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Weekly Indian River Lagoon Harmful Algal Bloom Observations

Project Summary

Report Date	Project Name	Prepared By
June 20th to 26th, 2022	Florida Department of Environmental Protection Grant INVO14: Remote Sensing of Harmful Algal Blooms in the Indian River Lagoon and Connected Waterways in Brevard County	Andrew Kamerosky, Iulia Bibire

Status Summary

Available Sentinel 2 and 3 Imagery

The availability and usability of satellite imagery is contingent upon both the satellite being overhead and low cloud cover. The orbits of the Sentinel satellites will on occasion cover a portion of the Indian River Lagoon. Likewise cloud cover can also result in only portions of the Indian River Lagoon (IRL) being visible.

Table 1 below lists the availability of Sentinel imagery and its usability for Harmful Algal Bloom (HAB) analysis.

Table 1. Sentinel-2 and 3 imagery availability for June 20th – 26th 2022

N - Imagery Not available

Y - C – Imagery Available, Cannot Use Due To Cloud Cover

Y - P – Imagery Available, Only Partial Imagery of IRL

Y - G – Imagery Available, No Issues Over The IRL

Date	S2 - A	S2 - B	S3 - A	S3 - B
20-June-22	N	N	N	Y – G
21-June-22	N	N	Y - C	N
22-June-22	Y - C	N	Y - C	N
23-June-22	N	N	N	Y - C
24-June-22	N	Y - P	N	Y – G
25-June-22	N	N	Y - C	N
26-June-22	N	N	Y - C	N

Summary of Harmful Algal Bloom (HAB) Activity

There was no HAB activity detected across the lagoon for the week of June 20th to 26th, 2022. The St. John River Water Management District (SJRWMD) Continuous Monitoring (CM) stations showed no values above 5.2 Relative Fluorescence Units (RFU) (**Figure 1**, **Table 2**).

Current and historical data are added to the SJRWMD's database continuously; subsequent visits may reflect such additions or revisions. SJRWMD provides no warranty as to the accuracy, reliability, or completeness of these data.

Figure 1 – St. John River Water Management District (SJRWMD) Indian River Lagoon (IRL) Continuous Monitoring Station Relative Chlorophyll A (ChlA) readings from June 20th to 26th, 2022.

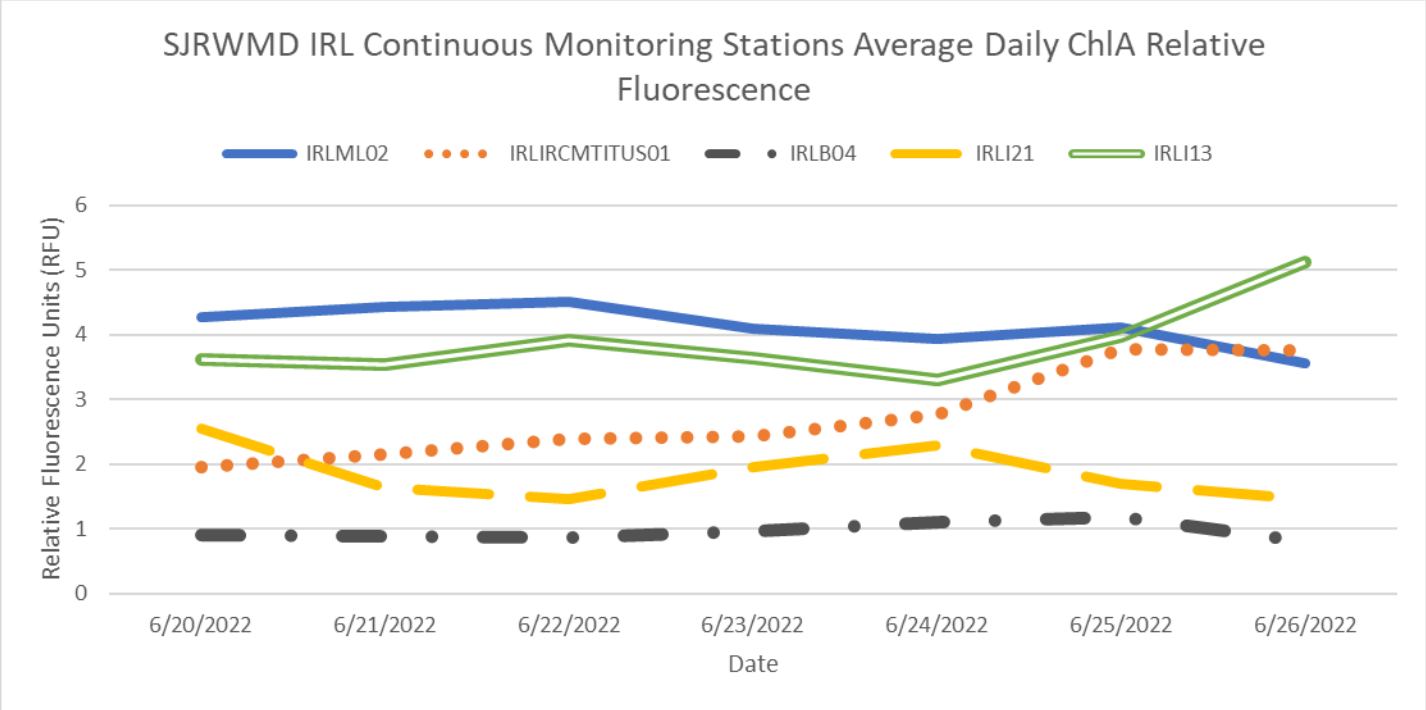


Table 2 - St. John River Water Management District (SJRWMD) Indian River Lagoon (IRL) Continuous Monitoring Station Chlorophyll A (ChlA) Relative Fluorescence averages from June 20th to 26th, 2022.

Date	IRLML02	IRLIRCMTITUS01	IRLB04	IRLI21	IRLI13
20-June	4.3	1.9	0.9	2.5	3.6
21-June	4.4	2.2	0.9	1.6	3.5
22-June	4.5	2.4	0.9	1.5	3.9
23-June	4.1	2.4	1.0	2.0	3.6
24-June	3.9	2.8	1.1	2.3	3.3
25-June	4.1	3.8	1.2	1.7	4.0
26-June	3.6	3.8	0.8	1.5	5.1

HAB's observed by this project are defined as over 80 Micrograms/Liter (µg/L) Chlorophyll A (ChlA) (as estimated by a calibrated Normalized Difference Chlorophyll Index (NDCI)) and persistent across the week in review. The algorithms that transform the NDCI index value to estimated ChlA concentrations were developed using a second order polynomial equation. The Sentinel 2 equation has a Root Square (R^2) of 0.81 with a Root Mean Square Error (RMSE) of 14.14 ug/L of ChlA. The Sentinel 3 equation has an R^2 of 0.92 and a RMSE of 9.92 ug/L ChlA. The RMSE is a measure of the accuracy of a model in estimating values, ChlA in this instance, where a lower value is indicative of higher accuracy. It does not identify if the model consistently over or underestimates the modeled values. The equations are below:

- S2 Estimated ChlA = $297.36(\mathrm{NDCI})^2 + 313.98(\mathrm{NDCI}) + 36.152$
- S3 Estimated ChlA = $437.07(\mathrm{NDCI})^2 + 348.98(\mathrm{NDCI}) + 33.928$

Due to the high cloud coverage over the IRL during the past week, only 3 Sentinel scenes were usable for the detection of HAB activity. Of these, the Sentinel 3B imagery from June 20th and June 24th were selected for further analysis due to lowest cloud cover over the lagoon. The highest mean estimated ChlA concentration observed on June 20th occurred at station IRLML02, with a value of 17.6 µg/L using Sentinel 3B imagery. On June 24th the highest mean ChlA concentration observed using Sentinel 3B imagery was of 19.6 µg/L and was observed at station IRLI21 (**Table 3, Table 4**).

There are several areas throughout the IRL which continue to have high estimated ChlA which correspond with shallow locations that likely have Submerged Aquatic Vegetation (SAV) or emergent vegetation. These locations will be evaluated and determined if they can be filtered out for the high estimated ChlA not being caused by algae.

Table 3. Sentinel 3B estimated Chlorophyll A (ChlA) statistics in Micrograms/Liter (ug/L) for June 20, 2022, over the St. John River Water Management District (SJRWMD) Indian River Lagoon (IRL) Continuous Monitoring Stations.

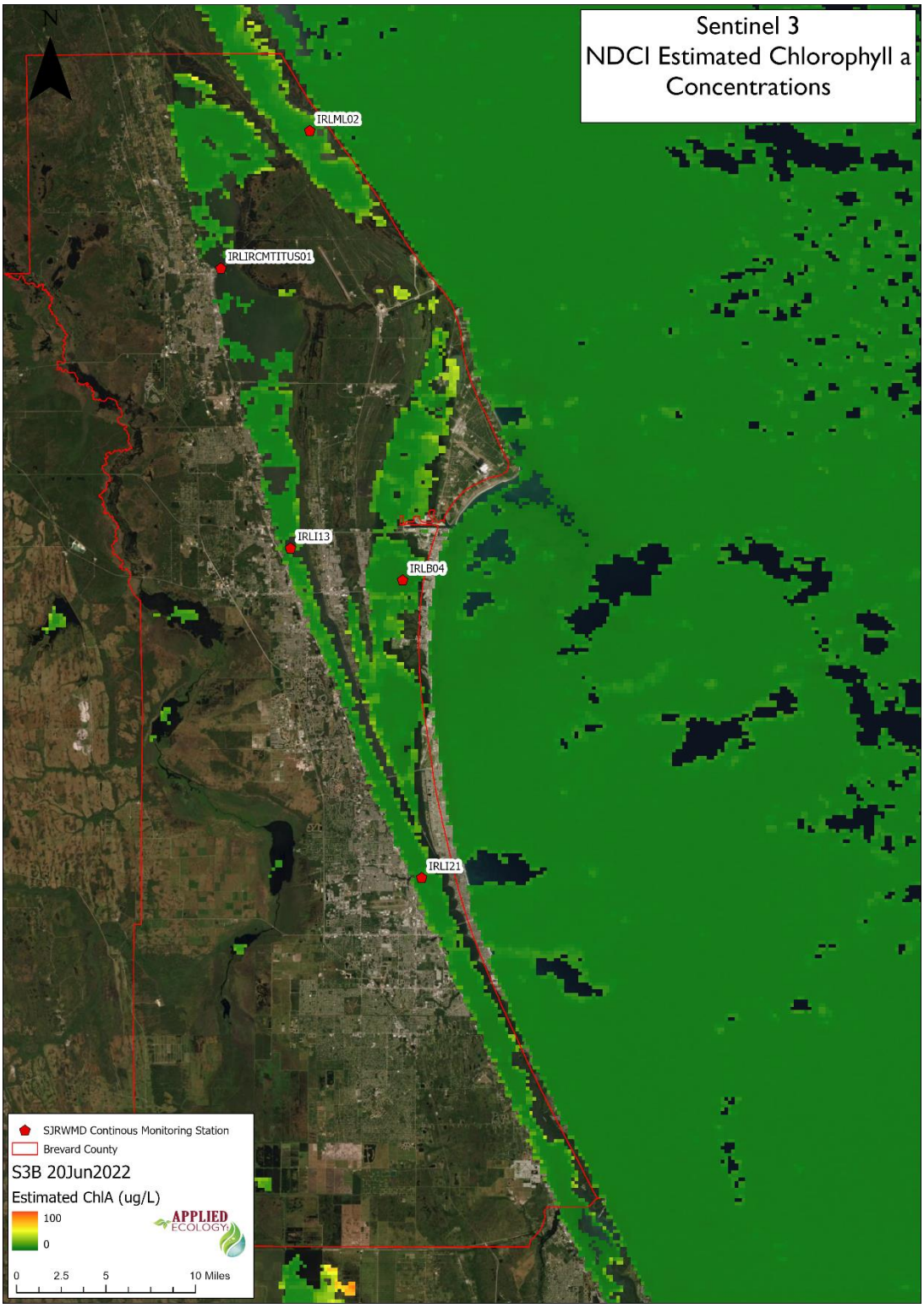
Station	Min ChlA	Max ChlA	Mean ChlA
IRLB04	4.4	6.8	5.3
IRLI13	9.6	19.9	14.5
IRLML02	13.1	22.6	17.6
IRLTITUS	12.1	18.4	15.3
IRLI21	7.0	9.9	8.5

Table 4. Sentinel 3B estimated Chlorophyll A (ChlA) statistics in Micrograms/Liter (µg/L) for June 24, 2022, over the St. John River Water Management District (SJRWMD) Indian River Lagoon (IRL) Continuous Monitoring stations.

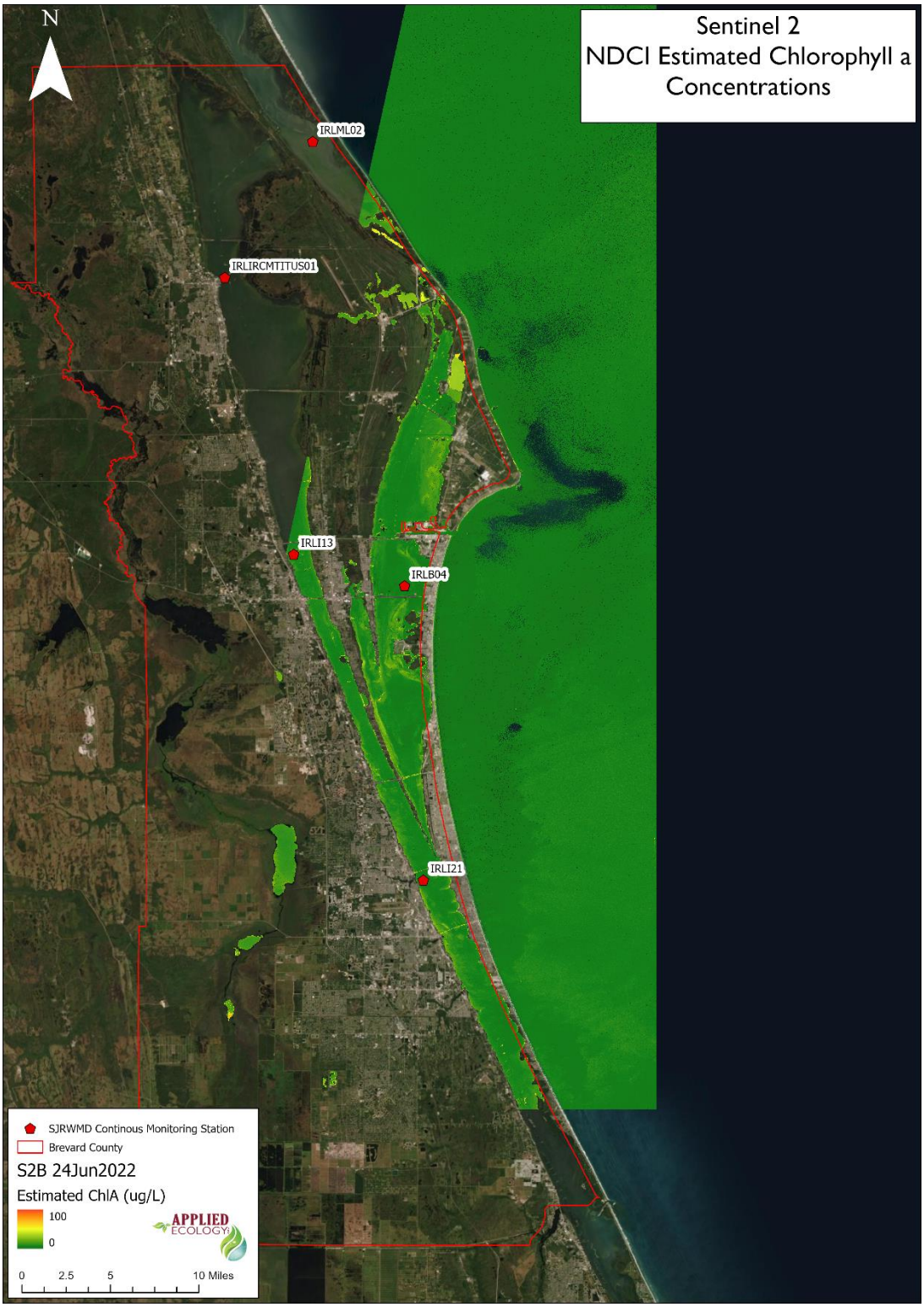
Station	Min ChlA	Max ChlA	Mean ChlA
IRLB04	7.7	9.6	8.4
IRLI13	9.2	10.2	9.7
IRLML02	10.4	12.2	11.3
IRLTITUS	11.0	23.1	16.3
IRLI21	18.0	22.9	19.6

Processed Imagery

20 June 2022- Sentinel 3B



24 June 2022- Sentinel 2B



24 June 2022- Sentinel 3B