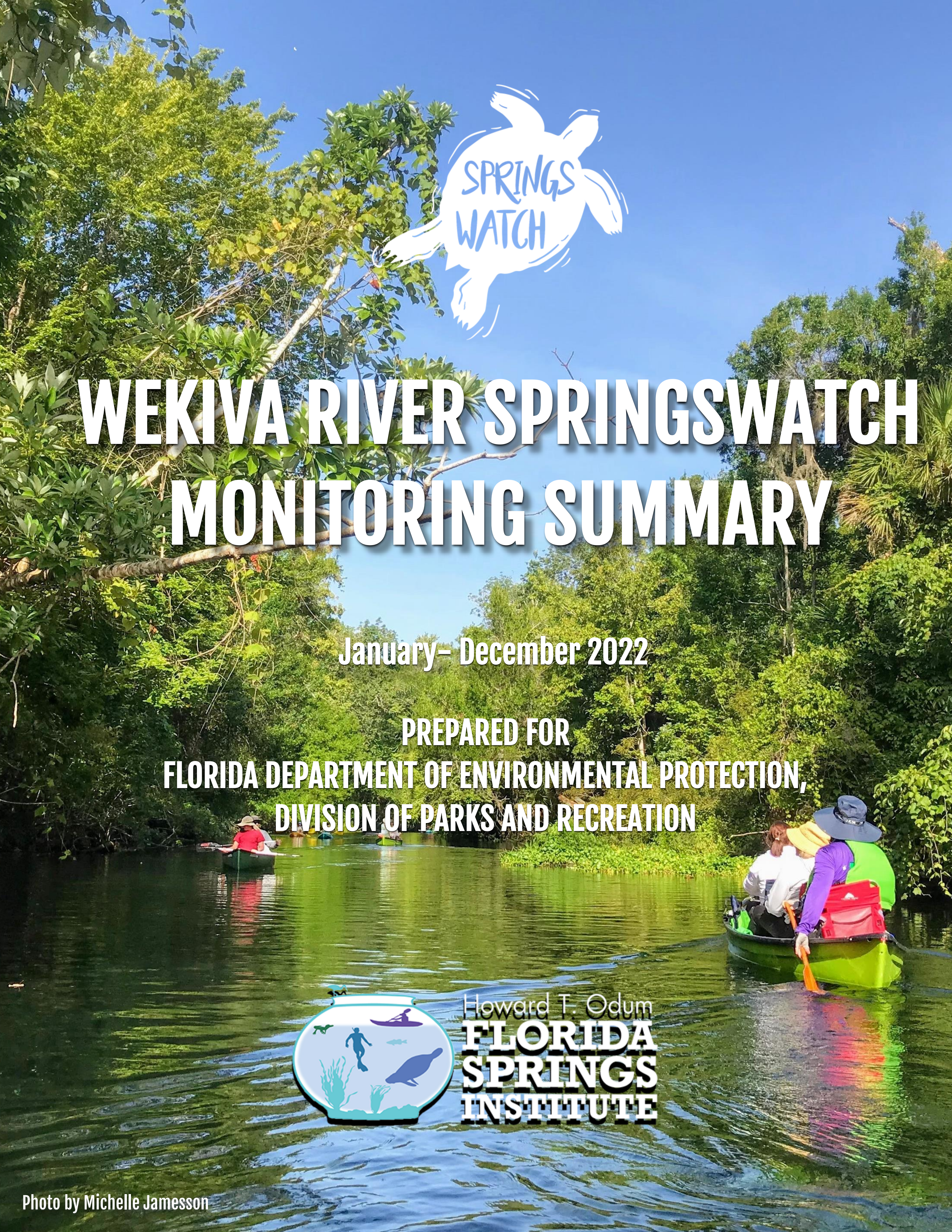


SPRINGS WATCH

WEKIVA RIVER SPRINGSWATCH MONITORING SUMMARY

January- December 2022

PREPARED FOR
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION,
DIVISION OF PARKS AND RECREATION

Howard T. Odum
FLORIDA SPRINGS INSTITUTE

Photo by Michelle Jamesson

Volunteer and Staff Acknowledgments

This report was prepared by the Howard T. Odum Florida Springs Institute (FSI). Ecological monitoring was conducted by Florida SpringsWatch volunteers and FSI staff under the Florida Department of Environmental Protection Division of Recreation and Parks Research/Collection Permit Number 06212220.

Our Wekiva River SpringsWatch program would not be possible without the hard work of team leaders, Chris Newport and Michelle Jamesson, and their dedicated team of volunteers: Annie Alcolea, Joy Bonin, Kaley Deal, Hannah Bozenhardt, Daniel Bryant, Marie Burdette, Chris Canfield, Mike Cliburn, Chris Croll, Denise de Prouw, Audrey Harris, Jestin House, Ana Jamesson, Ashley Konon, James Kutzner, Shannon Letcher, Wren Letcher-Whitfield, Wyatt Letcher-Whitfield, Victoria Marshall, Madison McVey, Emily Miranda, Tyrell Motsinger, Lori Patterson, Mark Patterson, Julia Petersen, Stephen Polczer, Natalia Rodriguez, Monique Simpson, Emily Steboduik, Trevor Sweeney, Aimee Tate, Peter Van Camp, Kate Watson, Yvette Witherell, Valeria Yon, Archan Zifos, Iliana Zifos, Jaclyn Zifos, and Jenson Zifos. Together they put in 171 volunteer hours over 10 monitoring sessions in 2022.

We would also like to thank FSI's SpringsWatch Coordinator Jill Lingard and Environmental Scientist Bill Hawthorne for their contributions to this report, as well as the ongoing guidance of Executive Director Dr. Bob Knight. We also acknowledge the data entry efforts from our diligent FSI science interns.

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 more than 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.

FSI's SpringsWatch volunteer citizen-science program has provided enhanced monitoring of the Wekiva River and springs since 2019. The resulting data are provided in annual reports and via FSI's SpringsWatch website (floridaspringsinstitute.org/springswatch) to inform the state's environmental agencies and educate the public about the river and springs health.

This report was prepared by the Howard T. Odum Florida Springs Institute and is focused on the ecological monitoring of the Wekiva River and springs conducted by SpringsWatch volunteers in 2022.

1.1 Monitoring Stations

Figure 1 shows the eight SpringsWatch monitoring stations along the Wekiva River. These stations included the Wekiwa Head Spring (WEK-HS), 6 stations along the Wekiva River (WEK-2 through WEK-7), and its confluence with Rock Spring Run (RS-1).

Figure 1. Wekiva SpringsWatch monitoring stations.

Section 2.0 Methods

Ecological monitoring was conducted on the Wekiva River from January 2021 to December 2021. Data collection included water quality field parameters, light measurements, and vegetation.

2.1 Sampling Events

Table 1 summarizes the sampling events along the Wekiva River. With assistance from FSI, SpringsWatch volunteers conducted six sampling sessions in 2021. Circumstances surrounding the COVID-19 global pandemic cancelled outings from January to April, and inclement weather kept the group off the water during June and July.

Table 1. Wekiva SpringsWatch sampling events (January–December 2022).

Sampling Date	Water Quality	Nitrate-Nitrite	Light Attenuation	Vegetation	Bird Survey
1/20/2022	X		X	X	X
3/17/2022	X		X	X	
4/21/2022	X		X	X	X
5/19/2022	X		X	X	X
6/16/2022	X		X	X	X
8/18/2022	X		X	X	X
9/15/2022	X	X	X	X	X
10/20/2022	X		X	X	X
11/17/2022	X		X	X	X
12/15/2022	X		X	X	X

2.2 Water Quality

SpringsWatch volunteers used handheld YSI ProODO and YSI EcoSense EC300A meters at each of the eight monitoring stations along the Wekiva River to collect measurements of dissolved oxygen, temperature, and specific conductance. The team leader maintained water quality meters according to factory instructions and calibrated them 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 eight monitoring stations. Volunteers used a LI-COR brand LI-192 underwater quantum photometer to measure PAR energy reaching the water surface and at depth intervals of one foot and two feet. Figure 2 provides an image of the LI-COR photometer.

Figure 2. LI-COR LI-192 photometer.

2.4 Vegetation

Submerged aquatic vegetation (SAV) was monitored monthly at each of the eight Wekiva SpringsWatch stations. Volunteers took two underwater photographs at each station in two different locations, which they sent to FSI for analysis. The photographs will be used to provide the overall average percent plant coverage at each station.

Section 3.0 Results

This section summarizes field data along the Wekiva River and springs collected from January to December 2022 by SpringsWatch volunteers.

3.1 Water Quality

3.1.1. Dissolved Oxygen, Water Temperature, and Specific Conductance

Figure 3 through Figure 11 present water quality results collected by Wekiva SpringsWatch volunteers in 2022. Figures 3 and 4 show dissolved oxygen results measured in percent saturation (DO%) at each river station and by month. Figures 7 and 8 show DO results measured in milligrams per liter (mg/L), or parts per million, at each river station and by month.

DO levels fluctuated between spring and river stations primarily due to groundwater vs. surface water influence. Spring stations tend to exhibit lower DO values than river stations since emerging groundwater typically contains less free oxygen depending on the duration of time the water has been underground before reaching a spring vent.

The lowest DO results were found at the Wekiwa headspring 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. 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 increased the overall DO concentration of the Wekiva River from WEK-4 to WEK-7.

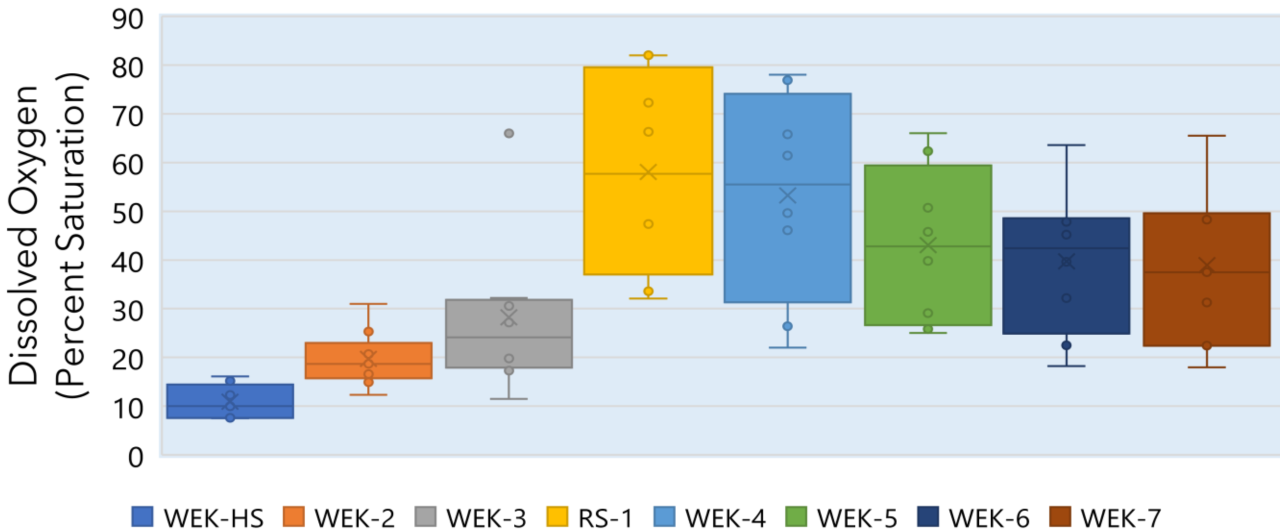


Figure 3. Dissolved oxygen percent saturation (DO%) by Wekiva SpringsWatch station (January-December 2022).

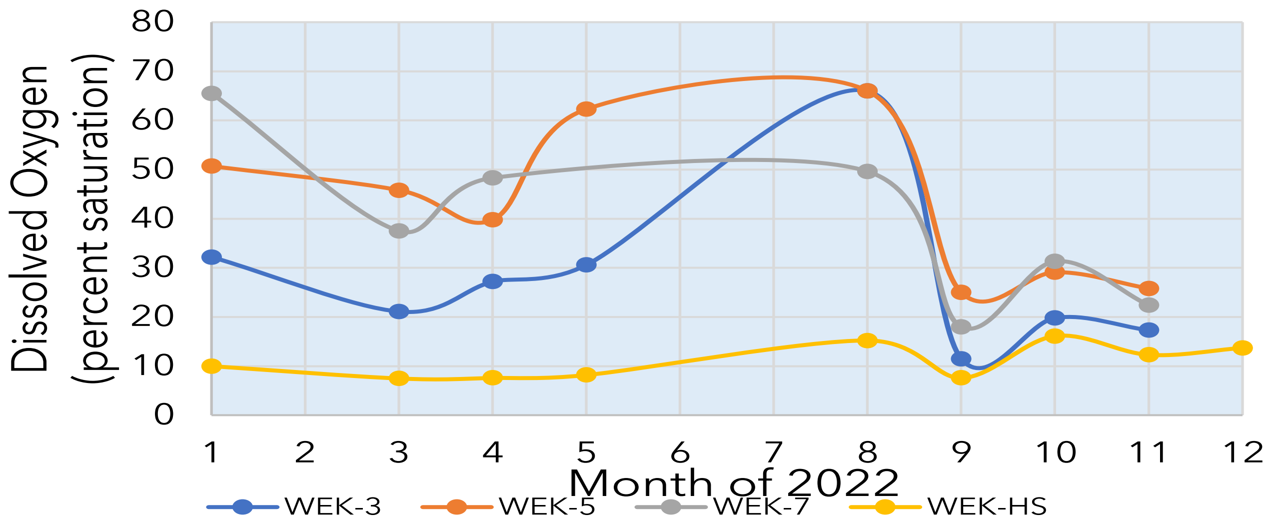


Figure 4. Dissolved oxygen percent saturation (DO%) by month for Wekiva SpringsWatch (January-December 2022).

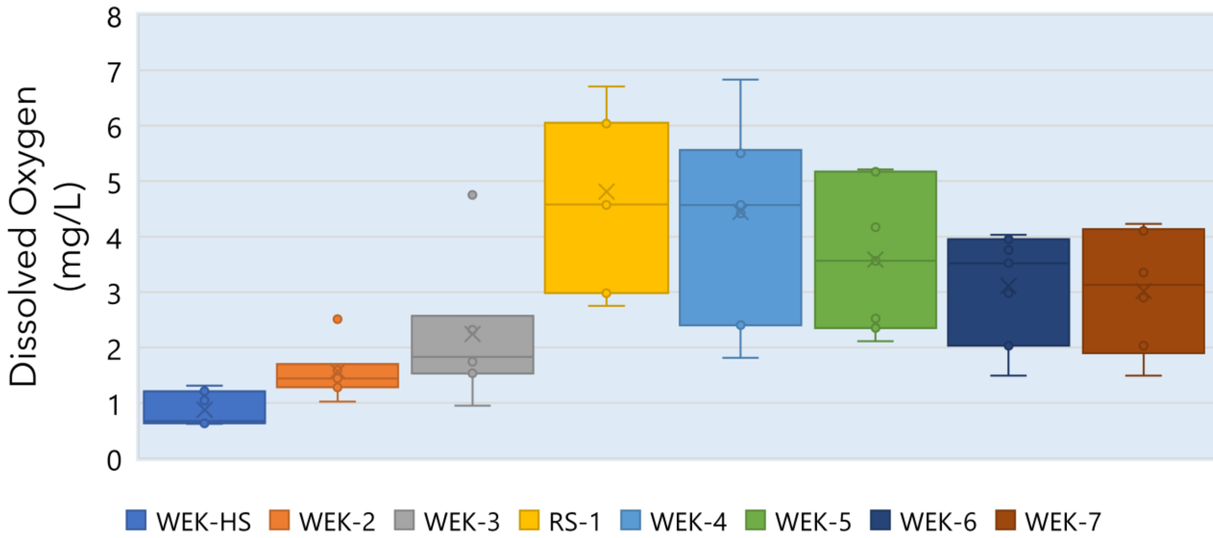


Figure 5. Dissolved oxygen (mg/L) by Wekiva SpringsWatch station (January-December 2022).

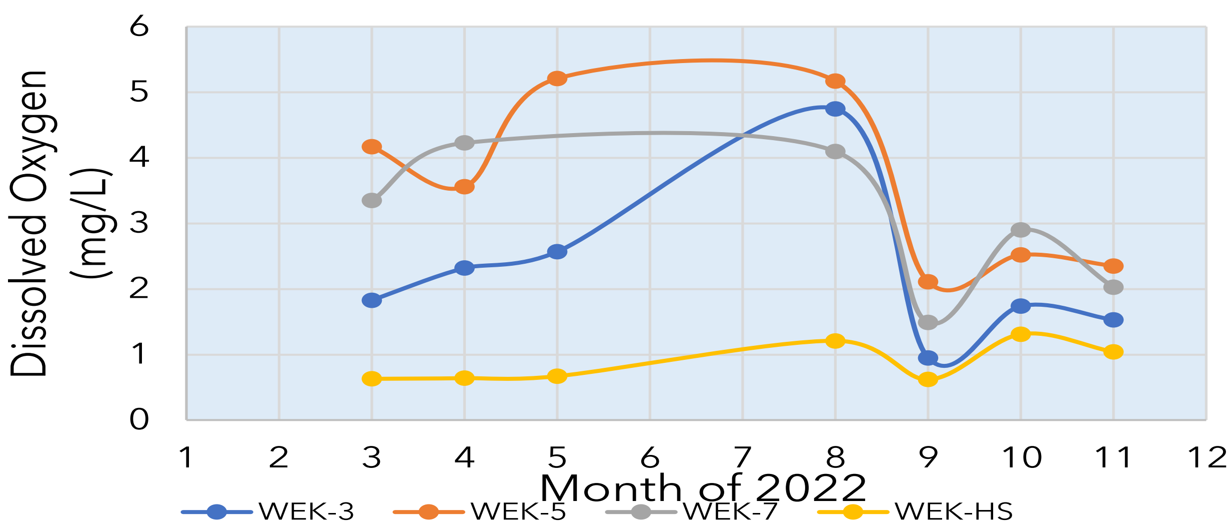


Figure 6. Dissolved oxygen (mg/L) by month for Wekiva SpringsWatch (January-December 2022).

Figures 7 and 8 present data for water temperature (°C) field measurements. Figure 7 shows water temperature for each station; Figure 8 presents this data by month.

Water temperature in the Wekiva River ranged from 15.9-26.5°C. Water emerging from Wekiwa Spring averages about 24°C, typical of the springs in the Central Florida region. From WEK-HS to WEK-3, temperature remains relatively constant (~24°C) until cooler water from RS-1 mixes with the spring water from Wekiwa Spring. As the water moves downstream (WEK-4 to WEK-7), the two different water sources blend, resulting in an average temperature of about 21.7°C.

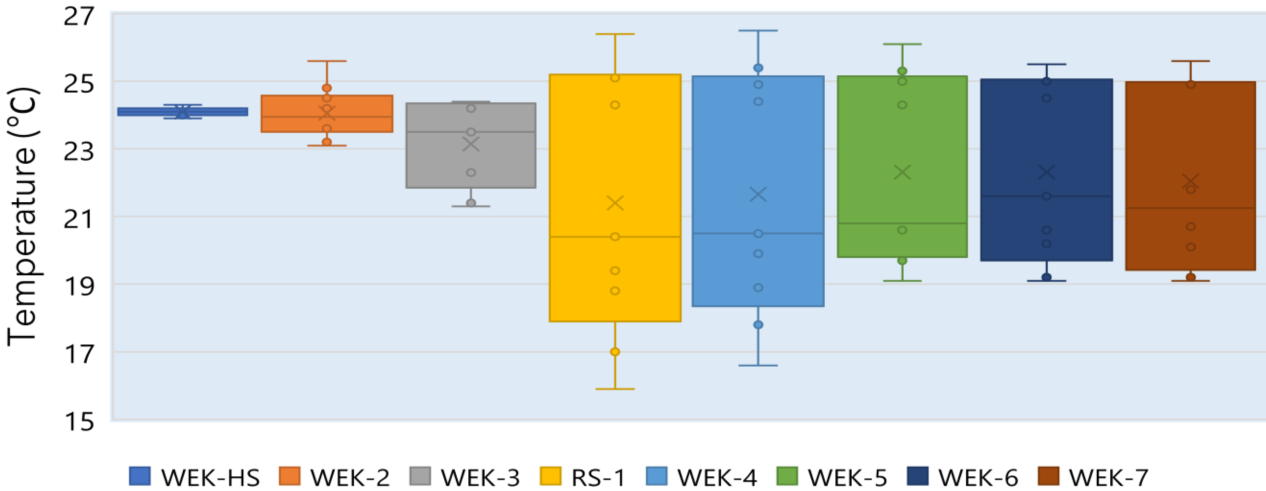


Figure 7. Water temperature (°C) by Wekiva SpringsWatch station (January-December 2022).

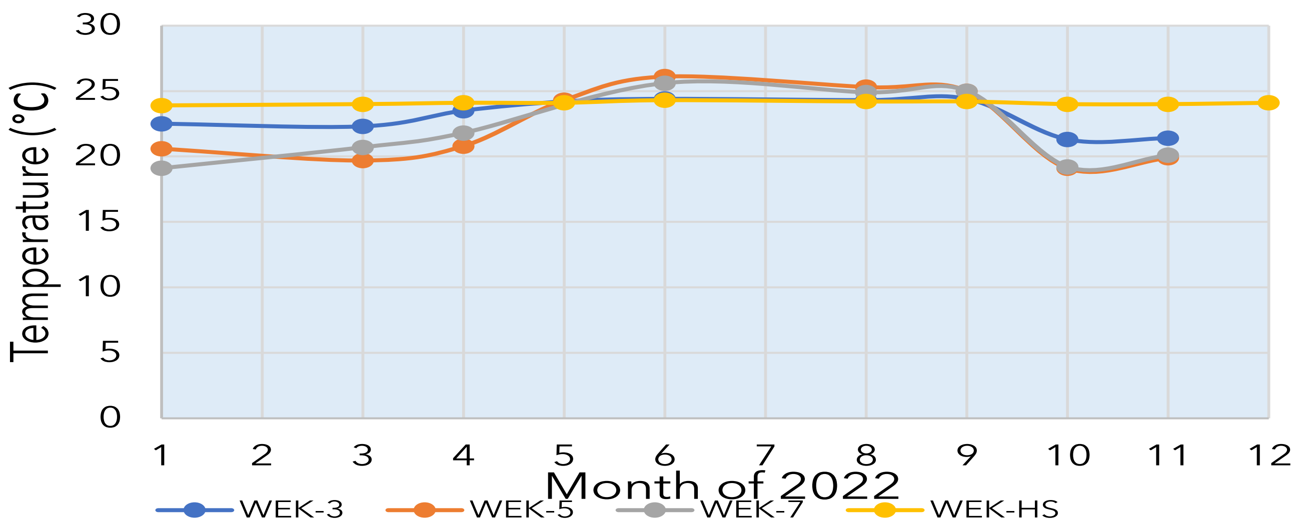


Figure 8. Water temperature (°C) by month for Wekiva SpringsWatch (January-December 2022).

Figures 9 and 10 show the results for specific conductance (uS/cm) field measurements along the Wekiva River. Figure 9 presents specific conductance data for each station; Figure 10 shows this data by month.

Specific conductance levels can be influenced by naturally occurring ions present in spring water but also from ions present due to higher levels of nitrate/nitrite, 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 10). These data indicate that Rock Springs receives groundwater with less dissolved ions than Wekiwa Spring.

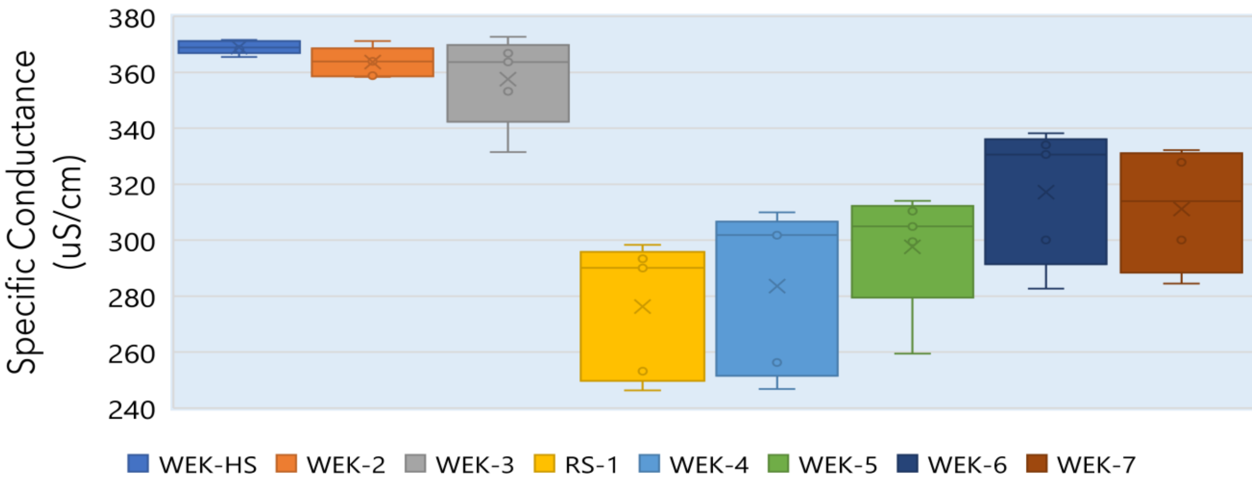


Figure 9. Specific conductance (uS/cm) by Wekiva SpringsWatch station (January-December 2022).

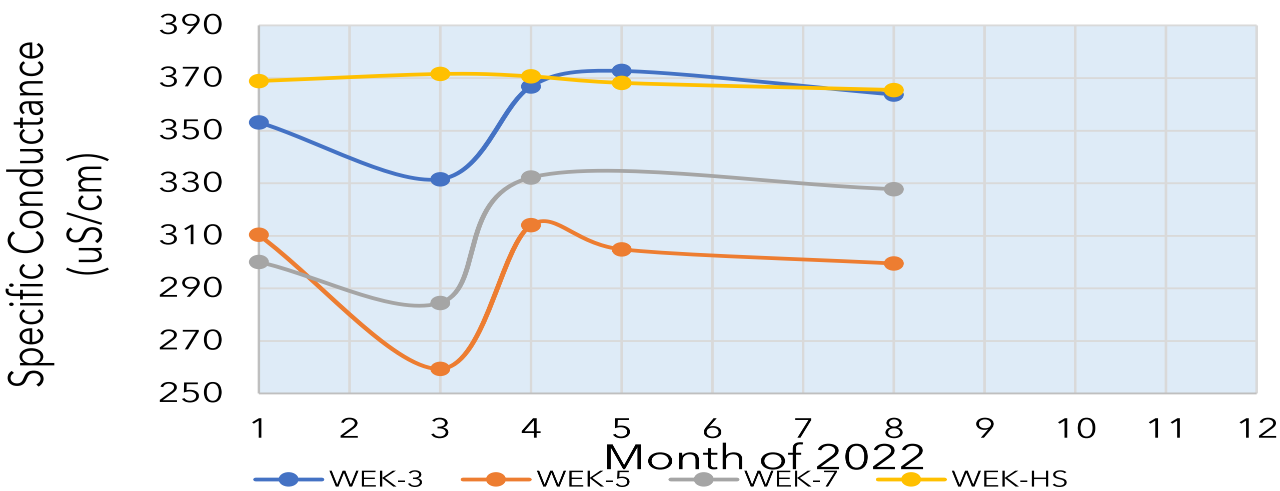


Figure 10. Specific conductance (uS/cm) by month for Wekiva SpringsWatch (January-December 2022).

FSI staff collected Nitrate-nitrite (NOX-n) samples at Wekiwa headspring during their September 2022 sampling session. Figure 11 summarizes 2022 NOX-n data for all 11 SpringsWatch groups; the orange bar highlights the result for Wekiva. The horizontal red line denotes the 0.35mg/L springs impairment level set by the Florida Department of Environmental Protection. NOX-n at Wekiwa headspring was 1.32 mg/L, which is 4 times greater than the FDEP threshold.

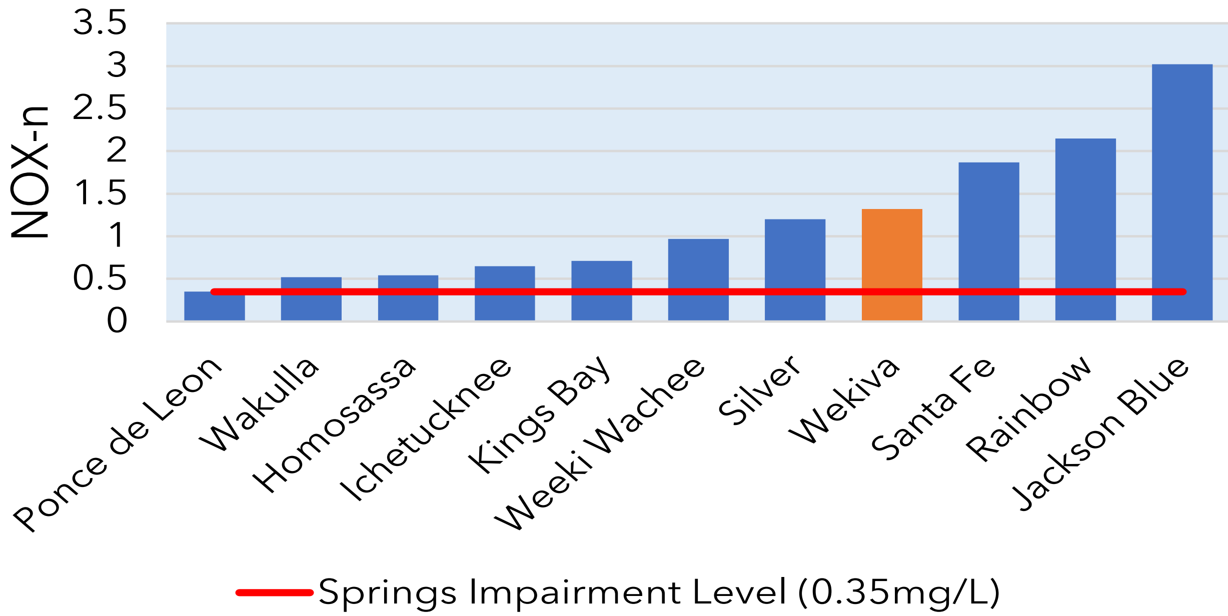


Figure 13. Nitrate-nitrite (NOX-n) levels by SpringsWatch group in 2022. Taken in September, Wekiva is denoted by the orange bar.

3.2 Light Measurements

Table 2 and Figure 14 present the percent transmittance estimates collected by Wekiva SpringsWatch volunteers from January through December 2022.

Percent transmittance refers to the amount of light that is able to pass through the water column to a depth of 1 meter below the surface. A higher value indicates greater water clarity. Lower percent transmittance values can indicate poor water clarity since light cannot pass as easily through the water column, often due to increases in dissolved substances such as tannins (color) and suspended solids (turbidity) in the water.

Percent transmittance is higher at Wekiwa Spring (WEK-HS) with decreasing water clarity moving downstream. Clarity picks up a little with the blending of spring water from Rock Springs Run at station RS-1. Station WEK-5 exhibited the lowest percent transmittance. Moving away from Wekiwa spring and Rock Springs Run, the water darkens due to tannins from leaf litter and increased surface runoff input, decreasing water clarity.

Table 2. Percent transmittance (@ 1m) for Wekiva SpringsWatch (January–December 2022).

Summary of 2022 PAR (percent transmittance) data					
Site	Average	N	Max	Min	StDev
WEK-2	24.03	10	68.69	0.84	25.74
WEK-3	20.22	11	57.74	1.74	16.25
WEK-5	22.48	11	67.31	0.03	24.51
WEK-6	7.91	9	46.23	0.51	14.64
WEK-7	13.78	10	34.64	0.32	14.38
RS-1	29.70	10	53.39	0.02	23.05
WEK-4	21.68	6	100.00	0.23	39.20
WEK-HS	39.97	9	92.10	19.78	24.03

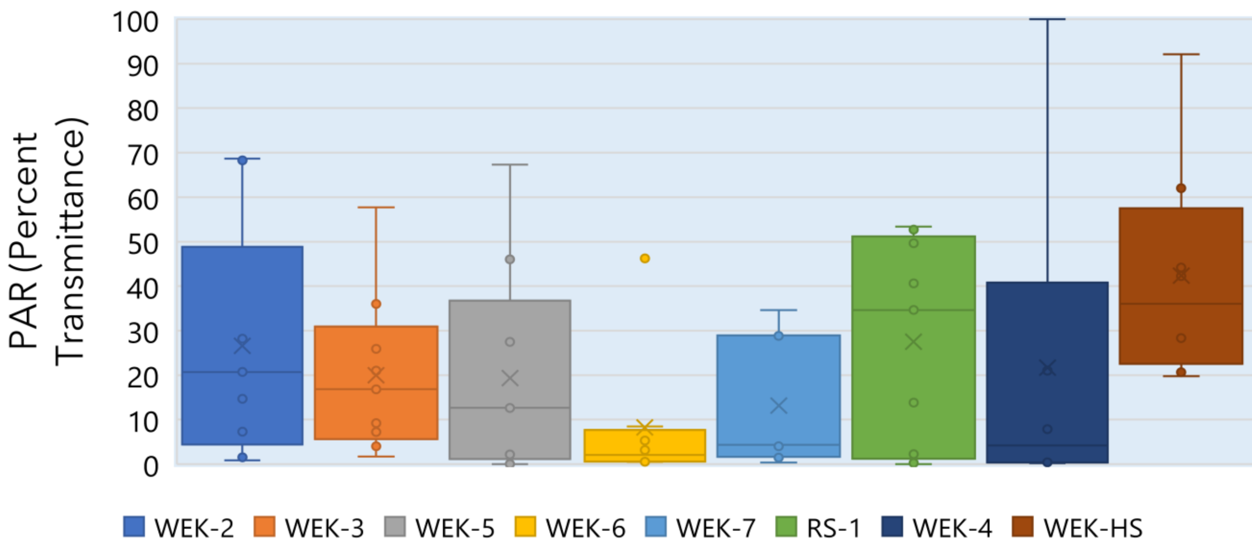


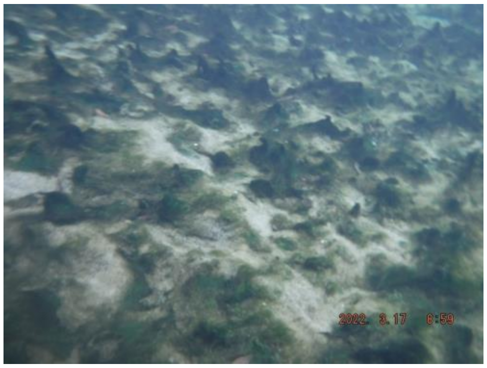
Figure 14. Percent transmittance (@ 1m) for Wekiva SpringsWatch (January–December 2022).

3.3 Aquatic Vegetation Survey

Submerged aquatic vegetation plays an important ecological role within a springs system. It provides habitat and food for fish and other wildlife, increases water clarity, affects nutrient cycles, and stabilizes shorelines and sediments.

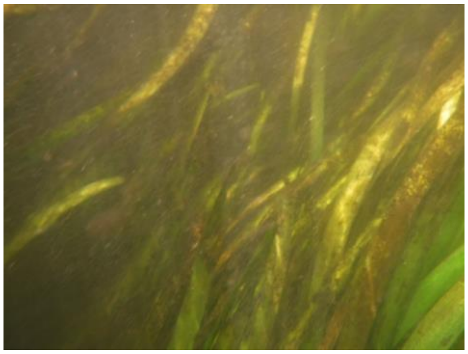
The river bottom nearest Wekiwa Spring (WEK-HS) is mostly bare sand covered with patches of algae. As SpringsWatch volunteers paddled downstream, they surveyed mostly Spatterdock and algae, with small patches of Strap-leaf Sagittaria.

Pictured below are river bottom photos taken by SpringsWatch volunteers in 2022 which feature the SAV of the Wekiva River and springs.

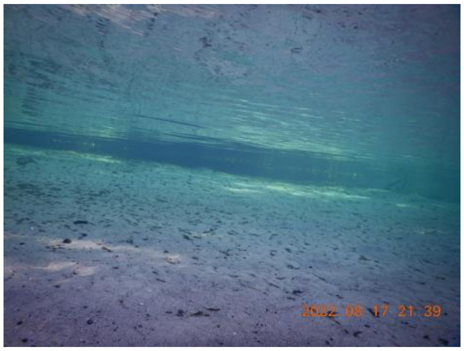


Algae and bare ground

Young Spatterdock and algae

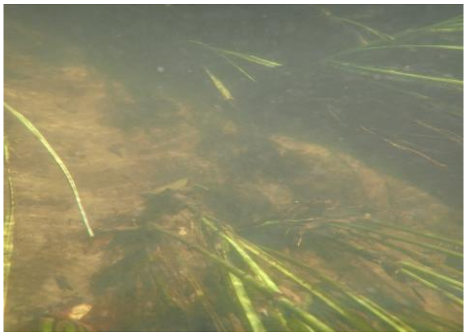


Strap-leaf Sagittaria and algae



Mostly bare sand at headspring

Spatterdock



Strap-leaf Sagittaria and algae

Section 4.0 References

Florida Springs Institute (FSI). (2015), *Florida Springs Baseline Ecological Assessment: Standard Operating Procedures.* Howard T. Odum Florida Springs Institute, High Springs, Florida. Unpublished manuscript.

Wetzel, R. G. (2001). *Limnology: Lake and River Ecosystems. Third Edition.* San Diego, CA, CA: Academic Press.