



# Using the Forest Change Assessment Viewer



*from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)*

## A Users Guide for map navigation, data layers and interpretation

*(click heading to jump to section)*

1. [Map Navigation](#)
2. [Obtaining Data Layer Information](#)
3. [Basemap Types](#)
4. [Choosing 'Themes' of Data Layers](#)
5. [Viewing the most recent Forest Change](#)
6. [Sharing views with Colleagues](#)
7. [The "Graph NDVI" Control](#)

[Quick Start Guide](#)

[Data Layers Used to Vet Disturbances](#)

[Investigative Protocol](#)

[Access to Web Map Services](#)

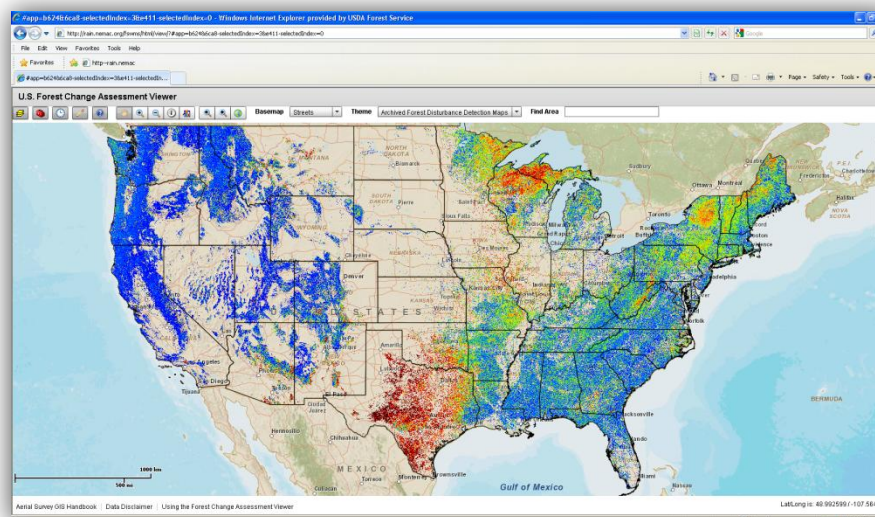
[Tips and Hints](#)

[Frequently Asked Questions](#)

[Points of Contact](#)

[Phenology-related Internet Websites](#)

[Appendices: Other Phenology Data Sets](#)



### ForWarn Quick Links

Website: <http://forwarn.forestthreats.org/>

Viewer: <http://forwarn.forestthreats.org/fcav/>

Help Videos: <http://forwarn.forestthreats.org/support/video-resources>

### Forest Service Threat Assessment Centers

Eastern: <http://forestthreats.org/>

Western: <http://www.fs.fed.us/wwetac/>



National Environmental Modeling and  
Analysis Center (NEMAC)  
University of North Carolina - Asheville



- Partners -



NASA  
Stennis Space  
Center, Mississippi





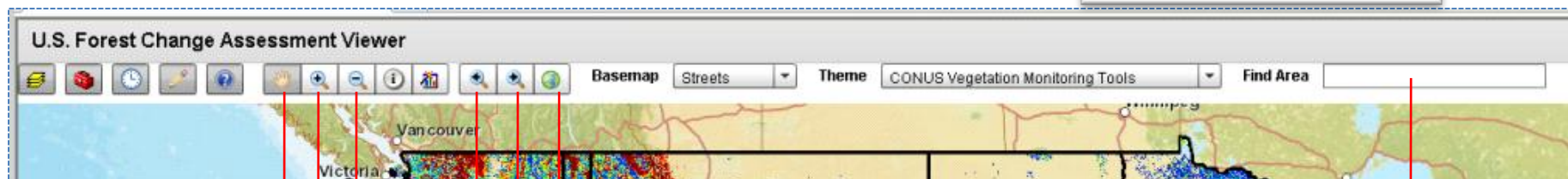
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Portion of Viewer detailed is shown in red

## Basic Navigation: Moving around the map



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

[Back to Contents page](#)



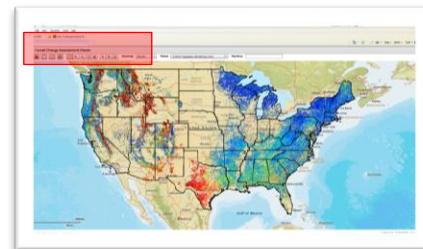
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and the Western Wildland Environmental Threat Assessment Center (WWETAC)



## Basic Navigation: **Obtaining Information**

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"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](#))

Toggles on and off the 'Map Tools' box

Toggles on and off the 'Table of Contents'

[Back to Contents page](#)



# Using the Forest Change Assessment Viewer

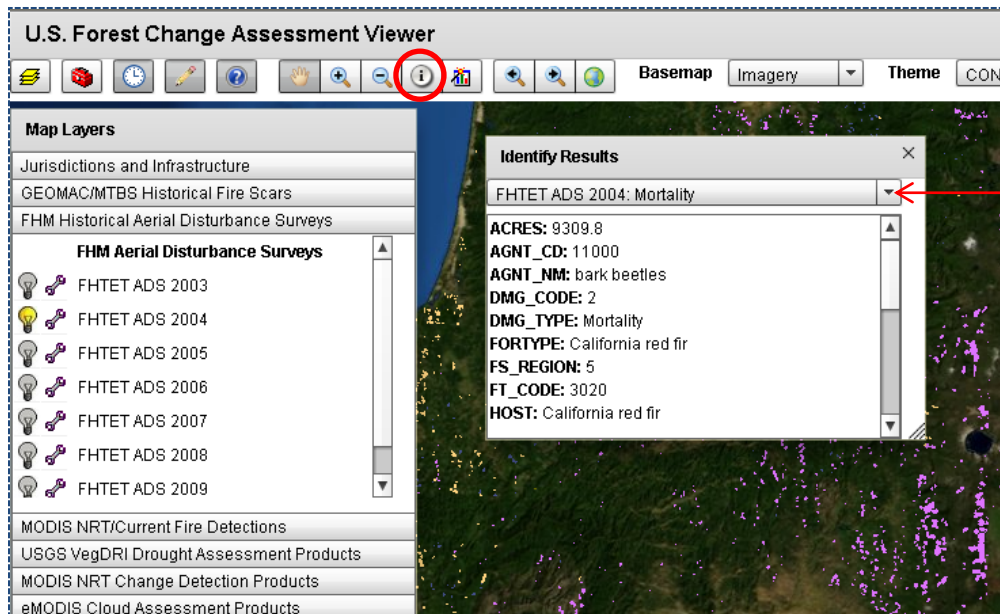
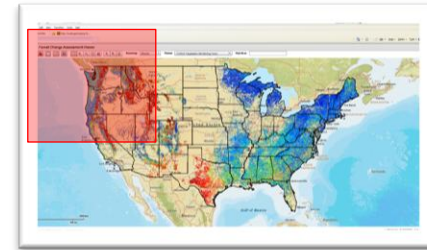
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## Basic Navigation: Obtaining Information

Using the Identify feature

Portion of Viewer detailed is shown in red



Choose the "Identify" icon and click any active data layer feature visible in the viewer.

If more than one data layer is active, use the dropdown in the "Identify Results" window to change which active layer's feature information is displayed

To unselect a highlighted feature, turn off the active data layer in the Table of Contents and click outside any of the features displayed in the viewer. To close the Identify Results window, click the 'x' in the upper right corner of the results window

Note: before performing an Identify operation, turn off the data layer "Political Boundaries and Roads / State Boundaries"

[Back to Contents page](#)





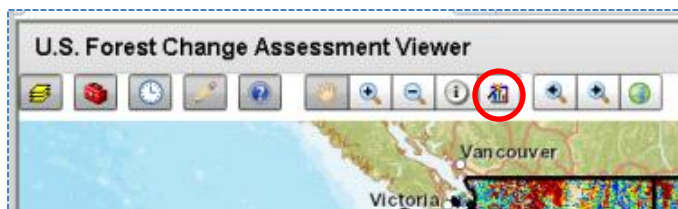
# Using the Forest Change Assessment Viewer

from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)



## Basic Navigation: **Obtaining Information**

Using the Graph NDVI feature



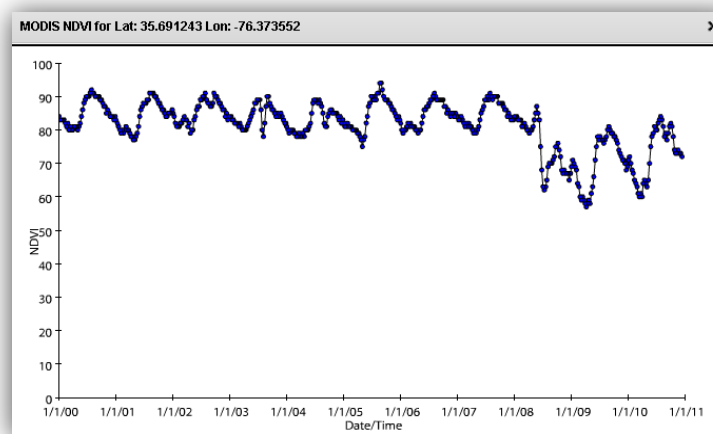
Large scale best use:

- 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

[Back to Contents page](#)



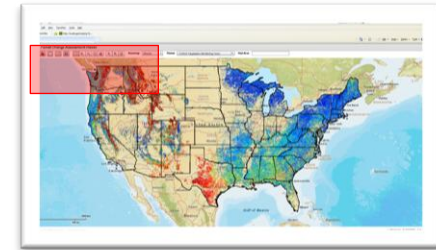
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## Data Layers: Choosing a Basemap



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

[Back to Contents page](#)



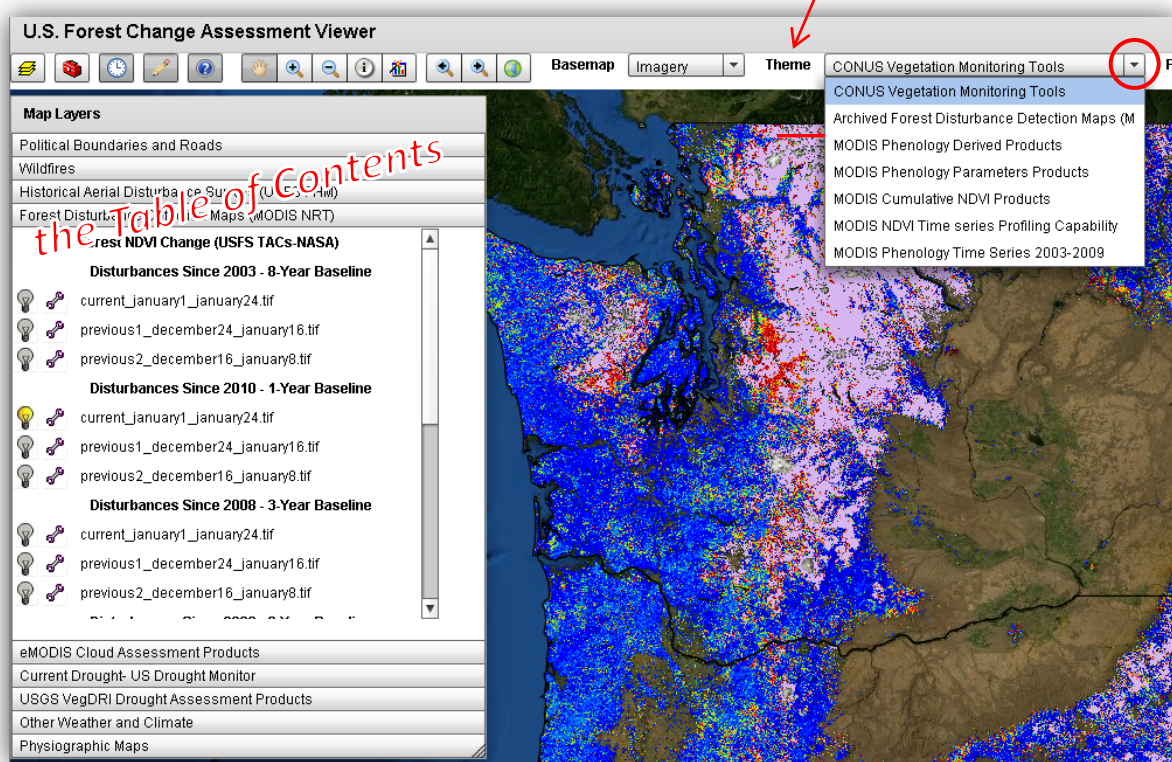
# Using the Forest Change Assessment Viewer



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## Data Layers: Choosing a Data Theme



- The “Theme” dropdown adds specific data layers to the Table of Contents, only one “Theme” can be chosen at a time

- Beginning users should leave the theme choice set to the default “CONUS Vegetation Monitoring Tools”

- More detail will follow regarding the other thematic collections, the specific data layers that are added to the Table of Contents and to which purpose(s) the other themes and data layers are appropriate

[Back to Contents page](#)





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## Data Layers: Viewing the most recent 1-year baseline forest change product

1. 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)
2. Click the 'light bulb' to the left of the top data layer, this turns-on the most recent baseline-specific forest change image
3. Use the 'wrench' icon adjust the transparency of any layer to better view the basemap, or other layers
4. The top three layers are the (3) most current eight-day, percent NDVI forest change products from EFETAC (using the 8-yr baseline)
5. Uses: toggle the three most recent products to view a time-based progression of NDVI decline, or disturbance (shades of yellow to red), or NDVI increase, or "green-up" (shades of green to blue)

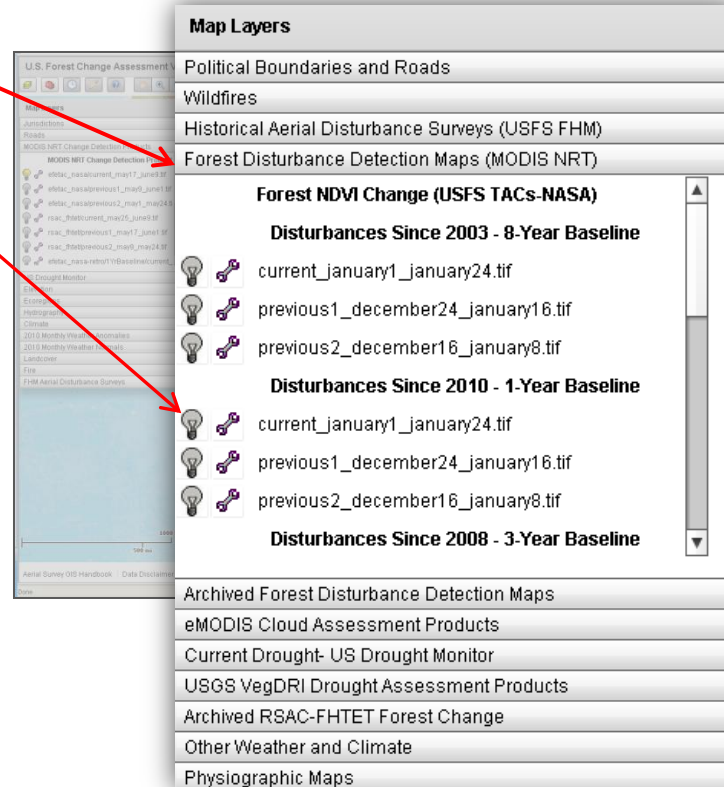
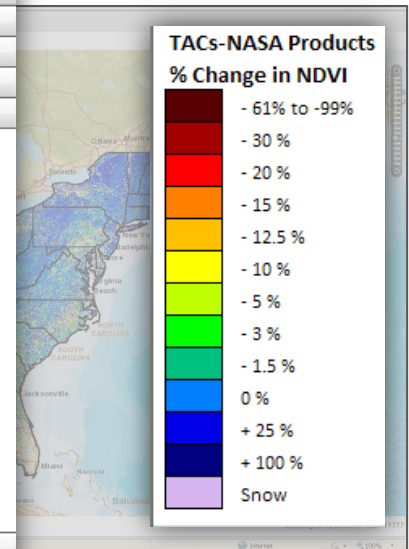


Table of Contents  
window expanded



[What do the colors mean?](#)

[Back to Contents page](#)





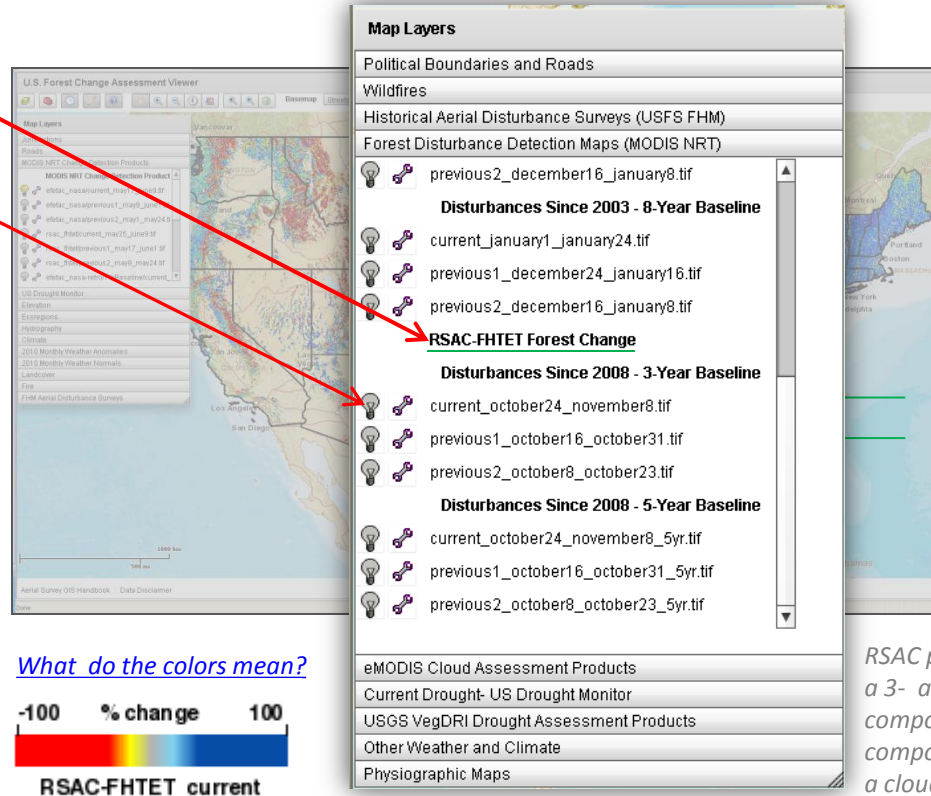
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from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
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## Data Layers: Forest Change image products from the RSAC (Remote Sensing Application Center, USDAFS)\*

1. 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)
2. Scroll down and click the 'light bulb' to the left of the top "RSAC" data layer, this turns-on the most recent forest change detection image from the RSAC Forest Health Technology Enterprise Team of the USDA Forest Service (\*)
3. Uses: toggle the three most recent RSAC image products to view a time-based progression of a percent NDVI change based on average NDVI values



(\*) Different methodologies are employed by EFETAC and RSAC to produce forest change image products: EFETAC uses a 24-day compositing window and maximum NDVI values when computing percent NDVI change; RSAC uses a 16-day compositing window and computes percent NDVI change based on average NDVI values

RSAC products are based on a 3- and 5-year baseline and composed via a 16-day compositing period to obtain a cloud-free CONUS mosaic

[Back to Contents page](#)



# Using the Forest Change Assessment Viewer

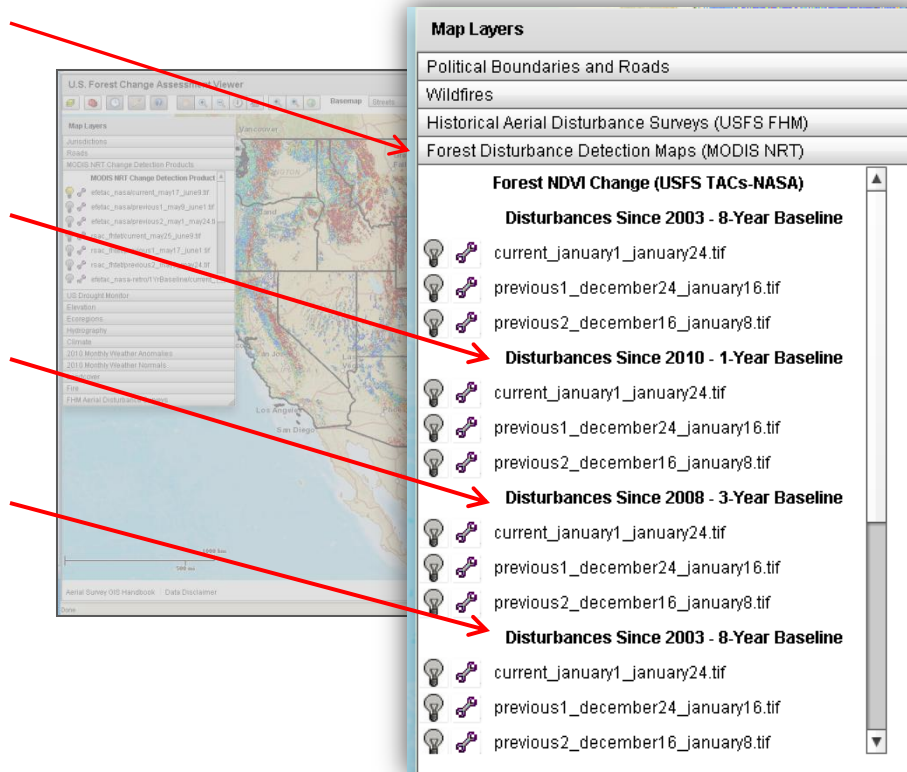


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## Data Layers: The (3) most recent “**BASELINE**” forest change image products

*The different baseline time periods are used to create (3) separate, 'percent NDVI change' products, change compared to the previous 1-, 3- or 8-year time periods*

1. In the Table of Contents window, click on the tab heading “Forest Disturbance Detection Maps,” this expands the tab and presents the data layers (NRT – near real time)
2. The “Baseline” products are identified by three time periods, a 1-year, 3-year and an “All-year,” or 9-year baseline
3. The 1-year baseline image presents the percent of NDVI change for the specific 8-day product compared to the maximum NDVI value of for same date (and 24-day window) for the previous year (2010)
4. The 3-year baseline image presents the percent of NDVI change for the specific 8-day product compared to the maximum NDVI value of for same date (and 24-day window) for the previous 3-years (2007-2010)
5. The 8-year baseline image presents the percent of NDVI change for the specific 8-day product compared to the maximum NDVI value of for same date (and 24-day window) for the previous 8-years (2003-2010) (*duplication in TOC required*)
6. The top three layers are the (3) most recent eight-day forest change products from EFETAC based on the 8-year baseline
7. Uses: toggle three products of the same baseline period to view a time-based progression percent NDVI change (NDVI decline = forest disturbance, shades of yellow to red, or NDVI increase = forest recovery, or “green-up,” shades of blue to green)



*Expect to see greater 'percent NDVI change' in the 3-, and 8-yr baseline products than seen in the 1-yr baseline forest change product.*

[Back to Contents page](#)



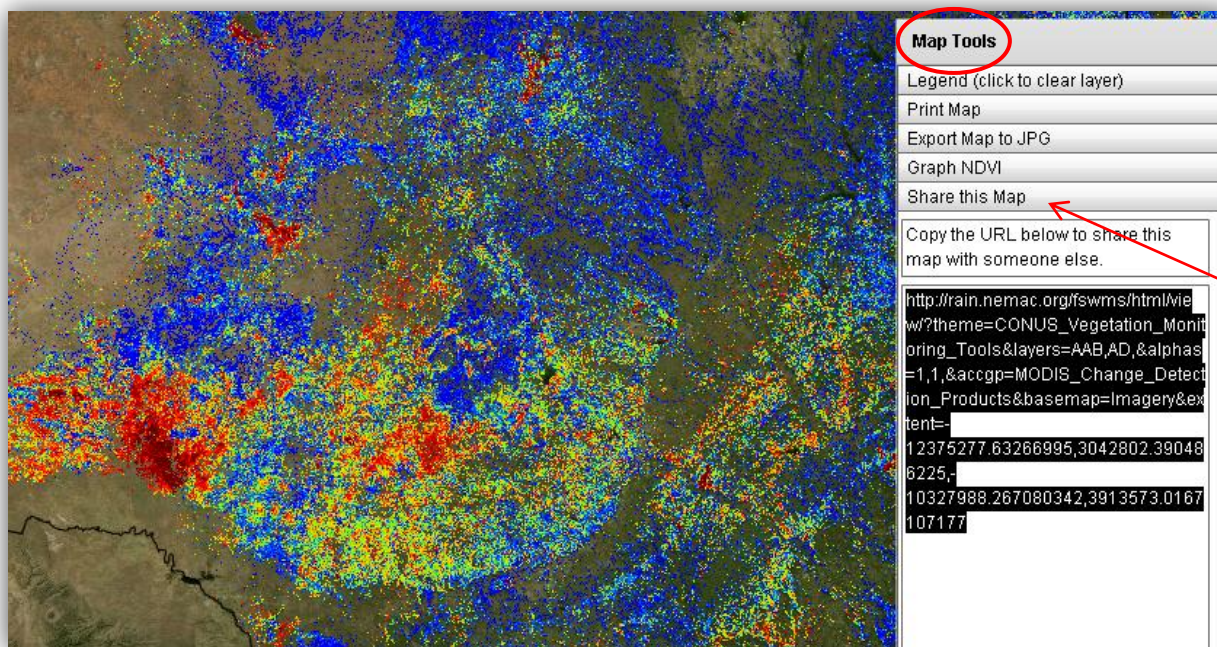
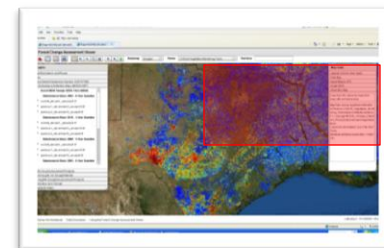
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*Portion of Viewer detailed is shown in red*

## Share Disturbance Events with Colleagues



- 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.

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

[Back to Contents page](#)





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*from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)*

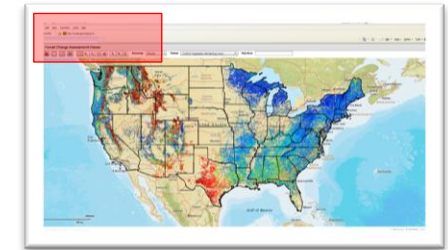


## What is the “Graph NDVI” Tool *(pg 1 of 4)*



The “Graph NDVI” tool presents a graph of NDVI values for a specific location over the period of 11-years, with measurements recorded every 8-days

*Portion of Viewer detailed is shown in red*



Use of this tool allows one to observe an 11-year NDVI history of a single MODIS pixel (231 meter square area), anywhere in the conterminous U.S. (CONUS). NDVI values are presented in x and y graph format. NDVI values are plotted along the y-axis, and the 11-year time scale, with measurements recorded every 8-days, are plotted along the x-axis. Changes in NDVI values fluctuate and relate primarily to changes to vegetative condition and vigor, but also can noticeably change due to natural disturbance events and anthropogenic modifications.

### 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

[Back to Contents page](#)



# Using the Forest Change Assessment Viewer



from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)

## Use of the "Graph NDVI" Tool (pg 2 of 4)

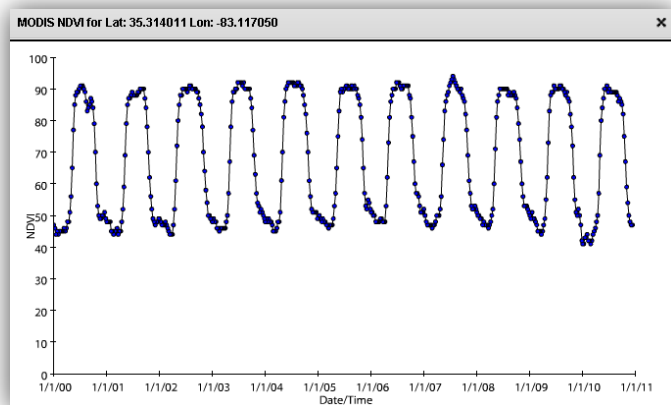


The "Graph NDVI" tool presents a graph of NDVI values for a specific location over the period of 11-years, with measurements recorded every 8-days

Portion of Viewer detailed is shown in red



To operate the "Graph NDVI" tool, first, zoom to your area of interest, then select the icon displayed in the Viewers top left banner. Perform a single click of the mouse on your area of interest and a separate window will open with a graph of the NDVI values for that specific location. Try using the 'imagery' basemap to guide your selection of a point to graph with the Multi-graph tool.



- To CLOSE the multi-graph window, click the 'x' in the upper right corner of the graph window

### Optional

Expanding the axes spreads-out the data measurements and provides more detail:

- to spread-out the Date/Time axis, place the mouse cursor inside graph window and on the x-axis, press and hold SHIFT, and move cursor left and right to expand and contract the timescale axis, release the SHIFT key and 'drag' the Date/Time axis left and right to see more detail
- to spread-out the NDVI axis, place the mouse cursor inside graph window and on the y-axis, press and hold SHIFT, and move cursor up and down to expand and contract the NDVI axis, release the SHIFT key and 'drag' the NDVI axis up and down to see more detail
- whether expanding or contracting an axis, remember to place your cursor on the axis to affect

[Back to Contents page](#)



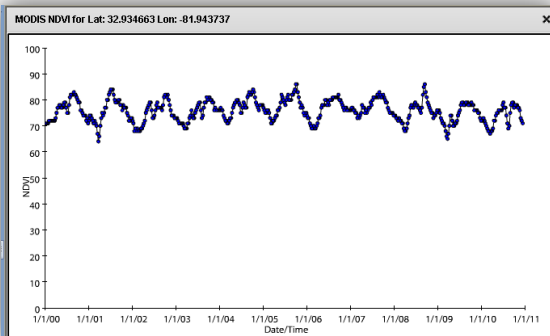
# Using the Forest Change Assessment Viewer



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## Interpreting NDVI Pheno-signatures, *The Basics* (pg 3 of 4)

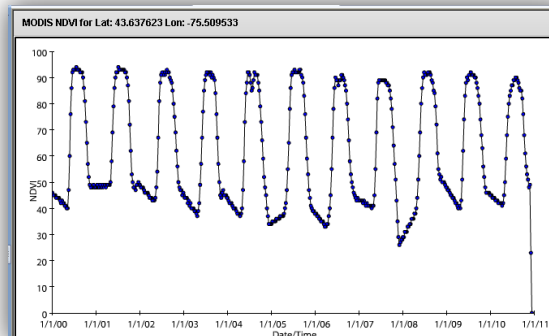
An entire course of study can be devoted this topic alone. Be aware of the following NDVI-curve response characteristics when interpreting the NDVI signature that the multi-graph produces: the data range and amplitude of NDVI values, the duration of change that NDVI values experience across time, the modality, or period, of reoccurring NDVI values of similar character, the type of land cover or land use that was selected, the phenological character of increase and/or decrease in NDVI value over time and denote the date that abrupt changes in NDVI values occur. Here are a few typical NDVI response curves from basic vegetative land covers:



### Pine Plantation

(*Pinus sp.*, GA)

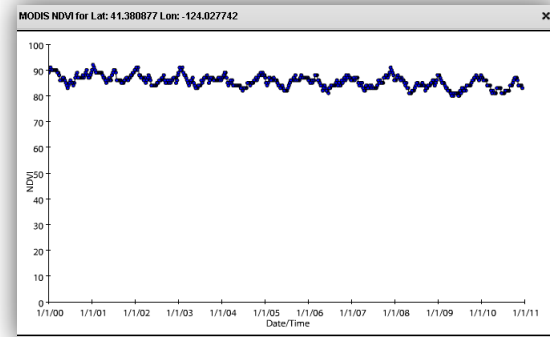
- relatively high average-NDVI values
- amplitude relatively narrow
- annual NDVI value increase and decrease due to photosynthetic response to annual phenology



### Mixed Hardwood Forest

(Adirondack Park, NY)

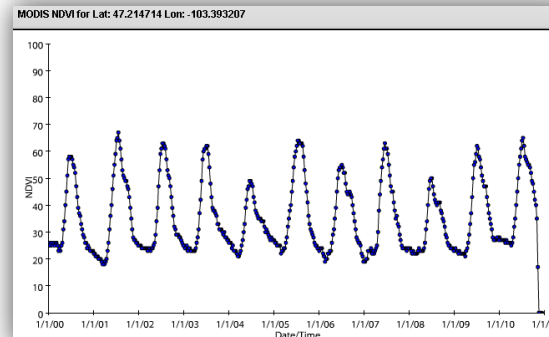
- high maximum-NDVI values
- data range relatively high
- NDVI increase and decrease due to annual phenology
- NDVI-minimum variability may be due to snow events masking the shrub layer



### Coastal Redwoods

(*Sequoia sempervirens*, CA)

- relatively high and constant NDVI values
- amplitude of change very narrow
- slight phenological variation across time



### Prairie Grasslands

(National Grasslands, ND)

- relatively low average-NDVI values and range large
- sharp NDVI increase and decrease due to annual phenology
- variability in yearly maximums due to variations in seasonal precipitation





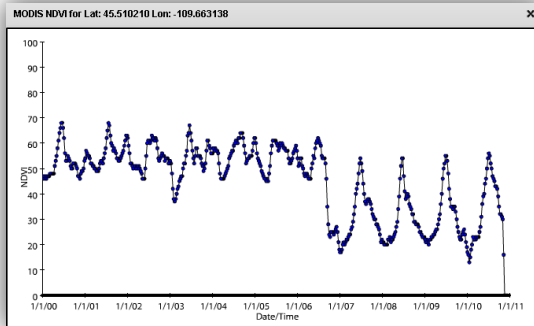
# Using the Forest Change Assessment Viewer

from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)



## Interpreting NDVI Pheno-signatures, *Advanced* (pg 4 of 4)

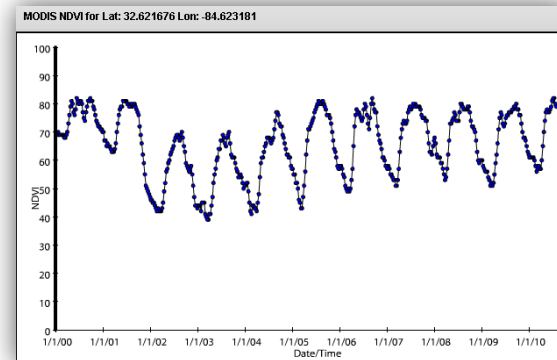
Abnormal, or unexpected changes in NDVI values can be explained. Here are some typical examples of changes in vegetative vigor that is observed in the NDVI curve produced by the Multi-graph tool:



### 2006 Derby Wildfire

(southern Montana)

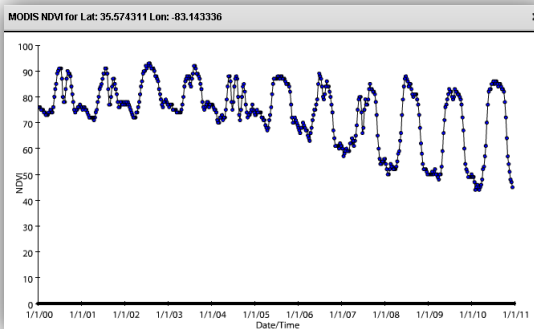
- Pre-fire, dominated by low density Ponderosa Pine
- Post-fire, tree killing event led to grass dominated landscape
- observe greater peakedness and lower winter minimums



### Timber Harvest and Recovery

(central Georgia)

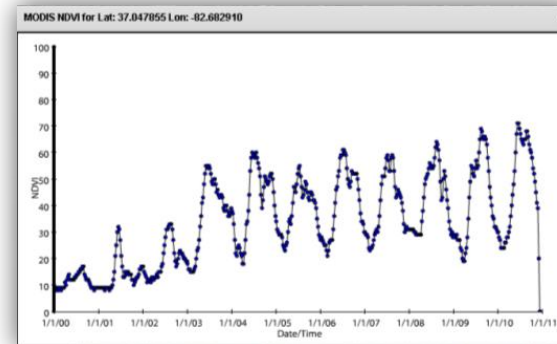
- drop in NDVI due to plantation clear-cut in 2001
- crown closure of the pine plantation reduces the amplitude of the annual phenological signal
- note the trend in increased minimum NDVI values over time



### Non-native Invasive Species

(Hemlock Woolly Adelgid, TN)

- declining Hemlock composition causes a drop in the winter minimum
- defoliation began during the 2005 growing season
- this tool can be used to monitor the rate of decline for this area and for new sites



### Strip-Mining Reclamation

(western Virginia)

- NDVI increase due to the mined area being replanted
- has not achieved maximum greenness of original forest cover
- this tool can provide insights into the ability of reclaimed land to recover its productivity within a specified time frame



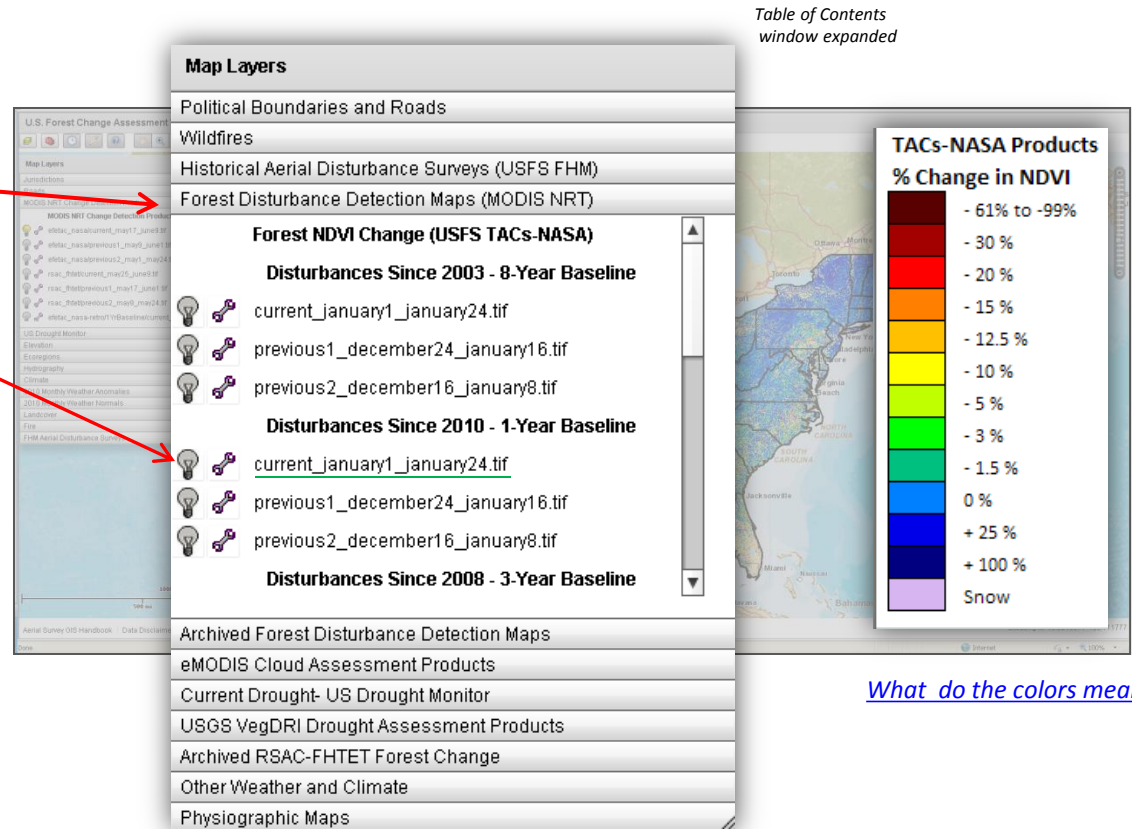
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## Quick Start Guide

1. Open this URL in a web browser  
<http://forwarn.forestthreats.org>
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. Determine which baseline you are interested in, and click the 'light bulb' icon next to an image in either the 1, 3 or 8-year baseline groupings. The first (top) change image listed is the most recent in the group (most recent 1-yr baseline indicated by arrow)
4. 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
5. Use the 'wrench' icon to adjust the transparency of any layer to better view the basemap, or other layers



[What do the colors mean?](#)

[Back to Contents page](#)



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and the Western Wildland Environmental Threat Assessment Center (WWETAC)*

## These data Layers can be used to determine the cause of NDVI change

<u>Platform</u>	<u>Data Item</u>	<u>Primary</u>	<u>Secondary</u>	<u>Location</u>
ForWarn FCAV	1, 3 and/or 8-yr baseline images	x		<a href="http://forwarn.forestthreats.org">http://forwarn.forestthreats.org</a>
	Aerial Disturbance Surveys (ADS)	x		<a href="http://forwarn.forestthreats.org">http://forwarn.forestthreats.org</a>
	ADS Pest Proximity	x		<a href="http://forwarn.forestthreats.org">http://forwarn.forestthreats.org</a>
	Cloud TCC 24-day CONUS	x		<a href="http://forwarn.forestthreats.org">http://forwarn.forestthreats.org</a>
	Drought Monitor (NOAA)	x		<a href="http://forwarn.forestthreats.org">http://forwarn.forestthreats.org</a>
	VegDri Products (USGS)	x		<a href="http://forwarn.forestthreats.org">http://forwarn.forestthreats.org</a>
	ESRI Imagery Basemap		x	<a href="http://forwarn.forestthreats.org">http://forwarn.forestthreats.org</a>
	ESRI Topo (situation)		x	<a href="http://forwarn.forestthreats.org">http://forwarn.forestthreats.org</a>
	Historical Fire Scars		x	<a href="http://forwarn.forestthreats.org">http://forwarn.forestthreats.org</a>
	MODIS Hotspots layer (2)		x	<a href="http://forwarn.forestthreats.org">http://forwarn.forestthreats.org</a>
	"Graph NDVI" Tool		x	<a href="http://forwarn.forestthreats.org">http://forwarn.forestthreats.org</a>
	RSAC Change Products		x	<a href="http://forwarn.forestthreats.org">http://forwarn.forestthreats.org</a>
Desktop GIS	Landsat TM 5/7 (most recent)	x		<a href="http://glovis.usgs.gov/">http://glovis.usgs.gov/</a>
	RSAC Image Server (newer NAIP)	x		<a href="http://fsweb.rsac.fs.fed.us">http://fsweb.rsac.fs.fed.us</a> (FS-only)
	WMS 1, 3 and 8-yr baselines	x		<a href="http://fswms.nemac.org/ewswcs?">fswms.nemac.org/ewswcs?</a> (denote version 1.0.0)
	Protected Areas Database (PADUS)		x	<a href="http://gapanalysis.usgs.gov/data/padus-data/">http://gapanalysis.usgs.gov/data/padus-data/</a>
Web Browser	Active Fire Maps (sat. imagery)		x	<a href="http://activefiremaps.fs.fed.us/imagery.php">http://activefiremaps.fs.fed.us/imagery.php</a>
	Active Fire Maps (occurrence)		x	<a href="http://activefiremaps.fs.fed.us/">http://activefiremaps.fs.fed.us/</a>
	InciWeb (active events and maps)		x	<a href="http://www.inciweb.org/">http://www.inciweb.org/</a>
	RAWS Weather Station Data		x	<a href="http://www.raws.dri.edu/">http://www.raws.dri.edu/</a>
	News Articles (recent via Google)		x	<a href="https://www.google.com/">https://www.google.com/</a>
	National Forest 'Alerts & Notices'		x	go to specific NF home web pages

[Back to Contents page](#)





# Using the Forest Change Assessment Viewer



*from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)*

## Investigative Protocol: Determine the cause of NDVI departure

1. View the 'current' forest change images and zoom into areas of moderate to high NDVI decline, view the imagery basemap to determine land cover and land use in location of departure
2. Use the three most recent change images of one of the baseline groups and toggle through the forest change images, observe disturbance progression, extent, speed, pattern, NDVI change percent and seasonality
3. If appears rapidly in one change image, look for graphic patterns in the percent change NDVI colors to indicate possible sensor, snow or cloud anomalies, if not, go to 4.
  - a. Reference same date MODIS Cloud product and look for cloud contamination in the area of disturbance in the forest change image, if clouds present, stop here
  - b. If necessary, check availability of recent Landsat imagery (GloVis), download and image interpret, if not sensor anomaly, snow or cloud-related effects, go to 4.
4. Progresses 'naturally' and not due to sensor anomalies, snow, snowpack fringe, clouds or cloud-removal image processing:
  - a. Display imagery basemap and see if decline appears spatially related to 'edge-of-forest-mask' or 'edge-of-snowpack' region
    1. Regarding 'edge-of-forest' mask, if yes, check NOAA Drought Monitor and USGS VegDri products "days since precip 7 and 30-day," etc.
    2. Regarding 'edge of snowpack,' if yes, check MODIS Cloud product dated the same as the forest change image used and image interpret condition
    3. If not drought related or snowpack related 'mixed pixel edge' go to 4b or 5
  - b. Desktop GIS display of recent NAIP from your state (if Forest Service personnel, display aeriels from the RSAC Image Server in desktop GIS)
    1. Observe if disturbance visible, if yes interpret cause of percent NDVI change
  - c. If not explained with newer NAIP, go to 5
5. High, moderate and low percent NDVI decline
  - a. Natural disturbances
    1. Insect and/or disease activity, check annual Aerial Disturbance Survey (ADS) polygons and ADS Pest Proximity layer (for a short list of possible disturbance agents)
    2. Fire scar, confirm with MODIS Hotspots and other fire related data layers outside of the FCAV
    3. Extreme weather, use NOAA Drought Monitor and USGS VegDri products (also Google the area for local news stories)
      - a. Possible causes, tornado, hail, wind, hurricane, drought, flood, snow, check via Google news stories and NWS severe weather announcements
    4. Normal or premature fall season brown-down, check RAWS data (freeze/frost), download and enhance Landsat image dated to closely match the date of the forest change image
  - b. Anthropogenic disturbances
    1. Silvicultural Management (clearcut, thinning, salvage logging, etc.), observe "Graph NDVI" for the specific MODIS pixel(s) if in date range of Graph NDVI dataset, and download and image interpret recent Landsat product
    2. Prescribed fire, check with MODIS Hotspot and fire related layers inside, and outside the FCAV
    3. Development related, acquire recent Landsat and image interpret, apply image enhancement techniques and different band combinations
6. If NDVI decline is undetermined or to confirm a suspected cause, obtain newest Landsat image via GLOVIS, create 453 RGB FCC (for seasonality issues a 321 RGB TCC), display on desktop GIS with the latest 1-yr FCAV change image, image interpret and ascribed potential cause, collaborate with colleagues through the FCAV "Share this Map" URL feature
7. Return to the FCAV in a week to view next most recent forest change product and assess the disturbances' condition and progression from previous forest change images
8. If necessary, contact a public land manager in the area to inquire and question (use PADUS on the desktop if necessary, or Google for point of contact information)

[Back to Contents page](#)



# Using the Forest Change Assessment Viewer



from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)

## Determining the cause of NDVI change

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 Multigraph NDVI**, when viewing the 3-year and 8-year baseline forest change products

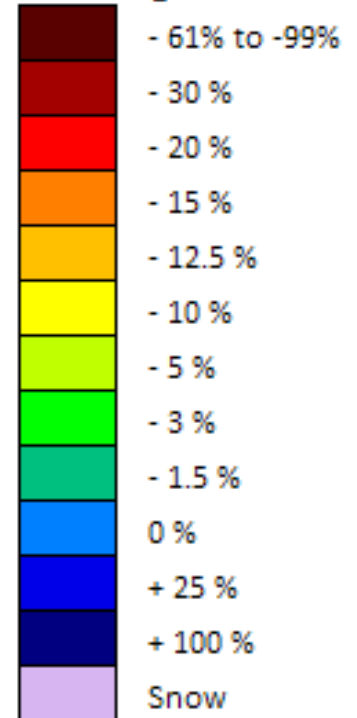
Drought Severity,  
insect and disease  
outbreaks, all other

Wild and prescribed  
fire, clear cutting,  
extreme weather  
events

Seasonal brown-up,  
thinning, early  
disturbance  
detection zone

Precipitation events,  
reforestation,  
vegetative recovery,  
seasonal green-up,  
canopy closure,  
pheno-state normal in  
baseline comparison

### % Change in NDVI



[Back to Contents page](#)



# Using the Forest Change Assessment Viewer



from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)

## Web Map Service (WMS) and Web Coverage Services (WCS)

A **Web Map Service (WMS)** is a standard protocol for serving geo-referenced map images over the internet to a user GIS. With regards to the *ForWarn* products served by the FCAV, the **Web Coverage Service (WCS)** allows users to download the forest change raster files directly to the users local hard drive where additional geospatial processing can be performed.

### WMS

- To view MODIS Forest Change Detection Products on a desktop GIS via a Web Map Service (WMS) connection, use the URL below to view the WMS services available for the *ForWarn* system :

<http://wms.forwarn.forestthreats.org/>\*

**\*you must finish this URL by adding in a collection name from right**

example: <http://wms.forwarn.forestthreats.org/ews1year>

- Using the *ForWarn* WMS connection will allow desktop users to integrate and view their own local data layers for comparison and analysis. The spatial extent and severity of forested areas undergoing change can be viewed and quantified
- Use the *ForWarn* WMS connection to screen digitize polygons of forest disturbance and levels of severity, or vegetative recovery and re-growth

### Individual WMS Collections

/ews	(3) 1, 3 and 8-year baseline products, Web Mercator
/ewswgs84	(3) 1, 3 and 8-year baseline products, native WGS84
/ewswcs	<i>in development</i>
/ews1year	1-year baseline products, 2-years history every 8-days
/ews3year	3-year baseline products, 2-years history every 8-days
/ewstruecolor	MODIS true color composites, Cloud Products
/vlayers	multi-year ADS and MTBS; pest proximity
/derivatives	National Phenology Datasets
/modisndvi	16-day NDVI images (old, once used for Graph NDVI tool)
/parameters	Phenological parameters datasets
/integrals	"area under the curve" datasets
/rlayers	monthly precipitation "percent of normal"; forest types and forest groups
/wlayers	TRMM weather; cumulative fire detections and current large fire incidents

### WCS

- Coming soon, the web coverage service is in development

[Back to Contents page](#)





# Using the Forest Change Assessment Viewer

*from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
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## Tips and Hints

- If a URL hangs up during load, try changing the backdrop
- The "imagery" basemap works very well to locate general disturbances, since it has dark colors
- To see if a potential disturbance is drought related, try turning on the Drought Monitor Data Layer
- To see if a potential disturbance is wildfire related, open the "Wildfires" tab in the table of contents to view current and historical wildfire information
- To see if a potential disturbance is insect or disease related, try turning on the sketchmapper polygons from past years under the table of contents tab labeled "Historical Aerial Disturbance Surveys." If there has been insect or disease activity nearby in the past, it is likely to have happened again
- Use the FCAV to zoom you your specific area of interest and apply your desired data layers and layer transparencies, perform a "share URL" operation and save the link to your desktop or as a favorite in your browser regularly monitor potential disturbances quickly
- The 1-year Baseline product can present less 'noise' when interpreting the severity of a forest disturbance
- Use the MODIS NRT WMS connection to screen digitize polygons of forest disturbance severity or vegetative recovery and re-growth
- To view a past disturbance to a forested area, access the Archived imagery and choose imagery before and after the incident:
  - to view previous 8-day imagery, change the "Theme" to "MODIS Forest Change Products," in the Table of Contents open the tab named "Archived NRT EFETAC-NASA," scroll to dated pre- and post-incident to view the extent of forest change, or disturbance
- The FCAV provides an extraordinary mechanism for mapping fuel-producing events and fuel moisture. Blow-downs, ice storms and beetle kill areas can be targeted for fuels management (Norman, EFETAC)

[Back to Contents page](#)



# Using the Forest Change Assessment Viewer

from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)

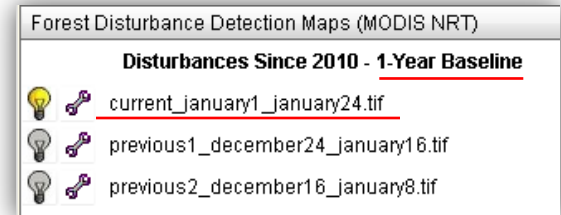


## Frequently Asked Questions (pg 1 of 3)

### What is the best image to display to see if there is any forest disturbance in my area of interest?

The most recent forest disturbance image is located in the Table of Contents, under the tab named "Forest Disturbance Detection Maps." Click this tab and look at the top of the listing in either of the baseline groupings for the most recently-dated forest disturbance image (try using the 1-yr baseline)

For descriptions of the "Baseline" products, [click here](#) (MODIS = Moderate Resolution Imaging Spectrometer, 231 meter spatial resolution; NRT = Near-Real-Time)

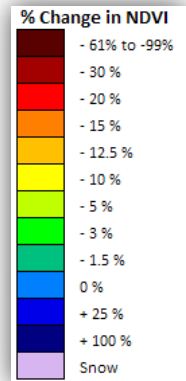


### What do the colors mean?

Generally, the colors relate to forest productivity as compared to a previous baseline (8-year: the default, 3-year or 1-year baseline). Shades of blue-to-green denote a healthy forest condition and similar in development to previous year (s). Shades of red-to-yellow denote a forest condition where the greenness at that time period differs greatly-to-moderately when compared to the forest productivity, or greenness values of the previous year(s).

Specifically, the colors denote the percent change difference when comparing the current images NDVI (Normalized Difference Vegetation Index) value with the maximum NDVI pixel value over the past 8-, 3- or 1-year baseline NDVI image set. NDVI values are calculated via a band ratio of red to infrared (of the electromagnetic spectrum) and range from +1.0 to -1.0 in value.

Baseline products: Located under the same tab named "Forest Disturbance Detection Maps," the first three forest change images (the three most recent) are a result of comparing the observed "greenness" for that date range with the maximum "greenness" observed over the past 8-years (2003-2010). Try looking at the "current" 1-year baseline for the most recent date to display the forest change image for the current period compared to ONLY last year (be sure to unclick the most recent 8-year baseline image to see the 1-year baseline image).



### The forest disturbance image is covering up the basemap and I can't see where I am viewing?

Located in the Table of Contents beside each data layer is a "wrench"-looking icon, clicking this icon will open a control that one can use to apply a transparency for any data layer. Set the slider at a position where you can see both the basemap and the colors of the forest disturbance image.



The transparency tool  
is located in the Table of Contents

[Back to Contents page](#)



# Using the Forest Change Assessment Viewer



from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)

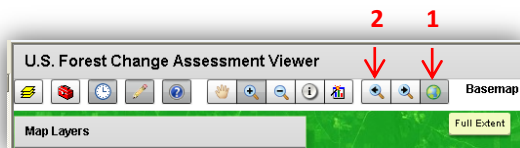
## Frequently Asked Questions (pg 2 of 3)

### What are the "Baseline" products?

The (3) forest change image products are based on the difference between the current NDVI value compared to three separate historical periods of time, specifically a 1-, 3- and 8-year timeframes. Located under the tab named "Forest Disturbance Detection Maps," the three forest change images in each baseline group are the three most recent, and depict the percent change by comparing the observed "greenness" for that date range with the maximum "greenness" observed over the 1-, 3-, or 8-years baseline time periods. Try looking at the "current" 1-year baseline to display a forest change image for the current period compared to ONLY last year (be sure to turn off the most recent 8-year baseline image to see the 1-year baseline image).

### How do I remove the highlight color after an "Identify" operation is performed ?

- Turn off any active layer and click anywhere on the screen with the identify tool.
- Turn off the "States" layer under the "Jurisdictions" tab in the table of contents.
- As a last resort, click "1", the Full Extent icon, click an area outside of CONUS, then click "2", the Previous Extent button to zoom back to the area that you were viewing:



### What is the quickest way to see if a forest disturbance is taking place in my area?

Reference the "Quick Start Guide" of this help document ([click here](#)).

**What if the Table of Contents is empty?** Clear your computers internet cache by pressing F5.

[Back to Contents page](#)



# Using the Forest Change Assessment Viewer



*from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)*

## Frequently Asked Questions (pg 3 of 3)

**How do I find older Products?** - choose second thematic collection, "Archived Forest Disturbance Maps," and select Map Layers tab of same name

**How do I look at a time series?** - choose second thematic collection, "Archived Forest Disturbance Maps," and select Map Layers tab of same name

**If I see a disturbance, how do I determine the cause?** - view these sections in the Users Guide "[Data Layers Used to Vet Disturbances](#)," and "[Investigative Protocol](#)"

**How do I share maps?** - see Users Guide [Section 6](#)

**What should I do if I find a forest disturbance in my area?** – first determine if the cause of NDVI decline is due to cloud contamination or a sensor or image processing anomaly by using the MODIS Cloud Products located in either the default thematic data collection or the second collection, the "Archived Forest Disturbance Maps." If not, then check to see if the changed areas are primarily located on the margin of the forest mask, or snow pack margin. Does the forest change image pixels contain a high grass component (use the imagery basemap in the Viewer, or load into your desktop GIS and use your states' recent NAIP imagery to view the most up to date aerial photography, or download a recent Landsat image via GloVis). If still undetermined, use the Viewers weather and climate layers to see if possibly related to drought. Perform a Google search for any recent news items. Call a land manager in the areas to inquire of any forest disturbances. Use the "Share URL" feature of the FCAV and collaborate with other resource professionals, or contact the Eastern, or Western Threat Centers to assist with the analysis.

**Why can't I find my area using the Find Area search feature?** – this feature operates only on county names, try typing in an established U.S. county name?

### List of Acronyms:

ADS – Aerial Detection Survey (USDAFS)

FHM – Forest Health Monitoring (USDAFS)

FHTET – Forest Health Technology Enterprise Team (USDAFS)

FWS LCC – US Fish and Wildlife Landscape Conservation Cooperative

MODIS – Moderate-Resolution Imaging Spectroradiometer (USGS)

NEON – National Ecological Observatory Network

NRT – Near-Real-Time

RSAC – Remote Sensing Application Center (USDAFS)

TRMM – Tropical Rainfall Measuring Mission (NASA)

eMODIS – expedited Moderate-Resolution Imaging Spectroradiometer (USGS)

FHP – Forest Health Protection (USDAFS)

FIA – Forest Inventory and Analysis (USDAFS)

GEOMAC – Geospatial Multi-Agency Coordination Group

MTBS – Monitoring Trends in Burn Severity

NOAA – National Oceanic and Atmospheric Administration

NWS – National Weather Service (NOAA)

SRTM – Shuttle Radar Topography Mission (NASA)

[Back to Contents page](#)



National Environmental Modeling and  
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University of North Carolina - Asheville



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Center, Mississippi

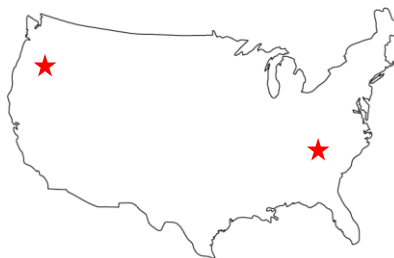






Western Wildland  
Environmental Threat  
Assessment Center

<http://www.fs.fed.us/wwetac>



Eastern Forest  
Environmental Threat  
Assessment Center

<http://forestthreats.org/>



## Points of Contact

### Eastern US

#### **Team Leads:**

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#### **Assistance:**

#### **Mailing**

#### **Address:**

Eastern Forest Environmental Threat Assessment Center  
USDA Forest Service, Southern Research Station  
200 W.T. Weaver Blvd., Asheville, NC 28804

#### **Outreach:**

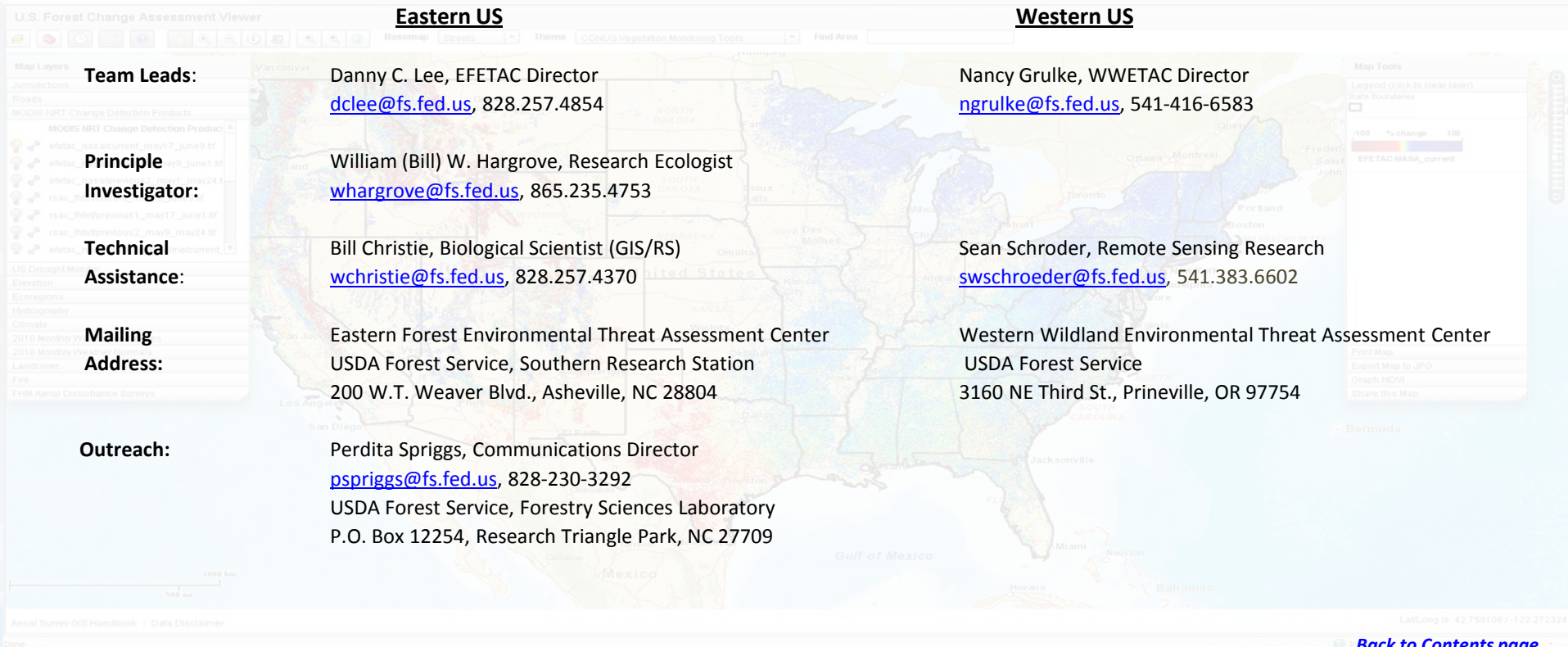
Perdita Spriggs, Communications Director  
[pspriggs@fs.fed.us](mailto:pspriggs@fs.fed.us), 828-230-3292  
USDA Forest Service, Forestry Sciences Laboratory  
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Western Wildland Environmental Threat Assessment Center  
USDA Forest Service  
3160 NE Third St., Prineville, OR 97754

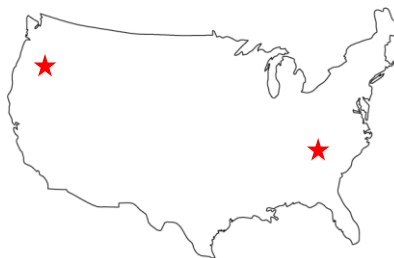


[Back to Contents page](#)



Western Wildland  
Environmental Threat  
Assessment Center

<http://www.fs.fed.us/wwetac>



Eastern Forest  
Environmental Threat  
Assessment Center

<http://forestthreats.org/>



## Phenology-related Websites

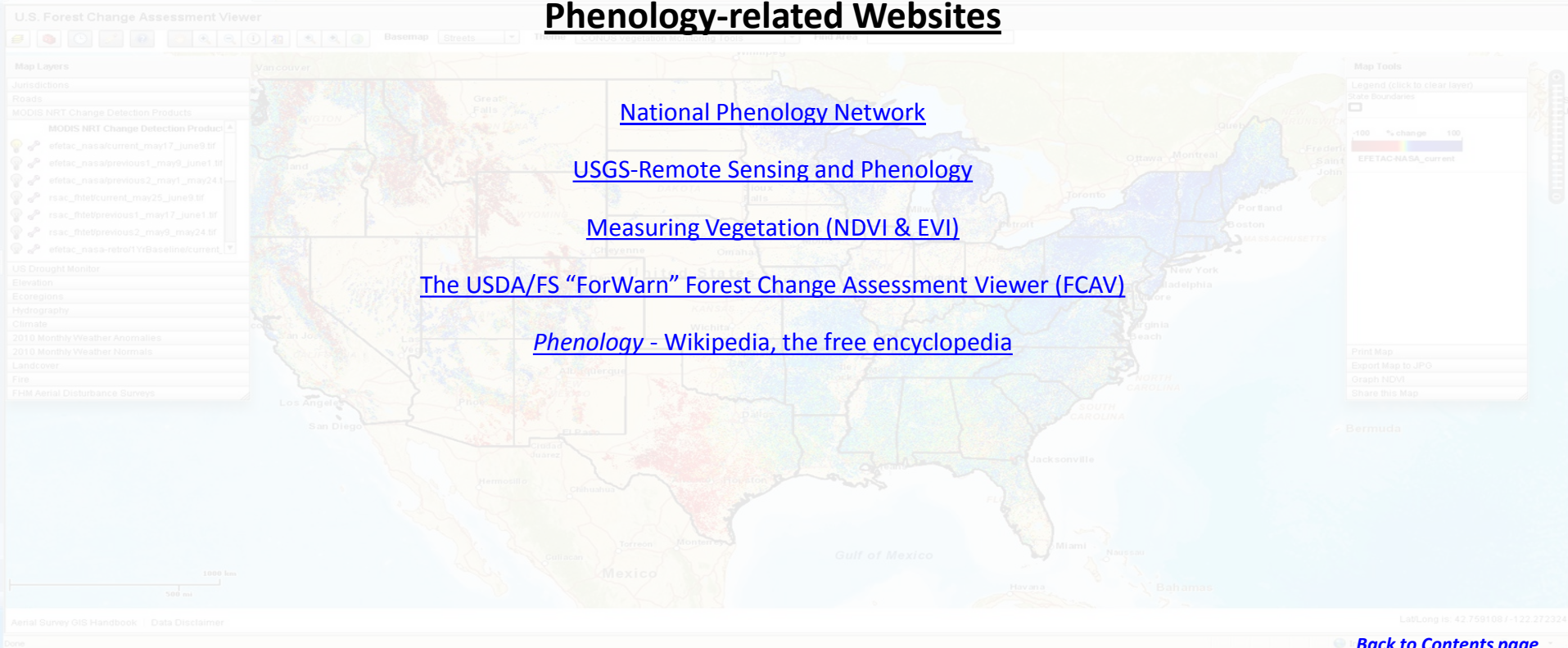
[National Phenology Network](#)

[USGS-Remote Sensing and Phenology](#)

[Measuring Vegetation \(NDVI & EVI\)](#)

[The USDA/FS "ForWarn" Forest Change Assessment Viewer \(FCAV\)](#)

[Phenology - Wikipedia, the free encyclopedia](#)



[Back to Contents page](#)



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Center, Mississippi





# Using the Forest Change Assessment Viewer

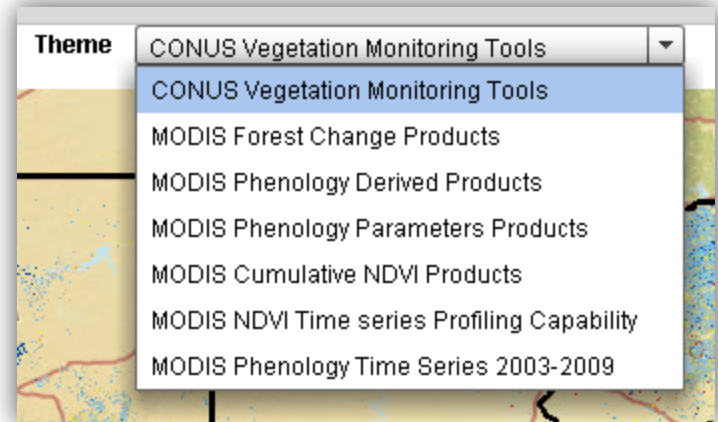
*from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)*



## Appendices: Theme-based Data Layers

*(click heading to jump to section)*

1. [CONUS Vegetation Monitoring Tools](#) (default, %NDVI change)
2. [MODIS Forest Change Products](#) (archived time series)
3. [MODIS Phenology Derived Products](#) (ecologically higher order)
4. [MODIS Phenology Parameters Products](#) (threshold timing)
5. [MODIS Cumulative NDVI Products](#) (accumulating total NDVI)
6. [MODIS NDVI Time Series Profiling Capability](#) (8-day NDVI maps)
7. [MODIS Phenology Time Series 2003 – 2009](#) (multiple)



**For a description of these products, go to:**

<http://forwarn.forestthreats.org/advanced/national-phenology-data-set>

[Back to Contents page](#)



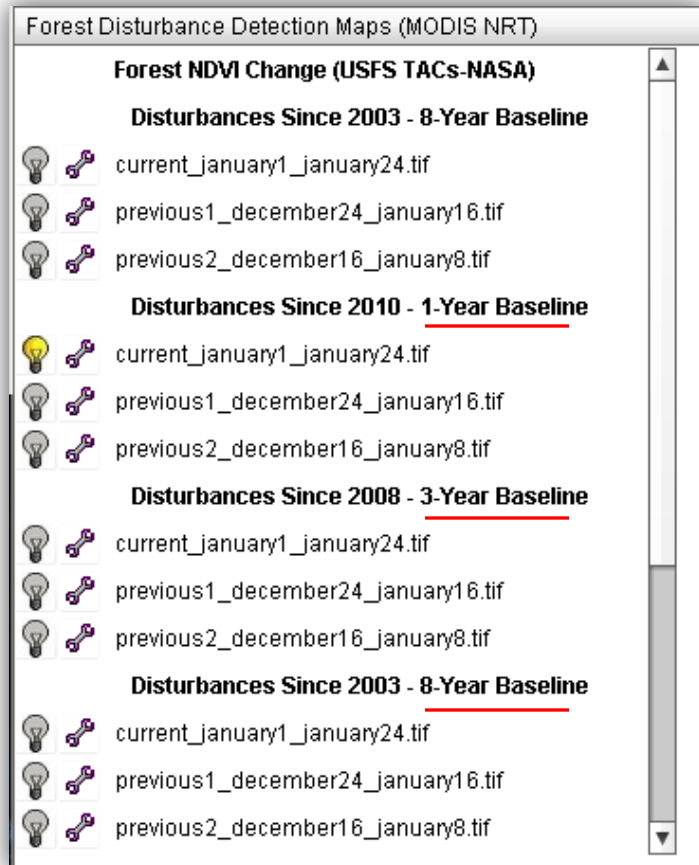


# Using the Forest Change Assessment Viewer

from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)



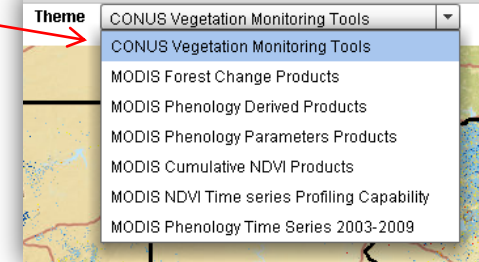
## Appendix 1: CONUS Vegetation Monitoring Tools (Thematic Group Data Layers)



*The (3) most recent forest change image products for each of the three separate baselines are available, look for a new forest change image for each of the baselines every 8-days from the FCAV.*

*The 8-year baseline group is repeated at the top of the listing and near the bottom of the listing is required by the application*

*In preparing the current MODIS forest change images, a new NDVI image is compared to one of three baselines to establish percent change. As of 06/2011, change products are created via looking at the maximum NDVI value for a pixel against the longest baseline, specifically, the 2003 – 2008 baseline. Future plans are to create the (3) most recent forest change products based on each baseline length, namely, the current NDVI value compared to the maximum NDVI value during baseline 2001 – 2010, during baseline 2005-2010, and during baseline 2010.*



[Back to Contents page](#)



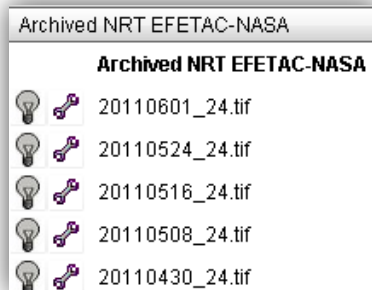


# Using the Forest Change Assessment Viewer

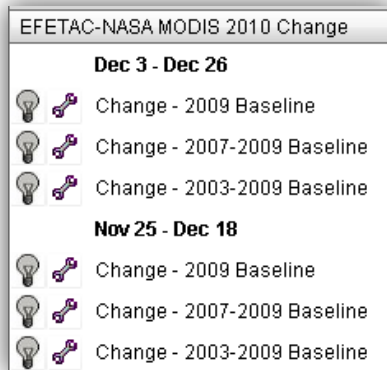
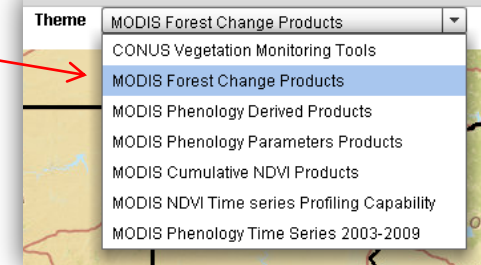
from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)



## Appendix 2: MODIS Forest Change Products (Thematic Group Data Layers )



*Individual 8-day images of forest change produced throughout the year from EFETAC. Look for a similar archive in the Table of Contents that presents forest change products from USDAFS Remote Sensing Application Center (RSAC)*



*Composite forest change images given the current 3-baseline time periods from EFETAC. Look for a similar data layer set in the Table of Contents that presents forest change products from USDAFS Remote Sensing Application Center (RSAC) for 2010.*

[Back to Appendix list](#)

[Back to Contents page](#)



# Using the Forest Change Assessment Viewer

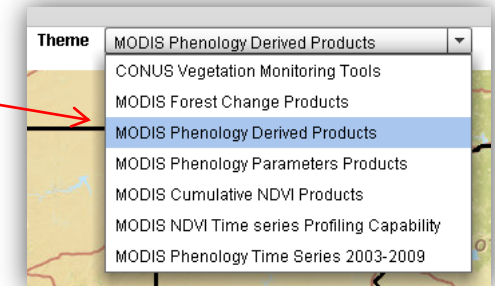


*from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)*

## Appendix 3: MODIS Phenology Derived Products (Thematic Group Data Layers )

### Examples of Derived Products

- Season durations (pheno-periods, number of days)
- Rates (speed and intensity of development)
- Ratios (show which season makes up the greater proportion of the year)
- Variance (shows the degree of variability in duration of spring, fall, and growing season)
- Mean X (time of year at greatest NDVI) and Y (greatest NDVI value).
- Standard Deviations and Means (from normal and mean max and min NDVI)



**For a description of these products, go to:**

<http://forwarn.forestthreats.org/advanced/national-phenology-data-set>

[Back to Appendix list](#)

[Back to Contents page](#)



# Using the Forest Change Assessment Viewer



from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)

## Appendix 3: MODIS Phenology Derived Products (continued)

### 2003 – 2009 Phenology-based image products

MODIS Phenology Derived Products	
Phenology- Derived Products 2009	
	2009 Fall Brown Down Length
	2009 Spring Leaf Out Length
	2009 Growing Season Length
	2009 Growing Season Midpoint
	2009 Max NDVI Midpoint
	2009 Peakyness
	2009 Fall Spring Ratio
	2009 Skewness
	2009 Slope Fall
	2009 Slope Spring
	2009 Mean Position
	2009 Mean Value
	2009 Mean XY
Phenology- Derived Products 2008	
	2008 Fall Brown Down Length

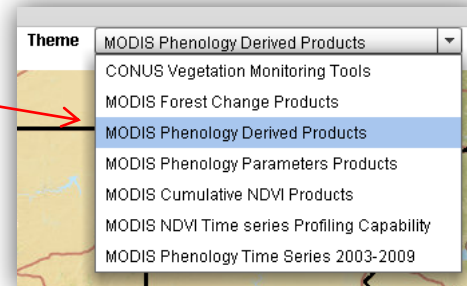
Pheno-periods  
(length in days)

Contrasts  
vegetation that  
keeps a small  
amount of leaf area  
over a long period  
of time versus  
vegetation that  
explosively  
produces a large  
amount of leaf  
area, but only holds  
it for a short time

listing repeats for next year...

### 2003 – 2009 Phenology Standard Deviations and Means

Phenology- Standard Deviations	
	2003-2009 Fall Standard Deviation
	2003-2009 GS Standard Deviation
	2003-2009 Spring Standard Deviation
Phenology- Means	
	2002-2008 Fall Length Mean
	2003-2009 GS Length Mean
	2002-2008 Spring Length Mean
	MaxMean 2003-2009
	MinMean 2003-2008
	MaxMean-MinMean 2003-2009



Shows places that are particularly  
predictable versus places that are  
particularly unpredictable  
(GS – Growing Season)

For a description of these  
products, go to:

[http://forwarn.forestthreats.org/  
advanced/national-phenology-  
data-set](http://forwarn.forestthreats.org/advanced/national-phenology-data-set)

[Back to Appendix list](#)

[Back to Contents page](#)



# Using the Forest Change Assessment Viewer



from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)

## Appendix 4: MODIS Phenology Parameter Products (Thematic Group Data Layers )

### 2003 – 2009 Phenology parameter products

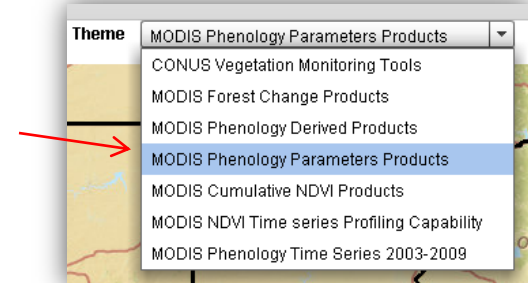
MODIS Phenology Parameters Products	
Phenology- Parameters 2009	
	2009 Large Integral
	2009 Maximum NDVI Position
	2009 Maximum NDVI Value
	2009 QC Flags
	2009 Left 20% Position
	2009 Right 20% Position
	2009 Left 20% Value
	2009 Right 20% Value
	2009 Left 80% Position
	2009 Right 80% Position
	2009 Left 80% Value
	2009 Right 80% Value
	2009 Left Minimum Position
	2009 Right Minimum Position
	2009 Left Minimum Value
	2009 Right Minimum Value
	2009 Small Integral
Phenology- Parameters 2008	

listing continues...

*Phenological Parameters do not represent the percentage of the year, but rather the percentage of the maximum NDVI values over the course of the year*

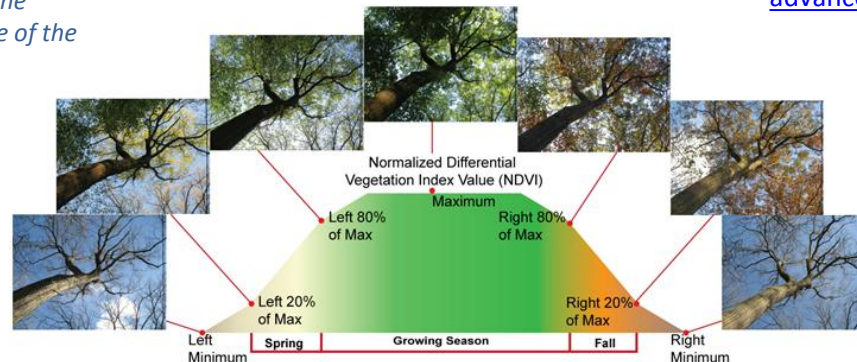
### Phenology Parameter Means

Parameter Means	
	2003-2009 Left 20% Position Mean
	2003-2009 Right 20% Position Mean
	2003-2009 Left 80% Position Mean
	2003-2009 Right 80% Position Mean
	2003-2009 Max NDVI Position Mean
	2003-2009 Min Position Left Mean
	2003-2009 Min Position Right Mean
	2003-2009 Small Integral Mean



For a description of these products, go to:

<http://forwarn.forestthreats.org/advanced/national-phenology-data-set>



The Phenological Curve  
(red dots indicate measurement points)

[Back to Appendix list](#)

[Back to Contents page](#)














# Using the Forest Change Assessment Viewer

from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)



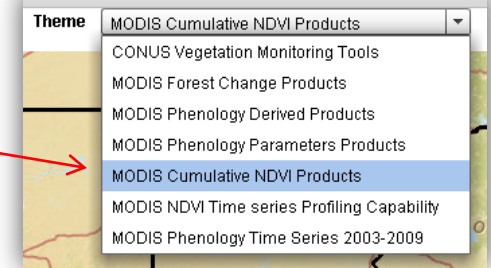
## Appendix 5: MODIS Cumulative NDVI Products (Thematic Group Data Layers )

### 2003 – 2009 Cumulative NDVI products

MODIS Cumulative NDVI Products 2003-2006	
MODIS Cumulative NDVI Products 2007-2009	
	2009 Cumulative Integral 2
	2009 Cumulative Integral 1
<b>2008 Cumulative NDVI</b>	
	2008 Cumulative Integral 22
	2008 Cumulative Integral 21
	2008 Cumulative Integral 20
	2008 Cumulative Integral 19
	2008 Cumulative Integral 18
	2008 Cumulative Integral 17
	2008 Cumulative Integral 16

*Treating yearly NDVI in a cumulative way causes differences to become more pronounced throughout the year (Hargrove, EFETAC).*

*The MODIS satellite takes a complete picture of the continental United States every day, although cloud cover, smoke, and other interference often blocks the view of the landscape. To get a complete picture, a 16-day composite is made by taking the highest value for each pixel recorded over the 16-day period. For the Cumulative Phenology data set, the NDVI values in each successive 16-day interval are then summed to form an accumulating total, starting over at the beginning of each year. The first national 16-day interval map, or Interval #1, is usually excluded from products because it covers the December-January transition from one year to the next. Therefore, there are usually 22 intervals that make up one year (#2–23).*



**For a description of these products, go to:**

<http://forwarn.forestthreats.org/advanced/national-phenology-data-set>

[Back to Appendix list](#)

[Back to Contents page](#)

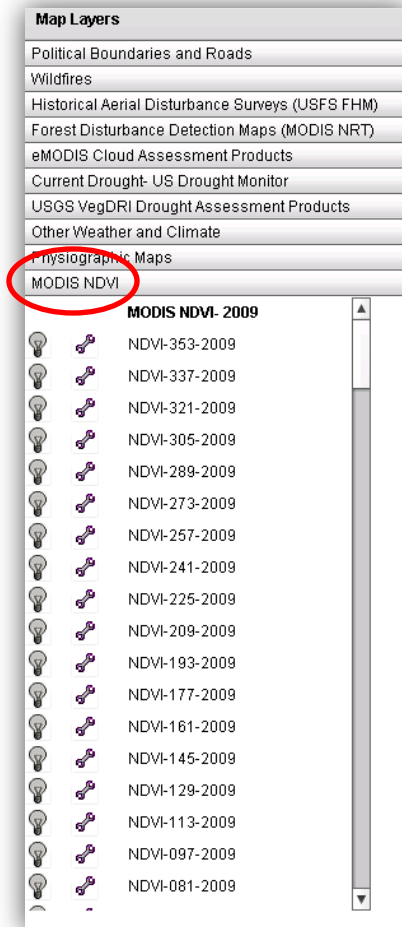


# Using the Forest Change Assessment Viewer



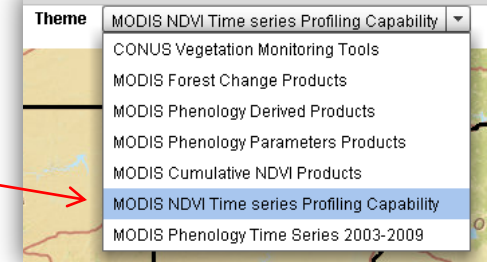
from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)

## Appendix 6: MODIS NDVI Time Series Profiling Capability (Thematic Group Data Layers)



2003 – 2009 NDVI Time Series Products  
(DOY – Day of Year)

*The DOY products can tell one what day in the year a threshold is attained*



For a description of these products, go to:

<http://forwarn.forestthreats.org/advanced/national-phenology-data-set>

[Back to Appendix list](#)

[Back to Contents page](#)



# Using the Forest Change Assessment Viewer



from the Forest Services' Eastern Forest Environmental Threat Assessment Center (EFETAC)  
and the Western Wildland Environmental Threat Assessment Center (WWETAC)

## Appendix 7: MODIS Phenology Time Series 2003 - 2009 (Thematic Group Data Layers )

The image displays three screenshots of the Forest Change Assessment Viewer interface, showing the MODIS Phenology Time Series 2003-2009 data layers. The first screenshot shows the 'MODIS Phenology Derived Products' list, with 'Phenology- Derived Products 2009' and 'Phenology- Derived Products 2008' highlighted. The second screenshot shows the 'MODIS Phenology Derived Products' list, with 'MODIS Phenological Parameters' highlighted. The third screenshot shows the 'MODIS Phenology Derived Products' list, with 'MODIS Cumulative Integrals' highlighted. The fourth screenshot shows the 'Theme' dropdown menu, with 'MODIS Phenology Time Series 2003-2009' selected.

For a description of these products, go to:

<http://forwarn.forestthreats.org/advanced/national-phenology-data-set>

← Replicated here from previous collection

[Back to Appendix list](#)

[Back to Contents page](#)