



# Monitoring Spring Ecosystems

## Importance

Springs are important water sources in arid landscapes, supporting unique plant associations and sustaining high levels of biotic diversity. Because springs rely on groundwater, they can serve as important indicators of change in local and regional aquifers. On the Colorado Plateau, springs also provide vital habitat for both endemic and regionally rare species, including several types of orchids and declining populations of leopard frogs. Throughout the Southwest, more than 90% of springs have been developed for human or livestock use in historic times. Springs on National Park Service lands can provide reference condition data for degraded springs in other areas.



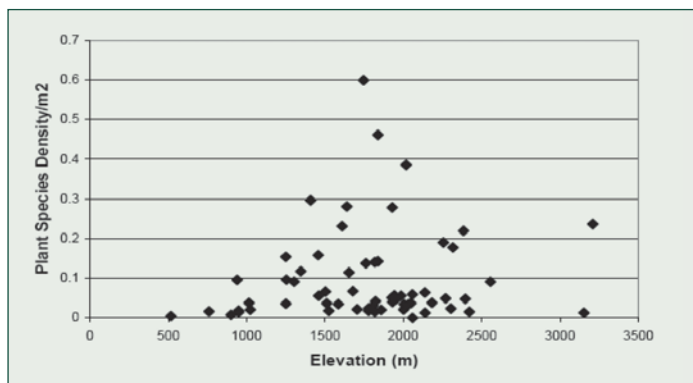
Spring-fed hanging garden, Glen Canyon National Recreation Area.

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## Long-term Monitoring

Springs will be monitored on a five-year, rotating basis at selected sites in 12 Southern Colorado Plateau Network (SCPN) parks. Spring flow and water quality will be monitored, and the total habitat area associated with

each spring will be measured. In addition, aquatic and terrestrial macroinvertebrates will be sampled, and the composition and structure of wetland vegetation will be described (see graph). Human alterations and impacts will be documented, and their effects tracked. A comprehensive inventory of 79 selected springs in and near parks across the Colorado Plateau was completed in 2005. Additionally, spring sites were inventoried at Canyon de Chelly National Monument in 2006.



Plant species density (species/m<sup>2</sup>) as a function of elevation across Colorado Plateau springs. This graph shows that plant diversity here varies non-linearly with elevation, with greatest species diversity at intermediate elevations.

## Management Applications

Historically, springs on the Colorado Plateau have been widely used as domestic and livestock water sources. At some springs within SCPN parks, the remnants of previous land use, such as water diversions and spring boxes, are still visible—and their impacts, including altered vegetation composition, are still evident. The effects of visitor use, including water pollution, social trailing, and trampling, are also a concern in some parks. Potential decline in flow due to groundwater withdrawals outside park boundaries threatens springs in many parks. Climate change, especially altered precipitation regimes, can also change groundwater availability, resulting in altered spring flow and habitat availability.

The first few years of monitoring data will be used to establish current conditions in SCPN springs. Over the long term, these data will be used to (1) track trends in spring flow, water quality, and biotic diversity, (2) document effects of human impacts on spring ecosystems, (3) determine ranges of hydrologic and biologic variability in spring ecosystems, and (4) document spring ecosystem response to climate change.

## Contact

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### Network park units where springs will be monitored

Bandelier NM	Mesa Verde NP
Canyon de Chelly NM	Navajo NM
Chaco Culture NHP	Petrified Forest NP
El Morro NM	Salinas Pueblo Missions NM
Glen Canyon NRA	Walnut Canyon NM
Grand Canyon NP	Yucca House NM

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