Environmental Monitoring of the Rainbow River

Published on June 26, 2025

The Southwest Florida Water Management District (District) monitors environmental conditions in a number of water bodies in its 16-county area, including Rainbow River, to determine the health of our local waters. Various information is collected to understand these conditions, including water quality, hydrologic, and submerged aquatic vegetation (SAV) data. This report provides current information about the Rainbow River in relation to the parameters collected by the District.

Figure 1: An otter swimming in Rainbow River.

Sampling Locations

The maps below (Fig 2) indicate the sampling locations for some of the environmental conditions collected within the Rainbow River. The surface water sampling location numbers indicate approximate distance from the headspring.

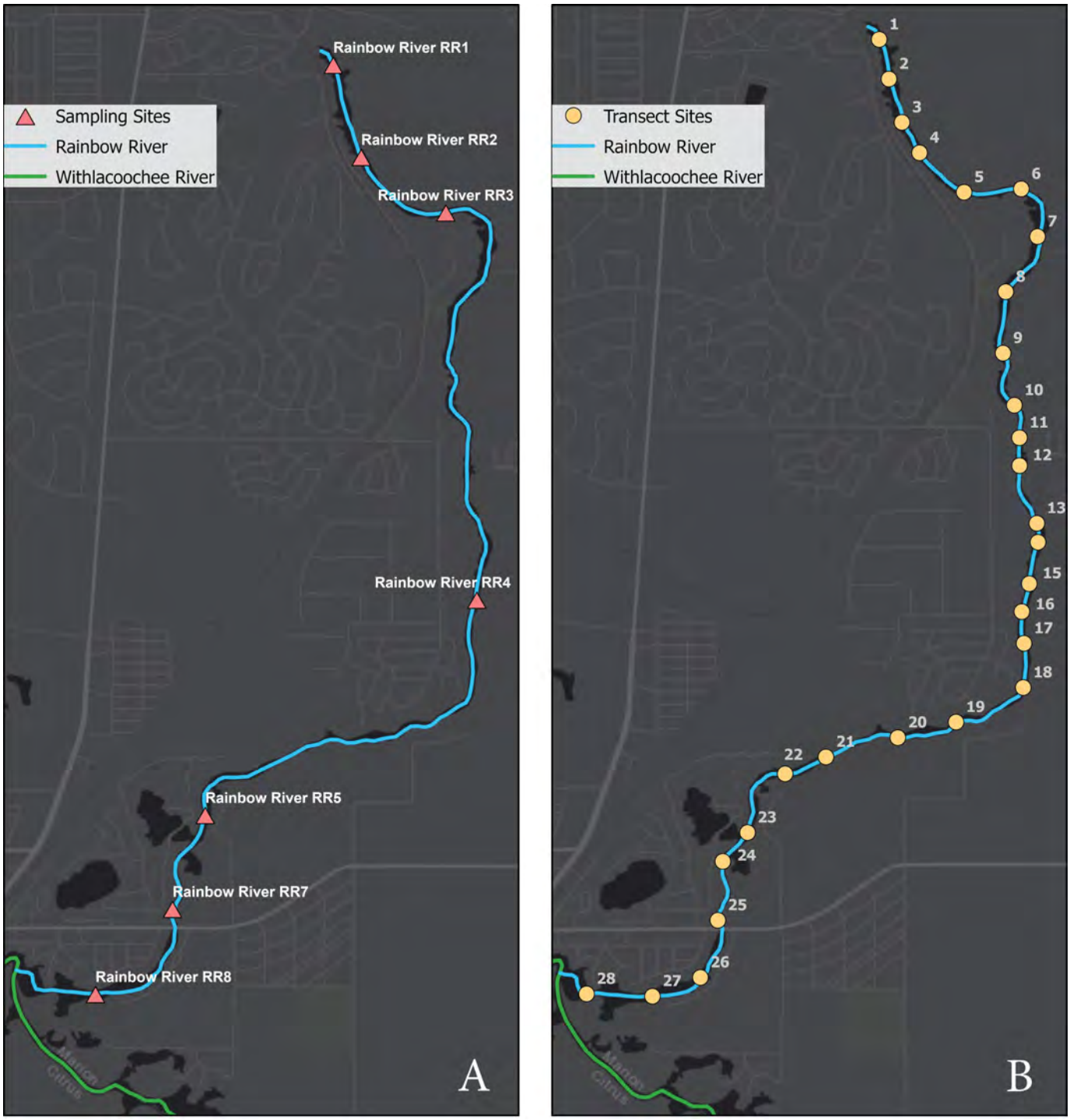


Figure 2: Sampling locations for (A) surface water sites and (B) submerged aquatic vegetation in Rainbow River.

Water quality and hydrologic data

The District's Data Collection Bureau is responsible for the collection and management of water resource data. Water quality and hydrologic data is available through the District's Environmental Data Portal.

At each of these locations (Fig 2A), surface water samples and measurements are collected and include parameters such as water clarity, total nitrogen, dissolved oxygen, salinity, specific conductance, and temperature. Water clarity is recorded from horizontal secchi measurements.

In addition to the surface water sites, nitrate data is collected from the spring vent and reported to the Springs Coast Committees. This location is referenced in the Environmental Data Portal as station number 23319.

Rainfall data is derived from the monthly rainfall total throughout the Rainbow Springshed.

Figure 3: Water quality data collection at one of the sampling stations in Rainbow River.

Submerged aquatic vegetation (SAV) data

Twenty-two sampling locations (Fig 2B), which are referred to as transects, are used to evaluate SAV in the river and are currently mapped during the winter and summer of each year. SAV data may be requested by emailing the Springs Team at SpringsTeam@WaterMatters.org.

Figure 4: *Sagittaria kurziana* is one of the SAV species found in Rainbow River.

Water Quality and Hydrologic Data

Rainfall and spring flow

The amount of rainfall a region receives affects the amount of water that flows from a spring. As rain falls to the ground, it is absorbed and percolates downward into the limestone bedrock. The limestone holds the water like a sponge, and the water becomes part of the Floridan Aquifer. This natural replenishment of the aquifer through rainfall is referred to as recharge, and is demonstrated in Figure 5.

Figure 5: Hydrologic cycle showing how recharge occurs.

Due to the complexity of the aquifer system, travel time can take days to years before the water reaches the spring vent. However, patterns between rainfall and spring flow (Figure 6) can still be seen.

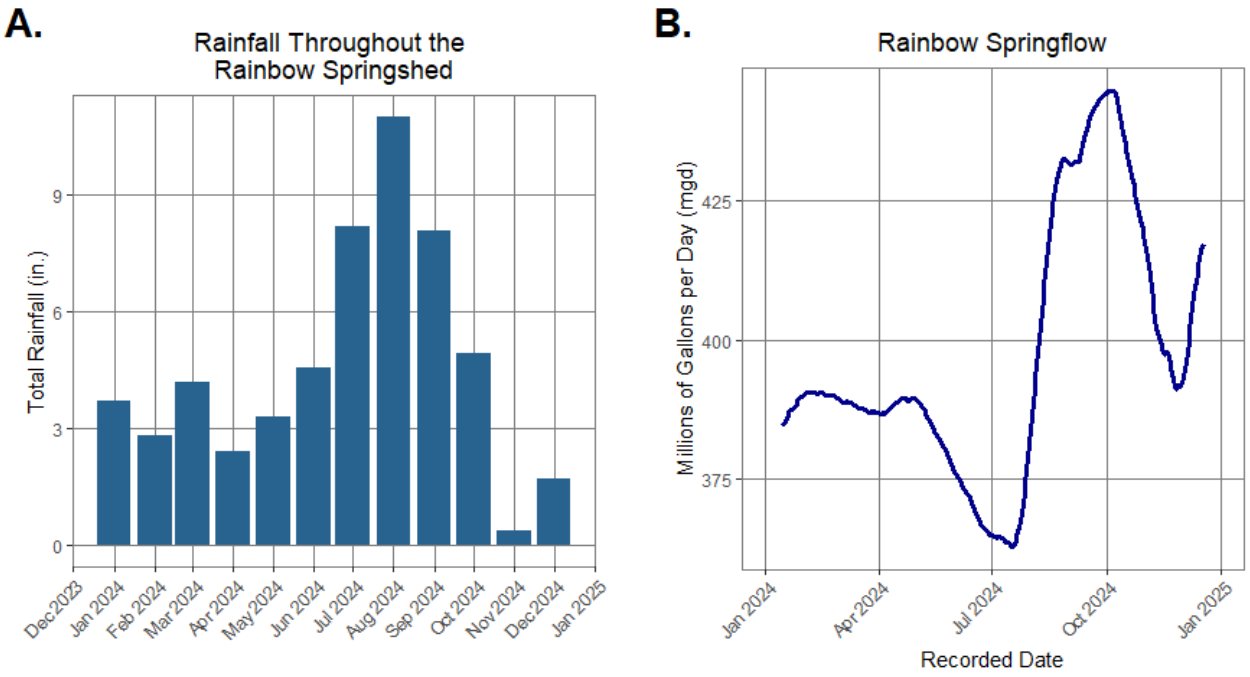
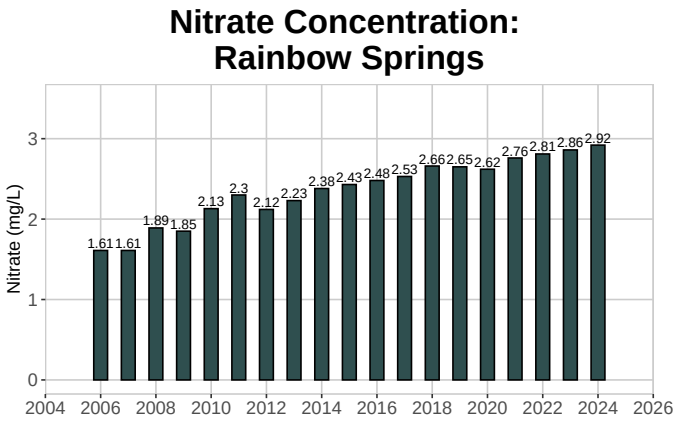


Figure 6: (A) Rainfall in the Rainbow Springshed influences the (B) amount of springflow.

Nutrients and other water quality parameters

Development within the Rainbow springshed has contributed to increased nutrients within the spring. These nutrients are from a variety of sources, including fertilizer use and septic tanks. Excess of nutrients can cause an ecological imbalance in the river. The Florida Department of Environmental Protection (FDEP) has adopted a Basin Management Action Plan (BMAP) to implement the total maximum daily load (TMDL) for the protection and restoration of this system. The below graph shows the nitrate concentration in the river, which is reported to the Springs Coast Committees.

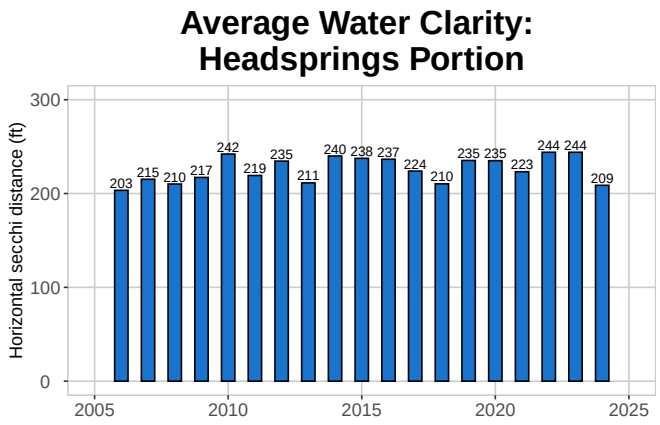


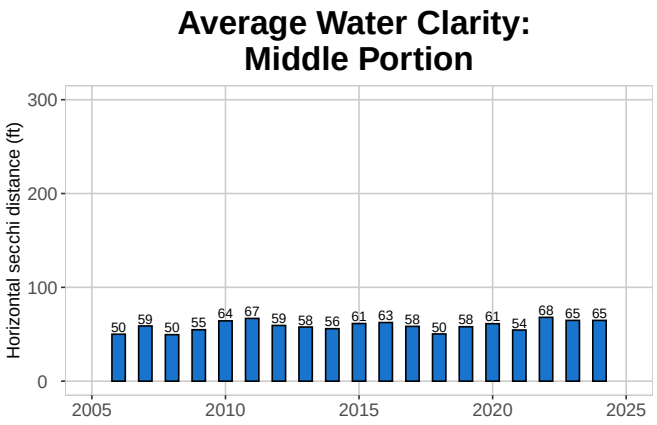
Excess nutrients in the water can cause reduced water clarity. However, water clarity is also impacted by many other natural factors such as wind, cloud cover, and tannins. Tannins are compounds derived from plant organic matter that give water a brown pigment, which is how tea gets its color. Tannins from surrounding wetlands can enter spring-fed rivers and cause a change in the river's color.

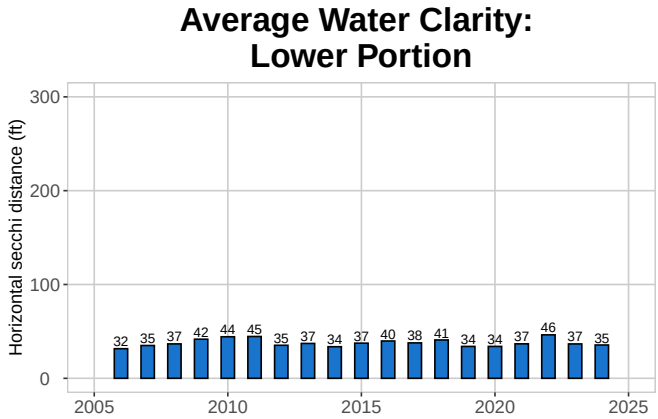
Water clarity is measured using horizontal secchi measurements. A secchi disk is a black and white circular disk used by scientists to measure the distance until the disk is no longer visible. This method is often used by lowering the disk from a boat, but water clarity in springs often exceeds river depth. Horizontal secchi measurements are therefore conducted, where a diver swims until the disk is no longer visible. An example of this process is shown in Figure 7.

Figure 7: A secchi disk is used to measure water clarity.

Water clarity decreases with downstream distance, which is a common phenomenon in many riverine systems. The below graphs show water clarity as the headsprings, middle, and lower portions of the river, which are reported to the Springs Coast Committees.







Submerged Aquatic Vegetation

Submerged aquatic vegetation (SAV) is mapped in the winter and summer of each year at specified locations called transects (see Fig 2B). Quadrats, which are square frames made of PVC pipe as seen in Figure 8, are used to measure coverage of species present. At each of these transects, one 0.25 m^2 quadrat is randomly tossed in the middle of the river and two are randomly tossed to each side approximately one-third and two-thirds the distance to the shoreline. The average of these five quadrats is used to capture the percent coverage at each transect to capture the variation between each riverbank.

Figure 8: A quadrat is used to measure percent coverage of SAV species in Rainbow River.

Due to unique patterns present in this system, the Springs Coast Committees evaluate the SAV community as shown in Figure 9.

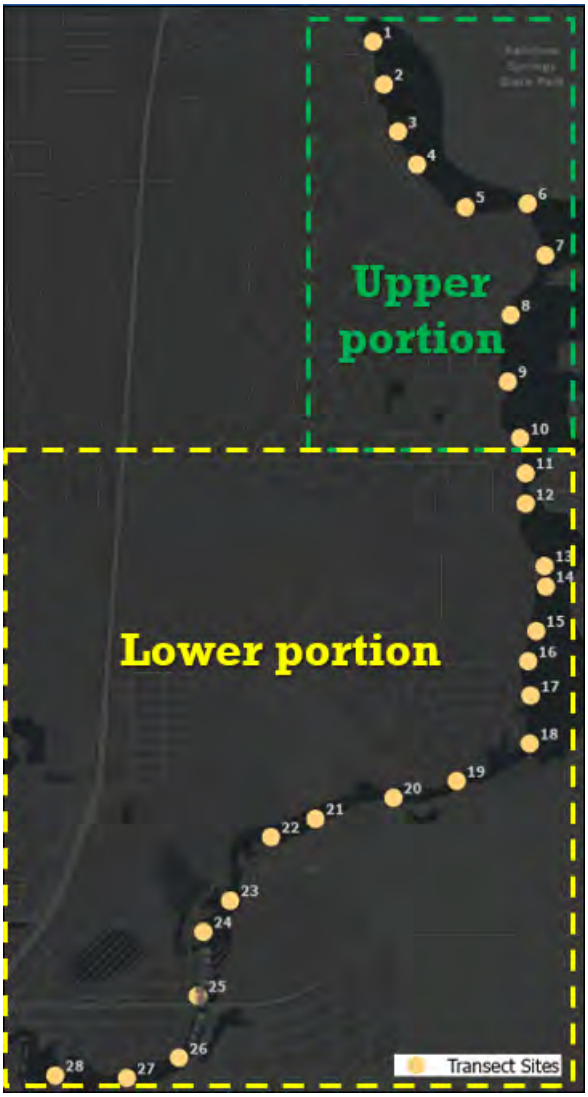
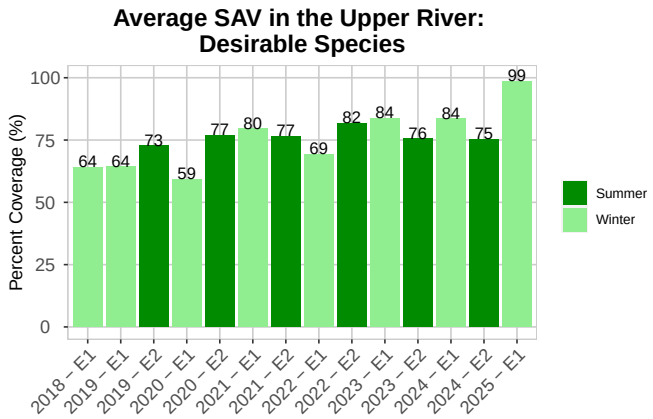
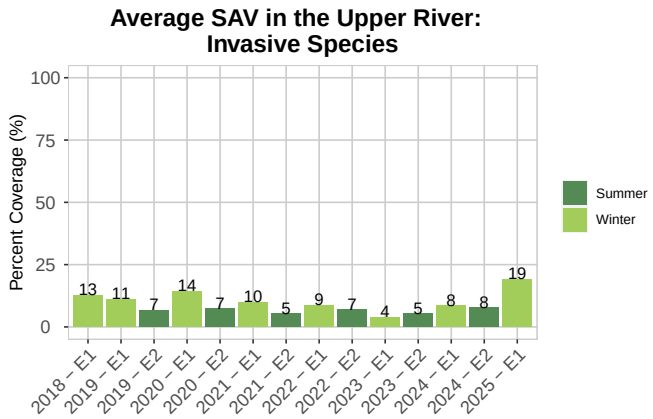
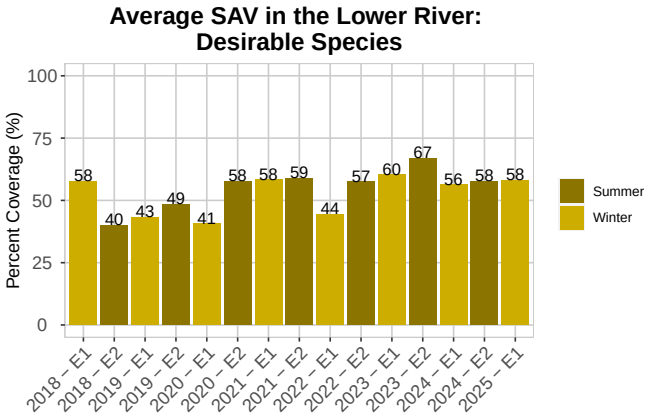


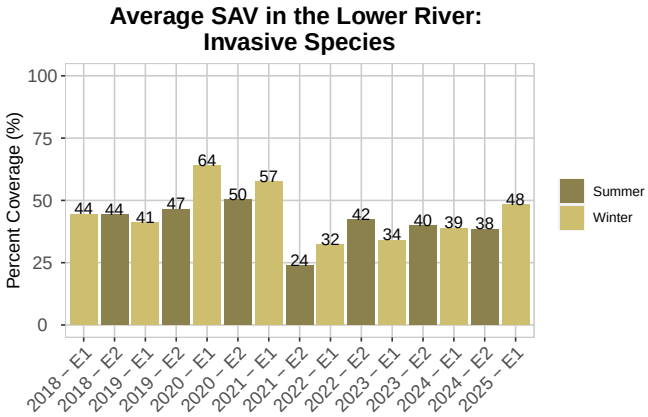
Figure 9: The submerged aquatic vegetation (SAV) in Rainbow River can be classified into the upper and lower portions of the river.

The below graphs show the average desirable and invasive SAV species in the different zones present in Rainbow River.






Average SAV in the Lower River:
Desirable Species
Percent Coverage (%)
100
75
50
25
0
58
40
43
49
41
58
58
59
44
57
60
67
56
58
58
2018 – E1
2018 – E2
2019 – E1
2019 – E2
2020 – E1
2020 – E2
2021 – E1
2021 – E2
2022 – E1
2022 – E2
2023 – E1
2023 – E2
2024 – E1
2024 – E2
2025 – E1
Summer
Winter


Average SAV in the Lower River:
Invasive Species
Percent Coverage (%)
100
75
50
25
0
44
44
41
47
64
50
57
24
32
42
34
40
39
38
48
2018 – E1
2018 – E2
2019 – E1
2019 – E2
2020 – E1
2020 – E2
2021 – E1
2021 – E2
2022 – E1
2022 – E2
2023 – E1
2023 – E2
2024 – E1
2024 – E2
2025 – E1
Summer
Winter