








STRATEGIES FOR MANAGING AND SUSTAINING GROUNDWATER DEPENDENT ECOSYSTEMS IN NEVADA






Groundwater-dependent ecosystems (GDEs) are ecosystems that rely on groundwater for all or part of their water needs. GDEs are extremely important to plants and wildlife, with almost half of Nevada’s endemic species associated with GDEs. GDEs are also critical for human uses, including drinking water, agriculture, water quality improvements, and recreation. Recently, an assessment of 12 stressors and threats to GDEs in Nevada found GDEs across the state are projected to have less water available from the atmosphere in the future (2022-2060), which will compound other stressors and threats they face. Strategies are needed to provide direction and prioritization for reducing the risks of these stressors and threats to ensure that GDEs are managed and sustained for future generations. Each ideal strategy for this purpose should have the following characteristics:






- **Specific** (i.e., strategy addresses goal and leads to actions to connect to the strategy, but is not an action in itself)
- **Useful** (i.e., for communicating to leadership, articulating the need for funding or capacity, or prioritizing actions)
- **Plausible** (i.e., rational, logical, and realistically achievable)

Stressors (S)

-  S1: Groundwater pumping status
-  S2: Declining groundwater levels
-  S3: Current climate
-  S4: Ungulate impacts
-  S5: Non-native species presence
-  S6: Surface diversions
-  S7: Current urbanization

Threats (T)

-  T1: Appropriation status
-  T2: Potential withdrawal proximity to GDEs
-  T3: Future climate
-  T4: Non-native species presence
-  T5: Future urbanization

Strategies	Example actions	Stressors/threats addressed
SCIENCE AND MONITORING		
<i>Knowledge and data can reduce uncertainty, increasing the likelihood that other strategies can be successful.</i>		
Increase understanding of co-benefits of healthy and restored GDEs	<ul style="list-style-type: none"> • Gather/analyze data on carbon dynamics in GDEs in NV • Develop models and framework tools to estimate co-benefits • Quantify ecosystem services of GDEs 	
Increase monitoring and reporting over space and time	<ul style="list-style-type: none"> • Monitoring and reporting of non-native species and groundwater levels • Permanent monitoring networks • Bioblitzes • Citizen science monitoring 	
POLICY		
<i>Policy changes can refine governance structures at the federal, state, or local level that support GDE management.</i>		
Enact policies to reduce current excessive groundwater withdrawals & overappropriation to protect GDEs	<ul style="list-style-type: none"> • Enable voluntary permanent retirement of groundwater rights • Incentivize GDE protections • Set limits or allocations on groundwater consumption 	
Enact policies to prevent future groundwater withdrawals that would negatively affect GDEs	<ul style="list-style-type: none"> • Use conservation easements and land withdrawals to protect areas with important GDEs • Incorporate considerations for GDEs in Code of Federal Regulations and NV water law 	
Include requirements for maintaining or protecting GDEs in regulation, codes, and laws for land and water management and economic development	<ul style="list-style-type: none"> • Enact policies to apply Smart-from-the-Start planning to prioritize areas where development can have minimal or no impacts to GDEs • Enact policies that require and implement management plans for federal or state listed or sensitive species • Include protection for vulnerable GDE species in zoning codes and Federal, State or local codes, regulations or other policies 	

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MANAGEMENT Management commitments can bolster informed decision-making and on-the-ground action to conserve GDEs.		
Include consideration of GDEs in permitting, guidance & large-scale planning documents to identify and prioritize areas for protection and management of GDEs	<ul style="list-style-type: none"> • Include NV iGDE database in BLM GIS layers and GIS layers used by staff • Use NV iGDE database to prioritize management and conservation of GDEs • Incorporate BMPs in permit issuances and renewals that help sustain GDEs 	
Increase the pace and scale of restoration of GDEs in time and space	<ul style="list-style-type: none"> • Prepare programmatic EISs/EAs to specify actions that can conserve or improve resiliency for GDEs • Invest in or fund GDE restoration projects • Integrate incentives for restoring GDEs in land or water management funding opportunities 	
Incorporate collaboration, including public-private partnership, to manage and sustain GDEs	<ul style="list-style-type: none"> • Identify and promote incentive and disincentive programs to manage and sustain GDEs through public-private partnerships • Implement Candidate Conservation Agreements with Assurances to conserve GDE habitat for at-risk species • Implement partnerships and co-management to leverage and prioritize work to manage and sustain GDEs 	
EDUCATION AND OUTREACH Awareness and communication can foster collaboration to implement successful strategies		
Increase awareness of the value of GDEs and the need to protect and reduce impacts to them	<ul style="list-style-type: none"> • Partner with networks and local groups to learn about management options and share knowledge of GDEs • Build and use accessible K-12 and higher education curricula about groundwater and GDEs • Educate legislators and judges about groundwater and GDEs to enable informed decision-making on issues that can affect GDEs • Educate and involve disadvantaged communities to empower them to take action and participate in sustainable planning for GDEs and groundwater • Educate recreational users about GDEs 	
Increase communication among water users, administrators, managers and academics about GDEs	<ul style="list-style-type: none"> • Promote communication between different levels of agencies, organizations, landowners and the public to coordinate management • Interact with indigenous communities while respecting sovereign ownership of knowledge 	



For more information, see <https://www.groundwaterresourcehub.org/where-we-work/nevada/strategies-for-managing-and-sustaining-gdes/> or contact Laurel Saito at laurel.saito@tnc.org