

STRATEGY 2

Increase monitoring and reporting over space and time

Why this strategy is needed

Lack of data (including indigenous knowledge; Fillmore 2017) can make it difficult to understand dynamics, threats, and best approaches for management to sustain GDEs (Saito et al. 2021). Access to data can reduce conflict and confusion while also informing management decisions (Christian-Smith and Abhold 2015; Mawdsley et al. 2009). For example, the assessment of stressors and threats to Nevada GDEs (Saito et al. 2022a) noted the lack of sufficient groundwater data to assess any groundwater trends in almost 10% of Nevada’s 256 administrative groundwater basins. Furthermore, <1% of springs and <22% of phreatophyte communities in Nevada were within 800 m of wells with sufficient data to be analyzed for an assessment of groundwater levels between 2002 and 2021 (Saito et al. 2022b). Another study estimated that ~44% of probable GDE areas may be associated with significant groundwater level declines between 1985 and 2021 (Saito et al. 2022c), but this was based on a small fraction of sites that had sufficient monitoring data near GDEs. Monitoring and reporting data are also needed for non-native species. Studies have reported that the introduction of non-native species at springs had resulted in extirpation of native species (Miller et al. 1989; Williams and Sada 2021), but only 7% of springs were assessed at high risk for non-native species presence in Saito et al. (2022a) based on reported data. Increasing the availability of data through monitoring and reporting over space and time can be useful for more strategic management actions.

Examples of actions associated with this strategy

- Improve monitoring and reporting of non-native species at springs and other GDEs, including repeat measurements
- Increase monitoring of groundwater levels throughout Nevada, especially at GDEs, including permanent monitoring networks and repeated measures
- Use Nevada Indicators of Groundwater Dependent Ecosystems (iGDE) database (available [here](#)) to inform Assessment, Inventory, and Monitoring (AIM) for lotic and lentic systems
- Use bioblitzes and citizen science monitoring

Challenges and considerations

Monitoring and reporting requires funding and commitment from agencies and NGOs where staff capacity is often a limiting factor. Monitoring and reporting alone will not result in reduced impacts to GDEs; the data need to be translated to action by being used with management, policy, and education strategies. Importantly, coordination of data collection and management is challenging, and an open-sourced platform for data reporting and dissemination could be helpful for making this strategy more effective. In addition, monitoring and reporting protocols

are needed for data to be consistent, respect privacy issues, and be reported in a timely and effective manner. Where resources are limited, a phased approach with prioritization could be used, and remote sensing or other technologies may be more appropriate. California’s Sustainable Groundwater Management Act could be considered as an example for how to implement a statewide monitoring strategy in Nevada.

Qualitative assessment of the effectiveness of Strategy 2’s ability to reduce the impacts of each GDE stressor and threat.

STRESSOR RISK	EFFECTIVENESS
S1: Groundwater pumping status	<i>Somewhat Likely</i>
S2: Declining groundwater level trends	<i>Somewhat Likely</i>
S3: Current climate	
S4: Ungulate impacts	<i>Somewhat Likely</i>
S5: Non-native species presence	<i>Somewhat Likely</i>
S6: Surface diversions	<i>Somewhat Likely</i>
S7: Urbanization	
THREAT RISK	EFFECTIVENESS
T1: Appropriation status	<i>Highly Likely</i>
T2: Potential withdrawal proximity to GDEs	<i>Somewhat Likely</i>
T3: Future climate	<i>Somewhat Likely</i>
T4: Non-native species spread	
T5: Future urbanization	

