

Permanent Wetlands Habitat Vulnerability Assessment Summary

Overall Vulnerability

Permanent Wetlands	Score (1-5)	Confidence (1-3)
Sensitivity	Moderate-High (4)	High (3)
Exposure	Moderate-High (4)	High (3)
Adaptive Capacity	Low-Moderate (2)	High (3)
Vulnerability	Moderate (3)	High (3)

Sensitivity

Climate-driven Stressors	Potential Impacts
Snowpack	Permanent wetland irrigation comes largely from water in snowpack and reservoir storage. Reductions in permanent wetland acreage due to water availability are well documented.
Precipitation timing and amount	Changes to the frequency, abundance, and nature of precipitation events will affect regional hydrology and the persistence and functioning of wetlands. Precipitation changes can influence a wetland's hydroperiod.
Drought	Substantial drying during the summer months will affect hydrologic regimes and soil moisture, which will impact wetland vegetation composition, structure, extent, and functioning and could shift some permanent wetlands to seasonal wetlands.

Non-climate Stressors	Potential Impacts
Land use change	Unprotected wetlands are vulnerable to future land use conversion.
Invasive species	Invasive species displace native species, altering wetland function and services. Prolonged warming and a longer dry season could shift some permanent wetlands to seasonal wetlands, allowing more xeric plants to encroach.
Nutrient loading	Increased nutrient availability can increase production of algae, decrease dissolved oxygen, and alter the species composition of plant, invertebrate, and aquatic vertebrate communities.
Groundwater overdraft	Groundwater overdraft may affect permanent wetlands where it is relied upon in place of other stored water source, in the San Joaquin Valley.
Pollutants and poisons	Permanent wetland habitats are affected by pesticides from adjacent lands, roads, and the ag practices conducted in/on them-- mercury, salts, heavy metals, and agricultural runoff. Wetlands could be seen as a source of mercury in the Delta.
Hunting	Funds for wetland protection and restoration are largely provided by hunting. In some cases, wetlands have been converted when hunting value declines.

Disturbance Regimes	Potential Impacts
Flooding	Flooding and high peak flows can benefit permanent wetlands, and flood magnitude and duration are important factors. Natural scouring from high water flows has been replaced by tractor disking; important for maintaining mosaic habitat for GGS.
Wind	Permanent wetlands are somewhat sensitive to extreme weather events, such as windstorms. high magnitude wind disturbances can affect wetland soil (sediment, deposition, and erosion), root growth, and vegetation survival .
Wildfire	Permanent wetlands are susceptible to high-severity fires, degrading wetland vegetation structure and composition.

Exposure

Projected Changes	Exposure Notes	Potential Refugia
Decreased snowpack and earlier snowmelt & runoff, resulting in less available stored water	Statewide, 1% or less of the current area of freshwater marsh is projected to remain suitable by the end of the century, and the small areas of marsh that are still suitable will likely occur as vegetation refugia	Sacramento Valley permanent wetlands, reservoirs/farm ponds in the Coast Range and Sierra foothills.
Increased drought	Less exposed than other habitats as long as stored water is available. Longer or more severe droughts are likely to impact habitat extent. Instream flow requirements for fish likely to further reduce water availability, especially during drought periods.	Regions where access to stored water is more secure- Sac Valley.

Adaptive Capacity

Extent, Integrity, and Continuity	Habitat reduced historically however freshwater wetland area has increased by about 30% from the mid-1980s. Changes from rice or other flooded crop can increase fragmentation; post-harvest flooding enhances landscape continuity. Canals may also provide wildlife corridors used by species such as the giant gartersnake.
Resistance & recovery	Most permanent wetlands are under some kind of easement, refuge, or other protection. Incentive programs can help private landowners to modify land use practices and restore native vegetation for conservation, but these programs don't compete well with other motivations for land use. There may be a growing desire to restore Central Valley wetlands for their multiple ecosystem services.
Diversity	Moderate overall habitat diversity with high species diversity. Tricolored blackbird, fish, and reptiles are the most sensitive component species.
Management potential	Moderate management potential. Highly managed, so easily manipulated, but valued less than flooded cropland and seasonal wetlands. Safe harbor agreements can promote restoration projects by allowing the incidental take of endangered species in exchange for habitat improvements that will benefit that species.