

Helping the California Winter Rice Habitat Incentive Program increase bird use of winter-flooded rice fields

The Central Valley of California provides important habitat for waterbirds (waterfowl, shorebirds, and wading birds). With more than 90% of the historical wetlands in the Central Valley lost due to agricultural development and water diversion, flooding agricultural rice fields after harvest provides an important alternative source of wetland habitats in the fall and winter for waterbirds that migrate through and overwinter in California, especially in the Sacramento Valley. To encourage private landowners to flood rice fields during the fall and winter, the California Department of Fish and Wildlife's (CDFW's) California Winter Rice Habitat Incentive Program was established in 2018 and provides monetary incentives to private landowners that agree to follow a management plan and flood their post-harvested rice fields for at least 70 days between October 15 and March 15 for the benefit of waterbirds.

USGS researchers conducted bird and habitat surveys to evaluate the importance of rice fields enrolled in the CDFW's California Winter Rice Habitat Incentive Program and identified management strategies that could increase waterbird use of these enrolled lands. USGS surveyed 253 rice checks (2,158 ha) in the Sacramento Valley during the fall and winter of 2021-2022 and 2022-2023. In total, 57 different bird species from 16 families used fall and winter-flooded rice fields and several individual rice checks contained > 12,000 birds. Dabbling ducks comprised 86% of all birds using flooded rice fields. USGS researchers estimated that properties enrolled in this public-private partnership provided habitat for at least 271,312 birds per day on the 16,248 ha of enrolled properties in 2021-2022 and 147,315 birds per day on the 8,448 ha of enrolled properties in 2022-2023, totaling >10 million bird-use-days each winter.

USGS researchers identified habitat variables that were most strongly related to bird use of flooded rice field habitats and could be managed and prioritized by landowner incentive programs to increase bird use of winter-flooded rice fields. Habitat variables included water depth, variation in the height of emergent vegetation, the availability of mudflat habitat, the shape of the rice check, the intensity of waterfowl hunting within the rice field, and the post-harvest treatment of the residual rice straw. Water depth had the greatest influence on waterbird abundance and diversity. Relatively shallow water depths (≤ 13 cm) had greater abundance of shorebirds, wading birds, and geese, and had higher diversity, whereas intermediate depths (~ 23 cm) resulted in the greatest abundance of dabbling ducks. Higher species-



Winter-flooded rice field, Sacramento Valley, California. (Photo: USGS)

MANAGEMENT IMPLICATIONS

- Water depth was consistently one of the most influential habitat variables for waterbird abundance and diversity.
- Flooding rice fields early in the fall, when fewer alternative flooded habitats are available in the Central Valley, and staggering the timing of flooding may increase bird use of flooded rice fields.
- Maintaining a diversity of habitats in flooded rice fields, such as varying the height of emergent vegetation and including some mudflats may increase bird diversity.

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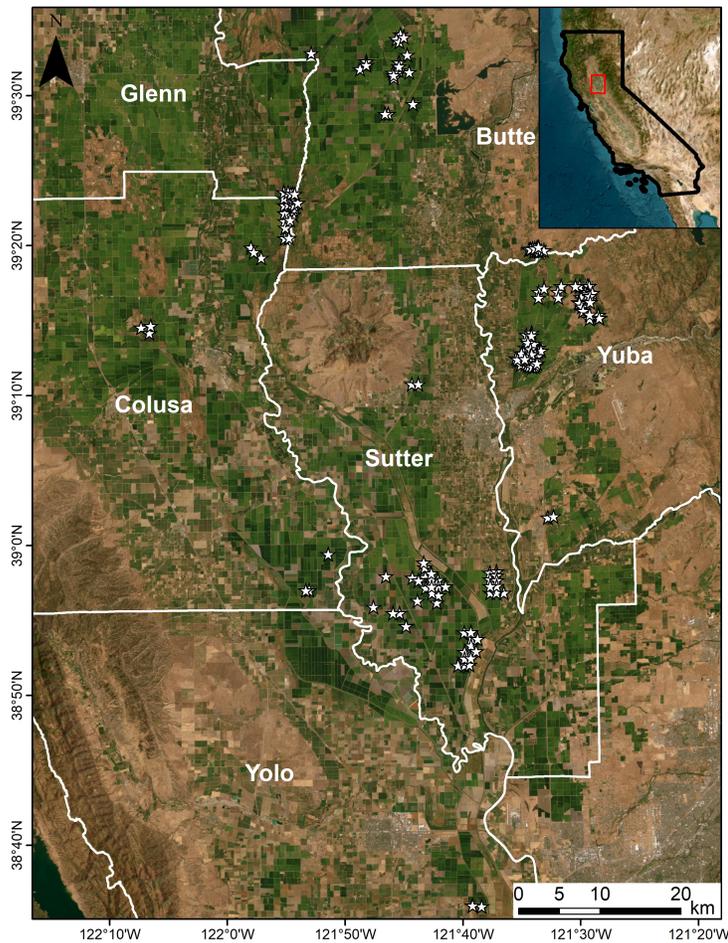
This spotlight refers to the following publication and data release:



Publication
<https://doi.org/10.15447/sfew.2024v22iss3art3>



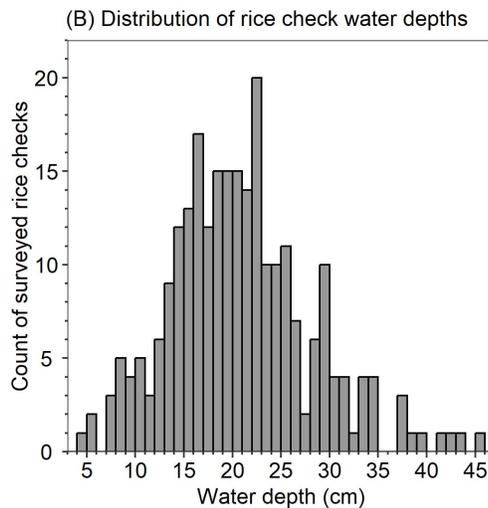
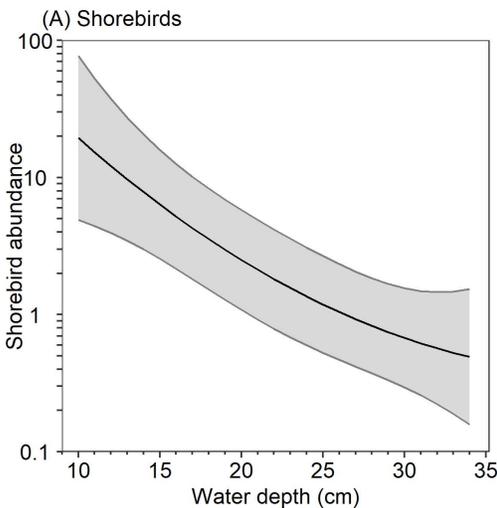
Data Release
<https://doi.org/10.5066/P9S48E60>



Locations of rice fields (stars) surveyed for waterbird use within the Sacramento Valley, California during the winters of 2021-2022 and 2022-2023. Counties are labeled in white. The inset map outlines California in black and delineates the main map in red.

and family-level diversity was observed in rice checks with greater variation in the height of emergent vegetation (vegetation above the surface of the water).

Bird density and overall bird abundances within flooded rice fields were also related to when rice fields were flooded. Abundance of all birds, ducks, geese, and wading birds were greatest and species richness and family diversity were highest 8 days after the onset of flooding in rice fields (typically late October), followed by a decline in bird use until approximately 65-87 days after the onset of flooding. After 83 days of flooding, overall bird abundances began to increase again until 127 days after flooding (150% increase from the lowest abundances). Prioritizing rice fields that could be flooded early in the enrollment period, when fewer alternative flooded habitats are available in the Central Valley could increase bird use of rice fields enrolled in the CDFW's California Winter Rice Habitat Incentive Program. Results also indicate that bird use might increase if rice fields had staggered flooding, especially early in the fall, that would maintain a portion of fields throughout the season that were either flooded for less than 30 days or greater than 100 days, flooding regimes that had higher overall bird densities observed in this study.



Model-averaged predictions (with 95% confidence intervals) for the abundance of (A) small and medium shorebirds, correlated with the water depth of winter-flooded rice fields in the Sacramento Valley, California. The range of depths for panel A includes the 5th to 95th quantile of observed water depths for all surveyed rice checks. Predictions were generated for the winter of 2021-2022 by holding all other variables in the model at their median or most values, except for days since flooding started, which was set at 20 days. Panel B shows the distribution of the mean water depths that were observed within all 253 rice checks that were surveyed during the winters of 2021-2022 and 2022-2023.