Summary of Proposed Allocation Process

1. **Define groups of crops**
2. **Define groups of irrigation types**
3. **Average NRCS leaching potential for each field**
4. **Place each field into a category based on:**
   a. average NRCS leaching potential
   b. crop type
   c. irrigation type
5. **Calculate total acreage within each category. Rank categories according to acreage.**
6. **Allocate samples to each category plus allocate to special high-risk conditions and locations proposed by CAFO or RCIM committees.**

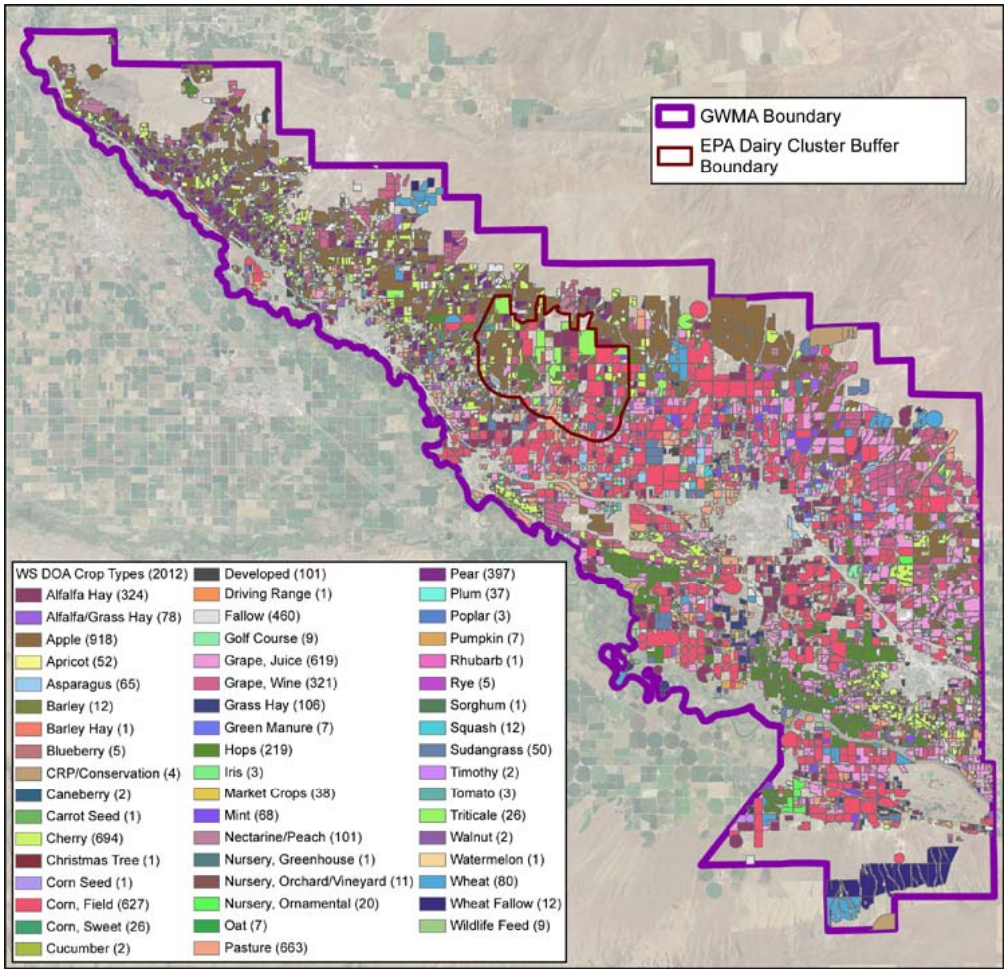
How Number of Categories and Samples Per Category could affect Budget

CALCULATION OF NUMBERS OF FIELDS SAMPLED DEPENDING ON DESIGN OF ALLOCATION PROCESS									
					hypothetical sample allocation				
					A	B	C	D	E
number of NRCS N Leach Potential values					4	4	3	3	3
number of crop types					6	6	5	4	4
number of irrigation types					4	4	3	3	3
number of categories:					96	96	45	36	36
number of fields sampled for first quintile					0	0	0	0	3
number of fields sampled for second quintile					0	0	0	0	3
number of fields sampled for third quintile					3	2	2	3	3
number of fields sampled for fourth quintile					5	4	4	4	3
number of fields sampled for fifth quintile					8	6	6	6	3
total number of fields sampled					307	230	108	94	100

GWMA Crops

Crop Type	Number of Fields	Acres	% of total	Cumulative %
Corn, Field	627	18565.7	19%	19%
Apple	918	16738.5	17%	36%
Grape, Juice	619	10624.8	11%	47%
Alfalfa Hay	324	6405.2	7%	54%
Cherry	694	6402.9	7%	61%
Pasture	663	5468.8	6%	66%
Grape, Wine	321	4987.9	5%	71%
Hops	219	4846.8	5%	76%
Pear	397	3859.1	4%	80%
Fallow	460	3221.9	3%	84%
Wheat	80	2219.0	2%	86%
Wheat Fallow	12	1852.2	2%	88%
Sudangrass	50	1278.6	1%	89%
Mint	68	1234.5	1%	91%
Triticale	26	1214.0	1%	92%
Grass Hay	106	1167.3	1%	93%
Asparagus	65	994.4	1%	94%
Nectarine/Peach	101	952.5	1%	95%
Alfalfa/Grass Hay	78	933.7	1%	96%
CRP/Conservation	4	626.1	1%	97%
Developed	101	625.3	1%	97%
Nursery, Ornamental	20	346.8	0%	98%
Apricot	52	305.3	0%	98%
Barley	12	240.4	0%	98%
Market Crops	38	214.9	0%	98%
Corn, Sweet	26	202.8	0%	99%
Squash	12	169.7	0%	99%
Plum	37	157.6	0%	99%
Golf Course	9	148.3	0%	99%
Wildlife Feed	9	144.0	0%	99%
Pumpkin	7	127.5	0%	99%
Rye	5	100.7	0%	99%

WSDA Crop data by field



Rooting Depths

WA682.50 Table WA682.50 –
methods.

Adapted Crops	Effective Root Zone (80% feeder roots)
Alfalfa Hay	5+
Alfalfa-Grass Hay	4
Alfalfa Seed	5+
Apples	5
Apricot	5
Asparagus	5+
Bean (bush)	2
Bean (dry)	2
Bean (pole)	5
Beet (sugar)	2.5
Beet (table)	1.5
Berries	5
Broccoli	2
Brussel Sprout	2
Bulb, Spring	2
Bulb, Fall	2
Cabbage	2
Cantaloupe	4
Carrot	2
Cauliflower	2
Celery	2
Chard	3
Cherry	5
Citrus	5
Clover-Grass Hay	2
Clover, Ladino	2
Clover Seed	2
Corn (Field & Silage)	3
Corn (Sweet)	2
Cranberries	1
Cucumbers	2
Flower Seed	2
Grain (Spring & Fall)	3
Grapes	3
Grass Seed	3
Hops	5
Lettuce	1.5
Mint	2
Melons	5
Nursery Stock	2
Nut Trees	5+
Oats	2.5
Onion, Dry	2
Onion, Green	2
Parsnip	3
Pasture/Turf	2.5
Peaches	5
Peas (all)	2
Pears & Plums	5
Potatoes	2
Pumpkin	4
Radish	1
Raspberries	4
Safflower	5
Sorghum	3
Soybeans	2.5
Spinach	2
Squash	3
Strawberries	1.5
Sunflowers	5
Tomatoes	4
Turnip	2.5
Watermellon	3.5

NRCS Irrigation Guide (1985)

NRCS Irrigation Guide (1997)

Table 3–4 Depths to which the roots of mature crops will extract available soil water from a deep, uniform, well drained soil under average unrestricted conditions (depths shown are for 80% of the roots)

Crop	Depth (ft)	Crop	Depth (ft)
Alfalfa	5	Peas	2 - 3
Asparagus	5	Peppers	1 - 2
Bananas	5	Potatoes, Irish	2 - 3
Beans, dry	2 - 3	Potatoes, sweet	2 - 3
Beans, green	2 - 3	Pumpkins	3 - 4
Beets, table	2 - 3	Radishes	1
Broccoli	2	Safflower	4
Berries, blue	4 - 5	Sorghum	4
Berries, cane	4 - 5	Spinach	1 - 2
Brussel sprouts	2	Squash	3 - 4
Cabbage	2	Strawberries	1 - 2
Cantaloupes	3	Sudan grass	3 - 4
Carrots	2	Sugar beets	4 - 5
Cauliflower	2	Sugarcane	4 - 5
Celery	1 - 2	Sunflower	4 - 5
Chard	1 - 2	Tobacco	3 - 4
Clover, Ladino	2 - 3	Tomato	3
Cranberries	1	Turnips	2 - 3
Corn, sweet	2 - 3	Watermelon	3 - 4
Corn, grain	3 - 4	Wheat	4
Corn seed	3 - 4		
Corn, silage	3 - 4		
Cotton	4 - 5	**Trees**	
Cucumber	1 - 2	Fruit	4 - 5
Eggplant	2	Citrus	3 - 4
Garlic	1 - 2	Nut	4 - 5
Grains & flax	3 - 4		
Grapes	5	**Shrubs & misc. trees for windbreaks**	
Grass pasture/hay	2 - 4		
Grass seed	3 - 4	< 10 ft tall	2 – 3+
Lettuce	1 - 2	10 – 25 ft tall	3 – 4+
Melons	2 - 3	> 25 ft tall	5+
Milo	2 - 4		
Mustard	2	**Other**	
Onions	1 - 2	Turf (sod & lawn)	1 - 2
Parsnips	2 - 3	Nursery stock	1 - 3
Peanuts	2 - 3	Nursery stock	pots

Define Crop Groups

SYCD Proposed Crop Groups

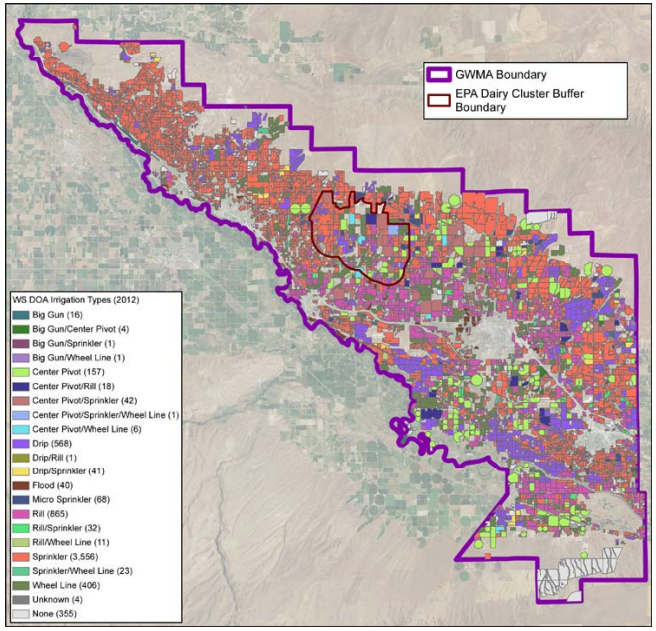
Rooting Depth (ft)	Important GWMA Crops
More than 4	Alfalfa, asparagus, tree fruits, hops
2.5 up to 4	Corn, wheat, grains/triticale, Sorghum/Sudangrass, pasture, grapes(1)
Less than 2.5	Mint

(1) NRCS data on grapes is not consistent: 1985 value is 5 ft, 1997 value is 3 ft.

Irrigation Types in GWMA

Irrigation Type	Number of Fields	Acres	% of Area	Cumulative %	Leach Rank
Sprinkler	3556	41459.1	43%	43%	3
Rill	865	13944.8	14%	57%	4
Drip	568	10492.9	11%	68%	2
Wheel Line	406	8789.5	9%	77%	3
Center Pivot	157	7035.9	7%	84%	3
None	355	5453.6	6%	90%	1
Center Pivot/Sprinkler	42	3398.7	4%	94%	3
Center Pivot/Rill	18	1291.8	1%	95%	3
Micro Sprinkler	68	1128.5	1%	96%	2
Drip/Sprinkler	41	773.8	1%	97%	2
Flood	40	614.9	1%	97%	4
Rill/Sprinkler	32	598.9	1%	98%	4
Sprinkler/Wheel Line	23	470.3	0%	99%	3
Center Pivot/Wheel Line	6	423.0	0%	99%	3
Rill/Wheel Line	11	347.3	0%	99%	4
Big Gun	16	271.1	0%	100%	3
Big Gun/Center Pivot	4	157.9	0%	100%	3
Center Pivot/Sprinkler/Wheel Line	1	153.9	0%	100%	3
Big Gun/Wheel Line	1	29.8	0%	100%	3
Unknown	4	24.8	0%	100%	1
Big Gun/Sprinkler	1	7.9	0%	100%	3
Drip/Rill	1	2.4	0%	100%	2

WSDA Irrigation Type and Leach Rank



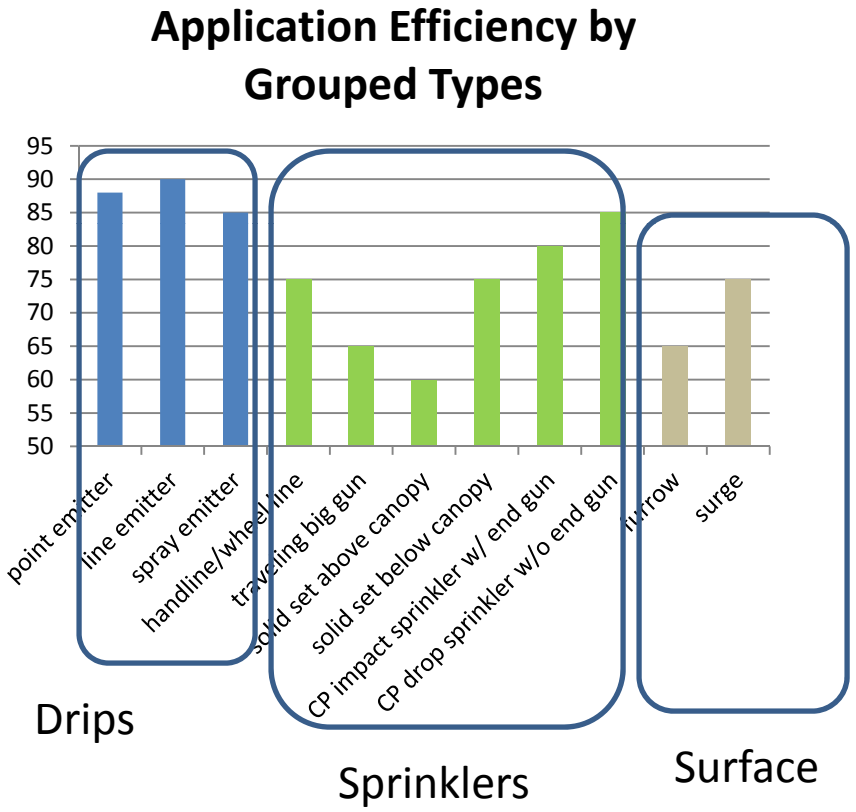
Option to Group Irrigation Types

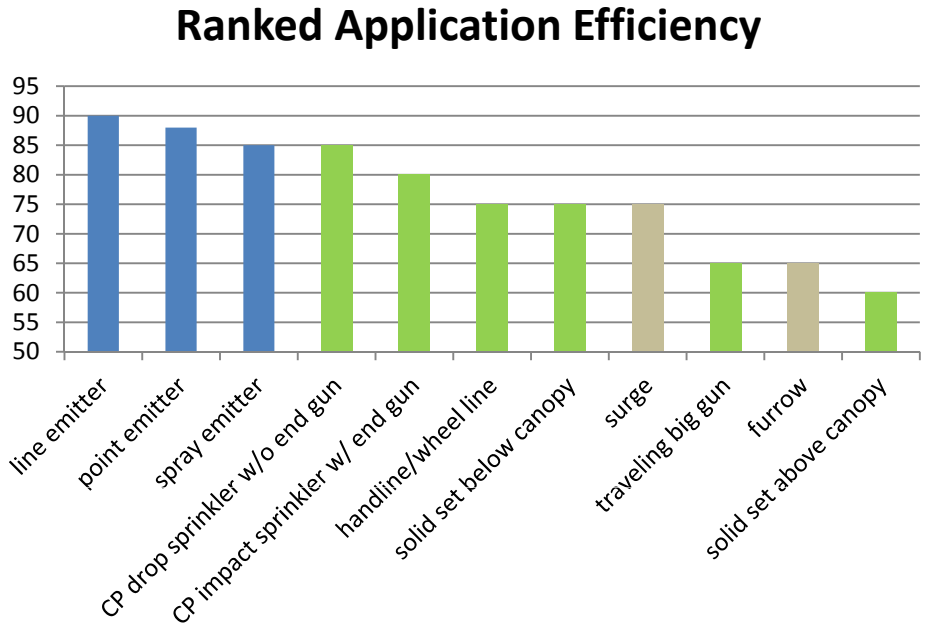
Group by WSDA Leach Rank

WSDA Leach Rank	Irrigation Types
1	none, none + anything, unknown
2	drip, micro sprinkler, drip + anything
3	sprinklers, sprinklers + anything, hand
4	flood, rill, rill + sprinkler

Option to Group Irrigation Types

Group by Efficiency (Data from NRCS Part 652 Irrigation Guide)





NRCS Leaching Potential

Factors Considered:

1. Annual precipitation minus PET (has a low weighting factor for irrigated areas)
2. Water travel time through soil (K and thickness)
3. Available water capacity to 150 cm (at field capacity)
4. Depth and duration of shallow water table
5. Land slope

Determined for soil mapping units (not fields) – therefore requires GIS to calculate average value for field.

NRCS web tool output for soil mapping unit:

1. Map
2. Value between 0 and 1 for soil map units
3. Class (high, med-high, med, low)
4. Dominant factors

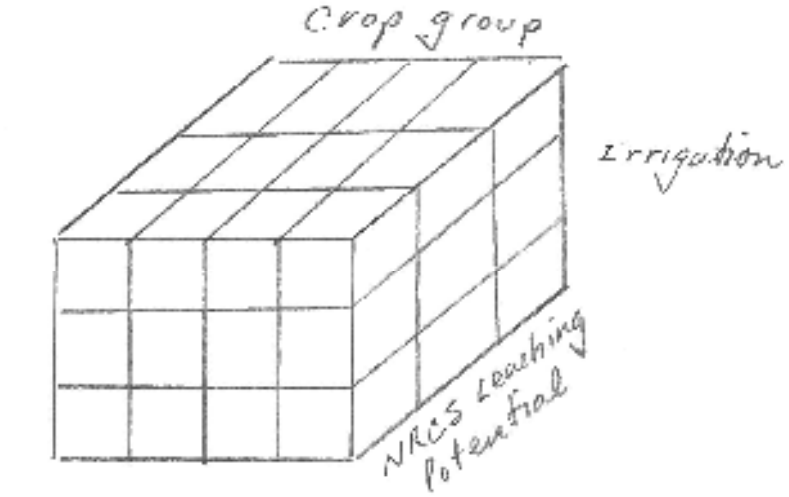
GWMA could use numbers to define 3 classes (high, med, low)

NRCS Leaching Potential Example Output

Yakima County Area, Washington

Map symbol and soil name	Pct. of map unit	Nitrate Leaching Potential, Nonirrigated (WA)		Nitrate Leaching Potential, Irrigated (WA)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
173:					
Outlook	5	Not rated		Not rated	
174:					
Warden	100	Low	0.2	Moderate	0.49
		Water travel time	0.81	Water travel time	0.81
175:					
Warden	100	Low	0.2	Moderate	0.49
		Water travel time	0.81	Water travel time	0.81
176:					
Warden	100	Low	0.2	Moderate	0.49
		Water travel time	0.81	Water travel time	0.81
177:					
Warden	100	Low	0.2	Moderate	0.49
		Water travel time	0.81	Water travel time	0.81
33:					
Esquatzel	100	Low	0.2	Moderate	0.49
		Water travel time	0.81	Water travel time	0.81
34:					
Fiander, drained	85	Low	0.06	Low	0.17
		Available water capacity	0.43	Available water capacity	0.43

Categories



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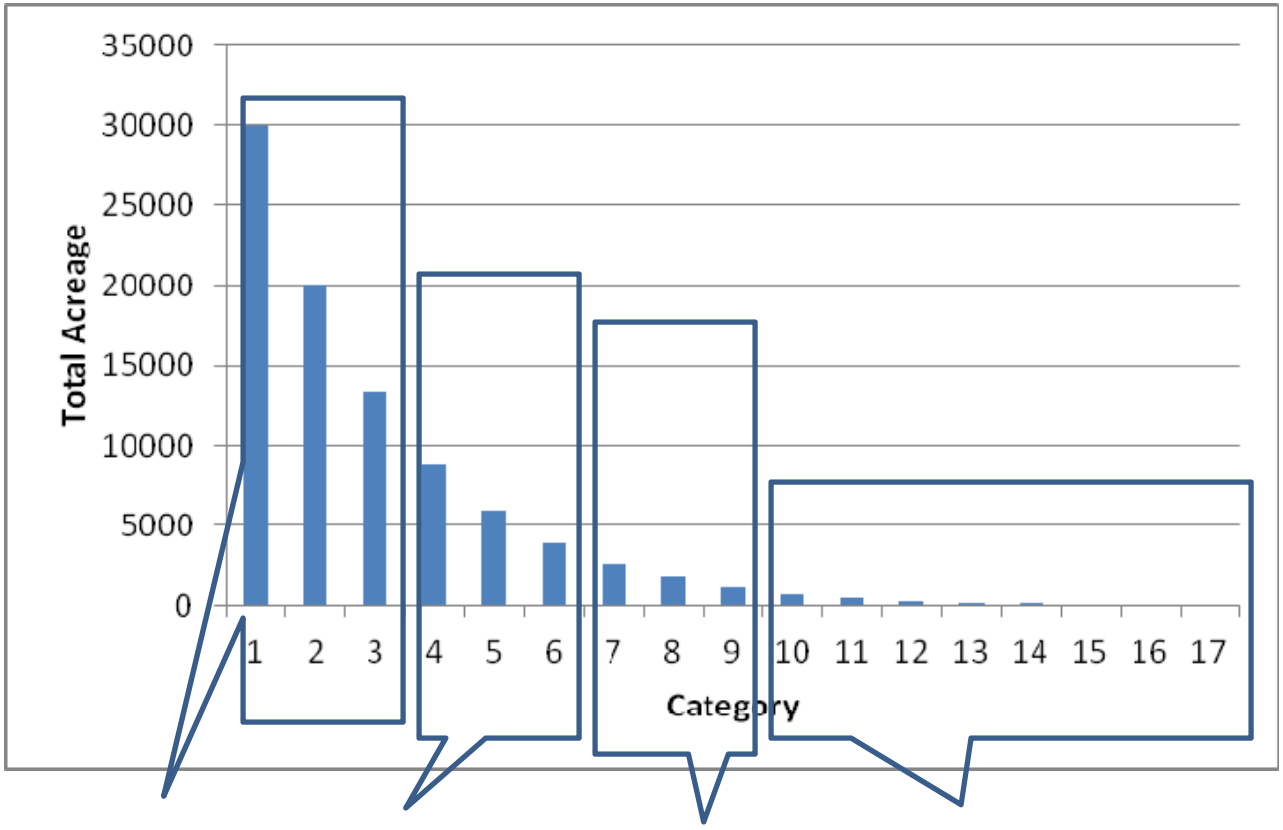
Example Sample Allocations



Sample 6 fields per category

Sample 4 fields per category

Sample 3 fields per category

Sample 0 fields per category