Dissemination of Earth Remote Sensing Data for Use in the NOAA/NWS Damage Assessment Toolkit

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Background

- Following the April 27, 2011 severe weather outbreak across the southeastern U.S., the SPoRT team provided MODIS and ASTER imagery to NWS forecast offices in Alabama
  - Imagery was used to refine and adjust some tornado tracks, particularly those that crossed CWA boundaries or were in areas with limited road access
- SPoRT was awarded a NASA Applied Science: Disasters “Feasibility” award to pursue inclusion of Earth remote sensing imagery and derived products within the NOAA/NWS Damage Assessment Toolkit

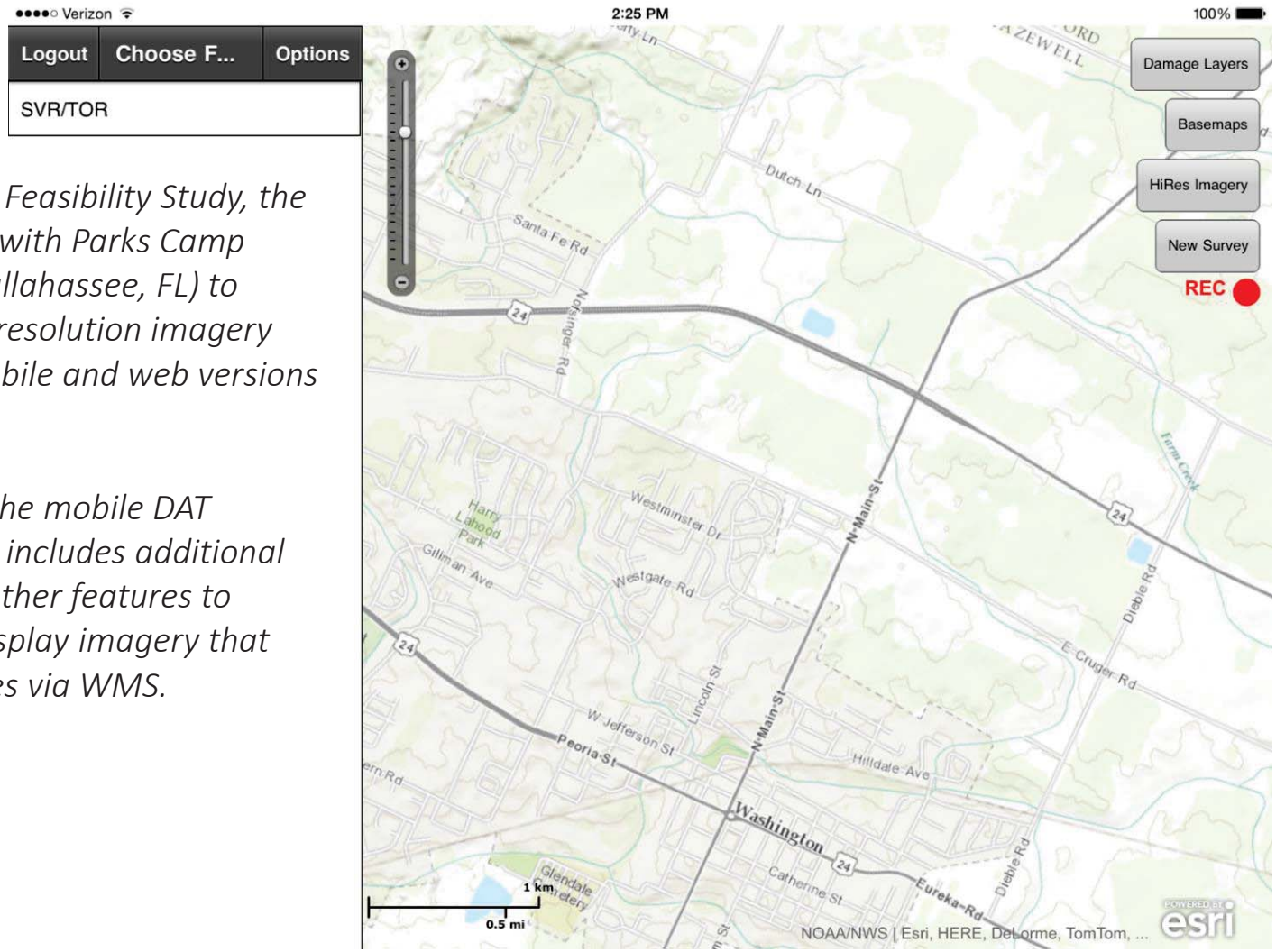
Damage Assessment Toolkit

- NOAA/NWS Damage Assessment Toolkit (DAT)
  - The DAT is a smartphone, tablet, and web-based framework for acquiring, editing, and publishing storm survey information.
  - Users can acquire geotagged photos and other information, assess storm damage and intensity, and log for further review at their office. Information collected provides additional spatial data regarding tornado damage, extent, and intensity.
- Through the NASA Applied Science award, SPoRT and NOAA/NWS collaborate to establish a Web Mapping Service and data feeds that provide satellite imagery and products as viewable data layers.

Damage Assessment Toolkit

As part of the Feasibility Study, the team worked with Parks Camp (NWS WFO Tallahassee, FL) to integrate full resolution imagery within the mobile and web versions of the DAT.

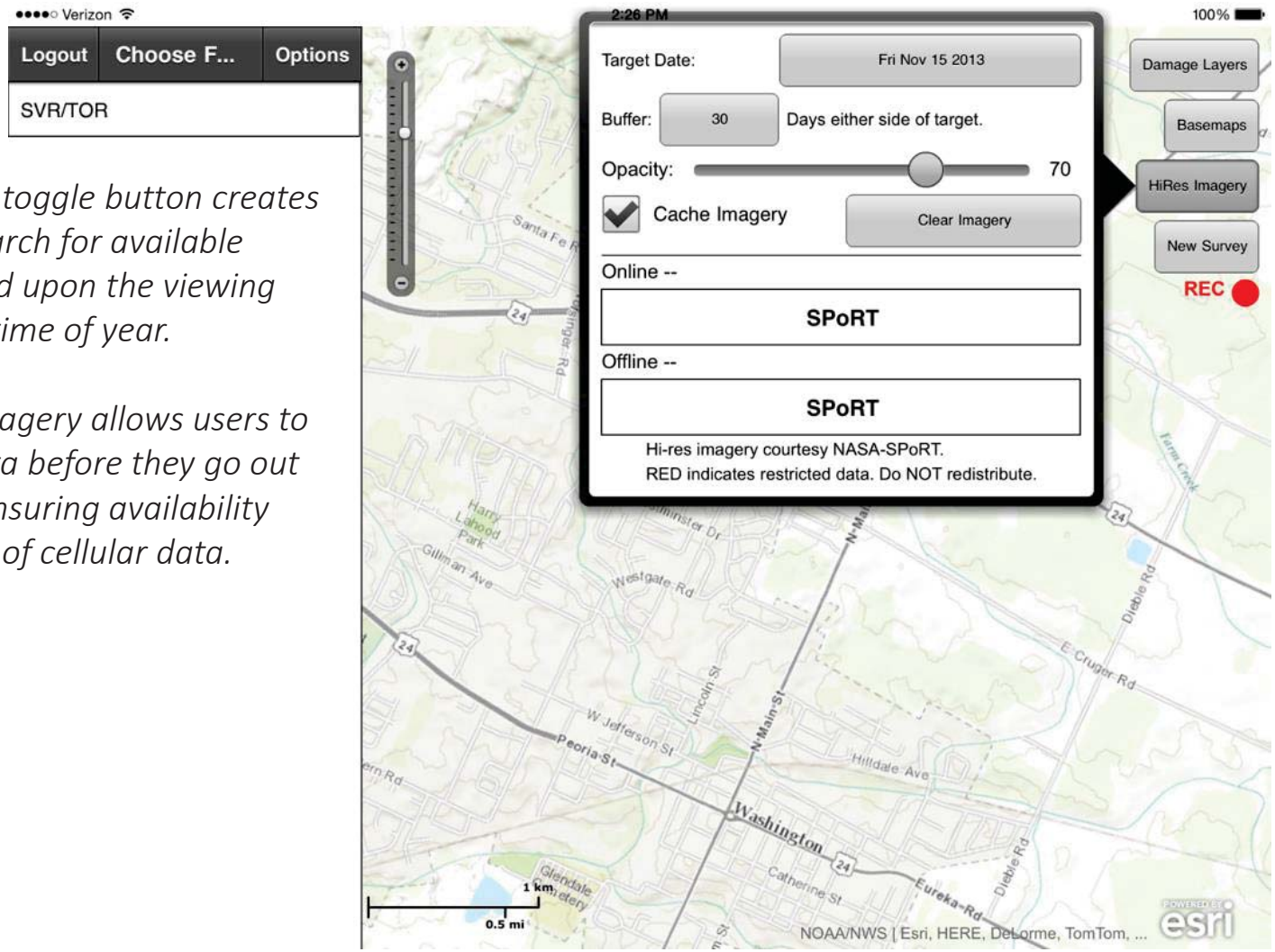
Shown here, the mobile DAT interface now includes additional buttons and other features to search and display imagery that SPoRT provides via WMS.



Damage Assessment Toolkit

An additional toggle button creates a menu to search for available imagery based upon the viewing location and time of year.

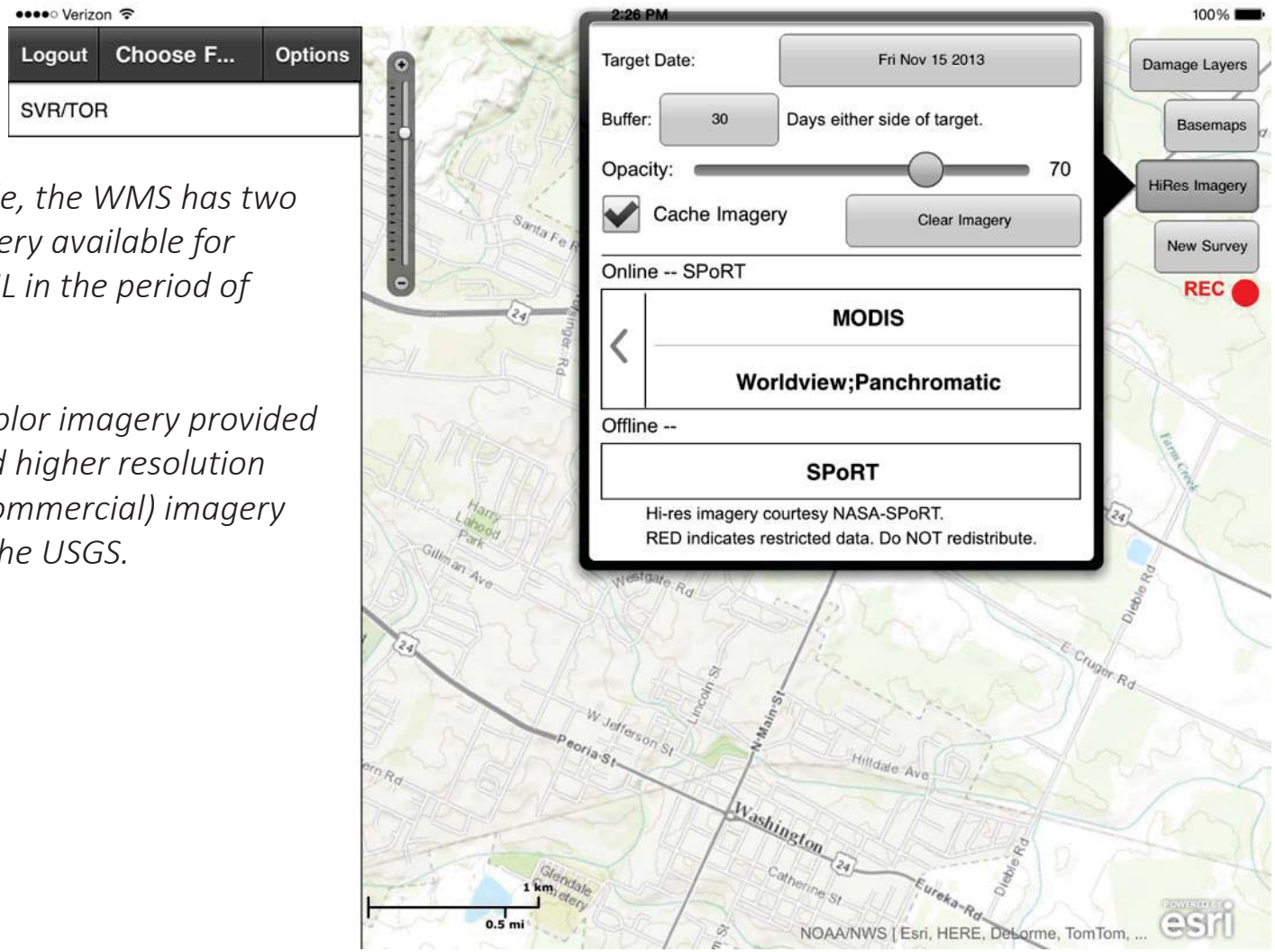
Caching of imagery allows users to download data before they go out to the field, ensuring availability despite a loss of cellular data.



Damage Assessment Toolkit

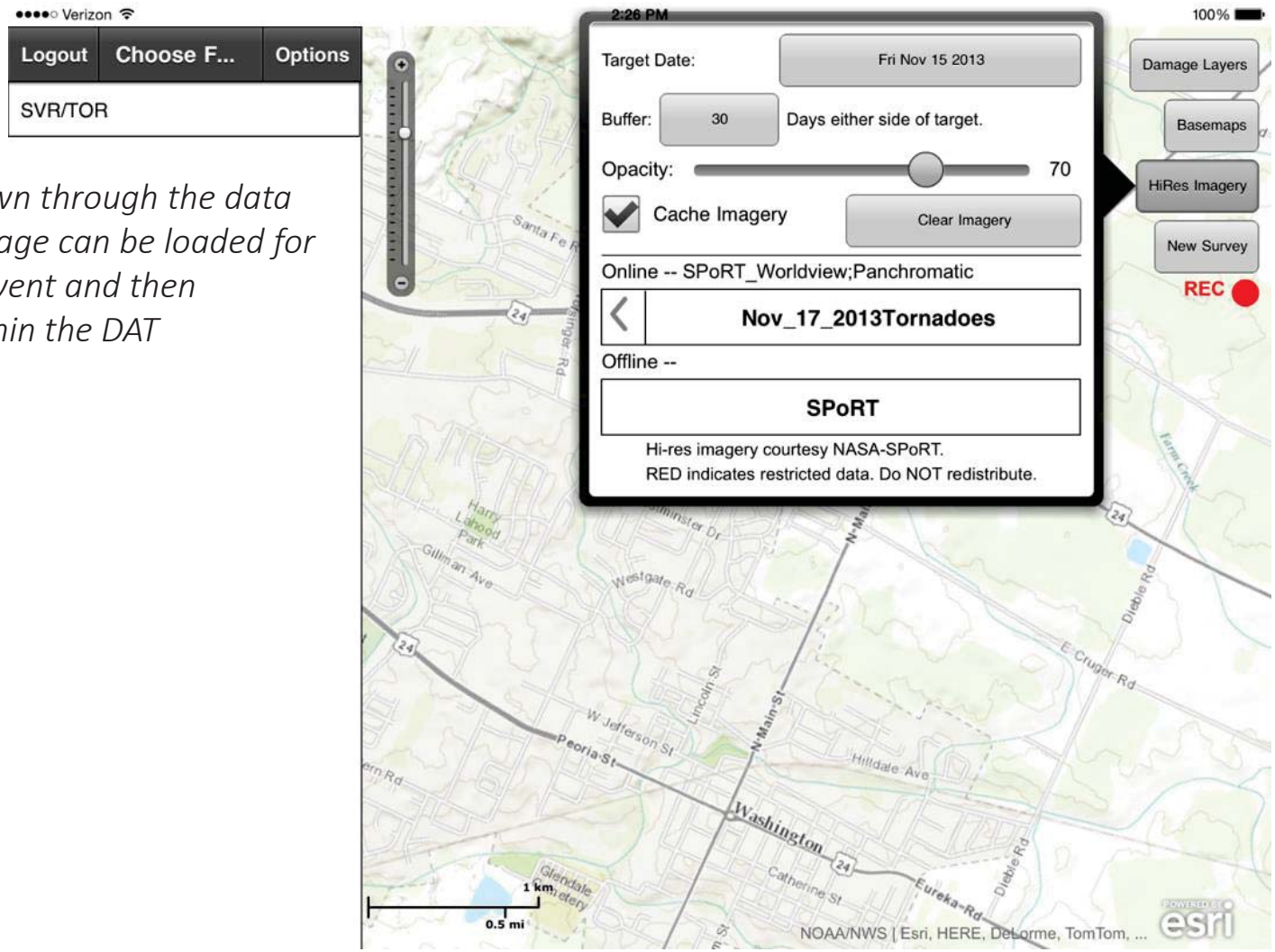
In this example, the WMS has two types of imagery available for Washington, IL in the period of interest:

MODIS true color imagery provided via SPoRT, and higher resolution Worldview (commercial) imagery provided via the USGS.



Damage Assessment Toolkit

By drilling down through the data menus, an image can be loaded for this specific event and then displayed within the DAT application.



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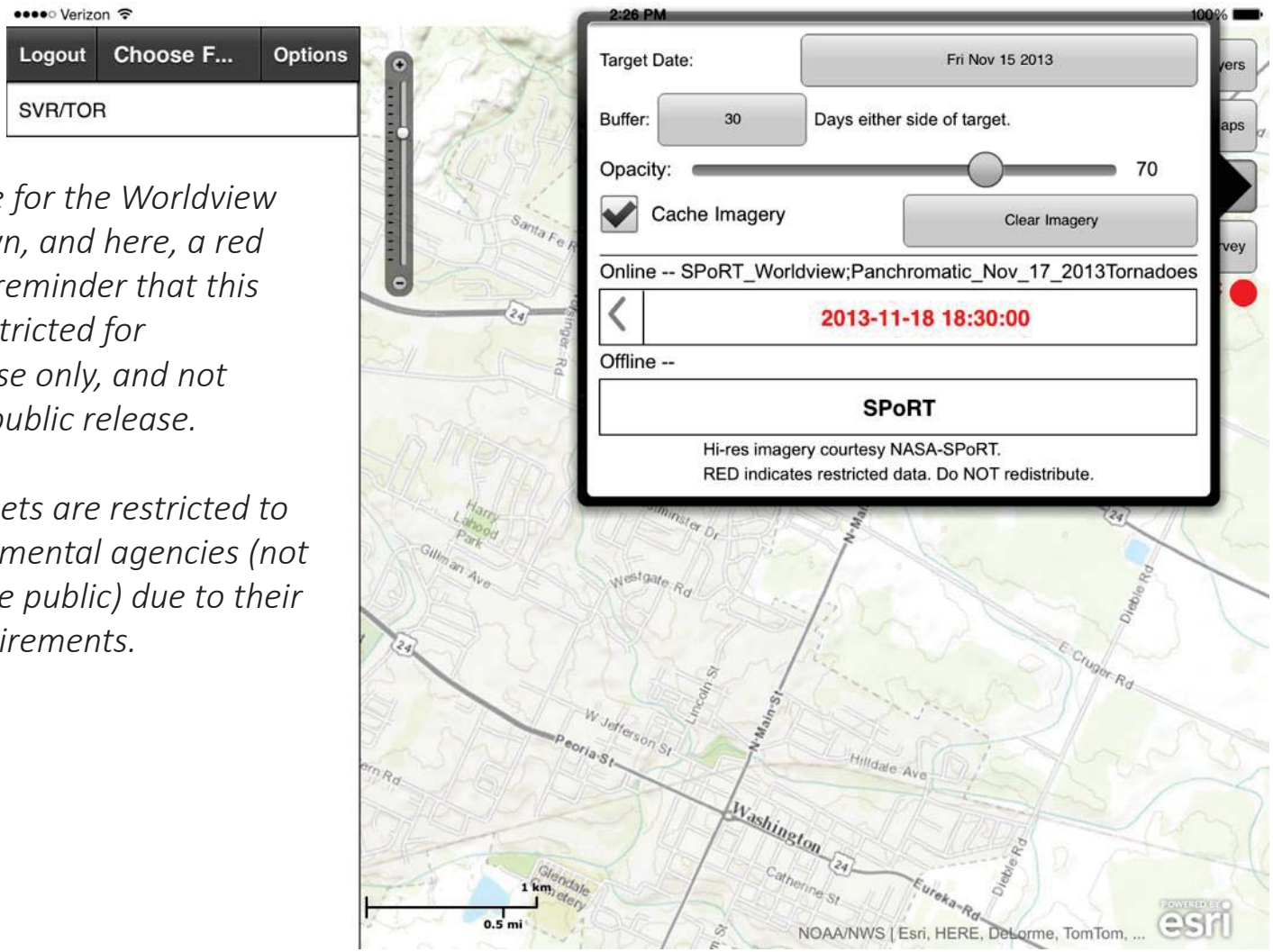
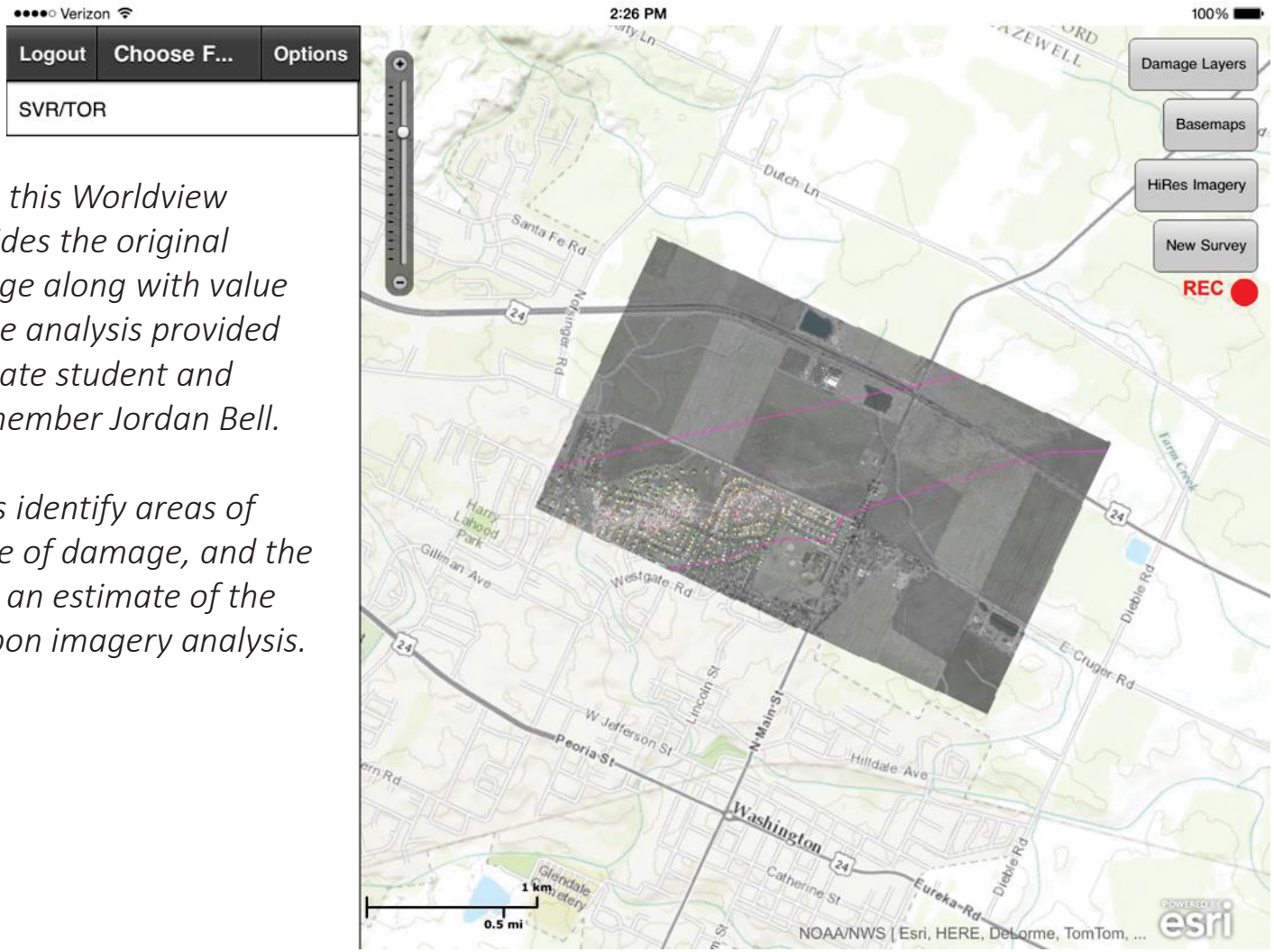


Date and time for the Worldview image is shown, and here, a red text view is a reminder that this imagery is restricted for NOAA/NWS use only, and not available for public release.

Certain data sets are restricted to use by governmental agencies (not released to the public) due to their licensing requirements.

Damage Assessment Toolkit



When loaded, this Worldview example provides the original grayscale image along with value added damage analysis provided by UAH graduate student and SPoRT team member Jordan Bell.

Colored points identify areas of varying degree of damage, and the pink outline is an estimate of the path based upon imagery analysis.

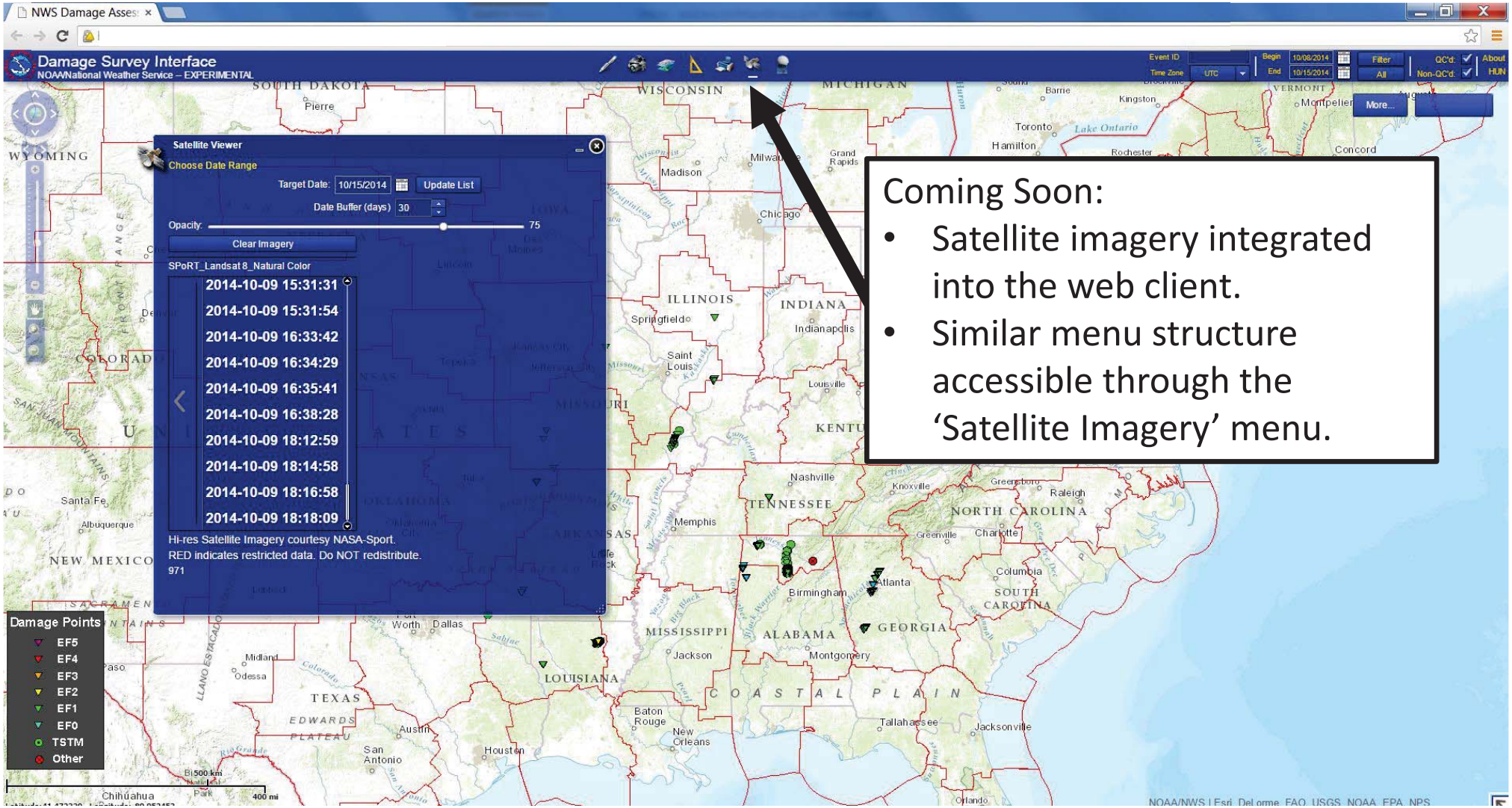
Damage Assessment Toolkit

The DAT application allows for pinching and zooming, just like Google Maps.

The WMS continues to provide higher resolution tiles, up to full resolution of the data (higher than shown here, ~0.5 m), so that DAT users can compare their survey to available imagery.

Imagery can help to identify damage in adjacent areas, clarify previous structures via pre-event imagery, and provide other analysis capabilities.

Damage Assessment Toolkit

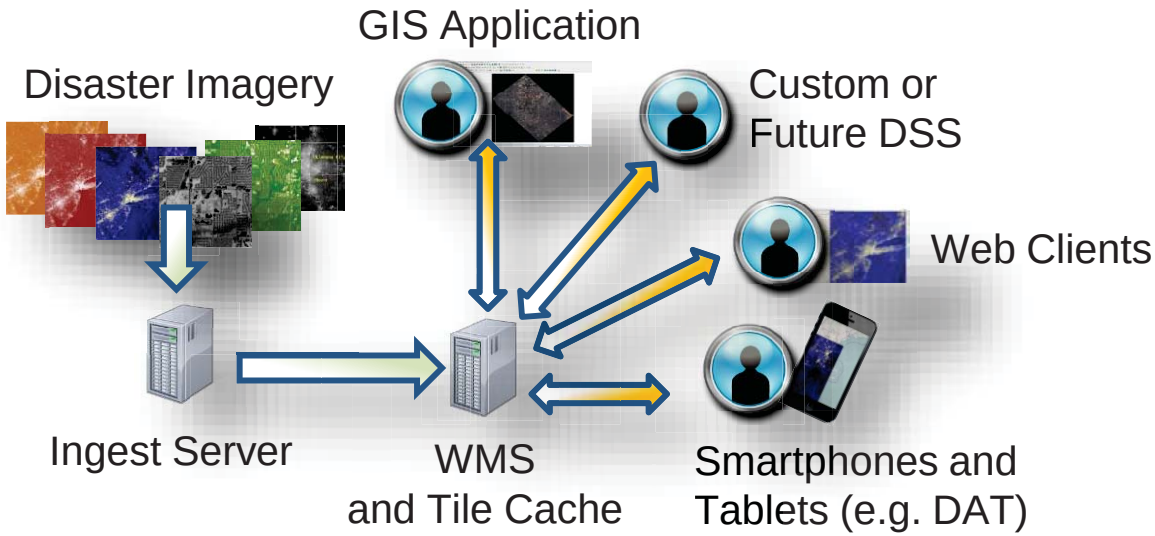


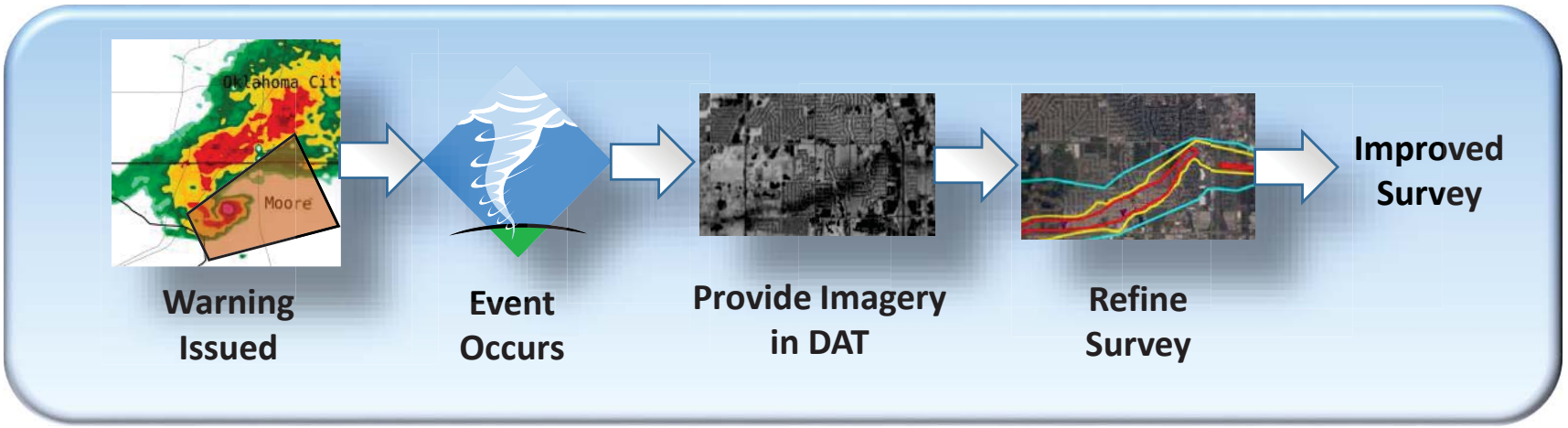
Satellite Products

Platform	Sensor	Product	Resolution	Repeat Cycle	Source
Terra / Aqua	MODIS	NDVI True Color	250 m 500 m	Daily	Direct Broadcast (CIMSS) NASA LANCE
Suomi NPP	VIIRS	NDVI True Color Day-Night Band	375 m 375 m 750 m	Daily	Direct Broadcast (CIMSS)
Landsat 7 Landsat 8	ETM+ OLI	Natural Color NDVI	30 m	16 Days	USGS Earth Explorer
Terra	ASTER	False Color NDVI	15 m	On Demand	ASTER Expedited USGS Earth Explorer
International Space Station	ISERV	True Color	5 m	On Demand	SERVIR Project at MSFC
Commercial	Varies	Panchromatic True Color	< 1 m 1 m	On Demand	USGS Hazards Data Distribution System

Latency of products vary by type of imagery and source. Through partners, we provide a broad range of sensors for post-storm analysis. Data can be used by surveyors up to 60 days after the event.

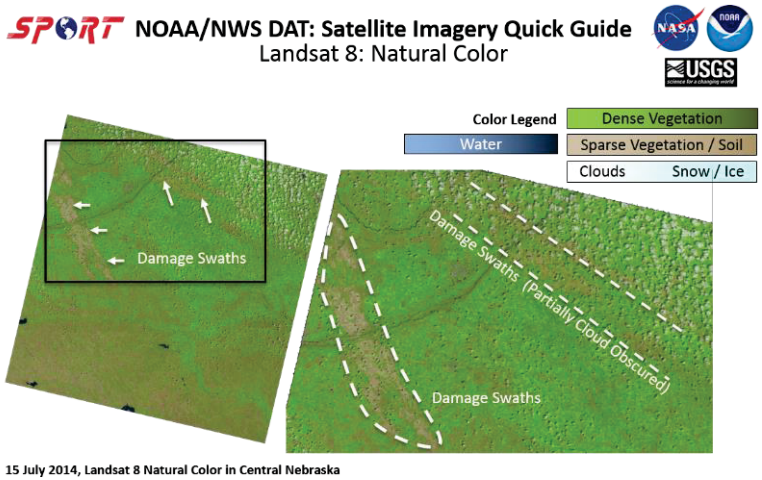
Data Dissemination and Use Case





Imagery Support and Training

- SPoRT provides training and support for delivered products.
- The team provided teletraining to partnering WFOs in NWS Southern Region
- A series of “Quick Guides” has been established for “just in time” training and use of data during operations.



15 July 2014, Landsat 8 Natural Color in Central Nebraska

Access	SPoRT > Landsat 8 > Natural Color
Restrictions	None
Resolution	30 m
Latency	Landsat 8 has a 16 day repeat cycle. It observes the same location every 16 days.
Provider	USGS / NASA SPoRT
Spectral Bands	Three red and near-infrared bands (6,5,4) are combined to create an image similar to true color, but with additional discrimination of clouds and snow.
Application	Damage tracks are typically identified as brown scars against a green, vegetated background. Corroborate suspected damage tracks with other information.

How is the image generated?

- Reflectance in the red and near-infrared bands (6,5,4) is combined into a single false-color image to approximate a true color appearance.

What should I be looking for in this product?

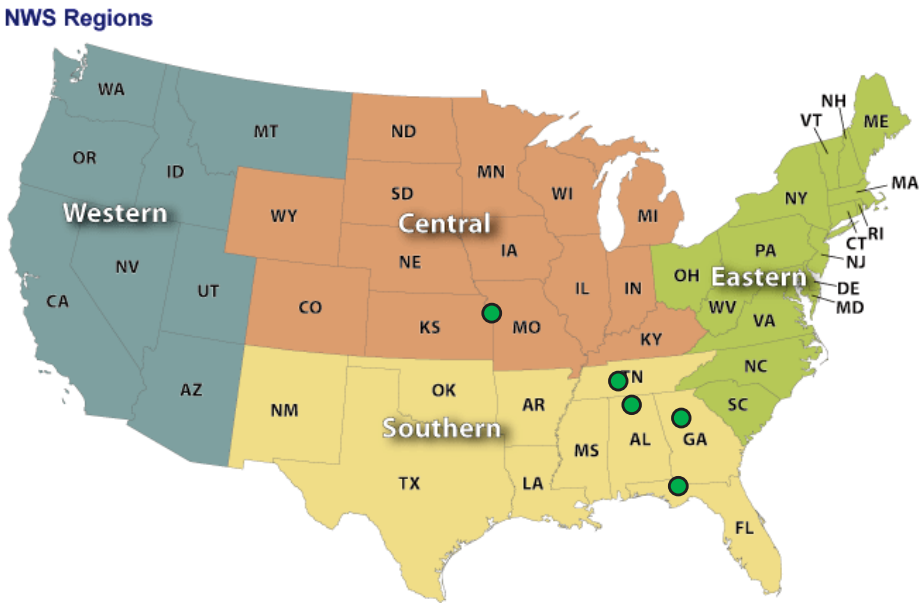
- Red and near-infrared bands are often used to measure vegetation health. Tracks are apparent as linear features along the storm path, typically in shades of brown where vegetation and soils have been disrupted.
- Suspected track location can be corroborated with radar rotational track information or survey information.

What are the product limitations?

- Limited swath width may truncate portions of the track that continue outside of the scene.
- Clouds and cloud shadows may obscure portions of the damage track.

NWS and SPoRT Partnership

- NASA's Applied Science projects require a full "research to applications" transition
- SPoRT and the NWS will partner over three years to ensure a successful transition
- Upcoming for 2015: Expanding partnerships to NWS Central Region



Initial DAT Project Partnerships (2014)

Future Work / Transition Plan

- January 2015-July 2015
  - Continue partnerships with selected Southern Region and upcoming Central Region WFOs.
  - SPoRT disseminates data, aids regions with acquiring commercial products provided through USGS
- Late Summer 2015
  - Project team meeting and discussion to begin transition of product dissemination to NOAA/NWS partners
  - Establish POCs for handling data and broader strategy for disseminating WMS products from NOAA/NWS
- Second Year (2015-2016)
  - SPoRT aids NOAA/NWS in setting up dissemination of selected products as a testbed activity

Questions?

- Check out some related talks!
  - Development of a Near Real-Time Hail Damage Swath Identification Algorithm for Vegetation
    - J. Bell, University of Alabama in Huntsville, J8.5
      - Tuesday, 2:30 pm, 231ABC (20th Satellite)
    - L. Schultz, University of Alabama in Huntsville, 1A.2A
      - Thursday, 2:00 pm, 230 (20th Satellite)
- If you're interested in learning more about the project, contact me at andrew.molthan@nasa.gov