



Land Condition Monitoring

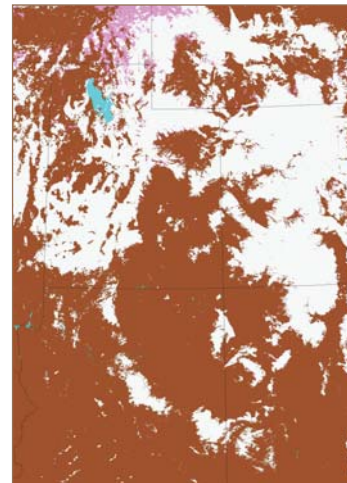
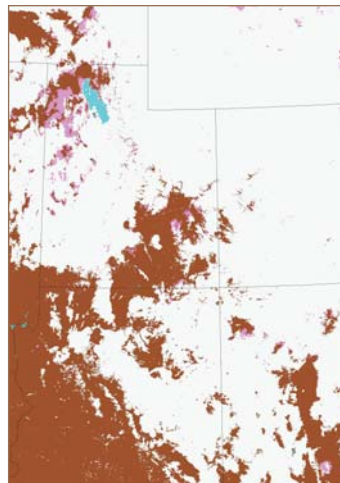
Importance

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, exotic plant invasions, fire-regime changes, recreational off-road travel, 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 uses MODIS (MODERate Resolution Imaging Spectroradiometer) satellite imagery to measure vegetation productivity and snow-cover extent. The Normalized Difference Vegetation Index (NDVI) is calculated from imagery over time to estimate the start and end of the growing season, the time of peak production, and seasonal productivity. Comparison of these attributes among years can indicate substantive changes in the extent of vegetation conditions, changes in the duration of the growing season, impacts due to drought, or large-scale natural or human-caused disturbances. In grassland systems, the shape of the NDVI curve can also indicate the relative extent of exotics (e.g., cheatgrass), due to phenology that differs from that of native vegetation.

A snow-cover extent map derived from MODIS imagery (see above) is used to estimate storage and release of water over time (a primary determinant of biological and physical processes). The objective of this protocol is to determine status and trends in snow cover and the seasonally integrated NDVI for Northern Colorado Plateau Network (NCPN) parks and adjacent lands. Additionally, the network will explore the reasons behind anomalous departures from previous NDVI trends with information from other vital signs monitoring. Progress on this project includes draft protocols and programming scripts for extracting phenology metrics from MODIS imagery. The scripts will be evaluated for two NCPN parks in summer 2009.



USGS/8. REED

MODIS images of Colorado Plateau snow cover, January 17–25 (left) and February 20–27, 2007 (right), indicating changes in soil moisture and runoff that may influence biological and physical processes.

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 parks, and (2) an understanding of reasons for large-scale changes in land condition. This information can be used to differentiate between natural and anthropogenic changes, which is useful in mitigating human-caused impacts.

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