



Sustainable Groundwater Resources

NGWA Perspective

Groundwater, a basic life-sustaining and economic resource, must be managed locally through best practices of states and local governments and their residents and businesses recognizing the range of domestic, municipal, industrial, ecological, and agricultural uses it supports for their communities' continued well-being.

Significance of Groundwater

- Groundwater is the world's most extracted raw material with withdrawal rates currently estimated at 982 km³/year.¹ In the United States, groundwater extraction is approximately 76 bgd (105 km³/yr).²
- About 60% of groundwater withdrawn worldwide is used for agriculture; the rest is almost equally divided between the domestic and industrial sectors.³ In the United States, 71% of groundwater withdrawn is in agricultural use.⁴
- In many nations, more than half of the groundwater withdrawn is for domestic water supplies and globally it provides 25% to 40% of the world's drinking water.⁵ In the United States, about 23% of groundwater withdrawn provides for domestic and public water supply.⁶
- Globally, about 38% of irrigated lands are equipped for irrigation with groundwater.⁷
- In the United States, groundwater discharge contributes 40% of the baseflow of streams⁸ and significant discharge to most wetlands.
- Other essential purposes of groundwater are for maintenance of physical and chemical properties supporting ecosystems of shallow aquifers, streams, and coastal waters.⁹

Groundwater Sustainability Defined

Promote conservation and reuse of water as alternate sources for future use.

Groundwater sustainability is defined as “the development and use of groundwater resources to meet current and future beneficial uses without causing unacceptable environmental or socioeconomic consequences.”

Unacceptable consequences of the development and use of groundwater include excessive water-level declines, lost production, dry wells, reduction or cessation of spring flow, loss of wildlife and aquatic habitat, land subsidence, water-quality deterioration, and contamination resulting in illness, disease, and mortality of people and wildlife.

Principles to Guide Best Practices for Groundwater Resource Sustainability

NGWA identifies Principles for Groundwater Sustainability that states, local governments, businesses, and Association members may incorporate in best practices to provide sustainable groundwater resources and associated infrastructure for the well-being of communities:

- (1) Collaborate with adjacent local and regional jurisdictions within and among states and nations.
 - a. Recognize groundwater flows under jurisdictional boundaries
 - b. Develop a common understanding of the groundwater resource and influential factors
 - c. Conduct a local and state groundwater resource audit and develop a water budget
 - d. Share water plans, objectives, and data for local and state water management
- (2) Set groundwater resource objectives and forecast water demand.
 - a. Establish publicly vetted aquifer objectives for groundwater availability in future uses
 - b. Adopt aquifer management/groundwater use rules, codes, and laws
 - c. Evaluate future water uses and compare with available groundwater and alternatives
- (3) Incorporate the hydrologic cycle and natural processes in groundwater management.
 - a. Store water underground to reduce evaporative loss and protect groundwater quality
 - b. Facilitate recharge by use of green infrastructure and native-vegetated landscapes
 - c. Maintain groundwater levels to avoid nonrecoverable land subsidence
 - d. Preserve groundwater levels, flow, and quality for ecosystem biodiversity
- (4) Minimize the carbon footprint of groundwater infrastructure and production.
 - a. Evaluate water supply alternatives for minimizing life-cycle footprint and costs
 - b. Use most efficient pumps, equipment, and production processes
 - c. Reduce water loss in storing and delivering groundwater
 - d. Promote conservation and reuse of water as alternate sources for future use
- (5) Implement source water protection and remediation for private and public groundwater uses.
 - a. Eliminate or reduce sources of contamination
 - b. Protect usable groundwater from future contamination through practices and laws
 - c. Remediate contaminated groundwater
- (6) Measure, report, and share resource status data with residents and other jurisdictions.
 - a. Monitor groundwater levels, quality, and use
 - b. Report on achievement of groundwater resource objectives

- (7) Prepare to avoid disruption from extreme events affecting reliable safe groundwater supply.
 - a. Consider effects of extreme weather events and human interventions
 - b. Identify and address water supply vulnerabilities of infrastructure and operations
 - c. Establish processes for timely recovery of water services to communities
- (8) Reassess groundwater management on regular intervals.
 - a. Evaluate availability, source, protection, provision, use, and resilience alternatives
 - b. Conduct life-cycle assessments of natural and constructed infrastructure
 - c. Adjust codes, laws, and practices for cost-effective provision of safe sustainable water

Consultation to Communities, Businesses, and Governments

NGWA offers to work with communities, businesses, and governments to identify capabilities within its membership to assist in developing plans and conducting best practices using these principles to provide safe sustainable groundwater resources to support their health and natural and economic vitality.

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Date

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The National Ground Water Association is a not-for-profit professional society and trade association for the global groundwater industry. Our members around the world include leading public and private sector groundwater scientists, engineers, water well system professionals, manufacturers, and suppliers of groundwater-related products and services. The Association's vision is to be the leading groundwater association advocating for responsible development, management, and use of water.