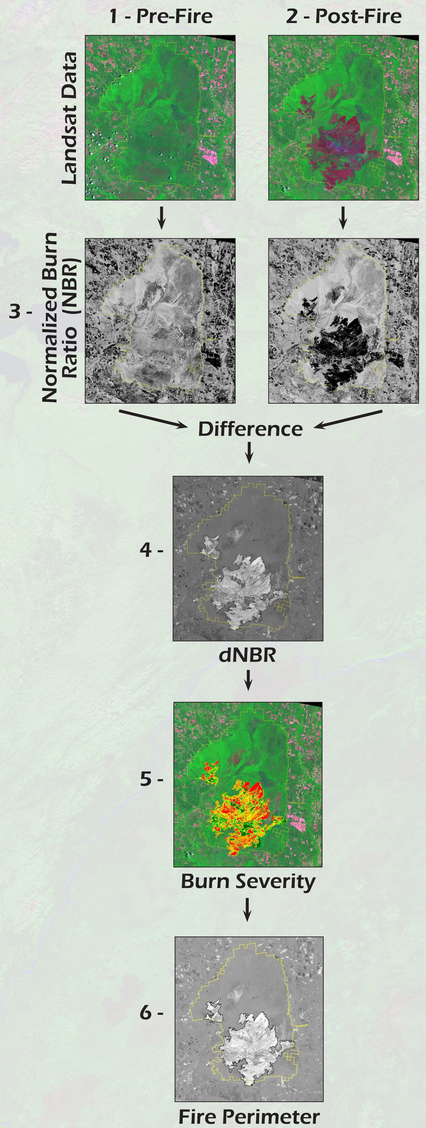
MONITORING TRENDS IN BURN SEVERITY

Alternative Landscape Pattern Analyses using MTBS Historical Burn Severity Data

Deriving Burn Severity Data from Landsat Imagery



1 - Prefire scenes are selected from the peak growing season prior to a fire.

2 - Postfire scenes are selected for either an extended severity assessment (next peak growing season after the fire(s)), or a perimeter assessment (shortly after the fire).

3 - The Normalized Difference Burn Ratio (NBR) is designed to highlight differences in burn severity. NBR is calculated from the Landsat data using the formula (Band 4 – Band 7) / (Band 4 + Band 7).

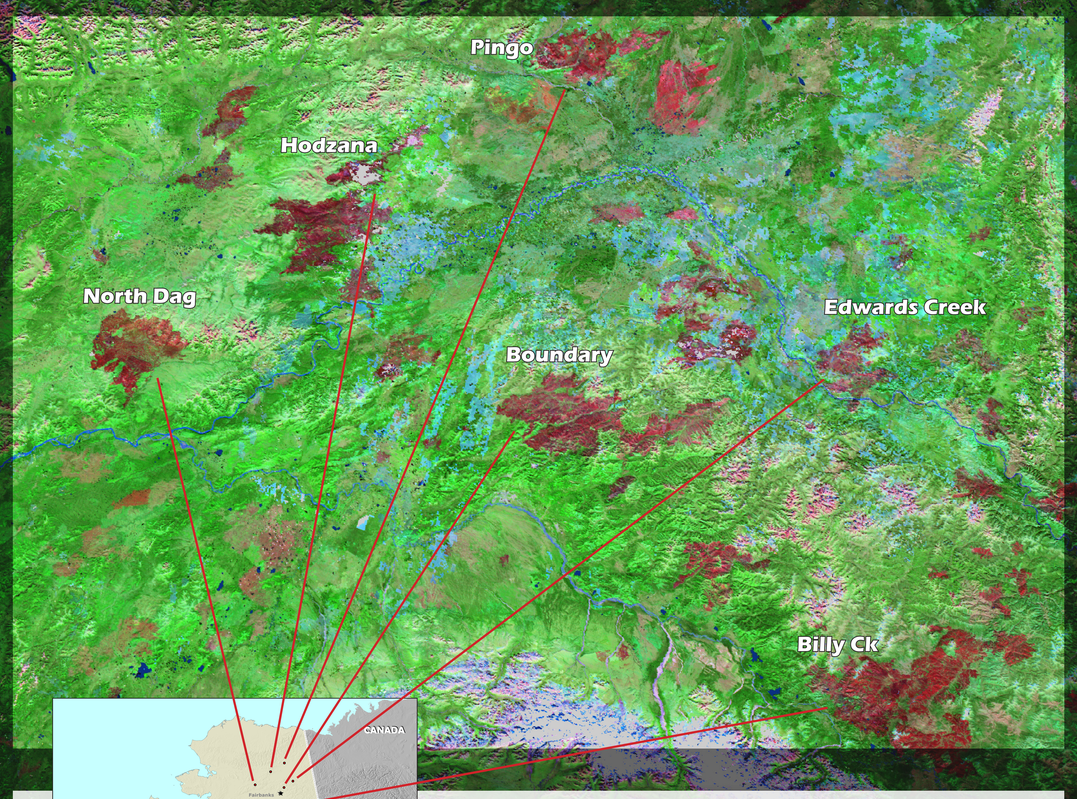
4 - Delta NBR (dNBR) is calculated by subtracting post-fire NBR from pre-fire NBR. dNBR images are archived and available in 16-bit GeoTIFF formats.

5 - Burn severity layers are 5 class thematic images depicting severity as unburned / undetectable, low, moderate, high, and increased post-fire vegetation response. Burn severity layers are archived and available in 8-bit GeoTIFF formats.

6 - Fire perimeter layers are archived and available in shapefile format.

Monitoring Trends in Burn Severity (MTBS) is a multi-year project designed to consistently map the burn severity and perimeters of fires across all lands of the United States for the period spanning 1984 through 2010. The data generated by MTBS will be used to identify national trends in burn severity, providing information necessary to monitor the effectiveness and effects of the National Fire Plan and Healthy Forests Restoration Act.

MTBS is sponsored by the Wildland Fire Leadership Council (WFLC), a multi-agency oversight group responsible for implementing and coordinating the National Fire Plan and Federal Wildland Fire Management Policies. The project will be conducted through a partnership between the U.S. Geological Survey National Center for Earth Resources Observation and Science (EROS) and the USDA Forest Service Remote Sensing Applications Center (RSAC). More information can be found at http://svinetfc4.fs.fed.us/mtbs/ (soon http://www.mtbs.gov).



An Alternative Method for Landscape-scale Burn Severity Analysis

Wildfires are the dominant source of disturbance in boreal forests, and are significant elements in the boreal carbon cycle. In addition, they are reportedly increasing in frequency and severity over the last 25 years. The increasing frequency of wildfires is supported by fire occurrence databases; however, observations regarding increased fire severity are more difficult to assess over large areas. Burn severity data, like those being prepared by the MTBS project, will help to objectively address the fire severity question.

MTBS burn severity data are produced in two (2) formats – (a) as thematic data sets, which represents burn severity in 5 categories, and (b) as continuous dNBR data, which represent the full range of burn severity detail. The thematic data more intuitively represent burn severity information and serve intra-fire analysis. This thematic data is, however, an interpreted product and subject to biases and inconsistencies that are present in any interpretation. While the continuous data offer greater analytical flexibility, they are more complex to work with. The additional complexity may be worth the effort, however, when evaluating fires over large areas and/or through time.

Inter-fire comparisons over large areas and/or through time require an objective, consistent means of analyzing burn severity data. This poster presents simple arithmetic partitioning as an efficient way to reliably classify continuous dNBR data for inter-fire comparisons. Arithmetic partitioning can be applied quickly and does not introduce biases in the analysis. A wide range of independent analyses can be supported by MTBS data through arithmetic partitioning because the thematic resolution required for each analysis can be individually defined.

The analysis of fires in boreal ecosystems, indeed elsewhere, should be science-based and independent of interpreter biases. Recent debate over the accuracy of burn severity data in boreal ecosystems is, in part, related to biases stemming from issue-based ecological interpretation. Basing landscape and trend analyses on objective characterizations of burn severity may provide the most universal depictions of changes in pattern and magnitude of fire over the last quarter century.

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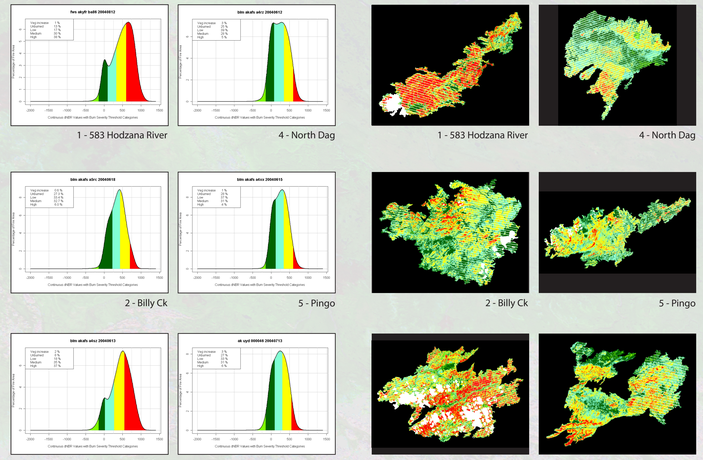
Landscape-scale Burn Severity Analysis

MTBS burn severity data are currently available for individual fires. These data are useful for investigating fire effects within a given fire; however, investigating fire effects across landscapes may require a different approach. Landscape pattern and trend analyses over large areas or long time periods (or both) will likely be better served using dNBR data from all fires as one dataset, as opposed to a collection of individual fires. In this case the sum of the parts may be less than the whole.

The following sequence of images are from Alaskan fires in 2004. The images illustrate differences in burn severity when the six fires are analyzed individually compared to the result if they are analyzed in aggregate. Examples of alternative severity characterizations are presented to demonstrate the differences between continuous dNBR, interpreted severity, and two levels of objective partitioning.

Fires Analyzed Individually



Fires Analyzed as Geographic Groups