

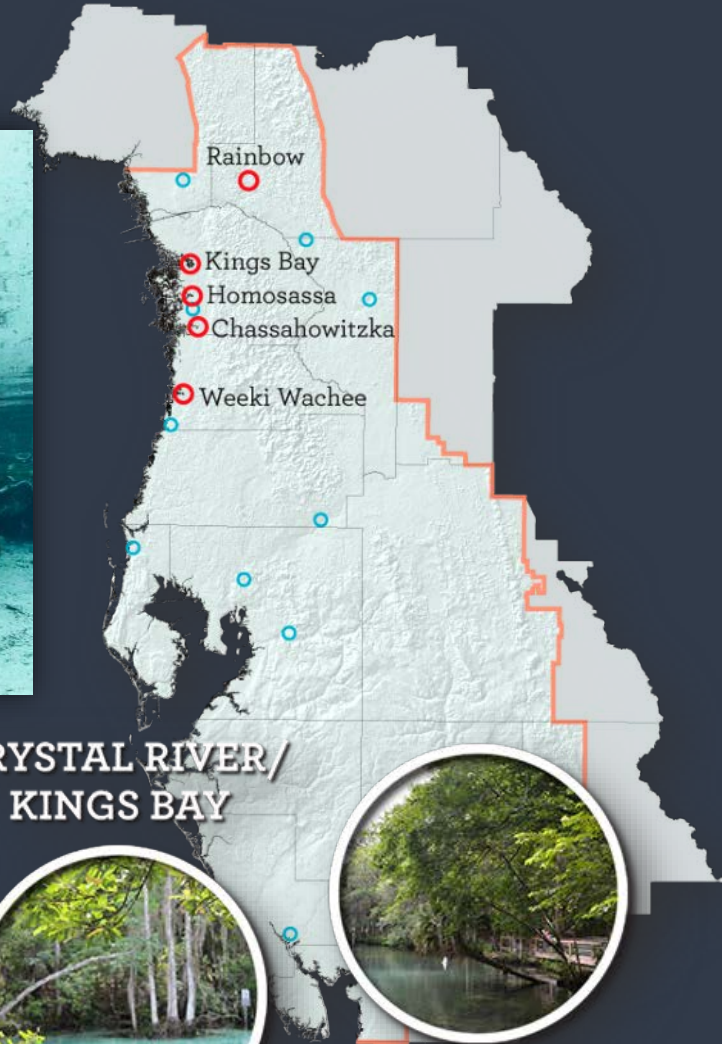
# Real-Time Springs Monitoring: The Next Generation in Water Quality Monitoring

Water Quality Monitoring Program





# Real-Time Springs



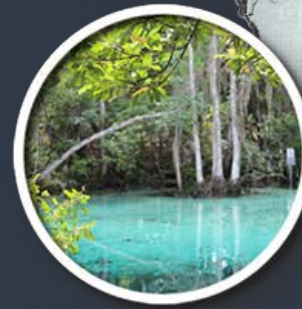
WEEKI WACHEE  
SPRINGS

CHASSAHOWITZKA  
SPRINGS



RAINBOW  
SPRINGS

CRYSTAL RIVER/  
KINGS BAY



HOMOSASSA  
SPRINGS



# Continuous Offshore Monitoring



pH  
Depth  
Salinity  
Temperature  
Dissolved Oxygen  
Specific Conductance  
Turbidity  
Chlorophyll





## Rainbow Springs Spring Dashboard

### Current Readings

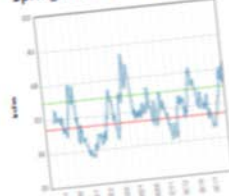
As of Oct. 14, 2019, 1:39 pm

74.1° F Water Temp.	7.95 pH	243 uS/cm Specific Conductance	0.11 ppt Salinity	6.88 mg/l Dissolved Oxygen
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### Current Conditions

Historical Average Rainfall  
for October: 3.02 in  
Actual Rainfall Received  
for October: 1.31 in

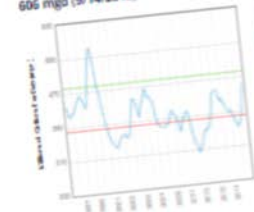
### Springshed Region Rainfall



Data source: SWFWMD

### Stream Flow

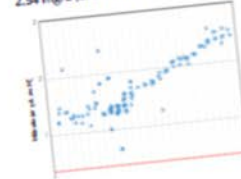
Rainbow River Stream Flow:  
606 mgd (9/14/2018)



Data source: USGS

### Nitrate Concentration

Nitrate Concentration:  
2.54 mg/L (5/1/2019)



### Location



View from headsprings looking downstream.  
(Inset: State of Florida counties and  
Rainbow Springs Springshed location.)

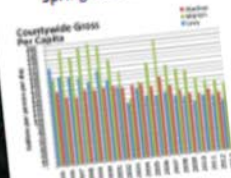
### Rainbow Springs, Marion County



Data source: SWFWMD, Esri

### Characteristics

#### Springshed Water Use



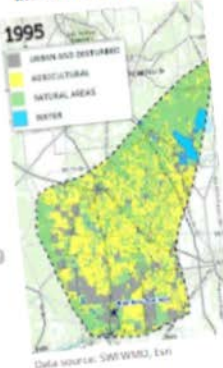
Data source: SWFWMD, SPRWMD

#### Nitrate Loading



Data source: IDEP, 2006

#### Interactive Land Use Map



Data source: SWFWMD, Esri

### Clarity

Clarity at Headsprings:  
242 feet (4/16/2019)

Clarity at CR 484 Bridge:  
31 feet (4/18/2019)

Data source: SWFWMD



## Weeki Wachee Springs

### Springshed Dashboard

### Current Spring Readings

As of Apr. 19, 2020, 2:00 pm

74.8° F  
Water Temp.

7.74  
pH

352 uS/cm  
Specific  
Conductance

0.17 ppt  
Salinity

2.36 mg/l  
Dissolved  
Oxygen

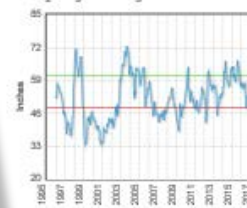
Data source: SWFWMD

### Current Conditions

Historical Average Rainfall  
for April: **2.71 in**

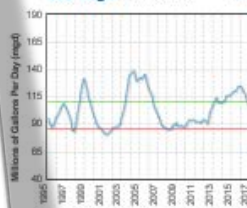
Actual Rainfall Received  
for April: **3.83 in**

### Springshed Region Rainfall



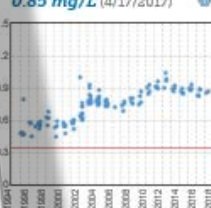
Data source: SWFWMD

### Weeki Wachee River Stream Flow: 100 mgd (4/17/2018)



Data source: USGS

### Nitrate Concentration: 0.85 mg/L (4/17/2017)



Data source: SWFWMD

Clarity at Headsprings:  
**116 feet** (4/11/2017)

Clarity at Downriver Site:  
**16 feet** (4/11/2017)

Data source: SWFWMD

### Location



Undervater view of Weeki Wachee River  
looking upriver within Weeki Wachee  
Springs State Park. (Inset: State of Florida  
counties and Weeki Wachee Springshed  
location.)

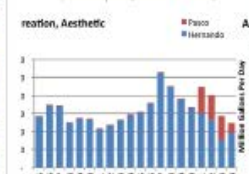
### Weeki Wachee Springs



Data source: SWFWMD, Esri

### Characteristics

#### Springshed Water Use (Click to pause; click to advance.)



Data source: SWFWMD

#### Nitrate Loading



Data source: IDEP, 2006

#### Interactive Land Use Map



Data source: SWFWMD, Esri

My Home.  
My Springs.

Southwest Florida  
Water Management District

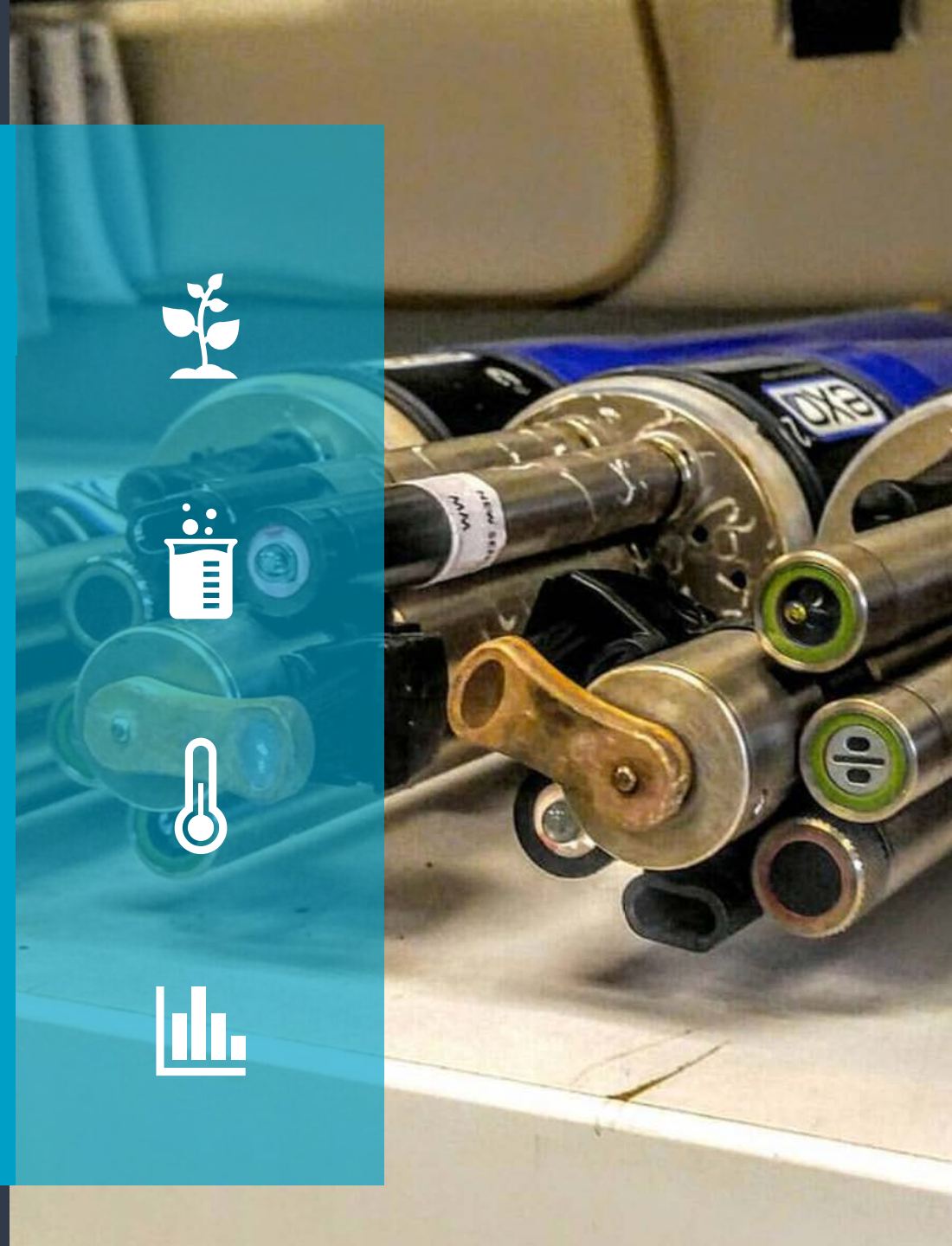
#MySprings

<http://www.watmatters.org/springs>



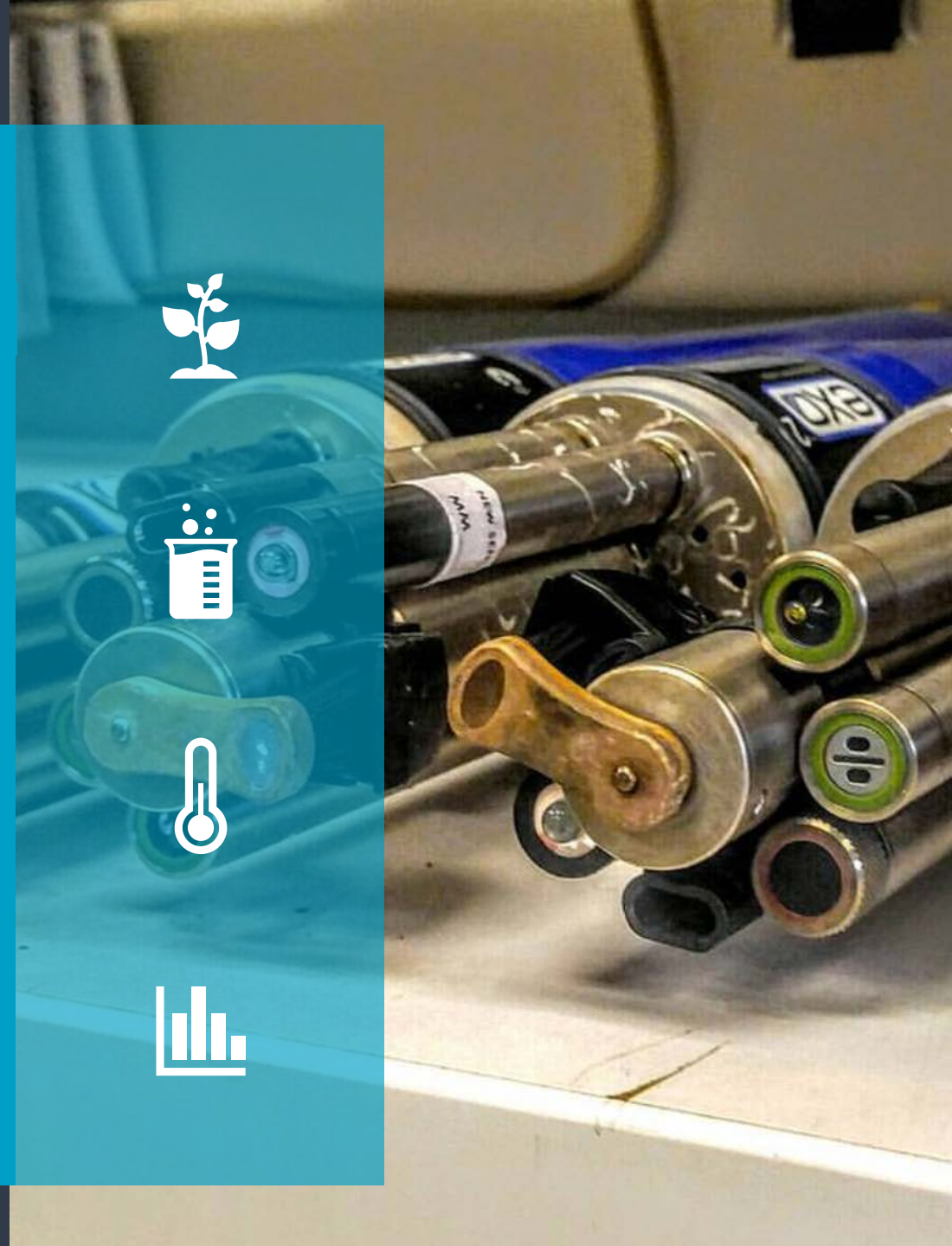
## WHY IS REAL-TIME WATER-QUALITY MONITORING IMPORTANT?

- Correlates flow with water quality data in order to identify relationships.
- Monitor water quality in which changes occur
- Reduce the need to collect lab samples
- Provides data immediately
- Identifies gaps in water quality monitoring
- Provide tools for early trend detection
- Detects water quality changes pertaining to weather events (hurricanes, floods, etc.)



## WHAT ARE SOME OF THE CHALLENGES OF REAL-TIME?

- Higher upfront costs
- Telemetry requires a station to be constructed
- Environmental conditions for equipment aren't always ideal
- Bio-fouling and electrolysis are an uphill battle
- Requires consistent maintenance
- Equipment is susceptible to vandalism



# SO WHY CONTINUOUS MONITORING?

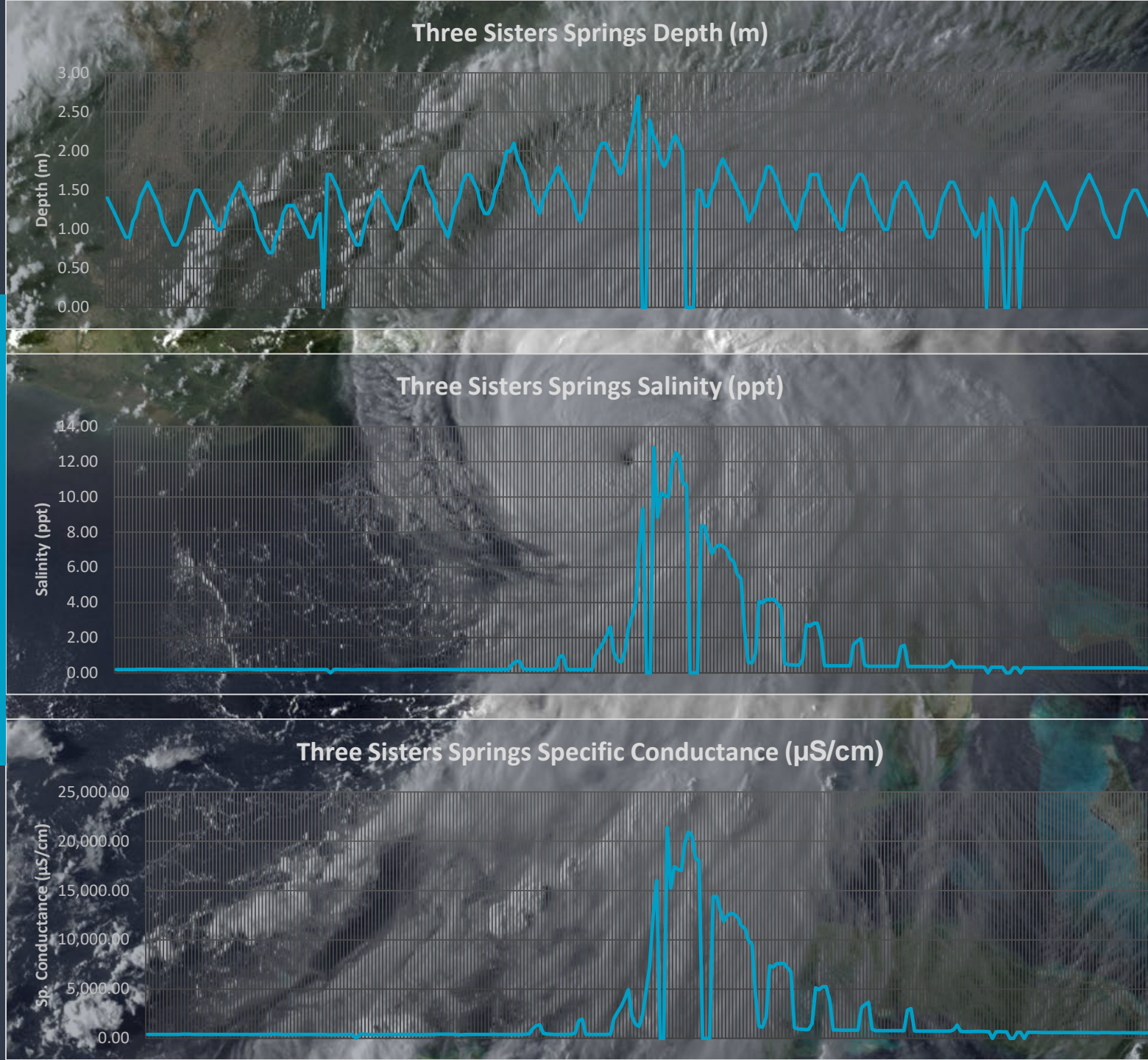
Imagine watching a movie through a View Master.





# Hurricane Hermine

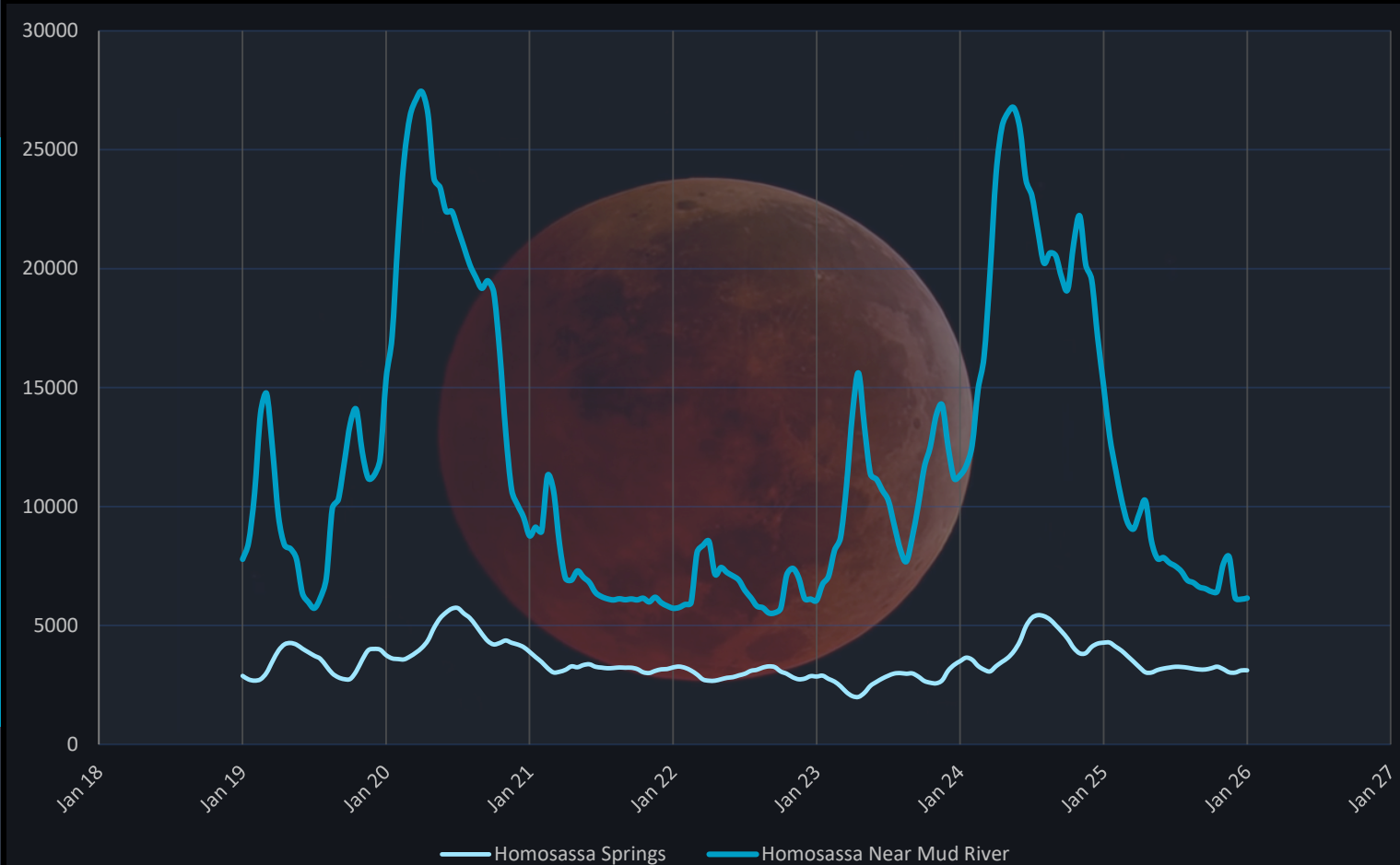
August 27, 2016 –September 8, 2016





# Lunar Eclipse

January 21, 2019



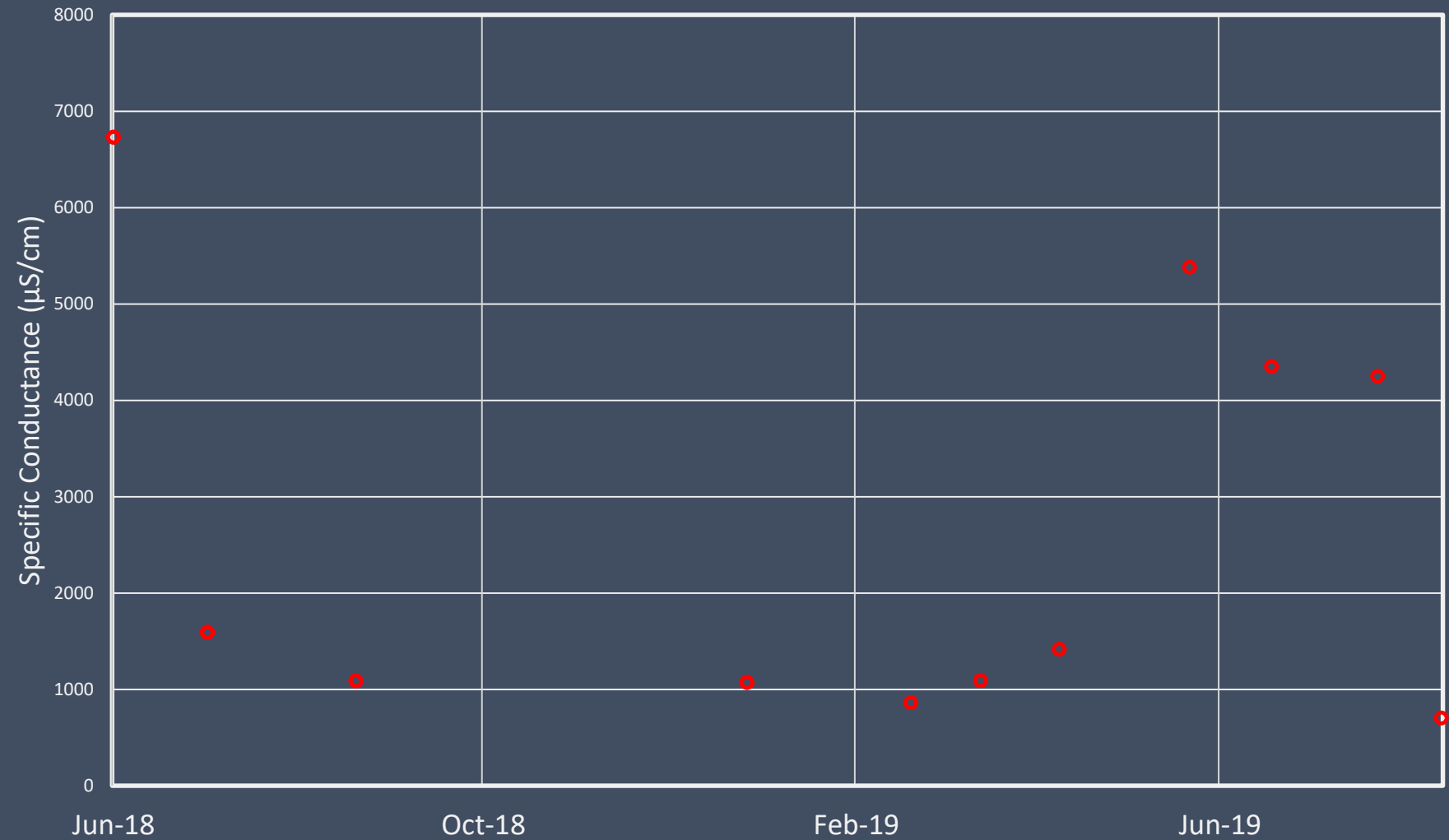


# Field Data

## Chassahowitzka Springs

FIELD READINGS

12 per year





# Continuous Data

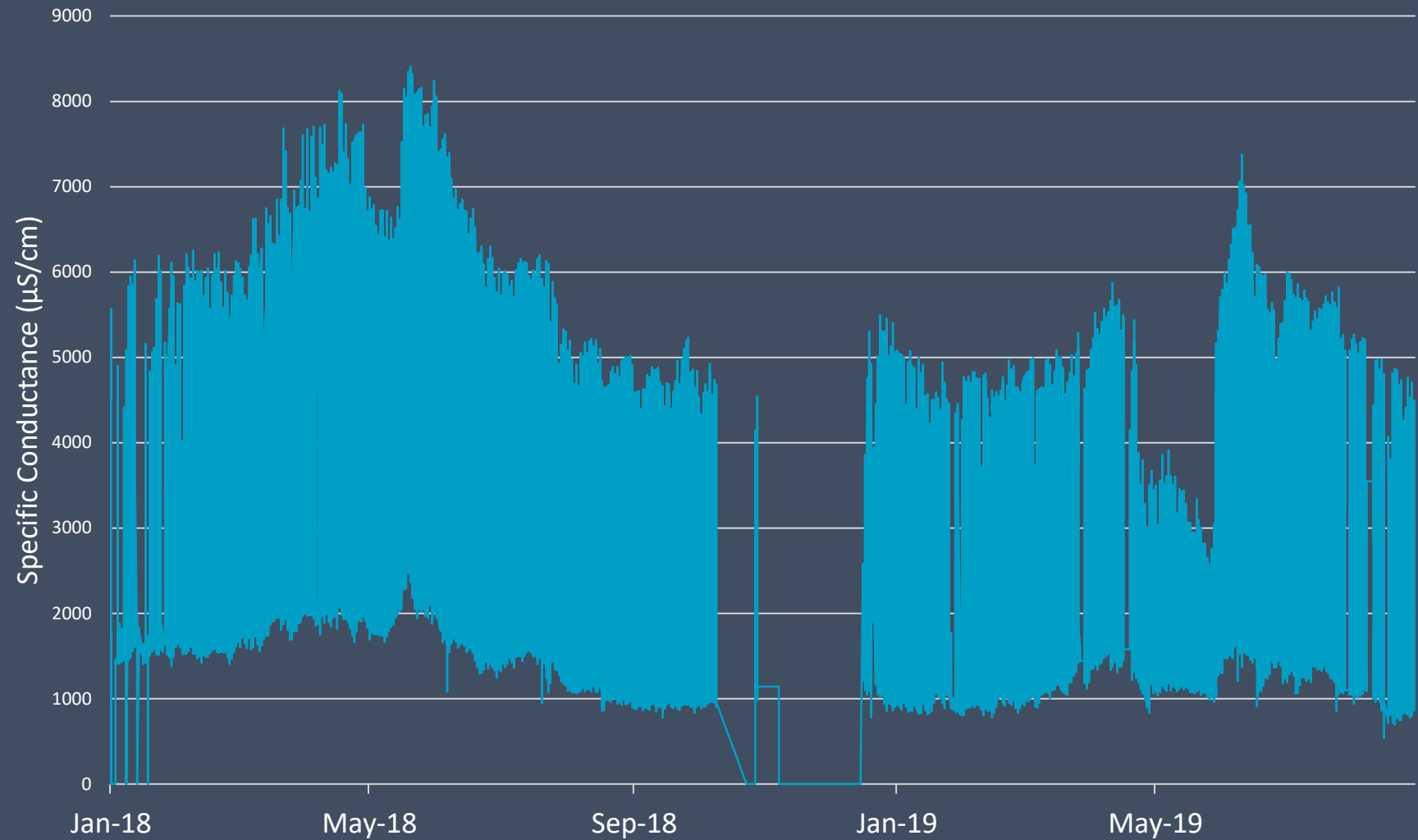
## Chassahowitzka Springs

FIELD READINGS

12 per year

CONTINUOUS  
READINGS

8760 per year





# Continuous Data

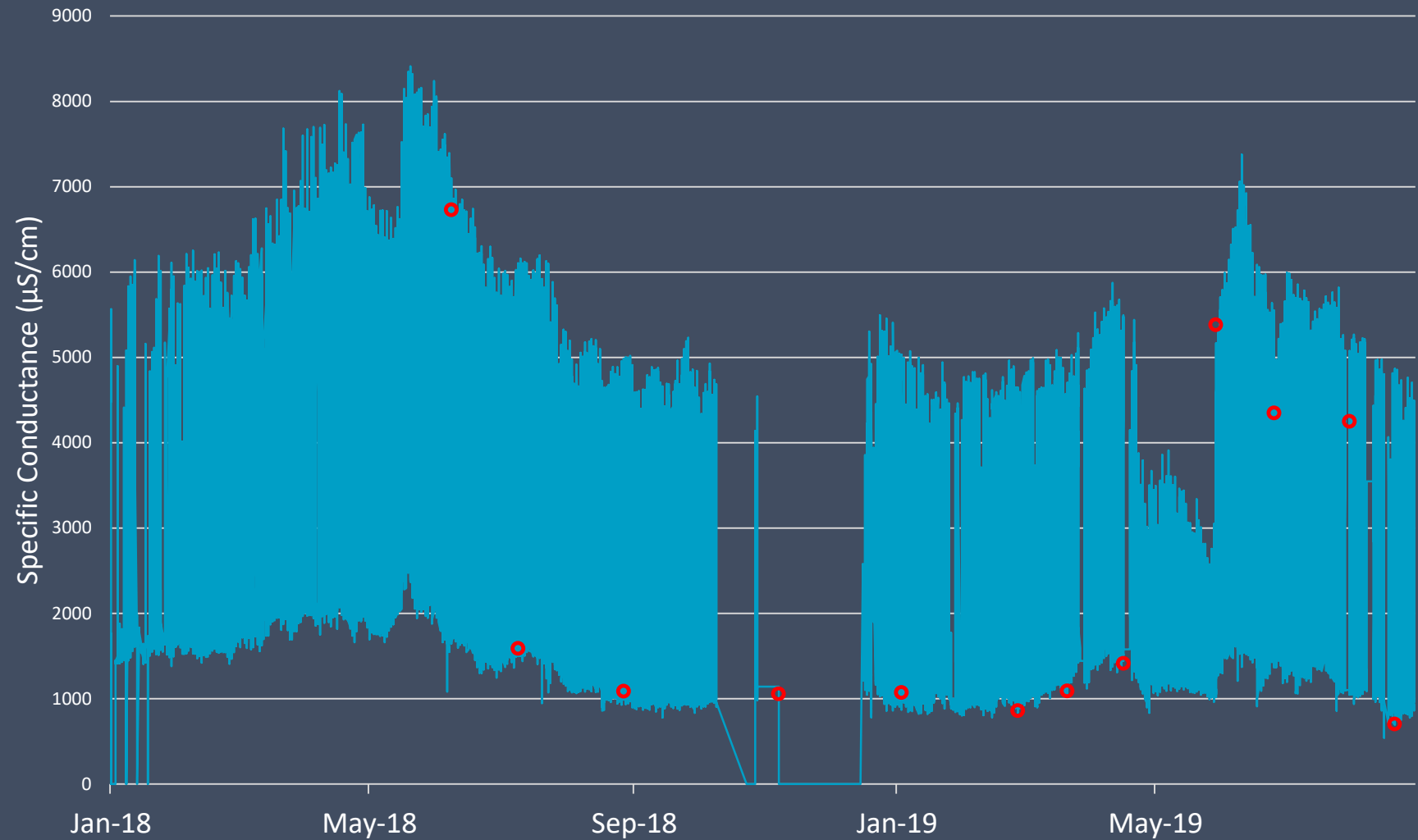
## Chassahowitzka Springs

FIELD READINGS

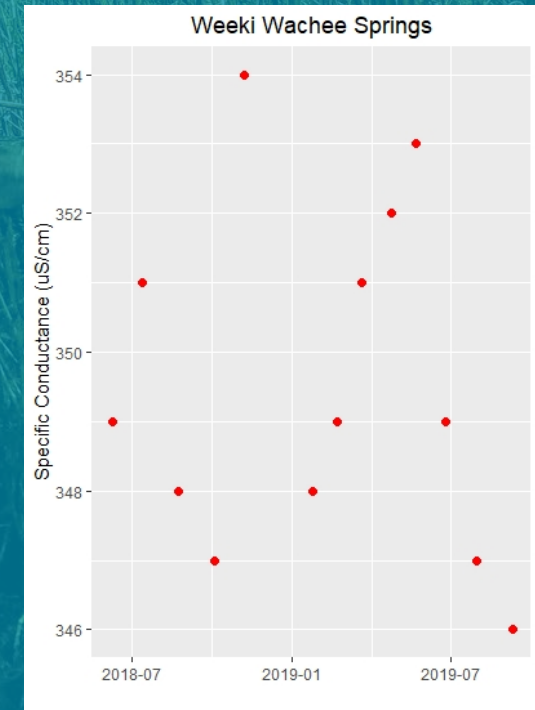
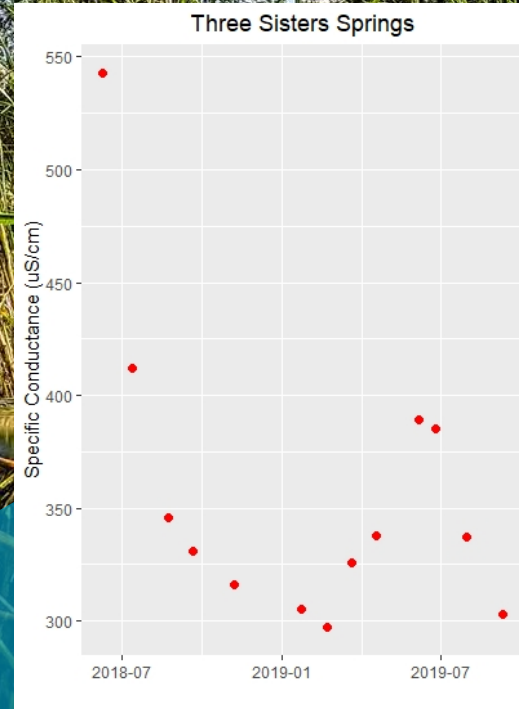
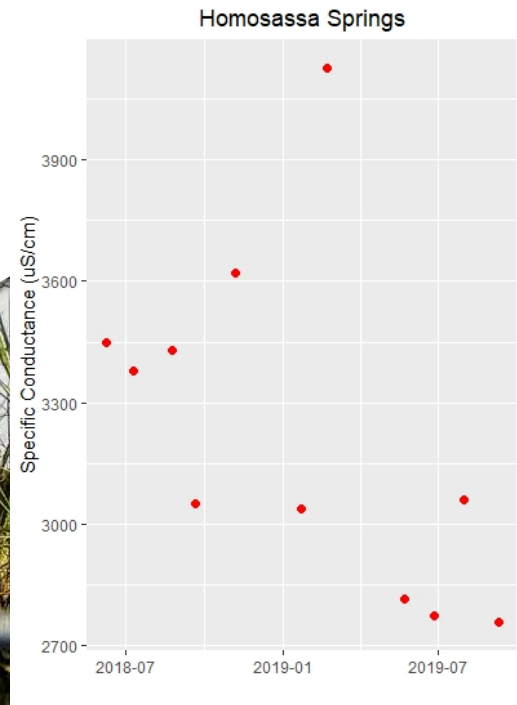
12 per year

CONTINUOUS  
READINGS

8760 per year

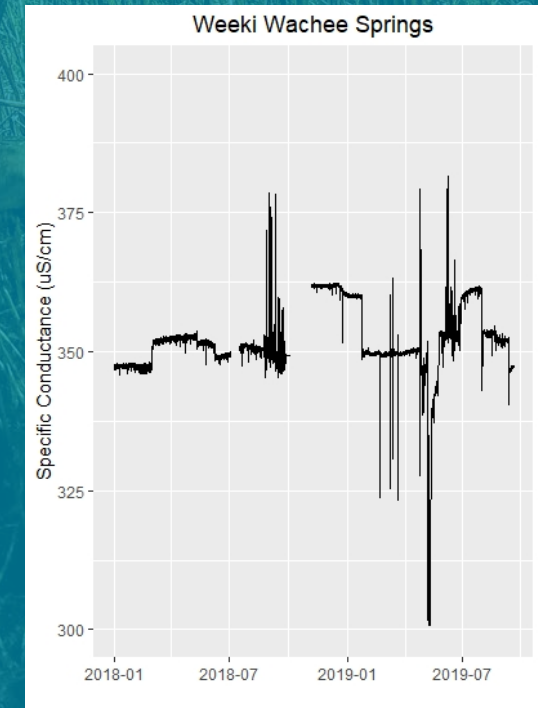
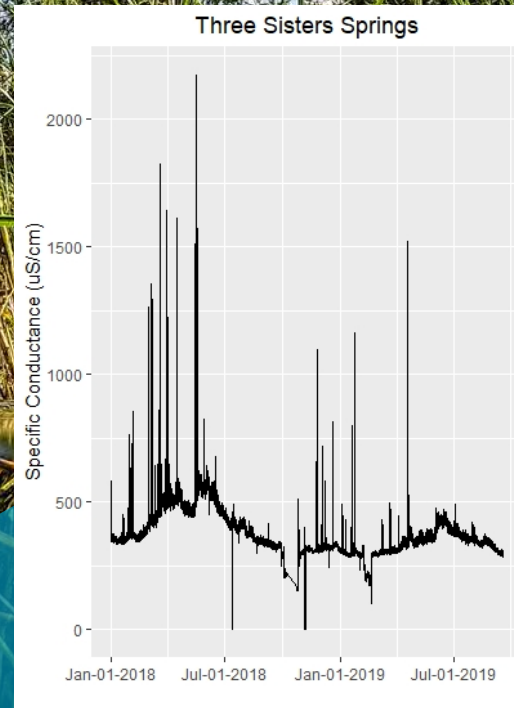
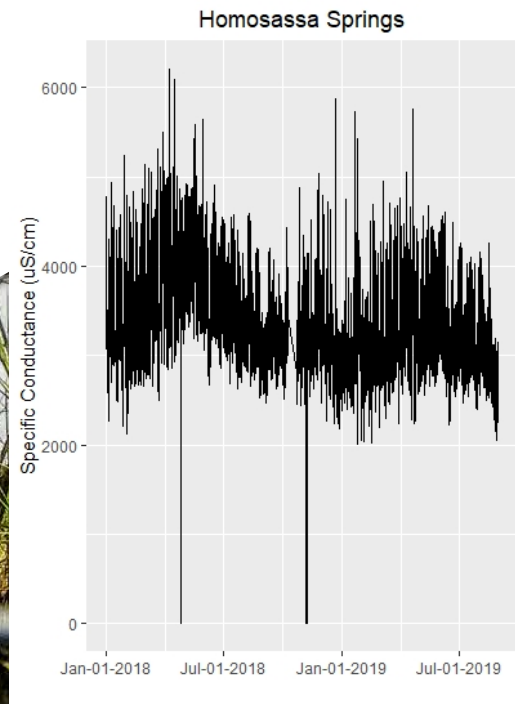


# Field Readings



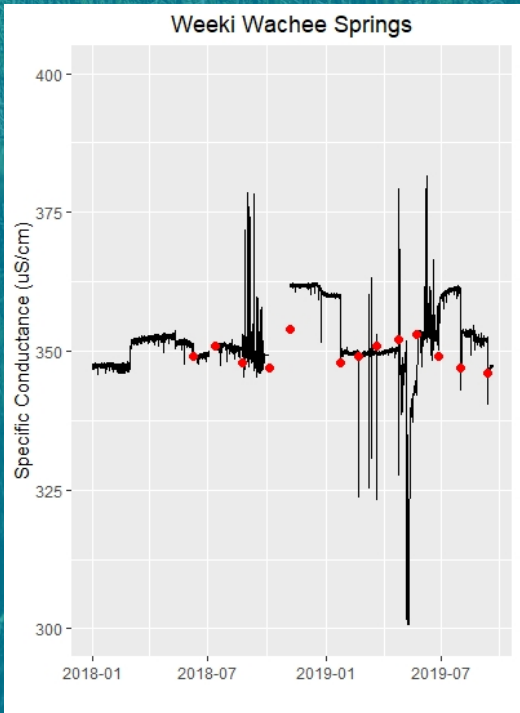
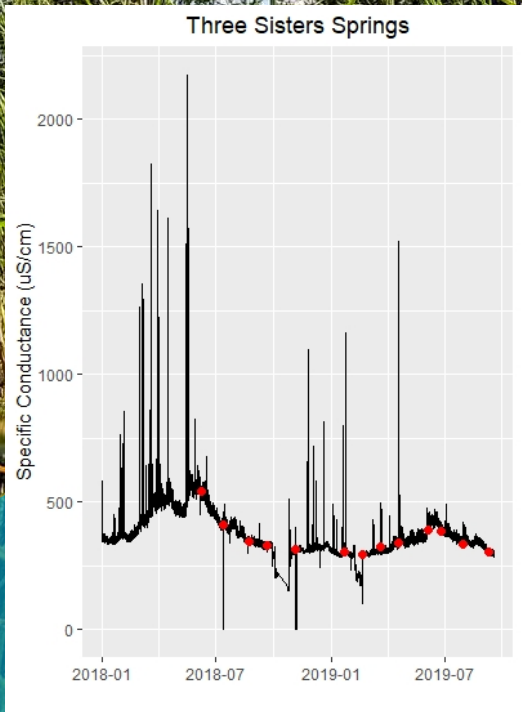
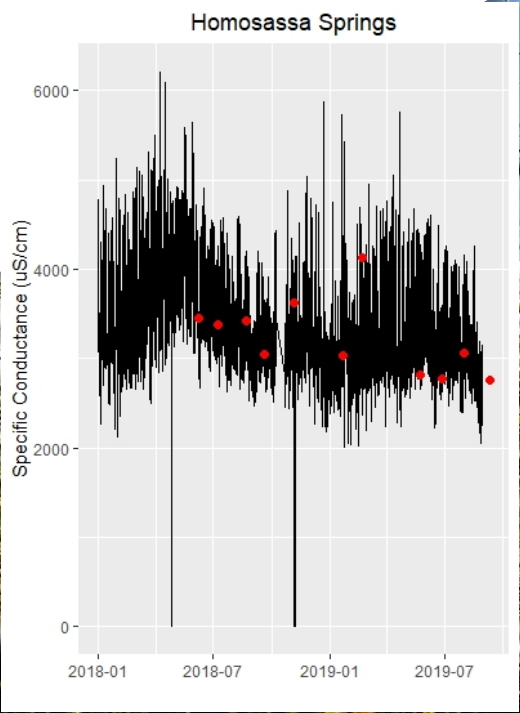


# Continuous Data





# Real-Time vs Field







# COST PER STATION

Offshore Continuous Monitoring Stations	Real-Time Springs Stations
Cost per station $\approx$ \$20,000	Cost per station $\approx$ \$14,000
Data points collected per station $\approx$ 2 million	Data points collected per station $\approx$ 3 million
Parameters Collected = 8	Parameters Collected = 6
Cost per Reading $\approx$ \$0.01	Cost per Reading $\approx$ \$0.0047





QUESTIONS?

