Community and Commercial Stormwater Ponds

Aquatic Vegetation Management

The balance of vegetation in stormwater ponds is critical for a healthy ecosystem. Not only do plants add aesthetic value to ponds, but they also provide oxygen through photosynthesis, temperature buffering by shading and can stabilize edges, preventing erosion. Some other benefits for various aquatic plant species include absorption of pollutants, food for aquatic life and habitat benefits for diverse species. Although there are many good qualities of aquatic plants in stormwater ponds, dense vegetation can negatively impact the function of the pond by increasing sedimentation and obstructing pipes or outfall areas. Plants can inhibit the flow of water through the pond systems and can also reduce residence time and water volume. Together, the result can be stagnancy and impaired water quality. When dense vegetation utilizes all the nutrients present decay can occur, causing noxious odors and unsightliness that lead to increased maintenance/upkeep costs. Some of the prevalent aquatic plant species are outlined below.

▶ Planktonic Algae

Planktonic algae are a staple of many aquatic food chains. These microscopic plants are active in producing oxygen and removing nutrients directly from the water. Though individual plants cannot be seen without a microscope, the clusters form blooms that are recognizable from their coloration. Blooms are stimulated by nutrients that run off from impervious surfaces or oversaturated yards.

Indicators: Murkiness is a sign of growing algae in response to nutrients from the pond system. The presence of certain planktonic algae can be visualized by films on the surface of water. For instance, blue-green algae (cyanobacteria) produce a vibrant green, oily film on the surface of ponds. There are also planktonic algae that produce cloudy, pea green coloration.

Problems: An imbalance in planktonic algae can lead to plant death and decay from shading. This process removes oxygen from the water and can lead to eutrophication or low oxygen events. Additionally, cyanobacteria are a group of algae that often produce toxins that can have adverse effects on fish and wildlife that encounter them. These algae are stimulated by elevated concentrations of phosphorus, most associated with animal waste or lawn runoff.

Example of blue-green algae in pond

Management: Chemical treatment should always be done by a licensed applicator using a proper concentration of herbicide to minimize environmental impact. Chemical treatments only provide temporary control and usually a reactive response to algal blooms. This method can also lead to rapid death and decay of algae which can deplete pond oxygen. To best manage the issue, the source of excessive nutrients (lawn fertilizer, landscape runoff, etc.) should be identified and steps taken to ensure proper removal. Other methods for more effective and permanent treatment include building a buffering zone around the pond for land-based plant nutrient sorption or incorporating water aeration/circulation to prevent stagnation while introducing more oxygen.

Filamentous Algae

Filamentous algae are another important part of the aquatic food web and an essential provider of oxygen to ecosystems. These colonies of microscopic plants normally grow on the surface of hard objects under the water, including pond bottoms, and as their filaments link together, they eventually detach and form floating mats. The algae have no root systems, which makes them completely dependent on nutrients in the water. The dense mats of linked filamentous algae limit oxygen exchange with the air, create stagnant conditions and can lead to clogging in water flow infrastructure. There are several types of filamentous algae in Louisiana's waters, but the most problematic grow during winter and spring when water clarity is high, and subsequently slough off as temperatures rise in the summer. At the pond surface, stress from direct sunlight and high temperatures causes mats to die and decay.

Indicators: During the summer, fertilizer from lawns and animal waste can stimulate the growth of algae. The first stage is seeing small clumps of floating algae or clusters on vegetation. In most cases, these are naturally occurring and are good for the ecosystem as they remove nutrients and other pollutants. However, when large mats begin to cover more than 20 percent of the stormwater pond, then action should be taken.

Problems: Though filamentous algae are not toxic, the dense mats can create low-oxygen areas by reducing sunlight and causing stagnant water. Additionally, if the nutrients fueling algae growth are from pet or wildlife waste, there could be harmful bacteria or pathogens living on the algal mats. If mats persist throughout the summer months, the algae can cause outflow clogs, potentially leading to localized flooding.

Management: There are many treatment techniques for controlling filamentous algae. The most effective approach is to reduce the source of nutrients into the pond. If the nutrients are controlled, the algae will not be able to grow. Short-term control can include the manual removal or harvesting of algae from the pond to destabilize the cluster. In this case, caution should be taken to wash hands thoroughly and sanitize equipment whenever bacteria may be present on the floating mats. Chemical control, such as herbicides or pond dyes, can be applied by licensed applicators to eliminate algae in ponds as another short-term solution. This could, however, induce death and decay of plants and lead to low dissolved oxygen. Pond dyes slow the photosynthesis process for plants, decreasing the rate at which they grow. A final nature-based solution could be the implementation of a floating garden to remove the nutrients. Floating gardens will compete for nutrients that the algae need to grow and create an aesthetic appeal to the stormwater pond.

Example of full pond coverage of filamentous algae

Submerged Plants

Shallow stormwater ponds promote the growth of submerged plants due to adequate sunlight and nutrients. These allow for vegetation to root on the pond bottom and grow upwards through the water column. The stems and leaves of these plants provide nutrients and shelter for many aquatic organisms and produce oxygen in the water. In some cases, the vegetation can cause moderate water temperature regulation from shading. Similar to pond algae, excessive submerged vegetation can cause clogs in pipes or outfalls and be increasingly detrimental to the circulation of pond water. If pond water fluctuates, increasing depth can prevent sufficient sunlight from reaching submerged plants, and the corresponding death and decay can cause low oxygen events and noxious odors. Conversely, once submerged plants establish a foothold, they can occasionally take up so many nutrients that planktonic algae cannot compete and the water clarity increases. This allows the submerged vegetation to spread farther into the pond.

Indicators: Submerged vegetation is typically restricted to the shallow areas around the pond for rooting. It usually presents as grass or moss-like underwater plants. Rarely should these plants be present at the surface of the water.

Problems: Like other forms of aquatic plants, dense clusters of submerged plants can cause clogging of pipes that control water movement. During large rain events, these plants can become uprooted and flushed downstream, which creates backups and potential localized flooding. Additionally, aeration systems functioning in shallow water can be clogged with submerged vegetation, preventing aeration or water circulation and requiring costly repairs or replacement.

Management: There are many methods for managing submerged plants in recreational ponds with biological control, with plant-eating fish being a more common practice. But for stormwater ponds, manual or mechanical harvesting can help in the short term. Larger projects could include dredging to establish a deeper pond profile that creates limited sunlight penetration for submerged plant growth. Depth to at least four feet will reduce, but not completely eliminate, the potential for submerged plant growth. Contacting a licensed applicator to apply aquatic herbicides or dyes could be a short-term solution, but it should always be done by a specialist to ensure the safety of downstream ecosystems.

Example of submerged vegetation

Floating Plants

Floating plants come in many different forms, including free-floating, submersed with floating leaves and trailing. The common theme is leaves at the surface of the water, while root systems can be suspended or rooted to the bottom of the pond. Free-floating plants (such as duckweed or water hyacinth) are completely suspended in the water, which allows plants to be moved by water circulation or wind. Submerged floating-leaved plants, like lily pads, are anchored to the pond bottom, and stems stretch to the surface to float. A trailing plant will root in shallow water near the banks, while its stem and leaves allow it to link together, floating in the current or extending across the water's surface. This type of vegetation provides a positive benefit to shoreline erosion

Indicators: These plants are visible at the surface and represent a fast-growing vegetative covering. The various forms of floating plants can be found across shallow and deep water due to their ability to move with currents.

Problems: Floating plants are not ideal for stormwater ponds due to their mobility and ability to clog. These plants allow for greater interference with infrastructure and aeration processes such as water level fluctuation and wind push mats around ponds. Though free-floating plants have the most potential to cause backups leading to flooding, the submerged floating leaf plants can increase sedimentation and lead to stagnancy. These plants are also likely to prevent oxygen exchange from the atmosphere if plants are too dense on the surface. Eventually, anaerobic conditions can lead to foul odors and a build up toxic compounds in the pond itself and outflowing water.

Management: Treatment should always be done by a licensed applicator using a proper concentration of herbicide to minimize environmental impact. Most floating plants have a targeted approach based on the location of plants in the water column. There are biological control options, like sterile grass carp for submerged and trailing plants and mechanical or manual harvesting is also an option, though labor-intensive. In most cases, commercial herbicide application by a licensed applicator can help mitigate the issue for short-term solutions.

Example of various floating plants

▶ Invasive Pond Plants

Invasive plants that are not native to a Louisiana landscape can cause harm to local ecosystems when they become established. Possession or transport of many of these plants is illegal. For stormwater ponds, if any of the aquatic invasive species are noticed, it is important to act immediately before the plant spreads. Though there are some management techniques for eliminating invasive plants, it is much more difficult to control them once they have taken over a pond space. The following plants are invasive in Louisiana pond systems. For additional information, check out LSU AgCenter Invasive Species (www.lsuagcenter.com/topics/environment/invasive%20species) page.

Hydrilla: Hydrilla will grow from the pond bottom with a single stem that has very few, intermittent leaf clusters until it reaches a depth with adequate sunlight, at which point it will begin splitting to form a cluster of stems with abundant short leaves (with teeth, in groups of four to eight). Each of these stems can also split. Growth takes place at the tip of each stem. Eventually most of the upper water column will be filled with these leaf-covered stems. At this point it is not uncommon to see thin stalks with microscopic white or pink flowers extending from the tips of some stems. Hydrilla is very persistent because it can reproduce from potato-like roots, from seed, and from broken pieces of stems.

Hydrilla

Myriophyllum: This plant is also characterized by long primary stems, often with a reddish-brown or pink color. Whorls of three to five feathery leaves are spaced regularly along the stems, but more closely near the tips. Small flowers and fruits can be seen at the end of some stems at the water's surface. It is widely recognized as an aggressive, non-native aquatic plant.

Water Hyacinth: This floating plant has leaves below and above the water surface. Those that are on the surface are wide with a bulbous shape where their base connects with the main plant. Roots and thin submerged leaves extend into the water from the base of the plant, often accompanied by horizontal shoots that give rise to new plants. In this way, dense mats are often formed, eventually choking everything below the water's surface. When flowering, a number of blue to purple two-inch hyacinth-like flowers emerge in all directions from a central stalk.

Water Hyacinth floating in pond

Salvinia: There are two types of salvinia found in Louisiana: giant and common. They are floating plants and do not have stems, just leaves (often in overlapping clusters) and roots. Both are non-native and aggressive invaders. Both can reproduce by fragmentation, and Common Salvinia can also reproduce via spores.

Salvinia

▶ Shoreline and Emergent Plants

Shoreline and emergent plants are typically associated with vertical wetland plants or vine-like, creeping edge-of-pond vegetation. These plants are rooted in shallow water or on the immediate bank and thrive in soil that is permanently saturated with water. For stormwater ponds, these plants offer the most benefit as they prevent erosion of the banks, act as a buffer zone for nutrients that contribute to algae growth, filter debris that would otherwise end up in the ponds and shade the water in some cases. Additionally, this supports habitat for aquatic and terrestrial wildlife and helps stabilize the bank ecosystem by reducing the wind and wave energy.

Indicators: Shoreline plants are normally naturally growing and quintessential wetland plants, like cattails and bull rush. Mostly known for vertical growth, these present as obstructions to water and can impact recreational activities. These plants will be growing in close proximity or on the bank, with most of the plants outside the water.

Problems: These plants are the most beneficial to storm-water ponds' dynamics, with the only real drawback being maintenance, restricted pond access and habitat for dangerous wildlife. If not maintained, shoreline plants can take over a space and lead to restricted access to the pond. This will require additional maintenance to alleviate problems. This can also provide habitats for snakes and other unwanted species that could be dangerous.

Management: Due to the nature of shoreline plants, periodic pruning may be needed to keep them from taking over the shoreline. Most related upkeep involves removing debris that is filtered out before making it into the receiving waterway. Debris that collects from runoff can also cause negative impacts to the ecosystem if tangled in shoreline plants. Educational activities like community cleans up could be hosted to learn about stormwater ponds and encourage habitat preservation.

Shoreline plants near stormwater pond

Resources:

AEC807/WC468: Frequently Asked Questions about Stormwater Wet Ponds (*https://edis.ifas.ufl.edu/publication/WC468*)
Stormwater Pond Problem Solving (*www.clemson.edu/extension/water/stormwater-ponds/problem-solving/index.html*)
Stormwater Wet Pond and Wetland Management Guidebook, February 2009 (*www.epa.gov/sites/default/files/2015-11/documents/pondmgmtguide.pdf*)

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