

The background of the slide is a satellite image showing three large hurricanes over the Gulf of Mexico and the Caribbean Sea. The hurricanes are characterized by their distinct eye walls and spiral cloud patterns.

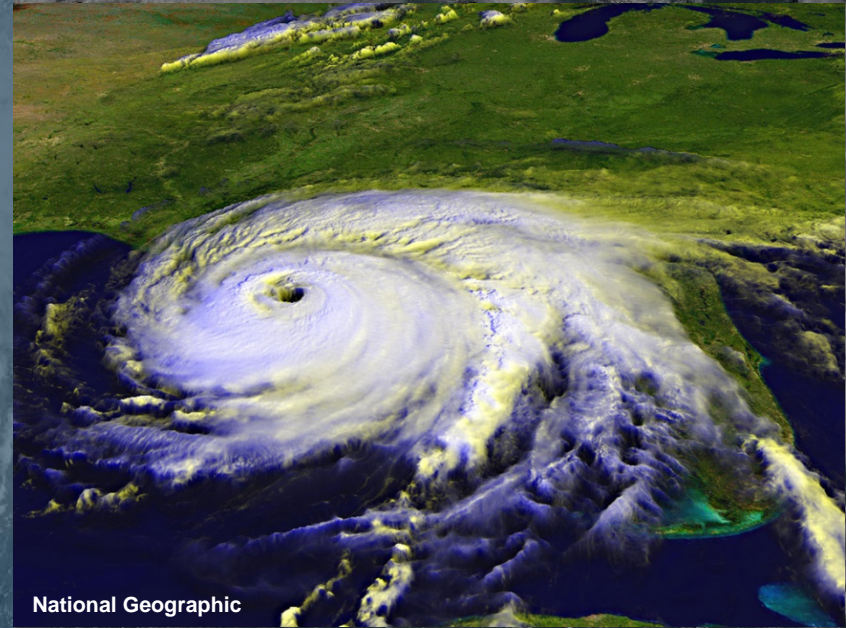
USGS FaST System Updates

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Wetland and Aquatic Research Center, Gainesville, FL, USA**

Nonindigenous Aquatic Species Flood and Storm Tracker (NAS FaST) Maps

- Created to help assess transportation of nonindigenous aquatic species between drainages due to storm surge and inland flooding
- As part of the EDRR system, the NAS program is interested in alerting managers of these possible new introductions
- Once a species is introduced, the best chance of eradication or containment is as an incipient population



NAS FaST Essentials

■ Location of current established populations

Species Observations

● Clustered Specimen Records ?

- 1
- 2 to 5
- 6 to 10
- 11 to 19
- 20 or more
- Selected

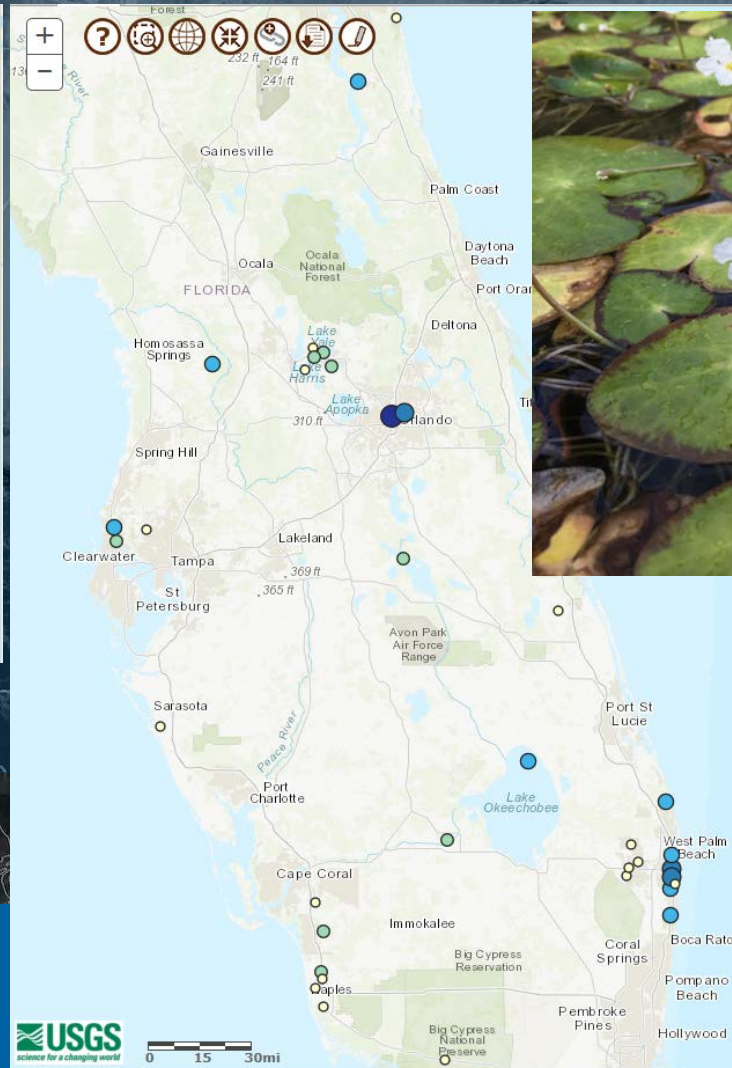
○ Individual Specimens ?

- ◆ Selected



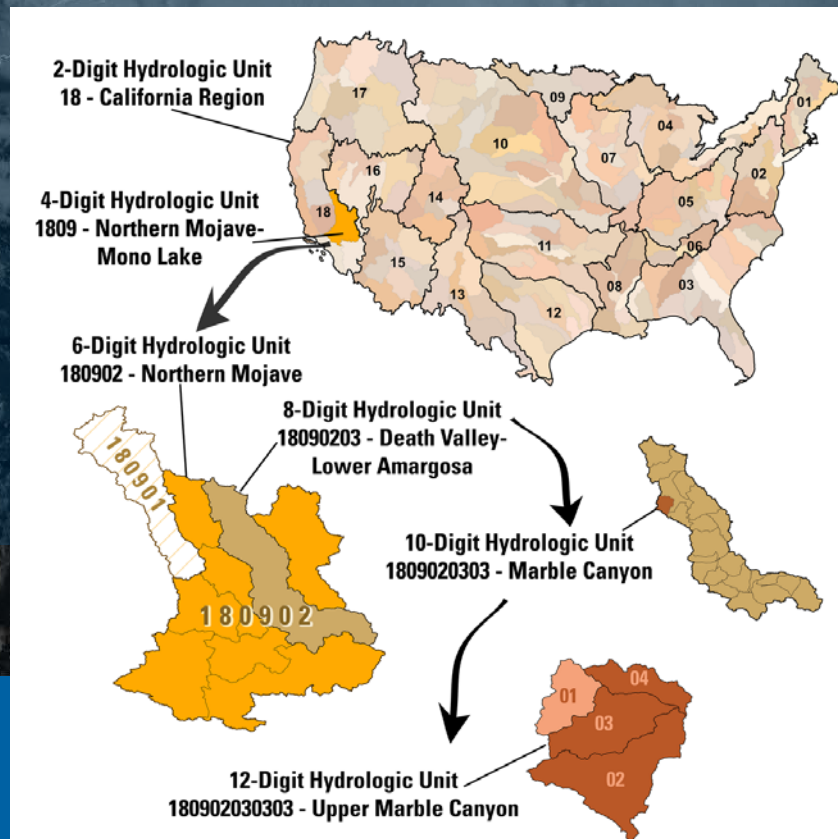
Nymphoides cristata
crested floating-heart
Plants
Exotic

☒ Include ☐ HUC8 Level Records



NAS FaST Essentials

- Location of current established populations
- Defined area where flooding may have occurred and units within that area delineated by hydrology
 - Hydrologic Unit Codes (HUCs), drainage basins, watersheds, etc.



NAS FaST Essentials

- Location of current established populations
- Defined area where flooding may have occurred that area delineated by hydrology
 - Hydrologic Unit Codes (HUCs), drainage basins, reach
- Measurements of flood heights
 - Streamgages, high water marks (hwm)



USGS WaterWatch

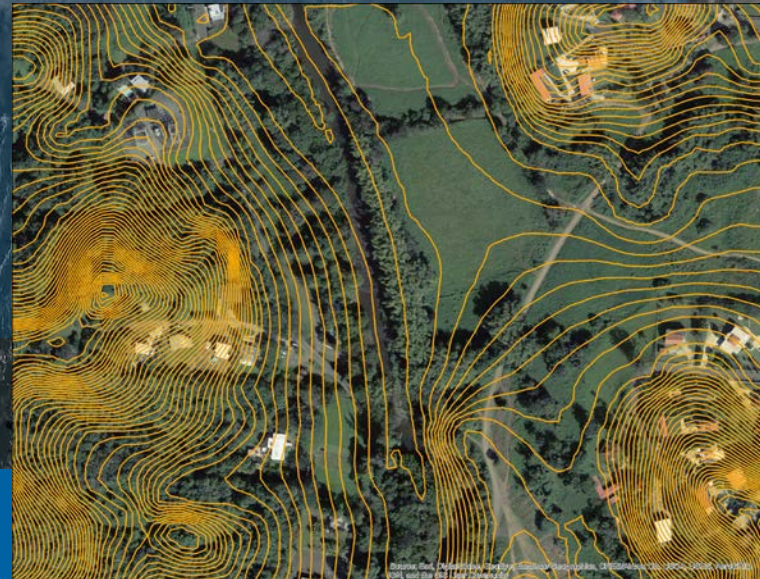
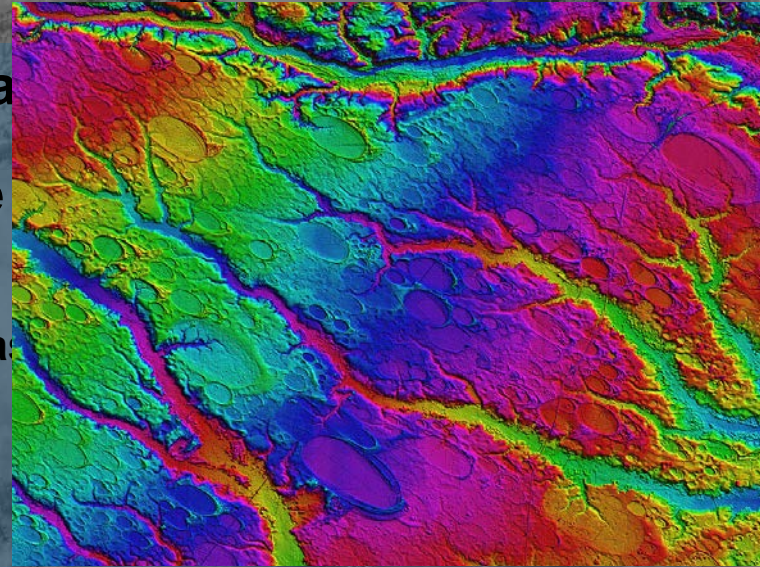
<http://waterwatch.usgs.gov>

USGS Flood Event Viewer

<https://stn.wim.usgs.gov/FEV>

NAS FaST Essentials

- Location of current established population
- Defined area where flooding may have occurred
 - Hydrologic Unit Codes (HUCs), drainage basins
- Measurements of flood heights
 - Streamgages, high water marks (hwm)
- Topography around drainage divides
 - Contours, Digital Elevation Models (DEMs)



NAS FaST Essentials

- Local
- Data
- Measurements of flood heights
 - Streamgages, high water marks (hwm)
- Topography around drainage divides
 - Contours, Digital Elevation Models (DEMs)
- Post-storm surveys



NAS FaST Maps

Stage 1 2-4 Days

Initial rapid response and the creation of a map of potential flooded HUCs. Maps will include information about NAS that could spread.

Stage 2 4-6 Weeks

Follow-up assessment of drainages that had flooding conditions that could breach drainage divides from coastal storm surge or inland flooding.

Stage 3 12-18 Months

Final review of which drainages were connected from flooding and any records of potential NAS transport due to coastal storm surge or inland flooding.

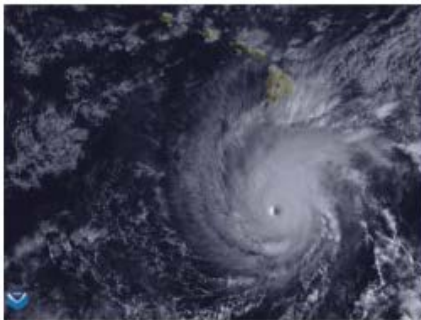
NAS FaST Maps

<https://nas.er.usgs.gov/viewer/Flooding/>

Hurricane Lane - Initial map

Hawaiian Islands

August 17, 2018 - August 27, 2018



Hurricane Florence - Initial map

The Carolinas

September 14, 2018



Hurricane Michael - Initial map

Florida Panhandle

October 10, 2018



Hurricane Harvey - Revised map

Gulf coast of east Texas and western Louisiana

August 25, 2017 - September 3, 2017



Hurricane Irma - Revised map

Peninsular Florida and Atlantic coast of Georgia and South Carolina

August 30, 2017 - September 16, 2017



Hurricane Maria - Revised map

Island of Puerto Rico

September 16, 2017 - October 3, 2017



Hurricane Nate - Revised map

Eastern Gulf Coast states

October 4, 2017 - October 11, 2017



Future maps

- Any future hurricane or storm event with significant flooding
- Previous storms to validate

Midwest Spring Flood - Initial map

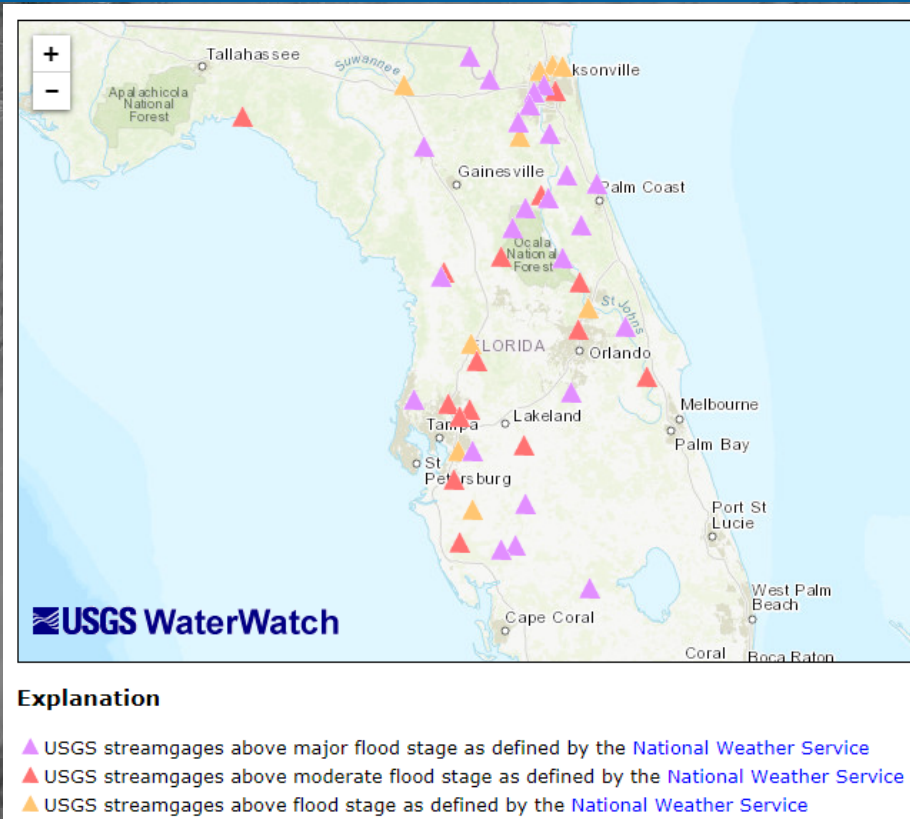
Upper Mississippi River Basin

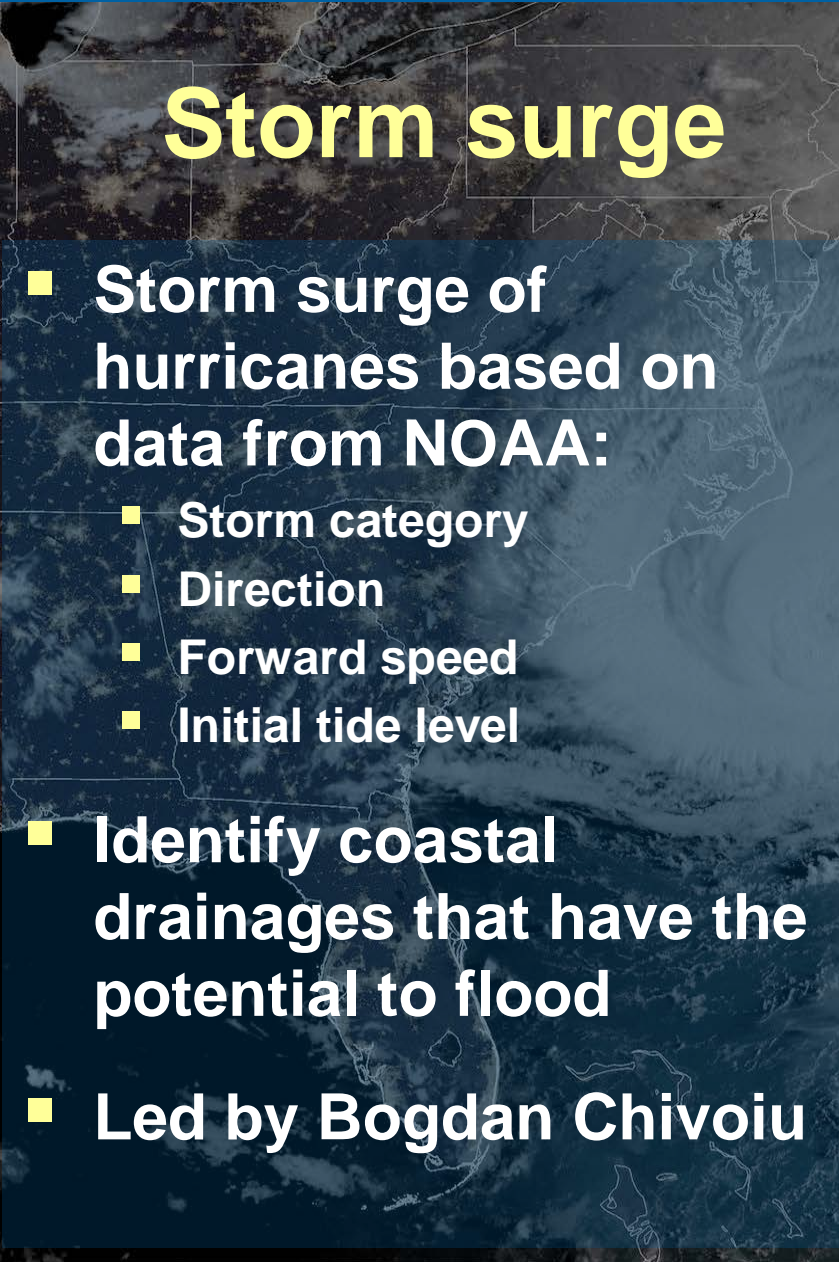
March 18, 2019



Stage 1 (2-4 days post-storm)

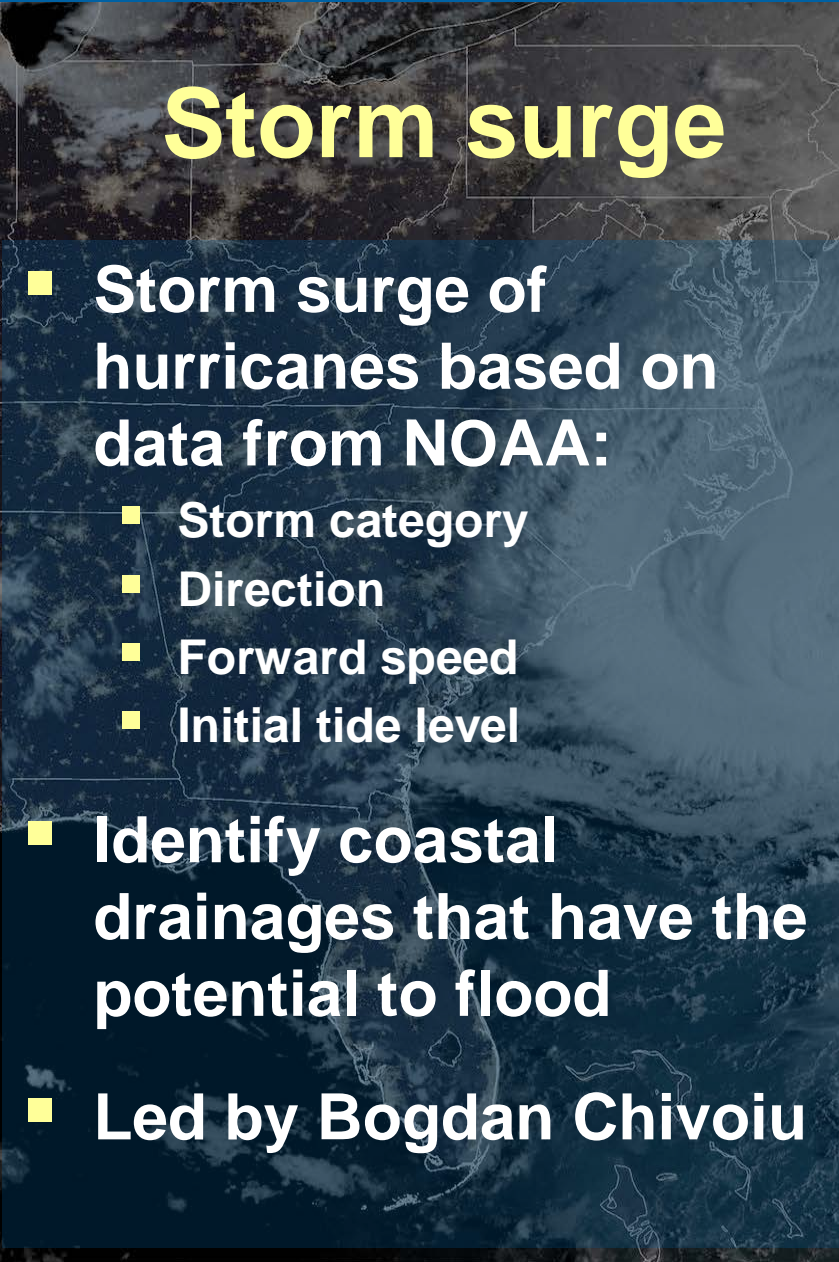
- Area of interest was defined using USGS WaterWatch data on flood and high flow conditions
- The areas with streamgages or storm tide sensors at flood stage were selected
- The map was created by using known locations of established or possibly established species
- All surrounding hydrologic units (HUCs at the 8 digit level) were selected as potential areas of infestation

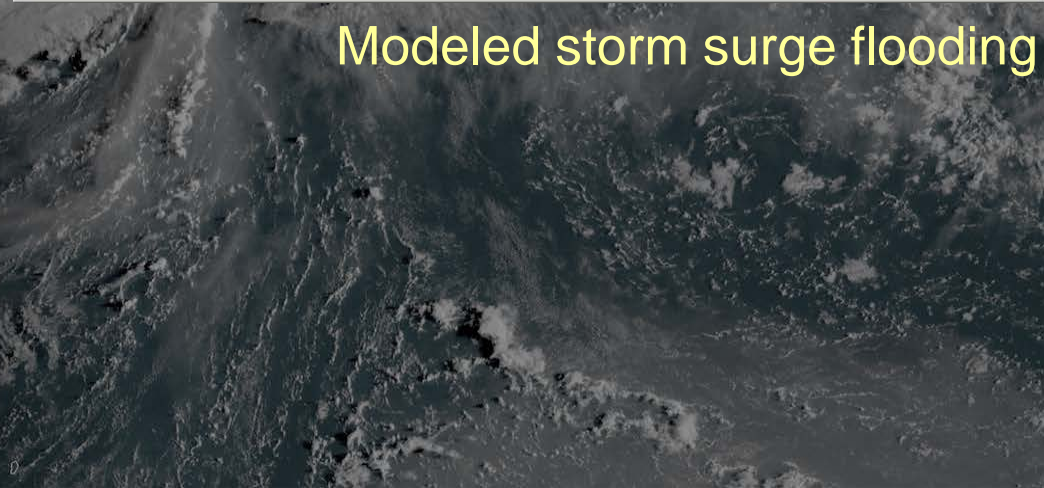
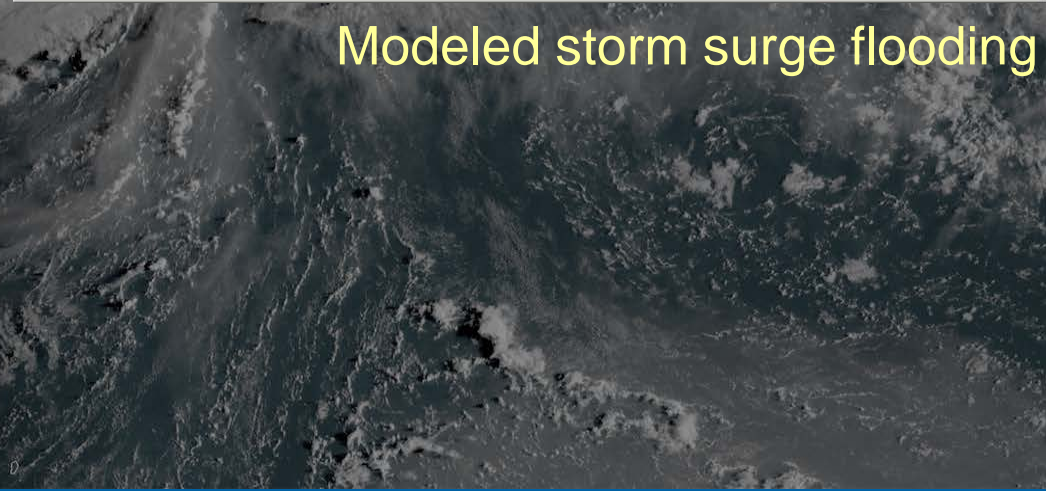




Storm surge

- Storm surge of hurricanes based on data from NOAA:
 - Storm category
 - Direction
 - Forward speed
 - Initial tide level
- Identify coastal drainages that have the potential to flood
- Led by Bogdan Chivoiu

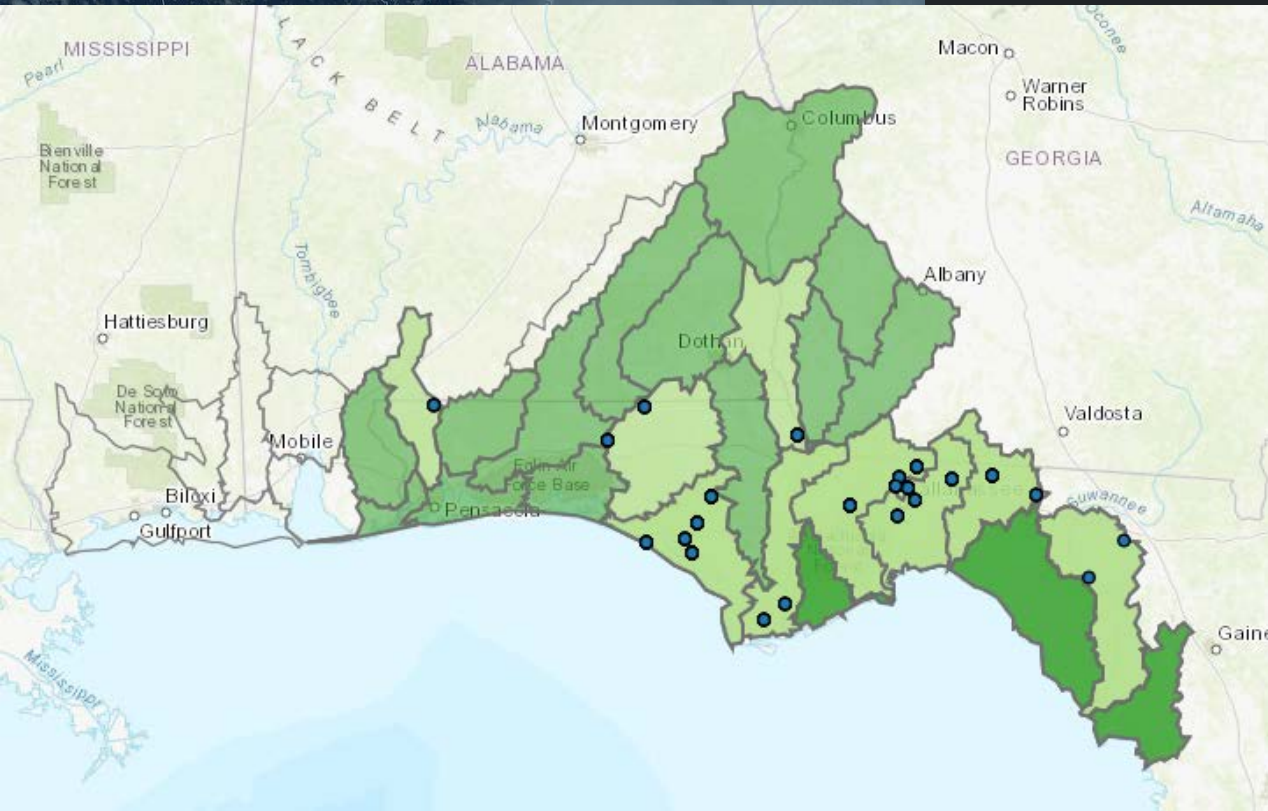
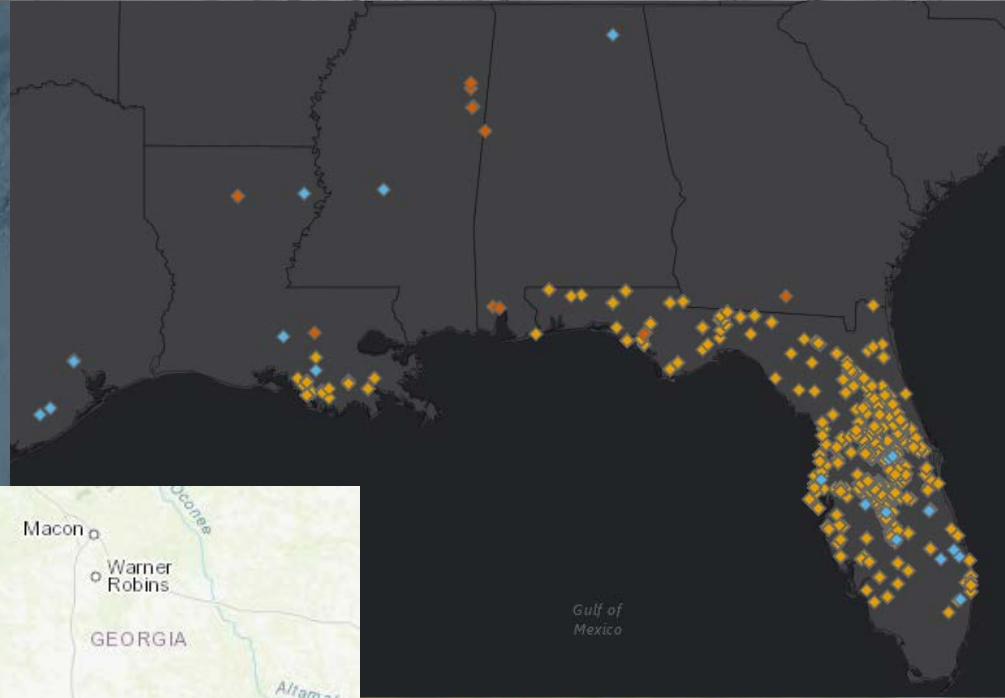
- 
- # Storm surge
- Storm surge of hurricanes based on data from NOAA:
 - Storm category
 - Direction
 - Forward speed
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Modeled storm surge flooding

Initial Hurricane Michael Map

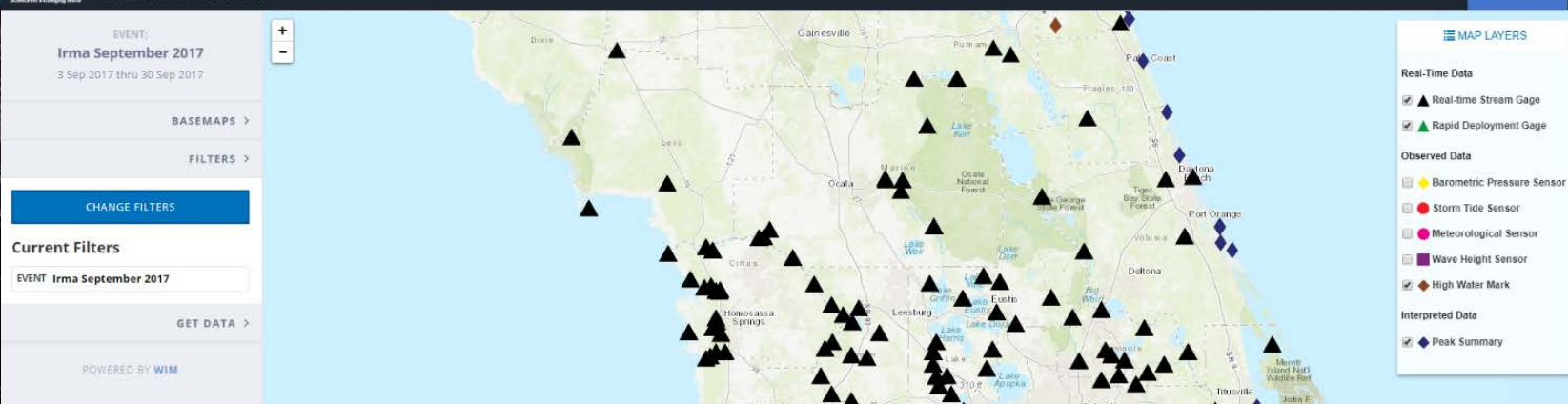
- Cuban bulrush
 - (*Cyperus blepharoleptos*)
- Native to South America and the West Indies
- Introduced range throughout southeast (mostly FL)



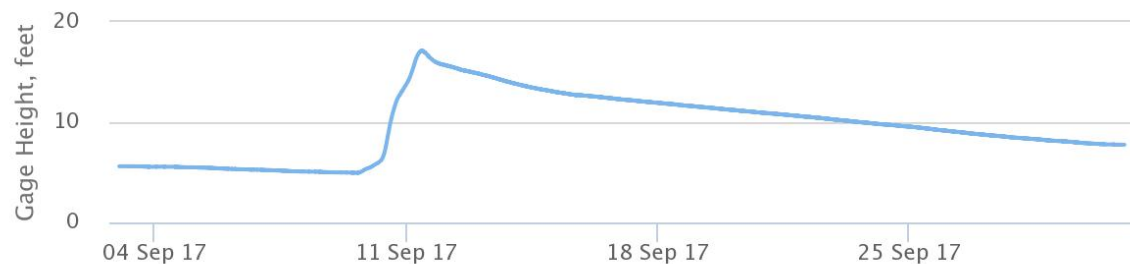
Stage 2 (4-6 weeks post-storm)

- Utilize digital elevation model contours to find heights at drainage divides (typically state-by-state)
- Make use of USGS WaterWatch data of streamgages or storm tide sensors at flood stage
- Identify which drainages that had flooding conditions that would also breach drainage divides

USGS Flood Event Viewer



NWIS Site 02320700
SANTA FE RIVER NEAR GRAHAM, FLA.



Stage 2 high water marks

Photo of hwm at Elfers Parkway stone angels, Pasco County, FL,
09/30/2017. Photograph by Andrew Knaak, USGS GA.



Revised Hurricane Irma Map

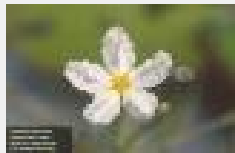
Hurricane Irma - Revised map

Click on a drainage in the map or select a species from below.





Select a species:

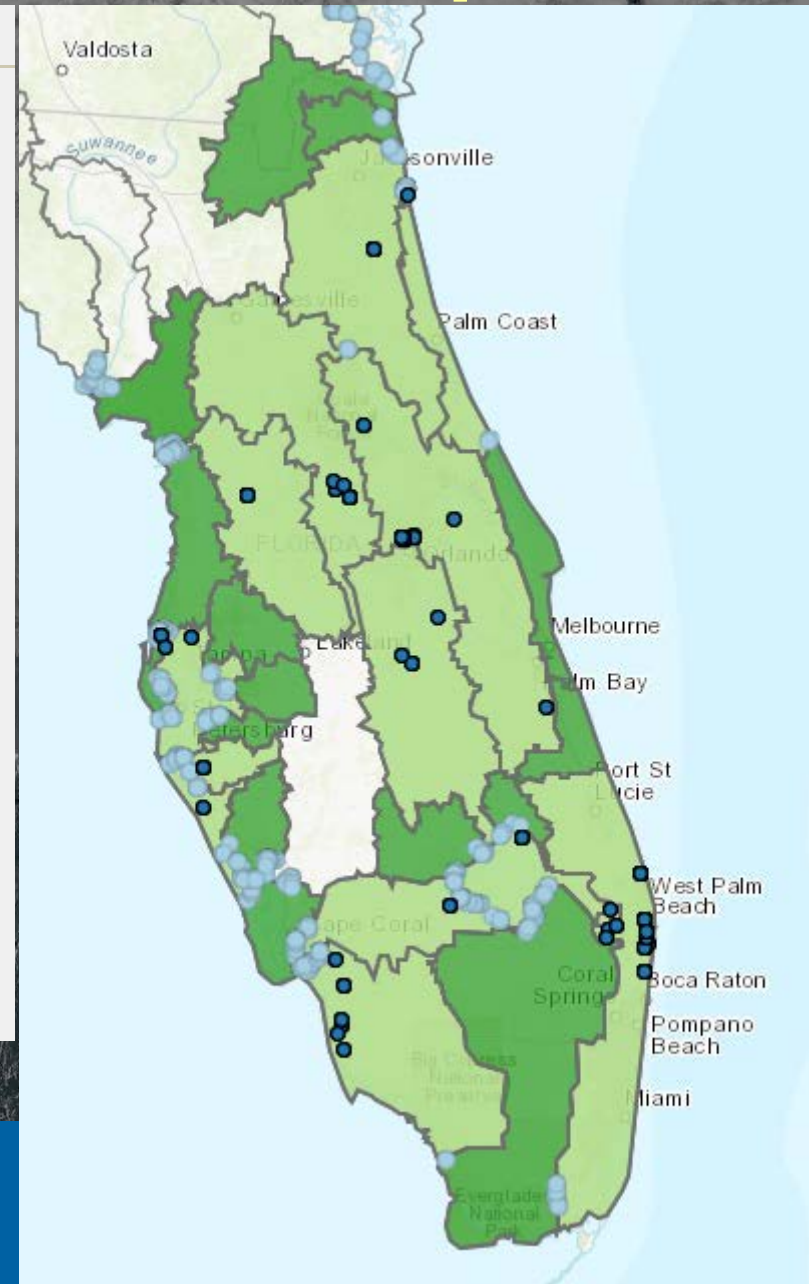
crested floating-heart (*Nymphoides cristata*) ▼

Map updated 3/28/2018



Nymphoides cristata
crested floating-heart
Plants
Exotic
[View Species Profile](#)

-  Present in watershed
-  Potential spread due to flooding
-  Connection points
-  Species Observations



Stage 3

12-18 months post-storms

- Review post-hurricane NAS surveys or sightings to identify any species that could have been transported by flooding
 - Will take time to potentially find
- Utilize final USGS WaterWatch data to determine which drainages were connected

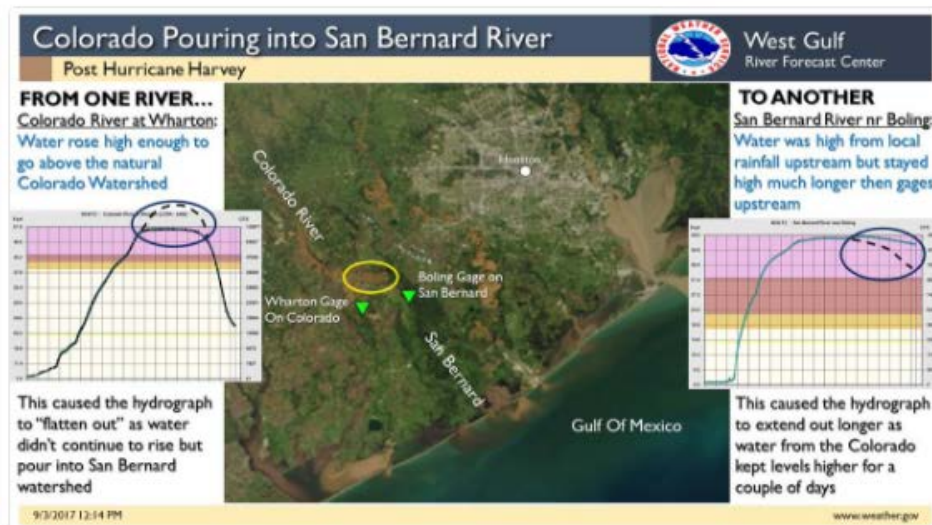
Picture from Twitter showing the Colorado River flooding into the San Bernard River



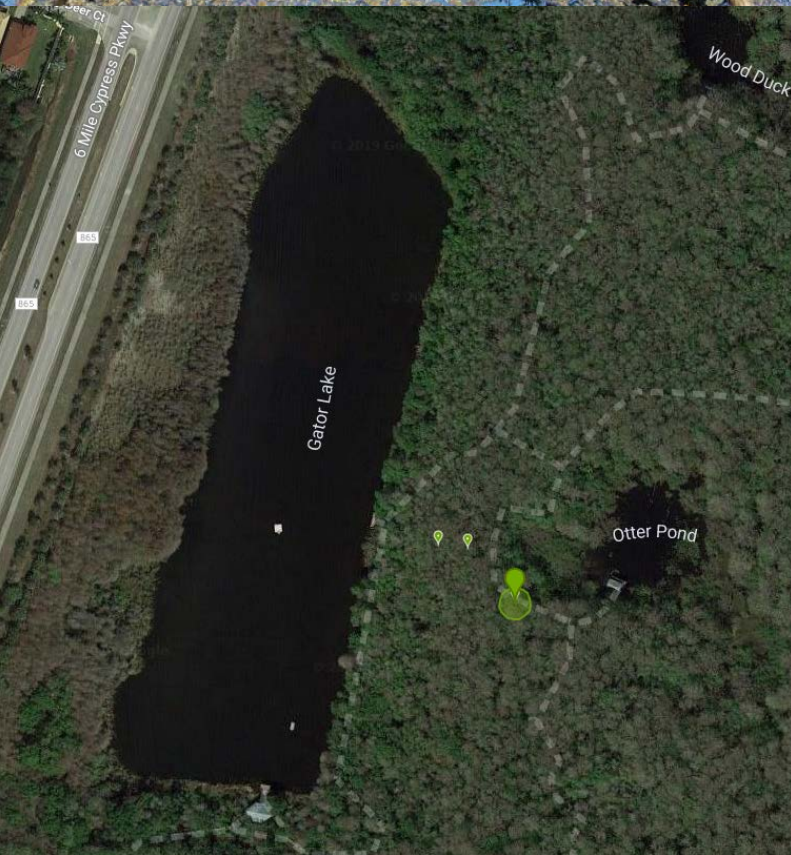
NWSWGRFC
@NWSWGRFC

Follow

[#HurricaneHarvey](#) caused such significant flooding the rivers have jumped over watershed boundaries! [#txwx](#) [#txflood](#) [#HarveyFlood](#) [#houwx](#)

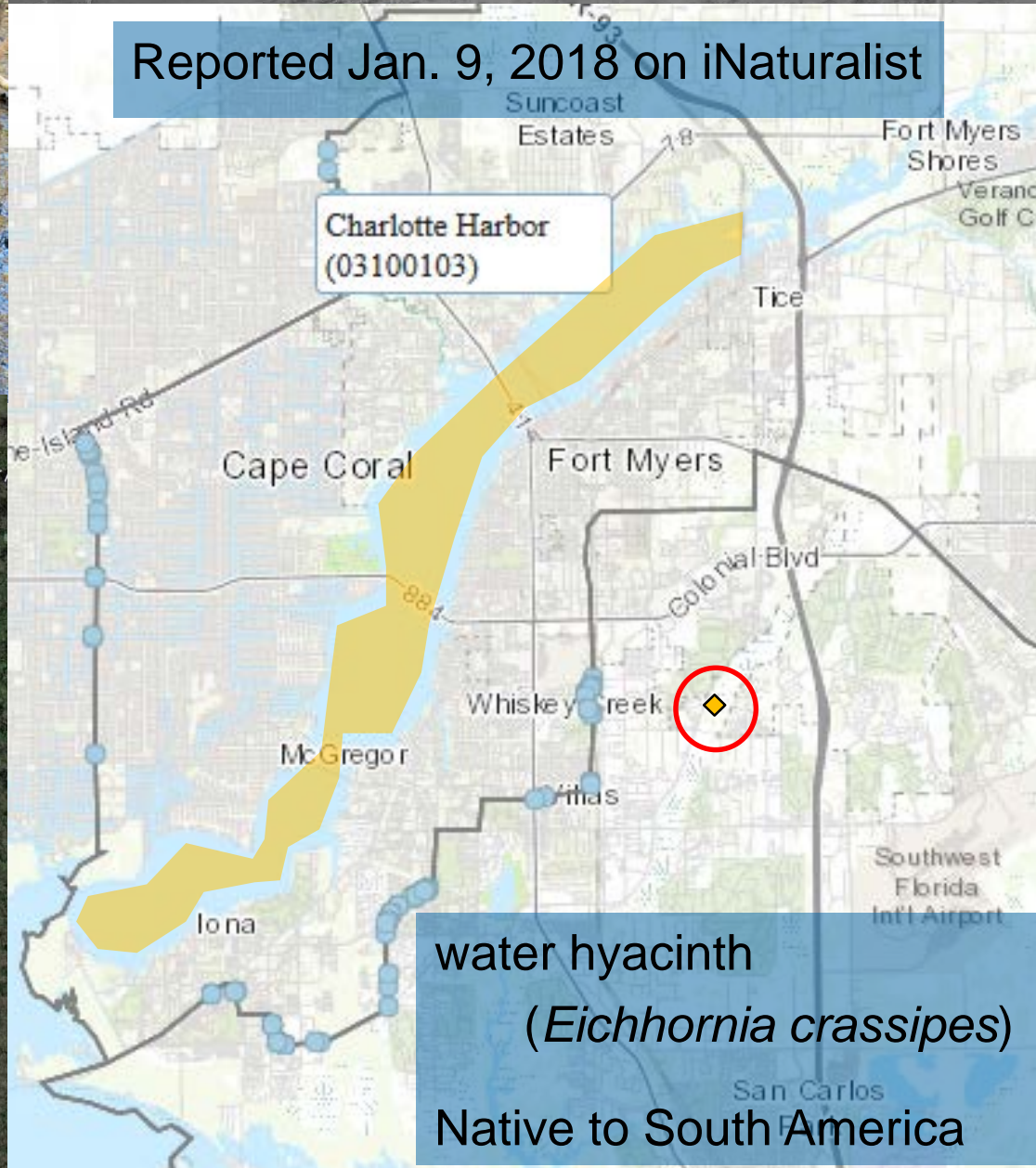


10:20 AM - 3 Sep 2017



Hurricane Irma Stage 3

Reported Jan. 9, 2018 on iNaturalist

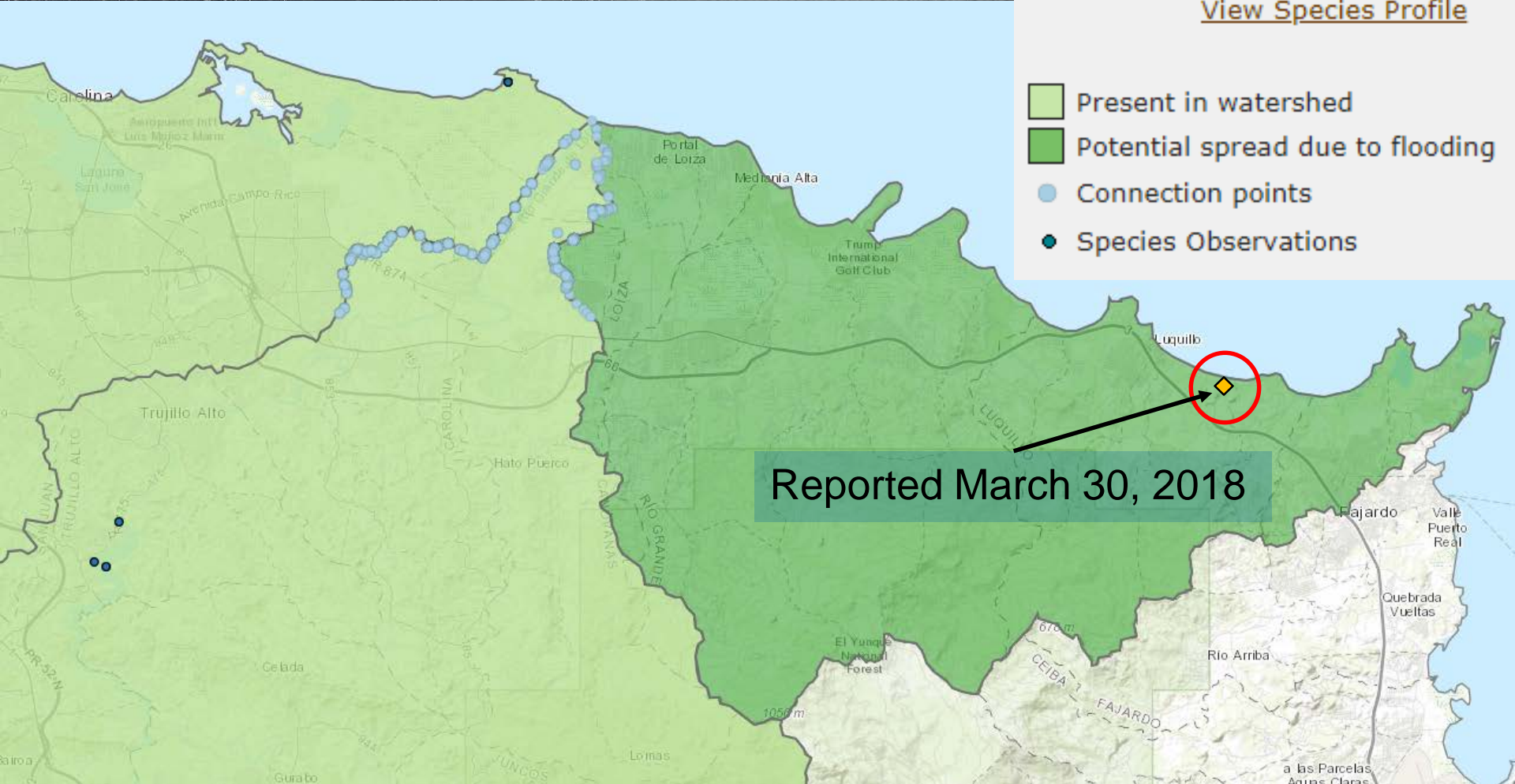


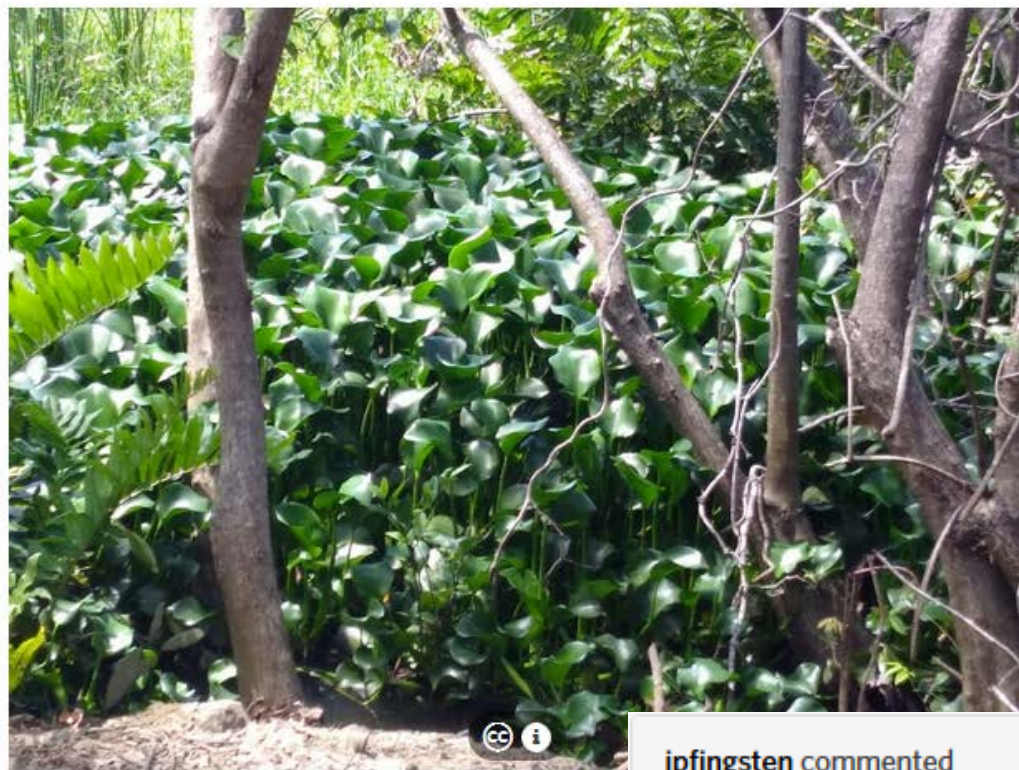
Hurricane Maria Stage 3

Map updated 3/28/2018



Eichhornia crassipes
floating waterhyacinth
Plants
Exotic
[View Species Profile](#)





ricardocolonrivera

164 observations

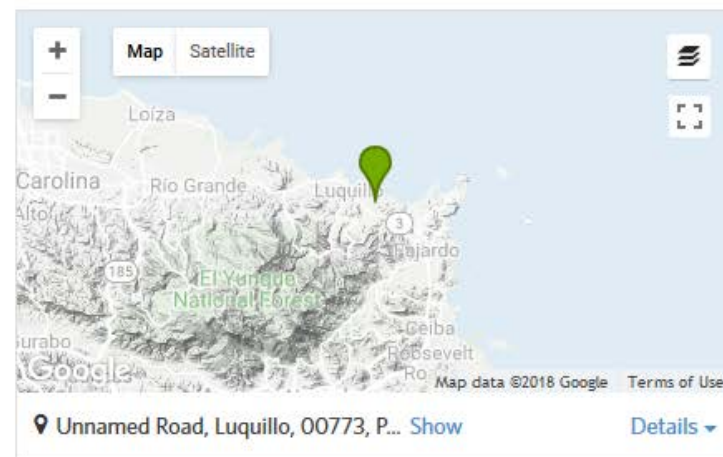


Observed:

Mar 30, 2018 · 1:55 PM ADT

Submitted:

Mar 30, 2018 · 2:56 PM ADT



ipfingsten commented

6mo



Do you know how long this population has been present?

ricardocolonrivera commented

6mo



Yes actually, we first noticed them about a month after Hurricane Maria. Since that time they have colonized a 100 m stretch of a channel that is between 5-10 m wide. Another aquatic that I have observed in adjacent areas is *Lemna minor* but that species did not become a problem or grew above 20% cover.

Upcoming enhancements

- Addition of life history traits
 - Assess the species ability to be transported in flood conditions
 - Salinity tolerance (freshwater lens around coastal areas)
 - Ability to float (e.g., apple snails)
 - Movement of nonindigenous plants by vegetative fragmentation



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Giant salvinia (*Salvinia molesta*) Post-Hurricane Katrina



Fuller, P.L., M.G. Pursley, D. Diaz, and W. Devers. 2010. Effects of Hurricane Katrina on an incipient population of giant salvinia *Salvinia molesta* in the lower Pascagoula River, Mississippi. Gulf and Caribbean Research 22:63-66

JUN 4 2006

Questions?

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<https://nas.er.usgs.gov>

