



Seagrass Monitoring in South Florida/Caribbean Network Parks

2022

Importance

Seagrass meadows represent one of the most valuable ecosystems on the planet. Communities of seagrass and other submerged aquatic vegetation (SAV) cover large areas of South Florida/Caribbean Network (SFCN) parks. These habitats serve as nurseries for numerous marine species, provide ontogenetic connectivity between mangrove, nearshore, and offshore habitats, and support a variety of vertebrate and invertebrate life (Figure 1). Seagrass communities are also valued for their role in balancing climate change by sequestering carbon from the atmosphere and for ecosystem services such as nutrient cycling and sediment stabilization. Environmental factors such as salinity, nutrients, water quality, light and soft and hard-bottom sediments influence SAV community composition and distribution.

Six native seagrass species occur in SFCN parks: Shoal Grass (*Halodule wrightii*), Manatee Grass (*Syringodium filiforme*), Turtle Grass (*Thalassia testudinum*), Paddle Grass (*Halophila decipiens*), Star Grass (*H. engelmannii*), and Widgeon Grass (*Ruppia maritima*). *R. maritima* was known to occur in Everglades National Park but has recently been reported in Virgin Islands National Park by the South Florida/Caribbean Network and park staff. Additionally, the federally listed Johnson's seagrass (*Halophila johnsonii*) occurs off Virginia Key just north of Biscayne National Park close to its northern border. An eighth species, Broadleaf Grass (*Halophila stipulacea*), is native to the Persian Gulf, Red Sea, and Indian Ocean but is now an invasive exotic in the eastern Caribbean basin (Figure 2).

Objectives and Approach

The primary objective of the SFCN seagrass protocol is to monitor trends in seagrass cover, community composition, and the presence of invasive exotic species within mapped seagrass habitat. Sampling in parks occurs every alternating third year in Virgin Islands National Park, Buck Island Reef National Monument, Salt River Bay National Historical Park & Ecological Preserve, and the ocean side of Biscayne National Park. The SAV communities in Everglades National Park, Dry Tortugas National Park, and the bay portion of Biscayne National Park are currently monitored by partner institutions. A stratified random survey design is used and is stratified by three depth zones (> 15 meters [49.2 feet], 5–15 meters [16.4–49.2 feet], < 5 meters [16.4 feet]).



Figure 1. Seagrass habitats coupled with coral reefs provide critical nursery areas for juvenile fish and many marine species. NPS photo.



Figure 2. Left, A seagrass meadow of *Halophila stipulacea*, an invasive species, August 2022 in Virgin Islands National Park. Right, diver with sampling gear, including 0.25 square meter (2.7 square feet) quadrats used for seagrass surveys. NPS photo.

Monitoring

In August 2022, a 10-day monitoring mission was conducted in Virgin Islands National Park in collaboration with park staff. A rapid assessment Braun-Blanquet method was used to characterize seagrass and algal cover density by species and seagrass canopy height using 0.25 square meter (2.7 square feet) quadrats (Figure 2) at 124 sites around the island of St. John. Sediment type and sediment depth in centimeters were also recorded within each quadrat using a probe. Additionally, divers collected water depth, current, visibility, and the number of Queen Conch (*Aliger gigas*) present.



Status and Trends: Virgin Islands National Park

The first park-wide seagrass monitoring effort in Virgin Islands National Park obtained essential baseline information on the distribution of seagrass species in the park. The relative frequency of seagrass density for the four most abundant species is shown in Figure 3. *Halophila stipulacea* was first reported in St. John, USVI in 2012 (Valdez et al. 2020). Since then, the distribution of this species has expanded throughout Virgin Islands National Park (Figure 4A). *H. stipulacea* was not observed in native seagrass beds within Reef Bay during an SFCN pilot seagrass survey in August 2015 (Figure 4B). However, by 2022, *H. stipulacea* had expanded throughout Reef Bay, especially offshore, compared to more disturbed shallow inshore areas (Figure 4C).

H. stipulacea competes well with the native Caribbean seagrass *Syringodium filiforme* for space and has empirically been shown to alter the abundance and composition of seagrass-associated organisms and the local seagrass community (Willette and Ambrose 2012). *H. stipulacea* can out-compete native seagrass species, has a wide range of environmental tolerances, and can survive where other species cannot (Willette and Ambrose 2012). This adaptability may bolster its invasion potential, where recolonization of damaged seagrass beds may become less suitable for native species. A recent study showed juvenile green sea turtle (*Chelonia mydas*) will graze upon *H. stipulacea* if native seagrass species are not available (Siegwalt et al. 2022). However, *H. stipulacea* has less nutritional value than native species but higher digestibility. With increased colonization rates of this invader, more investigation is needed to determine its potential interactions with native seagrasses and implications for higher levels of the food chain.

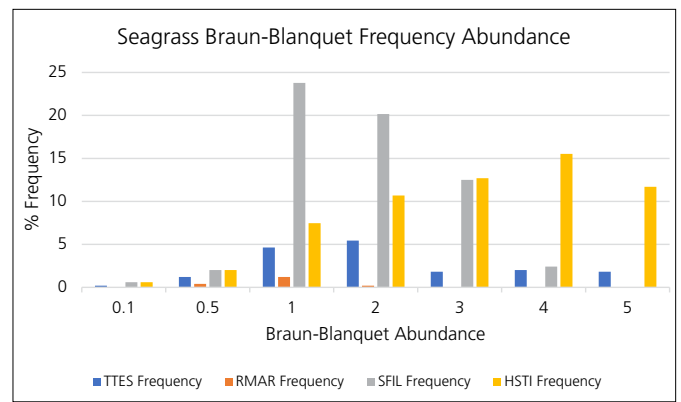


Figure 3. Relative frequency of seagrass density (Braun-Blanquet) for *Thalassia testudinum* (TTES), *Ruppia maritima* (RMAR), *Syringodium filiforme* (SFIL) and *Halophila stipulacea* (HSTI) in Virgin Islands NP.

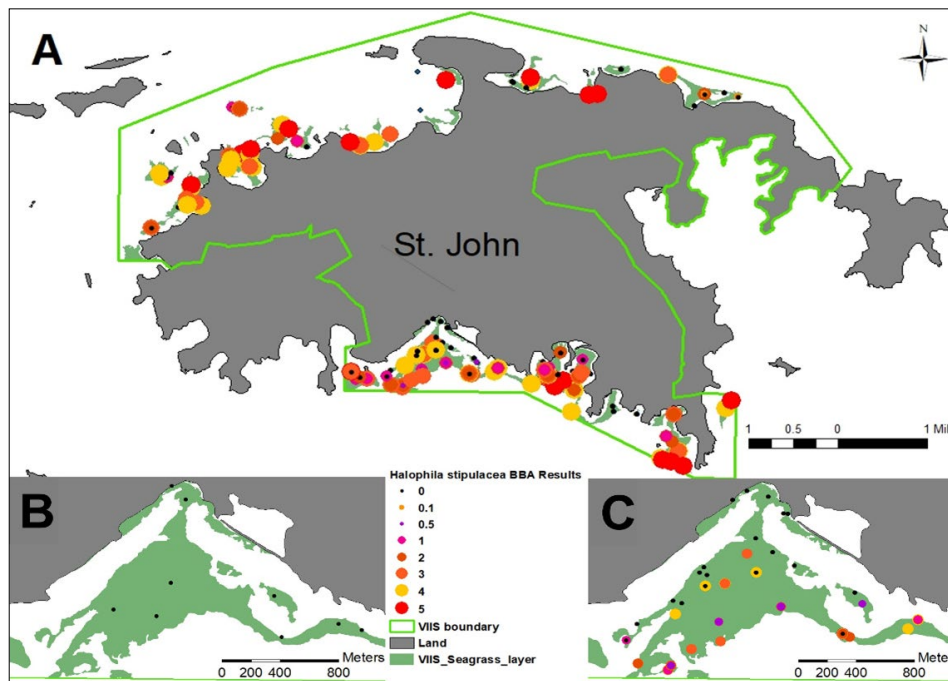


Figure 4. (A) Raw Braun-Blanquet seagrass density ranking for *Halophila stipulacea* at randomized sites surveyed in Virgin Islands National Park in August 2022; (B) Absence of *Halophila stipulacea* in Reef Bay during a pilot seagrass study in August 2015; (C) Expansion and density of *Halophila stipulacea* in Reef Bay in August 2022.

Literature Cited

- Siegwalt, F., Jeantet, L., Lelong, et al. (2022). Food selection and habitat use patterns of immature green turtles (*Chelonia mydas*) on Caribbean seagrass beds dominated by the alien species *Halophila stipulacea*. *Global Ecology and Conservation*, 37, e02169. <https://doi.org/10.1016/j.gecco.2022.e02169>
- Valdez, S. R., Shaver, E. C., Keller, D. et al. (2021). A survey of benthic invertebrate communities in native and non-native seagrass beds in St. John, USVI. *Aquatic Botany*, 175, 103448. <https://doi.org/10.1016/j.aquabot.2021.103448>
- Willette, D. A., & Ambrose, R. F. (2012, October). Effects of the invasive seagrass *Halophila stipulacea* on the native seagrass, *Syringodium filiforme*, and associated fish and epibiota communities in the Eastern Caribbean. *Aquatic Botany*, 103, 74–82. <https://doi.org/10.1016/j.aquabot.2012.007>

