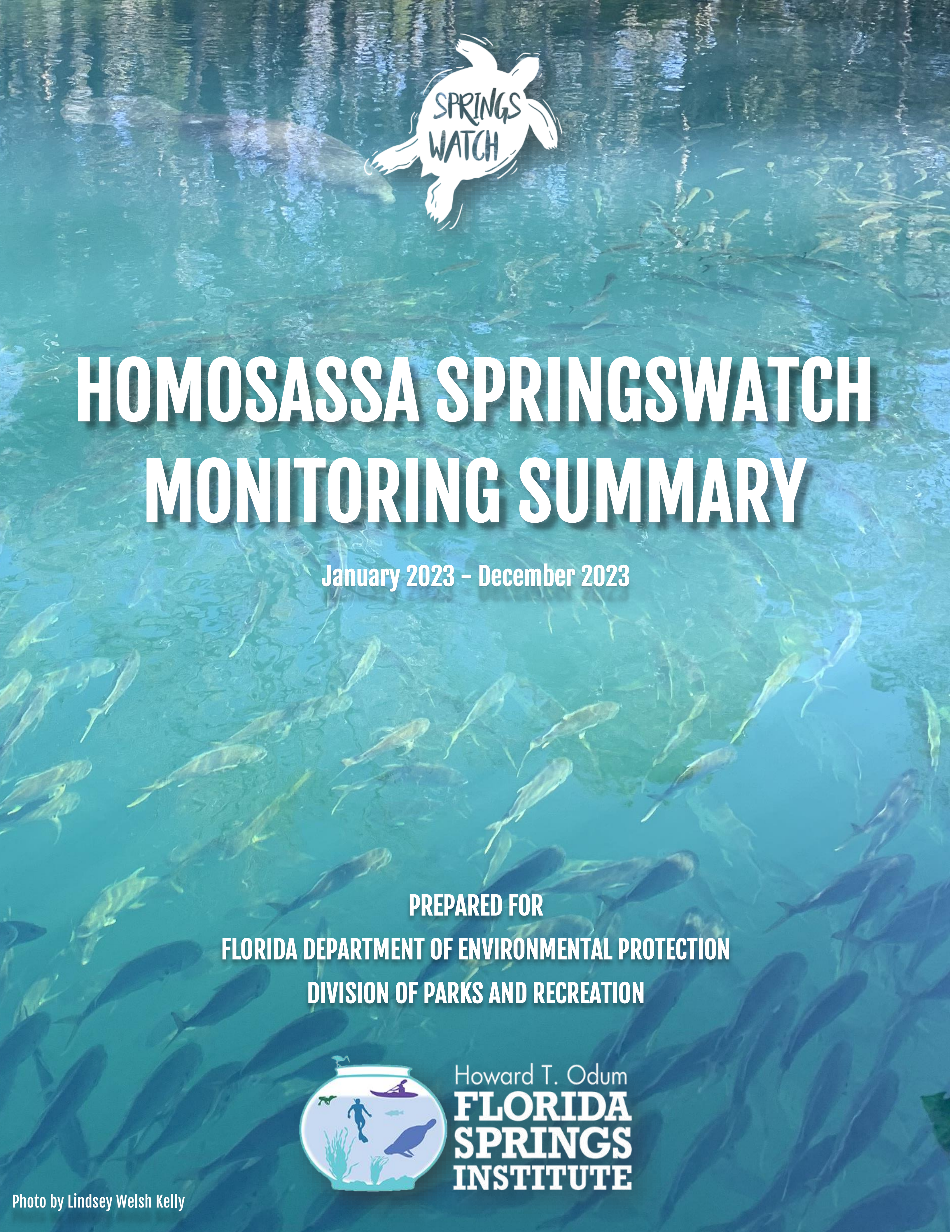


HOMOSASSA SPRINGSWATCH MONITORING SUMMARY

January 2023 - December 2023

PREPARED FOR

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF PARKS AND RECREATION

Howard T. Odum FLORIDA SPRINGS INSTITUTE

Photo by Lindsey Welsh Kelly

Volunteer and Staff Acknowledgments

This report was prepared by the Howard T. Odum Florida Springs Institute (FSI). Ecological monitoring was conducted by FSI staff and the Florida SpringsWatch volunteers under the Florida Department of Environmental Protection (FDEP) Division of Recreation and Parks Research/Collection Permit Number 07012340.

Our Homosassa SpringsWatch program would not be possible without the hard work of our team leaders, Lindsey Welsh Kelly and Ken Alvord, who have guided the group for the past 11 years. We would also like to acknowledge the contribution and dedication of our SpringsWatch volunteers: Scott Jantz, Alice Trautman, Laura Sanchez, Judy Lathrop, Dana Hamilton, Michael Fay, Casey Fay, Kyle Fay, Renaka Arts, Blake Harvey, and Roy Lathrop. Together 13 volunteers put in 94 volunteer hours over 12 monitoring sessions in 2023. We also acknowledge the data entry efforts from our diligent science interns. We would like to thank Isaac Szabo for his underwater fish photography utilized in this report.

We would like to thank FSI's SpringsWatch Coordinators, Emanuela Torres-Marquis, Shannon Letcher, and Jill Lingard, Environmental Scientist Bill Hawthorne, and Associate Director, Haley Moody for their contributions to this report; all who worked under the guidance of Executive Director, Dr. Emily Taylor. We also acknowledge the ongoing guidance from former Executive Director Dr. Robert Knight.

Section 1.0 Introduction

The Homosassa Springs Group is a first magnitude spring located within the boundaries of Ellie Schiller Homosassa Springs Wildlife State Park in Citrus County, Florida. The Group is comprised of three spring vents (HSG-1, 2, and 3), which originate from a conical depression with exposed limestone along the sides and bottom of the spring pool and form the head of the Homosassa River.

All three spring vents discharge into the spring pool, which is located below an underwater observatory called the "Fish Bowl." The spring pool measures 189 feet north to south and 285 feet east to west, for a total surface area of 0.5 acre. The depth for each vent is 67, 65, and 62 feet for HSG 1, 2, and 3, respectively.

Approximately 1,000 feet downstream, a fence spans the river to keep boats out of the spring pool. There is also a barrier immediately outside the spring area which keeps the park's captive manatees in the spring pool. This cross-river barrier is removed in the winter months as manatees use the spring for refuge during the colder weather; however, manatees frequent the spring pool and river year-round. Additionally, a variety of saltwater and freshwater fish inhabit the pool.

The surrounding land is comprised of Gulf coastal lowlands with thick hardwood-cabbage palm forest cover. The Homosassa River flows west approximately six miles to the Gulf of Mexico (Figure 1). Additional river inputs occur about a mile downstream from the head springs where the spring-fed Halls River flows in from the north. The entire river system is tidally influenced.

Since 2015, Florida SpringsWatch citizen science volunteers have provided enhanced monitoring of the Homosassa River's ecological health through monthly sampling sessions. 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 conducted at Homosassa Springs in 2023 by SpringsWatch volunteers.

Figure 1. Homosassa Springs and River. The red circle denotes the sampling area.

1.1 Monitoring Stations

Figure 2 shows the location of the two Homosassa Springs stations monitored by SpringsWatch volunteers. HOM-1 is Fish Bowl (FB), the upstream station at the spring vents. HOM-2 is Main Bridge (MB), the downstream station near the foot bridge and enclosing fence.

Figure 2. Homosassa SpringsWatch monitoring stations.

Section 2.0 Methods

SpringsWatch volunteers conducted ecological monitoring at Homosassa Springs from January through December 2023. Data collection included water quality field parameters, vertical light attenuation, water clarity, and fish observations.

2.1 Sampling Events

Table 1 provides 2023 dates for monthly sampling sessions conducted at Homosassa's Fish Bowl and Main Bridge stations. Each month, volunteers collected data at these two stations on the following field parameters:

- Water quality: water temperature, dissolved oxygen, nitrate-nitrite, and specific conductance
- Photometer measurements: k (diffuse attenuation coefficient) and percent transmittance.
- Water clarity via Secchi disk
- Visual fish observations

Table 1. Summary of Homosassa SpringsWatch sampling events (January-December 2023).

Date	Temperature	Dissolved Oxygen	Specific Conductance	PAR	Secchi	Nitrate+Nitrite	Fish
1/27/2023	X	X			X		X
2/17/2023	X	X		X	X		X
3/24/2023	X	X		X	X		X
4/22/2023	X	X	X	X	X	X	X
5/14/2023	X	X		X	X		X
6/18/2023	X	X		X	X		X
7/23/2023	X	X		X			X
8/13/2023	X	X		X			X
9/23/2023	X	X		X	X		X
10/15/2023	X	X		X	X		X
11/11/2023	X	X		X	X		X
12/22/2023	X			X	X		X

2.2 Water Quality

SpringsWatch volunteers used a handheld YSI ProODO meter at each of the monitoring stations in the Homosassa Springs System to collect monthly measurements of water temperature and dissolved oxygen. Team leaders calibrated and maintained water quality meters according to factory instructions and calibrated them before and after each sampling event.

2.2.1 Specific Conductance

Specific conductance was only collected in April 2023 during a FSI staff visit to the citizen science group using a handheld YSI ProDSS multiparameter meter. FSI staff calibrated and maintained water quality meters according to factory instructions and calibrated them before and after the sampling event.

2.2.2 Nitrate-Nitrite (NOx-N)

FSI staff collected nitrogen as nitrate + nitrite (NOx-N) samples at the Fish Bowl (station HOM-1) during the April 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 collect 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 with a submersible photometer at the two monitoring sites. Volunteers used an Apogee brand MQ-200 underwater quantum sensor to measure PAR energy reaching the water surface and at intervals of one foot and two feet of depth. Figure 3 provides an image of the Apogee MQ-200 PAR light sensor.

Figure 3. Apogee MQ-200 PAR photometer.

2.4 Secchi Disk Visibility

SpringsWatch volunteers took horizontal Secchi disk measurements in the Fish Bowl (HOM-1) from January to December to measure water clarity. In December and January, when the Fish Bowl was closed to swimmers during manatee season, they took vertical measurements from the Main Bridge (HOM-2).

The Secchi disk (Figure 4) is a tool for measuring water clarity in aquatic ecosystems. It is a disk with alternating black and white quadrants that is lowered into the water until it is no longer visible. The depth at which the disk disappears is known as the Secchi depth and is used as an indicator of water quality. The longer the Secchi depth, the clearer the water is. As Florida springs are often clearer than they are deep, we often measure Secchi horizontally. Secchi length can be used to monitor changes in water clarity over time and can be used to identify problems such as algal blooms or pollution.

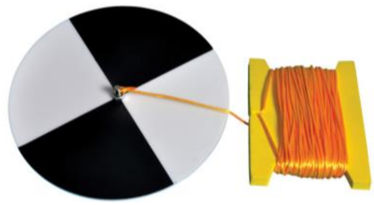


Figure 4. Secchi disk.

2.5 Fish Survey

SpringsWatch volunteers performed monthly visual fish counts between the Fish Bowl (HOM 1) and Main Bridge (HOM-2) stations. During colder months, when manatees use the park for refuge, out-of-water fish counts were conducted by observers on shore. For warm season in-water fish counts, volunteers donned masks and snorkels to count and identify fish to the lowest practical taxonomic group.

Section 3.0 Results

This section summarizes field data collected as part of the ecosystem monitoring conducted by Homosassa SpringsWatch volunteers from January to December 2023.

3.1 Water Quality

3.1.1 Dissolved Oxygen, Water Temperature, and Nitrate-Nitrite

Figures 5 and 6 present dissolved oxygen (DO) results measured in milligrams per liter (mg/L), or parts per million. A healthy aquatic ecosystem tends to have higher concentrations of DO from atmospheric diffusion and from photosynthesizing SAV and algae, resulting in more oxygen available for uptake by fish and other living organisms. Groundwater typically contains less free oxygen, depending on the duration of time the water has spent underground before emerging from a spring vent. In 2023, on average there was slight decrease in DO heading downstream from station HOM-1 (Fish Bowl) to station HOM-2 (Main Bridge), indicating that there is enough respiration to slightly offset primary productivity and oxygen diffusion between the head spring and the bridge.

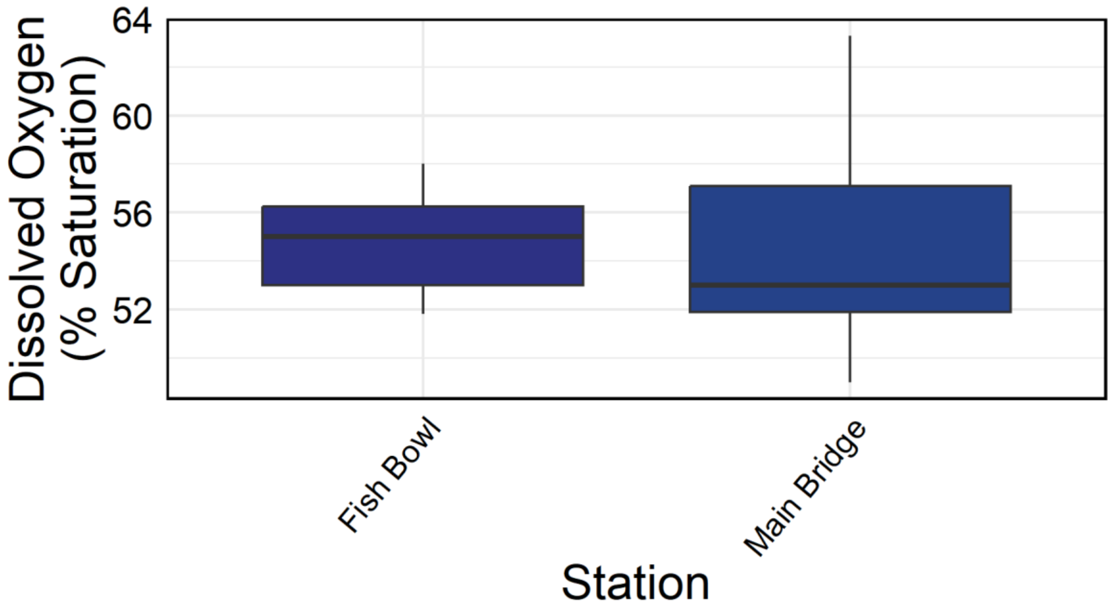


Figure 5. Dissolved oxygen (mg/L) at Homosassa SpringsWatch stations (January–December 2023).

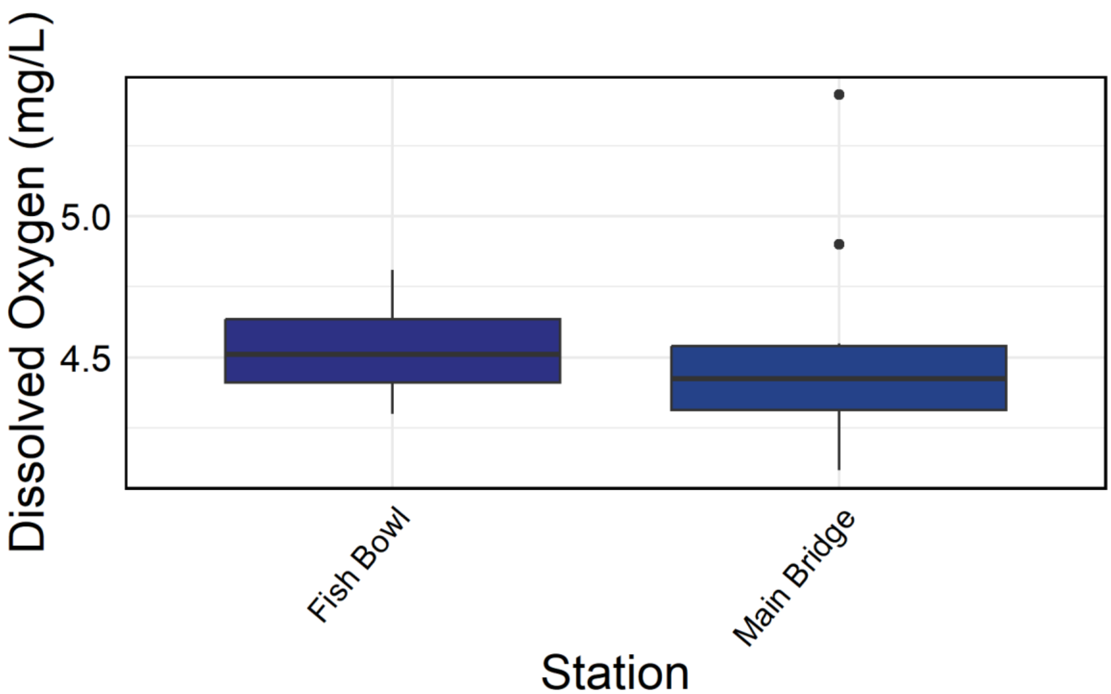


Figure 6. Dissolved oxygen (mg/L) by month for Homosassa SpringsWatch (January–December 2023).

Figures 7 present data for water temperature field measurements. The temperature of Homosassa Spring remains relatively constant year-round since it is fed by groundwater (typically ~23°C).

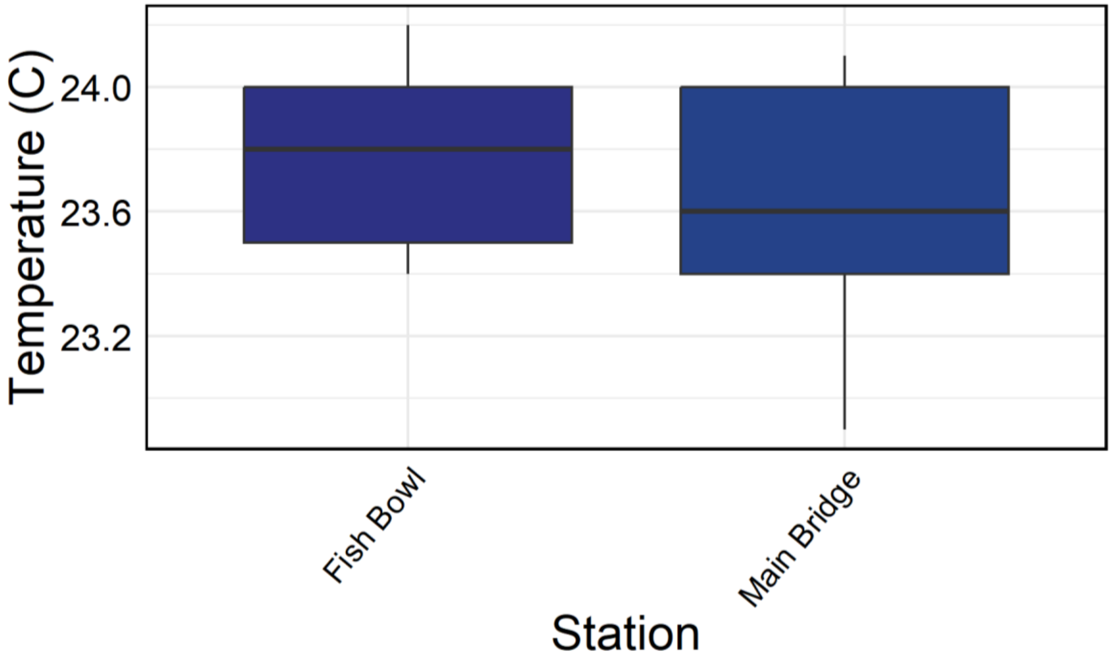


Figure 7. Water temperature (°C) by Homosassa SpringsWatch station (January–December 2023).

FSI staff collected Nitrate-nitrite (NOx-N) samples at the Fish Bowl (station HOM-1) during the April 2023 sampling session. Figure 8 summarizes 2023 NOx-N data for all 11 SpringsWatch groups; the orange bar highlights the result for Homosassa Springs. The horizontal red line denotes the 0.35mg/L springs impairment level set by the Florida Department of Environmental Protection. NOx-N at Homosassa Springs was 0.97 mg/L, nearly 3 times greater than the FDEP threshold.

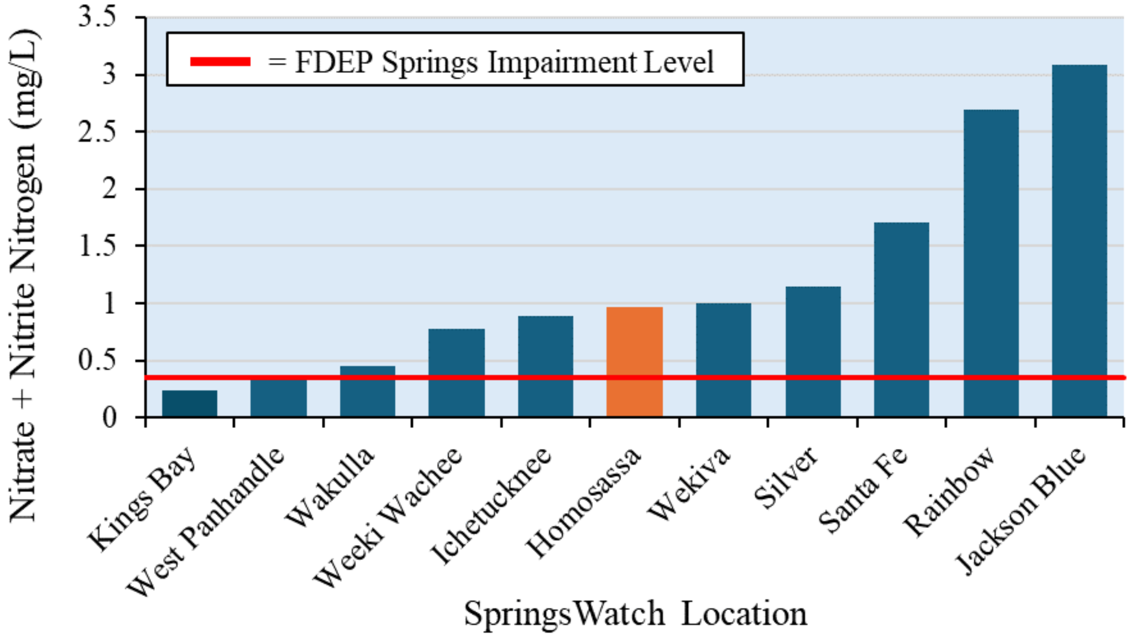


Figure 8. Nitrate-nitrite (NOx-N) levels at SpringsWatch samples sites in 2023. Taken in April 2023, Homosassa is denoted by the orange bar.

3.2 Clarity and Light Measurements

3.2.1 Secchi Disk Visibility

Water clarity based on horizontal Secchi disk visibility measurements at the Fish Bowl (station HOM-1) are summarized in Figure 9. SpringsWatch volunteers recorded a maximum Secchi reading of 22.9 meters (75 feet) in June and a minimum of 6.5 meters (21.33 feet) in January and February. The average reading was 12.1 meters (39.7 feet). These measurements indicate significant variability of water clarity of the groundwater feeding Homosassa Springs.

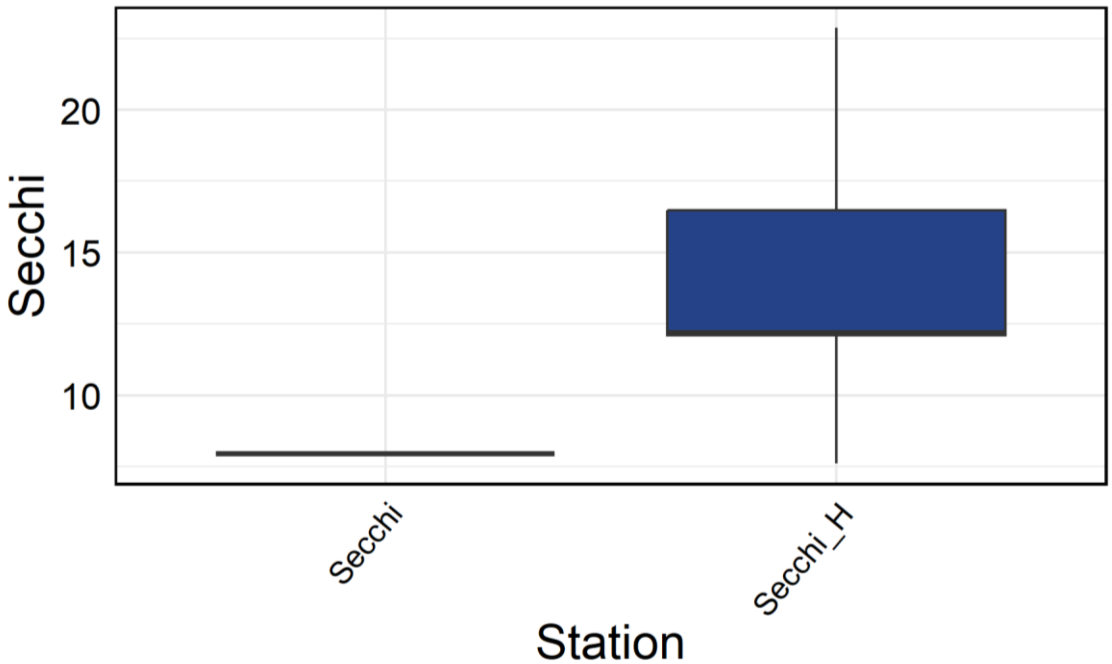


Figure 9. Vertical secchi disk (Secchi) and horizontal secchi disk (Secchi_H) measurements (m) in Homosassa Springs Fish Bowl (January–December 2023).

3.2.2 Light Measurements

Figure 10 presents the percent transmittance estimates collected by Homosassa SpringsWatch volunteers from January through December 2023. Figure 11 shows the calculated

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.

The results demonstrate a similar average percent transmittance between Fish Bowl (HOM-1) and Main Bridge (HOM-2).

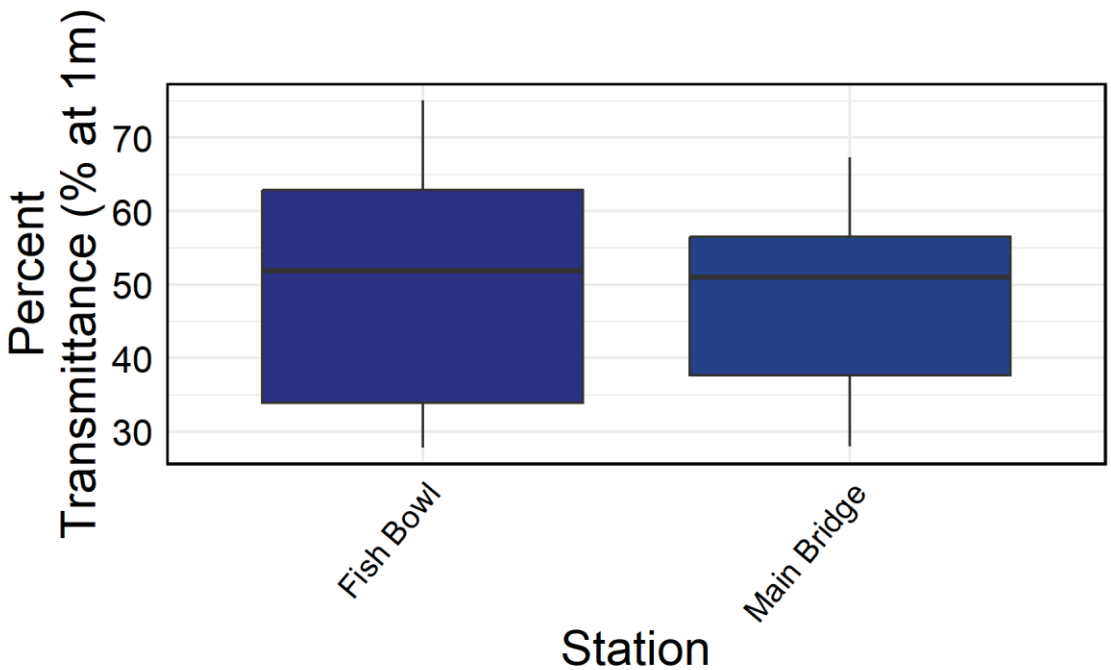


Figure 10. Percent transmittance (@1m) for Homosassa SpringsWatch (January–December 2023).

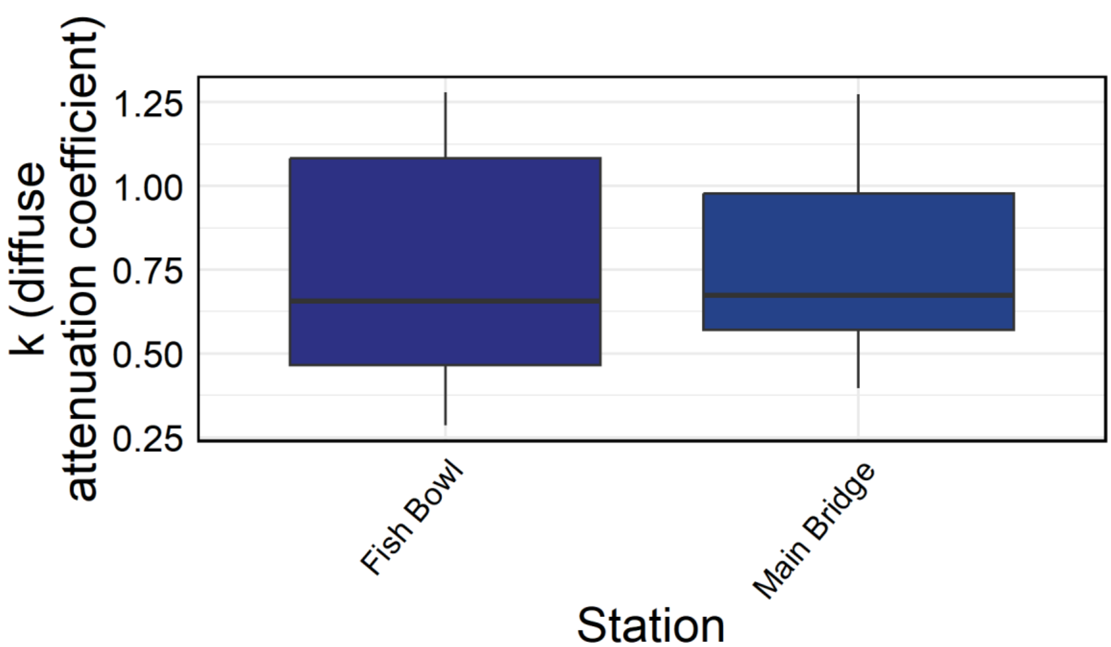


Figure 11. k (diffuse attenuation coefficient) Homosassa SpringsWatch (January–December 2023).

3.3 Fish Survey

SpringsWatch volunteers conducted visual fish counts monthly from January through December 2023. Table 3 presents a summary of fish observed during twelve monitoring sessions in 2023. In total, 14 species were observed. The most frequently observed fish were Striped Mullet.

Table 3. Fish observed during fish surveys for Homosassa SpringsWatch (January-December 2023).

Common Name	Scientific Name	Average # Counted per Survey
Atlantic Needlefish	*Strongylura marina*	15
Atlantic Stingray	*Dasyatis sabina*	2
Bass	*Micropterus* sp.	50
Black Drum	*Pogonias cromis*	5
Clown Goby	*Microgobius gulosus*	100
Common snook	*Centropomus undecimalis*	33
Crevalle jack	*Caranx hippos*	20
Florida Bass	*Micropterus floridanus*	29
Florida Gar	*Lepisosteus platyrhincus*	10
Grey snapper	*Lutjanus griseus*	89
Mojarra	*Eugerres plumieri*	139
Pinfish	*Lagodon rhomoides*	73
Sheepshead	*Archosargus probatocephalus*	1
Striped Mullet	*Mugil cephalus*	200
Minnow sp.	*Notropis* sp.	46

Pictured below are some of fish species frequently observed by Homosassa SpringsWatch volunteers during their monthly outings from January to December

Striped Mullet

Mojarra

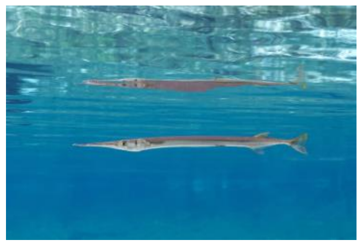
Grey/Mangrove Snapper


Largemouth Bass


Pinfish


Crevalle Jack


Common Snook


Atlantic Needlefish


Florida Gar

Section 5.0 References

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5.0 Appendix

Table A.1. Data collected during Homosassa SpringsWatch from January to December 2023

Station Name	Parameter Name	Average	Number of Samples	Maximum	Minimum	Standard Deviation
Fish Bowl	k (diffuse attenuation coefficient)	0.8	11	1.3	0.3	0.4
	Temperature (°C)	23.8	12	24.2	23.4	0.3
	Dissolved Oxygen (%)	54.6	11	58.0	51.8	2.1
	Dissolved Oxygen (mg/L)	4.5	11	4.8	4.3	0.2
	Specific Conductance (µS/cm)	4336.0	1	4336.0	4336.0	NA
	Secchi (meters)	12.1	10	22.9	6.5	5.3
	Nitrate+Nitrite (mg/L)	1.0	1	1.0	1.0	NA
	Percent Transmittance (% at 1 meter)	49.4	11	75.1	27.8	16.5
Main Basin	k (diffuse attenuation coefficient)	0.8	11	1.3	0.4	0.3
	Temperature (°C)	23.6	12	24.1	22.9	0.4
	Dissolved Oxygen (%)	54.5	11	63.3	49.0	4.7
	Dissolved Oxygen (mg/L)	4.5	10	5.4	4.1	0.4
	Specific Conductance (µS/cm)	3965.0	1	3965.0	3965.0	NA
	Percent Transmittance (% at 1 meter)	48.1	11	67.3	28.0	13.1