



Ecotoxicity Program

Saint Sebastian River Pollution Mapping Project

Funded by Impact 100 Indian River

- Heavy Metals and Muck -

Introduction: The Indian River Lagoon's floor used to be comprised mostly of sand, but now much of that is covered by 'muck', fine-grained organic-rich sediment. This sediment often feels almost slimy and smells bad due to being anoxic (low in oxygen) from decomposition of organic material. Muck is often associated with higher concentrations of pollutant due to the finer particle size providing more surface area to bind those pollutants. Heavy metals occur at small concentrations within the environment naturally, but increased concentrations from those natural sources or from other anthropogenic sources have many negative effects on animals and humans. Lead can affect every organ in the human body, but the nervous system is usually the most affected. In aquatic ecosystems, lead can affect the physiological and biochemical functions of organisms. Industrial processes can introduce lead into the environment through air emissions and soil contamination. Copper is very toxic to fish and invertebrate species. Copper can alter brain function, enzyme activity, blood chemistry, and metabolism of aquatic organisms. Common sources of anthropogenic copper pollution include antifouling points and chromated copper arsenate treated timbers. Mercury is a potent neurological poison to fish, wildlife, and humans. There are natural sources of mercury (volcanic eruptions, weathering of rocks, etc.) in addition to anthropogenic sources (mining, burning fossil fuels, waste incineration, etc.).

About the Data: In ORCA's Ecotoxicity program, ORCA staff and Citizen Scientists collect water quality data and water and sediment samples. They measure the depth of the water using a depth sounder. A long, marked pole is pushed through the water and down as far as possible into the sediment to give the total depth (water depth plus muck thickness), which we use to calculate muck thickness. These samples are analyzed for a wide array of nutrients, pollutants, and anthropogenic markers. Five sediment subsamples are collected with a grab pole at locations around each specific site. These five subsamples are later composited to create a whole sample that is representative of the conditions at a site. The sediment samples are sent to an EPA certified commercial laboratory to measure heavy metals. Copper, lead, mercury, and iron data are reported as milligrams per kilogram of sediment (mg/kg), which can also be reported as parts per million (ppm).

Variables:

- Water depth
- Muck thickness

- Copper concentration in sediment
- Lead concentration in sediment
- Mercury concentration in sediment
- Iron concentration in sediment

References:

[Mercury, Human Health, and the Environment](#)

[Lead Contamination: Impacts on Humans and the Environment](#)

[Aquatic Life Criteria - Copper](#)

Examples of questions you could creatively answer with this dataset:

Level 1: What heavy metal is the most prominent?

Level 2: Does muck thickness correlate with copper concentration?

Level 3: Is water depth associated with muck thickness?

Definitions:

Antifouling- treatment of a boat's hull with a paint or similar substance designed to prevent fouling, attaching of marine organisms like oysters, mussels, and barnacles (Oxford)

Chromated copper arsenate treated timbers- pesticides containing chromium, copper, and/or arsenic that protect wood against termites, fungi and other pests that can degrade or threaten the integrity of wood products (EPA)

Composited- mixed together/combined