

## **NOWRA Position Paper:**

### **Addressing Seagrass Die-Offs in the Indian River Lagoon**

Multifaceted Causes and the Need for Comprehensive Solutions

#### **Introduction**

Seagrass ecosystems are vital to the health and productivity of estuarine environments, providing habitat, food sources, and supporting water quality. In recent years, the Indian River Lagoon (IRL) has experienced alarming seagrass die-offs, sparking debate over the root causes and potential solutions. This position paper aims to clarify the multifactorial nature of seagrass decline in the IRL and advocate for a broad-based remediation strategy, rather than focusing on a single pollutant source.

#### **Sources of Contamination in the Indian River Lagoon**

Evidence from the Indian River Lagoon (IRL) shows that seagrass die-offs are caused by multiple factors, not just nitrogen from septic systems. Relying on a single study to blame septic systems alone misrepresents the broader issue, which also involves development, aging infrastructure, and older wastewater plants, all contributing to the problem. A 2014 article noted that “Septic tanks may not be as big a villain ... as previously thought” in the IRL context: suggesting conflicting evidence and reinforces there are multiple sources of nitrogen- and phosphorus-loading.

Other causes that have been listed by local environmental agencies include:

- Stormwater run-off carrying fertilizers, sediments, herbicides/pesticides.
- Increased drainage and modified/expanded watershed (canals) bringing more fresh water, sediment, and nutrient loads from agriculture and other sources, altering salinity.
- Accumulation of “legacy muck” (sediment/organic matter) that releases nutrients as they decay.
- Sediment/turbidity reducing light available to seagrasses.

#### **Stormwater Contamination**

Stormwater is listed as a major contributor to the issues with IRL. Stormwater enters the lagoon via rain-runoff from roads, rooftops, lawns, canals, and drainage systems. Because many surfaces are impermeable now (roads, rooftops, urban development), rainfall is less filtered through soil and more rapidly conveyed into the lagoon carrying pollutants.

The main impacts of stormwater on seagrass in the IRL include:

- Nutrient loading (nitrogen, phosphorus): Stormwater picks up fertilizer, grass clippings, pet waste, urban debris, and agricultural inputs and carries them into the lagoon. These nutrients stimulate algae growth (both macro- and micro-algae) which shade seagrasses.
- Increased sediment/turbidity and “muck” accumulation: Sediments and organic debris delivered via stormwater reduce water clarity, blocking sunlight needed by seagrass for photosynthesis. Also, “muck” (fine, organic-rich sediment) accumulates on the bottom, smothers seagrass, depletes sediment oxygen, and stores nutrients that can later release.
- Freshwater/low-salinity pulses: Large stormwater discharges can reduce salinity in parts of the lagoon (especially poorly flushed sections), stressing seagrasses that prefer more stable salinity regimes.
- Altered hydrology / flushing: Increased runoff and canal drainage enlarge the watershed and increase volume of freshwater entering the lagoon; this affects residence times, flushing, and exposure of seagrass beds to pollutants.

### **Sanitary Sewer Overflow Contamination**

There are documented sanitary sewer overflows (SSOs) caused by infiltration/inflow, aging infrastructure, and storm-event failures in the Indian River Lagoon (IRL) watershed which led to the conclusion that human generated sewage is present in the lagoon. This is likely contributing to the “legacy muck” that is releasing nutrients as it decays.

A document titled “Save Our Indian River Lagoon Project Plan 2020 Update” notes that “infiltration and/or inflow continues to be a problem that contributes to overflows that discharge untreated wastewater into the Indian River Lagoon. It states that rain/flooding caused “overflow from the South Beaches Regional WWTF sewer system” in Brevard County.

In October 2022, during Hurricane Ian, the wastewater treatment plant on the south beaches in Brevard County reportedly discharged 7.2 million gallons into the lagoon due to storm-related inflow/overload. They noted that this was down from 22 million gallons of sewage spilled into the lagoon in 2018 after Hurricane Irma. There are also reports of manhole overflows and system backups during heavy rains as well and these become part of the stormwater during these events. In July 2018, the city of Titusville had a leak that released 870,000 gallons of sewage into the lagoon.

The Brevard County sewer-projects page indicates smoke-testing for private sewer laterals (pipes from houses to sewer mains) to detect excess groundwater or stormwater inflow, which can overload wastewater collection systems.

## Temperature Change Causes and Resulting Effects on Seagrass in the IRL

In addition to contamination from stormwater and sewage, water temperature in the IRL changes (warms or cools) in ways that affect seagrass ecosystems:

### Shallow Depth, Limited Flushing, Longer Residence Time

- In parts of the lagoon (especially the northern portion), shallow waters and limited exchange with the ocean mean that the water warms (or cools) more strongly and retains that temperature longer.
- Longer residence times can lead to elevated temperatures (especially under warm weather) because there's less mixing and exchange to moderate the temperature.

### Weather Extremes: Cold-Snaps or Heat Events

- Historical cold snaps (e.g., unusually low winter temperatures) have been tied to major ecosystem disturbances in the IRL.
- Conversely, warming trends (due to climate change or local warming) extend the period of elevated water temperatures.
- Ambient air temperature increases, more frequent heat waves, longer warm seasons all contribute to elevated water temperatures. Some reports note that warmer waters are extending algal bloom seasons in the lagoon.

### Freshwater Inflows, Stormwater Pulses, Altered Hydrology

- Massive freshwater discharges (cooler or warmer than the lagoon's ambient water) can alter local water temperatures. For instance, large volumes of runoff or canal releases can change temperature regimes.
- Urbanization and changes to the watershed (more surfaces, altered drainage) can impact how quickly water heats up / cools, and thus influence lagoon temperature regimes.

### Impacts of Water Temperature Changes on Seagrass

Water temperature affects seagrasses both directly (physiological stress) and indirectly (via interacting stressors). Below are key impacts:

#### *Direct Physiological Effects*

- **Thermal tolerance limits:** Each seagrass species has an optimal temperature range. When water temperatures go outside (too cold or too hot) the plants may experience reduced growth, increased mortality, or failure to regenerate. For example, one study noted that when

temperature, salinity, or light exceeded limits for certain species, large changes in distribution/abundance occurred.

- **Reduced dissolved oxygen (DO) capacity:** Warmer water holds less oxygen, which can stress plants (and associated organisms) by reducing available DO. For example, the lagoon’s management plan notes that as temperature increases the water’s capacity to hold oxygen decreases, contributing to hypoxia risk.
- **Cold stress events:** When temperatures drop suddenly (cold snaps), plants stressed by low light or other conditions may die back. The IRL has documented such events preceding large seagrass losses.

#### *Indirect/Ecosystem Effects That Impact Seagrass*

- **Extended algal bloom season:** Warmer water can prolong seasons favorable for phytoplankton or harmful algae. These blooms shade seagrasses by reducing light penetration. In the IRL, warmer temperatures have been tied to blooms beginning earlier and lasting later.
- **Increased turbidity / light attenuation:** Elevated temperatures plus nutrient loads often correlate with higher algae and sediment/organic matter turnover, reducing light available to seagrasses. Light is critical for photosynthesis in seagrasses.
- **Synergy with other stressors:** Temperature changes don’t act alone. For instance, warmer water plus nutrient stress plus low flushing can create conditions where seagrasses cannot recover.
- **Habitat shift / species vulnerability:** Some seagrass species may be more tolerant of certain temperatures, so shifts may favor less sensitive species, or allow macroalgae to substitute. For example, the study on seagrass replacement by macroalgae in the IRL used water temperature among the variables assessed.

## Conclusion

It is the position of this paper that seagrass decline in the Indian River Lagoon is a result of multiple, interacting anthropogenic stressors. Efforts to restore and protect seagrass habitats must adopt a holistic approach, targeting stormwater management, upgrading wastewater infrastructure, regulating agricultural inputs, and remediating legacy muck. Singularly blaming any one contaminant or phenomenon is both scientifically inaccurate and counterproductive; only comprehensive, coordinated action will safeguard the IRL’s seagrass ecosystems for future generations.

*This position paper was approved unanimously at the December 15, 2025, NOWRA Board of Directors meeting.*