



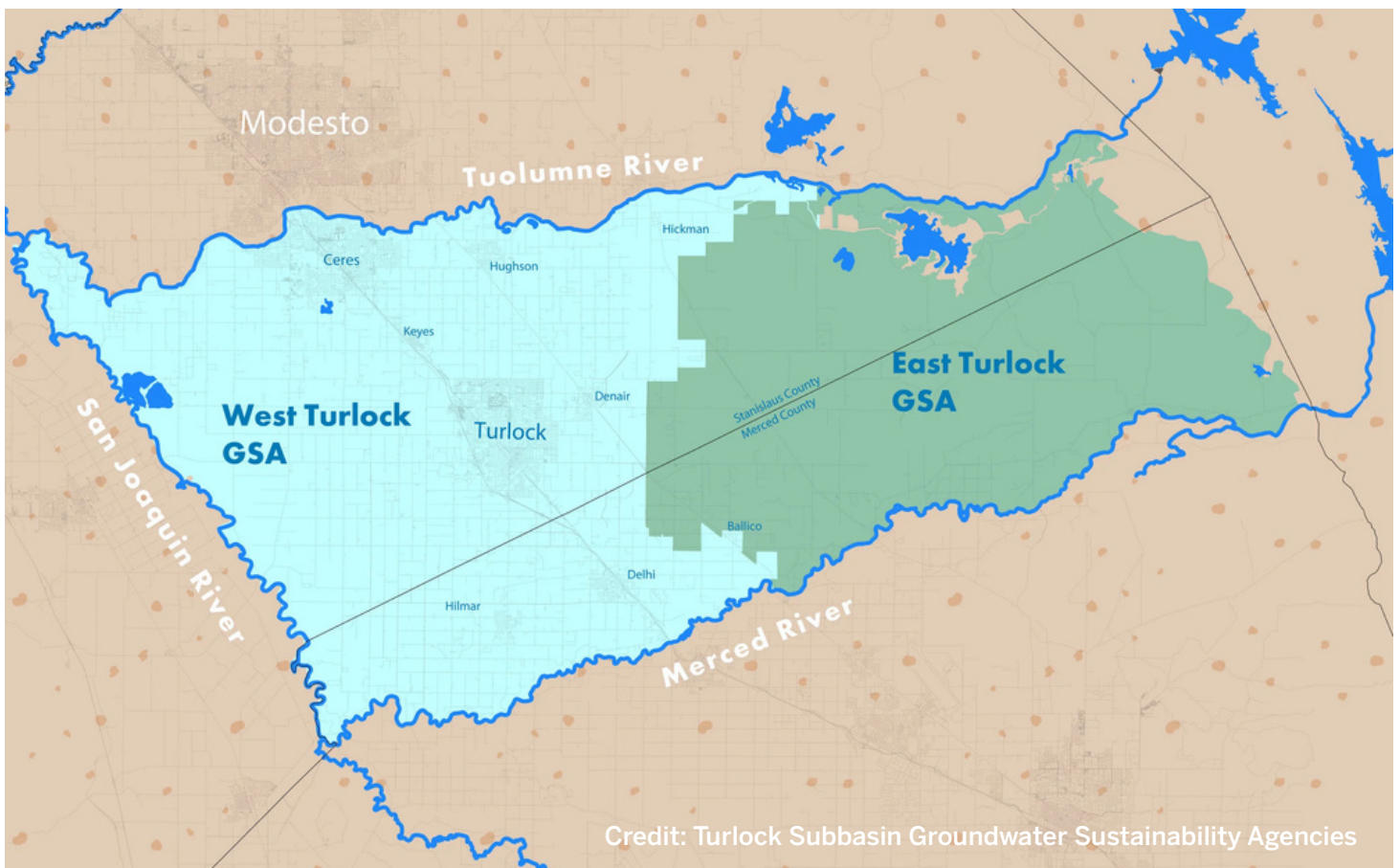
Technical Memorandum

August 5, 2026

To: California Department of Water Resources
West Turlock Subbasin GSA and Turlock Irrigation District
East Turlock Subbasin GSA

From: Sustainable Conservation

Groundwater Recharge Program Guidance and Recommendations for Turlock Subbasin GSAs





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Introduction

The West Turlock Subbasin Groundwater Sustainability Agency (WTSGSA), made up of 12 member agencies, and the East Turlock Subbasin Groundwater Sustainability Agency (ETSGSA), made up of 5 member agencies, jointly manage the Turlock groundwater subbasin (Figure 1) under one [Groundwater Sustainability Plan](#) (GSP). Conditions on the west side of the basin differ considerably from the east side. The west side enjoys access to surface water sources through senior water rights and water systems that store and convey surface water to irrigated farmland as well as municipalities. The east side is more rural and has less access to surface water supplies and is therefore more groundwater dependent.

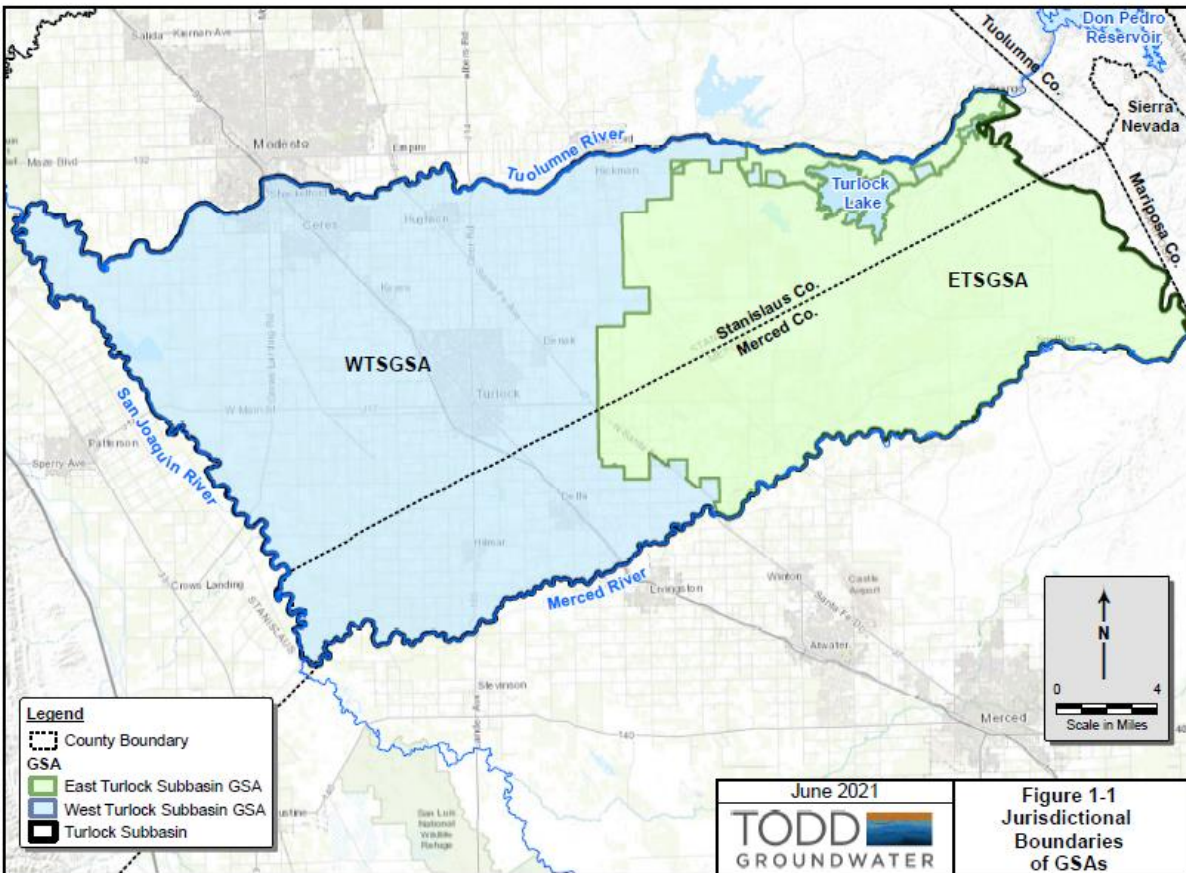


Figure 1: Turlock Subbasin GSA boundaries. Reproduced from the [Turlock Subbasin Groundwater Sustainability Plan](#), rev. July 2024.

The two GSAs have been working together towards groundwater sustainability since the inception of the Sustainable Groundwater Management Act (SGMA). While developing their GSP, the two GSAs negotiated the different groundwater realities on the two sides of the basin—groundwater drawdown is occurring mostly on the groundwater-dependent east side (Figure 2) while surface water for recharge is much more available on the west side. Through years of negotiation and collaboration, the two GSAs allocated responsibility for groundwater conditions between east and west and developed strategies for addressing undesirable groundwater outcomes that fit both the responsibilities and the capabilities of each GSA. For example, WTSGSA’s relatively secure access to surface water has allowed the GSA to prioritize in-lieu recharge, in which surface water is used for irrigation in lieu of groundwater to prevent further groundwater decline. In contrast, ETSGSA has focused on groundwater demand reduction strategies such as repurposing irrigated agricultural land to lower water uses. They have worked out an agreement for Turlock Irrigation District (TID), a member of WTSGSA, to sell up to 35,000 acre-feet of surface water (known as replenishment water) for both irrigation and recharge to the ETSGSA agencies when water supplies and conveyance capacity allow. In exchange, ETSGSA has committed to

significant land fallowing and demand reduction, and, through a Water Accounting Framework, offsets some of its remaining overdraft through payments to TID, with payments to be used to fund groundwater sustainability projects throughout the subbasin. This agreement was negotiated over a period of two years and has become a foundation for both GSAs to invest in improving surface water conveyance and delivery infrastructure in ETSGSA.

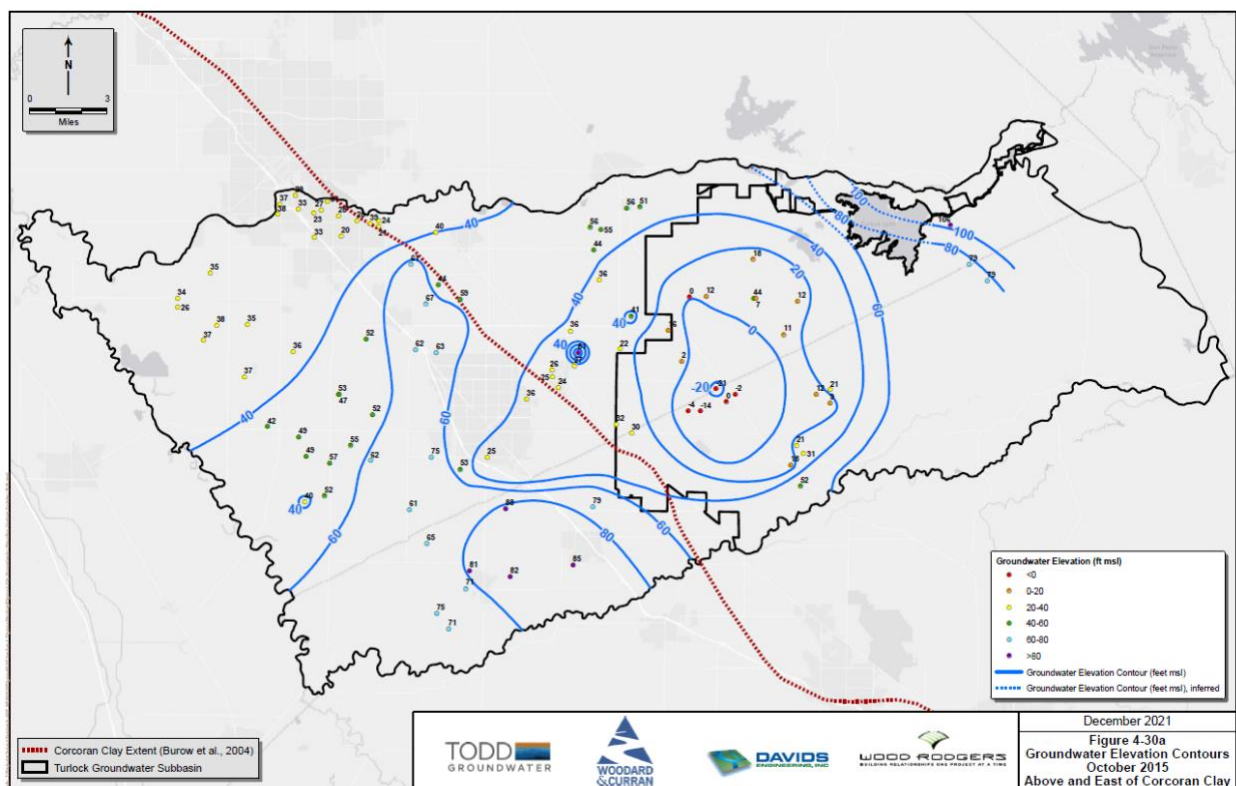


Figure 2: Groundwater elevation contours in October 2015 (drought conditions), showing the cone of depression in the East Turlock GSA area. The red dotted line is the eastern boundary of the Corcoran clay, a restrictive layer that lies about 100-250 feet below the ground surface in this area. Groundwater elevations shown are for the aquifer that lies above the Corcoran clay, where it is present. Reproduced from the Turlock Subbasin Groundwater Sustainability Plan, rev. July 2024.

The recharge programs in WTSGSA and ETSGSA, and their ongoing partnership, have been built on common technical understanding of groundwater in the subbasin and clear strategies for groundwater sustainability that address the different priorities and conditions on the west and east sides. Although TID has reliable access to surface water and an efficient water management pattern now, predicted changes in climate conditions may shift the timing of surface water availability and force changes to the way water is stored and delivered on the west side of the basin. In anticipation of this, while continuing to emphasize in-lieu groundwater recharge now, WTSGSA is considering how its conveyance system might be used to deliver shoulder- and winter-season water and is testing methods of direct recharge to accommodate a greater need for underground water storage in the

future. On the east side, better understanding of groundwater conditions and likely future climate conditions combined with the reality of limited surface water supply have made groundwater demand reduction a top priority, along with securing access to surface water when it is available from neighboring districts and restoring natural hydrology to retain more stormwater in local drainages. Both GSAs are working hard to preserve agricultural production in their jurisdictions to the maximum extent possible under their current and predicted future conditions.

Sustainable Conservation has helped the Turlock Subbasin partners to advance groundwater sustainability, lending expertise on agricultural managed aquifer recharge (Ag-MAR) technical tools and providing technical assistance and programmatic guidance to build recharge programs on agricultural lands across the subbasin.

Recharge Program – West Side

Turlock Irrigation District (TID) is a leading member of WTSGSA. TID's territory includes several municipal and city water districts that are WTSGSA members, and it covers most of the irrigated farmland area in WTSGSA. Due to TID's close engagement with farmers on water management, Sustainable Conservation has focused on collaborating with TID on its groundwater recharge efforts.

WTSGSA and TID currently do not have groundwater pumping allocations (limits on the amount of groundwater each user can pump each year to prevent aquifer depletion in the basin) and therefore do not use a groundwater accounting platform for individual grower accounts. The focus for WTSGSA is on in-lieu recharge, maximizing the use of surface water for irrigation to minimize groundwater pumping. WTSGSA has some district-operated recharge projects. These include filling the 26-acre, 105-acre-foot volume Dianne stormwater basin (an excavated basin, owned and maintained by the City of Turlock, designed to hold excess runoff during storm events to reduce urban flooding) for recharge when water is available and incidental recharge in unlined conveyance canals. WTSGSA supports on-farm recharge on a project-by-project basis through its Idle Lands Recharge Program, offering recharge water to fallow agricultural fields or to fields where a whole-orchard recycling (WOR) project has been completed to help decompose the wood chips. WTSGSA is considering supporting recharge in small, privately-owned basins (micro-basins) on farms.

Groundwater recharge metrics tracked by TID for the WTSGSA include water delivered to fallow lands, water delivered to basins and the infiltration galleries, and replenishment water delivered to ETSGSA for in-lieu and direct recharge.

Recharge Program – East Side

ETSGSA's member agencies contract with Formation Environmental to manage the GSA. Sustainable Conservation has focused on collaboration with the GSA manager and other partners who are helping to implement the Projects and Management Actions outlined in the GSP and the Department of Conservation-funded grant program known as the Multibenefit Land Repurposing Program (MLRP) that ETSGSA launched in 2023.

In ETSGSA, where growers are more groundwater dependent, groundwater allocations have been implemented, and grower accounts are managed in the Groundwater Accounting Platform (GAP). The accounting system allows growers to interact with ETSGSA and to track groundwater use and allocations for each farm parcel. There is an assessment by acre on each groundwater user as well as a groundwater use fee based on volume of usage. ETSGSA measures usage of groundwater through remote-sensing measurements of evapotranspiration (ET), or by well meter readings where ET measurements are not possible or where landowners prefer to use meter data. The accounting system debits a grower's account for groundwater use and credits a grower's account with effective precipitation (the portion of precipitation that is estimated to be retained in soil and usable for plant growth), applied surface water for irrigation, documented groundwater recharge, and any carryover credits from prior years ([ETSGSA Rules and Regulations, 2025](#)). Growers who use cover crops in ETSGSA get another bonus in their groundwater budgets: effective precipitation is credited at a higher rate on cover cropped fields compared to fields with no winter vegetation, reflecting research reported in [Cover Cropping in the SGMA Era](#) (Sustainable Conservation, 2024) showing greater infiltration, increased soil moisture retention, and decreased runoff where cover crops are used.

ETSGSA focuses on groundwater demand reduction as well as direct and in-lieu groundwater recharge through a broad array of efforts. ETSGSA and its member agencies purchase surface water from neighboring districts, including TID and Merced Irrigation District (MID). When replenishment water is available, ETSGSA covers the cost of water for in-lieu recharge by irrigation, or for growers to spread on farm fields and in micro-basins for direct recharge. In-lieu recharge is incentivized in two ways: a grower receives a credit to their groundwater account when they purchase surface irrigation water supplies, and Eastside Water District (EWD), a member agency of ETSGSA, will pay to install a new surface water turnout to enable a grower to access surface water supplies for irrigation or recharge. EWD requires those farms that have received new turnouts to purchase and take surface water for irrigation when it is available. Growers in ETSGSA report quantities of surface water applied for in-lieu and direct recharge, the water source, and the location of recharge in GAP. ETSGSA then calculates the recharge credit to the grower according to

GSA policy. For details on ETSGSA policies, including calculation and verification methods, refer to the [ETSGSA Rules and Regulations](#) (August 2025), available on the [ETSGSA website](#).

ETSGSA offers growers incentives to reduce groundwater demand in two programs: a voluntary long-term land fallowing incentive funded through GSA assessments, and the MLRP. Growers can choose from several types of land repurposing projects in the [ETSGSA MLRP](#), including long-term fallowing, orchard swale rewinding, multi-benefit recharge basins or stormwater basins, floodplain reconnection, and flood flow spreading (equivalent to on-farm recharge).

Technical Tools

Sustainable Conservation and Earth Genome began developing a local Groundwater Recharge Assessment Tool (GRAT) for the Turlock Subbasin in 2020, following many conversations with water managers in the region over prior years. GRAT is a modeling approach that combines the best available geophysical data with hydrologic models and local water delivery systems to find the most suitable and cost-effective recharge sites and optimize the delivery of available water for recharge. The primary driver to develop GRAT for Turlock was to address the cone of depression in the groundwater table on the east side, which would require fundamental coordination between WTSGSA and ETSGSA. The Turlock Subbasin GRAT, which was released in early 2022, was the first GRAT designed to foster cross-GSA coordination. This GRAT helped the two GSAs formulate complementary and cooperative recharge strategies that leverage each partner's strengths and advance groundwater sustainability for the entire basin.

Subsequently, the Turlock Subbasin was part of the California Department of Water Resources' (DWR) [San Joaquin Basin Flood-MAR Watershed Studies](#) (2025), which evaluated recharge opportunities across five watersheds in the San Joaquin Basin in the face of a changing climate. For these studies, GRAT was used in combination with meteorological, groundwater, and other models to evaluate groundwater outcomes under different water management and climate scenarios. The studies included updates to GRAT components like Water Available for Recharge (WAFR) and additional GRAT features like Recharge Management Areas (RMAs). RMAs allow GSAs to target recharge for different objectives, such as increased water supply for in-basin retention, disadvantaged communities, and groundwater-dependent ecosystems, according to local priorities in the subbasin. The updated data and functionality from the Watershed Studies and a new land repurposing prioritization routine developed from ETSGSA's MLRP ranking priorities are currently being incorporated into the Turlock Subbasin GRAT. The new Turlock Subbasin GRAT will be completed in 2026, and the partners expect to use it to inform operation of an expanded replenishment water delivery system.

To ensure the success of the East Turlock Subbasin MLRP, ETSGSA and partners (Sustainable Conservation, Earth Genome, Formation Environmental, and EKI Environment & Water, Inc.) identified opportunities to increase grower interest and engagement in the program, as well as associated challenges. This led to the creation of the [MLRP Viewer](#), a user-friendly tool developed by Sustainable Conservation and Earth Genome that allows growers to visualize MLRP project opportunities and potential benefits of repurposing their land. The MLRP Viewer was completed in the fall of 2025, in time to help growers applying for MLRP funding in January and February 2026 to develop their project plans.

Technical Assistance

Sustainable Conservation started collaborating with TID and farmers in that District to support their on-farm recharge efforts in the fall of 2022. Sustainable Conservation assisted with multiple on-farm visits to discuss project logistics with partners, and the partnership led to three on-farm recharge pilot projects in winter 2022-23. In January 2023, Sustainable Conservation showcased this collaboration with local stakeholders and farmers at a field day held at one of the pilot recharge sites. Guest speakers included Wade Crowfoot, California Secretary of Natural Resources; Michelle Reimers, TID General Manager; and Karen Ross, California Secretary of Agriculture. Since then, Sustainable Conservation has worked with the GSAs and their member agencies and partners to host events on how to expand recharge and multibenefit land repurposing efforts (Table 1, Figure 5).

After receiving funding from DWR in late 2023 to assist water districts in developing recharge programs, Sustainable Conservation continued to work with TID and WTSGSA. In the spring of 2024, WTSGSA's Board of Directors approved the Idle Lands Recharge Program to be offered throughout TID's water service area, and Sustainable Conservation worked with TID to launch and provide technical assistance to interested growers. Sustainable Conservation provided expertise in site selection, implementation strategies, and monitoring and reporting practices to ensure that on-farm recharge could be conducted successfully and safely. In the initial year of the program, TID reported delivering 68 acre-feet of water for groundwater recharge to four growers covering 74 acres under the Idle Lands program. As growers become more comfortable with recharge practices and TID evaluates the costs and outcomes of these initial projects, the Idle Lands Recharge Program could expand to deliver more water to more farms in the area for on-farm recharge.

Sustainable Conservation worked with TID to help develop WTSGSA's recharge strategies. Using GRAT and data developed in the DWR Watershed Studies, scenarios were formulated and tested to maximize recharge potential to achieve multiple objectives, including aquifer

recovery as well as increasing groundwater supply for community water systems and groundwater-dependent ecosystems (GDEs). GRAT analysis helped WTSGSA and ETSGSA develop a water purchasing agreement and mutual investment in increasing grower access to surface water for direct and in-lieu recharge, as well as an agreement between the two GSAs to address the cone of depression in groundwater levels in ETSGSA. Under this agreement, ETSGSA compensates WTSGSA for groundwater that flows laterally into the cone of depression from TID's conveyance infrastructure and works to reduce groundwater demand to allow groundwater recovery.

As previously mentioned, ETSGSA received funding from the California Department of Conservation for the development and implementation of its local MLRP. In early 2024, Sustainable Conservation began working as a subcontractor to ETSGSA among a team of partners led by Formation Environmental and EKI to develop and launch ETSGSA's MLRP. Sustainable Conservation's Water for the Future Team and the Soils Team advised ETSGSA during development of its MLRP program, providing expertise on recharge site evaluation and individual project design, and on incorporating soil health practices like cover crops into recharge and land repurposing practices. Sustainable Conservation's Accelerating Restoration Team reviewed the permitting strategy for land repurposing projects and offered feedback to Environmental Science Associates, the partner in charge of permitting for the ETSGSA MLRP. Sustainable Conservation participated in technical tool development, leveraging the Turlock Subbasin GRAT as a foundation to analyze potential recharge from stormwater runoff and flood flows and helping develop the specifications and implementation requirements for the various land repurposing strategies offered in the MLRP. The GRAT team, which includes Sustainable Conservation and Earth Genome, developed the [MLRP Viewer](#) for project proponents and project managers to visualize potential land repurposing options on any parcel in ETSGSA, as well as regional priority areas for recharge (Figures 3 and 4). As a member of the MLRP Planning Group, Sustainable Conservation reviewed and provided feedback on the MLRP application materials and project scoring framework. The GRAT team developed the recharge component of the groundwater sustainability score for evaluating proposed land repurposing projects. Sustainable Conservation also provided technical assistance to GSA management through participation in the MLRP Technical Advisory Committee.

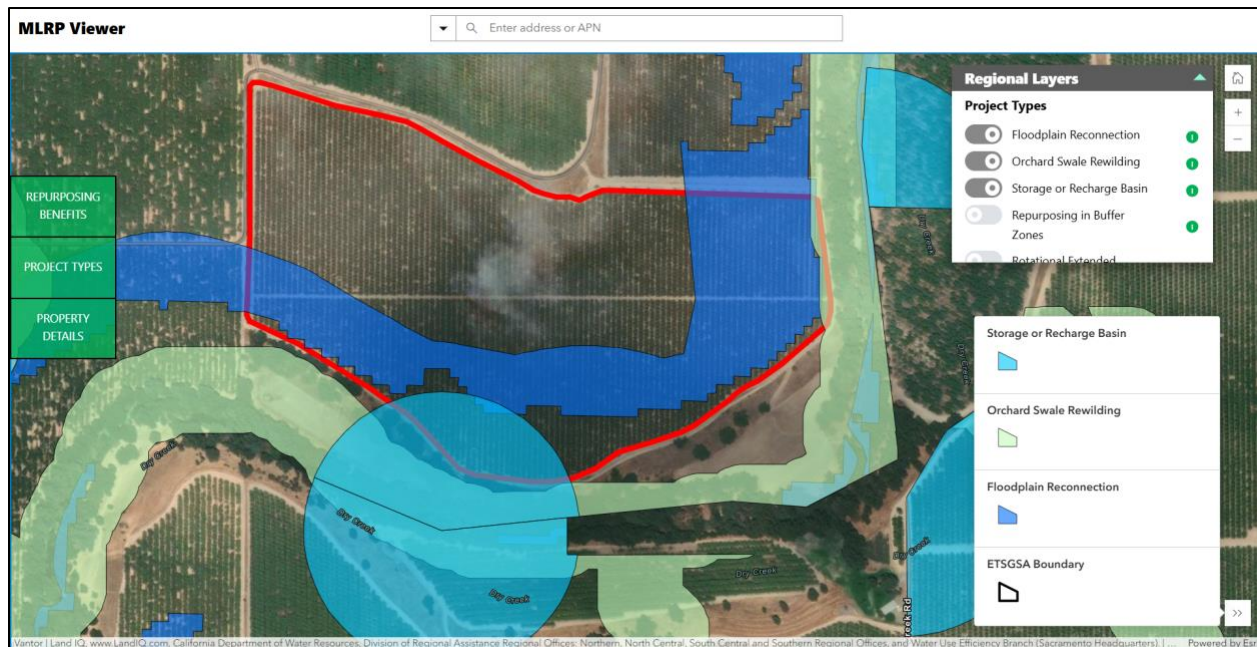


Figure 3: MLRP Viewer shows project suitability for individual parcels

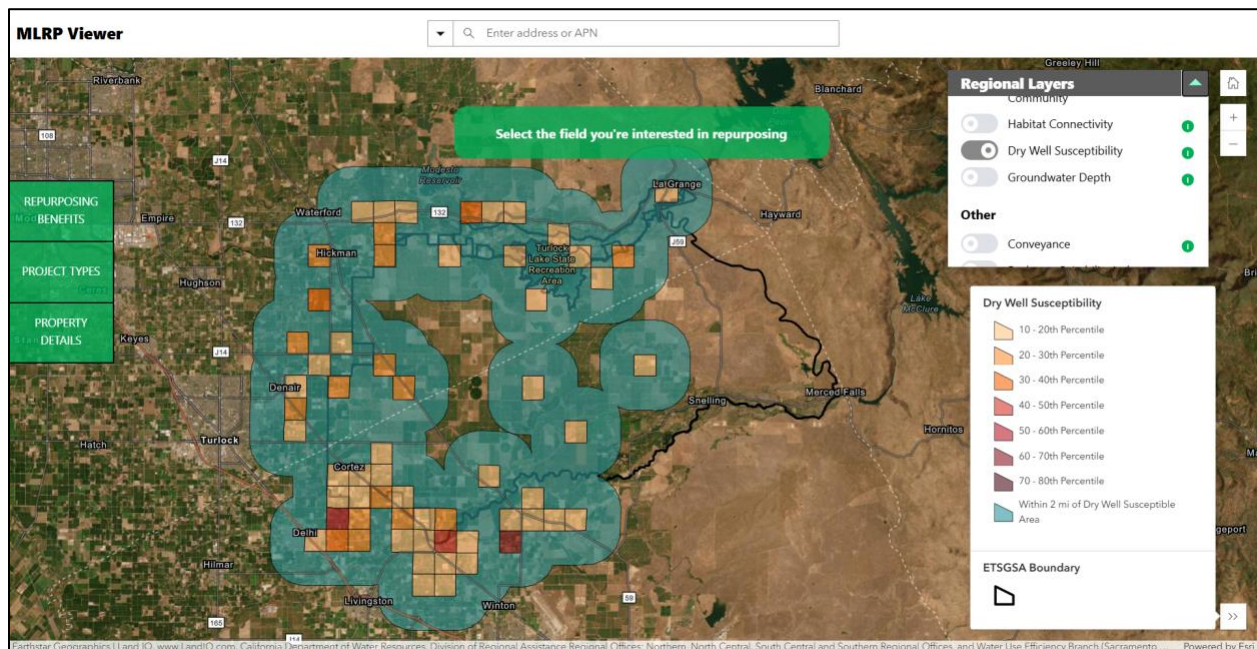


Figure 4: MLRP Viewer shows regional priority areas for recharge

Sustainable Conservation was a key partner during MLRP outreach to growers, working with the Grower Ad-hoc Committee, a forum for farmers and landowners to discuss land repurposing ideas and proposals with program partners. Sustainable Conservation participated in education and outreach efforts to engage potential participants and provided technical assistance to farmers through farm visits with project proponents, including those who became the first four pilot projects in ETSGSA's MLRP. Sustainable

Conservation also shared expertise in site selection, implementation strategies, and monitoring and reporting practices during two Technical Assistance Fairs for growers, to ensure that on-farm recharge could be conducted successfully and safely.

*Table 1: Outreach and Education Events for On-Farm Recharge and MLRP. *Events partially or fully funded through ETSGSA MLRP.*

Event, Location, and Date	Agenda or Purpose	Partner(s)	Attendees
On Farm Recharge Demonstration Field Day Ceres, CA June 26, 2024	Launch of TID's Idle Lands Recharge Program and on-farm recharge demonstration	Turlock Irrigation District (TID)	35, including 10-12 farmers. Other attendees included District staff.
Tree and Vine Expo* Turlock, CA November 11, 2025	Groundwater Session panel discussion about on-farm recharge. Topics discussed were: • GSA Perspective and Approach to MLRP (ETSGSA) • MLRP project examples and incentives (EKI) • On-farm Recharge (OFR/MAR) Field Technical Support, Turlock experience (Sustainable Conservation) • Farmer's Perspective Panel with two Turlock MLRP Pilot project proponents and one TID on-farm recharge pilot participant	ETSGSA, EKI, Turlock area growers	1,100 farmers attended the conference. Approximately 800 people were in attendance during this session, of which 200-300 were Turlock area famers or landowners
Farm visits with project proponents East Turlock Subbasin* Summer 2025	Visits to 4 project proponent sites to advise growers on recharge project suitability and project design for their land.	ETSGSA MLRP Technical Advisory Committee	Project proponents and ETSGSA, EKI, and Formation Environmental staff
Technical Assistance Fairs* Cortez, CA January 14 and February 11, 2026	Provide information about land use alternatives offered under MLRP, demonstrate MLRP Viewer , and help interested landowners apply for MLRP funding during the Jan - Feb 2026 Request for Proposals period.	ETSGSA, EKI, Formation Environmental, Environmental Science Associates (ESA)	31 attendees at January TA Fair; similar number at February TA Fair



Figure 5: On-Farm Recharge Workshop in Ceres, CA, June 2024

Recommendations and Next Steps

In WTSGSA, where the focus is on in-lieu recharge and where TID controls a great deal of its own delivery system, adaptation to predicted hydrologic changes from climate change will be critical. As the watershed shifts from a snow-dominated to a rain-dominated system, runoff is expected to come earlier in the water year. TID may need to evaluate changes to its operations, including expanding storage and canal capacities, to handle greater winter flows. Forecast-informed reservoir operations (FIRO) combined with groundwater recharge strategies could help TID relieve pressure on surface water storage facilities by utilizing groundwater storage to enhance the conjunctive management of surface and groundwater. As the San Joaquin Basin Flood-MAR Watershed Studies showed, expanded on-farm and in-lieu recharge will be an important component of a strategy to mitigate the impacts of climate change on water supplies. GRAT can be used to identify the most suitable recharge locations across the entire subbasin and to inform the operation of conveyance infrastructure for delivery of recharge water. This type of analysis will help the two GSAs collaborate to maximize surface water conveyance for direct and in-lieu recharge for the benefit of the entire basin. GRAT analysis could be used to evaluate how active recharge could help reach other groundwater sustainability goals, such as improving conditions for groundwater-dependent ecosystems (GDEs), community water supply, and depleted groundwater levels. Active and in-lieu recharge strategies modeled in GRAT can then be evaluated for economic and physical feasibility and incorporated into new Projects and Management Actions for SGMA compliance.

In the third and fourth quarters of calendar year 2026, Sustainable Conservation will support land repurposing projects funded by ETSGSA's MLRP in their transition from project development to implementation. As the MLRP grant comes to a close, Sustainable Conservation will work with ETSGSA and other partners to carry sustainable groundwater management and land-use change forward in the subbasin. GRAT analysis will help to maximize effective use of surface water for direct and in-lieu recharge, utilizing ETSGSA's water purchase agreements with TID and Merced Irrigation District. These analyses will help ETSGSA plan and evaluate investments to build new infrastructure for surface water delivery. ETSGSA continues to explore new approaches to land repurposing and groundwater recharge, such as floodplain reconnection and flow-through basins (FTBs). FTBs are designed to function as "mini floodplains" to slow and retain flood water along small creeks, and they can also serve ecological functions. Sustainable Conservation will provide technical expertise to ETSGSA to develop implementation requirements for FTBs.

Enrolling more growers in groundwater recharge efforts will be critical to maximize recharge benefits across the Turlock Subbasin and keep working lands operating sustainably. Sustainable Conservation can provide expertise in outreach, [design of incentive programs](#), and on-farm planning to assist WTSGSA and ETSGSA in expanding their collective capacity for recharge. Incentive programs can be designed to attract and compensate growers for their efforts and target desired outcomes for Recharge Management Areas (RMAs) at the same time. The [MLRP Viewer](#) is a powerful tool to show growers both recharge and non-recharge opportunities on their property that may create social or environmental benefits. This tool can be maintained and updated as new approaches to land repurposing are developed.

The new Turlock Subbasin GRAT to be completed in 2026 can be used to test future project scenarios for MLRP and the TID Idle Lands Program alongside district-scale recharge projects, helping GSA decision makers evaluate policies and funding decisions to tailor incentives or target recharge efforts to support RMAs and GSP outcomes.