



Water Quality Monitoring

Importance

Most Northern Colorado Plateau Network (NCPN) parks are located in semi-arid to arid environments where water is a major factor in determining the distribution of flora, fauna, and historic human habitation. Additionally, the abundance and quality of water resources reflect human activities and land use in and near parks, and are a primary factor influencing park visitation and recreational activities. Water bodies in national parks are protected by the Clean Water Act and other policies that prevent unacceptable levels of pollution and establish acceptable values for other water-quality measures. Park managers need information on status and trends in surface-water quality and quantity to comply with the Clean Water Act and to mitigate historic and future impacts to park water resources that may have ecological and social significance.



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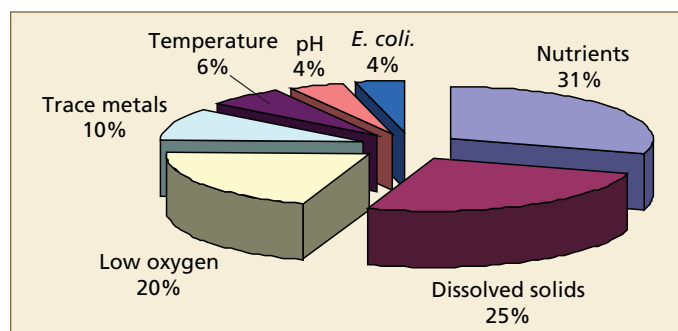
Sampling water quality in Arches National Park.

Long-term Monitoring

Water quality monitoring sites are selected based on historic impacts, perceived threat, current monitoring by others, or to determine baseline status as a starting point for long-term trend detection. As many as 30 water-quality parameters are measured at each site visit. At every site, the core parameters (specific conductivity, flow, temperature, pH, and dissolved oxygen) are measured as basic indicators of water quality using portable water-quality sensors. Measurements are then compared to standards to determine whether water-quality goals are being met and if, over time, conditions are changing beyond acceptable normal ranges. NCPN water quality monitoring is a coordinated effort between the network, 10 park units, the U.S. Geological Survey, and the State of Utah.

Status and Trends

From January 2005 to July 2007, state water-quality criteria



Most common water-quality exceedances in NCPN parks, 2005–2007.

were exceeded for one or more parameters on 19.7% (180) of 916 site visits to eight NCPN parks (data for two parks are not yet available). While some exceedances may have been caused by human activities, many were due to naturally occurring conditions. The chart at left shows the most common exceedances and their abundance. In general, water-quality values fell within expected ranges relative to historical results.

Management Implications

Water bodies whose natural conditions preclude their meeting assigned water-quality standards may be re-evaluated with respect to natural conditions and their assigned designated-use class. For instance, in 2007, the Utah Division of Water Quality (UDWQ) removed Zion NP's North Creek from its 303(d) list of impaired water bodies, based on monitoring results indicating that high salt concentrations are a natural result of underlying geology. The National Park Service has also petitioned the UDWQ to upgrade classification of North Fork Virgin River (also in Zion) from secondary-contact to primary-contact recreation. Reclassification is pending.

Network park units where water quality is being monitored

Arches NP	Curecanti NRA
Black Canyon of the Gunnison NP	Dinosaur NM
Bryce Canyon NP	Hovenweep NM
Canyonlands NP	Natural Bridges NM
Capitol Reef NP	Zion NP

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

Diving Deeper into Water Quality

Although water quality measurements for most NCPN parks were within or below the standards set by the states of Colorado and Utah during 2005–2007, there were some exceedances worth noting. Resource managers in two parks utilized these findings when choosing to implement management changes that may help improve water quality.

At Bryce Canyon and Zion national parks, NCPN staff recorded occasional spikes in the levels of *E. coli*. and total phosphorus. At Bryce Canyon, high bacteria counts were recorded in both Sheep and Yellow creeks near the park boundary during summer months.

Visitor-use statistics for the Zion Narrows in summer months suggest a high probability of human contact with water at times when water quality may be impaired. On 8% of site visits, the North Fork Virgin River upstream from the Zion boundary showed indication for impairment to secondary-contact recreation and cold-water game fish species, due to heightened levels of total phosphorus. The timing of the higher phosphorus levels corresponded to higher bacteria counts at Zion, possibly indicating that the two had a common source.

Potential sources of bacteria and phosphorus in these waters include livestock, wildlife, natural weathering, and erosion. Seasonal levels of flow and turbidity can also affect the concentration of bacteria and phosphorus in these streams. Cattle trespass has been documented at both Bryce Canyon and Zion, and is one potential source of contamination that can be rectified through management action. Therefore, as a preventive measure, resource managers at Bryce Canyon and Zion decided to adjust their management priorities with the goal of re-fencing the areas where the elevated readings and trespass occurred, in an effort to improve water quality.



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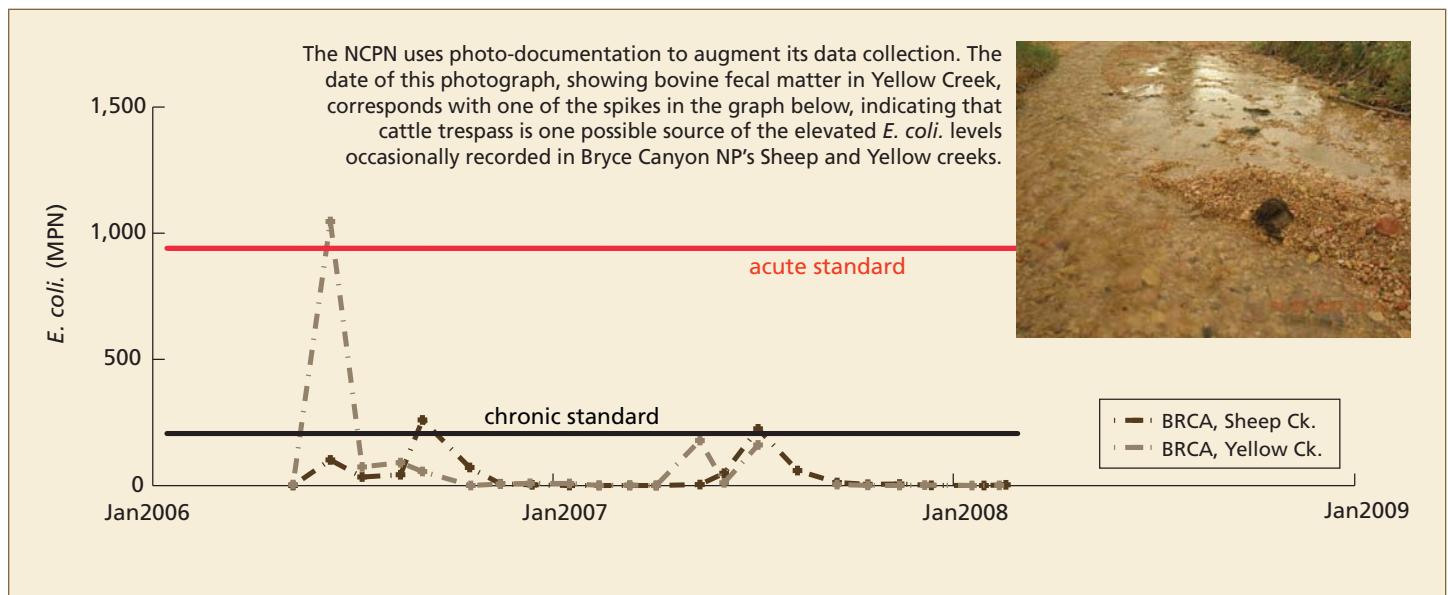
The North Fork Virgin River is a popular spot with summer visitors to Zion National Park.

NCPN monitoring is a monthly “grab sample,” and should be compared only against the acute standard for *E. coli*. As such, although monthly counts might not exceed water quality standards, it is possible that impairment might be evident at a chronic level if sampling were conducted more frequently.

Continued NCPN monitoring of water quality bears watching over time to identify trends and determine whether park management actions are changing water quality, or if there are other actions that may be taken, in cooperation with local stakeholders, to improve water quality in these areas.

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Graph showing spikes in *E. coli* levels in Bryce Canyon National Park's Sheep and Yellow creeks during 2006 and 2007.