Groundwater Recharge Assessment Tool - GRAT

Sustainable Conservation

theEARTH GENOME
REVEALING THE POSSIBLE

GRA Conference – Oct. 4, 2017

Daniel Mountjoy, Sustainable Conservation
Glen Low, The Earth Genome

Photo: John Greening, 2012.

SGMA Planning Needs

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?

Groundwater Recharge Assessment Tool

Water Available for Recharge

- Surface water availability
- Excess flood flows
- Water rights

Conveyance

- Conveyance infrastructure
- Delivery capacity to fields

Site Suitability

- Recharge suitability: slope, soil type, clay layers, underlying geology, depth to groundwater
- Crop and land use suitability

On-Farm and Fallow Recharge

- Infiltration-percolation potential (crop compatibility calendar)

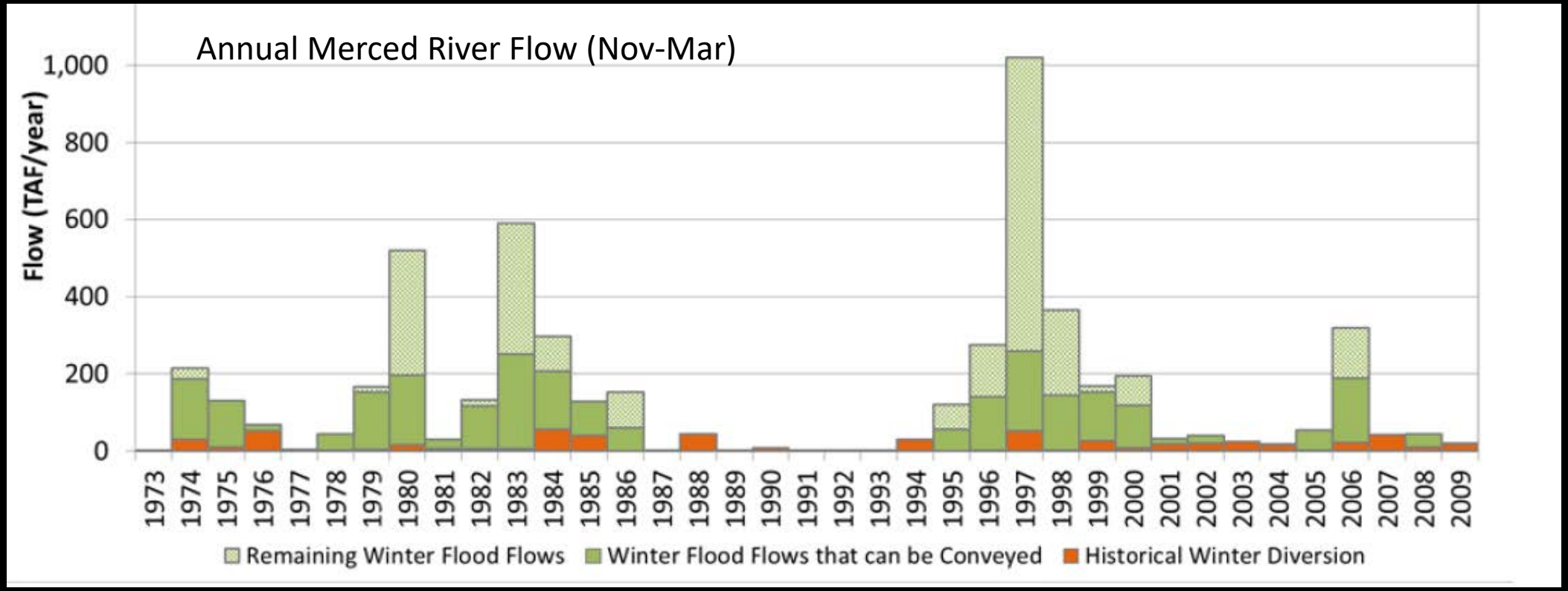
Dedicated Basins

- Percolation rate of existing dedicated recharge basins

Recharge Benefit / Cost Analysis

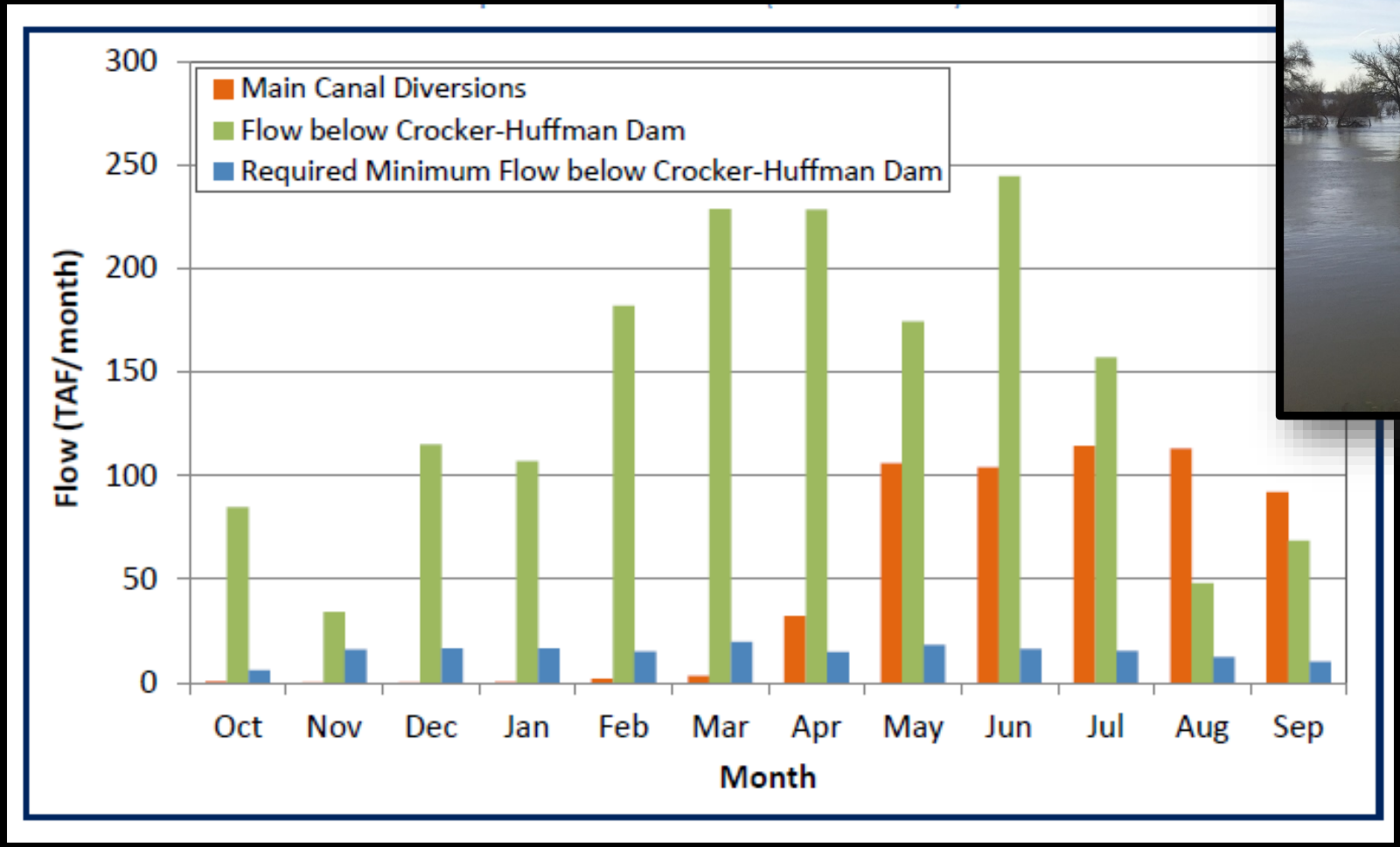
- Relative cost per acre foot ($/acre foot)
- Increased groundwater recharge

Data Needs in the SGMA Era - Water Available for Recharge with Climate Change



RMC 2015

Water Available for Recharge – Predicting Weekly Flows



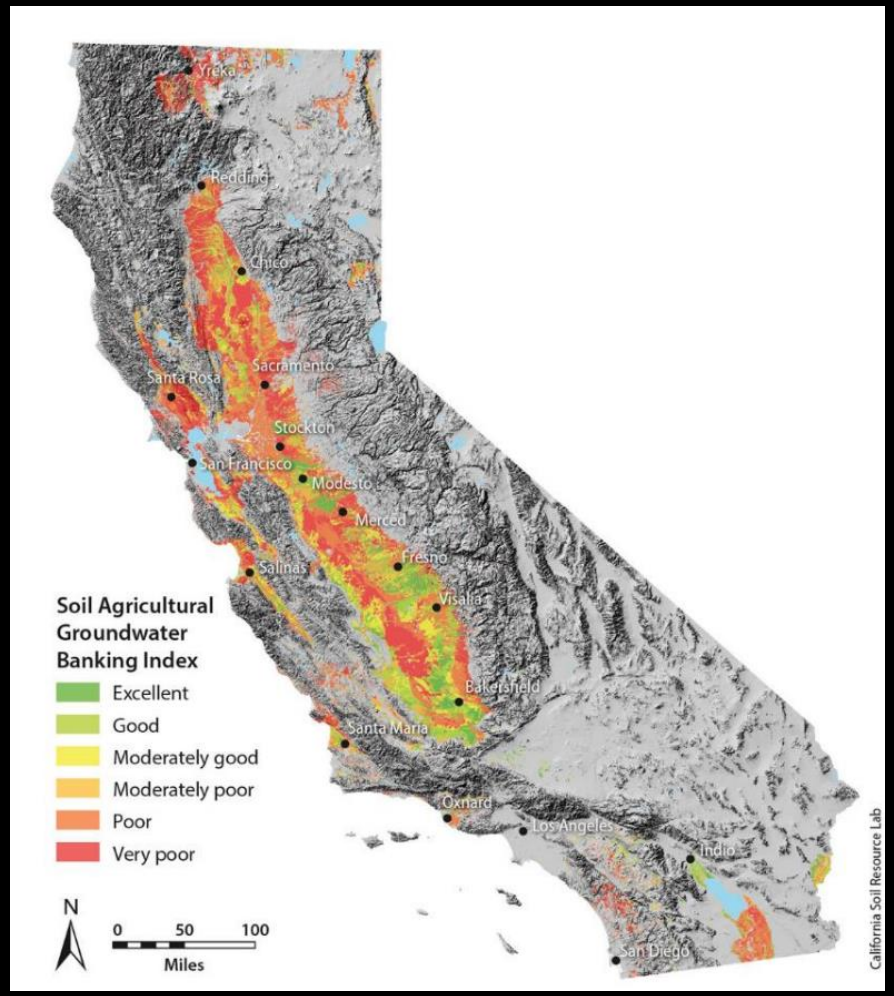
Monthly Wet Year Merced River Flow (Nov-Mar)

RMC 2015

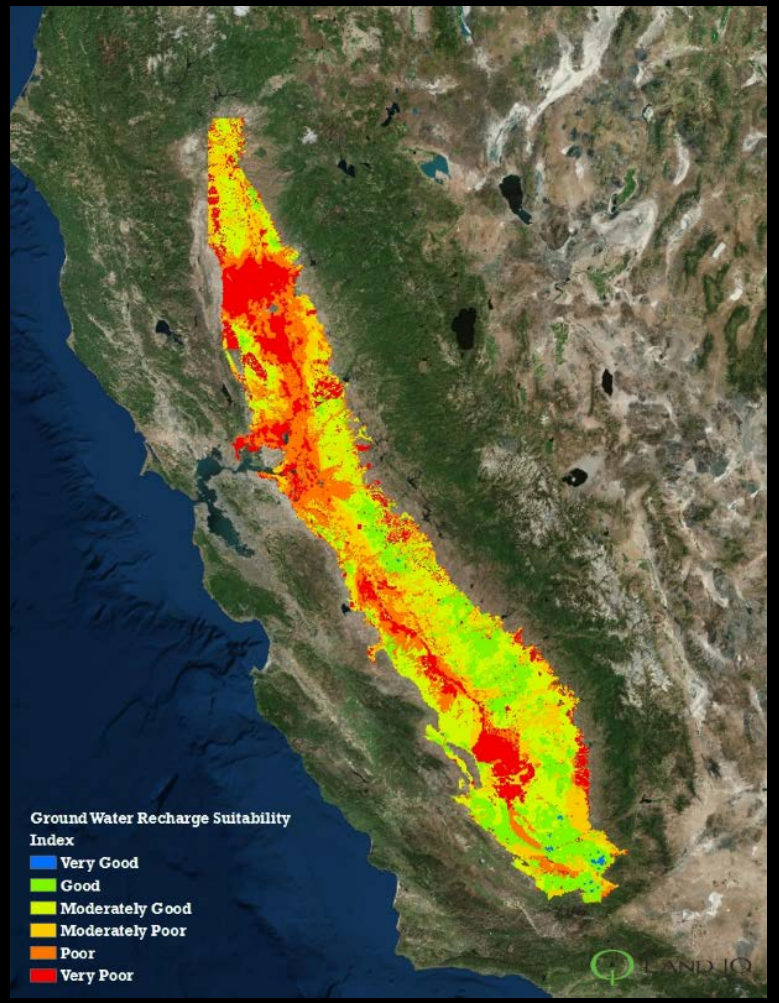
San Joaquin River 2017

Recharge Suitability Indexes

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



UC Davis SAGBI

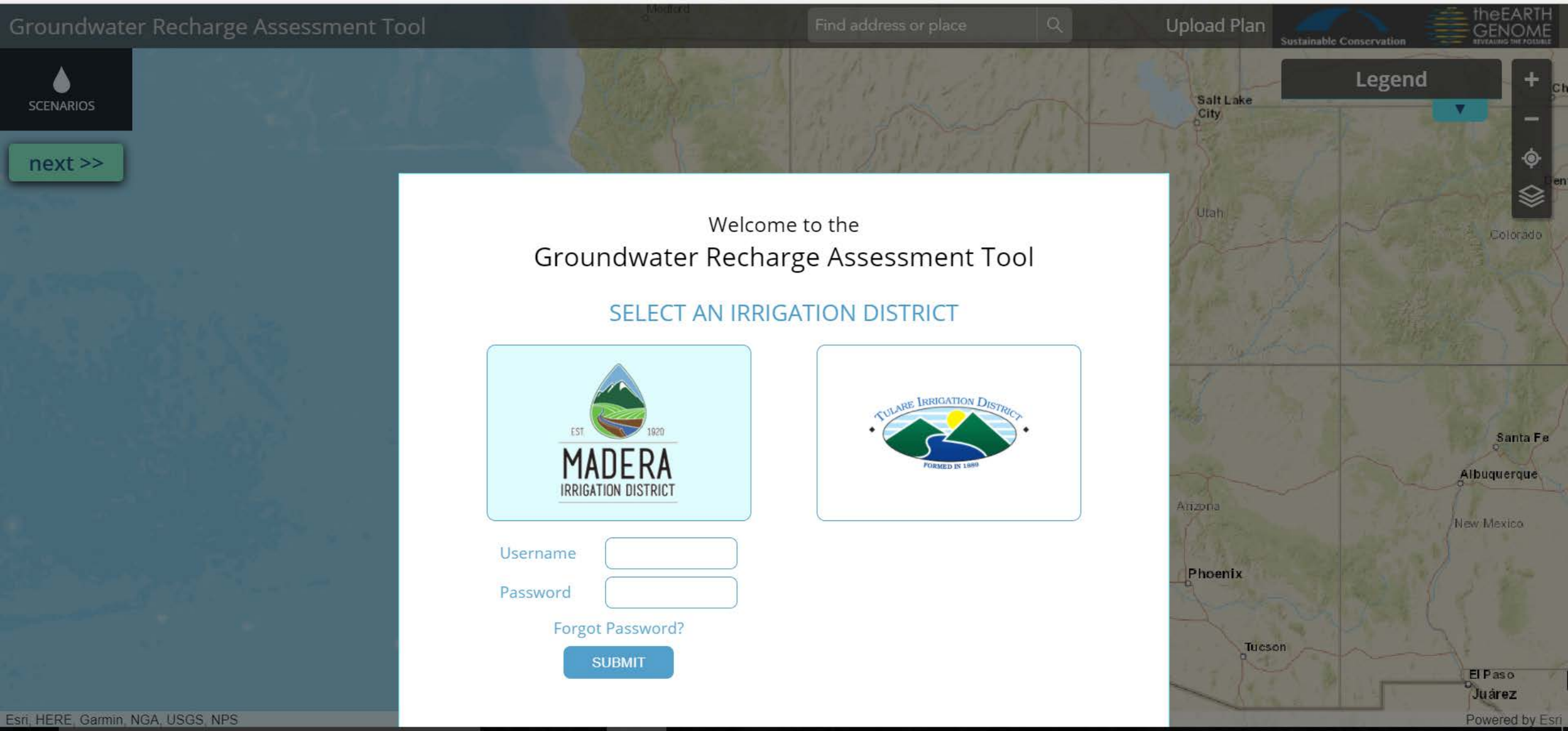


Land IQ Recharge Suitability Index

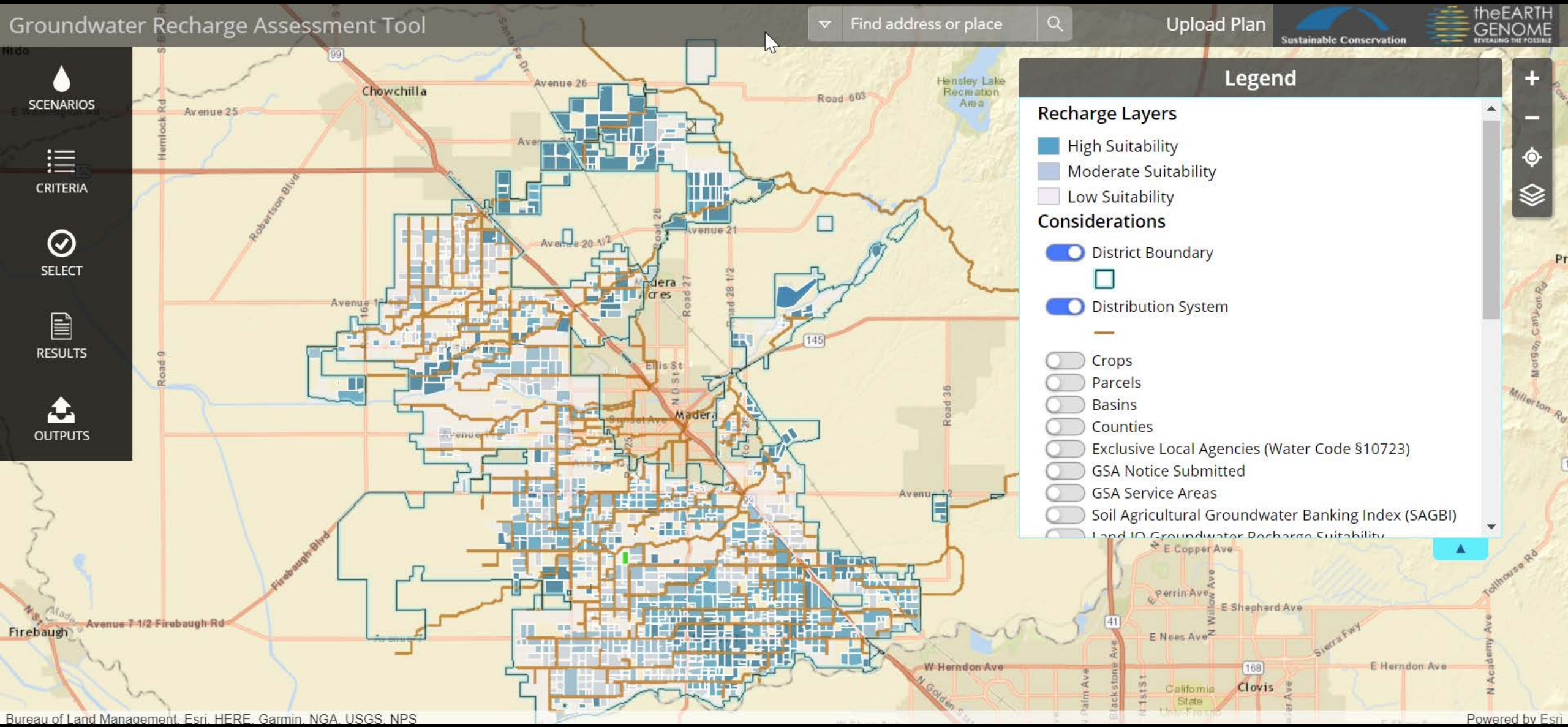
Crop Compatibility Calendar

- Weekly capacity of crops to receive water in excess of crop demand
- Best available data based on farmer and field agronomist experience
- Assumes well drained soils
- Available for grapes, alfalfa, walnuts, almonds, pistachios

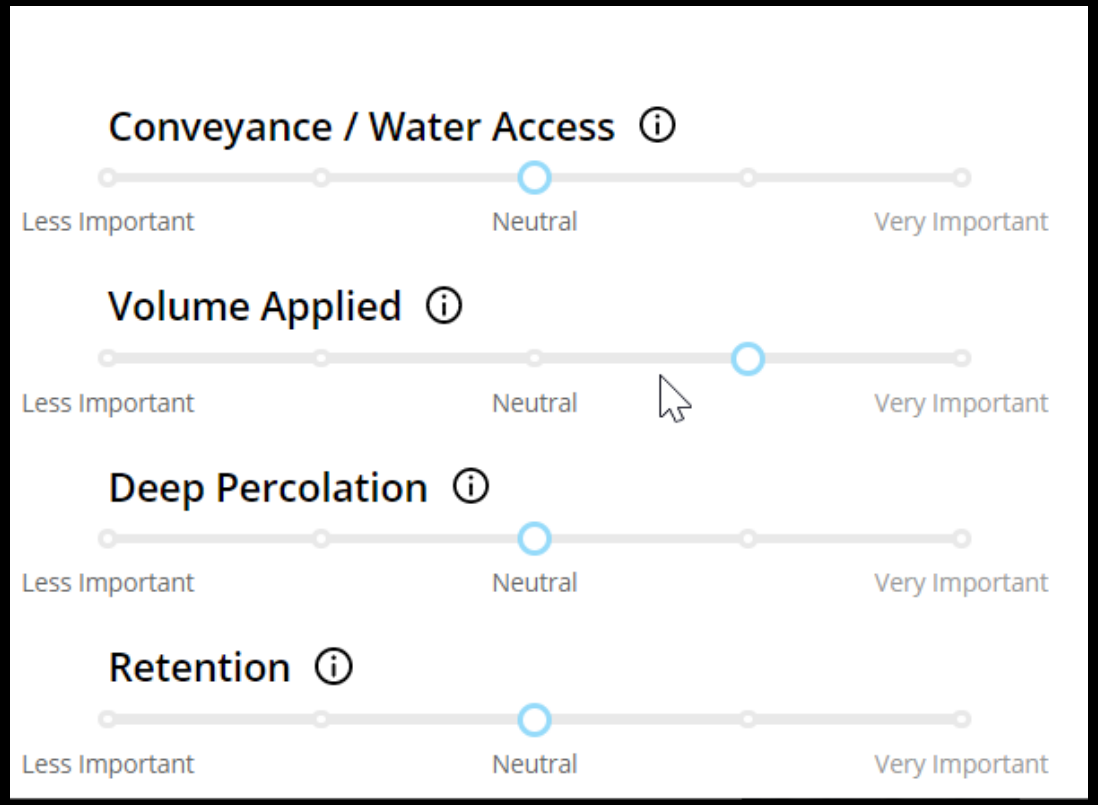
GRAT cloud-based access



Individual fields ranked by Recharge Potential



Site Selection Weighting Criteria



Relative weighting of each criteria can be adjusted to conduct sensitivity analyses

1. Conveyance / Water Access

Proximity and size of existing water conveyance for any field unit

2. Volume Applied

Amount of water applied per crop compatibility calendars

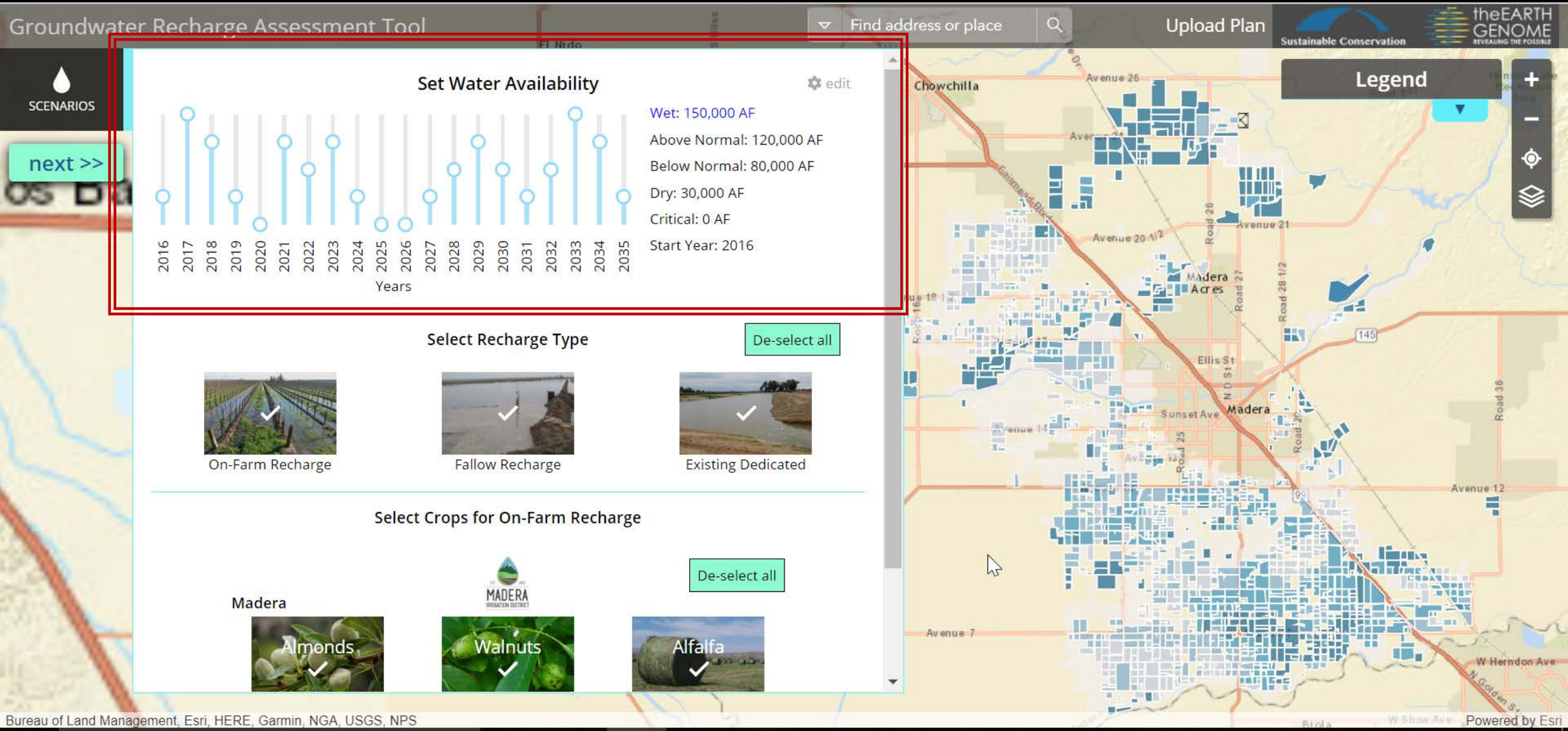
3. Deep Percolation

The ability of water to percolate down to the first encountered aquifer per SAGBI/ LandIQ index

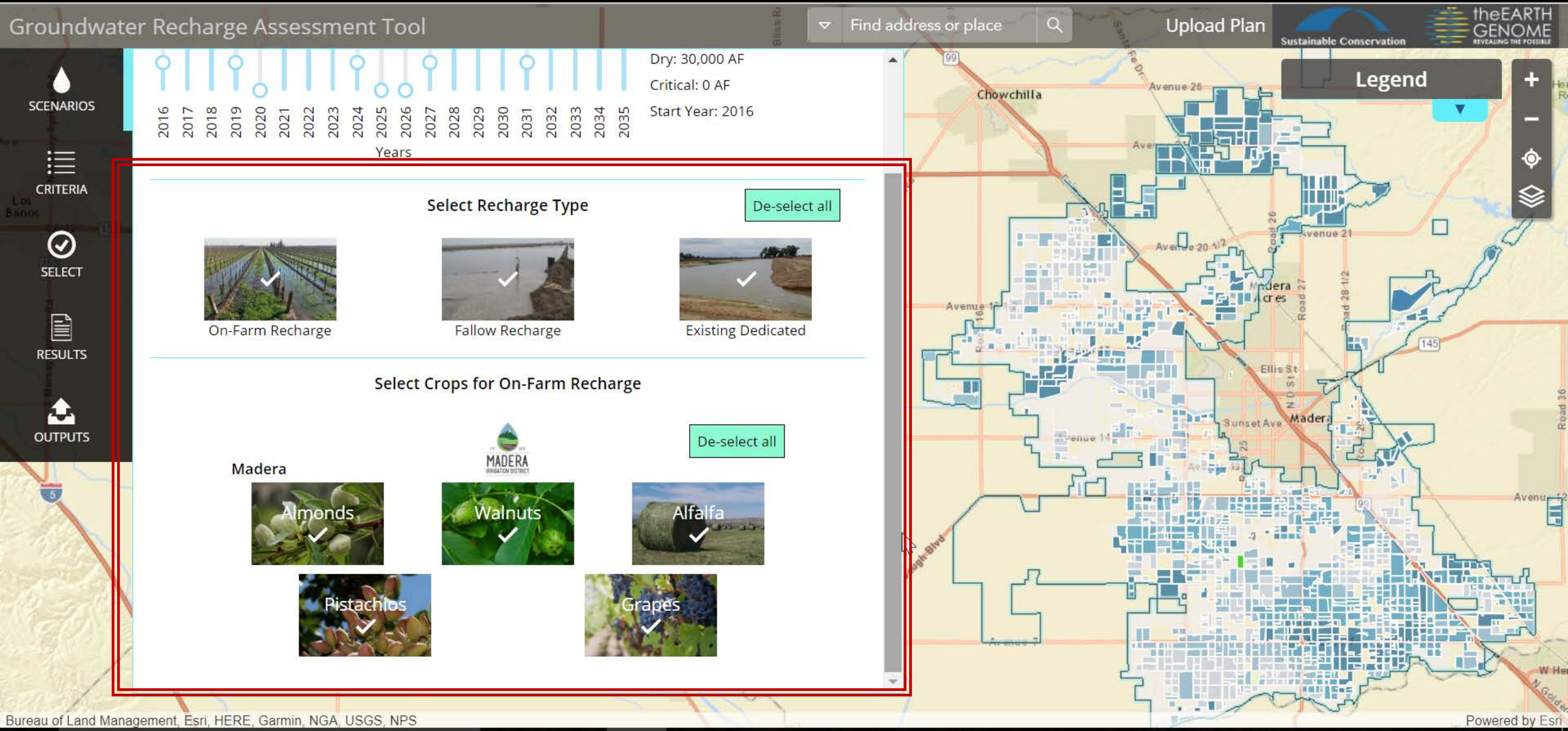
4. Retention

How much deep percolation water is retained in the GSA, based on proximity to surface water source or GSA boundary

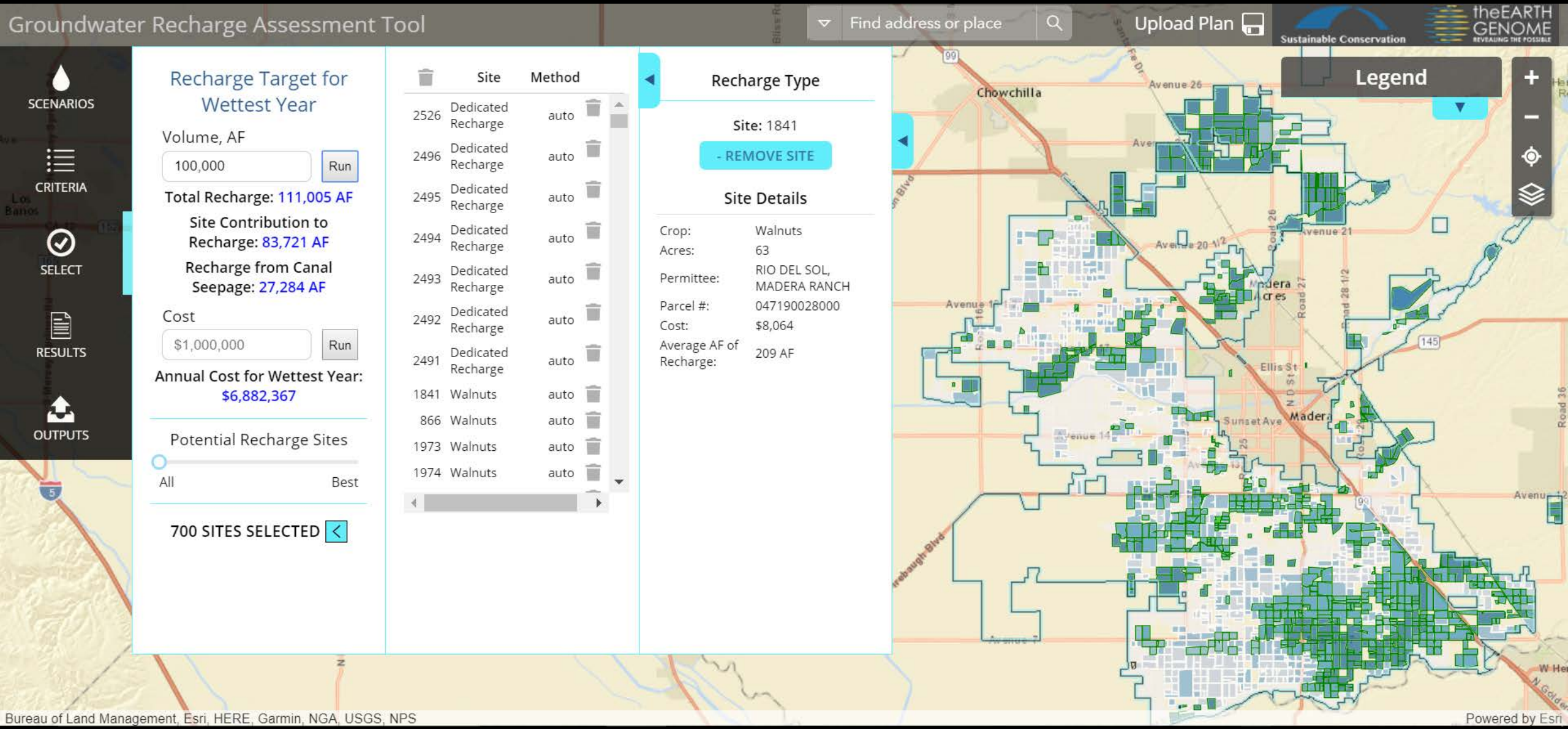
Scenarios: Water Availability



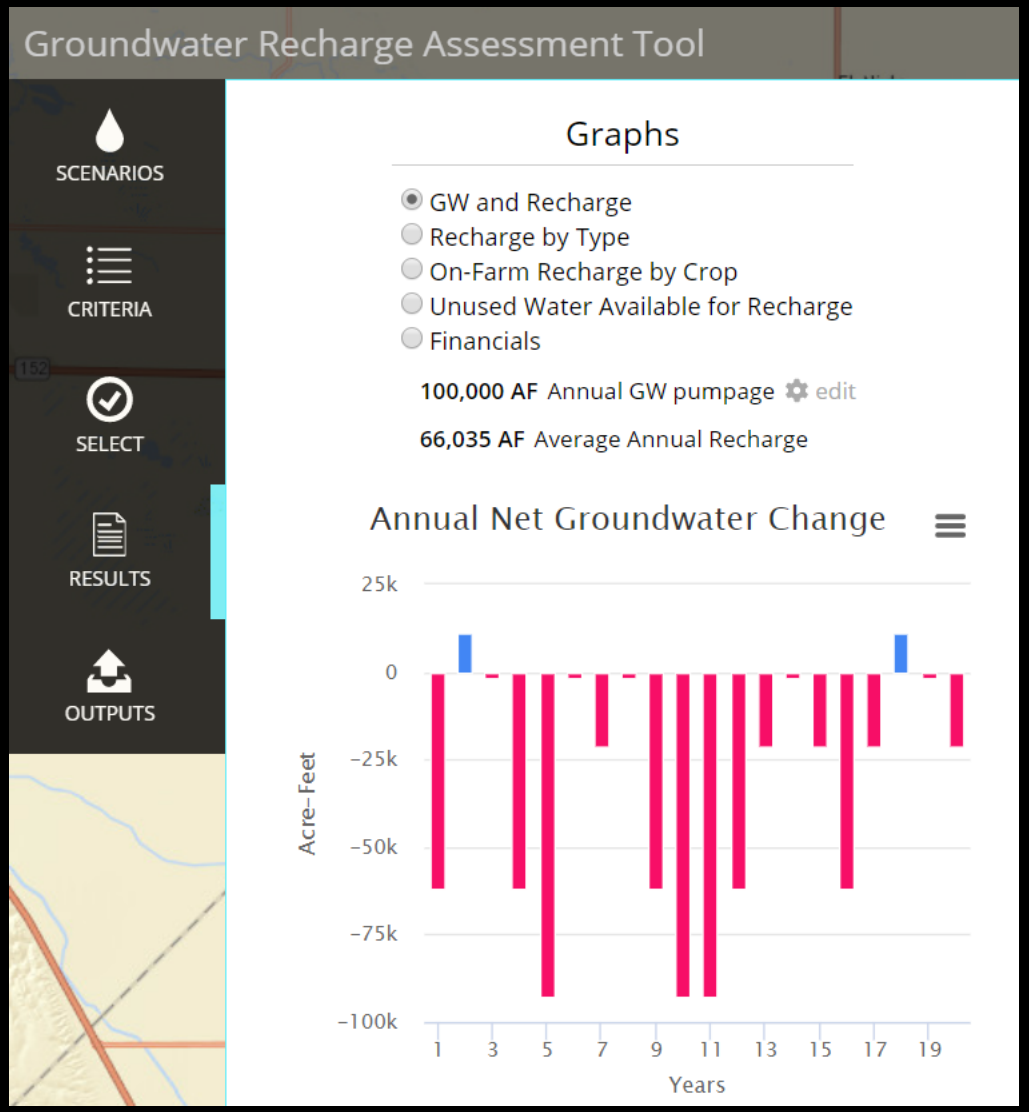
Scenarios: Recharge Type

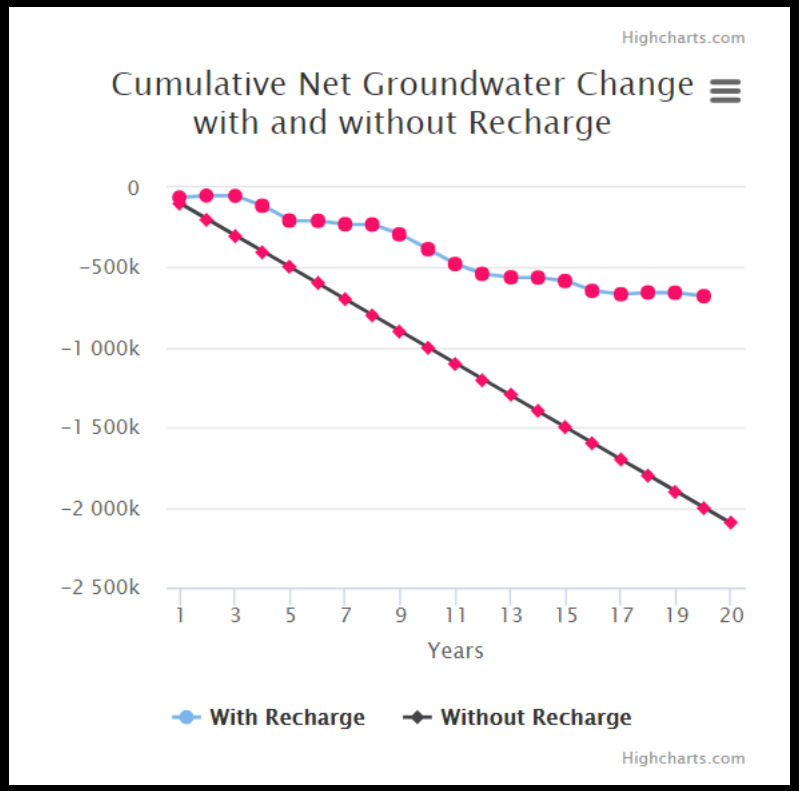


Select Sites: Recharge Quantities and Costs

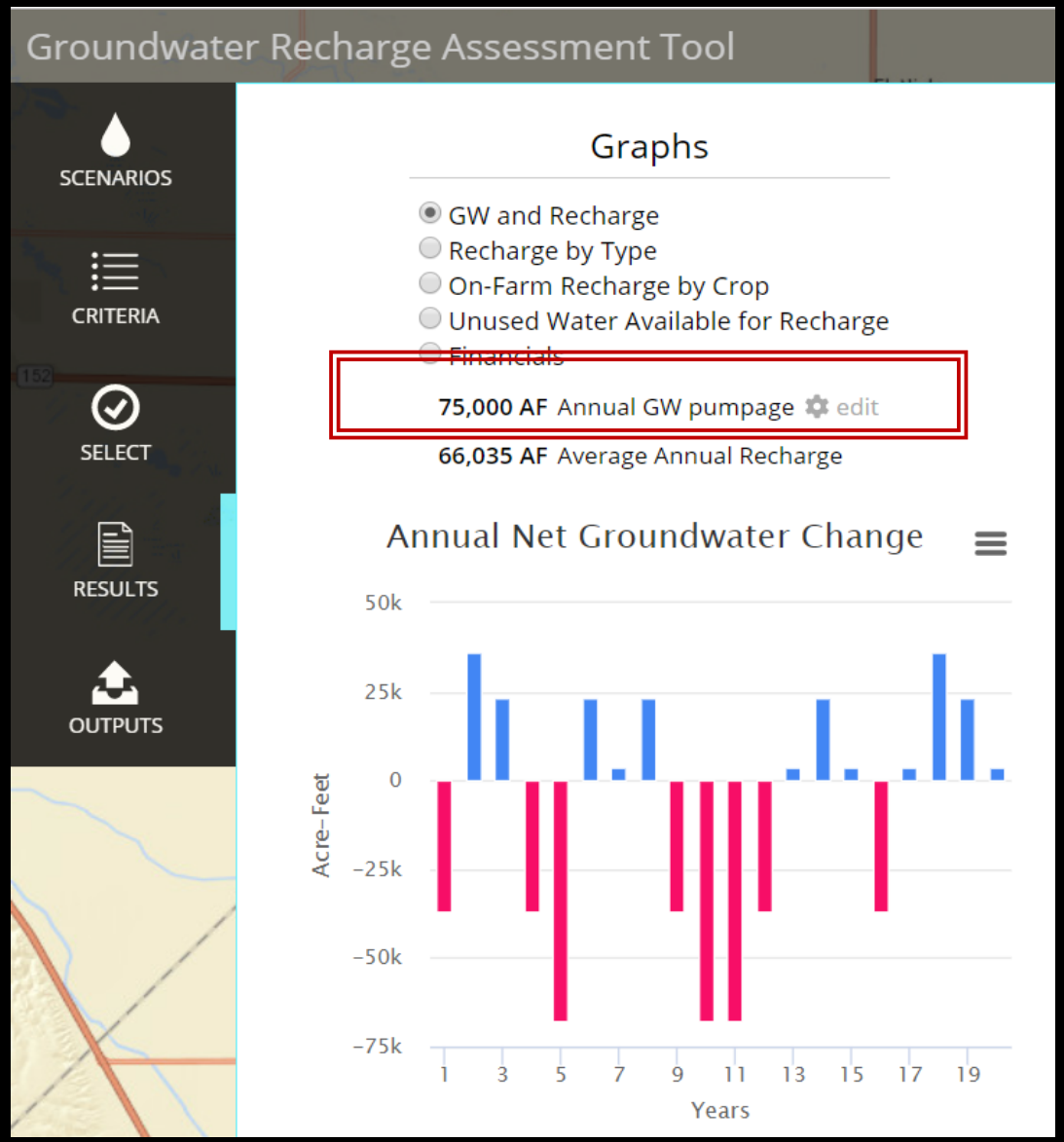


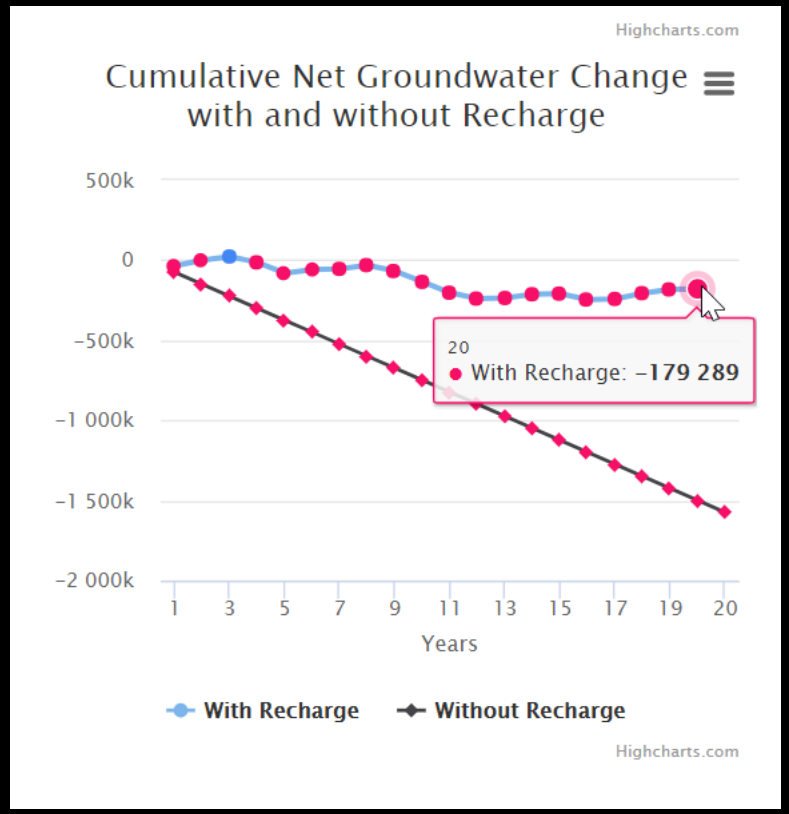
Results: Net Groundwater Change



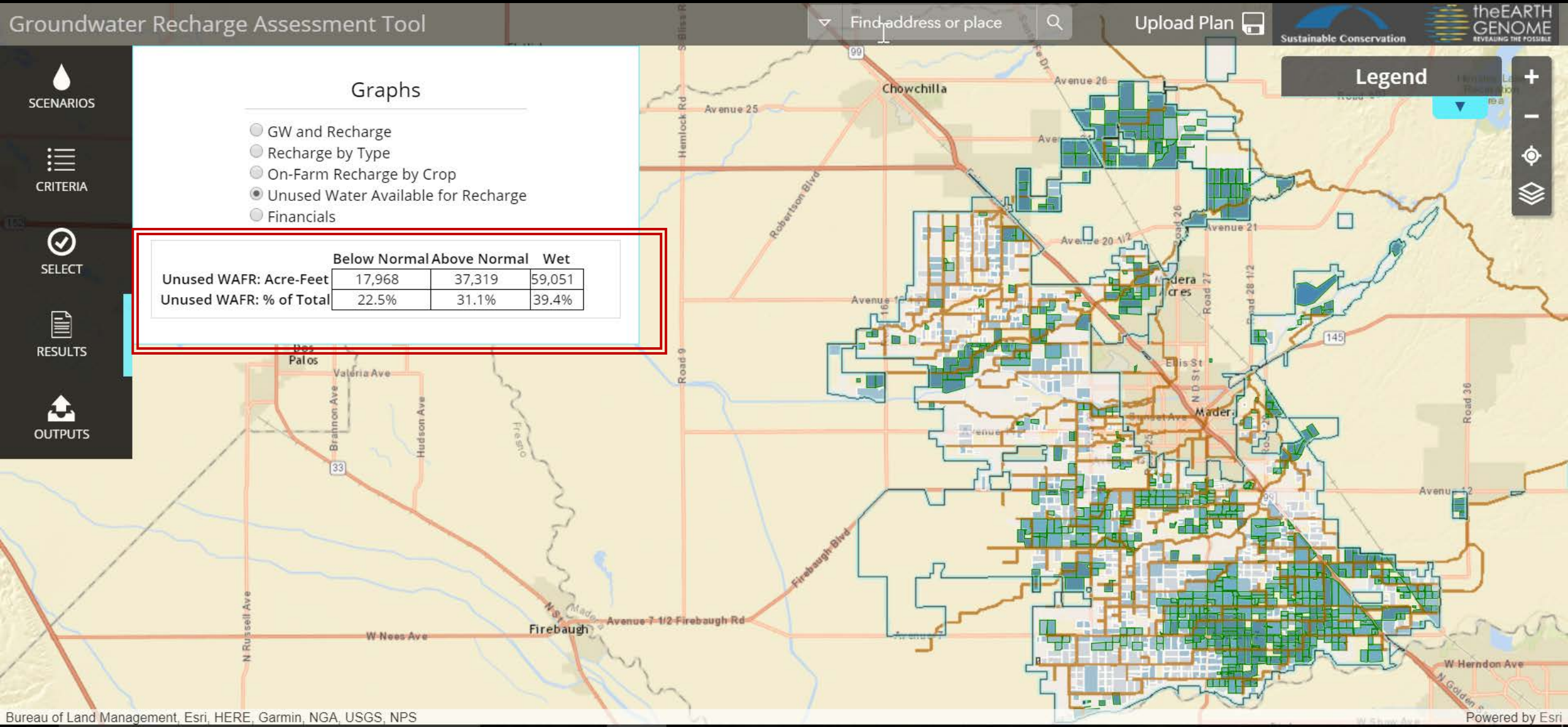


Results: Net Groundwater Change with pumping restrictions



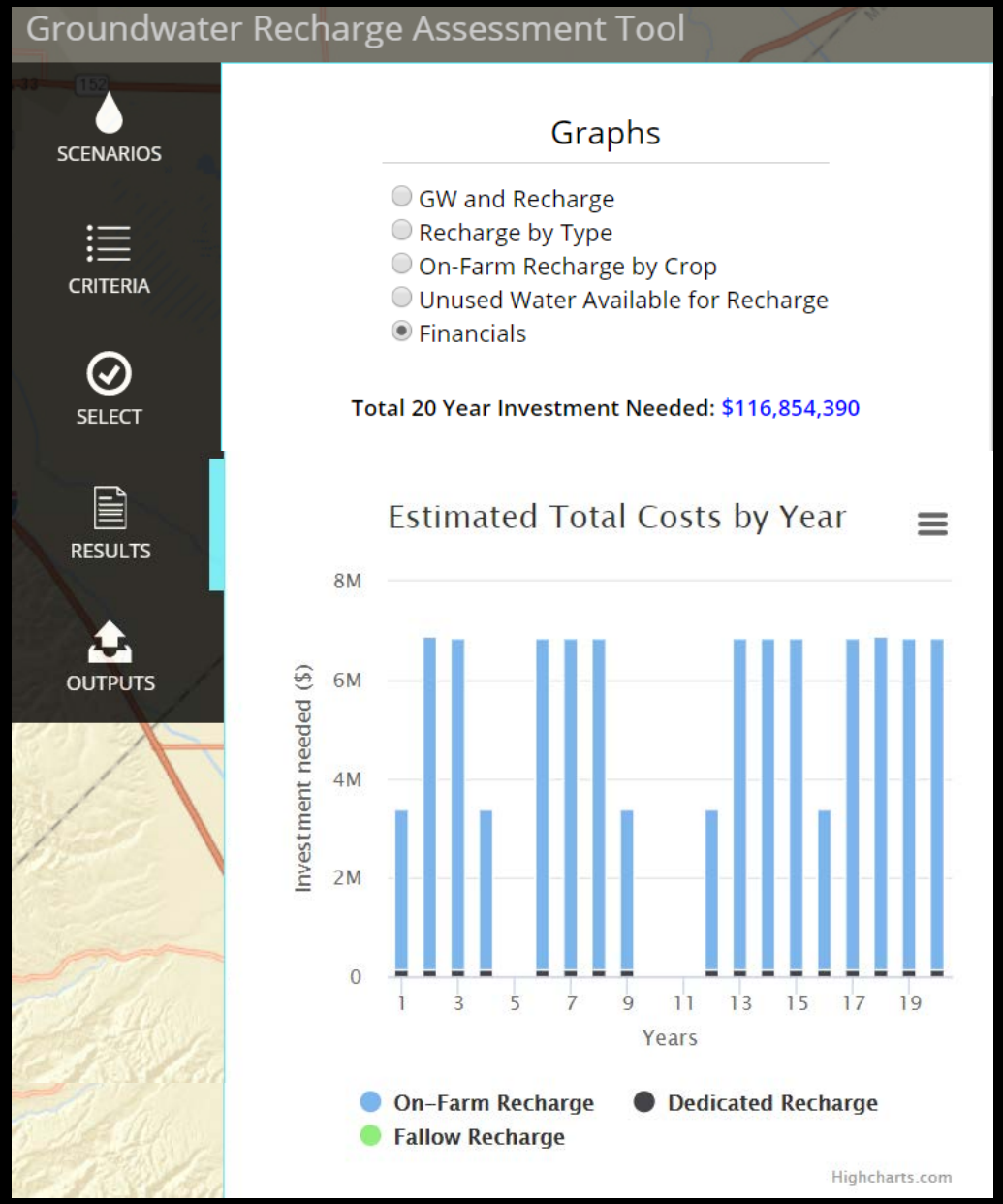


Results: Unused Water Available for Recharge



	Below Normal	Above Normal	Wet
Unused WAFR: Acre-Feet	17,968	37,319	59,051
Unused WAFR: % of Total	22.5%	31.1%	39.4%

Results: Investment Cost by Year and Total



Potential GRAT Plus functionality

New Storage/Conveyance

- **Site new dedicated basins.**
- **On-farm to fallow**. Option to change current crops to fallow land
- **New conveyance**. Add new infrastructure

Science and Modeling

- **Groundwater modeling**. Add capabilities on groundwater movement
- **Actual percolation**. Add soil moisture flux and on-farm recharge data based on pilots
- **Conveyance**. Model conveyance limitations

Operations

- **Daily/weekly timescale**. Assist near real-time decisions on where to divert WAFR

Financials

- **Value in financials**. Build in positive value into the financials (not just costs)

For further information

suscon.org/GRAT/

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