Climate Change Vulnerability Information
Wetlands Group

Sub-habitats:
Permanent wetlands
Seasonal wetlands and saline playas
Semi-permanent wetlands
Flooded cropland
Tidal wetlands and salt marsh
Estuarine

Species Groups and Species:
Dragonflies and damselflies
Wetland-obligate plants
Wetlands-dependent mammals
Wetland-dependent reptiles
Wintering and breeding water birds
Mallard
Tricolored blackbird

Description
The Central Valley of California is one of the most important regions for waterbirds in North America. Estimates indicate that California has lost over 90% of its original wetlands and what remains is highly fragmented. Nearly 90% of all wetlands are managed on a seasonal basis and about two thirds of all managed wetlands in the Central Valley are privately owned.

Waterbird habitats in the Central Valley that are critical to waterfowl and other wetland birds are dependent on snowpack and other precipitation for water supplies. The hydrology of most waterbird habitats in the Central Valley, which include wetlands, flooded rice fields, and other flooded agricultural lands, has been greatly modified. Natural overflow flooding from snowmelt and rain mostly has been replaced by managed flooding with controlled diversions and pumped water delivery from ditches, rivers, sloughs, and wells. Thus, the amount of water stored in reservoirs is crucial to determining the amount of waterbird habitat in the Central Valley. Rice fields provide a large proportion of the food habitat for many waterfowl and other waterbird species. (The above information was taken from Matchett et al., 2015, who cite multiple sources).

Sub-habitat distinctions:
Permanent wetlands are flooded year round.
Seasonal wetlands are typically flooded in the fall, with drawdown occurring between March and May.
Semi-permanent wetlands are usually flooded from early fall through early July.
Flooded cropland: The value of rice habitat for wetland dependent birds is increased by winter flooding in the post-harvest period. Many harvested cornfields are intentionally flooded in the Delta Basin to provide waterfowl habitat and decrease subsidence.

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Exposure – Measure of how much of a change in climate or other environmental factor a species or habitat is likely to experience.

Changes in timing, amount, and distribution of precipitation and snowmelt runoff have major impacts on waterbirds and wetland habitats. All models point to an overall reduction of water availability, and frequency and intensity of extreme events—drought periods as well as periods of high precipitation and flooding—are projected to increase for the region.

Climate change-related impacts that will affect water supply management controlling the timing and amount of water supplied to Central Valley wetland and waterbird habitats include:

- Intensified competition for water resources with agricultural and urban sectors (Matchett et al., 2015).
- Reductions in post-harvest flooded crop fields (Ackerman et al., 2011)
- Climate-induced changes in soil moisture that impact vegetation and associated fauna and insects surrounding wetlands will reduce ecosystem diversity (Matchett et al., 2015).
- Changes in crop types, idling of rice land to allow interregional water transfers (Matchett et al., 2015).
- Increased streamflow protection measures for fisheries. Streamflow requirements can impact waterbirds by restricting the timing and amount of water that can be diverted for waterbird habitat management (Matchett et al., 2015).

Sensitivity – measure of whether and how a species or habitat is likely to be affected by a given change in climate

Wetland habitats:

- Results of four climate-urbanization-water management scenarios through year 2065 demonstrate potential marked decreases in availability of Central Valley waterbird habitats.
- Expansive urbanization had a greater impact than strategic urbanization, on annual availability of waterbird habitat.
- Scenarios including extensive rice-idling or substantial instream flow requirements on important water supply sources produced large impacts on annual availability of waterbird habitat.
- In the year corresponding with the greatest habitat reduction for each scenario, the scenario including instream flow requirements resulted in the greatest decrease in habitats throughout all months of the wintering period relative to other scenarios. (Matchett et al., 2015)

Wetland Birds:

- Climate change is likely to exacerbate current stressors, further increasing extinction probability for threatened and endangered taxa. In California, many listed species are wetland-specialists (Gardali, 2012).
- Egg hatching, clutch sizes, and nesting season length are projected to decline for Mallard due to increased temperatures in the Central Valley (Ackerman et al., 2011)

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Adaptive Capacity – Ability to accommodate or cope with climate change impacts with minimal disruption.

- Reiter et al. 2011-- total area of flooded habitat has been relatively stable through that time-period, however there is significant year to year variation in the total amount of flooded habitat occurs in some basins. The Tulare Basin and the Delta Basin exhibited the largest year to year variation in flooded habitat. The largest extent of regular flooding (>30% of years) occurred in the northern part of the Valley, which largely represents flooded post-harvest rice as well as the extensive managed wetlands in this region.

- Stralberg et al. 2011-- 1.4 million ha would be required to conserve 50% of wintering waterbird populations. Agricultural habitats comprised a substantial portion of priority areas, suggesting that under current management conditions, large areas of agricultural land, much of it formerly wetland, are needed to provide the habitat availability and landscape connectivity required by shorebird and waterfowl populations.