



Shorebirds

- Legs are often long and thin.
- Bills thin. If long, then used to probe in the soil. If short, then used to peck food off the surface of the ground.
- Eat various bugs, worms and other invertebrates.
- 13 species use the Central Valley regularly.
- Some populations are declining; others are stable.

- Open mudflats or shallowly flooded environments.
- Some short, sparse vegetation is OK.
- Less than 40% vegetation cover is recommended.
- Remaining vegetation should be smashed or incorporated.

- Timing**
- Shorebirds are present in the Central Valley year-round.
 - Migration is a critical period when habitat is needed: spring (March to May) and fall (July to September).
- Depth**
- Saturated mudflat to 6 inches deep.
 - Variable water depth is ideal and will benefit a wider diversity of shorebirds and other waterbirds



Waterfowl

- Ducks, geese and swans
- Most have flat bills that filter plants, seeds and invertebrates from the water and mud for food.
- Webbed feet make them strong swimmers.
- Some populations are declining; others are stable.

- Open water is generally preferred for feeding.
- Some species like vegetation (cattails/tules) to hide in.
- Some dry land (berms or islands) is important for resting areas.
- Vegetation on resting areas should not be very dense. However, some species that breed in Central Valley would use denser vegetation for nesting.
- Forage plants for waterfowl (watergrass, smartweed and swamp timothy) will provide food during winter.

- Timing**
- Winter (October to March) is the most important time to provide habitat for waterfowl in the Central Valley.
 - Some species breed in the Central Valley from March to mid-July.

- Depth**
- Water depths from 6 inches to 18 inches are recommended.
 - Some species will use depths greater than 18 inches.
 - Forage plants may require additional irrigation in dry periods.



Pollinators

- More than 1,000 species of honey bees, native bees, butterflies and beetles.
- Wide range of sizes and colors, from tiny sweat bees less than ¼” long to monarch butterflies larger than 3”.
- Nearly all populations are declining.

- Prefer a diversity of native vegetation that flowers (providing food and cover) throughout the year.
- Plant vegetation along the sides and throughout the basin bottom.
- Drier areas should remain undisturbed (no disking) to provide nesting habitat in soil.

- Timing**
- Water should not inundate vegetation for long periods in areas designated as a dry zone because it can kill the plants and drowns the burrowing insects

- Depth**
- Plant in zones related to how much water each will likely receive. Some will only get winter rain, some flooded only occasionally, others flooded regularly.



Building multibenefit recharge basins

As California faces an unpredictable water future, policy makers and water managers across the state are seeking solutions to build resilience into our water supply system. Groundwater recharge is an excellent tool to replenish depleted aquifers and bank water for future use. In addition to helping water managers balance their water budget, groundwater recharge also provides an opportunity to create habitat for wildlife. This guide highlights recharge basin management strategies that create wildlife habitat and provide operational benefits to basin managers.

Operational Benefits

Reduce sediment and clogging

Sediment buildup and pore clogging can greatly diminish the efficiency of basin recharge. Creating multiple subbasins within a series can allow for the first receiving basin to act as a settling area, enabling the successive basins to recharge more efficiently over time. Settling basins filter fine sediment in the water and minimize clogging of successive recharge ponds. Creating basins with a sloped floor will result in sediment accumulation in a smaller area, reducing the operational cost of removing sediment buildup.

Planting vegetation on basin bottoms during dry spells can also help maintain recharge rates over time as roots create channels for water to infiltrate the soil.

Stabilize basins

Planting vegetation along the sides of basins will help prevent erosion and stabilize berms. These plantings can also inhibit the establishment of nuisance weeds such as Russian thistle. Installing perching structures for hawks can help control burrowing rodents that can compromise berms.

Funding Sources

Potential federal, state and local funding sources for multibenefit recharge projects that create waterbird habitat include:

- Wildlife Conservation Board Pacific Flyway Program
- U.S. Fish and Wildlife Service Partners for Fish and Wildlife Program
- Natural Resources Conservation Service Environmental Quality Incentives Program
- California Department of Fish and Wildlife California Waterfowl Habitat Program

Key features of multibenefit recharge

Berms planted with perennial grasses and shrubs from local seed can prevent bank erosion and provide additional habitat for birds and pollinators.

Earthen berms can be used to create separate basins. Interbasin water control structures are needed to control movement, flow rate, and water levels in and between basins.

Grazing is the recommended method for vegetation management due to its low cost and effectiveness. There is a risk of soil compaction if herds are too dense or if grazers are applied for an extended duration. Grazing should only be used when soil conditions are dry to avoid soil compaction.

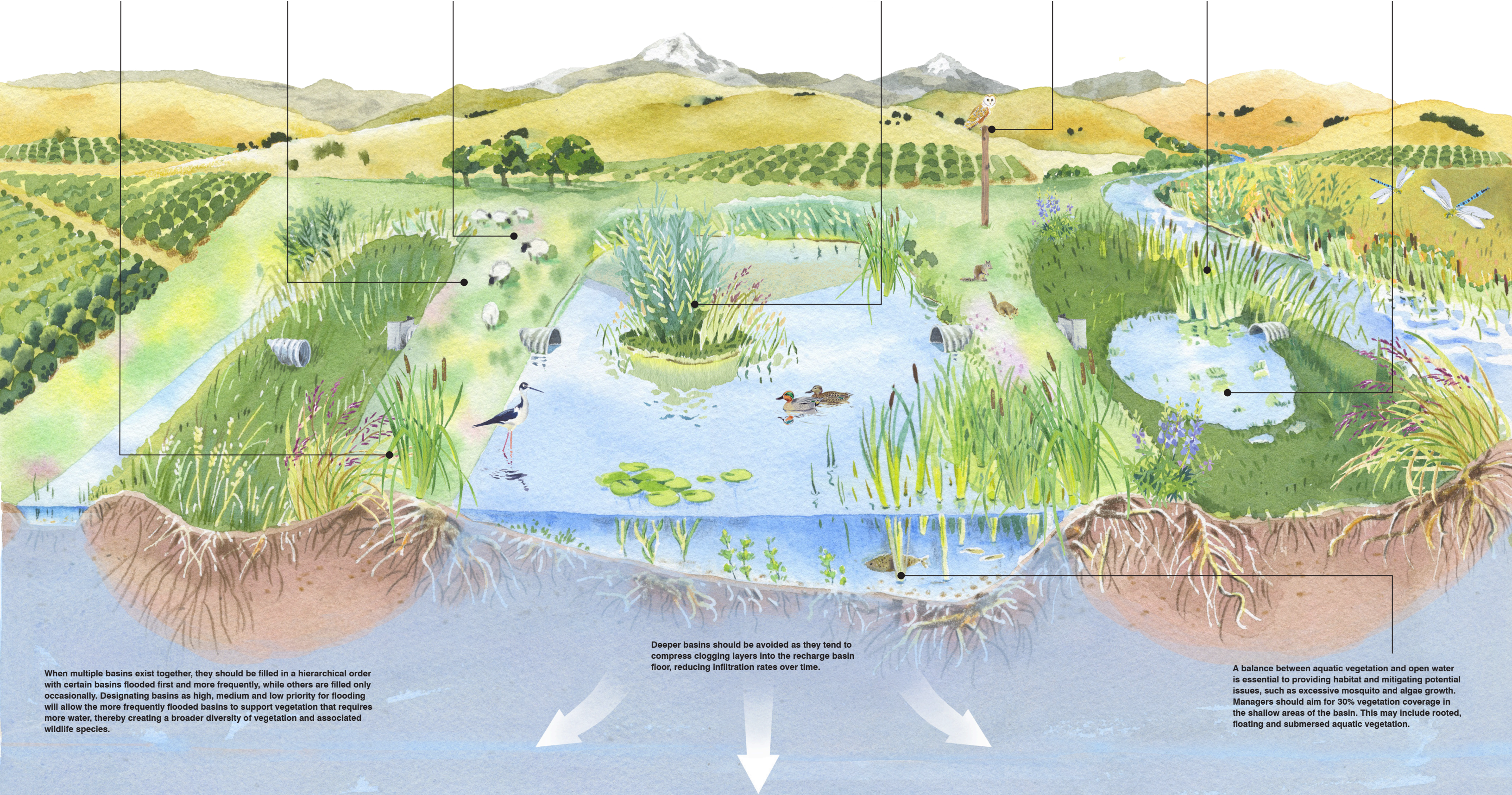
Frequent heavy disking and mowing is not recommended for vegetation removal as heavy equipment can result in soil compaction and reduced infiltration rates. However, these methods may be needed periodically to control overgrowth of cattails or tule.

Over time, sediment can build up, resulting in clogged soil pores and decreased infiltration rates. Excess sediment can be removed using a grader and then added to islands within the recharge basins, providing resting habitat for waterbirds.

Burrowing rodents can cause structural damage to earthen berms. Because rodenticides can be harmful to wildlife, we suggest alternative methods for rodent control, including trapping and/or installing owl boxes and perching structures for hawks to encourage predation.

When possible, use surface water from natural waterways to supply recharge basins. This will expedite the introduction of vegetation and invertebrates, which can act to jump-start habit creation.

Establishing a vegetated forebay at the basin inflow can help filter water and reduce sediment transport and clogging throughout the basin system.



When multiple basins exist together, they should be filled in a hierarchical order with certain basins flooded first and more frequently, while others are filled only occasionally. Designating basins as high, medium and low priority for flooding will allow the more frequently flooded basins to support vegetation that requires more water, thereby creating a broader diversity of vegetation and associated wildlife species.

Deeper basins should be avoided as they tend to compress clogging layers into the recharge basin floor, reducing infiltration rates over time.

A balance between aquatic vegetation and open water is essential to providing habitat and mitigating potential issues, such as excessive mosquito and algae growth. Managers should aim for 30% vegetation coverage in the shallow areas of the basin. This may include rooted, floating and submersed aquatic vegetation.