SPRINGS WATCH

JACKSON BLUE SPRINGSWATCH MONITORING SUMMARY

February 2023 – October 2023

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

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Photo by John Moran

Volunteer and Staff Acknowledgments

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Our Jackson Blue SpringsWatch program would not be possible without the hard work of our group leader, Jennifer McGee. They put in 12 volunteer hours over three monitoring sessions in 2023. We also acknowledge the data entry efforts from our diligent FSI science interns. We would like to thank Isaac Szabo for his underwater fish photography utilized in this report.

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Section 1.0 Introduction

Located in Jackson County's Blue Springs Recreation Area, Jackson Blue Spring is located outside the city of Marianna, Florida, and supplies freshwater to the 202-acre impounding reservoir known as Merritt's Mill Pond, a clear water pond known for its redear sunfish and largemouth bass. Jackson Blue Spring is the only first magnitude spring in the Chipola River Basin. Jackson Blue Spring was designated an Outstanding Florida Spring when the Florida Springs and Aquifer Protection Act was passed in 2016.

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

This report was prepared by the Howard T. Odum Florida Springs Institute (FSI) and is focused on ecological monitoring at Jackson Blue Spring and other springs along Merritts Mill Pond conducted by SpringsWatch volunteers.

1.1 Monitoring Stations

SpringsWatch volunteers collected data at seven stations (Figure 1). JB represents the station at Jackson Blue headspring. Stations SL, TC, IW, and GH represent smaller springs throughout the northeast end of Merritts Mill Pond. MM1 and MM2 are Merritts Mill Pond monitoring sites.

Figure 1. Jackson Blue Springs SpringsWatch Monitoring Stations

Section 2.0 Methods

Ecological monitoring was conducted on Jackson Blue Spring, Merritt's Mill Pond, and additional springs feeding into the pond from February to October 2023.

2.1 Sampling Events

Table 1 summarizes the 2023 sampling events conducted by Jackson Blue SpringsWatch volunteers. SpringsWatch volunteers conducted the sampling events in January and two in May, FSI staff conducted the sample in August and October. Each month, volunteers collected data at seven stations on the following field parameters:

- Water quality field parameters (temperature, dissolved oxygen, specific conductivity, and nitrate-nitrite)
- Light measurements
- Visual fish surveys.

Table 1. 2023 Jackson Blue SpringsWatch Sampling Events

Date	Temperature	Dissolved Oxygen	Specific Conductance	PAR	Nitrate+Nitrite	Fish
2/4/2023	X	X		X		X
5/1/2023	X	X	X	X		X
5/26/2023	X	X	X	X		X
8/26/2023	X	X	X		X	
10/6/2023	X	X	X			

2.2 Water Quality

SpringsWatch volunteers used YSI water quality meters to collect surface water data at each station along the Jackson Blue springs system. Handheld YSI ProODO and YSI EcoSense EC300A meters were used to collect measurements of dissolved oxygen, water temperature, and specific conductance. The team leader maintained water quality meters according to factory instructions and calibrated them before and after each sampling event

2.2.1 Nitrate-Nitrite

FSI staff collected nitrogen as nitrate + nitrite (NOx-N) samples at station JB (Figure 1) during the August 2023 sampling session. Water samples were sent to a state-accredited laboratory (McGlynn Laboratories Inc.) for NOx-N analysis. Preparation, storage, and analysis all followed FDEP Standard Operating Procedures. Samples were hand collected from approximately 0.1m depth. Sample bottles were re-capped and sealed before being acidified with approximately 0.25mL of 50% sulfuric acid (H_2SO_4) and then stored on ice prior to transport. Water sampled were held in a refrigerator for

<21days before being sent to a state-accredited laboratory (McGlynn Laboratories Inc.) for NOx-N analysis. All analyses were conducted within a standard holding time of 28 days from sample collection.

2.3 Light Measurements

Photosynthetically Active Radiation (PAR) underwater light transmission and attenuation coefficients were measured monthly at the three monitoring sites. Volunteers used an Apogee brand MQ-200 underwater quantum sensor 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 Apogee PAR meter.

Figure 2. Apogee MQ-200 PAR Meter

2.5 Fish Surveys

SpringsWatch volunteers donned masks, snorkels, and fins to conduct visual fish counts at Jackson Blue head spring and identify them to the lowest taxonomic group.

Section 3.0 Results

This section summarizes field data collected by Jackson Blue SpringsWatch volunteers from February to October 2023.

3.1 Water Quality

3.1.1 Dissolved Oxygen, Water Temperature, and Specific Conductance

Figures 3 through 7 present field parameter results collected from the seven stations in the Jackson Blue springs system by SpringsWatch volunteers from February to October 2023. Figures 3 present DO results measured in milligrams per liter (mg/L). Figure 4 presents DO results measured in % saturation.

The Jackson Blue spring system has one of the highest DO levels of any spring in Florida. We expect that these springs have principal conduits very close to the ground surface with or without direct contact through karst windows.

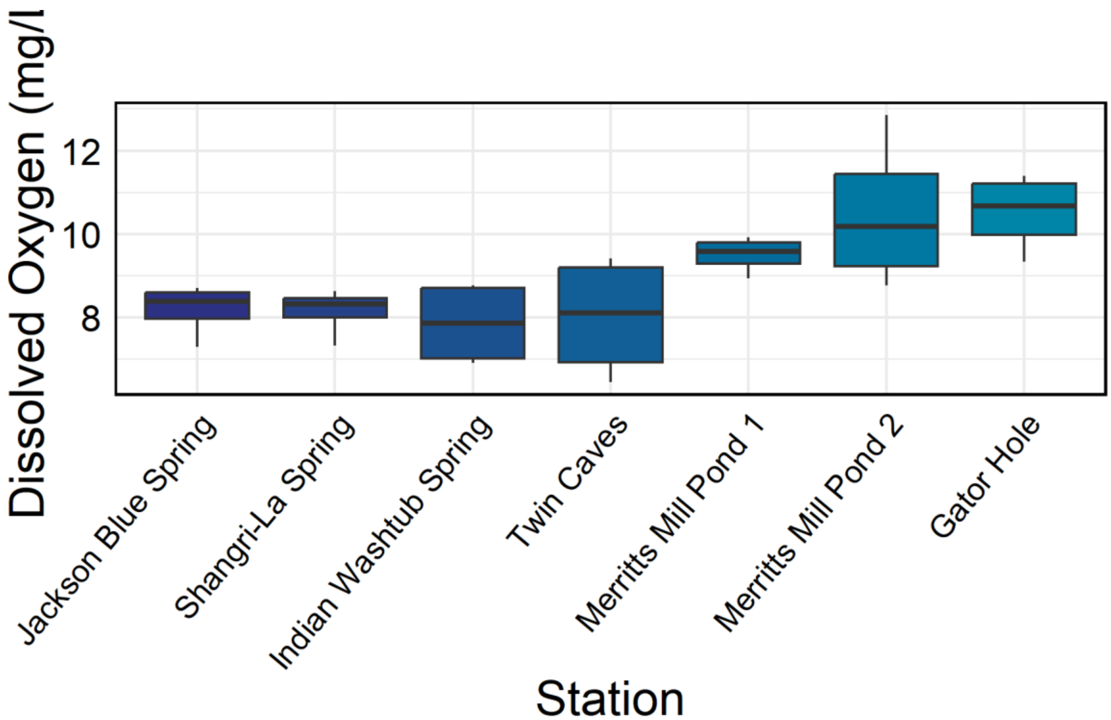

Figure 3. Dissolved oxygen (mg/L) by Jackson Blue SpringsWatch station (February - October 2023).

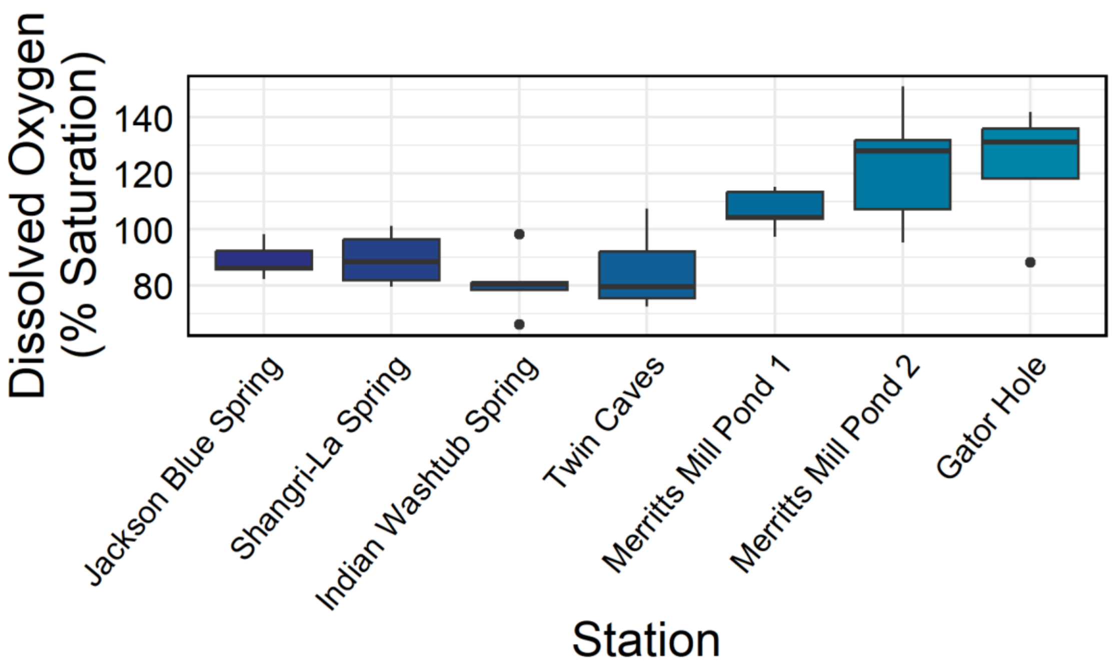

Figure 4. Dissolved oxygen (% saturation) by Jackson Blue SpringsWatch station (February -October 2023).

Figures 5 present data for water temperature (°C) field measurements. Temperature in the Jackson Blue springs system ranged from 18.1-26.1 in 2023. The water temperature of the run remains relatively constant throughout the year due to the consistent temperature of its groundwater sources, which reflect the annual average ambient air temperature.

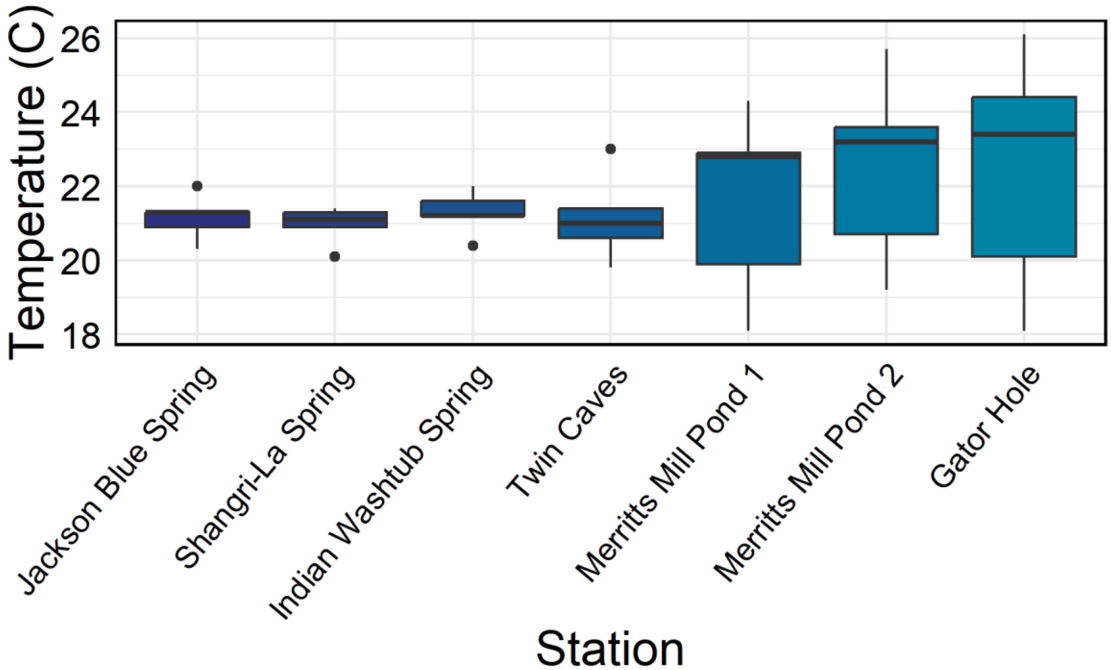

Figure 5. Water temperature (°C) by Jackson Blue SpringsWatch station (February – October 2023)

Figures 6 present the results for specific conductance field measurements. Specific conductance can be influenced by naturally occurring ions present in spring water, but also from ions present due to higher levels of nitrate/nitrite, phosphorus, saltwater, and other pollutants. Higher specific conductance values suggest a higher concentration of these ions in the water.

There are no significant differences between the Jackson Blue SpringsWatch stations. The lower conductivity indicates that the water is not underground as long as North Central Florida springs.

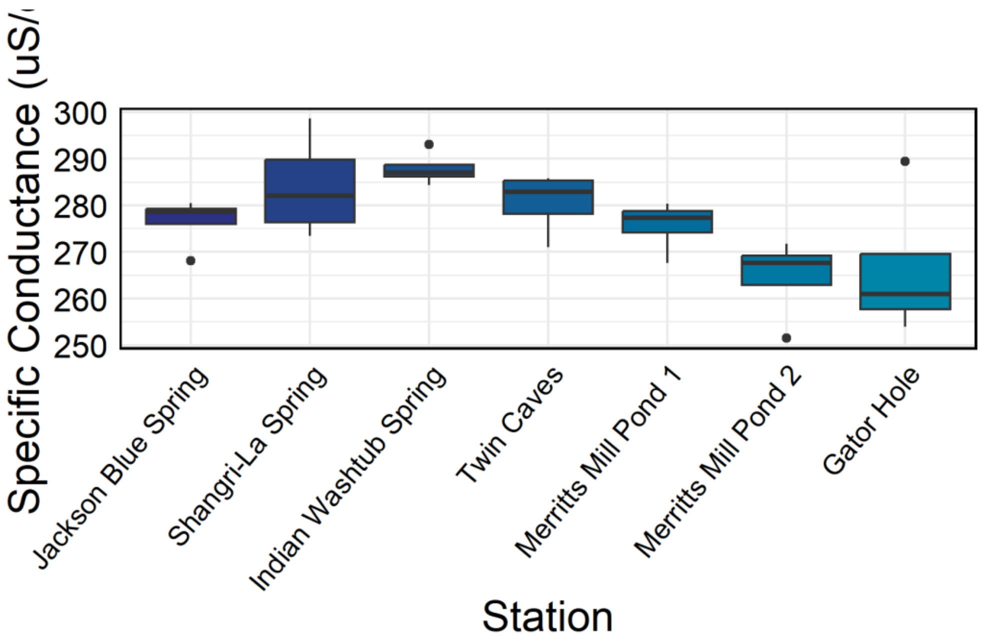

Figure 6. Specific conductance (% @1m) by station for Jackson Blue SpringsWatch (February to October 2023).

FSI staff collected Nitrate-nitrite (NOx-N) samples at Jackson Blue headspring in August 2023. Figure 7 summarizes 2023 NOx-N data for all 11 SpringsWatch groups; the orange bar highlights the result for Jackson Blue. The horizontal red line denotes the 0.35mg/L springs impairment level set by the Florida Department of Environmental Protection. NOx-N at the Jackson Blue headspring was 3.08 mg/L, which is 8.5 times greater than the FDEP threshold.

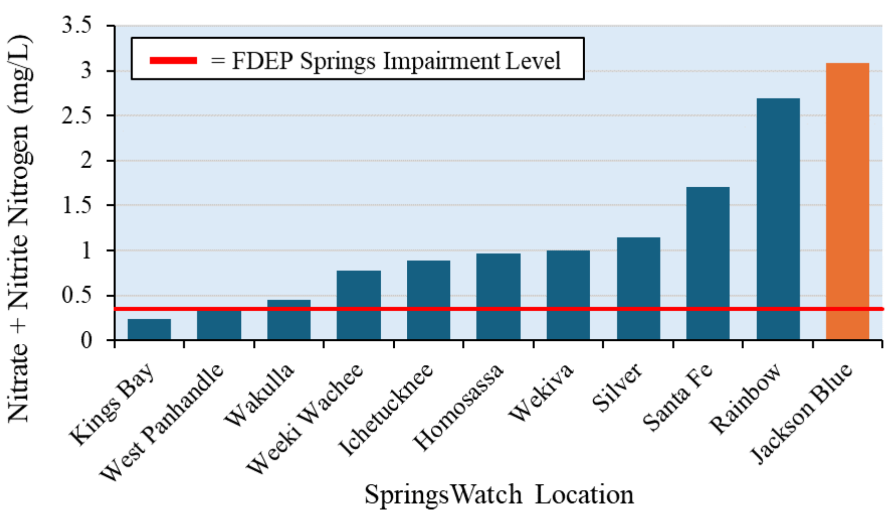

Figure 7. Nitrate-nitrite (NOx-N) levels by SpringsWatch group in 2023. Taken in August, Jackson Blue is denoted by the orange bar.

3.2 Light Measurements

Figure 8 presents the percent transmittance estimates collected by Jackson Blue SpringsWatch volunteers from January through November 2023. Figure 9 presents the average k (diffuse attenuation coefficient) for each station (January to November 2023.

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. 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 attenuation values correspond to less water clarity. 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 increases in dissolved substances such as tannins (color) and suspended solids (turbidity) in the water.

In aquatic ecosystems, the diffusion attenuation coefficient can have a significant impact on the biota that inhabit the water. For example, in shallow, clear water with a low diffusion attenuation coefficient and high percent transmittance, light can easily reach the bottom of the water column, enabling the growth of aquatic plants and phytoplankton. This, in turn, can support the entire food web, from primary producers to top predators. On the other hand, in deep, turbid water with a high diffusion attenuation coefficient and low percent transmittance, light is unable to penetrate as far, limiting the growth of aquatic plants and phytoplankton. This can have cascading effects on the entire ecosystem, potentially reducing the population size and diversity of biota that depend on these primary producers. Thus, the diffusion attenuation coefficient is an important factor to consider when evaluating the health and productivity of aquatic ecosystems.

On average, the station at Jackson Blue exhibited clearer water than the other stations.

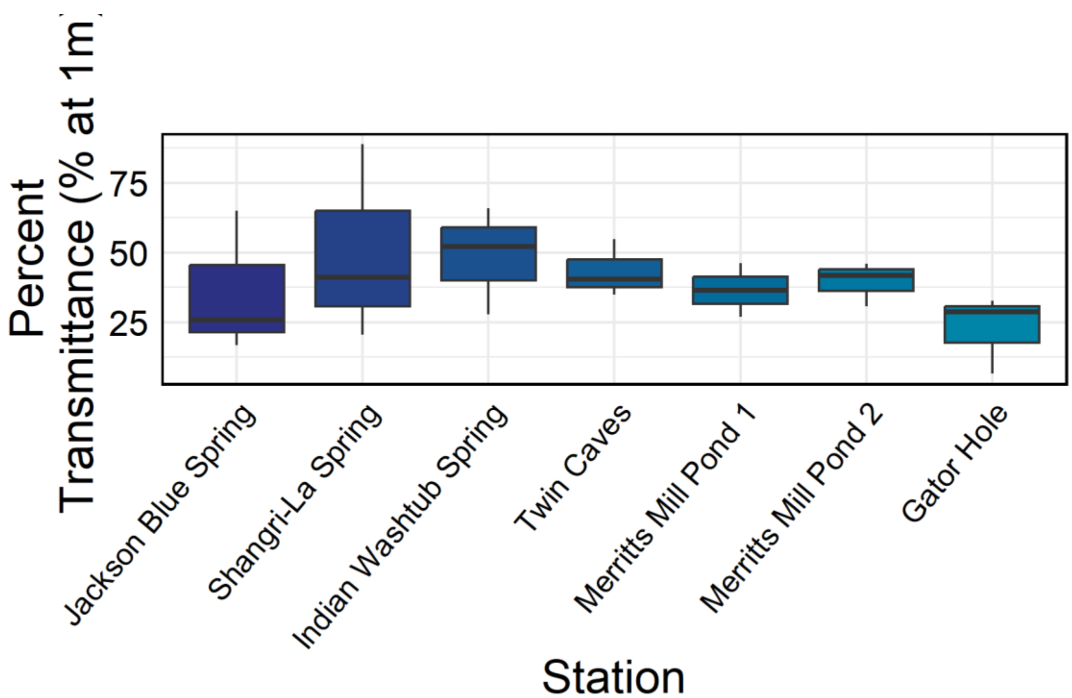

Figure 8. Percent transmittance (@ 1m) by station for Jackson Blue SpringsWatch (February to October 2023)

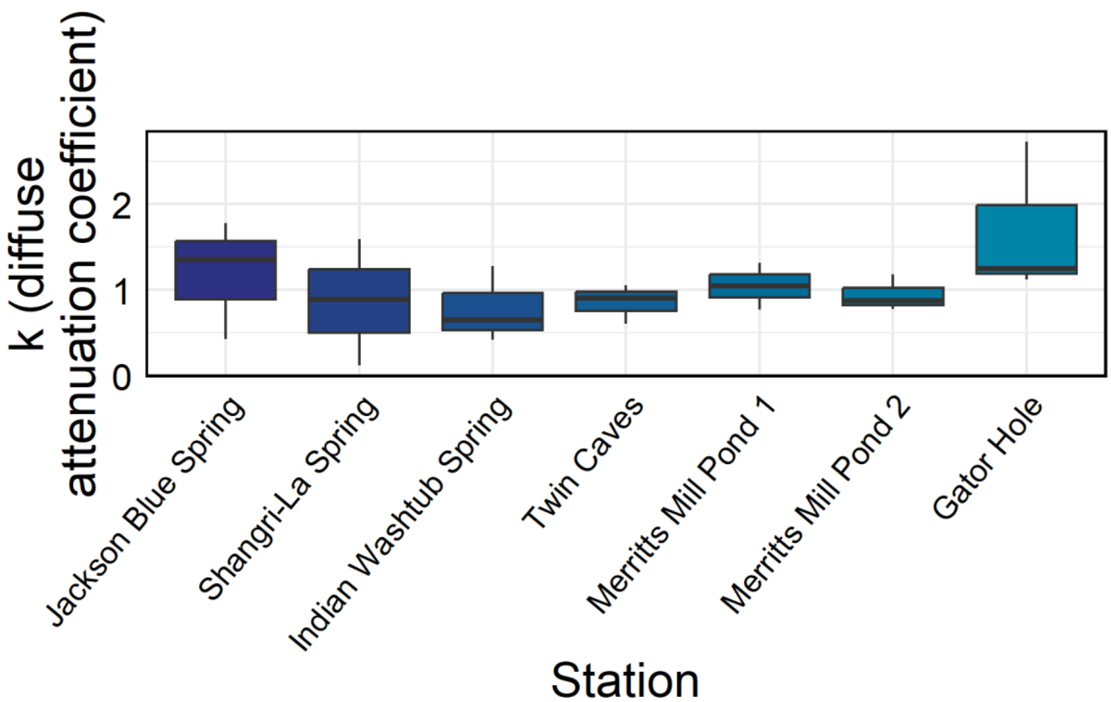

Figure 9. k (diffuse attenuation coefficient) by station for Jackson Blue SpringsWatch (February to October 2023

3.4 Fish Surveys

SpringsWatch volunteers conducted visual fish counts monthly at Jackson Blue Spring, covering about 1.2 acres of surface area. Table 4 presents a summary of fish observed.

Table 2. Average of each type of fish observed during Jackson Blue SpringsWatch monitoring sessions

Common Name	Scientific Name	Average # Counted per Survey
Bass	*Micropterus* sp.	90
Eastern Mosquitofish	*Gambusia holbrooki*	60
Sunfish sp.	*Lepomis sp.*	156
Minnow sp.	*Notropis sp.*	70
Grass Carp	*Ctenopharyngodon idella*	1

Pictured below are some of fish observed by Jackson Blue SpringsWatch volunteers during their outings from February to October 2023.

Bass

Redear Sunfish

Bluegill Sunfish

Spotted Sunfish

Redbreast Sunfish

Grass Carp

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.

Section 5.0 Appendix

Table A.1. Data collected during 2023 Jackson Blue SpringsWatch monitoring sessions

Station Name	Parameter Name	Average	Number of Samples	Maximum	Minimum	Standard Deviation
Gator Hole	k (diffuse attenuation coefficient)	1.7	3	2.7	1.1	0.9
	Temperature (°C)	22.4	5	26.1	18.1	3.3
	Dissolved Oxygen (%)	123.1	5	141.8	88.3	21.3
	Dissolved Oxygen (mg/L)	10.5	4	11.4	9.3	0.9
	Specific Conductance (µS/cm)	266.3	4	289.4	253.9	15.8
	Percent Transmittance (% at 1 meter)	22.6	3	32.6	6.5	14.1
Indian Washtub	k (diffuse attenuation coefficient)	0.8	3	1.3	0.4	0.4
	Temperature (°C)	21.3	5	22.0	20.4	0.6
	Dissolved Oxygen (%)	80.8	5	98.2	66.0	11.5
	Dissolved Oxygen (mg/L)	7.9	4	8.8	6.9	1.0
	Specific Conductance (µS/cm)	287.9	4	293.1	284.4	3.7
	Percent Transmittance (% at 1 meter)	48.6	3	65.8	27.8	19.2
Jackson Blue Spring	k (diffuse attenuation coefficient)	1.2	3	1.8	0.4	0.7
	Temperature (°C)	21.2	5	22.0	20.3	0.6
	Dissolved Oxygen (%)	88.9	5	98.2	82.2	6.3
	Dissolved Oxygen (mg/L)	8.2	4	8.7	7.3	0.6
	Specific Conductance (µS/cm)	276.5	4	280.5	268.1	5.7
	Nitrate+Nitrite (mg/L)	3.1	1	3.1	3.1	NA
	Percent Transmittance (% at 1 meter)	35.9	3	65.1	16.8	25.7
Merritts Mill Pond 1	k (diffuse attenuation coefficient)	1.0	2	1.3	0.8	0.4
	Temperature (°C)	21.6	5	24.3	18.1	2.5
	Dissolved Oxygen (%)	106.8	5	115.1	97.4	7.4
	Dissolved Oxygen (mg/L)	9.5	4	9.9	8.9	0.4
	Specific Conductance (µS/cm)	275.7	4	280.4	267.6	5.6
	Percent Transmittance (% at 1 meter)	36.5	2	46.2	26.8	13.7
Merritts Mill Pond 2	k (diffuse attenuation coefficient)	0.9	3	1.2	0.8	0.2
	Temperature (°C)	22.5	5	25.7	19.2	2.6
	Dissolved Oxygen (%)	122.6	5	151.0	95.2	21.9
	Dissolved Oxygen (mg/L)	10.5	4	12.9	8.8	1.8
	Specific Conductance (µS/cm)	264.6	4	271.7	251.5	9.0
	Percent Transmittance (% at 1 meter)	39.5	3	45.9	30.8	7.8
Shangri-La Spring	k (diffuse attenuation coefficient)	0.9	3	1.6	0.1	0.7
	Temperature (°C)	21.0	5	21.4	20.1	0.5
	Dissolved Oxygen (%)	89.4	5	101.2	79.5	9.3
	Dissolved Oxygen (mg/L)	8.1	4	8.6	7.3	0.6
	Specific Conductance (µS/cm)	284.0	4	298.6	273.4	11.2
	Percent Transmittance (% at 1 meter)	50.2	3	88.9	20.4	35.1
Twin Caves	k (diffuse attenuation coefficient)	0.9	3	1.1	0.6	0.2
	Temperature (°C)	21.2	5	23.0	19.8	1.2
	Dissolved Oxygen (%)	85.4	5	107.3	72.4	14.4
	Dissolved Oxygen (mg/L)	8.0	4	9.4	6.5	1.5
	Specific Conductance (µS/cm)	280.6	4	285.8	271.0	6.8
	Percent Transmittance (% at 1 meter)	43.3	3	54.8	34.8	10.3