WEKIVA RIVER MONITORING SUMMARY

July 2019 - December 2019

PREPARED FOR

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION, DIVISION OF PARKS AND RECREATION

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This report was prepared by the Howard T. Odum Florida Springs Institute (FSI). Ecological monitoring was conducted by FSI and the Florida SPRINGSWATCH volunteers under the Florida Department of Environmental Protection (FDEP) Division of Recreation and Parks Research / Collection Permit Number 04261910. The establishment of the Florida SPRINGSWATCH Wekiva River group was made possible by funds granted to the Florida Springs Institute by the Fish and Wildlife Foundation of Florida’s Protect Florida Springs Tag Grant program.

Our Wekiva River SPRINGSWATCH program would not be possible without the hard work of our volunteer team leaders, Ashley Konon and Bethany Sciortino. We would also like to acknowledge the contribution and dedication of our other volunteers: Chris Newport, Viviana del Campo, Sara Alvarez, Niles Morrow, Mary Sullivan, and Joy Bonin.
Section 1.0 Introduction

Located 17 miles north of Orlando, the Wekiva River is a major tributary to the St. Johns River, receiving over half of its flow from over 30 artesian springs. The Wekiva River begins its flow at Wekiwa Spring, a second magnitude spring discharging over 43 million gallons per day. The Wekiva River is also fed by input from Rock Spring Run, which flows roughly 8.5 miles before meeting with the Wekiva River. Because of its natural beauty and cool waters, the Wekiva River is a popular place for recreation such as kayaking, canoeing, paddle boarding, swimming, and other water-related activities. Through citizen science conducted via the SPRINGSWATCH volunteer program, FSI is able to enhance monitoring of the Wekiva River and use the resulting data to more accurately assess springs and river health to further educate the public.

This report was prepared by the Howard T. Odum Florida Springs Institute (FSI) and is focused on ecological monitoring currently being conducted by SPRINGSWATCH volunteers along the Wekiva River and springs.

1.1 Monitoring Stations

Data were collected by Florida SPRINGSWATCH volunteers at a total of 8 monitoring stations along the Wekiva River (Figure 1). These stations included the Wekiwa Head Spring (WEK-HS), 6 stations along the Wekiva Spring River/Run (WEK-2 through WEK-7), and Rock Spring Run (RS-1).
Section 2.0 Methods

Ecological monitoring was conducted on the Wekiva River from July 2019 to December 2019. Data collection included water quality field parameters, light measurements, and nitrate samples.

2.1 Sampling Events

Table 1 summarizes the sampling events along the Wekiva River and Spring. Monitoring was conducted monthly during 2019 by the Florida SPRINGSWATCH Volunteer Program with assistance from FSI. Months with missing DO or Specific Conductance data were the result of issues with equipment calibration. These were resolved by December sampling.

Wekiva River SPRINGSWATCH monitoring events included the following:

- Water quality field parameters (temperature, dissolved oxygen, and specific conductivity)
- Vertical light attenuation (PAR)
- Nitrate samples (August 2019)

Table 1. Wekiva River Sampling Events (July 2019 – December 2019)

<table>
<thead>
<tr>
<th>Sampling Date</th>
<th>DO %</th>
<th>DO (mg/L)</th>
<th>Specific Conductance</th>
<th>Temperature</th>
<th>Light Attenuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/20/2019</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>8/28/2019</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>10/27/2019</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>11/25/2019</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>12/28/2019</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

2.2 Water Quality

Surface water data were collected monthly at each station along the Wekiva River with YSI water quality meters. Handheld YSI ProODO and YSI EcoSense EC300A meters were used at each of the 8 monitoring stations along the Wekiva River to collect measurements of temperature/dissolved oxygen, and specific conductance respectively. Calibration and maintenance of water quality meters was conducted according to factory instructions. Instruments were calibrated before and after each sampling event.
2.3 Light Measurements

Photosynthetically Active Radiation (PAR) underwater light transmission and attenuation coefficients were measured monthly at the 8 monitoring sites during comprehensive ecological assessments. Data were collected using a LI-COR brand LI-192 underwater quantum sensor to measure PAR energy reaching the water surface and at 1-foot intervals from the surface to a depth of 2 feet in the water column. Figure 2 provides a typical light sensor installation. Light extinction (attenuation) coefficients were calculated from these data using the Lambert-Beer equation (Wetzel 2001):

\[ I_z = I_0 (e^{-kz}) \]

Where:
- \( I_z \) = PAR at depth \( z \)
- \( I_0 \) = PAR at the water surface
- \( k \) = diffuse attenuation coefficient, m\(^{-1}\)
- \( z \) = water depth, m

2.4 Nitrate Sampling

In August of 2019 FSI Environmental Scientists accompanied SpringsWatch volunteers for monthly sampling along the Wekiva River. Water samples were collected at 6 of the 8 sample sites and sent to McGlynn Laboratories Inc. for nitrate nitrogen analysis. Samples were collected by placing a capped sample bottle below the surface water, uncapping to collect water, and recapping underwater. Samples have a 28-day holding time and were sent to the lab by FSI.
Section 3.0    Results

This section summarizes field data collected as part of the ecosystem monitoring conducted along the Wekiva River from July 2019 to December 2019. Data collected by Florida SPRINGSWATCH volunteers included water quality field parameters, nitrate samples and light measurements. These data provide a quantitative record of existing conditions in the river and springs and will be useful for comparison to future evaluations of the ecological health of the Wekiva River and springs system.

3.1 Water Quality

Figure 3 through Figure 6 present field parameter results collected from the 8 stations along Wekiva River as part of the Florida SPRINGSWATCH program from July 2019 to December 2019. Figure 3 presents dissolved oxygen (DO) data measured in percent saturation (%), and Figure 4 presents DO results measured in milligrams per liter (mg/L), or parts per million (ppm). DO levels differed between spring and river stations primarily due to ground water vs surface water influence. Groundwater typically exhibits a lower DO saturation, depending on the duration of time the water has spent underground before emerging from a spring vent. The lowest DO results were found at the Wekiwa spring station (WEK-HS) with DO concentrations increasing downstream from the spring. DO increases as the water accumulates more free oxygen from the atmosphere as well as photosynthesizing submerged aquatic vegetation (SAV). Rock Spring run (RS-1) flows 8.5 miles before meeting with the Wekiva River, and exhibits a much higher DO concentration. Input from RS-1 seemed to increase the overall DO concentration of the Wekiva River from WEK-4 to WEK-7 (figure 3, figure 4).

Figure 5 presents data for temperature (°C) field measurements. Water emerging from Wekiva Spring is a bit warmer, roughly 23.3°C, than what is typically observed for springs (~22°C). From WEK-HS to WEK-3 temperature remains relatively constant (~24°C) until colder water from RS-1 drops the temperature by about one degree (Figure 5). As the water moves downstream (WEK-4 to WEK-7) temperature gradually increases (Figure 5).

Figure 6 demonstrates the results for Specific Conductance field measurements. Specific conductance levels can be influenced by naturally occurring ions present in spring water but also from ions present due higher levels of nitrate/nitrite, phosphorous, saltwater, and other compounds. Higher specific conductance values suggest a higher concentration of these ions in the water. Specific conductance levels are highest from WEK-HS to WEK-3, dropping significantly after input from RS-1 (Figure 6). The results presented in figure 7 show higher nitrate concentrations at WEK-HS and WEK-2, 1.29mg/L and 0.822 mg/L respectively. RS-1 exhibited significantly lower concentrations of nitrate at 0.016mg/L (figure 7). These differences in nitrate concentration could explain the differences in specific conductance observed between stations. The red, dotted line in Figure 7 indicates the FDEP nitrate standard of 0.35 mg/L for springs.
Figure 3. Florida SPRINGSWATCH Program Wekiva River Dissolved Oxygen Percent Saturation (DO %) Measurements (October and December 2019)

Figure 4. Florida SPRINGSWATCH Program Wekiva River Dissolved Oxygen Measurements (mg/L) (July, October, and December 2019)
**Figure 5.** Florida SPRINGSWATCH program Wekiva River Temperature Measurements (°C) (July 2019-December 2019)

**Figure 6.** Florida SPRINGSWATCH program Wekiva River Specific Conductance Measurements (uS/cm) (July 2019-December 2019)
3.1.1 Florida SPRINGSWATCH Wekiva River Light Measurements

Figure 7 displays the diffuse attenuation coefficient (k) and percent transmittance estimates collected by the Florida SPRINGSWATCH program along the Wekiva River from July 2019 to December 2019. Percent transmittance refers to the amount of light that is able to pass through the water column. The diffuse attenuation coefficient (k) is calculated via the Lambert-Beer equation (Wetzel 2001) to measure how readily light dissipates throughout the water column. Higher values of percent transmittance tend to correspond with lower values of coefficient k. Higher k values, or lower percent transmittance values, can indicate poor water clarity since light cannot pass as easily through the water column, often due to an increase in suspended solids (turbidity) in the water. Percent transmittance is higher with corresponding lower k values at Wekiwa Spring (WEK-HS) with decreasing water clarity moving downstream (figure 7). The Wekiva River is a tannic river. Moving away from Wekiwa spring the water darkens due to tannins from leaf litter and increased runoff input, decreasing water clarity.
Figure 8. Wekiva River Diffuse Attenuation Coefficient (k) and Percent Transmittance Measurements (July 2019-December 2019)

Section 4.0 References

