

‘Viva la Révolution’

Mapping Forest Disturbances with Precision



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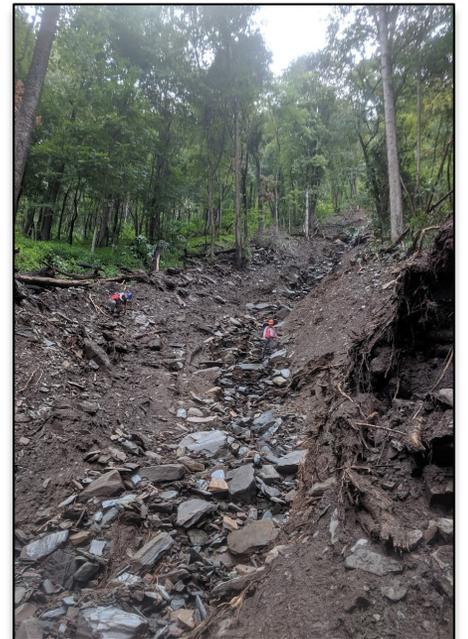
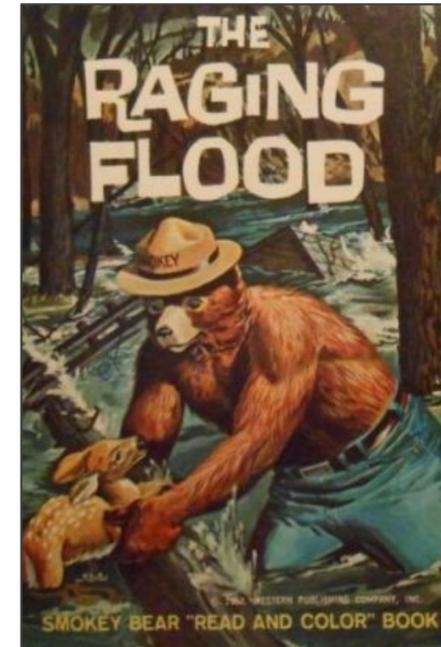
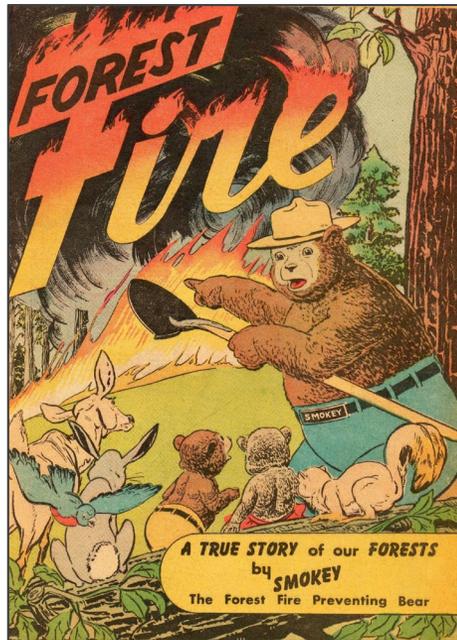
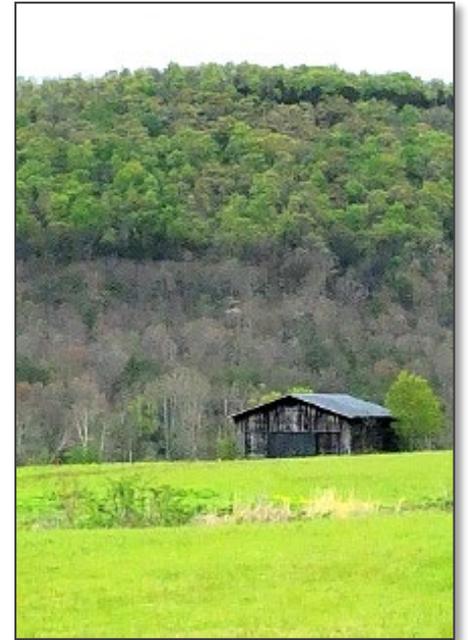
US Forest Service
Southern Research Station
Science in Practice Webinar
20 July 2020

What is forest disturbance, and why do we care?

DEFINITION:

Forest disturbances are biological and abiotic forest stressors from weather (wind, hail, drought, freeze), fire, flooding, landslides, insects, diseases, and management activities.

Disturbances affect forest values, such as timber, recreation, habitat and water—yet their occurrence and impacts are often poorly mapped. We can improve forest management and planning through better monitoring of short and long-term impacts.

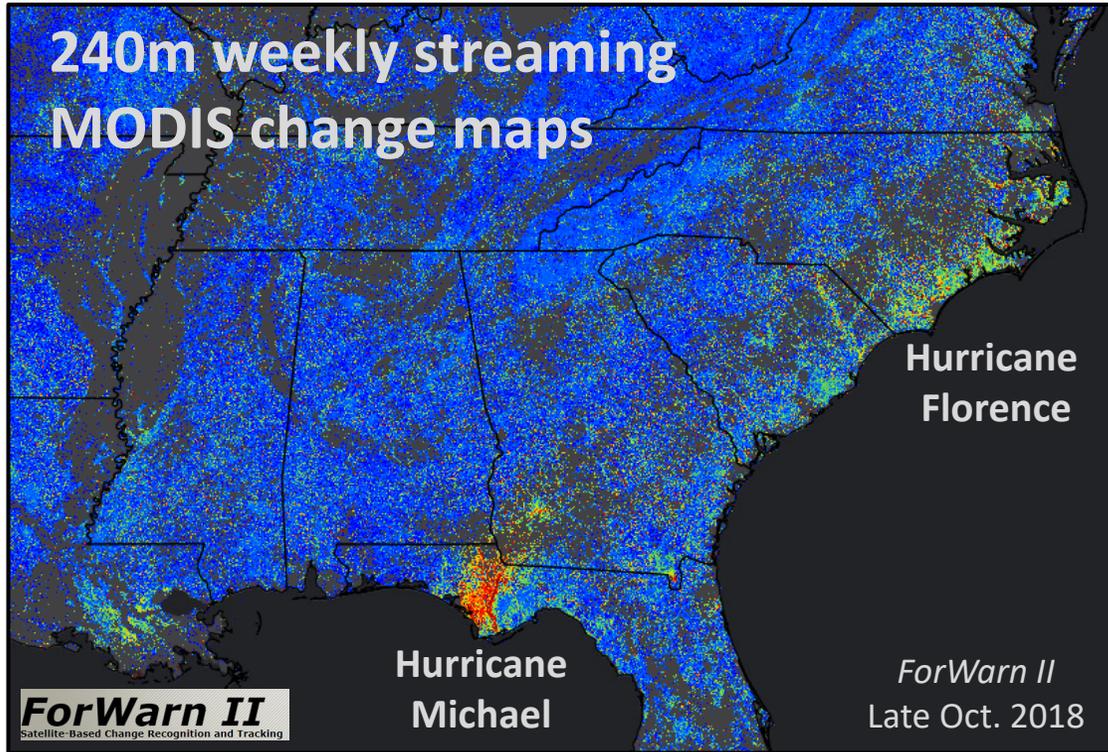


New high-resolution remote sensing and analytical tools are *revolutionizing* how we *can* and *are* monitoring disturbance!

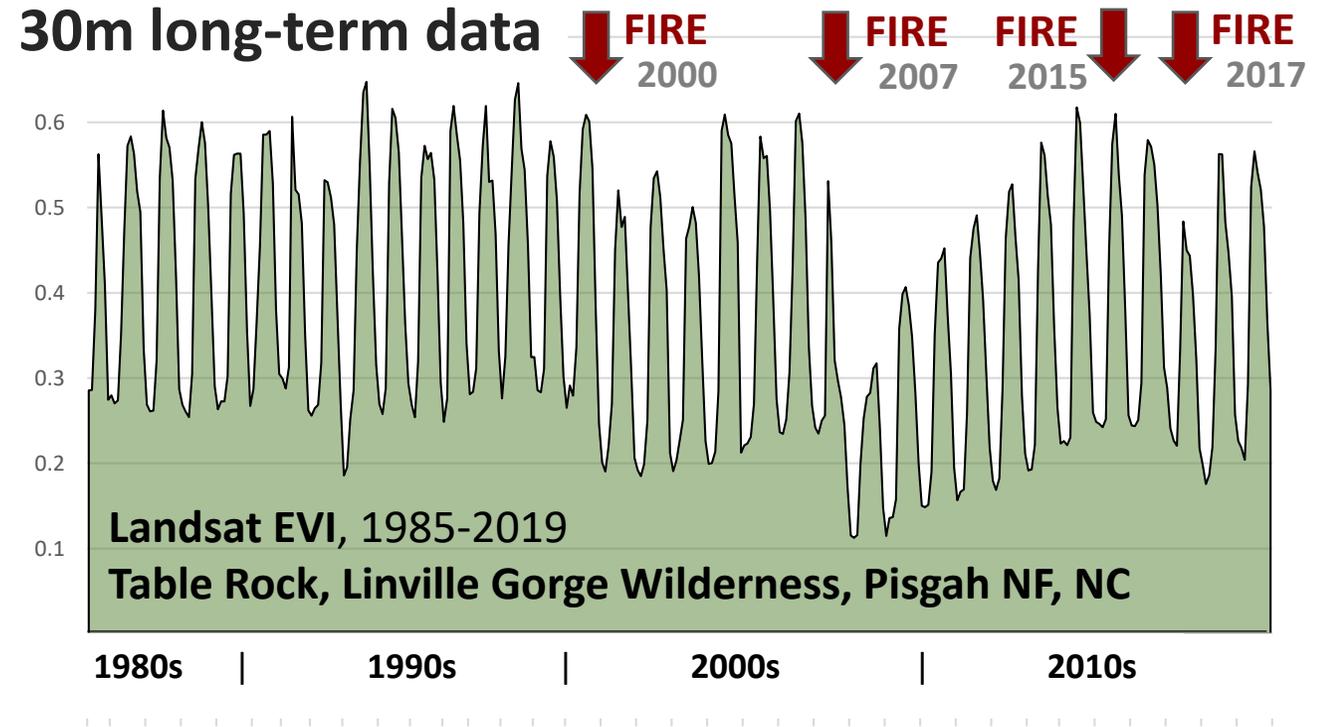
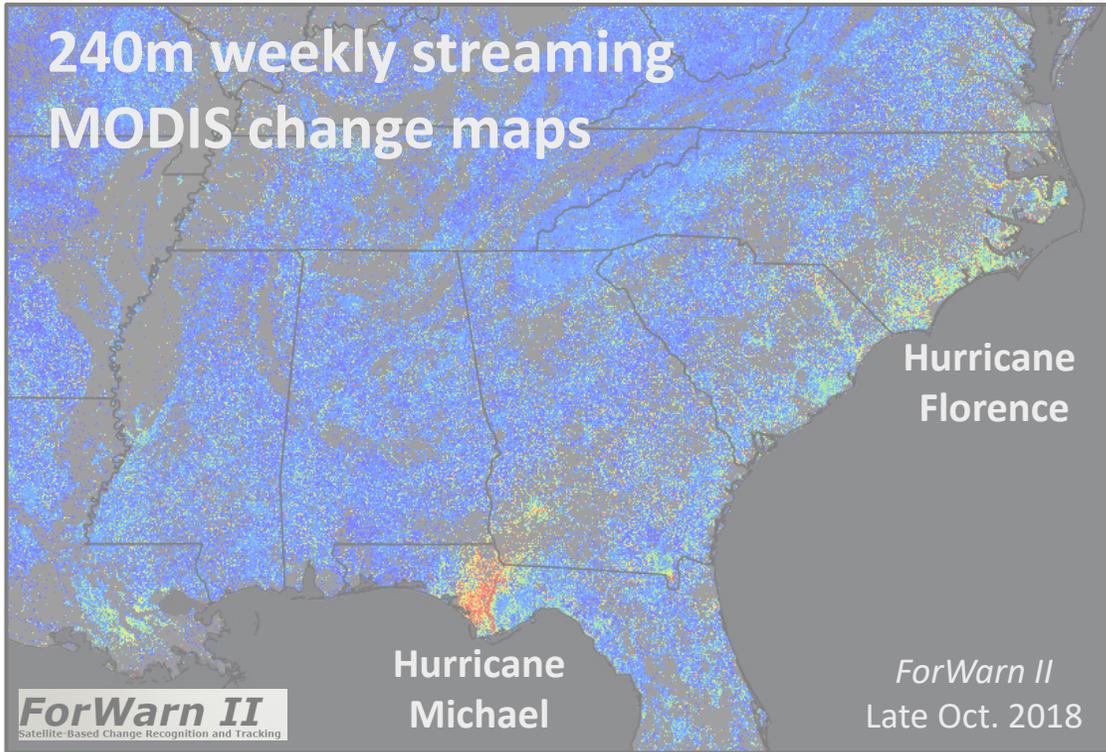
The over-promise of past forest monitoring “solutions”—from low to high tech—should give you pause, but...



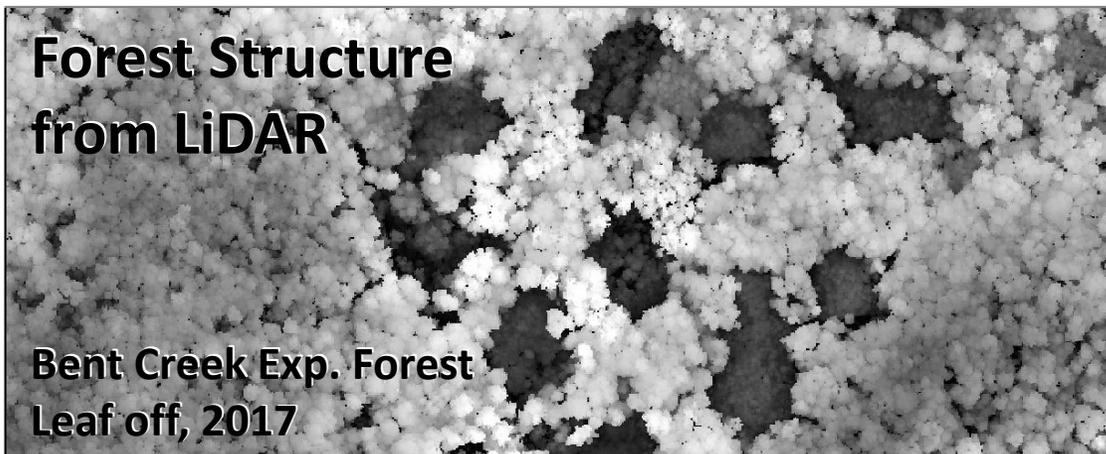
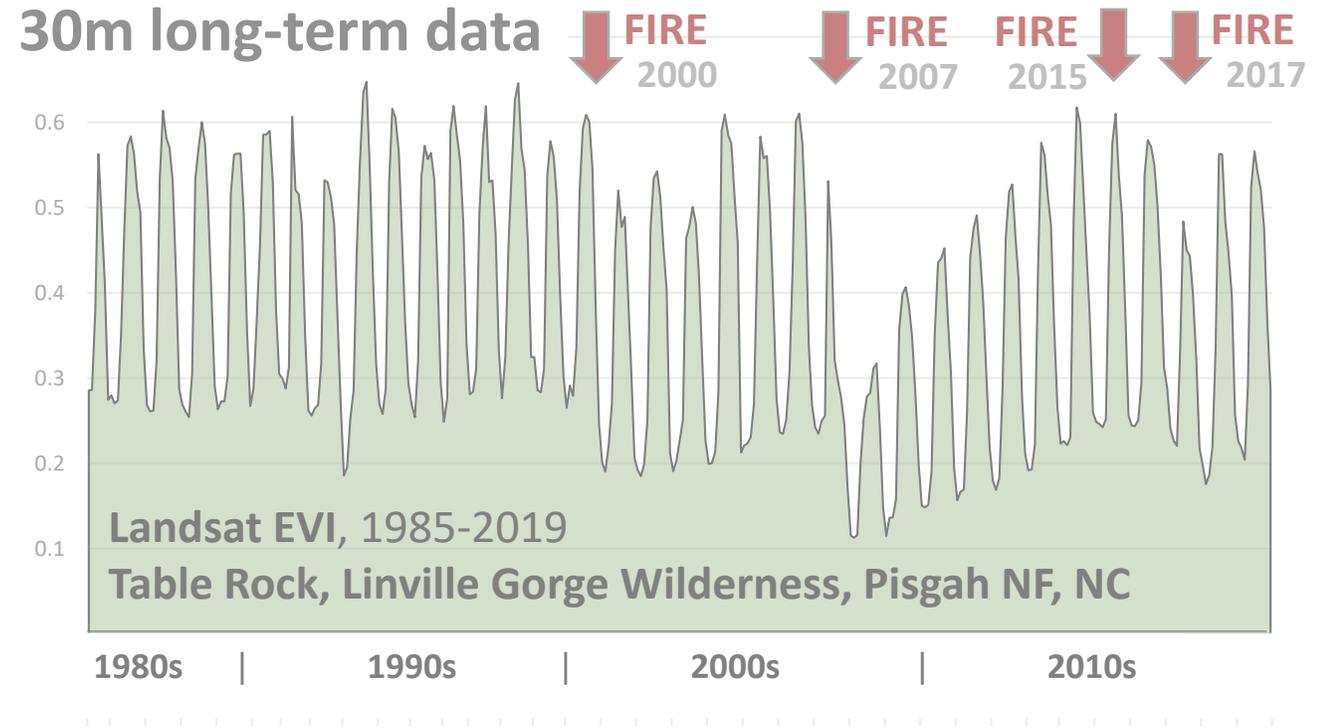
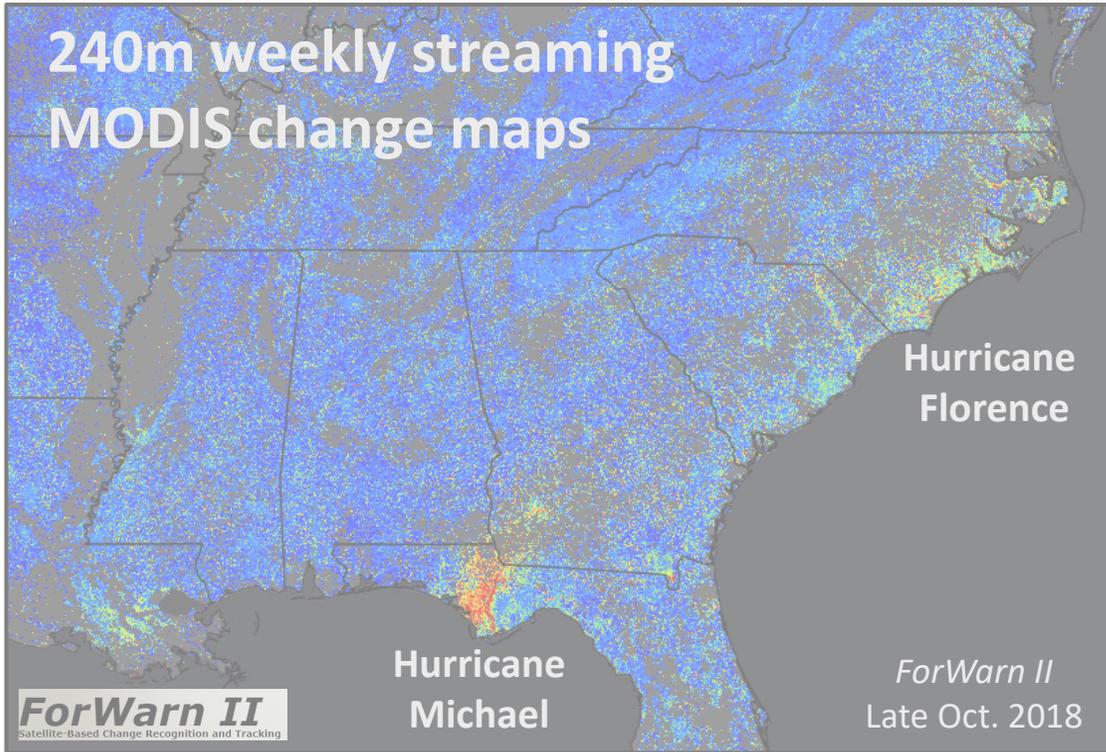
...the ongoing revolution in ***Gridded Forest Monitoring*** is real!



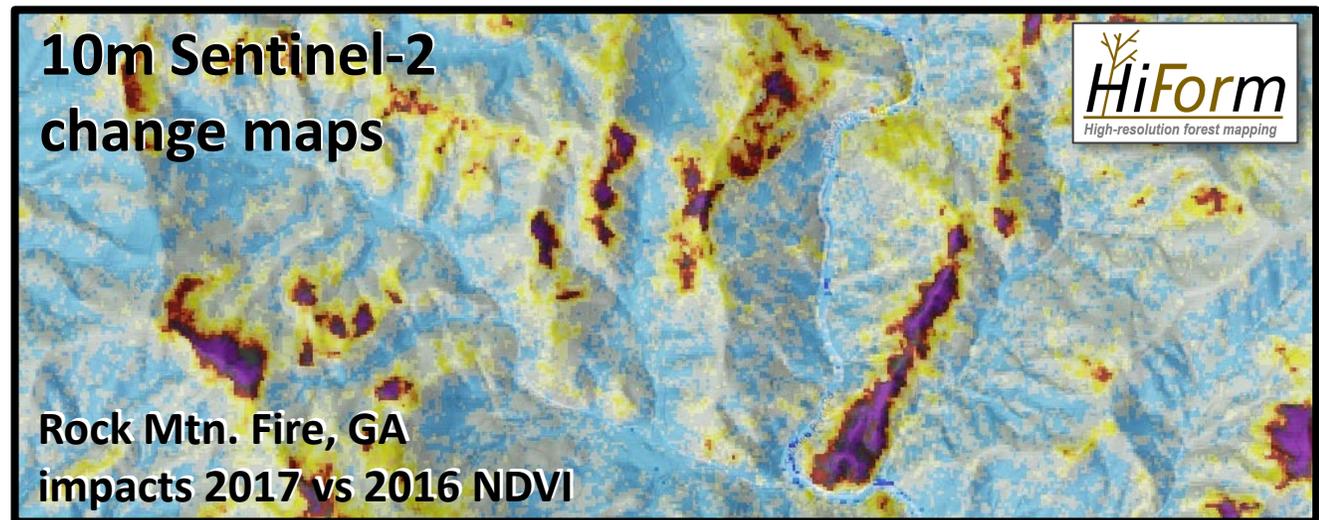
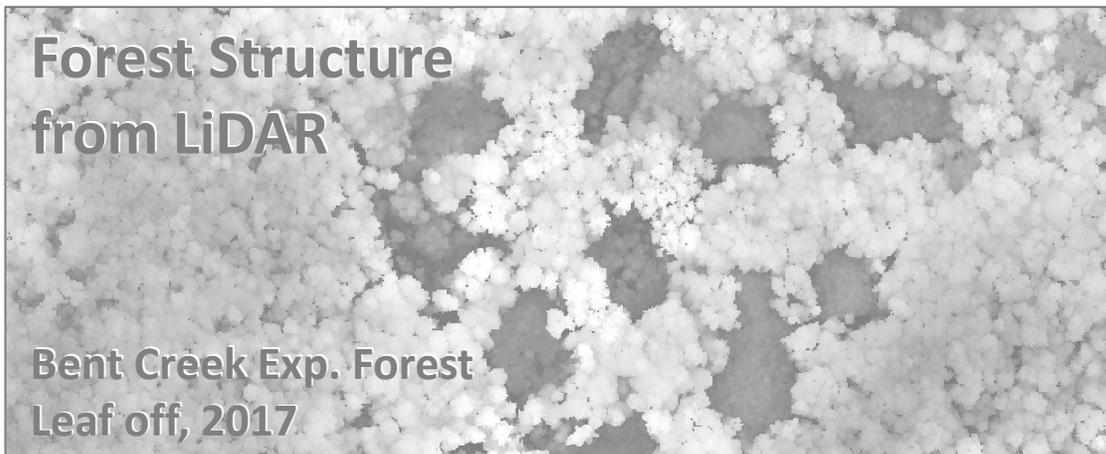
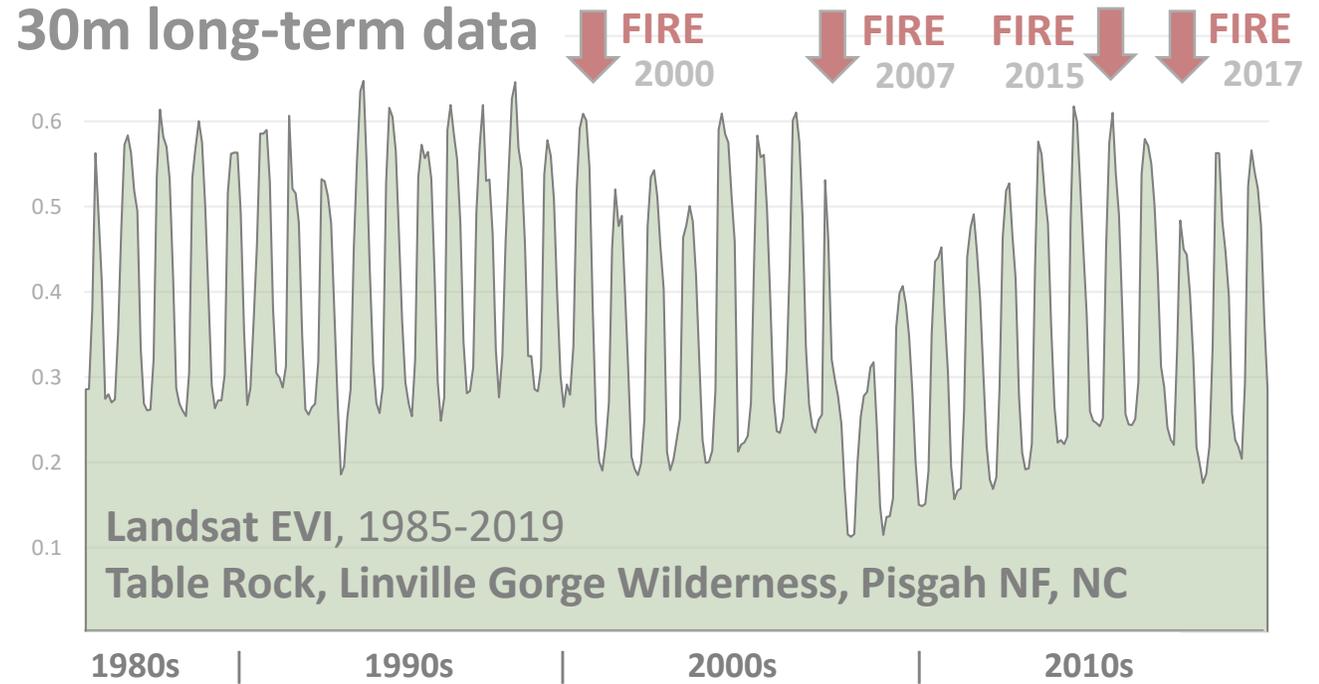
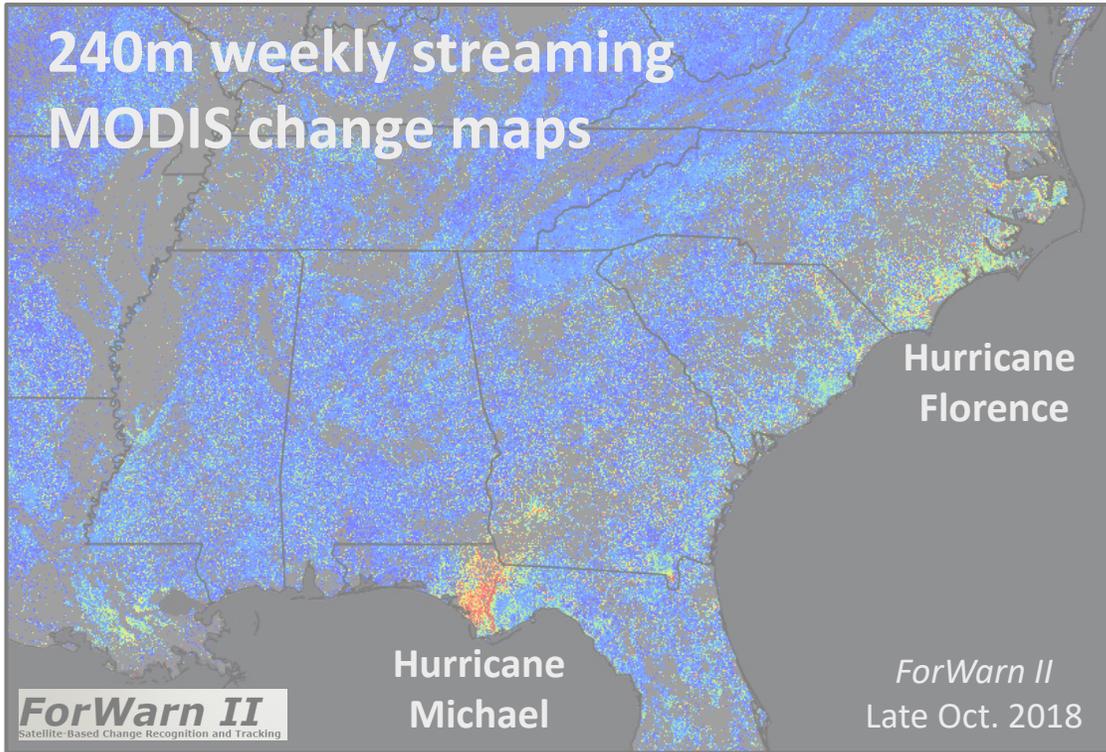
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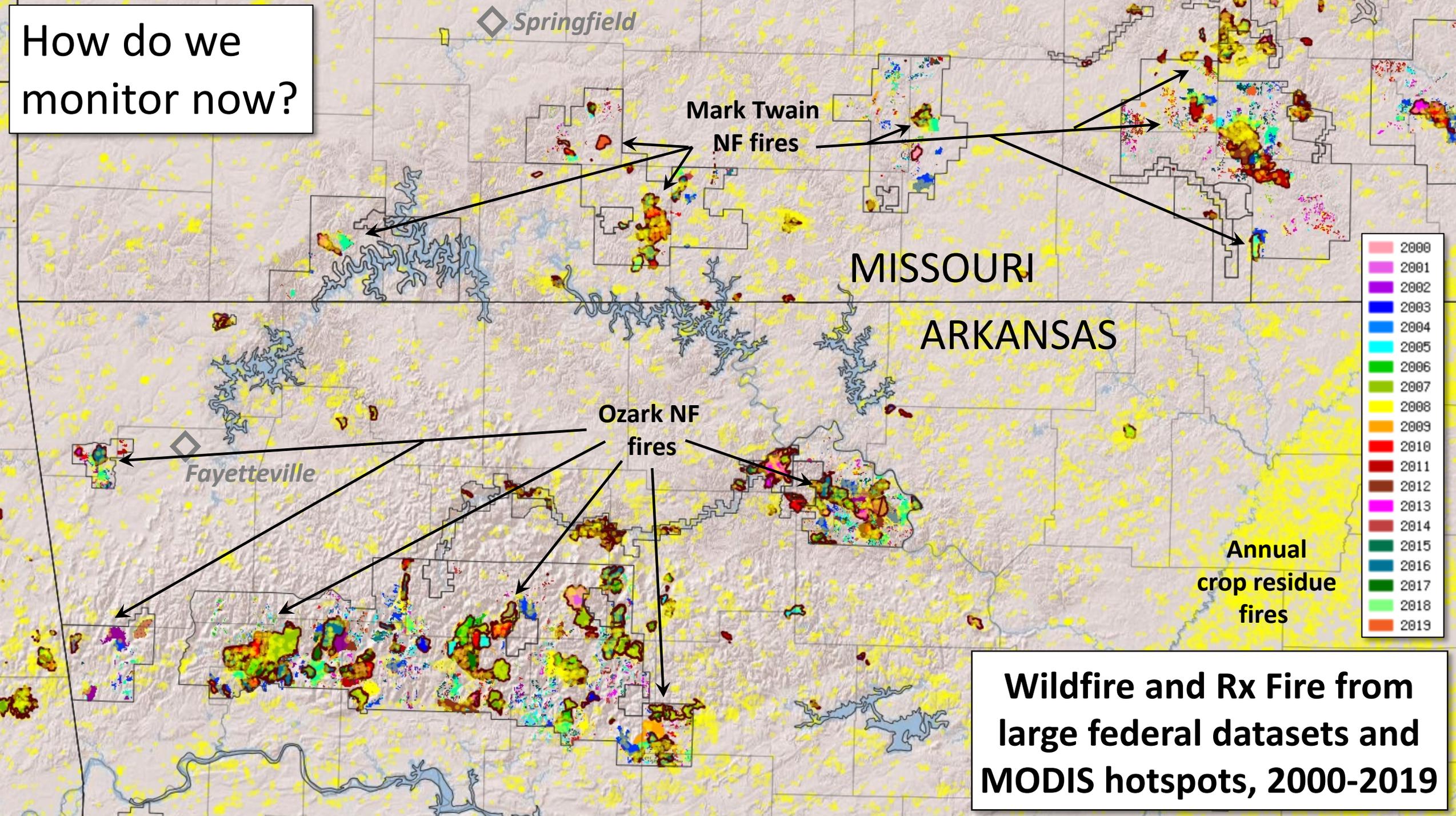
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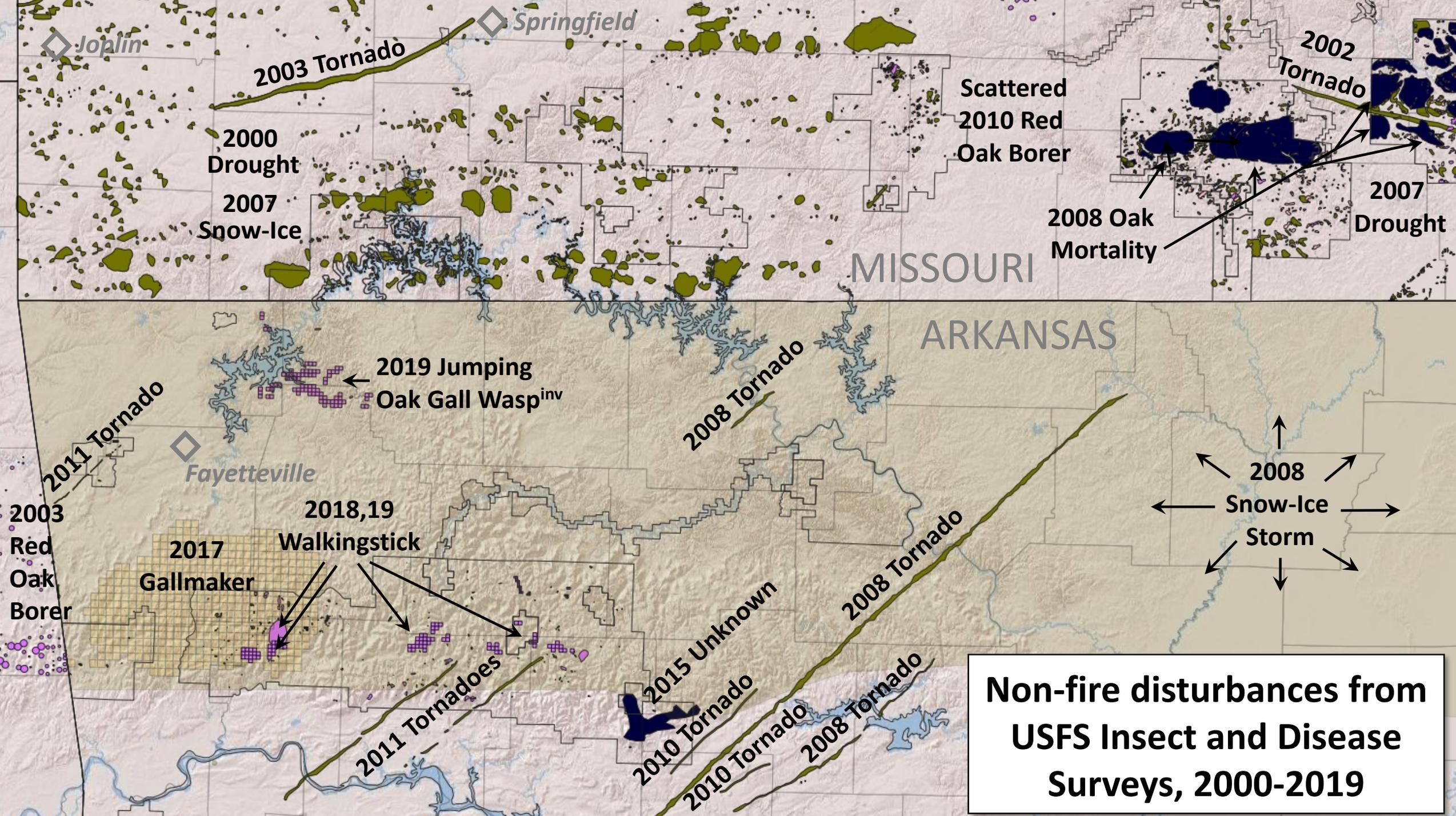
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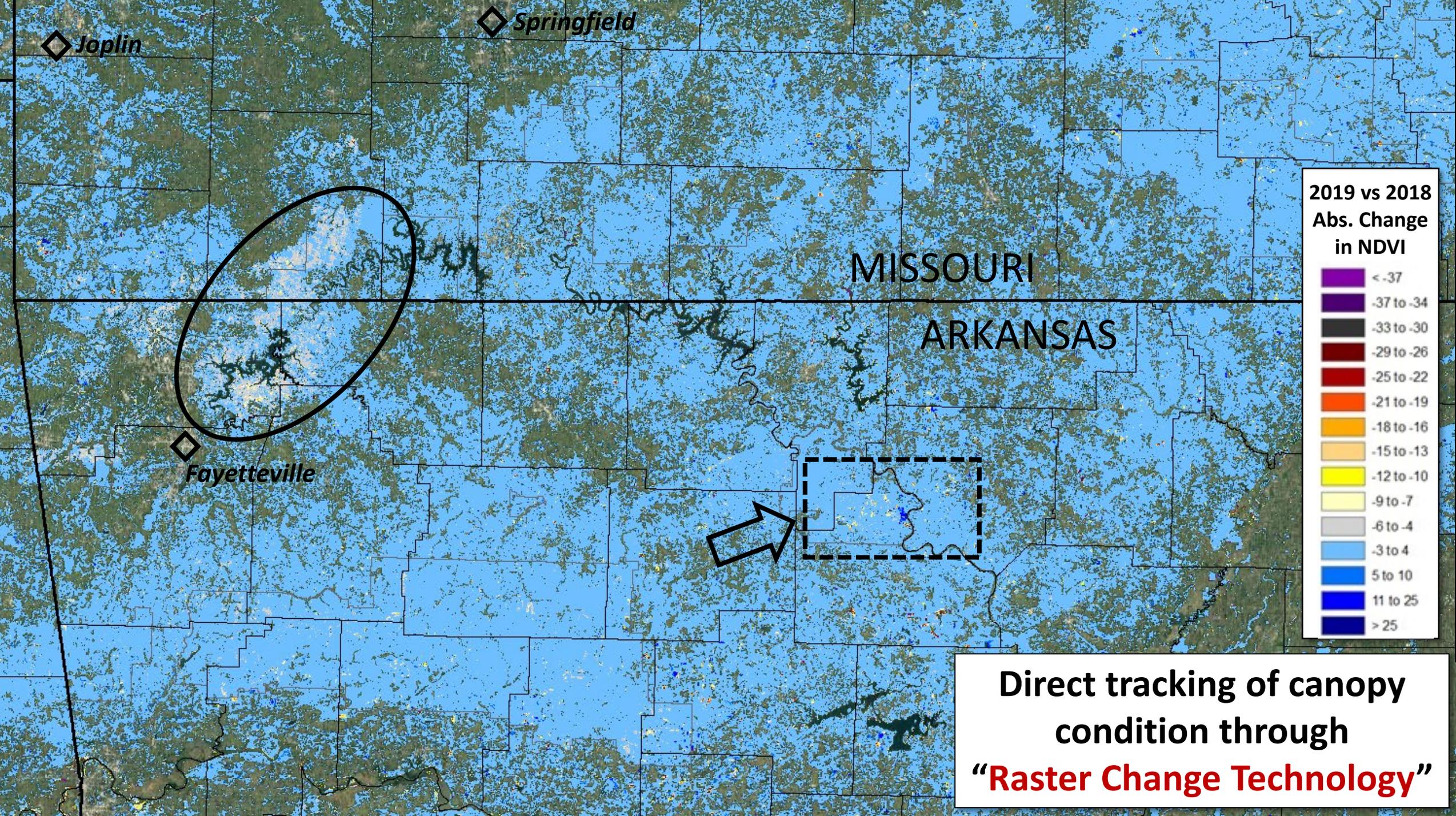


How do we monitor now?

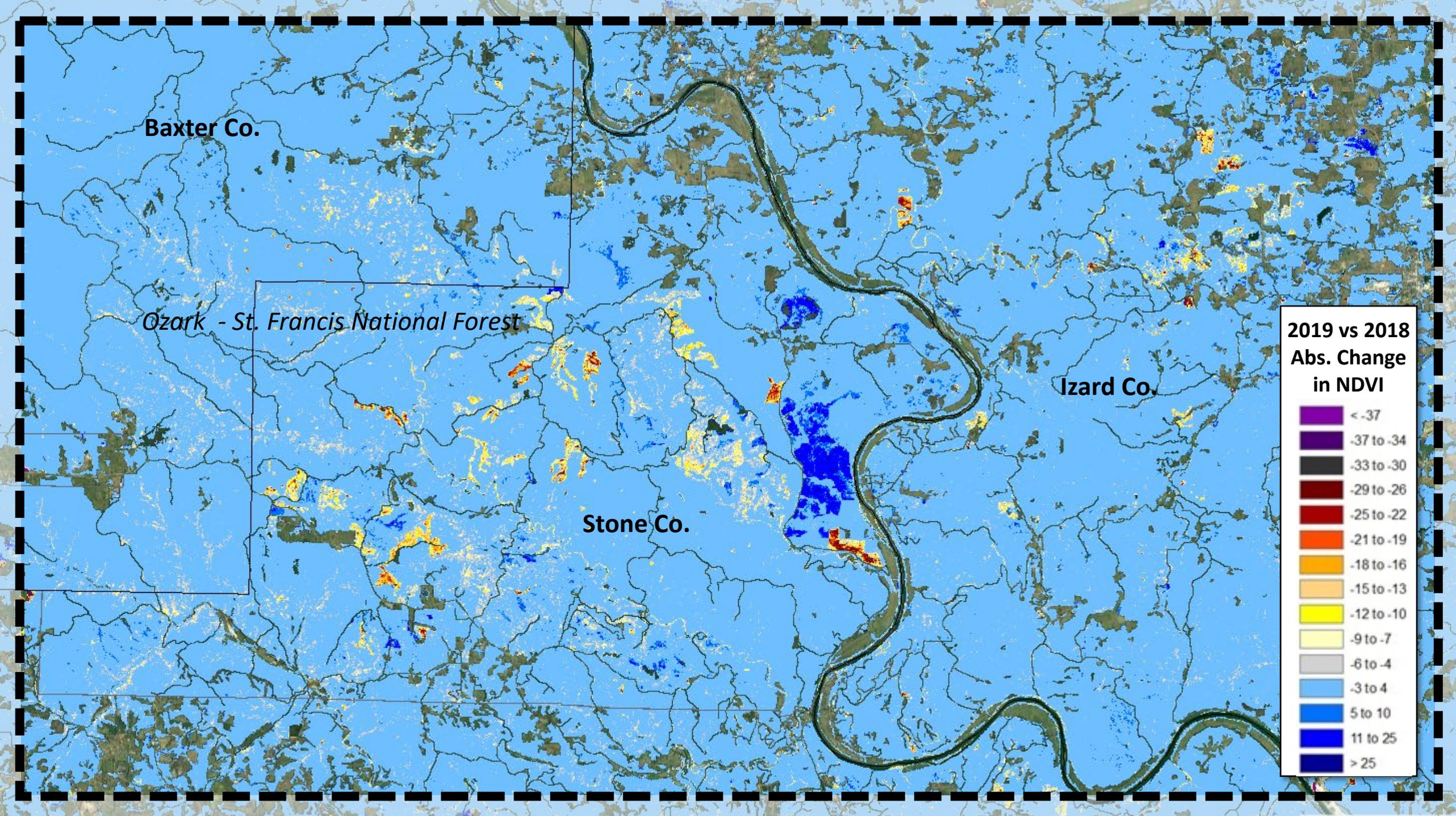


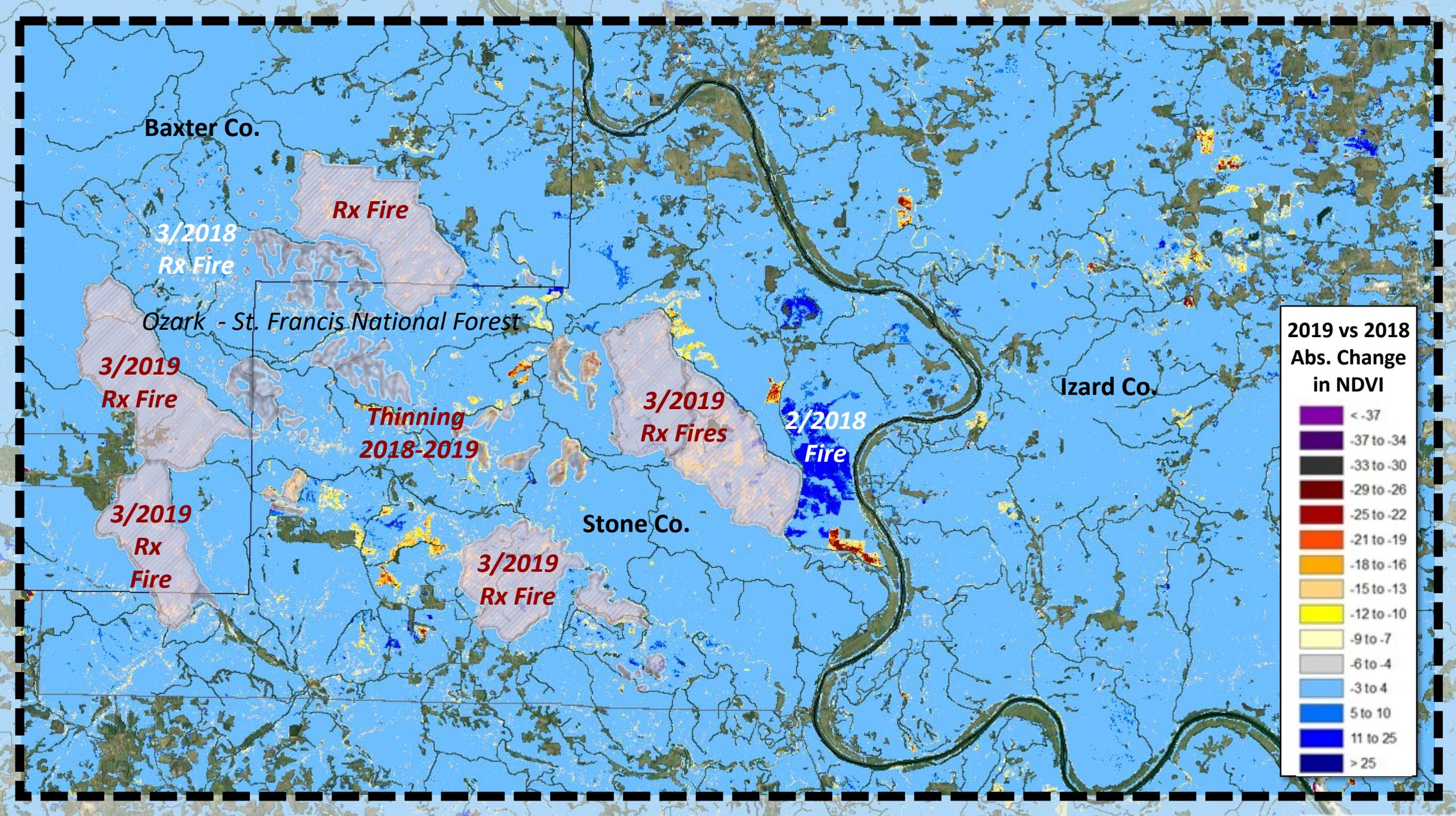
Wildfire and Rx Fire from large federal datasets and MODIS hotspots, 2000-2019





**Direct tracking of canopy
condition through
“Raster Change Technology”**





Baxter Co.

Rx Fire

*3/2018
Rx Fire*

Ozark - St. Francis National Forest

*3/2019
Rx Fire*

*Thinning
2018-2019*

*3/2019
Rx Fires*

*2/2018
Fire*

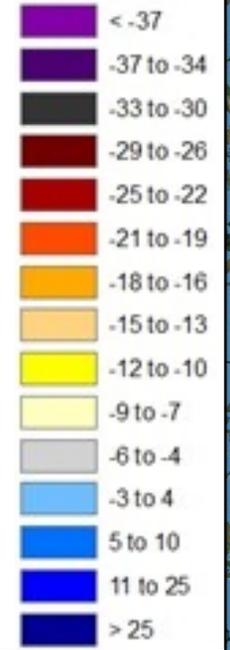
IZard Co.

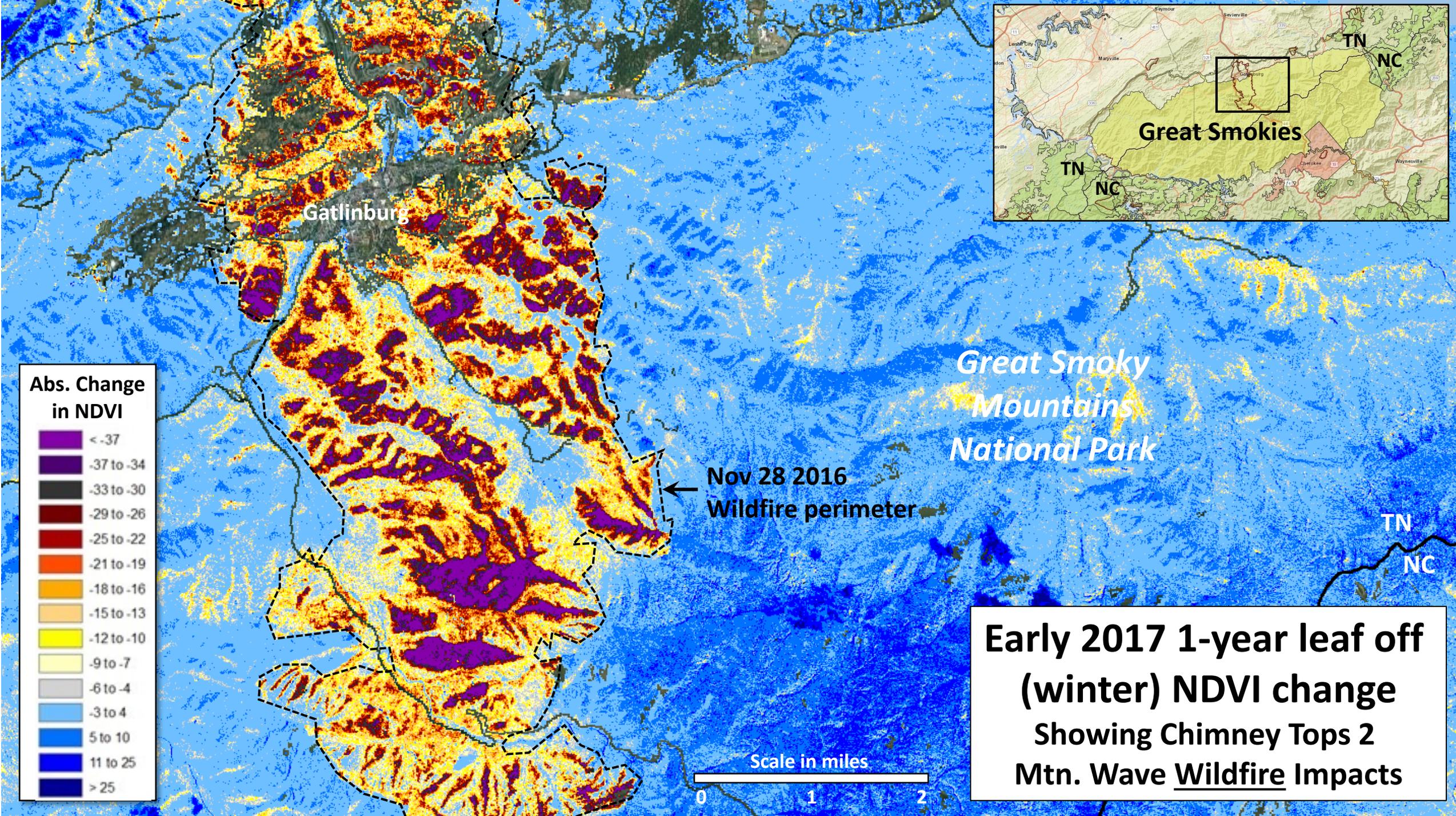
*3/2019
Rx
Fire*

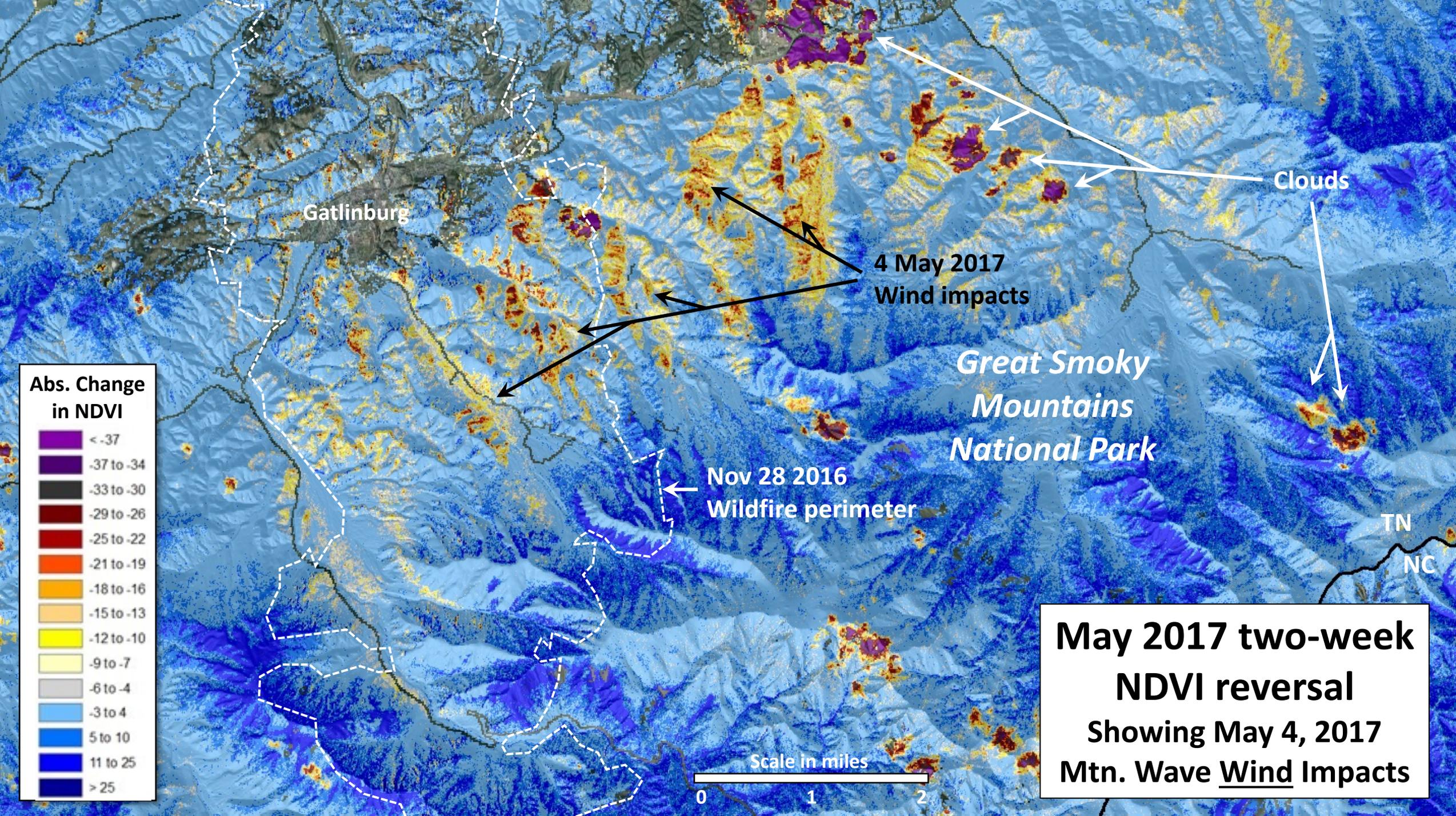
Stone Co.

*3/2019
Rx Fire*

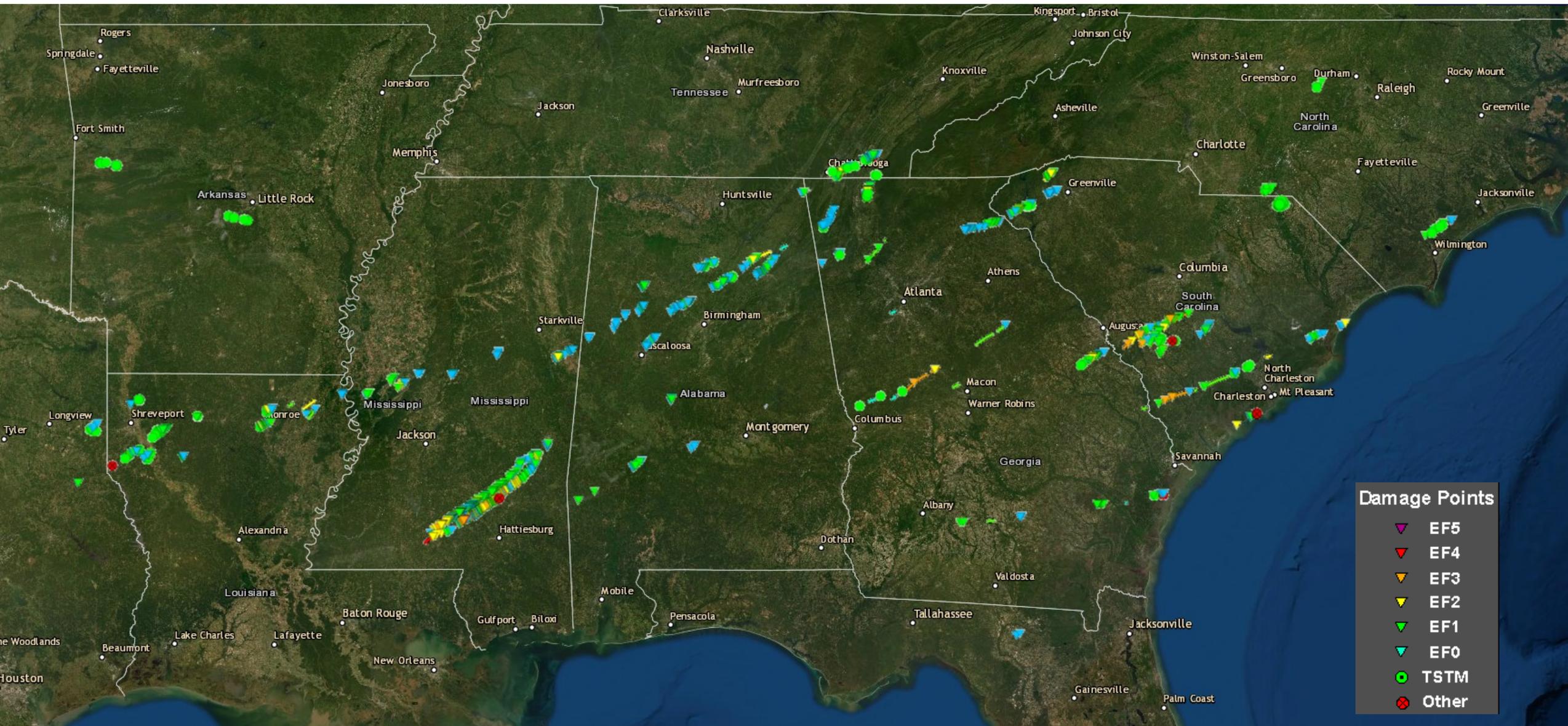
**2019 vs 2018
Abs. Change
in NDVI**







Tornado Outbreak across the Southeast: 12-13 April 2020

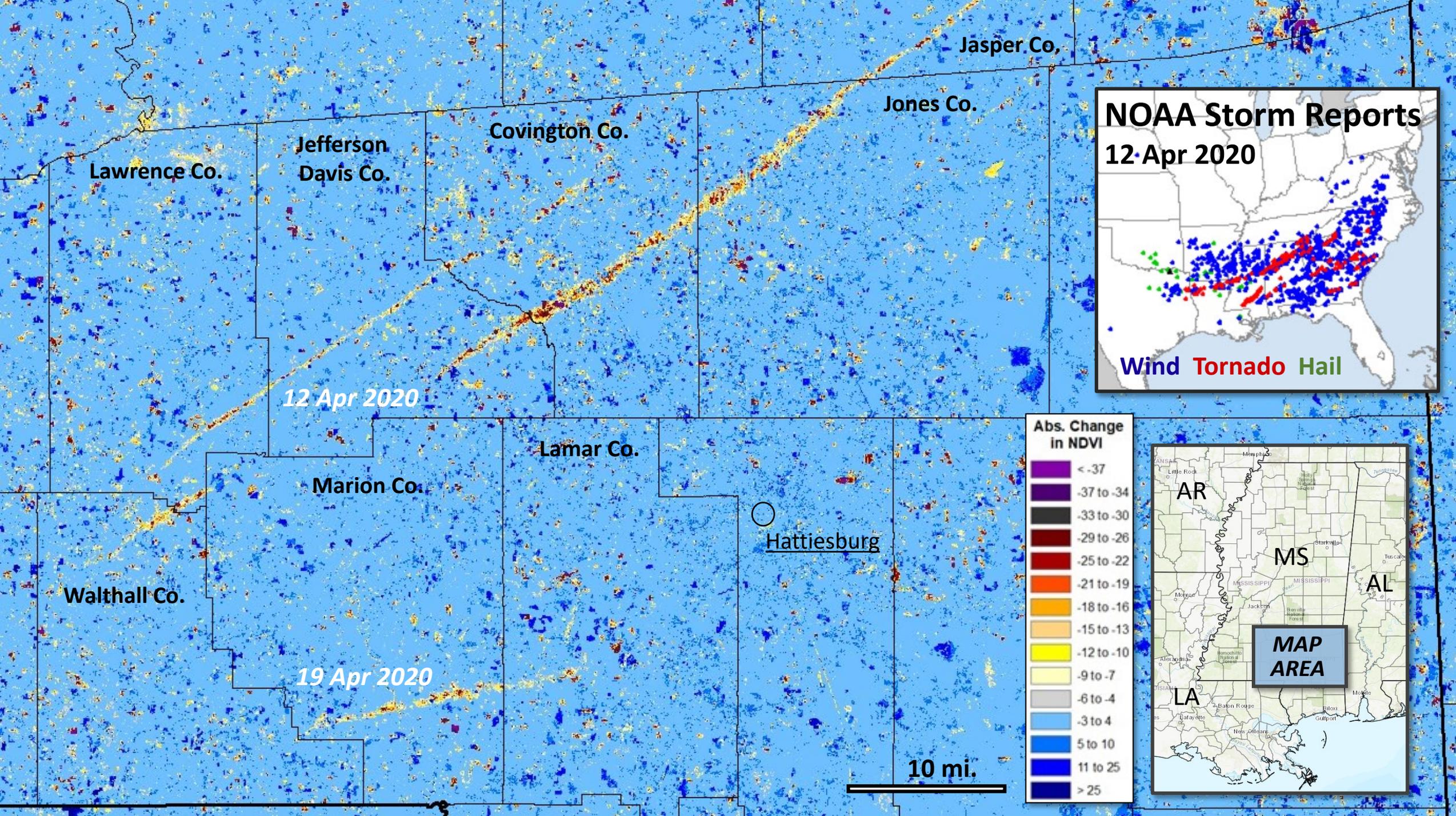


Source: NOAA Damage Survey Viewer: apps.dat.noaa.gov/stormdamage/damageviewer

The 12 April 2020 Covington Co., Mississippi tornado snapped tree trunks with 135mph winds



Image credit: NOAA damage survey



Jasper Co.

Jones Co.

Covington Co.

Jefferson Davis Co.

Lawrence Co.

12 Apr 2020

Lamar Co.

Marion Co.

Hattiesburg

Walthall Co.

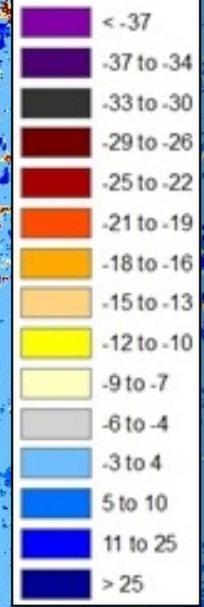
19 Apr 2020

10 mi.

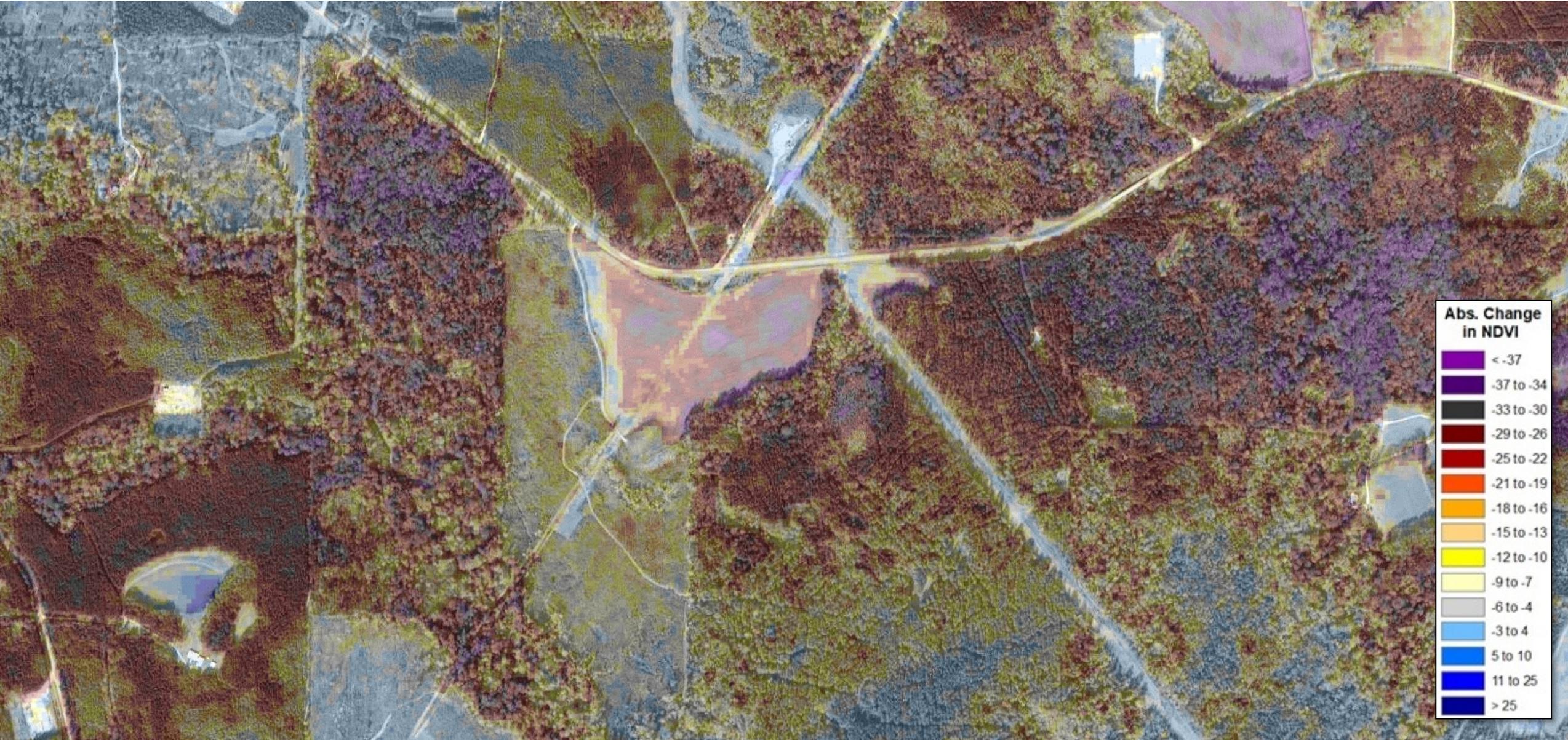
NOAA Storm Reports 12 Apr 2020

Wind Tornado Hail

Abs. Change in NDVI



Mississippi tornado damage shows that impacts varied among and within vegetation types



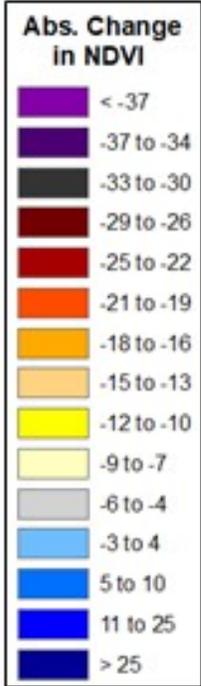
Mississippi tornado damage shows that impacts varied among and within vegetation types

True color aerial image prior to the tornado

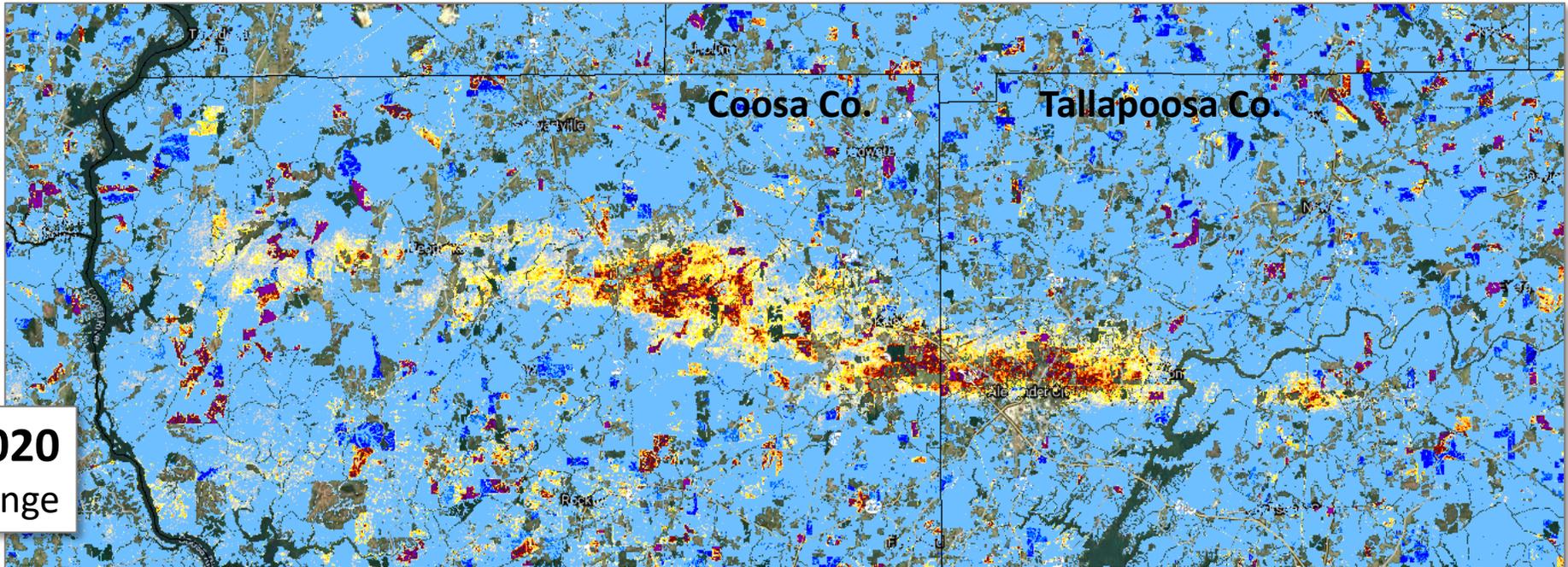


Ephemeral impacts after sudden spring hail

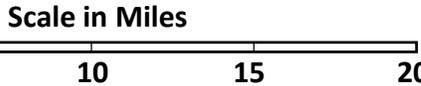
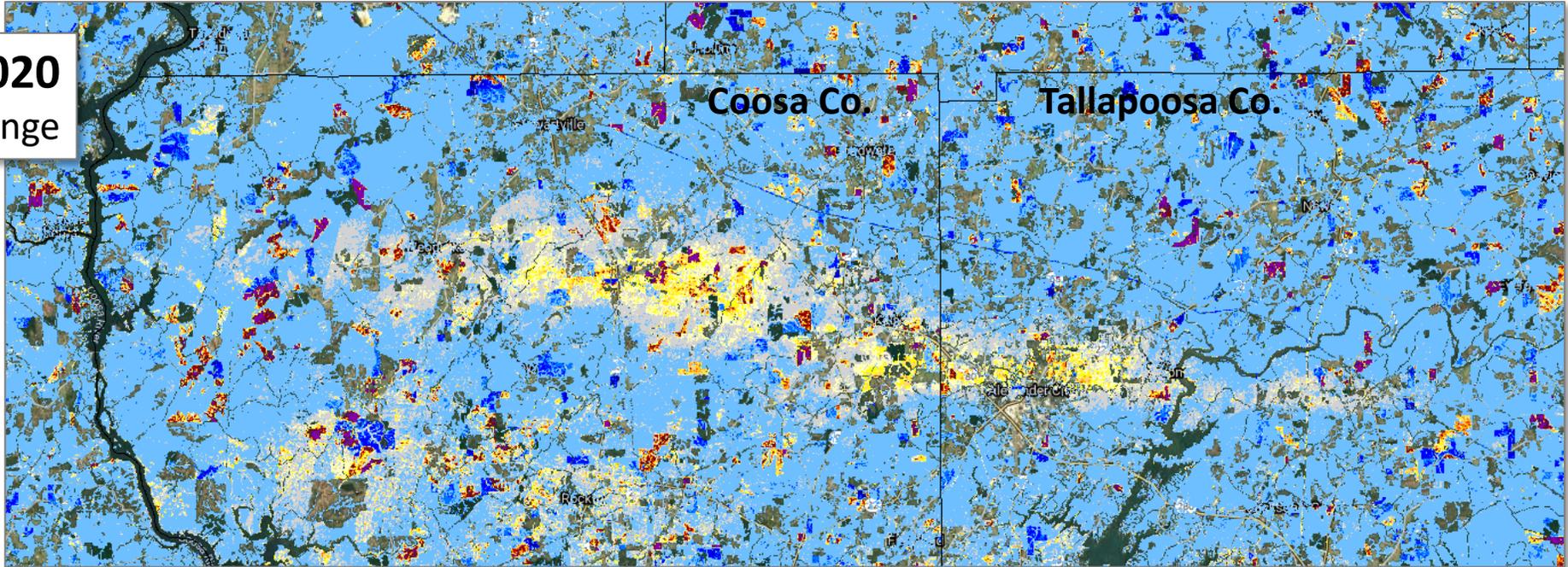
near Alexander City, AL
19 Apr. 2020 (1-1.75" hail)



Early May 2020
1 year change



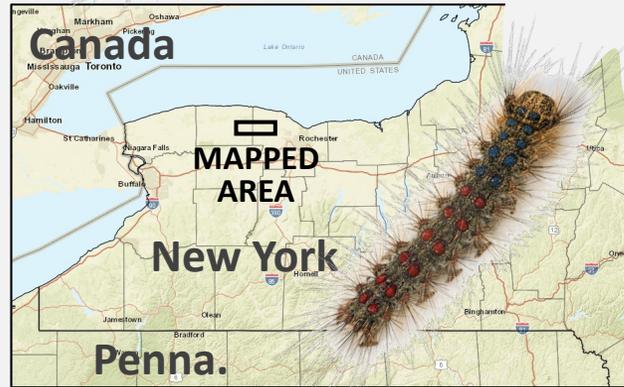
Late June 2020
1 year change



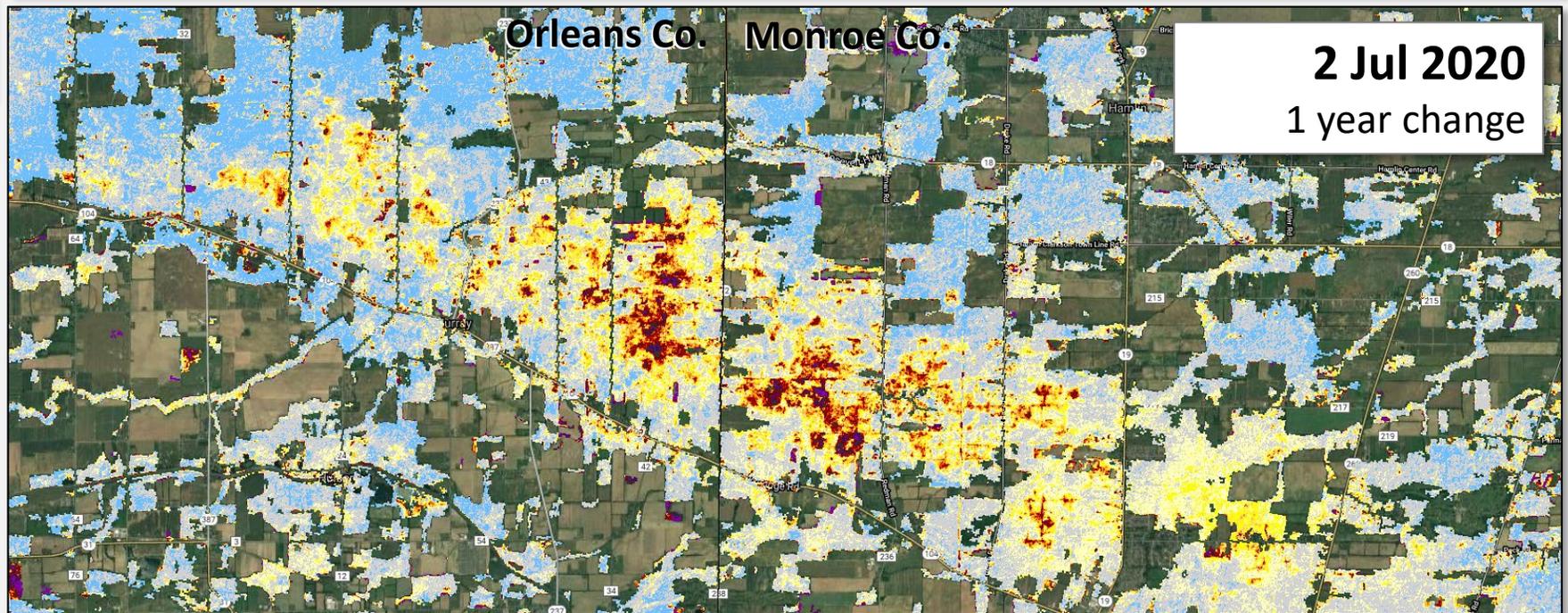
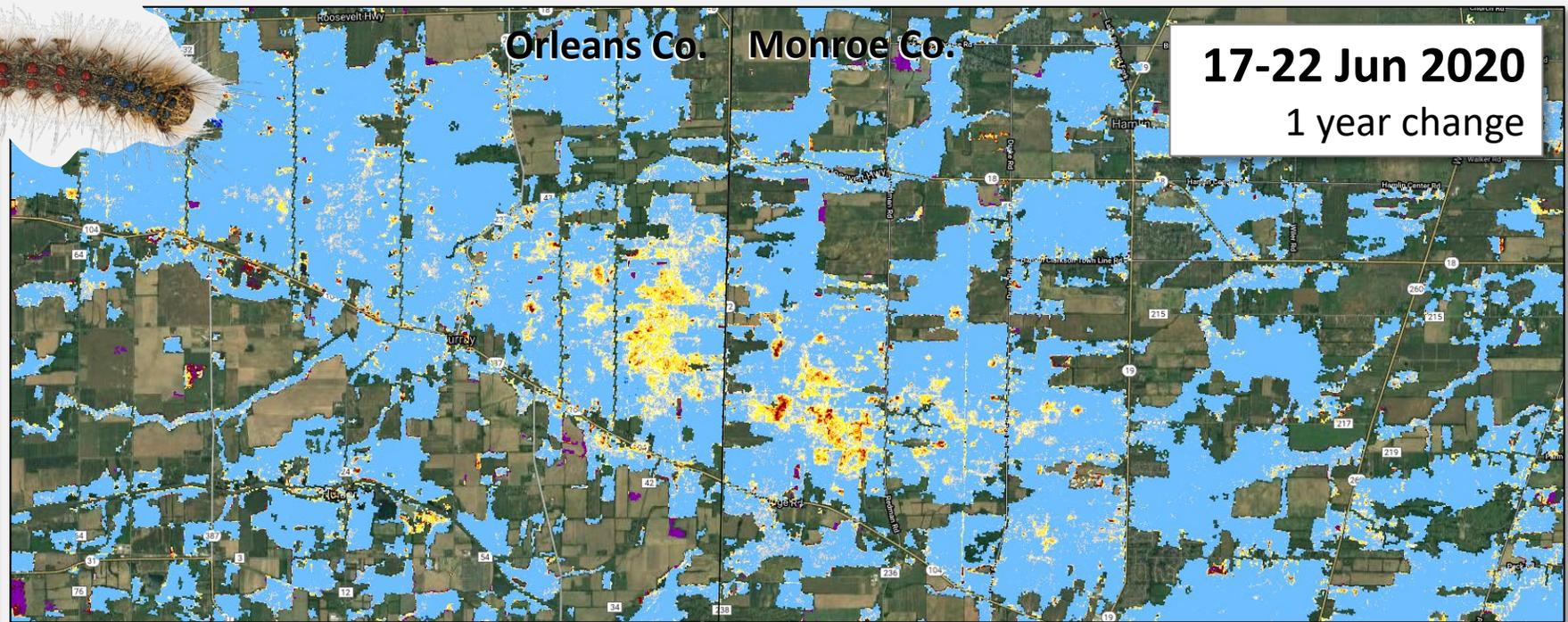
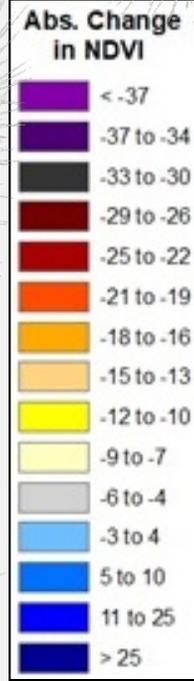
Progressive gypsy moth defoliation

near Rochester, New York

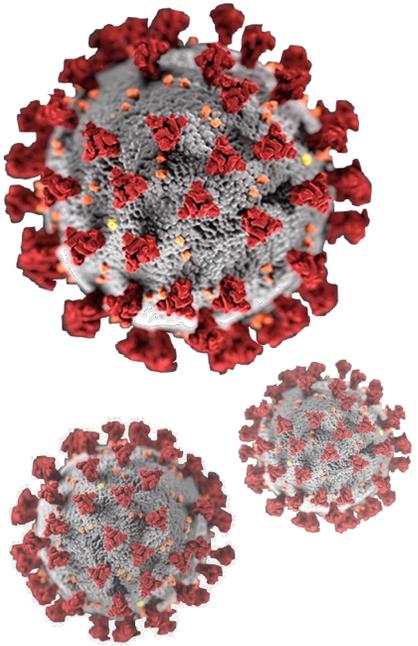
Diagnostically, anomalies worsen over weeks



Scale in Miles



Land Between the Lakes: a mystery



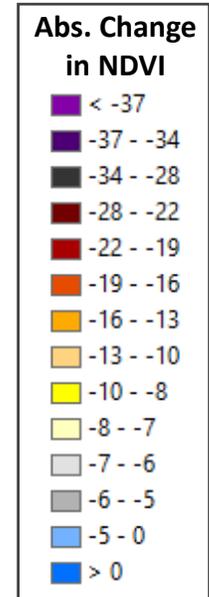
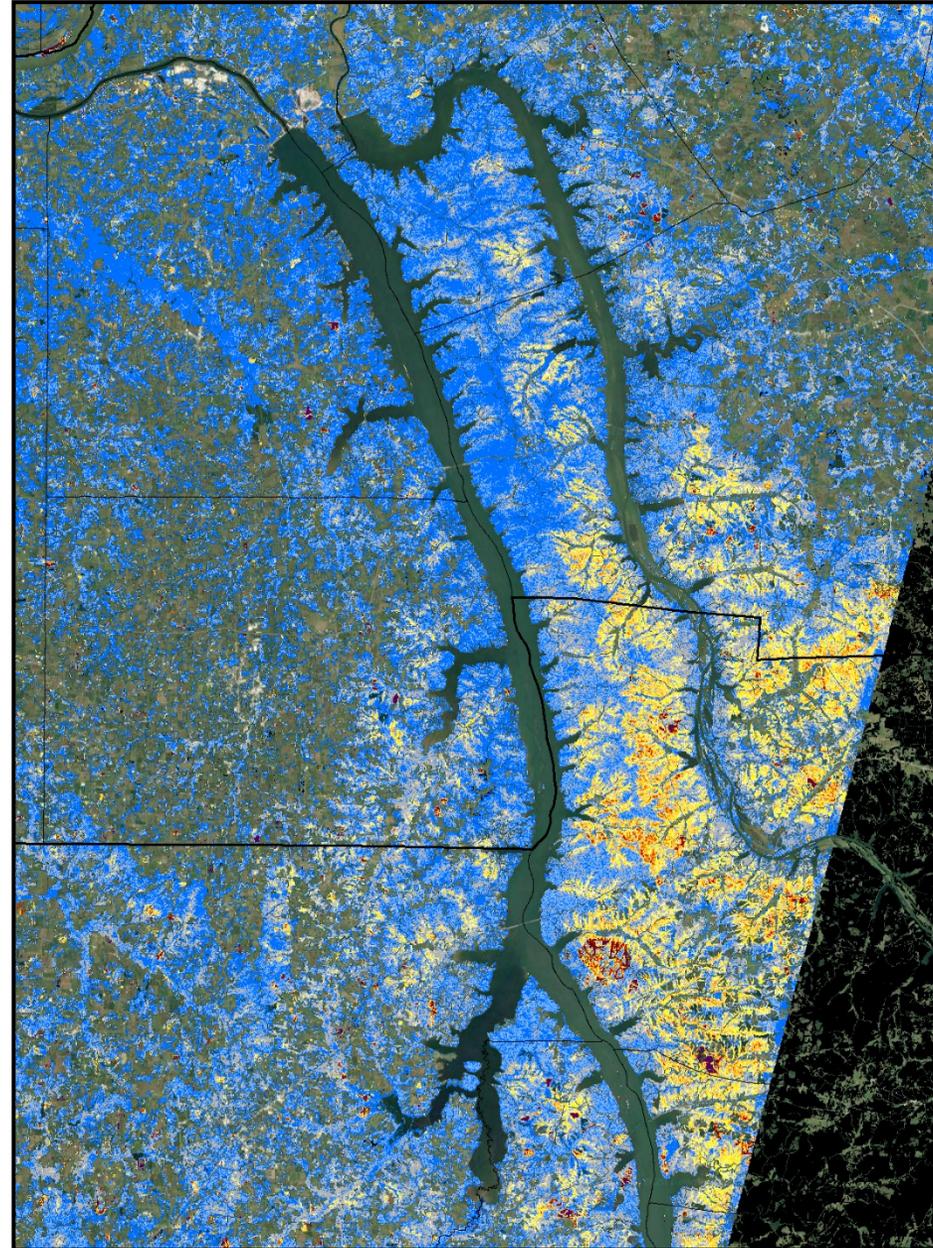
*Covid-19 made
aerial and field
mapping more
challenging*



20 Apr. 2020 vs. 1 May 2018 Sentinel 2

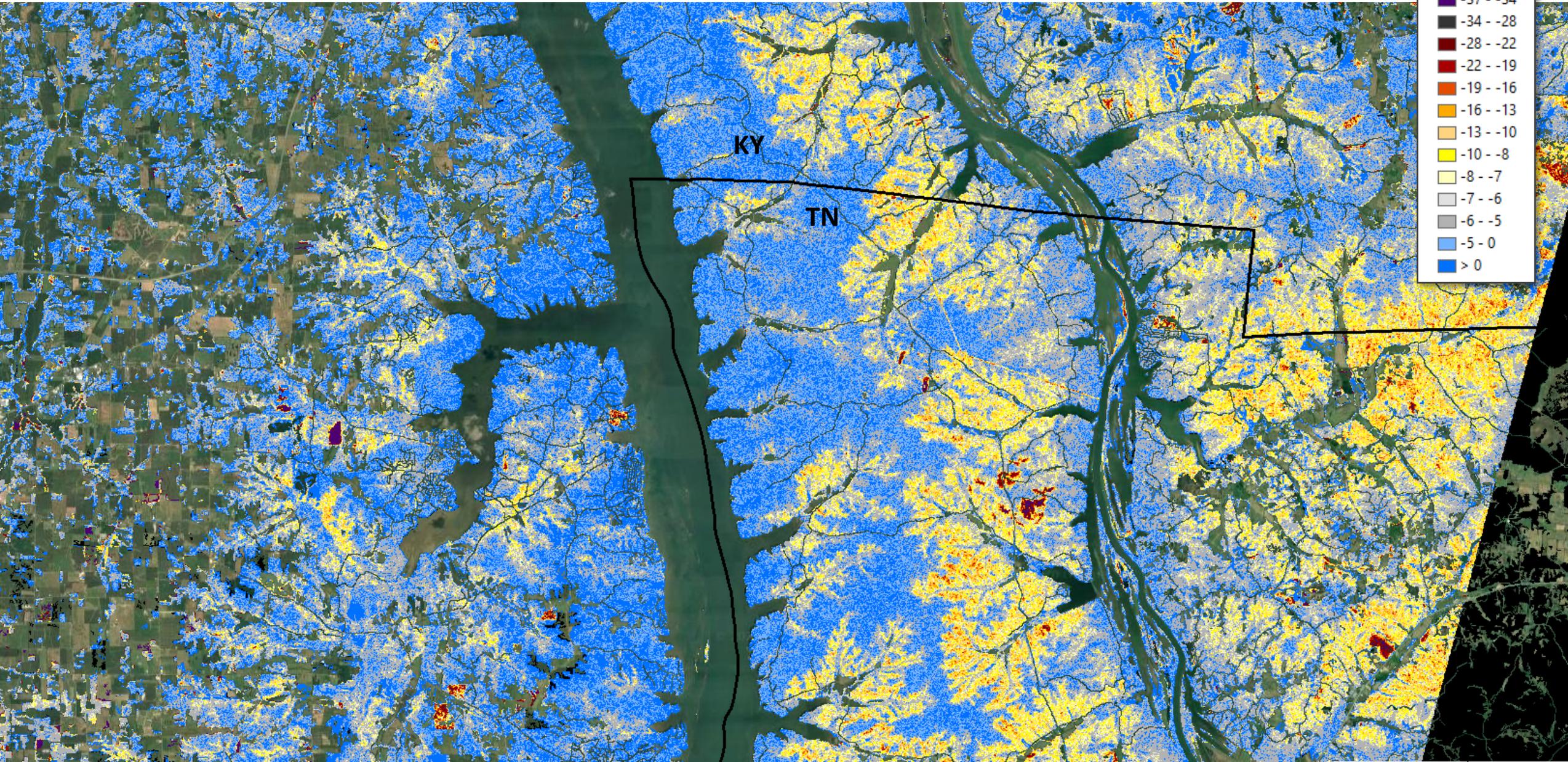
Land Between the Lakes: a mystery

Sudden NDVI decline in
“protected” lower and
mid-slope positions
during spring green-up



Land Between the Lakes

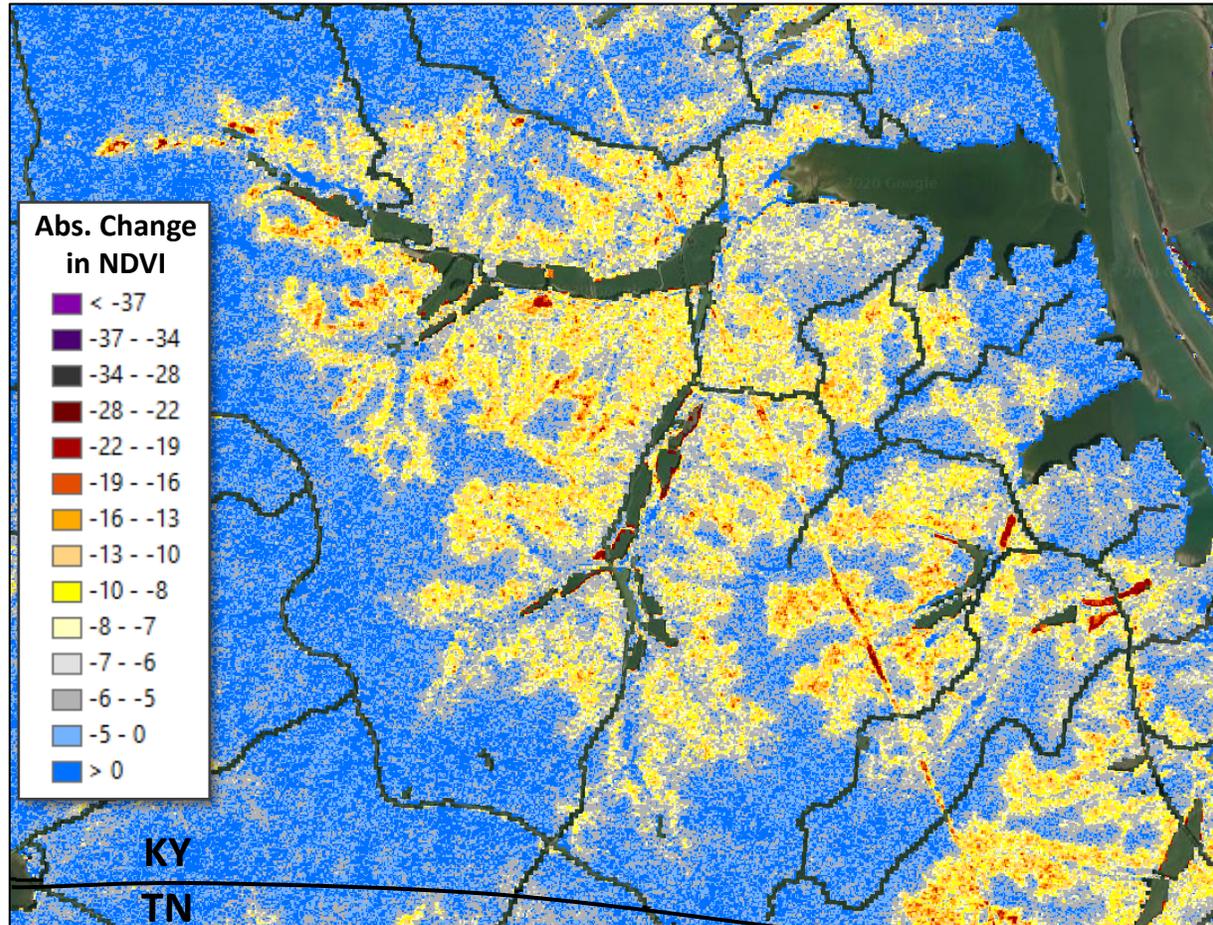
Absolute Change in NDVI: 20 Apr. 2020 vs. 21 Apr. 2019



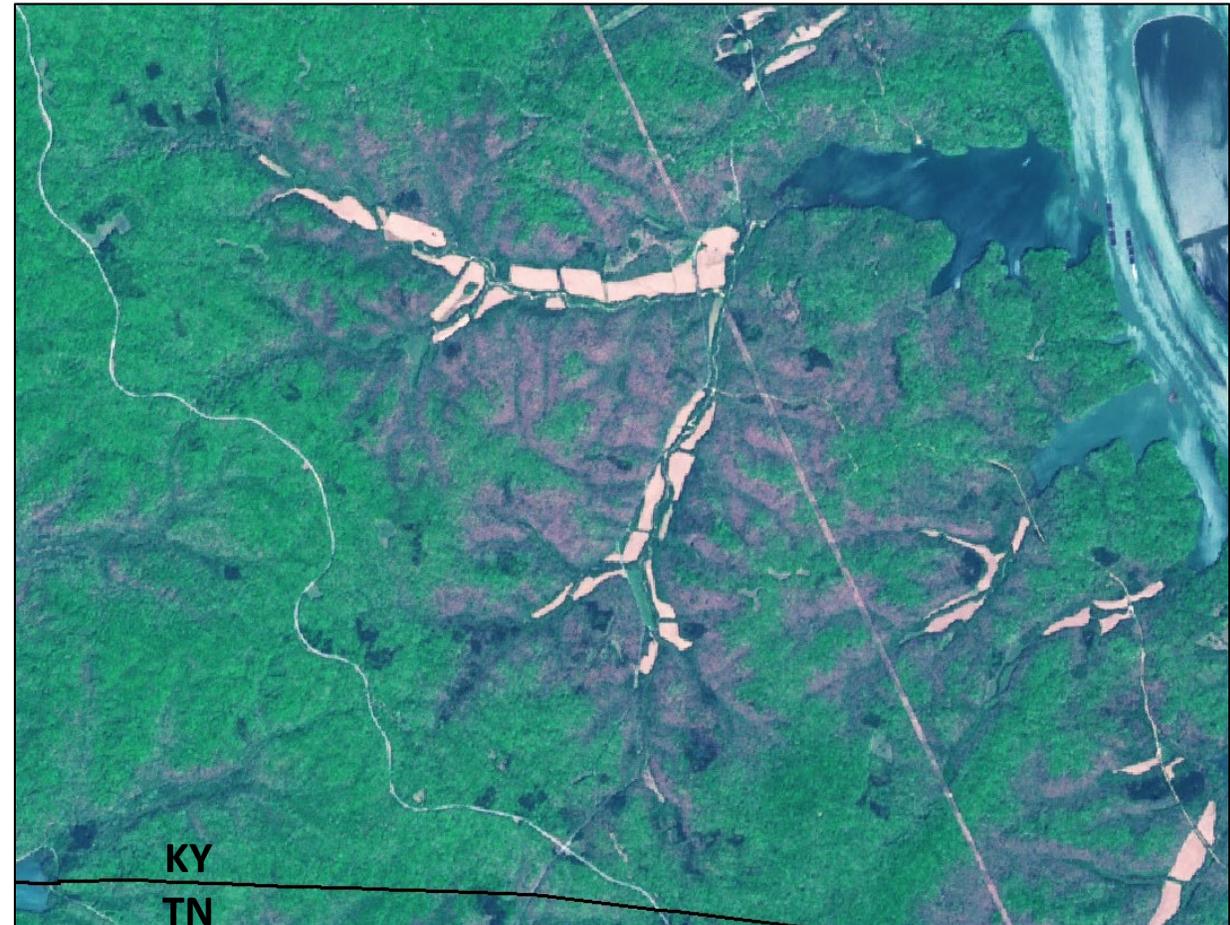
Land Between the Lakes

Absolute Change in NDVI and True Color Perspectives

20 Apr. 2020 vs. 21 Apr. 2019
Atmospherically-corrected NDVI change



20 Apr. 2020
Atmospherically-corrected true color



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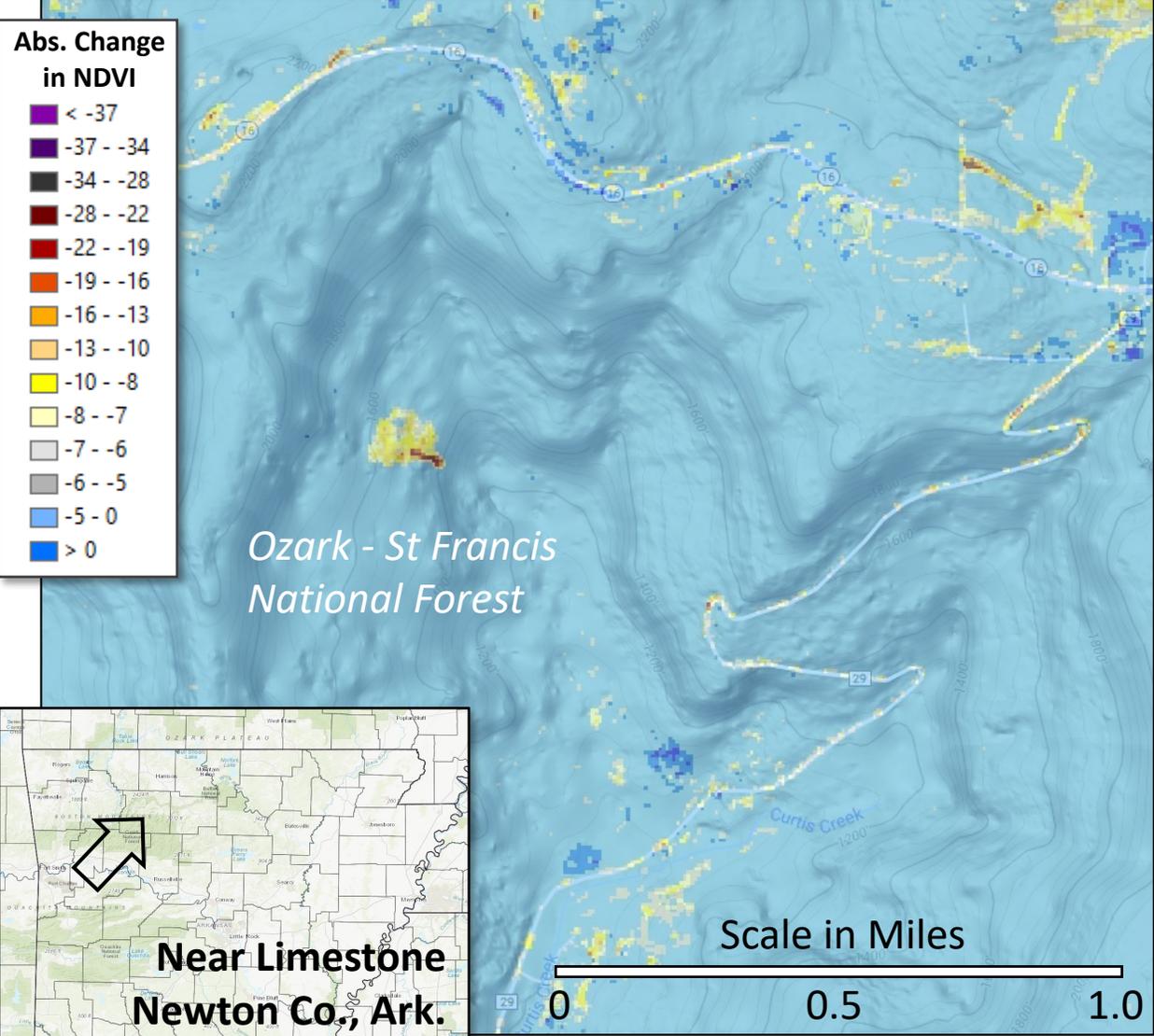


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15 Apr 2020 freeze damage to oaks showing new leaf emergence weeks later



Tracking landslide progression in Arkansas using 10m Sentinel-2



Summary

- The *HiForm workflow* rapidly generates vegetation change maps that show the footprint and severity of disturbances.
- Having this technology is only half the battle, as *assessment* requires local knowledge, ancillary data, and skill.
- *Communicate* with us about difficult interpretations or interesting phenomena.

**HiForm**

High-resolution forest mapping

<http://hiform.org>



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