Environmental Assessment of Crystal River/Kings Bay

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The Southwest Florida Water Management District (District) monitors environmental conditions in a number of water bodies in its 16-county area, including Crystal River/Kings Bay, 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 Crystal River/Kings Bay in relation to the parameters collected by the District.

Figure 1: Manatees at Pretty Sister Spring, which is one of the 70 springs in the Crystal River/Kings Bay system.

Sampling Locations

The maps below (Fig 2) indicate the sampling locations for some of the environmental conditions collected within Kings Bay.

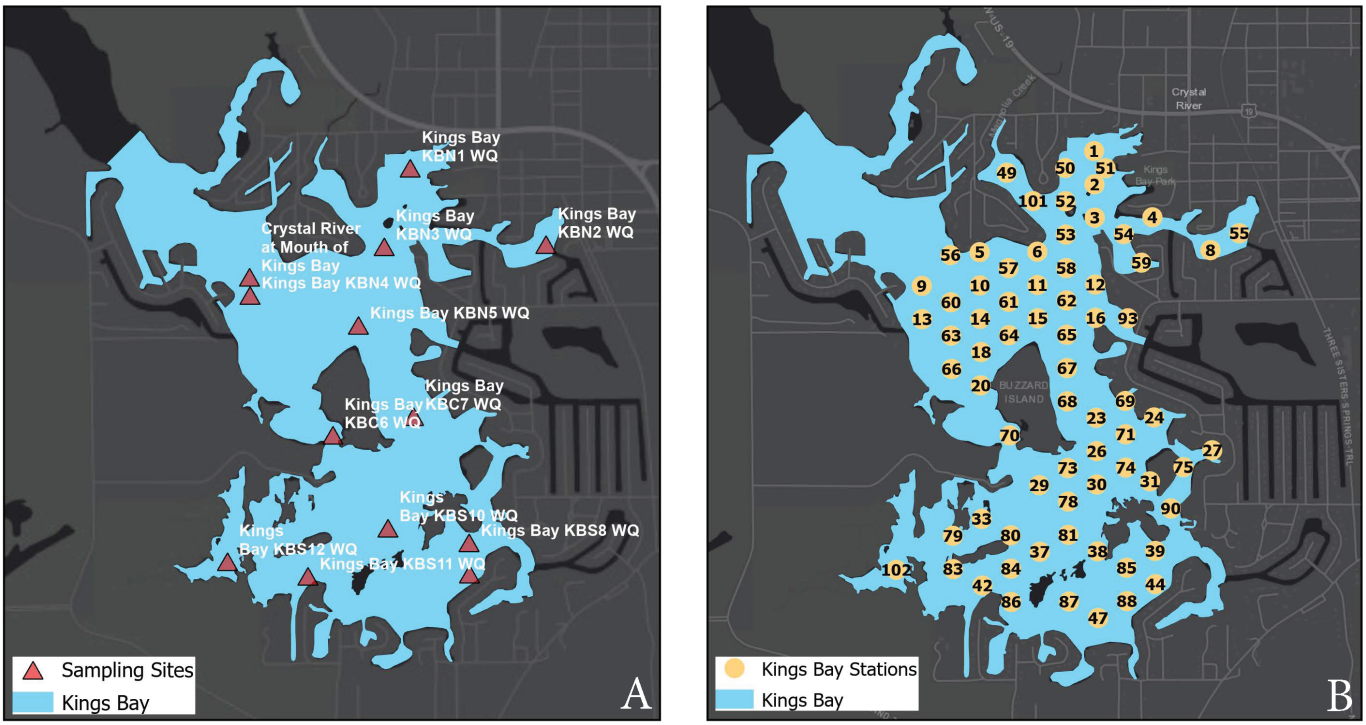


Figure 2: Sampling locations for (A) surface water sites and (B) submerged aquatic vegetation in Kings Bay.

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, total phosphorus, chlorophyll, specific conductance, and temperature. Water clarity is recorded from horizontal secchi measurements. Chlorophyll, total nitrogen, and total phosphorus data are reported as an average of the twelve surface water sites. Water clarity data are recorded from horizontal secchi measurements at KBN2 for Hunter Cove and at KBN1, KBN3, KBN4, KBN5, KBC6, KBC7, KBS8, KBS10, KBS11, and KBS12 for Kings Bay Proper (Fig 2A).

Rainfall data is derived from the monthly rainfall total throughout the Crystal River/Kings Bay Springshed. Springflow was calculated based on the USGS gage located at the Saragassa Canal. This location is referenced in the Environmental Data Portal as station number 858089.

Figure 3: Water quality data collection at one of the sampling stations in Kings Bay.

Submerged aquatic vegetation (SAV) data

Seventy-one sampling locations (Fig 2B), which are referred to as stations, are used to evaluate SAV in Kings Bay 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.

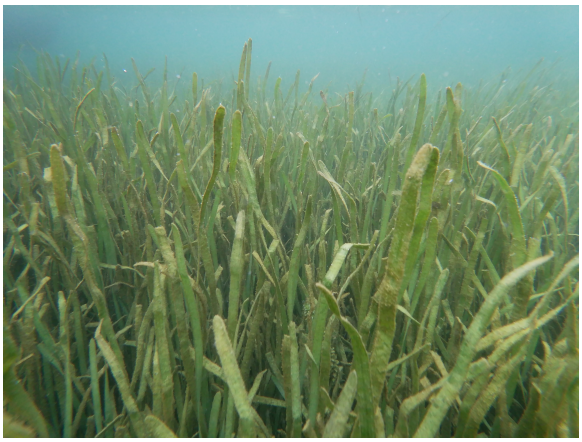


Figure 4: *Vallisneria americana* is one of the SAV species found in Crystal River/Kings Bay.

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.

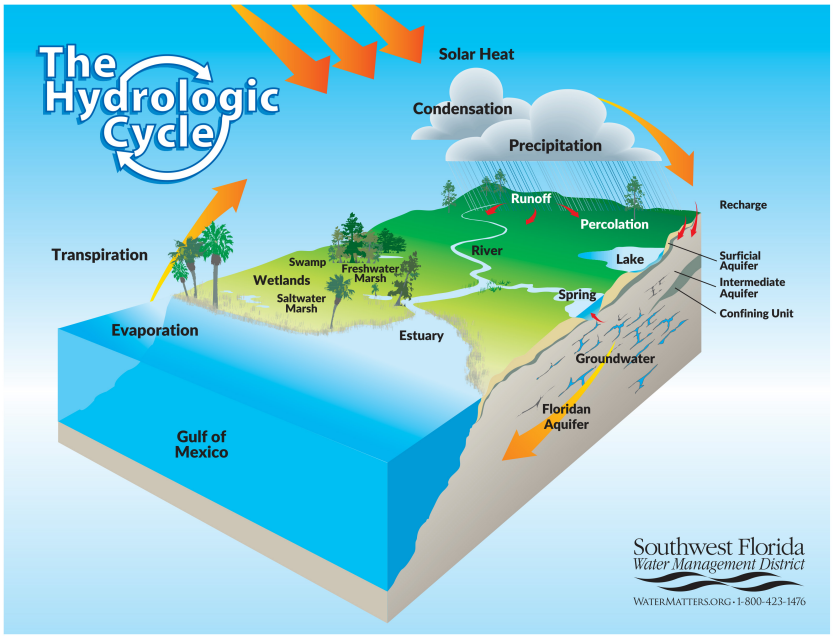


Figure 5: Hydrologic cycle showing how recharge occurs.

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.

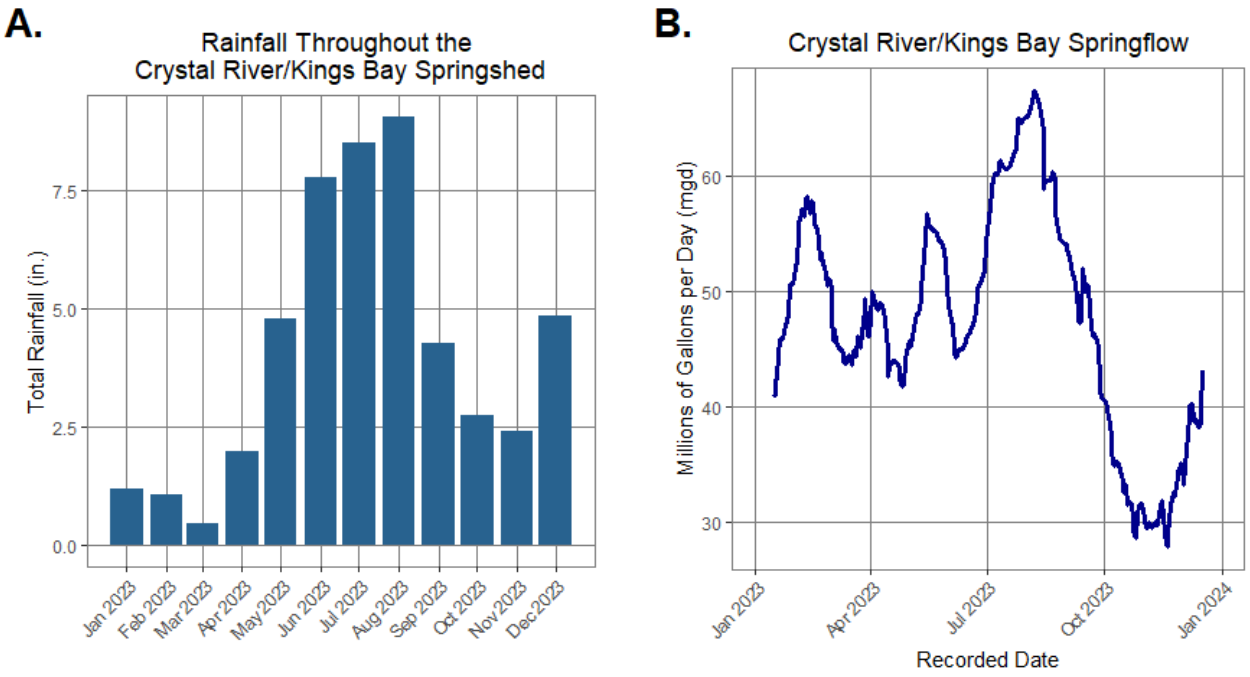
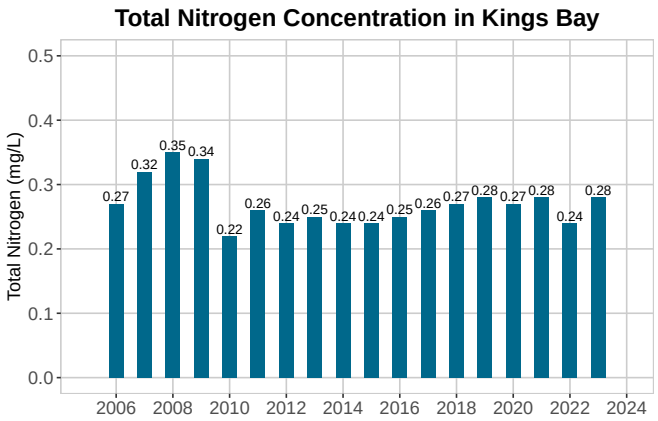
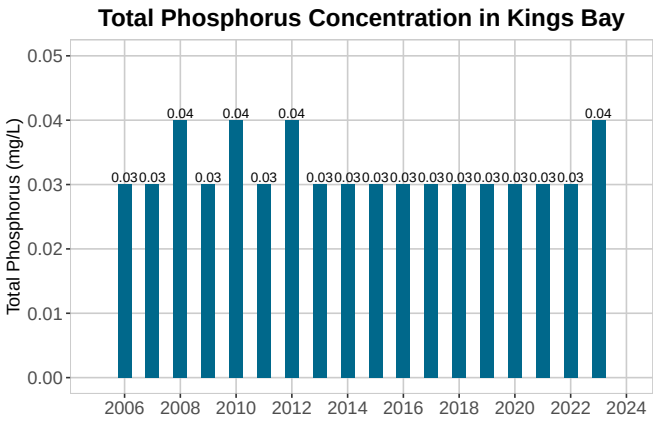


Figure 6: (A) Rainfall in the Crystal River/Kings Bay Springshed influences the (B) amount of springflow.

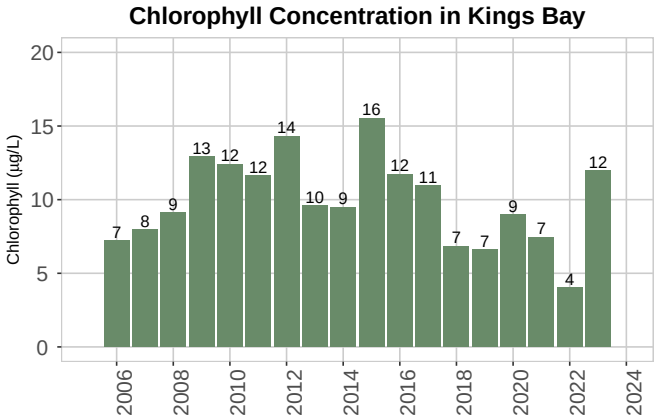
Nutrients and other water quality parameters

Development within the Crystal River/Kings Bay 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 bay/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 graphs show the total nitrogen and total phosphorus concentrations in the bay, which is reported to the Springs Coast Committees.





These nutrients can impact the amount of phytoplankton within the bay along with other parameters such as water residence time. Chlorophyll concentrations are used as a proxy for phytoplankton abundance and are highly variable. Higher chlorophyll levels can decrease water clarity. The below graph shows chlorophyll concentrations in the bay, which is reported to the Springs Coast Committees.

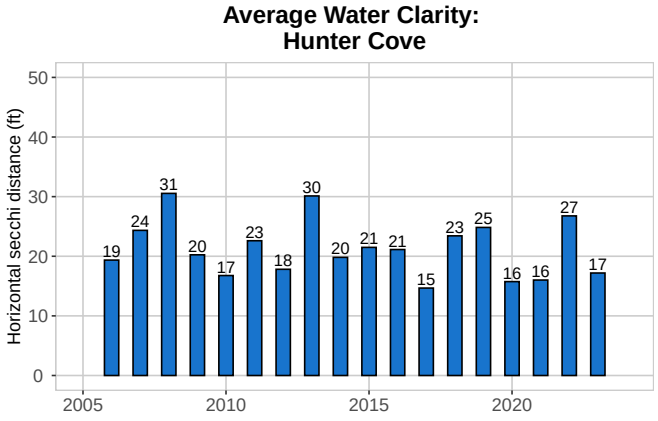


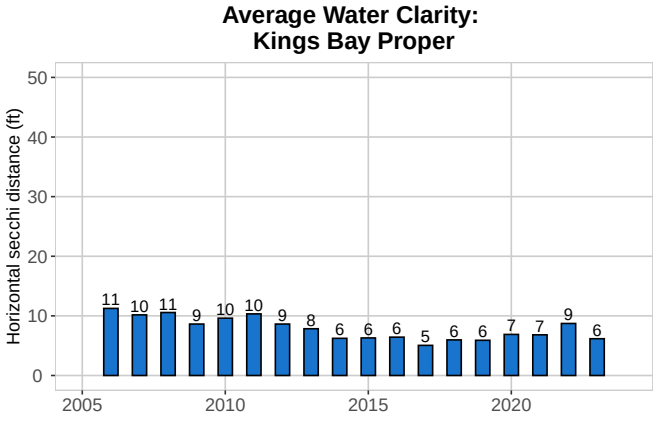
Excess nutrients in the water can cause reduced water clarity. However, water clarity is also impacted by many other natural factors such as tides, wind, and tannins. Tannins are compounds derived from plant organic matter that give water a brown pigment, which is how tea gets its color. Tannins from surrounding wetlands can enter the bay and cause a change in color. Clarity in the bay, particularly in the open water portions, is also affected by the amount of chlorophyll and suspended sediment in the water column.

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.

Spatial variation in water clarity occurs throughout the bay, primarily due to proximity to large spring vents where greater water flushing occurs. The below graphs show water clarity near Hunter Cove and in the open water portion of the bay (herein referred to as Kings Bay Proper), 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 stations (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 stations, three 0.25 m^2 quadrats are randomly tossed. The average of these three quadrats is used to capture the percent coverage at each station.

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

The below graphs show the average desirable and invasive SAV species present in Kings Bay.