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Creating a Buffer for Texas Ponds

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INTRODUCTION

The shoreline area of any pond, be it for recreation, ornamental, or agricultural purposes, plays an important role in maintaining the overall health and functionality of both the waterbody and its surrounding environment. The vegetated transition area starting a foot below the water line and extending upward to the drier bank is termed the *emergent zone* and provides many protective and ecological qualities that benefit the aquatic ecosystem (Fig. 1). Acting as a natural barrier between the water and surrounding land uses, this zone can serve as a vegetated *buffer*, filtering runoff pollutants like sediment and nutrients. At the same time, this area can also provide critical habitat for aquatic organisms and other wildlife species. The proper vegetation composition of the buffer is also key in minimizing erosion and providing shoreline stabilization.

Emergent zone buffers enhance water quality and habitat function and are generally easy to maintain, yet pond owners may not know where to begin when assessing and improving their water's edge. The purpose of this publication is to introduce the concept of and describe how to best implement vegetated buffers in Texas pond emergent zones. Additional resources on related topics, such as finding an aquatic plant nursery, designing or renovating a pond, and aquatic plant management, can be found at the end of this publication.

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Did You Know?

Aquatic vegetation is typically broken up into four categories—algae, floating, submerged, and emergent—based on where the vegetation grows in relation to the pond or water column, along with shared form and structural characteristics within each group of the vegetation.

- **Algae** are primitive, non-seedbearing plants with no roots, stems, or true leaves.
- **Floating plants** are classified by all parts of the plant floating, which includes the roots.
- **Submerged plants** are characterized by being mostly underwater and rooted with flaccid or limp stems.
- **Emergent plants** are rooted with stiff or rigid stems, with all or parts of the plant standing above the water's surface.

A common misconception is that water lilies or similar plants are considered to be floating due to their leaves and flowers floating on or sitting just above the water's surface. However, water lilies have thick tuberous roots in the sediment and are anchored by long fibrous stems, so they fall under the emergent category because they are rooted plants that emerge above the surface.

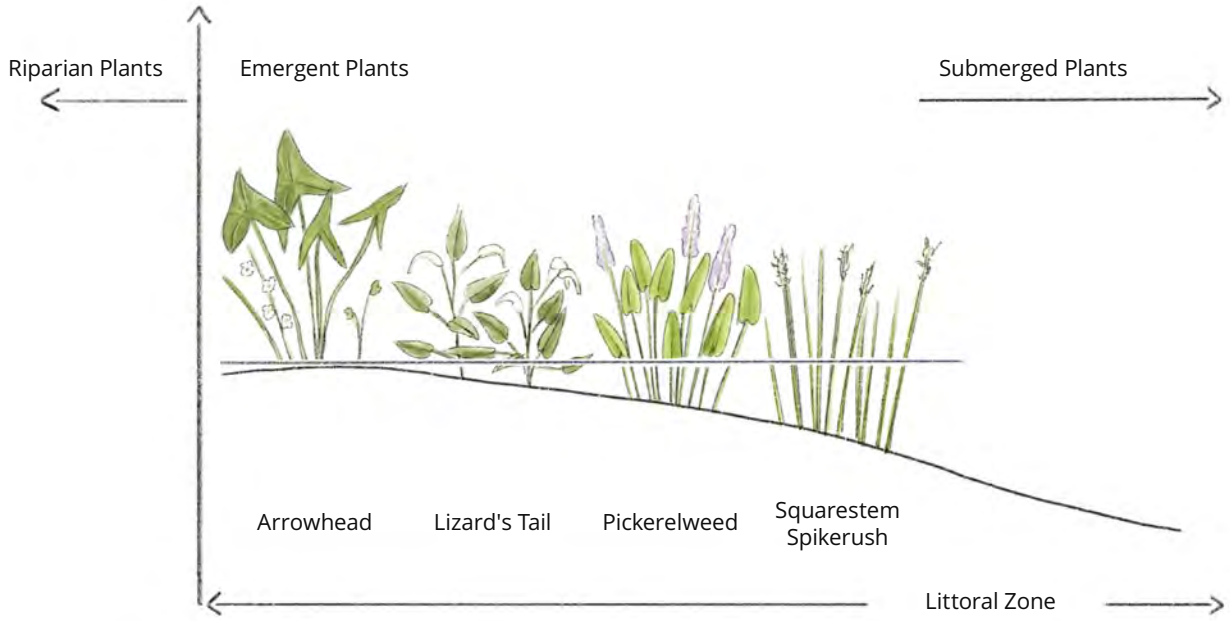

Figure 1

CREATING BUFFER IN THE EMERGENT ZONE

One of the easiest and lower-cost ways to create a buffer strip is to stop mowing, spraying, or weed-eating, allowing the natural grasses and vegetation surrounding a pond to grow undisturbed. At minimum, pond owners should consider changing to the highest mower setting when mowing adjacent to the pond area. Even maintaining the grass a few inches higher (e.g., 5 inches) is better than nothing. However, ideally, the grasses in a buffer strip should be a minimum of 8 inches to receive the full benefits of the buffer. Generally, the taller the grass, the more substantial the roots need to be to obtain nutrients and water for the grass, resulting in better buffering capacity. To achieve a more optimal height or to create a more aesthetically pleasing buffer, pond owners may want to spend additional time planning and preparing their buffer.

Various factors, including upland land use, land slope, pond depth, and specific activities occurring on the property, will guide an optimal buffer design aimed at maximizing effectiveness and subsequent ecological benefits. Here, we go over basic considerations and recommendations specific to vegetative buffers in the emergent zone of Texas ponds.

Preparation and Planning

Buffer implementation or improvements should always begin with removing existing undesirable species and assessing pond conditions to make informed plant selections. In cases where non-native, invasive aquatic species are established, or nuisance vegetation has become dense, mechanical or chemical control will be necessary to properly prepare the site. When using herbicides, ensure that they are labeled for aquatic sites and keep in mind that other non-targeted species may be affected depending on chemical selection and application method.

Ideally, buffer areas should consistently have moist soil or up to a foot of water throughout the year. When evaluating the shoreline, it is best to avoid assessing this condition during times of extremes, including drought years and months with historically low rainfall, such as August and September, or during flooding and heavy rain events. Noting the amount of direct sunlight the area typically receives throughout the day is another important assessment. Sunlight conditions (i.e., partial/full sun/full shade) will dictate what plants will be most appropriate for planting. Similarly, determining what USDA Plant Hardiness Zone a pond falls within is critical for selecting plants that will best tolerate the location's environment.

Planting

Whether using established plants or seedlings, planting practices should ideally occur in early to late spring to allow plants to establish before the stress of summer heat begins. Planting in the early fall is also an option but will give plants less time to establish before dying back or becoming dormant for the winter.

Established plants purchased from aquatic plant nurseries are often used to fill gaps in buffer zones. For larger areas or new/renovated ponds, consider using a native seed mix to cover more area at a lower cost. Propagating established plants from the property is another option, but generally, this method takes more time to implement and may be more appropriate for supplementing future maintenance needs.

Some species may establish quicker or have a propensity to grow faster. To avoid a monoculture in the buffer, monitor the vegetation composition over time and make adjustments as needed through additional planting or removal measures.

Buffer Widths

Any width of natural vegetation will provide some level of benefit in buffer zones. However, purposefully defining the width based on desired management goals and site characteristics will maximize buffer effectiveness. For example, areas with steeply sloped banks would benefit from a wider buffer to slow the higher velocity of sediment runoff. A 10- to 20-foot buffer is a good target for any scenario.

Creating a continuous buffer along the perimeter of the shoreline is ideal but not always practical when considering pond use. In some cases, pond owners may want to include access points for fishing, livestock, or other uses. In these instances, focusing buffer implementation in key areas is important. For example, if one side of the pond is bordered by a livestock pasture, a buffer along the adjoining side would help reduce nutrient runoff entering the waterbody.

Buffer Vegetation/Characteristics

The composition of vegetation within a buffer plays a significant role in its aesthetic qualities, health and functionality, maintenance needs, and overall effectiveness. While there are various considerations when selecting plants to incorporate, the first should be prioritizing native plants that are indigenous to the pond's locale, as they are well-suited to the local climate and generally resistant to diseases and pests. Native plants also offer specific habitat and food sources favored by native wildlife and better promote the development of self-sustaining ecosystems.

Different water, air, and soil combinations will dictate what plants are best suited for an area. For the emergent zone, selecting plants that prefer moist soils year-round, labeled as obligate wetland species, is most appropriate. Obligate, emergent plants have rigid stems and extensive root systems to hold the plant erect in soft, saturated soils. They also form very dense colonies in the water along the shoreline, but they do not generally grow in water deeper than 3 feet. If a pond has large areas that are 3 feet or less, the pond may need to be deepened, or other options may need to be explored to meet overall goals. In most situations, woody species are not recommended for planting in this zone since their root systems will interfere with dam integrity.

Ensure selected plants fit the amount of sunlight observed during the planning phase. Full sun plant species can tolerate 6 to 8 hours of direct sunlight a day, whereas plants labeled partial sun can only endure 4 to 6 hours of direct sunlight during cooler parts of the day.

Table 1 provides native plant recommendations for use in emergent zone buffers. Some species listed may not be appropriate for all areas due to local conditions and site-specific needs. It is preferred to go with a mixture of different plants, with a few grass-like species (e.g., rushes or sedges) mixed in small clumps.

Pay attention when planting taller species, like three-square bulrush, as they are effective but can be quite tall (6 feet) and dense. Despite their utility for breaking waves and stabilizing soils, many people cannot tolerate them obscuring their view of the pond, so shorter species should be chosen if this is an issue.

Did You Know?

Emergent zone species fall within two functional groups—colonizers or stabilizers—both of which are necessary for creating an ideal ecosystem due to their complementary qualities. Colonizers, which include sedges and grasses, are rapid to establish and act as filters for nutrients and microbes, while stabilizers, like forb species, provide bank protection due to their deep root systems. Including a mix of colonizer and stabilizer plants in the buffer will provide a wider array of benefits to the pond.

Intermediate to shorter species, like squarestem spikerush, soft rush, or sedges, are also quite effective, but their rather bland or weedy-looking appearance can be unappealing to pond owners. In these cases, their utility must be judged against aesthetics.

Other plants, like Southern blue flag iris, Texas spiderlily, or lizard's tail, can have marginally less effectiveness relative to other species on the list. However, they are more aesthetically appealing due to flower production, colors, and unique shapes. Additionally, most of these species are fairly short, so they do not obscure views.

ADDITIONAL RESOURCES

- *Aquatic plant nurseries* – Texas A&M AgriLife Extension AquaPlant (tamu.edu)
- *Pond design and maintenance* – National Resource Conservation Service Handbook 590 (nrcs.usda.gov)
- *Aquatic vegetation resources* – AquaPlant | A Diagnostics Tool for Pond Plants and Algae (tamu.edu)

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Squarestem Spikerush: Shaun Pogacnik, no rights reserved (CC0)

Three-square Bulrush: Peter Dzuik, Minnesota Wildflowers.

Sedges: jim isleib, no rights reserved (CC0)

Soft Rush: Peggy Romfh, Texas Master Naturalist

Arrow Arum: Erik Schiff, no rights reserved (CC0)

American Water Willow: Marilyn Knight, Texas Master Naturalist

Southern Blue Flag Iris: Peter Dzuik, Minnesota Wildflowers.

Pickerelweed: Jerry Hamby, Texas Master Naturalist

Arrowhead: Hoiman Low, Texas Master Naturalist

Lizards tail: Jason Pike, Texas Master Naturalist

Texas Spiderlily: Nautilus 211, no rights reserved (CC0)

Table 1. Recommended species

	Common Name/ Scientific Name	Water dep.	Growth Type	Duration	Sunlight Requirements	Max Height (in)	Hardiness Zone*	Notes	Other names
	Squarestem Spikerush *Eleocharis quadrangulata*	Standing water, up to 1 ft.	Grass-like	Perennial	Full sun	36	5–9	"Weedy" in appearance	Four-angled Sprikerush, Square Rush, Square-stem Spikerush, Square-stem Spikesedge
	Three-square Bulrush *Schoenoplectus pungens*	Up to 3 ft.	Grass-like	Perennial	Full sun – part-shade	72	3–9	May obstruct view "Weedy" in appearance	Common Threesquare, Common Three-square, Chairmakers Bulrush
	Sedges *Carex* spp.	Variable	Grass-like	Perennial	Full sun – part-shade			"Weedy" in appearance	
	Soft Rush *Juncus effusus*	Up to 3 in.	Grass-like	Perennial	Full sun – part-shade	48	2–9	"Weedy" in appearance	Common Rush

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	Arrow Arum *Peltandra virginica*	Standing water, up to 6 in.	Forb/ herb	Perennial	Full sun – part-shade	24	5–9	Nice foliage plant	Green Arrow Arum, Green Arum, Tuckahoe
	American Water Willow *Justicia americana*	Up to 3 ft.	Forb/ herb	Perennial	Full sun – part-sun	39	4–10	Attracts butterflies	Water-willow
	Southern Blue Flag Iris *Iris virginica*	Moist soil up to 6 in.	Forb/ herb	Perennial	Full sun – part-shade	30	5–9	Provides ample shelter for small animals that enter and exit water features	
	Smartweed *Polygonum* spp.	Variable	Forb/ herb	Annual/ perrenial	Full sun			Heavily consumed by ducks, small birds and small mammals	Water Pepper

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	Common Name/ Scientific Name	Water dep.	Growth Type	Duration	Sunlight Requirements	Max Height (in)	Hardiness Zone*	Notes	Other names
	Pickerelweed *Pontederia cordata*	3–5 in.	Forb/ herb	Perennial	Full sun	48	3–10	Good for pollinators; edible fruit/seeds	Pickerel Rush
	Arrowhead *Sagittaria* spp.	Standing water, up to 6 in.	Forb/ herb	Perennial	Full sun – part-shade			The stalks are borne on starch-rich tubers. These have a taste that has been likened to that of chestnuts or potatoes. Apart from the tubers, this plant's fruits and buds are also edible. Underground tubers are a favorite of ducks, geese, muskrats, and nutria.	
	Lizard's Tail *Saururus cernuus*	Up to 4 in.	Forb/ herb	Perennial	Full sun – part-shade	24	3–10	Great as a spreading ground cover	Breastweed, Water Dragon
	Texas Spiderlily *Hymenocallis liriosme*	Up to 2 in.	Forb/ herb	Perennial	Full sun – part-shade	36	7–10	Showy, aromatic blooms; good for nectar insects	Spring Spiderlily, Spiderlily, Louisiana Spiderlily, Western Marsh Spiderlily

*Based on the U.S. Department of Agriculture (USDA) Plant Hardiness Zone Map (*https://planthardiness.ars.usda.gov/*)