Technical Memorandum

June 10, 2026

To: California Department of Water Resources
Yolo County Flood Control & Water Conservation District

From: Sustainable Conservation

Groundwater Recharge Program Guidance and Recommendations for Yolo County Flood Control & Water Conservation District and Yolo Subbasin GSA



Sustainable Conservation

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Introduction

Sustainable Conservation (SC) received funding from the Department of Water Resources (DWR) to assist water districts in developing recharge programs. As part of this work, SC began working with Yolo County Flood Control & Water Conservation District (the District), which falls under the Yolo Subbasin Groundwater Agency (YSGA), in late 2023 to assist the District's effort to expand groundwater recharge to agricultural lands. In this memo "Yolo" may be used to refer to the subbasin, the YSGA, or the District.

The District has used its unlined canal system to recharge groundwater for decades, and in 2023 wanted to expand their recharge program to allow water to be applied on agricultural lands to help implement their Groundwater Sustainability Plan (GSP). The District received a permit for temporary water rights to deliver excess flows for the purpose of on-farm recharge in early 2024. SC and the District began to work together to enroll growers for on-farm recharge projects and to develop tools to help the District prioritize and identify lands where recharge would be most feasible and most beneficial for groundwater outcomes.

Expanding On-Farm Recharge in Yolo

The District's on-farm recharge program is funded through Sustainable Groundwater Management Act (SGMA) implementation grants from DWR. The District developed a set of incentives for growers to participate in on-farm recharge as part of their overall recharge program. Although groundwater account credits are popular incentives in many GSAs, Yolo does not have groundwater allocations in place. Instead, the District reimburses landowners for their costs to set up agricultural fields to conduct recharge, which might involve moving earth or installing irrigation infrastructure and water measurement devices, in addition to the costs of conducting the recharge activities themselves. The District offers

no-cost water in January and February and a 50% discount on water from March 1st through April 15th, when the permit term ends. Landowners order recharge water through the same system used to order irrigation water, and the District relies on them to take what they ordered, spot checking by monitoring turnouts and flow rates. Landowners can use the recharge water on their fields immediately or put the water into a holding basin for later recharge, as long as all recharge water is infiltrated in the basin or on the fields by April 15th. Landowners can also capture recharge water in dry creek beds or existing ponds on their properties. The District has taken responsibility for monitoring recharge outcomes in their network of groundwater recharge wells.

Grower outreach is an important part of the on-farm recharge efforts in the District. The District communicates frequently with member-growers and compiled a list of several growers who were enthusiastic about trying groundwater recharge. In 2024, the first year of collaboration, outreach was largely focused on those self-identified growers to begin planning individual projects.

As the collaboration continued, it became clear that the District wanted to be more intentional about choosing locations for recharge, and asked SC to help develop a prioritization tool. Priority areas for special consideration for well permits had been drafted for the District by West Yost Associates delineating areas of greater vulnerability to groundwater pumping (West Yost 2024). This report served as a source of local information around priority areas for groundwater recharge. SC drew on experience developing Groundwater Recharge Assessment Tools (GRATs) for other districts and proposed a simplified prioritization map. The map would use existing spatial data on physical feasibility and District priorities to target fields for recharge, without requiring the time and money needed to develop a full GRAT.

Developing the Recharge Prioritization Map

Data, Methodology, and Assumptions

Within the Yolo subbasin, SC created a map to target areas for recharge based on the District's interests and priorities (**Figure 1**). This map, intended to be used as a first step for screening potential recharge sites, ranked individual agricultural fields using a series of data layers. These layers and their sources are provided in **Table 1**.

Table 1. Data layers used for targeting areas for recharge in the Yolo subbasin.

Data Layer	Source
Suitable land use and crop types for on-farm recharge	Determined by Sustainable Conservation team, using data and recommendations from the Department of Water Resources[1] that are based on several factors including agricultural practices and crop biological constraints.
Conveyance	Provided by the District
Landowner willingness	Provided by the District
Reported dry wells	Provided by the District
Water system service area boundaries	Provided by the District
Subsidence areas	Provided by the District
Ponds	Provided by the District
Groundwater-dependent ecosystems	Rohde et al. (2024)

Each field was given points based on its overlap with or proximity to these layers, with a maximum of five points for each parameter. For example, a field with a willing landowner and within 1 mile of a dry well would receive 5 points for each of those categories, giving it a higher ranking.

Suitable land use and crop type for recharge was used to select fields that could receive recharge water. This layer was not used for priority scoring. SC made two key assumptions during the screening exercise, both of which were discussed with and approved by the district.

- The first assumption was that recharging within 1 mile of a location (e.g., ecosystem, dry well) will provide benefits. The screening did not determine best sites for recharge based on where the water would flow, since this would require developing and using a groundwater model.
- The second assumption was that recharging in subsidence-prone areas may reduce subsidence. It is commonly agreed that the most immediate method for managing subsidence is to stop pumping; the benefits of direct recharge are less certain. However, if recharge is done where pumping is occurring, it may prevent further overdraft of the groundwater by offsetting the water pumped.

[1] Flores-López F, Arrate D and Bastani M (2025) A conceptual root zone model to calculate the application amount and frequency of water available for recharge. Front. Water 7:1554774. doi: 10.3389/frwa.2025.1554774

Water quality was a consideration that ultimately was not included in the spatial analysis. The District plans to assess water quality on a case-by-case basis, checking with individual growers about their nitrogen use and conducting soil tests if needed.

Deliverables

The following deliverables for the recharge prioritization map were provided to the District:

- A Geopackage[2] containing the ranked fields, with attributes for each of the data layers and scoring components.
- A spreadsheet containing metadata for the Geopackage's attributes, a breakdown of how points were determined for each data layer, the months during which each land use or crop type can tolerate recharge based on the Crop Compatibility Calendar developed for GRAT, and a list of acreages by different categories (e.g., all fields suitable for on-farm recharge in the focus area), as requested by the district. See **Appendix A** for the scoring and crop compatibility data.

[2] A geopackage is an Open Geospatial Consortium (OGC) spatial data storage format that can contain multiple datasets of geographic features, non-spatial tabular data, and raster data. Geopackages are frequently used as an interchange format for geographic data (ESRI, 2026).

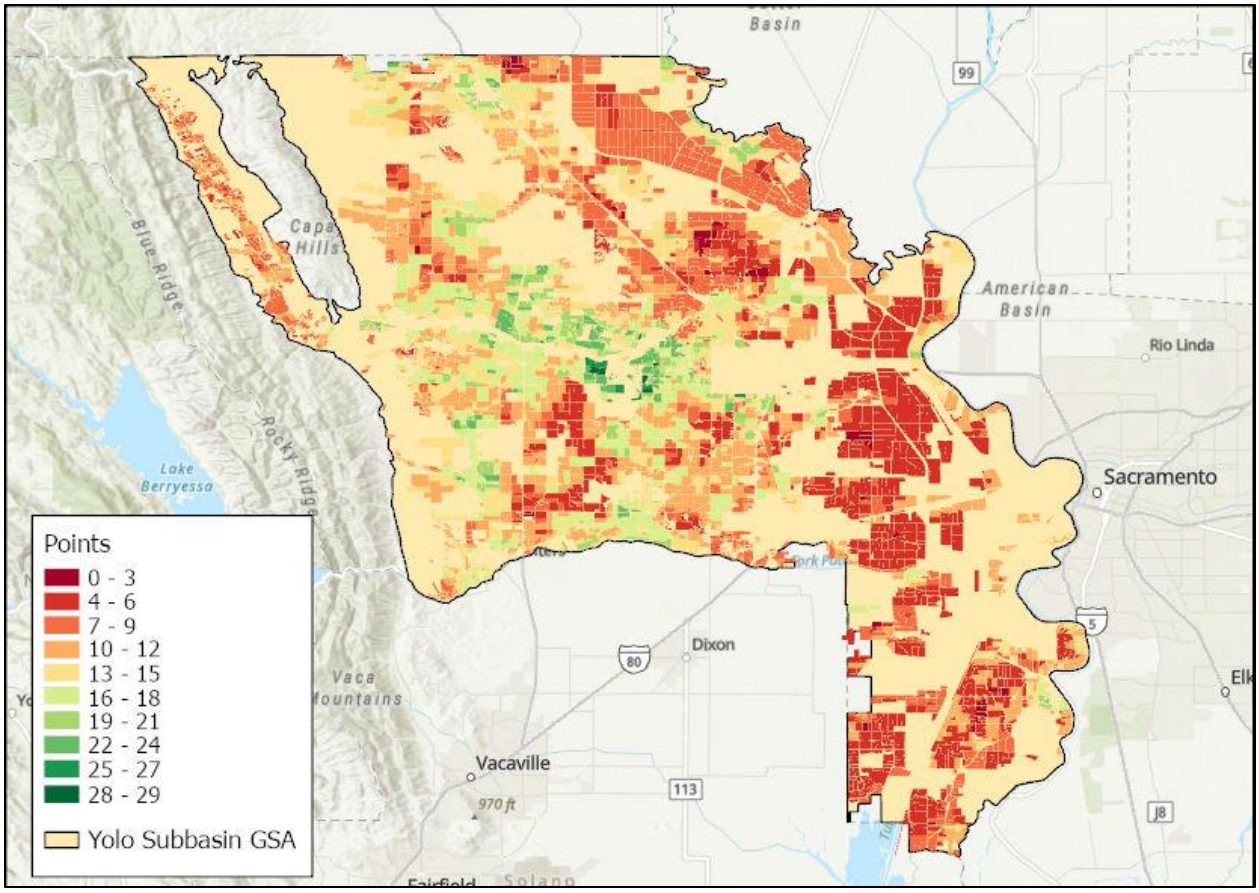


Figure 1. Ranked fields in the Yolo Subbasin GSA. Higher values (darker green) indicate greater suitability for recharge.

Guidance and Technical Assistance

Winter 2024-25 Recharge Program

In early 2024, after the District received their permit for on-farm recharge water, efforts to enroll growers in the on-farm recharge program launched. The prioritization map was developed over the summer and fall of 2024. SC presented recharge methods and examples developed over years of experience in the San Joaquin Valley to District staff. SC provided recharge guidance documents, including the Recharge Methods Manual, to the District, which were then shared with growers at a District workshop. SC was not present at that workshop but followed up with interested landowners through individual interviews and site visits to discuss site-specific recharge plans in the late summer of 2024. See **Table 2** for details of outreach events and **Table 3** for site visits.

Diversions for groundwater recharge did occur in the winter of 2024-2025, though recharge only occurred in the unlined canal system. Water was not delivered for on-farm recharge

because canal maintenance projects and the timing of water availability from the reservoir severely limited potential on-farm recharge sites.

Winter 2025-26 Recharge Program

In anticipation of water availability in the winter of 2025-26, SC and the District began outreach to growers in the spring of 2025. SC presented recharge methods and examples to growers alongside District staff who introduced their incentives program and prioritization mapping at a meeting hosted by the Yolo Resource Conservation District. The District used the recharge priority map developed by SC to identify growers in high priority areas and invited them to an in-person workshop focused on recharge in December of 2025. SC again presented recharge methods and examples and answered grower questions about recharge operations. The workshop was followed by on-site visits with interested growers to discuss specific recharge plans for their farms, with both SC and District staff.

Water for recharge became available and was delivered between January 9 and 21, 2026. More than 4,000 acres of farmland participated and more than 3,800 acre-feet of water was applied. Rice fields turned out to be the dominant acreage participating in the 2026 recharge program, even though SC had not considered rice a suitable crop and had not identified rice fields as candidates for recharge. Water tenders at the District reported that the rice fields in western Yolo County usually require large amounts of irrigation water because the fields drain quickly, in contrast to the more traditional rice growing areas on clay soils along the Sacramento River in eastern Yolo County. Rice growers wanted the winter water to help decompose their rice straw residue. Rice fields are already set up to flood irrigate, so additional field work was unnecessary. Thus, rice growers enrolled late in the recharge program and successfully conducted recharge, contrary to assumptions about rice fields having too much clay in their soils to infiltrate water efficiently.



Figure 2. Recharge event on rice field in Yolo County, January 2026

The District also facilitated delivery of water to an orchard grower who applied water via the drip irrigation system. While this method is not expected to apply sufficient volumes of water to directly recharge groundwater, it may be an effective “pre-irrigation” strategy that could decrease groundwater demand later in the growing season. The irrigation demand for this orchard will be tracked during the 2026 irrigation season to test this approach to demand reduction.

Table 2. Outreach events for Yolo's On-Farm recharge program supported by SC.

Date	Location	Title/Purpose	Attendees
04/10/2025	Yolo RCD Woodland, CA	Farm and Ranch Programs 101 Agenda excerpt: • Rogell Rogers, Sustainable Conservation: "Advancing Groundwater Recharge with Sustainable Conservation" • Kristin Sicke, Yolo County Flood Control and Water Conservation District (YCFCWCD) "Water Resources Management in Yolo County"	15 farmers
12/10/2025	Yolo FCWCD, Woodland, CA	Groundwater Recharge Program Planning and Overview Agenda • Overview of district recharge program (water, monitoring, agreement terms) • Goal for winter 2026 • Examples of success on various crops (SC) • Q&A • Next steps	12 farmers

Table 3. Direct farmer outreach by Sustainable Conservation staff in support of Yolo's on-farm recharge program.

Site Visit Date	Crop/Recharge type	Outcome (recharge planned, recharge completed)
08/2024	Orchard crops	Unable to complete- no recharge water in winter 2024-25
9/2024	Pistachio orchard	Unable to complete- no recharge water in winter 2024-25
12/2025	Annual crops including rice, basins	Recharge completed Jan 2026
12/2025	Pistachio orchard using drip	Unable to recharge due to District maintenance on canal
12/2025	Dry creekbed recharge	Recharge completed Jan 2026

Recommendations and Next Steps

Future recommendations for the District's on-farm recharge plans are informed by the experiences and (sometimes surprising) outcomes of the successful on-farm recharge efforts in 2026. The District used the prioritization map to consider and plan delivery and conveyance, and to reach out to growers who could effectively recharge. This shows that a strategic approach of recruiting participants based on their field's recharge suitability can be combined with an opportunistic approach of using lands with willing participants.

The prioritization map developed for the Yolo subbasin will be updated and expanded into a full Groundwater Recharge Assessment Tool (GRAT) in 2026, as part of a pilot project with the California Water Data Consortium. SC will incorporate lessons learned during the 2026 recharge season such as the recharge performance of rice fields in western Yolo County. The new Yolo GRAT will use the most current aquifer mapping available and be linked to a groundwater model so that recharge scenarios can be evaluated for outcomes of interest for the District. These outcomes may include improved groundwater levels, subsidence mitigation, increased groundwater supply for disadvantaged communities, and increased supply for groundwater dependent ecosystems. The District is considering additional incentives to growers who conduct Towed Transient Electromagnetic (T-TEM) surveys on their properties and share the data with the District. This data could then be used to corroborate coarser-scale geologic data and improve groundwater models, which in turn would improve identification of effective recharge areas.

Some Yolo County orchard growers have told the District that they are reluctant to participate in recharge due to fears of increased disease incidence with repeated winter flooding. Although San Joaquin Valley growers have not experienced increased soilborne or fungal disease following recharge, the soils in Yolo County are generally heavier in texture and drain more slowly, and Yolo growers are fearful that their outcomes might be different. SC has followed up with researchers and orchard crop experts to explore this concern. While specific research on groundwater recharge and disease incidence is currently unavailable, SC has connected University of California plant pathologists with District staff. SC recommends that these experts be invited to speak about common plant diseases contracted from soil and prevention strategies in orchards during future farmer and landowner recharge information meetings sponsored by the District.

The recharge program in Yolo has addressed nitrate loading on the farm site through stipulations in their landowner agreement that a grower be in compliance with Irrigated Lands Regulatory Program (ILRP) irrigation and nutrient management requirements or that fertilizers not be applied to the recharge site within 3 months. SC recommends that growers also certify that they are aware of and in compliance with state regulation that

prohibits recharge on sites where pesticides designated in the Groundwater Protection List (3CCR 6800) as highly leachable have been applied within 6 months. SC can provide sample language for the grower agreement and references to the state code, if the District desires.

As Yolo's groundwater recharge program moves forward, upgrading the prioritization map to a full GRAT will improve the District's capability to plan the most effective recharge strategy, and continuing outreach and incentives will be critical to expanding groundwater recharge in the District. Since Yolo SGA does not currently have a groundwater allocation framework in place, incentivizing novel approaches (for example, allowing the use of low-cost recharge water for winter season "pre-irrigation" to maximize soil water and reduce in-season pumping) will be needed to increase grower participation in the recharge program. The District plans to begin outreach efforts early in the summer of 2026 for the 2026-27 winter recharge season, so that growers have time to develop a recharge plan before harvest. This would give growers time to make any needed modifications to their fields after harvest and before the recharge season. As more growers participate, the District can build a community of practice around recharge through active outreach and education programs and sponsoring farmer-to-farmer learning opportunities.

Appendix A: Data tables for Yolo GSA Recharge Prioritization Map

Points allocation for priority layers:

Priority attribute	Description	Points
SAGBI	Excellent	5
	Good	4
	Moderately Good	3
	Moderately Poor	2
	Poor	1
	Very Poor	0
Conveyance (creeks + canals)	Currently connected conveyance (provided by district)	5
	Potentially connected to conveyance (provided by district)	4
	Potentially connected to conveyance (adjacent to conveyance or in RDs 108 or 787)	3
Willing Landowner		5
Reported Dry Well	Within 1 mi of Reported Dry Well	5
Water system service area boundaries	In service area boundary of a community water system OR within 1 mi of state small water system	5
Subsidence (exceeds MT)		5
Within 1 mi of GDE		5
Ponds		5
Max Score		**40**

Crop Compatibility Calendar: Months when each crop can tolerate recharge

Crop	SAGBI rating	Months for Recharge (inclusive), based on cultural practices assumptions
Alfalfa	Excellent	Jan - Sept
Alfalfa	Good	Jan - Sept
Alfalfa	Moderately Good	Jan - Sept
Alfalfa	Moderately Poor	Jan - Sept
Alfalfa	Poor	Jan - Sept
Alfalfa	Very Poor	Jan - Sept
Almonds	Excellent	Oct - Feb, Apr, Jun
Almonds	Good	Oct - Feb, Apr
Almonds	Moderately Good	Oct - Feb
Almonds	Moderately Poor	Oct - Feb
Almonds	Poor	Oct - Feb
Almonds	Very Poor	Oct - Feb
Vineyards	Excellent	Oct - Apr
Vineyards	Good	Oct - Apr
Vineyards	Moderately Good	Oct - Mar
Vineyards	Moderately Poor	Oct - Mar
Vineyards	Poor	Oct - Mar
Vineyards	Very Poor	Oct - Mar
Pasture	Excellent	Nov - Feb
Pasture	Good	Nov - Feb
Pasture	Moderately Good	Nov - Feb
Pasture	Moderately Poor	Nov - Feb
Pasture	Poor	Nov - Feb
Pasture	Very Poor	Nov - Feb
Pistachios	Excellent	Oct - May
Pistachios	Good	Oct - May
Pistachios	Moderately Good	Oct - May
Pistachios	Moderately Poor	Oct - May

Crop	SAGBI rating	Months for Recharge (inclusive), based on cultural practices assumptions
Pistachios	Poor	Oct - May
Pistachios	Very Poor	Oct - May
Walnuts	Excellent	Nov - Apr
Walnuts	Good	Nov - Apr
Walnuts	Moderately Good	Nov - Apr
Walnuts	Moderately Poor	Nov - Apr
Walnuts	Poor	Nov - Apr
Walnuts	Very Poor	Nov - Apr
Fallow	Excellent	Oct - Sept
Fallow	Good	Oct - Sept
Fallow	Moderately Good	Oct - Sept
Fallow	Moderately Poor	Oct - Sept
Fallow	Poor	Oct - Sept
Fallow	Very Poor	Oct - Sept
Tomatoes	Excellent	Oct - Mar, Sept
Tomatoes	Good	Oct - Feb, Sept
Tomatoes	Moderately Good	Oct - Feb, Sept
Tomatoes	Moderately Poor	Oct - Feb, Sept
Tomatoes	Poor	Oct - Feb, Sept
Tomatoes	Very Poor	Oct - Feb, Sept