GIS Task 5:
Develop Crop Sensitivity Tools

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GIS Task 5 Workplan (thru 5.2)

● 5.1: Research And Develop Map Layers
  ■ Political or Other Boundaries and Base Map Information, and Preliminary Policy Recommendations
  ■ General (Statsgo2) and Order 2 (SSURGO) Soil Mapping
  ■ Irrigation Supply Water Sources and Quality
  ■ Agriculture Beneficial Use Listings
  ■ Current Crops Grown
  ■ Current and Historic Value of the Crops Grown
  ■ Other Constraints Limiting Growth of Crops

● 5.2: Identify Crop Sensitivity Zones
  ■ Define CSZs Based on…(cropping, source and water quality of irrigation water, drainage basin delineations, soils, climate conditions)
  ■ Summaries and Presentation of CSZ Properties
Crop Sensitivity Zones, Main Points

- Issues & approaches to regulating discharges into Ag-dominated waterways: Live Oak
- Map of sensitive crops locations in the Central Valley
- Why location in the watershed matters
- Water quality (salinity) thresholds (possible range of values)
- Process for determining Crop Sensitivity Zones
- CSZs & characteristics
- Applied water salinity: the status quo
Issues & Approaches: Live Oak

“…there is no permitted or planned agricultural use of City effluent in Reclamation District 777 Lateral Drain No. 1 or Lateral Drain No.2.

…If the effluent were used locally, without dilution, by agriculture

…plums (prunes) are the most salt sensitive major crop

…no reduction in yield for EC of soil extract (ECe) of 1,500 µmhos/cm. With an irrigation water EC of 1,100 µmhos/cm (the final effluent limitation) and a leaching requirement of only 10 percent (which represents a highly efficient irrigation method), the resulting ECe is estimated to range from 1,294 µmhos/cm (exponential model) to 1,403 µmhos/cm (arithmetic model)

…the final effluent limitation of 1,100 µmhos/cm poses no material risk to area agriculture even if a farmer replaced his current water supply with undiluted effluent from the Reclamation District 777 drainage ditches.”
Distribution of Major, Sensitive Crops
Areas of Sensitive Crop Concentration
It matters where sensitive crops are located relative to recharge areas

Schematic example:
Surface water recharge areas with co-mingled surface drainage

Area with sensitive crops

Channel network (assuming return flows to same network)
It matters where sensitive crops are located relative to recharge areas

Schematic example: Surface water recharge areas with isolated surface drainage
It matters where sensitive crops are located relative to recharge areas

Schematic example:
Groundwater recharge areas

All AW is surface water here

AW is both surface & groundwater here
Initial Crop Sensitivity Zones
\[ LF = \frac{(AW\text{-runoff})}{ET} \approx 15\% \]
Common Beans

Relative Yield (%)

ECe (dS/m)

1.26 ~ 527 mg/L  
TDS @ 15% LF
## Crops for which coefficients have not been measured

<table>
<thead>
<tr>
<th>Sensitive</th>
<th>Moderately Sensitive</th>
<th>Moderately Tolerant</th>
<th>Tolerant</th>
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<tbody>
<tr>
<td>Okra</td>
<td>Brussels sprouts</td>
<td>Fig</td>
<td>Jojoba</td>
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<td>Parsnip</td>
<td>Cauliflower</td>
<td>Jujube</td>
<td>Kenaf</td>
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<td>Apple</td>
<td>Kale</td>
<td>Papaya</td>
<td>Millet, channel</td>
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<td>Avocado</td>
<td>Kohlrabi</td>
<td>Pineapple</td>
<td>Oat</td>
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<td>Cherimoya</td>
<td>Pumpkin</td>
<td>Pistacio***</td>
<td>Alkali grass, nuttall</td>
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<tr>
<td>Cherry, sweet</td>
<td>Watermelon</td>
<td>Pomegranate</td>
<td>Alkali sacaton</td>
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<tr>
<td>Cherry, sand</td>
<td>Castorbean</td>
<td>Safflower</td>
<td>Kallar grass</td>
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<td>Currant</td>
<td>Bentgrass</td>
<td>Brome, mountain</td>
<td>Kikuyagrass**</td>
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<td>Gooseberry</td>
<td>Bluestem, Angleton</td>
<td>Canary grass, reed</td>
<td>Oat (forage)</td>
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<td>Brome, smooth</td>
<td>Clover, Hubam</td>
<td>Paspalum, Polo**</td>
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<td>Buffelgrass</td>
<td>Clover, sweet</td>
<td>Salt grass, desert</td>
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<td>Mango</td>
<td>Burnet</td>
<td>Dhairncha</td>
<td>Wild rye, Altai</td>
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<td>Passion fruit</td>
<td>Clover, white Dutch</td>
<td>Fescue, meadow</td>
<td>Wild rye, Russian</td>
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<tr>
<td>Pear</td>
<td>Dallis grass</td>
<td>Guinea grass</td>
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<td>Glycine</td>
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<td>Grama, blue</td>
<td>Paspalum, PJ299042**</td>
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<td>Raspberry</td>
<td>Milkvetch, cicer</td>
<td>Rape</td>
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<td>Rose apple</td>
<td>Millet, Foxtail</td>
<td>Rescue grass</td>
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<td>Oatgrass, tall</td>
<td>Rhodes grass</td>
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<td>Sirato</td>
<td>Ryegrass, Italian</td>
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<td>Sesame</td>
<td>Eucalyptus</td>
<td>Trefoil, broadleaf bird's foot</td>
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<td>Walnut</td>
<td>Timothy</td>
<td>Wheat grass, intermediate</td>
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<td>Wheat grass, slender</td>
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<td>Wheat grass, western</td>
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<td>Wild rye, Canadian</td>
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<td>Kiwi</td>
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Crop Patterns based on DWR Land Use Survey
Distribution of Major, Sensitive Crops
Average Effective Precipitation
Available Water Supply at 0-25 Soil Depth (cm) based on the NRCS-SSURGO
Available Water Supply at 0-100 Soil Depth (cm) based on the NRCS-SSURGO
Soils Data for Electrical Conductivity (dS/cm) based on the NRCS-SSURGO
Drainage Classes based on the NRCS-SSURGO
Sodium Adsorption Ratio based on the NRCS-SSURGO
Applied water salinity: the status quo
Applied water salinity, WARMF model areas, based on WARMF applied water concentrations

TDS of Applied Water (mg/L)

Area (acres)
Initial Crop Sensitivity Zones
Summary

- Hydrography a helpful CSZ delineation starting point from the standpoint of AGR implementation
- Sensitive crop areas often localized; irrigation water sources can be determined
- Crop sensitivity target concentrations crop/soil/climate driven; exact method TBD
- To protect sensitive crops, AGR needed in recharge zones for irrigation source waters
- Recharge areas likely portions of initial CSZs, but hydrographically driven