

Northern Colorado Plateau Network

Monitoring Brief

National Park Service
U.S. Department of the Interior

Intermountain Region
Inventory & Monitoring Program



2010

Integrated Upland Monitoring

Importance

Uplands represent the vast majority of land area in the Northern Colorado Plateau Network (NCPN), and include rock outcrops, badlands, shrublands, grasslands, woodlands, and forests. Upland vegetation provides energy to other trophic levels, habitat structure for various organisms, and is a significant component of species diversity. The ability of uplands to retain soil and nutrients, absorb and release water, and buffer high-runoff precipitation events is a major influence on riparian condition. Upland ecosystems are easily disturbed and slow to recover, yet several NCPN units contain relatively undisturbed examples of grasslands and shrublands. Historic land uses include livestock and timber production; more recently, recreational use has increased. To effectively manage uplands, the National Park Service needs to know the impacts of these uses.



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Upland monitoring plot, Dinosaur National Monument.

Long-term Monitoring

Integrated upland monitoring includes measuring soil stability, hydrologic function, biological soil crusts, and vegetation composition and cover. The NCPN uses a complex survey design to select randomized sampling plots that are visited in two consecutive years, followed by a relatively long interval between revisits (3–6 years). This design minimizes the chances that sensitive, arid-ecosystem plots will be damaged by repeated visits in successive years and is a cost-effective way to estimate the health of upland ecosystems across a large area. NCPN upland monitoring is intended to strike a balance between increasing fundamental understanding of these systems and providing managers with early warning of undesirable change.



NPS/D. WITWICKI

Surface litter, Dinosaur National Monument.

Status and Trends

The NCPN initiated upland monitoring in 2006. By the end of the 2010 field season, the network will have established plots in nine of the ten park units where uplands are monitored. To optimize upland monitoring and ensure that we are sampling the appropriate number of plots to detect trends, pilot sites are sampled for three consecutive years in most park units, to estimate variability of ecosystem measures. In 2010, a power analysis was conducted on this data from Capitol Reef NP to identify an “affordable” sample size that optimizes tradeoffs between trend and status estimation and overall operational reality. A survey and revisit design was created for the park based on this analysis. In addition, data from the 2009 field season were summarized in annual reports for Black Canyon of the Gunnison, Canyonlands, and Capitol Reef national parks; Curecanti National Recreation Area; and Cedar Breaks and Timpanogos Cave national monuments. After five full years of monitoring at any park, the NCPN will perform more detailed analyses to identify trends.

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Network park units where uplands are monitored

Arches NP	Cedar Breaks NM
Black Canyon of the Gunnison NP	Curecanti NRA
Bryce Canyon NP	Dinosaur NM
Canyonlands NP	Timpanogos Cave NM
Capitol Reef NP	Zion NP

NP = National Park; NM = National Monument; NRA = National Recreation Area

Monitoring Changes at High Elevation: Cedar Breaks National Monument

With elevations reaching more than 10,000 feet, Cedar Breaks National Monument is the highest park unit in the Northern Colorado Plateau Network. Here, the NCPN monitors high-elevation meadows, spruce-fir forests, and aspen stands. Management issues of concern include expansion and contraction of vegetation types, recovery of spruce-fir forests from beetle kill, sudden aspen decline, and the spread of smooth brome invasion.

Currently, the area above the rim in Cedar Breaks NM is dominated by a mixture of meadows and spruce-fir forest. There are large patches of forest in many areas, as well as islands and fingers of forest interspersed throughout the meadows. How climate change will favor certain community types and reposition their distribution across the landscape is of interest to the monument's resource managers. Spruce-fir forests, especially Engelmann spruce within the forests, have been heavily attacked by bark beetles, creating a high percentage of dead

trees throughout these forests. Tracking the recovery of these trees is a high priority for managers, given the extent of the affected area.

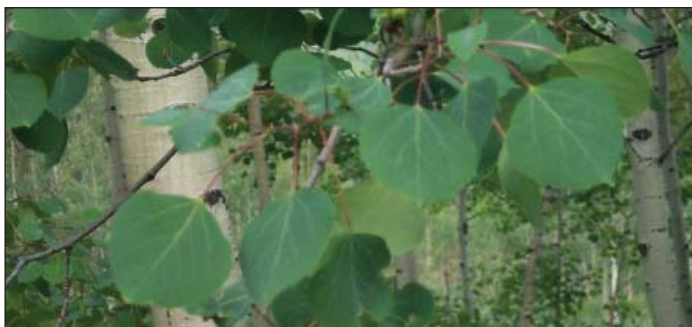
Although aspen stands make up a relatively small part of high-elevation vegetation in Cedar Breaks NM, they are a concern due to the threat of sudden aspen decline (SAD), which is contributing to aspen forest declines throughout the Rocky Mountain region, with some stands exhibiting extremely high mortality. The cause of SAD is not well understood; potential causes include drought, climate change, and fire management, while the actual mortality agents have included cytospora canker, bark beetles, and poplar borers. Low-elevation and south-facing sites appear to be more susceptible to SAD than others.

Smooth brome, an invasive exotic perennial grass, is present along roadsides and has expanded into other areas of the monument. Although Cedar Breaks NM actively treats some areas to remove this species, there is concern that it is displacing native grasses and forbs in the meadows.

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Clockwise from top left: Spruce-fir forest killed by bark beetles, Cedar Breaks NM; smooth brome invasion, Cedar Breaks NM; quaking aspen (*Populus tremuloides*).