RICHARD WHITMAN/PROVIDED

A double-rainbow appears over Port Charlotte during a summer storm.

Rain rules Charlotte Harbor

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From mid-May through mid-October, Charlotte Harbor is governed by rain.

Each wet-season storm reshapes the harbor's chemistry and biology. Rain lowers salinity, warms surface waters, increases color and nutrients, and delivers bacteria, pollutants, and organic matter.

The Peace, Myakka and Caloosahatchee rivers—along with hundreds of canals, ditches, wetlands, thousands of yards, and storm drains—act like a vast plumbing system, funneling freshwater from across the watershed into the estuary.

Charlotte Harbor then has to deal with the consequences of everything these storms carry with them.

Freshwater is lighter than saltwater, so when it enters the harbor it spreads across the surface, forming a floating layer. Beneath it, denser, cooler Gulf water remains trapped below.

This stratification reduces vertical mixing further depleting the oxygen in the lower layer. Eventually, wind and tides mix these layers, blending river runoff with seawater. Once that happens, most of the harbor's water column reflects everything the watershed has delivered, both good and bad.

During dry weather, many pollution sources remain trapped in soils, sediments, and septic fields. But rain changes everything. The first rainfall after a dry spell often produces little runoff, as thirsty soils absorb the initial precipitation. After the ground becomes saturated — usually by the second or third storm — water begins to flow rapidly over land and through drainage systems, carrying nutrients, bacteria, and pollutants straight to the harbor. Rainfall is dynamic and chaotic.

PHOTO PROVIDED/DIANNA WHITMAN

Richard Whitman takes samples at Ponce de Leon Park after Tropical Storm Debby in 2024.

It loads the system. Tides, by contrast, act to redistribute and dilute what rain delivers through successive flushings. USGS estimates that only 50% of the higher upper harbor is flushed by Gulf water over 10-20 day period. The impacts of hurricanes can persists between seasons or longer.

Incoming tides bring clear, salty Gulf water that is low in nutrients, color, and bacteria. This water dilutes contamination and pushes freshwater plumes back up canals and rivers.

For a time, pollution can be hidden beneath cleaner water. Samples collected at high tide often look deceptively good.

As the tide turns and begins to fall, the harbor tells the truth.

Outgoing tides drain rivers, canals, marinas, and shallow flats. Septic plumes migrate, bacteria and nutrients are released, and fine, pollution-rich sediments are stirred up and carried outward. This is when phosphorus, nitrogen, fecal bacteria, surface foam, slicks, and blue-green algae are most likely to appear. In Charlotte Harbor, the worst water quality generally occur on the ebb tide when the system is draining.

Canals and marinas are especially vulnerable. Rain fills them, but tides only partially flush them. Organic-rich sediments accumulate on their bottoms, storing bacteria and nutrients.

After storms, this material is repeatedly stirred up and slowly leaks into the harbor over many tidal cycles. That is why canals often stay polluted long after the rain has stopped.

Charlotte Harbor is uniquely sensitive to this process. It is large but shallow, with limited tidal exchange compared to open coastlines. It is fed by major rivers draining nutrient-rich landscapes.

The result is a system prone to low oxygen, harmful algal blooms, high bacteria levels, and seagrass loss — problems that intensify after heavy rains and hurricanes.

So the harbor operates on a simple but powerful rule: rain loads the system, and tides release it. We have amplified that process by altering the land with drainage, development, and flood-control systems that speed polluted runoff to the water.

We cannot return to pre-development conditions, but we can choose to manage growth, wastewater, fertilizers, and stormwater more wisely.

When it rains, it no longer just pours.

It carries everything we allow on the land into the harbor — and ultimately back to us.

Charlotte Harbor never truly rests. Rain and tide simply decide how loudly the watershed speaks.

We can't stop the rain, but we can improve what gets dumped into our precious harbor: nutrients, fecal bacteria, sediment, fertilizers, wastewater, oil, and trash.

That means:

- Converting high-risk septic systems to sewer or nitrogen-reducing septics
- Properly maintaining existing septic systems
- Eliminating fertilizer use during the wet season
- Picking up pet waste and keeping it off sidewalks and streets
- Shifting to native vegetation that needs little or no fertilizer
- Managing bird-feeding areas near docks, canals, and rivers
- Restoring shorelines so wildlife does not concentrate in polluted rookeries
- Slowing water down—fast water is dirty water; slow water is filtered water
- Using rain gardens, swales, and permeable surfaces instead of concrete
- Vegetating ditches with native plants
- Restoring and protecting wetlands, and creating wetlands at outfalls
- Restoring seagrass, oyster beds, and mangrove stands
- Requiring stormwater treatment on new developments
- Preserving natural buffers along rivers

Charlotte Harbor needs both rain and tide to function as a healthy estuary. It is our choice whether that rain degrades or sustains it. Humans have re-plumbed the watershed; now we must decide what it flushes.

Clean land equals clean rain equals clean Charlotte Harbor.