

## CASE STUDY

# Enhancing Rice Agriculture in California's Central Valley



Long-billed Curlew (*Numenius americanus*) in a flooded rice field. Photo credit: Drew Meyers.

**LOCATION:** Sacramento Valley of California, USA

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**LAND OWNERSHIP:** The majority of the land is privately owned and farmed; the dominant crop is rice.

## Focal Habitat

» Agriculture

## Habitat Goal

To protect and enhance agricultural habitat in California's Central Valley to sustain healthy migratory shorebird populations in the Pacific Flyway in the face of changes in land use and climate.

## Species Benefitted

Most shorebird species that use the inland portion of the Pacific Flyway in California rest and forage in post-harvest flooded rice fields in the Sacramento Valley (northern portion of Central Valley). The most abundant species include Dunlin (*Calidris alpina*), Dowitchers (predominantly Long-billed; *Limnodromus scolopaceus*), Least Sandpiper (*Calidris minutilla*), Western Sandpiper (*Calidris mauri*), Greater Yellowlegs (*Tringa melanoleuca*), Killdeer (*Charadrius vociferous*), and Long-billed Curlew (*Numenius americanus*).

## Threats to Shorebirds at Site

The Central Valley of California has lost over 90% of its natural wetlands. Today in the Sacramento Valley, approximately 150,000 hectares of flooded, post-harvest rice fields complement the 33,000 hectares of managed seasonal wetlands to provide a mosaic of flooded habitats for waterbirds—some of which are suitable for shorebirds given their shallow water depth and sparse vegetation. Threats to this mosaic include conversion of rice to permanent crops such as trees and vines that are not waterbird-friendly, urban expansion and development, and the availability of water for both growing rice and flooding fields after harvest, especially in times of water scarcity. Changing cultural practices of farmers may also be a threat, if for example, more choose to physically remove cut straw from their fields instead of flooding for onsite decomposition.

## Actions Taken to Improve Habitat for Shorebirds

Audubon California, Point Blue Conservation Science, and The Nature Conservancy have worked directly and collaboratively with local rice farmers, the California Rice Commission, and the United States Department of Agriculture's Natural Resources Conservation Service (NRCS) to develop rice field management practices that enhance the habitat value of farms for shorebirds and other waterbirds.

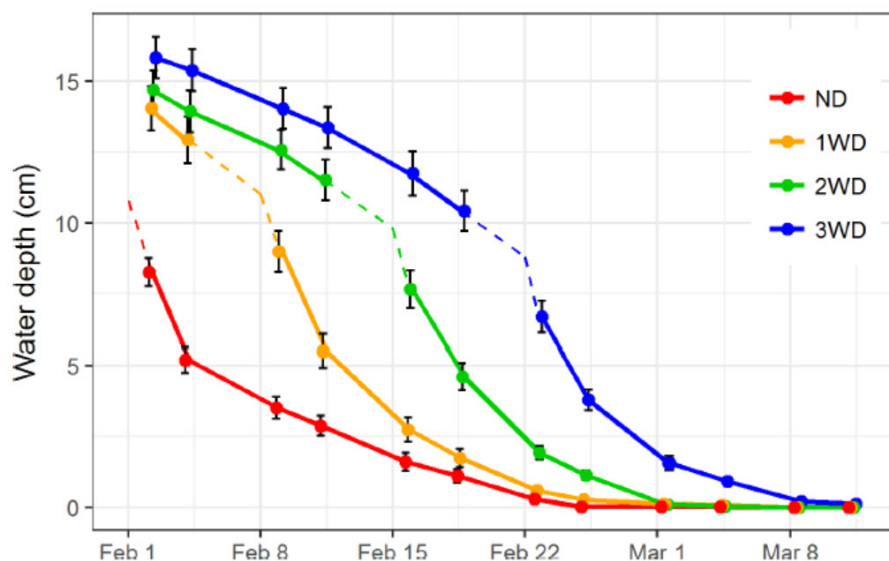
We started by identifying time periods when 1) shorebirds were moving through or using the area, 2) shorebird habitat was limited, and 3) the rice production cycle had the potential to provide improved habitat. We identified two key time periods when habitat is most limited for shorebirds, mid-July to September (during southbound migration) and March through mid-May (northbound migration).

Working with the rice growing community, we then developed and tested practices that farmers could incorporate into their operations to help alleviate habitat shortfalls for shorebirds in the Central Valley.

- » **Flooding Fallow Fields during southbound migration**—Between mid-July and September, when growing rice fields are still in production (with tall, dense vegetation), we recommend flooding fallow rice fields and other compatible agricultural fields (e.g. maize or wheat) and actively managing the water drawdown over a period of 3-4 weeks. Field studies demonstrated that providing shorebird habitat during southbound migration (fall) was critically important (Golet et al. 2018), confirming the results of bioenergetic modelling which identified this season as a time of consistent habitat shortfall in the Central Valley (Dybala et al. 2017).
- » **Staggered Drawdown during northbound migration**—Most rice farmers drain winter flooded rice fields at the end of January which allows fields to dry sufficiently before the farmers begin groundwork in March for planting in mid-April and May. We recommend actively flooding rice fields from November through January and then delaying the drawdown by two weeks or more and then staggering the dewatering of rice fields by 25% each week during February and March. Fields should have a starting depth of at least 10 cm (4 inches) before initiating drawdowns. This shift in the usual dewatering protocol extends the traditional flooding period and creates a mosaic of water depths that supports multiple waterbird guilds (Sesser et al. 2018).

## Outcomes

These studies and other research on alternative management strategies on rice fields informed the development of the



Delayed drawdowns of flooded rice fields extends the availability of shallow water habitat and supports waterbirds. Mean water depth  $\pm$  standard error for each survey occasion in each treatment over a six-week study period of the staggered drawdown of flooded rice fields during northbound migration. The known start date of each drawdown is indicated by the inflection point in each dashed line.

ND – no delay in water drawdown,  
1WD – one week delay in water drawdown,  
2WD – two week delay in water drawdown,  
3WD – three week delay in water drawdown.

Further delaying the drawdown would create similar habitat later and support migratory shorebirds during the peak of migration.  
*Figure from Sesser et al. 2018.*

NRCS Waterbird Habitat Enhancement Program (WHEP), which, over eight years, has enhanced over 120,000 acres of California ricelands for waterbirds and provided over \$15 million in federal Farm Bill funds to support on-the-ground conservation. This program helps to sustain production agriculture in the Sacramento Valley while simultaneously providing birds and other wildlife with flooded habitat to help offset substantial loss of wetlands over the past 150 years. **Results of field studies indicate that fields with applied habitat-enhancing practices can support up to 8 times more shorebirds than fields with traditional management (Strum et al. 2013, Sesser et al. 2018).**

Building on the success of the program developed with NRCS, The Nature Conservancy launched the BirdReturns program—applying a new funding model to similar practices. Farmers were invited to participate in a reverse auction bidding process, in which winning bids were selected based on their cost and potential to provide high quality shorebird habitat. This program is an important, dynamic complement to the NRCS program that seeks to provide habitat when and where the birds need it most (Reynolds et al. 2017). The BirdReturns program has contributed 50,000 additional acres to those provided through WHEP. Adaptive and appropriately timed (specifically between September and early October and March through early April) conservation incentive programs can effectively support large numbers of migratory shorebirds on private agricultural lands (Golet et al. 2018).

Audubon, The Nature Conservancy, and Point Blue Conservation Science also work at a policy level to ensure the longevity of these landowner incentive programs to support the implementation of bird-friendly agricultural practices. We participate in the Central Valley Joint Venture, a 20-member partnership devoted to conserving migratory birds and their habitats for the benefit of wildlife and the public, to develop habitat and population objectives for shorebirds in the Central Valley using the best available data. One outcome of our continued engagement in conservation policy is the recent passing of legislation to support a state-funded program to support winter flooding of rice fields.

## Advice/Precautions

» **Flooding Fallow Fields**—Enhancing habitat in the time period between mid-July and September requires fallow rice or other crop fields, which may be available in varying quantity each year. Water availability during this time period may be limited and caution should be taken to minimize the production of mosquitos near human-populated areas.



Dunlin (*Calidris alpina*) using a field with delayed drawdown in late winter (March). Photo credit: Monica Iglecia.

- » **Staggered Drawdown**—From an agronomic standpoint, late season rains coupled with delayed drawdowns of flooded fields have the potential to delay field preparation and planting. Additionally, water availability can be impacted by irrigation district maintenance or drought.
- » **Collaboration**—Collaborations and effective communication are essential to scaling conservation outcomes. Having a strong partner in the agricultural industry, the California Rice Commission, was paramount to reaching and engaging rice growers. The relationship with NRCS, a government agency with capacity and programs to support implementation was also critical. Bringing the landowners in at the beginning of this process and including them in development of the practices themselves provided an important opportunity for building trust and cultivating relationships. All of these pieces were key to the success of this program.

## REFERENCES

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Shallow flooded rice field enrolled in The Nature Conservancy's BirdReturns program. Also shown is the tractor that was used to incorporate residual rice stubble into the soil. *Photo credit: Greg Golet.*