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Considerations for Remote Sensing on Southeastern Burns.

Carl Key, U.S. Geological Survey, Northern Rocky Mountain Science Center, carl_key@usgs.gov
Nathan Benson, National Park Service, National Interagency Fire Center, nate_benson@nps.gov
Duncan Lutes, U.S. Forest Service, Missoula Fire Sciences Lab, dlutes@fs.fed.us

Both initial and extended assessments may be necessary in the Southeast due to variable fire responses and seasonal conditions.

Abstract: No matter what remote sensing approach is applied, timing and environmental factors greatly influence fire effects detection and evaluation quality. Particularly in the southeastern U.S., several factors control the ability to map and characterize burned areas. First, areas tend to be vegetatively productive under relatively warm and moist climate. Regrowth may be rapid and dense following fire, while clouds and haze often reduce data suitability. Second, many tree and shrub species can resprout from burned canopies, so observations too near the time of fire can greatly under represent the actual mortality. Both these factors argue for remote sensing at two intervals post fire. Once soon after fire to better detect the extent and pattern of burning and changes to surface fuels. Then again some months later when comparison to the earlier sampling can reveal the extent of survivorship and mortality. This strategy is limited, however, since many fires occur in October through February, a period of low sun angle and leaf-off conditions. Low illumination and shadow created by low sun elevation is most detrimental, yielding very low to no discrimination of effects over significant areas. Moreover, leaf-off conditions mean that litter and ground fuel may be charred or consumed, but little impact to live crowns can be detected. When fire intensity is low, mostly unaffected canopies leaf out the following spring and show little change from before fire, making portions of the burn essentially indiscernible. Again, conditions argue for two samplings by remote sensing, and a blending of results for the final assessment of the burn.

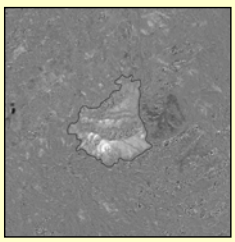
Late Fall burn, leaf off. The *Green Mountain Fire*, Great Smoky Mountains National Park. 2313 ac, started November 20, 2001.

Initial Assessment (IA)

12/01/2000 Pre-fire

12/04/2001 Post-fire

Initial Assessment dNBR

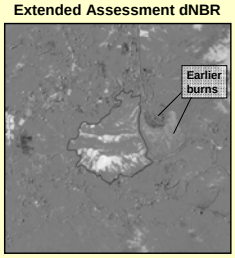


Extended Assessment (EA)

05/16/2000 Pre-fire

05/22/2002 Post-fire

Extended Assessment dNBR



December imagery detects the fire scar, but low illumination and shadow make patterns less clear. Speckling (artificially high + or – values) signifies less than meaningful reflectance levels. IA is useful to show the footprint of the burn, especially where plants exhibit little lasting affect from fire and leaf out by next spring. EA shows higher values where dead and charred canopies persist and effects contrast more with green pre-fire vegetation, compared to IA where pre-fire vegetation is senescent. Such scenarios often result in higher severity detected in EA than in IA. Areas with change detected in IA but little to no change in EA indicate burning with low severity.

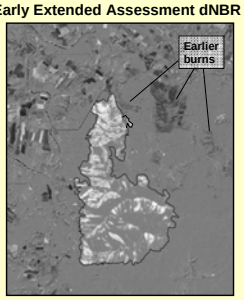
Late Winter burn, leaf off. The *Fultz Run Fire*, Shenandoah National Park. 4323 ac, started February 26, 2002.

Extended Assessment (EA)

05/26/2000 Pre-fire

05/24/2002 Post-fire

Early Extended Assessment dNBR

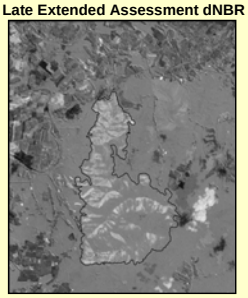


Extended Assessment (EA)

07/19/1999 Pre-fire

08/12/2002 Post-fire

Late Extended Assessment dNBR



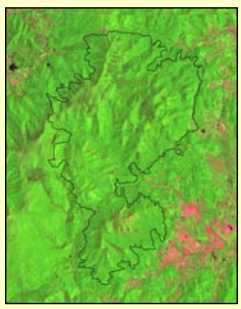
Here, the first assessment opportunity follows spring green-up, since the fire occurred in winter and IA imagery was not adequate. Early EA is sufficient to define the perimeter, and indicate high degrees of change and patchiness. Where little change is detected, under burning with low-severity is likely, as canopies may be fully leafed out to pre-fire levels. Patch distribution is very similar by the August EA, indicating persistent effects, but dNBR magnitudes are generally reduced, most likely due to regrowth.

We gratefully acknowledge assistance and support from the USGS Center for Earth Resource Observation and Science (EROS), the USGS-NPS Burn Severity Mapping Project, and NPS Fire Ecologists and Fire Monitors from Shenandoah NP, Great Smoky Mountains NP, and Tall Timbers Research Station.

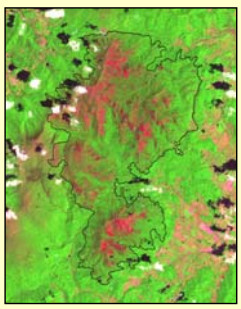
Late Fall burn, leaf off. The *Shenandoah Complex*, Shenandoah National Park. 22,226 ac, started November 1, 2000.

Extended Assessment (EA)

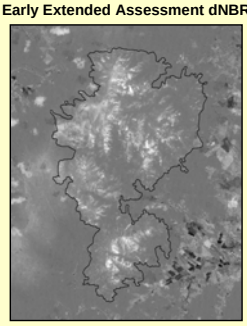
05/26/2000 Pre-fire



05/13/2001 Post-fire



Early Extended Assessment dNBR



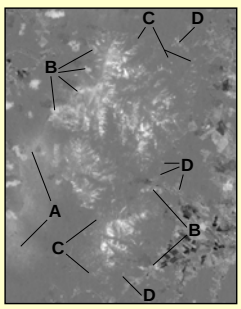
With no imagery available for IA, the EA dNBR alone can be confusing for this type of burn. Only careful comparison of scenes with dNBR helps locate perimeter.

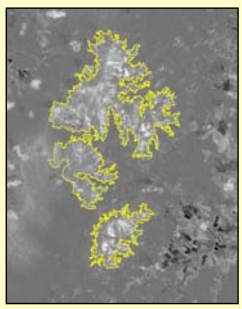
Things to consider:
A) Phenology is less advanced at high elevation in post-fire scene.

B) Clouds and cloud shadow.

C) Small-scale mottled burn pattern, disjunct spots.

D) Features present in pre-fire scene, not likely fire related.





Final perimeter, top, required major manual revisions to the automated perimeter, bottom right.

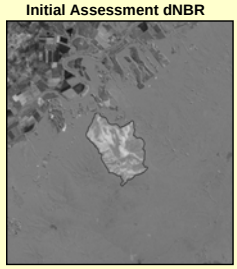
Summer burn, leaf on. The *Rocky Top Fire*, Shenandoah National Park. 1468 ac, started June 21, 2002.

Initial Assessment (IA)

07/19/1999 Pre-fire

08/12/2002 Post-fire

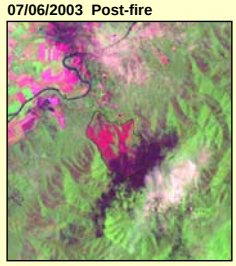
Initial Assessment dNBR



Extended Assessment (EA)

06/30/2001 Pre-fire

07/06/2003 Post-fire



Extended Assessment dNBR

The burn pattern and dNBR gradient are very similar between IA and EA, indicating relatively high severity persisting a full year after fire. Such results may be a function of burning when canopy fuels are greater, resulting in higher fire intensity and mortality, compared to fall or winter burns that can recover more quickly when only litter and light fuels burn. Clouds impact the EA, a common regional problem, but shadows tend to be less detrimental to dNBR than the cloud itself.