



Siuslaw National Forest, © Allison Aldous/TNC

Fast Facts: Global

- Groundwater is about 30% of the world's freshwater. This is second only to ice & snow, and is much greater than all freshwater lakes & rivers.
- As the world's largest distributed source of fresh water, groundwater plays a central part in sustaining ecosystems and enabling human adaptation to climate variability & change.

Fast Facts: National

- About 90% of the freshwater supplies in the United States lie underground.
- According to the National Groundwater Association, nearly 40% of Americans rely on groundwater for their domestic supply.
- Across the entire United States, 17% of species listed under ESA are groundwater-dependent.
- The Forest Service is the largest source of fresh water supply under single management in the United States, which originates from the 193 million acres of land encompassed in National Forests and Grasslands.

Fast Facts: Local

- In Oregon, 40% of the drinking water for urban centers comes from groundwater; in rural areas, it's over 90%.
- There are more than 31,000 mapped springs in Oregon; however, most experts agree that this number is underestimated.
- In Oregon, nearly 40% of species of conservation concern are dependent on groundwater for some part of their life cycle, including salmon, bull trout, and many amphibians and plants.

Groundwater Dependent Ecosystems Across National Forests



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Groundwater is the water that fills the openings in soil and rocks. About 25% of all the rainfall in the United States soaks into the ground and becomes groundwater. Springs, along with many streams, lakes, and wetlands, receive groundwater as a major source of water. Groundwater maintains water levels and flows, and the temperatures and chemistry unique to an aquifer's geology. Ecosystems that rely on access to groundwater to maintain ecological structure and function are termed *groundwater-dependent ecosystems*, or GDEs. GDEs provide countless ecosystem services such as natural water storage, cold water, late summer flows, sediment retention, carbon storage, and habitat for unique plants and animal communities. Pressures on groundwater, affecting both quality and quantity, have the potential to impact the ability of GDEs to support both ecological needs and human uses. To utilize groundwater in an ecologically sustainable manner, we must develop an approach to balance the groundwater needs of society with those of GDEs.

Managing Groundwater Resources: A Partnership

The USDA Forest Service and The Nature Conservancy (the Conservancy) have formed a partnership to develop and implement a comprehensive program to promote long-term maintenance, restoration, and protection of groundwater resources and GDEs. Through this partnership, the Forest Service and the Conservancy are working together to inventory, monitor and steward groundwater resources and the ecosystems that depend on groundwater for their health and viability. This partnership, which began in the Pacific Northwest, is expanding across both organizations to address GDEs at a broader scale.

Groundwater-Dependent Ecosystems are Nature's Expressions of Buried Treasures



Wallowa-Whitman National Forest, © Leslie Bach/TNC

The Partnership: Accomplishments

Despite the importance of groundwater for biodiversity conservation, there is little information describing the types and distribution of GDEs across the nation and their sensitivity to different kinds of disturbance. Many agencies and organizations advocate for groundwater protection for human health, but the Conservancy and the Forest Service have been the leaders in advancing awareness of GDEs in the US. These two organizations have collaborated on programs to inform decisions regarding the stewardship and protection of GDEs. One outcome of this collaboration has been the development and testing of protocols to inventory and monitor GDEs across National Forests and Grasslands.

To address the question of balancing the ecosystem and human needs for groundwater, the Conservancy and the Forest Service are developing methods for determining "Environmental Flows and Levels for GDEs". Environmental Flows and Levels are defined as "...the quantity, quality, timing, and range of variability of water flows and levels needed to sustain or restore freshwater and estuarine ecosystems and the functions and services they provide...". Initial methods were developed for wetlands on the Fremont-Winema National Forest; these methods are now being tested and refined for inter-dunal wetlands on the Siuslaw National Forest, swale wetlands on the Sheyenne National Grassland in North Dakota, and springs on the Ochoco National Forest in Oregon. Once completed, these methods will serve as guidelines to help managers make decisions about resource management and protection.



Deschutes National Forest, © Allison Aldous/TNC

Moving Forward

Much work has been done in this important partnership. There is much work still to do. We are only beginning to realize the benefits from fostering the Forest Service - Conservancy partnership and sharing lessons learned with other resource managers. Advancing the collective understanding of groundwater and GDEs across the nation, filling critical data gaps, and developing and implementing water management strategies will help ensure that groundwater resources are protected to sustain ecosystems and meet water needs for humans, especially in the face of climate change.



Columbia Spotted Frog, © Allison Aldous/TNC

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The Nature Conservancy is a leading conservation organization working around the world to protect ecologically important lands and waters for nature and people. In Oregon, the Conservancy owns or manages over 40 nature preserves and has helped protect over 500,000 acres of important habitats, with support from over 19,000 member households. Learn more at nature.org/oregon.