

Crop Sensitivity Zone Review

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Main Outline

- Background and context of work
- Zone concept and potential function in identifying WHERE thresholds might apply
- Illustration of application
- Remaining issues
 - WHAT thresholds might reasonably be
- Next steps

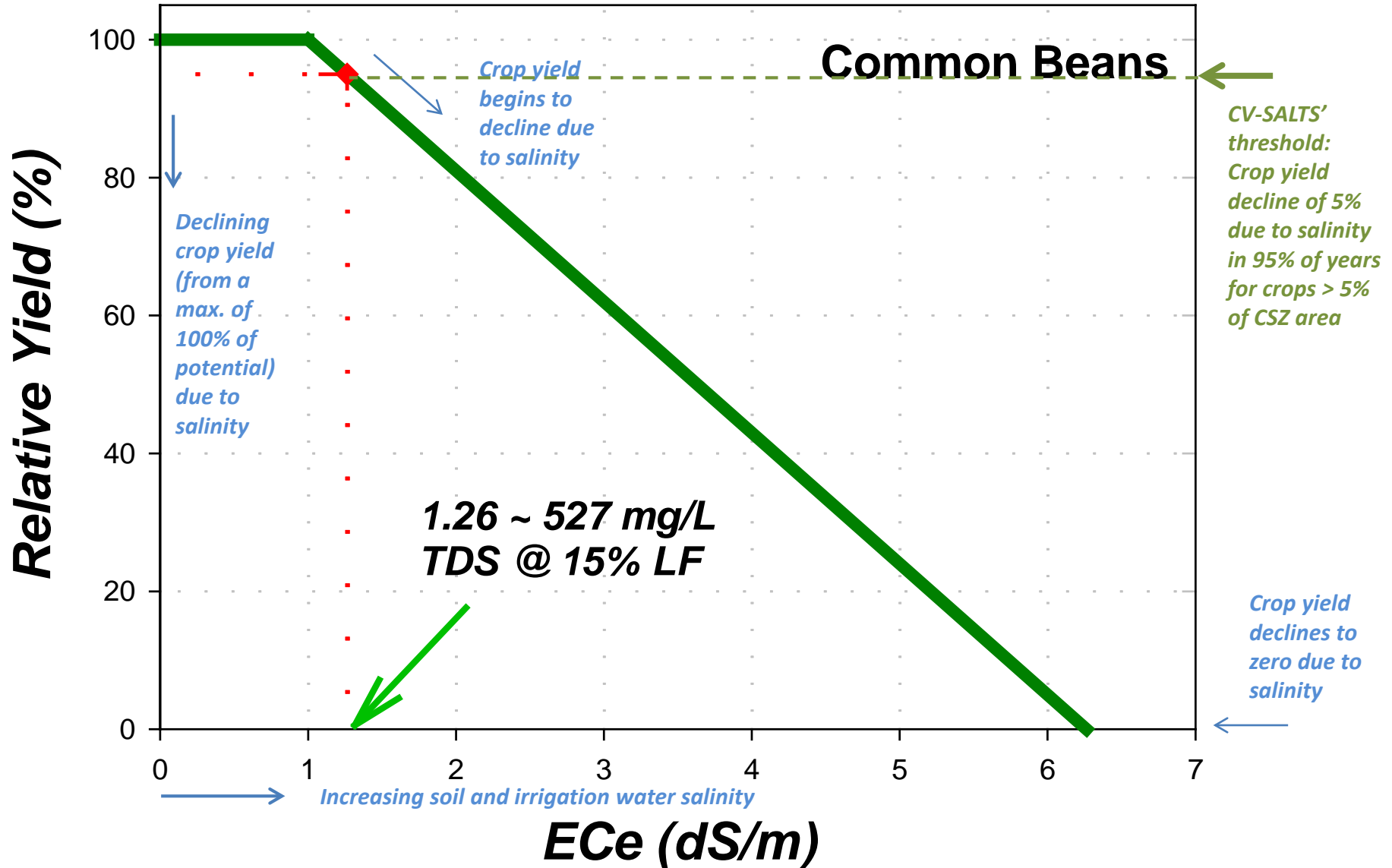
CSZ Background & Context

- Policy guidance
 - Avoid crop yield decline of >5% due to salinity in 95% of years for crops occupying > 5% of CSZ area (“major” crops)
- Workplan timing & content
 - Developed in late 2012
 - Phase 1 (authorized early 2013, , executed in mid-2013)
 - Develop many crop, climate, soil, district, and hydrology layers that might be relevant to zones and to later calculation of thresholds (5.1)
 - Delineate up to 25 CSZ’s (5.2)
 - Hoffman-like analysis to develop thresholds for one zone (5.3)
 - Phase 2 (not authorized)
 - Hoffman-like analyses to develop thresholds for remaining zones (5.3)

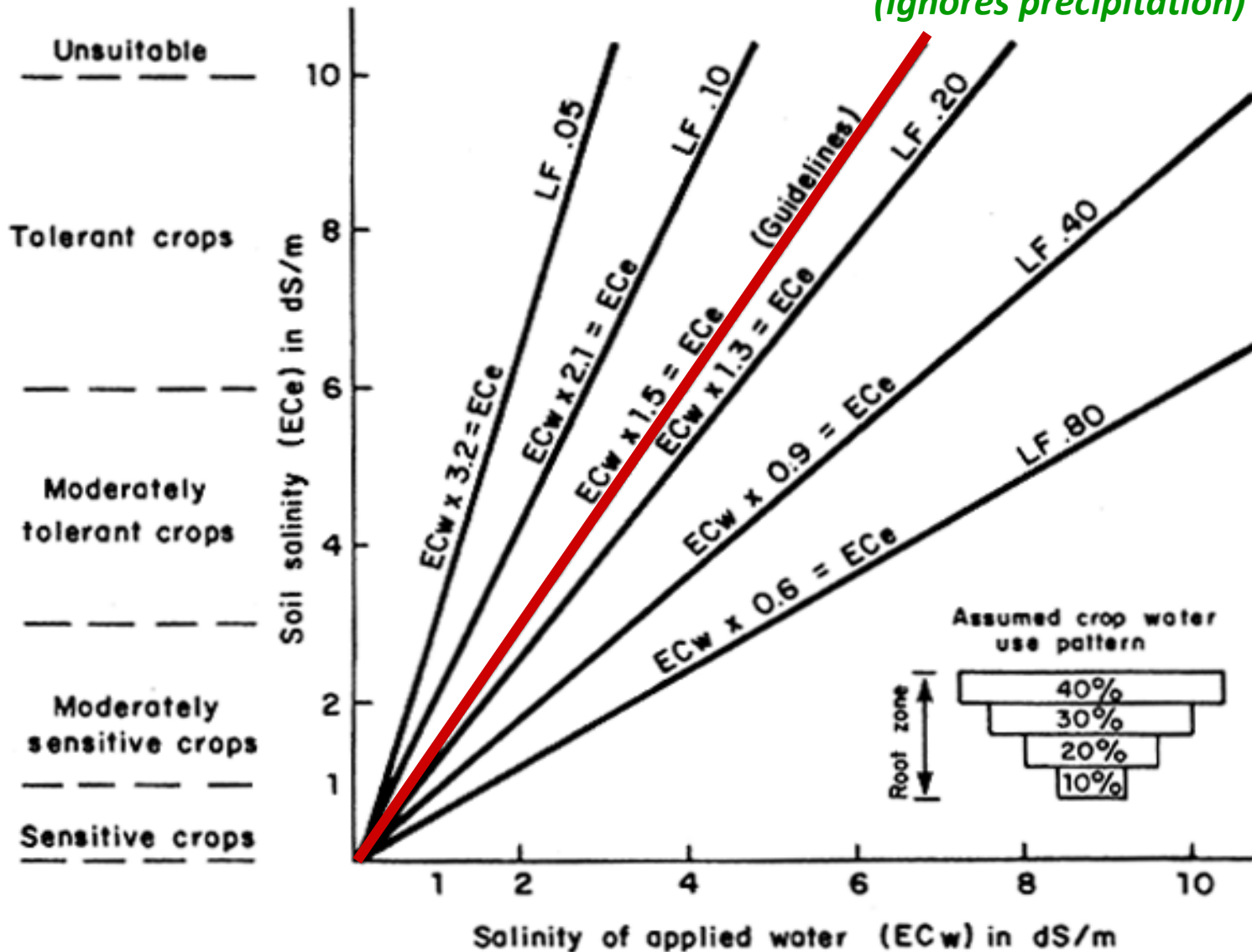
Crop Sensitivity and Major Crops

- Crop sensitivity from literature, interpreted based on policy for:
 - CSZ delineation
 - To inform interpretation of AGR narrative standard
- Thresholds preliminary, to provide a rough connection to water supply quality

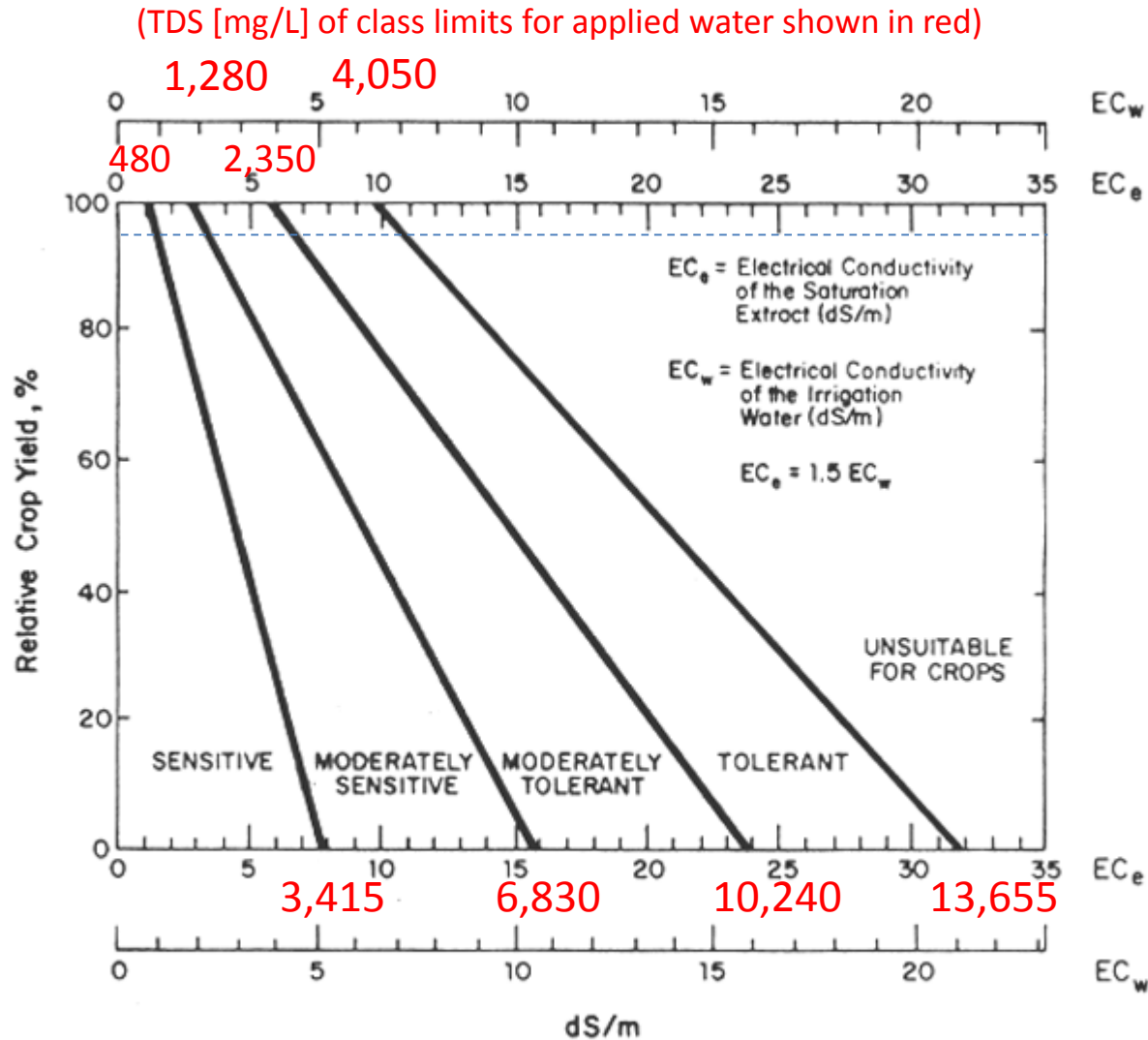
Example Sensitivity for Common Bean



$LF = (AW\text{-runoff})/ET \sim 15\%$
(ignores precipitation)



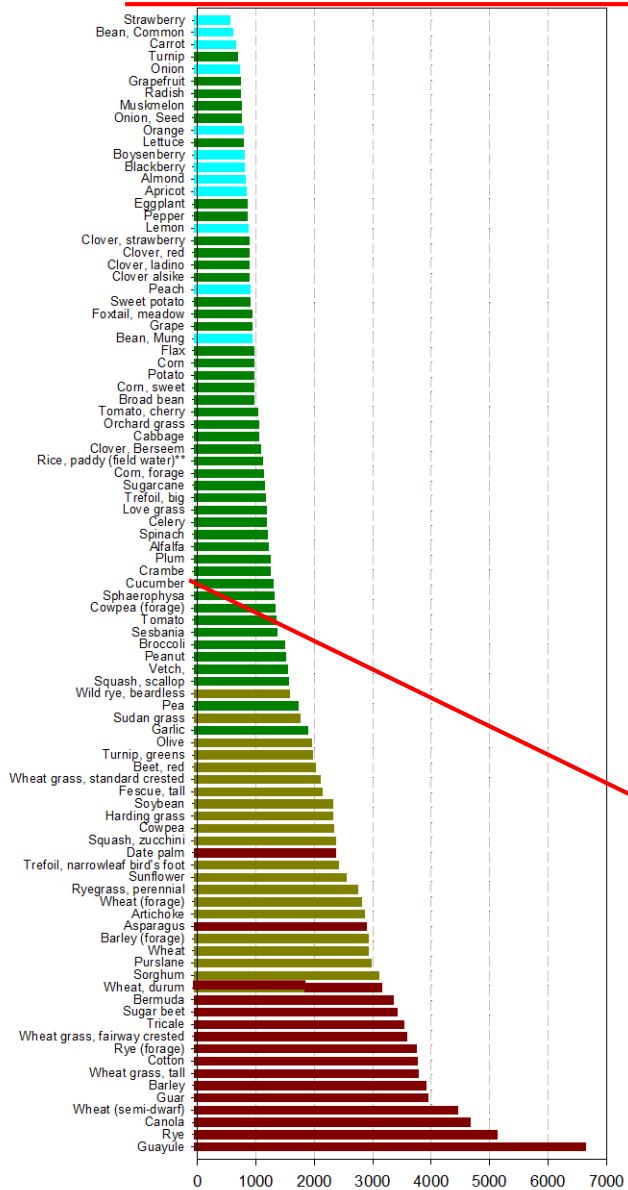
Crop Tolerance Classes^a



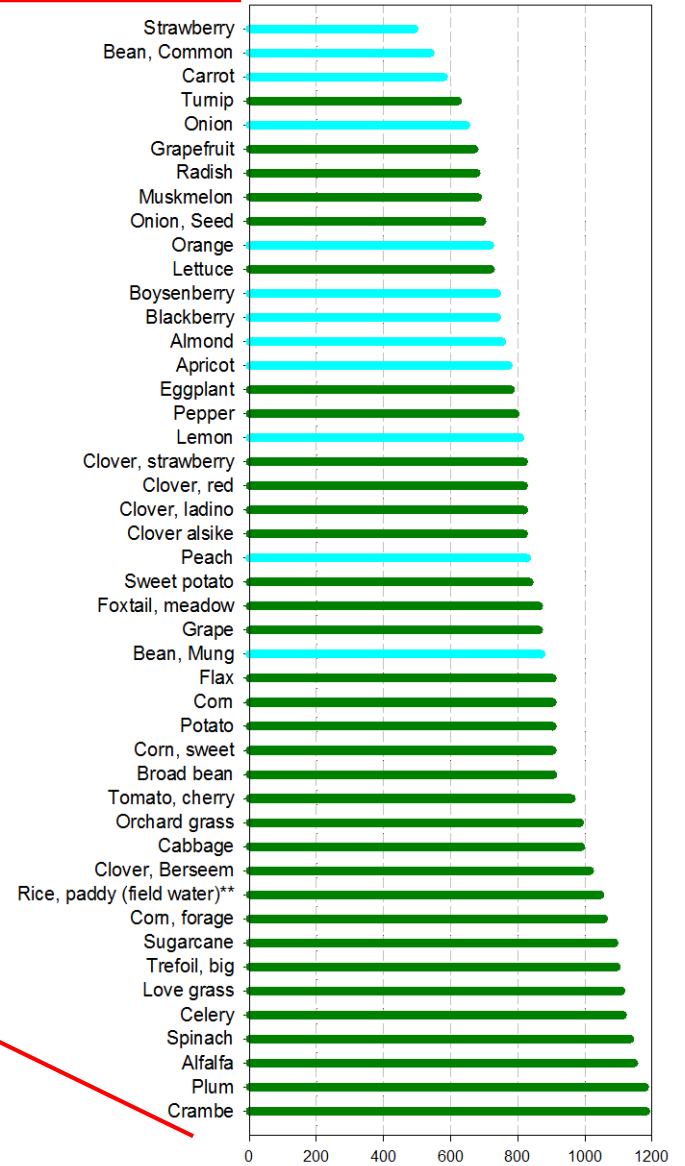
^aFigure from Ayers and Westcot (1985). TDS (mg/L) estimates were added, and were calculated from applied water salinity (EC_w) limits shown on the figure. There are functions of this type for individual crops.

Preliminary Crop Sensitivity Thresholds^a

^aNew data compilation or analysis for CV-SALTS



TDS IW (assuming 95% RY, 15% LF per A&W 1994)



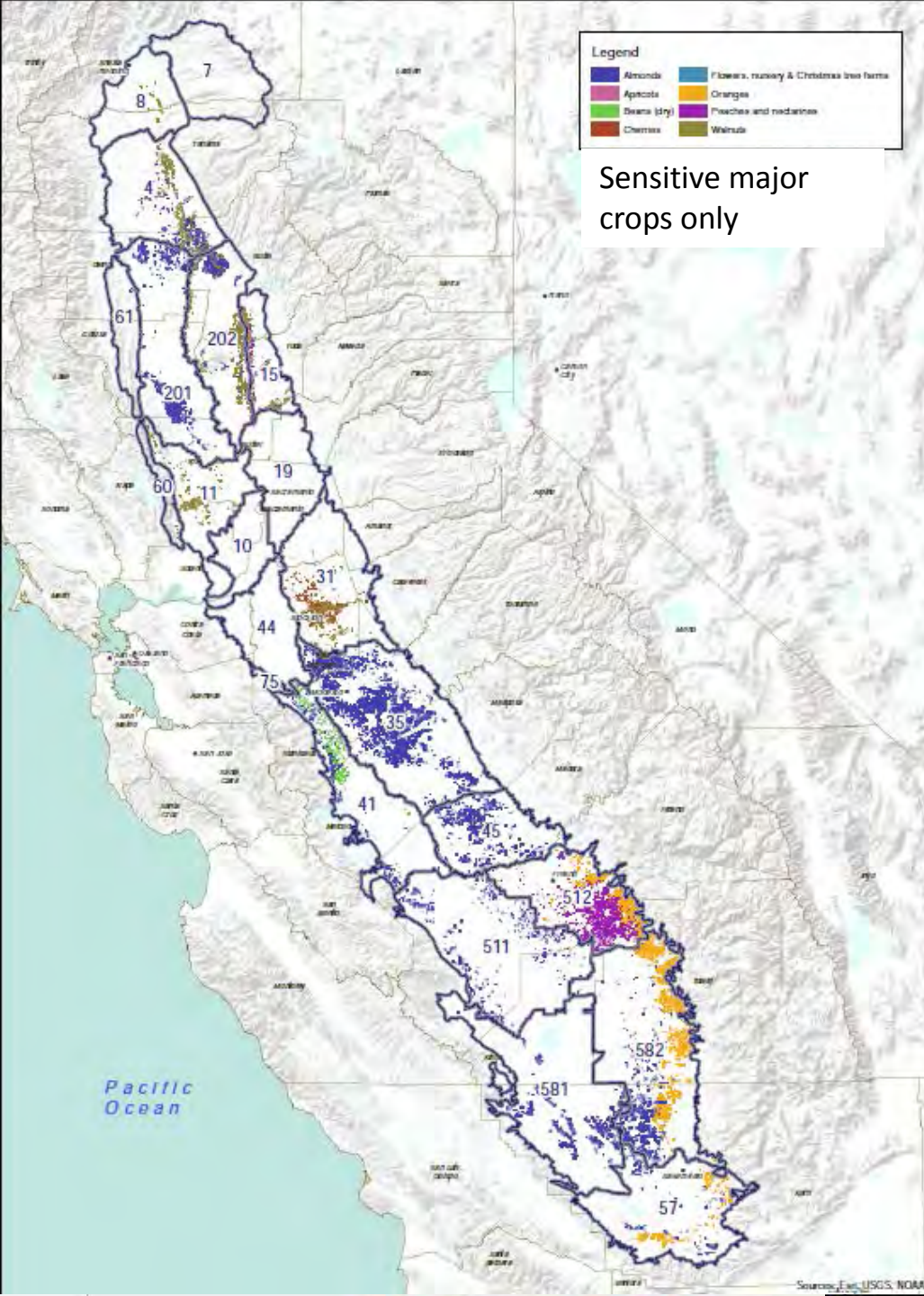
TDS IW (assuming 95% RY, 15% LF per A&W 1994)

Crops for which coefficients have not been measured^a

<i>Sensitive</i>	<i>Moderately Sensitive</i>	<i>Moderately Tolerant</i>	<i>Tolerant</i>
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	Timothy
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		Wheat grass, intermediate	
Nursery		Wheat grass, slender	
Mixed		Wheat grass, western	
		Wild rye, Canadian	
		Kiwi	

Crop Cover

- Crop cover from recent DWR mapping
- Tied to sensitivity by crop class lookup
- Classified major & minor crops
 - Major & minor crops determined within each CSZ
 - Cannot be done until CSZ is delineated
- Results in maps of the following within CSZs:
 - Sensitive crops
 - Sensitive major crops

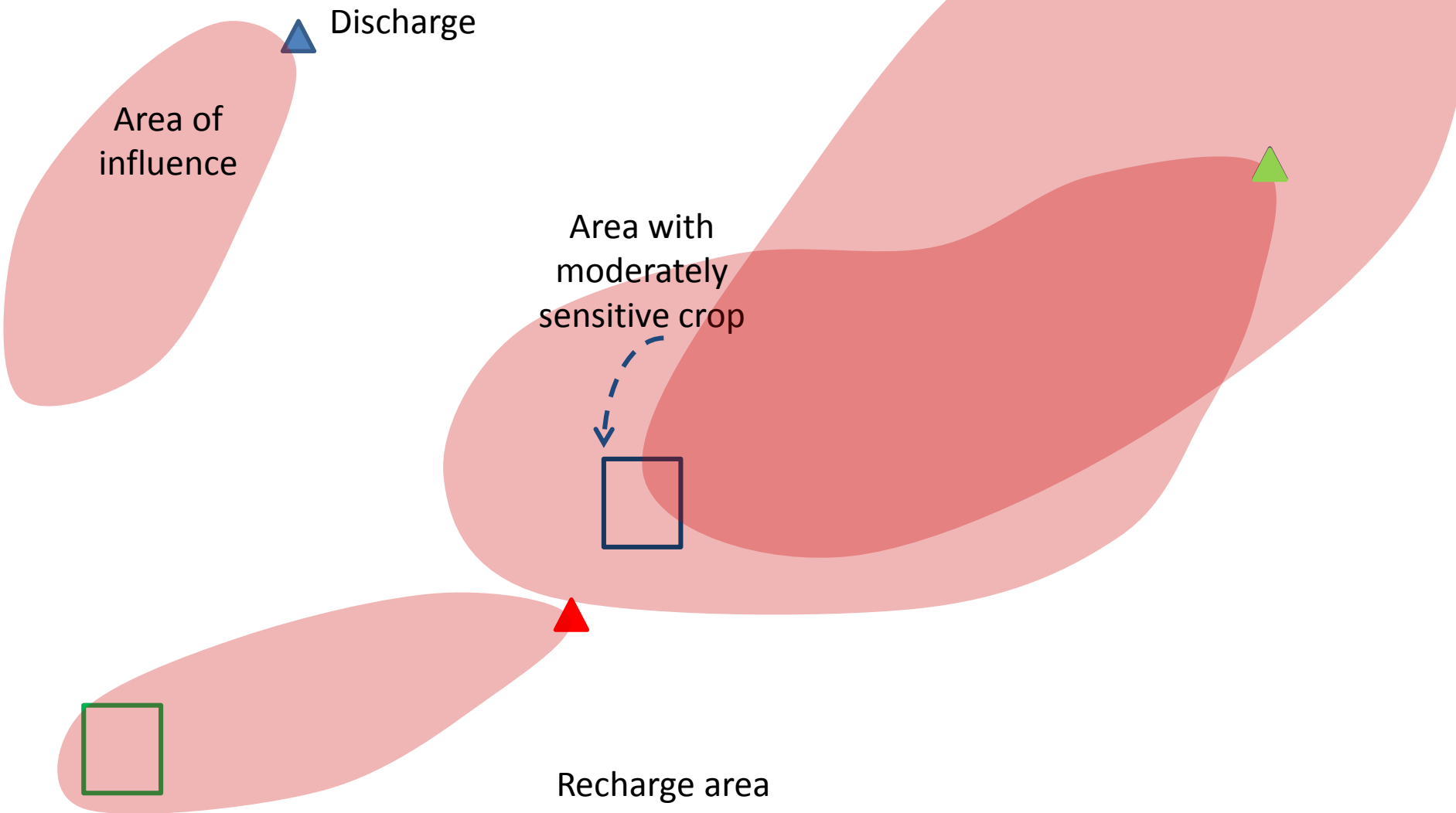


- DWR Land Cover
- Sensitivity Classes
- Preliminary threshold
- Sensitive major crops (SMCs)

CSZ Concept

- Must delineate CSZs first to identify major crops
 - Zones are spatial, therefore most strongly associated with WHERE thresholds apply
 - Concentrated recharge to water supplied to sensitive crops can reasonably affect those crops unless adequately diluted
- Base CSZs on patterns of water flow so that they are a reasonable starting point
 - Identify source of applied water (surface, ground)
 - Map recharge zones

Implementation, moderately sensitive crops



Application Example^b

1. Locate sensitive major crops in a zone
2. Determine source and quality of applied water
3. Refine threshold for sensitive crop(s) at this location
4. Prioritize areas where threshold is not \gg quality
5. Locate recharge zones
6. Identify return flows and other discharges
7. Determine potential for impact, considering dilution and other factors
8. Apply controls such that irrigation water quality remains below threshold
9. In other areas, repeat for moderately sensitive major crops

^bRefer to “Maps.ppt” slides for illustrations of steps 1, 2, 4, 5, and 9

Data compiled in 5.1

- Data to inform WHERE to implement
 - Crop cover & sensitivity, major crops identified
 - Irrigation sources
 - Hydrography
 - Groundwater and drainage basins
 - Water Districts
- Data to inform WHAT thresholds would be protective
 - Crop cover & sensitivity, major crops identified
 - Climate
 - Soils
- Data to help prioritize areas
 - Irrigation sources
 - Applied water quality

End

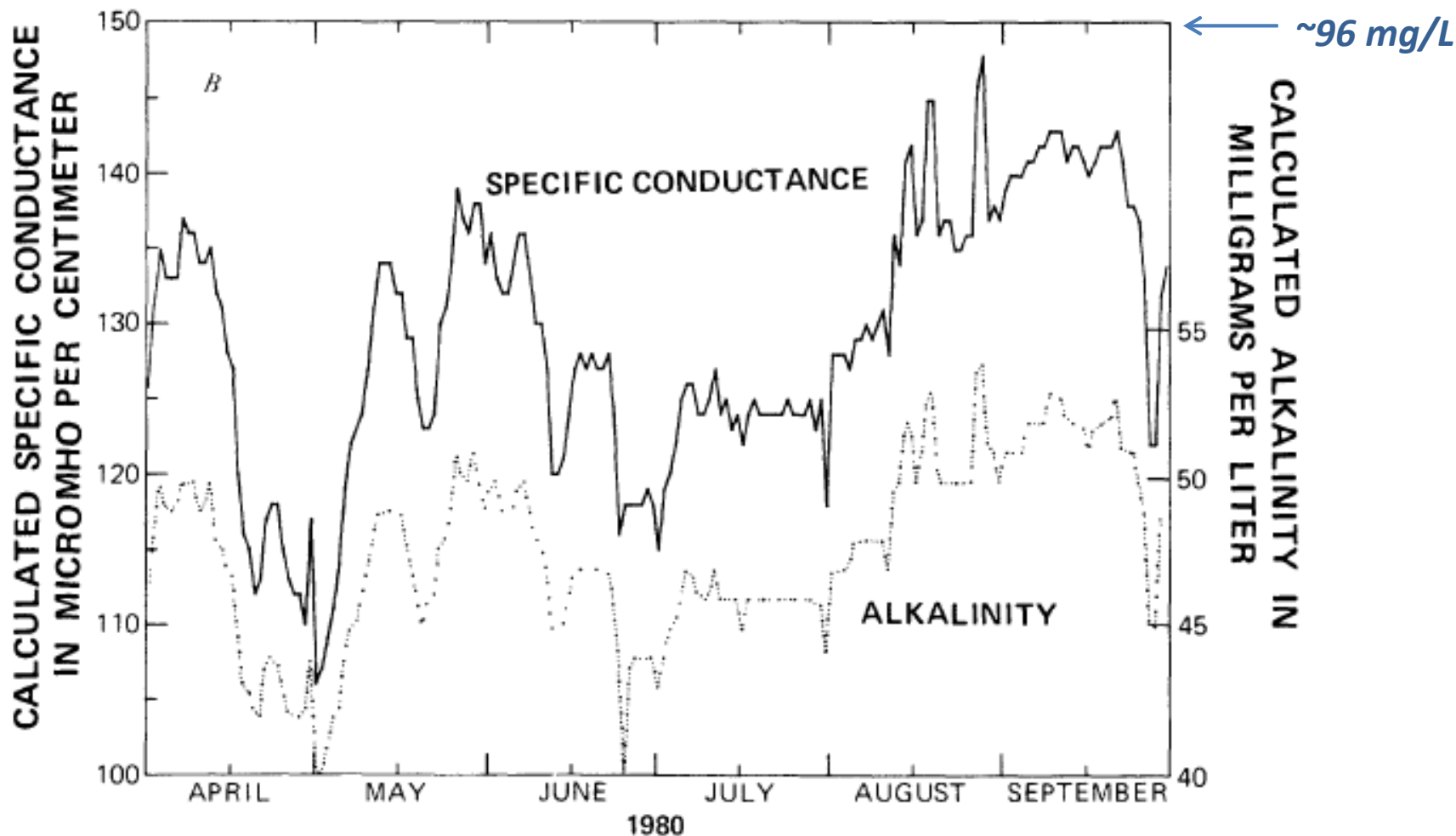


Figure 7. Sacramento River, Feather River, and American River average daily flows expressed as percentage of the total during spring through summer of 1980 (A), and specific conductance and alkalinity resulting from the mixing of the tributary rivers as calculated from their annual-average concentrations (B).

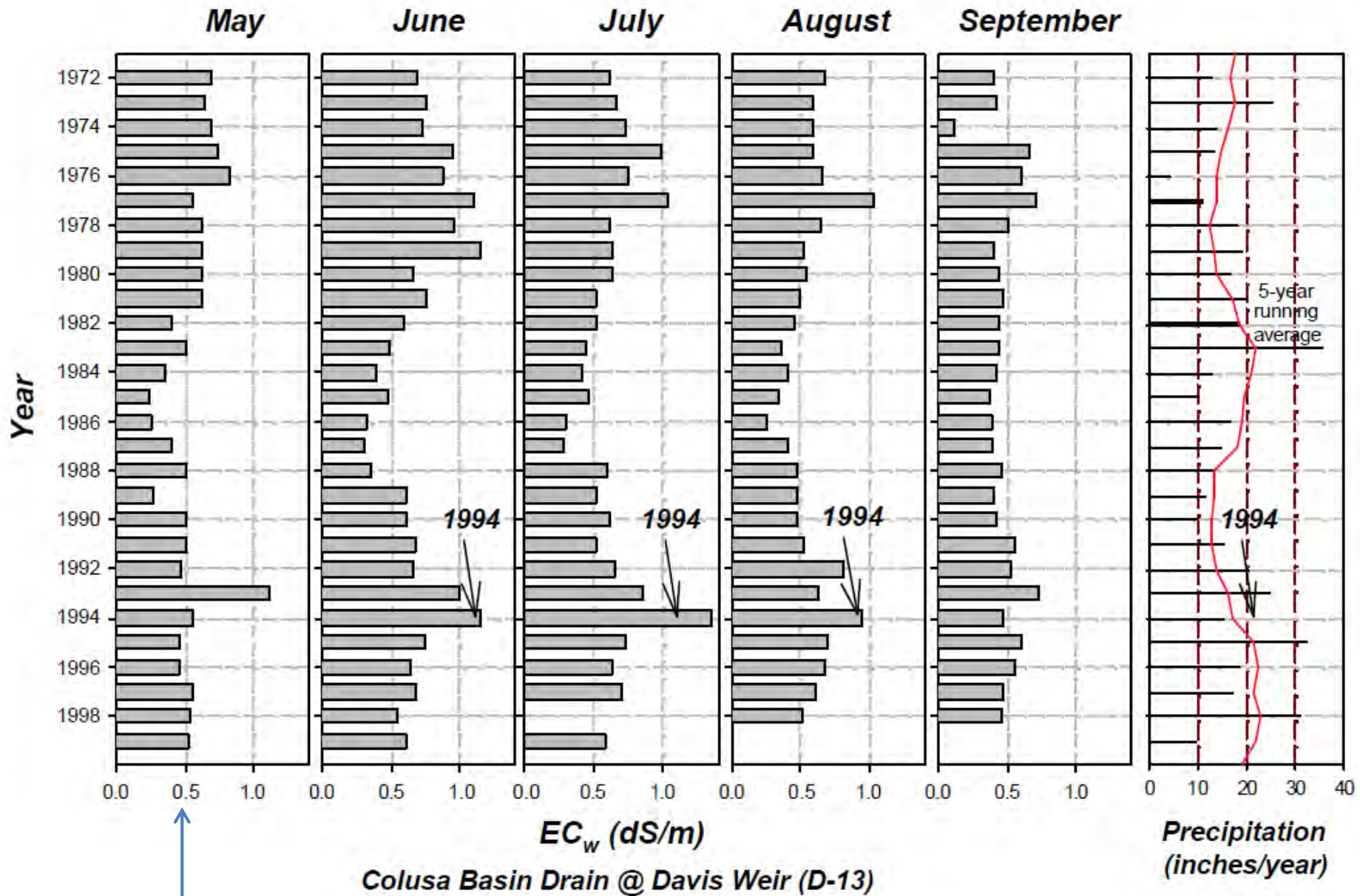
TABLE 2. ESTIMATED 1961 MONTHLY FLOW* AND MEAN CONDUCTIVITY* IN SACRAMENTO RIVER SYSTEM
BELOW CBD TO VERONA
1961 HYDROLOGY

TRIBUTARIES AND OTHER INFLOWS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
BELOW CBD												
FLOW	341	447	731	467	1745	1318	546	429	413	426	464	441
CONDUCTIVITY	189	195	180	140	157	167	207	268	254	247	221	147
FEATHER-NICOLAUS												
FLOW	57	157	264	180	508	469	404	281	108	40	40	32
CONDUCTIVITY	147	144	120	126	105	96	90	89	105	133	132	157
SACRAMENTO SL												
FLOW	0	0	0	0	0	0	0	0	0	0	0	0
CONDUCTIVITY	0	0	0	0	0	0	0	0	0	0	0	0
NATOMAS & CANAL												
FLOW	0	0	0	0	0	0	0	0	0	0	0	0
CONDUCTIVITY	0	0	0	0	0	0	0	0	0	0	0	0
AVOUL INFLOW												
FLOW	0	0	0	0	0	0	0	0	0	0	0	45
CONDUCTIVITY	0	0	0	0	0	0	0	0	0	0	0	900
M AND J WASTES												
FLOW	0	0	0	0	0	0	0	0	0	0	0	0
CONDUCTIVITY	700	700	700	700	700	700	700	700	700	700	700	700
OTHER ACCRETIONS												
FLOW	0	55	13	59	29	32	0	17	15	0	10	0
CONDUCTIVITY	0	214	368	350	328	397	0	400	400	0	400	0
DIVERSIONS AND OTHER OUTFLOWS												
DIVERSIONS												
FLOW	0	0	0	0	0	0	7	17	15	18	19	0
CONDUCTIVITY	0	0	0	0	0	0	207	268	252	247	221	197
WEIR SPILLS												
FLOW	0	0	0	0	0	0	0	0	0	0	0	0
CONDUCTIVITY	183	184	166	180	146	153	157	200	231	237	218	257
OTHER LOSSES												
FLOW	0	0	0	0	0	0	0	0	0	0	0	0
CONDUCTIVITY	0	0	0	0	0	0	0	0	0	0	0	0
NET VALUES AT VERONA												
FLOW	418	659	1008	786	1882	1839	943	710	521	448	515	512
CONDUCTIVITY	183	184	166	180	146	153	157	200	231	237	218	257

Sac below CBD ~200 = 128 mg/L

Feather-Nicolaus ~120 = 77 mg/L

* Monthly flow is shown in 1,000 acre-feet and mean conductivity is shown in micromhos.



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

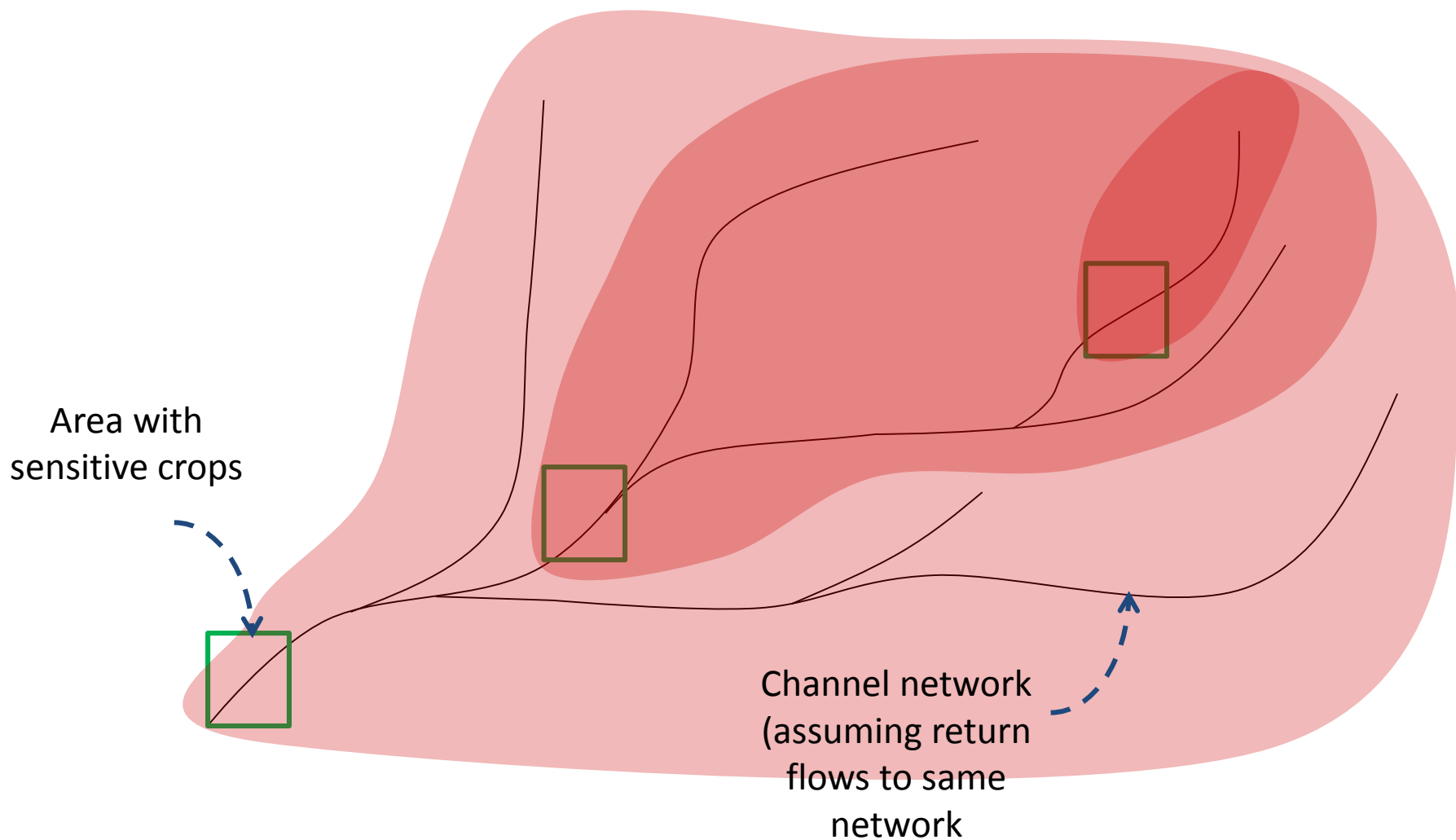


Figure 3e. Schematic example: Surface water recharge areas with isolated surface drainage.

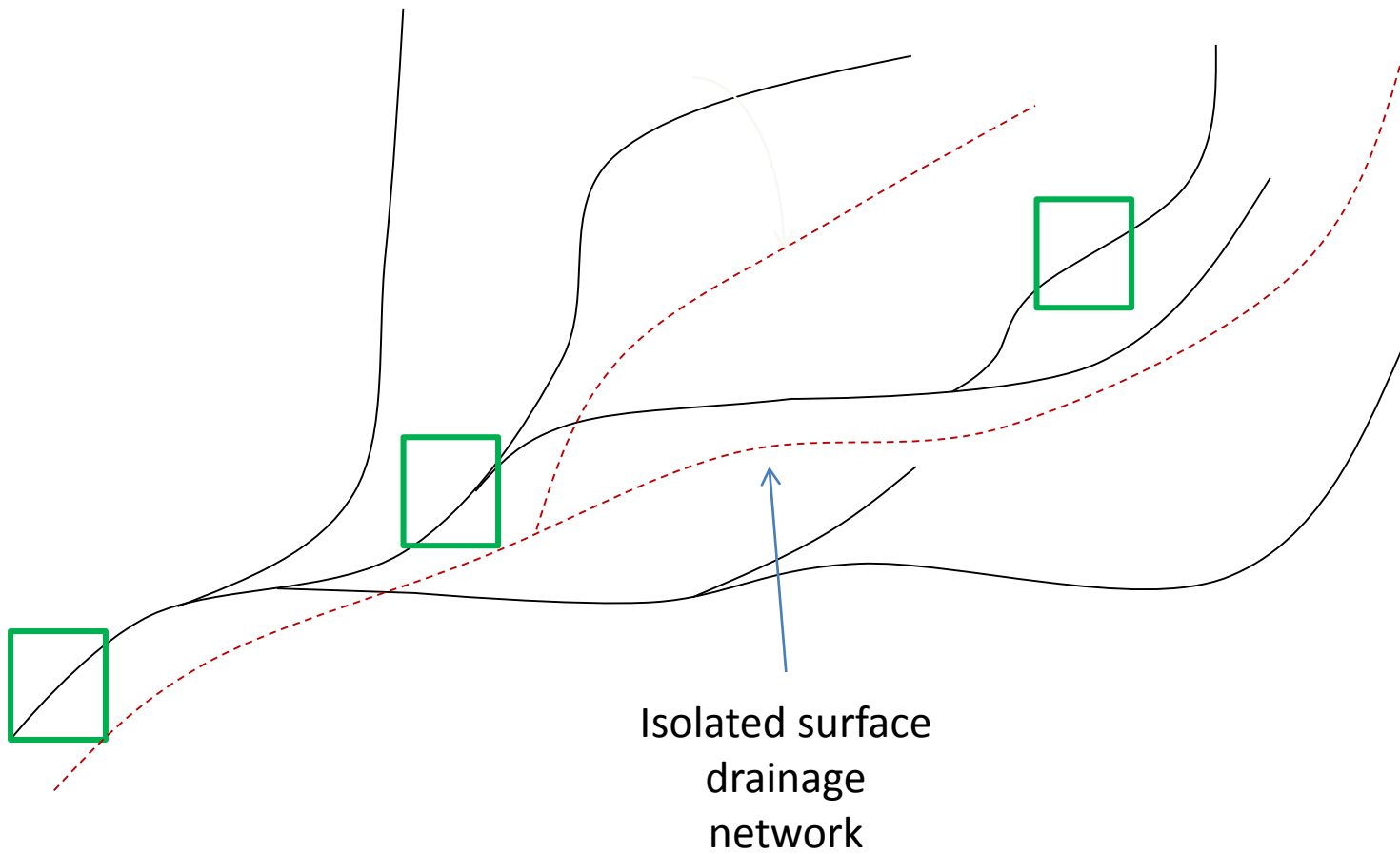
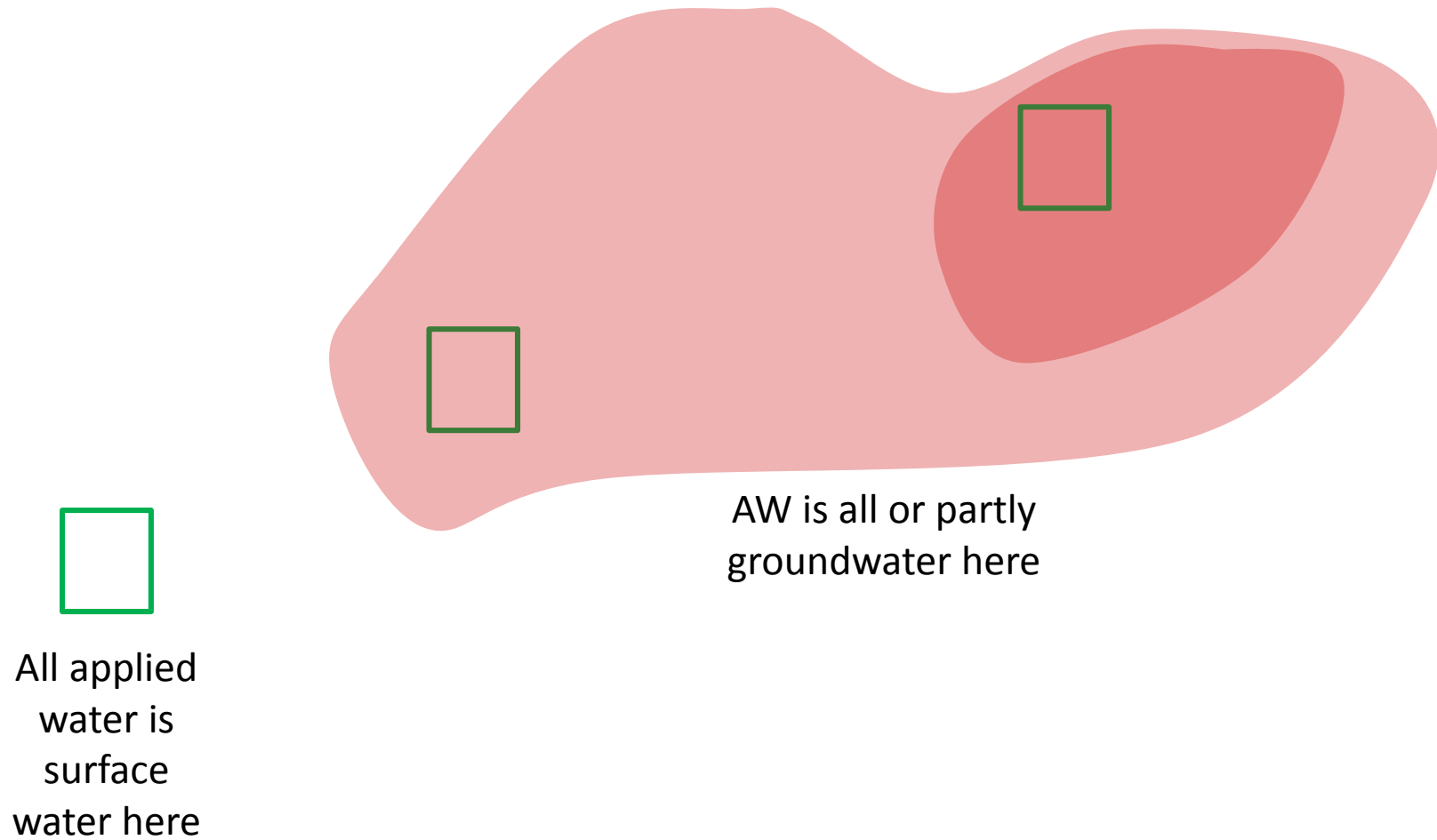


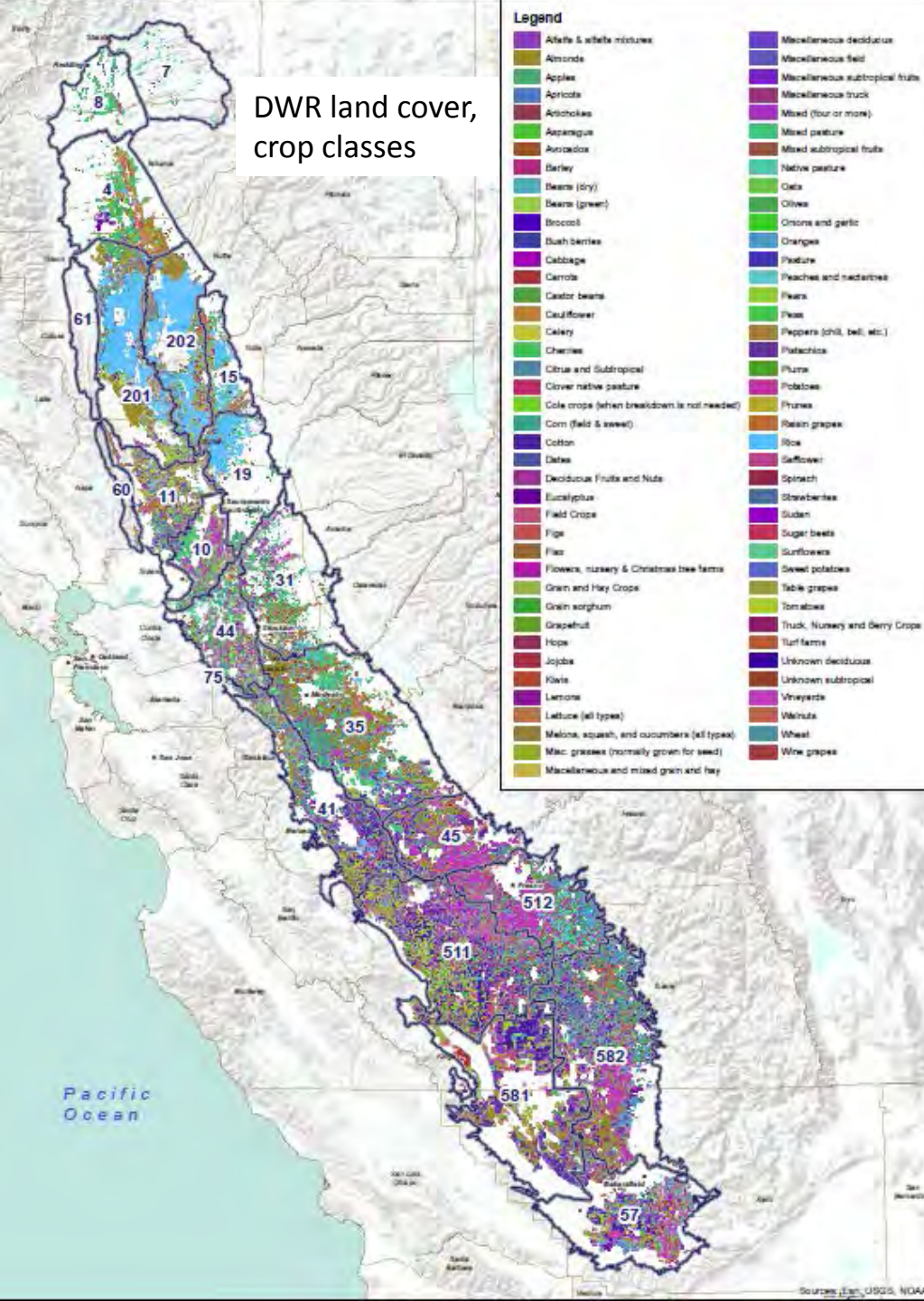
Figure 3f. Schematic example: Groundwater recharge areas.



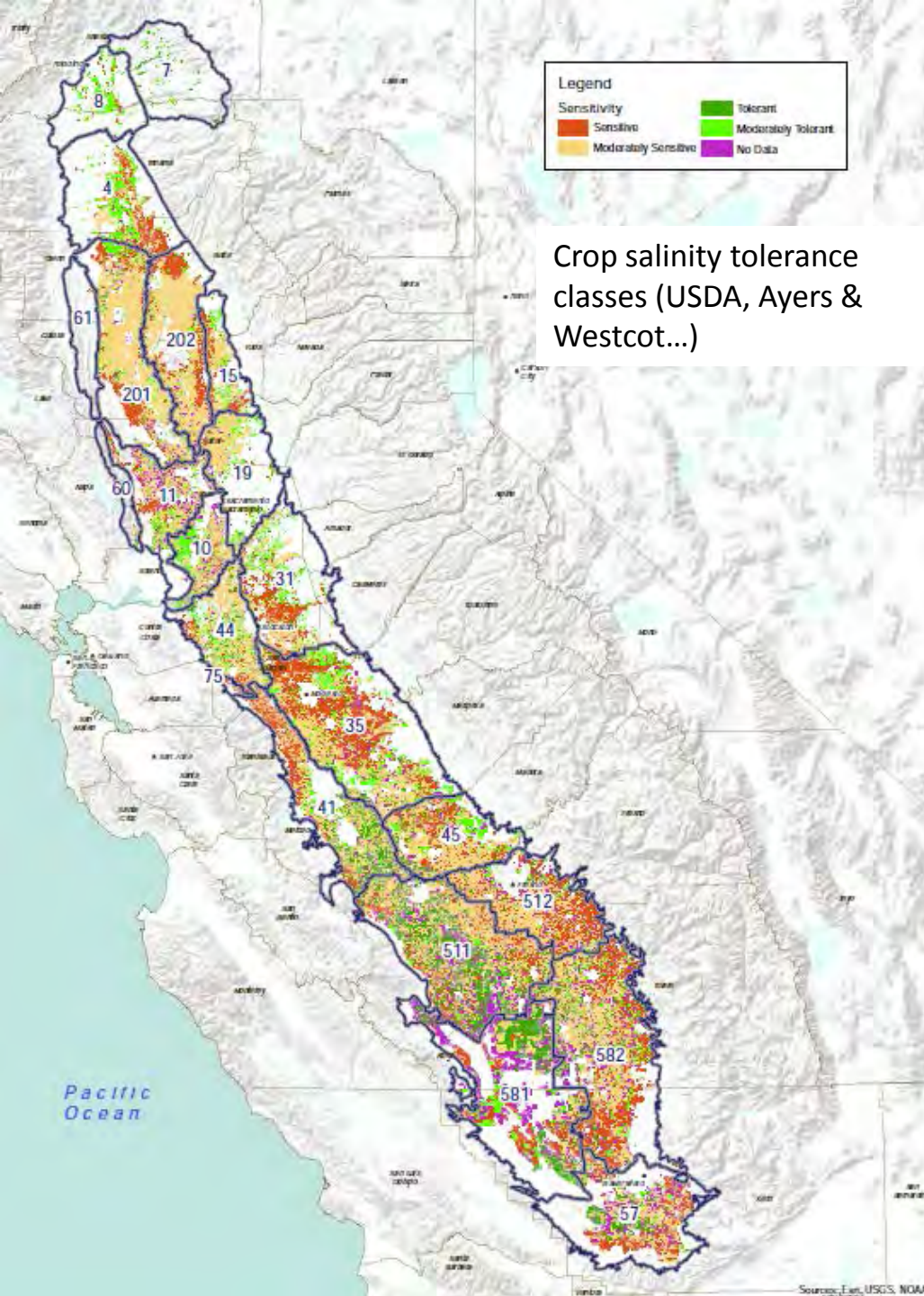
Outstanding issues

- Are recharge areas for irrigation water a reasonable basis for determining WHERE AGR interpretations should be developed & applied?
- Is the conceptual framework here reasonable in this regard?
- Would it fit into Tim's framework, as the detailed analysis (if needed) step?
- Is there a preference with regard to resolving similar, technical issues with regard to WHAT thresholds should be (TDS limits)?

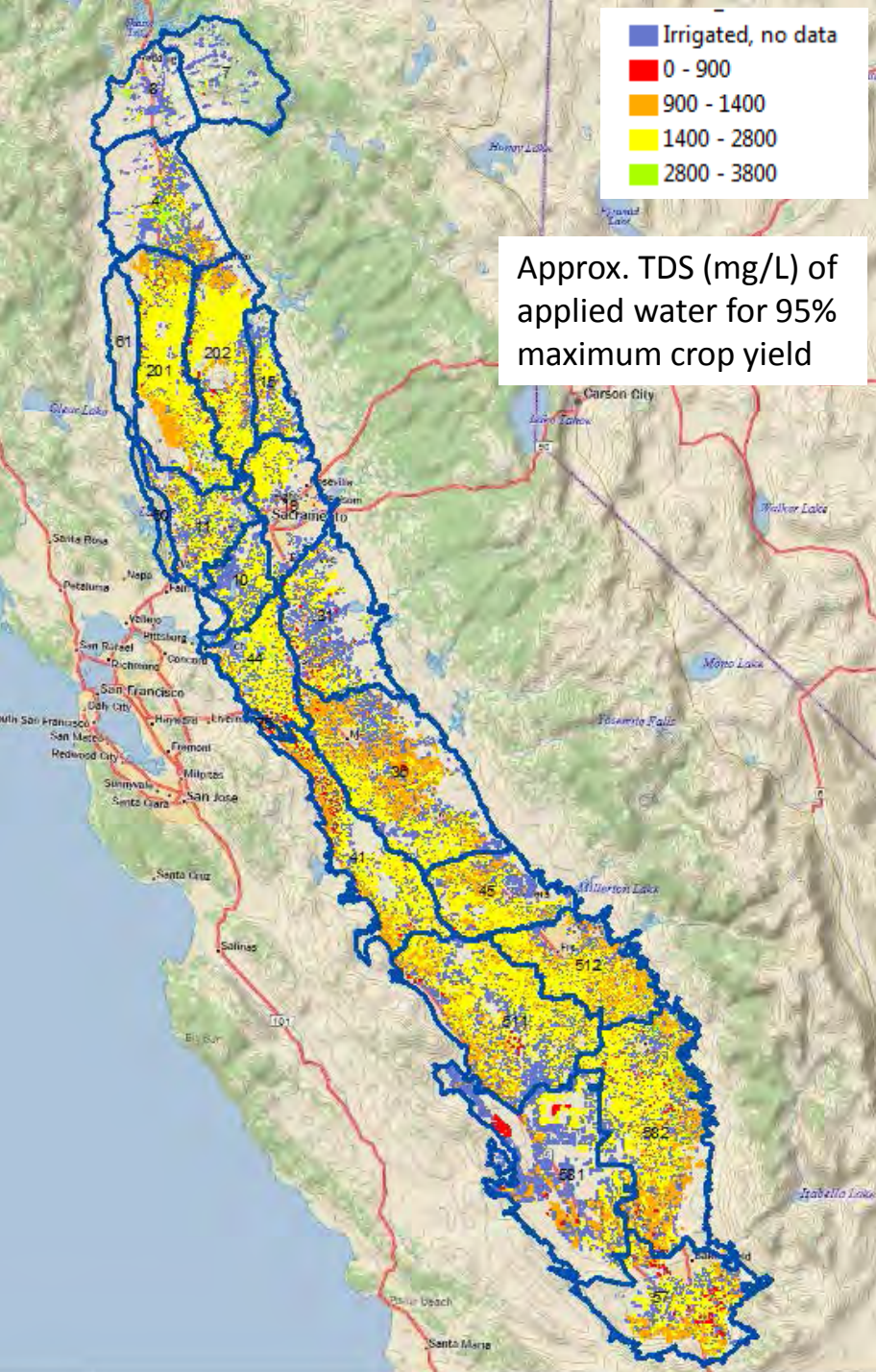
DWR land cover, crop classes



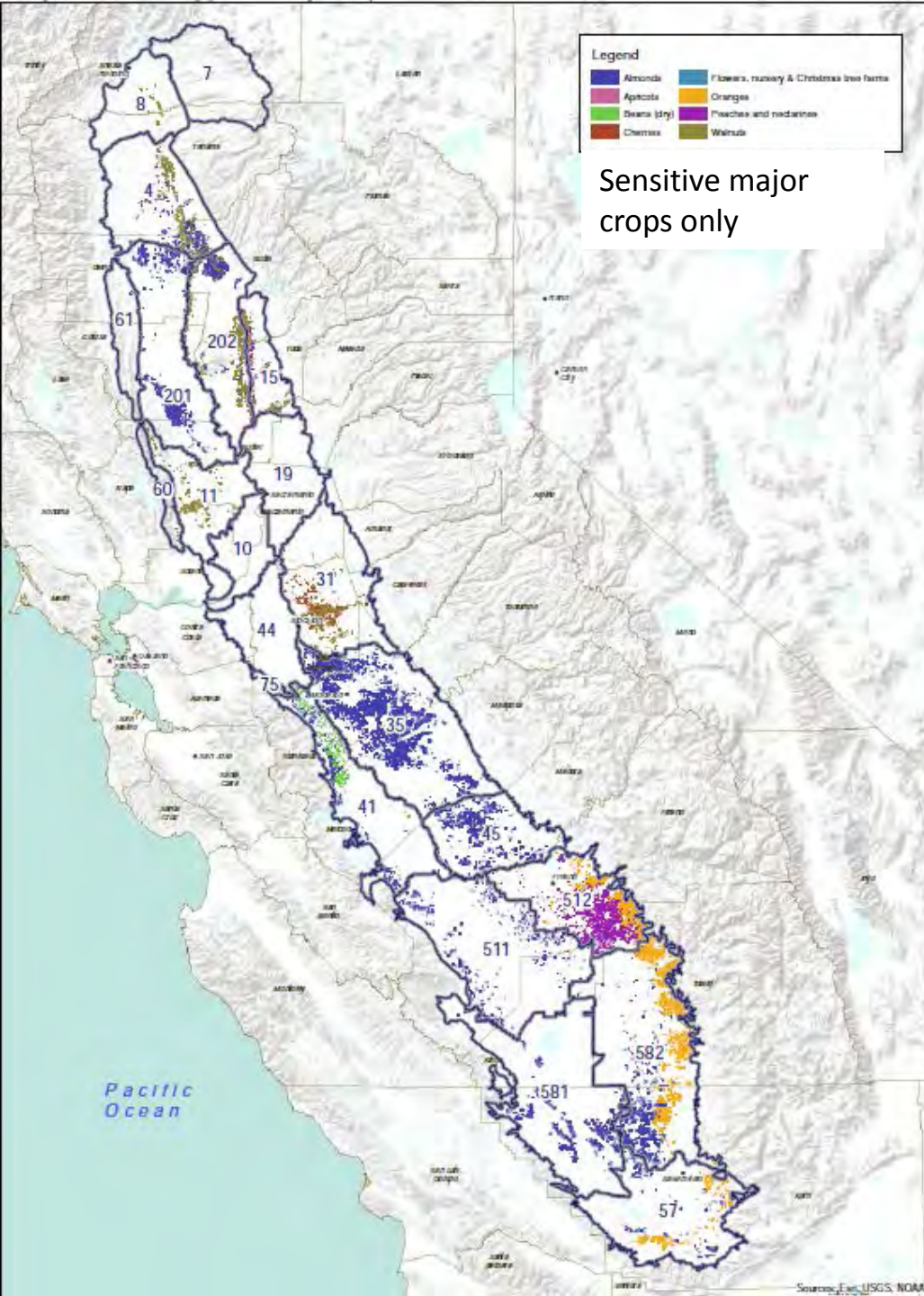
- DWR Land Cover



- Sensitivity Classes



- Preliminary threshold



- Sensitive major crops (SMCs)