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EPA Tools & Resources Training Webinar

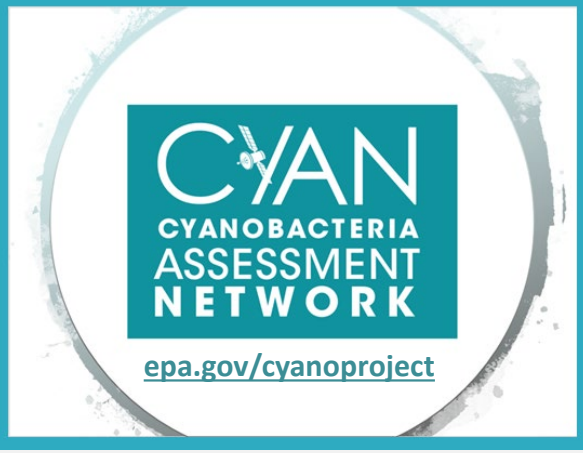
CyAN App:
Cyanobacteria Assessment Network Mobile Application

Tool for the Early Detection of Algal Blooms in US Freshwater Systems

Presenters: Blake Schaeffer, John Johnston and Darryl Keith
US EPA Office of Research and Development (ORD)

May 13, 2020

Partnership



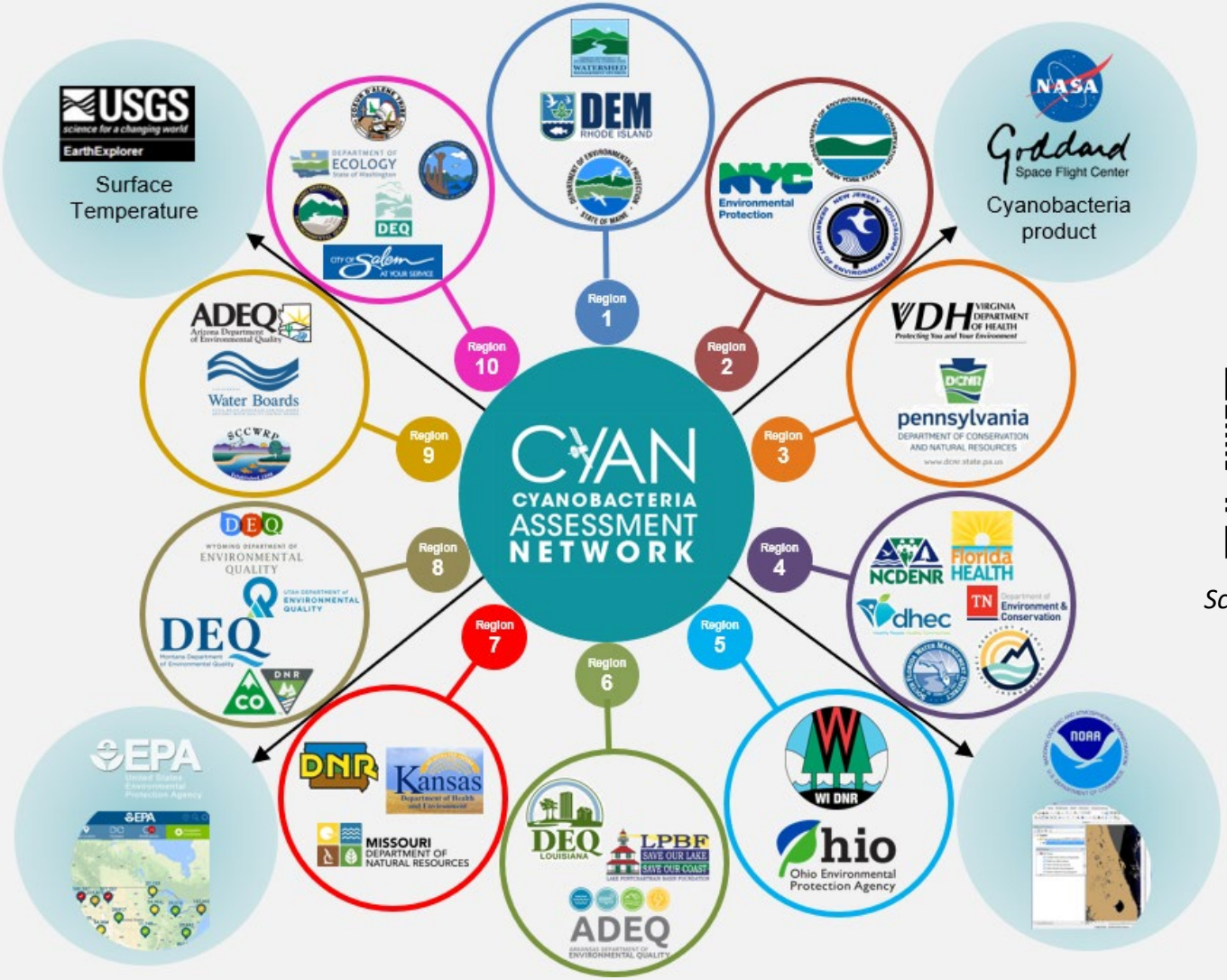
CyAN is a multi-agency (NASA, NOAA, USGS and EPA) effort that supports environmental management and public use of US lakes and reservoirs by providing a capability of ***detecting and quantifying algal blooms*** using satellite data records and disseminating this information through a mobile application developed and hosted by EPA.

- CyAN App provides water quality managers with a user-friendly tool that reduces the complexities associated with accessing satellite data to allow ***fast, efficient, initial assessments*** across lakes and drinking water reservoirs.

- Data from the Ocean and Land Colour Instruments (OLCI) sensor onboard the European Space Agency Copernicus Sentinel-3 satellite are used in ***near real-time*** to make initial water quality assessments and quickly alert managers to potential problems and emerging threats related to cyanobacteria.

Impact of CyAN

Supporting the environmental management and use of U.S. waters, protecting human health, conserving money and resources using satellite data records



Schaeffer et al. Eos.
Article URL

Sentinel-3A Satellite Remote Sensing

Video Source: European Space Agency

Ocean and Land Colour Instrument (OLCI)

- Revisit: 2-3 day
- Spatial resolution: 300m
- Surface water measures

EUMETSAT

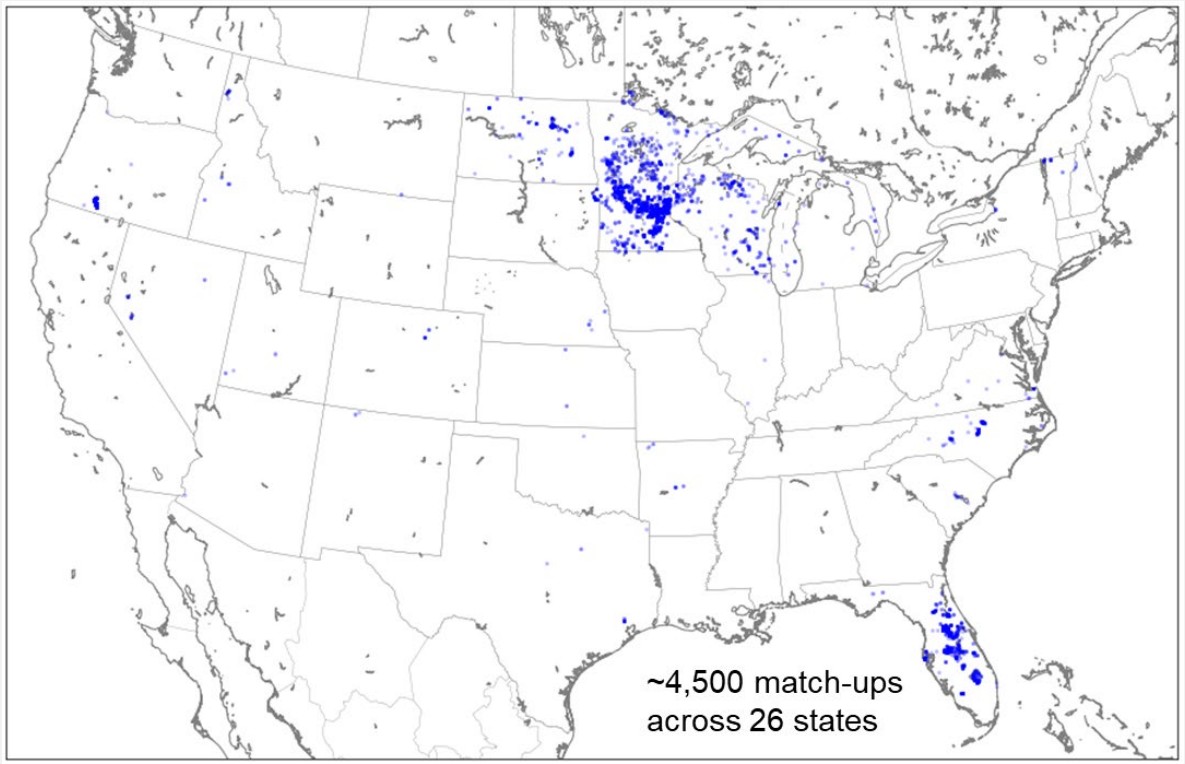
esa

European Space Agency

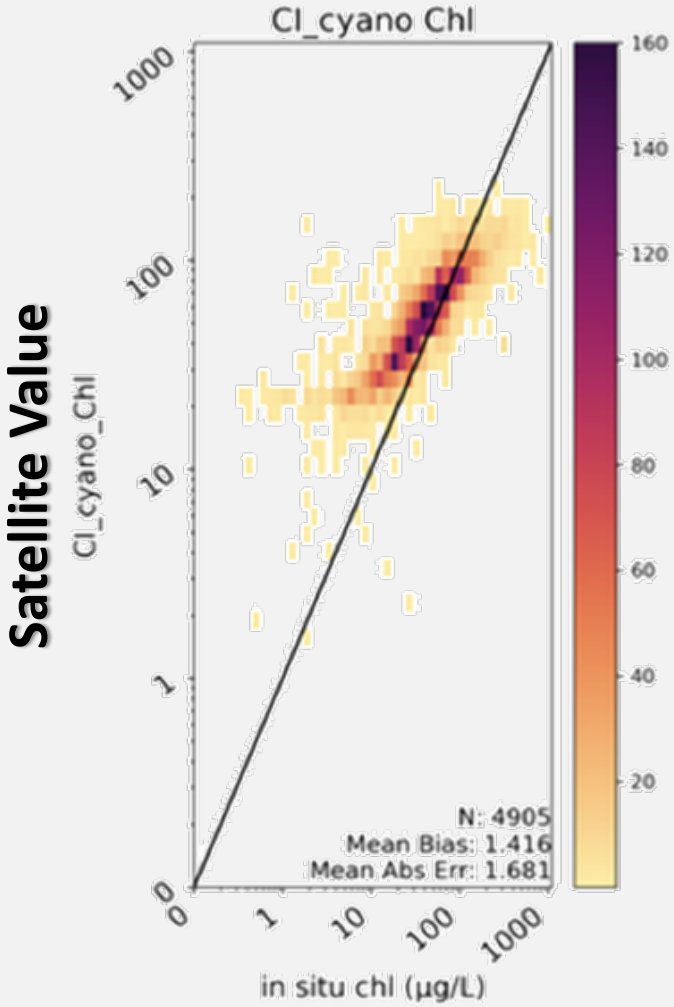
Known Issues with Satellite Remote Sensing

- Mixed pixels, drought/flood dynamics
- Ice and snow
- Provisional data may have errors
- Test QA flags now applied for mixed pixels and snow/ice

Initial Chlorophyll Validation

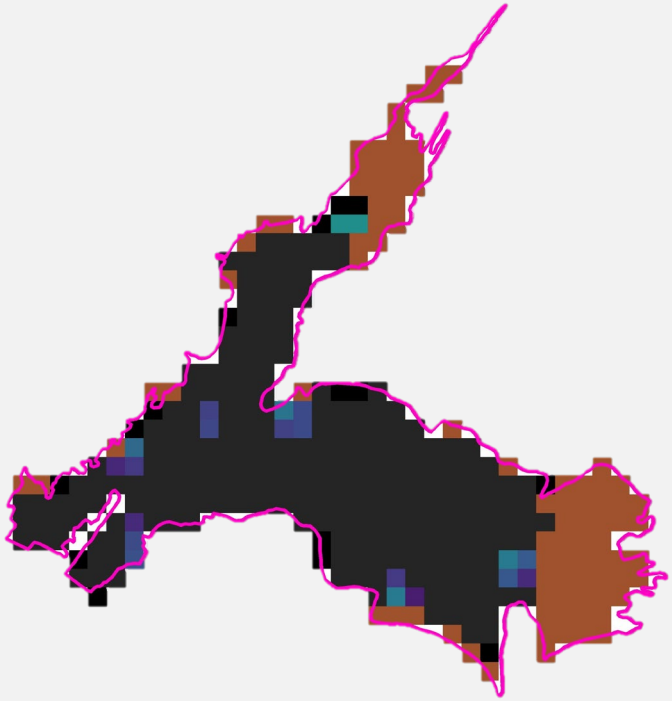


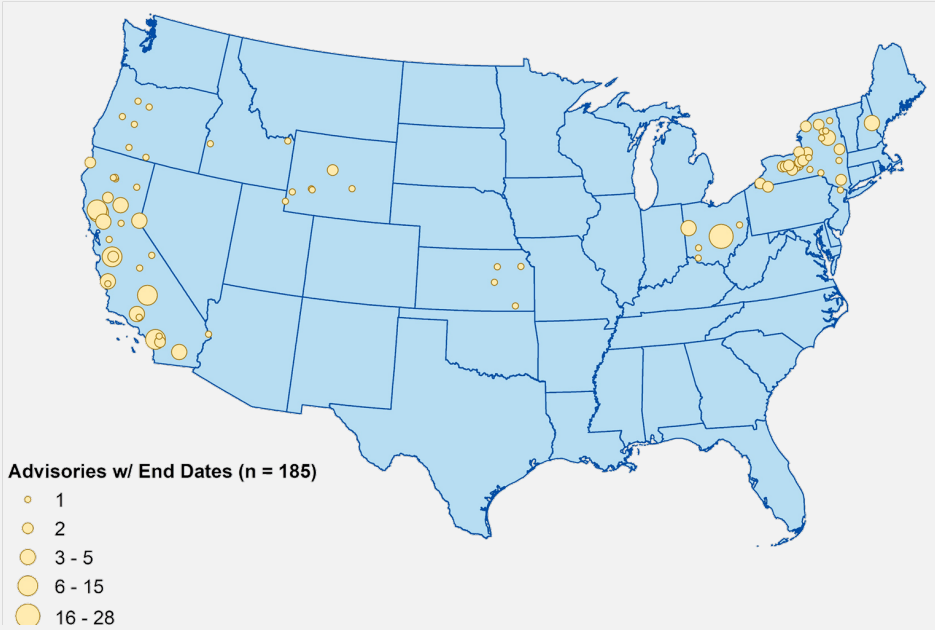
Seegers et al. In Prep.



Bottle Samples

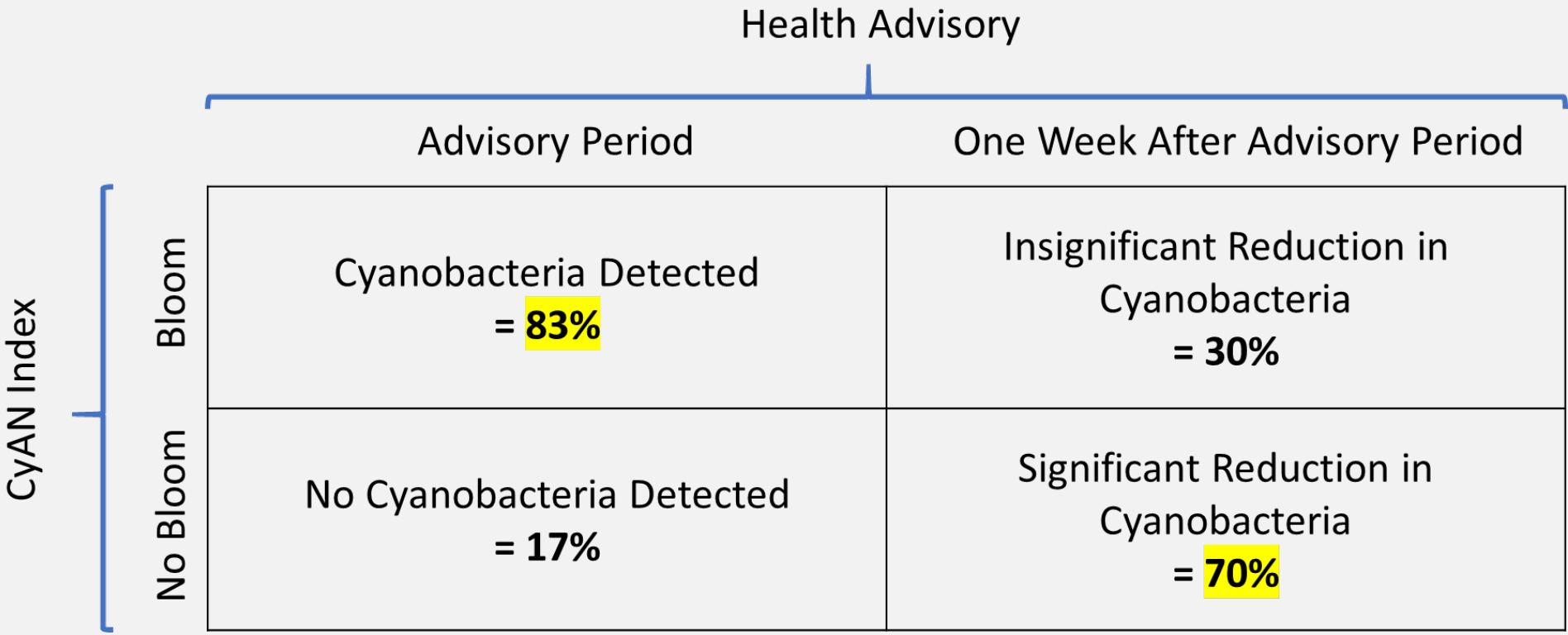
State Health Advisory Validation





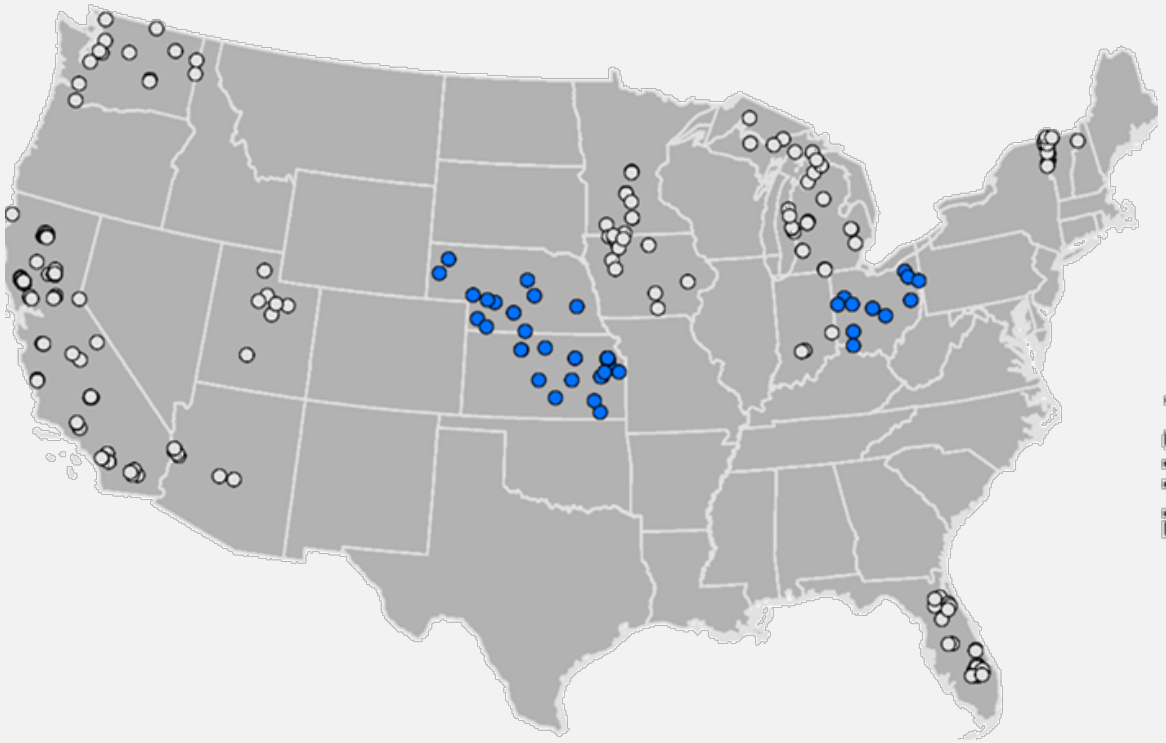
Whitman et al., *In Prep.*

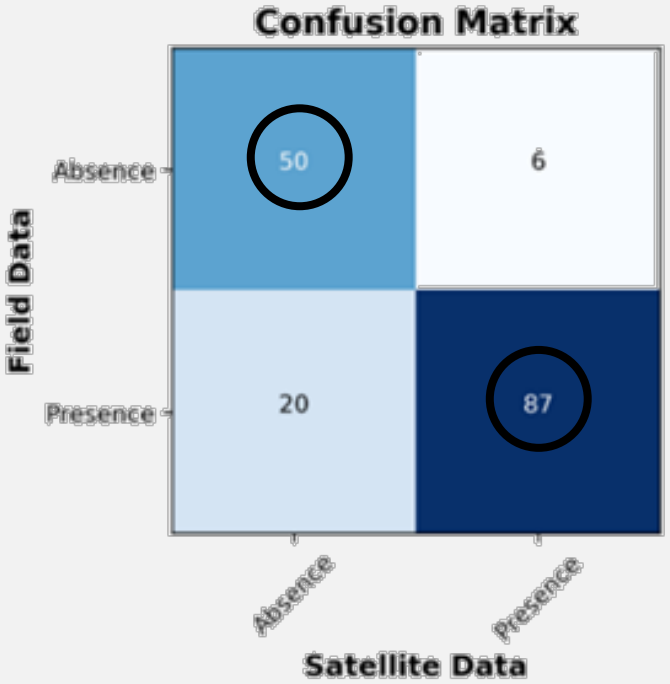
Health Advisory Validation



Whitman et al., *In Prep.*

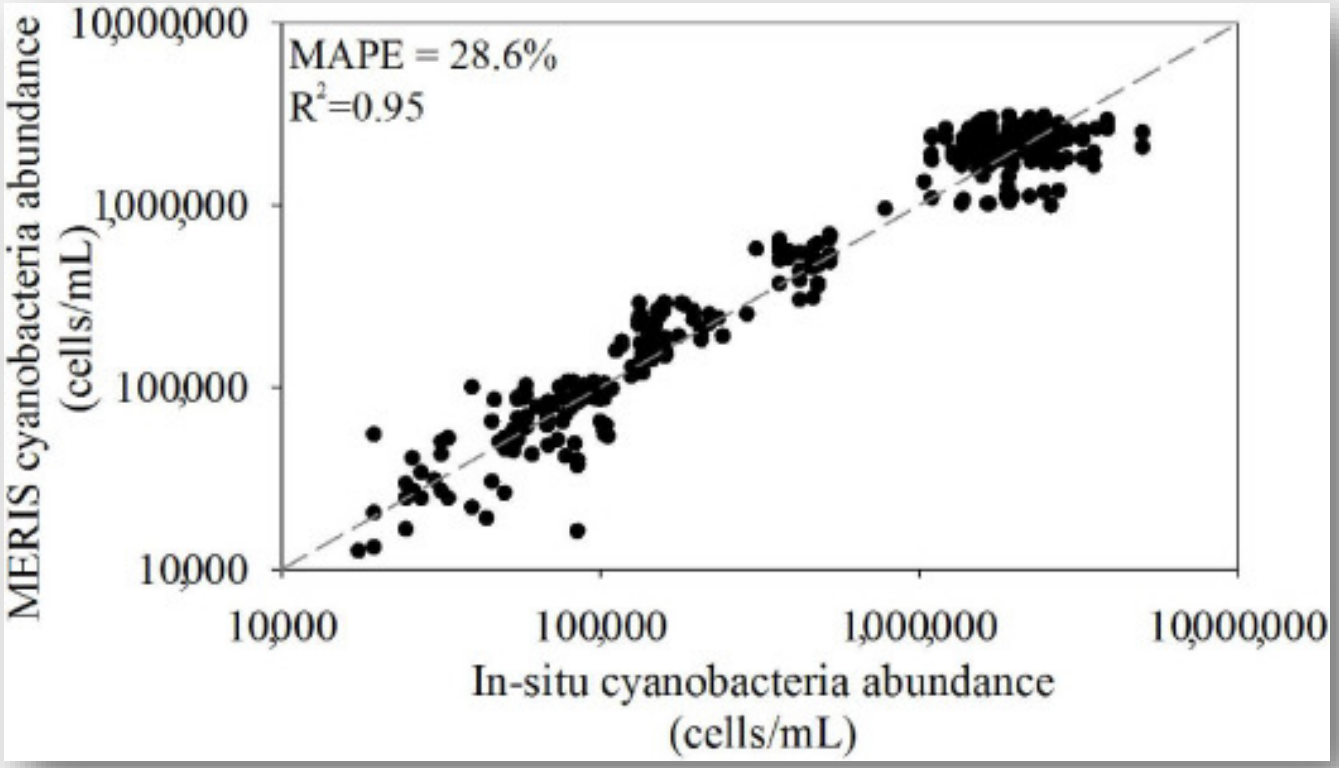
Toxin Health Advisory Validation





Mishra et al. In Prep.

Initial Cyanobacteria Validation



Satellite Value

Bottle Samples

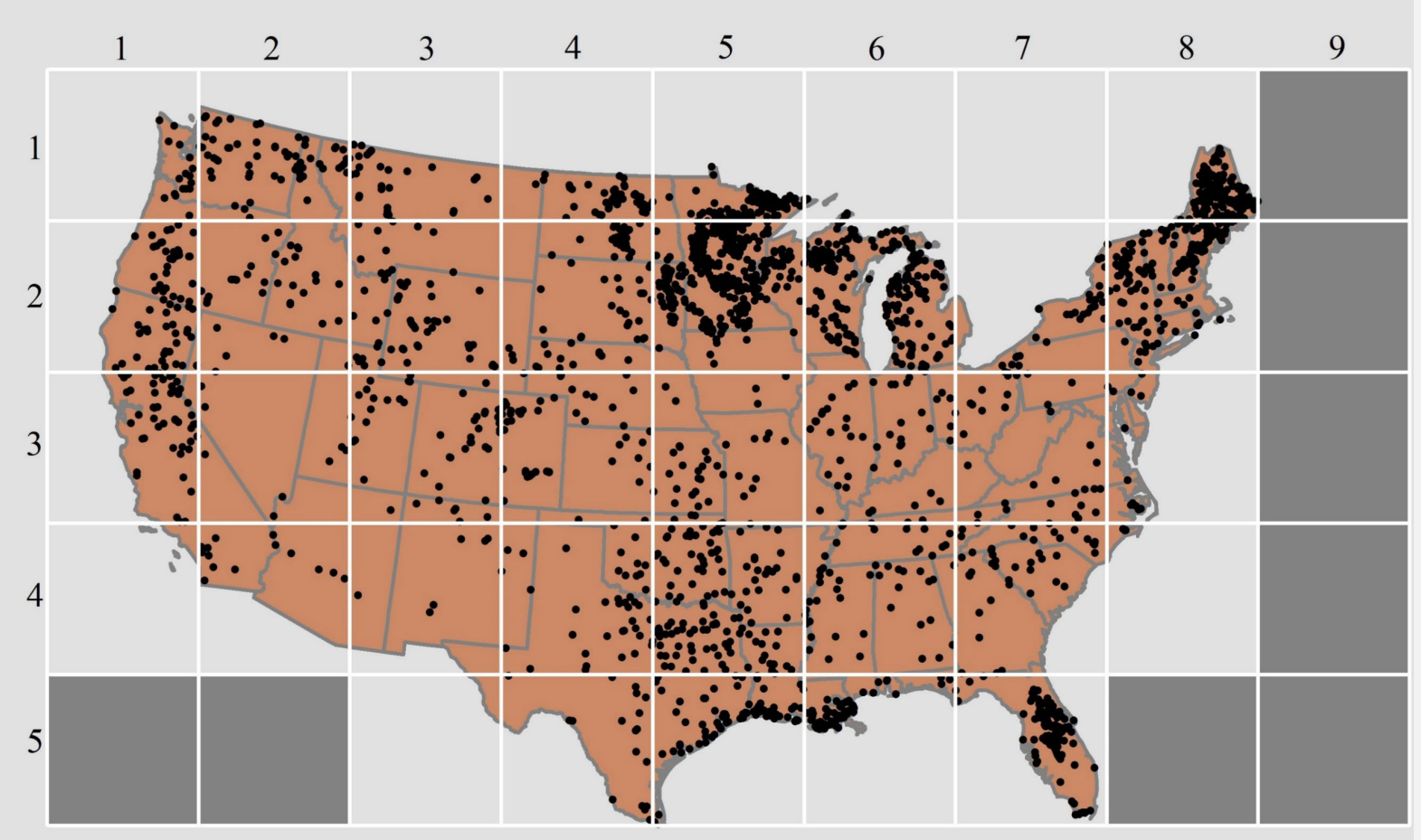
Satellite results represent what is seen in the field.

Clark et al. 2015. Ecological Indicators.
doi.org/10.1016/j.ecolind.2017.04.046

Lunetta et al. 2015. Remote Sensing of Environment.
doi.org/10.1016/j.rse.2014.06.008

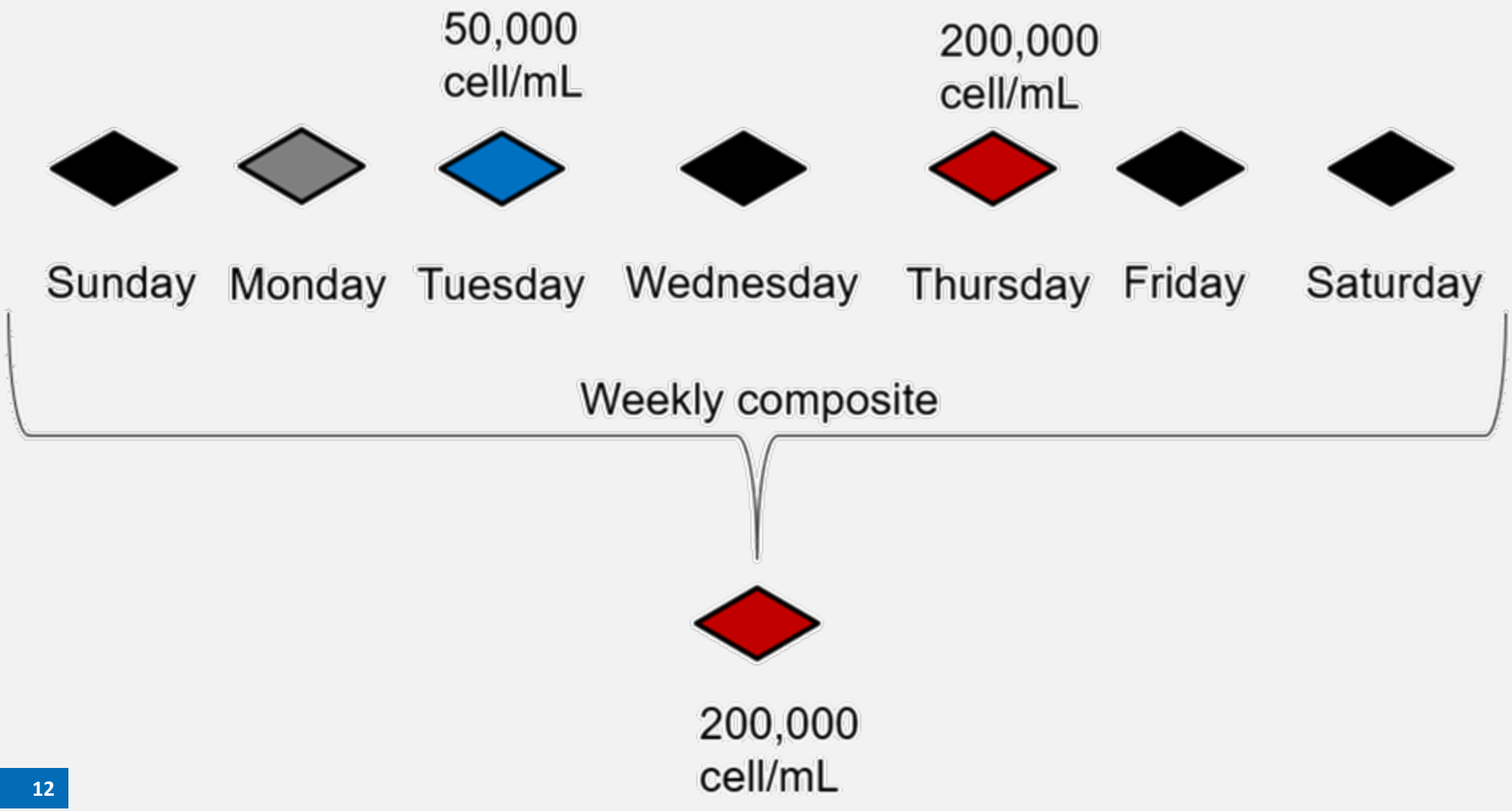
Can I use the CyAN App for my lake?

CyAN app provides access to cyanobacterial bloom satellite data for over 2,000 of the largest lakes and reservoirs across the US

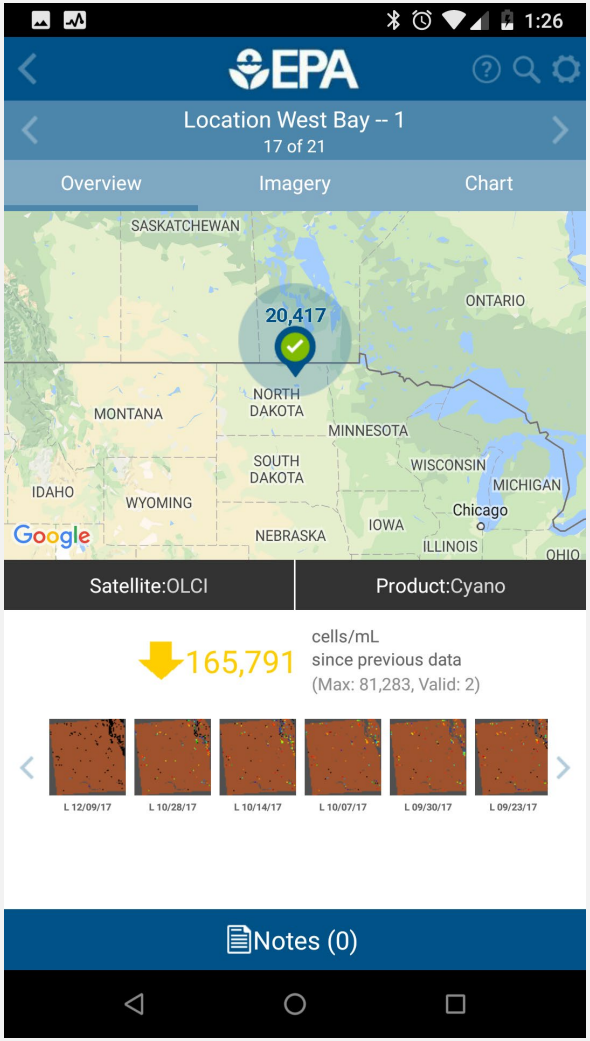


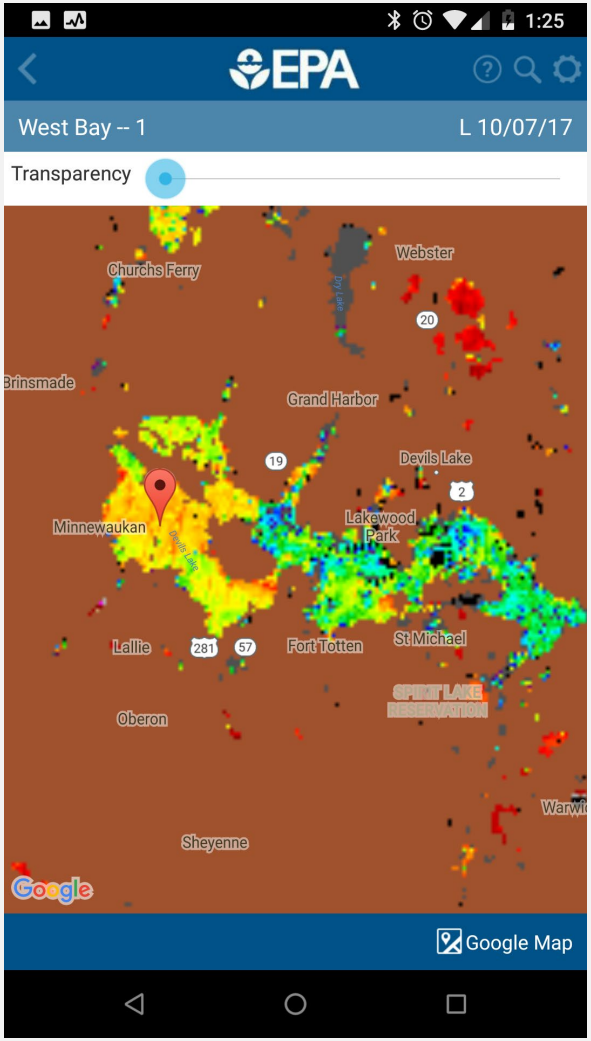
Schaeffer et al 2018. Environmental Modelling & Software.
doi.org/10.1016/j.envsoft.2018.08.015

Weekly Data *Behind the Scenes*



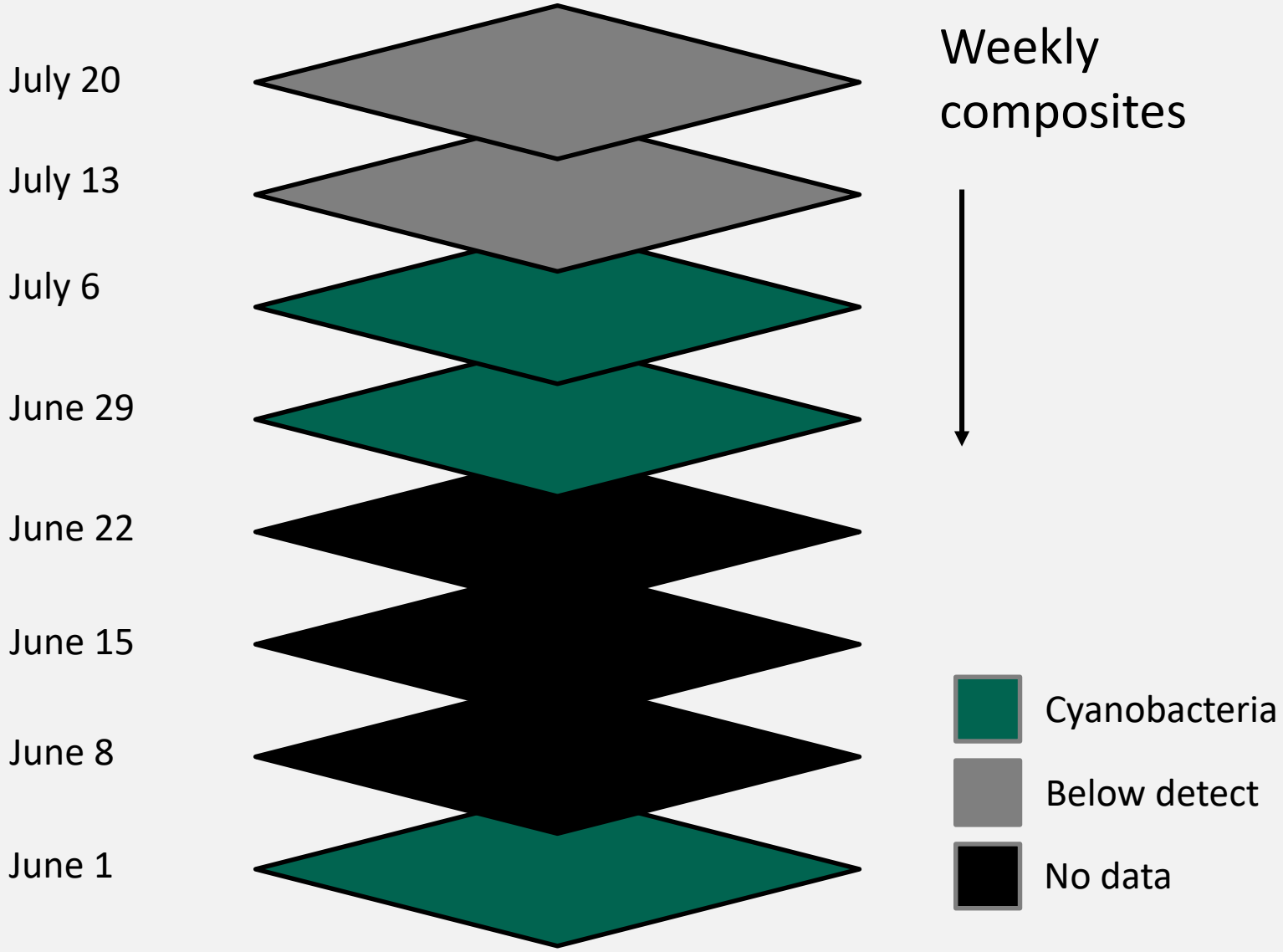
Mobile App Overview

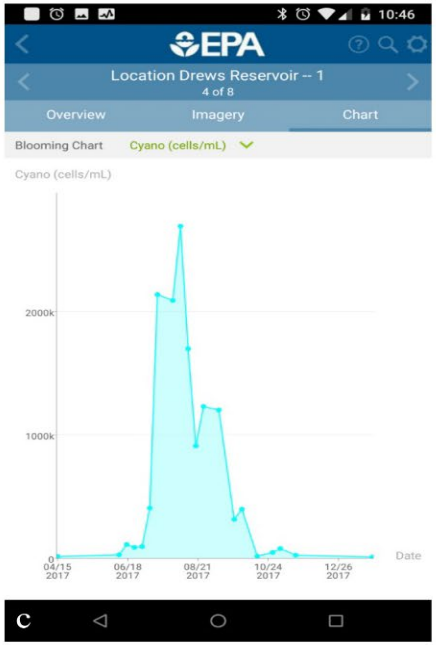


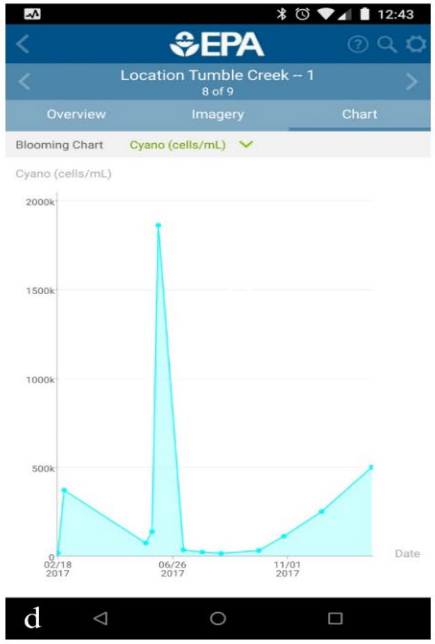


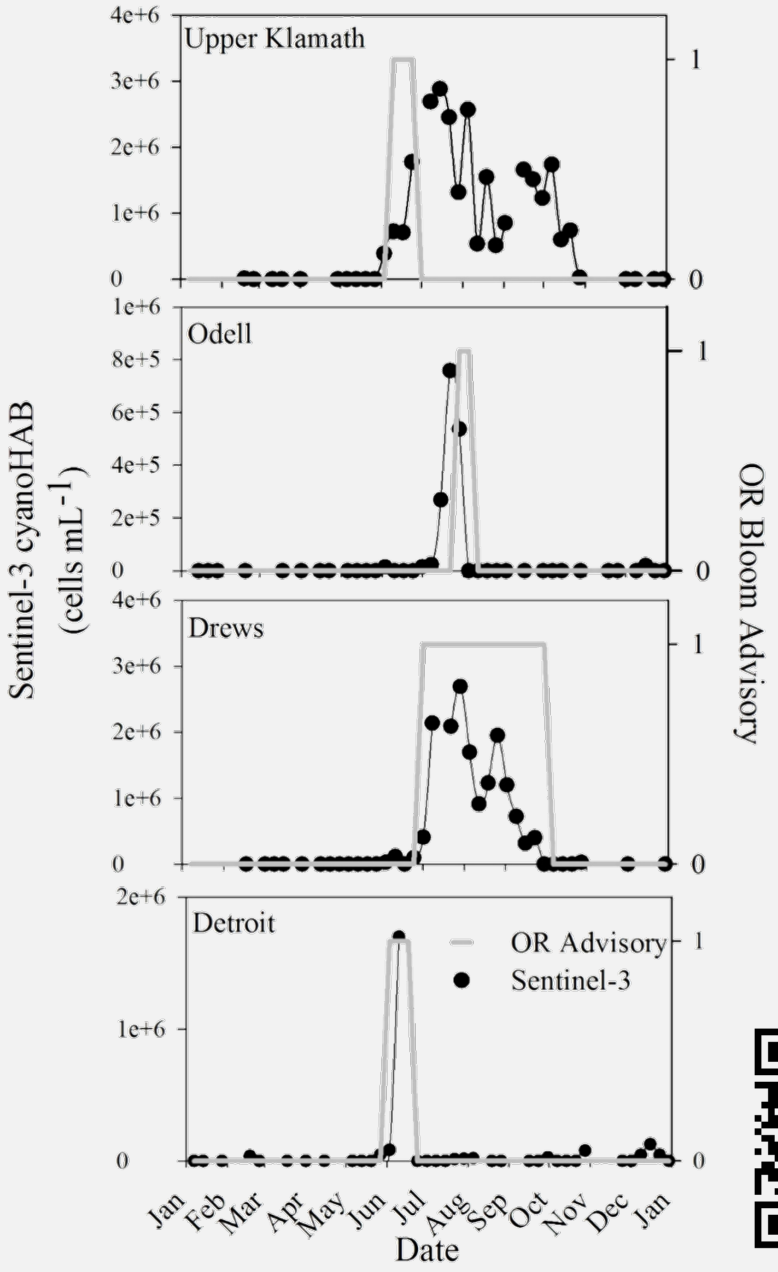
Is the App Up-to-Date?

Only reports when cyanobacteria is detected.









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Step-by-Step Training

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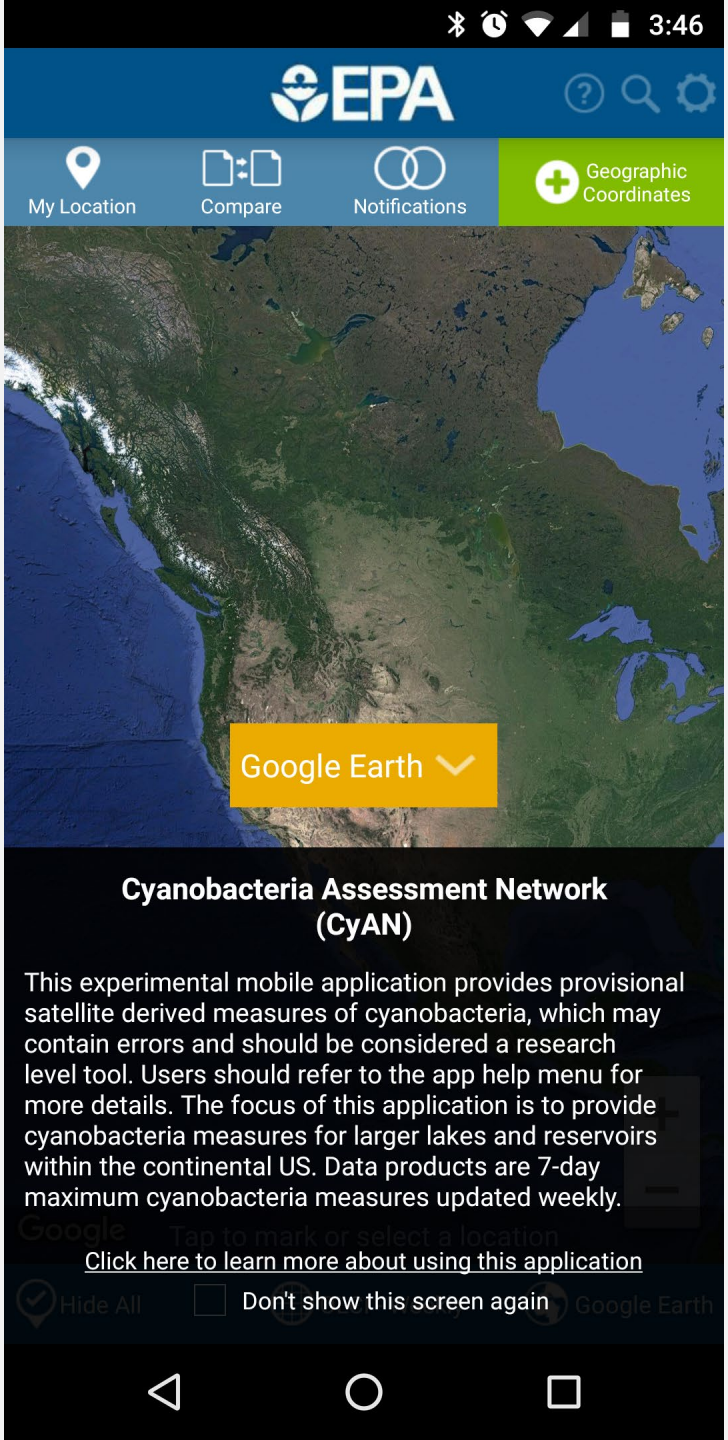
Single point location example



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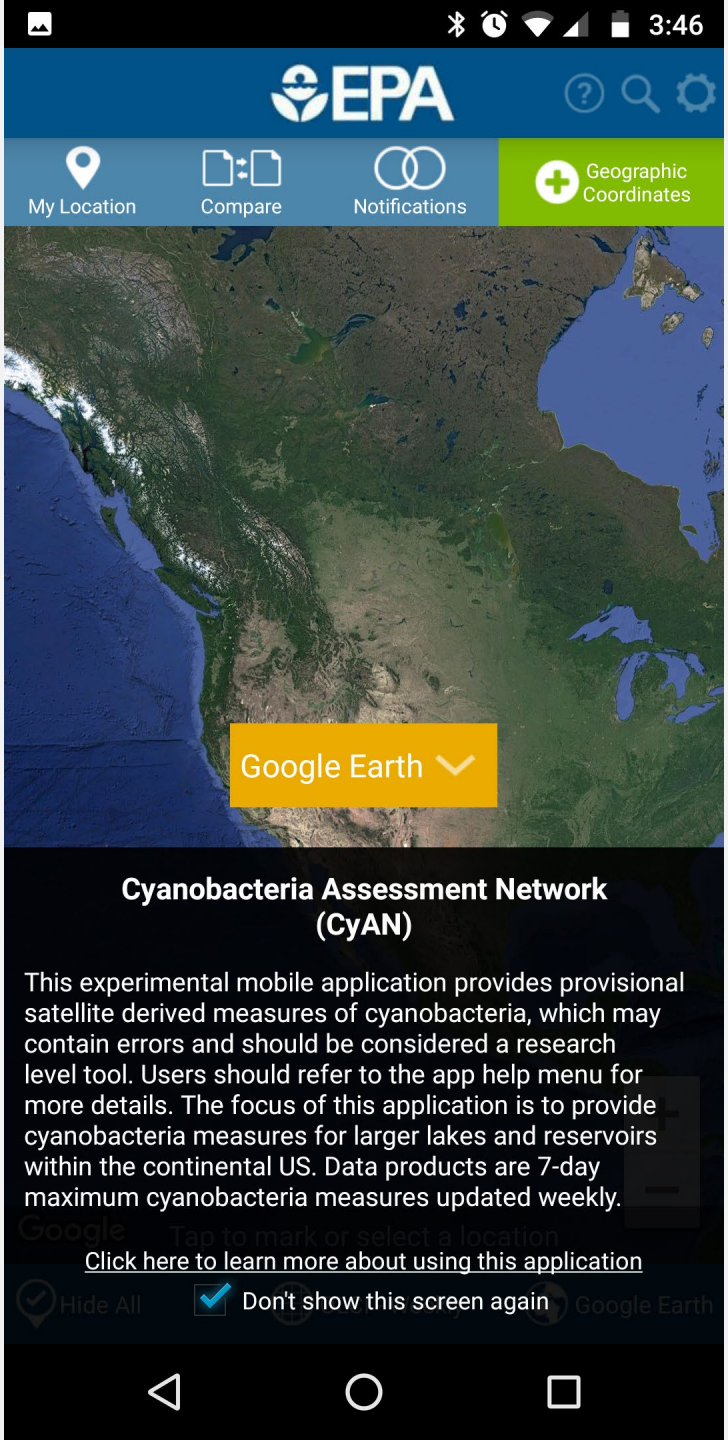

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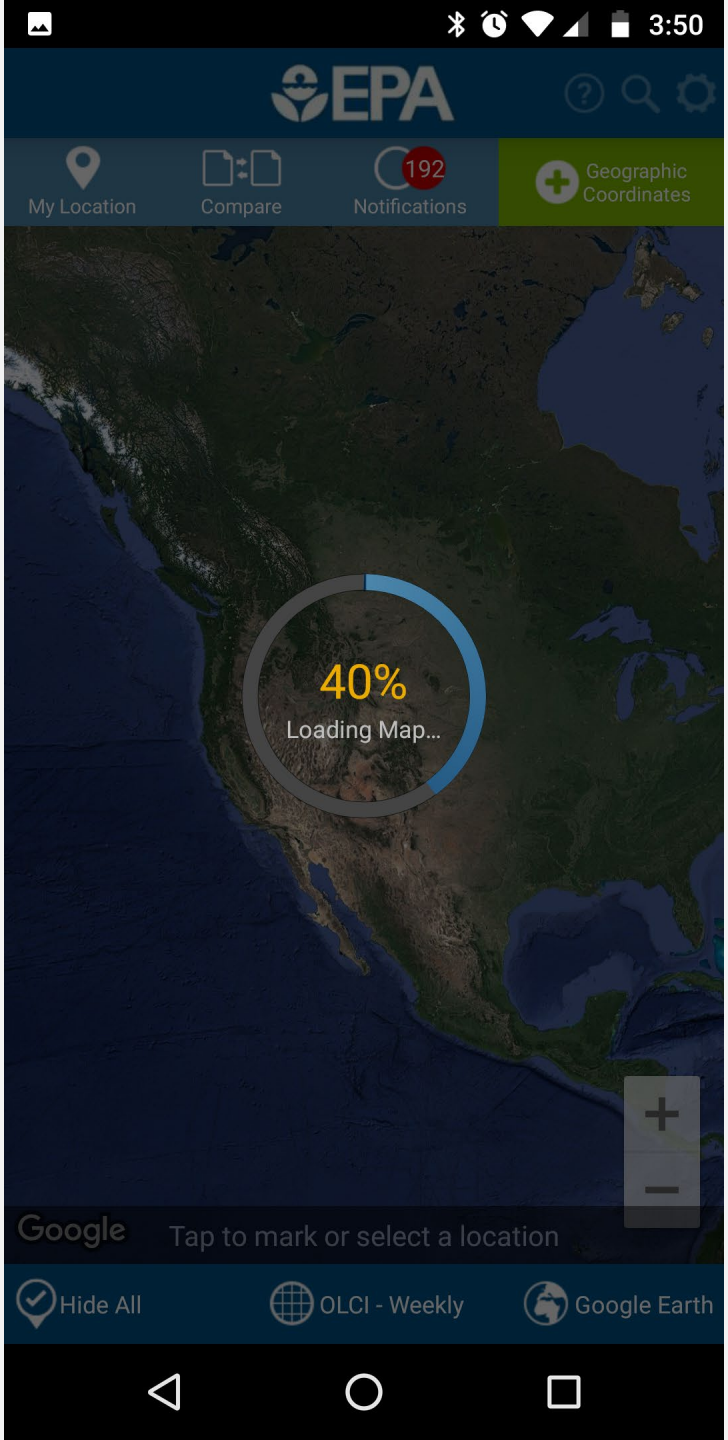

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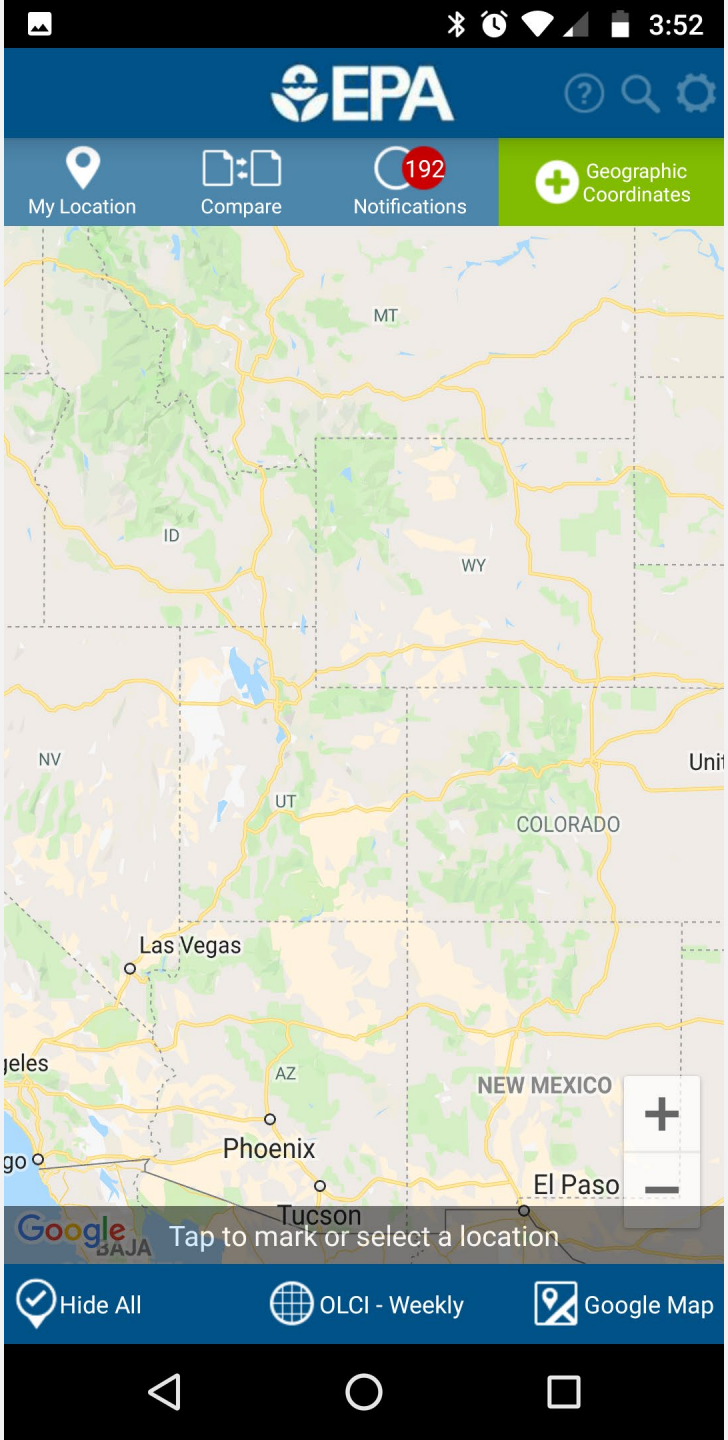

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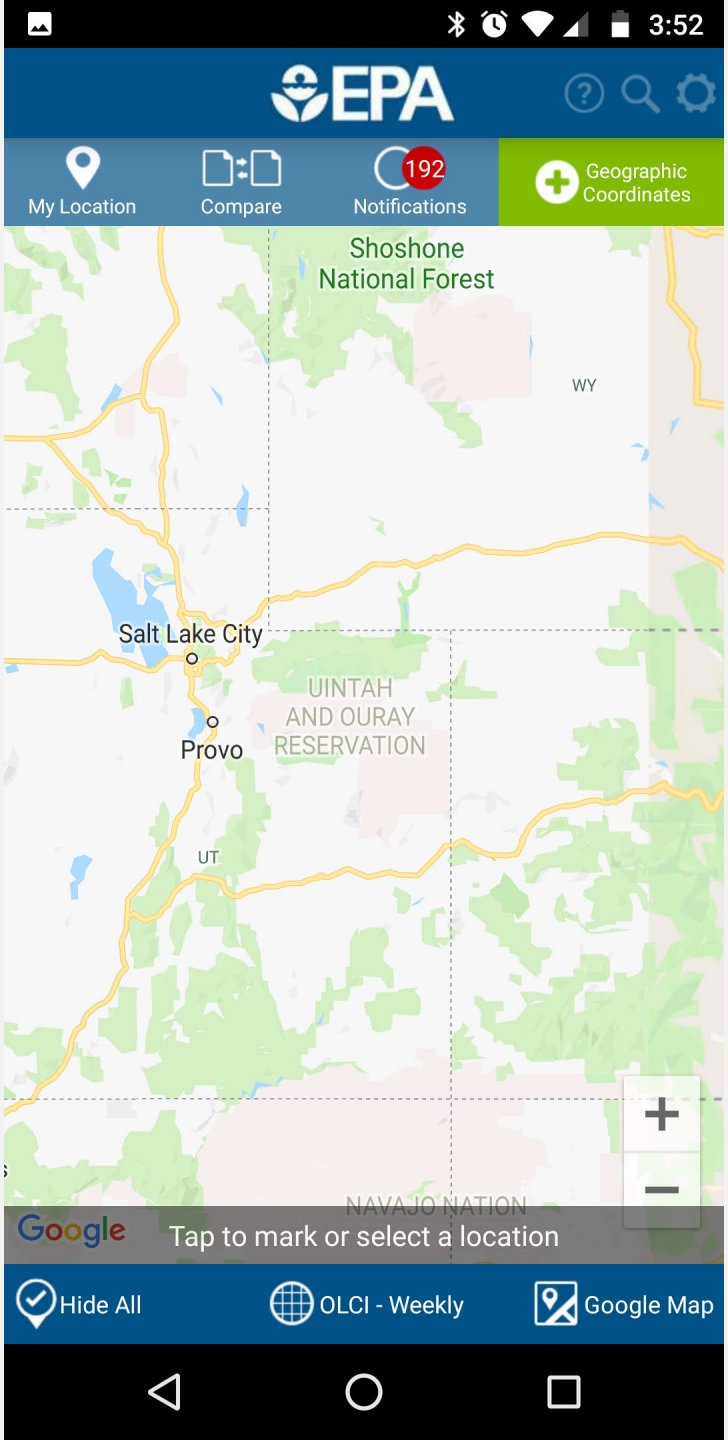

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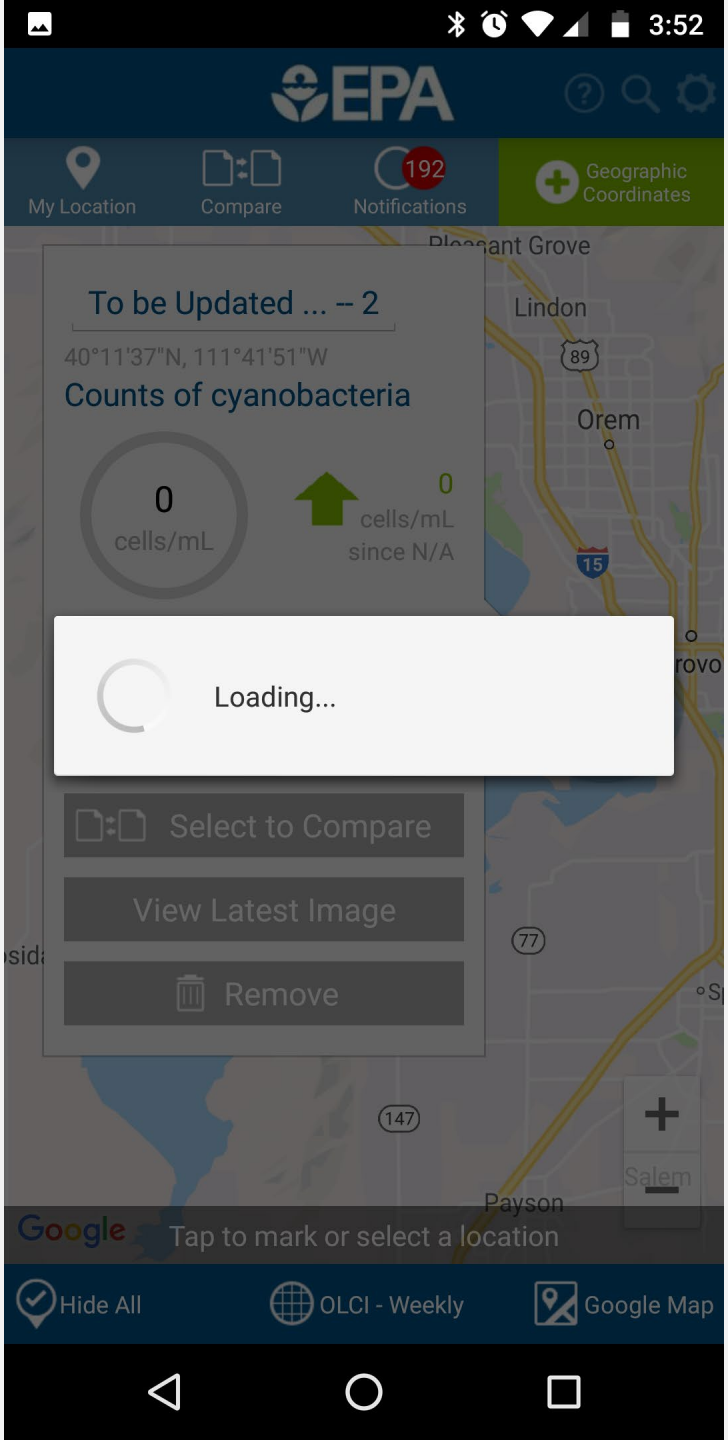

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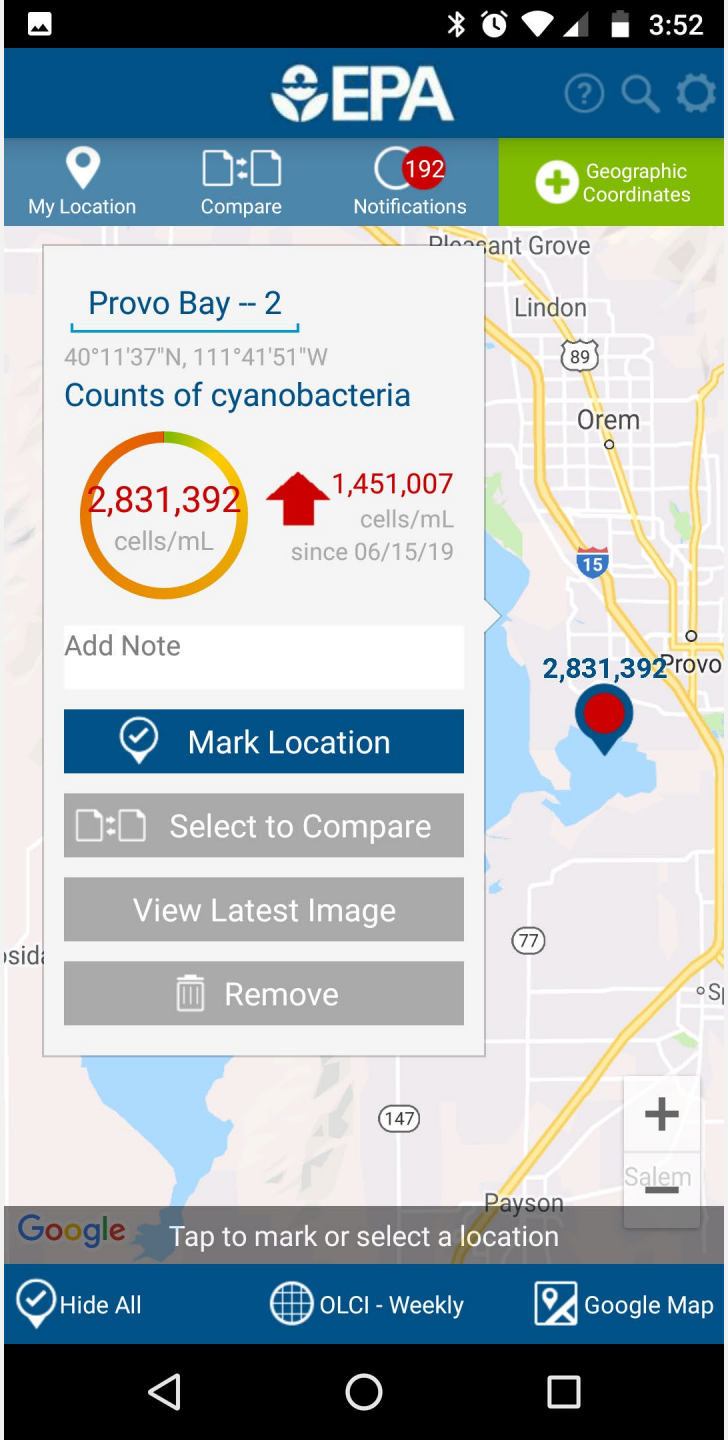

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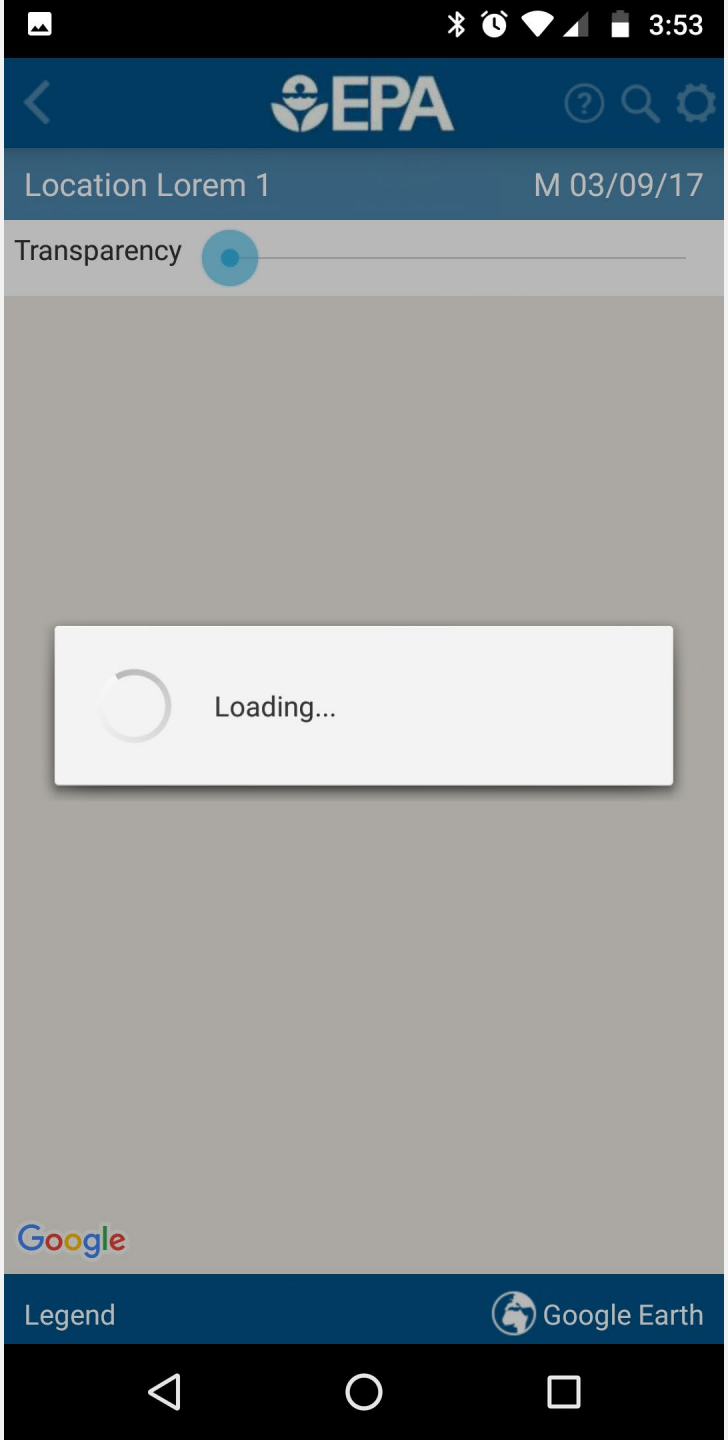

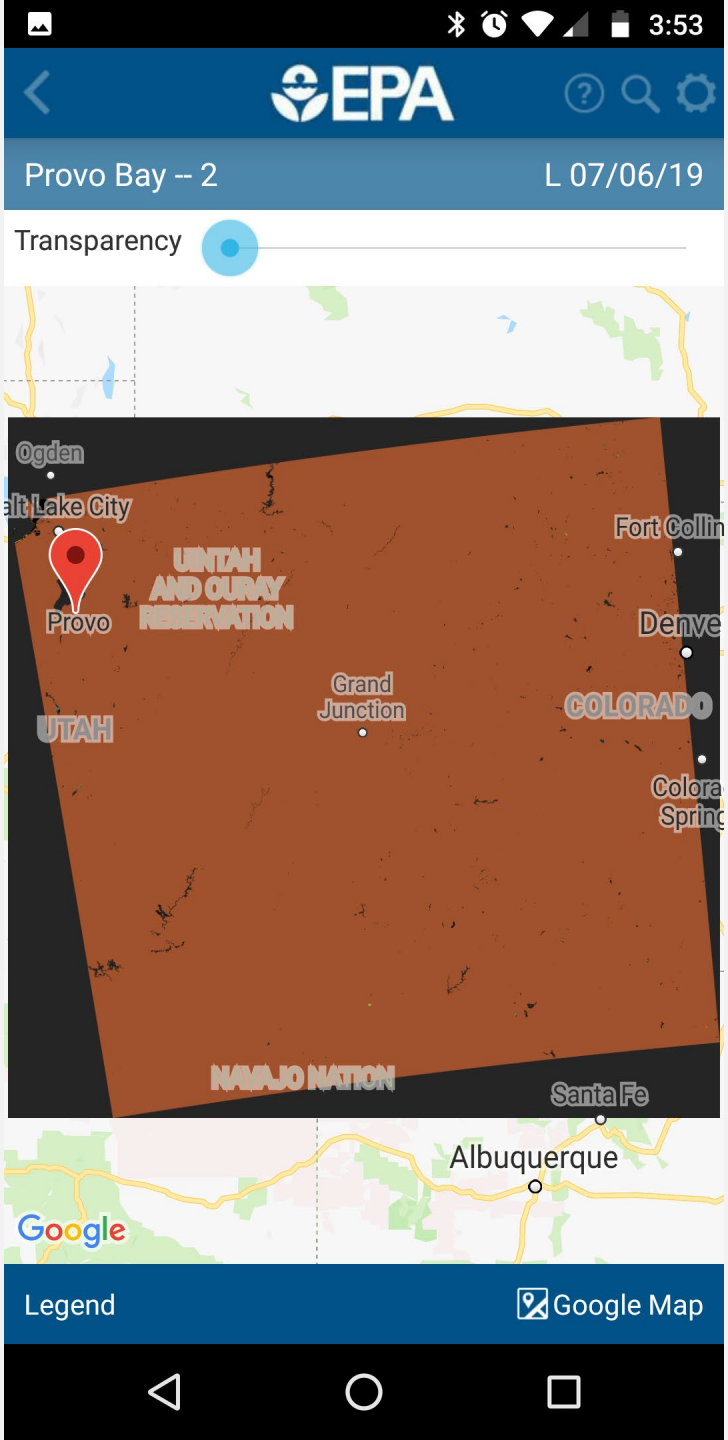
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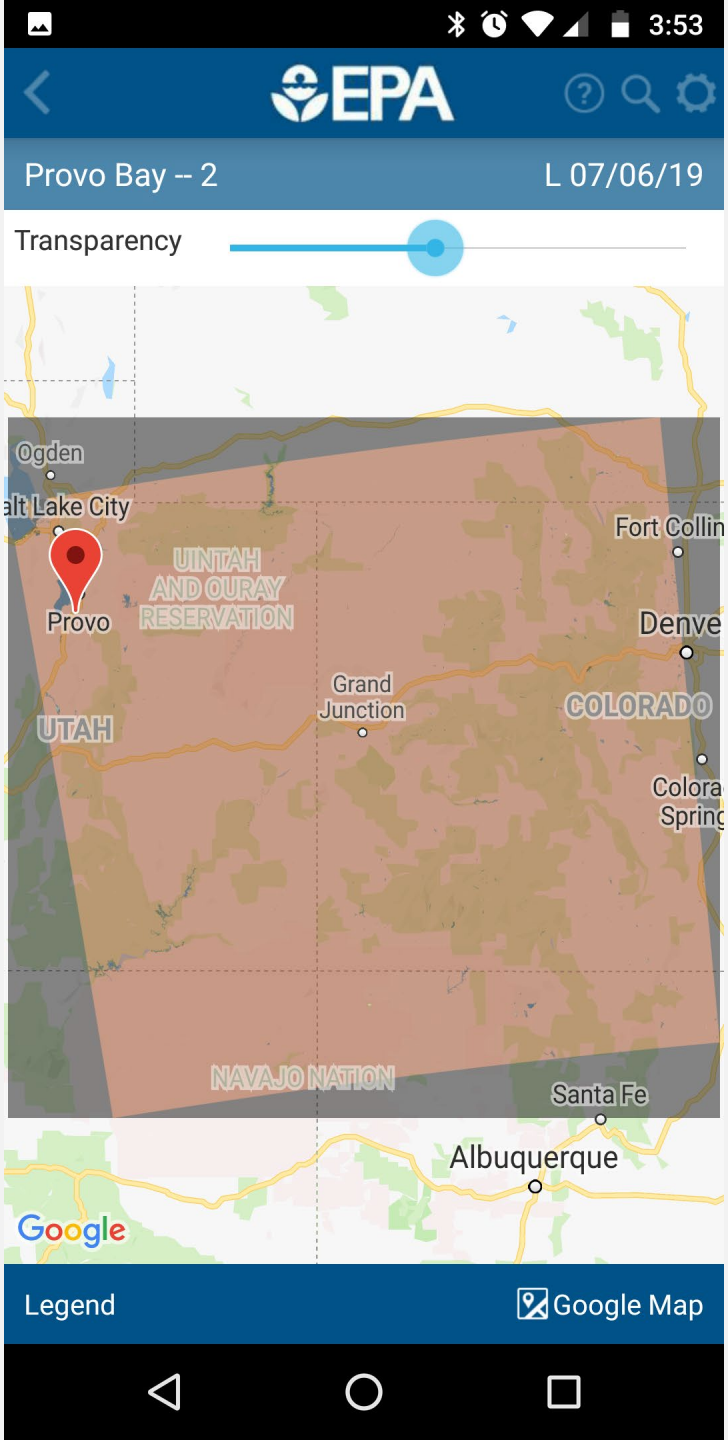
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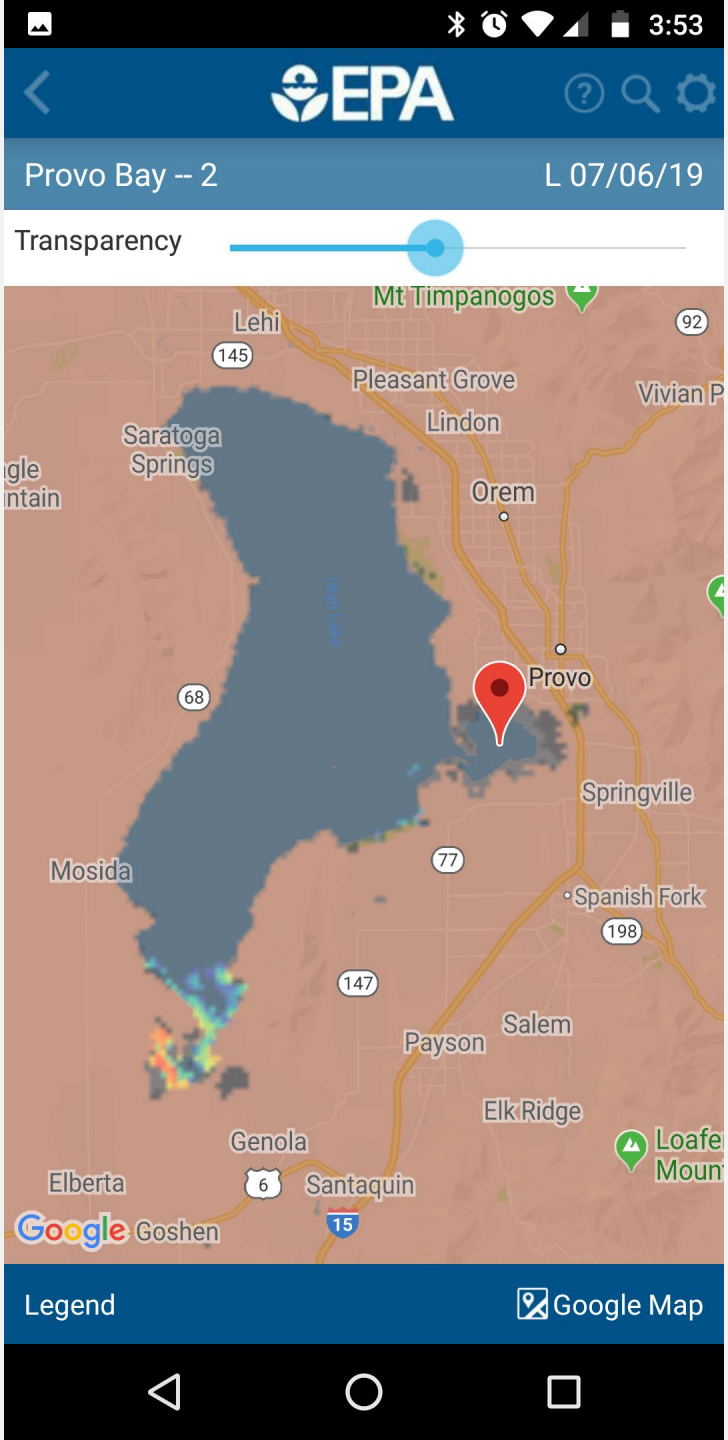

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View the country in minutes

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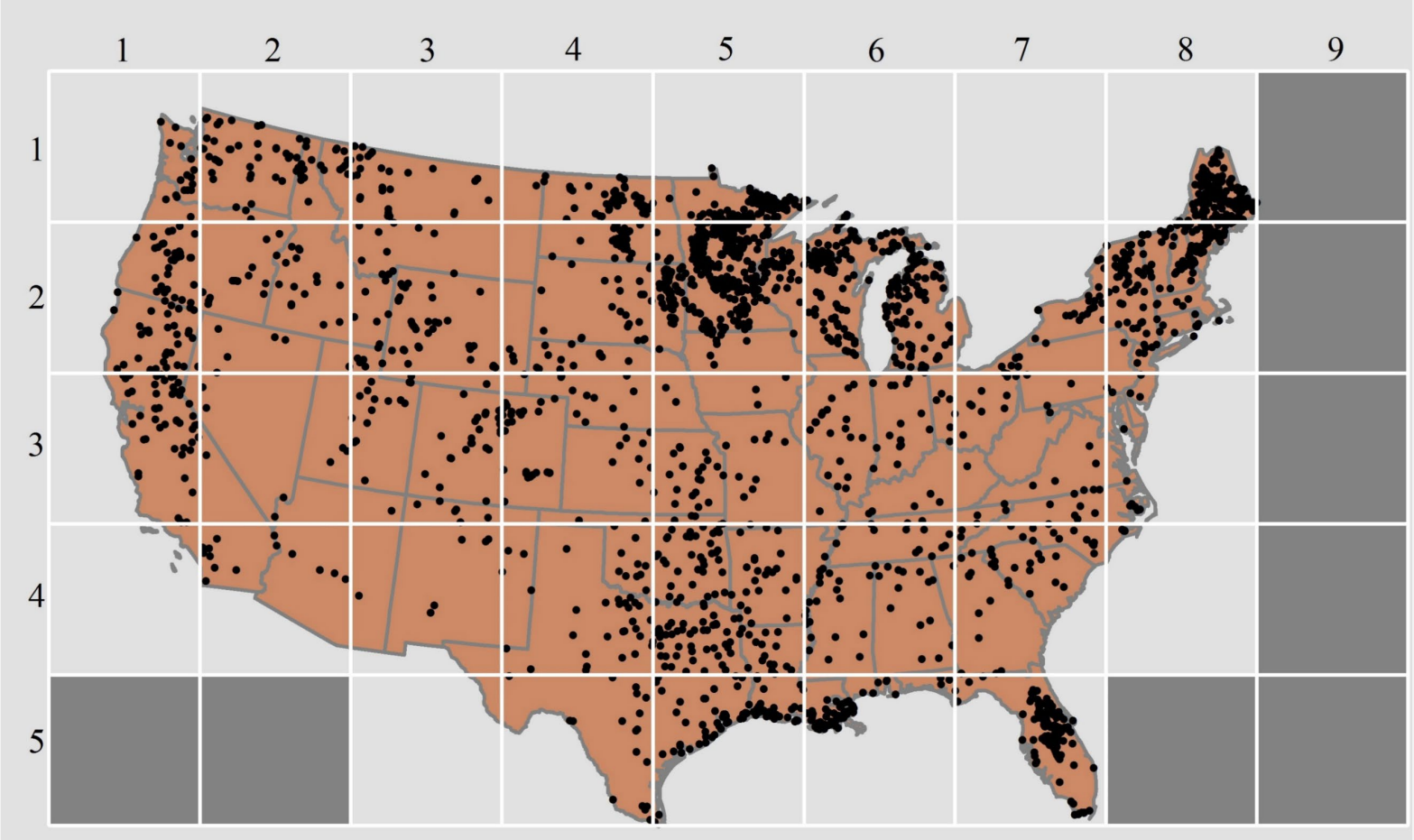

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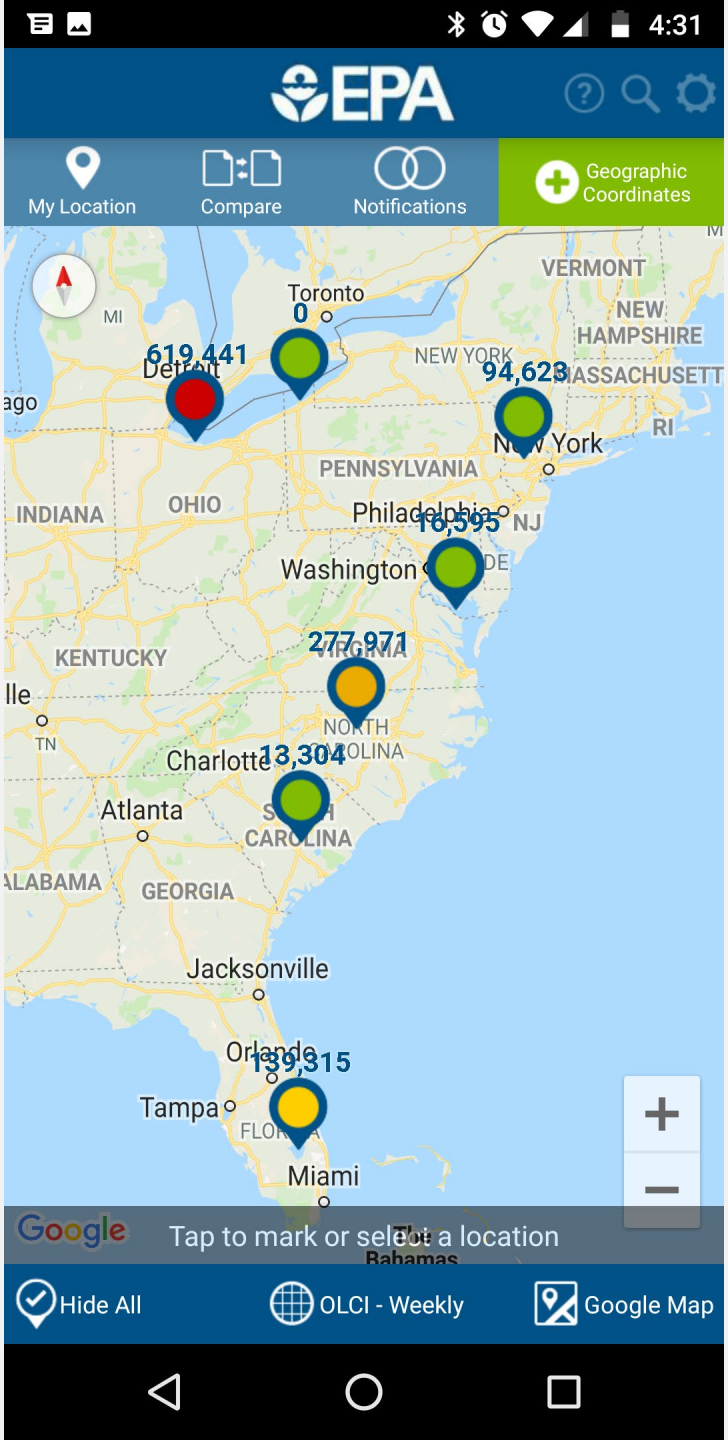

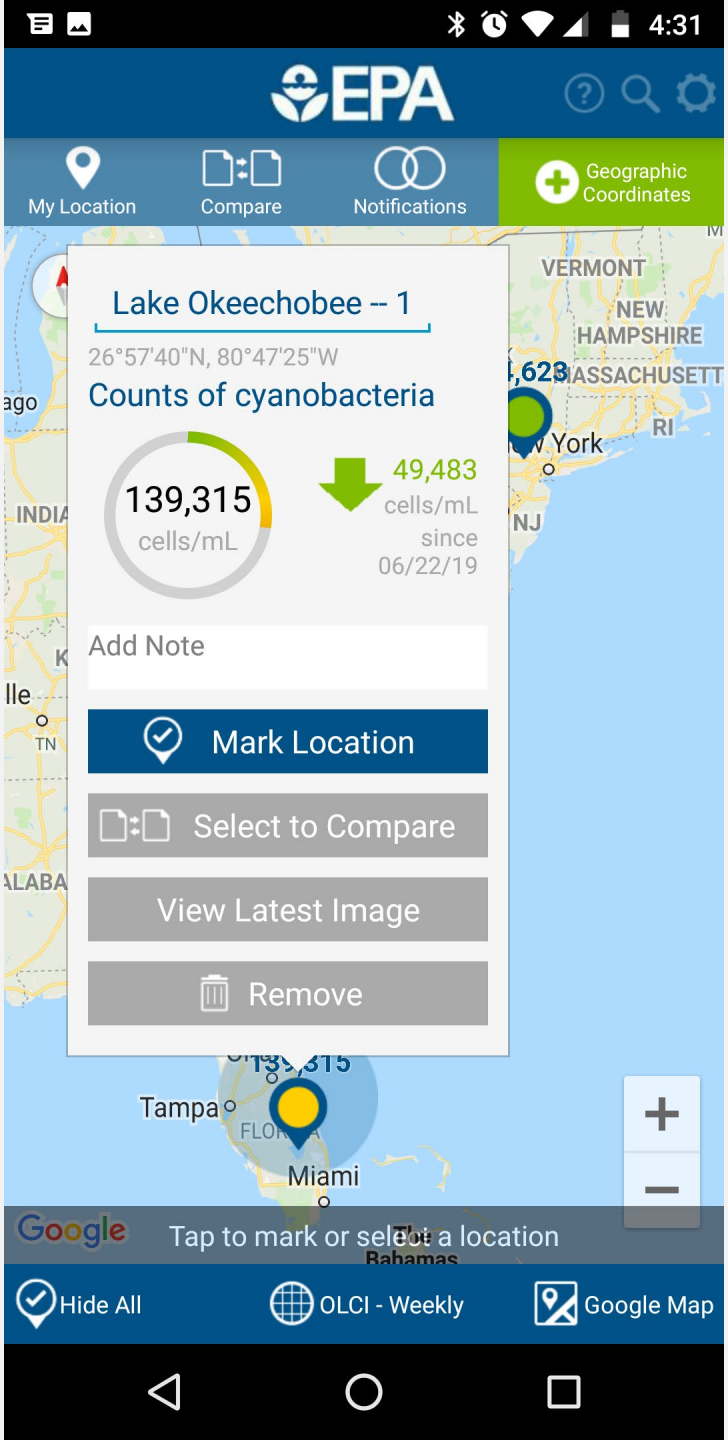
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Counts of cyanobacteria
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cells/mL
49,483
cells/mL
since
06/22/19
Add Note
Mark Location
Select to Compare
View Latest Image
Remove
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Miami
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Tap to mark or select a location
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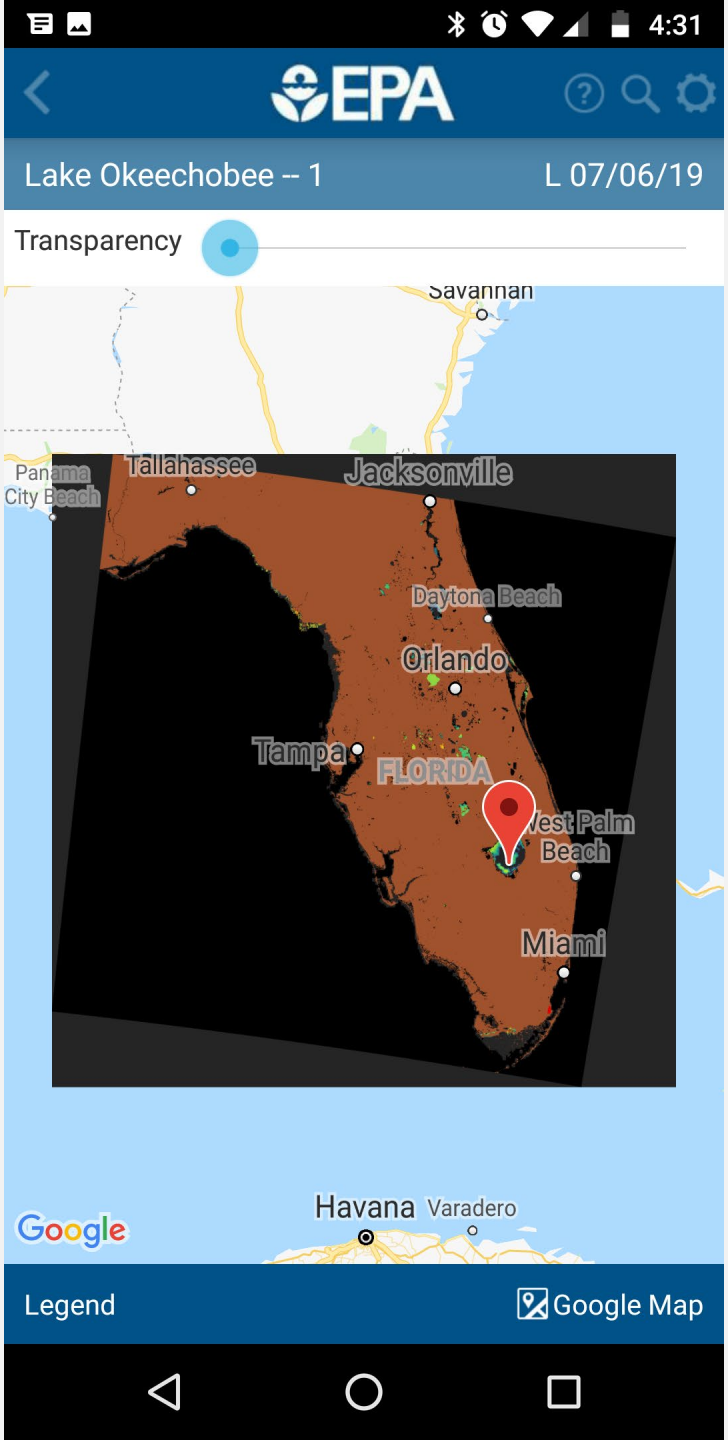
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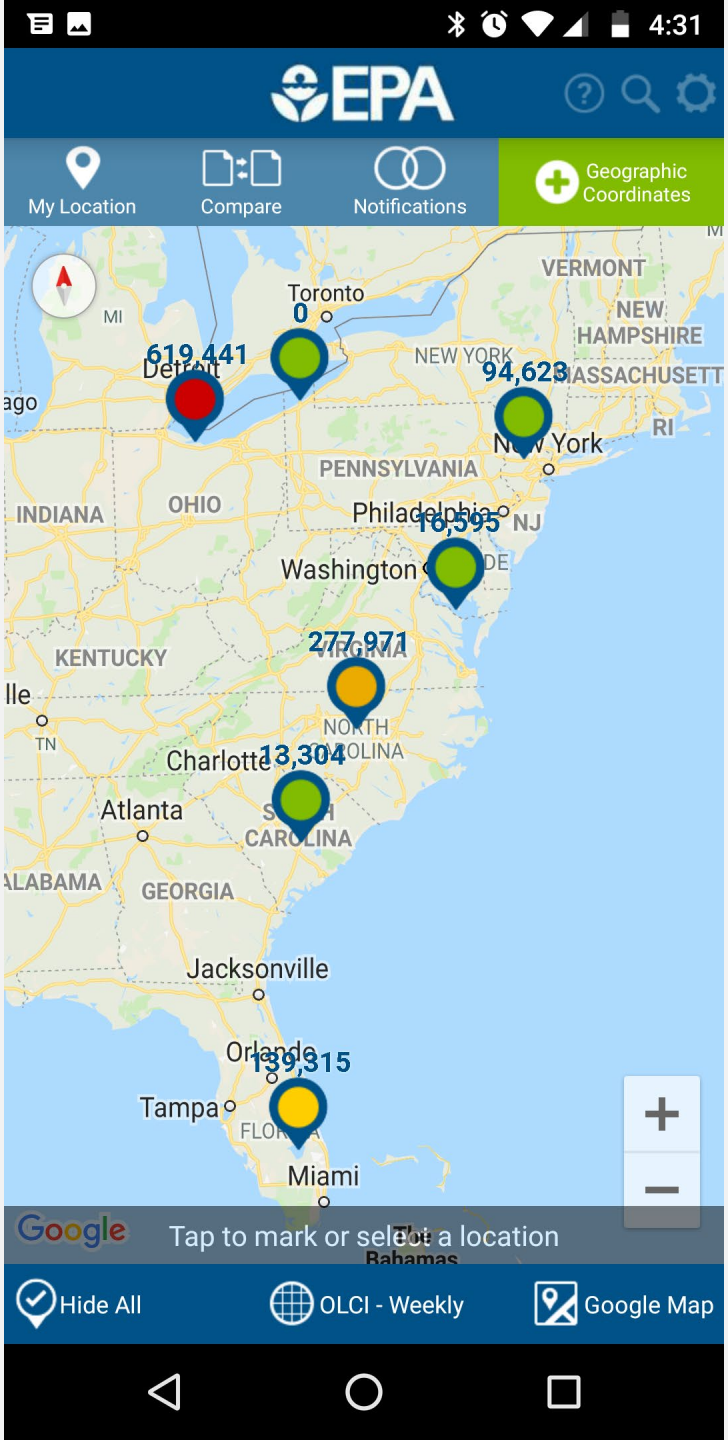

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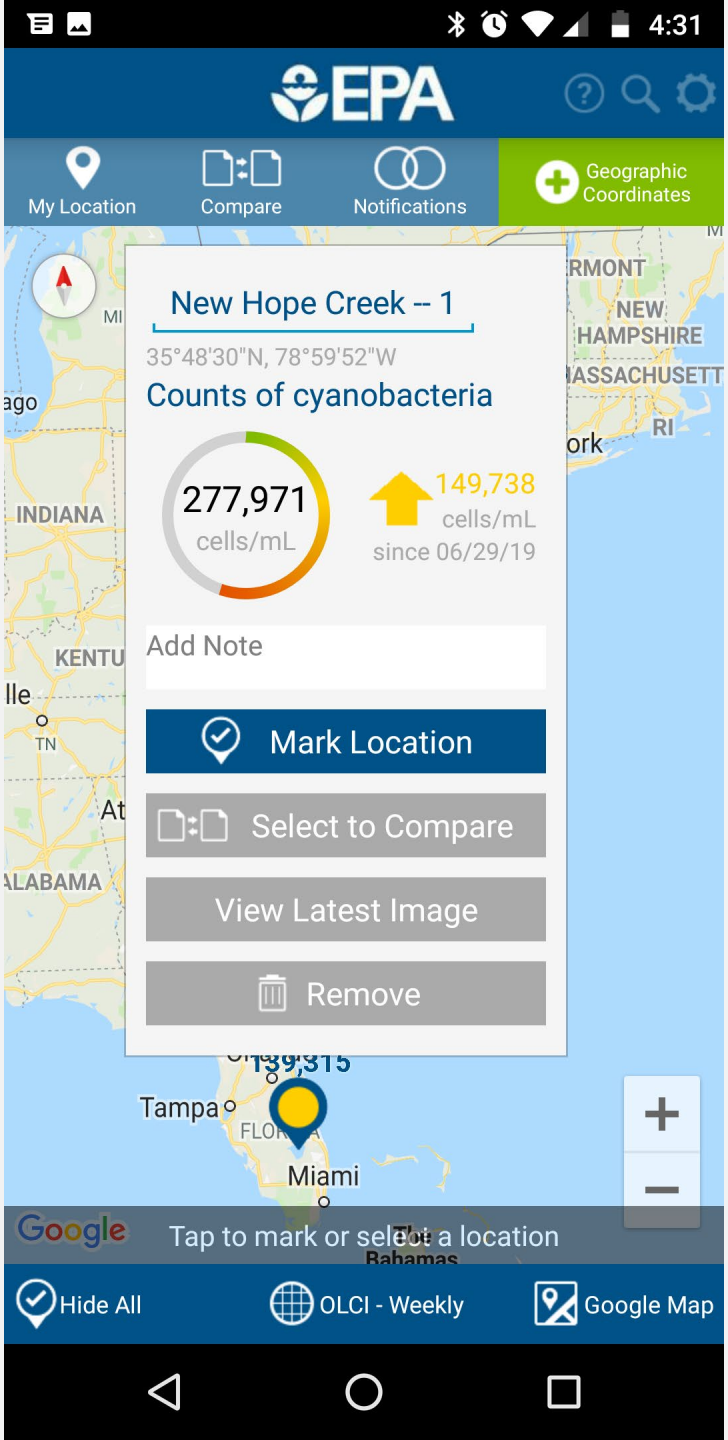

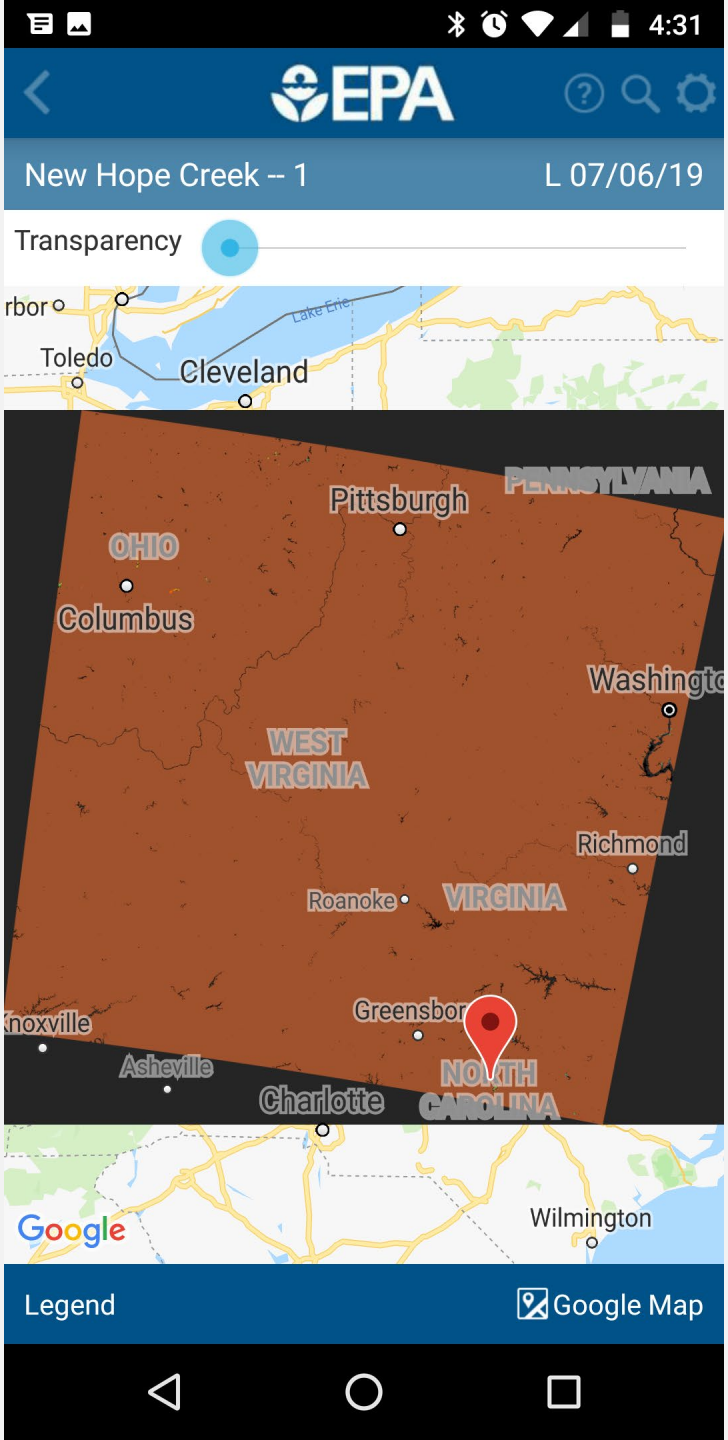
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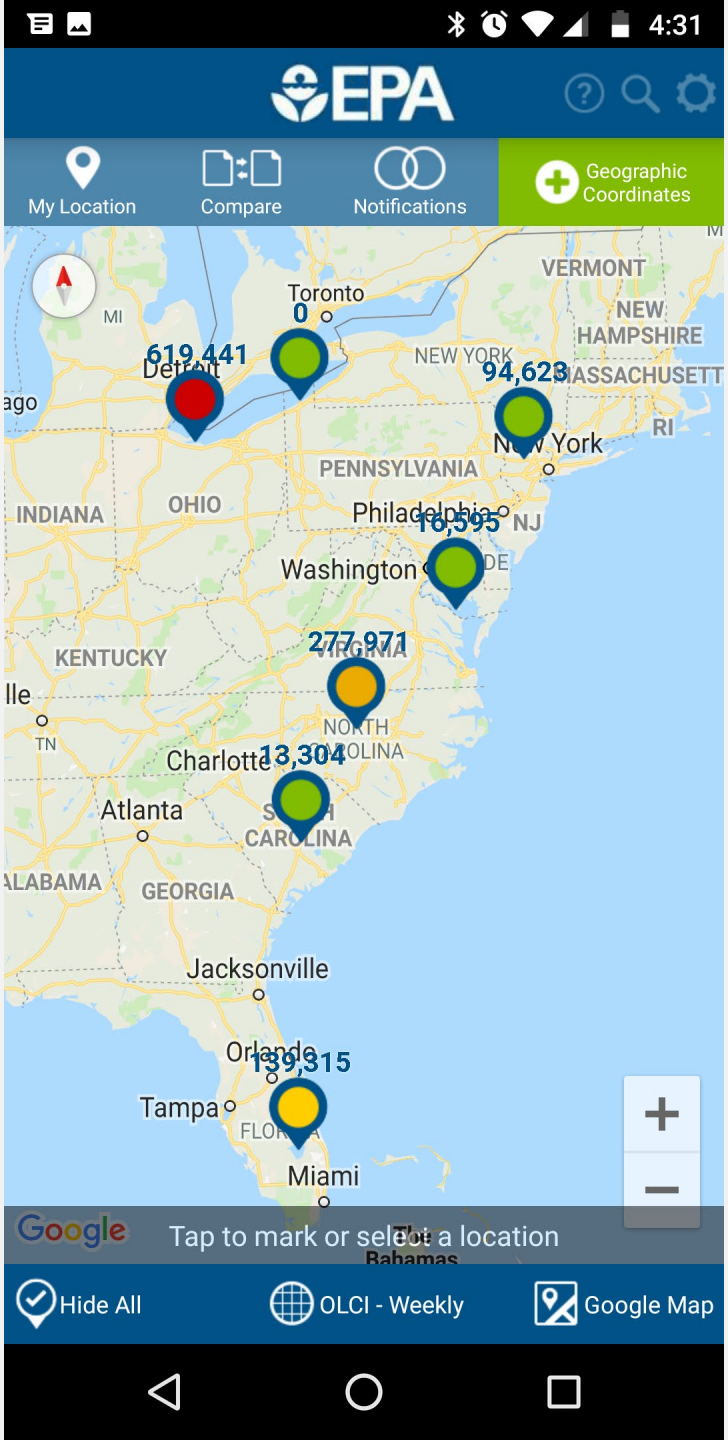

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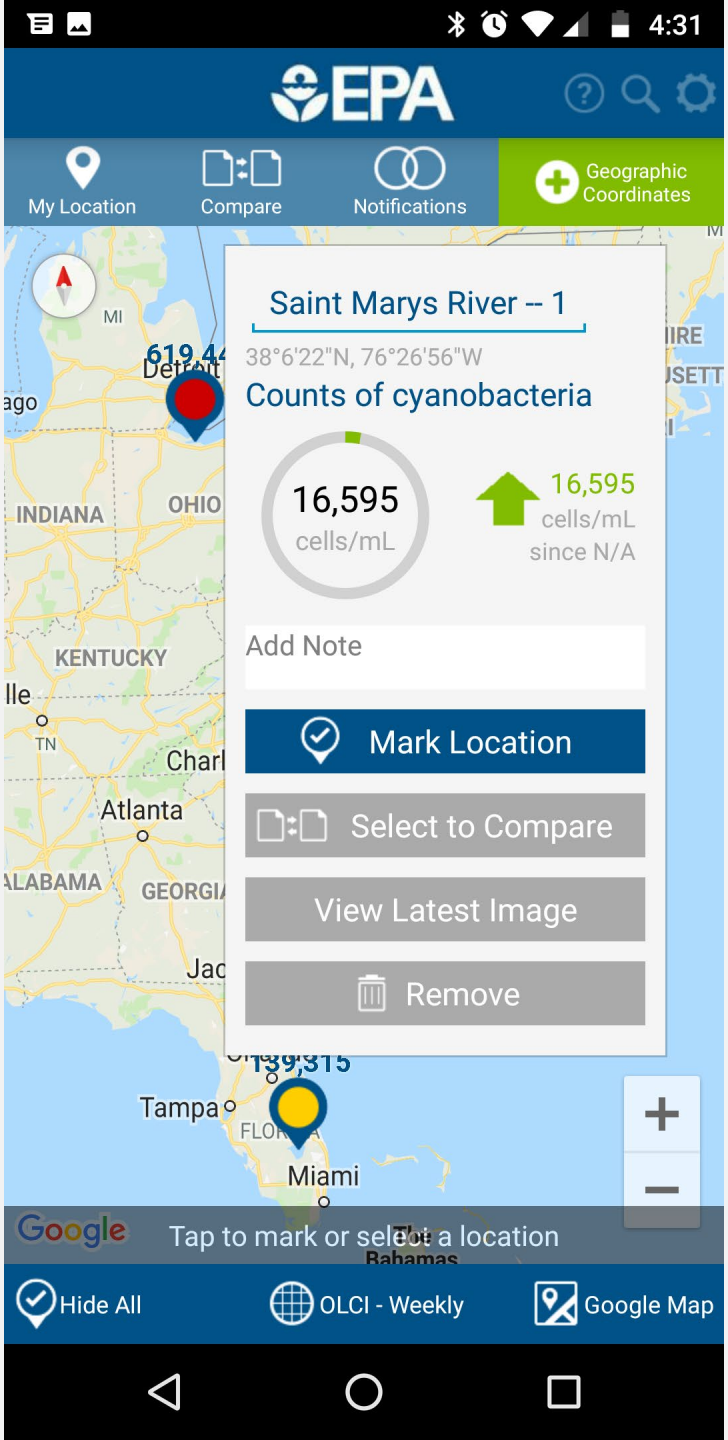

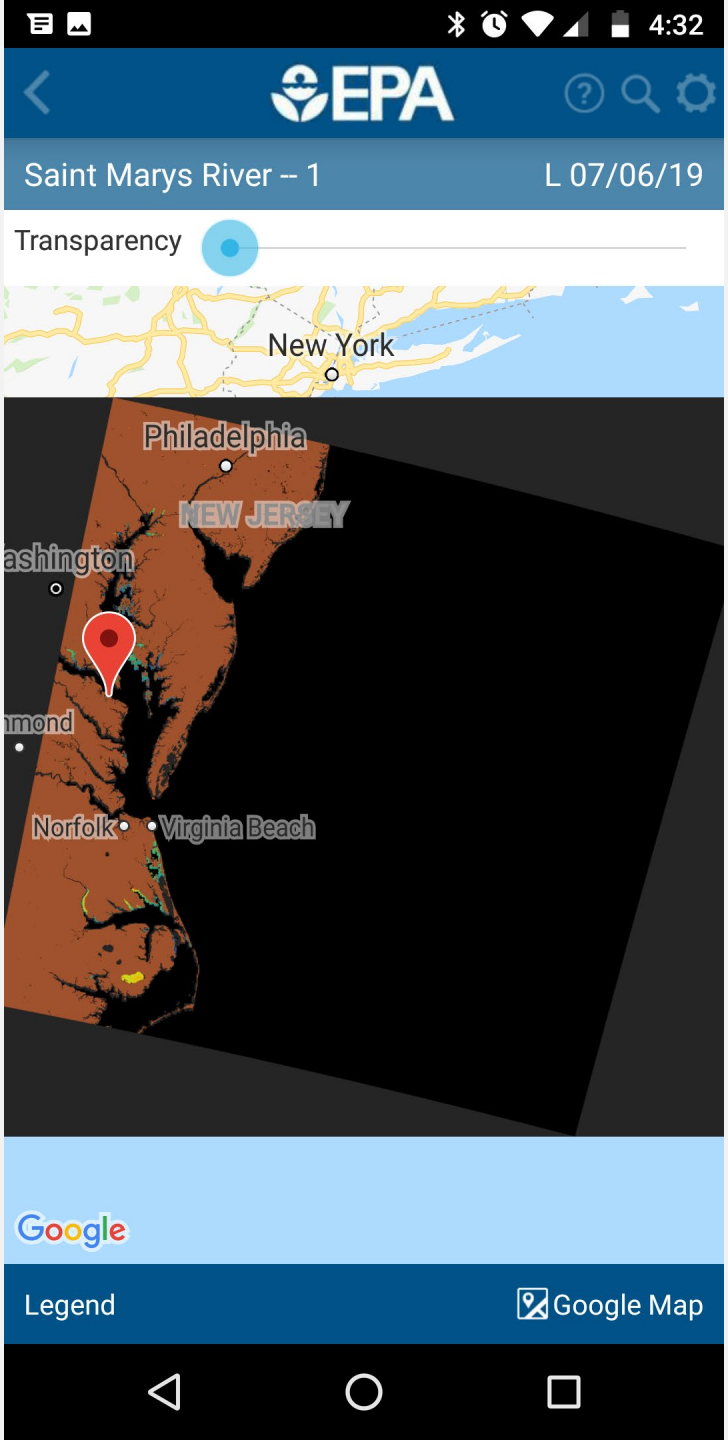
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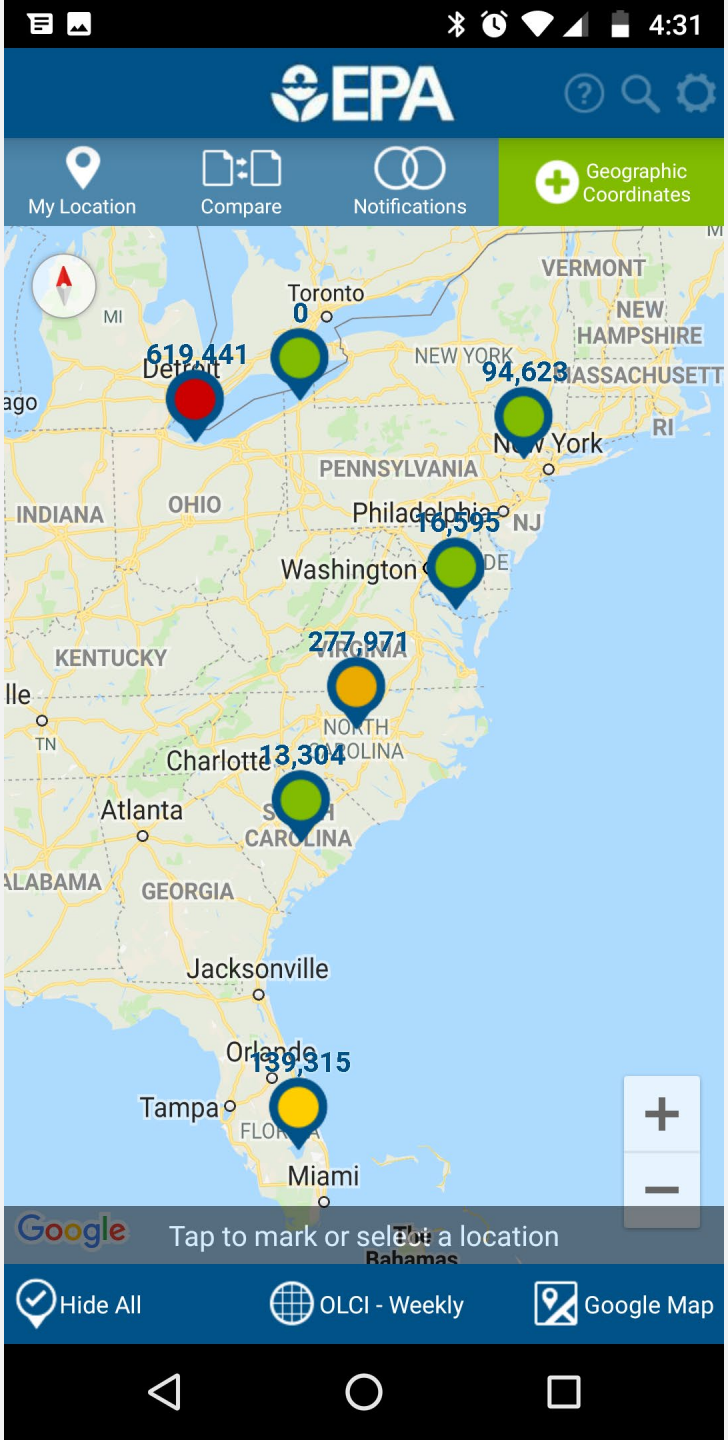

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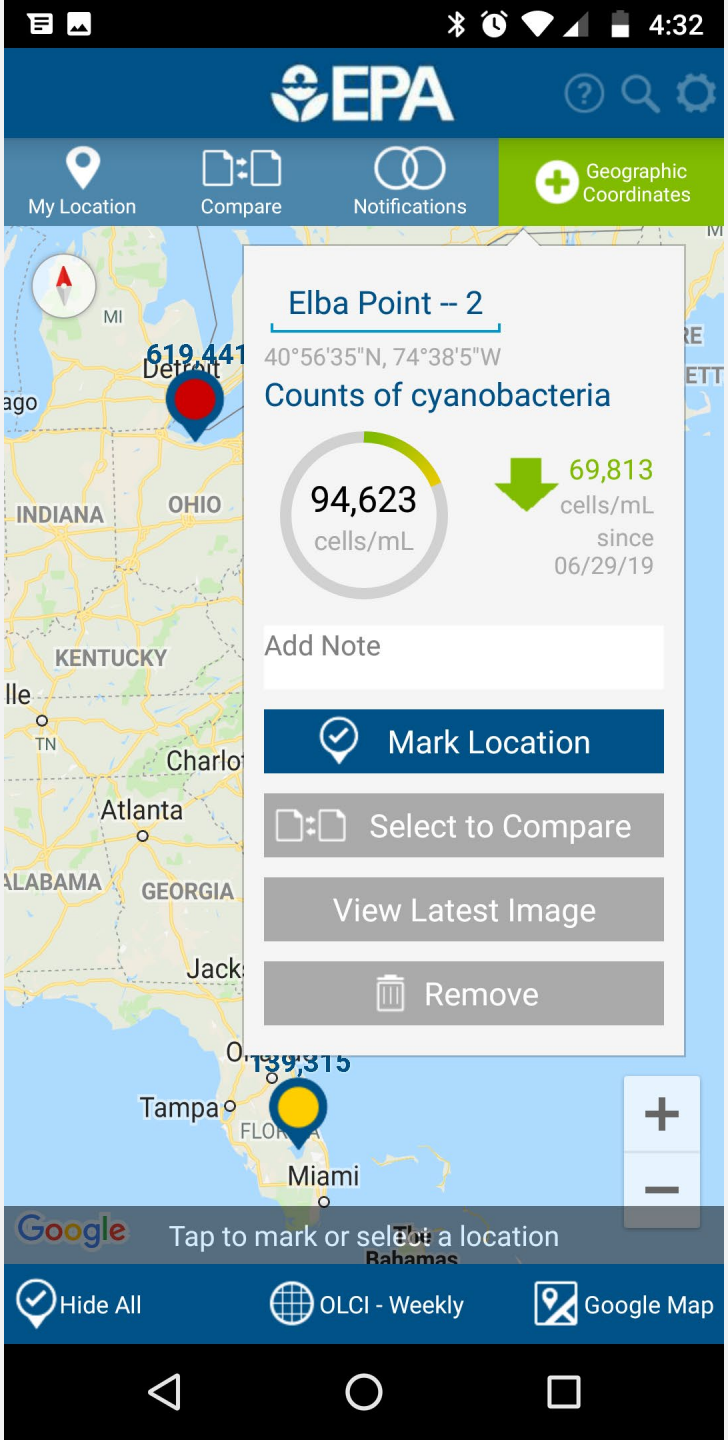

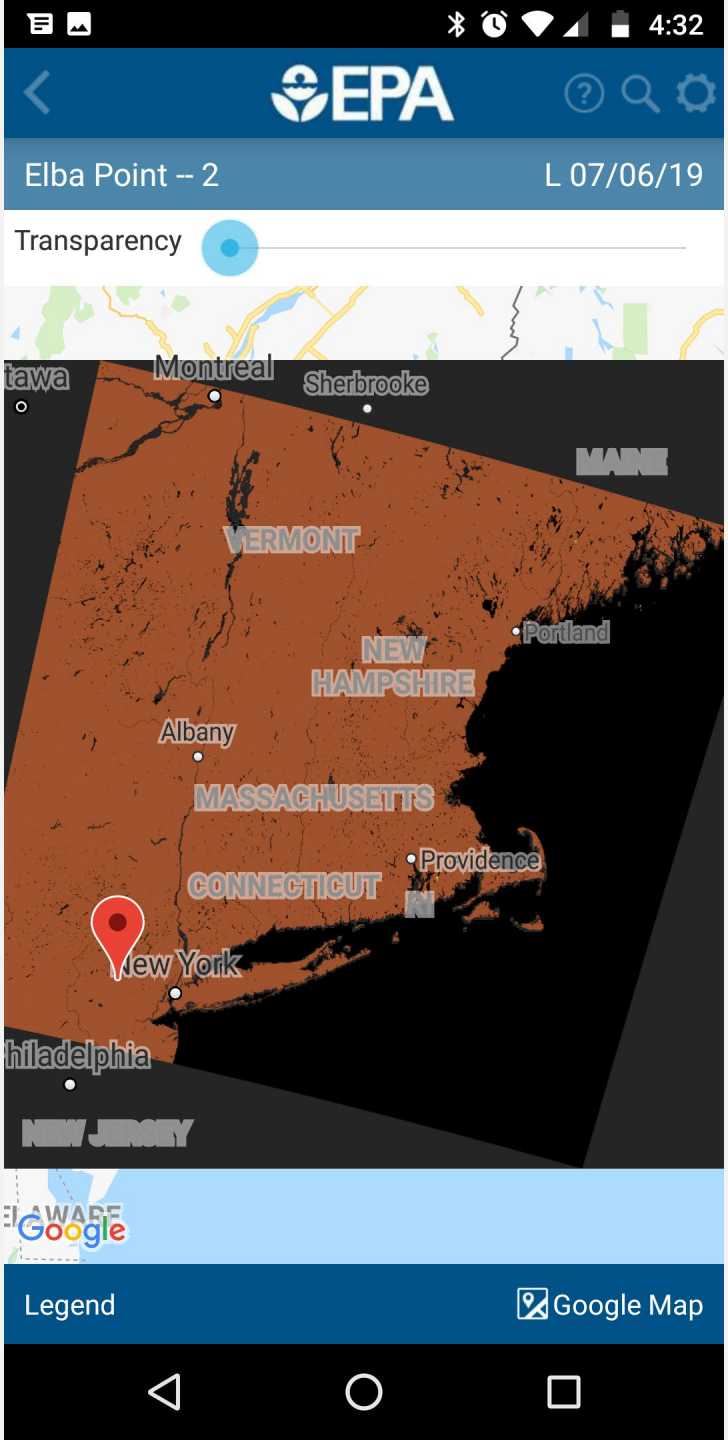
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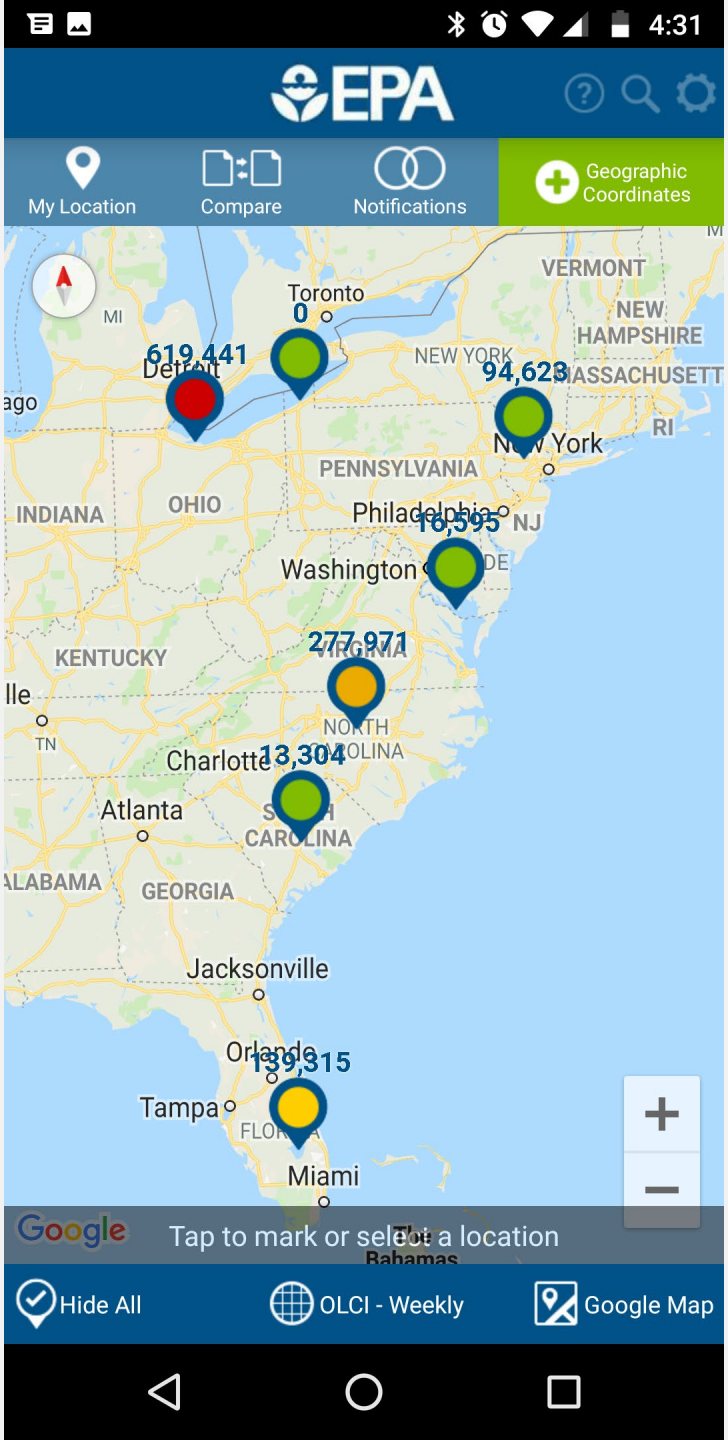

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Environmental Protection
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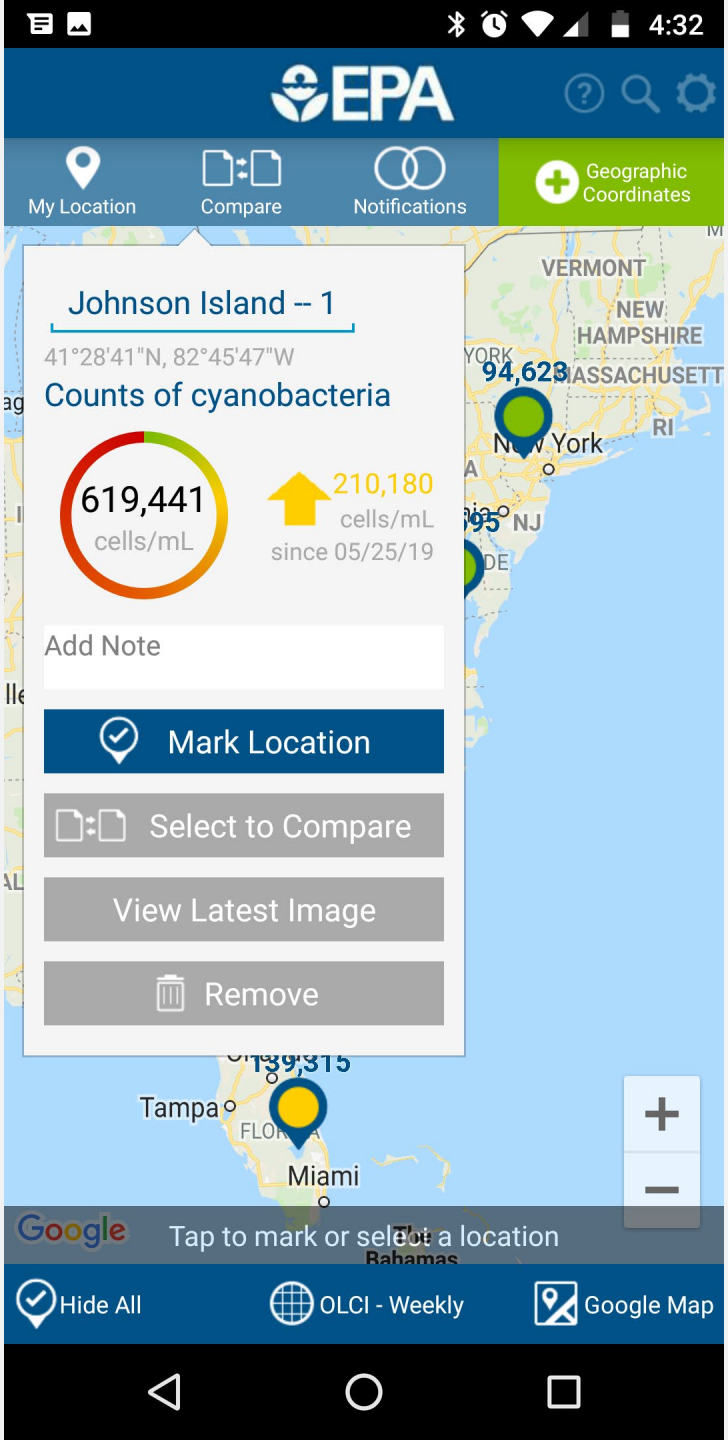
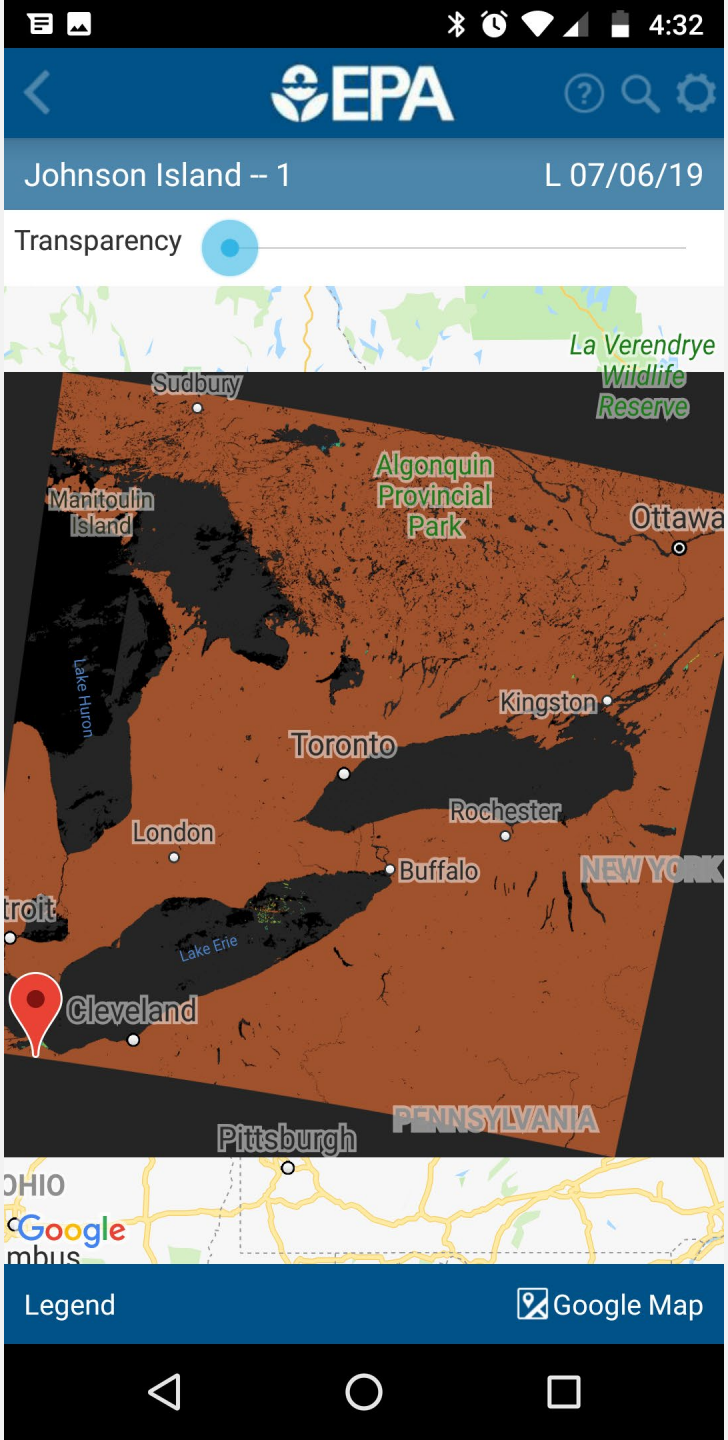
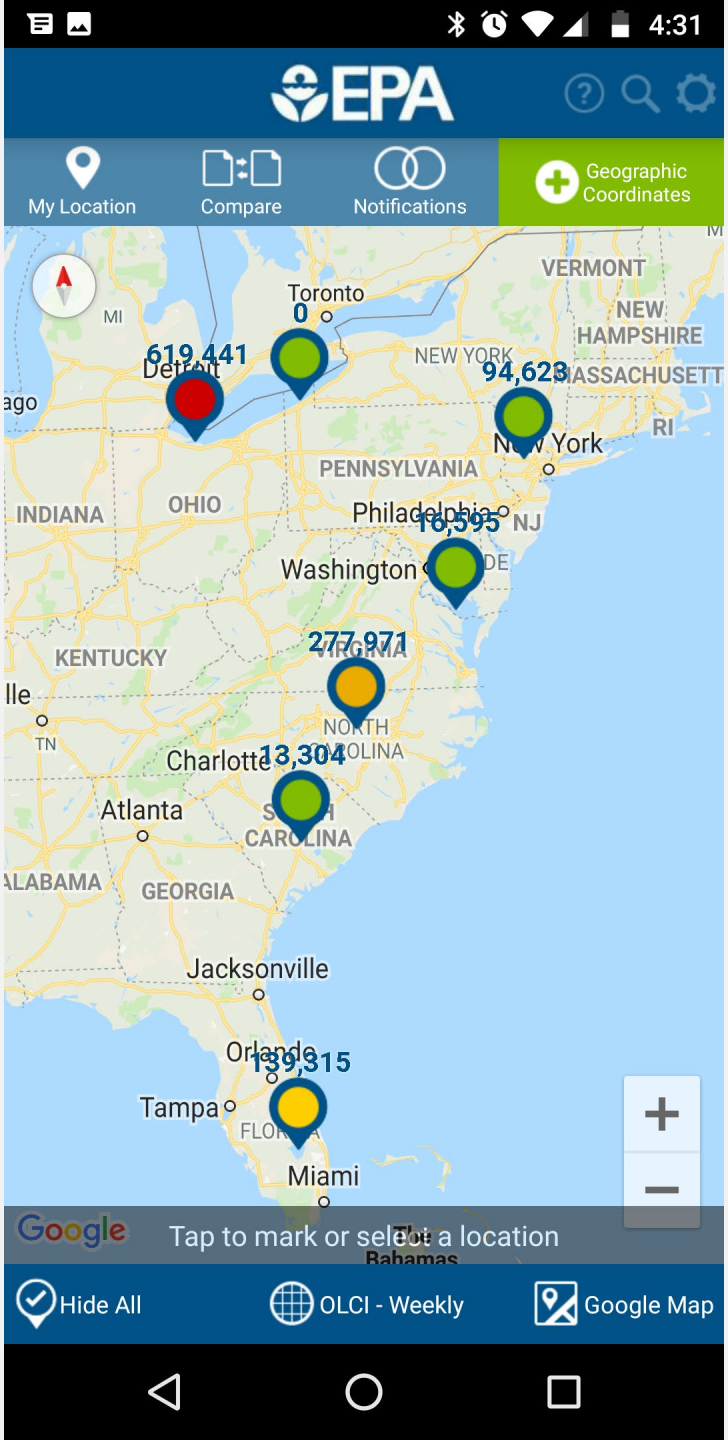
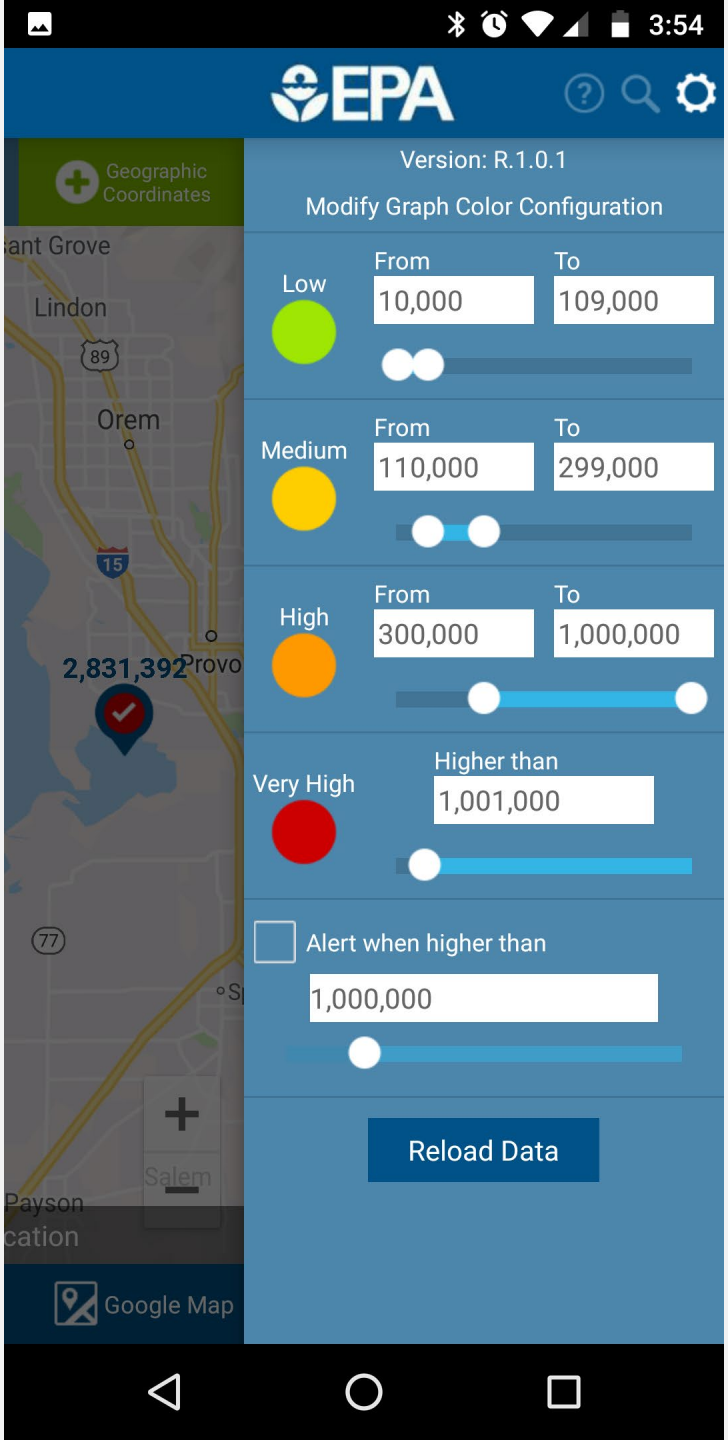
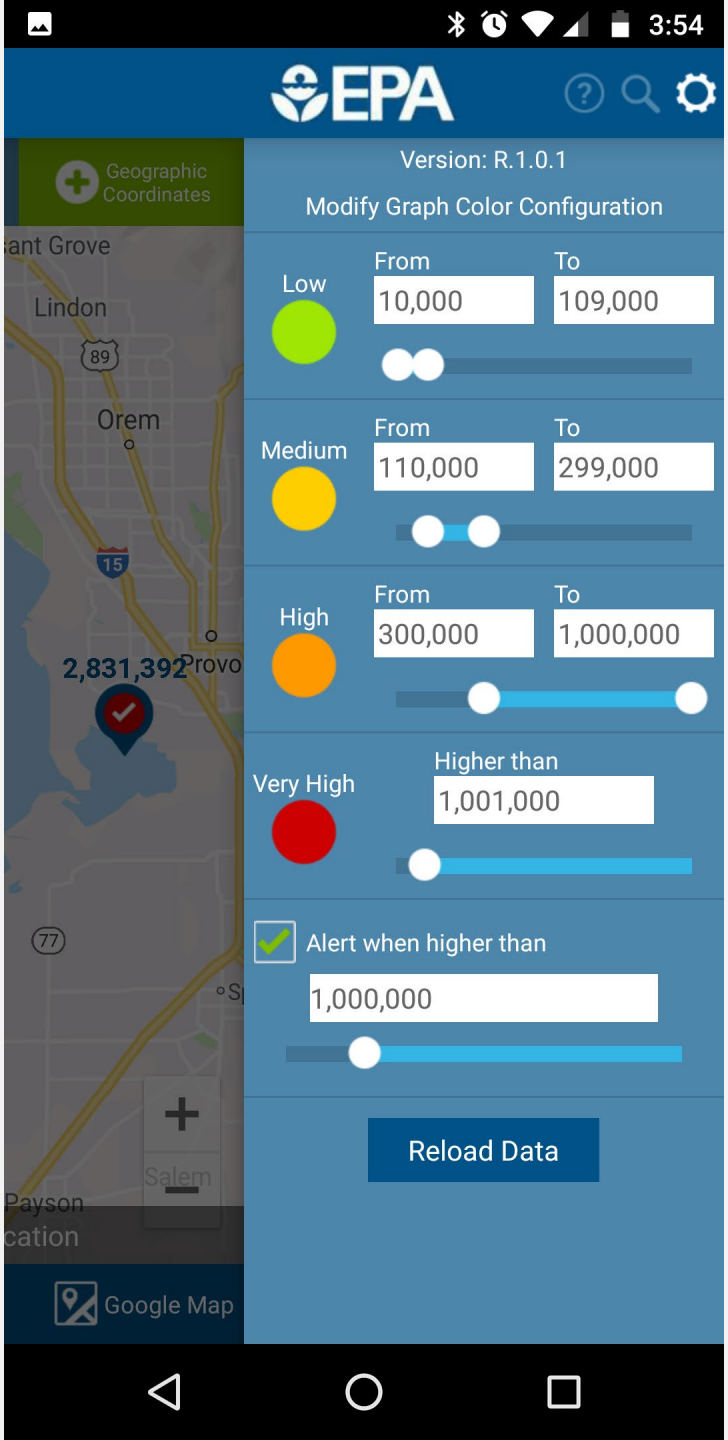
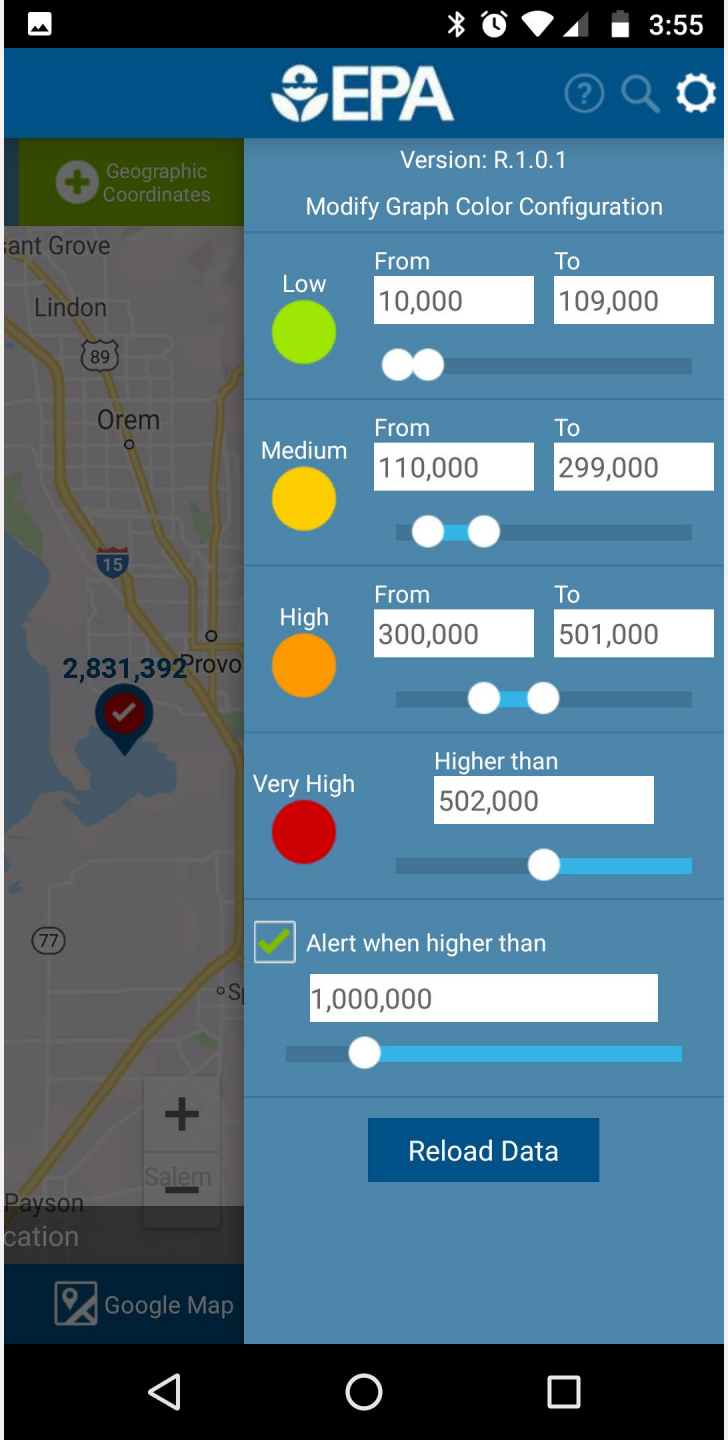


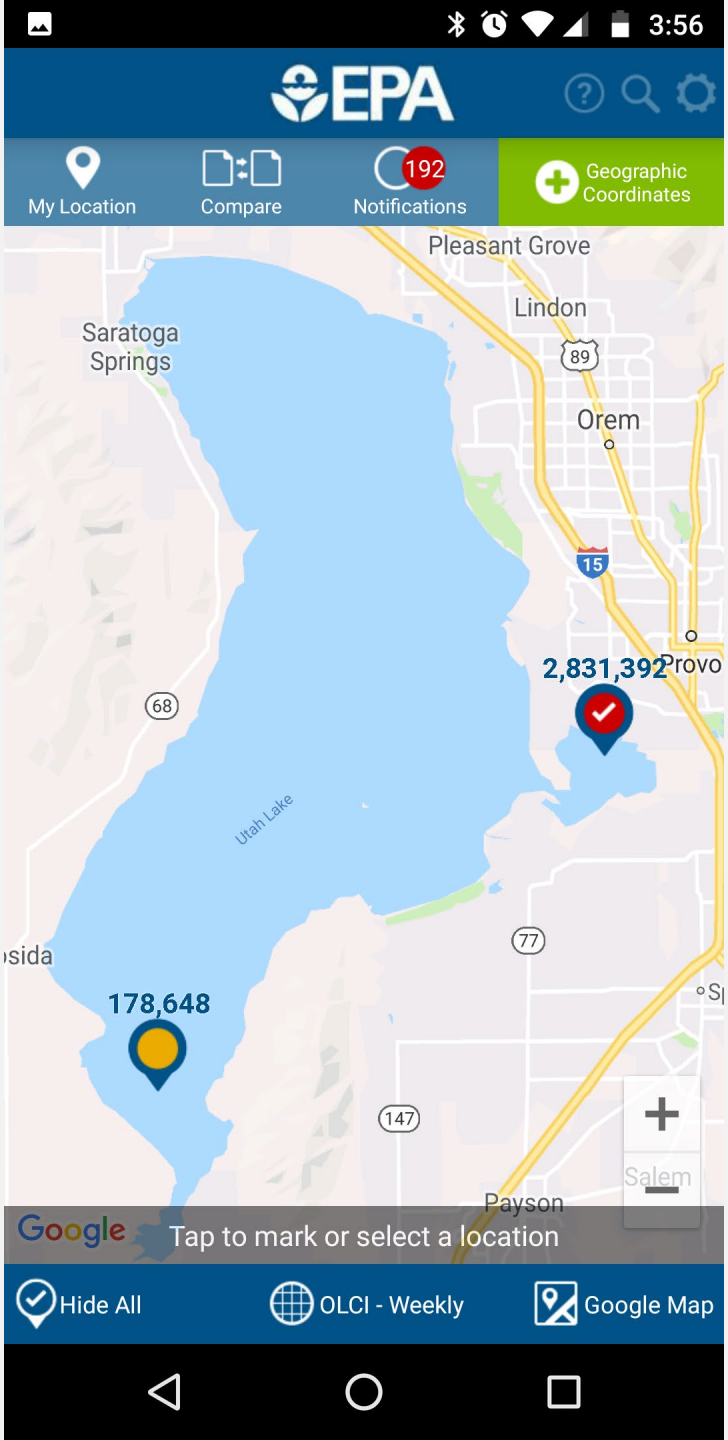

4:32
EPA
Johnson Island -- 1
L 07/06/19
Transparency
La Verendrye
Wildlife
Reserve
Sudbury
Algonquin
Provincial
Park
Manitoulin
Island
Ottawa
Lake Huron
Kingston
Toronto
Rochester
London
Buffalo
NEW YORK
troit
Lake Erie
Cleveland
PENNSYLVANIA
Pittsburgh
OHIO
Google
mbus
Legend
Google Map

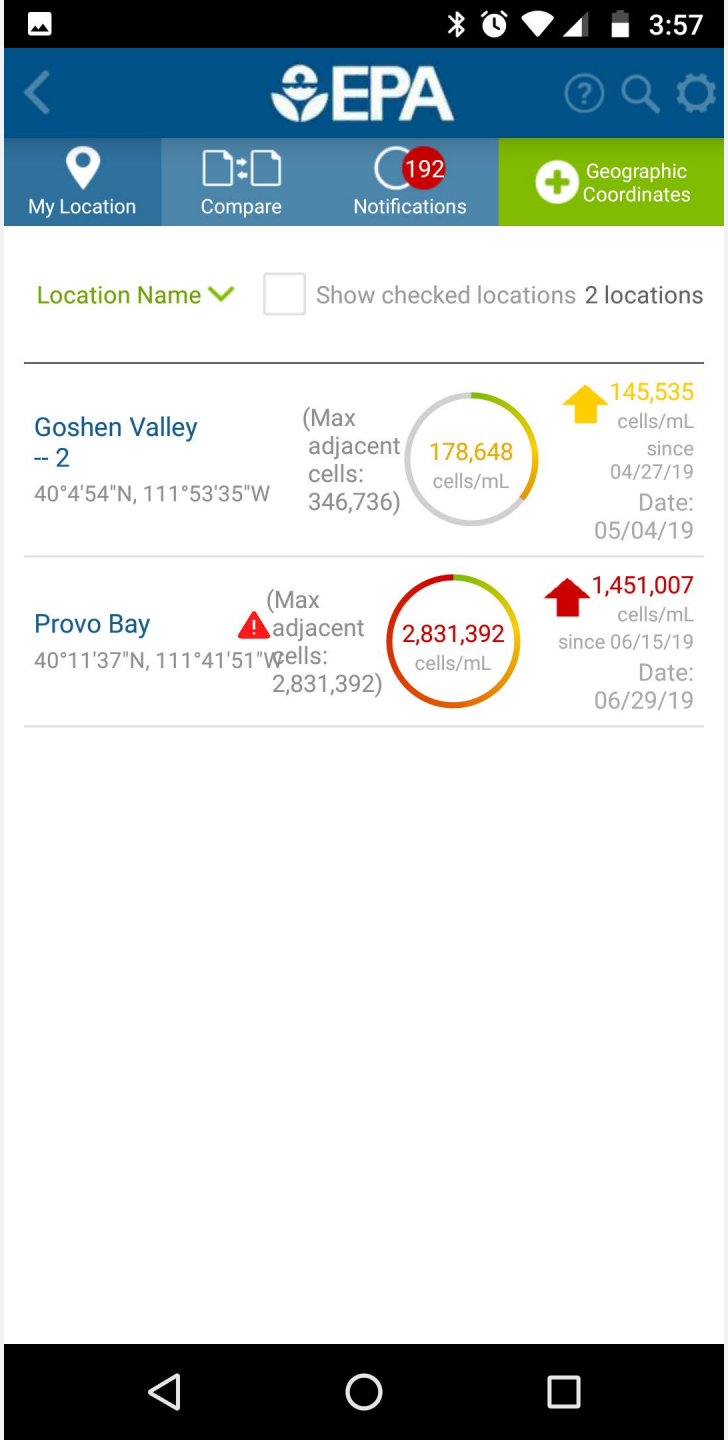

4:31
EPA
My Location
Compare
Notifications
Geographic Coordinates
VERMONT
NEW HAMPSHIRE
Toronto
0
MI
619,441
Detroit
NEW YORK
94,623
MASSACHUSETTS
RI
New York
PENNSYLVANIA
INDIANA
OHIO
Philadelphia
16,595
NJ
Washington
277,971
KENTUCKY
TN
NORTH CAROLINA
Charlotte
13,304
Atlanta
SOUTH CAROLINA
ALABAMA
GEORGIA
Jacksonville
Orlando
139,315
Tampa
FLORIDA
Miami
Google
Tap to mark or select a location
Hide All
OLCI - Weekly
Google Map

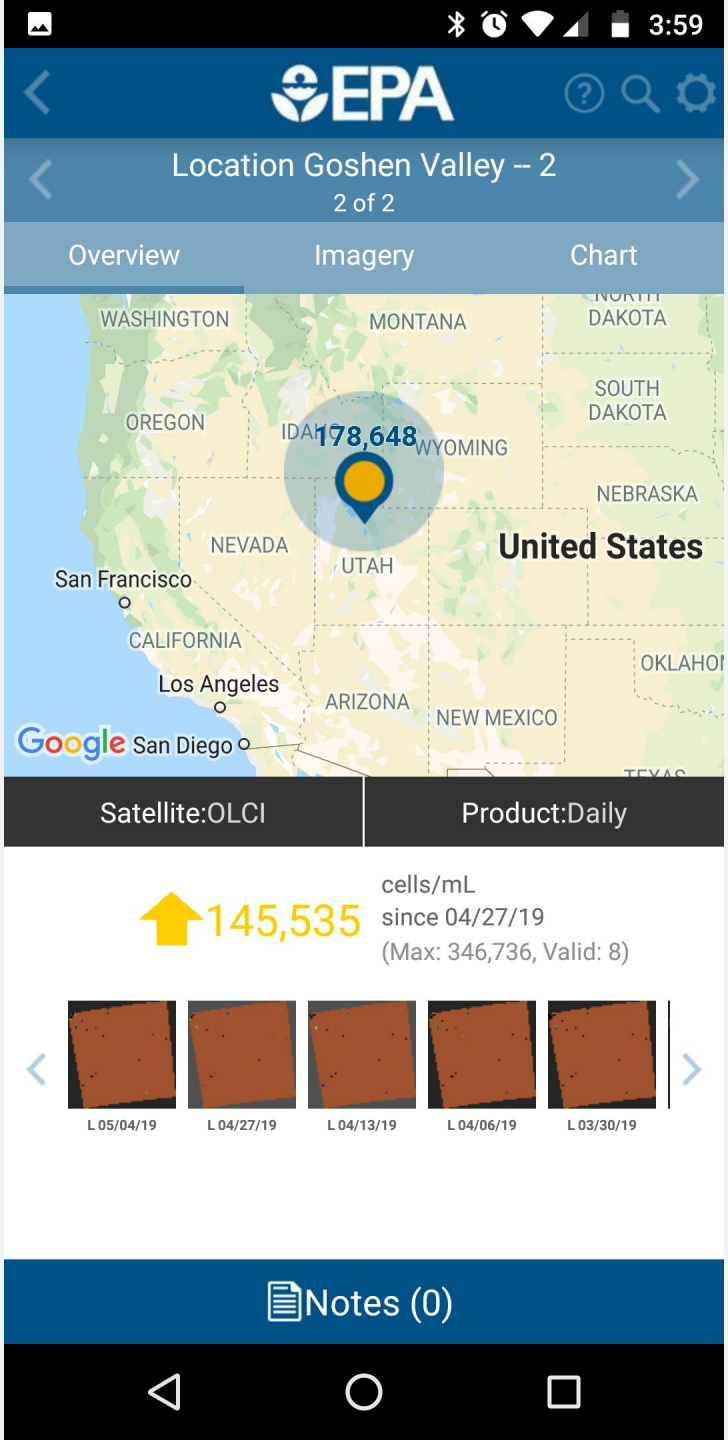

3:54
EPA
Geographic Coordinates
Version: R.1.0.1
Modify Graph Color Configuration
Lindon
89
Orem
15
2,831,392
Provo
77
Salem
Payson
Google Map
Low
From
10,000
To
109,000
Medium
From
110,000
To
299,000
High
From
300,000
To
1,000,000
Very High
Higher than
1,001,000
Alert when higher than
1,000,000
Reload Data

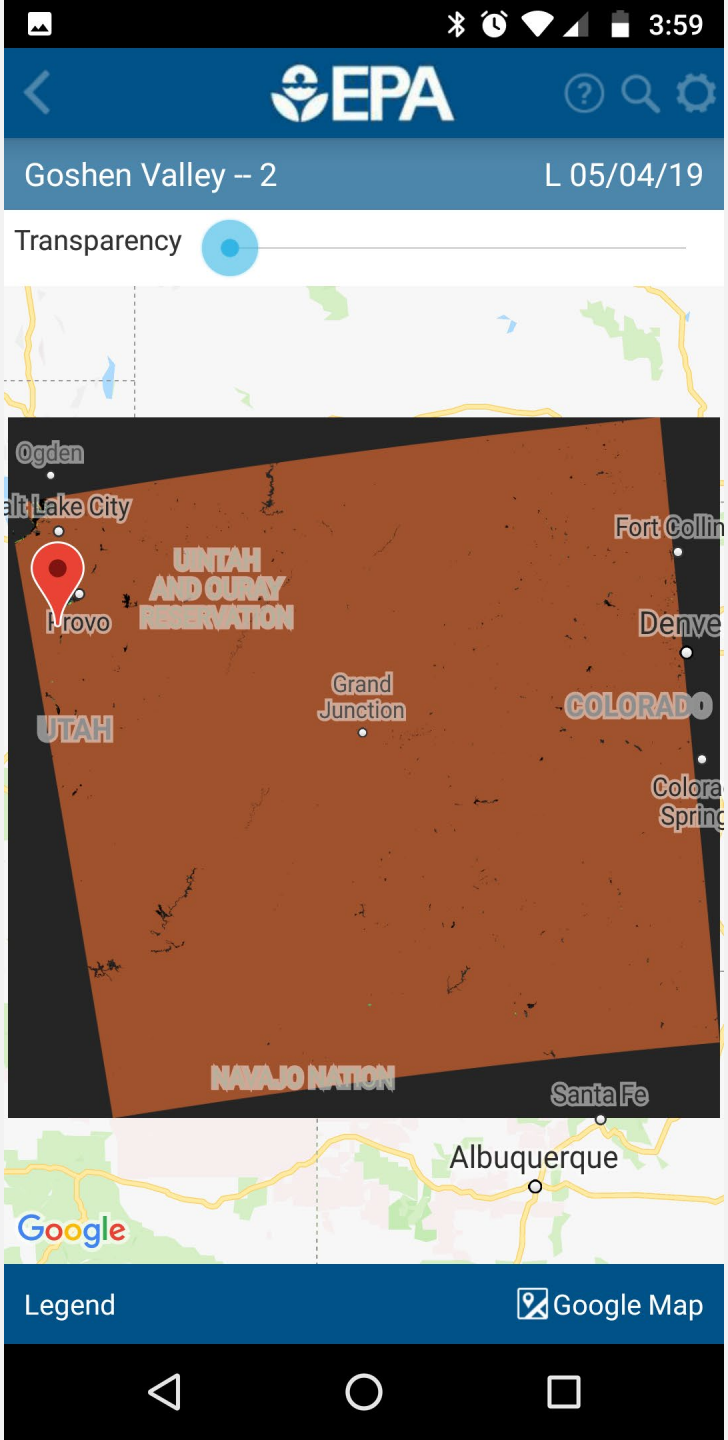

3:54
EPA
Geographic Coordinates
Version: R.1.0.1
Modify Graph Color Configuration
Lindon
89
Orem
15
2,831,392
Provo
77
Salem
Payson
Google Map
Low
From
10,000
To
109,000
Medium
From
110,000
To
299,000
High
From
300,000
To
1,000,000
Very High
Higher than
1,001,000
Alert when higher than
1,000,000
Reload Data


3:55
EPA
Geographic Coordinates
Version: R.1.0.1
Modify Graph Color Configuration
Lindon
89
Orem
15
2,831,392
Provo
77
Salem
Payson
Google Map
Low
From
10,000
To
109,000
Medium
From
110,000
To
299,000
High
From
300,000
To
501,000
Very High
Higher than
502,000
Alert when higher than
1,000,000
Reload Data

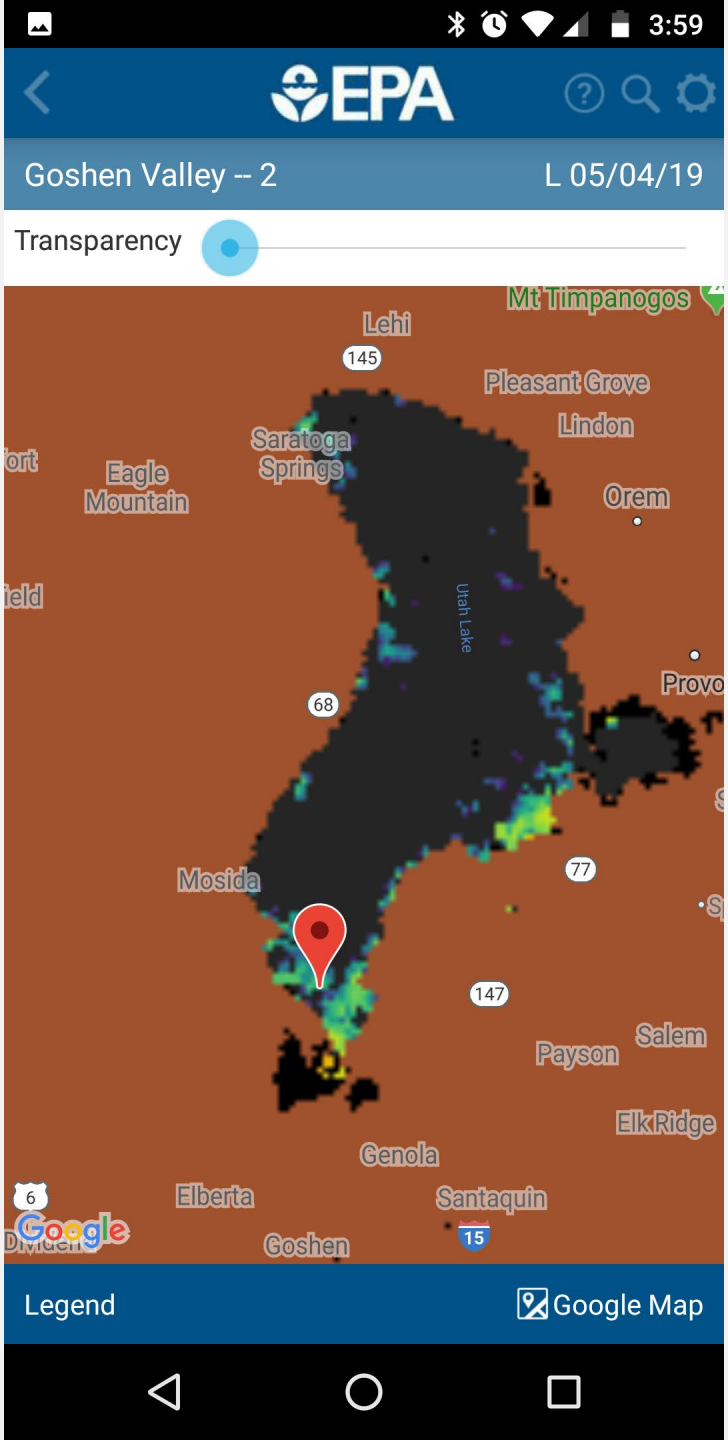

3:56
EPA
My Location
Compare
192
Notifications
Geographic Coordinates
Pleasant Grove
Lindon
Saratoga Springs
89
Orem
15
Provo
2,831,392
68
Utah Lake
77
178,648
147
Salem
Payson
Google
Tap to mark or select a location
Hide All
OLCI - Weekly
Google Map

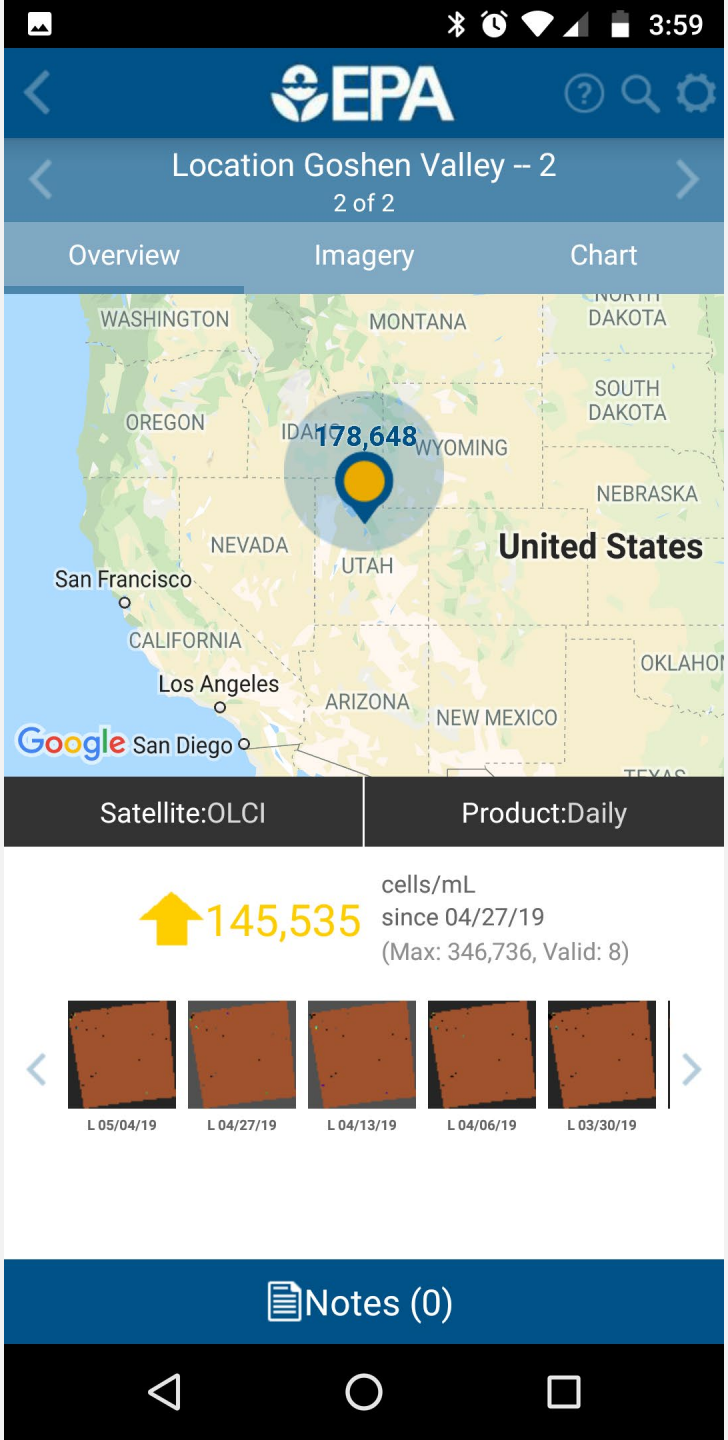

3:57
EPA
My Location
Compare
192
Notifications
Geographic Coordinates
Location Name
Show checked locations 2 locations
Goshen Valley
-- 2
40°4'54"N, 111°53'35"W
(Max adjacent cells: 346,736)
178,648
cells/mL
145,535
cells/mL
since
04/27/19
Date:
05/04/19
Provo Bay
40°11'37"N, 111°41'51"W
(Max adjacent cells: 2,831,392)
2,831,392
cells/mL
1,451,007
cells/mL
since 06/15/19
Date:
06/29/19


3:59
EPA
Location Goshen Valley -- 2
2 of 2
Overview
Imagery
Chart
WASHINGTON
MONTANA
DAKOTA
SOUTH DAKOTA
OREGON
IDAHO
178,648
WYOMING
NEBRASKA
NEVADA
UTAH
United States
San Francisco
CALIFORNIA
Los Angeles
ARIZONA
NEW MEXICO
Google
San Diego
Satellite:OLCI
Product:Daily
145,535
cells/mL
since 04/27/19
(Max: 346,736, Valid: 8)
L 05/04/19
L 04/27/19
L 04/13/19
L 04/06/19
L 03/30/19
Notes (0)


3:59
EPA
Goshen Valley -- 2
L 05/04/19
Transparency
Ogden
Salt Lake City
Provo
UINTAH AND OURAY RESERVATION
Fort Collin
Denve
Grand Junction
UTAH
COLORADO
Colora
Spring
NAVAJO NATION
Santa Fe
Albuquerque
Google
Legend
Google Map

EPA
United States
Environmental Protection
Agency




3:59
EPA
Location Goshen Valley -- 2
2 of 2
Overview
Imagery
Chart
WASHINGTON
MONTANA
DAKOTA
SOUTH DAKOTA
OREGON
IDAHO
178,648
WYOMING
NEBRASKA
NEVADA
UTAH
United States
San Francisco
CALIFORNIA
Los Angeles
ARIZONA
NEW MEXICO
Google
San Diego
Satellite:OLCI
Product:Daily
145,535
cells/mL
since 04/27/19
(Max: 346,736, Valid: 8)
L 05/04/19
L 04/27/19
L 04/13/19
L 04/06/19
L 03/30/19
Notes (0)

EPA
United States
Environmental Protection
Agency

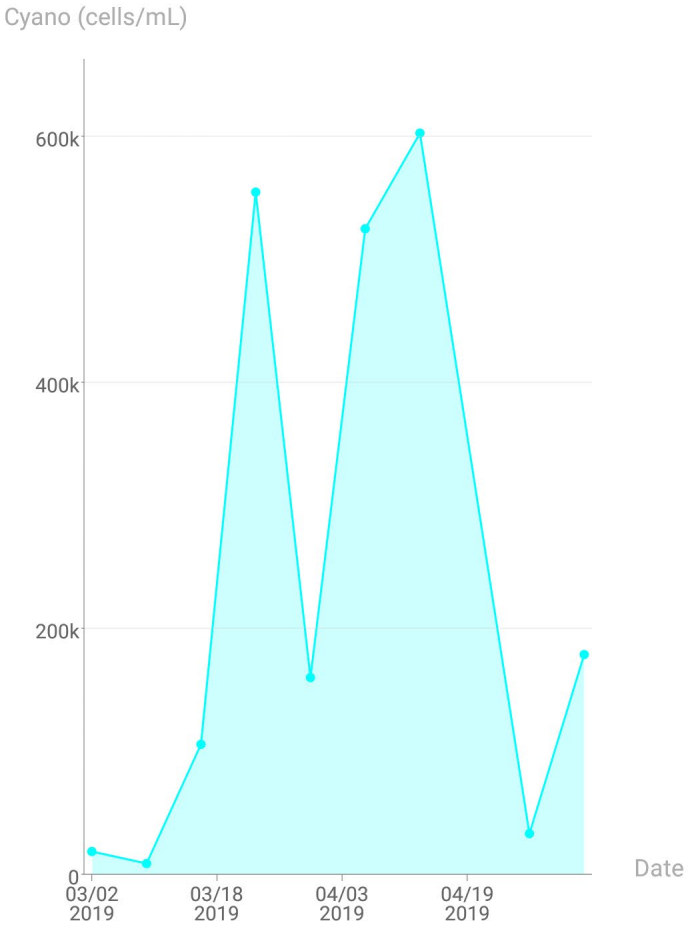
4:00

EPA

Location Goshen Valley -- 2
2 of 2

Overview | Imagery | Chart

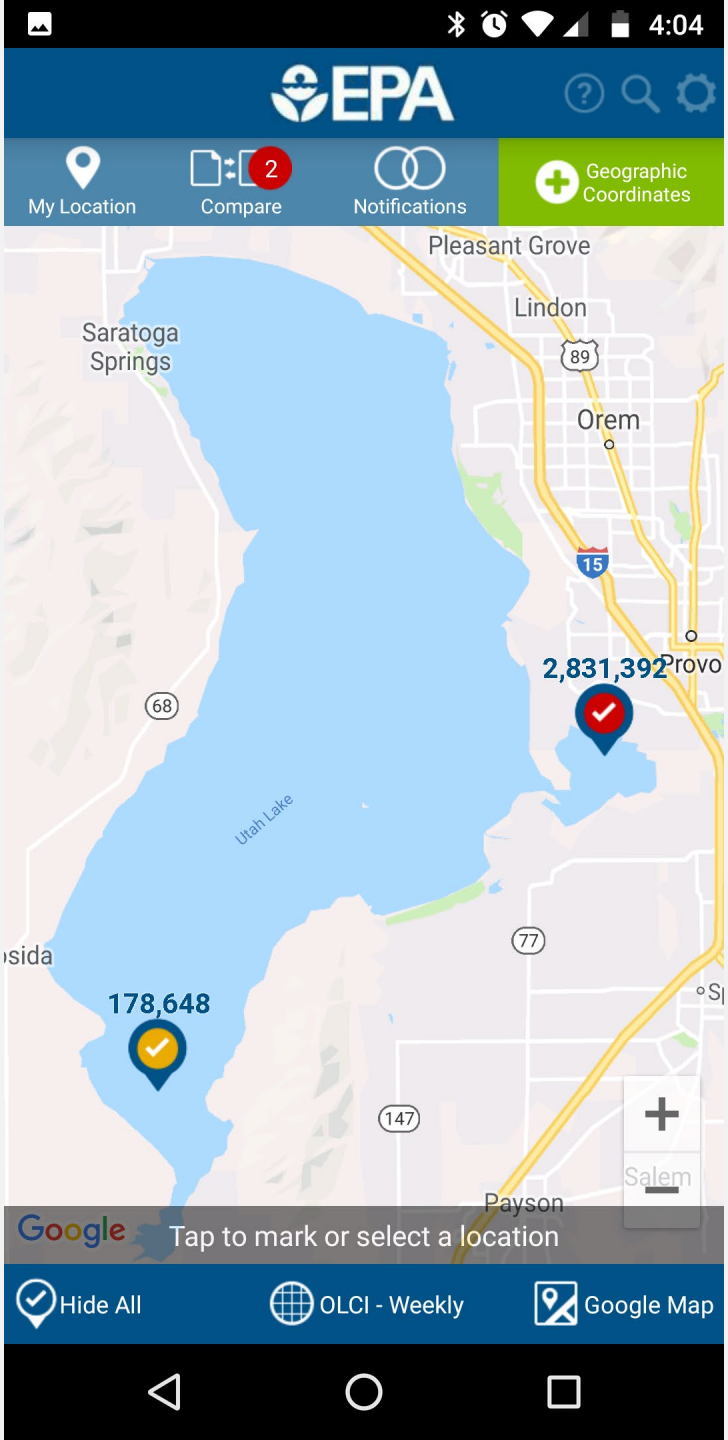
Blooming Chart | Cyano (cells/mL)

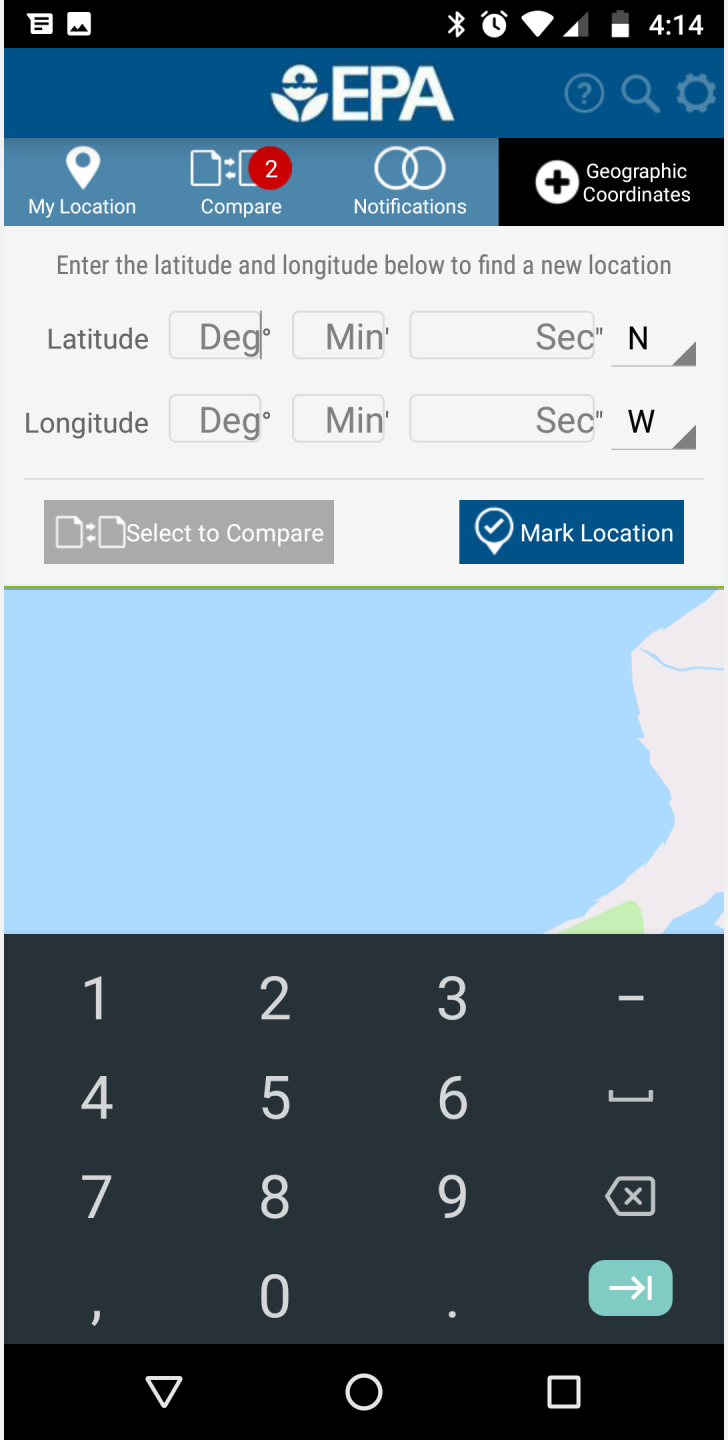


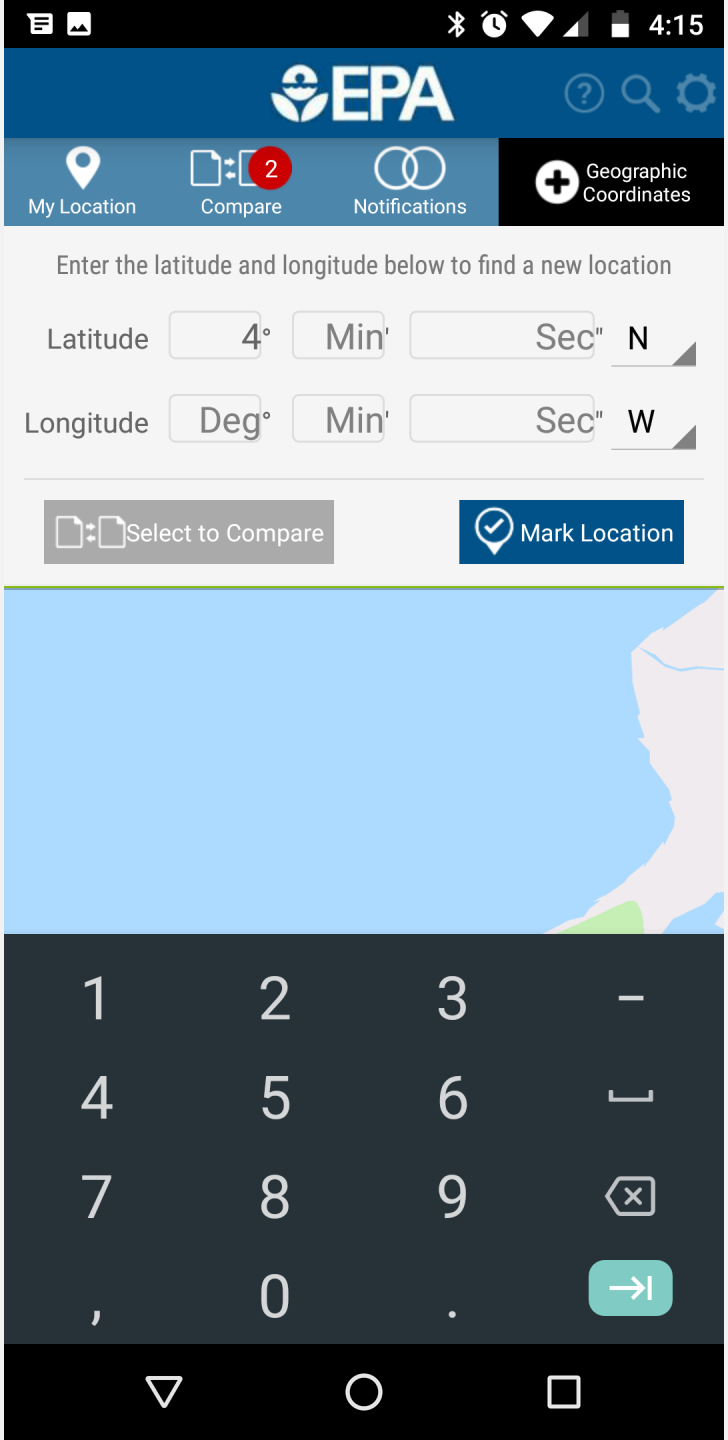
EPA United States Environmental Protection Agency

Specific GPS location

EPA
United States
Environmental Protection
Agency




4:14
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Enter the latitude and longitude below to find a new location
Latitude
Deg°
Min'
Sec"
N
Longitude
Deg°
Min'
Sec"
W
Select to Compare
Mark Location
1
2
3
4
5
6
7
8
9
,
0
.


4:15
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Enter the latitude and longitude below to find a new location
Latitude
4°
Min'
Sec"
N
Longitude
Deg°
Min'
Sec"
W
Select to Compare
Mark Location
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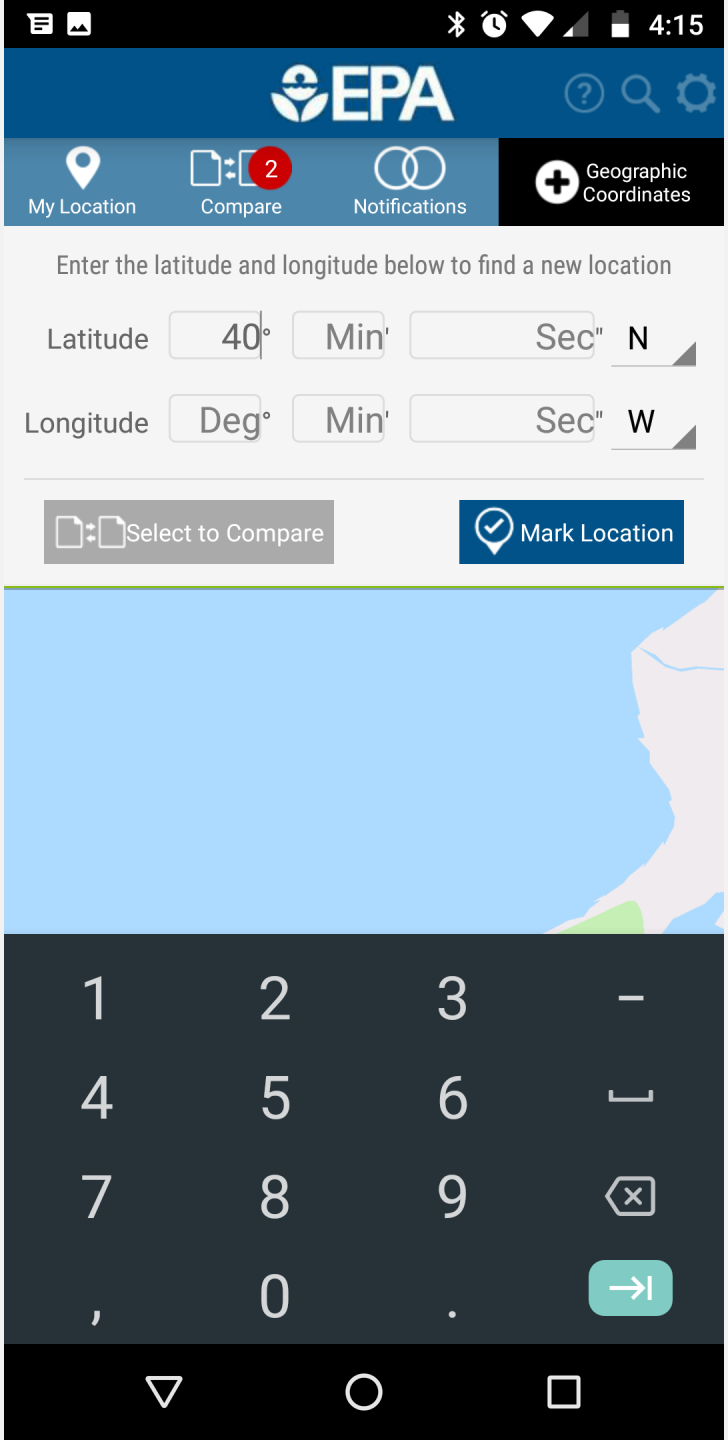
4:15
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Enter the latitude and longitude below to find a new location
Latitude
40°
Min'
Sec"
N
Longitude
Deg°
Min'
Sec"
W
Select to Compare
Mark Location
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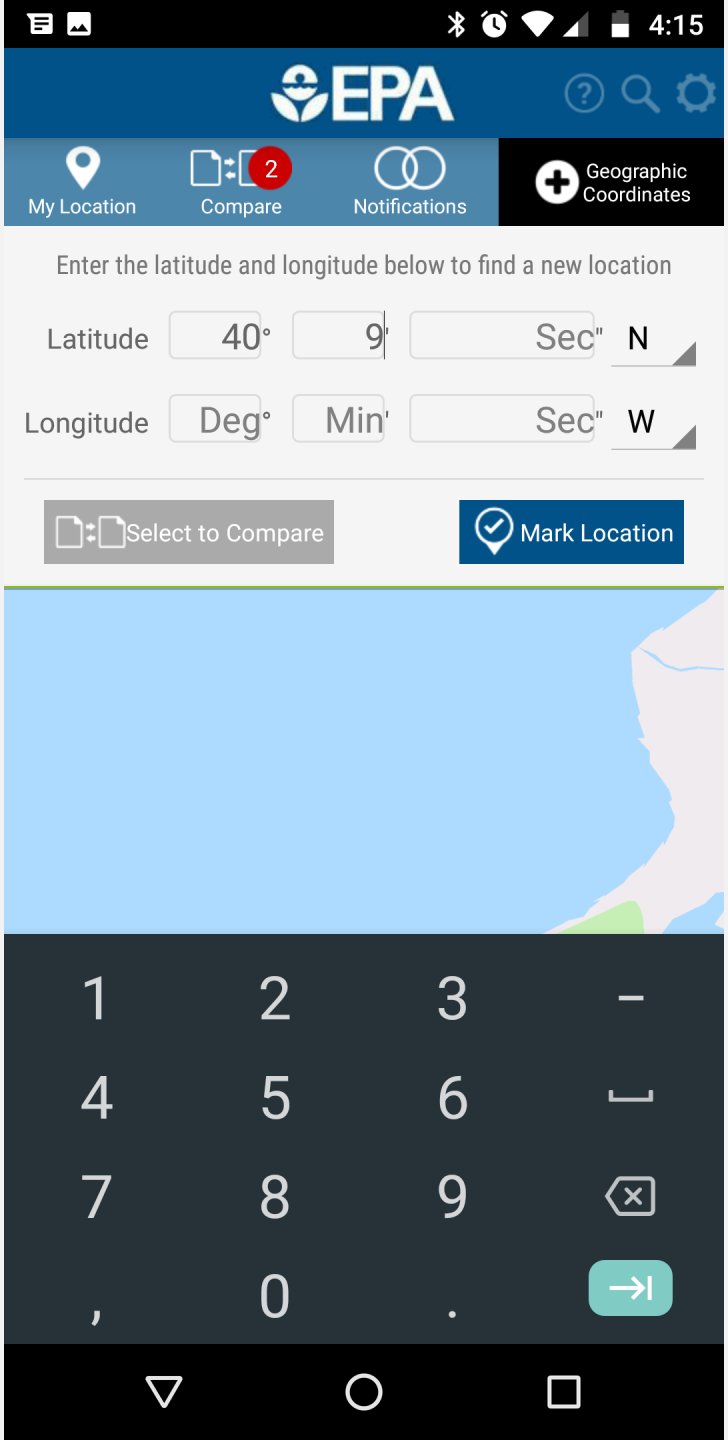
4:15
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Enter the latitude and longitude below to find a new location
Latitude
40°
9'
Sec"
N
Longitude
Deg°
Min'
Sec"
W
Select to Compare
Mark Location
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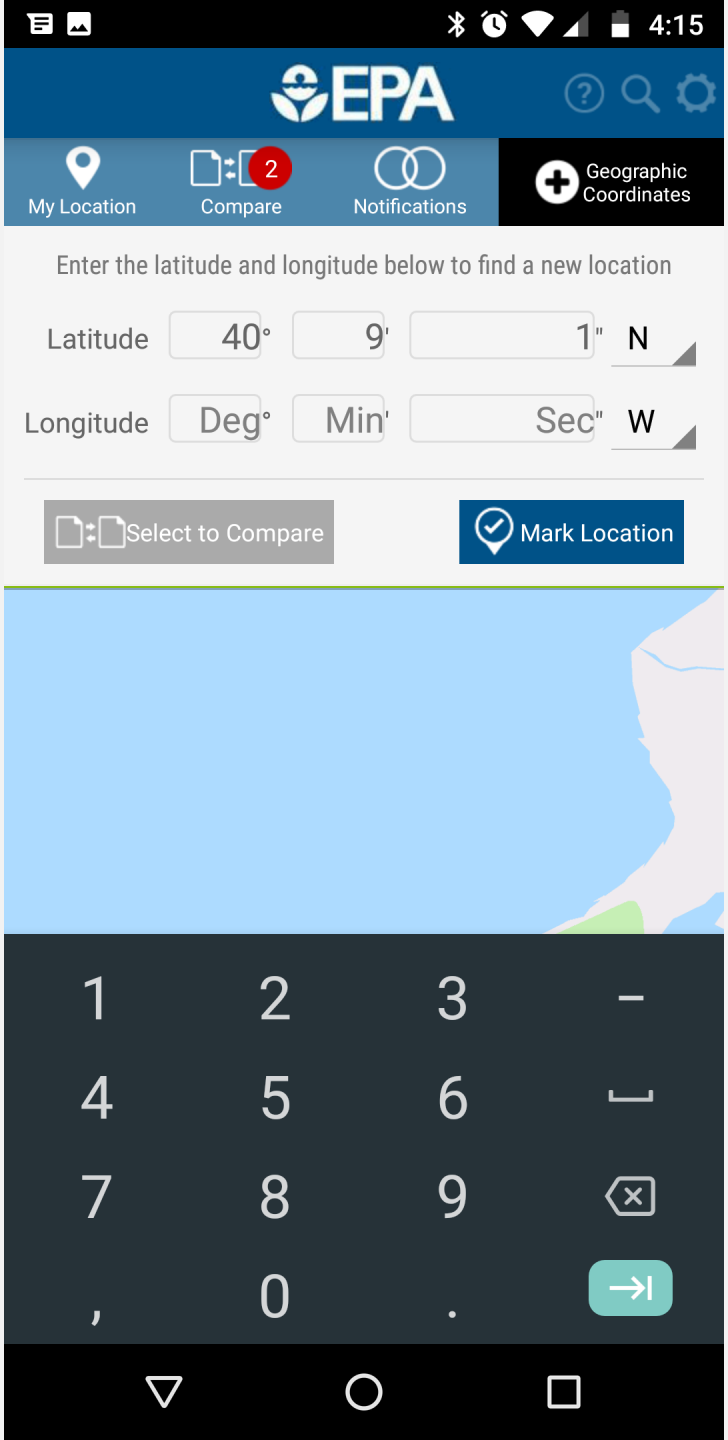
4:15
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Enter the latitude and longitude below to find a new location
Latitude
40°
9'
1"
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Longitude
Deg°
Min'
Sec"
W
Select to Compare
Mark Location
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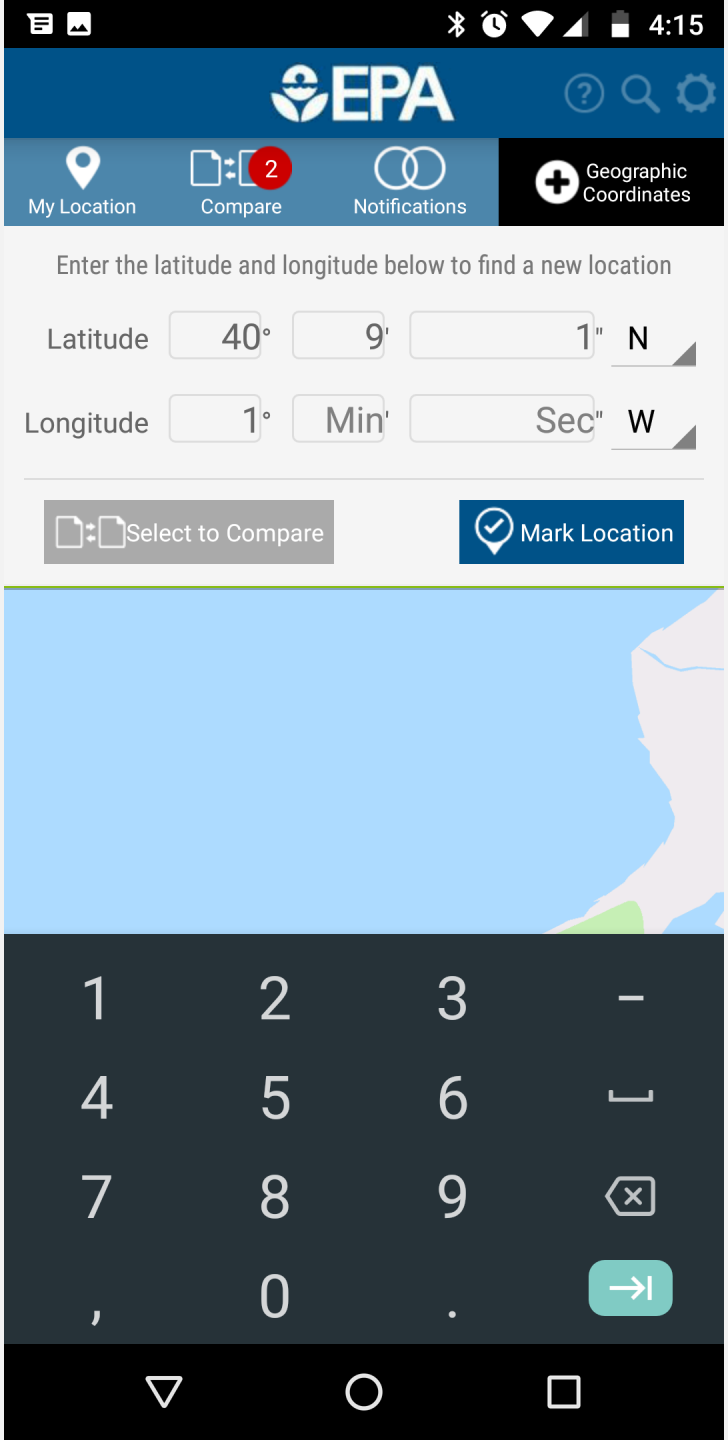
4:15
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Enter the latitude and longitude below to find a new location
Latitude
40°
9'
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Longitude
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Select to Compare
Mark Location
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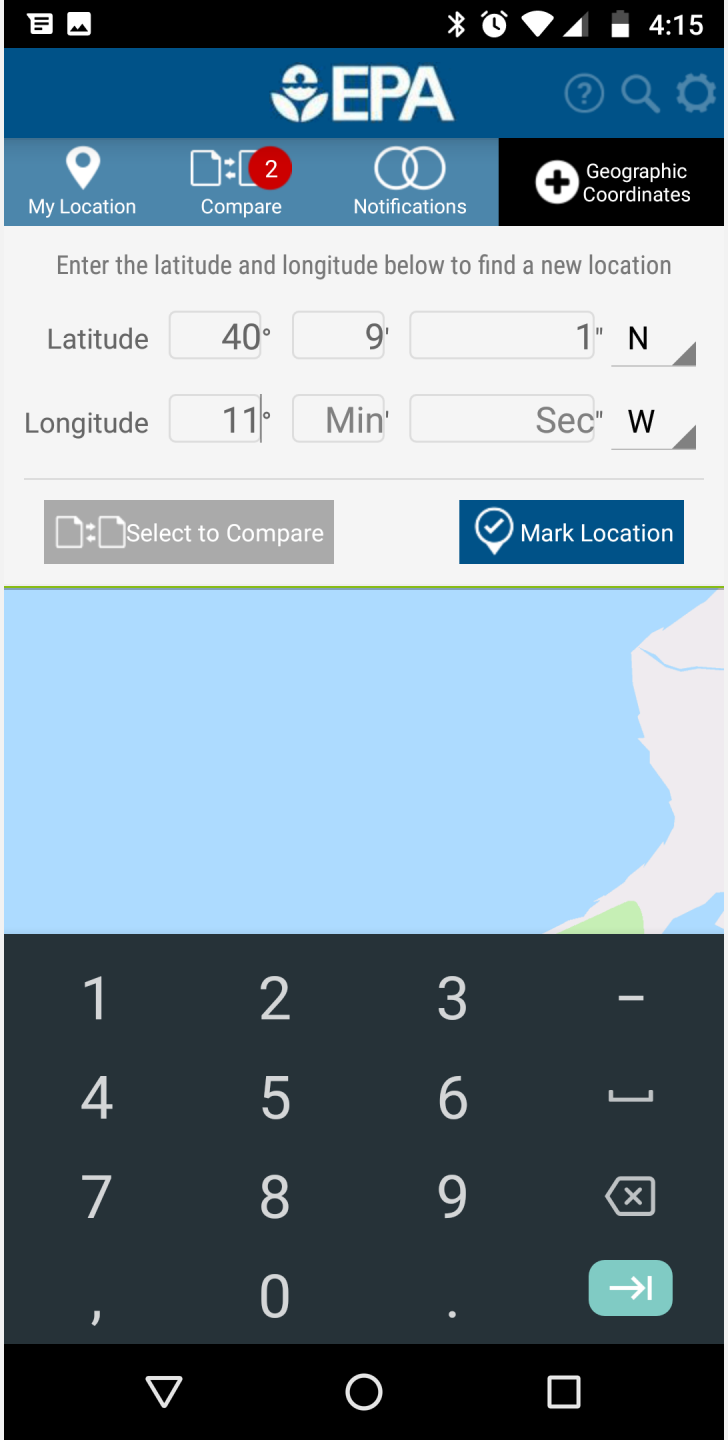
4:15
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Enter the latitude and longitude below to find a new location
Latitude
40°
9'
1"
N
Longitude
11°
Min'
Sec"
W
Select to Compare
Mark Location
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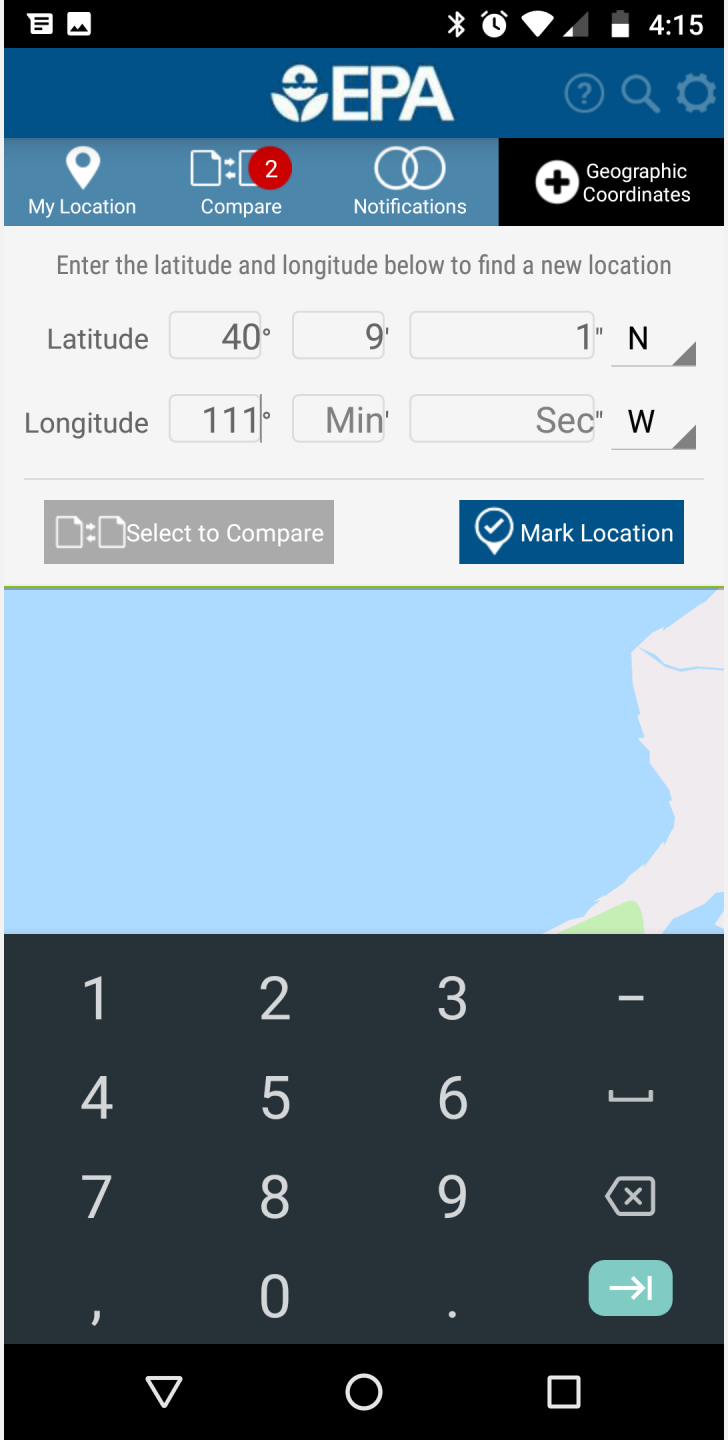
4:15
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Enter the latitude and longitude below to find a new location
Latitude
40°
9'
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Longitude
111°
Min'
Sec"
W
Select to Compare
Mark Location
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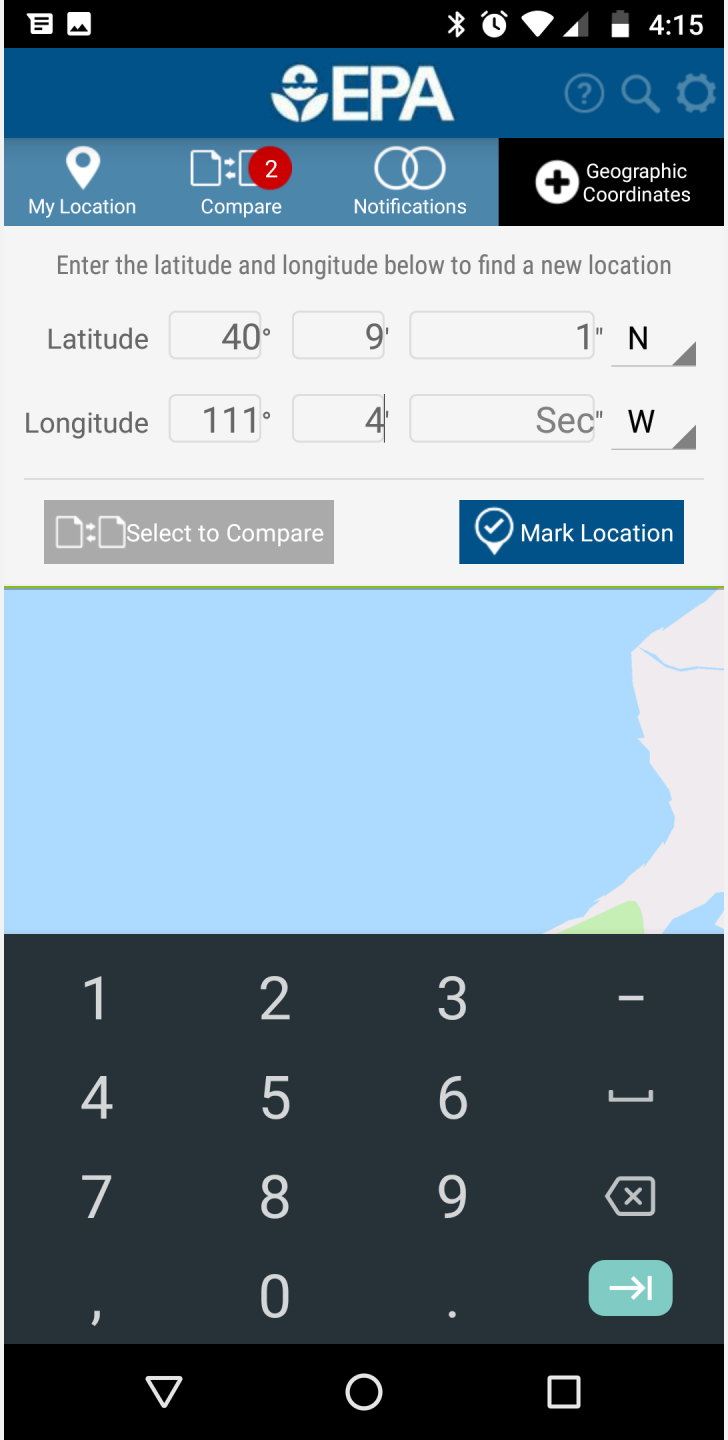
4:15
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Enter the latitude and longitude below to find a new location
Latitude
40°
9'
1"
N
Longitude
111°
4'
Sec"
W
Select to Compare
Mark Location
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,
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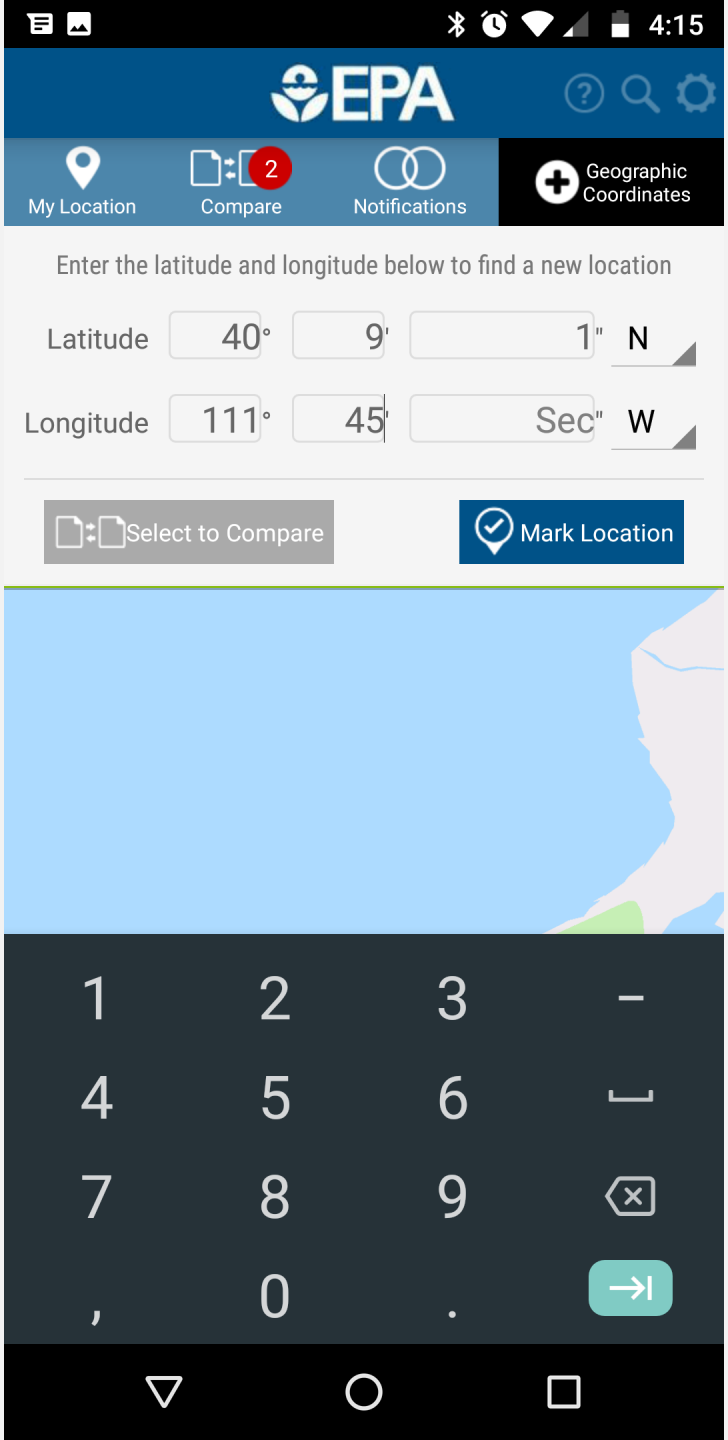
4:15
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Enter the latitude and longitude below to find a new location
Latitude
40°
9'
1"
N
Longitude
111°
45'
Sec"
W
Select to Compare
Mark Location
1
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6
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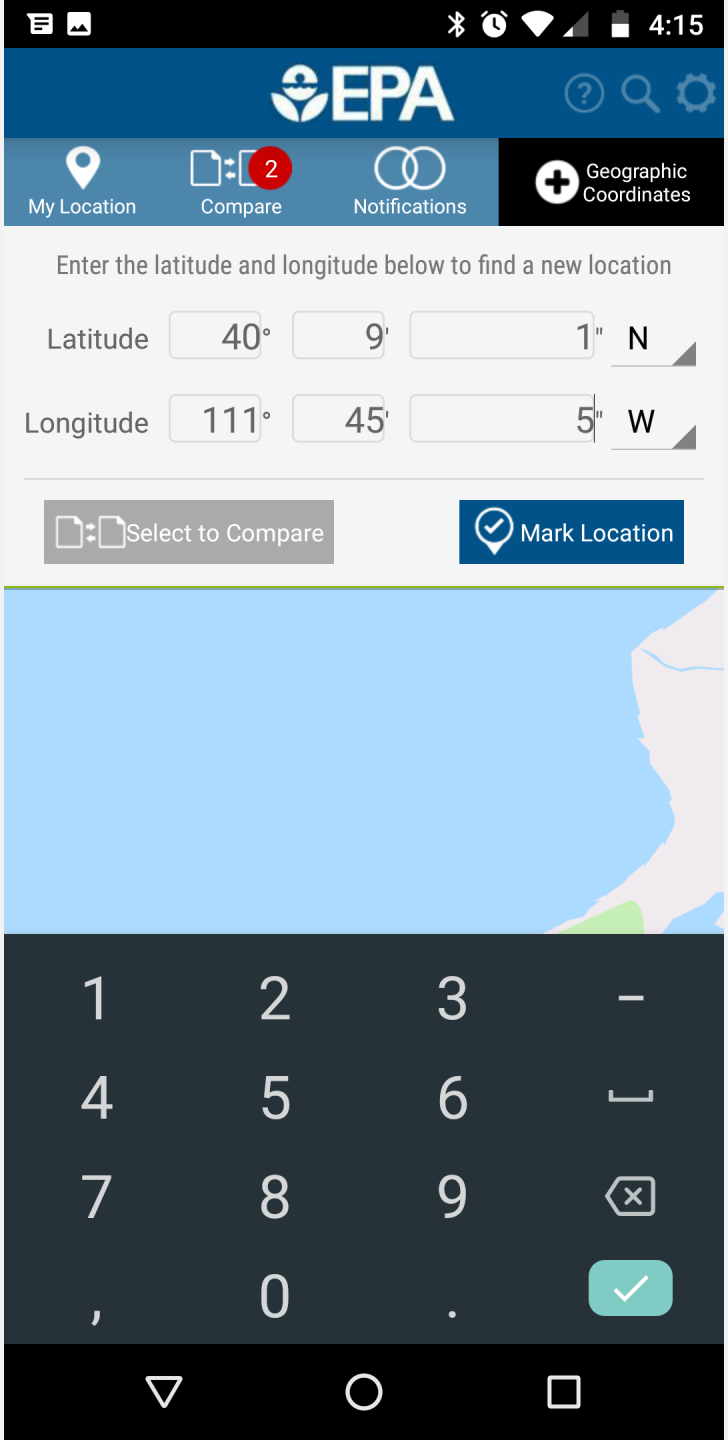
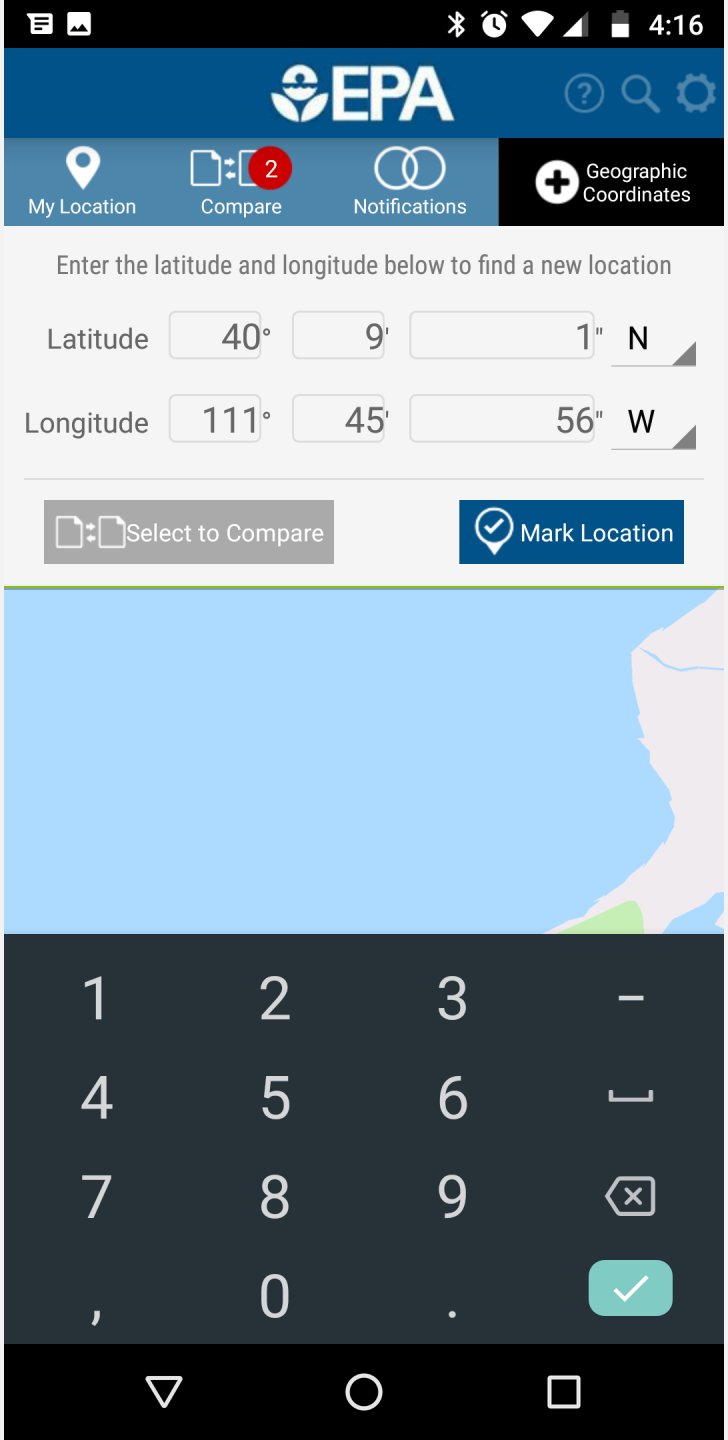
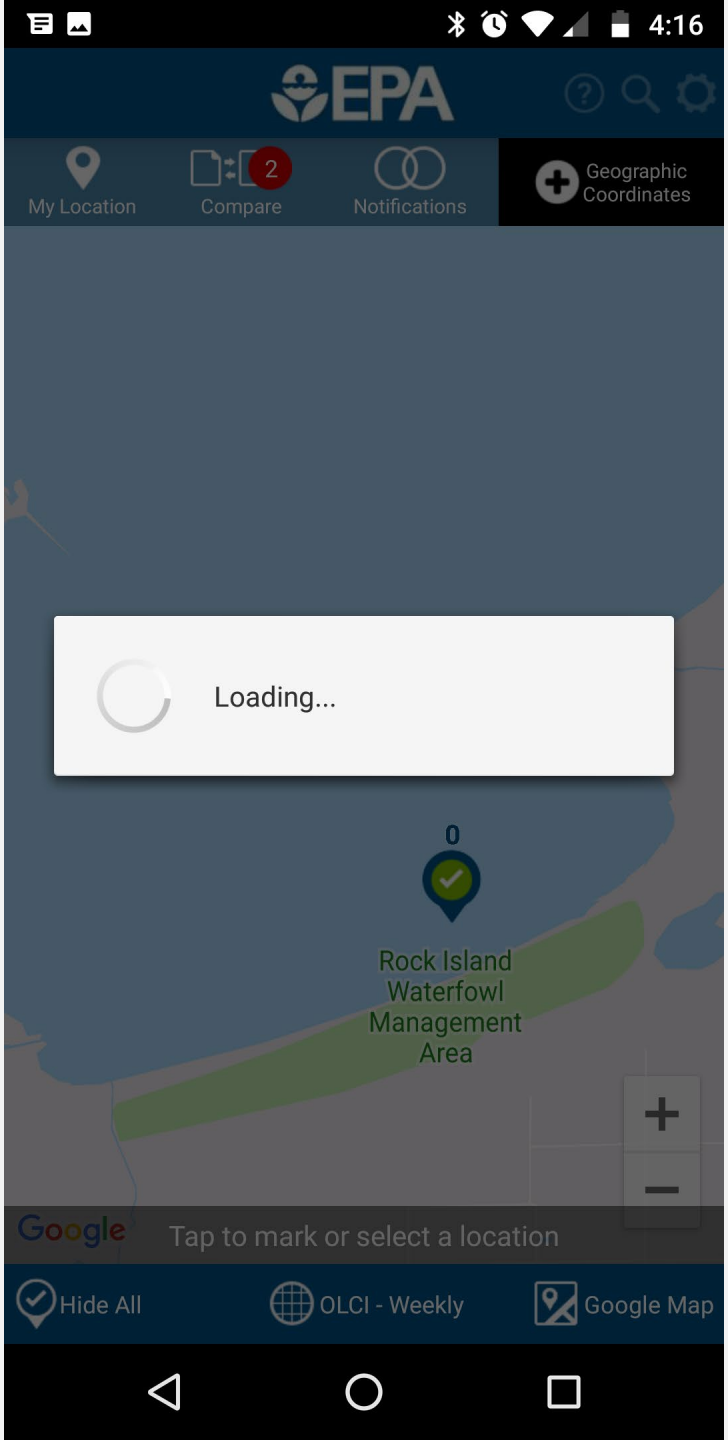
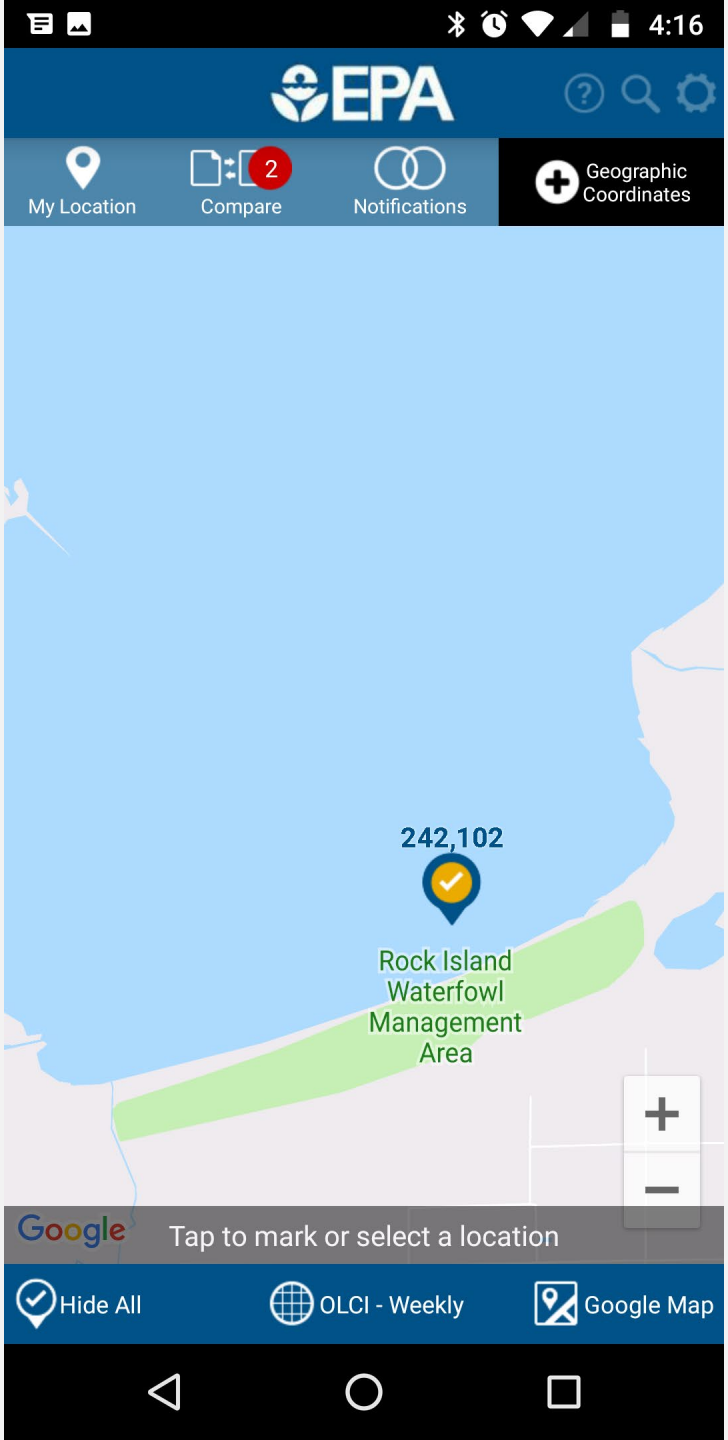
0
.


4:15
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Enter the latitude and longitude below to find a new location
Latitude
40°
9'
1"
N
Longitude
111°
45'
5"
W
Select to Compare
Mark Location
1
2
3
4
5
6
7
8
9
,
0
.

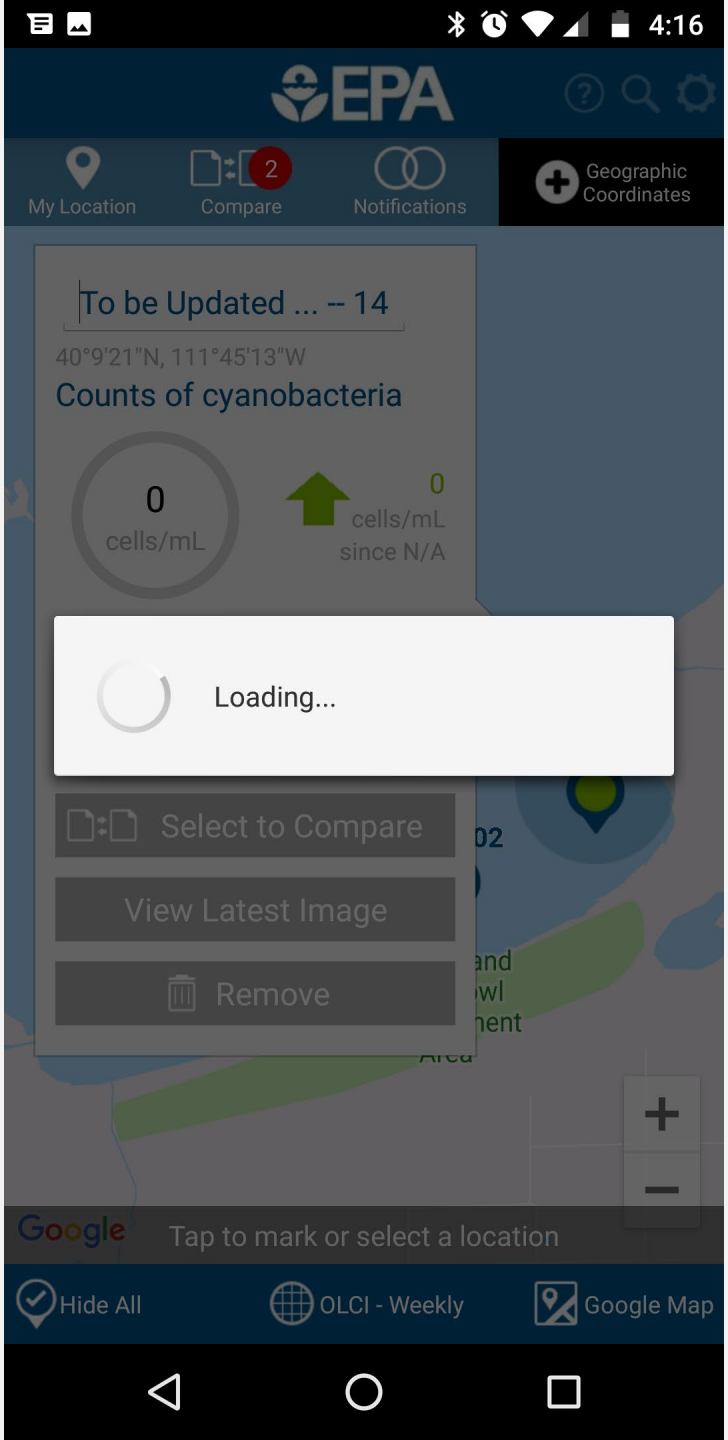

4:16
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Enter the latitude and longitude below to find a new location
Latitude
40°
9'
1"
N
Longitude
111°
45'
56"
W
Select to Compare
Mark Location
1
2
3
4
5
6
7
8
9
,
0
.


4:16
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
Loading...
0
Rock Island Waterfowl Management Area
Google
Tap to mark or select a location
Hide All
OLCI - Weekly
Google Map

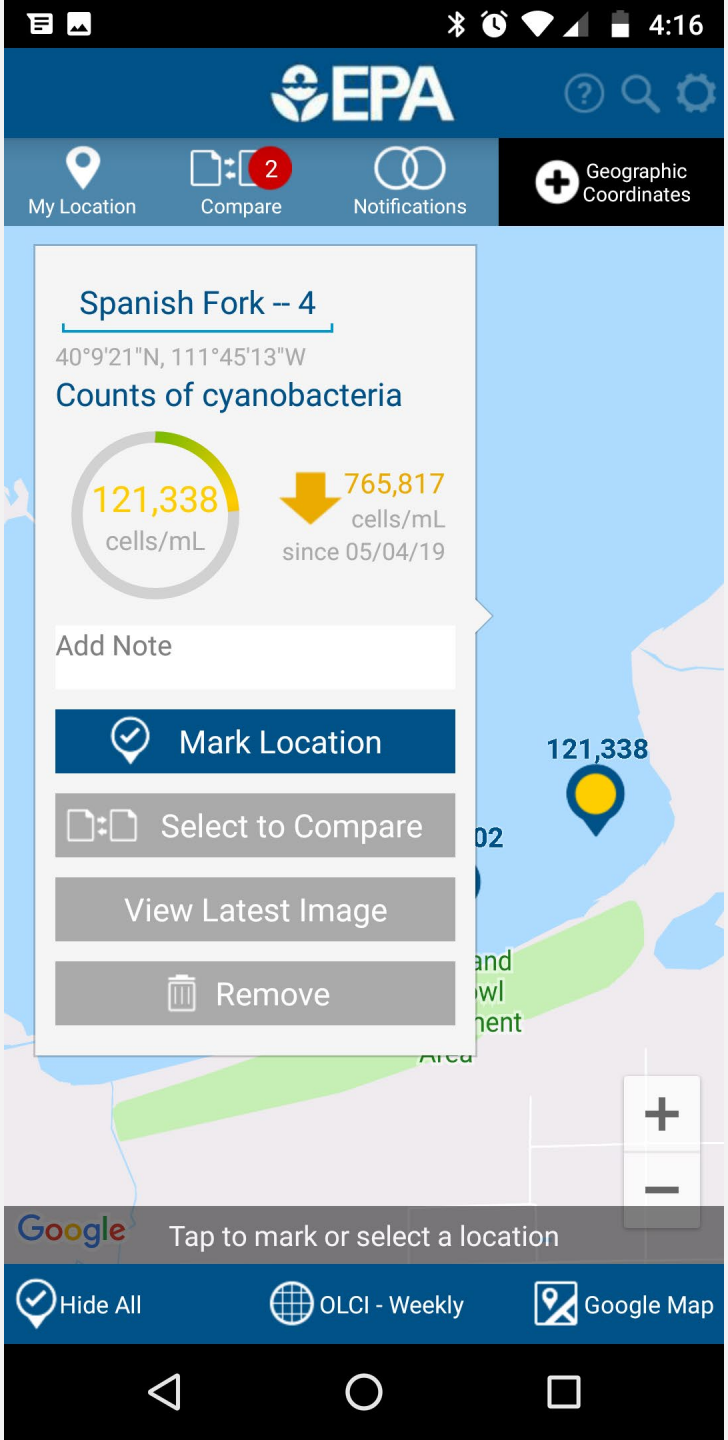

4:16
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
242,102
Rock Island
Waterfowl
Management
Area
Google
Tap to mark or select a location
Hide All
OLCI - Weekly
Google Map

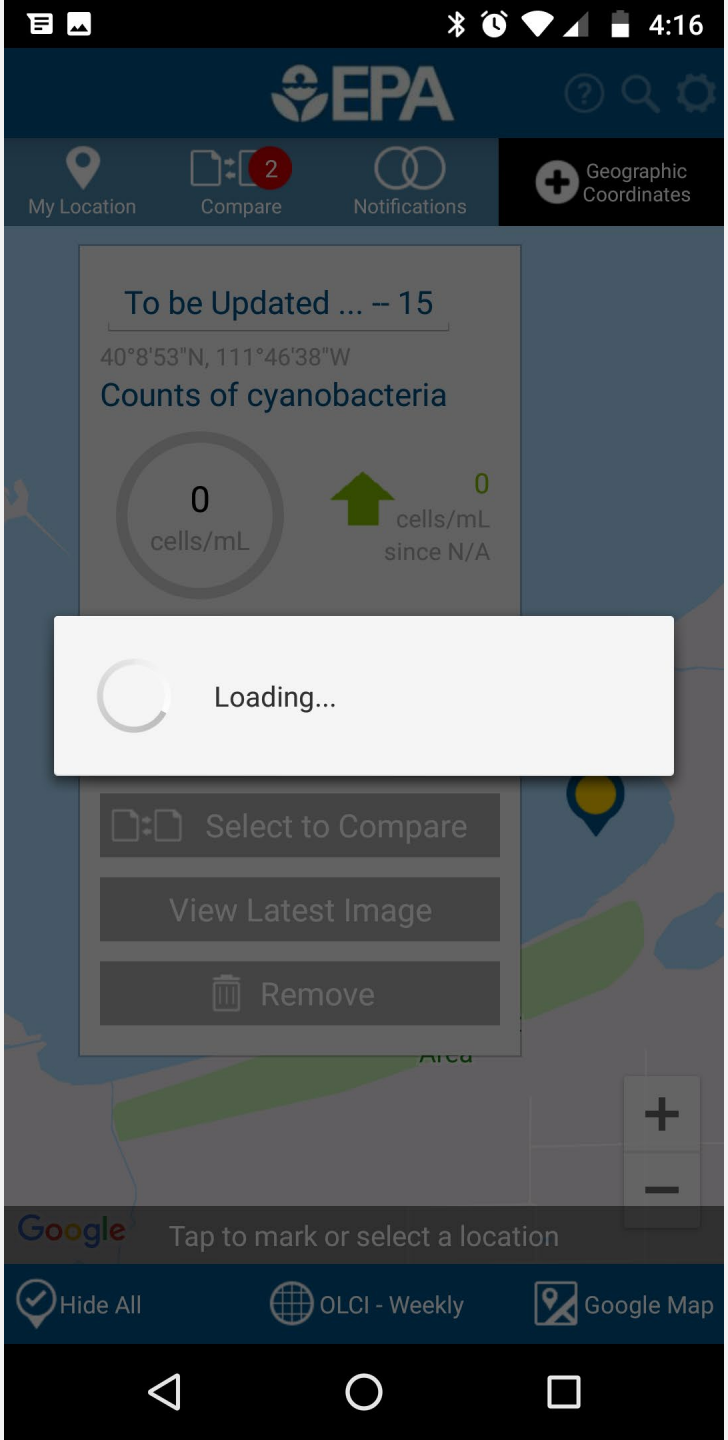
EPA United States Environmental Protection Agency

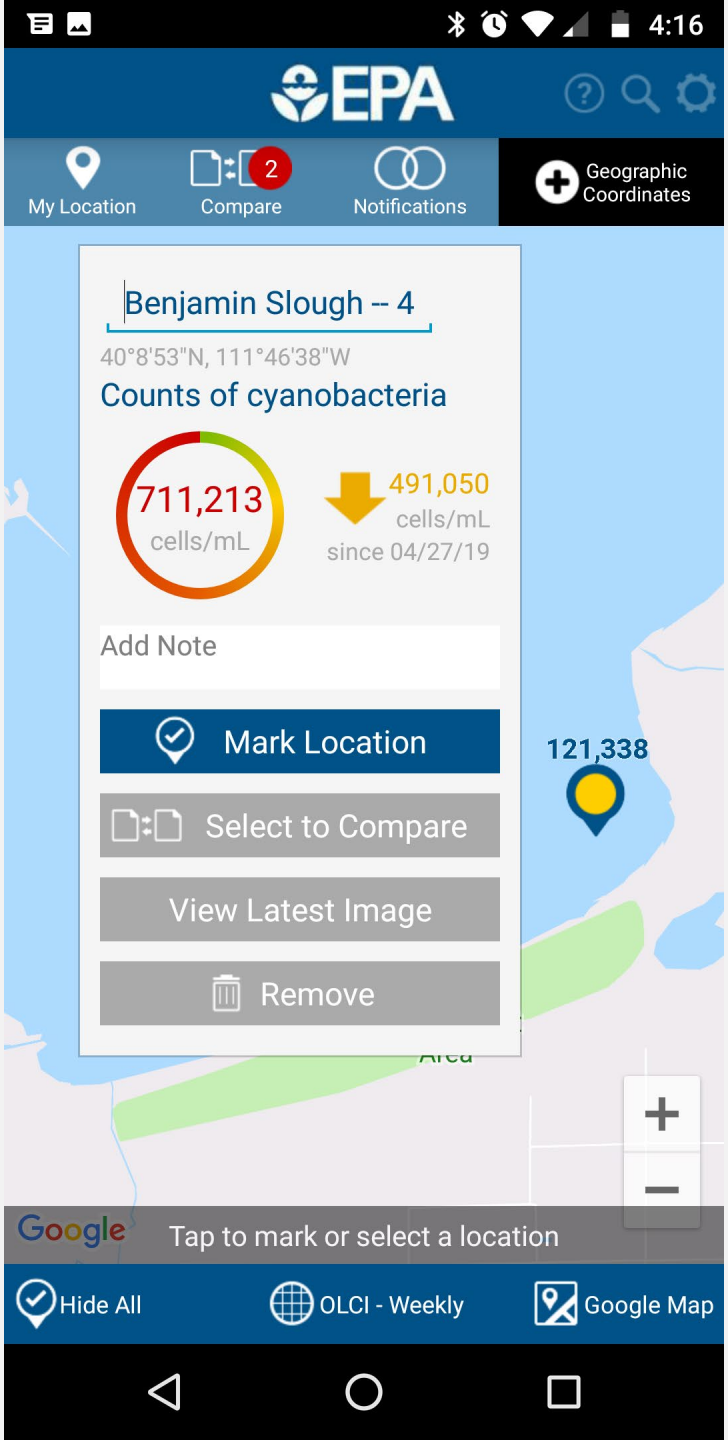
Recreation area

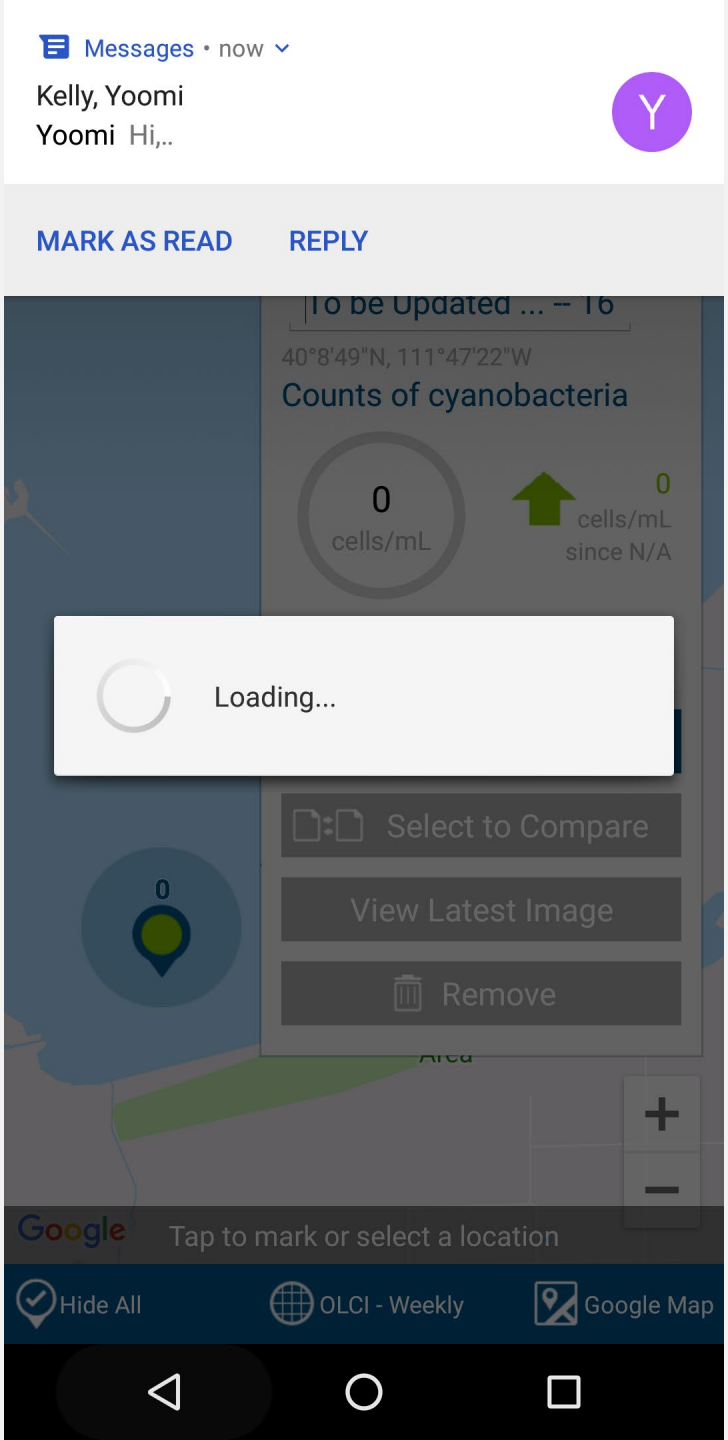

4:16
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
To be Updated ... -- 14
40°9'21"N, 111°45'13"W
Counts of cyanobacteria
0
cells/mL
0
cells/mL
since N/A
Loading...
Select to Compare
View Latest Image
Remove
Google
Tap to mark or select a location
Hide All
OLCI - Weekly
Google Map

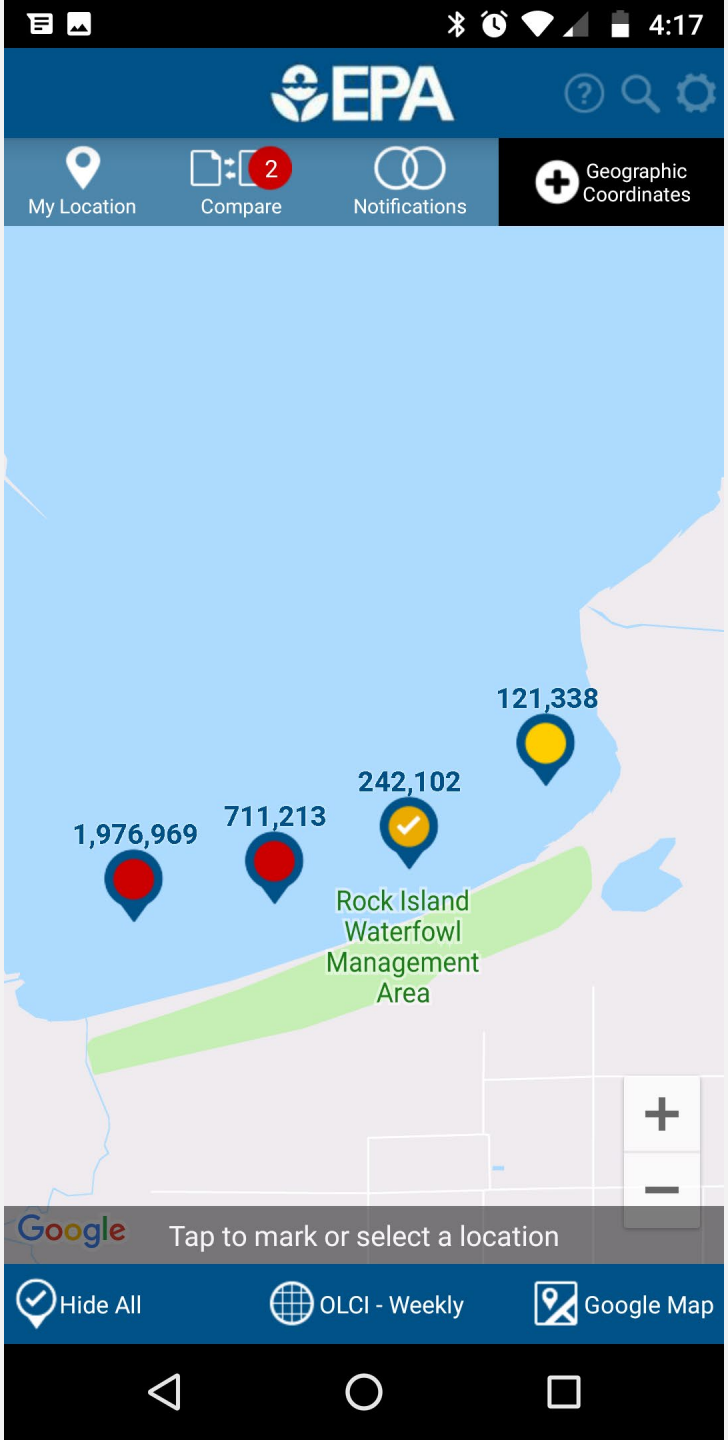
EPA United States Environmental Protection Agency




4:16
EPA
My Location
Compare
2
Notifications
Geographic Coordinates
To be Updated ... -- 15
40°8'53"N, 111°46'38"W
Counts of cyanobacteria
0
cells/mL
0
cells/mL
since N/A
Loading...
Select to Compare
View Latest Image
Remove
Google
Tap to mark or select a location
Hide All
OLCI - Weekly
Google Map


4:16
EPA
My Location
2
Compare
Notifications
Geographic Coordinates
Benjamin Slough -- 4
40°8'53"N, 111°46'38"W
Counts of cyanobacteria
711,213
cells/mL
491,050
cells/mL
since 04/27/19
Add Note
Mark Location
Select to Compare
View Latest Image
Remove
121,338
Google
Tap to mark or select a location
Hide All
OLCI - Weekly
Google Map


Messages • now
Kelly, Yoomi
Yoomi Hi,..
Y
MARK AS READ
REPLY
To be Updated ... -- 16
40°8'49"N, 111°47'22"W
Counts of cyanobacteria
0
cells/mL
0
cells/mL
since N/A
Loading...
Select to Compare
View Latest Image
Remove
0
Google
Tap to mark or select a location
Hide All
OLCI - Weekly
Google Map


4:17
EPA
My Location
2
Compare
Notifications
Geographic Coordinates
121,338
242,102
711,213
1,976,969
Rock Island
Waterfowl
Management
Area
Google
Tap to mark or select a location
Hide All
OLCI - Weekly
Google Map

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