



Looking Beyond Local Water Supply:

Multi-benefit Recharge Projects for Ecosystem Enhancement

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TO DATE, much of the recharge project implementation focus has been on groundwater supply benefits for local water users and achieving sustainable groundwater management, because approximately 30 million Californians (about 75% of the population) depend on groundwater for a portion of their water supply, with some areas being 100% dependent on groundwater.



ABOVE Twitchell Island Multi-benefit Project.

Groundwater recharge is more than a local water supply strategy; it is a central component of the natural water cycle, and it is critical to all the natural and built systems that rely on it. Recharge projects can be designed and operated to provide multiple benefits, including:

- Flood risk reduction
- Drought preparedness
- Aquifer replenishment
- Ecosystem enhancement
- Subsidence mitigation
- Water quality improvement
- Working landscape preservation and stewardship
- Climate change adaptation

Considerations for Formulating Multi-benefit Recharge Projects

RECHARGE PROJECTS are often operated to inundate landscapes either actively (e.g., water is diverted by pumps or other intake structures) or passively (e.g., via natural floodplain or weirs). When formulating a multi-benefit recharge project, there are several important considerations:

- **Landowner and local agency objectives**
What local or regional problems can be addressed and what opportunities can be leveraged?

"Where you recharge matters..." Specific site conditions may make a project location better for achieving some benefits than others. For example, if increasing water levels to support groundwater dependent ecosystems or reduce the number of dry wells, project should be sited so recharged water reaches those areas.

- **State and federal program alignment**
How can the project align with State and federal programs and objectives, and how can those alignments unlock cost-share opportunities or additional resources/assistance?
- **Scale**
Can project benefits increase with scale, such as adding points of diversion or capacity?
- **Project siting**
Are site conditions suited to the benefits that the project is trying to achieve?
- **Diversion threshold/frequency and duration**
When, how often, at what depth, and for how long is an area inundated?

To the extent feasible, water managers and growers should seek to implement recharge projects that provide multiple benefits.

Ecosystem Enhancement Opportunities in Recharge Projects

WHEN RECHARGE PROJECTS raise groundwater levels, increase surface and groundwater interaction, or increase water supply reliability, both humans and ecosystems benefit. Consequently, water managers and growers are strongly encouraged to consider ecosystem benefits in their design and operation of recharge projects, such as reconnecting and inundating floodplains; creating temporary, seasonal habitat; supplementing nearby river and creek baseflows; and supporting groundwater-dependent ecosystems (GDE). Projects that reconnect surface and groundwater can also improve water quality, provide cooler water temperatures, support critical habitat for

salmon and other native fish species, and provide source water for wetlands, riparian vegetation, and other GDEs. Recharge project design and operation can also include sizing water diversions and conducting project operations in a manner that protects river functions, seasonal baseflows, and flow variability in creeks and rivers.

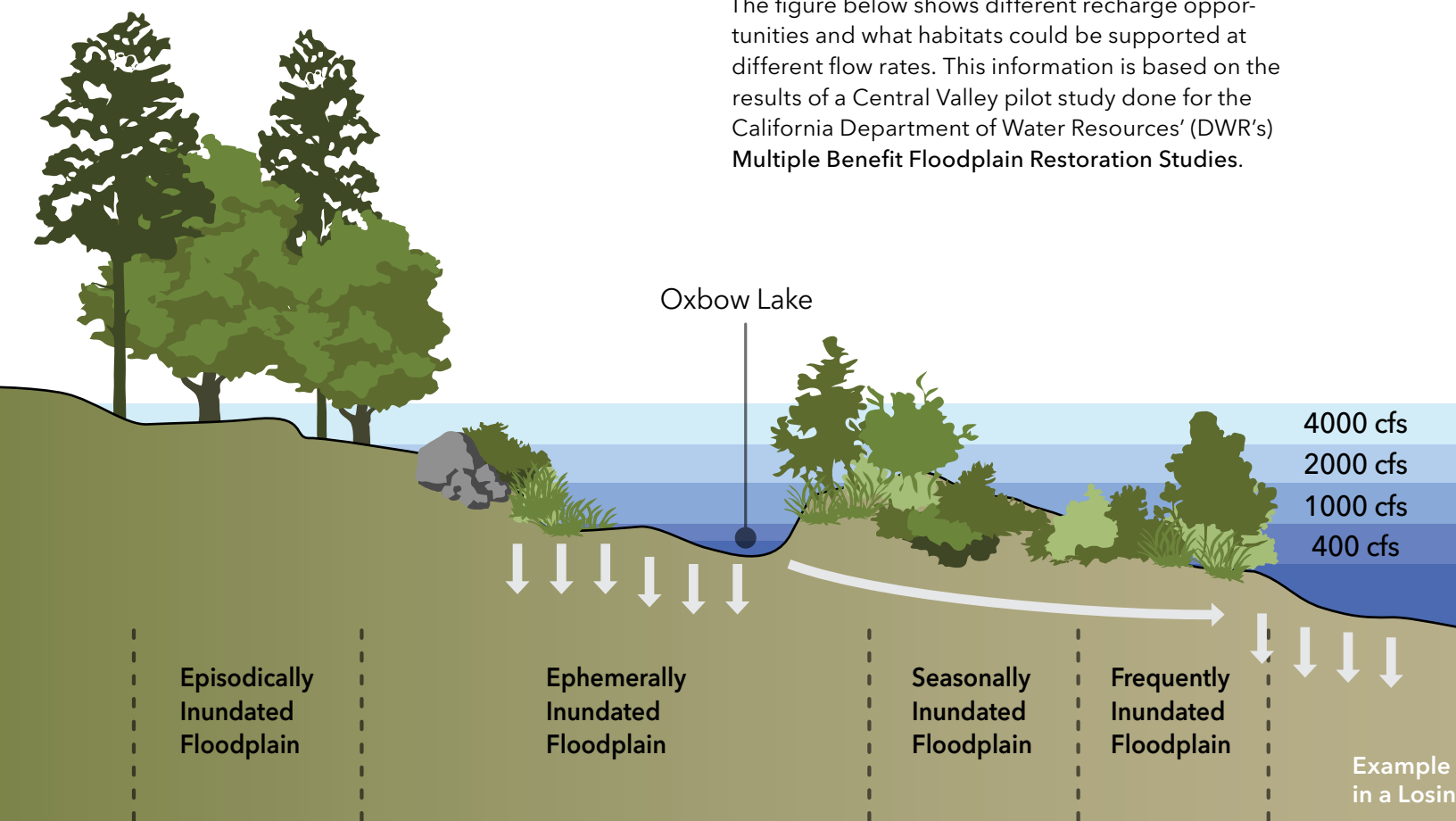
The potential benefits to different species, habitats, and ecosystem functions from recharge projects are determined by land use, proximity and connectivity to water body or existing habitat, magnitude and timing (e.g., season) of recharge flows, and duration and depth of inundation.

Creating or Reconnecting Habitat through In-channel or Near-channel Recharge Projects

IN-CHANNEL OR NEAR-CHANNEL recharge projects that increase inundation frequency, depth, and duration can provide recharge and ecosystem opportunities like identifying instream or floodplain inundation flow targets for species or restoration objectives, rehabilitating channels, creating floodplain benches, creating side channels or alcoves, and connecting habitat. Recharge projects can provide rearing

habitat for salmonids and help protect flows that perform specific ecological and physical functions (e.g., seasonal base flows or a 2-year flood event). For example, floodplains with a 2-year inundation frequency are considered to have high ecological value, especially if areas are inundated for consecutive weeks to encourage floodplain food production.

The figure below shows different recharge opportunities and what habitats could be supported at different flow rates. This information is based on the results of a Central Valley pilot study done for the California Department of Water Resources' (DWR's) Multiple Benefit Floodplain Restoration Studies.



Creating Temporary Habitat with Off-channel Recharge Projects

OFF-CHANNEL RECHARGE PROJECT opportunities can include on-farm recharge with wildlife-friendly management practices or dedicated areas designed to temporarily store surface water (e.g., recharge basins and transitory storage areas). These projects can be planned and operated to (1) provide critical resting and foraging habitat for migratory birds or open water habitat for waterfowl, or (2) be planted with a variety of native flowering plants to encourage pollinators.

The recharge and habitat benefits of seasonal inundation of agricultural lands have been demonstrated by The Nature Conservancy's BirdReturns



program, and through detailed opportunities analyses conducted in DWR's San Joaquin Basin Flood-MAR Watershed Studies.

Supporting Dry-season Baseflows through Winter Recharge

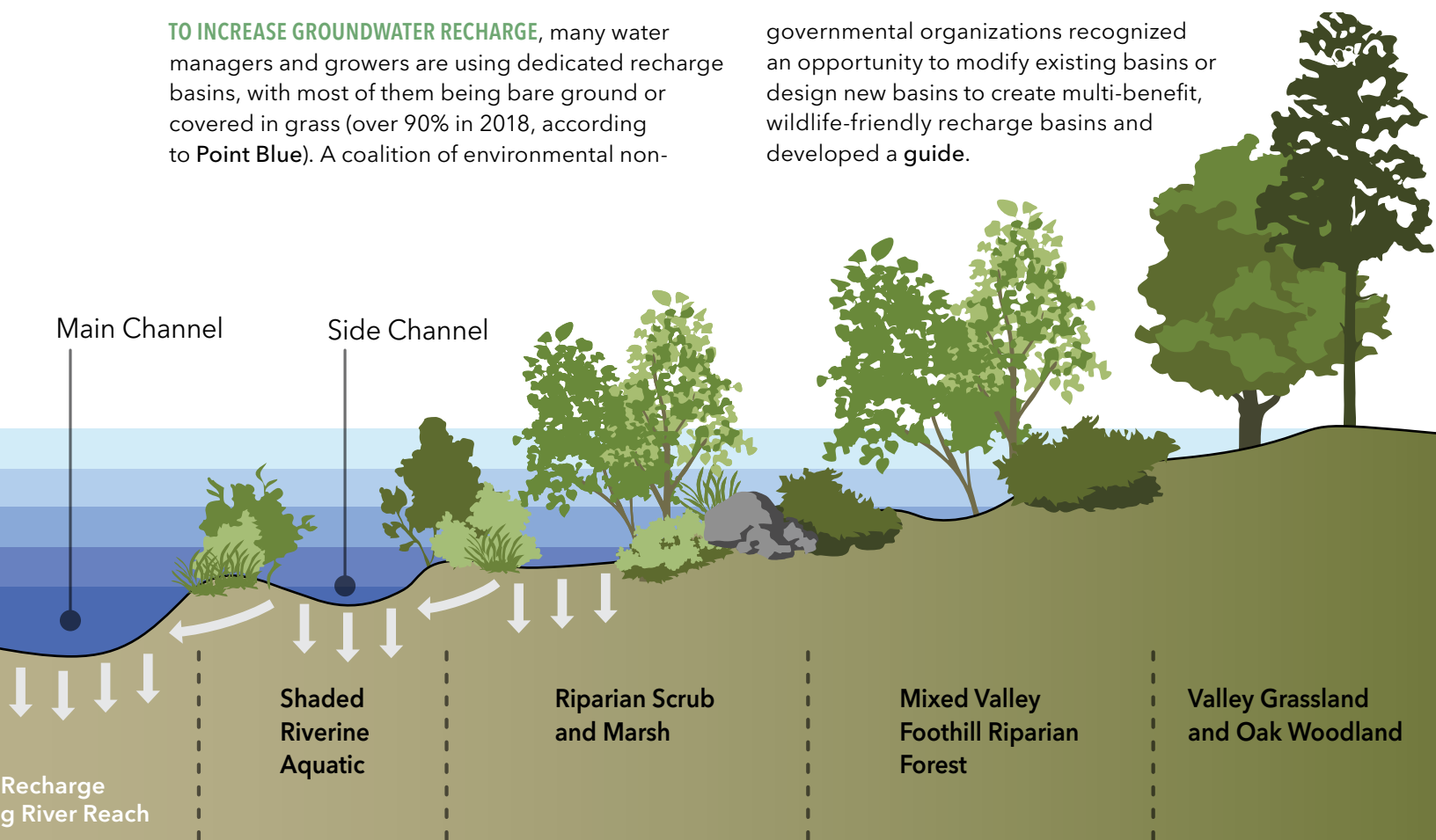
RECHARGE PROJECTS can support dry-season baseflow in waterbodies fed by shallow aquifers. A pilot project in Siskiyou County demonstrated that water diverted from the Scott River during high-flow periods (January–March) and applied to agricultural

fields for groundwater recharge can return to the river in late summer and fall to supplement dry-season baseflow. These potential benefits are also shown in DWR's San Joaquin Basin Flood-MAR Watershed Studies.

Envisioning Multi-benefit Recharge Basins

TO INCREASE GROUNDWATER RECHARGE, many water managers and growers are using dedicated recharge basins, with most of them being bare ground or covered in grass (over 90% in 2018, according to Point Blue). A coalition of environmental non-

governmental organizations recognized an opportunity to modify existing basins or design new basins to create multi-benefit, wildlife-friendly recharge basins and developed a guide.



CASE STUDY: Quantifying Recharge for a Multi-benefit Transitory Storage Project

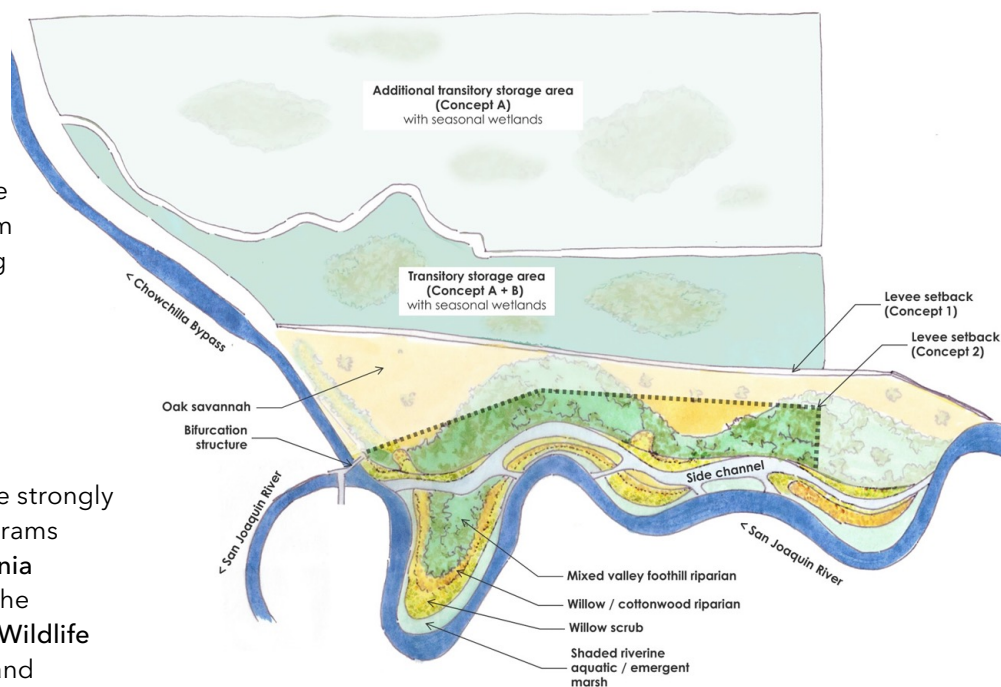
TRANSITORY STORAGE areas (i.e., temporary flood-water storage areas) are bermed areas that are disconnected from a river where water is diverted using weirs or by using pumps and conveyance infrastructure. While similar in function to recharge basins, transitory storage is designed for flood attenuation, which is generally done on a much larger scale than recharge basins. A greater volume of water is diverted into the area to reduce peak flows and reduce flood risk. Land use in transitory storage areas must be compatible with intermittent seasonal flooding, such as farming annual crops compatible with winter flooding or seasonal wetland habitat.

DWR has conducted several studies on transitory storage areas in the San Joaquin Valley. These studies demonstrate that recharge projects can also provide flood risk reduction and ecosystem enhancement benefits, depending on land use and operations (e.g., activation frequency, depth and duration of flooding).

Additional Resources

Multi-benefit recharge projects are strongly encouraged by State agency programs implemented by DWR, the California Department of Fish and Wildlife, the Department of Conservation, the Wildlife Conservation Board, and others, and may be eligible for Proposition 4 funding through State grant programs.

One conceptual multi-benefit transitory storage project on a single parcel adjacent to the San Joaquin River was designed to (1) include a setback levee to provide floodplain reconnection and a larger transitory storage area to increase flood risk reduction and recharge benefits, and (2) provide ecosystem enhancement benefits through a variety of different habitats and operations for different target species. Due to increased inundation frequency and land area, the estimated recharge benefits of this conceptual multi-benefit project were over 11,000 acre-feet per year.



ABOVE An example multi-benefit transitory storage area project concept. (Source: DWR)

For additional information, check out the following:

DWR | Flood-managed aquifer recharge webpage

DWR and Sustainable Conservation | From Runoff to Recharge

California WaterBlog | A Functional Flows Approach to Implementing Flood-MAR

CDFW | Fish and Wildlife Groundwater Planning Considerations

CDFW | Fish and Wildlife Groundwater Planning Considerations: Freshwater Wetlands

Migratory Bird Conservation Partnership | Groundwater to Benefit People and Wildlife

TNC | Multi-Benefit Recharge

