

ForWarn Forest Change Detection System Provides a Weekly Snapshot of US Forest Conditions to Aid Forest Managers



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EFETAC, USDA Forest Service, CSC, NASA Stennis, EFETAC, USDA Forest Service,
EFETAC, USDA Forest Service, Oak Ridge National Laboratory, and Oak Ridge National Laboratory





A national-scale near real-time "eye-in-the-sky" satellite-based recognition and tracking system for forest disturbances

ForWarn covers the **entire lower 48 United States**

Generates new potential disturbance maps every 8 days, even throughout the winter

Detects all types of forest disturbances

231 meter resolution map cells

ForWarn is the result of an ongoing, substantive **cooperation among four different government agencies**

USDA, NASA, USGS, and DOE

(Forest Service, Stennis Space Center, EROS Data Center, and Oak Ridge National Laboratory, respectively)



News Releases from the Southern Research Station



March 19, 2012
Perdita B. Spriggs
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USDA Forest Service and NASA release Web-based forest disturbance monitoring tool

Asheville, NC -- The USDA Forest Service's [Eastern Forest](#) and [Western Wildland](#) Environmental Threat Assessment Centers recently unveiled a product that helps natural resource managers rapidly detect, identify, and respond to unexpected changes in the nation's forests by using web-based tools. **ForWarn**, a satellite-based monitoring and assessment tool, recognizes and tracks potential forest disturbances caused by insects, diseases, wildfires, extreme weather, or other natural or human-caused events. The tool complements and focuses efforts of existing forest monitoring programs and potentially results in time and cost savings.

The prototype version of **ForWarn** has successfully operated since January 2010 and uses NASA MODIS (Moderate Resolution Imaging Spectroradiometer) satellite imagery to recognize and track changes in vegetation across the nation, providing a near-real-time view of potential forest disturbance and recovery. ForWarn uses a web-based map tool, the [Forest Change Assessment Viewer](#), to provide an 8-day coast-to-coast snapshot of the US landscape, interpret images, and create geographically relevant maps. The viewer allows users to explore and share recent and archived forest disturbance maps.

"ForWarn epitomizes the type of product envisioned when the Threat Assessment Centers were created," says [Danny C. Lee](#), Director of the Eastern Threat Center. "This tool literally puts space-age technology into the hands of forest resource professionals. It's a remarkable collaborative achievement." The Eastern and Western Threat Centers are jointly supported by the Forest Service's National Forest System, State and Private Forestry, and Research and Development.

***ForWarn Official Forest Service/NASA Unveiling and Roll-Out, March 19, 2012, but
ForWarn has been operating since January 2010***



ForWarn team wins award for excellence in Science Delivery

FRI, 12/07/2012 - 14:40 -- CADOUGHE

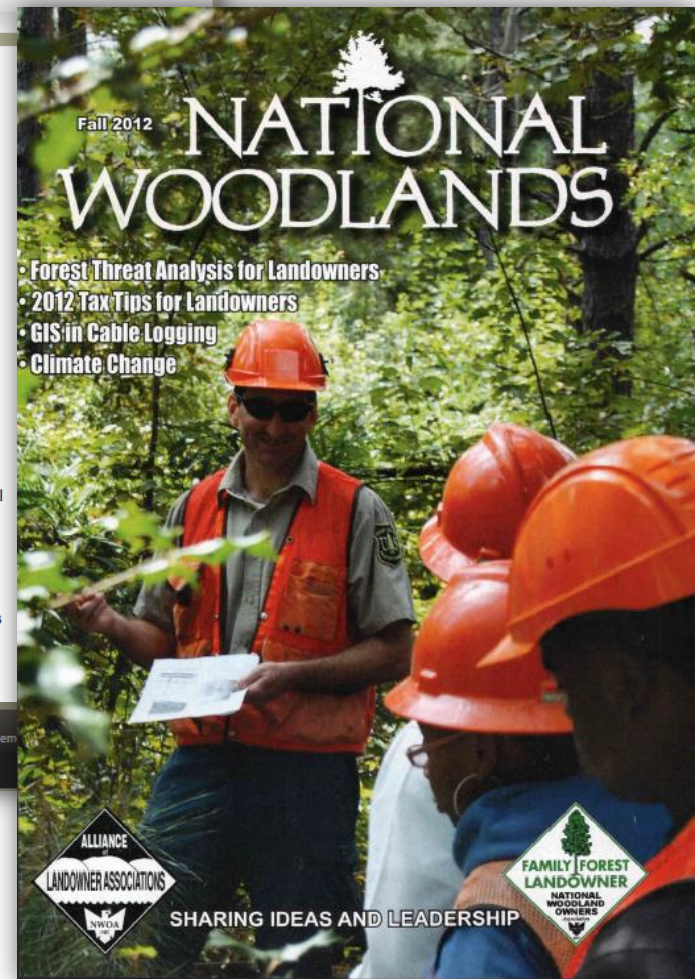
In October 2012, the 16-person ForWarn Team, which includes employees of four different U.S. Government Agencies (USDA Forest Service, NASA Stennis Space Center, US Geological Survey EROS, and DOE Oak Ridge National Laboratory), were selected by Dr. Rob Doudrick, Station Director at USDA Forest Service Southern Research Station, to receive the **2012 Southern Research Station Director's Award for Excellence in Science Delivery**. The honor was given "for exceptional creativity and performance in development and deployment of the ForWarn Forest Disturbance Monitoring Tool."

ForWarn team wins Interagency Partnership Award

FRI, 12/07/2012 - 14:41 -- CADOUGHE

The ForWarn team, on behalf of the USDA Forest Service, Stennis Space Center, Oak Ridge National Laboratory, and the US Geological Survey, has been chosen as the 2013 recipient of the **Federal Laboratory Consortium for Technology Transfer's (FLC) Interagency Partnership Award**. This award—one of the FLC's highest honors—recognizes the efforts of laboratory employees from at least two different agencies who have collaboratively accomplished outstanding work in the process of transferring a technology.

In recognition of their hard work and dedication in promoting technology transfer, the team will be honored at the 2013 FLC Awards program on Thursday, April 25, 2013 in Westminster, Colorado.



The Forest Change Assessment Viewer is the main delivery vehicle for output from *ForWarn*

Developed by the University of North Carolina Asheville National Environmental Modeling and Analysis Center (NEMAC)

- The Assessment Viewer is **totally open to anyone, no userid, no password** is required
- Runs on almost any computer using any browser; nothing is downloaded
- Intuitive and **easy to use**, similar to the Google Maps interface
- Shows the **three most-recent national *ForWarn* disturbance maps**, as well as all historical *ForWarn* products since Jan 2010
- Shows other relevant maps in the same spatial context
- Assess **likely causes of potential disturbances** based on past disturbance history using a "weight-of-evidence" approach

Resource managers (and anyone else!) can see the newest national disturbance maps **at the same time the Threat Centers do**

How Does *ForWarn* Work?

Based on a Simple Comparison between historical and current greenness

We find potential disturbance by comparing current greenness with the "normal," historically observed greenness that would be expected for healthy, undisturbed vegetation growing at this location during this time

- We develop this expected greenness from the 11-year historical MODIS satellite record
- Locations that are currently less-green than we expect are marked as potentially disturbed
- Locations having more actual greenness than we expected may represent vigorous or recovering vegetation, and will become the new expected value for next year

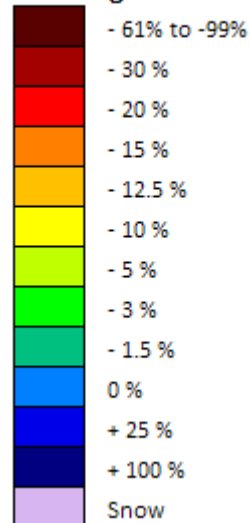
Only forested areas are shown, but *ForWarn* detects disturbances in all vegetation, including agricultural crops and rangeland forage

Compare actual greenness **as a percentage** of **expected greenness**

- **Less than 100% of expected greenness = Potential Disturbances** -- shown as **Greens, Yellows, and Reds**
- **Greater than 100% of expected greenness = Vegetation Recovery** -- shown as **Blues**

TACs-NASA Products

% Change in NDVI



Age of Disturbances and Length of Reference Baselines

We are producing **3 slightly different national disturbance maps** at every 8-day interval

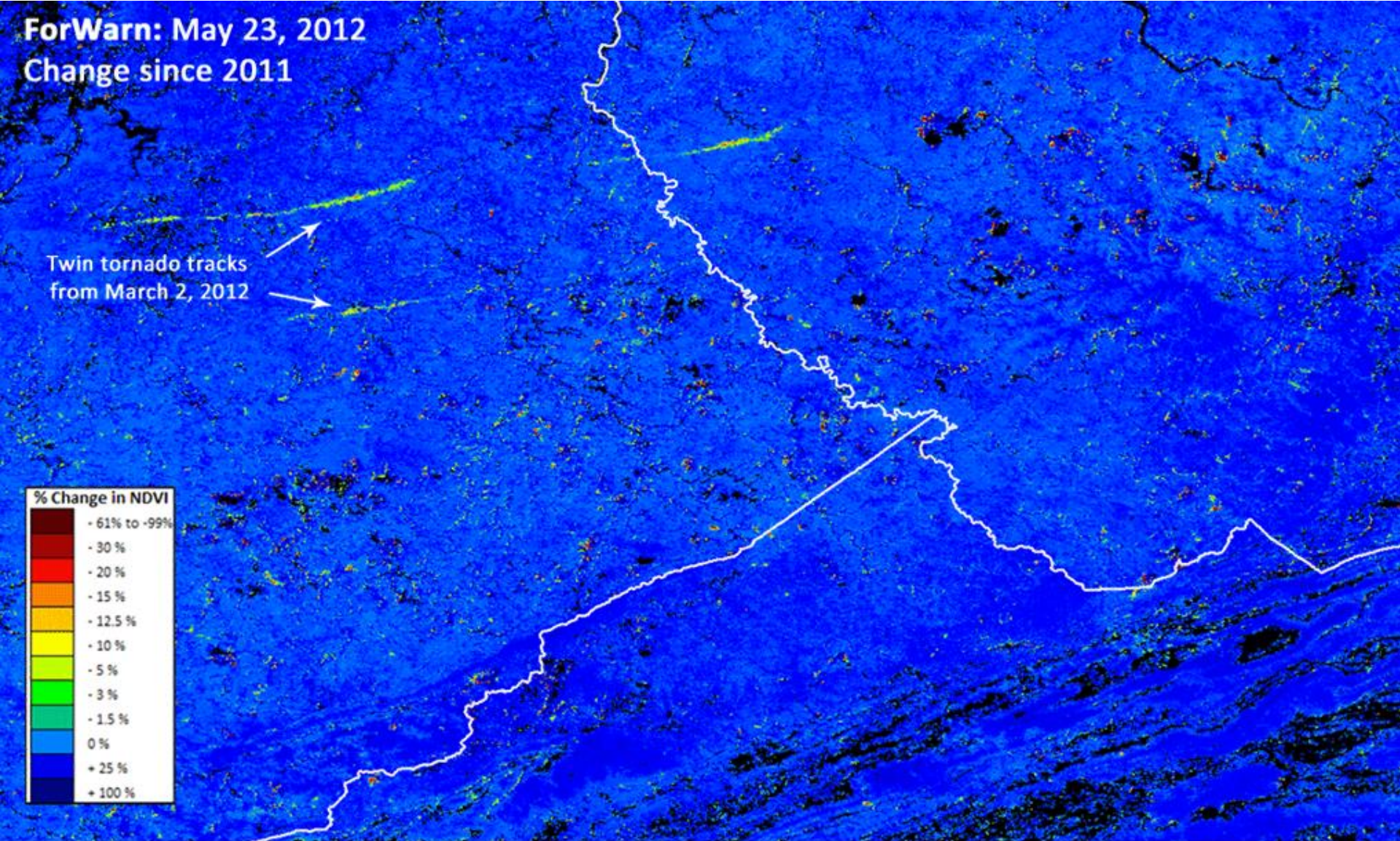
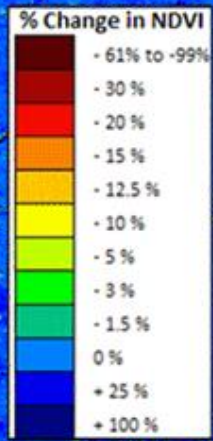
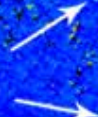
Differences relate to **the age of the disturbances that are mapped**

Three reference baselines of different length historical periods are used to calculate the normal, expected NDVI values:

- A short-term history baseline (**the prior year only**) shows **only recent disturbances**
- A mid-term history baseline (**the previous 3 years**) shows **intermediate-age disturbances**
- A long-term history baseline (**the entire available baseline period**) shows **all disturbances since MODIS**

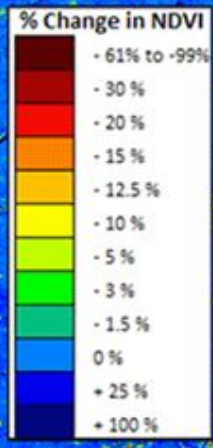
ForWarn: May 23, 2012 Change since 2011

Twin tornado tracks
from March 2, 2012



ForWarn: May 23, 2012
Change since 2000

Twin tornado tracks
from March 2, 2012

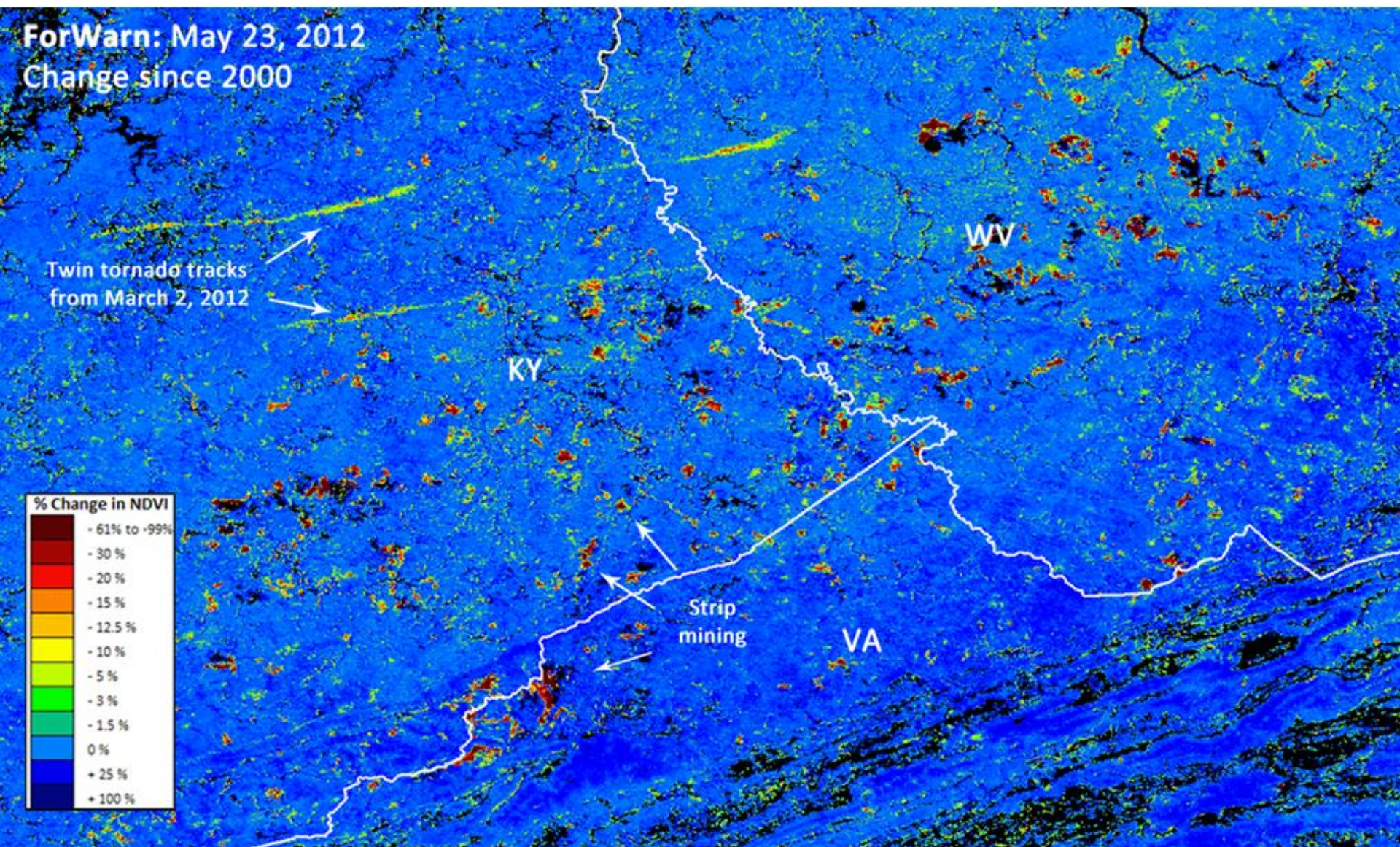


KY

WV

Strip
mining

VA



Examples of forest disturbance, or recovery, seen in the *ForWarn* forest change images

Natural disturbances causing a decline in NDVI value

Tornados and hurricane events
Wind, hail and ice storm damage
Drought and flood conditions
Insect and disease outbreaks
Fall season brown-up
Snow pack extent
Wildfire events

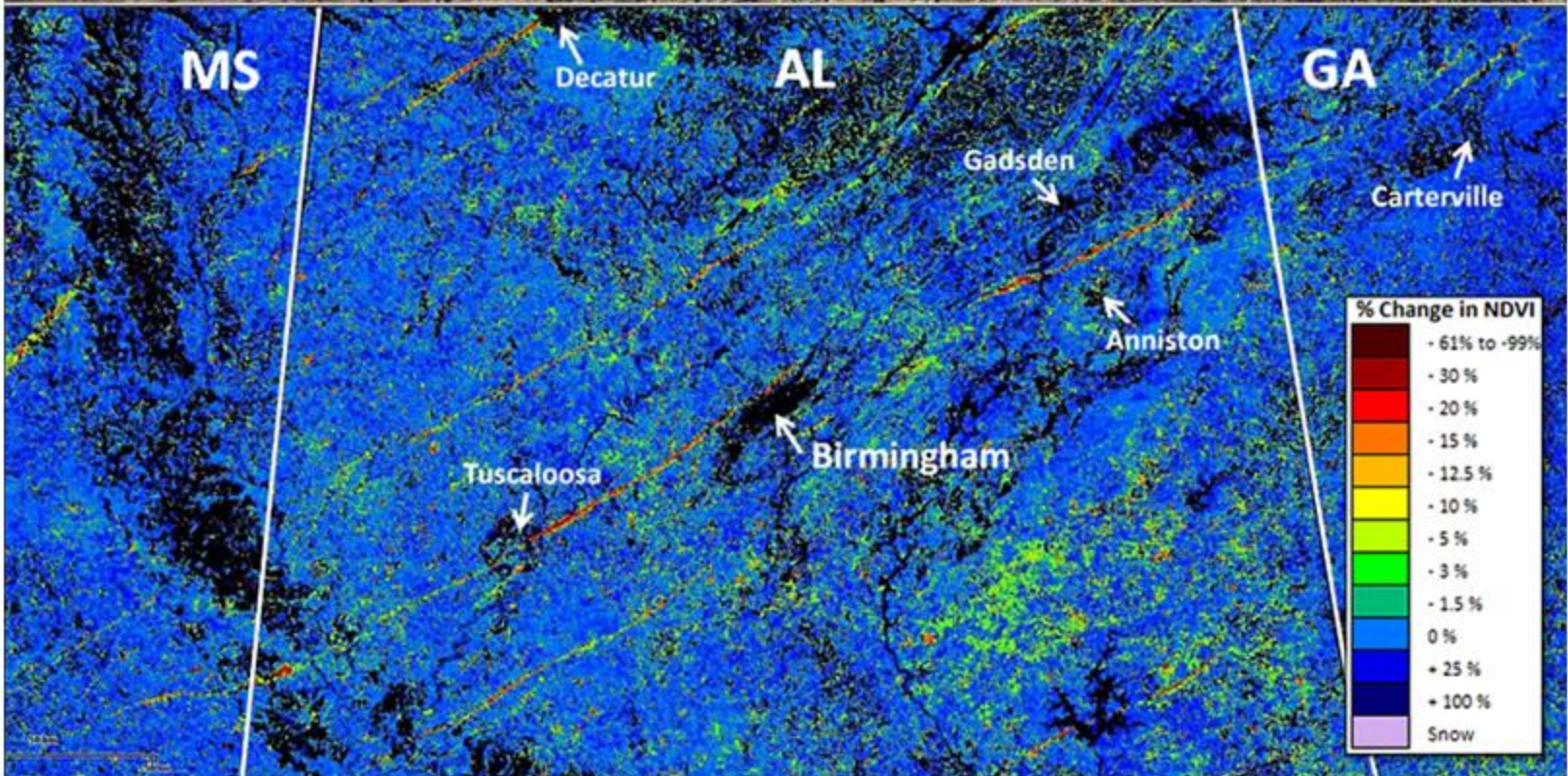
Human-Induced disturbances causing a decline in NDVI value

Forest fragmentation, conversion and urban sprawl
Forest clear-cutting and stand thinning
Mining, oil and natural gas activities
Non-native plant species invasions
Climate variability and change
Prescribed fire
Arson wildfire

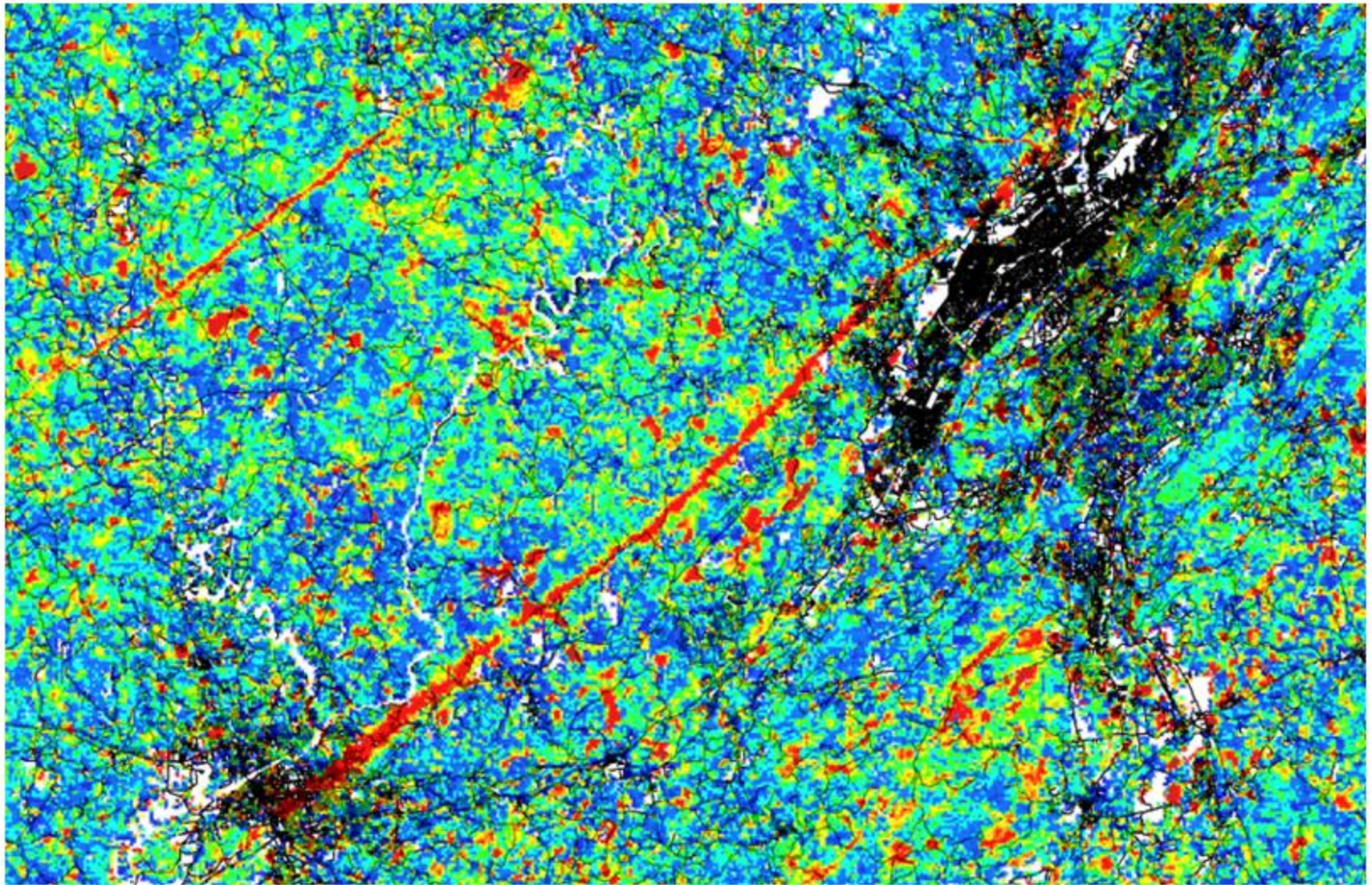
Events that can increase NDVI values

Vegetative recovery from disturbance
Non-native plant species invasions
Precipitation events in arid locales
Forest canopy closure
Forest plantings
Spring leaf-out

*Forest disturbance events often display degrees of severity.
Variation in rates of recovery can relate to ecological, or vegetative resilience.*

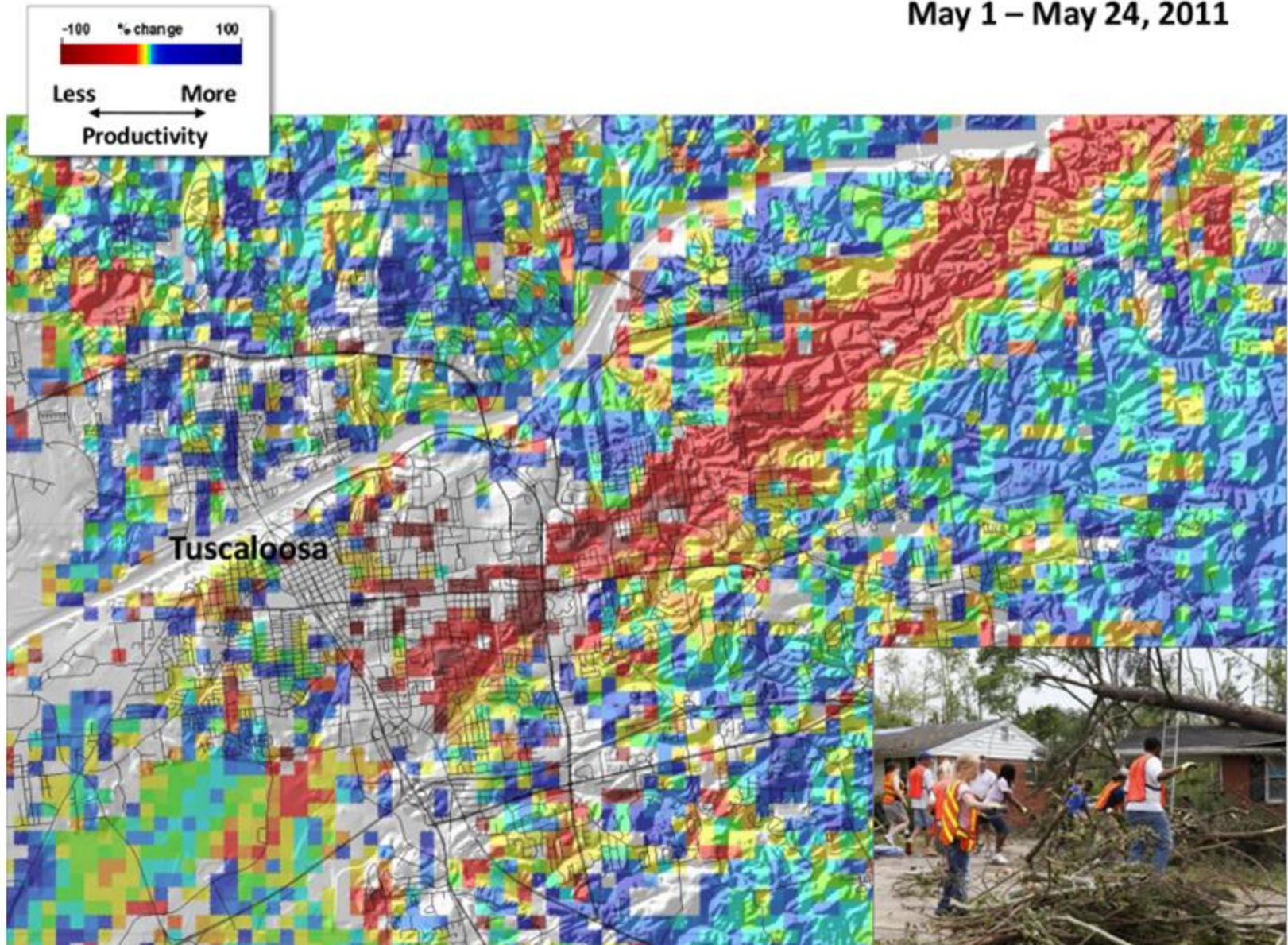


ForWarn image from June 1 (bottom), black areas are non-forest, such as agriculture or urban areas.

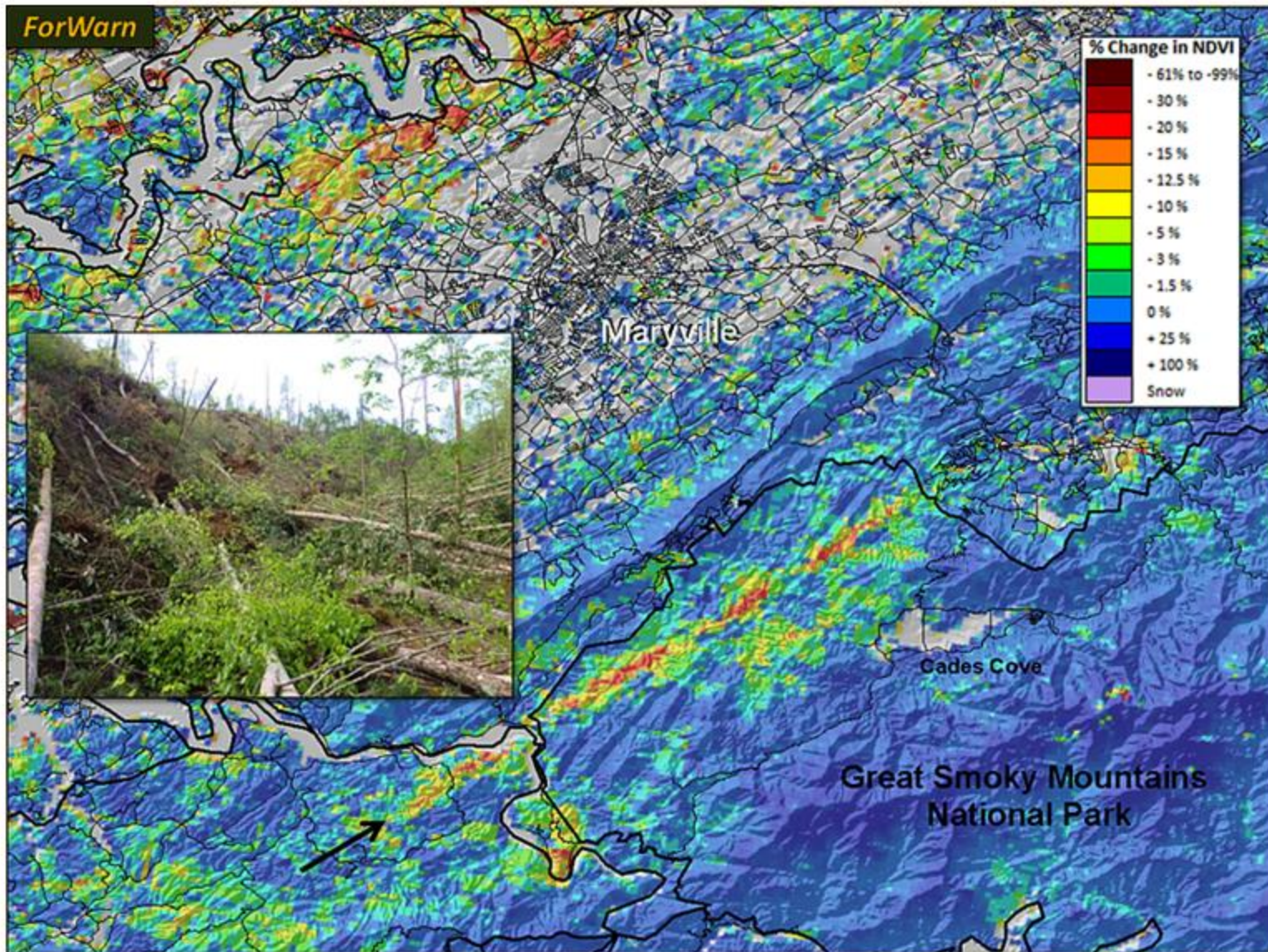


**April 27, 2011 Tornadoes Through Northern MS and AL
Track through Tuscaloosa/Birmingham, AL on May 24, 2011**

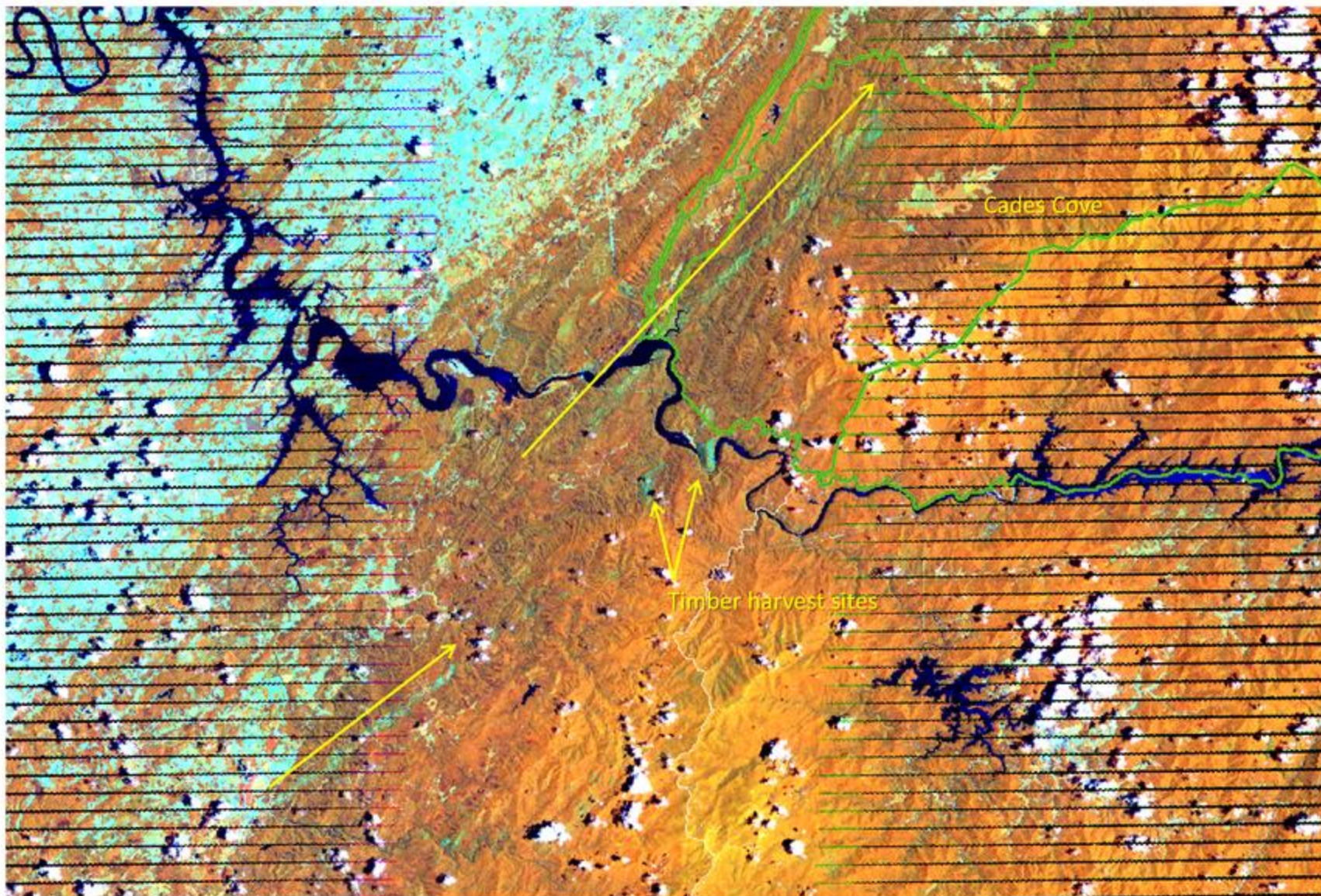
May 1 – May 24, 2011



***ForWarn* damage from Tornado track through Tuscaloosa, AL, USA, May 24**



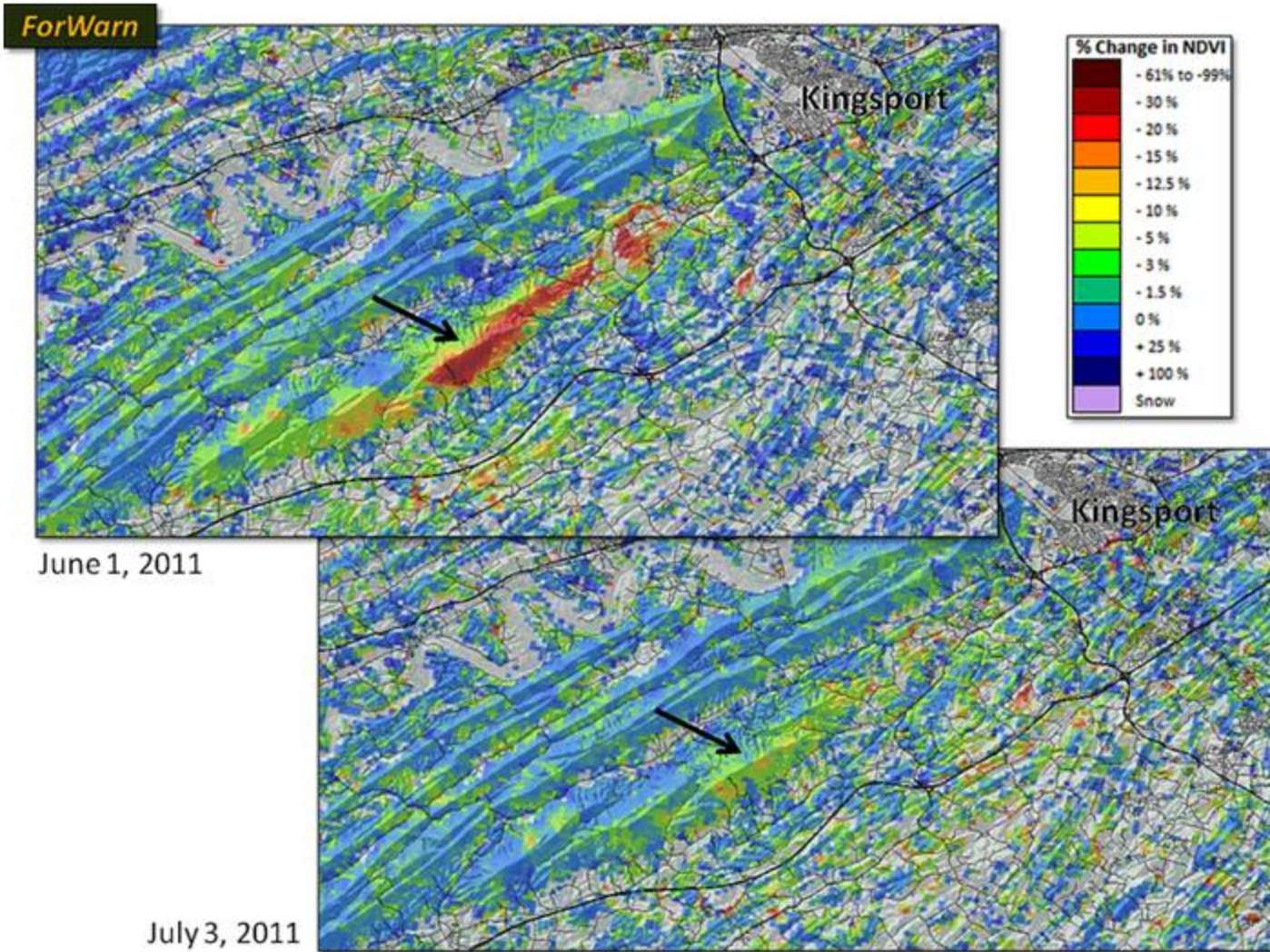
EF4 tornado through Great Smoky Mountains National Park April 27, 2011. Another forest disturbance northwest of Maryville, TN, is the result of strong wind and hail during the same event.



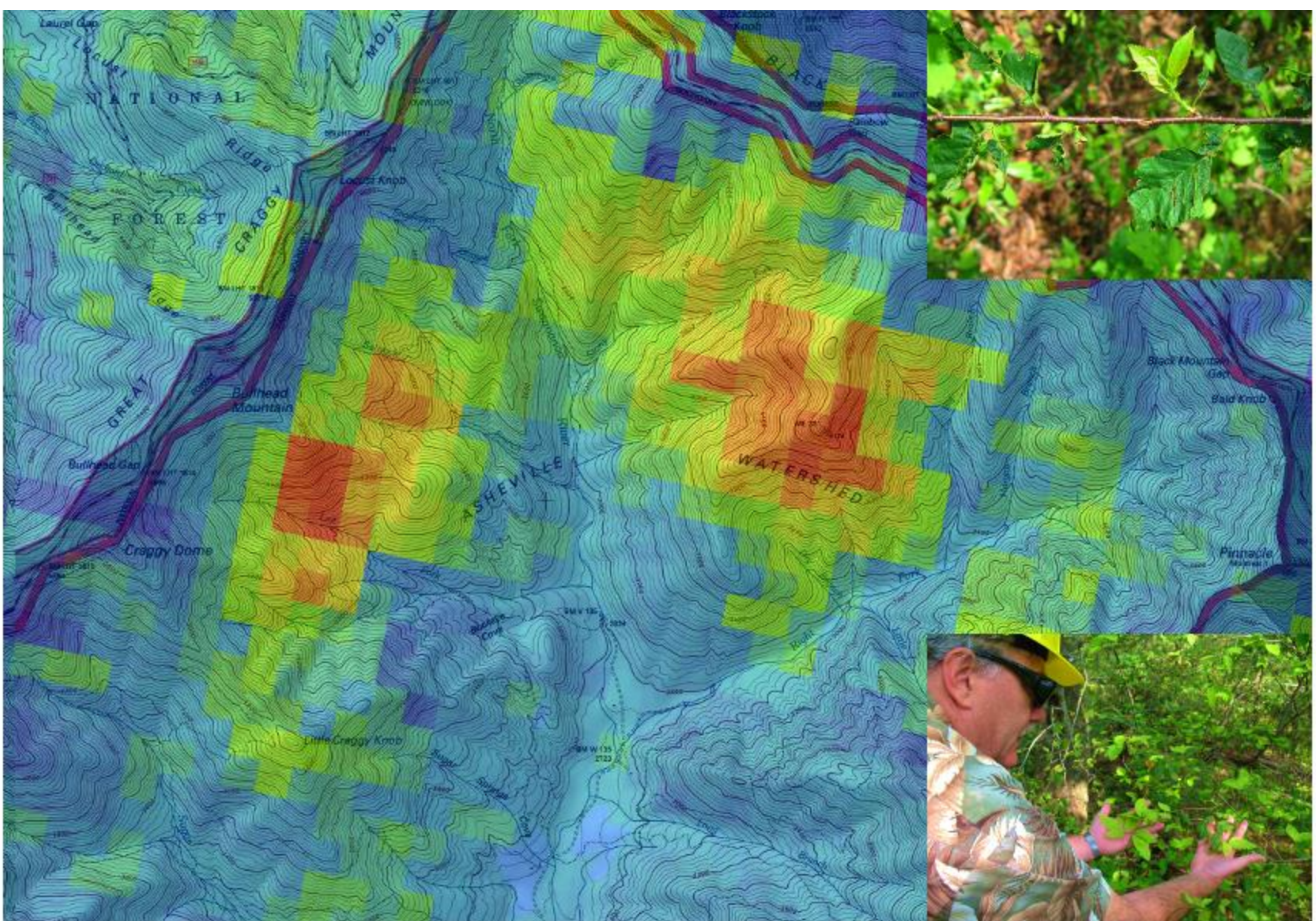
06/25/2012, Landsat 7, 453 RGB



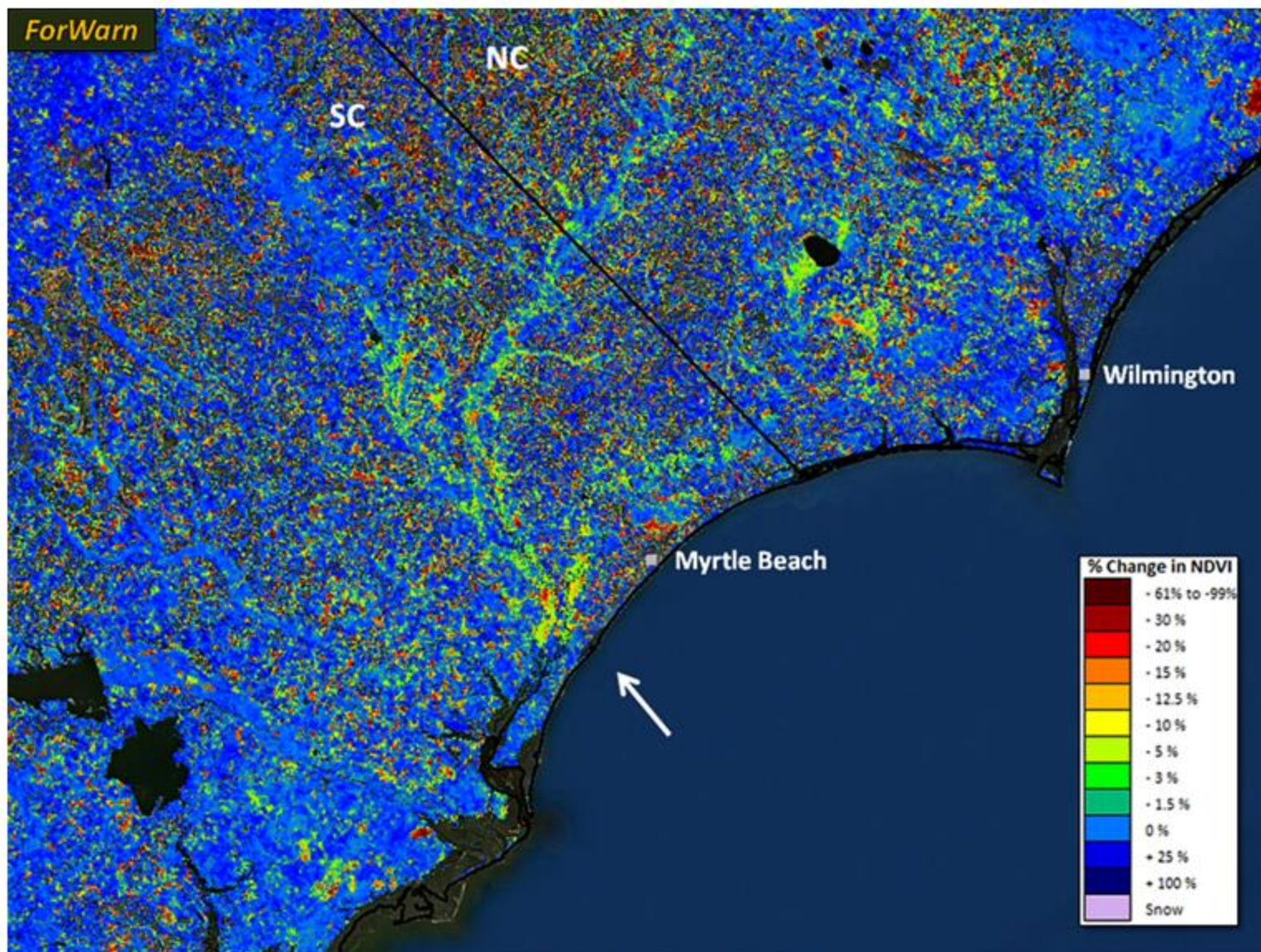
Landsat 453 verification of tornado tracks through the Great Smoky Mountains National Park.



One month after the April 2011 tornado outbreak (top), *ForWarn* mapped a localized linear windstorm event on a ridgeline forest southwest of Kingsport, TN. Two months later (bottom), the vegetation had almost completely recovered. Regular observations are needed to spot such ephemeral forest damage.



In June 2012, *ForWarn* detected a disturbance within the Asheville Watershed, from which the city of Asheville gets all of its drinking water. Visiting there with the AVL Municipal Water managers, we found evidence of a severe-but-localized hail storm, which had shredded leaves and left scars on the upper sides of branches.

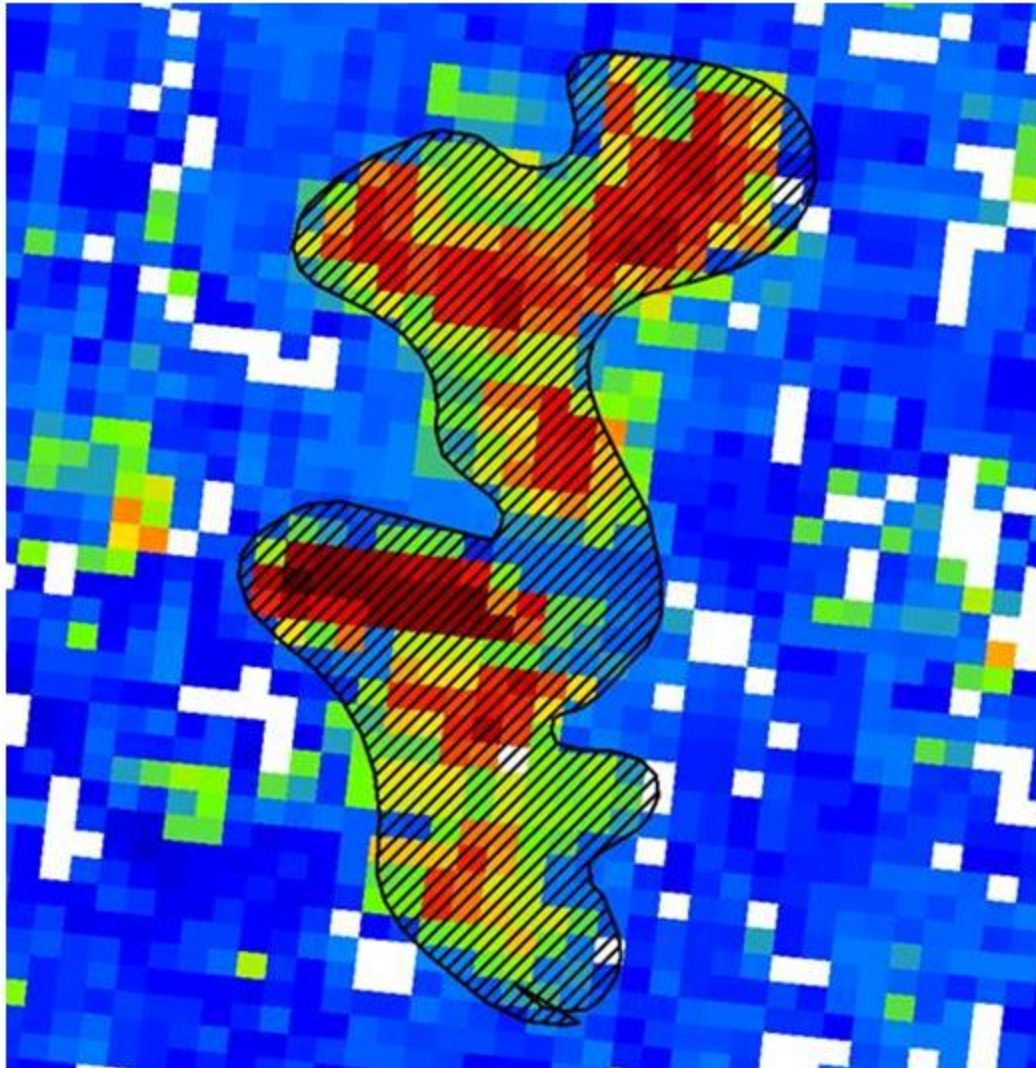


Not the result of flooding during a low-flow period, these riparian disturbances were caused by forest tent caterpillar defoliation, confirmed by ADS.



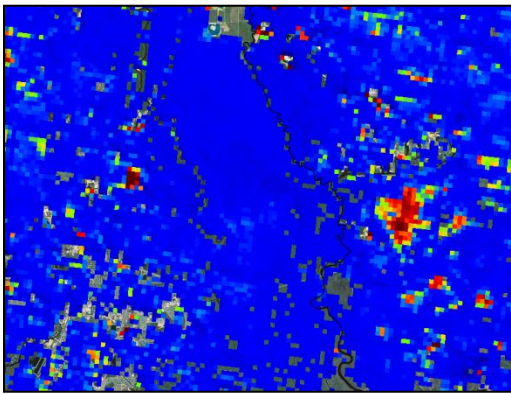
Aerial photo verifying FTC defoliation near the Pearl River, Louisiana detected by *ForWarn* in mid-April, 2012.



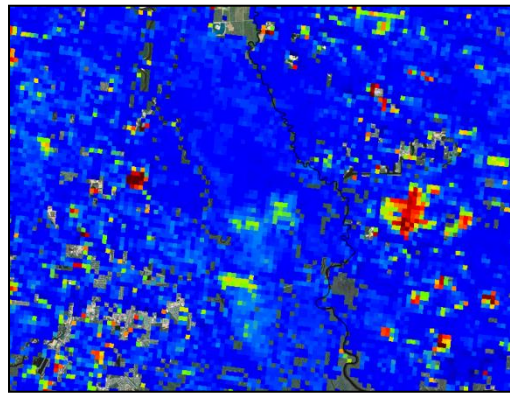


**Louisiana Department of Agriculture and Forestry
flown GPS polygon matching FTC defoliation detected
by *ForWarn* in mid-April, 2012.**

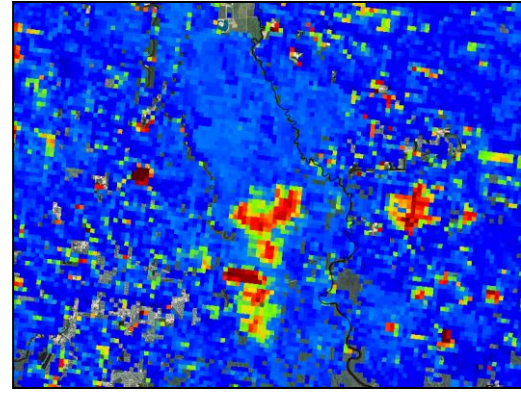




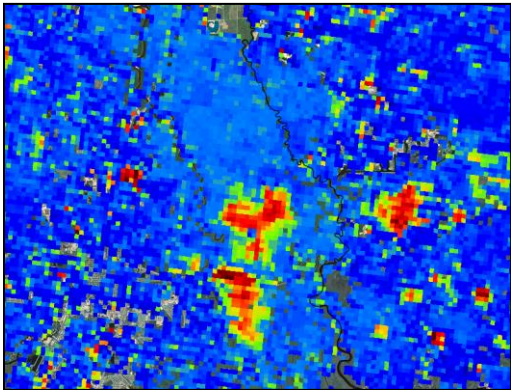
04/05/2012



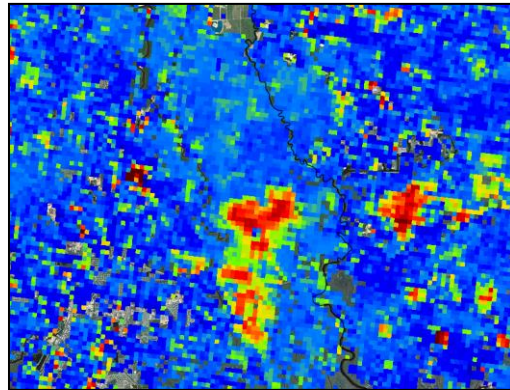
04/13/2012



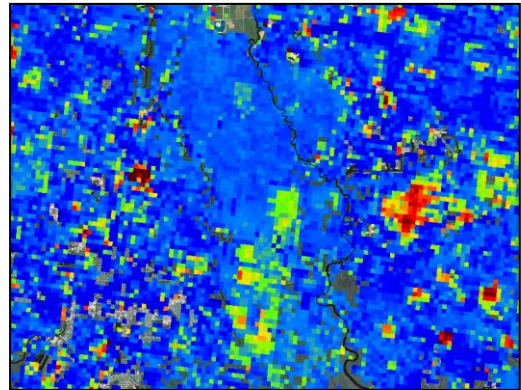
04/21/2012



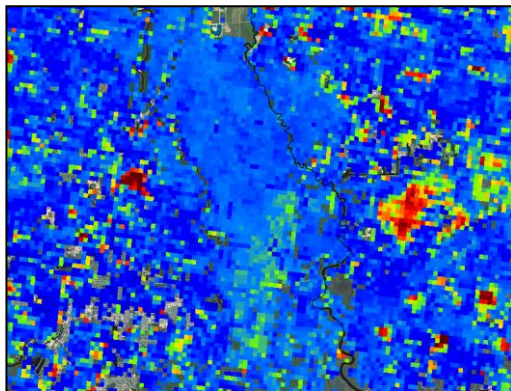
04/29/2012



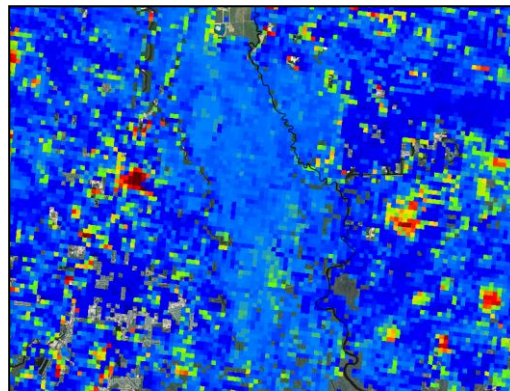
05/07/2012



05/15/2012

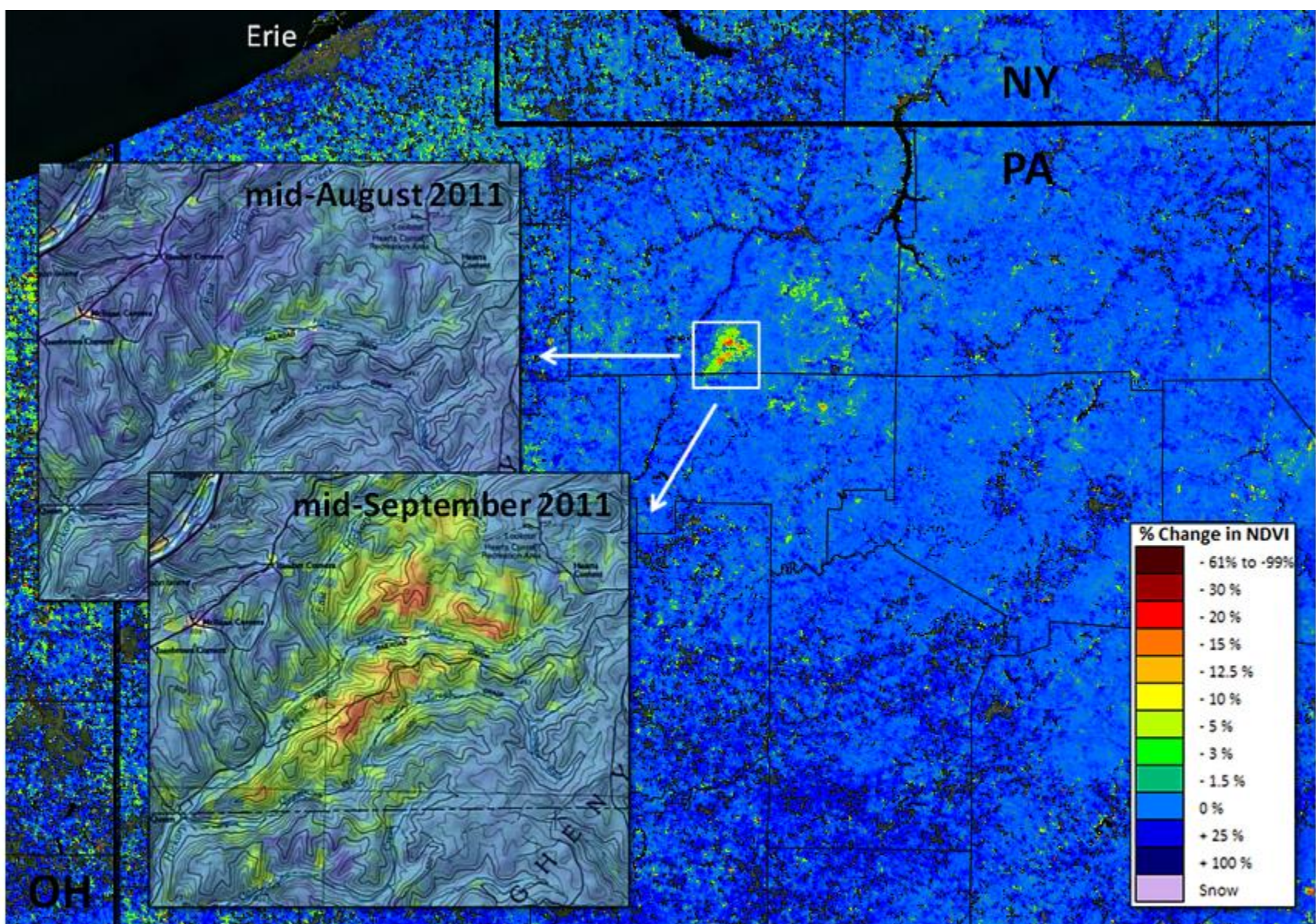


05/23/2012

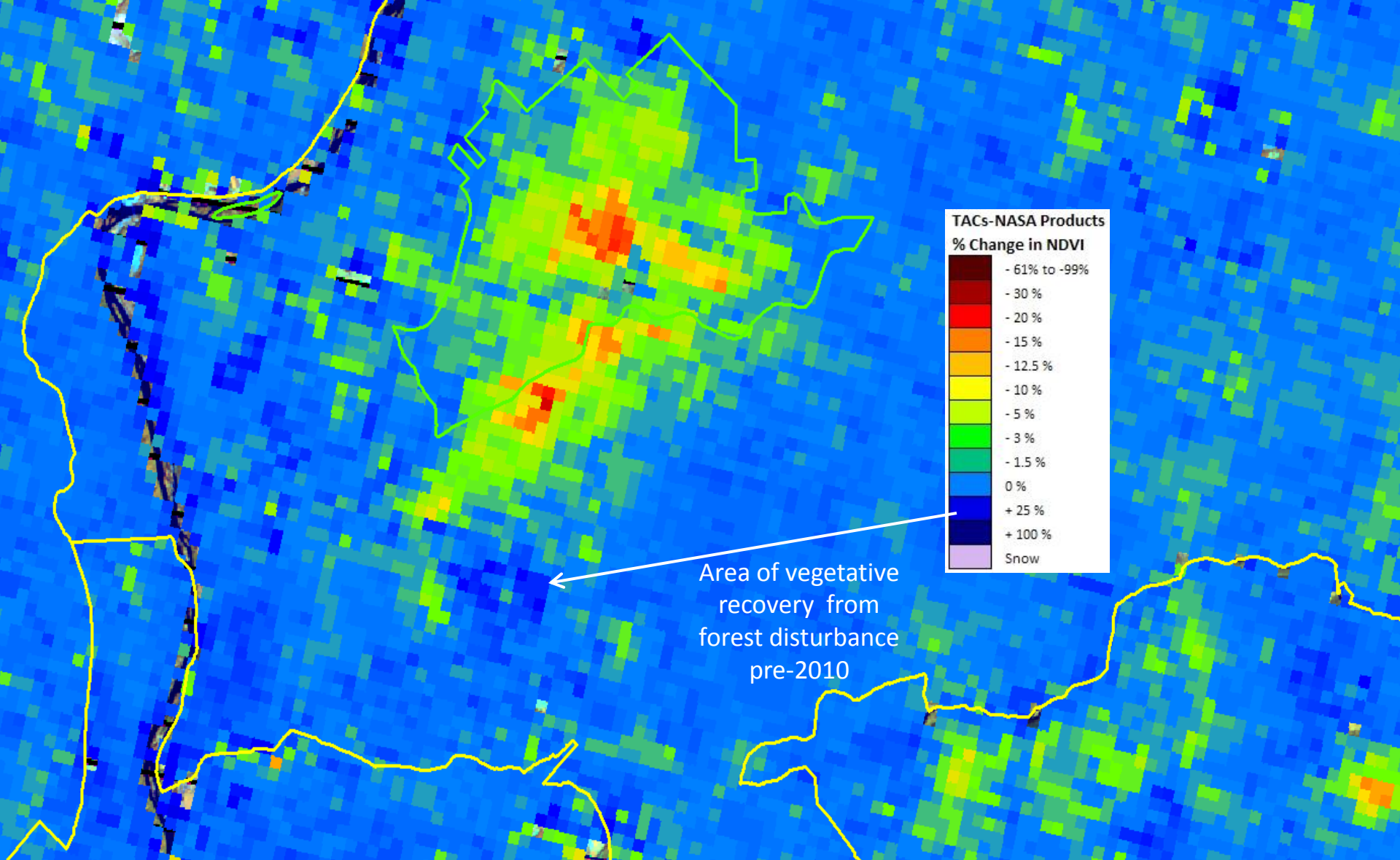


05/31/2012

In ***ForWarn***, this disturbance lasted approximately 6-7 weeks from inception to recovery. This was also witnessed in the Mobile Delta in Alabama. The consequence from this disturbance agent is loss of forest productivity.

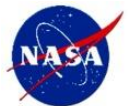


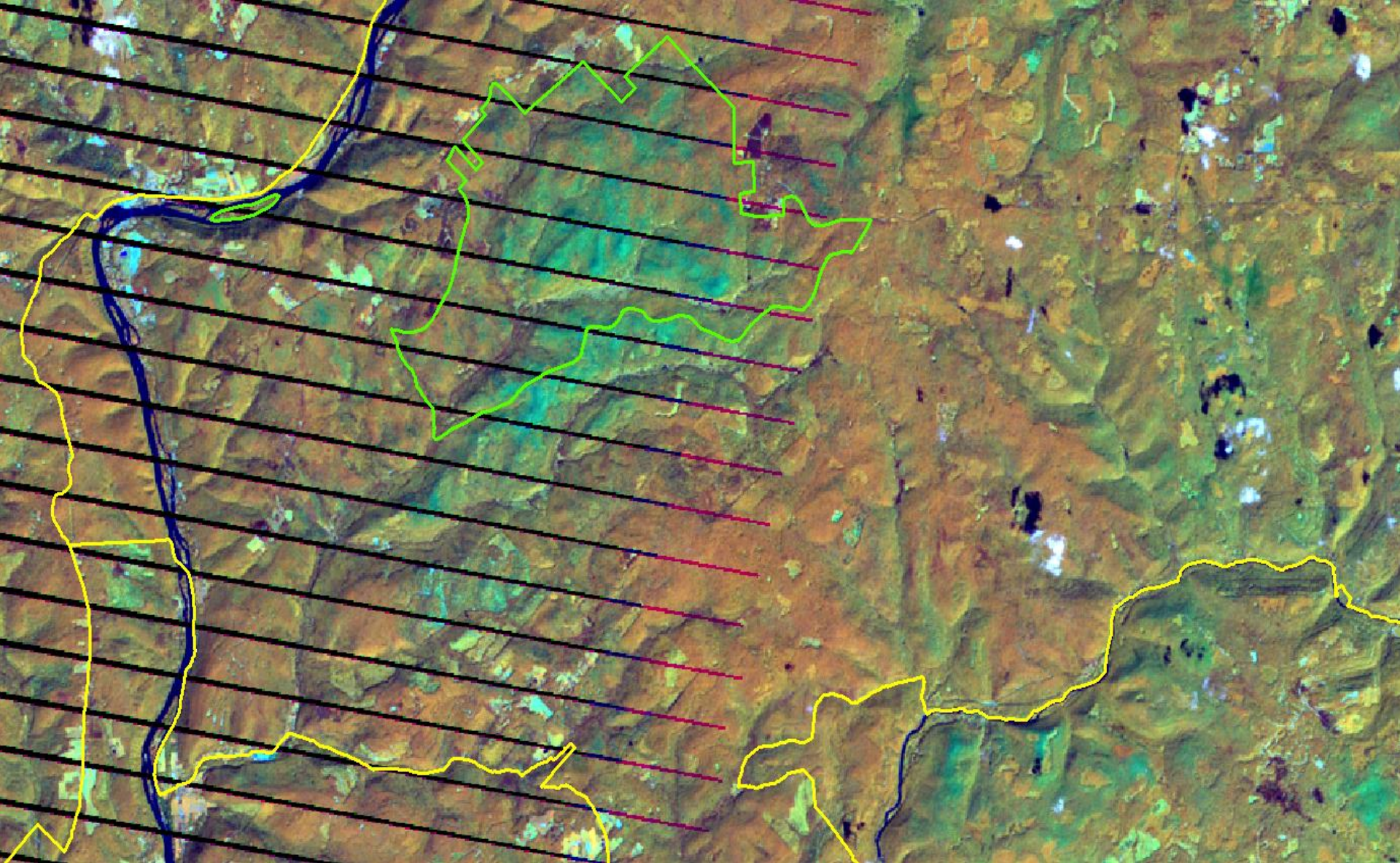
Fall webworms in the Hickory Creek Wilderness Area. Minimal indications of defoliation in mid-August, 2011, but clear patterns by mid-September, until leaf loss. In 2012, this area experienced an even more severe and widespread outbreak of fall webworms, detected by *ForWarn*.



<http://ews.forestthreats.org>

Allegheny National Forest
Hickory Creek Wilderness area
Forest Change Assessment Viewer (FCAV)
09/13/2011 1-yr baseline





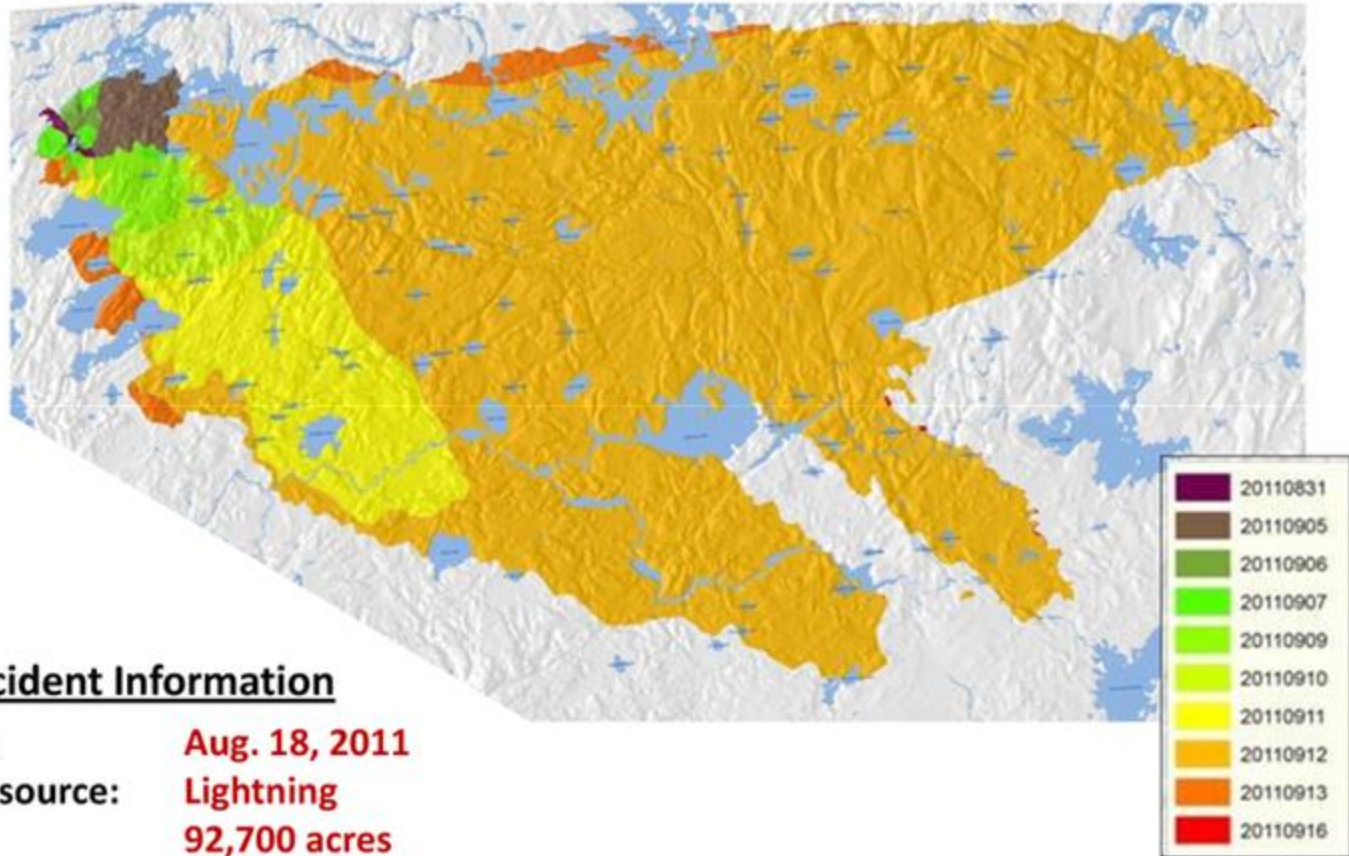
Allegheny National Forest
Hickory Creek Wilderness area
Landsat 7TM on **09/13/2011** , 453 RGB



<http://ews.forestthreats.org>



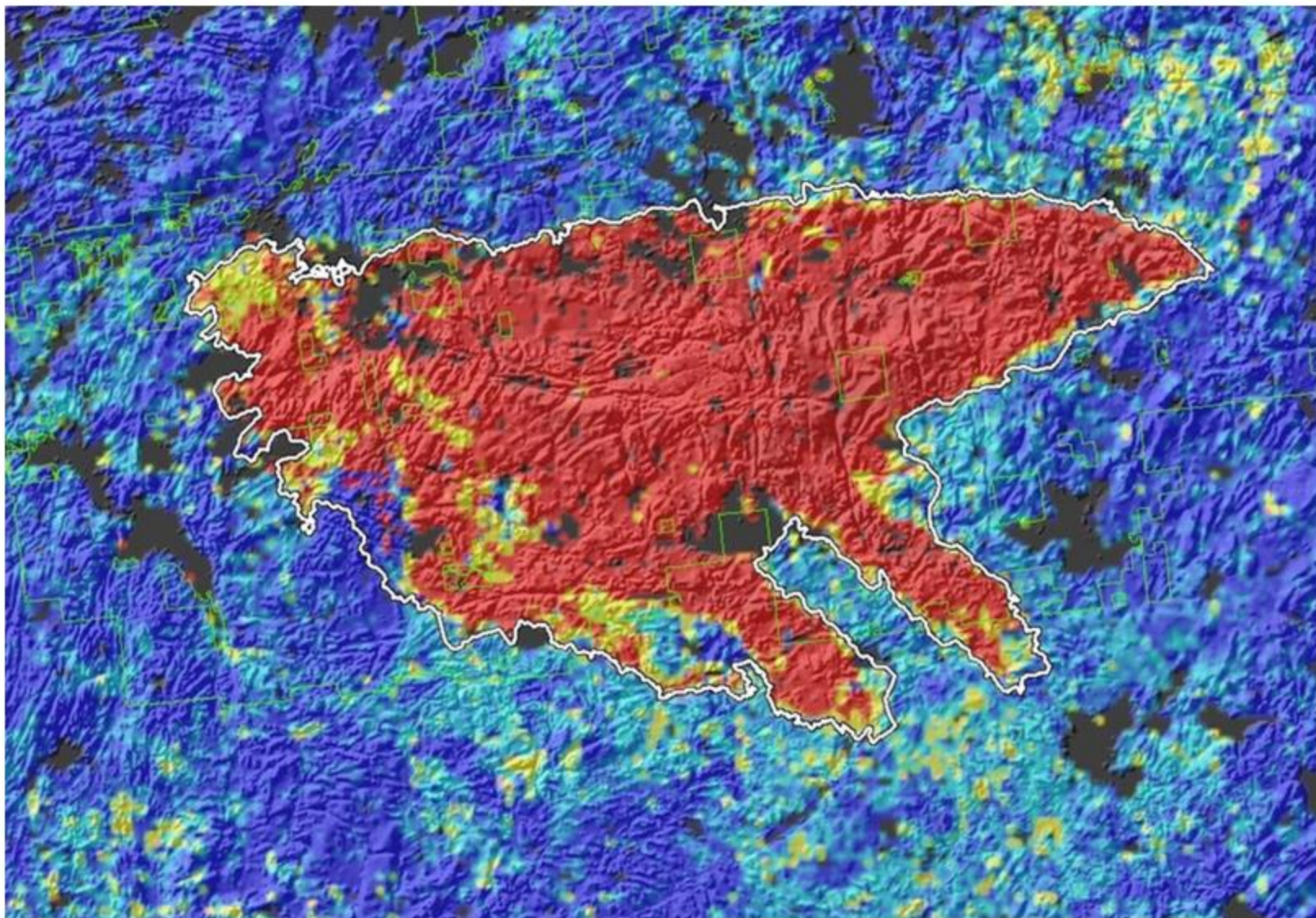
2011 Pagami Creek Fire—Boundary Waters Wilderness Area, MN Fire Progression through September 28



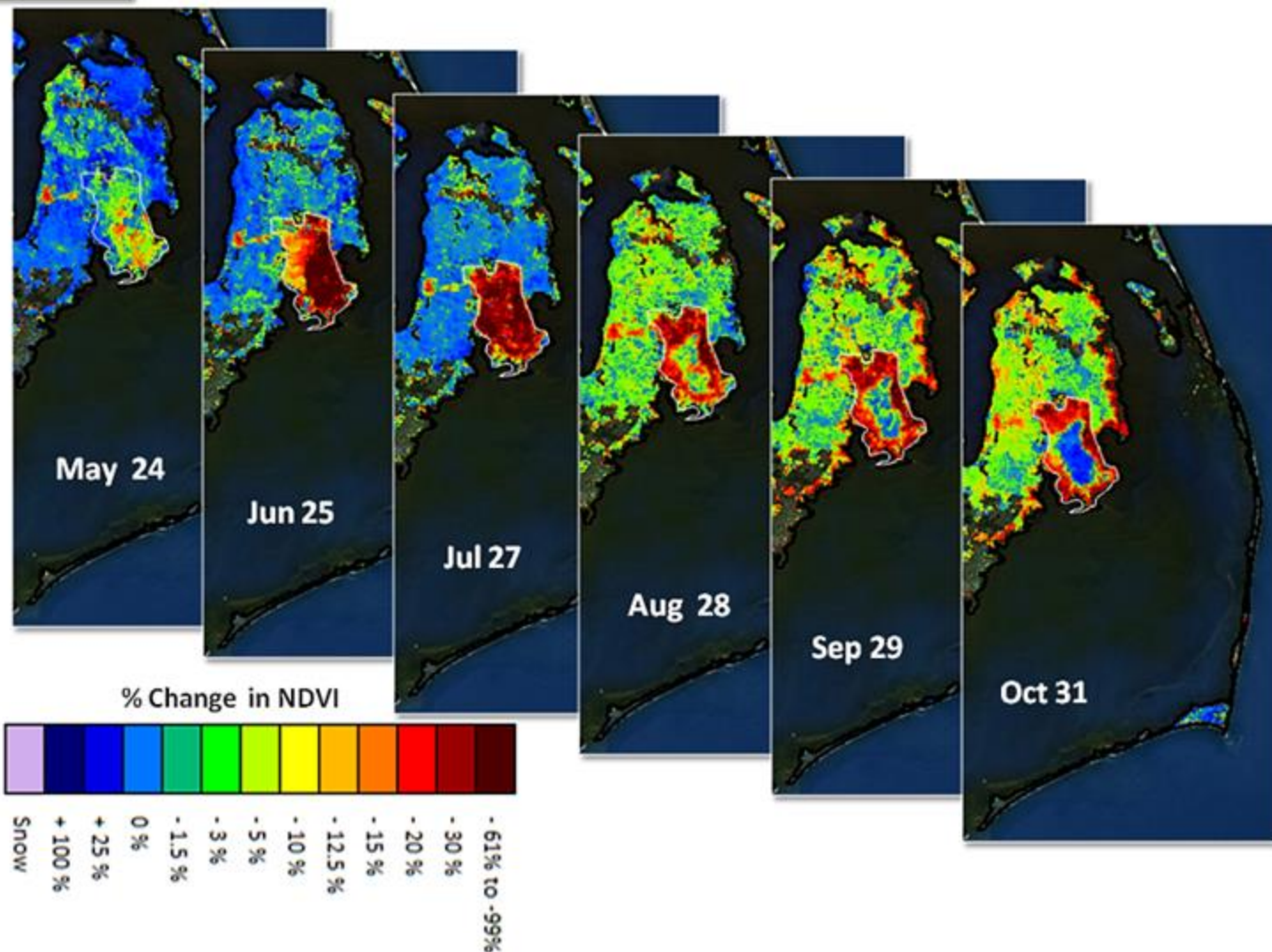
Incident Information

Ignition: **Aug. 18, 2011**
Ignition source: **Lightning**
Extent: **92,700 acres**
Dominant forest: **Jack pine**

Daily progression of an extensive 2011 wildfire in the Boundary Waters, MN

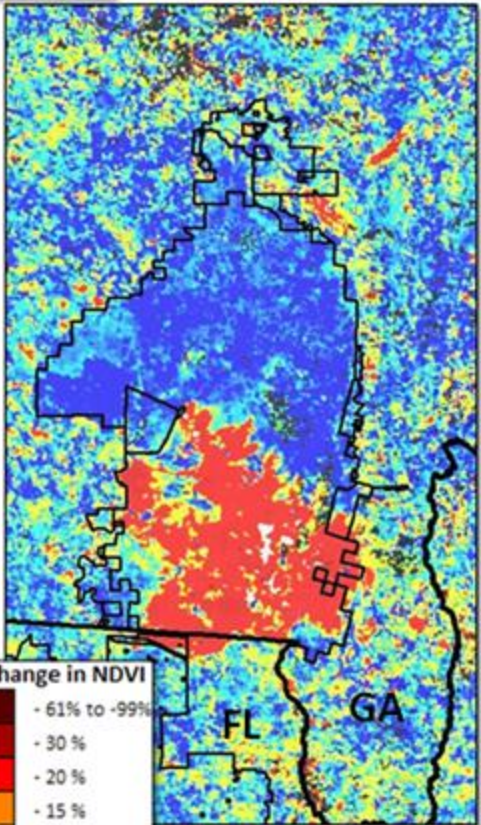


***ForWarn* maps clearly showed development, severity, and final extent of the Boundary Waters wildfire (image is from 10/31/2011)**

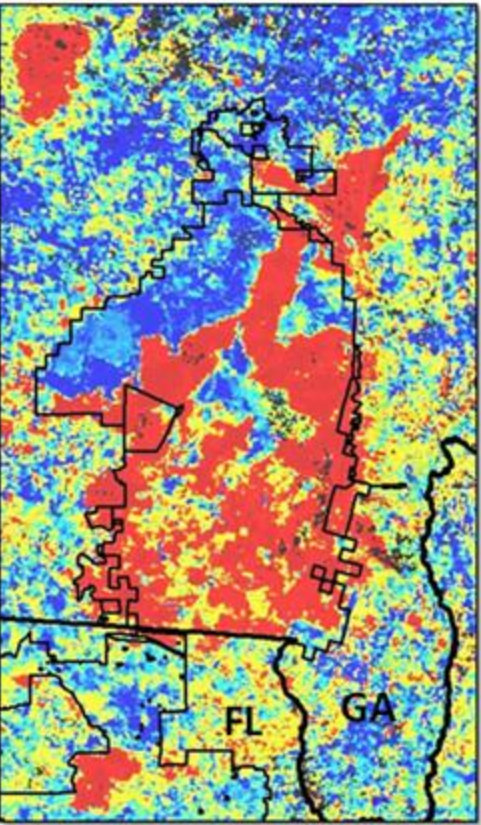


The center of the Pains Bay fire burned lightly, with low severity, allowing amazingly rapid recovery of herbs, ferns, and sprouting woody species by August. But an outer ring of the burn scar shows a longer lasting departure from prior years.

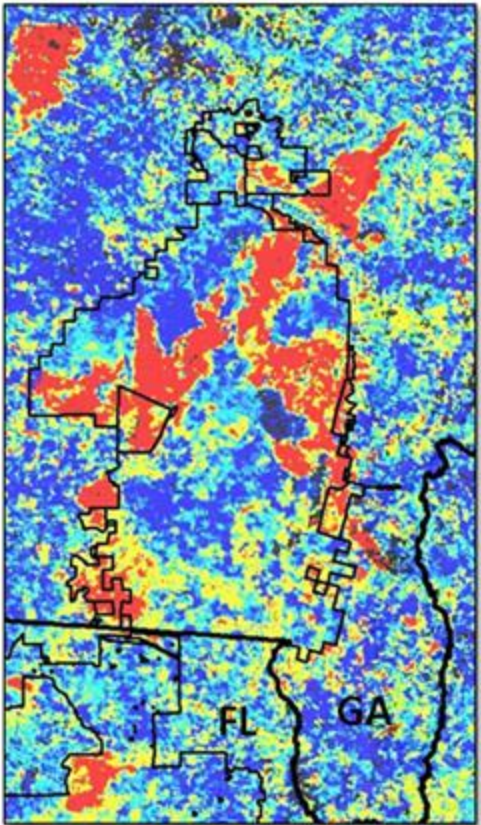
ForWarn



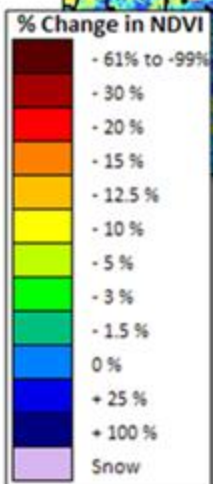
June 17, 2011



July 19, 2011



August 20, 2011



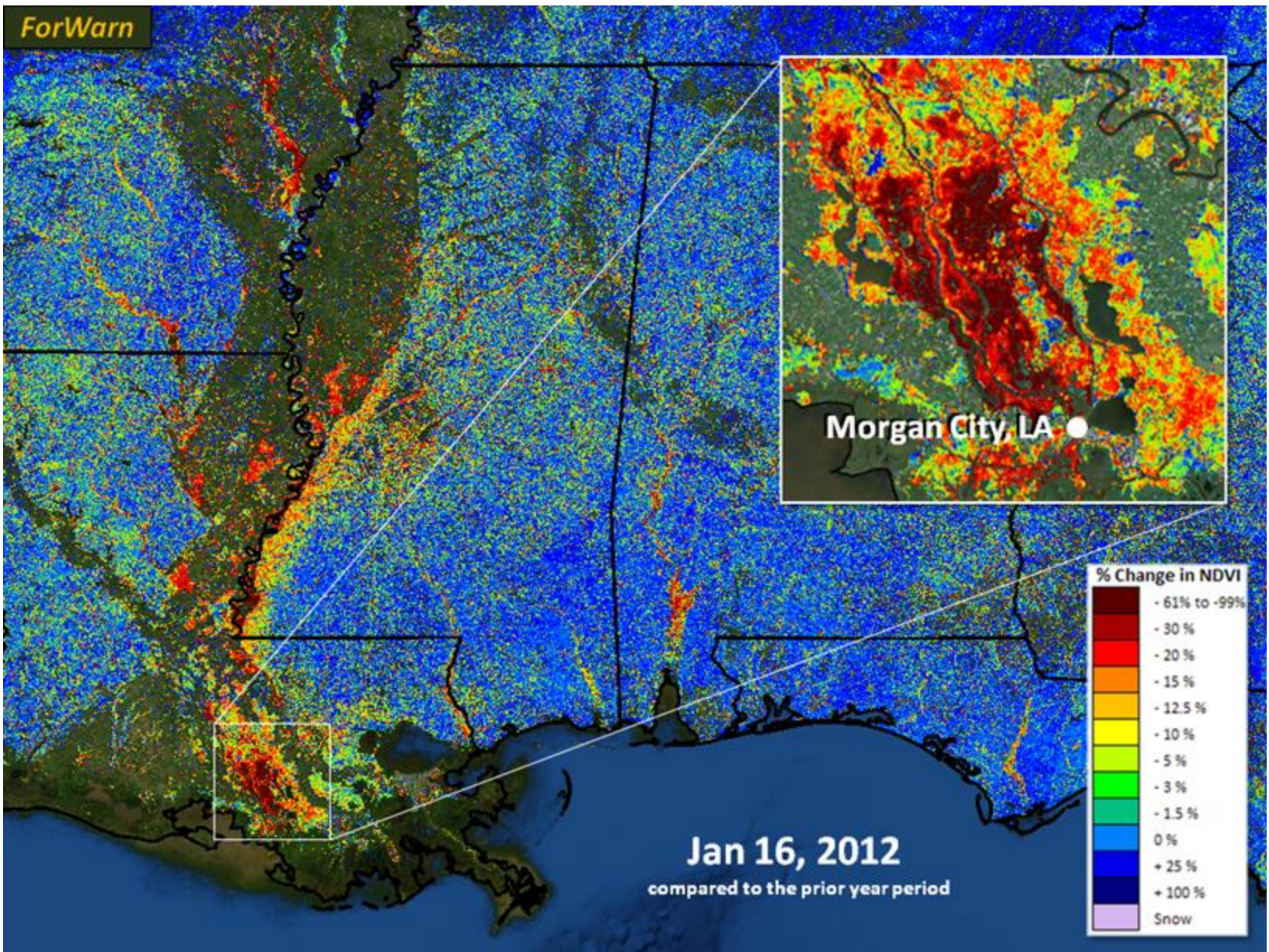
The *ForWarn* System is:

Not Measuring **Disturbance in a Strict Sense,
but instead **Departure from Normal** Phenological Timing**

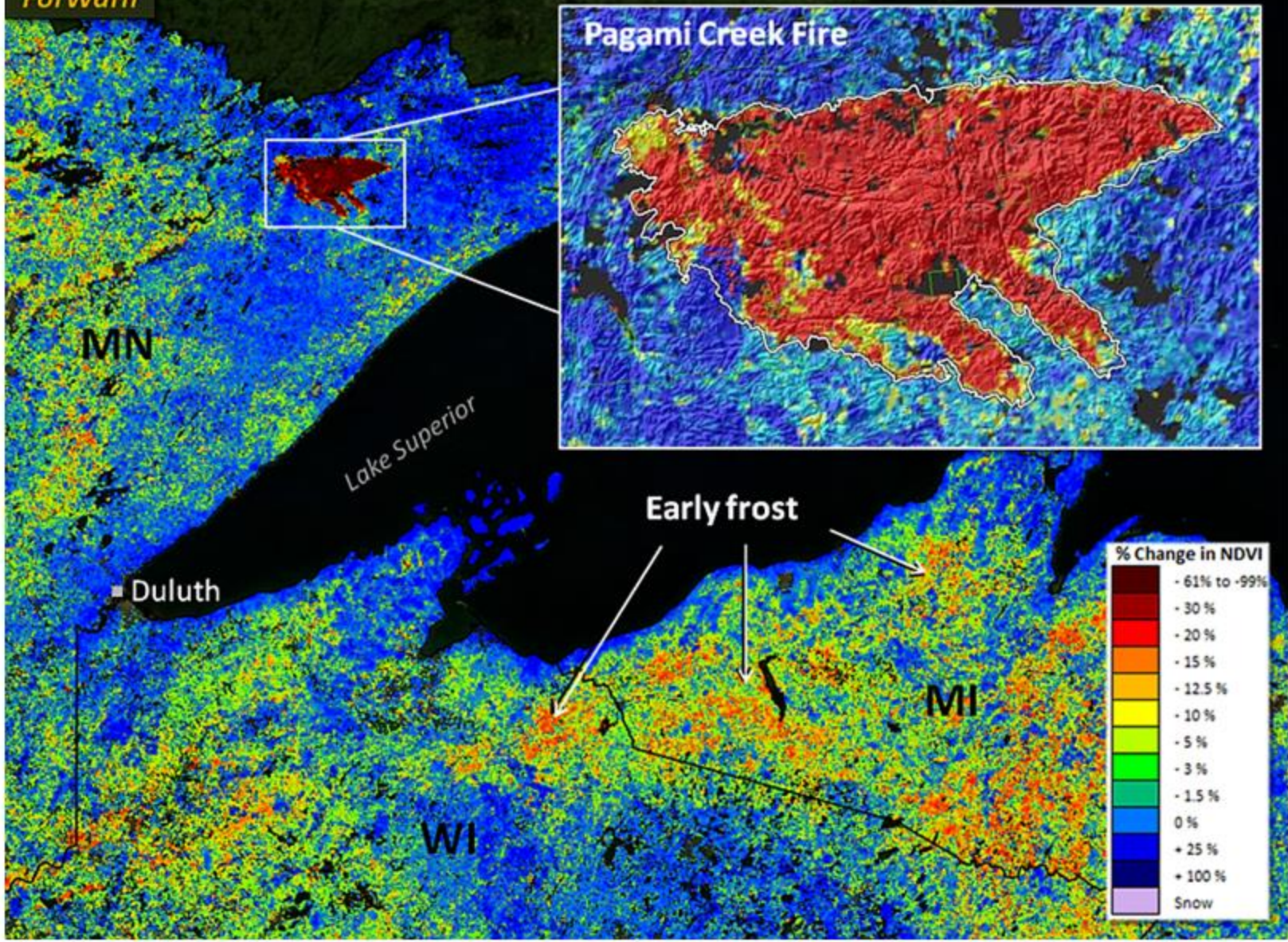
Not just detecting insects, diseases, invasives, storms, wildfire

Also detecting **weather departures caused by precipitation and temperature
deviations: extremes of hot and cold, or wet and dry periods**

***ForWarn* has proven to be sensitive to drought, warm/cold periods, shifts in timing of
leaf greenup and senescence**

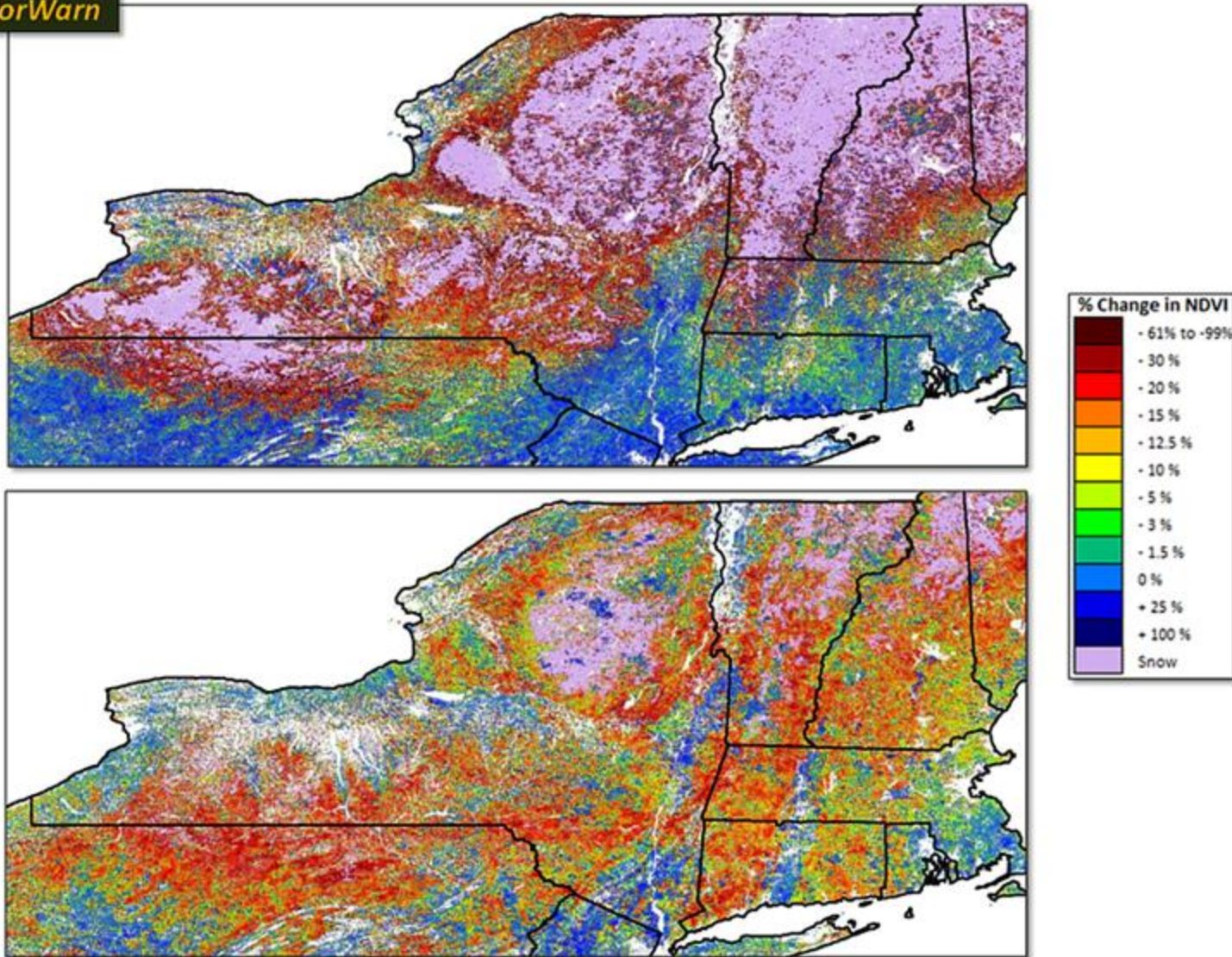


The Atchafalaya basin's forests thrive with seasonal flooding, yet high water is normally a spring phenomenon there. During the past month, unusually high water levels have inundated wetlands and forests along and near the Mississippi River basin. From space, floodwaters appear to decrease existing vegetation, as water masks low lying plant cover. According to the USGS, river discharge at Morgan City, Louisiana was 145,000 ft³/sec on January 16, 2012 compared to 84,000 ft³/sec the prior year. (See <http://waterdata.usgs.gov>.)

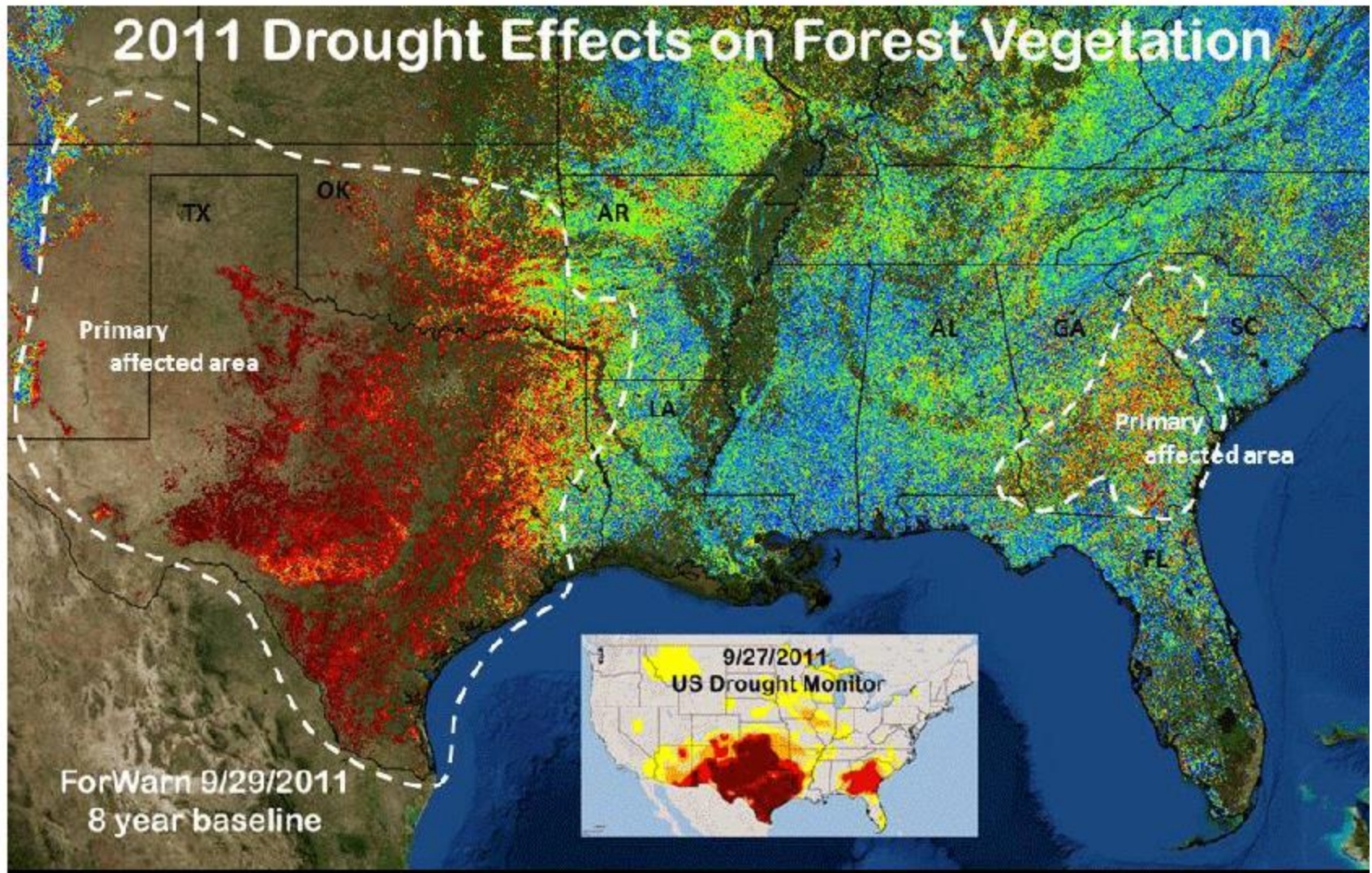


A single October, 2011 *ForWarn* image shows the final high-severity Pagami Creek Fire (92 thousand acres), as well as forest disturbance resulting from an early hard frost that hastened the end of the growing season in northern Wisconsin and Michigan.

ForWarn



Lots of snow in the northeast in March 2011. By early May (bottom), snow still lingered in the Adirondacks and northern New England, and spring greenup was delayed over most of the Northeast relative to the 8-year historical baseline.



The *ForWarn* system is a sensitive indicator of drought, which is a precursor to regional wildfire

ForWarn

Satellite-Based Change Recognition and Tracking



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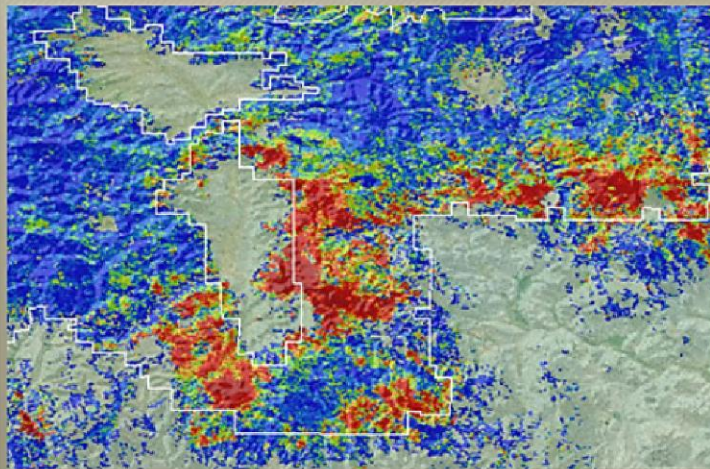
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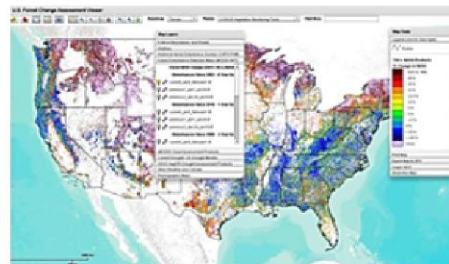
A rare outbreak of pine butterflies

Outbreaks of the defoliating pine white butterfly are rare. In eastern Oregon, outbreaks occurred in 1908-11, 1940-43, 1982 and 2008 to the present. Sometimes defoliations can lead to mass mortality of ponderosa pine—the primary host—but not...

[read more »](#)

What is ForWarn?

ForWarn is a satellite-based forest disturbance monitoring system for the conterminous United States. It delivers new forest change products every eight days and provides tools for attributing abnormalities to insects, disease, wildfire, storms, human development or unusual weather. Archived data provide disturbance tracking across all lands since 2000. Interactive maps are accessible via the [Forest Change Assessment Viewer](#). Read more about ForWarn [here](#).



Recent News

[ForWarn award featured in Compass Magazine](#)

01/10/2013 - 15:25 Click [here](#) to read an article in *Compass Magazine*...

[USDA Forest Service Article in National Woodlands Magazine](#)

01/07/2013 - 15:06 Click below to download an informative article, featuring ForWarn and written by EFETAC's Stephanie Worley Firley for the National Woodlands magazine.

[NATIONALWOODLANDS_FALL2012_EFETAC.PDF](#)

[more news »](#)

ForWarn

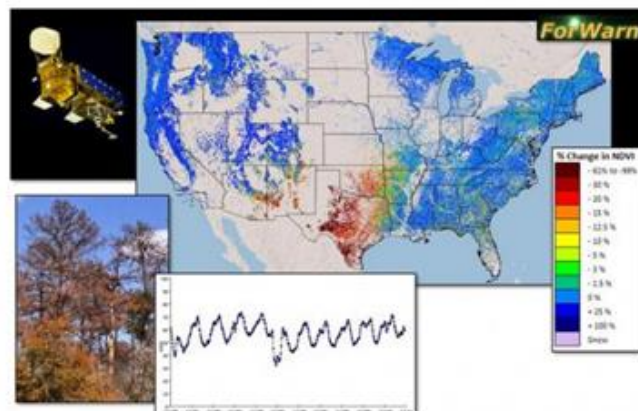
Satellite-Based Change Recognition and Tracking


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Overview

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[The Science of Detection](#)
[The Science of Assessment](#)

Introduction



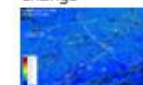
ForWarn is forest change recognition and tracking system that uses high-frequency, moderate resolution satellite data. It provides near real-time forest change maps for the continental United States that are updated every eight days. These maps show the effects of disturbances such as wildfires, wind storms, insects, diseases and human development, in addition to departures from normal seasonal greenness caused by anomalous weather. Using this state of the art tracking system, it is possible to monitor post-disturbance recovery months to years after disturbance occurs.

This technology supports a broader cooperative forest management initiative known as the National Early Warning System (EWS). The EWS network brings together various organizations involved in mapping disturbances, climate stress, aerial and ground monitoring, and predictive efforts to achieve more efficient forest planning and management across jurisdictions.

ForWarn consists of a set of inter-related products including near real time forest change maps, an archive of past change maps, an archive of seasonal vegetation phenology maps, and derived map products from these efforts. For a detailed discussion of these products, or to access these map products in the project's Assessment Viewer or to explore these data using other GIS services, look under the [Data](#) header.

Highlights

Multiple baselines reveal short and long-term change



The browning of the Black Hills



The Exceptional Drought of 2011



Defoliation on the bayou



[more highlights »](#)



Data

[Data Access](#)

Forest Change Products

Basic Phenology Products

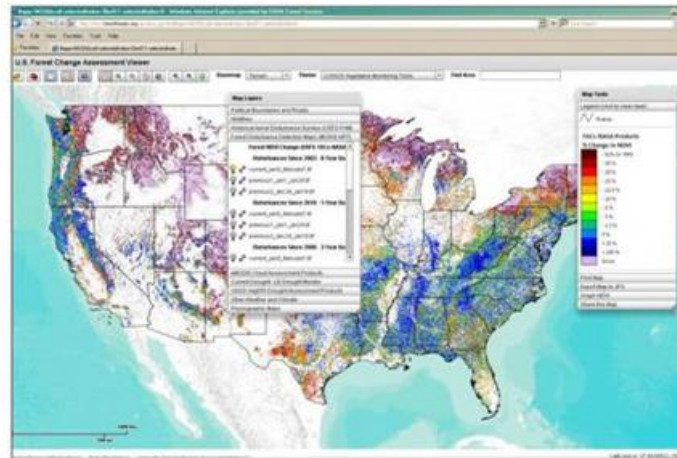
Derivative Phenology Products

Datasets for Assessment Support

Data Access

ForWarn data are readily accessed through the project's [Forest Change Assessment Viewer](#) using a standard internet browser.

To learn more about the functions and features of the Assessment Viewer, please read the [Forest Change Assessment Viewer Users Guide](#)



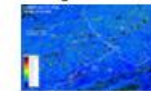
Web Map Service (WMS) Access

WMS allows access to the ForWarn forest change images using your desktop GIS or mobile mapping application software. The advantages of viewing the forest change images locally are: (1) to overlay with your GIS layers, (2) to screen-digitize disturbance extent and severity, (3) the increased use and functionality of a desktop GIS, and (4) to view the forest change images via mobile devices (such as using OruxMaps with Droid-based handhelds). Use the following WMS connection strings to access the ForWarn data products:

WMS Dataset	Contents	Connection URL (ArcGIS users denote version 1.0.0)
All-Year baseline forest change images (Web Mercator)	Begins 01/08/2010 for all-year baseline-only; current, previous 1 and previous 2 available for all baseline periods, disregard 16-day composite products	http://wms.forwarn.forestthreats.org/ews [GetCapabilities]

Highlights

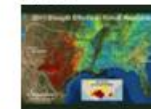
Multiple baselines reveal short and long-term change



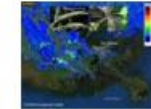
The browning of the Black Hills



The Exceptional Drought of 2011



Defoliation on the bayou



[more highlights »](#)

Support

[Training](#)

[Links](#)

[Partners](#)

[Contact Us](#)

[Branding](#)

Training

- Download the [Forest Change Assessment Viewer Users Guide!](#)
- [ForWarn Presentation Slides](#), March 1, 2012

ForWarn Overview Webinars

Webinar 1, *An Introduction and Overview of the ForWarn System*

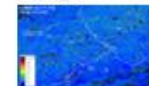
Share More info

% Change in NDVI

Spring greenup was delayed compared to the 8-year normal, and follows elevational gradients, esp. on the Olympic peninsula. Greenup proceeds from south to north from May through July.

Highlights

Multiple baselines reveal short and long-term change



The browning of the Black Hills



The Exceptional Drought of 2011



Defoliation on the bayou



[more highlights >](#)

U.S. Forest Change Assessment Viewer

Basemap Imagery Theme Archived Forest Disturbance Detection Maps Find Area

Map Layers

- Political Boundaries and Roads
- Fires
- Historical Aerial Disturbance Surveys (USFS FHM)
- Forest Disturbance Detection Maps (MODIS NRT)
- Archived Forest Disturbance Detection Maps
 - 20121225
 - 20130108
- Archived MODIS NRT 3-Year Baseline
 - 20100108
 - 20100116
 - 20100116
 - 20100124
 - 20100201
 - 20100209
 - 20100217
 - 20100225
 - 20100305
 - 20100313
 - 20100321
 - 20100329
- eMODIS Cloud Assessment Products
- Archived RSAC-FHTET Forest Change Disturbance
- Drought- US Drought Monitor
- USGS/NDMC VegDRI Drought Assessment Produ
- Other Weather and Climate

Map Tools

Legend (click to clear layer)

TACS-NASA Products

% Change in NDVI

- 61% to -99%
- 30%
- 20%
- 15%
- 12.5%
- 10%
- 5%
- 3%
- 1.5%
- 0%
- +25%
- +100%
- Snow

States

Print Map

Export Map to JPG

Graph NDVI

Share this Map

forwarn.foresthreats.org | Data Disclaimer | **FCAV Users Guide**

Lat/Long is: 39.175080 / -94.129067

Basic Navigation: Moving around the map

Portion of Viewer detailed is shown in red



Type in a U.S. county by name to zoom-to

“Full Extent,” resets the view to the conterminous United States (CONUS)

“Next Extent,” click to jump ahead to a viewing area previously visited

“Previous Extent,” click to jump back you your previous viewing area

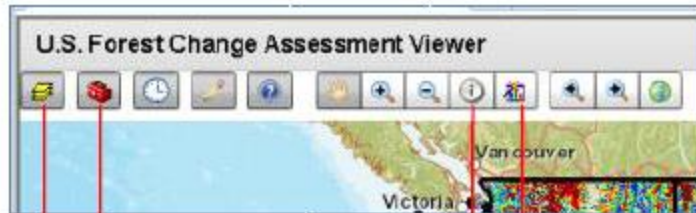
“Zoom-out” control, drag a box over the area of interest to zoom-out

“Zoom-in” control, drag a box over the area of interest to zoom-in

“Pan” around the image by clicking and dragging the image

Basic Navigation: Obtaining Information

Portion of Viewer detailed is shown in red

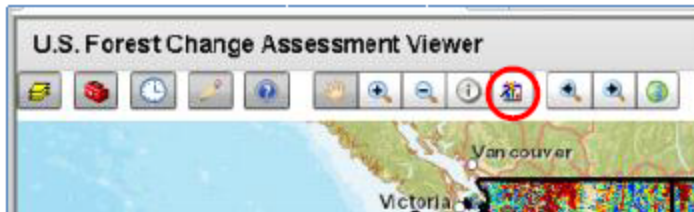


Toggles on and off the 'Map Tools' box
Toggles on and off the 'Table of Contents'

"Graph NDVI" shows a locations' change in NDVI value through time [\(use and interpretation\)](#)
"Identify" control, displays database information for layers that are clicked 'on' [\(to remove highlight\)](#)

Basic Navigation: Obtaining Information

Using the Graph NDVI feature



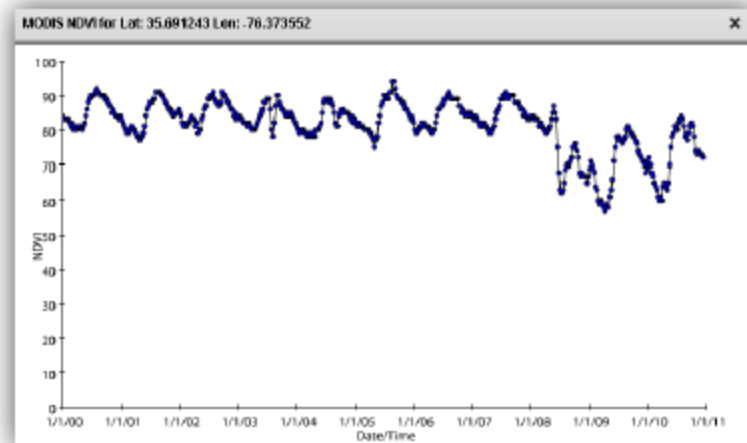
Large scale best use:

- zoom into your area of interest and choose the imagery basemap
- make active one of the forest change images and apply a transparency so you can see through to the aerial photography underneath (use the 'wrench' icon next to the layers 'light bulb')
- use the transparent pixels of the forest change image as a guide to select a specific pixels' land cover composition for which the NDVI history will be returned
- by using the transparent forest change images' pixels as a template, one can photo-interpret a pixels land cover composition before selection to better understand the character of that pixels' NDVI history
- different land covers, land uses and mixed pixel compositions create unique phenological signatures

Portion of Viewer detailed is shown in red



“Graph NDVI” shows a locations' change in NDVI value over an 11-years history, measured every 8-days



The “Graph NDVI” database covers the entire U.S. and is not restricted to the forest mask, as are the forest change images

Data Layers: Choosing a Basemap

Portion of Viewer detailed is shown in red



Click the "Basemap" dropdown to choose among the types below

...this may become more important when viewing forest disturbance image products later, keep the default "Streets" to begin with

Streets



Basic



Relief



Terrain



Imagery



Topo Map



USA Topo*



Notes – all basemap layers exhibit increased detail when zoomed

(*) USGS quads 1:24k, 1:100k and 1:250k

ForWarn Quick Start Guide

1. Open this URL in a web browser
<http://forwarn.forestthreats.org/fcav>
2. In the Table of Contents window, click on the tab heading **“Forest Disturbance Detection Maps”** to expand and view the data layers (NRT – near real time)
3. By default, the most recent forest change image in the **“All-Year”** baseline will be displayed. This image is a result of comparing the most recent MODIS NDVI image to the maximum NDVI value over the entire MODIS NDVI history (12+ years), and shows all forest disturbances over the entire historical period.
4. Turn-off the most recent **“All-Year”** baseline image and turn-on the most recent in the **“1-Year”** baseline group. This allows one to view only forest disturbance, or recovery, that has occurred within just the past one year (for this specific time period).
5. Use the map controls to zoom and pan, or type the name of a county in the **“Find Area”** box in the top-right area of the FCAV viewer window
6. Use the ‘wrench’ icon to adjust the transparency of any layer to better view the basemap, or other layers

Map Layers

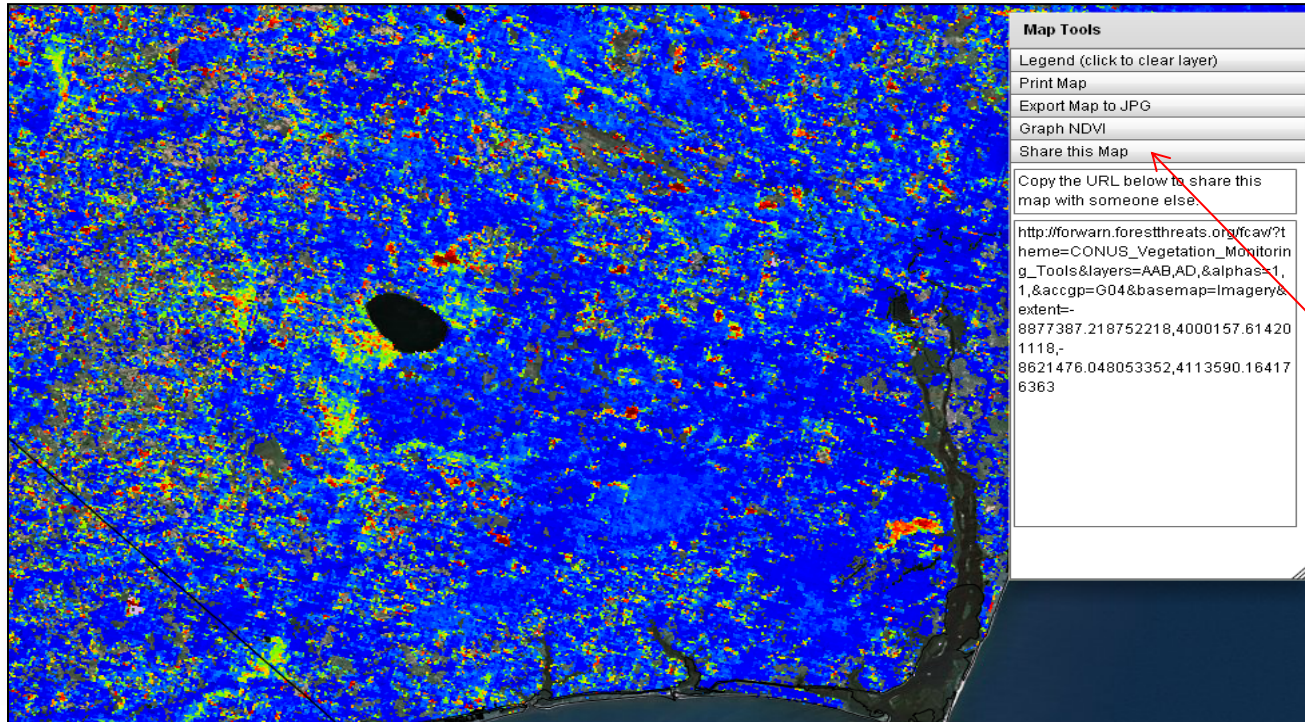
- Political Boundaries and Roads
- Fires
- Historical Aerial Disturbance Surveys (USFS FHM)
- Forest Disturbance Detection Maps (MODIS NRT)
 - Forest NDVI Change (USFS TACs-NASA)**
 - Change from All-Year Baseline**
 - current_jan9_february1.tif
 - previous1_jan1_jan24.tif
 - previous2_dec24_jan16.tif
 - Change from 1-Year Baseline**
 - current_jan9_february1.tif
 - previous1_jan1_jan24.tif
 - previous2_dec24_jan16.tif
 - Change from 3-Year Baseline**
 - current_jan9_february1.tif
 - previous1_jan1_jan24.tif
 - previous2_dec24_jan16.tif
- eMODIS Cloud Assessment Products
- Drought- US Drought Monitor
- USGS/NDMC VegDRI Drought Assessment Products
- Other Weather and Climate
- Physiographic Maps

Table of Contents
window expanded

TACs-NASA Products
% Change in NDVI

- 61% to -99%
- 30 %
- 20 %
- 15 %
- 12.5 %
- 10 %
- 5 %
- 3 %
- 1.5 %
- 0 %
- + 25 %
- + 100 %
- Snow

Share Disturbance Events with Colleagues



- Printing, graphing NDVI history and the ability to save a JPEG of the view is also available from the Map Tools tabs.

Portion of Viewer detailed is shown in red



- The “Map Tools” box in the upper right portion of the Viewer offers the capability to send a URL of a view via your email client to a colleague.
- Click the “Share this Map” tab, then highlight and copy the URL, and paste the link into your email program. Your colleague can open the Viewer to the same extent and data layers you were using to explore a disturbance event.

Application Limitation

- *Detection delay* -

Detection Delays are caused by the fixed-length 24-day Maximum Compositing currently used to get rid of Clouds in the Current View

Unfortunately, clouds act to lower NDVI, just like true forest disturbances -
Can cause false positives - Cloud contamination is continuous, not binary

We currently use the **MAXIMUM NDVI** seen over a 24-day compositing period to generate the Current view as cloud-free as possible

BUT

Taking the maximum NDVI seen over the period guarantees that the newly-lowered NDVI from a new forest disturbance **WILL NOT BE DETECTED** until after the 24-day compositing period has passed

This creates a delay in detection of new disturbances

** to be significantly reduced by the 2013 growing season with the implementation of the new 'adaptive length compositing' method (4th Baseline) developed by the Eastern Threat Center and NASA-Stennis*

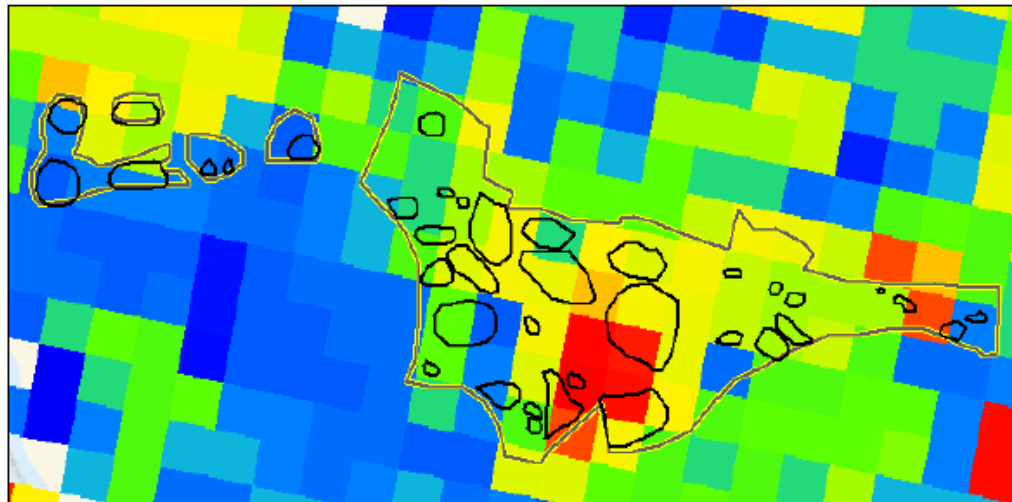
Application Limitation

- *Spatial resolution* -

08/14/2012
Landsat 453

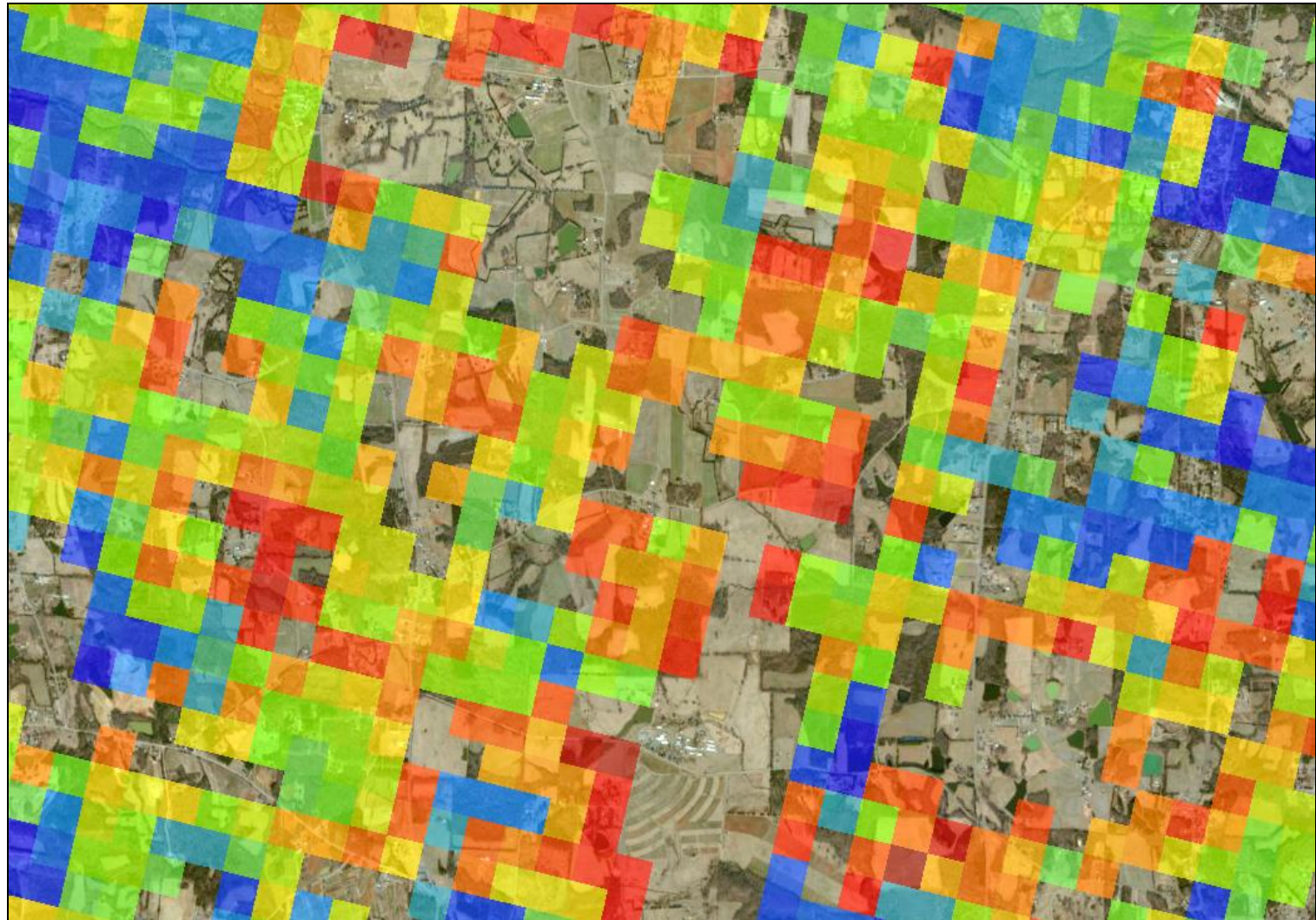


08/19/2012
ForWarn 11yr



Application ~~Limitation~~ Awareness

- "Edge-of-the-mask" mixed pixels -



Drought Sensitivity at the 'edge-of-the-mask'

Forest Disturbance Assessment Layers

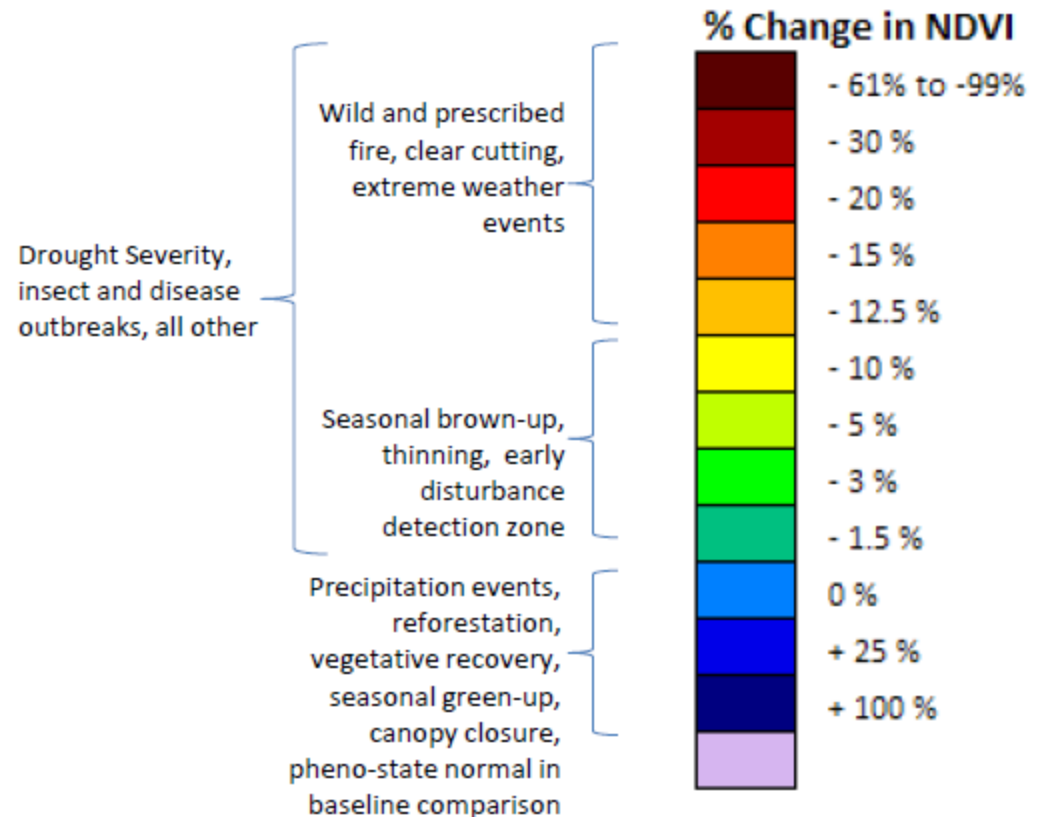
The FCAV contains ancillary data layers that can be used to identify variables that can help explain change in expected NDVI values.

Map Layers	
	Political Boundaries and Roads
Wildfire	Wildfires
Insects “& Dis.	Historical Aerial Disturbance Surveys (USFS FHM)
	Forest Disturbance Detection Maps (MODIS NRT)
Clouds	eMODIS Cloud Assessment Products
Drought/ Flood	Current Drought- US Drought Monitor
	USGS VegDRI Drought Assessment Products
	Other Weather and Climate
	Physiographic Maps

Desktop-based information, such as State specific current NAIP, current Landsat download via GLOVIS, local datasets

Web-based searches and sites, such as use of Google to search the area/county/state for local news and current information, federal wildfire websites

FCAV Multiqraph NDVI, when viewing the 3-year and 8-year baseline forest change products



Forest Disturbance Assessment Process

1. *Locate* (understand geographic site and situation)
 - **Land cover / land use** (recent aerials)
 - **Topographic position** (in mountainous terrain elevation and aspect may be important, use topographic maps, hill shade)
2. *Characterize* (NDVI departure)
 - **Progression speed and duration** (fast vs. slow, obs. successive images)
 - **Severity, or percent NDVI change** (positive or negative, light-to-heavy)
 - **Spatial extent** (large area or localized)
 - **Pattern and shape** (spotty/scattered, bulls-eye, target-like, linearity)
 - **Edges** (hard, well defined or trails-off, feathers out with less departure)
 - **Seasonality** (in spring and fall, the regional variation in annual phenology can cause NDVI departure, positive or negative)
3. *Assess* (using data layers in the Forest Change Assessment Viewer)
 - **Use ancillary data layers in the 'Viewer' to vet disturbance or recovery**
 - **Reference 'Disturbance Protocol' document**



Next Steps to Develop Additional Future *ForWarn* Capacities

- Adaptive Length Compositing
(due out spring-2013)
- NLCD-based “Masks”
- New Open-Source “Viewer”
- Clip, Zip and Ship
- Download data by point/line/polygon
- User-shapefile upload
- Disturbance auto-detect
- Disturbance auto-notify via any
social media format

For More Information...

- *ForWarn Home Page:*
<http://forwarn.forestthreats.org>
- *Forest Change Assessment Viewer
for the ForWarn System:*
<http://forwarn.forestthreats.org/fcav>

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828.257.4370 office

Many persons at many agencies and institutions
have contributed to this work



Thank you for the invitation!