

An aerial photograph of a large, intricate green maze. The maze is composed of dense, vibrant green hedges that form a complex network of paths. Several wooden walkways, made of vertical slats, are scattered throughout the maze, providing a way to navigate the paths. In the lower right quadrant, there is a small wooden structure with a white roof, possibly a shelter or a viewing platform. The overall scene is a striking contrast of green and brown, set against a dark background.

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Protective urban landscaping

Restoring Water Flow to Gulf Coast Mangroves

DUANE SULK AND PATRICK COX

When construction began in 1997 at Fiddler's Creek, a residential community in southwest Florida, much of the land it would occupy, as well as the wetlands to the south, was cut off from a natural and historic water flow. Today, because of the efforts of the developer of Fiddler's Creek, much of this water flow has been restored, giving new life to the preserves and more natural habitat to the wildlife that live there.

ON THE GULF OF MEXICO side of the main thoroughfare through Fiddler's Creek in southwest Florida, the shingled roof of a gazebo is visible to residents and visitors through a gap in the bordering trees. Known as the Overlook, the observation facility rises on stilts from still waters and can only be accessed via a raised wooden walkway that winds through the brackish wetlands of the Marsh Point Nature Preserve established by the community's developer the Gulf Bay Group of Companies.

"There is no better place to view both the primeval Gulf Coast mangroves to the south or, stretching out to the east, the community's namesake creek," relates Kim Minarich, vice president of corporate communications for the Gulf Bay Group of Companies. "Nor is there any better place to see what environmentally sensitive planners can do for southwest Florida's unique ecology."

Placid and serpentine, the Fiddler's Creek waterway is fed by canals and streams flowing from points north of U.S. 41. More than 100 feet wide in places, it resembles a quiet lagoon or bayou rather than the babbling brooks that some might expect. In fact, Fiddler's Creek does not appear even to flow unless there have been recent rains.

It does, however, exude water from its entire length as a "lateral sheetflow" into the lush tropical marshland and, ultimately, the Gulf of Mexico. Hydrologists and sedimentologists would, in fact, be more likely to call the waterway a "swale," a notably unromantic scientific term that does little to illuminate the beauty of the long, meandering watercourse or its environmental purpose. It is this lateral sheetflow, a gentle discharge of water from the south bank of the waterway into the coastal mangrove marshland, that makes Fiddler's Creek so important to the local estuarine ecology.

Despite the developed areas along Fiddler's Creek, the range of plant and animal life in the mangroves is extensive. Sightings of ibis, heron, and egret are frequent. Mangrove trees and marsh grasses are spotted with cabbage palm and tropical ferns. Wide, flattened pathways in the wet grasses indicate the nocturnal passage of turtles and alligators. At night, the area is populated by possum, armadillo, and even wild boar.

Fiddler's Creek not only is a natural amenity for residents who live on its banks,

and experience the views of primordial coastal habitat, but also it provides a long-awaited answer to environmental and flood control problems that have plagued the area since the Gulf Coast began to develop.

Before Fiddler's Creek came into being, much of its land, as well as the wetlands to the south, was cut off from natural and historic water flows. Tomato fields operated by a multinational agricultural firm, also involved in sugar cane and citrus production, covered almost 60 percent of the property while the marshland habitat downstream was subject alternately to artificial floods and droughts. Had it existed then, the Marsh Point Nature Preserve's Outlook would have provided a view primarily of despoiled marshlands, marred and rutted both by lack of water and off-road vehicles.

Those local conditions are traceable, primarily, to one well-known historical landmark—the Tamiami Trail, or U.S. 41—one of the great engineering feats of history. Though widely believed to have been named after some pre-existing Native American pathway, the word Tamiami actually is a contraction of the names of the two cities that mark its endpoints, Tampa and Miami.

Given the prosperous nature of the southwest Florida coast today, as well as the large percentage of the population that comes from out of state, there is little public awareness of what the construction of the Tamiami Trail did for—and to—Collier County.

At the turn of the 20th century, the city of Naples and the surrounding areas were effectively isolated by the Everglades—which were accessible only by ship for all but the most hearty and determined overland adventurers. It was easier in those days to get to Havana than to Jacksonville and, as late as 1923, the area that would eventually become Collier County had no paved roads.

The long-anticipated link to both Tampa and Miami had stalled as the Tamiami Trail approached Naples from both directions. The unexpectedly difficult and expensive challenge of building the interstate forced the project to a halt, stranding Naples as a virtual island until Barron Gift Collier, the largest landowner in Florida and the "pioneer and namesake" of Collier County, pushed the project forward with \$1 million of his own money. Dredges raised

the road from the often liquefied landscape. Workers, without the benefit of air conditioning, invaded territories previously ceded to alligators and mosquitoes, at a time when malaria, dengue, and yellow fever were serious and frequently fatal health problems. These crews endured the heat and humidity of Florida summers under working conditions that would be unimaginable, if not illegal, today.

Running 275 miles, the Tamiami Trail dips south from Tampa along the coast to Naples, before bisecting the southern tip of Florida on its way to Miami. When officially opened to traffic on April 26, 1928, the southwest coast for the first time was integrated into the rest of the Florida state economy.

During the process, however, the cut from east to west across the state inadvertently created the longest dam in America, if not the world—though it was not understood at the time how far-reaching the environmental impact would be. Within a few years of completion, signs began to emerge that the seamless River of Grass had been replaced by two distinct regions, wet uplands north of the Trail and dry lands south of the Trail. Observers reported instances in which one side of the road was under water, while the other side was a fire hazard.

Developers, farmers, and ranchers expanded activities in the newly dried-out areas. As late as 1962, water flowing into the Everglades was limited, at times, to only four control gates. On occasion, water was cut off entirely, resulting in the widespread death of alligators.

Today, attitudes about Florida wetlands, and the environment in general, have changed dramatically. As part of the Everglades restoration, the most expensive environmental restoration project in history, considerable efforts are being made to reverse or at least minimize the impact of the Tamiami Trail, as well as Alligator Alley to the north. Both are being retrofitted with an extensive system of culverts, bridges, and canals designed to end the impediment to the natural flow of water.

These remedies, however, are not perfect. Areas under and immediately adjacent to the Trail cannot, of course, be returned to their original states; though some have suggested raising the roads onto pylons—a proposal not

seriously considered because of the enormous costs it would entail. Nevertheless, the goal is that waters passing through these funnel points in the road eventually spread out into a wide, slow sheetflow, replicating historical patterns.

The Naples area, though, is a special case. The Tamiami Trail's north-south jog is extremely near the coast in Collier County, with its environmentally important mangrove swamps and estuarine ecology. In some places, the Trail actually runs adjacent to the last undisturbed coastal mangroves in America. This means that water coming through culverts or canals under bridges in the Trail will lack space to spread out before hitting sensitive habitat.

This can lead to serious problems for mangrove marshlands, which need a persistent gentle sheetflow for a full range of salinities, as fresh and ocean waters mix in different proportions. Only a gradation of salt concentrations across a wide area will support the extensive range of plant and animal life that is native to the coastline.

Moreover, matters are complicated further by the fact that the coastal real estate between the Tamiami Trail and the marshlands is considered among the most attractive and valuable properties in the nation today. Because runoff must be channeled through these developed areas to prevent flooding, this water has even less opportunity to spread out and become a sheetflow when it is finally released.

When freshwater is released in concentrated flows, as it often is, parts of the mangroves receive excessive freshwater while others are deprived of it. Worse, powerful stormwater runoff flowing south through canals may spew undiluted freshwater deep into mangroves that depend on brackish water for their survival.



GULF BAY GROUP OF COMPANIES

When construction began at Fiddler's Creek in 1997, much of the land it occupies, as well as the wetlands to the south, were cut off from their natural and historic water flow due, in part, to the construction of U.S. 41 years earlier (above). Today, much of the natural and historic water flow in the area has been restored (opposite page), giving new life to the preserves and more natural habitat to the wildlife that call the area home.

Periodic surges of freshwater from these canals not only erode and wash out the flora and fauna native to the coastal regions, but also, these sudden, enormous quantities of freshwater, when dumped in very localized torrents, can act as poison to some mangrove denizens, the obligate halophytes, killing plants and animals that depend on the intermingling of ocean salt and freshwater.

This, in turn, threatens the entire coastal region because mangroves are the hatcheries for much of the fish and plant life that is found nowhere else in America. The endangered Florida manatee depends on the health of the mangroves, as do the tourism and ocean fishing industries. Mangroves even provide protection from tidal surges related to tropical storms and hurricanes.

Indirectly, the effects are felt far inland. As water that once flowed over vast surface areas in southern Florida has been channeled into canals to allow inland development, an insufficient capacity for stormwaters downstream can and does lead to upstream flooding far south and east of the Trail.

"All of these and other challenges were evident to the Gulf Bay Group of Companies when planning began for the Fiddler's Creek development," explains Minarich.



Most of the property, located between the mangroves and the Tamiami Trail, was intensively farmed. With the advantage of extremely fertile soils and drier conditions created by the construction of the Trail, waters from north of the highway were captured and stored both to irrigate and to flood, cyclically, the fields. Not only were harmful pesticides and herbicides vented directly into the mangroves in runoff from this irrigation method, but also this was done in huge flushes that dramatically upset natural seasonal variations in water flow, or hydroperiods.

The far-reaching and still uncompleted solution was twofold. The first task was to increase the flow of water through the development by building a system of elongated lakes that radically increased the capacity to channel water through the development. There will be approximately 90 lakes covering more than 650 acres, including bodies of water integrated into golf courses.

While these lakes forestall flooding by moving water safely through the development, they have other benefits as well. By slowing the passage of water through these coastal regions, rainwater is better absorbed into the aquifer. Near the ocean, a depleted aquifer is at risk from subterranean seawater that can render waters unpalatable and damage inland ecologies. However, this is an issue of far

greater importance on the coastline than inland, where planners are concerned primarily with the need to manage the underground reservoir of freshwater and avoid sinkholes.

“The lakes designed within the Fiddler’s Creek development also provide one of the major categories of amenities in a development that is noted for its wide range of high-end amenities,” notes Minarich. “Many residents have bought properties in Fiddler’s Creek specifically because they wanted to live on the waterfront and experience its beauty.”

This experience has been amplified by Gulf Bay’s construction of extensive littoral zones, a critical shoreline habitat especially suited for wading birds. Well over \$500,000 has been spent removing invasive exotic trees, such as Brazilian Pepper trees, that have supplanted native species like cypress and palmetto that now cover large sections of the Fiddler’s Creek development.

“Nearly one fifth of the development—more than 700 of the 3,992 acres—has been dedicated to nature preserves,” Minarich says. “Together, the lakes, littoral zones, and preserves at Fiddler’s Creek create a particularly nature-friendly community that will include, at buildout, 6,000 homes—attracting buyers who place a high value on the environment and have a strong sense of responsibility. Few,

however, are aware that they also have helped find a solution for the flooding that has plagued their neighbors to the north.”

Because the capacity to handle water flow through the Fiddler’s Creek development has been significantly improved, Gulf Bay was able to grant Collier County, in 1997, the right to channel water from north of the Tamiami Trail through and around the property. This easement had been denied for years by the previous owner as it did not then fit the owner’s agricultural needs.

Collier County stormwater management director John Boldt recognized the value of these measures. “There are existing drainage and flooding problems north of U.S. 41 that could be significantly reduced by the proposed improvements in these easements. Currently, there are no significant north-south drainage facilities in that area that would allow the drainage from north of U.S. 41 to follow its historic path to the wetlands south of the Fiddler’s Creek addition. Granting drainage easements would alleviate some concerns about drainage north of U.S. 41 and allow the county to restore fairly normal historical drainage patterns, as opposed to forcing drainage into the undersized canal along the north side of U.S. 41, as currently is done.”

While Gulf Bay realized that replacing tomato fields with an environmentally conscious residential development would help protect flood-threatened uplands to the south, it did not fully address environmental problems in the adjacent mangroves. Though the runoff from agricultural fertilizers and insecticides would be eliminated, the system of lakes throughout Fiddler’s Creek would not replicate the ideal sheetflow condition needed by the fragile habitat on its border.

There was, however, a solution. Ten years before, excavation had begun on a multimillion-dollar spreader swale—the creek in the development named Fiddler’s Creek, along the southern boundary of the development.

In effect, this creek gathers the vast flow of water from the north through the property, but prevents it from erupting forth in seasonal blasts that would do little to restore and preserve the health of the mangroves. The creek, or spreader swale, holds the water that flows onto the property and releases it as it overflows its south bank, mimicking the wide,

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slow sheetflow that once slaked the mangroves' hydrologic needs.

The goal of the project, in fact, is to make the development north of Fiddler's Creek "invisible" to the thousands of acres of mangroves to its south along the coast.

"Perhaps the most surprising fact about the Fiddler's Creek spreader swale is that it was not required by ordinance, but was conceived of and implemented by the developer," adds Minarich. "Internal estimates put the cost of the project at well over \$7 million, but Gulf Bay and others believe the investment has yielded a particularly satisfying return."

As of now, Gulf Bay is still in the process of converting farmland into environmentally friendly neighborhoods. Similarly, the county

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has not yet tied into the system all of its water flows from north of the Tamiami Trail.

"Currently, the Fiddler's Creek waterway is about two miles long, but Gulf Bay is transitioning into a planned construction phase that will extend the creek to its full 5.5-mile length, with 3.5 miles acting as a spreader swale along the entire border with the mangrove marshland to its south," says Minarich.

If all goes according to plan, the completed hydrological system will be ready to provide all its environmental benefits to south Florida's coastal ecology in less than a decade. **U**

DUANE SULK is president of Sulk Whalen Public Relations, a Naples, Florida-based company that specializes in real estate development. **PATRICK COX** is the corporate writer for the Gulf Bay Group of Companies, a privately owned development company in Florida, with headquarters in Naples, Florida.

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GULF BAY® GROUP OF COMPANIES

8156 Fiddler's Creek Parkway
Naples, Florida 34114
239.732.9400
www.gulfbay.com