# 2024 HOMOSASSA SPRINGSWATCH MONITORING SUMMARY

PREPARED FOR

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF PARKS AND RECREATION

Howard T. Odum FLORIDA SPRINGS INSTITUTE

Photo by Emanuela Torres-Marquis

# 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 Florida SpringsWatch volunteers under the Florida Department of Environmental Protection (FDEP) Division of Recreation and Parks Research/Collection Permit Numbers 07012340 and 09132401.

The Homosassa SpringsWatch program would not be possible without the dedication of our team leaders, Lindsey Pavao and Ken Alvord, who have guided the group for the past 12 years. We also gratefully acknowledge the contributions of our committed SpringsWatch volunteers: Eric Cocere, MJ DoBoor, Campbell Eckhart, Sophia Famiglio, Casey Fay, Michael Fay, Rachel Guyer, Blake Havey, Alecia Runyon, Brent Strange, Ashlyn Stickland, Alice Trautman, and Michelle Whitford. Together, Homosassa SpringsWatch volunteers contributed 154 hours over 10 monitoring sessions in 2024. We thank our hardworking Fall 2024 science interns, Avery Rust, Renee Hartless, and Avah Lena, for their assistance with data entry. Special thanks go to Isaac Szabo for providing the underwater fish photography featured in this report.

We would also like to recognize FSI's SpringsWatch Coordinator, Emanuela Torres-Marquis, and Environmental Scientists Bill Hawthorne, Thomas "TJ" Comer, and Sky Notestein for their support, working under the direction of FSI Director Haley Moody. Finally, we acknowledge the ongoing guidance and vision of FSI founder, Dr. Robert Knight.


# Section 1.0 Introduction

## 1.1 Site Overview

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. This spring 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's 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 2024 by SpringsWatch volunteers.

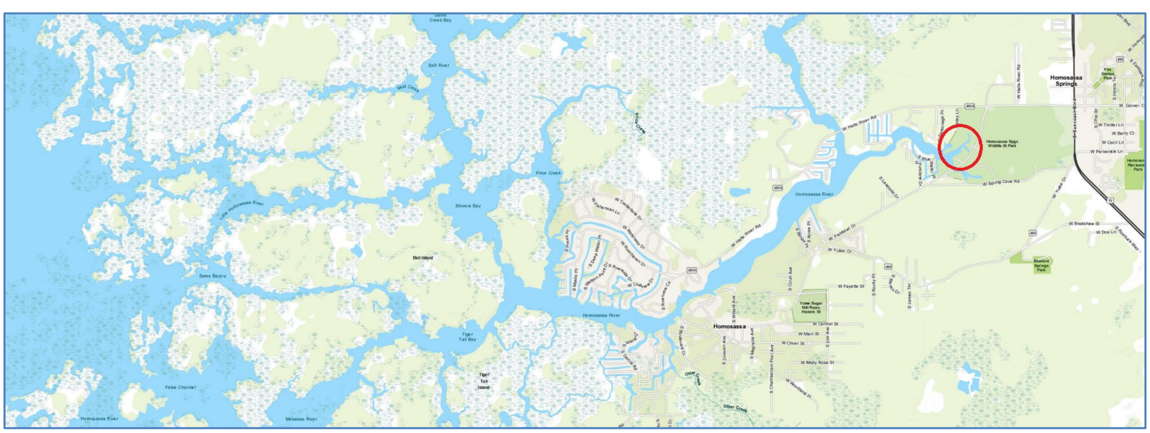


**Figure 1. Homosassa Springs and River. The red circle denotes the sampling area.**

## 1.2 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. A summary of all sampling sites, their station names, latitude, and longitude used within the Homosassa SpringsWatch groups can be viewed in Table 1.


**Figure 2. Homosassa SpringsWatch monitoring stations.**

**Table 1. Table of sampling sites used within the Homosassa SpringsWatch group.**

| Station Code | Station Name | Latitude | Longitude |
|---|---|---|---|
| HOM-1 | Fish Bowl (FB) | 28.7996572 | -82.589041 |
| HOM-2 | Main Bridge (MB) | 28.799235 | -82.588333 |

# Section 2.0 Methods

SpringsWatch volunteers conducted ecological monitoring at Homosassa Springs from January through December 2024. Data collection included water quality field parameters, vertical light attenuation, water clarity, and fish observations.

## 2.1 Sampling Events

Table 2 provides 2024 dates for monthly sampling sessions conducted at Homosassa's Fish Bowl and Main Bridge stations. Access to the park was not available in November 2024 due to unsafe conditions following a series of hurricanes. Each month, volunteers collect 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 2. Summary of Homosassa SpringsWatch sampling events (January 2024 – December 2024)**

| Date | Temperature | Dissolved Oxygen | Specific Conductance | PAR | Secchi | Nitrate-Nitrite | Fish |
|---|---|---|---|---|---|---|---|
| 1/26/2024 | X | X | | X | X | | X |
| 3/21/2024 | X | X | | X | X | | X |
| 4/14/2024 | X | X | | X | X | | X |
| 5/19/2024 | X | X | | X | X | | X |
| 6/15/2024 | X | X | | X | X | | X |
| 7/14/2024 | X | X | | X | X | | X |
| 8/11/2024 | X | X | | X | X | | X |
| 9/15/2024 | X | X | X | X | X | X | X |
| 10/13/2024 | X | X | | X | X | | X |
| 12/20/2024 | X | X | | X | | | |

## 2.2 Water Quality

### 2.2.1 Dissolved Oxygen and Temperature

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 manufacturer instructions and Florida Department of Environmental Protection Standard Operating Procedures (FDEP, 2017).

### 2.2.2 Specific Conductance

Specific conductance was only measured in September 2024 during an 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 manufacturer instructions and FDEP Standard Operating Procedure (SOP). If either the initial or post-sampling calibration failed, the associated data were excluded from this report and subsequent analyses.

### 2.2.3 Nitrate-Nitrite (NOx-N)

FSI staff collected nitrogen as nitrate + nitrite (NOx-N) grab samples at the Fish Bowl (station HOM-1; Table 1) during the September 2024 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. Grab 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. Samples 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 Water Clarity

### 2.3.1 Diffuse Attenuation Coefficient (k) and Percent Transmittance

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. Figures and results are from collections where percent transmittance is greater than 10% and less than 100% due to near zero or above 100 values all other values were flagged and omitted from this report and analyses.

Figure 3. Apogee MQ-200 PAR photometer.

### 2.3.2. Secchi Disk

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. SpringsWatch volunteers took horizontal Secchi disk measurements in the Fish Bowl (HOM-1; Table 1) from January to December 2024.

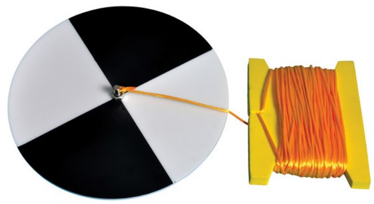


Figure 4. Secchi disk.

## 2.4 Fish Survey

SpringsWatch volunteers performed monthly visual fish counts between the Fish Bowl (HOM 1;Table 1) and Main Bridge (HOM-2;Table 1) stations. During cold months and manatee season (mid-November to March), when manatees use the park for refuge, out-of-water fish counts were conducted by observers on shore. During all other months, in-water fish counts were conducted; volunteers donned masks, snorkels, and fins 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 through December 2024.

## 3.1 Water Quality

Figure 5 through Figure 7 present water quality data collected in 2024 by Homosassa SpringsWatch volunteers at Homosassa Spring.

### 3.1.1 Dissolved Oxygen

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. Figure 5 and Figure 6 present dissolved oxygen (DO) results measured in milligrams per liter (mg/L), or parts per million. In 2024, 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 2).

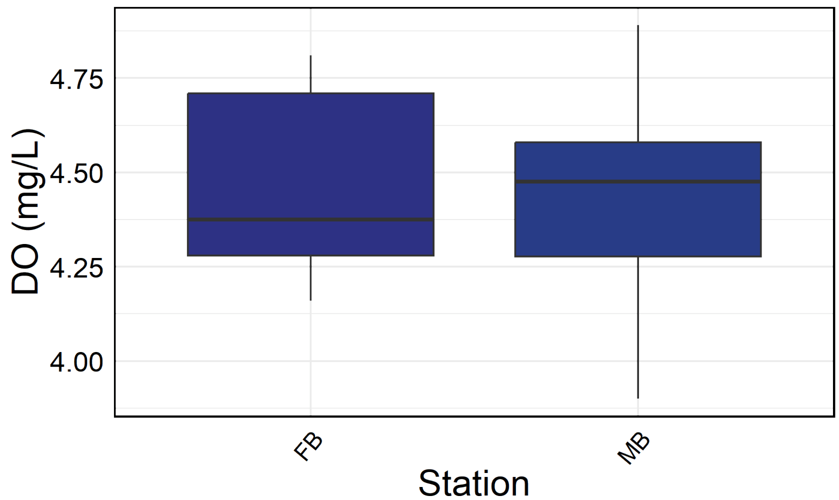



Figure 5. Dissolved oxygen (mg/L) at Homosassa SpringsWatch stations (January–December 2024).

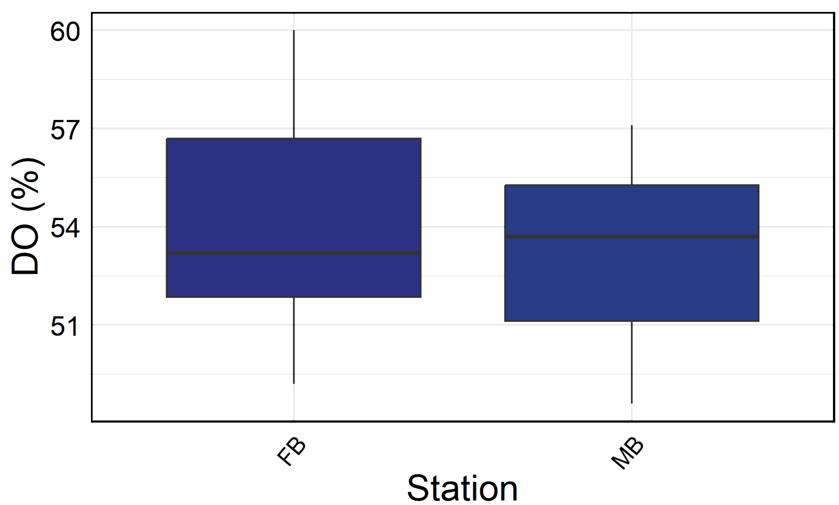



Figure 6. Dissolved oxygen (%) at Homosassa SpringsWatch stations (January–December 2024).

### 3.1.2. Water Temperature

Water temperature is relatively constant in Florida springs. However, heavy rain, runoff from land, river flooding, and spring reversals (when surface water flows back into the spring) can disrupt this stability and cause the temperature to fluctuate along the spring run. In Florida, the average temperature from the spring vent is determined by the annual average air temperature and depth of the groundwater source.

Temperature directly affects how much dissolved oxygen the water can hold and how fast plants and animals use energy, their metabolism (Stevens et al., 2002; Hawkins, 1995; Gillooly et al., 2001; Short et al., 2016). The purpose of monitoring water temperature is to indicate any significant changes that may have large effects on other biological and chemical processes in the spring system. Figure 7 presents data for water temperature field measurements collected in 2024. The temperature of Homosassa Spring remains relatively constant throughout the year, as it is fed by groundwater that typically maintains a temperature of approximately 24°C (75.2°F)

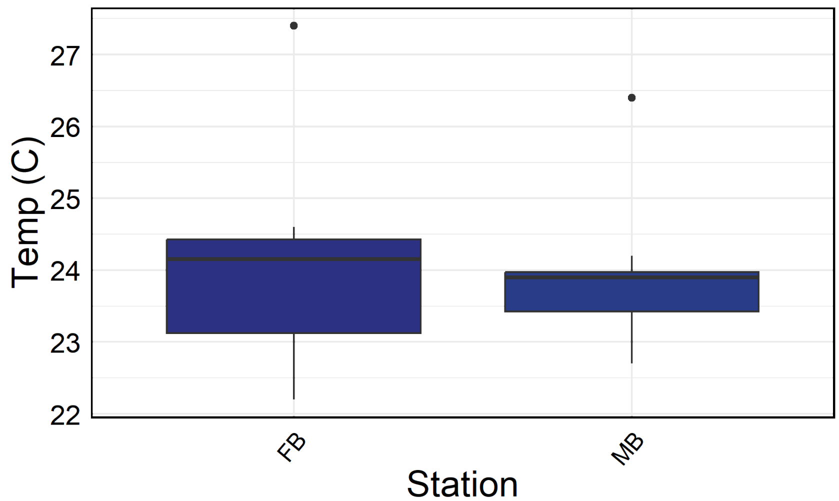



**Figure 7. Water temperature (°C) by Homosassa SpringsWatch station (January–December 2024).**

### 3.1.3. Specific Conductivity

Specific conductivity levels in spring water can be influenced by naturally occurring ions as well as by ions introduced from elevated levels of nitrate/nitrite, saltwater intrusion, and other compounds. Higher specific conductivity indicates a greater concentration of these dissolved ions in the water. Homosassa's coastal location (Figure 1) contributes to elevated specific conductivity levels compared to inland springs. In 2024, specific conductivity was recorded once, during the September monitoring session. On that day, the reading at Fish Bowl (FB) was 3,262 µS/cm, and at Main Bridge (MB) it was 3,242 µS/cm.

### 3.1.4. Nitrate-Nitrite

Nitrate and nitrite are forms of nitrogen that move easily through water and are the most common types of nitrogen pollution found in the Floridan Aquifer and many of Florida's springs (Cohen, 2007; Cohen, 2008; Brown et al., 2008; Copeland et al., 2009). This pollution mainly comes from human activities, with the largest sources being fertilizer used in agriculture and landscaping, wastewater from septic systems and treated sewage released into the ground, and animal waste that has not been properly managed (Eller and Katz, 2014; Mattson et al., 2006). High levels of nitrate can negatively impact spring ecosystems in several ways. It has been shown to affect the reproduction of mosquitofish (*Gambusia holbrooki*) (Edwards, 2006; Edwards et al., 2007), increase the growth of phytoplankton and algae (Smith, 2006; Cattaneo and Kalf, 1978; Osborne et al., 2017), worsen the effects of invasive aquatic plants (Wahl et al., 2021), and may contribute to the decline of amphibian populations (Rouse et al., 1999). Because of these risks, FDEP set a springs impairment level of 0.35mg/L in springs vents; suggesting that concentrations above that level may be harmful to the ecosystem (Brown et al., 2008).

FSI staff collected nitrate+nitrite as nitrogen (NOx-N) samples at the Fish Bowl (HOM-1) during the September 2024 sampling session. Figure 8 summarizes 2024 NOx-N data for the SpringsWatch groups that collected these samples; 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 (FDEP). NOx-N concentration at HOM-1 was 2.12 mg/L, which is approximately 6.1 times greater than the FDEP threshold.

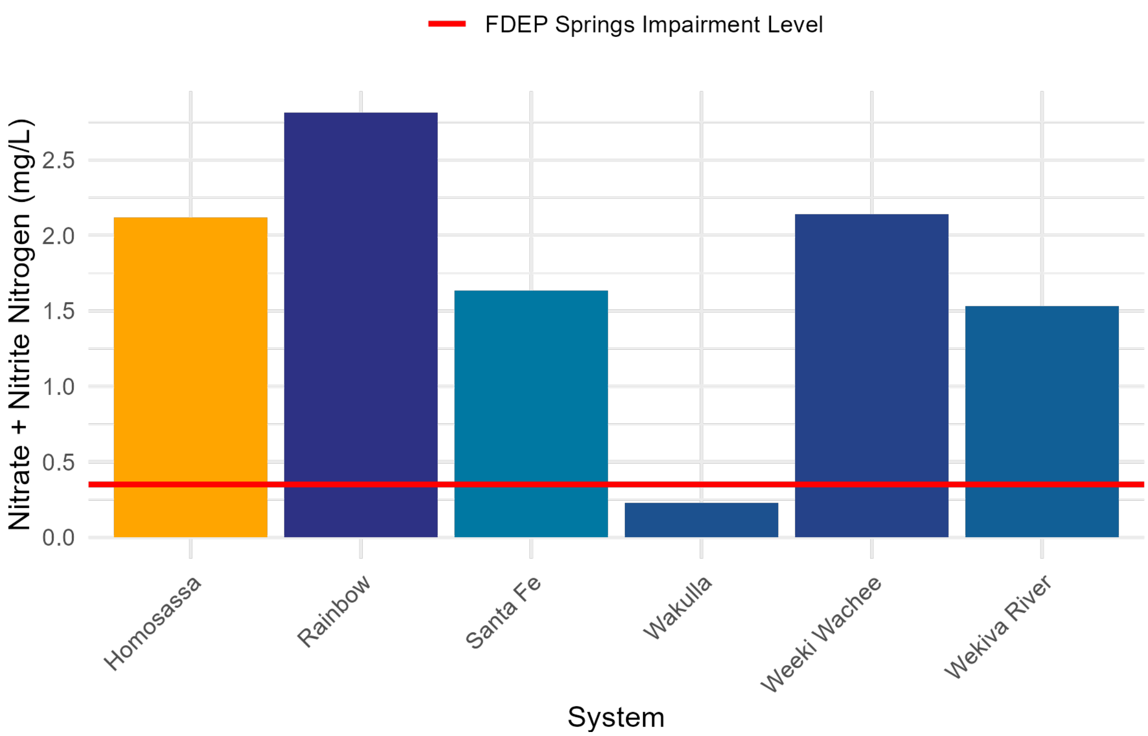



**Figure 8. Nitrate-nitrite (NOx-N) levels at SpringsWatch samples sites in 2024. Homosassa is denoted by the orange bar.**

## *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 11.6 meters (38.06 feet) in August and a minimum of 7.3 meters (23.95 feet) in January. The average reading was 9.6 meters (31.5 feet).

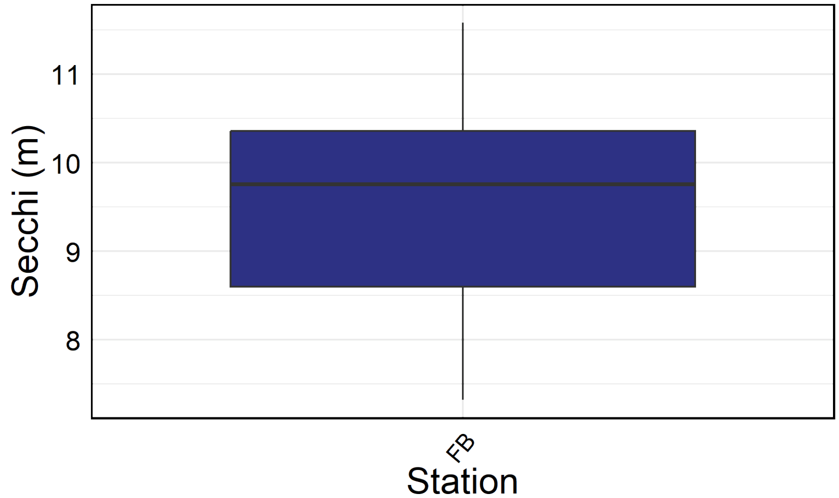



**Figure 9. Horizontal secchi disk (Secchi_H) measurements (m) in Homosassa Springs Fish Bowl (January–December 2024).**

### 3.2.2 Light Measurements

Percent transmittance refers to the amount of light that can pass through the water column to a depth of 1 foot 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. In turn, this can support the entire food web, from primary producers to top predators. Oppositely, 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.

Figure 10 presents the percent transmittance estimates collected by Homosassa SpringsWatch volunteers from January through December 2024. Figure 11 shows the calculated average k.

At Fish Bowl (FB), the average k value was 1.4, while at Main Bridge (MB), the recorded value was 0.5. This suggests that the water at FB may be more turbid or have more particles that scatter light. However, since only one measurement was taken at MB, it is difficult to draw firm conclusions. That said, the single MB sample also showed a higher percentage of light transmittance at one foot, which supports the idea that MB had clearer water conditions during that sampling event.

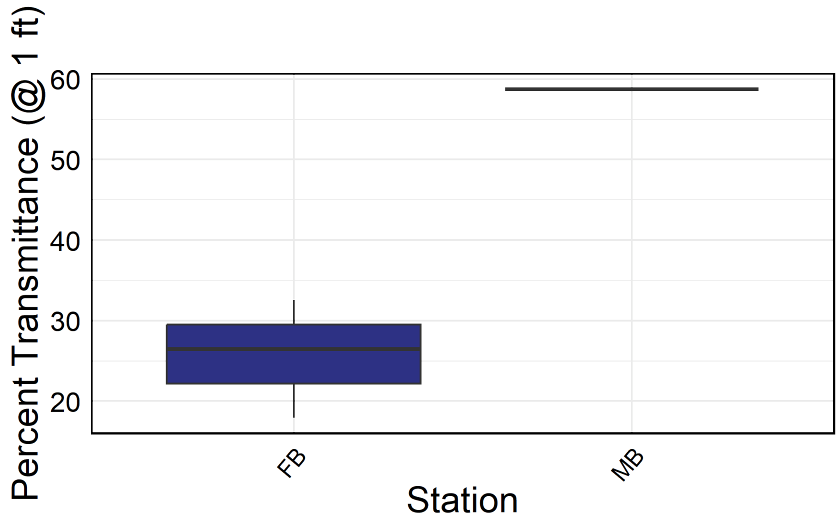



Figure 10. Percent transmittance (@1ft) for Homosassa SpringsWatch (January–December 2024).

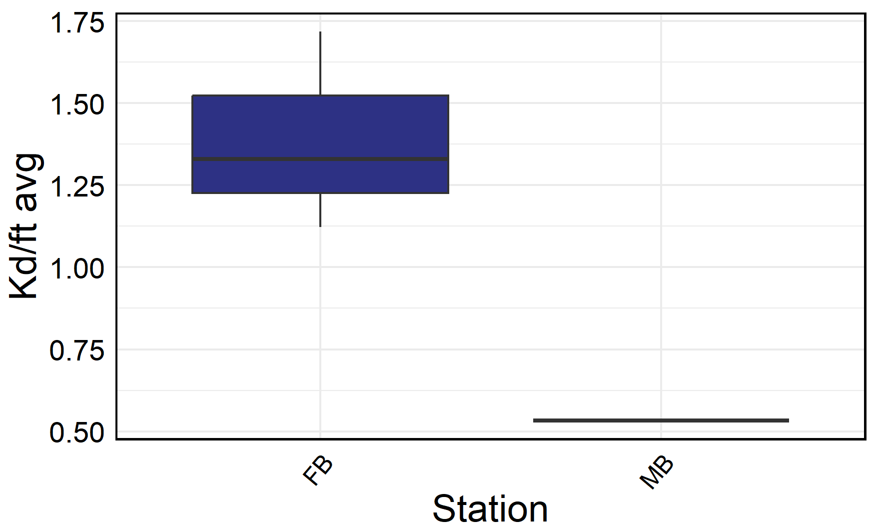



Figure 11. Average k (diffuse attenuation coefficient) by Homosassa SpringsWatch station (January – December 2024)

## 3.3 Fish Survey

Fish play a vital role in the ecosystems of Florida's springs by contributing to both ecological balance and economic value. Ecologically, they serve as a key food source for a variety of animals, including birds, mammals, and larger predatory fish. They also help regulate populations of other aquatic organisms, such as insects and crustaceans, by predating them. For instance, species like the Red Eye Chub and Bluegill Sunfish are prey for larger fish, birds, and alligators, and their decline can disrupt the balance of the entire food web. Beyond their role in the food web, fish contribute to nutrient cycling and energy transfer within spring systems, helping to maintain the health and productivity of these aquatic environments (McIntyre et al., 2008; Vanni, 2002). Fish also assist in the dispersal of aquatic plant seeds through their feces, which helps promote plant growth in new areas of the spring (Horn et al., 2011).

In addition to their ecological importance, freshwater fish are a significant part of Florida's recreation and tourism industries. Protecting and maintaining healthy fish populations is essential not only for sustaining the ecosystems of Florida's springs but also for preserving the economic and recreational benefits they provide.

SpringsWatch volunteers conducted visual fish counts monthly from January through December 2024 except for February, November, and December. Table 3 summarizes the fish observed during nine monitoring sessions completed by the volunteers in 2024. A total of 14 species were recorded, with minnow sp. and striped mullet being the most frequently observed. The designation minnows sp. refers to unidentified small-bodied (less than 3 inches in length) fishes primarily within the family Cyprinidae (true minnows) that could not be identified beyond the genus level. This includes species such as the redeye chub (*Notropis harperi*; family Cyprinidae). However, volunteers have also historically grouped other small-bodied fishes into this category, including the mosquitofish (*Gambusia holbrooki*) and the sailfin molly (*Poecilia latipinna*), both of which belong to the family Poeciliidae. The designation Sunfish sp. refers to members of the genus *Lepomis* (family Centrarchidae) commonly observed in spring systems, including the bluegill sunfish (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), redbreast sunfish (*Lepomis auritus*), and spotted sunfish (*Lepomis punctatus*).

**Table 3. Fish observed during fish surveys for Homosassa SpringsWatch (January-December 2024).**

| Common Name | Scientific Name | Average # of Counted per Survey |
|---|---|---|
| Atlantic Needlefish | *Strongylura marina* | 14 |
| Black Drum | *Pogonias cromis* | 18 |
| Bluegill | *Lepomis macrochirus* | 1 |
| Catfish sp. | *Ictalurus sp.* | 1 |
| Common Snook | *Centropomus undecimalis* | 24 |
| Crevalle Jack | *Caranx hippos* | 14 |
| Florida Gar | *Lepisosteus platyrhincus* | 2 |
| Grey Snapper | *Lutjanus griseus* | 35 |
| Largemouth Bass | *Micropterus floridanus* | 1 |
| Minnow sp. | *Notropis sp.* | 283 |
| Striped Mojarra | *Eugerres plumieri* | 43 |
| Pinfish | *Lagodon rhomoides* | 30 |
| Red Drum | *Sciaenops ocellatus* | 2 |
| Sheepshead | *Archosargus probatocephalus* | 15 |
| Striped Mullet | *Mugil cephalus* | 131 |

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


Striped Mullet


Pinfish

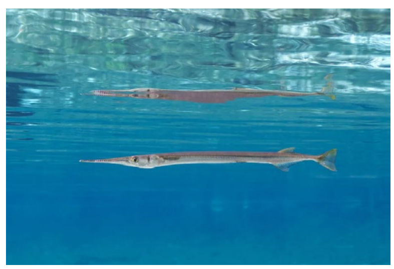

Grey/Mangrove Snapper


Largemouth Bass


Mojarra


Crevalle Jack


Common Snook


Atlantic Needlefish


Florida Gar

# Section 4.0 References

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# Section 5.0 Appendix

**Table A.1. Data collected during Homosassa SpringsWatch from January to December 2024**

| Station Name | Parameter Name | Average | Number of Samples | Maximum | Minimum | Standard Deviation |
|---|---|---|---|---|---|---|
| FB | Dissolved Oxygen (%) | 54.2 | 8 | 60.0 | 49.2 | 3.7 |
| | Dissolved Oxygen (mg/L) | 4.5 | 8 | 4.8 | 4.2 | 0.3 |
| | Secchi | 9.6 | 9 | 11.6 | 7.3 | 1.5 |
| | Specific Conductance (µS/cm) | 3262 | 1 | 3262 | 3262 | NA |
| | Temperature (°C) | 24.0 | 10 | 27.4 | 22.2 | 1.5 |
| | k (diffuse attenuation coefficient) | 1.4 | 3 | 1.7 | 1.1 | 0.3 |
| | Percent Transmittance (@ 1 ft) | 25.7 | 3 | 32.5 | 17.9 | 7.3 |
| | Nitrate+Nitrite (mg/L) | 0.97 | 1 | 0.97 | 0.97 | NA |
| MB | Dissolved Oxygen (%) | 53.3 | 8 | 57.1 | 48.6 | 3.1 |
| | Dissolved Oxygen (mg/L) | 4.4 | 8 | 4.9 | 3.9 | 0.3 |
| | Specific Conductance (µS/cm) | 3242 | 1 | 3242 | 3242 | NA |
| | Temperature (°C) | 23.9 | 10 | 26.4 | 22.7 | 1 |
| | k (diffuse attenuation coefficient) | 0.5 | 1 | 0.5 | 0.5 | NA |
| | Percent Transmittance (@ 1 ft) | 58.7 | 1 | 58.7 | 58.7 | NA |