



*Windsor Golf and Polo Club (Vero Beach, Florida) maintains a cordgrass (*Spartina bakeri*) shoreline with a littoral shelf consisting of duck potato (*Sagittaria lancifolia*) to accent the water feature next to the 17th fairway.*

# AQUASCAPING: The Natural Approach to Water Features

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**F**OR THE PAST several years, I have designed aquatic landscapes for shorelines and shallow water edges on golf courses in the southeastern United States. A few years ago I worked on a project near Vero Beach with Bob Snyder, an oceanographic engineer from Jupiter, Florida. “Most

people don’t see this,” Bob said. “They don’t get to experience wetlands. They miss all the colors, noises, beauty and critters that live here. We need to bring wetlands into backyards and onto golf courses where people will interact with them and come to appreciate the dynamics of aquatic ecosystems.”

Historically, golf course water hazards have been open bodies of water with manicured turfgrass shorelines. In recent years, however, golf course designers have begun to work more with natural features to incorporate native habitats into their designs. For example, specimen trees may be left in the

middle of fairways or wetlands utilized as natural hazards.

There are several advantages to building wetlands and planting aquatic vegetation on golf courses. Shoreline grasses stabilize slopes and control erosion. Emergent aquatic plant communities along the banks provide habitat, nesting sites, cover, and food for a wide variety of animals, ranging from invertebrates, like shrimp and frogs, to wading birds, big lizards (alligators) and mammals such as otters and manatees. Wetlands and vegetated shorelines also have an important function in the improvement of water quality. Aquatic plants, when properly arranged and blended, are also an attractive addition to the landscape. There are tall and short species of broad-leafed, flowering herbaceous plants, rushes, and grasses that can be planted in monotypic stands or in mixed aggregations for different effects.

### Erosion Control

Planting shoreline grasses on slopes and emergent aquatic plants below the waterline can effectively control erosion. The roots stabilize the soil substrate, and the plant stems in the water column act as wave buffers. Establishing native shorelines also significantly reduces the requirements for expensive hand maintenance on slopes that are too steep for conventional mowers. While it may not be practical to have wetlands along shorelines that regularly come into play, planted slopes and littoral zones can provide efficient and cost-effective erosion control around tees, greens, and in out-of-play areas.

### Wildlife Habitat

Natural areas, created by planting shoreline grasses, rushes, and trees, provide habitat and shelter for a variety of upland creatures that live or forage near water. An extensive shoreline community provides corridors for animals traveling between areas of natural cover. Marsh rabbits, raccoons, fox, birds, reptiles, and amphibians utilize these low-growing canopy areas.

The shallow water littoral zone provides

room and board for a diverse array of birds, fish, crustaceans, reptiles, amphibians, and mammals. Some species feed directly on the plant materials. Herbivorous fish, invertebrates, and mammals (the West Indian manatee, for instance) graze on emergent stands of herbaceous plants. As aquatic plants die, they produce soluble carbon compounds that feed plankton and microbial populations in the water. Obviously, such plants play an important basic function in the aquatic food web.

Another important function of shallow water plants is to provide shelter from predation for small animals, including the juvenile forms of some species that will grow up to become predators upon the residents of the marshes. Because wetland fringes provide cover for prey species, predators feed along the edges. Wading birds patrol the shoreline, stalking and spearing. Carnivorous fish species cruise the borders in search of smaller animals that may stray from the protective screen of emergent plants. Raccoons watch the landward edges of shoreline marshes for fish and crustaceans that venture into shallow pockets of water where they can be isolated and caught.

Some animals nest exclusively in thick stands of aquatic vegetation, usually some distance from the uplands. Marsh hens build nests in bulrush thickets, and river otters use

matted aquatic plants to form nests that are accessible through submerged passageways.

### Water Purification

Perhaps the most important but least understood or appreciated function of vegetated wetlands is their role in water quality improvement. This feature can be beneficially exploited in lakes around golf courses. Ponds and lakes that do not have vegetated shorelines or wetlands associated with them frequently experience problems with floating algae mats or blooms that inhibit water clarity and are unsightly. Rooted aquatic plants assist in the removal of nutrients from the water column. In fact, constructed and natural wetlands are now commonly used by water treatment facilities to treat wastewater effluent.

When nutrients such as nitrogen and phosphorus occur in excessive quantities, they fuel population explosions among several species of algae. Wetland plants help control these nutrients. One way that nitrogen (and phosphorus to a lesser degree) is taken out of the water is through assimilation into plant tissues by vascular plants and the microbes that adhere to them. Microbes (bacteria, fungi, algae, and protozoa) that are attached to the underwater portions of aquatic plants and submerged soils account for a substantial reduction in dissolved phosphorus and nitrogen. The more attach-

*Shoreline grasses help stabilize slopes and control erosion while providing habitat and nesting sites for a wide variety of animals.*



ment surfaces for microbial populations, the more potential there is for nutrient removal. As the vegetation slows water flow, sedimentation occurs, trapping phosphorus in the layers of fine mineral soils, where it is immobilized by metallic ions like calcium, aluminum, and iron.

The principal pathway for the removal of nitrogen from aquatic ecosystems is a process called denitrification, which is dependent upon rooted aquatic plants. Most submerged soils are oxygen poor (anaerobic), but the area surrounding the roots of aquatic plants (the rhizosphere) is rich in oxygen (aerobic). Dissolved nitrogen is converted to nitrate in the aerobic rhizosphere and then changed by microbes in the adjacent anaerobic soils to nitrogen gas that rises to the surface and leaves the water column permanently.

Wetlands alone can't completely purify a water body that is receiving excessive nutrient runoff, but they can help maintain a balance, especially if incorporated into an integrated plant management (IPM) program for the surrounding golf course.

#### **Aquascaping for Aesthetics**

Aside from the benefits to wildlife and the aquatic environment, planted shorelines can enhance the beauty of a golf course in the same way upland landscaping does. Waving fields of cordgrass (*Spartina bakeri*)

*The shorelines at the par-3 eighth hole at Grand Harbor in Vero Beach, Florida, combine a cordgrass (*Spartina bakeri*) hedge bordered by a band of pickerelweed (*Pontederia cordata*), duck potato (*Sagittaria lancifolia*) and blue flag iris (*Iris virginicus*) along a shallow littoral shelf.*

blending into shoreline hedges of rushes (*Juncus* or *Eleocharis*) form native plant savannahs that bridge the aquatic and terrestrial zones. Flowering herbs like duck potato (*Sagittaria*), pickerelweed (*Pontederia*), canna lily (*Canna*), and blue flag (*Iris*) provide bright colors at different times of the year, framed by variable shades of green foliage. Tall plants like bulrush (*Scirpus*) or fire flag (*Thalia*) can be used as accents or to warn golfers of hidden hazards.

While many people appreciate the beauty and value of wetlands, others question my

sanity when I begin to discuss aquatic landscaping. Questions like, "Why would you want to plant those weeds in our lake?" or "Do you really plant weeds for a living?" are common. Well, as James Taylor once wrote in a song, "It ain't always easy for a weed to grow," I hope that someday aquatic plants will be widely recognized as useful and attractive additions to water features, and not simply thought of as weeds. But I'm glad more and more golfers are beginning to appreciate the beauty and function of these plants.

*All of the storm water from the Hammock Dunes development in Palm Coast, Florida, including the golf course, flows through lake interconnects to several "kidney wetlands." The water is treated by these marshes prior to moving along the chain of lakes and ponds, eventually entering the estuary via percolation.*

