

AESTHETICS and More

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BY FRANK GARDNER

When Spanish explorer Sebastian Vizcaino anchored off the windswept white beach and dunes between the

Carmel and Monterey bays more than 400 years ago, he could not have envisioned the environmental ebb and flow of the place now called Spanish Bay. There was no 17-Mile Drive, no Asilomar Conference Center, no city of Pacific Grove. He did see a spectacular length of beach, offshore rocks hosting scores of sea lions, a dense and primeval forest, and, undoubtedly, sea otters frolicking in the kelp beds.

Monterey Bay made a much safer harbor and, almost 170 years later, an excellent site for a fort (the Presidio), piers, and customs operations for Monterey, the capital of Alta California. The winds, waves, and sudden squalls common to Spanish Bay left commercial development largely to the early 20th century, when Samuel F.B. Morse, a distant cousin of the inventor of the telegraph, began to mine the dunes there for sand. The rusting remains of the conveyors and other equipment from the operation were still there in the early 1970s.

Morse was a founder and early manager of the Del Monte Properties Co., which, through several incarnations, became the Pebble Beach Co. Considered the oldest golf course west of the Mississippi, the links at the Del Monte Lodge were built in 1897; the world-famous and scenic course at Pebble Beach was built in 1919. Because of its weather, however, Spanish Bay was not considered ideal for a golf course.

Not ideal, that is, until five-time British Open champion Tom Watson, along with former United States Golf Association president Frank “Sandy” Tatum and noted course

designer Robert Trent Jones Jr., decided to build a genuine, Scottish links-style course. Proximity to the ocean, the sand dunes, and the changeable, often-blustery weather made Spanish Bay the perfect location for their project.

First, though, all the derelict equipment had to be hauled off, thousands of tons of sand brought back in to re-create the dunes that would have been found here before Morse’s mining operation, and many native plant species reintroduced. It is somewhat ironic that all that restoration brought immediate responses from the local environmental community, but the builders, the Pebble Beach Co., and the golf course staff worked closely with the Del Monte Forest Foundation and other concerned environmental groups, set aside large protected habitat areas off-limits to golfers and walkers, and earned one of the first Audubon Certified Sanctuary designations.

Nowadays, Jeff Steen, the superintendent at The Links at Spanish Bay, maintains the golf course, which has been consistently rated at the highest level of resort golf courses in the United States and which offers a genuine feel of what a golfer would experience in



A piper strolls the grounds around the inn and golf course at Spanish Bay.

Scotland. In fact, The Links won the Gold Medal for 2006, awarded by *Golf Magazine*, and the inn and The Links have earned prestigious rankings from such publications as *Mobil Travel Guide* and *Condé Nast Traveler*.

Like the overwhelming majority of superintendents who are members of the Golf Course Superintendents Association of America, Steen is committed to the preservation of the environment and is justifiably proud of the course he maintains.

Along with the dunes, fescue, and other native grasses that give The Links its special feel, the wetlands are also part of the preservation effort. One of these gives the par-3 eighth hole its name, Marsh Corner. It literally sits at the corner of the golf course and requires a challenging shot over thick growths of reeds and the edge of a large, open pond in the midst of the fen. In the early days of the course, it was necessary to trim the tops of the reeds to allow visibility of the green from the tee.

"The wetlands are beautiful and provide plenty of native habitat, but they also act as a vital filtering mechanism," Steen says. He points out that no chemicals are used in the pond, in part because of the Audubon Sanctuary status.

Recently, Steen became concerned about persistent eutrophic conditions in the water. He knew that oxygen and movement were the solutions to stagnant conditions, and had used diffused air systems to good effect in the past, so he called on Mike McGee of EPAeration Inc., and his assistant, Rich Dennis, a recent graduate of Cal Poly San Luis Obispo in environmental technology. That company also has its bottom-laid, fine-bubble aeration systems operating at Spyglass Hill, another of the spectacular Pebble Beach courses.

"We wanted to get back to the basics and get some oxygen into the water there," Steen says. "I felt diffused aeration was the best option."

The pond itself is approximately 200 feet long and 150 feet wide, with the wetlands covering an area roughly equal. However, it has an average depth of only 5 feet and provides habitat for waterfowl and other wildlife, which raise the biochemical oxygen demand (BOD) of the water.

"Determining the system requirements at Marsh Corner was not a simple calculation," says McGee, president and general manager of the San Luis Obispo, CA-based EPAeration. "We never offer a one-size-fits-all solution, because we have to be sure that the system is adequate to meet the BOD and circulation needs of the water body. Because it is shallow, no aeration system can work at peak efficiency, so that also played a role in our determinations."



Rising aeration bubbles form lines in the pond at par-3 Marsh Corner.

EPAeration systems use specially developed diffusion tubing, keel-weighted to sit right on top of the sludge layer. The tubing features surgically cut slits at regular intervals on the top. About 2 psi of air flow is required to open the slits, which control the size and rate of rise of the air bubbles. This also ensures that the same quantity of air is available the entire length of the tubing and that there is a laminar (without turbulence) flow of bubbles from the bottom to the surface.

The idea of subsurface aeration is to move water molecules from the benthic (lowest) layer in a body of water to the surface without disturbing the sludge. That's because the sludge generally contains organic materials, metals like iron and manganese, and chemicals from runoff, like phosphates and hydrocarbons, all of which provide nutrients to various life forms, not all of them desirable. Roiling it would release these nutrients into the water column, which could result in nuisance algae blooms.

"That's why we only use diffusion systems which provide a laminar flow," McGee says.

Although aeration systems can provide oxygen transfer to the water, the greatest amount of oxygenation takes place at the surface. It's not the O in H₂O, the water molecule itself, but dissolved oxygen (DO) that's being added.

What often happens to sequestered bodies of water, such as golf course lakes, is that there's no natural movement of water from one level to another. Thermal stratification, which happens when there's a 3°C difference between the surface layer and the benthic, prevents any natural convection.

In either case, the lower levels of the water column rapidly become depleted of oxygen, because the living organisms (from microbes to fish) and chemicals like iron

consume it. All the living things die; at best, surviving fish may be driven to the surface, gasping for oxygen. Large algae blooms are likely to ensue.

The result is a stagnant, or eutrophic, body of water. Eutrophic, by the way, is a Greek word meaning (roughly) "good growth," although the organisms that grow best in those conditions are algae and anaerobic pathogens. Additionally, the lack of water movement limits the effectiveness of the wetlands and plants in the littoral zone at a lake's edge in acting as a filtering mechanism.

Bottom-laid, fine-bubble aeration systems offset these negative conditions by creating a gentle convection of water from the bottom to the surface and back. Dissolved oxygen levels increase throughout the water column, and temperatures are balanced.

Increasing the dissolved oxygen levels encourages the beneficial life forms to consume available nutrients while denying those nutrients to nuisance algae. Secondly, increasing the DO levels to above 2 ppm prevents what is called an "anoxic release" of nutrients from the sludge to the water column.

In the case of the Spanish Bay installation, it was determined that a single aeration/ozonation unit with two one-third-horsepower compressors and 500 feet of aeration tubing should be adequate. This system is estimated to "turn" (from bottom to top and back) the water in the Marsh Corner pond 20 times a day, a little more than double the necessary turn for the average golf course lake.

"It probably will take months before the restoration of the ecological balance is complete," McGee says. "That's what usually happens, even in newly constructed bodies of water with no life at all. Our calculations led us to specify a higher number of turns because of the factors of depth and wildlife, as well as the aesthetics."

Steen says he's planning to implement a bioremediation program, using microbes to reduce the sludge in the pond. The installation of the aeration system is the primary step in bringing the lake and marsh back to health, but raising the DO levels at the bottom will encourage the microbes as well.

In all likelihood, golfers and visitors will not even notice the subtle lines of bubbles on the lake surface at Marsh Corner. Just like the course and the magnificent Inn at Spanish Bay, everything blends into the natural setting—except, that is, for the sound of the skirling bagpipes each evening, as a kilted piper strolls the grounds of a place restored to its rightful glory. Even Vizcaino would probably approve.

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