

Marvelous MUD

“Ewwww!”

“Yuck – it’s icky, squishy and smelly!”

“Cool. Can we take off our shoes and play in it?”

These are the typical comments I get first time I take kids out to the estuary mud flats for a lesson on the web of life. Scientists refer to it as the intertidal benthic layer. To the casual observer it may seem devoid of interest – even a little disgusting – but fact is, its one of the most productive areas in our entire food chain.

It is here that the detritus (dead organic matter) of forests and fields accumulates, attracting creatures numbering in the billions per meter. Each year more than a million tons of fresh water sediment washes into the Tampa Bay estuary mixing with Gulf water to create salt marshes, mudflats, mangrove swamps and tidal channels – the very cradles of life.

Life in the MUD

Mud flats (also known as tidal flats) are usually found next to salt marshes. They tend to occur along a delta where the river meets the daily tides. As decaying organic detritus is swept into shallow areas, a thick ooze builds up from precipitating particulate matter. Phytoplankton and zooplankton are abundant here. Oysters and clams and other filter feeders cling to nearby mangroves enjoying the nutrient soup.

At high tide, you’ll find fish fry, shellfish spawn, snails and brittle stars hunting for sustenance. Drier periods occur between tides when frequent armies of fiddler crabs forage and court. They and their cousins the ghost crab and the mud shrimp cover the tidal flats with burrows up to three feet deep. Clams and worms also excavate tunnels throughout the mud, bringing in oxygen for the microbial communities and allowing nutrients to be recycled back to the water column.

The mud also important to wading birds and predatory animals like raccoons. As the flat matures, mangroves, rushes, sedges and grasses begin to take root and grow. Over time these become salt marshes which, providing habitat as well as food for the larger creatures. The salt marshes still catch the sedimentary detritus, but they are more stable and form excellent protection against storm tides and beach erosion.

MUD vs. Muck

Twice annually, the Environmental Protection Agency monitors dozens of benthic locations around Tampa Bay to determine the health of our estuaries. Their analysis is based on the quantity and type of tiny creatures they find. Of the more than 1400 species, the worms, mollusks and crustaceans that make up the largest populations. Indicator species in these categories tell scientists how much oxygen is available in the mud - a key factor in determining the degradation or health of the environment.

Ed Sherwood, from Tampa Bay Estuary Program explains it this way: "In the areas where light penetrates and the water is moving, the dissolved oxygen stays high. Sea grasses can grow, oysters filter sediment, and a wide variety of species thrive. Where we get into trouble is in shallow water when the sediment gets stirred up indefinitely. If the light gets blocked too long algae bloom using up all the dissolved oxygen. We also see hypoxia when the sediment precipitates into deep holes that are immune to the tidal influences. No light – no movement – no life."

Environmental engineer, Robert Rorebeck, recalls watching road construction projects where digging and dredging disturbed the mudflats around the perimeter of Tampa Bay. "The water got so silted up that in a matter of days it was covered with a green noxious scum. In the industry, this is no longer mud – it's muck. Where hypoxic muck continues unabated in an area, even the nearby mangroves start to die."

Deep channels dredged for boating traffic become dead zones as they fill with benthic mud. Away from the light and the tidal flush, they are almost lifeless. Repeated dredging must be done carefully because it can release decades of accumulated organic matter into pristine environments, creating a whole new environmental challenge.

Bacteria to the Rescue

Decades of muck? I started to wonder how much toxicity from human pollution could be building up in these areas, so I called Dr. Ernst Peebles, the USF Biological Oceanographer who's been so involved in the Deep Water Horizon research in the Gulf. Are we creating our own "oil spill" with all the toxic wastes we pour down our drains?

"Benthic mud, by its' very nature, has a strong affinity for the toxins released from boats, autos and runoff. Marinas and commercial boat traffic make up the largest amount of oil and hydrocarbons but they are far more refined, and probably less toxic than the suite of chemicals dumped in the Gulf during the BP accident."

Despite a number of ecological improvements, the 2007 EPA Coastal Condition report listed Tampa Bay's overall benthic condition as somewhere between fair and poor. Aside from hydrocarbon contaminants, heavy metals from household cleaners increase water toxicity. When medications are disposed of down the drain, endocrine disruptors are released into the waterway and mud, ultimately interfering with the hormone

systems of marine life. (Note: take your old, unused meds to the Sheriff's office to be incinerated.)

I asked Dr. Peebles if there was a hopeful note in all this. "Well, of course we can improve things with prevention. But in the meantime, we need to be thankful for bacteria – they eat just about anything. The microbes are the real heroes doing the work to clean up our mess."

The Fragrance of MUD

And speaking of bacteria... Did you ever wonder what created the occasional "Eau de la Bay" aroma along Tampa's Bayshore Boulevard? No, it's not a broken sewage pipe.

The Hillsborough River dumps tons of sediment into Hillsborough Bay in downtown Tampa (in fact, that's where land came from to create Davis Island.) Unlike sand, thick mud sediments are not highly porous and do not allow water carrying oxygen to pass through. The shallow mud flats provide an ideal home for anaerobic bacteria living just below the surface of the mudflats. These bacteria thrive in an environment of low oxygen, high organic material, and warm temperatures – all of which are present along the Bayshore on a warm summer's day.

As these bacteria convert matter into energy they produce hydrogen sulfide gas – the same gas that emanates from rotten eggs. The stench grows more powerful in the summer because gasses released in warmer air move faster and spread more quickly. It's like cheese -- when you put it out, it warms up, and it smells stronger. On a sultry day, mudflats can smell worse than aged Gorgonzola, but console yourself knowing that while these little stinkers are breaking bits of leaves, algae and wood into gasses, they are serving an important ecological role.

Play in the MUD

So let's return to the kids who came to learn about the web of life. After a short bit of instruction and the proper footwear, I armed them with benthic sieves and nets and sticks for poking things. And for one amazing afternoon they've forgotten about video games and Facebook. They're actually engrossed in a scavenger hunt for squirmy little creatures. Who'd have thought a bunch of icky mud would provide so much pleasure?

There are a number of organizations and locations where you and your family can learn about benthic mud, and even get some of the heavenly goo between your toes.