PROTECTING GROUNDWATER DEPENDENT ECOSYSTEMS

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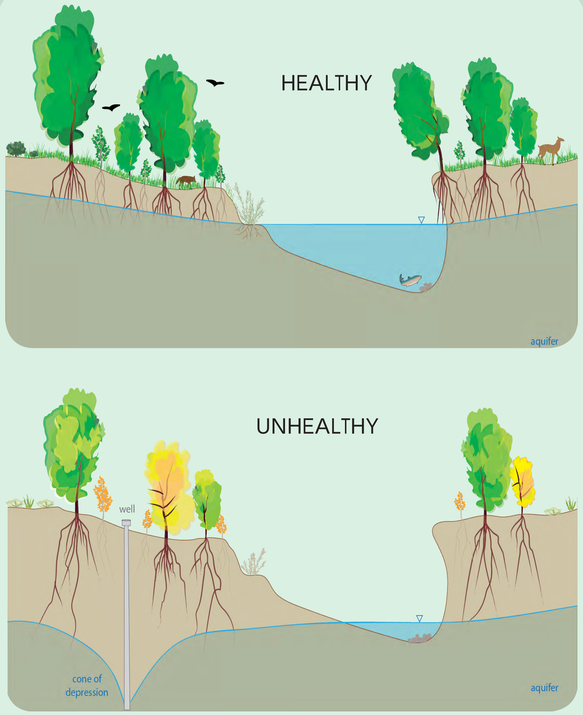
SGMA AND HOW IT WORKS

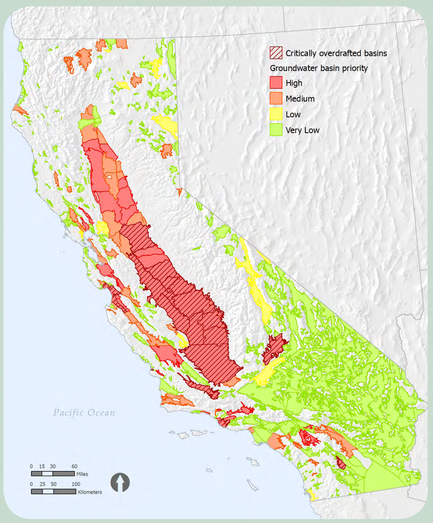
Groundwater is essential to California's agriculture, urban uses, flora, and fauna. Historically, limited regulation of groundwater has resulted in groundwater withdrawals that far exceed their rate of replenishment. Unsustainable groundwater use can reduce groundwater levels, streamflow, and water quality, which may adversely impact native species and habitats.

In 2014, California enacted landmark legislation, the Sustainable Groundwater Management Act (SGMA) that:

- Empowers Groundwater Sustainability Agencies to sustainably manage groundwater resources for current and future social, economic, and environmental benefits (Rohde et al. 2018)
- Requires basins to develop a plan for sustainable groundwater withdrawals within 20 years
- Requires that groundwater dependent ecosystems (GDEs) are identified and impacts are considered when setting sustainable management criteria, particularly where species and habitats are protected by federal, state, or local regulations



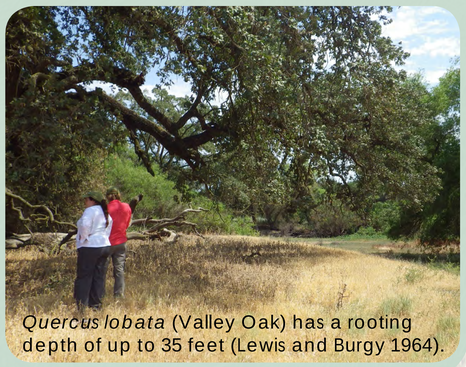
Pumping can alter the groundwater elevation causing the water table to decline below the rooting depth of groundwater dependent vegetation.



20 of California's 515 groundwater basins are considered critically overdrafted and over half lie within the Central Valley (DWR 2019).

IMPORTANT ACRONYMS

- GDE: Groundwater Dependent Ecosystem
- GSA: Groundwater Sustainability Agency
- GSP: Groundwater Sustainability Plan
- SGMA: Sustainable Groundwater Management Act



Quercus lobata (Valley Oak) has a rooting depth of up to 35 feet (Lewis and Burgy 1964).

GROUNDWATER DEPENDENT ECOSYSTEMS

WHAT ARE THEY?

GDEs are ecological communities of species—including plants, animals, and natural communities—that depend on groundwater emerging from aquifers or shallow groundwater for all or a portion of their water needs (State of CA 2014, Rohde et al. 2018).

GDEs are directly linked to groundwater in two ways: through groundwater-surface water interactions and direct connection through roots. As such, the focus of mapping GDEs is generally on trees because they are the linkage between the ecosystem and the aquifer.

WHERE ARE THEY?

GDEs occur in a variety of different environments ranging from seeps and springs, to groundwater-dependent wetlands, to river corridors enriched by groundwater or groundwater/surface water exchange. GDEs include nearly 400 mapped natural communities, over half of which are sensitive natural communities and many of which are habitat for rare plant, fish, and wildlife species.

WHY DO WE CARE?

Groundwater pumping and land conversion have decimated our GDEs – less than 6% of historical riparian vegetation and wetlands remain today (Bay Institute 1998). In California, this pumping has resulted in declines in:

- groundwater levels
- baseflow in rivers
- surface water flows

GDEs provide ecosystem services – everything from reducing flood risk and purifying our water to carbon sequestration and recreation. When groundwater is not managed sustainably, ecosystems suffer along with the flora and fauna that depend on them.

HOW ARE THEY PROTECTED?

The graphic below illustrates the steps local agencies can take to meet SGMA requirements, and highlights the interdisciplinary nature of assessing and protecting GDEs.

Identify GDEs
Data inputs:
- vegetation map
- depth to water
- geology
- special-status plant and animal occurrences

→ **Determine potential effects & predict future effects**
- trends in groundwater level
- hydrology
- rooting depth of plants
- predicted groundwater withdrawals

→ **Set sustainable management criteria**
- set sustainability goal with consideration of GDEs
- set minimum thresholds for: groundwater level, groundwater storage, seawater intrusion, water quality, land subsidence, and surface water connection
- set measurable objectives

→ **Monitor progress & success**

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Identify ways to maintain or improve GDEs
- groundwater recharge
- habitat restoration
- groundwater trading

ANALYSIS REQUIREMENTS

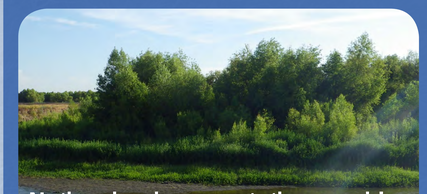
Evaluating GDEs is a multidisciplinary effort that synthesizes hydrologic and water quality data with ecological trends and condition of vegetation, fish, and wildlife. The quality of input data is critical to accurately assess GDEs.

To effectively protect ecological resources through SGMA, the following data are crucial:

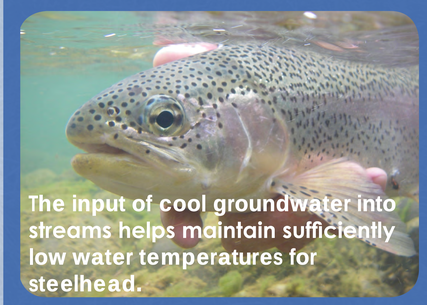
- High resolution depth to groundwater modeling data, including information on shallow groundwater
- High quality vegetation mapping data
- Rooting depths of plant species
- Understanding groundwater-surface water interactions

Species can be directly reliant on groundwater (e.g. willows and oaks, which rely on groundwater during the dry season) or indirectly reliant on groundwater (e.g. the willow flycatcher that depends on the willow for breeding and nearby surface water for nesting sites) (Rohde et al. 2019).

Coast redwood alluvial forests provide habitat for the endangered marbled murrelet and coho salmon.



Native riparian vegetation provides nesting and foraging habitat for birds, including least bells vireo and willow flycatcher.



The input of cool groundwater into streams helps maintain sufficiently low water temperatures for steelhead.

Seasonal wetlands support California red-legged frog and provide breeding habitat for California tiger salamander.

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