Managing Alfalfa and Small Grains After Multiple Years of Drought

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Alfalfa and Drought

- Crop with a double-edged sword when it comes to drought
- Alfalfa requires 24 to 30 inches of water annually to maximize yields (more water than most annual forage crops)
- Deep-rooted perennial that can utilize deep soil moisture
- Capable of going dormant in summer or fall under drought stress (short-term)

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Alfalfa and Drought

- Keys to Success in Wet and Dry Years
  - Healthy established plants
  - Soil conditions that favor deep, vigorous root systems
  - Proper irrigation management
  - Cutting schedules
  - Allocation of limited water across the farm

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Site selection and soil condition considerations when planting new stands

- Soil type and site selection are critical to success
- Fields with heavy soils (silt loam or clay loam) that allow for rooting depths over 5ft deep are most productive under limited water
- Fields with shallow restrictive layers (hardpans, bedrock), compaction, slope, or a previous trend of underwatering often have shallow roots
- Dig a backhoe pit in problem fields to examine root depth

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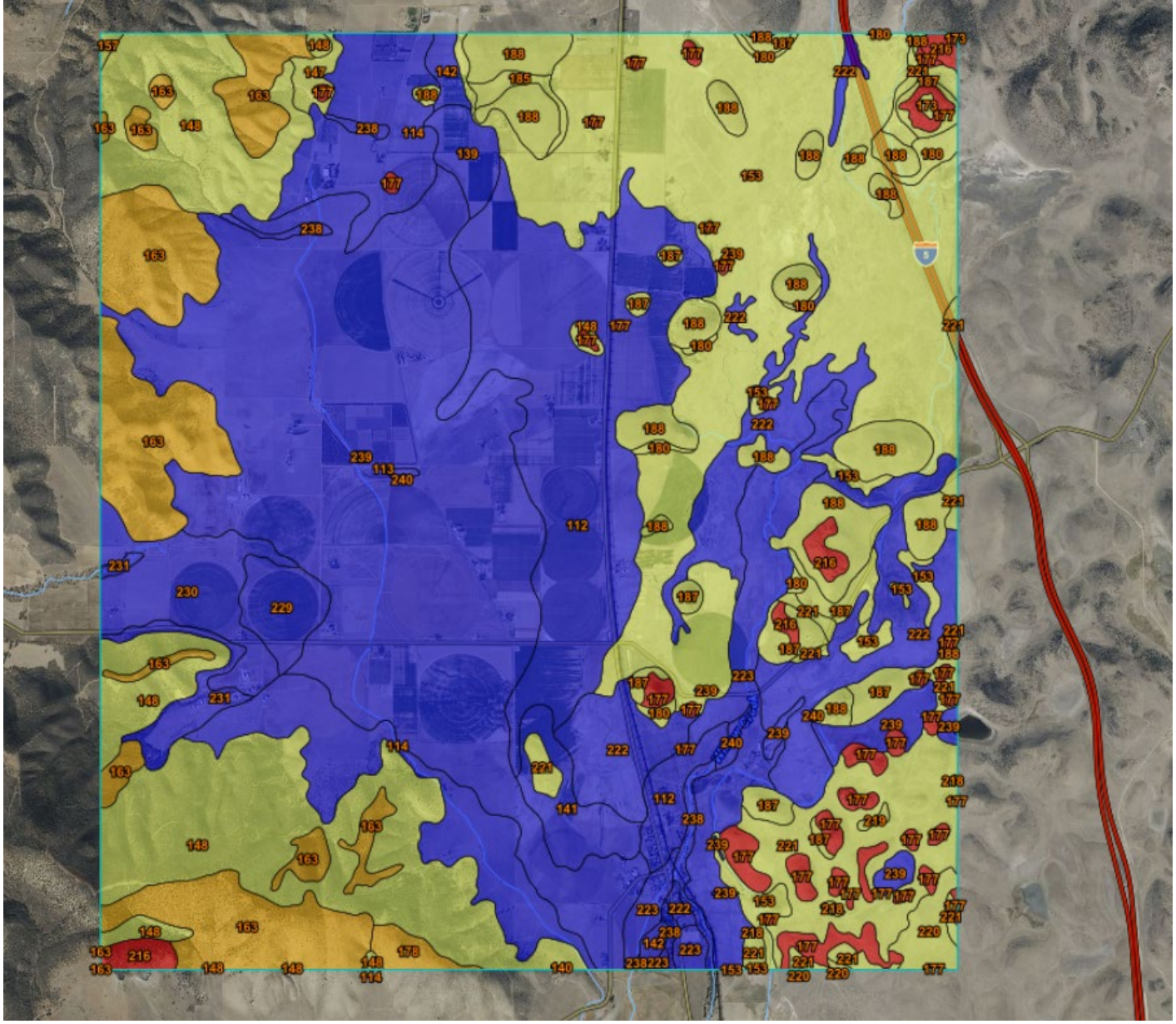

Gazelle, All soils with yellow have a restrictive layer at 32 inches or less

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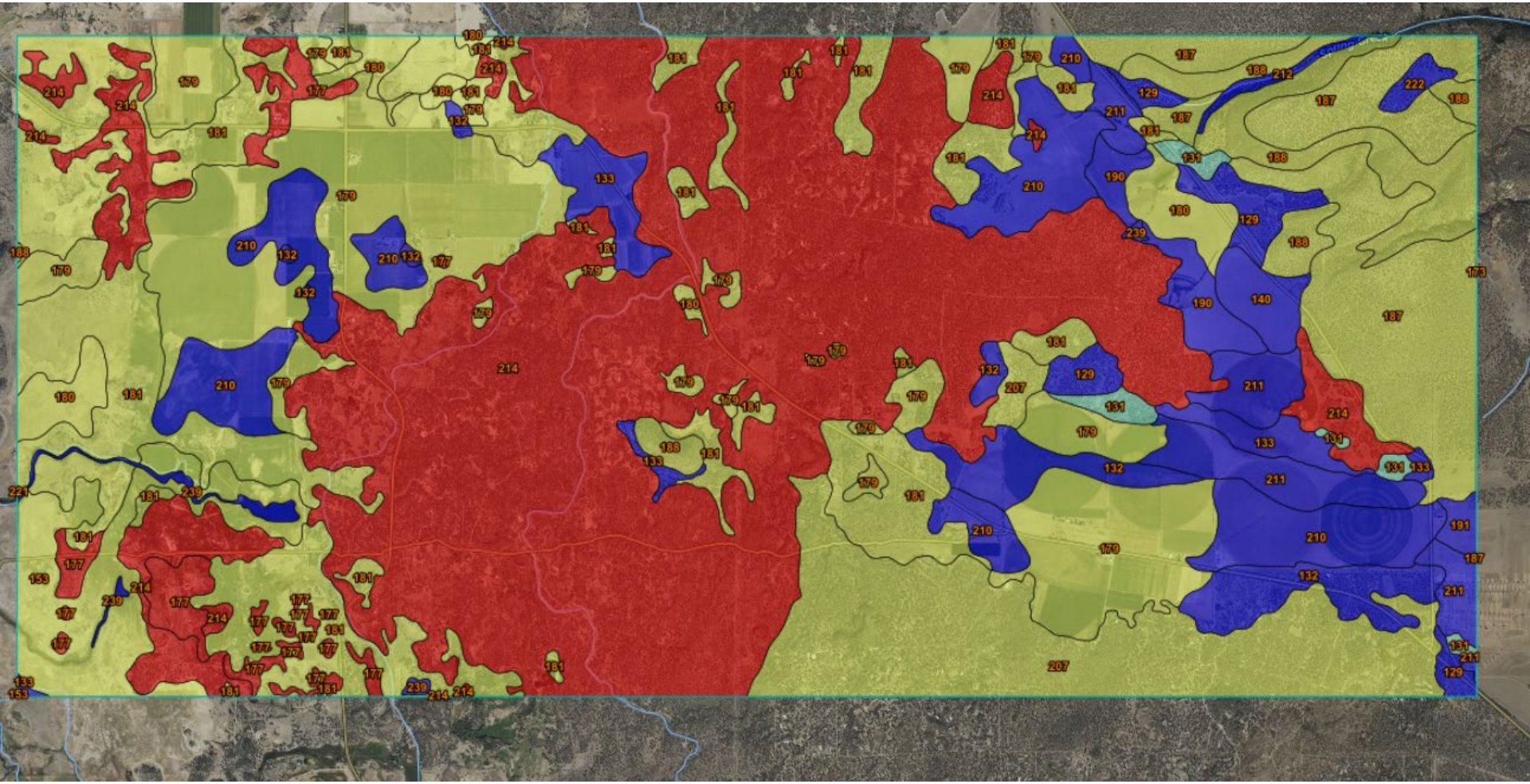

Big Springs, All soils with yellow have a restrictive layer at 32 inches or less

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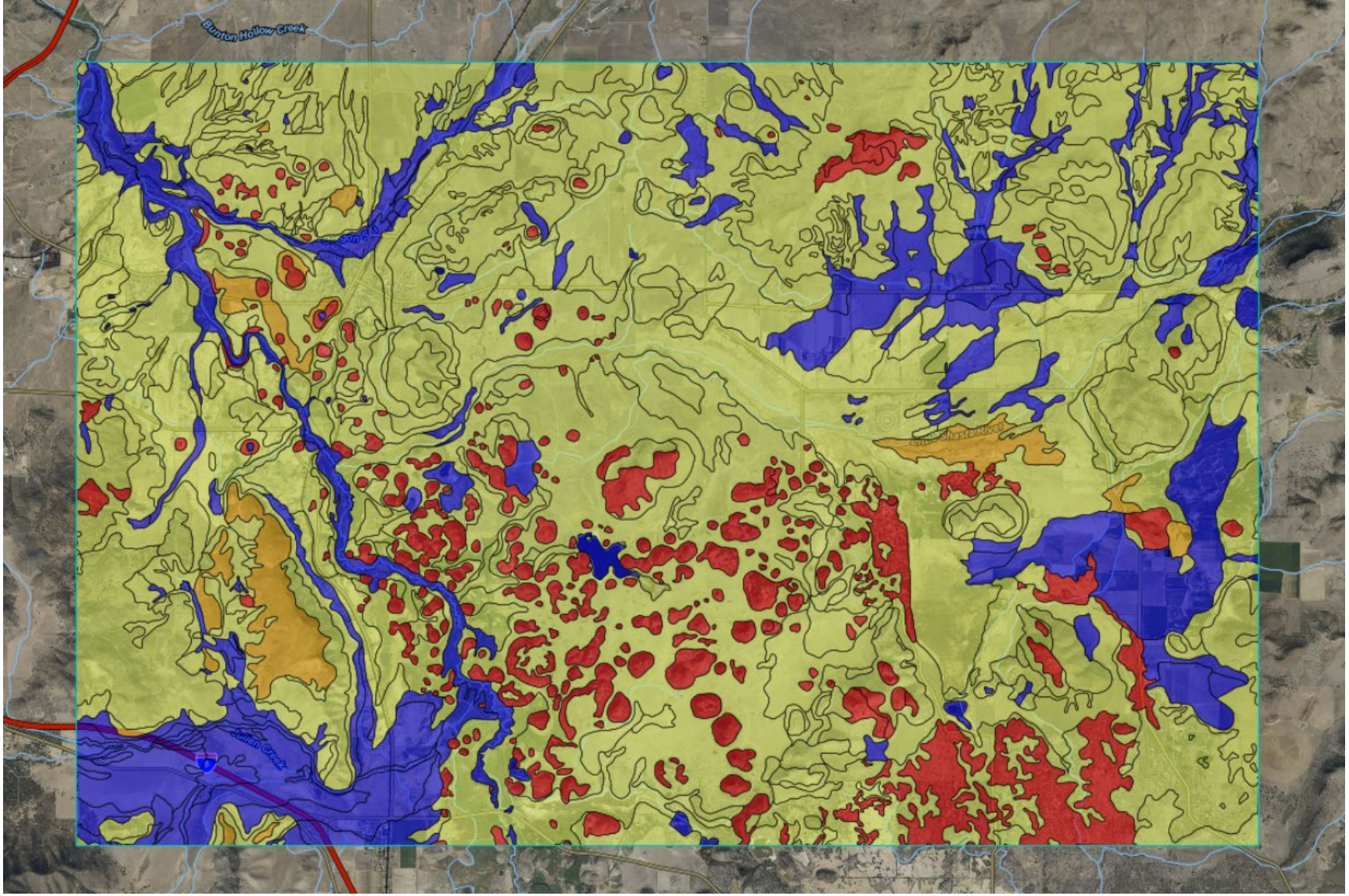

Montague, All soils with yellow have a restrictive layer at 32 inches or less

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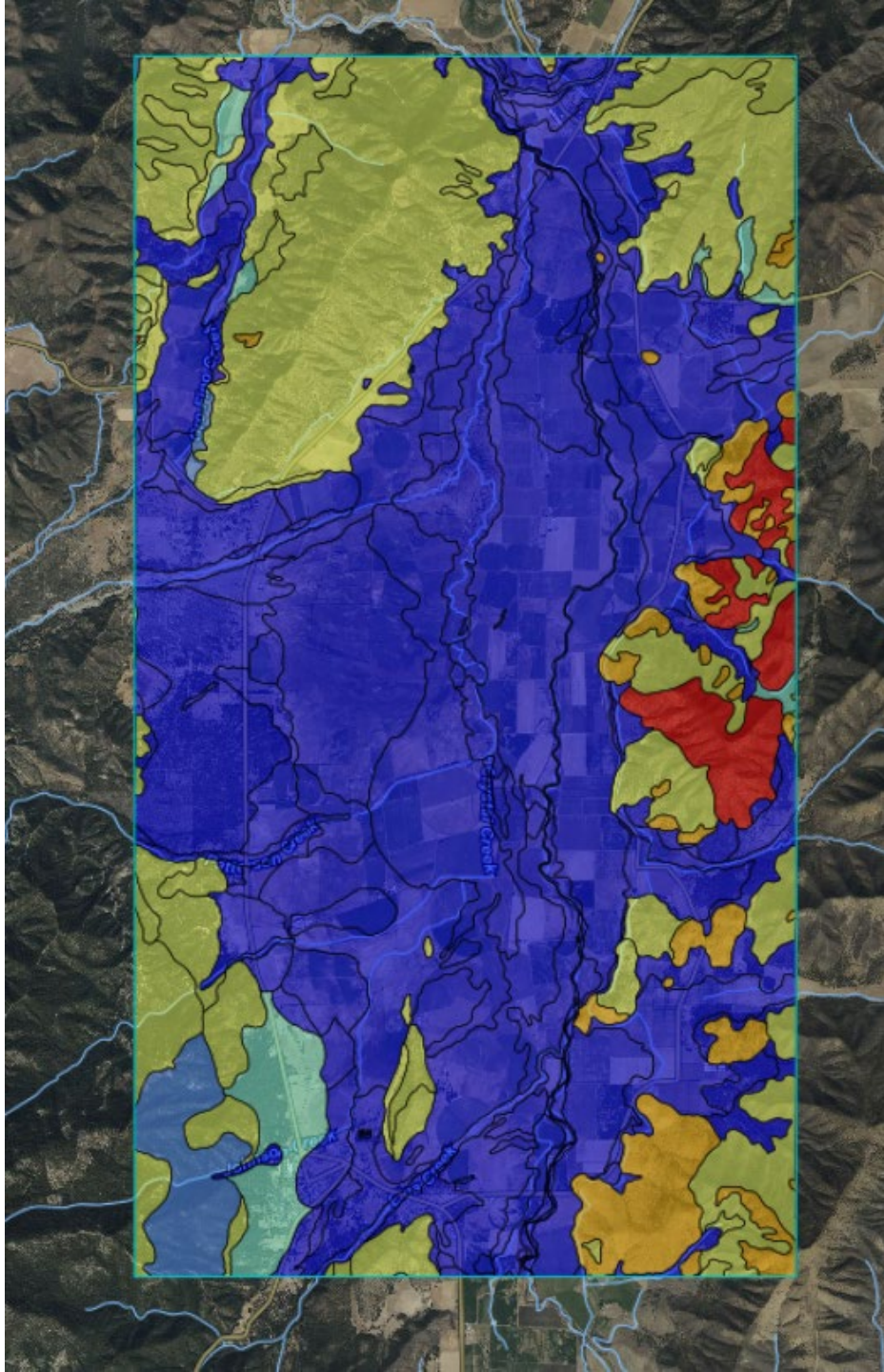
Fort Jones and Etna, All soils with yellow have a restrictive layer at 32 inches or less



Promote Plant Health

- Avoid aggressive harrowing and overwatering which can leads to root rots
- Maintain adequate soil fertility
- Control weed and insect pests

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Irrigation Management

- Maximize efficiency of your current system
  - Fix leaks
  - Make sure ALL nozzles are the correct size!
  - Operate at the correct pressure (measure at end of wheel-line)
  - Don’t water non-crop areas
  - Look at your fields on google earth

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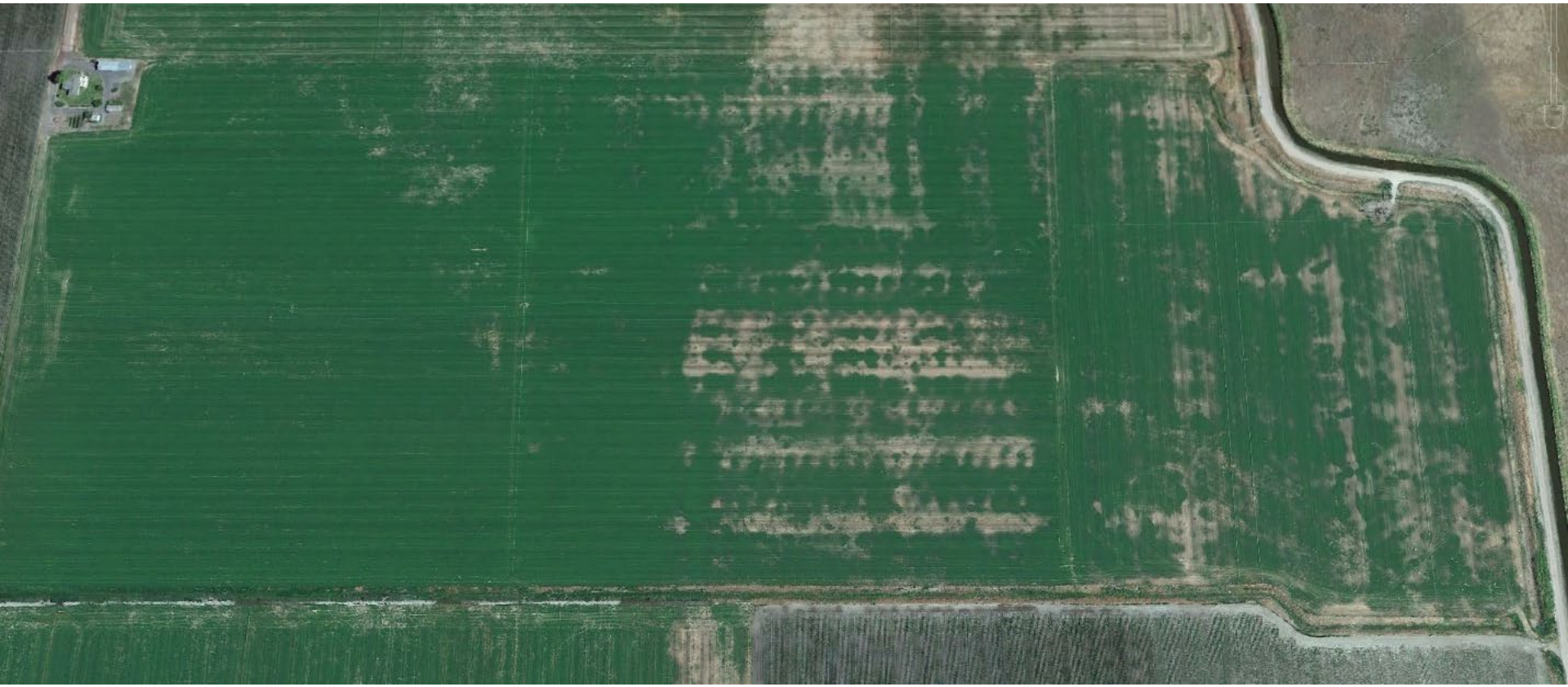
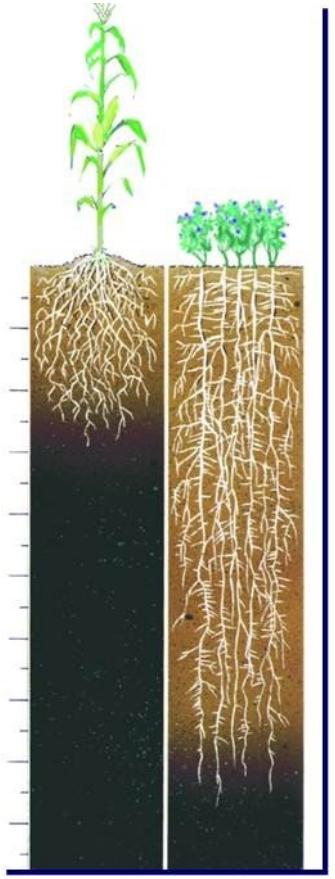


Irrigation Management

- If water is available, it's critical to refill the soil profile at the first irrigation of season!
  - Don't guess; check soil moisture before 1st irrigation and 1 week after
  - If you don't refill the profile, you will likely be behind the rest of the season
  - If you over water and over saturate the root zone you will slow growth
- Avoid windy days and offset wheel-lines two rolls every other irrigation to avoid wind strips



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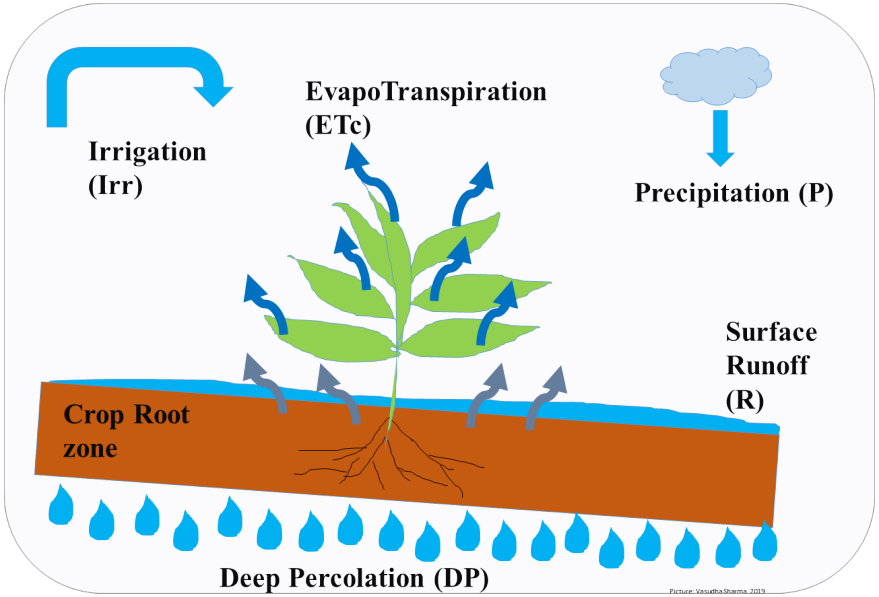
Irrigation Management

- You must know how much water alfalfa is using and how much you apply at each irrigation
- How?
  - Following your neighbor doesn't work
  - Know your root depth
  - Monitor soil moisture at 1 ft, 2 ft, and 3 ft
  - Become familiar with crop ETc estimates
  - Don't allow runoff



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Irrigation Management

Recommended values of soil moisture content at which irrigation should occur (50% of PAW depleted)

SOIL TYPE	AVAILABLE WATER (IN./FT)	ALLOWABLE DEPLETION (IN./FT)	AVAILABLE WATER IN 4FT ROOT ZONE (IN.)	ALLOWABLE DEPLETION IN 4FT ROOT ZONE (IN.)
COARSE SAND	0.5	0.25	2.0	1.0
LOAMY SAND	1.0	0.50	4.0	2.0
SAND LOAM	1.5	0.75	6.0	3.0
FINE SANDY LOAM	2.0	1.00	8.0	4.0
CLAY LOAM	2.2	1.10	8.8	4.4
CLAY	2.3	1.15	9.2	4.6
ORGANIC CLAY LOAMS	4.0	2.00	16.0	8.0

TABLE 2. Typical quantities of available water and allowable depletion.

- How much water do you apply per irrigation?

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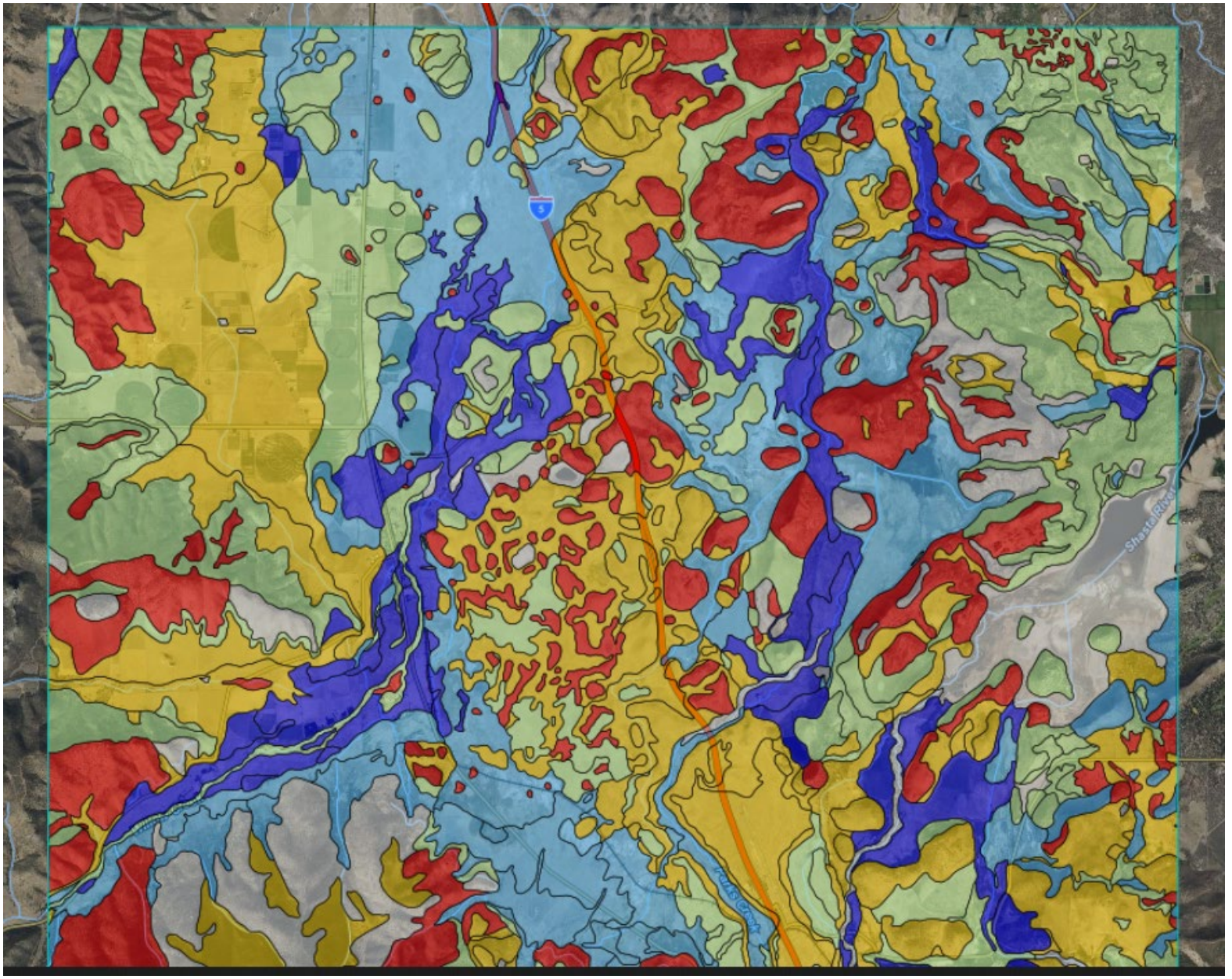
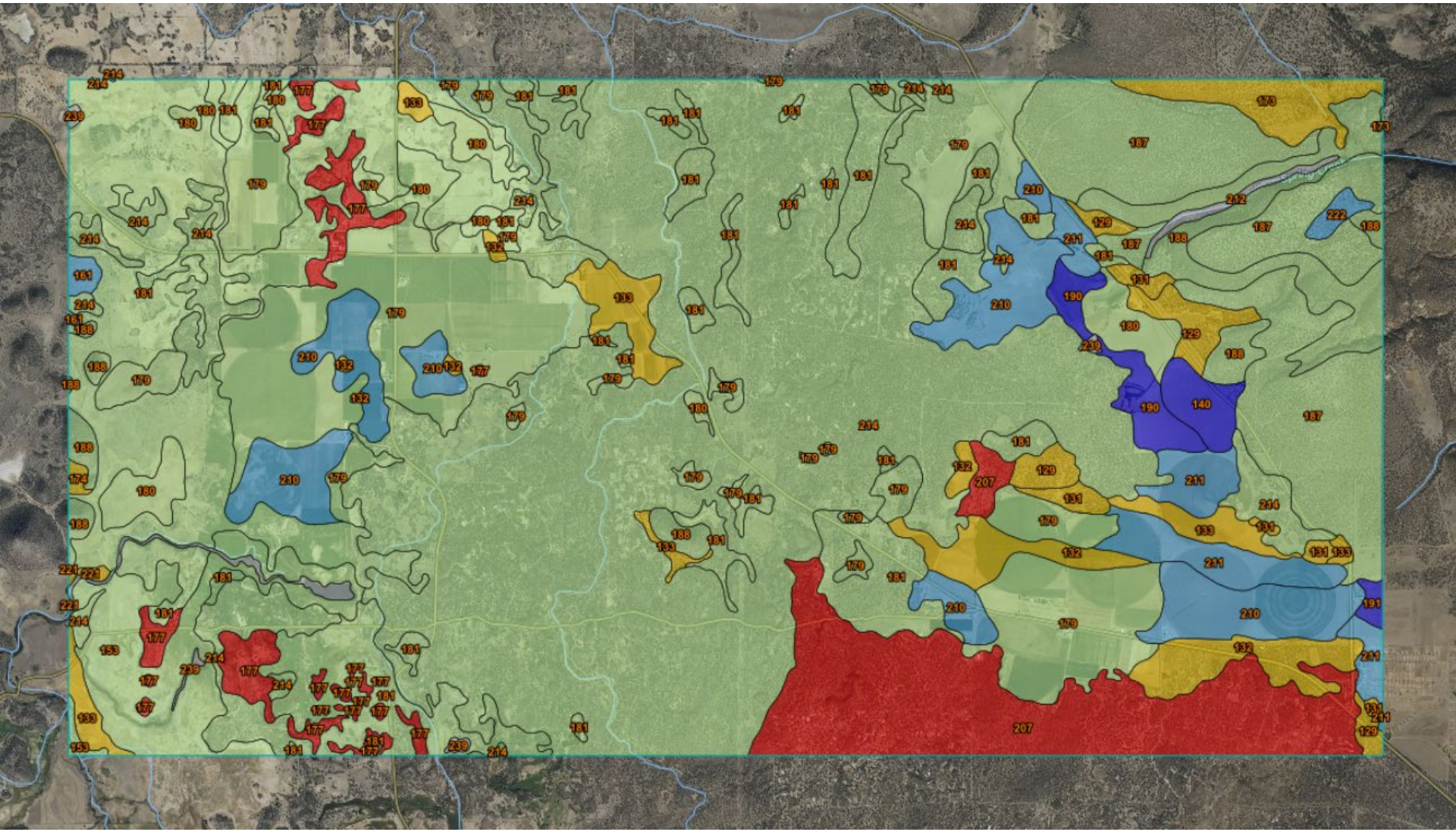
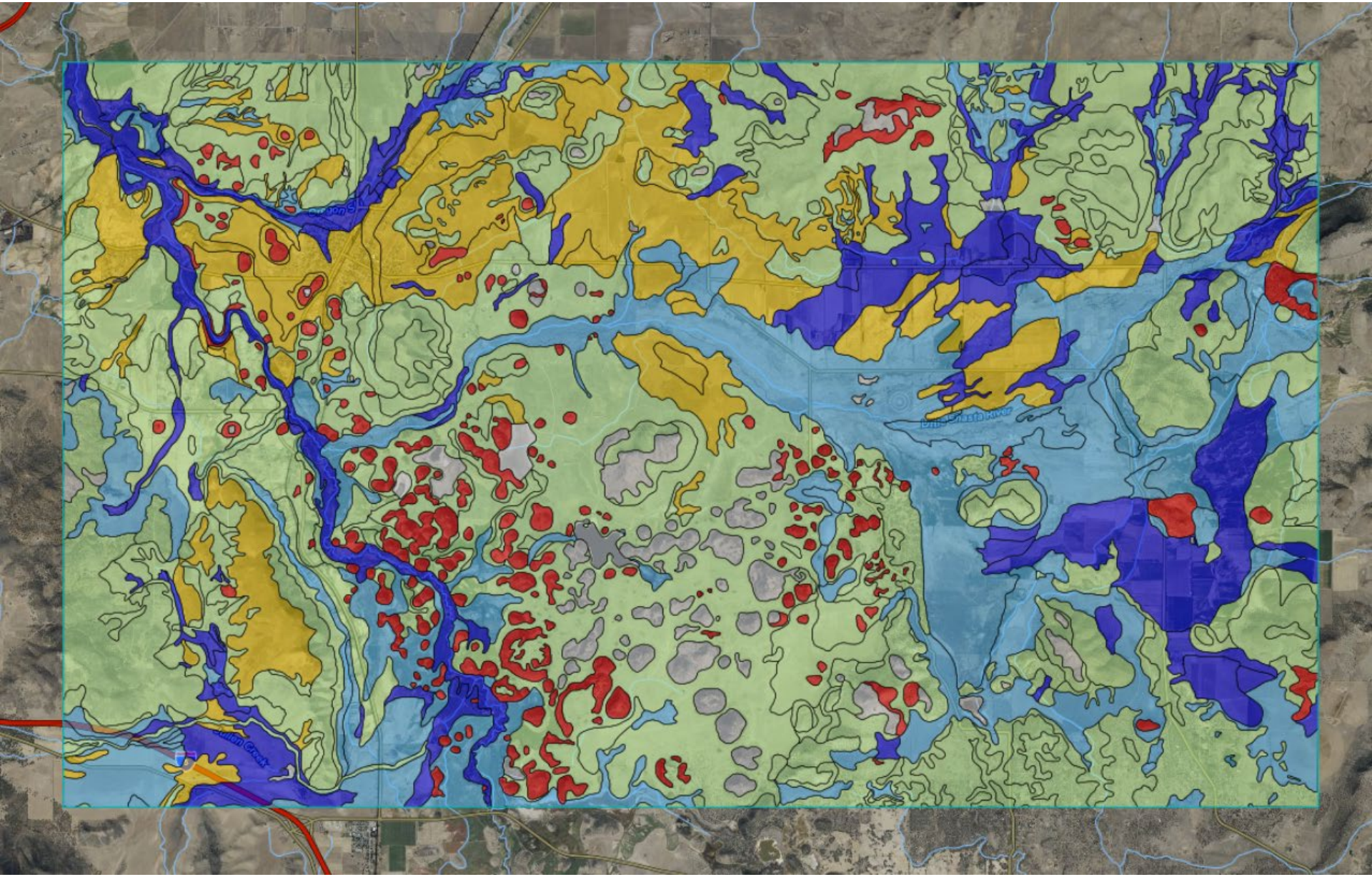


Gazelle, Soil Water Storage- 0-4 ft

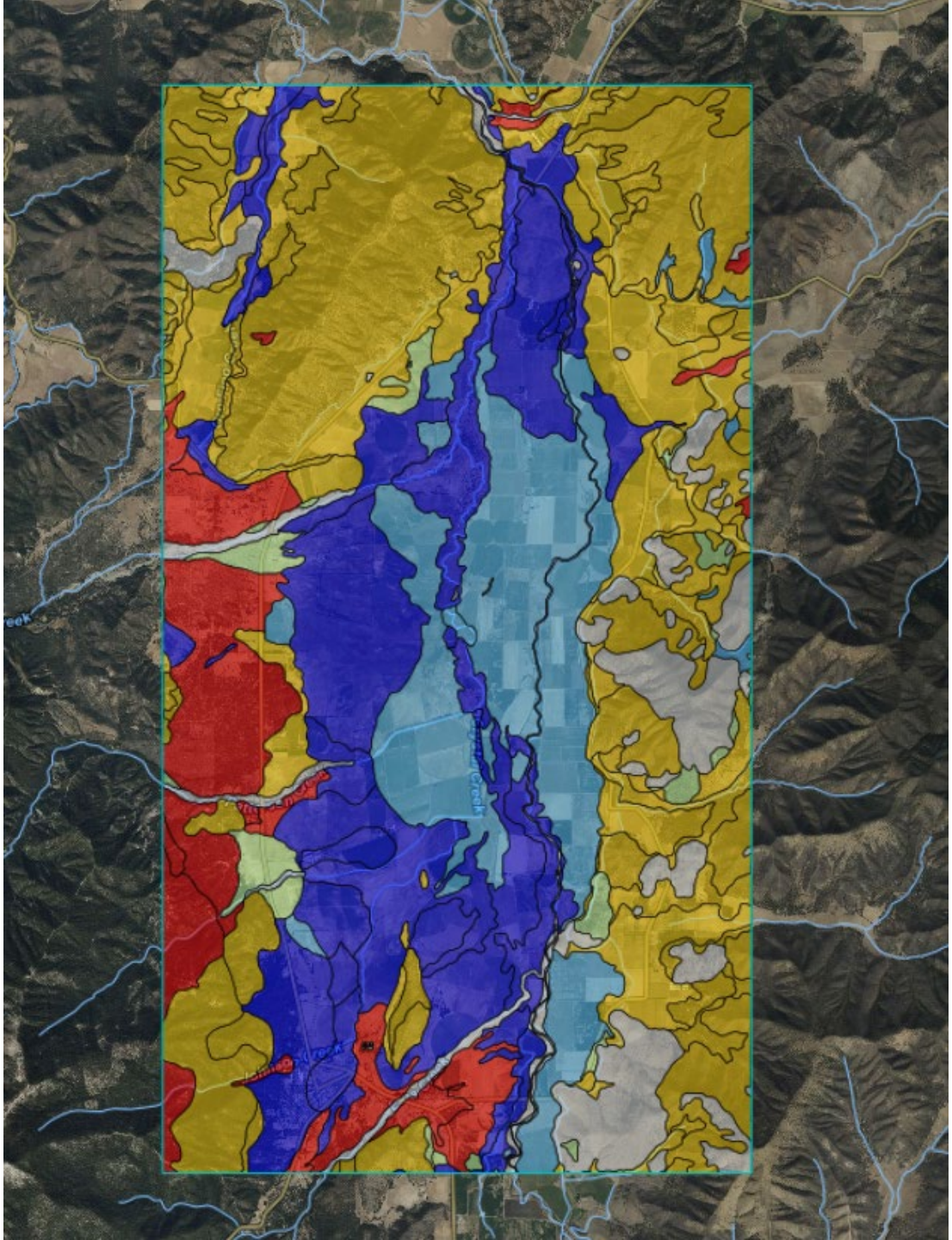


Big Springs, Soil Water Storage- 0-4 ft



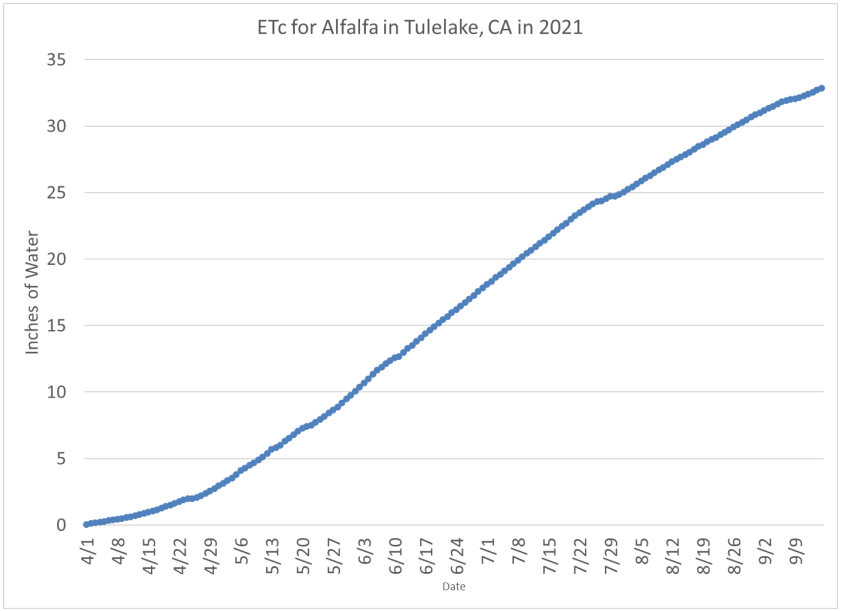
Montague, Soil Water Storage- 0-4 ft

Fort Jones and Etna
Soil Water Storage- 0-4 ft



Irrigation Management

- Irrigating with one 12hr set (4-5 inches) between cuttings works well in Tulelake but it doesn't work well for many fields in Siskiyou locations with sandy soils and shallow restrictive layers
- Sandy soils require 2 irrigations between cuttings with 2.5 inches water per irrigation
- For wheel-lines this means 1 line per 15-20 acres to get across the field quick enough



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R33LP
(#13430-1128)

R33/R33LP PART NUMBERS & PERFORMANCE

ASSEMBLED R33/R33LP CAP, BODY, + ADAPTER

13430-XXXX
- MODEL: Standard = 10, Low Pressure = 11
- NOZZLE (e.g. Gold = 18, Brown = 20, 4.0 33FC = 40, 5.0 33FC = 50)

ASSEMBLED R33/R33LP CAP, BODY, NO ADAPTER

13423-XXX
- MODEL: Standard = 0, Low Pressure = 1
- NOZZLE (e.g. Gold = 18, Brown = 20, 4.0 33FC = 40, 5.0 33FC = 50)

U.S. UNITS (FLOW IN GPM)

PLATE	NOZZLE	MODEL & RADIUS IN FEET	PSI 25	30	35	40	45	50	55	60	65
#18 Gold	Gold (9/64")	R33LP 39-42'	2.9	3.2	3.4	3.6	3.9	4.1	—	—	—
		R33 43'	—	—	—	3.6	3.9	4.1	4.3	4.5	4.6
#20 Brown	Brown (5/32")	R33LP 40-42'	3.5	3.9	4.2	4.5	4.7	5.0	—	—	—
		R33 44-45'	—	—	—	4.5	4.7	5.0	5.2	5.5	5.7
#22 Gray	Gray (11/64")	R33LP 42-45'	4.2	4.6	5.0	5.4	5.7	6.0	—	—	—
		R33 46-47'	—	—	—	5.4	5.7	6.0	6.3	6.6	6.8
#24 Green	Green (3/16")	R33LP 43-46'	5.0	5.5	6.0	6.4	6.8	7.2	—	—	—
		R33 47-50'	—	—	—	6.4	6.8	7.2	7.5	7.9	8.2
#26 Maroon	Maroon (13/64")	R33LP 43-47'	5.9	6.5	7.0	7.6	8.0	8.4	—	—	—
		R33 49-50'	—	—	—	7.6	8.0	8.4	8.8	9.2	9.5
#28 Blue	Blue (7/32")	R33LP 45-47'	7.0	7.6	8.2	8.8	9.4	9.9	—	—	—
		R33 51-52'	—	—	—	8.8	9.4	9.9	10.4	10.9	11.3

METRIC UNITS (FLOW IN LPH)

MODEL & RADIUS IN METERS	BAR 1.75	2.0	2.5	2.75	3.0	3.5	4.0	4.5
R33LP 12.0-13.0 m	660	703	786	825	863	931	—	—
R33 13.0 m	—	—	—	824	862	932	997	1057
R33LP 12.0-12.75 m	806	859	962	1009	1055	1144	—	—
R33 13.5-13.75 m	—	—	—	1009	1055	1141	1220	1291
R33LP 12.75-13.75	971	1036	1159	1217	1273	1376	—	—
R33 14.0-14.25 m	—	—	—	1217	1273	1376	1469	1553
R33LP 13.0-14.0	1147	1226	1376	1446	1514	1640	—	—
R33 14.25-14.75 m	—	—	—	1446	1514	1640	1755	1859
R33LP 13.25-14.5	1352	1449	1629	1712	1790	1931	—	—
R33 15.0-15.25	—	—	—	1712	1790	1931	2052	2154
R33LP 13.75-14.25	1590	1699	1905	2002	2095	2270	—	—
R33 15.5-16.0	—	—	—	2002	2095	2270	2430	2574

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Wheel-line application rates at 55 psi (40x60ft nozzle spacing)

Nozzle size	App. Rate/hr	App. Rate/8 hrs	App. Rate/12 hrs
11/64	.254 in	2.032 in	3.048 in
3/16	.302 in	2.416 in	3.624 in
7/32	.412 in	3.296 in	4.944 in

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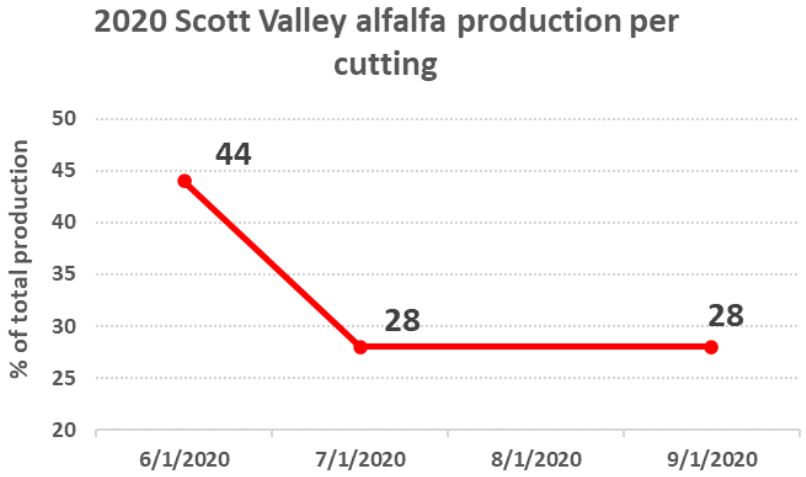
Irrigating with limited water

- Fully irrigating up until 1st or 2nd irrigation is better than spreading water short across the entire season
- Fully irrigate productive fields and leave low yielding fields and corners unirrigated
- Once alfalfa turns yellow and goes dormant from drought stress it is very slow to green-up again



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Planting a New Alfalfa Field

- Prioritize full irrigation on new stands to maximize stand establishment and root development; don't overwater early on.
- Control weeds in seedling alfalfa; don't wait until following year
- Check pH, P, and K levels before planting
- Make sure to break up shallow and deep compaction layers before planting! Ripping wet ground doesn't work!
- Firm seedbed (don't sink past sole of shoe)
- Avoid planting from mid-June thru July
- Try to select field locations that have deep soils and two years of rotation out of alfalfa
- Select a variety with good pest resistance and consider future potential for irrigation limitations

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Table 1. Dry matter yield of alfalfa cultivars under full and deficit irrigation, harvests 2 – 4 in each year. The top 7-8 cultivars is identified in red for each variable, and the list is sorted in descending order based on deficit yield in 2021.

	2020			2021		
Cultivar	Full	Deficit	Ratio	Full	Deficit	Ratio
RR AphaTron						
2XT	6.83	6.29	0.92	7.04	6.43	0.91
Hybriforce-4400	6.90	6.18	0.90	7.13	6.21	0.87
Velvet II	6.99	5.82	0.83	7.17	6.19	0.86
SW3407	6.70	5.51	0.82	6.93	6.07	0.88
SW5511	6.95	5.95	0.86	6.71	5.97	0.89
SW4503Z	7.20	6.39	0.89	6.99	5.96	0.85
6427R	6.85	5.58	0.81	6.93	5.86	0.85
Vernal	6.78	6.41	0.95	7.12	5.82	0.82
AFX 469	6.84	5.85	0.86	7.19	5.79	0.81
SW5212	6.86	5.64	0.82	6.77	5.77	0.85
Hi-Gest 360	6.78	5.26	0.78	7.23	5.72	0.79
X-C0416A3360	6.93	5.97	0.86	7.22	5.69	0.79
Rugged	7.10	5.85	0.82	7.28	5.64	0.78
Renew+	6.78	5.64	0.83	6.87	5.58	0.81
DKA40-16	6.70	5.66	0.84	6.74	5.54	0.82
Rebound AA	6.80	5.90	0.87	6.87	5.48	0.80
WL 365HQ	6.75	5.58	0.83	6.89	5.47	0.79
Oneida VR	6.05	5.42	0.90	6.68	5.47	0.82
Magnum 8-Wet	6.67	5.42	0.81	7.18	5.42	0.76
WL 349HQ	6.97	5.59	0.80	7.25	5.42	0.75
6472A	6.46	5.52	0.86	6.78	5.42	0.80
6585Q	6.72	5.59	0.83	7.09	5.32	0.75
WL 336HQ.RR	6.44	5.56	0.86	6.80	5.27	0.78
Pillar ST	6.20	5.17	0.83	6.57	5.09	0.77
Mean	6.76	5.74	0.85	6.98	5.69	0.82

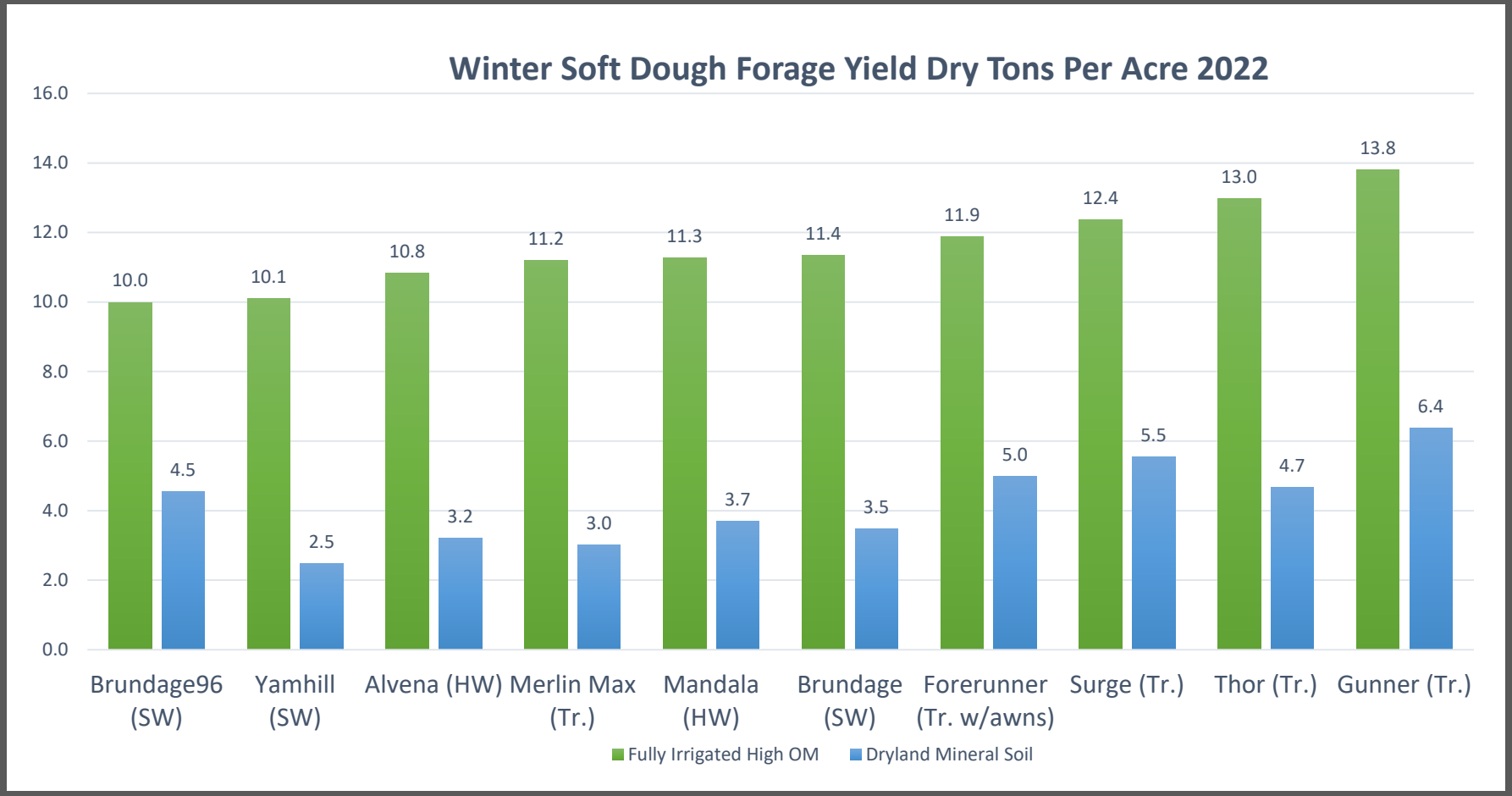
IREC Grain Research

Darrin Culp- Superintendent of Agriculture

UC Intermountain Research and Extension Center Tulelake, CA

Winter Triticale/Wheat Grain and Forage Yield

- 130#N/Acre Total Nitrogen/A; 110#N/A Applied in season at tillering (30ppm spring soil test)
- 12 Acre inches of applied irrigation


Winter Soft Dough Forage Yield Dry Tons Per Acre 2022
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
10.0
4.5
10.1
2.5
10.8
3.2
11.2
3.0
11.3
3.7
11.4
3.5
11.9
5.0
12.4
5.5
13.0
4.7
13.8
6.4
Brundage96 (SW)
Yamhill (SW)
Alvena (HW)
Merlin Max (Tr.)
Mandala (HW)
Brundage (SW)
Forerunner (Tr. w/awns)
Surge (Tr.)
Thor (Tr.)
Gunner (Tr.)
Fully Irrigated High OM
Dryland Mineral Soil

Special Thanks To IREC STAFF


Questions