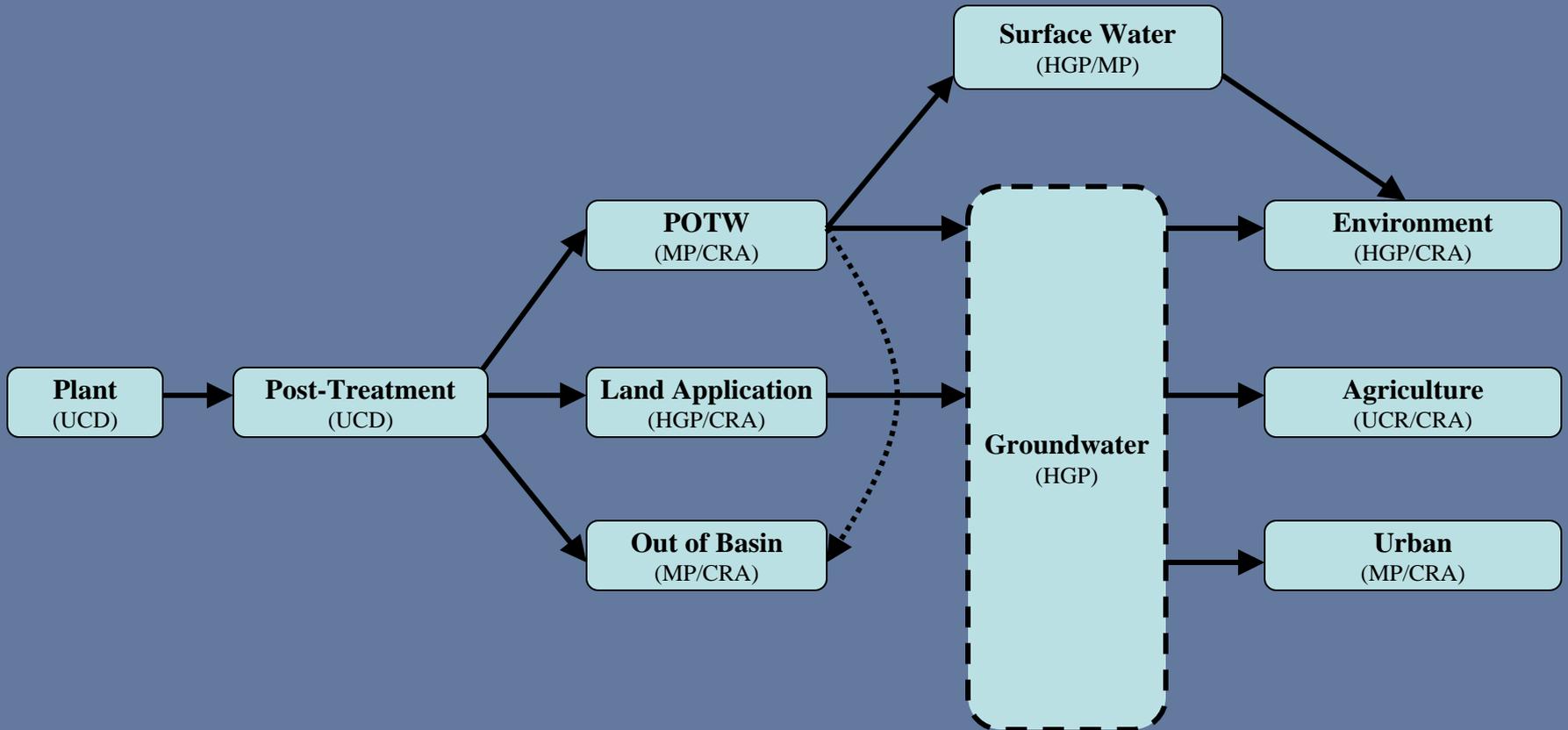


# Hilmar SEP Study: Saline Wastewater Discharges from the Food Processing Industry

Prof. Dave Sunding

# Hilmar SEP Wastewater Schematic



# Study Objectives

- Study examines alternatives for management of salt in food processing industry wastewater
- Point sources – results are generally applicable to urban/industrial discharges
- Study measures relative costs of management alternatives and the value of benefits achieved

# Location Location Location

- With limited mixing, groundwater pollution is localized
- Wide variation in concentrations
- Regional mass balance is inadequate – even misleading
- Our analysis is spatially explicit
- Most effort has been expended on detailed environmental modeling (fate and transport)

# Impacts of Salinity on Urban Water Systems

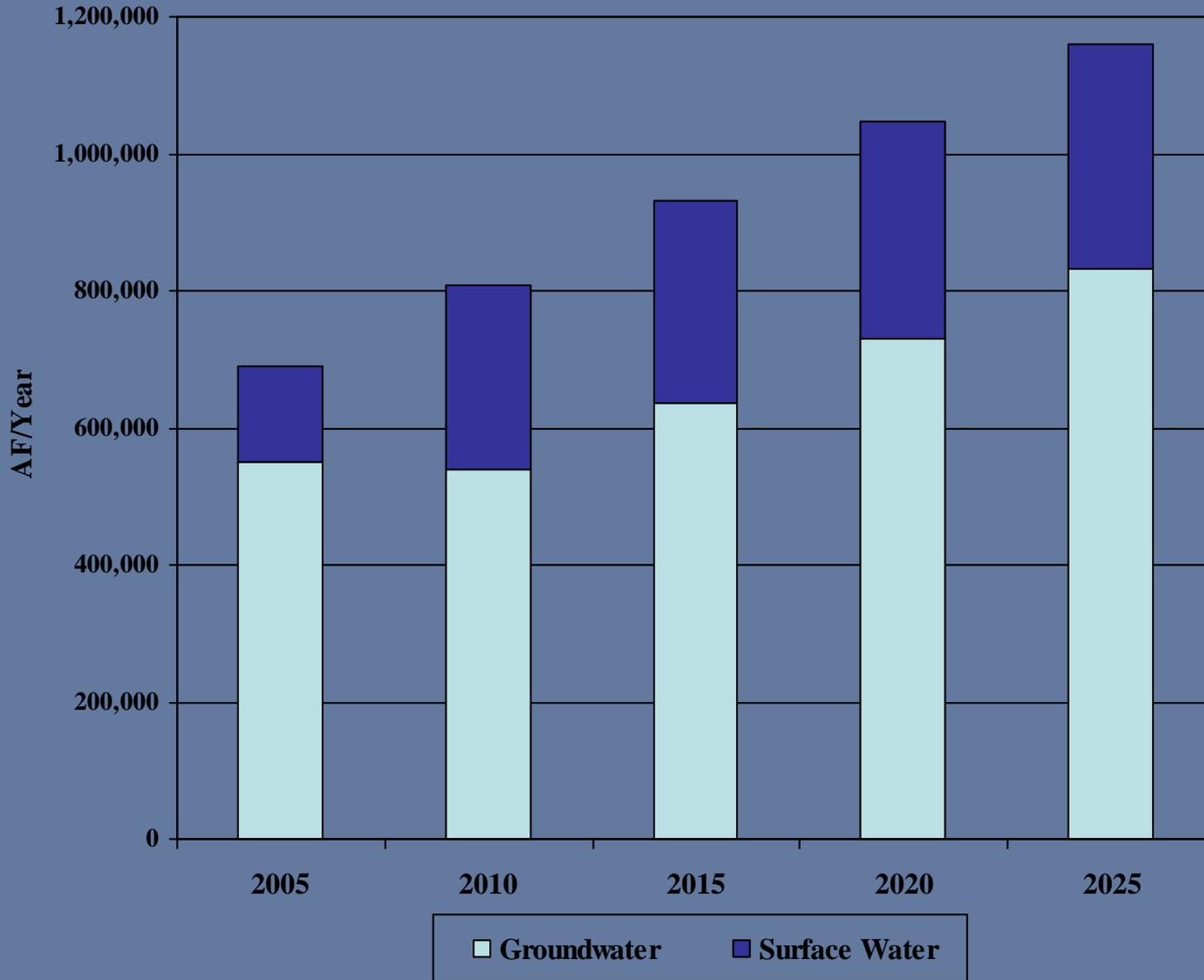
# Overview of Urban Water Systems

- How much groundwater is used for urban supply in the SJV?
- Will cities become more or less reliant on groundwater?
- Are there regional differences in urban groundwater demand?
- What incremental treatment costs result from food processing salts in groundwater?
  - Cost functions are being developed by Malcolm Pirnie

# Urban Water Management Plan (UWMP) Analysis Review

- California Water Code requires urban water suppliers to prepare and adopt UWMPs for submission to the Department of Water Resources (DWR)
- Urban Water Demand Analysis
  - 40 communities with population over 10,000 in the SJV identified, 34 selected for study
  - UWMPs were provided by DWR
  - Goal is to get a complete understanding of groundwater use in the SJV
- Across the 8 counties, included population is 90% of total incorporated population in the SJV.

# Total Water Supply Breakdown - San Joaquin Valley, 2005 - 2025



# UWMP Analysis Review – Regional Variation

City	2005	2025	Change
Bakersfield	100%	65%	- 35%
Fresno	90%	93%	+ 6%
Merced	100%	100%	0%
Modesto	59%	44%	-15%
Turlock	100%	28%	-72%
Visalia	100%	100%	0%

# Forecasting Urban Growth in SJV

- A key component of our analysis will be predicting where development will occur
- Developed a statistical model that predicts likelihood of development based on revealed consumer preferences and other factors

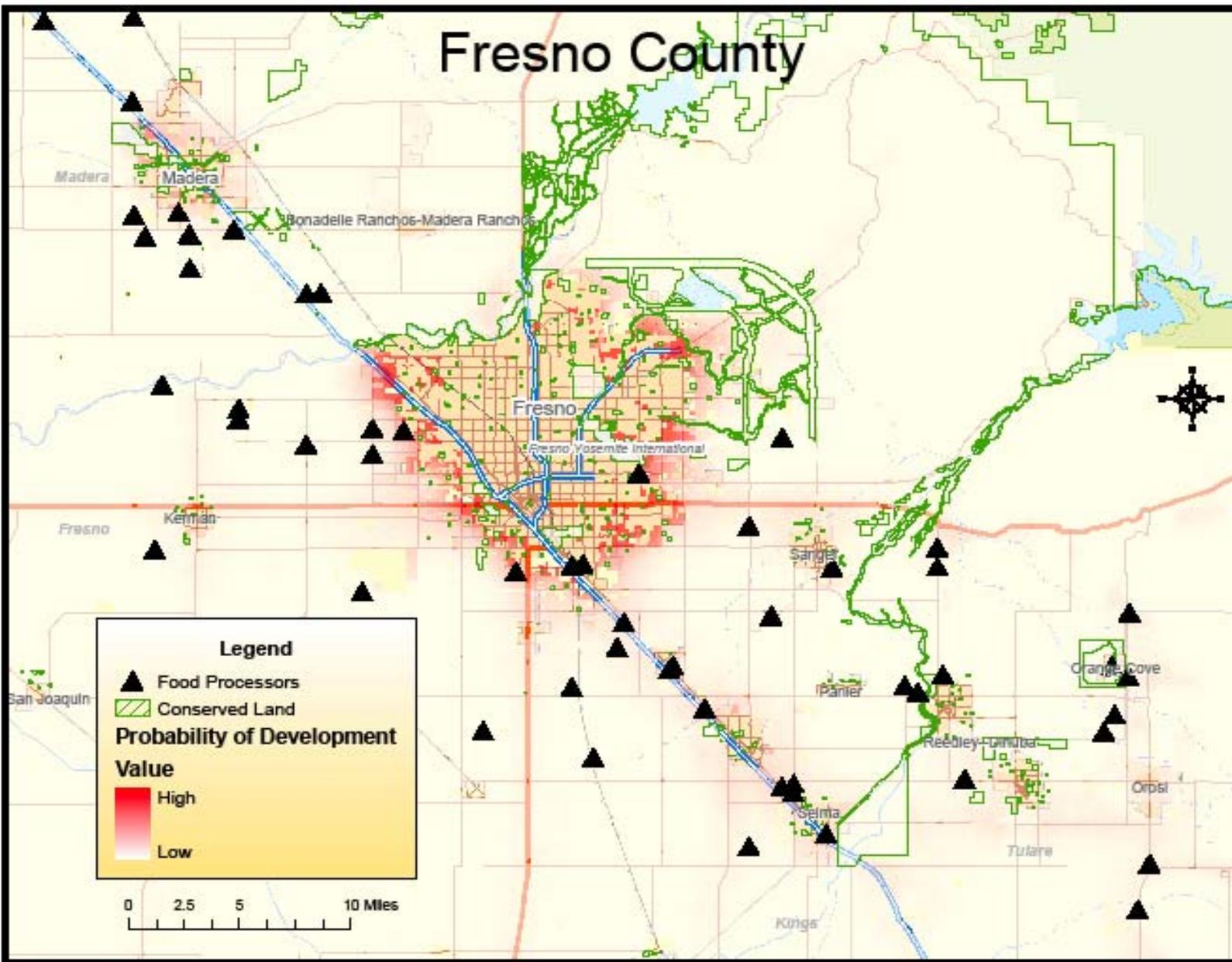
# Forecasting Urban Growth in SJV

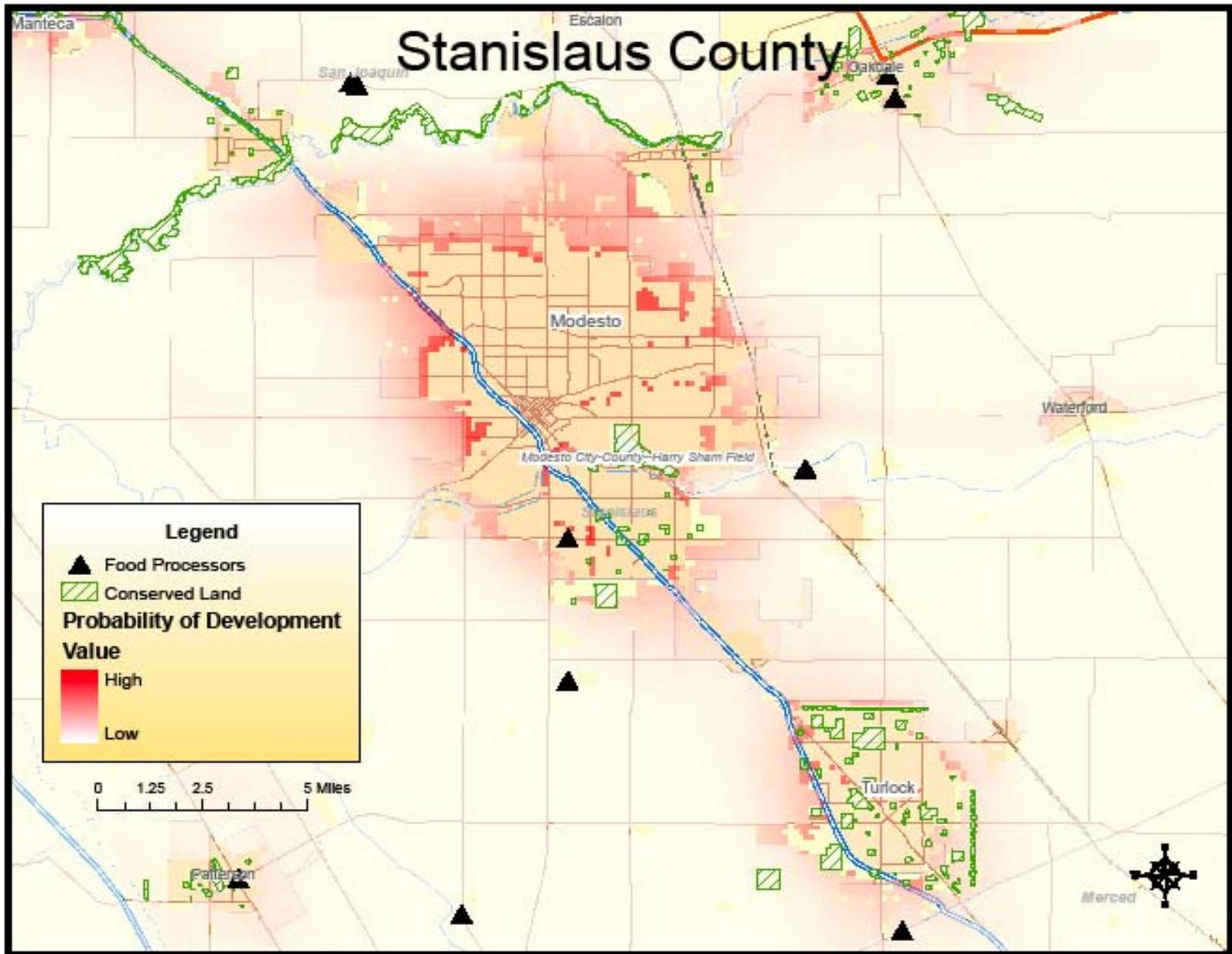
- Our model divides the landscape into 200 meter grid
- Factors that are considered include
  - Geographic factors
  - Demand/Economic factors
  - Present day use
  - Proximity to current development
  - Socioeconomic characteristics
- Based on these factors, a likelihood of development is assigned to each cell

# Forecasting Urban Growth in SJV

- The model is calibrated with data from the mid-1980s to 2000
- MPO forecasts used to fix amount of growth at the county or census tract level. Our model tells us where that growth is most likely to occur.

# Fresno County



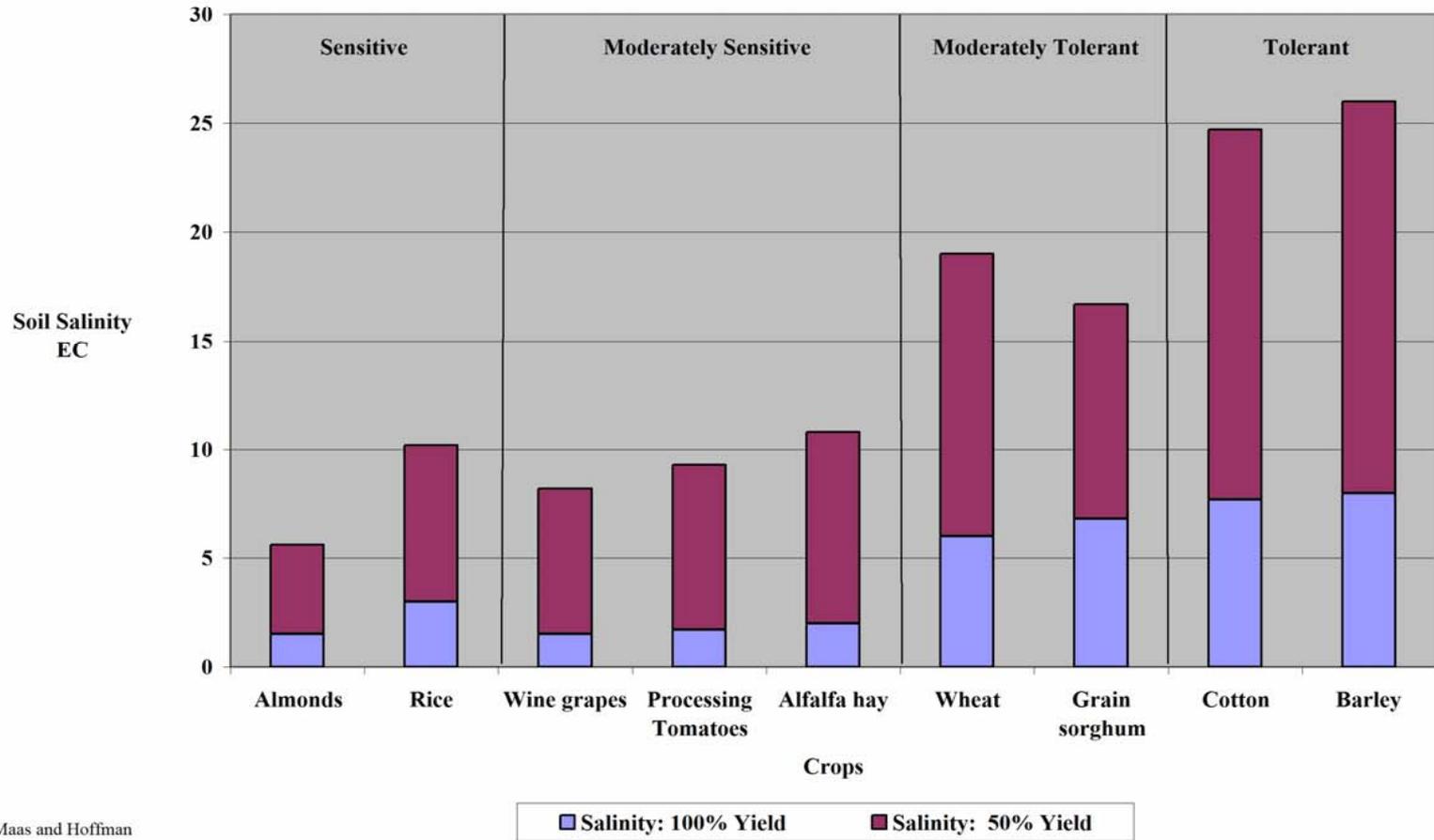


# Impacts of Salinity on Agricultural Production

# Agricultural Crop Yield: Salinity Impacts

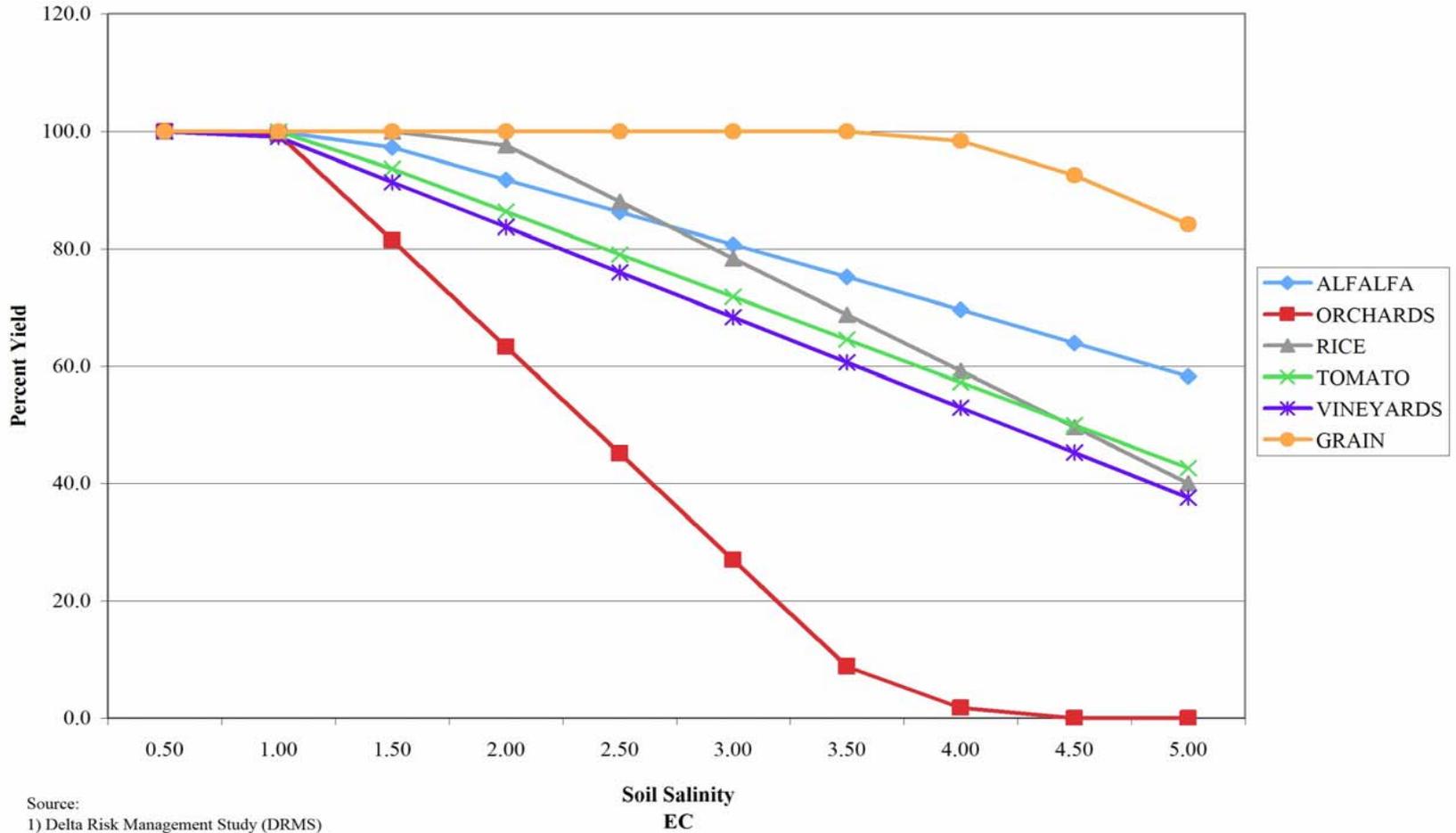
- How sensitive are various crops to salinity?
- Where is groundwater used for crop production?
- How can farmers respond to increasing salinity?
- What are lost profits and other economic impacts?
- We use the crop loss model developed in the Delta Risk Management Study (DRMS) model

## Salinity Threshold: 100% and 50% Yields

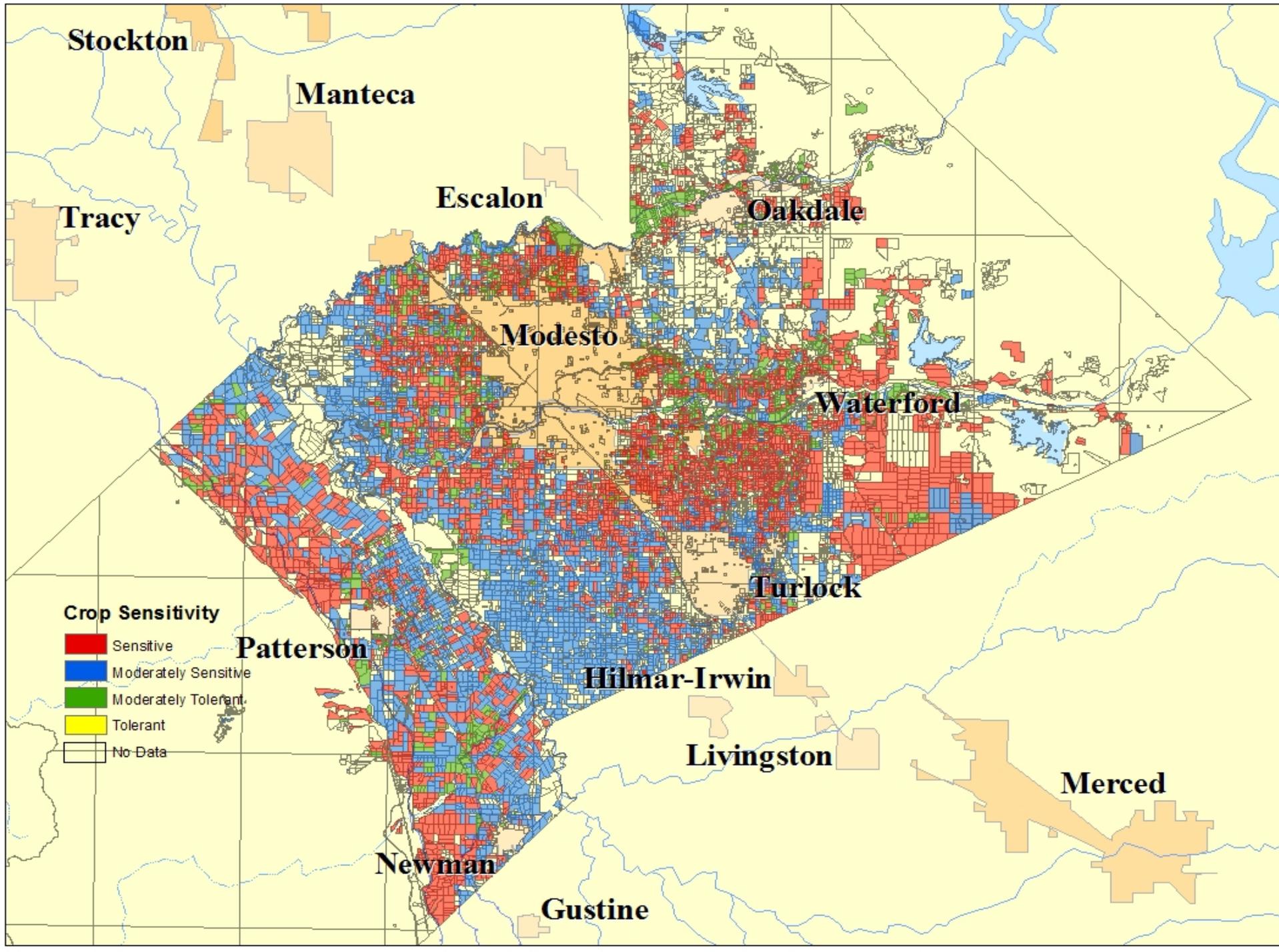


Source:  
1) FAO; Maas and Hoffman

Yield % of Normal



Source:  
1) Delta Risk Management Study (DRMS)



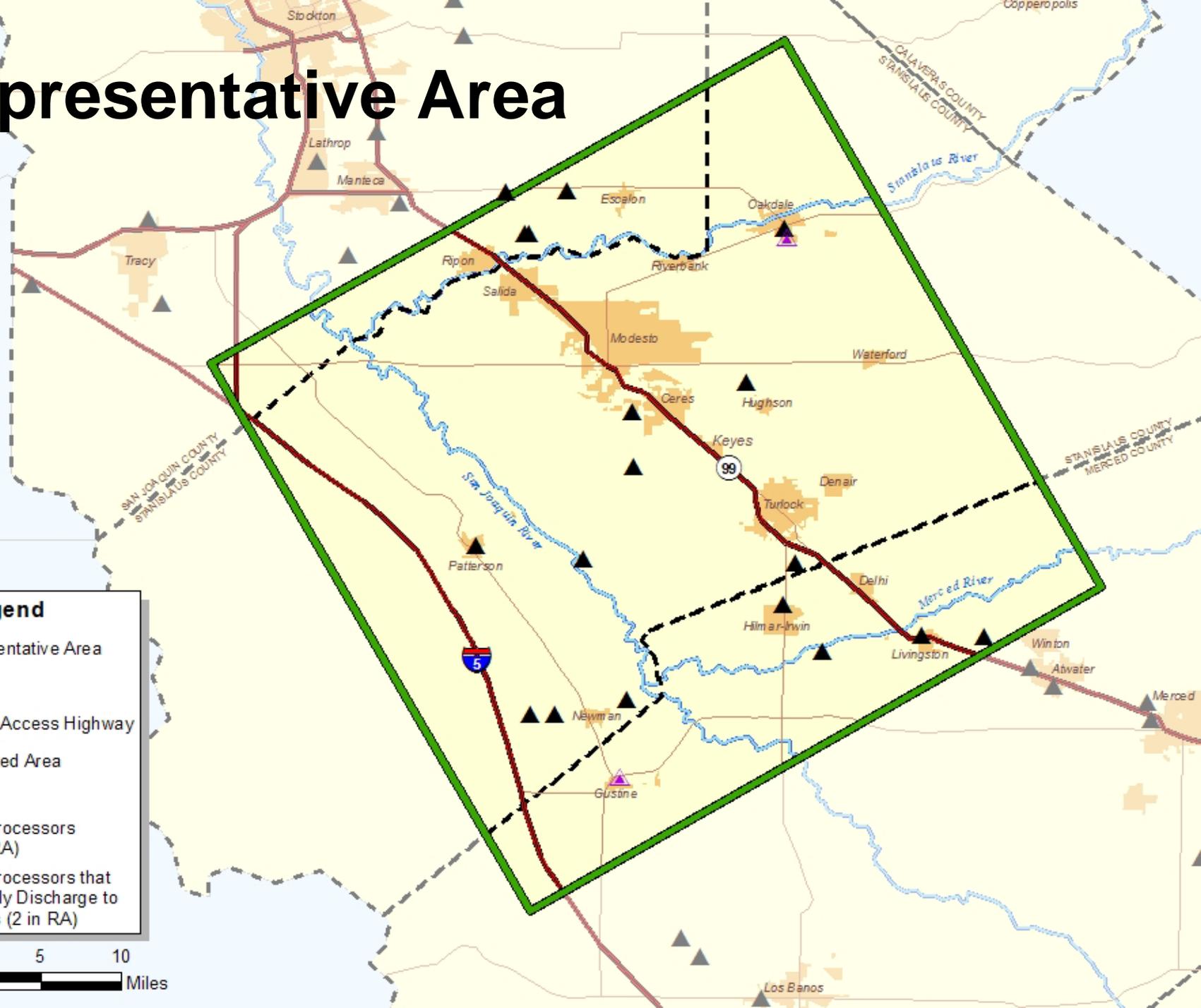
# Representative Area Analysis

- Relative impacts of salt management strategies will be compared for the representative area
- Roughly bordered by Stanislaus, Merced, and San Joaquin Rivers
- Chosen based on several screening criteria
  - Density of food processors
  - Availability of groundwater data
  - Urban and agricultural water use

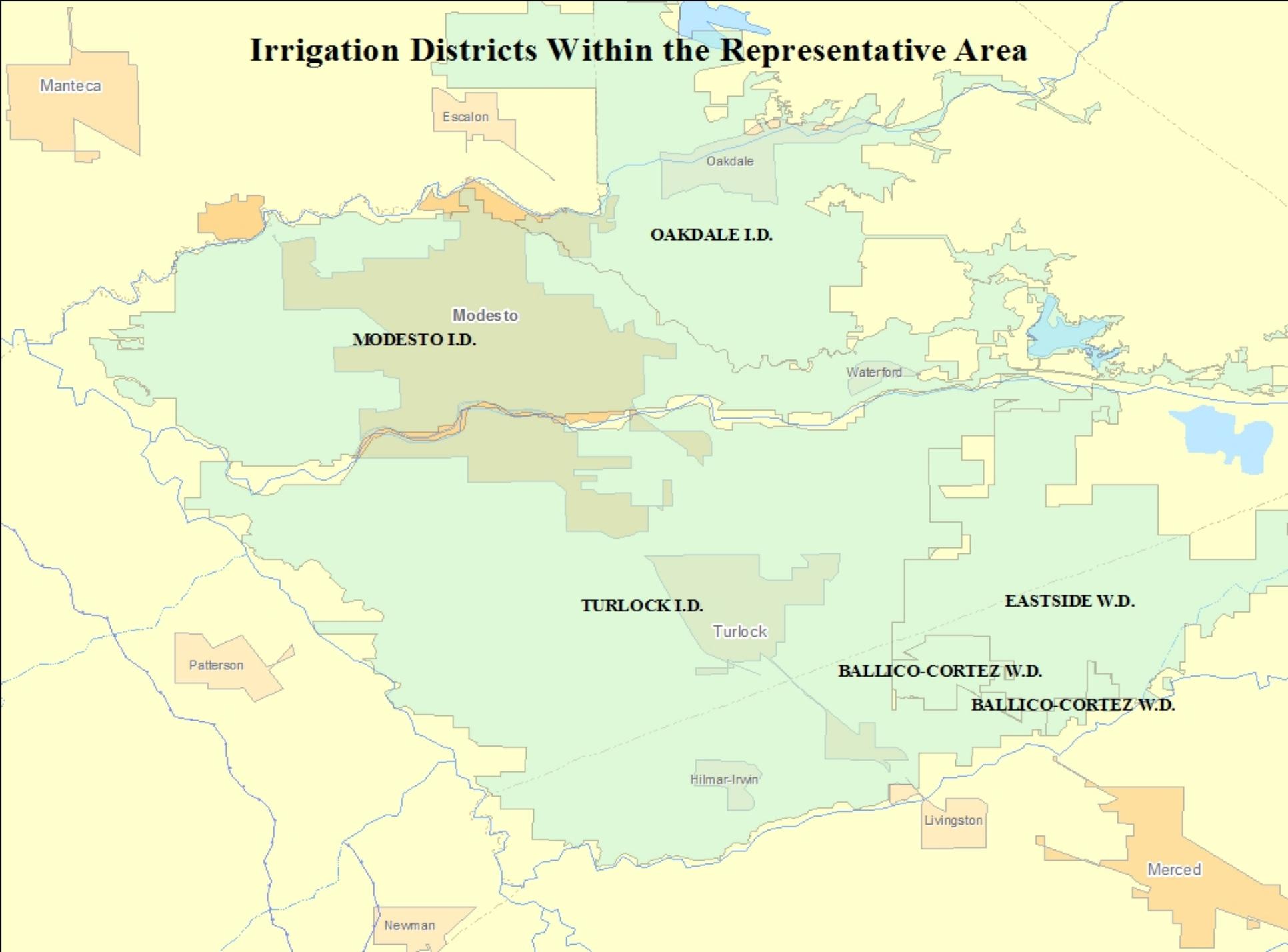
# Representative Area

**Legend**

-  Representative Area
-  Road
-  Limited Access Highway
-  Populated Area
-  River
-  Food Processors (18 in RA)
-  Food Processors that Currently Discharge to POTWs (2 in RA)



# Irrigation Districts Within the Representative Area



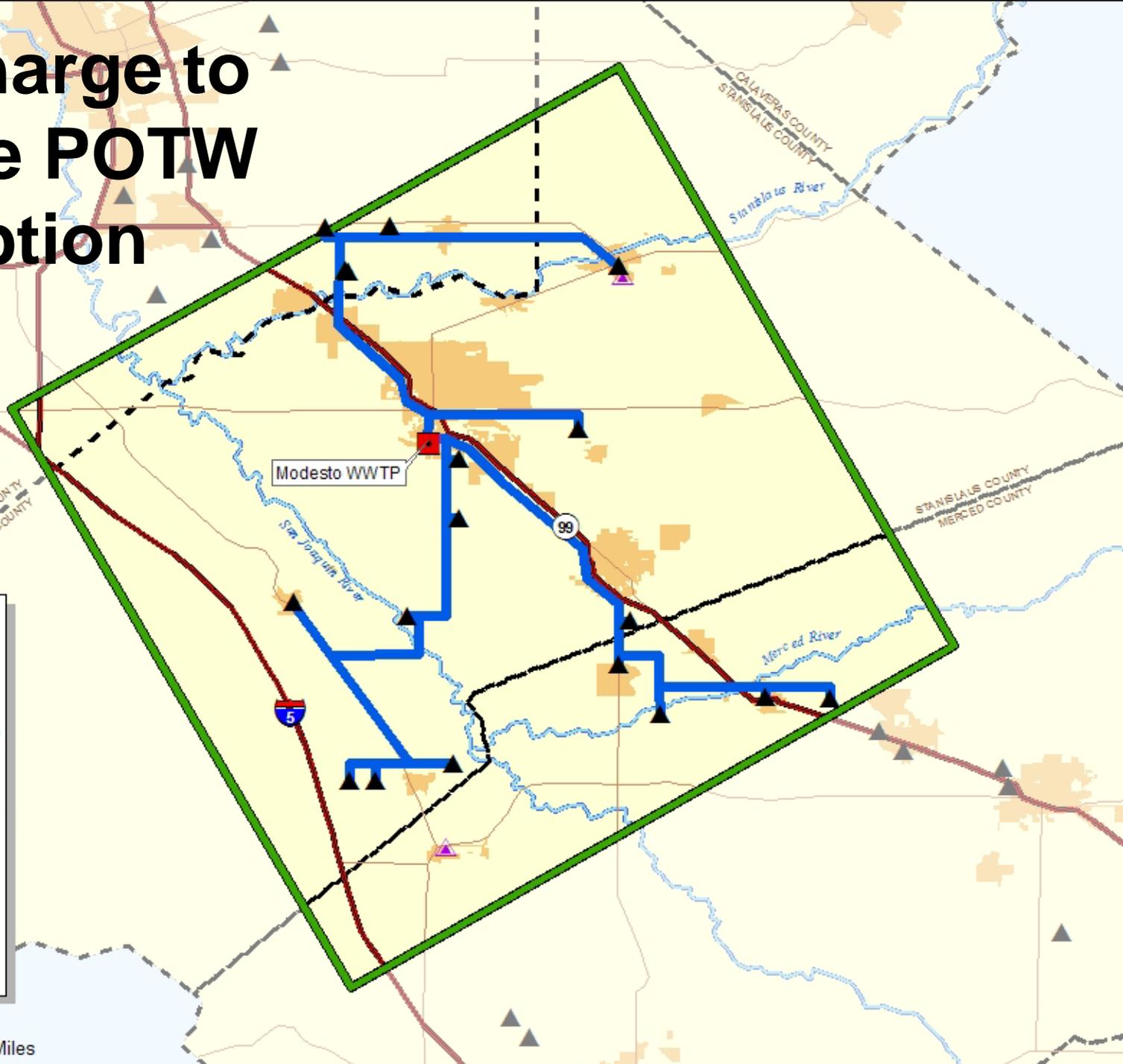
# Management Scenarios

- Land application
  - Local
  - Targeted
- In-plant abatement
  - Low cost
  - Maximum feasible
- Centralized disposal
  - POTW
  - Industry owned facility
- Out of basin disposal
  - Brine line
  - Deep well injection

# Discharge to Single POTW Option

**Legend**

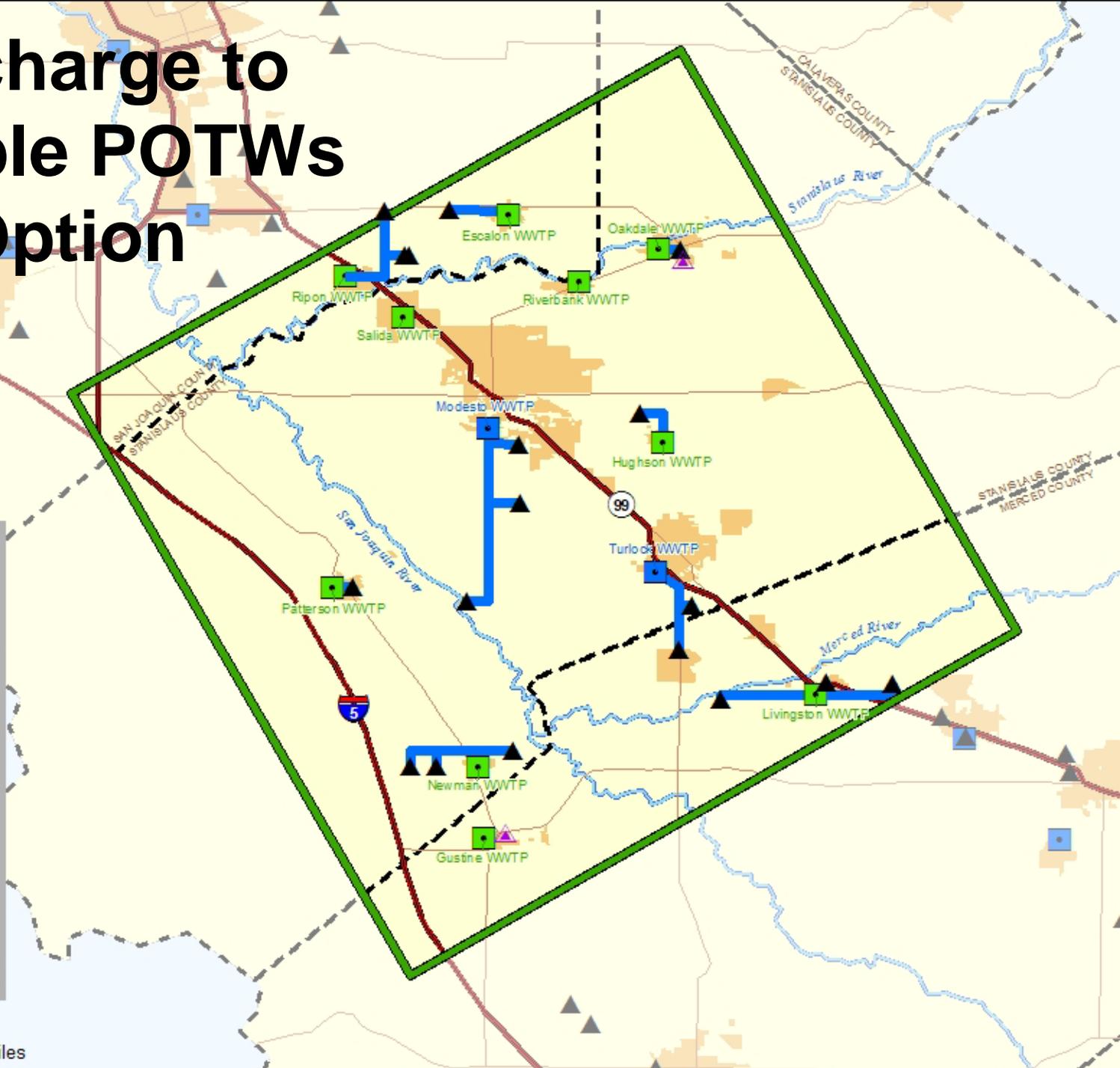
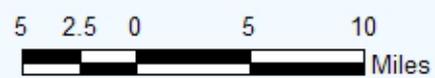
- Representative Area
- Road
- Limited Access Highway
- Populated Area
- Possible Collection Line
- River
- Food Processors (18 in RA)
- Food Processors that Currently Discharge to POTWs (2 in RA)



# Discharge to Multiple POTWs Option

**Legend**

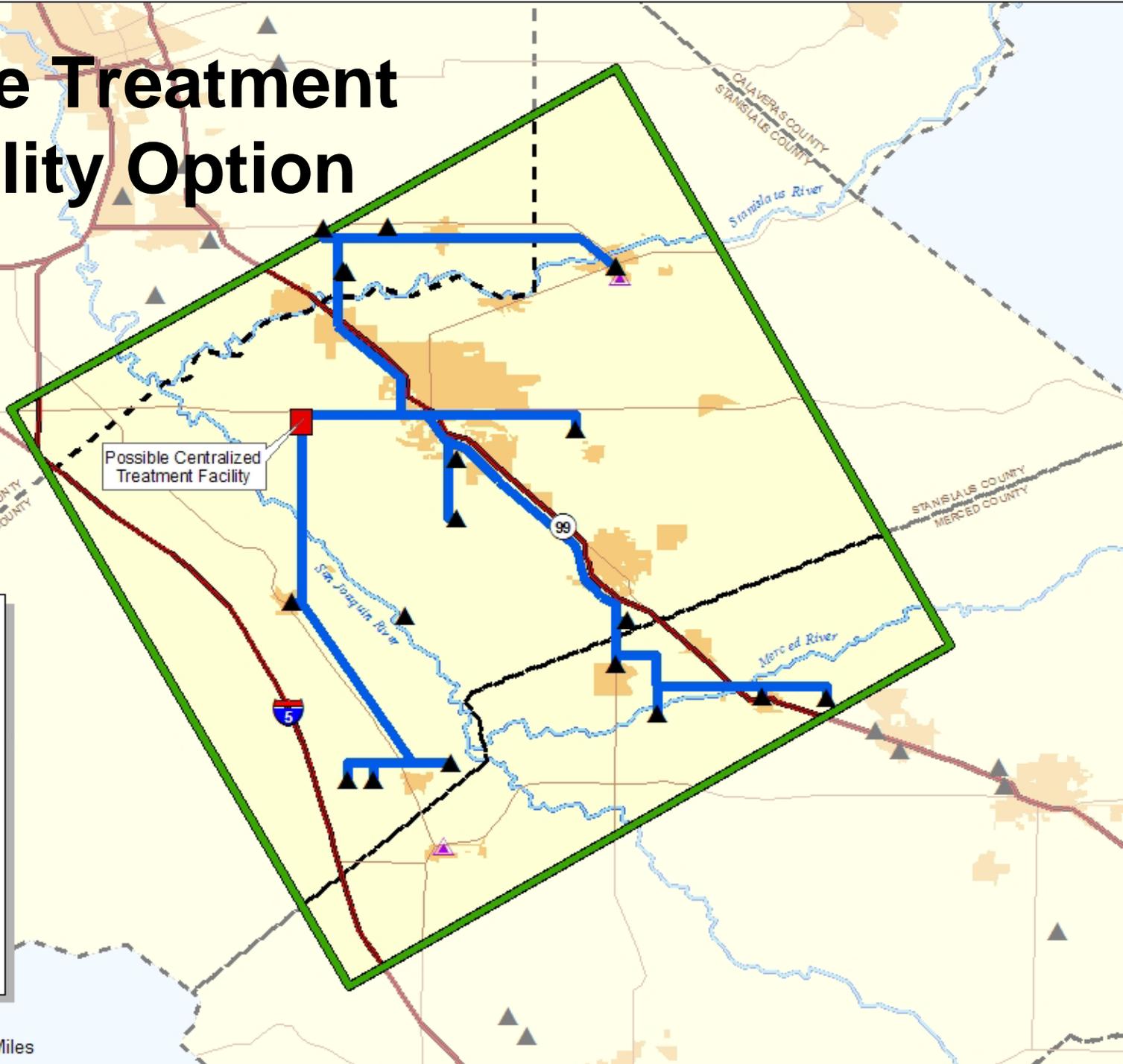
- ◇ Representative Area
- Road
- Limited Access Highway
- Populated Area
- Possible Collection Line
- ~ River
- ▲ Food Processors (18 in RA)
- ▲ Food Processors that Currently Discharge to POTWs (2 in RA)
- Major POTW (2 in RA)
- Other POTW (10 in RA)



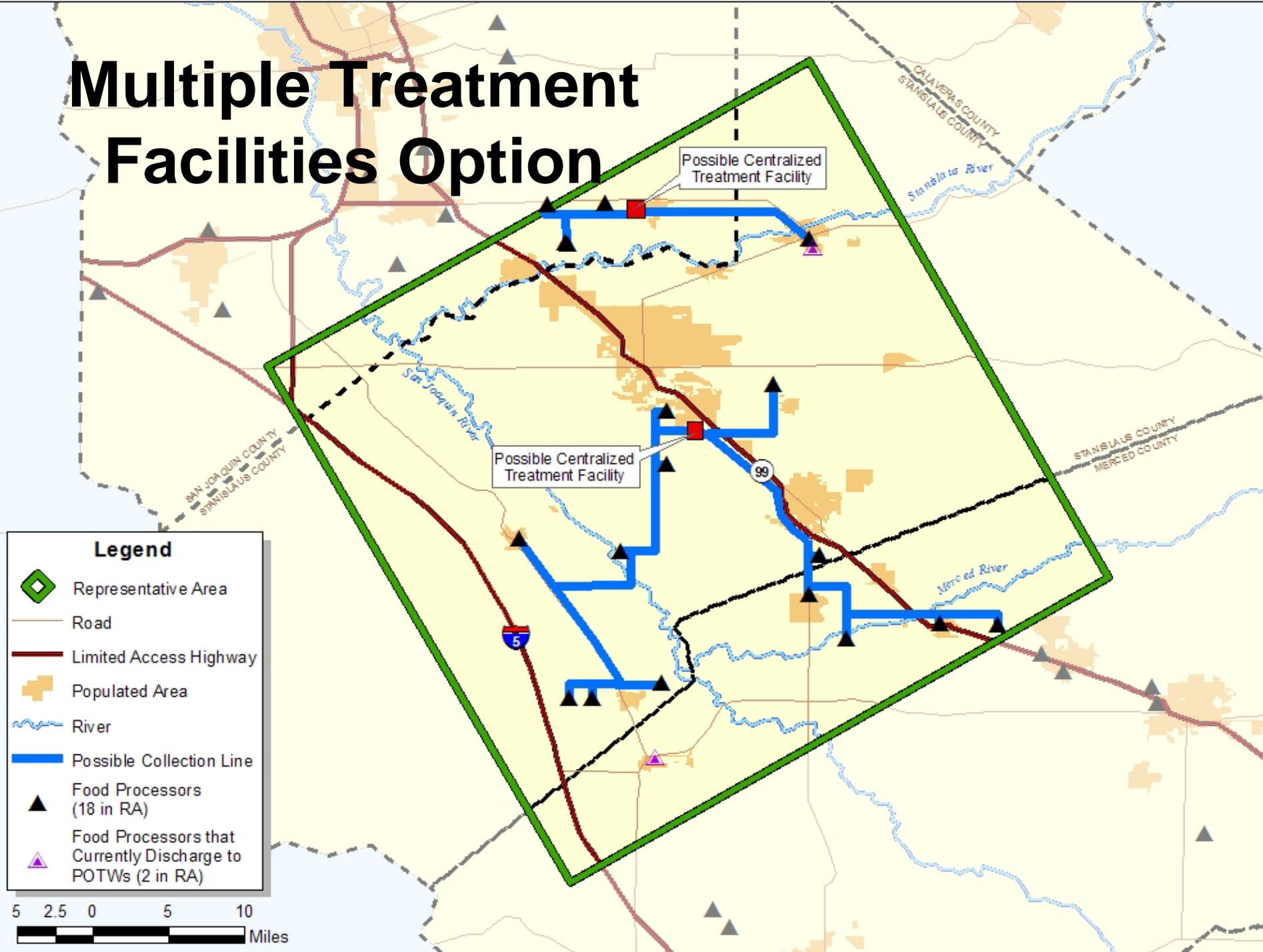
# Single Treatment Facility Option

**Legend**

- ◇ Representative Area
- Road
- Limited Access Highway
- Populated Area
- Possible Collection Line
- River
- ▲ Food Processors (18 in RA)
- ▲ Food Processors that Currently Discharge to POTWs (2 in RA)



# Multiple Treatment Facilities Option

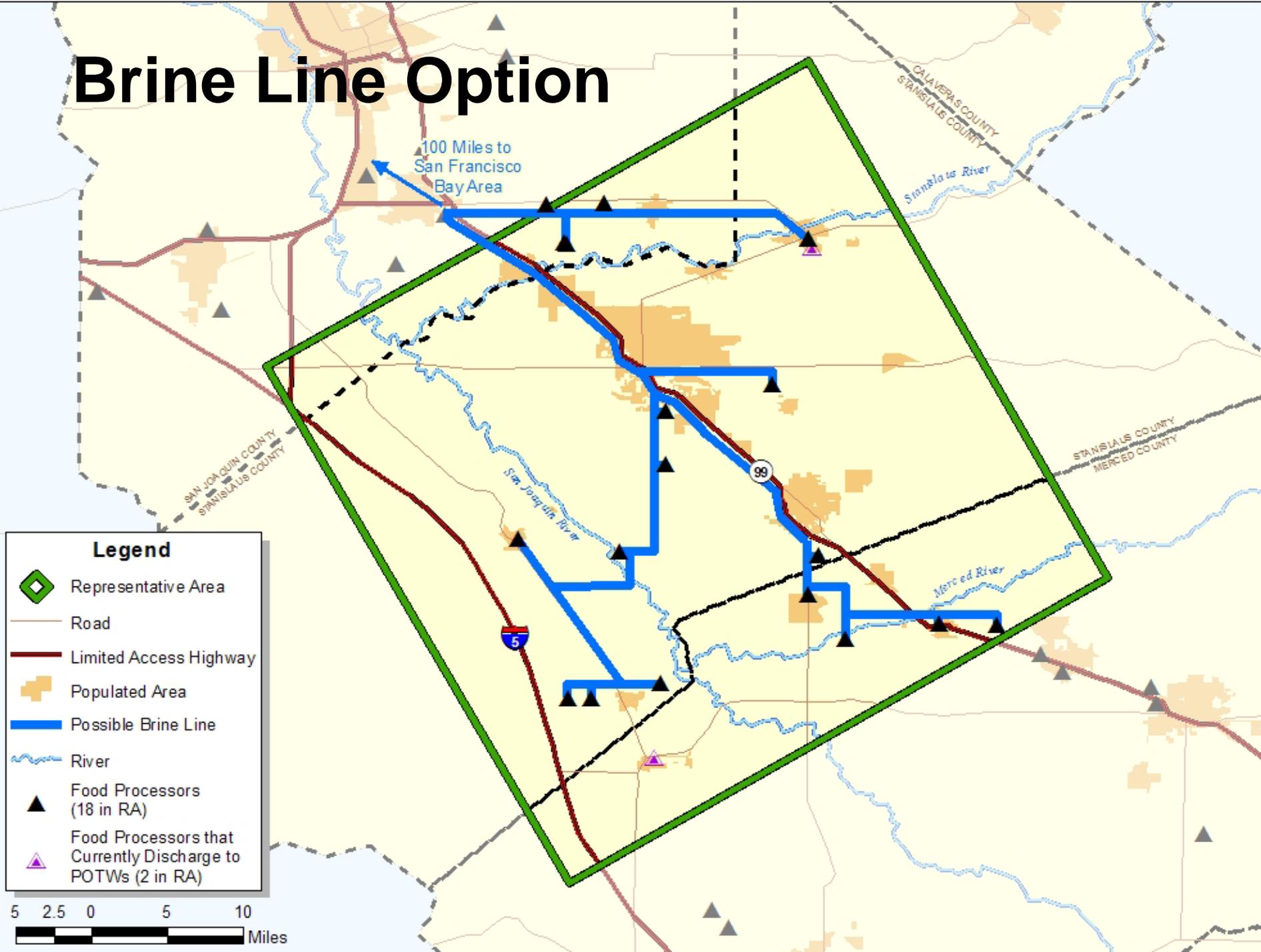


## Legend

-  Representative Area
-  Road
-  Limited Access Highway
-  Populated Area
-  River
-  Possible Collection Line
-  Food Processors (18 in RA)
-  Food Processors that Currently Discharge to POTWs (2 in RA)

5 2.5 0 5 10 Miles

# Brine Line Option



100 Miles to  
San Francisco  
Bay Area

CALAVERAS COUNTY  
STANISLAUS COUNTY  
Stanislaus River

SAN JOAQUIN COUNTY  
STANISLAUS COUNTY

STANISLAUS COUNTY  
MERCED COUNTY

San Joaquin River

Merced River

**Legend**

- ◇ Representative Area
- Road
- Limited Access Highway
- Populated Area
- Possible Brine Line
- River
- ▲ Food Processors (18 in RA)
- ▲ Food Processors that Currently Discharge to POTWs (2 in RA)



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**Santa Ana Watershed Project Authority (SAWPA)  
Santa Ana Regional Interceptor (SARI)**

- 93 miles long
- 5-10 MGD average flow; 30-MGD capacity
- Saline wastewater; domestic and other industrial wastewaters
- Treatment plant: Orange County Sanitation District No. 2
- Outfall: 5 miles offshore
- \$135 million for replacement of 73 miles (2002 costs) (\$1.8 M per mile)

**Calleguas Municipal Water District (CMWD)  
Calleguas Regional Salinity Management Pipeline  
– Currently in Construction**

- 30 miles long
- 19-MGD capacity
- High-salinity brine only
- No treatment plant
- Outfall: 1 mile offshore
- \$140 million (est. total cost) (\$4.7 M per mile)

**County of Los Angeles Sanitation District (CLASD)  
Metropolitan's Weymouth Water Treatment Plant/District 21**

- 40 miles long
- 4-50 MGD average flow
- Brine from desalting projects; domestic and industrial wastewater
- Treatment plant: Joint Water Pollution Control Plant
- Outfall: 2 miles offshore
- Cost comparable to typical sewer line

Orange

River

# Timeline

- Stakeholder meeting on Monday to finalize scenarios
- Draft report due August 15, 2007
- Public workshop in mid-September
- Peer review comments due October 15, 2007
- Final report due December 15, 2007