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Why is the water brown?

Dr. Richard Whitman — HEAL OUR HARBOR
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Water leaches tannins from decaying vegetation. Eventually, this dark water will reach a river, then an estuary, then the sea.

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Ever wondered why the water in Charlotte Harbor looks brown? It's not pollution — it's nature's tea, made up of plant-based chemicals called tannins. Tannins are naturally produced by plants to help them defend themselves from herbivores by being hard to digest and bitter to taste. They also contribute to plant coloration, especially in brown and red hues.

Tannins are used by humans too — for tanning leather, brewing wine and beer, and dyeing fabrics. That bold, nutty flavor in tea or coffee? That's tannins at work, with each plant species giving its own unique twist.

Despite their prevalence, raw tannins aren't a great food source for aquatic animals—they're tough to digest and offer little nutritional payoff. Scientists have a hard time classifying all the different types, but generally refer to them as largely polyphenolics, which fall under the broader category of dissolved organic matter (DOM) or, more casually, water color.

When we talk about water color, we're talking about the visible color of the water, the way it would look if you dipped it up in a white 5-gallon bucket. Scientists distinguish between apparent color — influenced by reflections, bottom material, suspended sediments, algae and even the sky — and true color, which is measured in the lab after filtering out particles. True color is more standardized and comparable across time, seasons and places.

For simplicity, we'll just refer to it as water color. It can be low (more clear) or high (more tinted).

Why water color matters

Water color is more than an aesthetic. It's an important ecological indicator. It tells us how much runoff from land (terrestrial input) is entering the Harbor. During the dry season (January to April), water color is low because salt water from the Gulf dominates the Harbor. Likewise, the closer you get to Boca Grande (and away from rivers), the lower the color.

But during the rainy season (May to October), freshwater inflows from wetlands, soils, forests, and developed areas via rivers and canals increase water color. Releases from Lake Okeechobee via the Caloosahatchee River add substantially. Unsurprisingly, water color and salinity are strongly inversely related: The higher the salinity, the lower the water color.

Scientists are especially interested in the nutrients that hitch a ride on these dissolved organic compounds. Microbes break them down, releasing nitrogen and phosphorus that can fuel algal blooms and nuisance growth. In fact, much of the digestible nitrogen in estuaries is bound to these dissolved particles.

High water color is also tied to nutrient-rich runoff, fertilizer use, and fine sediments that further enrich the system — sometimes to its detriment. Nutrients are necessary for life, but too much of a good thing can quickly become a big problem.

On the positive side, higher water color helps shade the water, limiting bacterial growth and acting as a natural filter. But its darkening effects can also block sunlight from reaching submerged aquatic vegetation.

In Charlotte Harbor, this means seagrasses — critical for fish and wildlife — can't photosynthesize effectively and may die off. Algae, which can tolerate lower light levels, may then take over these habitats. This kind of shift has happened suddenly after hurricanes, when sediment and freshwater stress wiped out large seagrass beds, creating an opportunity for fast-growing algae to dominate.

From sunlight to sportfish

Sunlight, especially UV light, breaks down dissolved organic matter into smaller bits that microbes can digest, accelerating nutrient release and oxygen depletion. That's bad news for fish and shellfish, which need oxygen-rich water to survive. Low oxygen

levels, driven by excessive organic matter and nutrient release, can lead to fish kills, harmful algal blooms (like red tide or excessive blue-green algae), and a general decline in water quality.

There's also a growing body of research, including my own over the past 30 years, showing a link between high water color and higher levels of fecal indicator bacteria, such as E. coli and Enterococci. These bacteria don't always come from human or animal waste. Some can grow naturally in soil, algae, sand, and even on dissolved organic particles, complicating water quality monitoring and public health regulations.

It's more than 'just tea'

So the next time someone says the brown color is "just tea," you can let them know it's a lot more complicated. Tannins and DOM give our Harbor its character. They're essential for upland plants and soil processes. But in excess, they can disrupt the ecology of Charlotte Harbor. Like many natural phenomena, it's about balance.

More development and land drainage mean more colored water ends up in the Harbor. As a community, we have to weigh our choices about water use, flood control, development, and conservation. Scientists and managers can offer guidance, but it's ultimately up to the public — and its elected representatives — to decide the future of Charlotte Harbor.

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