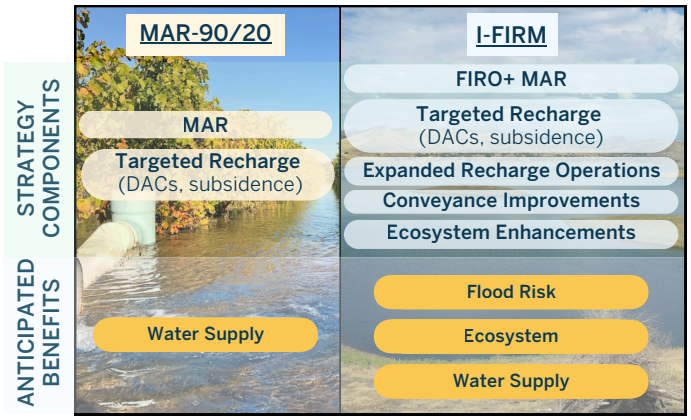
CALAVERAS WATERSHED - AT A GLANCE

Sustainable Conservation

A CHANGING CLIMATE: The Calaveras watershed receives most of its surface water from rainfall, rather than receiving sustained flows from melting snowpack. By 2050, rising temperatures are expected to reduce this runoff from rainfall and increase vegetative evaporative demand in the Calaveras watershed, further increasing agricultural reliance on already-strained groundwater supplies for irrigation. Without action, groundwater levels will fall and ecosystems will suffer.

FLOODWATER AS A RESOURCE: The San Joaquin Basin Flood-MAR Watershed Studies evaluated the opportunity for Flood-Managed Aquifer Recharge (Flood-MAR) and Forecast-Informed Reservoir Operations (FIRO) to mitigate the impacts of climate change. Working with growers, Flood-MAR can be scaled to capture more wet season flows in recharge basins and on farmland, thereby reducing flood risk and rebuilding groundwater stores for the dry season.



What is Impacted by Climate Change?

Groundwater Supply

By 2050, average annual groundwater overdraft is expected to increase by 38% to 54,000 acre-feet per year. Groundwater levels will fall by an average of 16 feet, and groundwater levels beneath Disadvantaged Communities (DACs) will fall by 11 feet.

What can Recharge Accomplish?

Compared to the baseline future scenario, MAR-90/20 would reduce annual groundwater overdraft by 6% and increase groundwater levels by 19%. I-FIRM would reduce annual overdraft by 20%, increase groundwater levels by 69%, and increase groundwater levels below DACs by 6 feet.

Flood Risk

In 2050, the maximum peak flow of the Calaveras River is expected to remain at its current peak of 12,500 cubic feet per second (cfs), 79% higher than the channel operational capacity of 7,000 cfs. Reduced runoff as a result of warmer temperatures will lead to a slight decrease in the frequency of flood events.

What can Recharge Accomplish?

MAR-90/20 would have negligible impacts on maximum peak flows, frequency, and duration of flow events exceeding channel design capacity. Under I-FIRM, reservoir reoperations allow maximum controlled flood releases to be reduced to meet operational channel capacity at 7,000 cfs, nearly eliminating flows that exceed operational capacity.

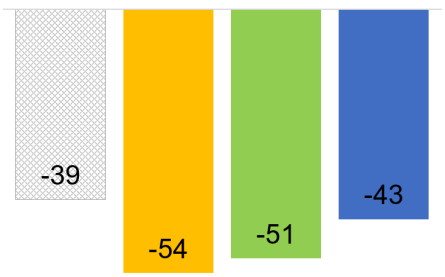
Ecosystems

By 2050, reduced river flows will reduce already limited off-channel floodplain habitat, where salmon feed before outmigration to the sea. Instream salmonid habitat, where salmon need low flows to lay eggs and raise juveniles, is unaffected. Groundwater-dependent ecosystems (GDEs) see a 10% decrease in suitable habitat across the watershed.

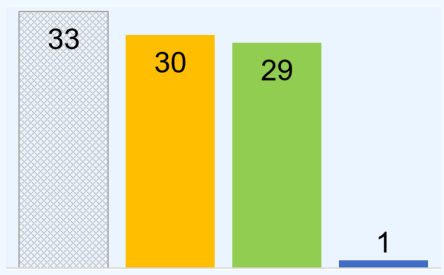
What can Recharge Accomplish?

MAR-90/20 has a negligible impact on these shifts. Managed ecosystem flows under I-FIRM would increase instream salmonid habitat by 29%, while managed flows combined with off-channel floodplain restoration increase off-channel habitat more than seven-fold. I-FIRM does not offset losses in GDE habitat, though it does create new shorebird and flow-through basin habitat in the watershed.

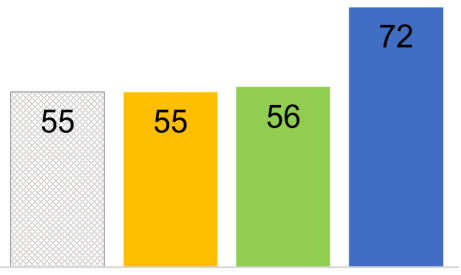
Average Annual Groundwater Overdraft
[TAF/Y]



Years Exceeding Design Channel Capacity
[per 100 years]



Instream Salmonid Spawning Habitat
[acre-days per linear mile]



Baseline Current | Baseline 2050 | MAR-90/20 | I-FIRM

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SCENARIO OUTCOMES

In a Baseline Future

- GW overdraft increases greatly
- Flood risk remains moderate
- Ecosystems suffer overall

With MAR-90/20

- GW overdraft remains high
- Flood risk remains moderate
- Ecosystems do not improve

With I-FIRM

- Increase in GW overdraft is lessened
- Flood risk is largely mitigated
- Ecosystems see some improvements

PLANNING FOR THE FUTURE

Strategic Flood-MAR implementation in the near-term can reduce groundwater overdraft in the region while providing additional benefits, such as supporting groundwater levels near DACs, and addressing the cone of depression. FIRO-MAR will take longer to implement, but it can mitigate some of the most severe climate change impacts expected in the Calaveras watershed.

To achieve multi-benefit watershed-scale outcomes, collaboration will be essential. Growers, water districts, Groundwater Sustainability Agencies, reservoir operators, flood control agencies, community groups, and environmental organizations must coordinate to develop and pilot management strategies and build system resilience.

Scaled MAR will depend on greatly expanded on-farm recharge in the Calaveras watershed, so grower involvement in project planning and implementation will be essential.

These studies help us envision how Flood-MAR can help shape California's water future. However, they rely on one set of assumptions and focus specifically on what is possible with recharge. Additional management actions such as land repurposing are not discussed in these studies but will be necessary to meet long-term groundwater sustainability goals.

Ultimately, local water and land managers, large- and small-scale growers, and residents of the Calaveras watershed will shape real-world outcomes for the region.

Whether you are a grower, water manager, community member, environmental advocate, or another interested party, you can play a role in building resilience to a changing water future in the Calaveras watershed. Sustainable Conservation has resources to help you learn more about Flood-MAR, and can connect you with partners to promote MAR in your area. Water managers can use a locally developed Groundwater Recharge Assessment Tool (GRAT) developed as part of the Watershed Studies toolset to plan recharge efforts that target benefits based on local priorities. Visit suscon.org and groundwaterrecharge.org for more information.

SCAN FOR MORE RESOURCES

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Runoff to Recharge .....