The SECAS Third Thursday Web Forum

Landscape scale assessment of floodplain inundation frequency using Landsat imagery

9-15-2022

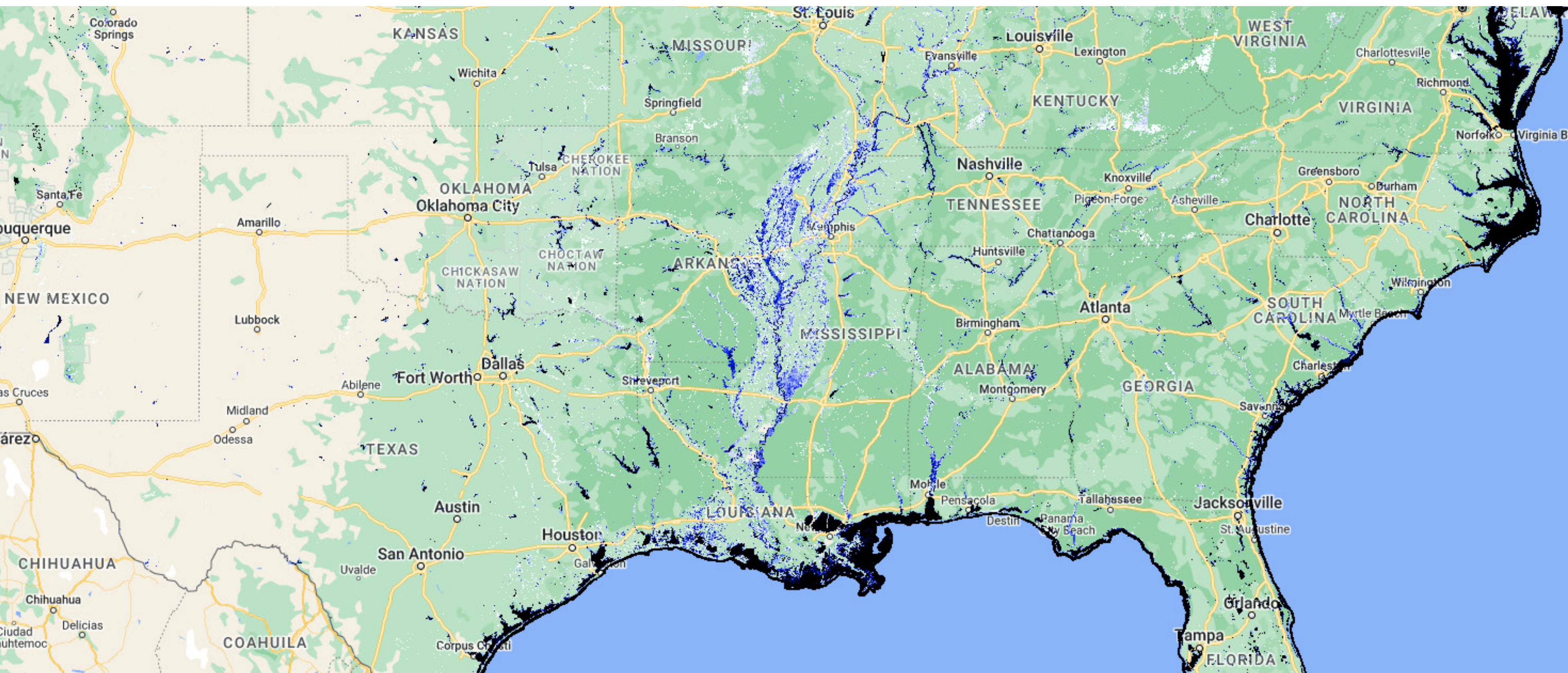
Agenda

- Introduction
- Monthly topic
- Q&A and discussion
- Preview of next webinar
- Staff updates

Landscape scale assessment of floodplain inundation frequency using Landsat imagery

Yvonne Allen, U.S. Fish and Wildlife Service

9-15-2022



Multitemporal Imagery to Assess Floodplain Inundation Extent and Frequency

15 Sep 2022

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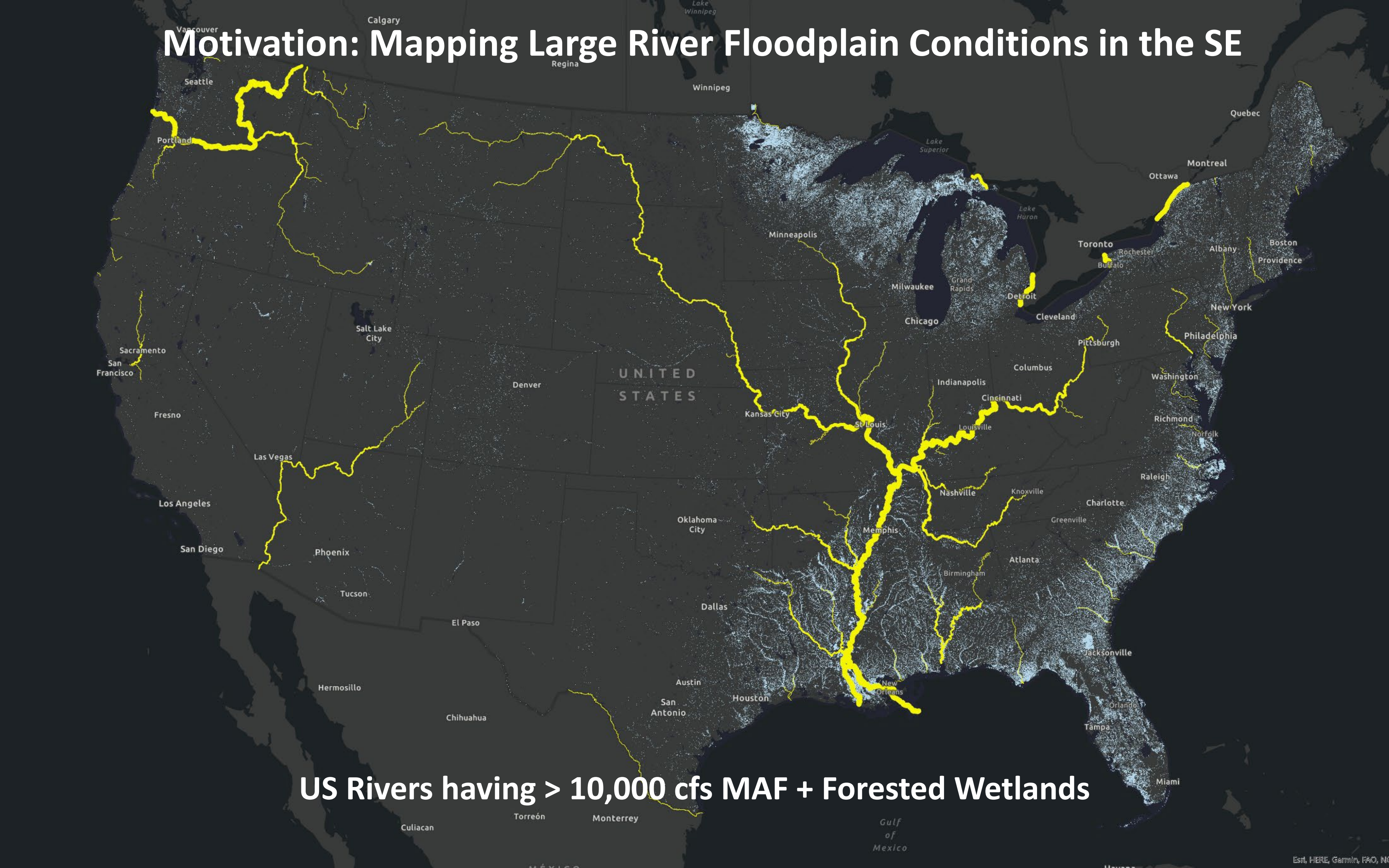
USFWS
Science Applications and Migratory Birds Program
Southeast Region

Outline

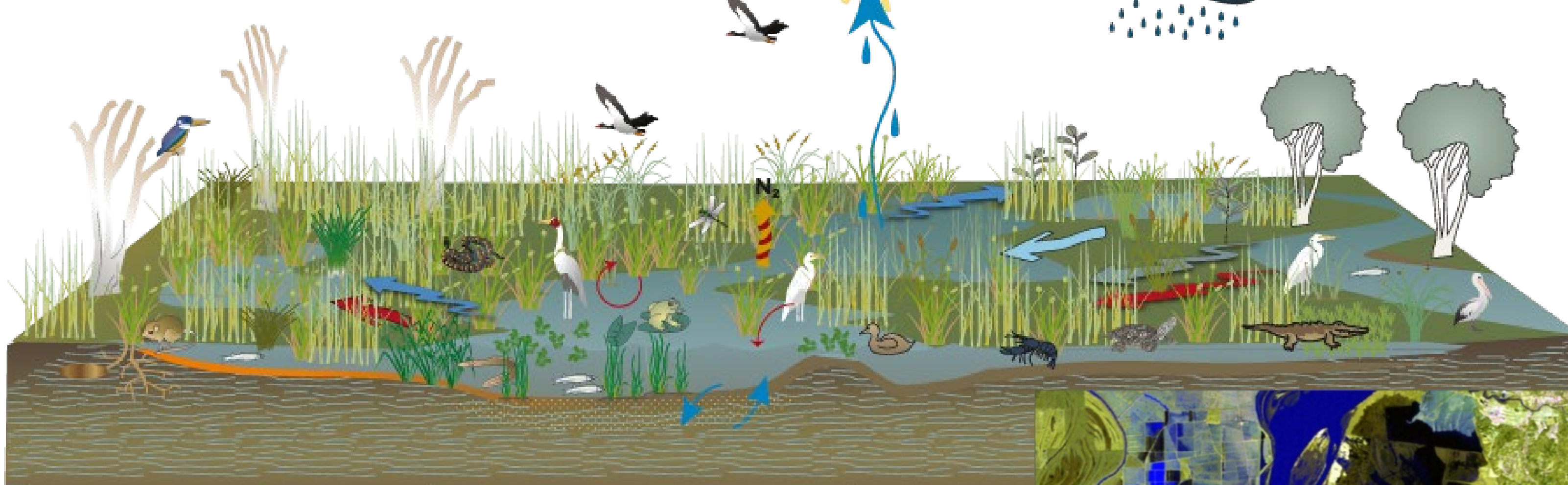
- Motivation for creating "Inundation Frequency and Extent Using Imagery"
- Under the hood – process for creating IF and temporal considerations
- Comparison with other similar datasets
    - JRC, NWI, FEMA
- Four example applications
- Demonstration of Google Earth Engine App

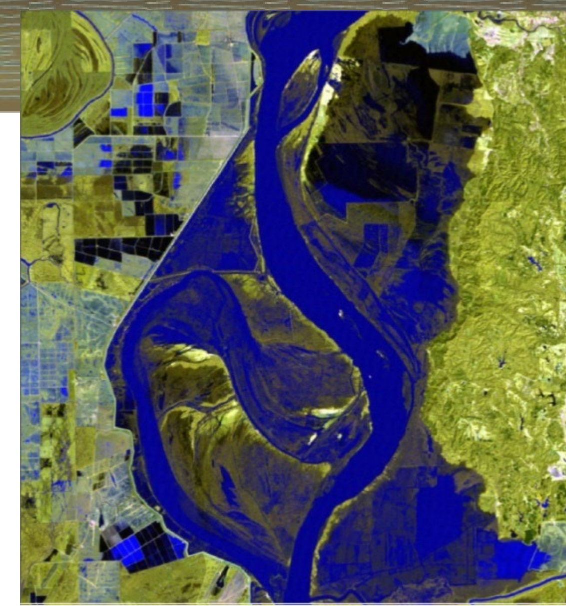
Motivation: Mapping Large River Floodplain Conditions in the SE



US Rivers having > 10,000 cfs MAF + Forested Wetlands

Floodplain Habitat



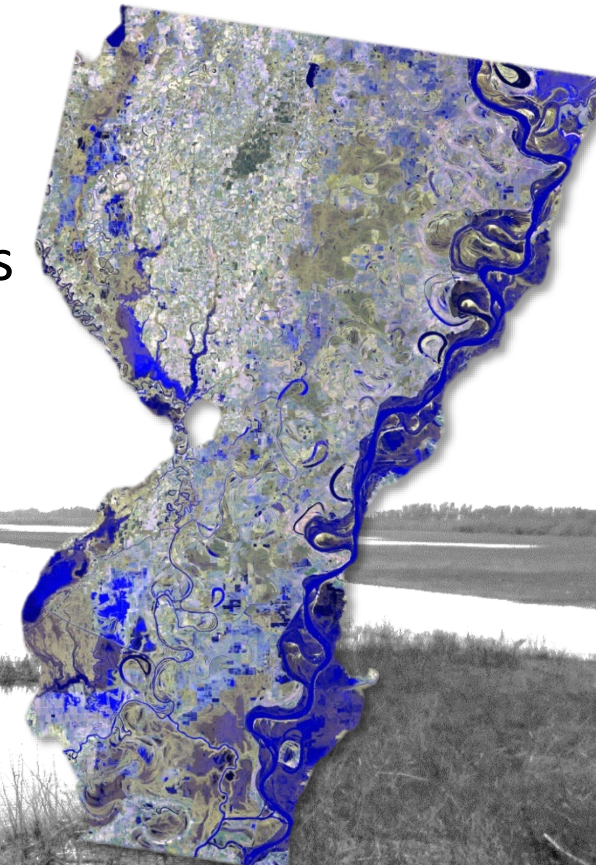


Floodplain Ecosystem Services

- habitat for aquatic species
- habitat for terrestrial species
- nutrient cycling
- flood risk reduction
- *Floodplain inundation extent and frequency* drive the delivery of ecosystem services

Raw Materials:

- Landsat Imagery (early 1980s to present)
- Cloud and Snow Free
- Extent of open water **and** flooded veg
- Acquired **Dec-Mar** (Apr)
    - capture a variety of hydro conditions
    - reduce obscuring from vegetation (canopy, ground, floating)



National distribution of peak flows

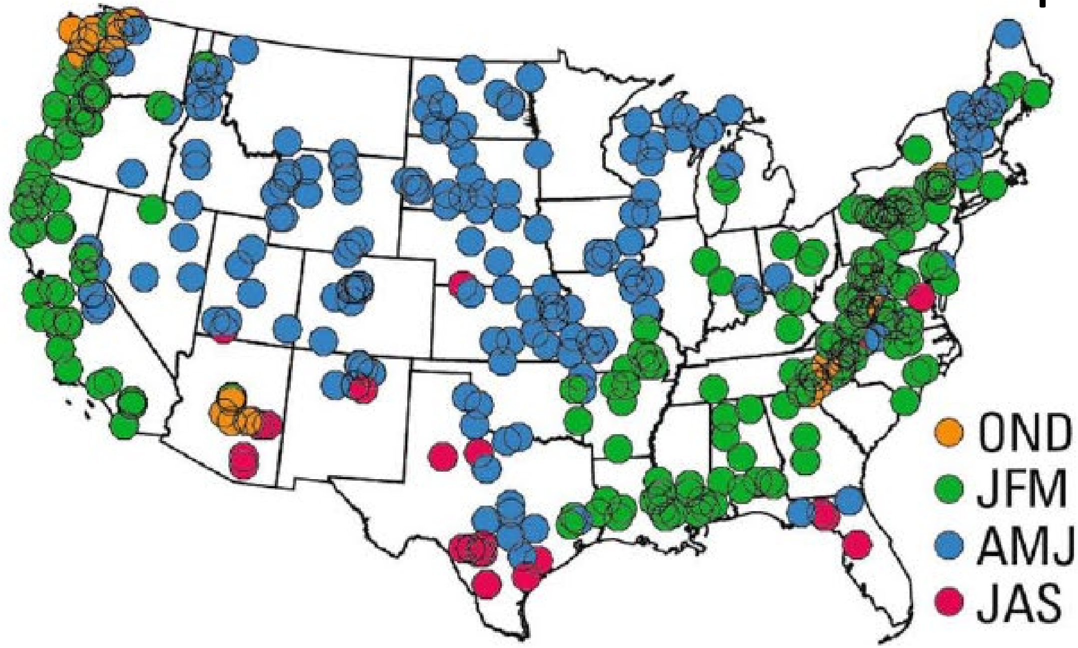
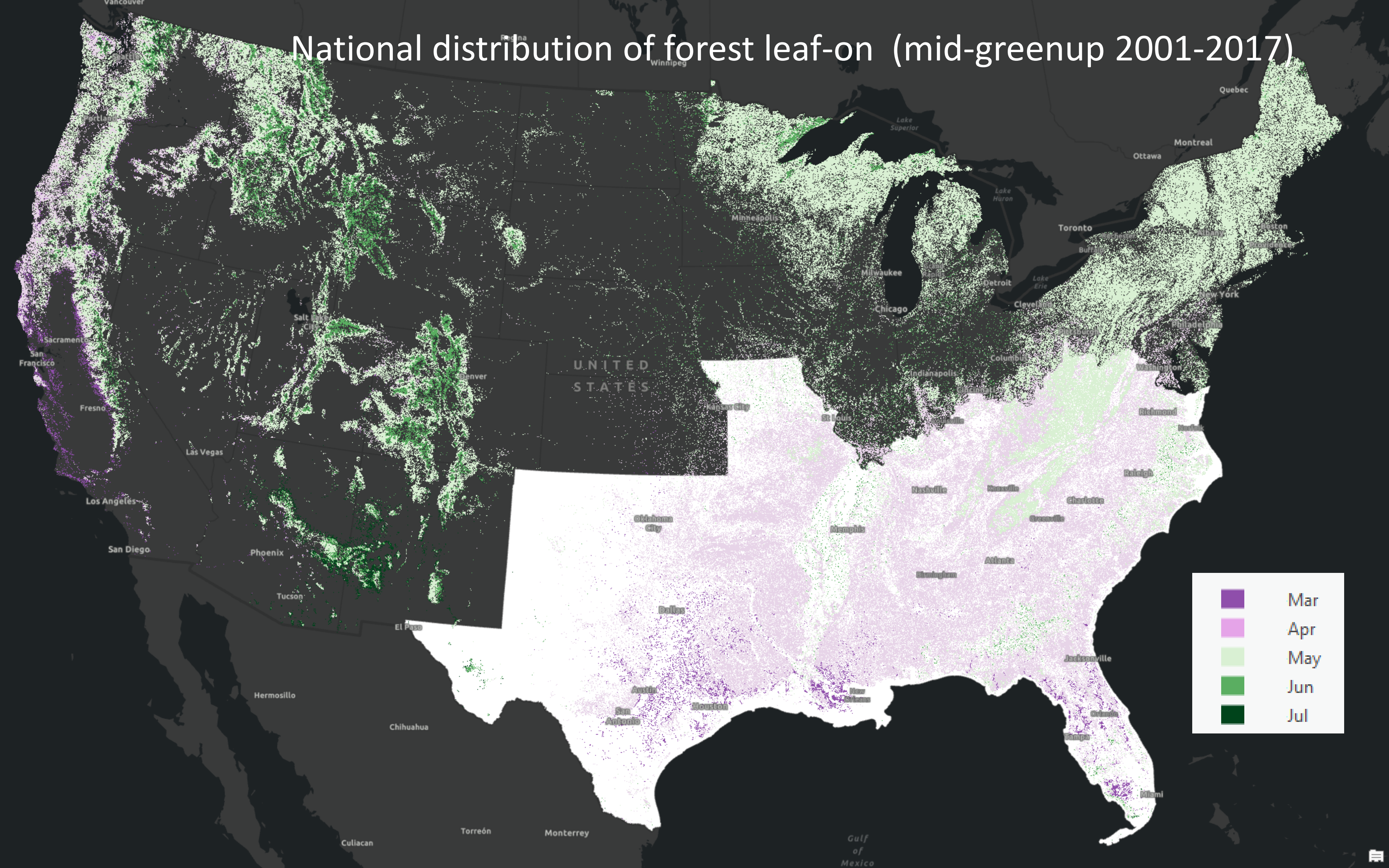


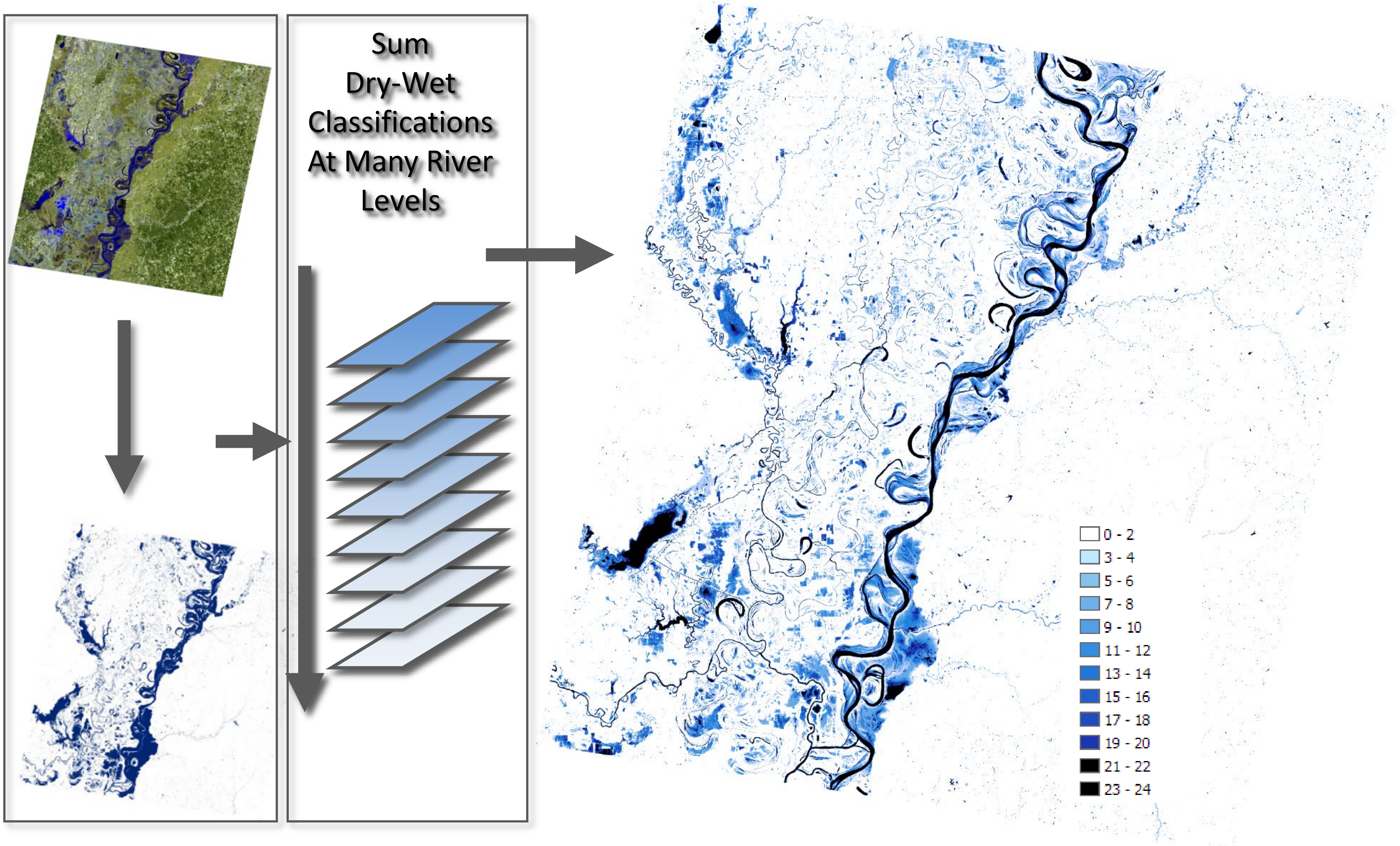
Figure 1 . Mean season of the annual peak flow from 1966-2015 at 415 streamflow gauges in the USGS HCDN-2009 network. The seasons are defined as October-December (OND), January-March (JFM), April-June (AMJ), and July-September (JAS).

From: Dickinson et.al 2019 "Seasonality of climatic drivers of flood variability in the conterminous United States" Nature Scientific Reports 9:15321

National distribution of forest leaf-on (mid-greenup 2001-2017)



Extent and Frequency of Inundation



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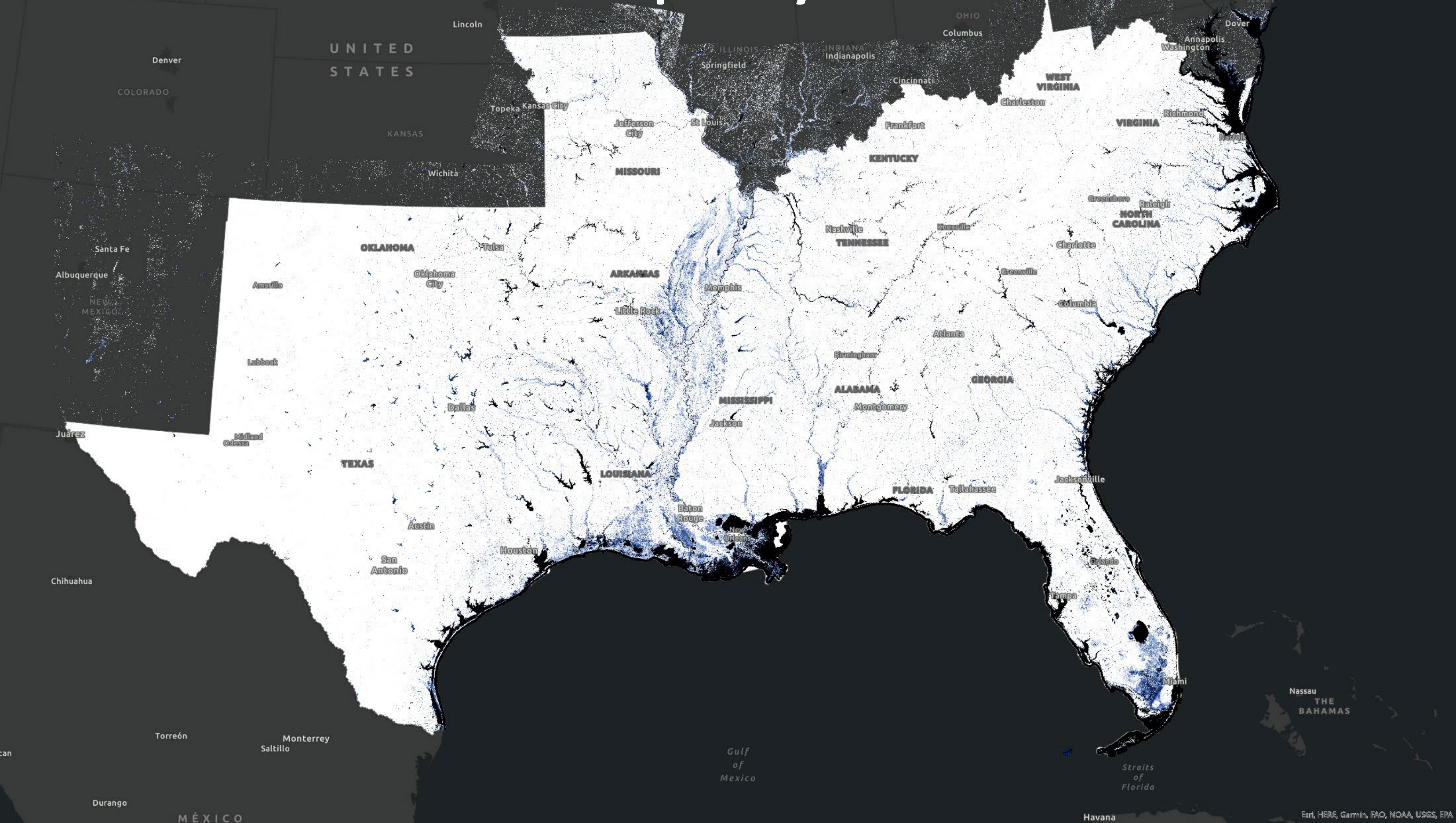
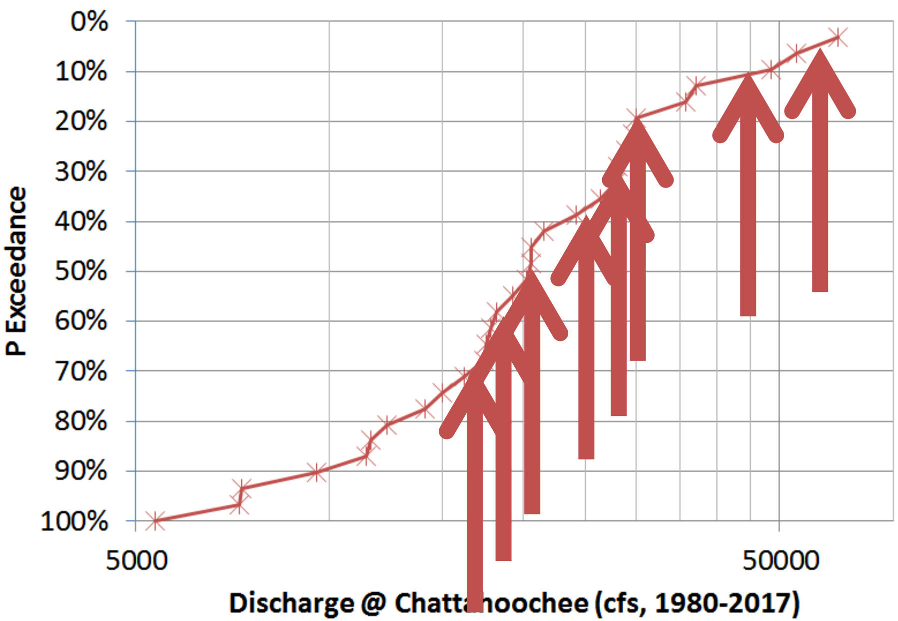
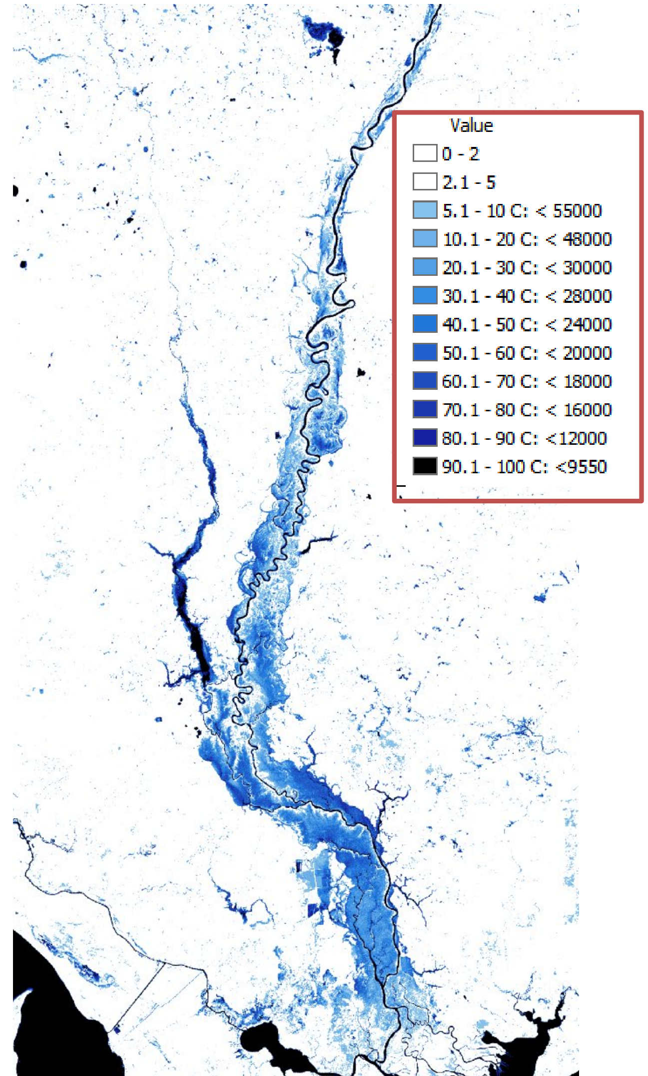


Extent and Frequency of Inundation – tied to local gaging





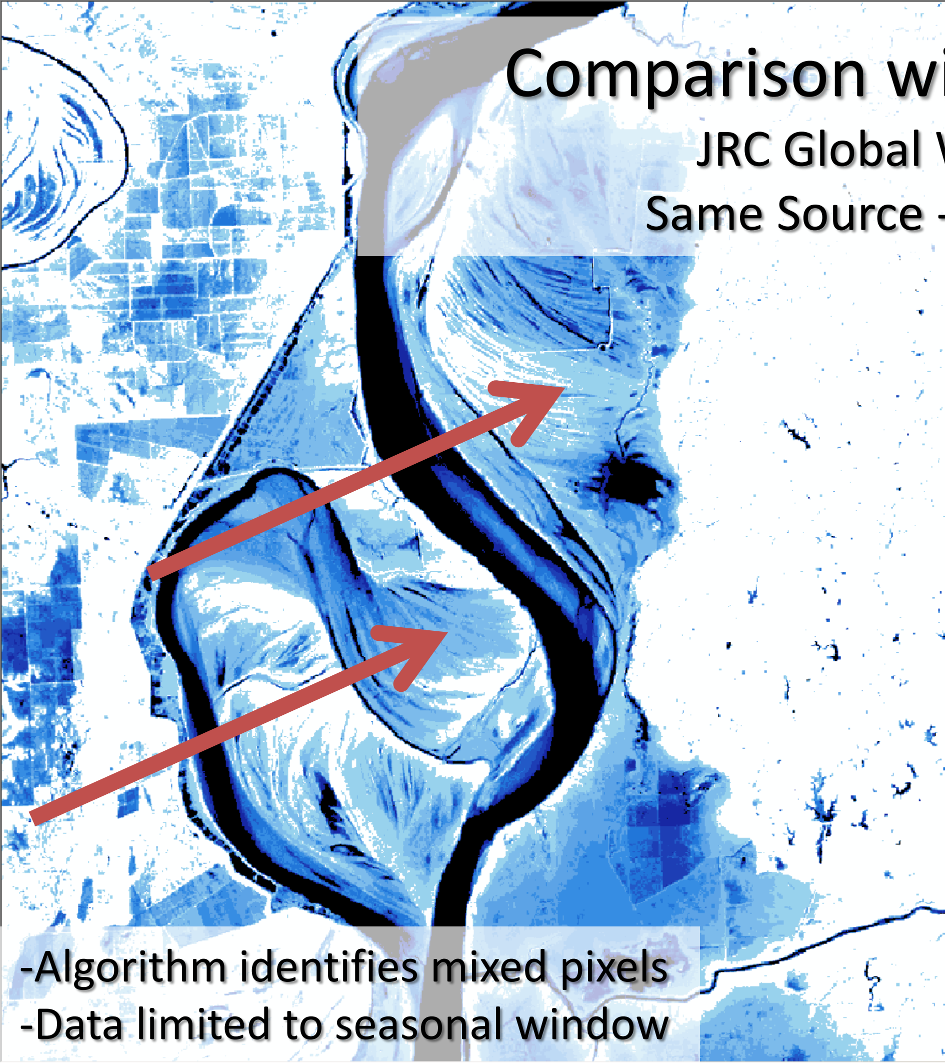
Application: Apalachicola River

- Estimate spatial extent of inundation with discharge
- Target monitoring locations for changes in flooding extent due to changes in water control manual

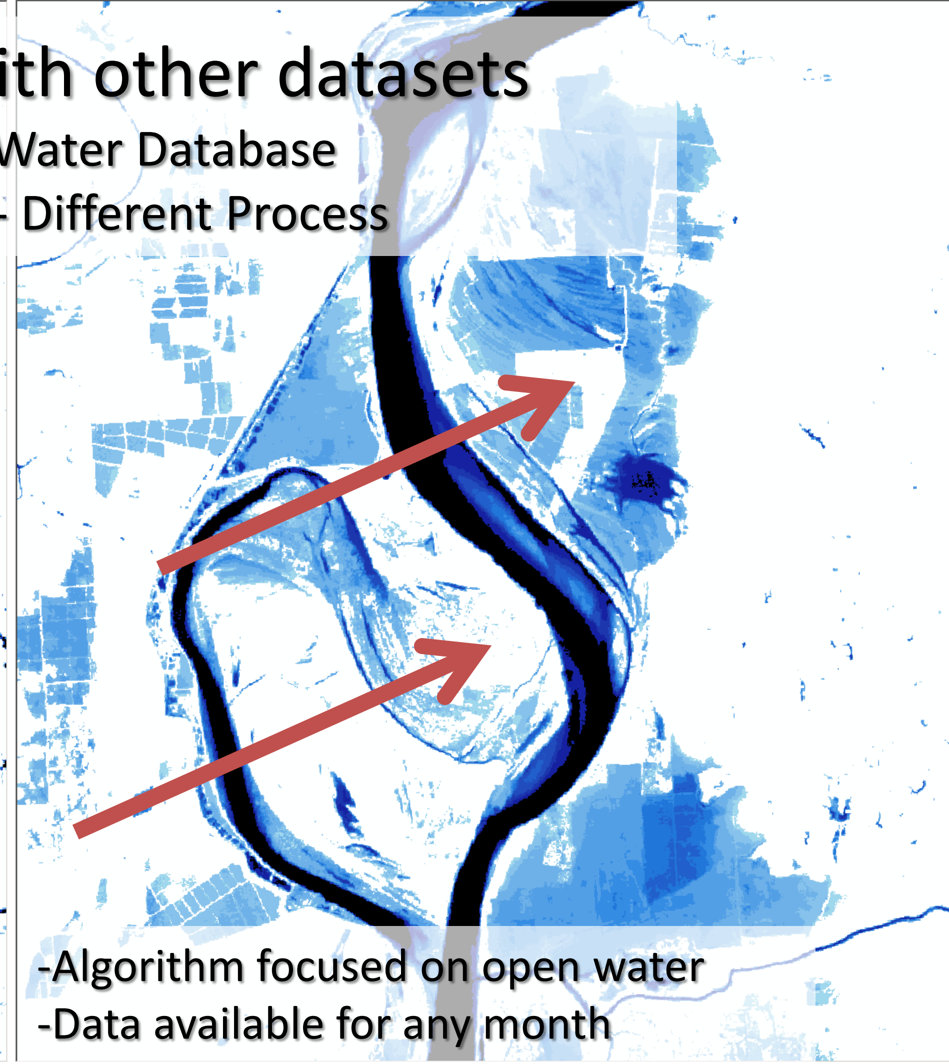
Comparison with other datasets

JRC Global Water Database

Same Source - Different Process

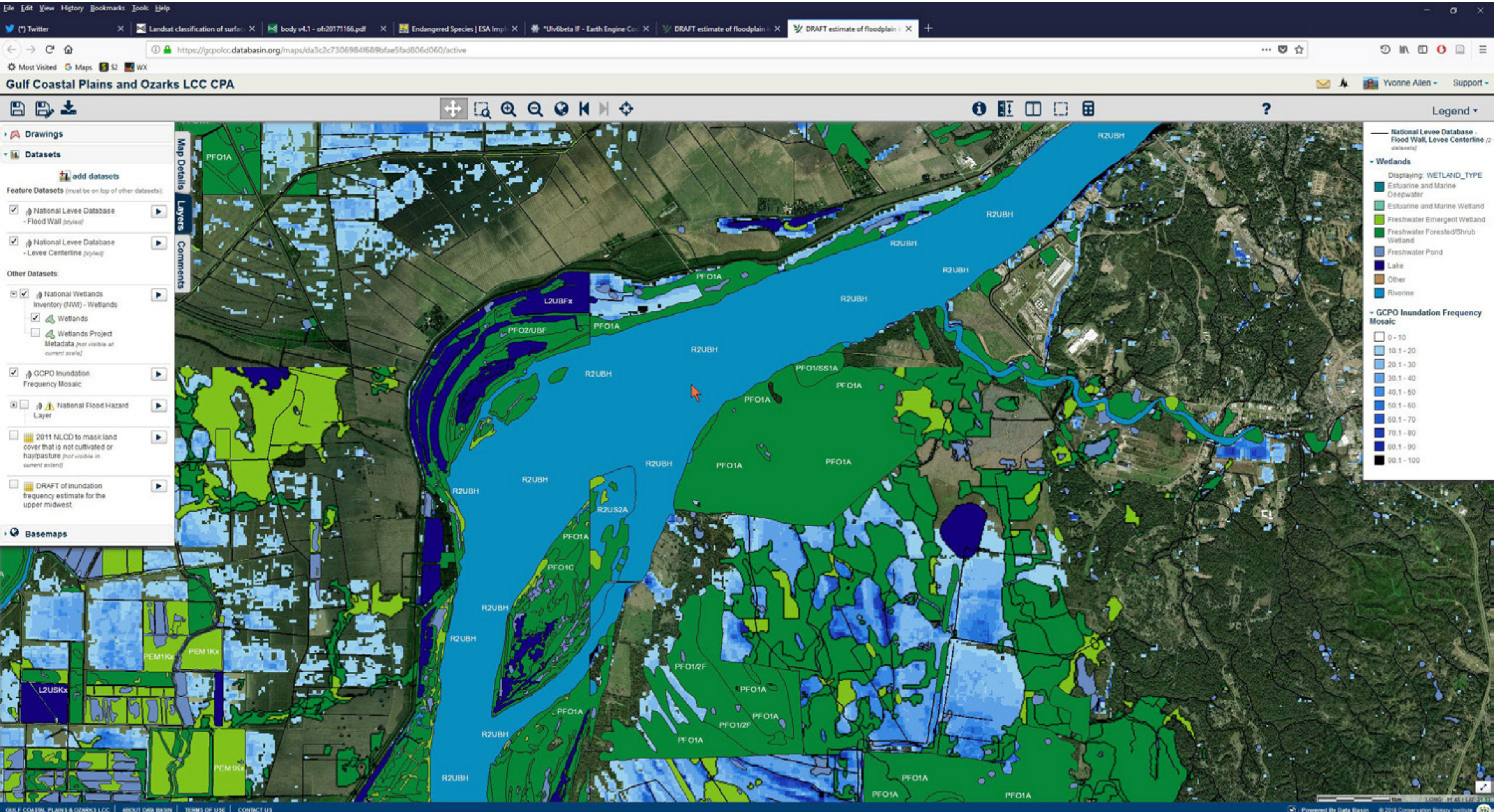


Inundation Index

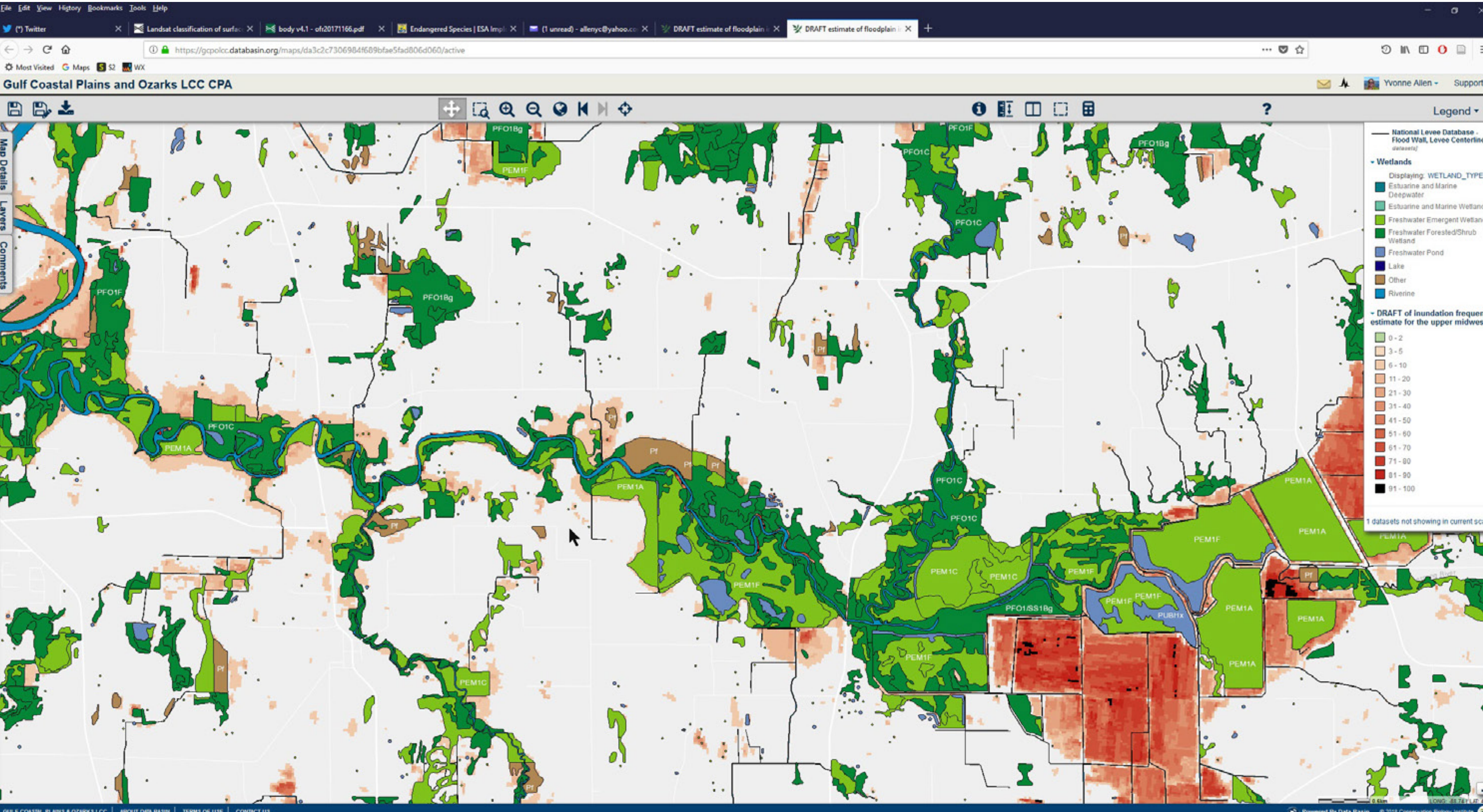


JRC Global Water Database

Comparison with NWI – Lower Mississippi



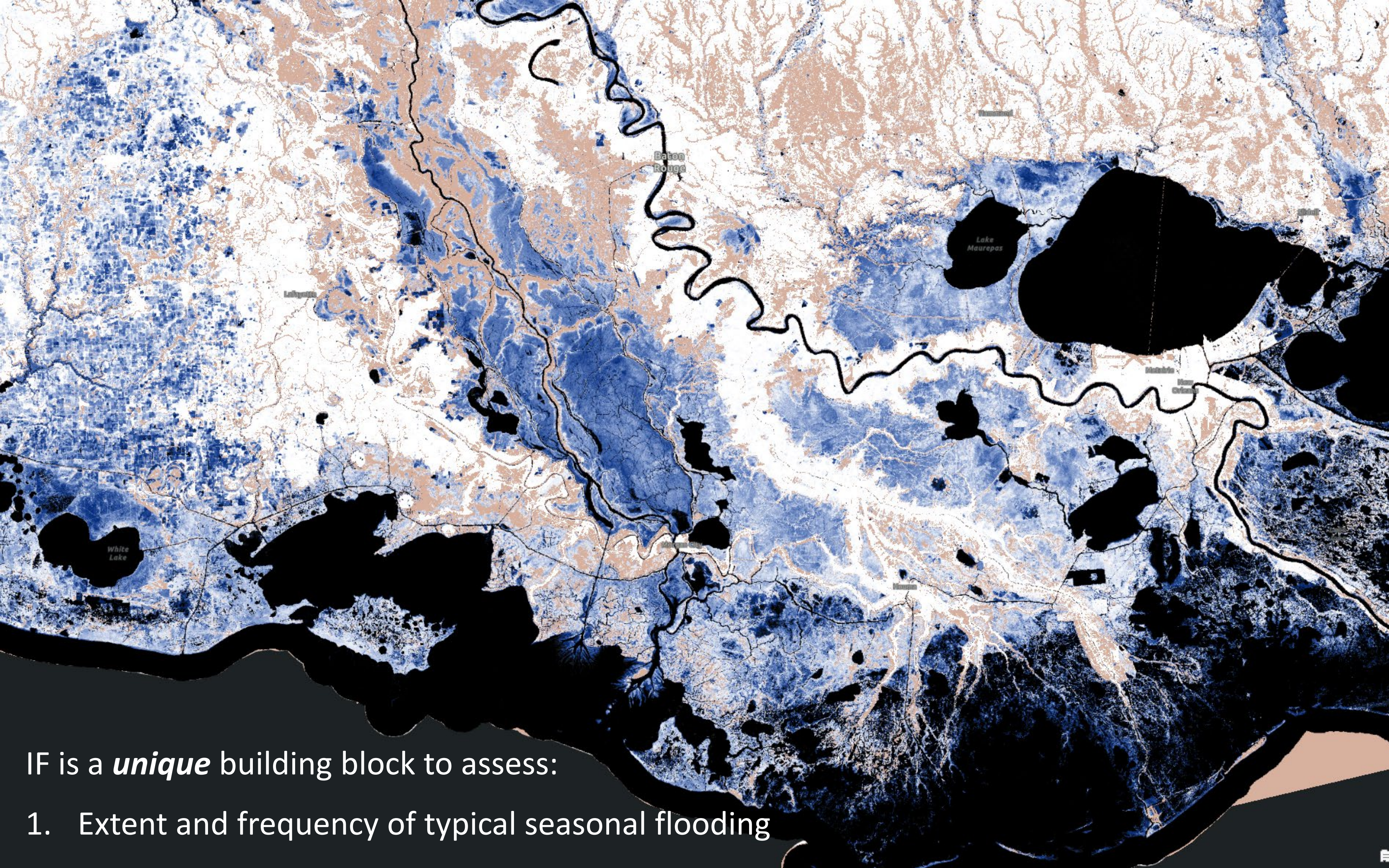
Comparison with FEMA FIRMS and NWI - SE Wisconsin



IF is a *unique* building block…

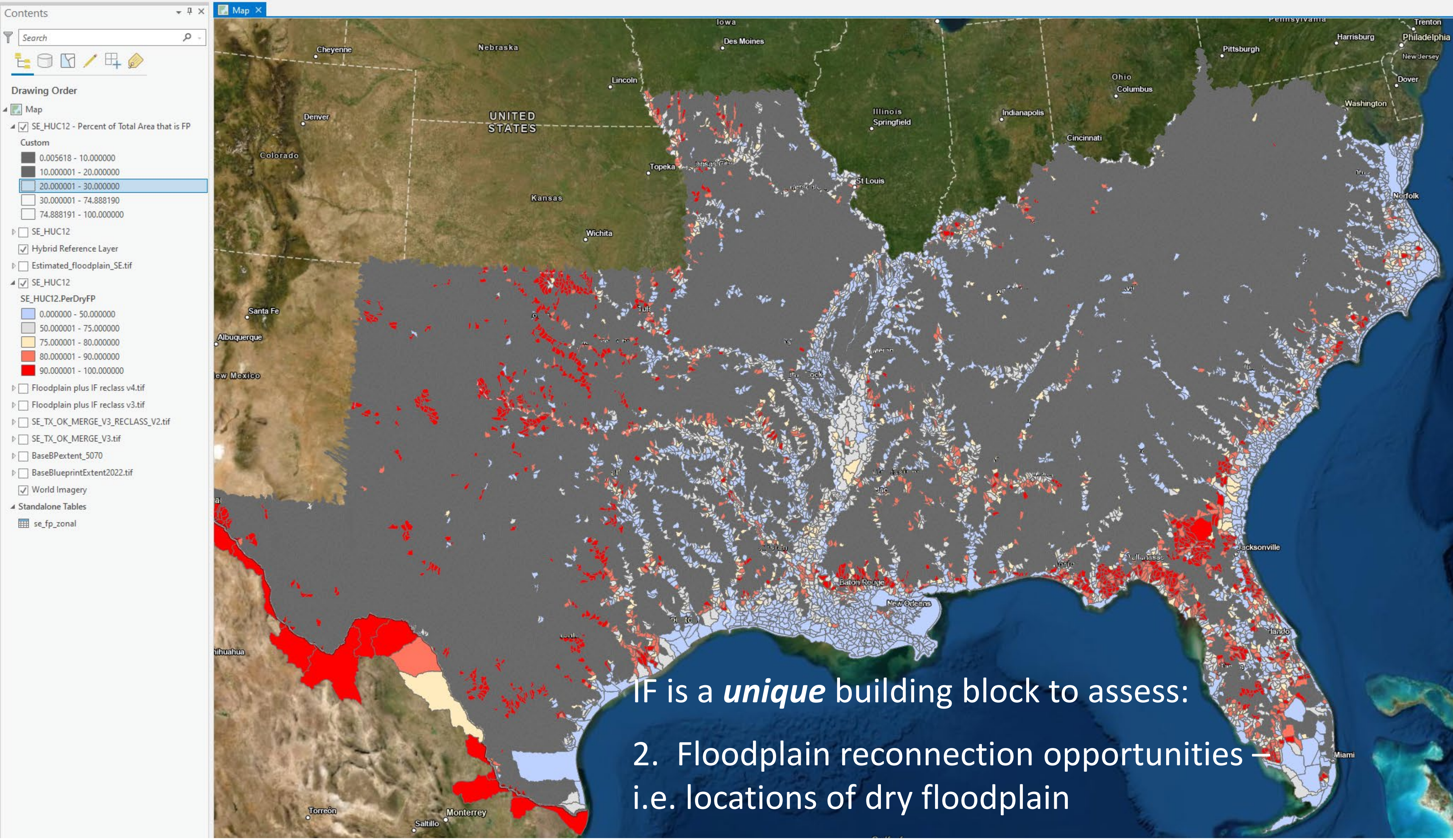
Four example applications:

1. Extent and frequency of typical seasonal flooding
2. Floodplain reconnection opportunities
3. Habitat suitability for floodplain dependent/sensitive species
4. Floodplain condition at a given time (e.g. during Lidar acquisition)



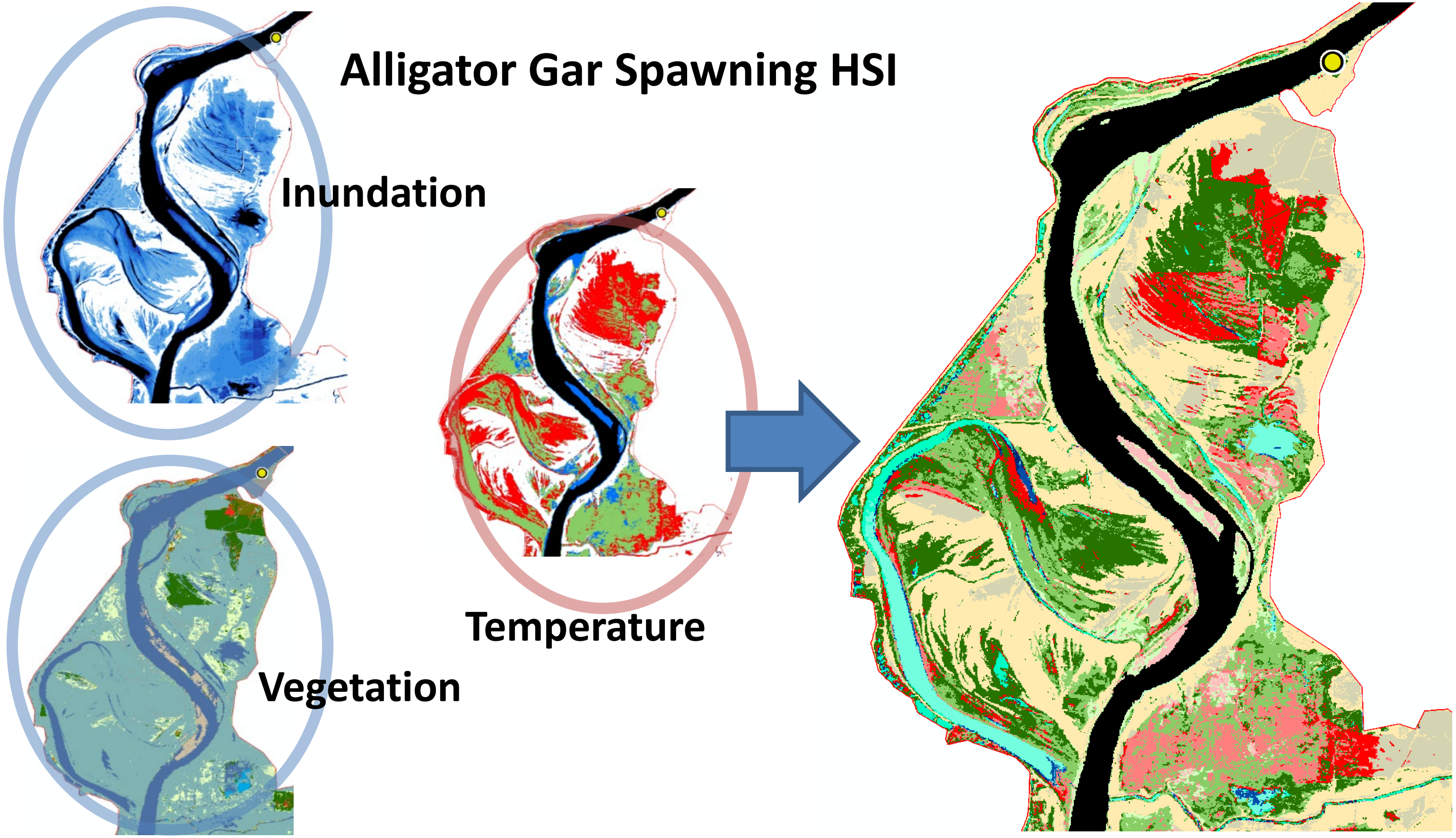
IF is a ***unique*** building block to assess:

1. Extent and frequency of typical seasonal flooding



IF is a ***unique*** building block to assess:

2. Floodplain reconnection opportunities – i.e. locations of dry floodplain

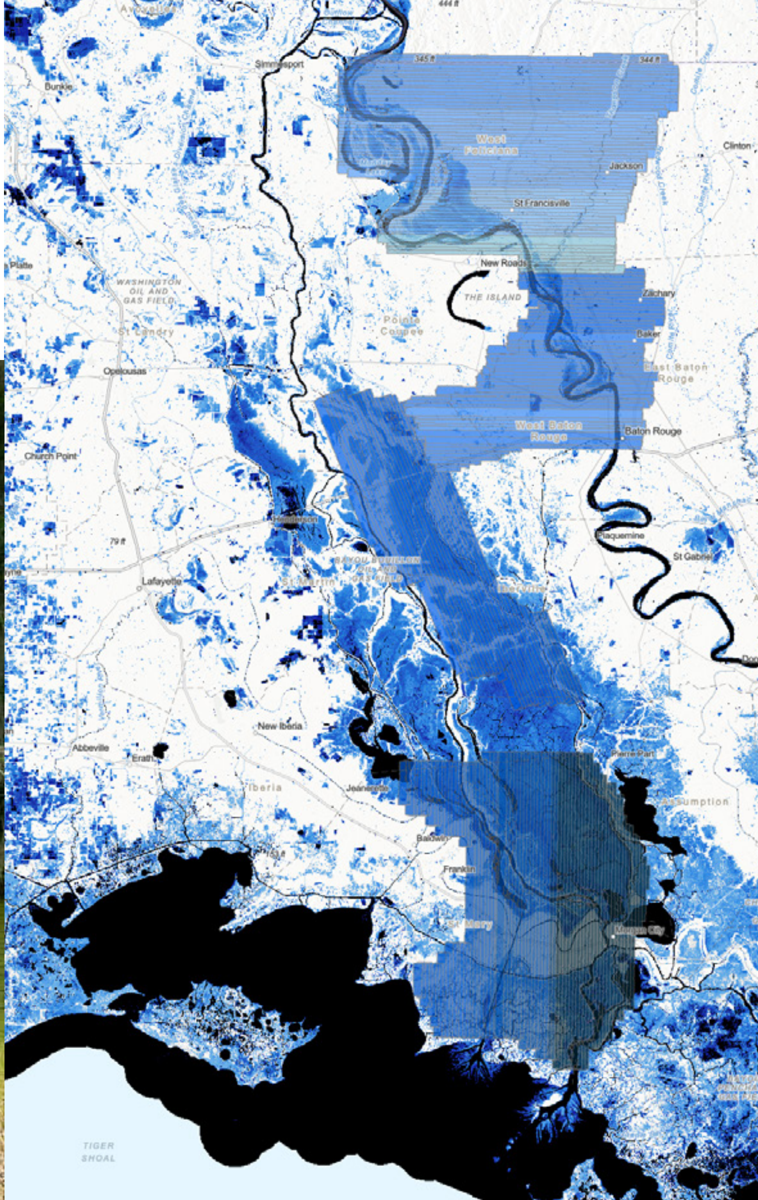


IF is a ***unique*** building block to assess:

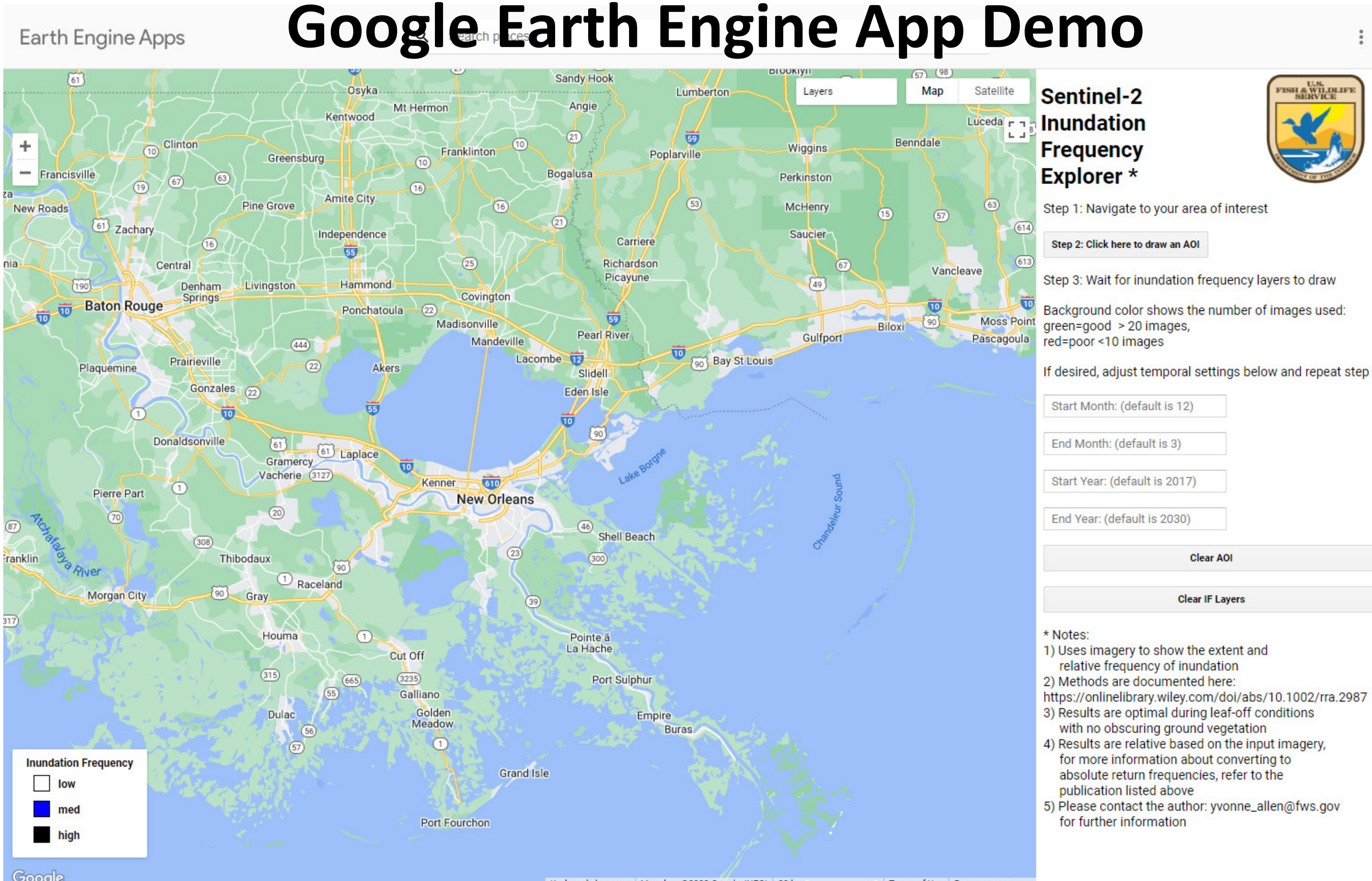
3. Habitat suitability (e.g. floodplain dependent/sensitive species)

IF is a ***unique*** building block to assess:

4. Floodplain condition at a given time (e.g. during Lidar acquisition)



Google Earth Engine App Demo



https://yallen.users.earthengine.app/view/inundation-frequency-explorer---sentinel-2

USGS
science for a changing world

Preliminary Classification of Water Areas Within the Atchafalaya Basin Floodway System by Using Landsat Imagery

Open-File Report 2008–1320

U.S. Departmen
U.S. Geological

Estuaries and Coasts (2012) 35:190–200
DOI 10.1007/s12237-011-9437-z

Using Multitemporal Remote Sensing Imagery and Inundation Measures to Improve Land Change Estimates in Coastal Wetlands

Yvonne C. Allen · Brady R. Couvillion · John A. Barras

2 September 2011

and sediment delivery, may be further

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dsat

RIVER RESEARCH AND APPLICATIONS
River Res. Applic. **32**: 1609–1620 (2016)
Published online 18 December 2015 in Wiley Online Library
(wileyonlinelibrary.com) DOI: 10.1002/rra.2987

LANDSCAPE SCALE ASSESSMENT OF FLOODPLAIN INUNDATION FREQUENCY USING LANDSAT IMAGERY

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ABSTI

In large river ecosystems, the timing, extent, duration and frequency
habitat and the supply of important ecosystem goods and services. Sea
and seasonal inundation of the floodplain governs ecosystem structure
have altered the connectivity of many rivers with
impacting the mainstem

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ISSN: 0275-5947 print / 1548-8675 online
DOI: 10.1002/nafm.10433

SPECIAL SECTION: ALLIGATOR GAR

Using Remote Sensing to Assess Alligator Gar Spawning Habitat Suitability in the Lower Mississippi River

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Open Access Article

Conservation–Protection of Forests for Wildlife in the Mississippi Alluvial Valley

by A. Blaine Elliott [1], Anne E. Mini [1], S. Keith McKnight [2] and Daniel J. Twedt [3,*]

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(This article belongs to the Special Issue Protected Areas in Forest Conservation: Challenges and Opportunities)

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References

- Allen, Y. C., G. C. Constant, and B. R. Couvillion. 2008. Preliminary Classification of Water Areas Within the Atchafalaya Basin Floodway System by Using Landsat Imagery. USGS Numbered Series, U.S. Geological Survey. https://pubs.er.usgs.gov/publication/ofr20081320
- Allen, Y. C., B. R. Couvillion, and J. A. Barras. 2011. Using Multitemporal Remote Sensing Imagery and Inundation Measures to Improve Land Change Estimates in Coastal Wetlands. Estuaries and Coasts 35:190–200. http://link.springer.com/article/10.1007/s12237-011-9437-z
- Allen, Y. 2016. Landscape Scale Assessment of Floodplain Inundation Frequency Using Landsat Imagery. River Research and Applications 32:1609–1620. http://onlinelibrary.wiley.com/doi/10.1002/rra.2987/abstract
- Elliott, A. B., A. E. Mini, S. K. McKnight, and D. J. Twedt. 2020. Conservation–Protection of Forests for Wildlife in the Mississippi Alluvial Valley. Forests 11:75. https://www.mdpi.com/1999-4907/11/1/75
- Allen, Y., K. Kimmel, and G. Constant. 2020. Using Remote Sensing to Assess Alligator Gar Spawning Habitat Suitability in the Lower Mississippi River. North American Journal of Fisheries Management 40:580–594. https://afspubs.onlinelibrary.wiley.com/doi/abs/10.1002/nafm.10433
- Mapped comparison: https://fws.maps.arcgis.com/apps/mapviewer/index.html?webmap=33f0148fc3d94f91a174bd78adfabc08

Questions??

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Or DOI Teams Chat

Yvonne Allen

Next Third Thursday Web Forum

10-20-2022

10:00 am

Kyle Buck and Rick Durbrow

U.S. Environmental Protection Agency

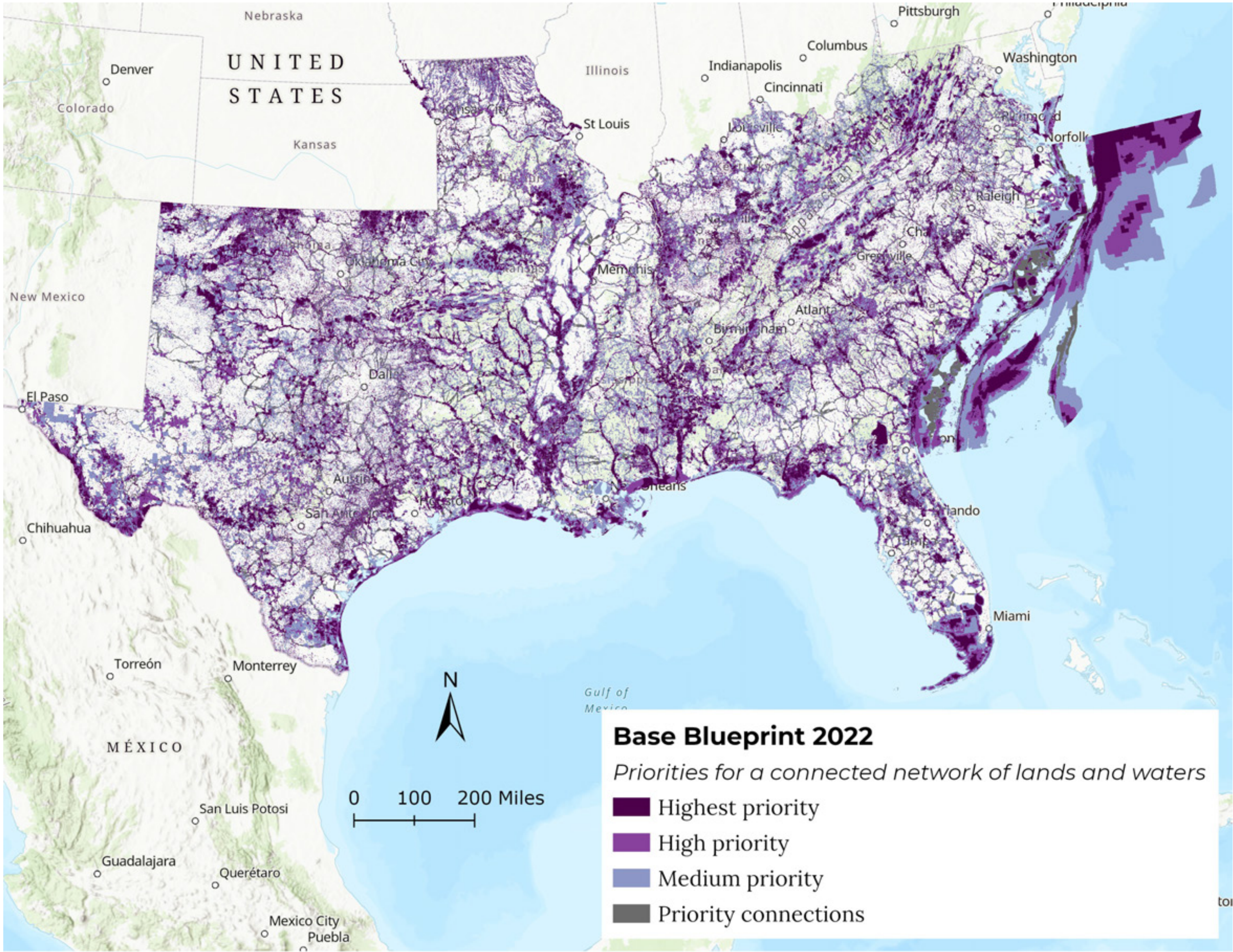
secassoutheast.org

Carbon and stormwater credit parks for regional recreation, social equity, and resilience in Florida

Staff updates

- Progress on Southeast Blueprint 2022

Progress on Southeast Conservation Blueprint 2022



How to get involved in SECAS

- Sign up for the SECAS newsletter

  secassoutheast.org

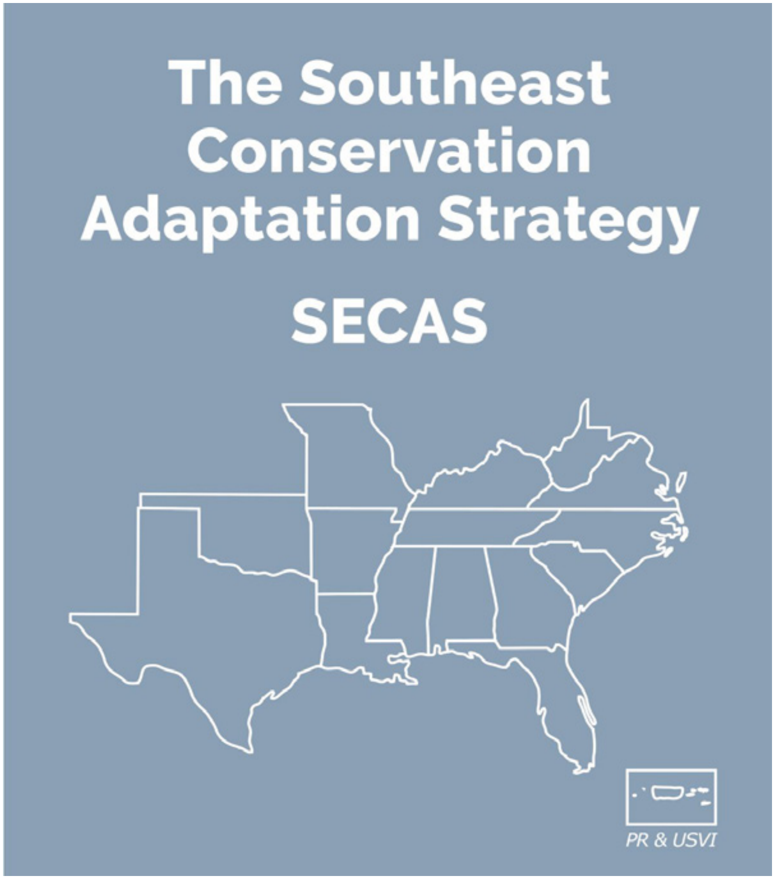
- Connect with SECAS staff or partners

  secassoutheast.org/staff

  secassoutheast.org/partners

- Explore the Southeast Conservation Blueprint

  secassoutheast.org/blueprint



Questions?