves the pond gradually through an outfall structure, ultimately resulting in cleaner water entering the receiving creek or river.

Stormwater Pond Design and Management

When stormwater ponds are well designed and maintained, they can be moderately to highly effective in reducing the amount of nonpoint source pollutants that reach our waterways. Especially important to pond design is the slope of the pond's sides. The side slopes of the above-water portion of a pond should be a ratio of 3 to 1 (3 feet of run for every 1 foot of rise) and the slope below the water level should be at a 2 to 1 ratio. The gentle 3 to 1 side slope allows for runoff to soak into the bank and prevents erosion of the bank. The steeper 2 to 1 side slope below waterline helps to control aquatic weed growth.



Management for Wildlife and Aesthetics

Well-managed stormwater ponds can serve as an amenity to a community and provide habitat for a variety of wildlife and vegetation. A vegetated buffer of native plants along the fringe of the pond can be used to attract wading birds, turtles, and other wildlife. Vegetation along the banks can also make the pond more attractive.

Aquatic plants are essential to the balance in the stormwater pond ecosystem. Certain plants protect pond slope by minimizing erosion, while floating plants and algae consume nutrients in the pond. However, without proper management, aquatic plants become unsightly and degrade the overall quality of the pond.

(See the photo section at the end of this booklet for more information on nuisance aquatic plant species.)



section three

Homeowners Associations' Maintenance Responsibilities

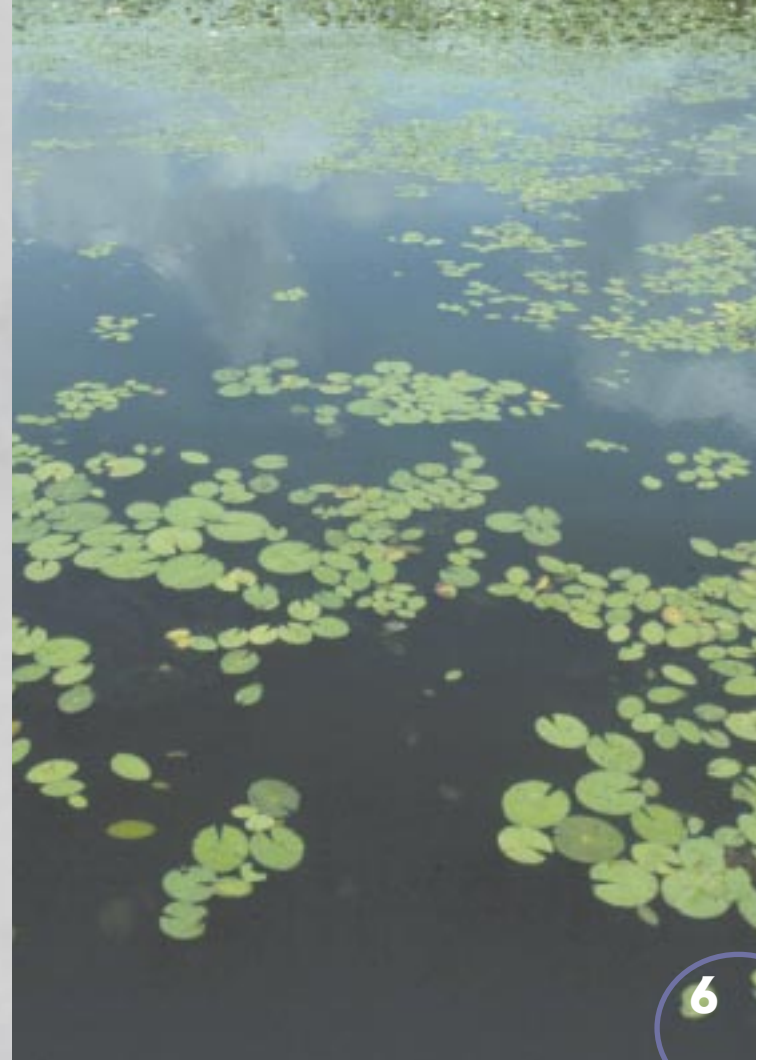
All stormwater ponds require maintenance. The homeowners association is often the party responsible for maintaining a neighborhood's stormwater pond. Contact the developer of a neighborhood to determine whether the homeowners association is responsible for maintenance either now or starting some time in the future. Regular maintenance, annual inspections, and periodic dredging are all necessary for proper pond management and to ensure a long stormwater pond life. If not adequately maintained, stormwater ponds can become an eyesore, breed mosquitoes, and create undesirable odors.

Inspections

Regular maintenance of a stormwater pond involves upkeep of the pond and its immediate surroundings, including periodic removal of trash and debris. Perhaps most important, aquatic plant growth should be monitored annually every spring to late summer. Inspections should include an assessment of aquatic weeds, the effectiveness of weed management, and the integrity of the pond's structure. In addition to these annual inspections, ponds should be inspected after major storms for side slope erosion and outfall structure damage, with needed repairs made as soon as possible.

Dredging

Periodic dredging is a necessary part of pond maintenance. Ponds should be dredged roughly every ten years to remove sediment buildup. If a pond is not dredged, the collected sediment built up over time could reduce the volume of water that the pond can hold, lessening its effectiveness for flood control and stormwater management. In order for dredging to take place, there must be access on at least one section of waterfront land so that dredging machinery can reach the water. Homeowners associations should consult their developers to make sure they have made provisions for such access.

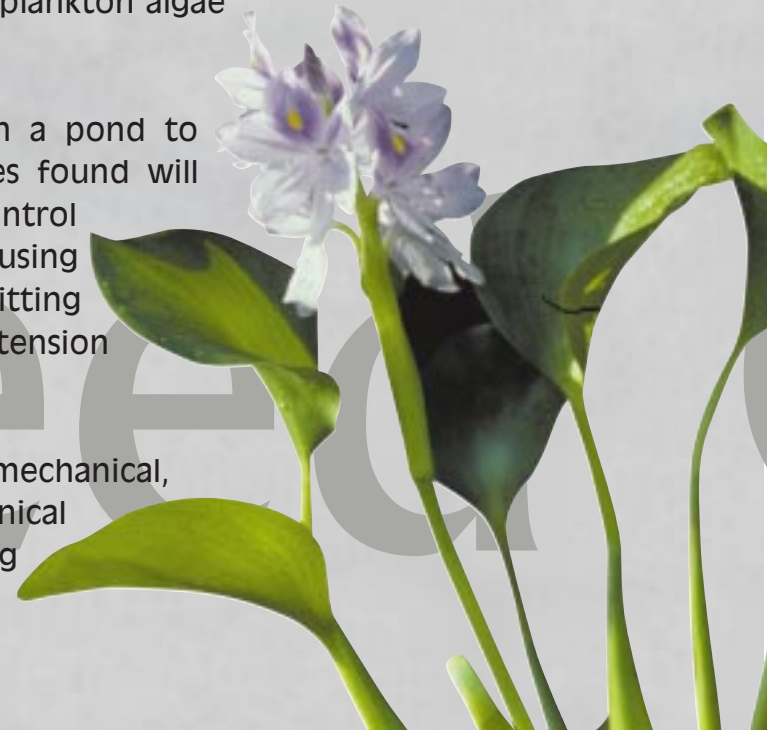


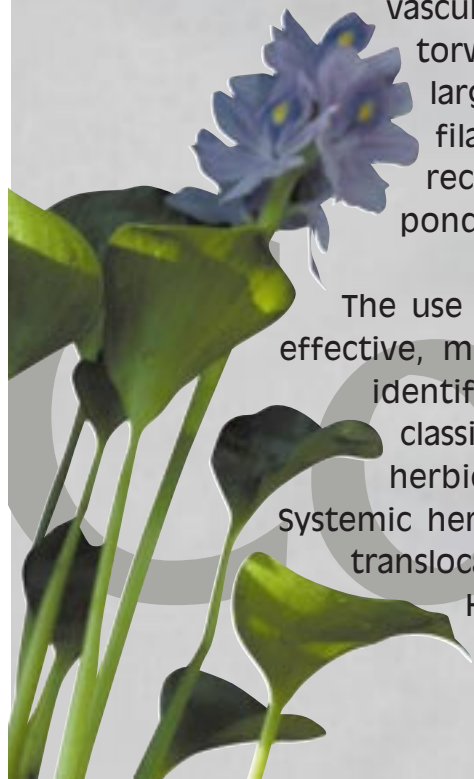
Weed Control

Aquatic vegetation thrives in warm, humid conditions that exist along the South Carolina coast. Therefore, it is imperative that aquatic plant growth is monitored and managed. These plants are classified into four groups: submersed, immersed, shoreline, and algae. For desirable native species to thrive, weed species such as alligatorweed, hydrilla, and plankton algae must be controlled.

It is important to inventory the plants in a pond to identify weed species, because the species found will help determine the appropriate weed control method. Weed species can be identified by using a field guide with a plant "key" or by submitting samples to the local Clemson University Extension Service office.

Weeds can be effectively controlled using mechanical, biological, or herbicidal controls. Mechanical weed control involves pulling or cutting weeds with special equipment.





Biological control refers to stocking the pond with certain species to control weeds. Biological control options in South Carolina consist of using tilapia (a fish) to control filamentous algae, using sterile grass carp to control most submerged vascular plants, and using the alligatorweed flea beetle against alligatorweed. However, grass carp are more commonly used in ponds larger than stormwater ponds. Although sometimes used for filamentous algae control, common and Israeli carp are not recommended by state agencies since they may cause muddy ponds and fish population problems.

The use of herbicides is the most common, and often the most cost effective, means of controlling weeds. However, weed species must be identified correctly to choose an effective herbicide. Herbicides are classified by either contact or systemic mode of action. Contact herbicides kill only the plant part that is physically contacted. Systemic herbicides are absorbed by foliage and exposed roots and then translocated in the plant. It is most effective on deep-rooted plants. Herbicides have little negative impact on wildlife when used properly. Aquatic herbicide users should always read and follow label instructions to reduce the risk of a fish kill.

Below is a list of the most commonly used herbicides and a brief description of their appropriate use:

Herbicide	Description
Copper Sulfate and copper Complexes	Primarily used to control algae. It is a contact herbicide and quickly kills algae. Most fish kills related to copper sulfate application is due to depleted oxygen from algae decomposition.
Diquat	A contact herbicide that can be used as a pour-in treatment for submersed weeds and filamentous algae. Diquat quickly kills plants and should be used as a partial pond treatment for dense vegetation.
Endothall	A contact herbicide that controls most submerged aquatic weeds.
Fluridone	Controls most submersed and immersed weeds. It is a translocated herbicide that slowly kills plants over a 30- to 90-day period. This slow action generally prevents the occurrence of weed decomposition. The entire pond must be treated to control the target weed.
Glyphosate	Used to control most shoreline vegetation and some immersed weeds. Glyphosate translocates to attack the underground storage organs (roots/rhizomes).
2,4-D	Comes in two forms: Granular and Liquid. The granular form controls submersed weed such as coontail and immersed weeds such as waterlily. The liquid form controls floating weeds such as the water hyacinth and other immersed weeds.

Tips and Responsibilities for Applying Herbicides

(Contact your local Clemson University Extension Services office for more information)

- Read and follow herbicide label directions.
- Avoid treating on cloudy or windy days so herbicides are not blown or washed away.
- Treat in early spring before the weeds get out of control.
- Treat when water temperature is above 60° F and plants are actively growing.
- Avoid applying herbicides during summer and winter months.
- Avoid mixing herbicide with turbid water or applying herbicides to turbid pond water because some herbicides bond with clay particles in the water.
- If the weed infestation is very bad, treat ponds in sections with intervals of two to three weeks between treatments to reduce the risk of a fish kill. Treating the whole water surface at once would lead to a depletion of dissolved oxygen in the pond from the dead plant materials breaking down, which could then cause a fish kill. If aquatic herbicides are applied following label instructions, the risk of a fish kill will be very low.

Pesticides

- Apply copper sulfate on sunny days, when it is most effective. (The herbicide kills weeds by disrupting the photosynthesis process in the plant.) Also, to prevent a fish kill, make sure the pond water hardness is greater than 50 ppm calcium carbonate before applying herbicide. Lime can be applied to raise the water hardness, although hardness below 50 ppm is not typically a problem in the South Carolina Lowcountry.



The user is always responsible for the effects of herbicides, therefore it is recommended that a licensed applicator be hired to apply any herbicides. To receive a Category 5 Certified Aquatic Pesticide Applicators License, an individual must pass a Core Pesticide test and an advanced specific test on Aquatic Pesticide Application administered by the SC Department of Pesticide Regulation (Call (864) 646-2150 or contact the local Clemson University Extension Service office for details). Tests are given quarterly throughout the state and study materials can be purchased from the Extension Service Bulletin Room at (864) 656-3261. Two licenses are issued: Non-commercial for government agency personnel only, which is free, and Commercial for operations on other individuals' or companies' property, which costs \$25 and proof of financial responsibility (a bond or insurance). A separate license category called Private also exists for your own property or farm use. It costs \$5 for local Clemson University Extension Service office training for all Restricted Use Pesticide Application. Ten hours of Continuing Certification Hours per five-year period are required for all licenses and are available through Extension programs.



Ways Homeowners Can Reduce Urban Pollutants in Surface Runoff:

Use less pavement. When landscaping, try to incorporate some alternatives to concrete and asphalt. Materials such as gravel, interlocking stones, crushed stone/shell and bark chips significantly minimize yard runoff by allowing water to seep into the ground.

Seed bare patches of soil. Establishing plants in bare areas helps to minimize erosion of sediments.

Keep kitty litter on hand. Kitty litter is handy for cleaning up spills like motor oil and other fluids. Once the spill is absorbed, simply sweep up the litter and throw it in the garbage.

Clean up after your pets. Clean up pet wastes and dispose in the trash or toilet.

Keep lawn clippings out of the water. Yard waste, such as lawn clippings, deposited into a pond will decay and can consume oxygen needed for fish and other aquatic organisms as it decays. Lawn clippings and non-woody debris can be easily composted or mulched at home. Contact your local extension office for more information. Curbside pick-up of yard waste is an option in many communities.

Don't overuse fertilizers. Have your soil tested before applying fertilizer. Excess fertilizer can be washed into ponds and fertilize pond weeds. Check the weather before applying fertilizer to ensure that there is no rain in the forecast. If you use native plants to landscape your yard, they will require little or no fertilizer and pesticides since they are already adapted to local environmental conditions¹. Landscaping along a pond with native plants is preferred over a grassed lawn and also provides a buffer to better control runoff and erosion.

Don't overuse herbicides and pesticides. Use herbicides and pesticides according to the label's exact directions since they can be toxic to wildlife and can contaminate waterbodies. Use nontoxic alternatives where possible and your own hands to remove weeds.

Don't water your driveway. Use a broom and not the hose to clean off your driveway. Try washing your car on the lawn instead of the driveway. You are watering your lawn at the same time and the soapy water will not hurt the grass.

Storm drains are only for rainwater. Don't pour motor oil, lawn clippings, or anything else down storm drains. Motor oil is especially toxic. Recycle it at gas stations or garages.

Try nontoxic extermination methods. Consider environmentally friendly warfare against yard pests. (see tips below)

¹ You can obtain a native plant list from OCRM (843) 744-5838

Environmentally Friendly Pesticide Alternatives:

- To treat problem ant mounds, add 1/2 cup Dawn dishwashing detergent to 2 gallons warm water and apply directly to the mound.
- Plant marigolds, mint or garlic around garden edges to repel pests.
- Use insecticidal soap or mild soft soap to kill many types of insects. (Note: the soft soap is effective only if the insect comes into direct contact with the soap).
- Encourage beneficial birds to nest near your house by adding birdbaths and houses. Birds are great for helping reduce the insect population.
- Try to coexist with some insects. Some are very helpful in controlling annoying pests. Example: Spiders eat carrot weevils, fleas and flies.

Alternatives

Aquatic Nuisance Plant Species

Below is a list of the worst aquatic nuisance plant species for stormwater ponds in South Carolina. When inspecting a stormwater pond, look for these species and make sure none of them is present in the pond. (All are introduced species except cattails):

Water hyacinth (*Eichhornia crassipes*)

This noxious free-floating plant from Brazil reaches up to three feet in height. Leaves are thick, leathery and elliptic (oval) to ovate (egg-shaped) and emerge from the plant base. The leaf stem is inflated and spongy to provide floatation. The flowering spike contains five to twenty very showy light purple flowers with a yellow spot. Roots are dark, fibrous and feathery in appearance. The plant's root system provides nesting habitat for certain aquatic insects.



Hydrilla (*Hydrilla verticillata*)

Hydrilla is an introduced submersed perennial. Leaves are up to 2/3 inch long with sharply toothed margins (edges) and occur in whorls (spirals) of three to eight around a long thin stem. Sharp teeth located on the lower midrib (central vein) of the leaves gives the plant a rough feel. Hydrilla exhibits multiple branching at a single node (point of origin). Translucent white flowers are less than 1/4 inch in diameter. It is sometimes sold as "Anacharis."



Common Reed or Phragmites (*Phragmites australis*)

Phragmites is a perennial grass that reaches ten feet in height. Leaves are two-ranked (two rows per stem), flat, long-attenuate (gradually tapering to a point) up to 1 1/2 feet long and 1/2 inch wide, and blue-green in color with rough margins. The leafy stem is topped by a one-foot long silvery brown silky panicle of flowers. Phragmites reproduce and spreads rapidly by rhizomes (horizontal underground stems).



Alligatorweed (*Alternanthera philoxeroides*)

Alligatorweed is an aggressive emergent perennial from South America. Stems reach a length of three feet or more. Leaves are opposite (occur on same node but on opposite sides of stem), entire (no teeth, lobes or indentations), and up to four inches long. It is distinguished by its small, white, clover-like flowers. Alligatorweed spreads rapidly by fragmentation.



Giant Salvinia (*Salvinia molesta*)

Giant salvinia is a small, free-floating, introduced aquatic fern. It usually appears as branched stems with floating leaves in whorls of three. Floating leaves are light to medium green, broadly rounded, and 1/2 to 1 inch long and wide. The upper surface is covered with dense, stiff, white hairs with distinct "egg beater" shaped tips. It has not established itself in the wild in South Carolina, but is expected to become a major problem if it ever does.



Cattails (*genus Typha*)

Cattails are native but could cause problems in a stormwater pond where excessive nutrient loads occur and depths are shallow enough (approximately three to four feet) to allow establishment. Cattails occur in dense stands and can provide mosquito breeding sites. They have long narrow leaves and one tall stem with a cylindrical spike of fuzzy brown fruits. Plants may attain a height of six to eight feet.



Who to Contact for More Information:

SCDHEC Office of Ocean and Coastal Resource Management
(OCRM) (843) 744-5838

Clemson University Extension Service
(Check the local phone book for nearest office)

South Carolina Sea Grant Consortium

Other documents:

Clemson Extension's *Coast-A-Syst* and *Home-A-Syst*

South Carolina Department of Natural Resources' Booklet
Illegal Aquatic Plants of South Carolina

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