Groundwater Recharge Assessment Tool
GRAT™

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Stanislaus County Water Advisory Committee

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Recharge Options

Uncropped district land:

1. Unlined canals
2. Dedicated Recharge Basins
3. Dry wells, Active wells

Uncropped private land:

1. Fallow fields
2. Transitioning fields
3. Pasture/grass land
4. Small privately owned basins
5. River floodplains

Active cropland

1. Annual crops (winter fallow)
2. Permanent crops (alfalfa, grapes, orchards: stone fruit, nut crops)

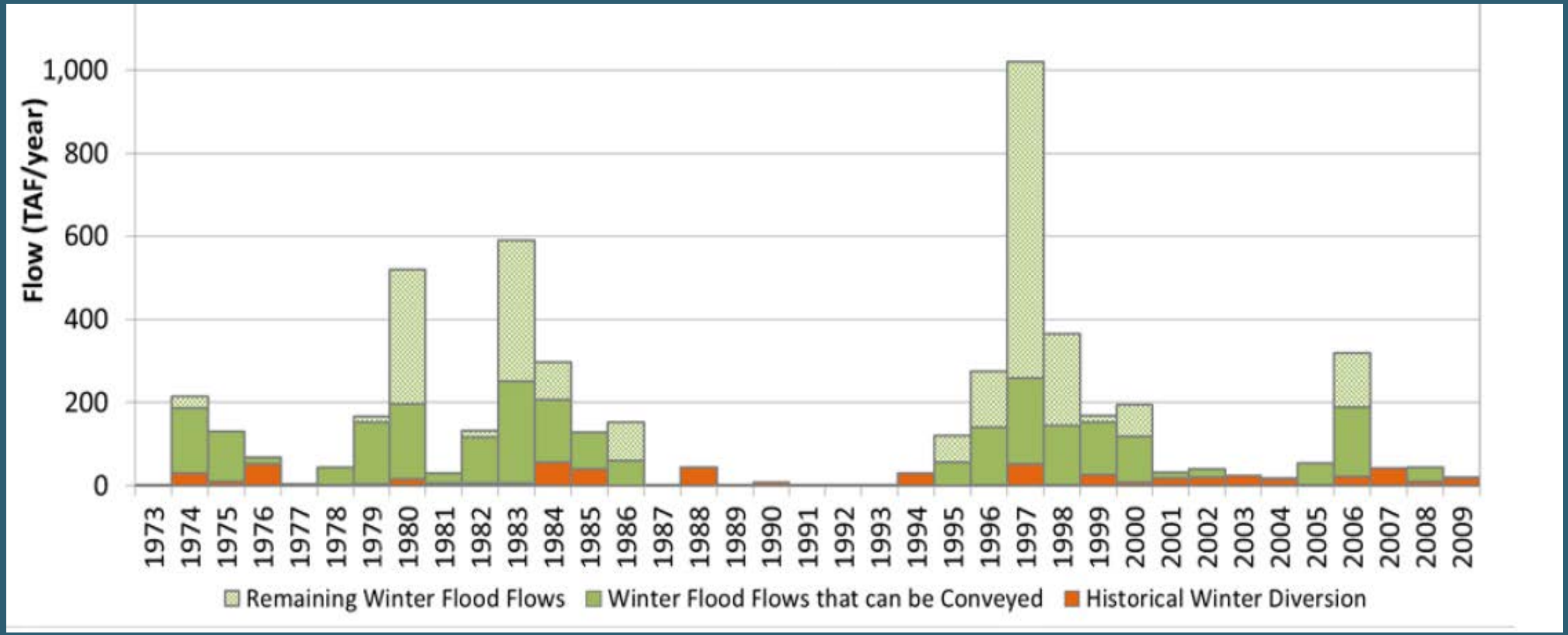
Monitoring Sites: *Documenting what is possible*

Adoption of On-Farm Recharge

Madera Irrigation District Recharge Program: 2017 - 2019

	Winter Program		Fall Program	
	2017	2019	2017	2019
Number of Growers	104	322	3	55
Number of APNs	223	296	7	57
Total Acres	18,715	39,760	278	6,190
Total Acre-Feet Applied	5,900	17,200	225	2,650
Total Acre-Feet Recharged (Applied – Etc)	4,000	~9,000	171	1,700

1. Water Available for Recharge with Climate Change

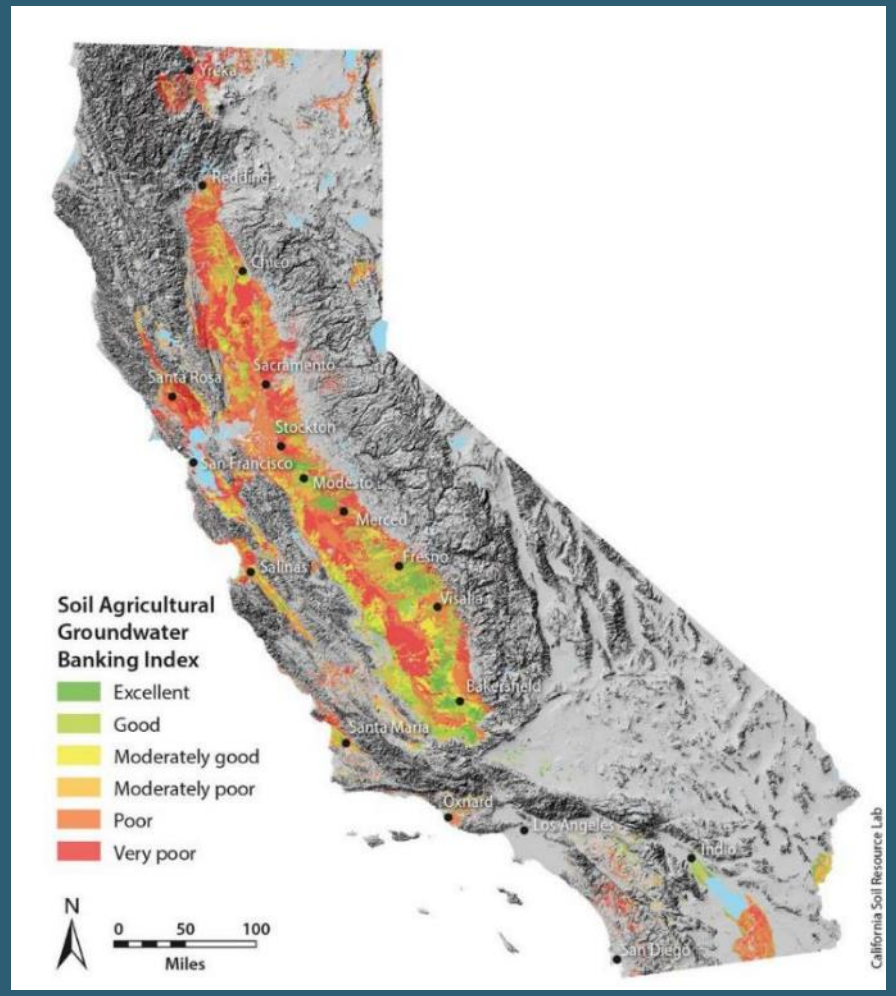


RMC 2015

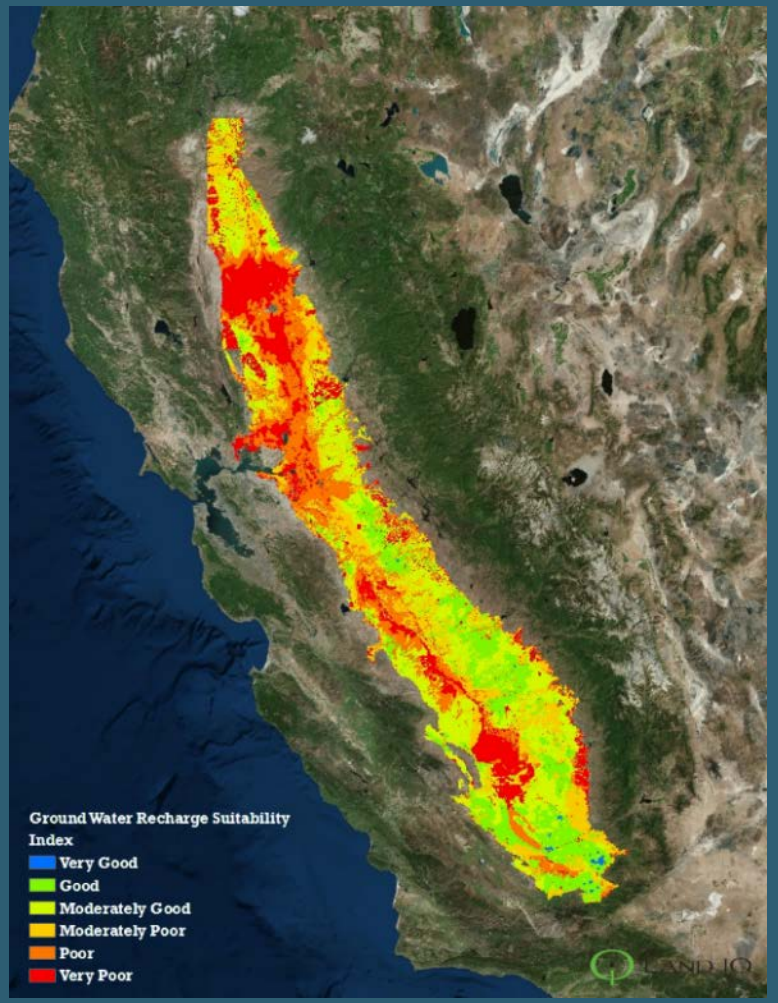
2. District Conveyance Capacity

3. Recharge Suitability Indexes

Weighted indexes of slope, soil type, clay layers, underlying geology, depth to groundwater

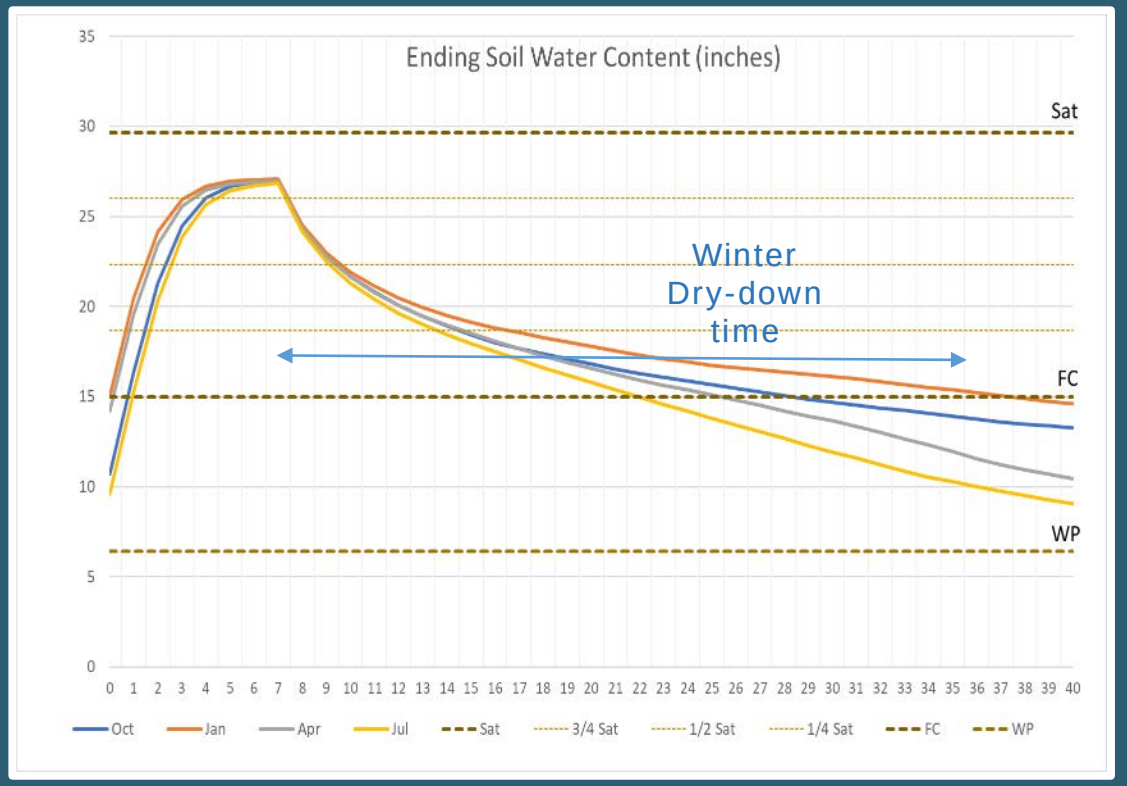


UC Davis SAGBI



Land IQ Recharge Suitability Index

4. Crop Compatibility Calendar



- Weekly capacity of crops to receive water in excess of crop demand
- DWR IDC model used for dry down period by soil type
- Best available data based on farmer and field agronomist experience
- Available for grapes, alfalfa, walnuts, almonds, pistachios, fallow land

5. Cost Comparison of Recharge Options

On-farm

$40 - 107/AF

Dedicated basin

$124- 250/AF

Groundwater Recharge Assessment Tool - GRAT™

1. **Where** is recharge best done? **When**?
2. **How much** surface water can we capture?
3. What would it **cost**?
4. **How much of our groundwater overdraft** can be addressed by increasing recharge?

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EST. 1920
MADERA
IRRIGATION DISTRICT

TULARE IRRIGATION DISTRICT
FORMED IN 1889

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How GRAT™ Works

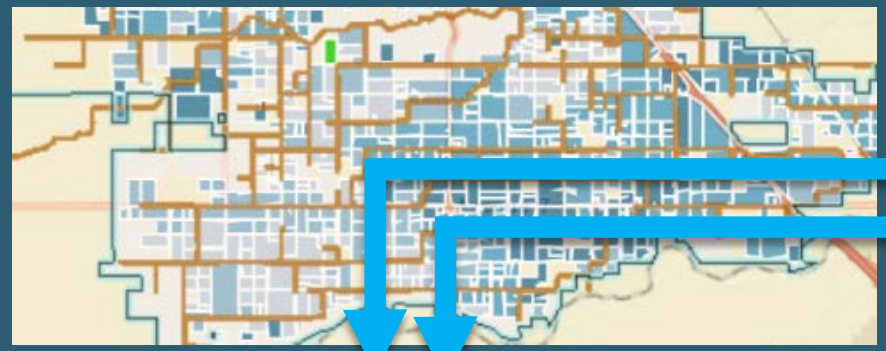
Site Suitability Index

Crop Compatibility Calendar

User defined weekly WAFR schedule

Fields ranked

Conveyance capacity to each field



Water applied to ranked fields:
52 weeks X 20 years

Weekly recharge by field

Total recharge by type, crop, year
Net recharge and costs

Unused water

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Groundwater Recharge Assessment Tool (GRAT)
What is it?

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GRAT = decision support tool that enables Groundwater Sustainability Agencies (GSAs) to identify and prioritize potential groundwater replenishment options to achieve sustainable groundwater supplies.

What will the tool do for Water Districts and GSAs?

- Quickly generate and compare different gw recharge scenarios
- Match available water with recharge potential based on soils, geologies, and crops
- Provide insight into how you can meet SGMA planning requirements
- Identify lowest cost strategies to capture available flood flows
- Compare cost effectiveness of capturing limited surface water supply across the entire subbasin
- Estimate intra-district cost allocation for greater basin benefit

Without further recharge, GSAs and Water Districts in CA may need to limit groundwater pumping, leading to $B's losses per year in lost field productivity

Potential value of GRAT at Subbasin Scale

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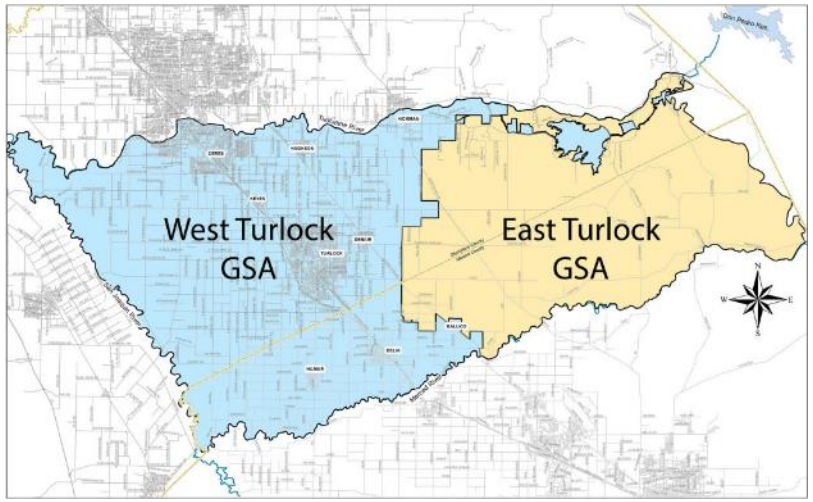
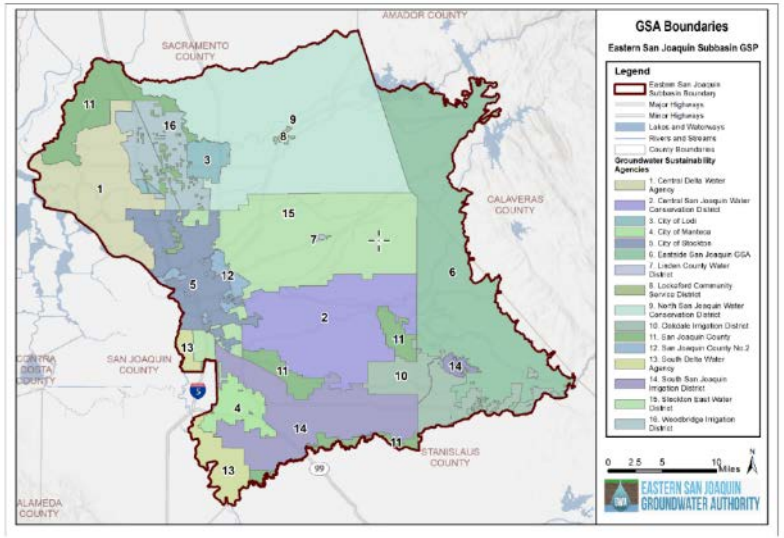
Turlock Subbasin



East San Joaquin Subbasin



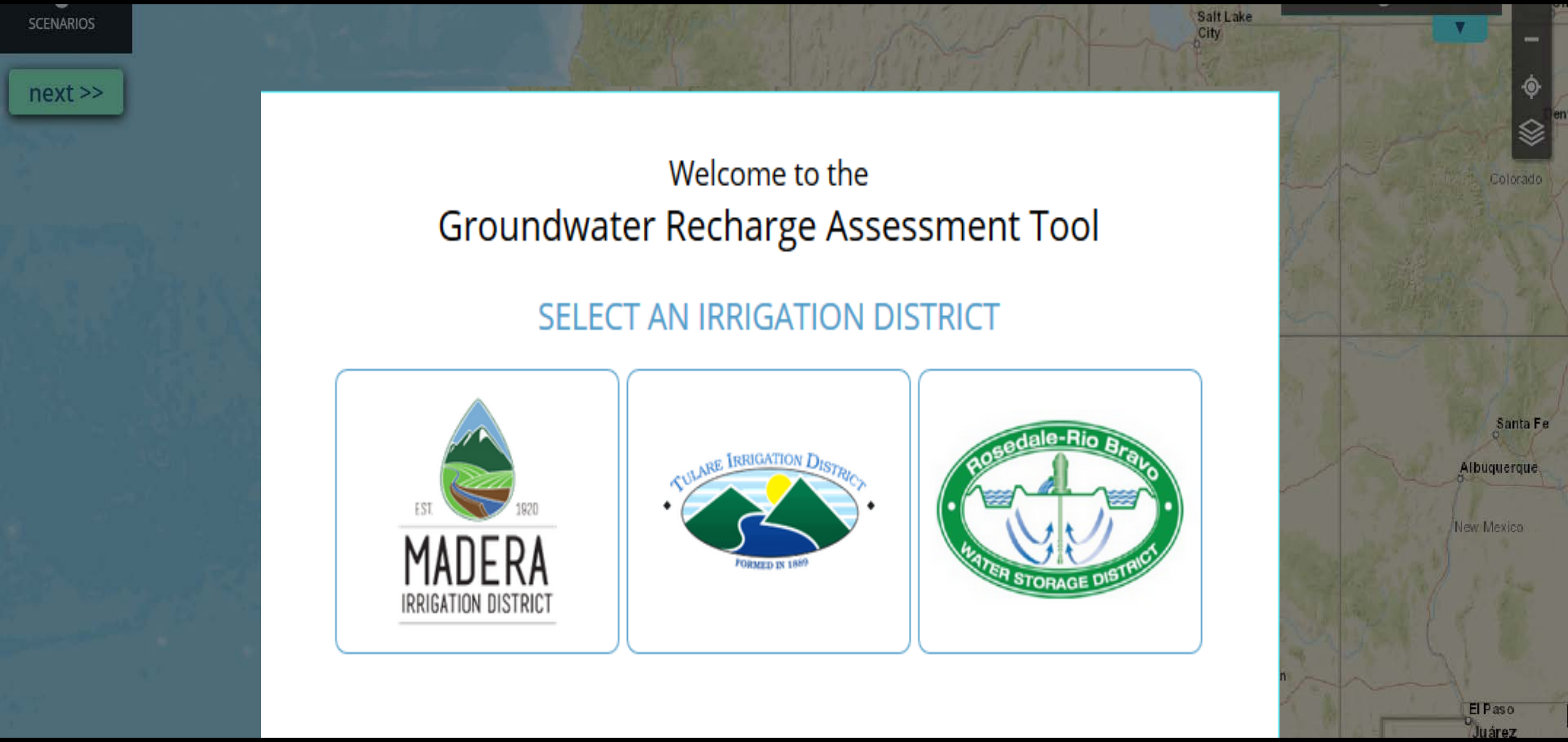
1. **Best options?** What recharge scenarios are available to address areas of greatest aquifer depletion?

2. **Farmer engagement**? What is the latest science on applying recharge water on fields when water is available? Right balance of risk and rewards?

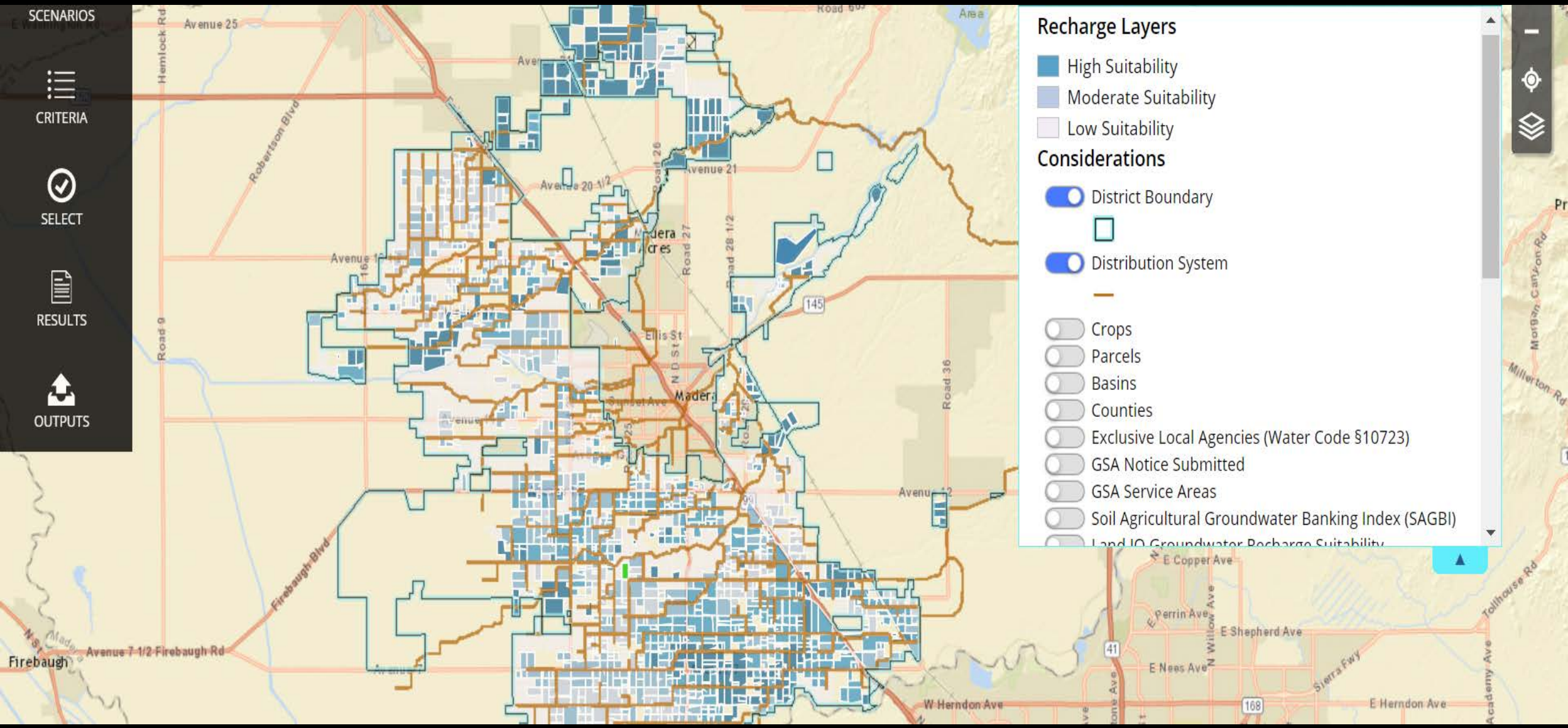
3. **SGMA/GSP**? How might on-farm recharge, fallow recharge, basin recharge, etc. help address the groundwater deficit in the subbasin? Help address GSP needs per SGMA?

4. **Common view**? Create a shared common view, using best available data and science, on what groundwater opportunities exist across multiple jurisdictions?

Cloud-based 24/7 Access



Individual fields ranked by Recharge Potential



Scenarios: User defined water availability

SCENARIOS

next >>

Wet: 150,000 AF

Above Normal: 120,000 AF

Below Normal: 80,000 AF

Dry: 30,000 AF

Critical: 0 AF

Start Year: 2016

Select Recharge Type

De-select all

On-Farm Recharge

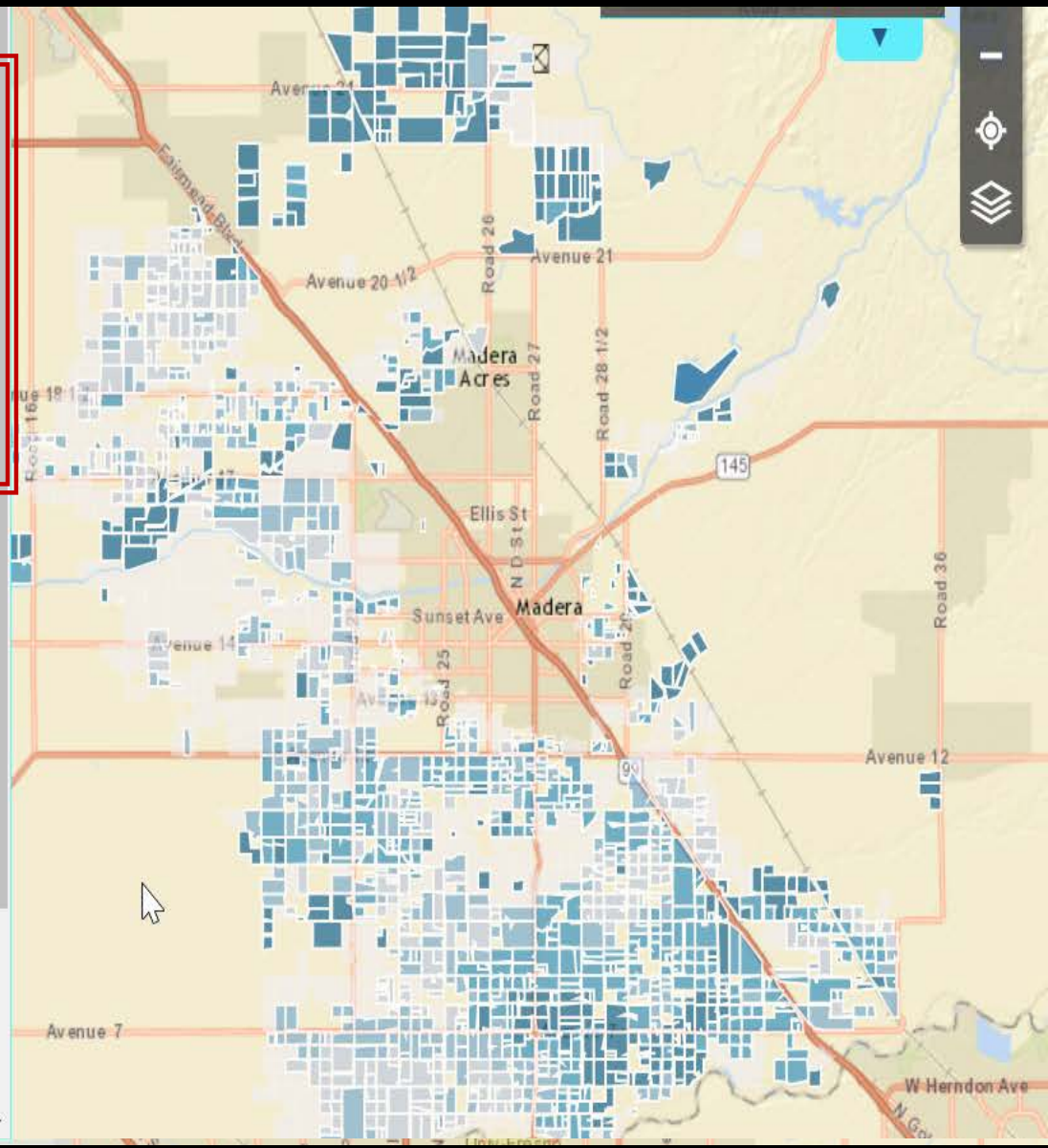
Fallow Recharge

Existing Dedicated

Select Crops for On-Farm Recharge

De-select all

Madera



Scenarios: Recharge Type

SCENARIOS

CRITERIA

SELECT

RESULTS

OUTPUTS

2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035

Years

Start Year: 2016

Select Recharge Type

De-select all

On-Farm Recharge

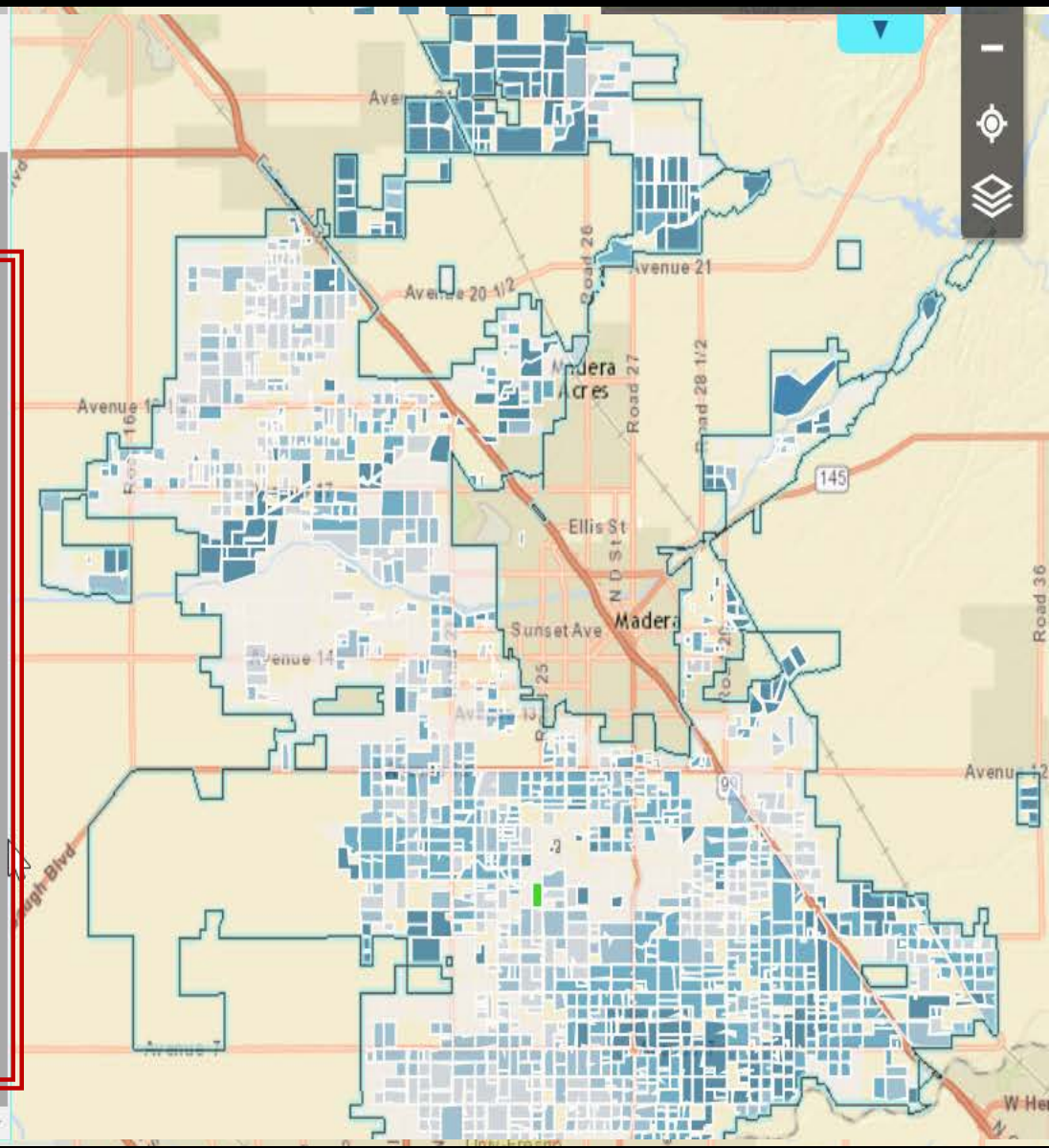
Fallow Recharge

Existing Dedicated

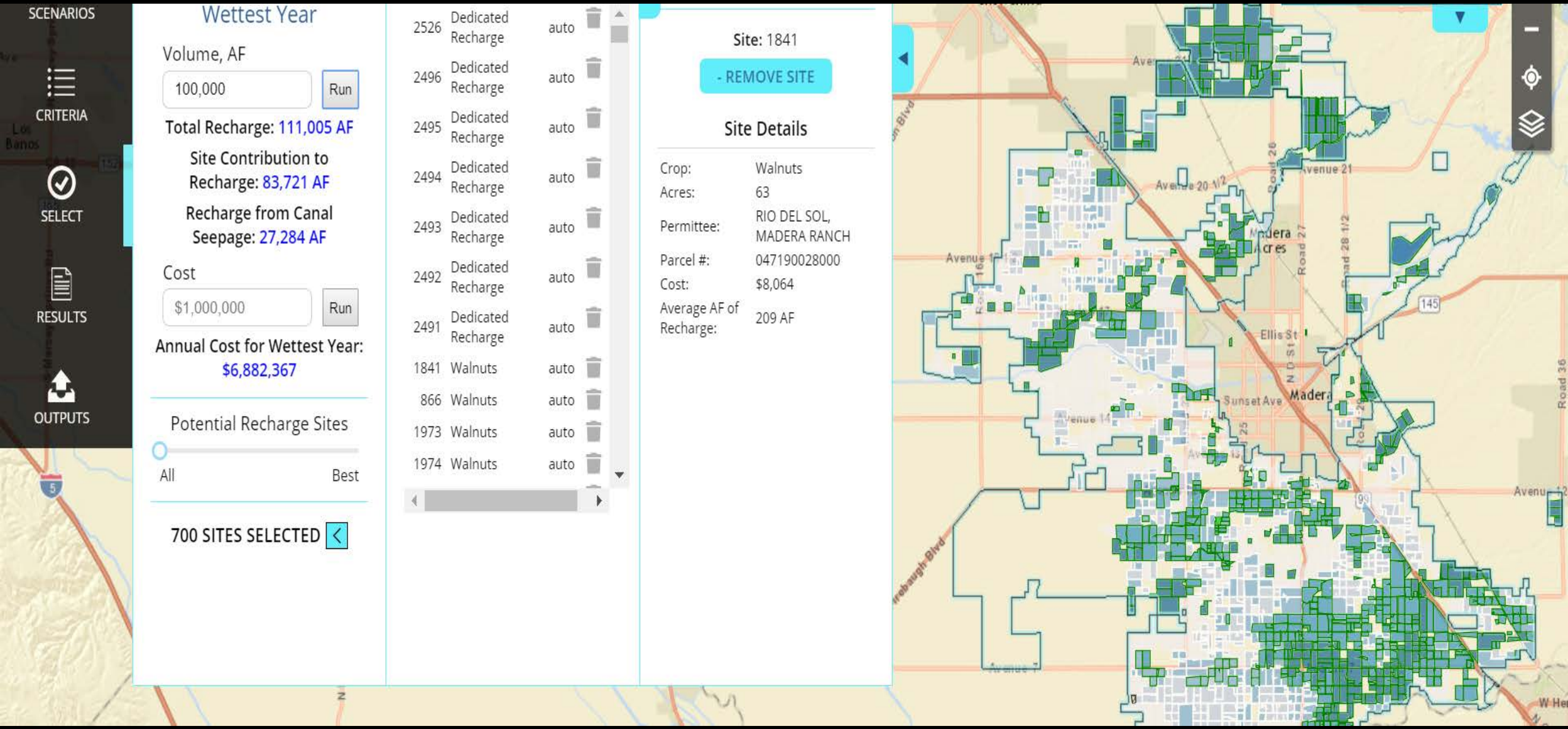
Select Crops for On-Farm Recharge

De-select all

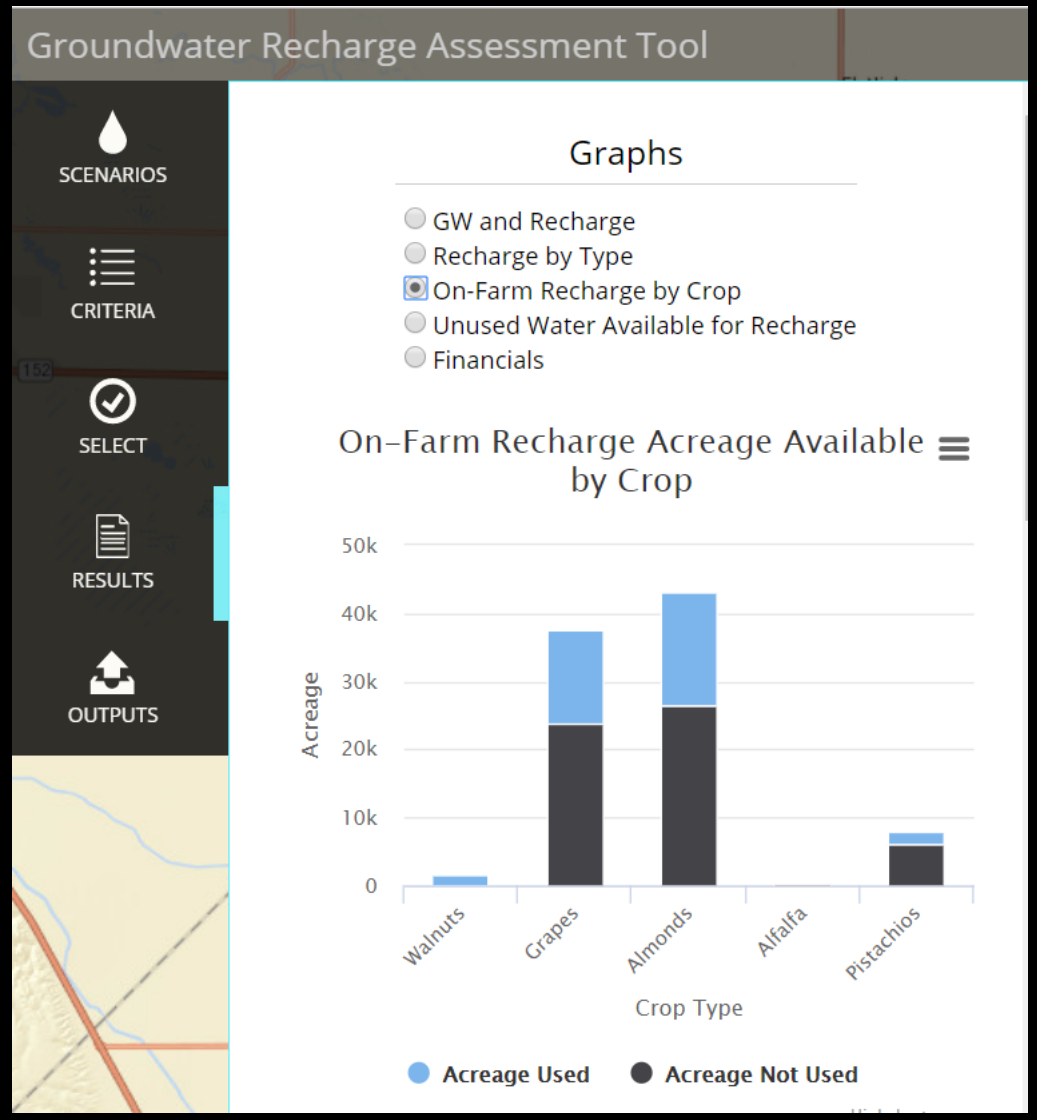
Madera

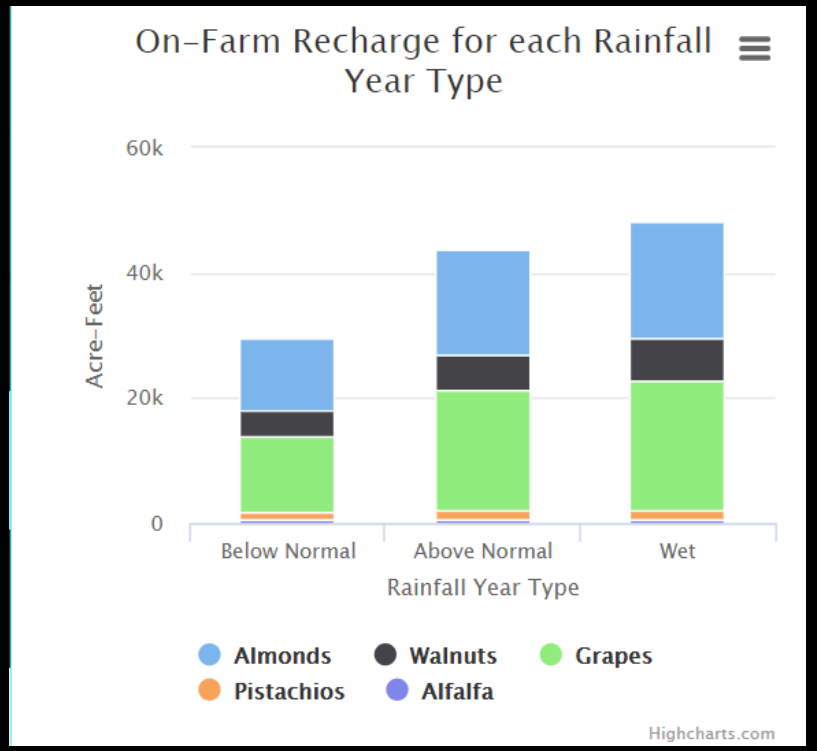


GRAT Selects Sites: Recharge Quantities and Costs

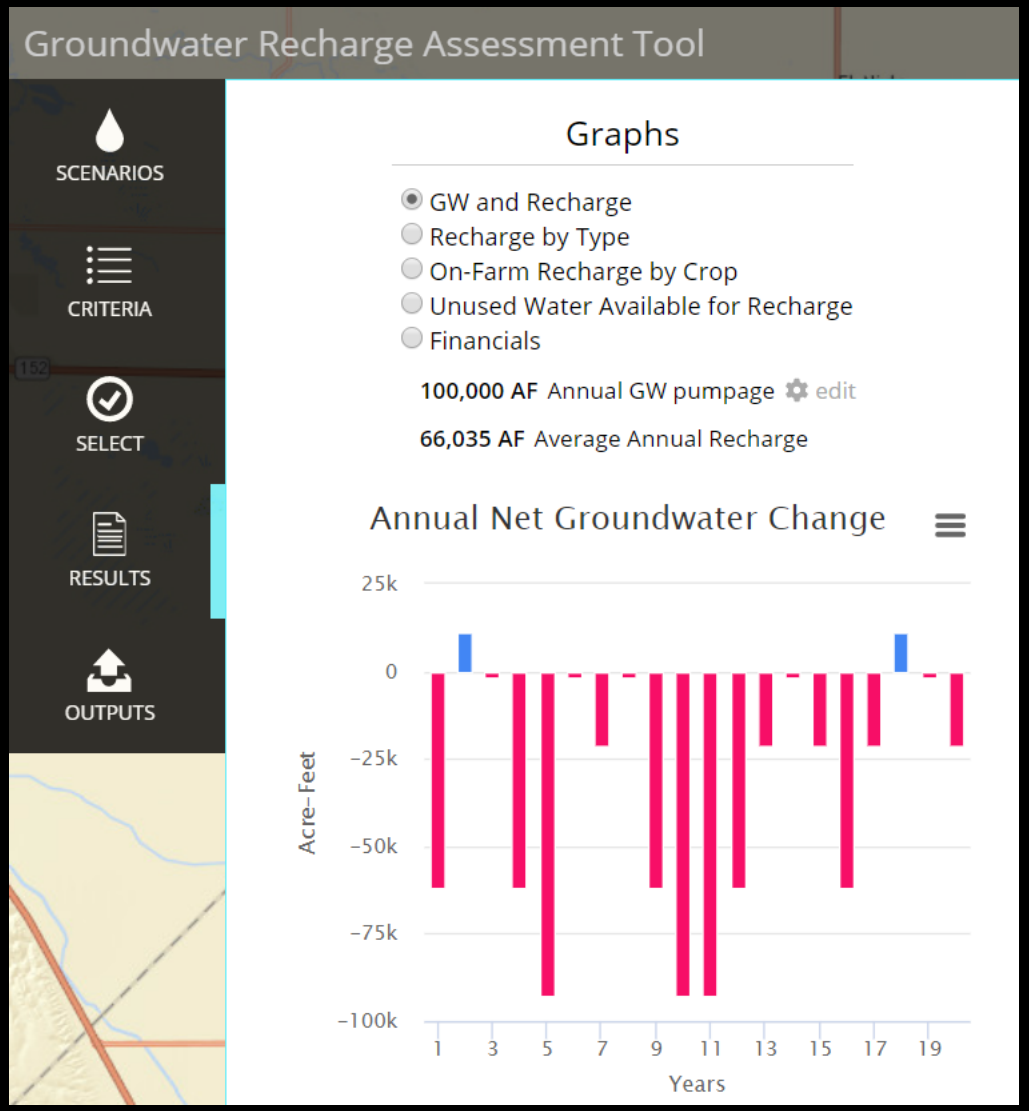


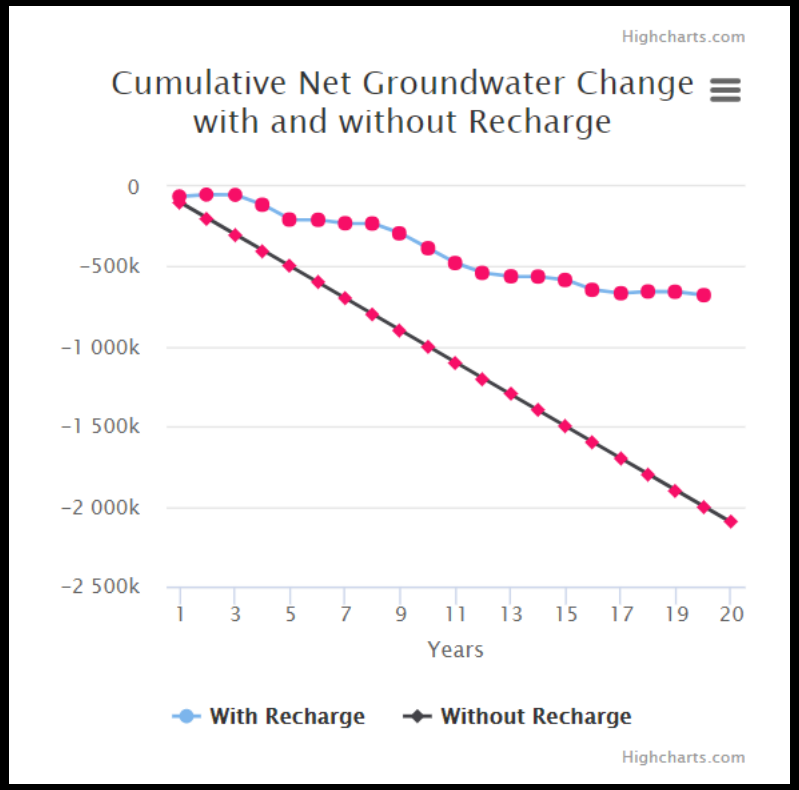
Results: Acreage Used by Crop and Water Year and remaining acreage potential



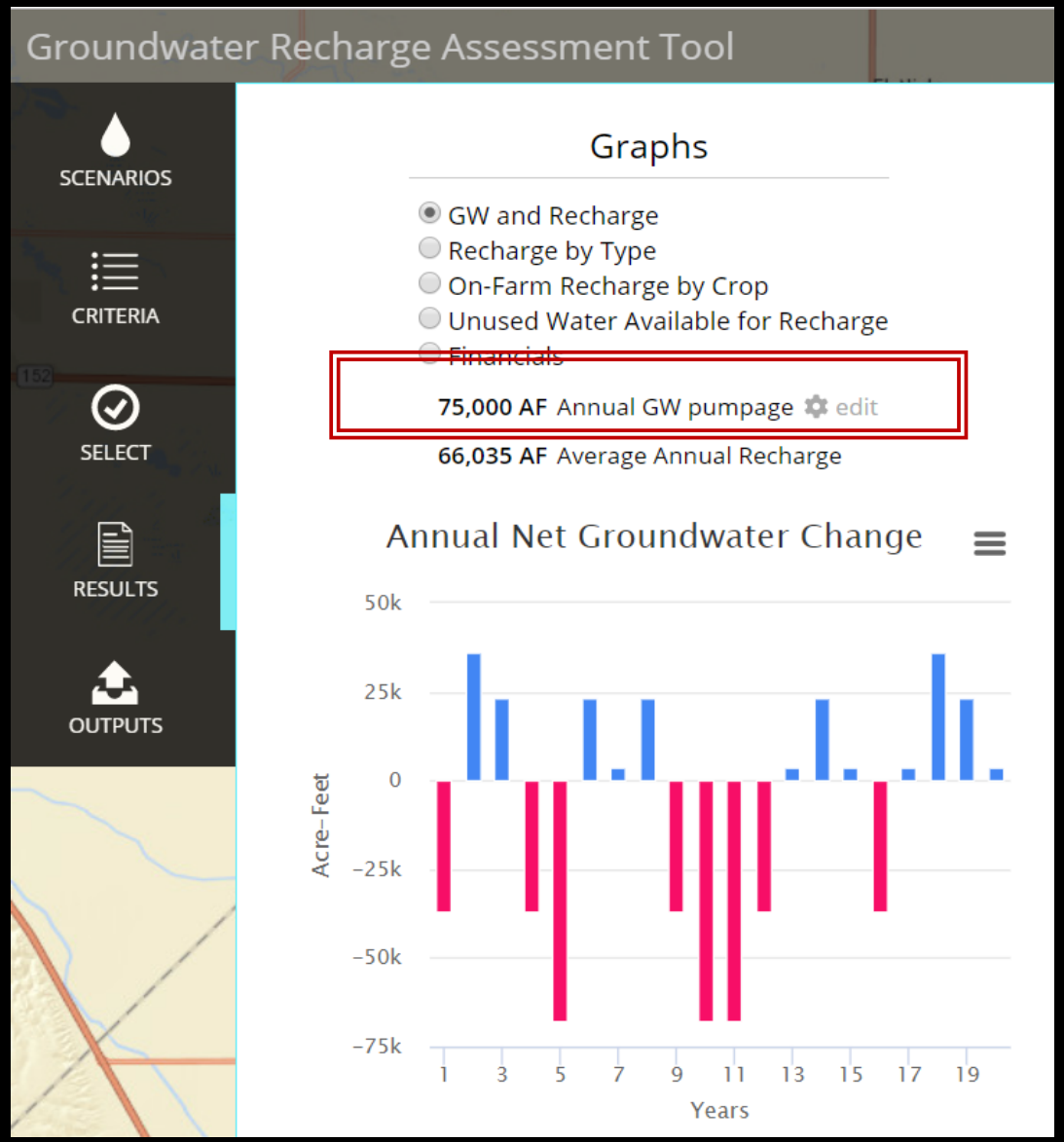


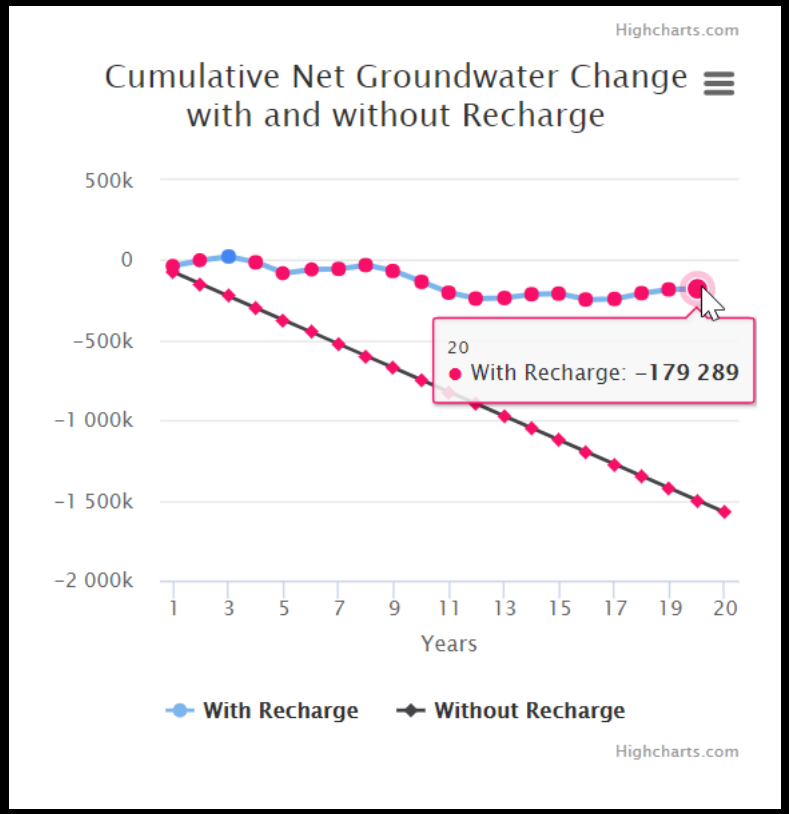
Results: Net Groundwater Change



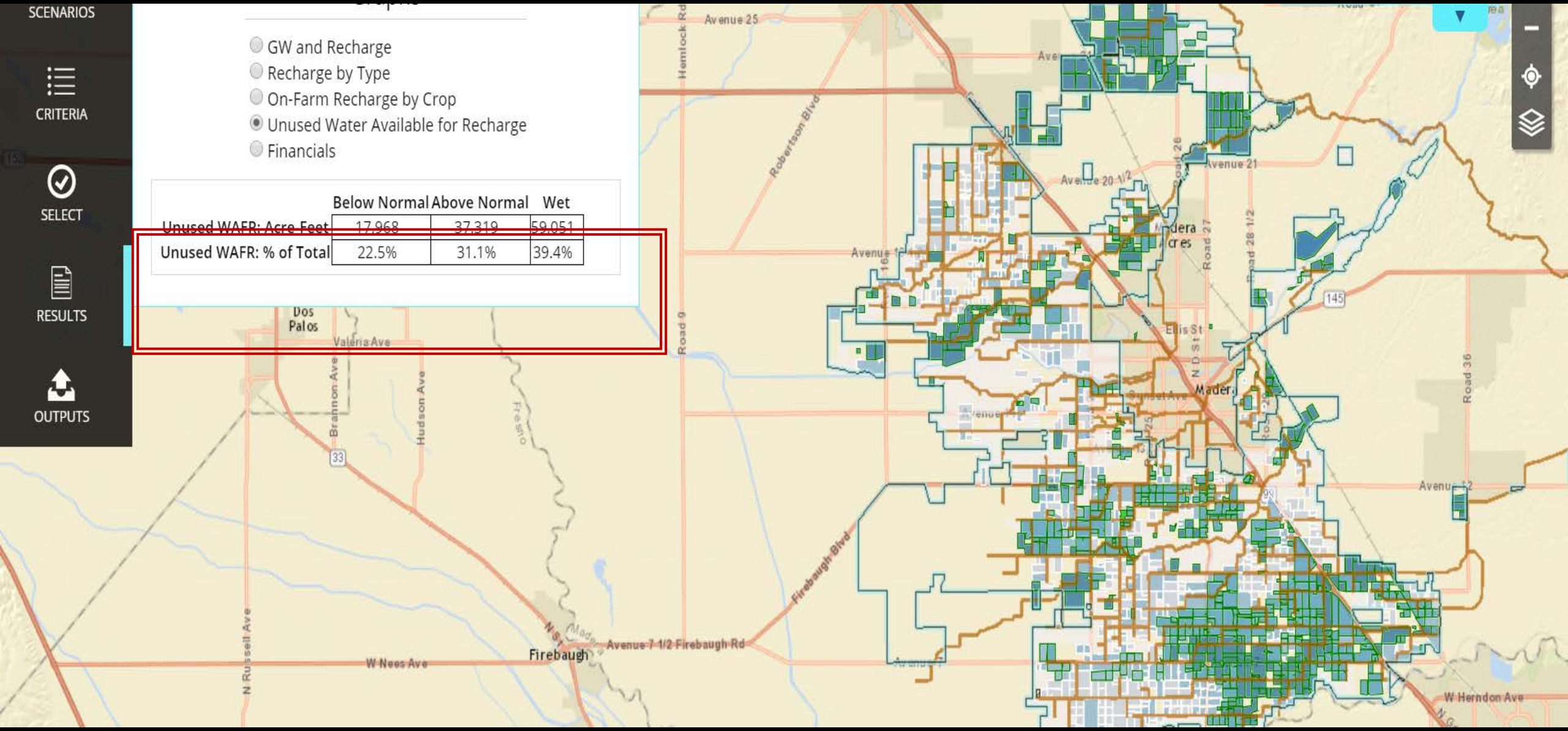


Results: Net Groundwater Change with pumping restrictions

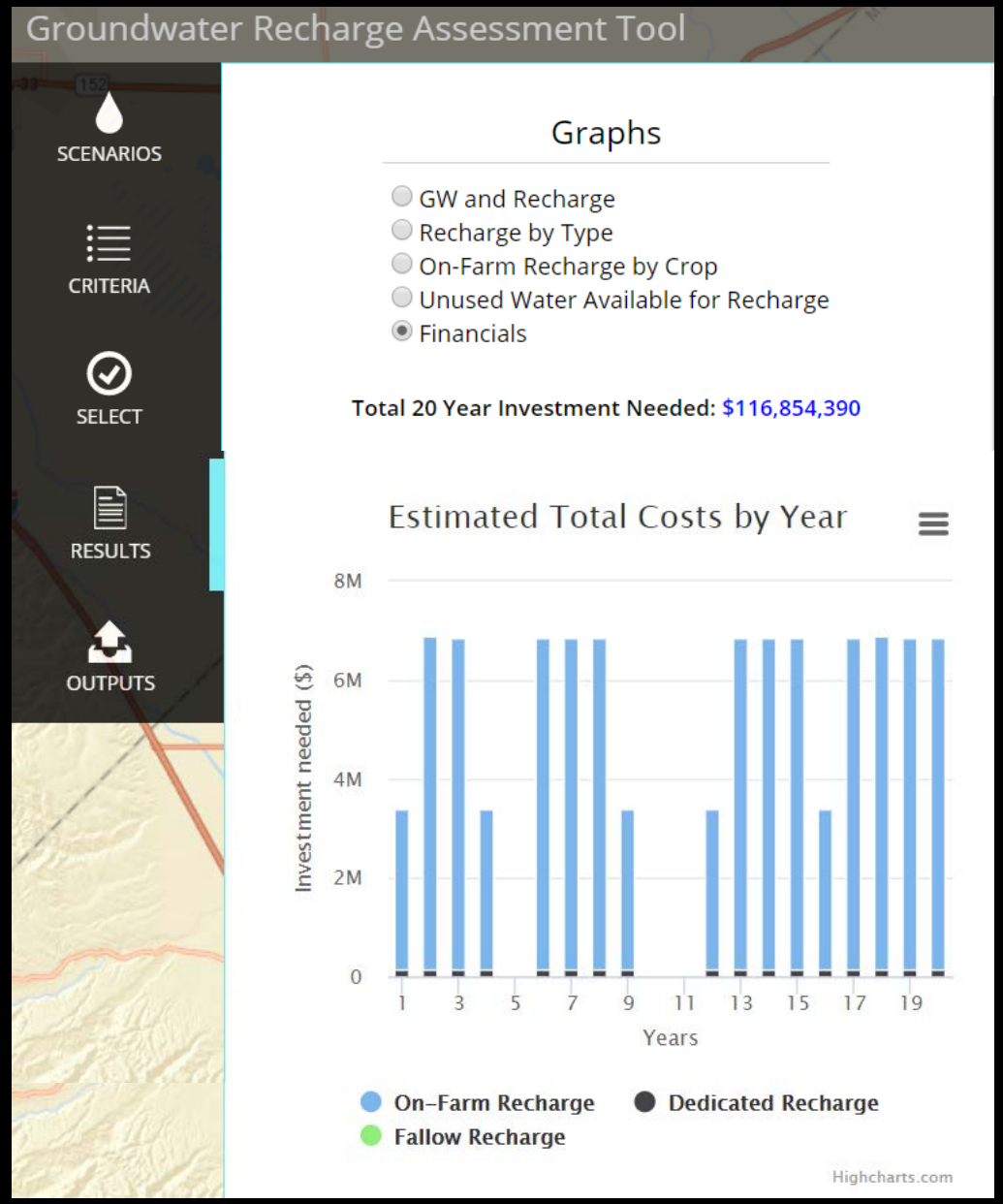




Results: Unused Water Available for Recharge



Results: Investment Cost by Year and Total

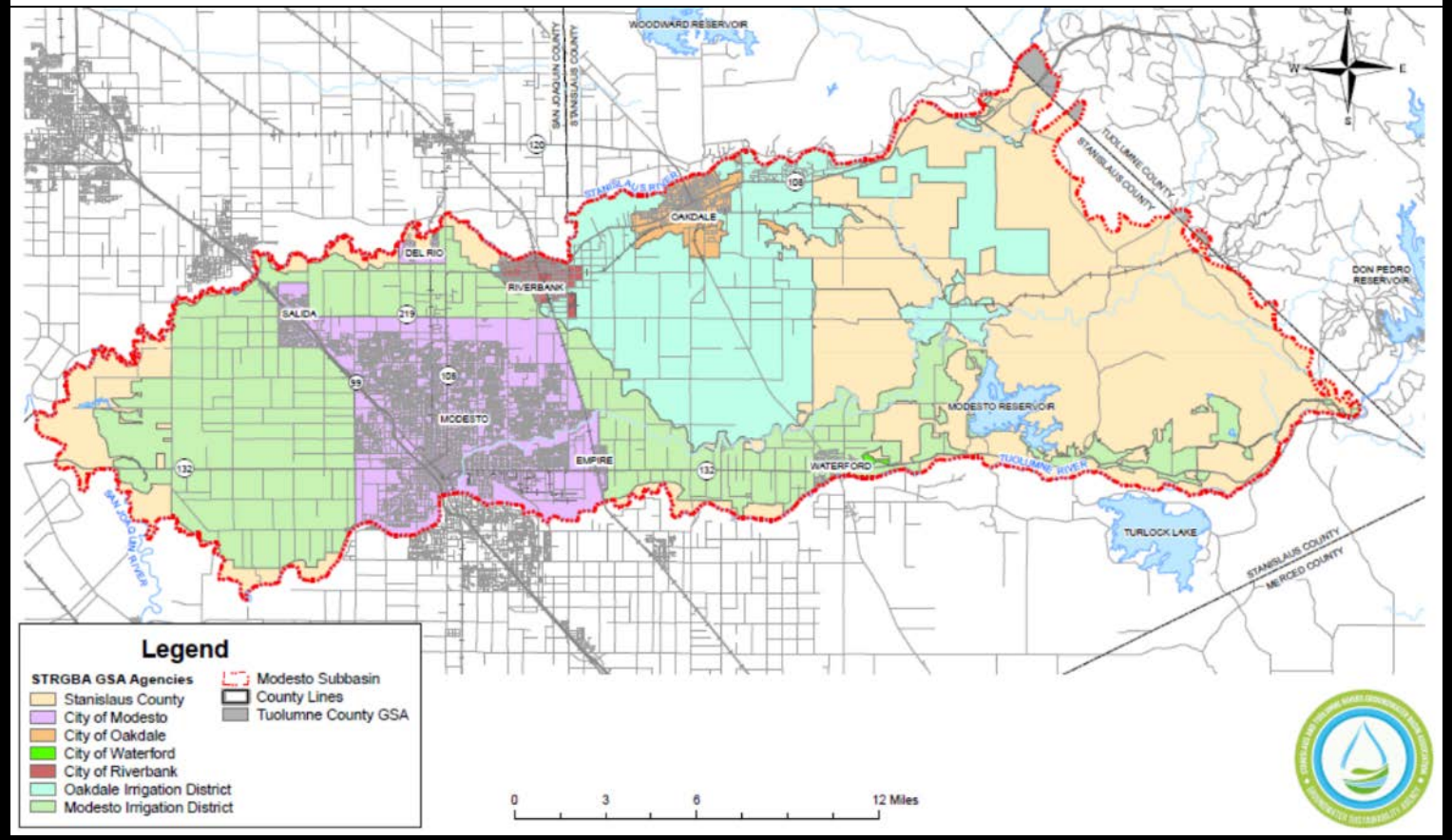


GRAT supports the GSP implementation process

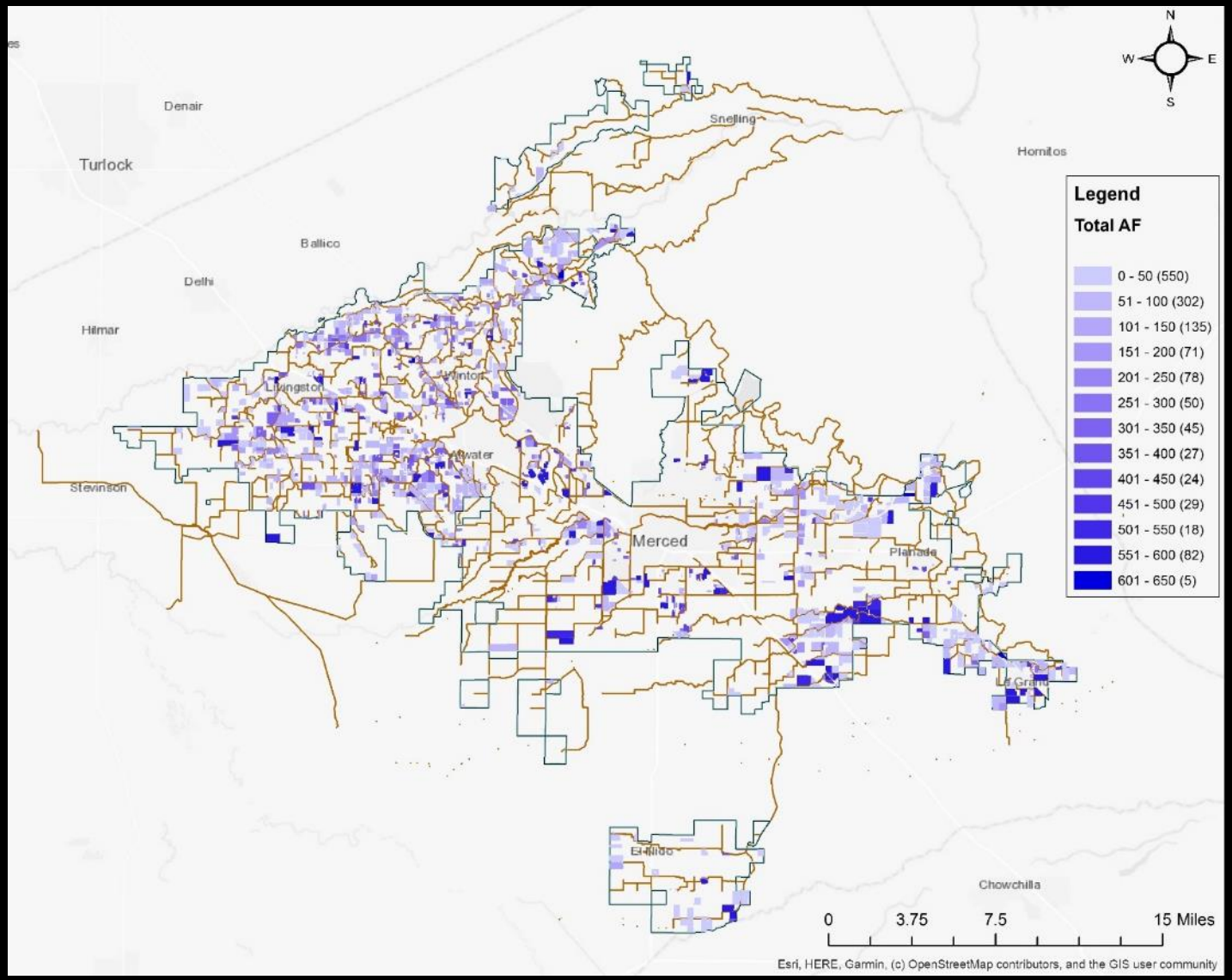
If multiple districts are running GRAT, you can:

- ✓ compare relative cost effectiveness of capturing limited surface water supply in different locations
- ✓ Estimate intra-district cost allocation for greater basin benefit

The Modesto Subbasin and STRGBA GSA

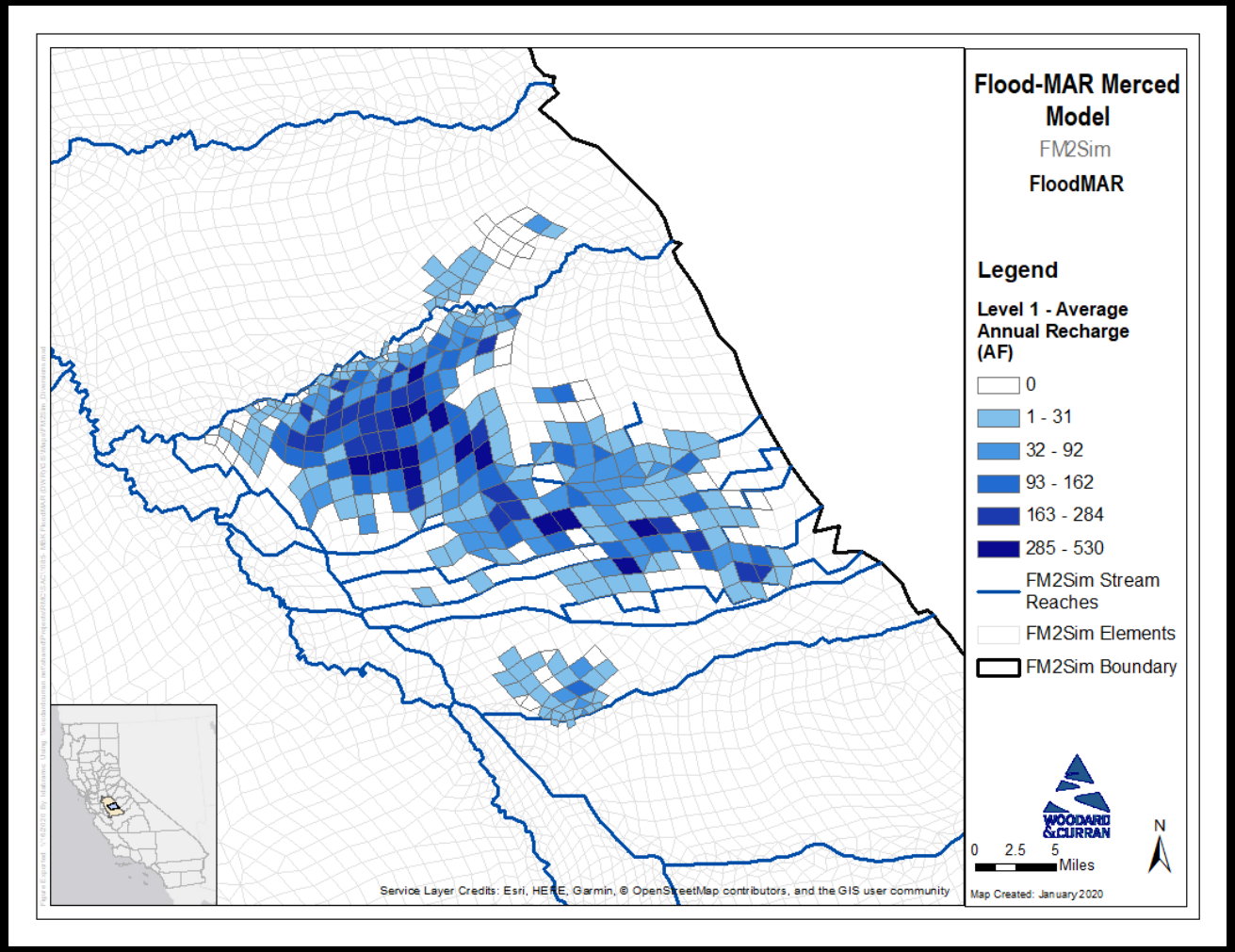


Where the water went



Wettest year scenario (1901)

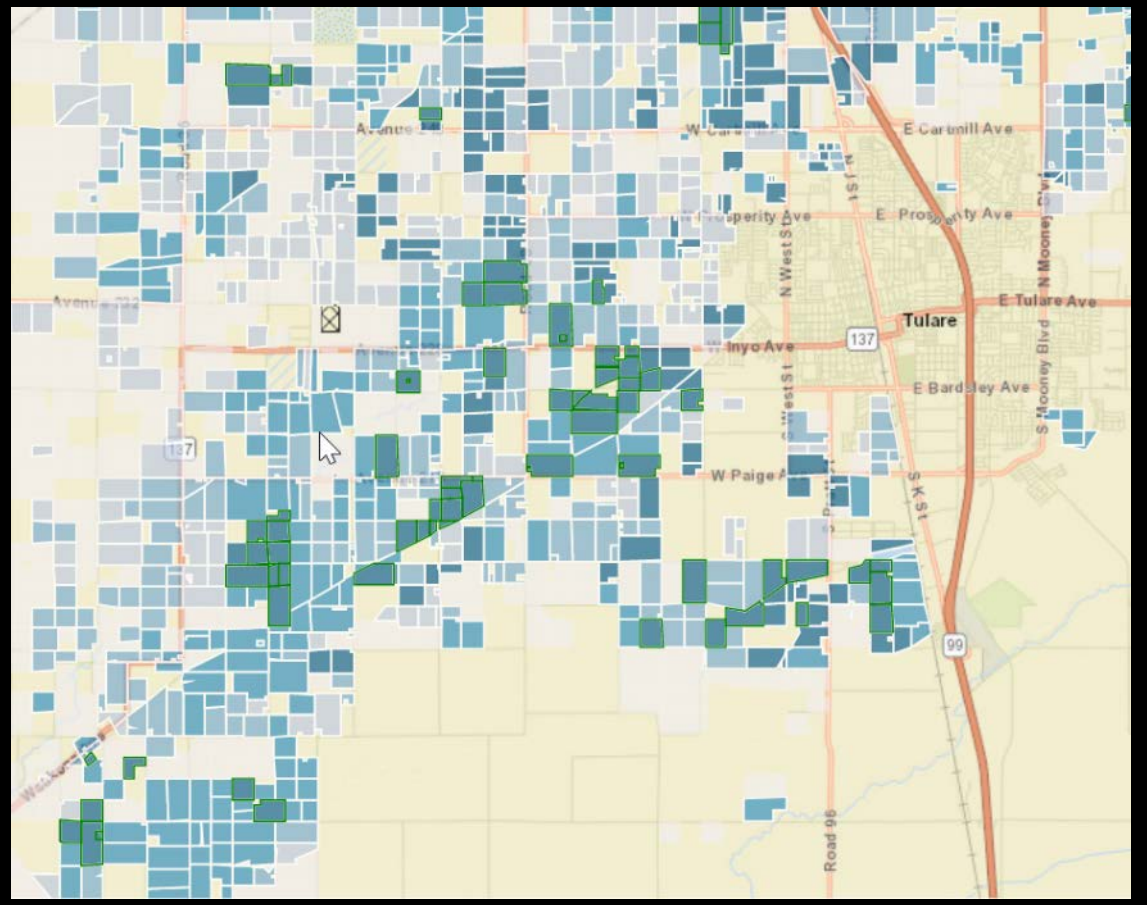
Recharge Benefits
Provide GRAT output to Groundwater Model



Wettest year scenario (1901)

GRAT supports ongoing operations

- ✓ Determine farmland compatibility to take extra water at specific times of year
- ✓ Prioritize outreach to encourage farmers to take anticipated flood flows
- ✓ Estimate costs to incentivize farmers to take water



For further information

Groundwaterrecharge.org

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Align recharge need with site suitability and water availability