

**Utilizing NASA EOS to Assess Burn Severity and Perform Risk Mapping of the 2011 Texas Wildfires**

**NASA Langley Research Center**

**Earthzine/DEVELOP Virtual Poster Session, Fall 2011**

**Video Transcript**

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Opening Scene: Fade In

PPT Slide #1: Zoom in on “NASA DEVELOP National Program”  
Background music “Importance” fading into play

Scene #2: Fade In

NASA Langley Research Center sign at Main Gate panning across with “Importance”  
background music

Scene #3: Fade In

Video of A-train satellites working over Earth obtained from NASA Goddard SFC with  
background music “Importance” playing

Scene #4: Circle Open

Aerial photo of NASA LaRC with the DEVELOP eight core values: Innovation, Service,  
Integrity, Passion, Professionalism, Stewardship, Scholarship, and Collaboration.  
Background music “Importance” in background

Scene #5: Fade In

Team Picture. From left to right: Kenneth Hall, Taylor Beard, Ande Ehlen, and Myles Boyd.  
Background music, “Importance” in background

Scene #6: Dissolve In

Black slide with audio of the Texas Forest Service talking about locations of fires on the  
radio. Sounds of alarm gradually creep into the scene.

Scene #7: Cross Zoom In

Video of fires burning a stand of trees in Texas (acquired from the Texas Forest Service).  
Dramatic background music, “Sad Anger”, plays. Project title appears.

Kenneth (voice over)

“Wildfires are natural disasters that have become a commonality in much of the southwestern United States. Since the first outbreak of fires in November 2010, the state of Texas has experienced several periods of severe wildfires..”.

Scene #8: Fade to White

Video of fire burns a different stand of tree during the 502 Fire in Texas (acquired from the Texas Forest Service). Dramatic background music, “Sad Anger”, plays.

Kenneth (voice over)

“that have burned nearly 4 million acres of land. The cause of this disaster can be attributed to excessive heat and drought brought on by La Niña conditions and exacerbated by the strong winds from Tropical Storm Lee.”

Scene #9: Cross Dissolve

Video of fire burning a different stand of trees during the 502 Fires in Texas (acquired from the Texas Forest Service). Dramatic background music, “Sad Anger”, plays.

Kenneth (voice over)

“These wildfires caused significant damage to the region’s ecosystems and greatly affected the livelihoods of many Texans.”

Scene #10: Cross Dissolve

Video of Taylor Beard on Langley Air Force Base giving the overview of community concerns associated with the fires. “Sad Anger” softly plays in the background

Taylor, “The results that our partners wanted to see included: a Fire Risk Assessment Map, as well as a way to gauge the socioeconomic impacts that the fires have had on the community. This wildfire season was the worst wildfire season in the history of Texas with over 21,000 fires...”

Scene #11:

Video from the Texas Forest Service of some completely burned homes. Taylor has voice over in the background. “Sad Anger” plays softly in the background.

Taylor (voice over)

“...leading to the destruction of 7,000 structures.”

## Scene #12: Fade to White

PPT Slide #3: Study areas. "Importance" plays in the background.

Taylor (voice over)

"We chose the areas of Possum Kingdom Lake, which destroyed approximately 127,000 acres, as well as Bastrop Complex, which destroyed nearly 35,000 acres. These areas were chosen not only because of the extent of their damage but also because of their close proximity to surface waters."

## Scene #13: Wipe Left

Video of Kenneth Hall sitting in the NASA LaRC Forest Fighting Truck "Importance" plays in the background

Kenneth, "We partnered with the Texas Forest Service whose responsibility it is to assure that the state's trees, forests, and related natural resources are protected and sustained."

## Scene #14: Fade to White

PPT Slide #4: Picture of Texas Forest Service logo

Kenneth (voice over)

"We have been working closely with Tom Spencer, the Head of the Predictive Services Department, and Curt Stripling, a GIS Specialist, to provide them biweekly status updates and to gather feedback on our project's direction."

## Scene #15

Picture of a TFS forecasted fire danger map from 10/5/2011.

Kenneth (voice over)

"Currently, the TFS does not use any NASA Earth Observing Systems data in their predictive risk mapping."

## Scene #16

Video of Aqua satellite working over Earth

Kenneth (voice over)

"Therefore, they could benefit greatly from the higher resolution of EOS remote sensing inputs."

Scene #17

Picture of Lake Bastrop and highly burn land

Kenneth (voice over)

“Furthermore, the TFS requested that we remotely analyze the surface water conditions and burn severity.”

Scene #18: Cross Dissolve

Myles Boyd in Bldg. 647 (LaRC DEVELOP Offices)

Myles, “Having understood the properties and abilities of Earth Observatory Systems and other various data acquiring equipment, we beg the question. Can NASA assist the Texas Forest Service in producing a more reliable and efficient way of producing fire risk maps and analyzing burn severity?”

Scene #19

PPT Slide #5: Project Objectives

Taylor (voice over)

“Based on the current decision making policies and needs of the Texas Forest Service, we aimed to provide burn severity analysis and fire risk mapping of both our study areas in hopes that it will provide additional fire mitigation techniques to the TFS. Per the request of our partner we have also provided a time lapse of the drought’s affect on the surface water resources in our study areas. Ultimately, we wish to develop a user tutorial that will allow the TFS to easily access and reproduce the end products necessary to analyze wildfires.”

Scene #20

PPT Slide #6: Project Methodology

Kenneth (voice over)

“To accomplish our objectives we established a three pronged methodology analysis drought impacts, land classification and water resources, and burn severity and fire risk mapping.”

Scene #21

Video of team processing images on their computers

Kenneth (voice over)

“The majority of our data analysis consisted of using Landsat 5 Thematic Mapper data processed through ArcGIS and ERDAS IMAGINE.”

Scene #22

## PPT Slide #6: Project Methodology

Kenneth (voice over)

“We also gathered data from the Global Land Data Assimilation System and the MODIS sensory on the Aqua and Terra satellites.”

### Scene #23

## PPT Slide #7: Drought Analysis

Kenneth (voice over)

“To quantify our analysis of the Texas drought we gathered data from the Keetch Byrum Drought Index (KBDI) website. KBDI is what is used by the TFS in their fire risk mapping. It ranged from 0 meaning no drought to 800 meaning extreme drought. As the drought levels begin to drastically increase in May 2010 the PKL water elevation levels begin a gradual decline based on the polynomial regression line, shortly after.”

### Scene #24

Video of Ande Ehlen standing on the shore of a river inlet by the King’s Street Bridge on Langley Air Force Base. “Lake Water” playing softly in the background.

Ande, “The accessibility of surface water resources is of great importance to the Texas Forest Service. The status of these water resources is important information for the location of fire-fighting helicopters. The Texas Forest Service wanted to know what this year’s extreme drought is doing to their water resources.”

### Scene #25: Ripple In

PPT Slide #8: Water Resources. “Lake Water” playing softly in the background.

Taylor (voice over)

“We composited bands 4,3, and 2 of Landsat 5 Thematic Mapper to show changes of water depth in PKL from January to April 2011. We found that the change in water depth correlates to the decline in PKL water elevation levels seen in the red circle.”

### Scene #26: Cross Blur In

Videos of fires scarring the land in Texas. Picture of Bastrop Complex burn land.

Kenneth (voice over)

“To analyze the burn severity of these wildfires...”

## Scene #27: Wipe Left

### PPT Slide #9: Burn Scarring and Severity

Kenneth (voice over)

“...we used this DN to Reflectance conversion model on the right in ERDAS, which converts Landsat 5 Thematic Mapper six-band layer stacks of pre-fire and post-fire images to reflectance values. Reflectance values for bands 4 and 7 were then ran through the NBR equation in ArcGIS to produce pre- and post-fire NBRs. Bands 4 and 7 were chosen because of the accuracy they provide in burn severity analysis of sparse and heavy pre-fire vegetated areas.”

## Scene #28

### PPT Slide #10: Relative difference Normalized Burn Ratios

Taylor (voice over)

“To show burn severity of PKL and Bastrop Complex fires we chose to use the RdNBR...”

## Scene #29

### PPT Slide #11

Taylor (voice over)

“...over the dNBR.”

## Scene #30

### PPT Slide #10: Relative difference Normalized Burn Ratios

Taylor (voice over)

“The RdNBR shows four levels of burn severity ranging from Unchanged to High Severity.

The RdNBR shows higher classification accuracy of high severity burns through the removal of the correlation between dNBR and pre-fire biomass. So if a sparse stand of trees is completely destroyed by fires, the RdNBR will classify that fire as high severity. Whereas the dNBR will only classify it as Moderate.”

## Scene #31

### PPT Slide #12: Fire Risk Assessment Map

Taylor (voice over)

“A pre-fire risk map was generated using four fire risk factors: soil moisture, wildland-urban interface, proximity to roads as an indication of human activity, and fuel cover.”

### Scene #32

PPT Slide #13 and #14: Fire Risk Assessment Maps

Taylor (voice over)

“To create our fire risk map, weights were assigned to different categories within each factor in order to align with the locations of fires. Categories with higher fire risk were assigned larger weights. Pre-fire areas of PKL and Bastrop Complex with higher risk of fire line up with the FIRMS Fire Mapper points overlaid on the maps on the right.”

Kenneth (voice over)

“At the end of this term we will be proudly handing over our methodologies and end products to the Texas Forest Service for use in their planning for the next fire season.”

### Scene #33

Kenneth (voice over). “Importance” plays in the background.

“We would like to thank the following individuals for their assistance in this project”

Credits rolling. Thanks to: Tom Spencer and Curt Stripling at the TFS, Lauren Childs (DEVELOP Projects Lead), Nate Makar (Center Lead, LaRC), Malcom Jones (IT Lead, LaRC), Dr. Kenton Ross (SSAI, NOAA), Jamie Favors (NASA LaRC), Linda Moon at the TFS.

### Scene #34

Kenneth (voice over)

“Additional videos sources include...”

Additional Video Sources: The Texas Forest Service, National Aeronautics and Space Administration

### Scene #35

Kenneth (voice over). “Importance” plays in background.

“This concludes our project video. Thanks for watching. And if you like the things you saw here, please visit the DEVELOP website.”

PPT Slide #14: NASA Emblem  
Scrolling URL of DEVELOP website.