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.

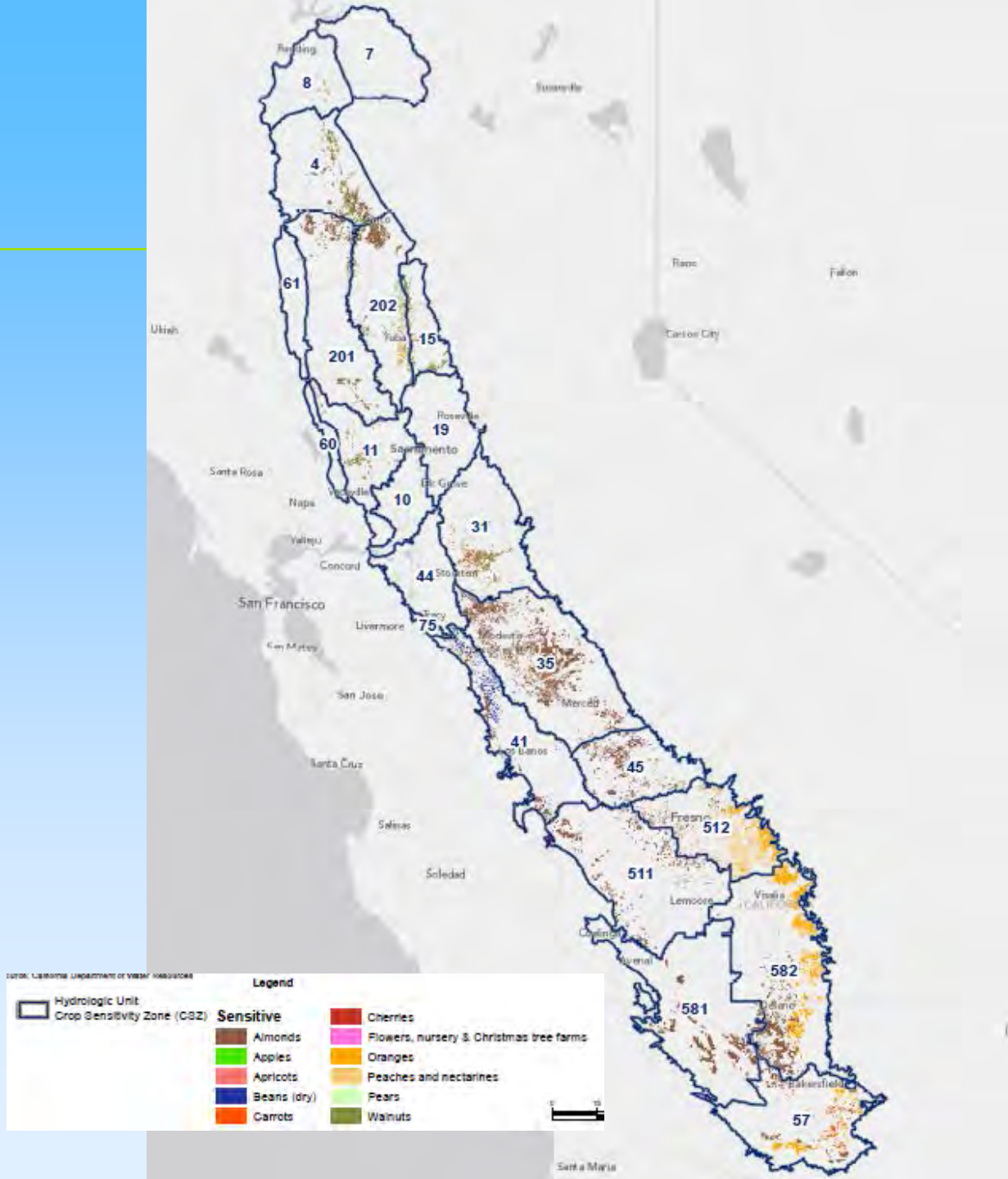
…If the effluent were used locally, without dilution, by agriculture

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

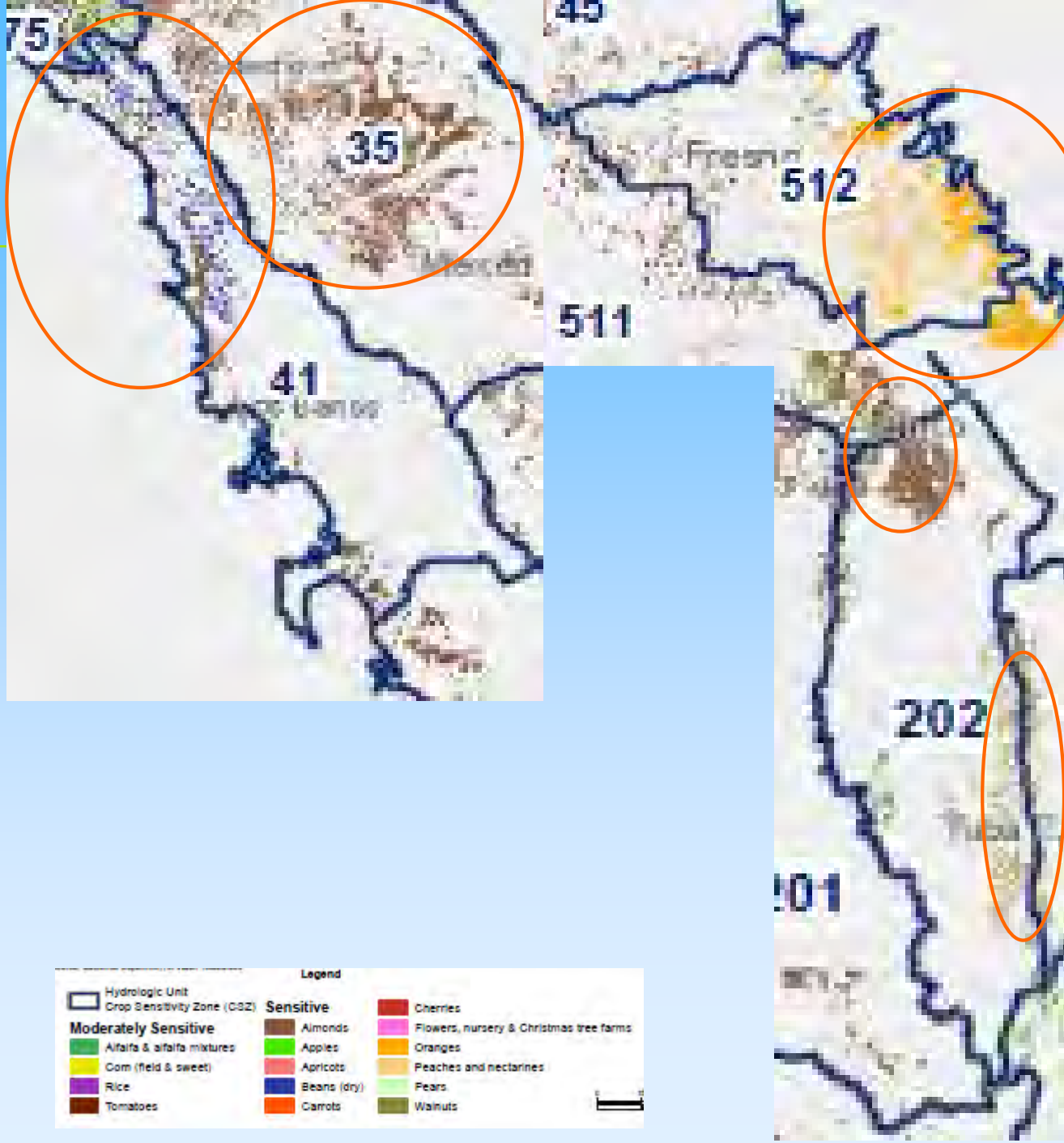
…no reduction in yield for EC of soil extract (ECe) of 1,500 µmhos/cm. With an irrigation water EC of 1,100 µmhos/cm (the final effluent limitation) and a leaching requirement of only 10 percent (which represents a highly efficient irrigation method), the resulting ECe is estimated to range from 1,294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

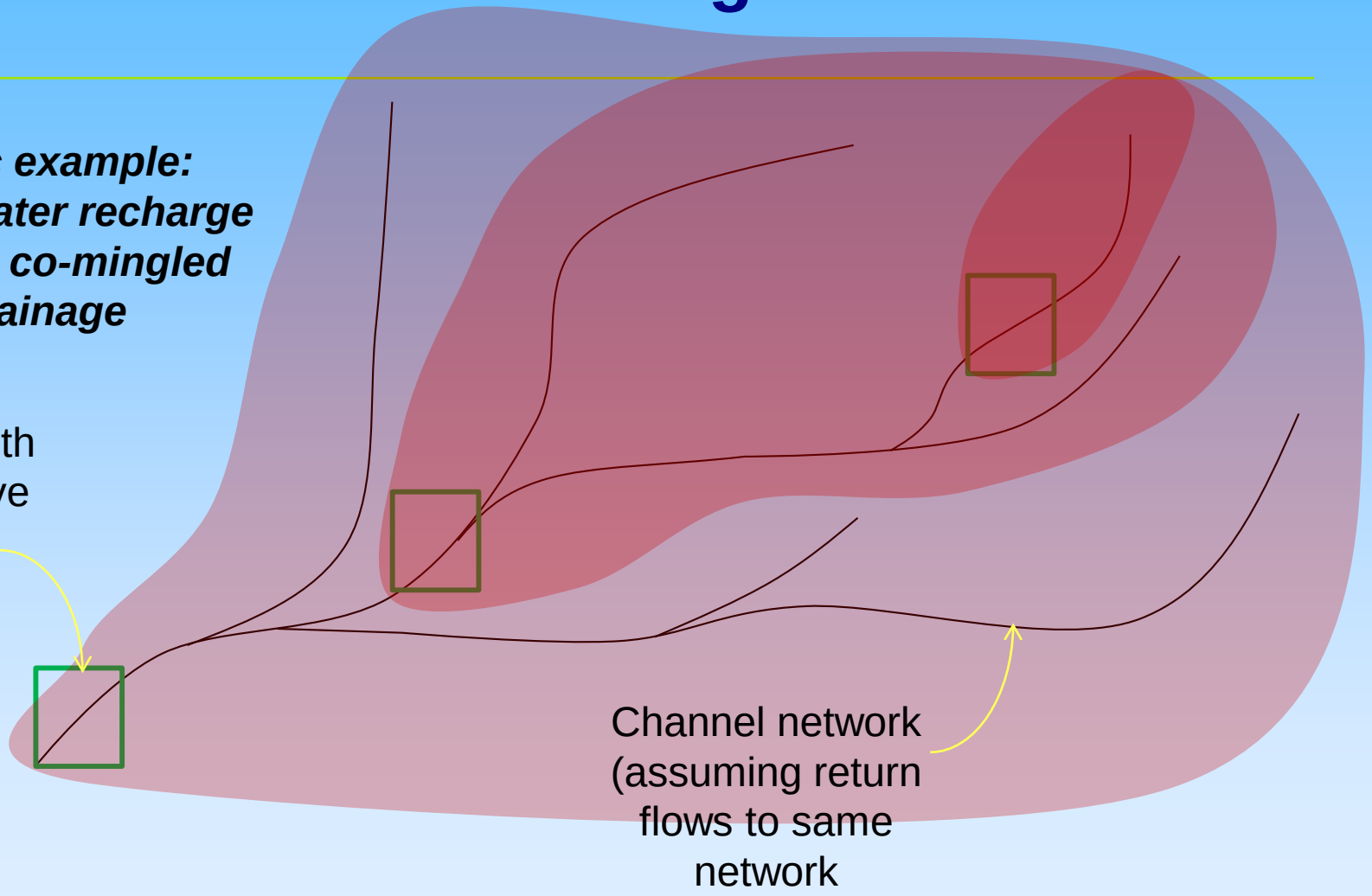


Areas of Sensitive Crop Concentration



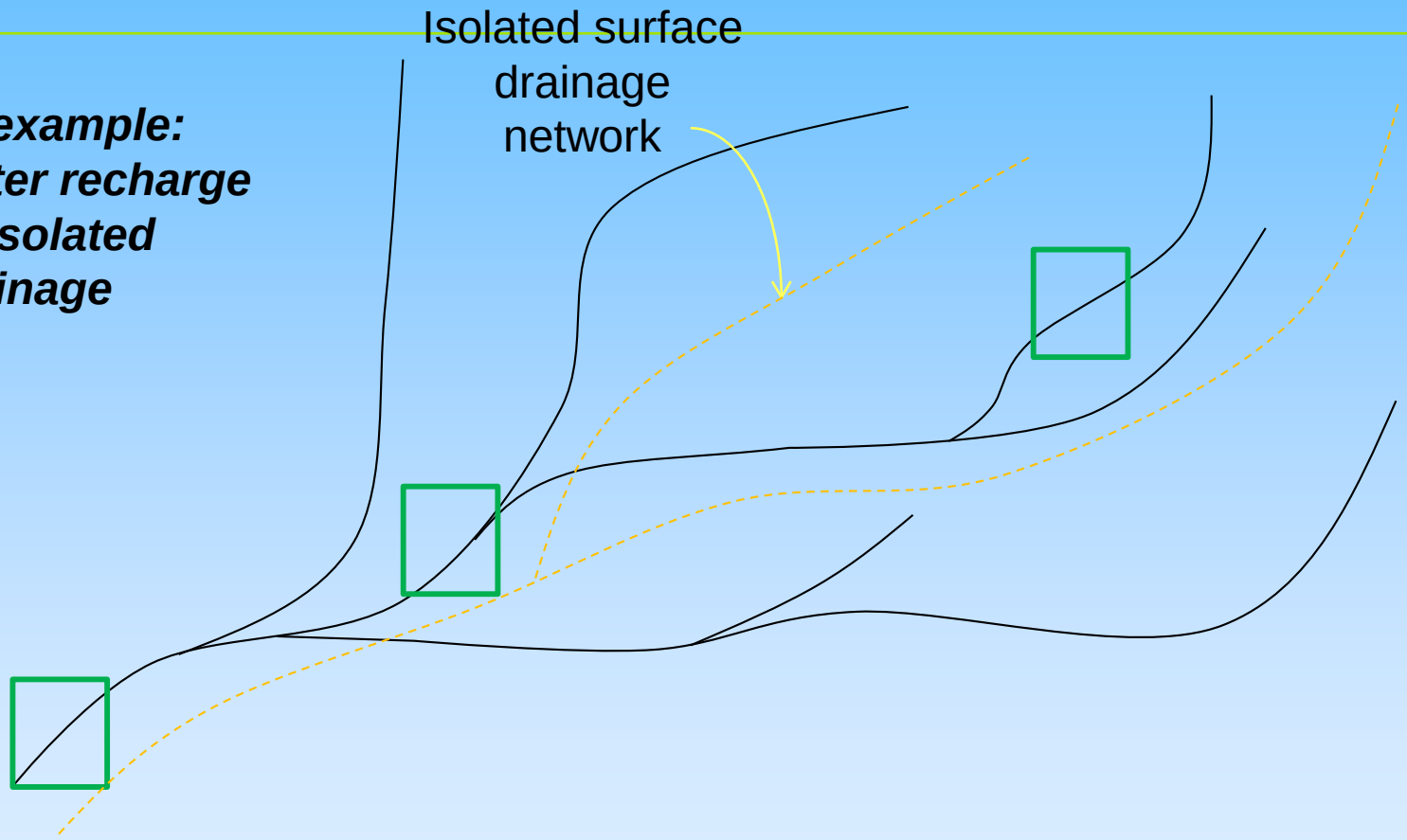
It matters where sensitive crops are located relative to recharge areas

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



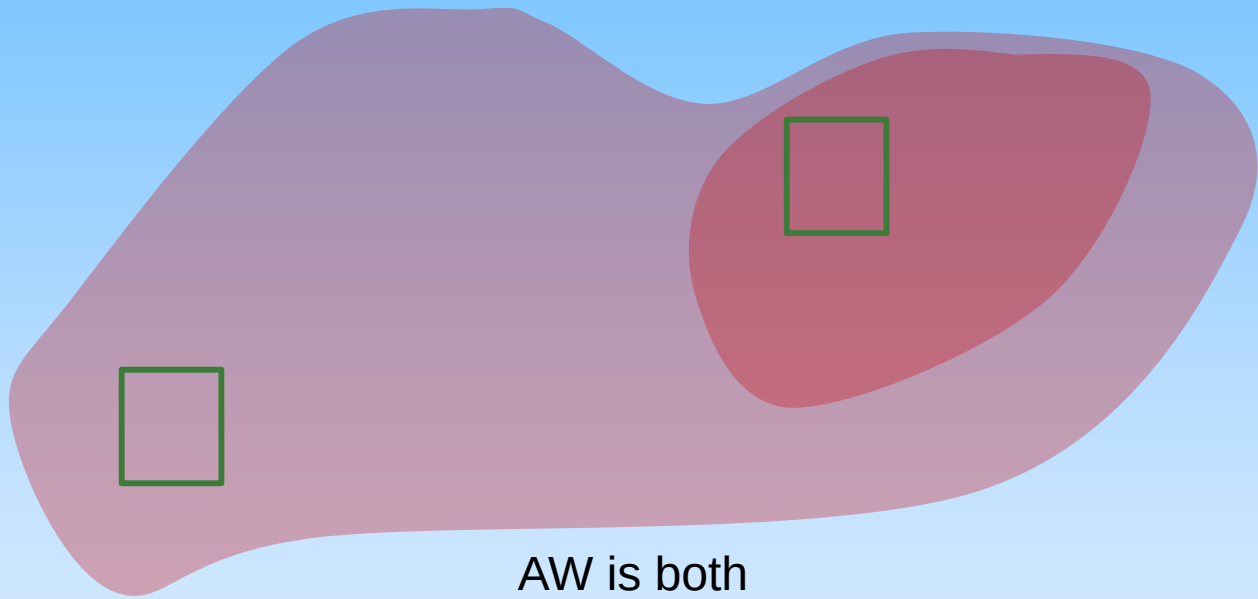
It matters where sensitive crops are located relative to recharge areas

Schematic example: Surface water recharge areas with isolated surface drainage



It matters where sensitive crops are located relative to recharge areas

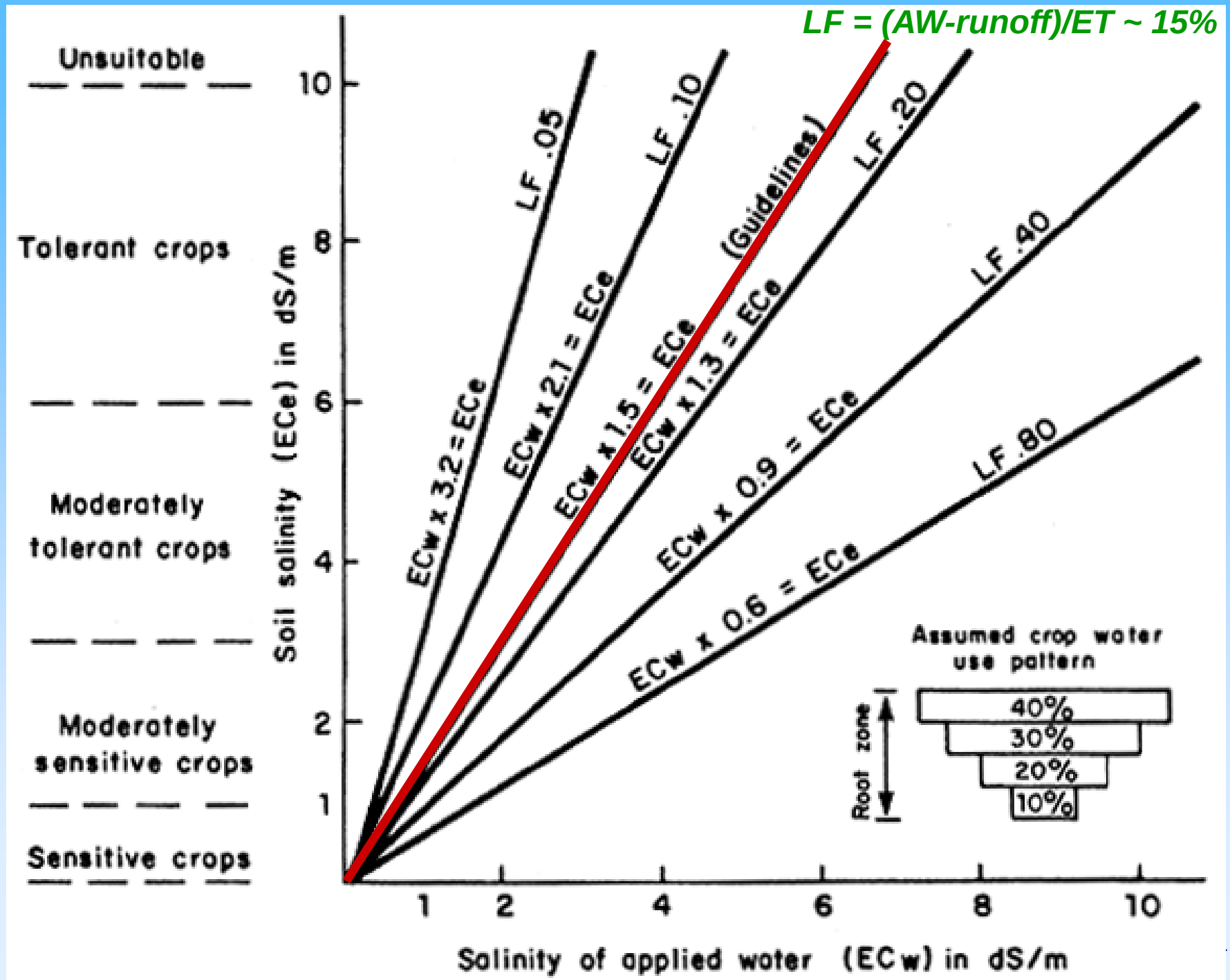
Schematic example: Groundwater recharge areas

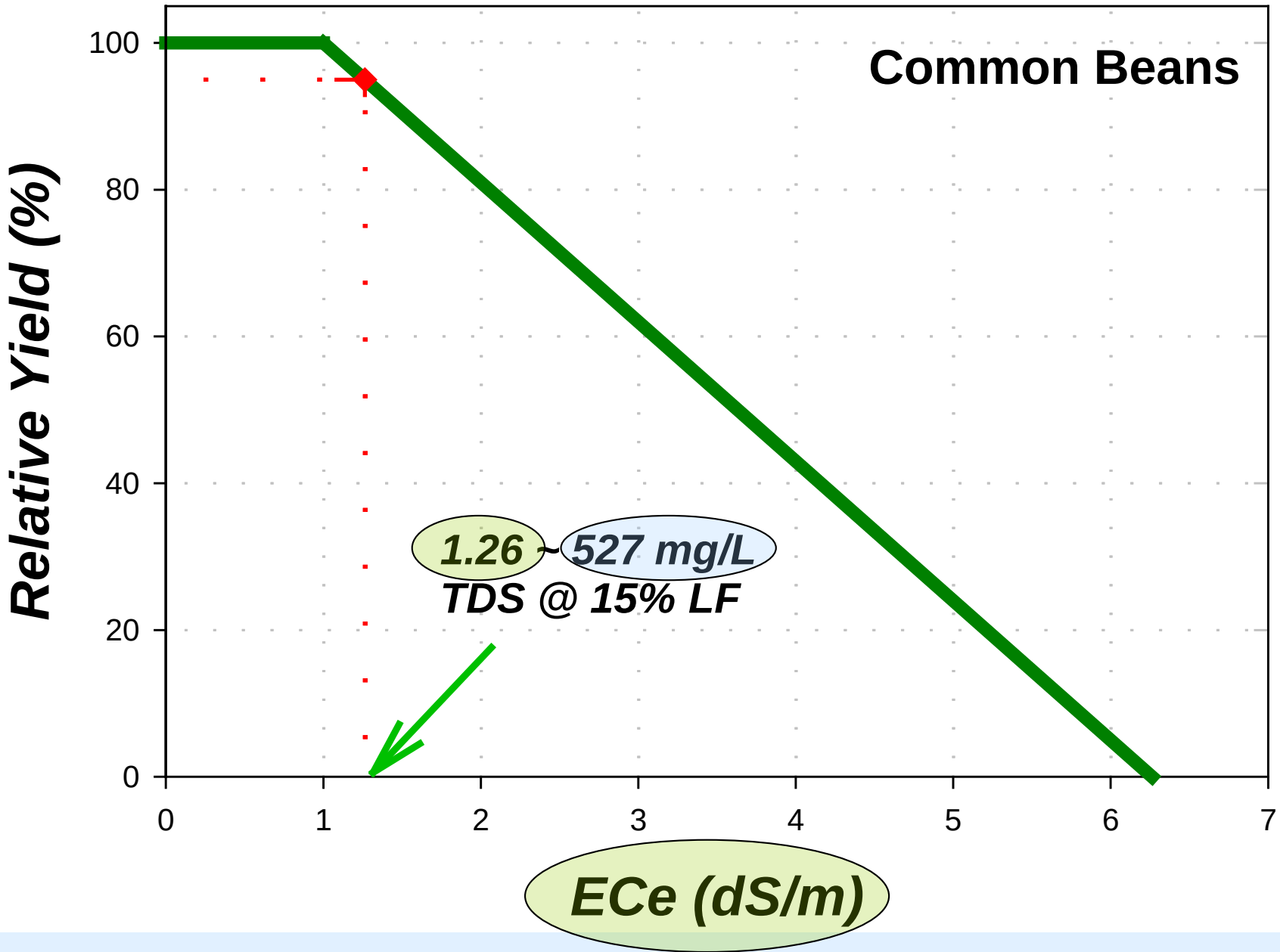


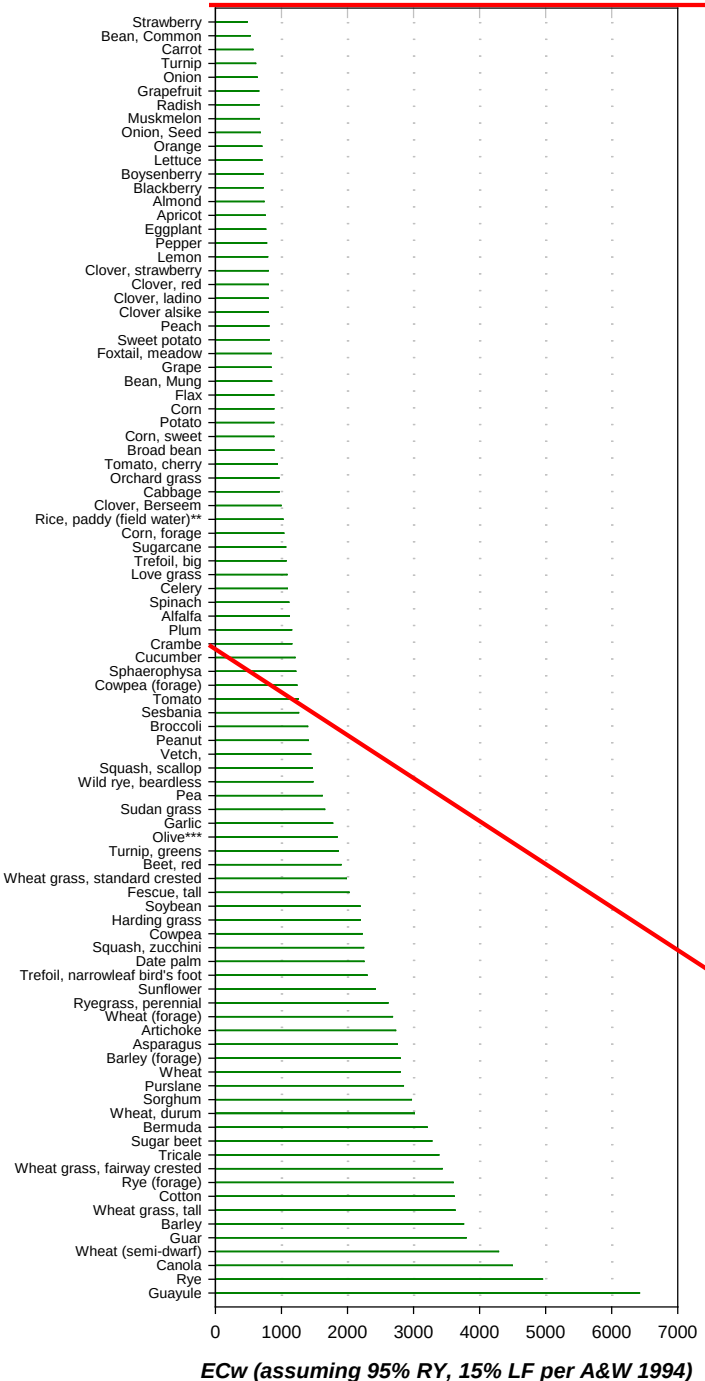
All AW is surface water here

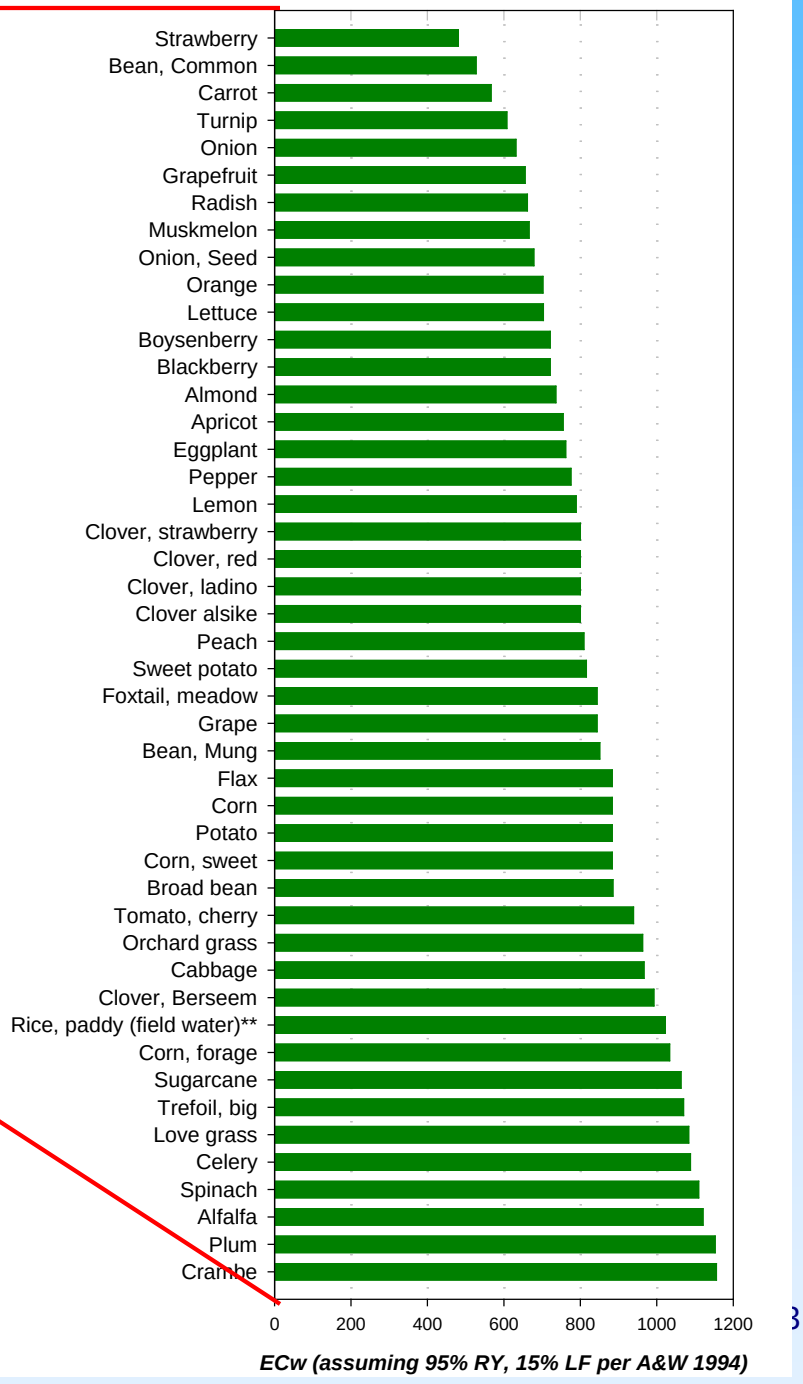
AW is both surface & groundwater here

Initial Crop Sensitivity Zones


LF = (AW-runoff)/ET ~ 15%
Unsuitable
Tolerant crops
Moderately tolerant crops
Moderately sensitive crops
Sensitive crops
Soil salinity (ECe) in dS/m
10
8
6
4
2
1
LF .05
LF .10
(Guidelines)
LF .20
LF .40
LF .80
ECw x 3.2 = ECe
ECw x 2.1 = ECe
ECw x 1.5 = ECe
ECw x 1.3 = ECe
ECw x 0.9 = ECe
ECw x 0.6 = ECe
Assumed crop water use pattern
Root zone
40%
30%
20%
10%
1
2
4
6
8
10
Salinity of applied water (ECw) in dS/m


Common Beans
Relative Yield (%)
100
80
60
40
20
0
0
1
2
3
4
5
6
7
1.26
527 mg/L
TDS @ 15% LF
ECe (dS/m)


Strawberry
Bean, Common
Carrot
Turnip
Onion
Grapefruit
Radish
Muskmelon
Onion, Seed
Orange
Lettuce
Boysenberry
Blackberry
Almond
Apricot
Eggplant
Pepper
Lemon
Clover, strawberry
Clover, red
Clover, ladino
Clover alsike
Peach
Sweet potato
Foxtail, meadow
Grape
Bean, Mung
Flax
Corn
Potato
Corn, sweet
Broad bean
Tomato, cherry
Orchard grass
Cabbage
Clover, Berseem
Rice, paddy (field water)**
Corn, forage
Sugarcane
Trefoil, big
Love grass
Celery
Spinach
Alfalfa
Plum
Crambe
Cucumber
Sphaerophysa
Cowpea (forage)
Tomato
Sesbania
Broccoli
Peanut
Vetch,
Squash, scallop
Wild rye, beardless
Pea
Sudan grass
Garlic
Olive***
Turnip, greens
Beet, red
Wheat grass, standard crested
Fescue, tall
Soybean
Harding grass
Cowpea
Squash, zucchini
Date palm
Trefoil, narrowleaf bird's foot
Sunflower
Ryegrass, perennial
Wheat (forage)
Artichoke
Asparagus
Barley (forage)
Wheat
Purslane
Sorghum
Wheat, durum
Bermuda
Sugar beet
Tricale
Wheat grass, fairway crested
Rye (forage)
Cotton
Wheat grass, tall
Barley
Guar
Wheat (semi-dwarf)
Canola
Rye
Guayule
0
1000
2000
3000
4000
5000
6000
7000
ECw (assuming 95% RY, 15% LF per A&W 1994)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Corn, forage
Sugarcane
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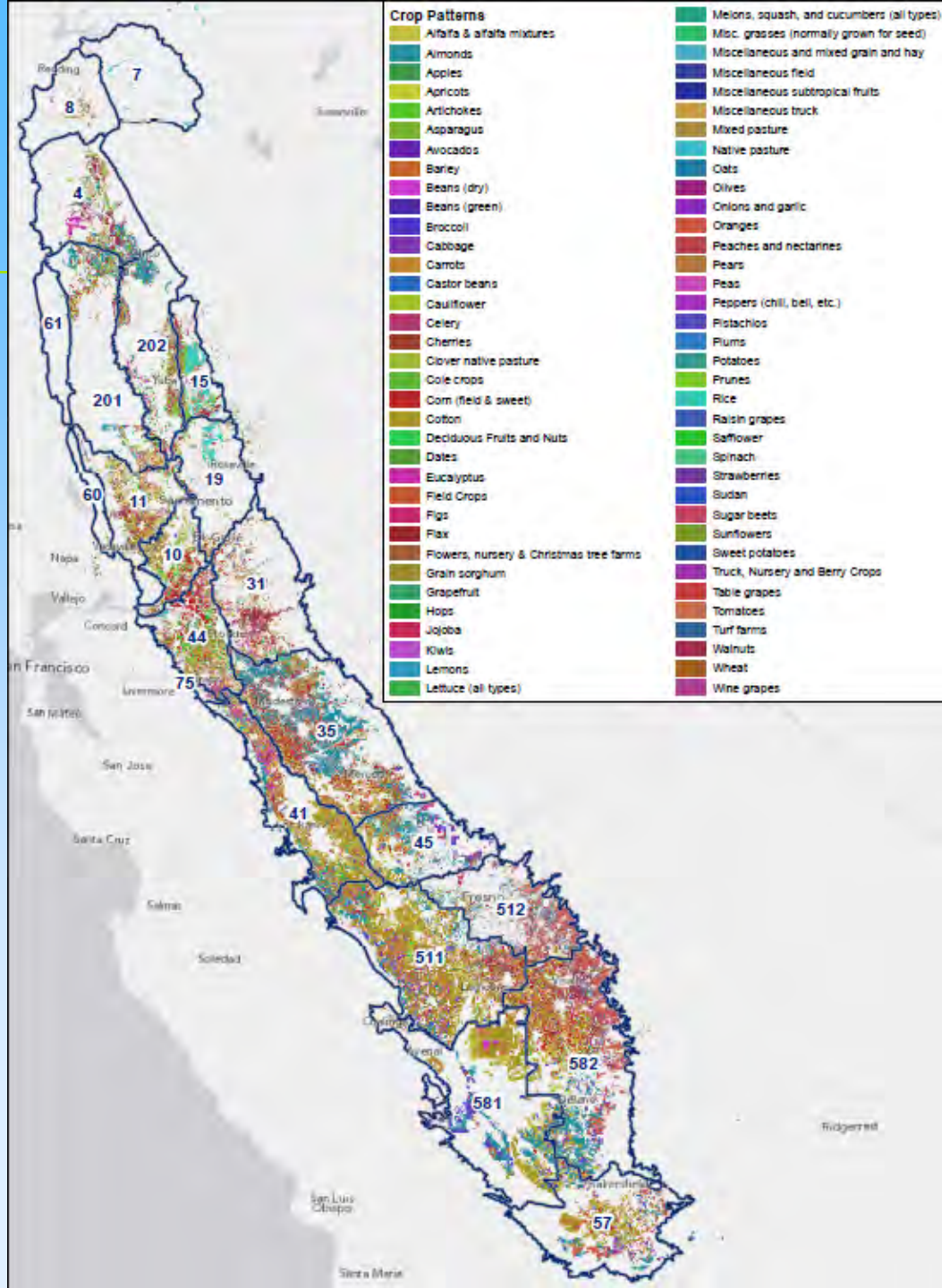
Love grass
Celery
Spinach
Alfalfa
Plum
Crambe
0
200
400
600
800
1000
1200
ECw (assuming 95% RY, 15% LF per A&W 1994)

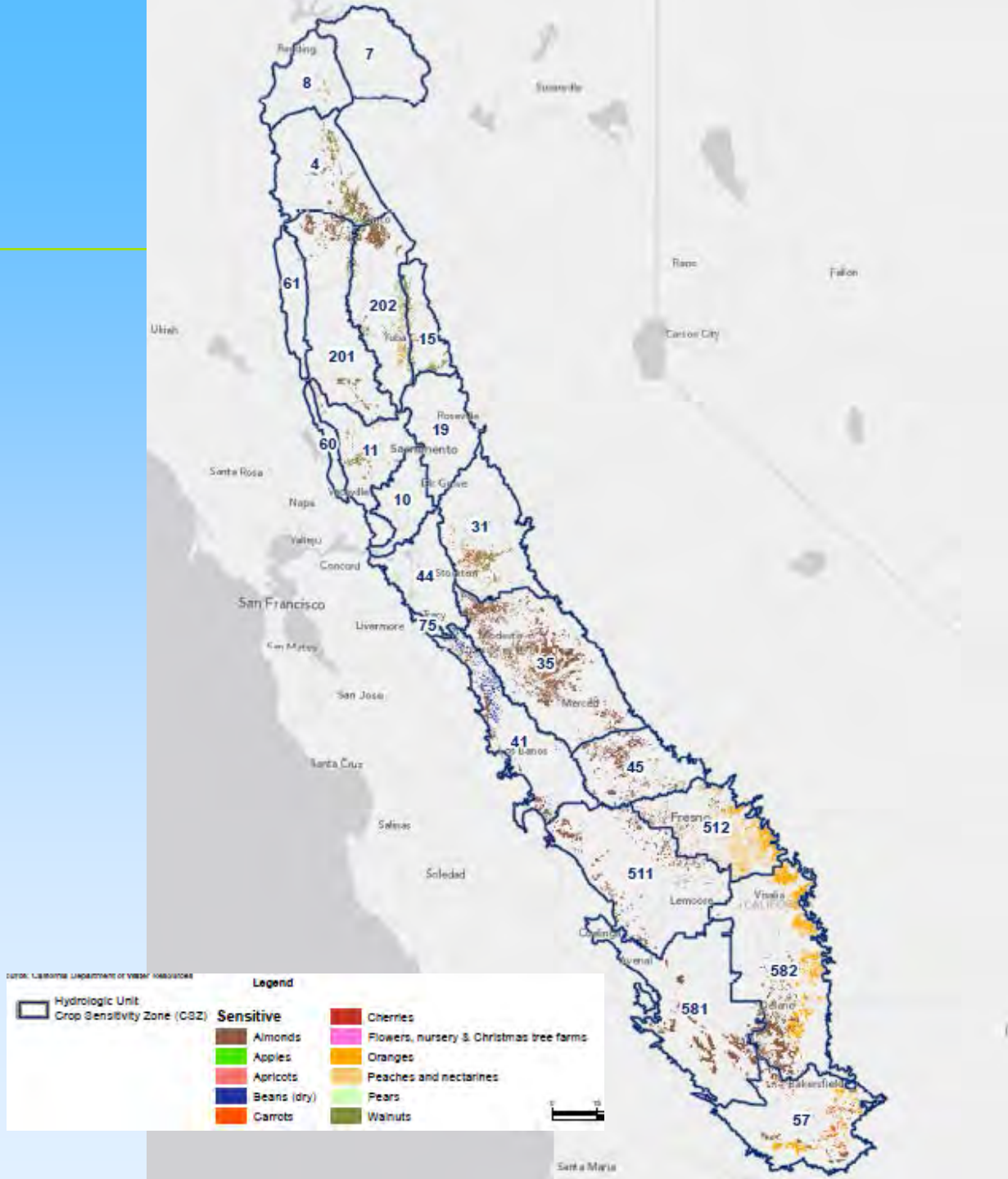
Crops for which coefficients have not been measured

Sensitive	Moderately Sensitive	Moderately Tolerant	Tolerant
Okra	Brussels sprouts	Fig	Jojoba
Parsnip	Cauliflower	Jujube	Kenaf
Apple	Kale	Papaya	Millet, channel
Avocado	Kohlrabi	Pineapple	Oat
Cherimoya	Pumpkin	Pistacio****	Alkali grass, nuttall
Cherry, sweet	Watermelon	Pomegranate	Alkali sacaton
Cherry, sand	Castorbean	Safflower	Kallar grass
Currant	Bentgrass	Brome, mountain	Kikuyagrass**
Gooseberry	Bluestem, Angleton	Canary grass, reed	Oat (forage)
Lime	Brome, smooth	Clover, Hubam	Paspalum, Polo**
Loquat	Buffelgrass	Clover, sweet	Salt grass, desert
Mango	Burnet	Dhaincha	Wild rye, Altai
Passion fruit	Clover, white Dutch	Fescue, meadow	Wild rye, Russian
Pear	Dallis grass	Guinea grass	
Persimmon	Glycine	Panicgrass, blue	
Pummelo	Grama, blue	Paspalum, PJ299042**	
Raspberry	Milkvetch, cicer	Rape	
Rose apple	Millet, Foxtail	Rescue grass	
Sapote, white	Oatgrass, tall	Rhodes grass	
Tangerine	Sirato	Ryegrass, Italian	
Sesame	Eucalyptus	Trefoil, broadleaf bird's foot	
Walnut	Timothy	Wheat grass, intermediate	
Nursery		Wheat grass, slender	
		Wheat grass, western	
		Wild rye, Canadian	
		Kiwi	

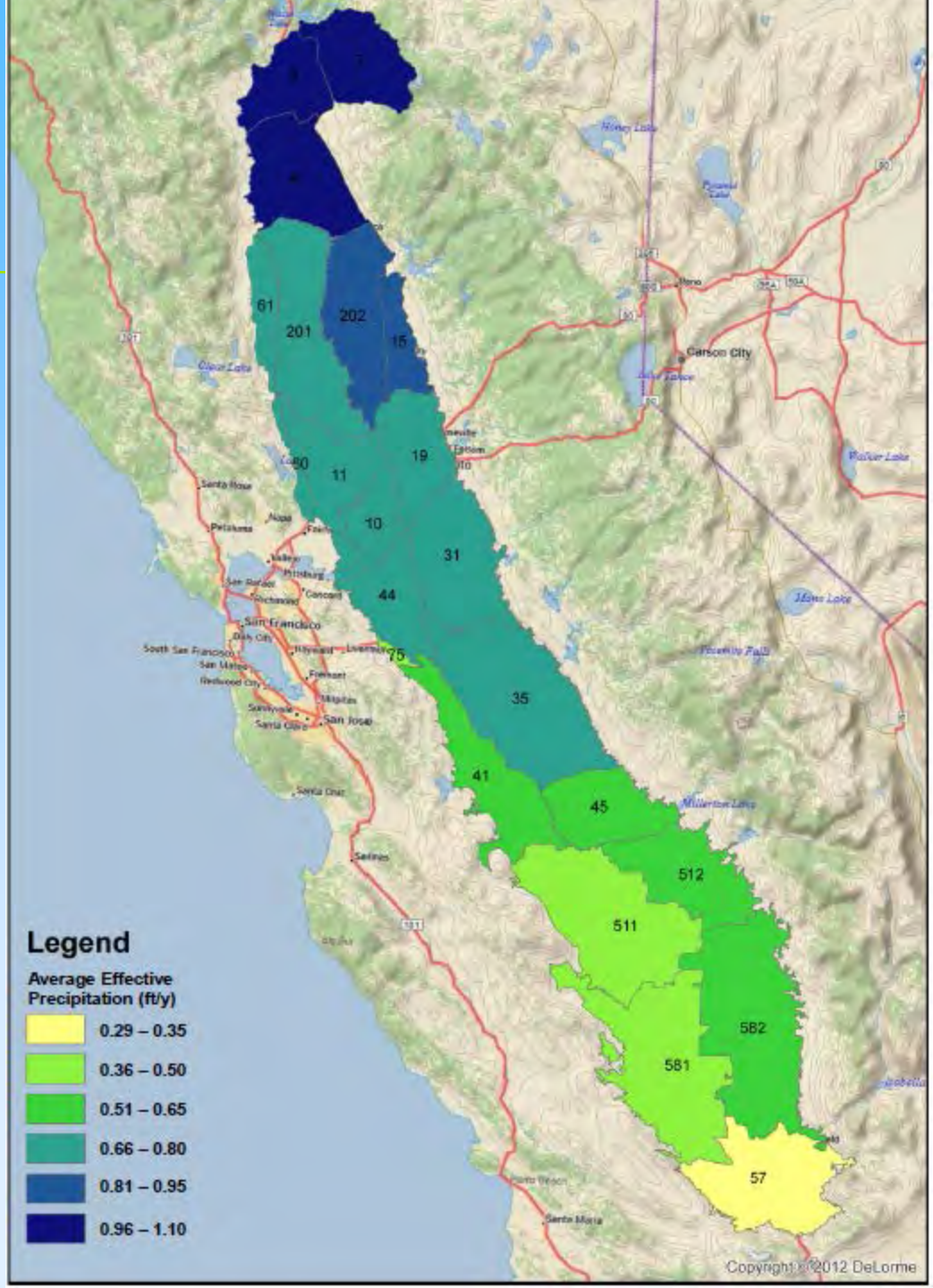
Crop Patterns based on DWR Land Use Survey



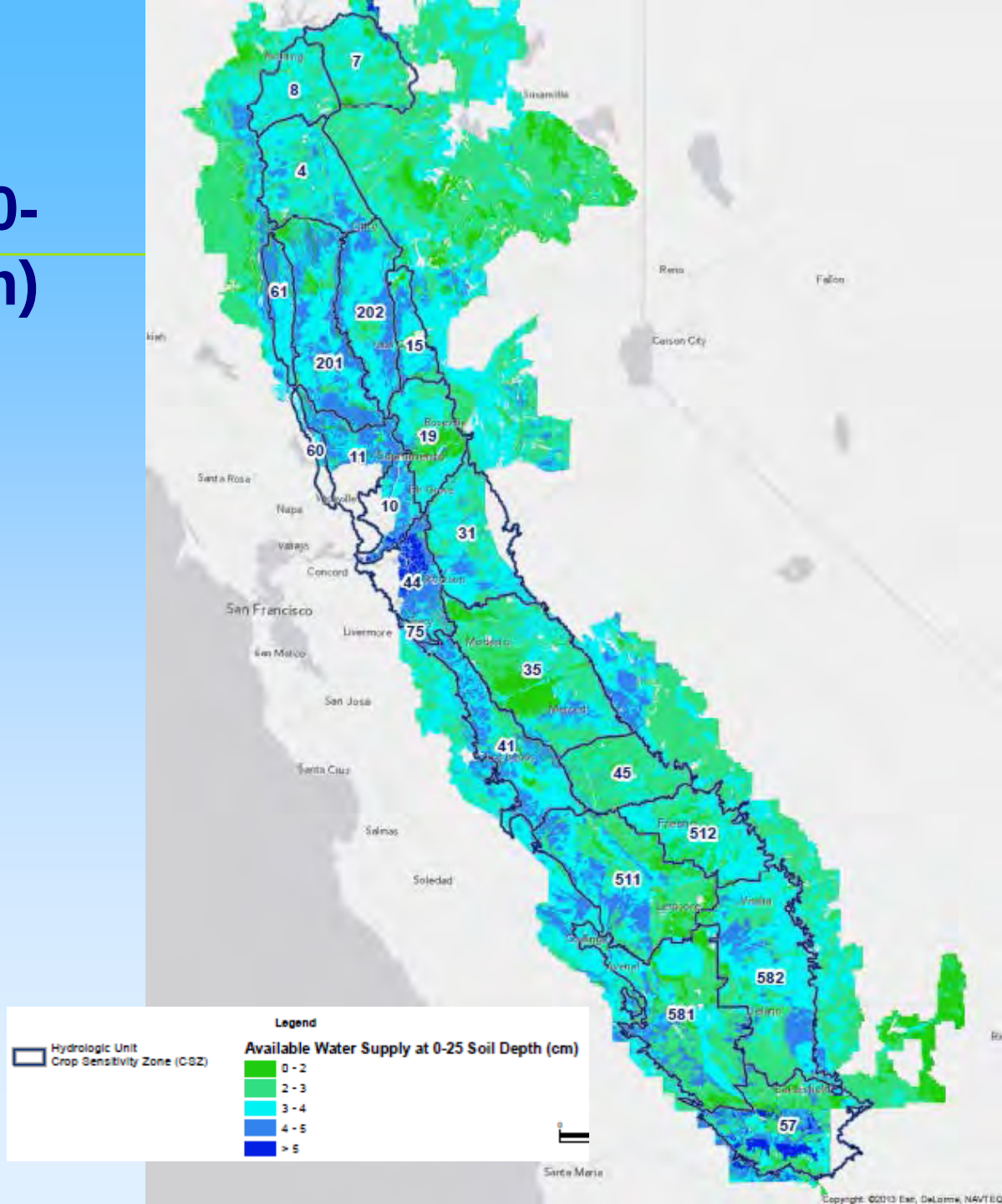
Distribution of Major, Sensitive Crops



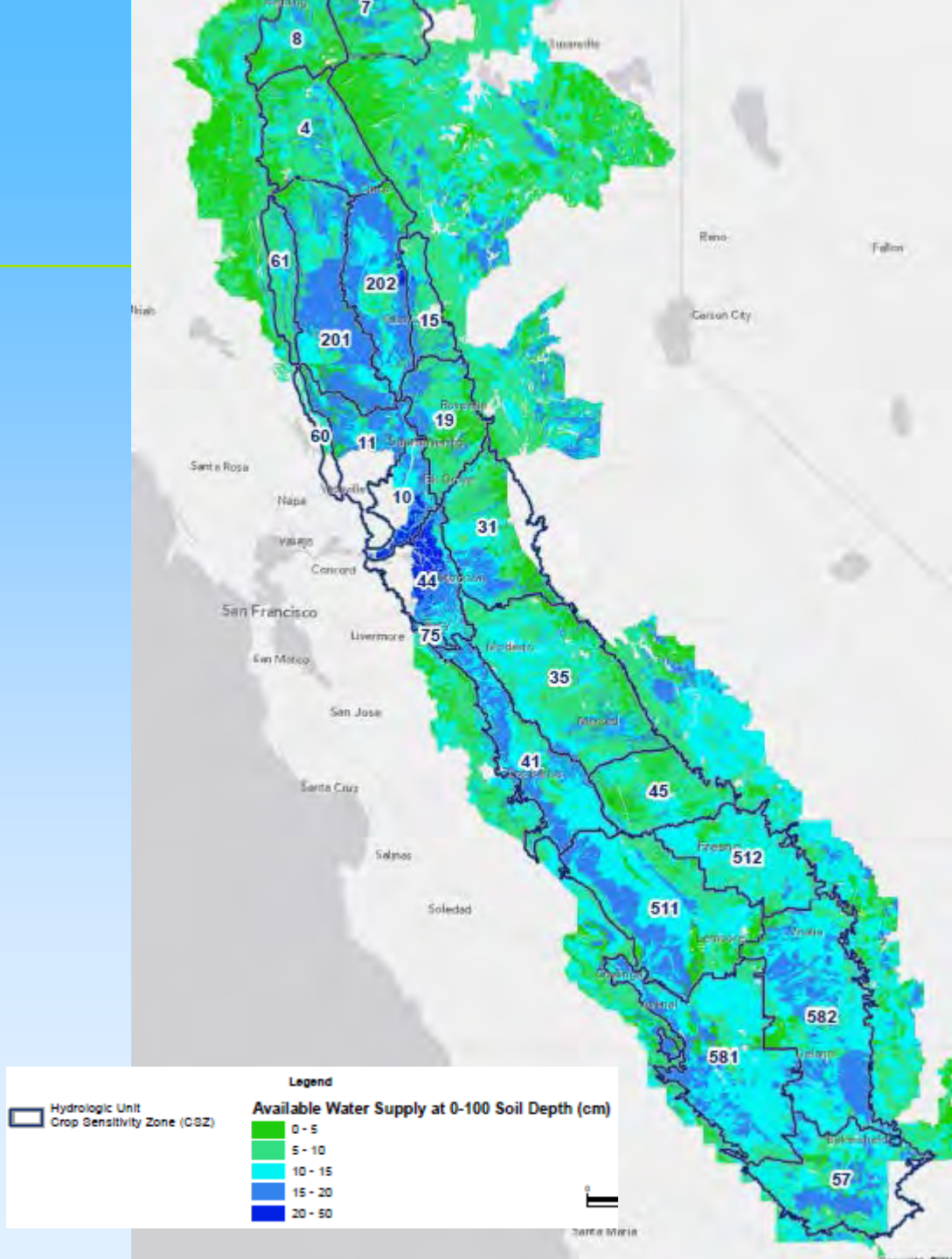
Average Effective Precipitation



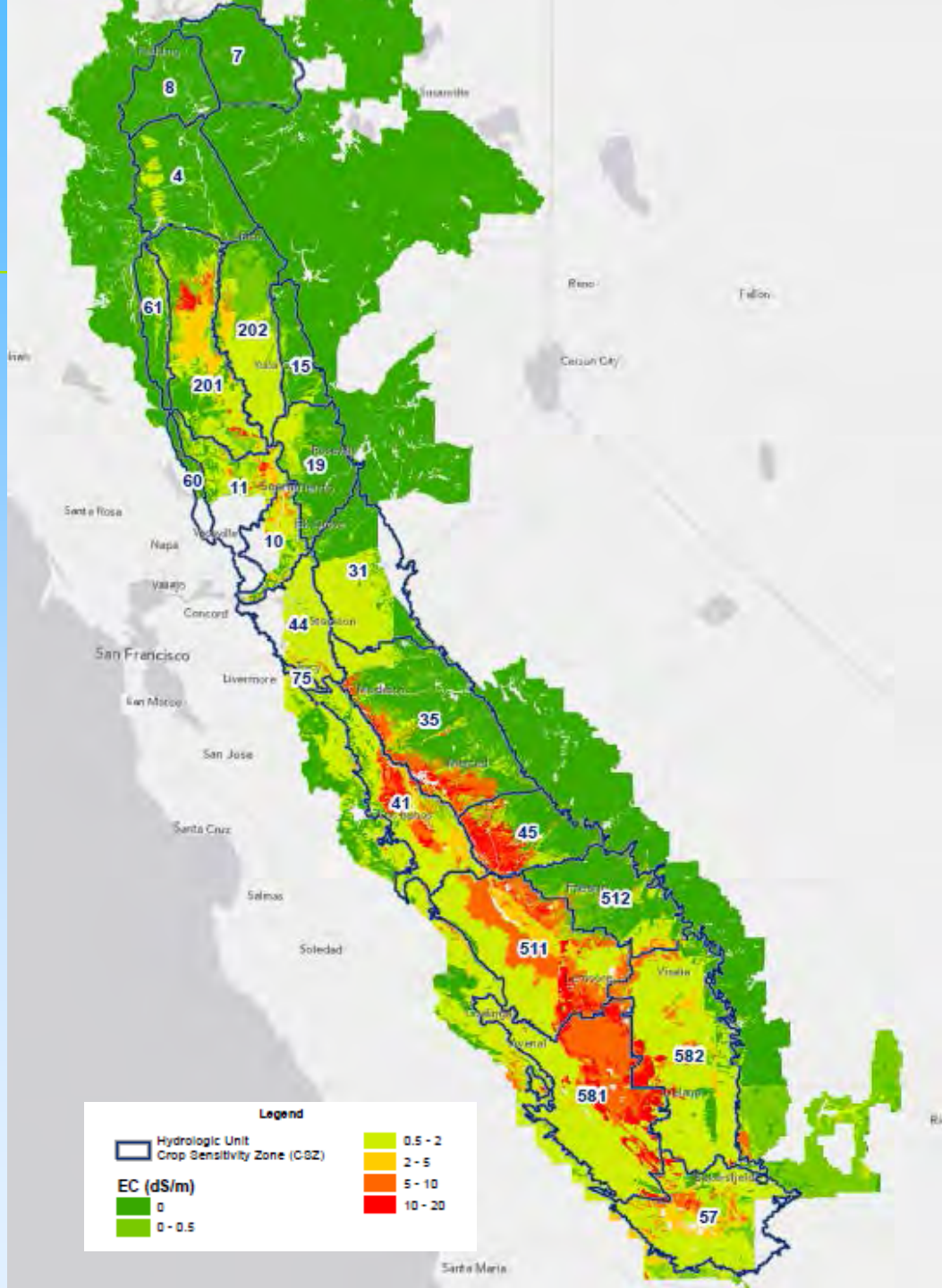
Available Water Supply at 0-25 Soil Depth (cm) based on the NRCS-SSURGO



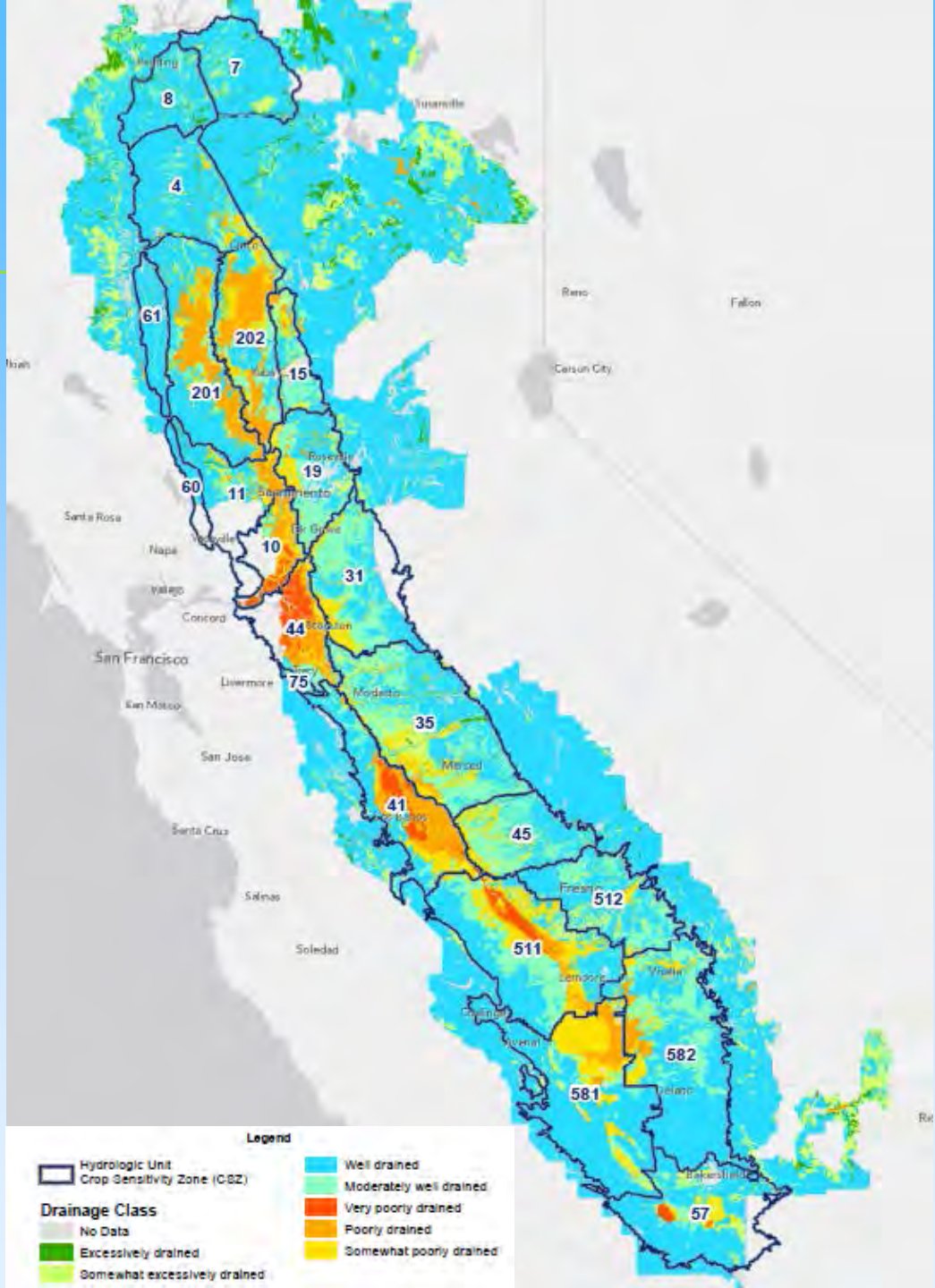
Available Water Supply at 0-100 Soil Depth (cm) based on the NRCS-SSURGO



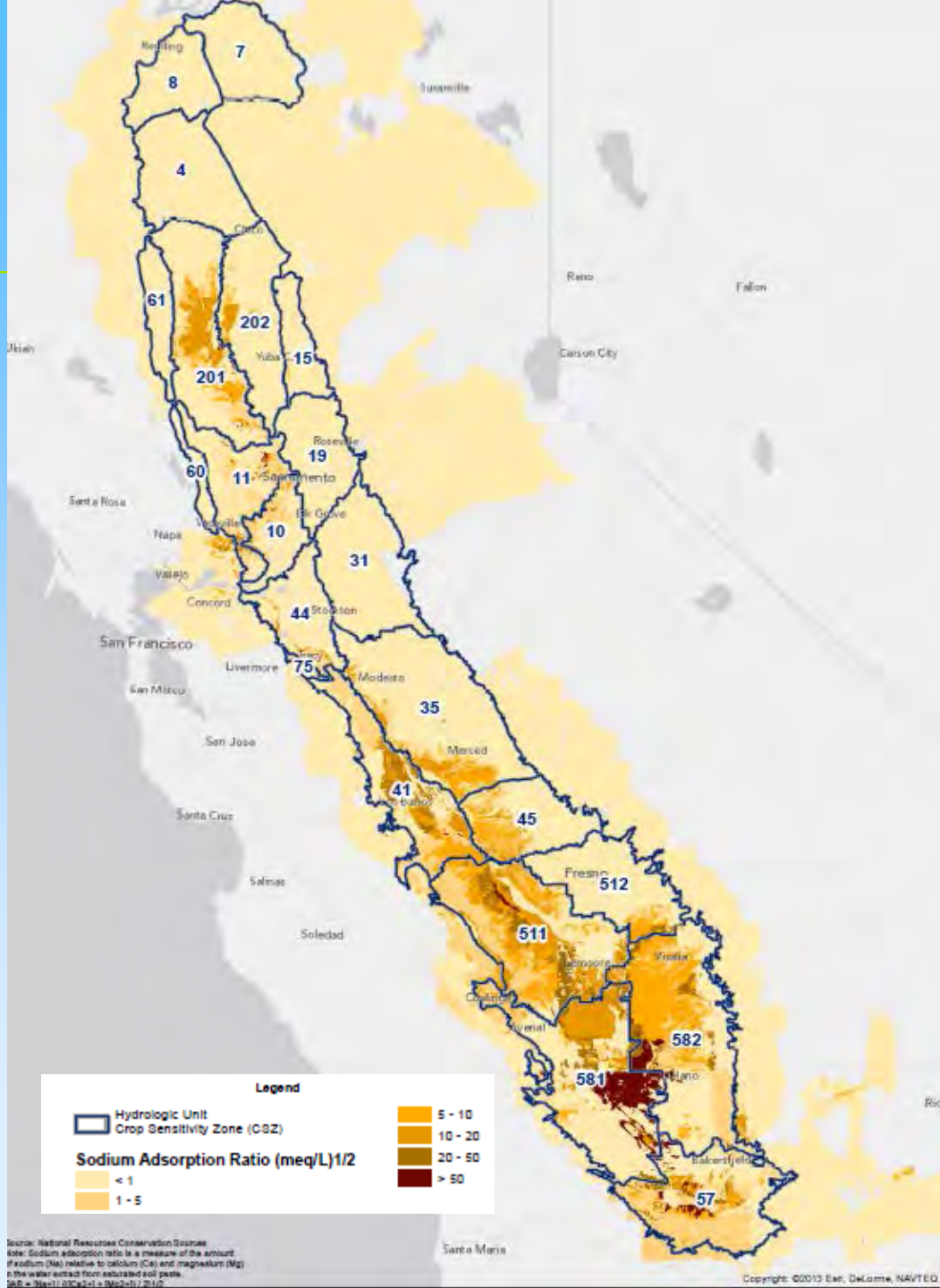
Soils Data for Electrical Conductivity (dS/cm) based on the NRCS-SSURGO



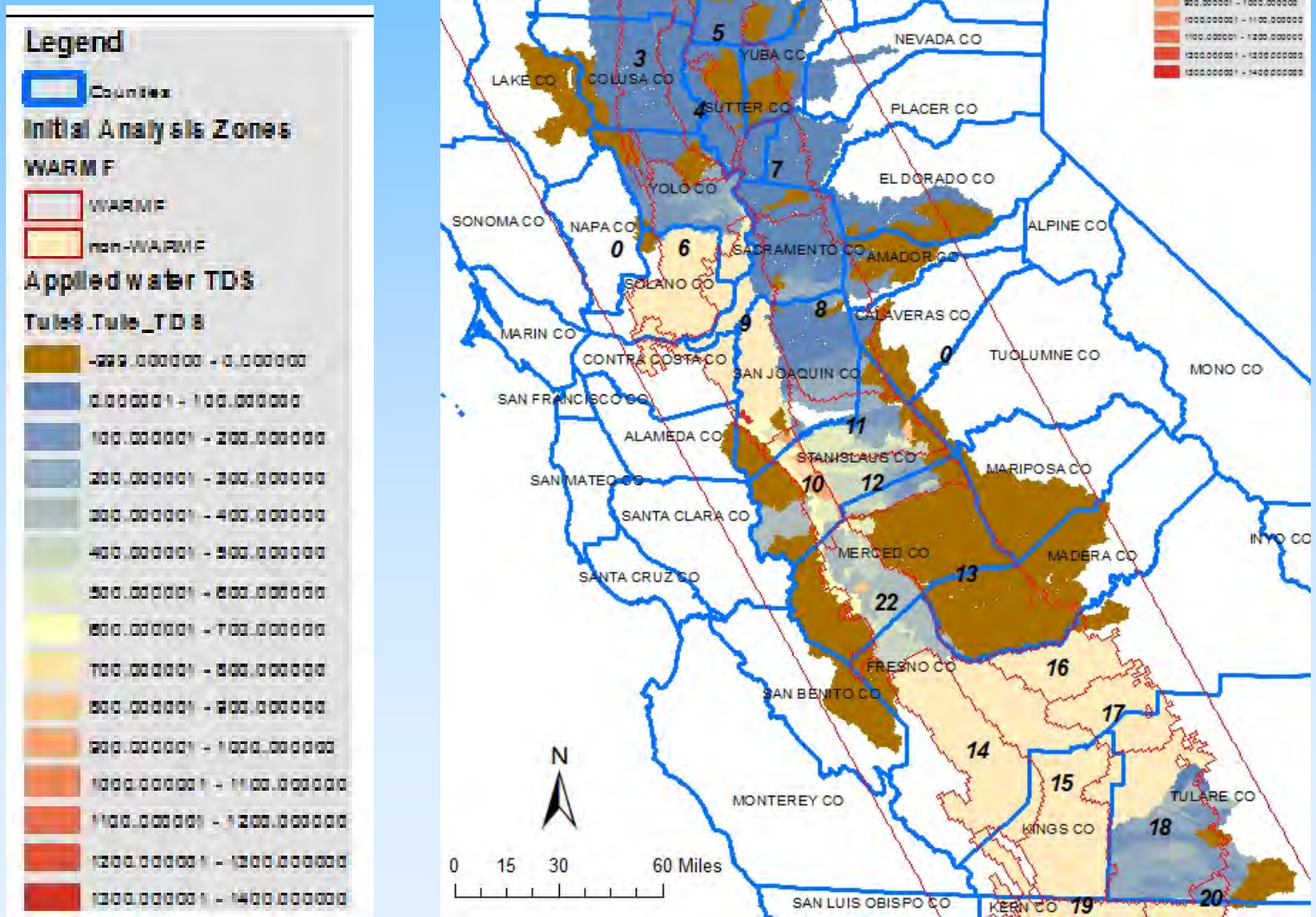
Drainage Classes based on the NRCS-SSURGO



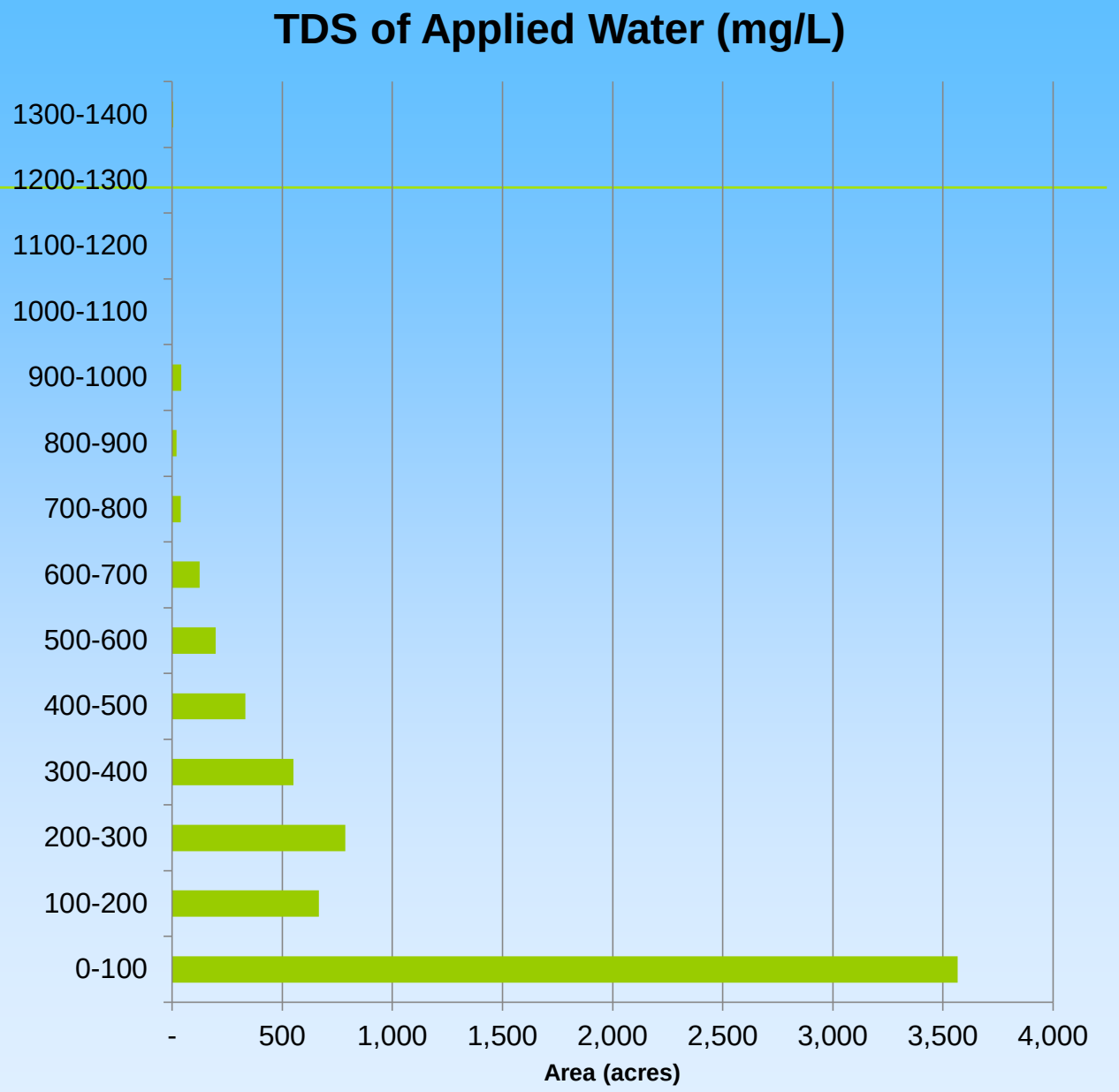
Sodium Adsorption Ratio based on the NRCS-SSURGO



Applied water salinity: the status quo



Applied water salinity, WARMF model areas, based on WARMF applied water concentrations



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