



Land Condition Monitoring

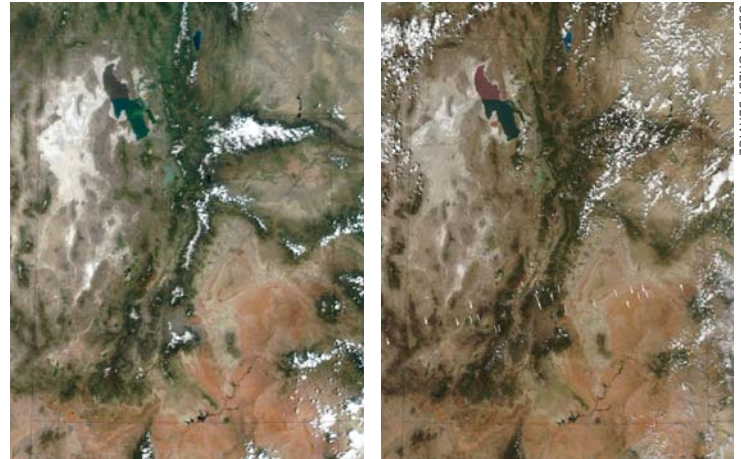
Importance

Information on landscape-scale plant vigor and productivity (land condition) is key to understanding natural and human-caused ecosystem changes. On the Colorado Plateau, land condition was historically influenced by climate, grazing, and fire. Current activities, such as livestock grazing and trailing, exotic plant invasions, fire-regime changes, and the creation of trails and backcountry campsites, have the potential to further alter the condition of park lands. Adjacent land-use activities, such as housing development, livestock grazing, and agricultural production, can impact park systems indirectly by increasing the contrasts along the park-non-park interface, and directly by increasing wind and water erosion of soil along park boundaries. Climate change is another likely influence. Understanding broad-scale changes in land condition will help park managers to make better-informed management and mitigation decisions in a context of complex change.

Long-term Monitoring

Land condition monitoring involves the use of the MODIS (MODerate Resolution Imaging Spectoradiometer) satellite platform, which records surface reflectance at a spatial resolution of 250×250 meters. MODIS provides an eight-day average measure of vegetative productivity throughout the year. A measure of vegetation productivity, Normalized Difference Vegetation Index (NDVI), is calculated over time to estimate the start and end of the growing season, the time of peak production, and seasonal productivity. In grassland systems, the shape of the NDVI curve can also indicate the relative extent of exotics (e.g., cheatgrass), as many of these species reach peak production early in the growing season compared to native grasses, which exhibit peak production later on. Comparison of these attributes among years can indicate substantive changes in the extent of vegetative conditions, changes in the duration of the growing season, impacts due to drought or large-scale natural or human-caused disturbances, and exotic invasions. Monitoring of land condition is annual, and extends across all park units and beyond park boundaries.

The objective of land condition monitoring is to determine annual status and trends in the seasonally integrated NDVI for NCPN park units and adjacent lands. Additionally, where anomalous departures from previous NDVI trends are evident, reasons for these departures will be explored with the use of information from other vital signs monitoring.



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Left: MODIS true-color image for the state of Utah, May 15, 2007.

Right: MODIS true-color image for the state of Utah, August 14, 2007.

Comparison of these images illustrates seasonal differences in vegetative conditions (green-dominated areas).

Management Applications

A coarse-scale assessment of land condition can reveal important trends in the overall health of a park and surrounding ecosystem. This information, alone and in concert with information from other vital signs monitoring, will provide park managers with (1) a baseline against which to assess future changes in plant vigor and productivity in and adjacent to park lands, and (2) an understanding of reasons for large-scale changes in land condition, to aid in discerning between natural and human-caused changes and development of mitigation efforts where human-caused changes are evident.

Contact

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Network park units where land condition will be monitored

Arches NP	Dinosaur NM
Black Canyon of the Gunnison NP	Fossil Butte NM
Bryce Canyon NP	Golden Spike NHS
Canyonlands NP	Hovenweep NM
Capitol Reef NP	Natural Bridges NM
Cedar Breaks NM	Pipe Spring NM
Colorado NM	Timpanogos Cave NM
Curecanti NRA	Zion NP

NP = National Park; NM = National Monument;
NRA = National Recreation Area; NHS = National Historic Site