SANDAG Grazing Study Progress Report

August 24, 2022

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https://www.sdmmp.com/view_project.php?sdid=SDMMP_SDID_187_5dfaaad75575d

Presentation Outline

- Project Goals
- Literature Review
- Conceptual Model
- Fieldwork and Data Collection
- Analysis and Preliminary Results
- Next Steps
- Discussion

Project Goals

Lynn Huntsinger, UCB

Aug. 24, 2022

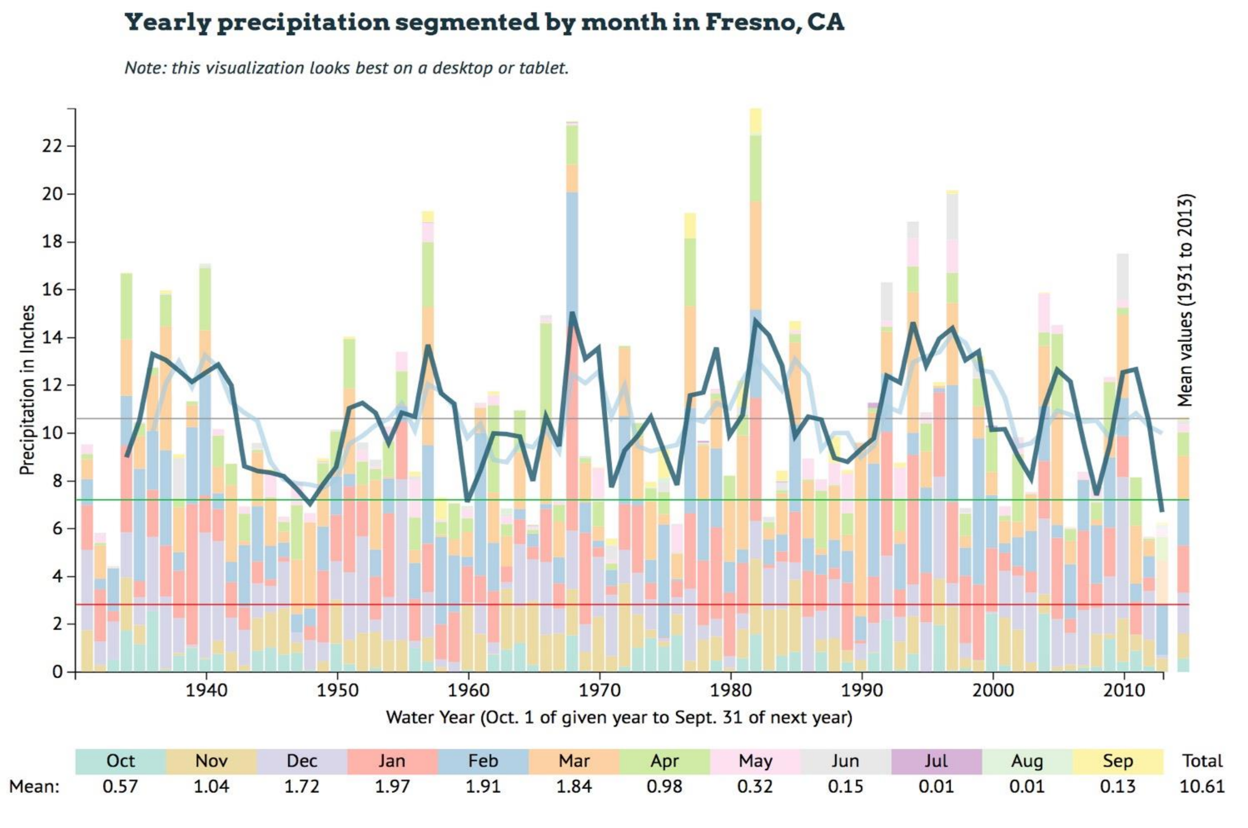
Project goal: Grazing Monitoring Plan

The purpose of the MSP Grazing Monitoring Plan is to determine the effectiveness of using grazing as a management tool to enhance ecological integrity of natural habitats on Conserved Lands in western San Diego County.

- How effective is grazing at reducing fire risk?
- Can grazing effectively enhance disturbed native grassland and forbland habitats?
- Can grazing enhance disturbed native coastal sage scrub habitat—including habitat for MSP listed species?

Rainfall is the dominant factor in vegetation response

- Rainfall and temperatures, soils and topography, all abiotic factors, interact with:
  - History of land use and vegetation
  - Management actions



C. Polis, Bytemuse.com

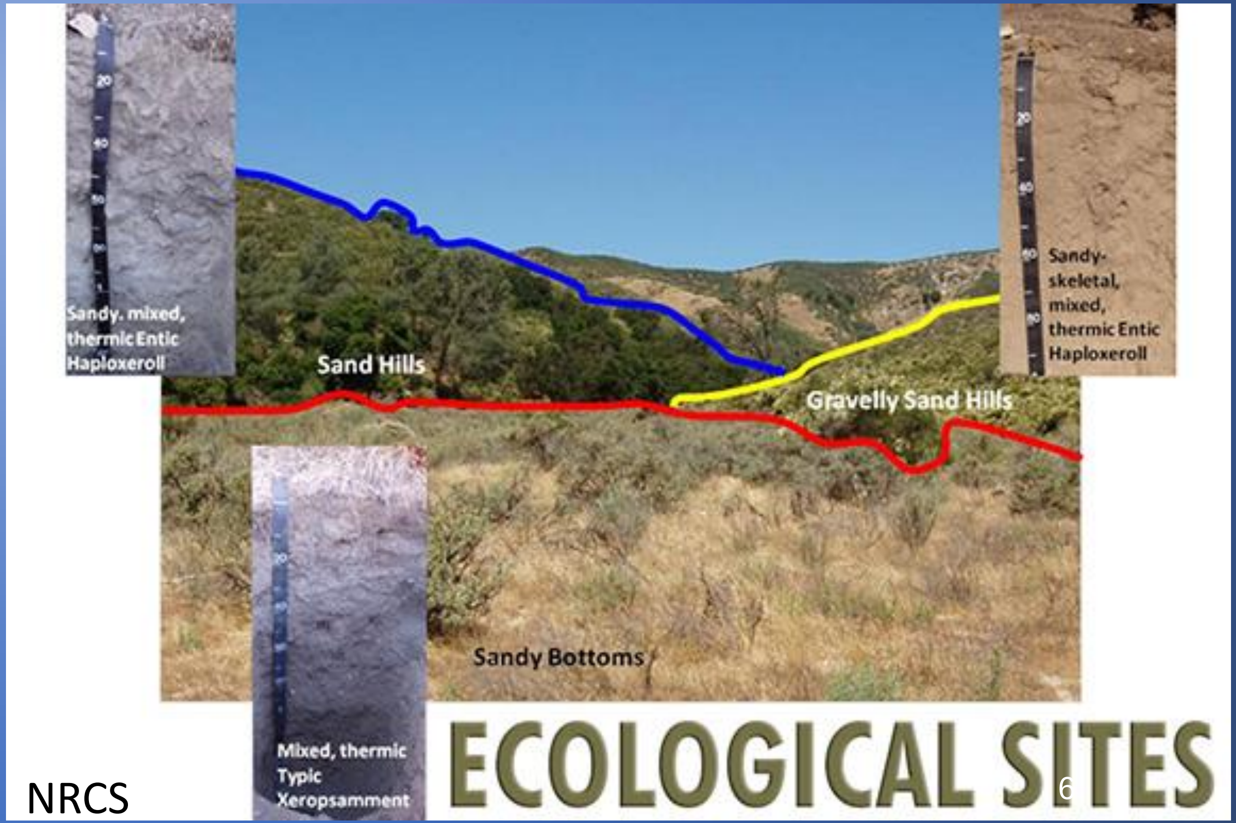
- **Stocking rate and grazing effects are NOT coupled.**

- **Grazing effects differ by site characteristics**

Ecological Site Description (ESD): a foundation for management

An ecological site is defined as a distinctive kind of land with specific soil and physical characteristics that differ from other kinds of land in its ability to produce a distinctive kind and amount of vegetation and its ability to respond similarly to management actions and natural disturbances. An ESD describes the ecological site.

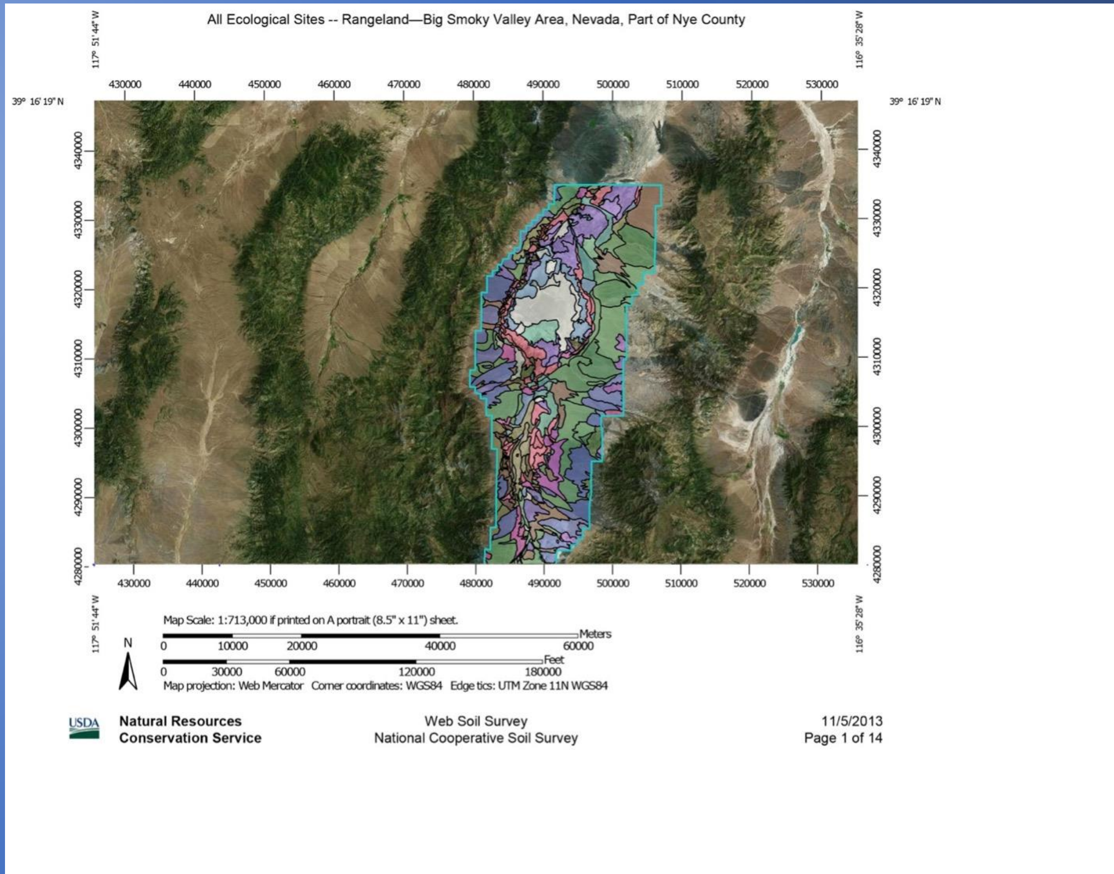
- Defined area
- Soils, topography, climate
- Site history (fire, cultivation, etc)
- States and transition models: data-driven models of vegetation dynamics and response to management



Ecological Site Descriptions: ESDs

- Different sites respond differently to management, grazing

- A landscape is made up of ecological sites
- Long term benefit to Jamul and Hollenbeck
- Nation-wide effort



Grazing is not a black box
it can be managed to:

- Reduce fuels
- Protect soils
- Reduce “thatch” and manage vegetation structure
- Consume invasive plants

“Selectivity” is an animal characteristic that means some vegetation is consumed first because of animal choice (preference)

- Can work in favor of management goals
- Interacts with intensity: the less feed available per animal the less selective animals can be
- Sometimes can work against management goals

How does animal behavior interact with specific “sites” with well-defined characteristics?: **Ecological Site Descriptions.**

Grazing management principles to attain desired outcomes for an ecological site:

1. **Kind and class** of livestock used

2. **Spatial distribution** of animals

3. **Temporal distribution** of animals

4. **Number** of animals per unit area

[Constrained by weather of course]

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Scientific Literature Review

Kaveh Motamed, UCB/LDFord
Associate Rangeland Manager

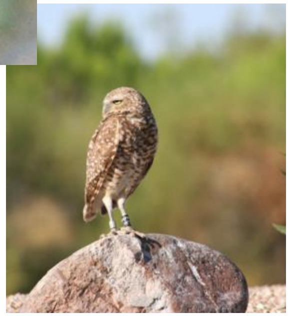
Literature Review Available Here:
https://sdmmp.com/view_project.php?sdid=SDMMP_SDID_187_5dfaaad75575d

Topics

- Ecological Site Descriptions and Associated State-and-Transition Models
- Grazing for Fire Risk Reduction
- Grazing to Enhance Disturbed Native Grassland and Forbland Habitats
- Grazing to Enhance Disturbed Coastal Sage Scrub Habitat
- Climate/Drought
- Type Conversion
- SDMMP Species
- Monitoring
- Benefits and Tradeoffs of Different Grazing Animals

Information Gaps

- Grazing for Fire Risk Reduction (In California rangelands)
- Grazing to Enhance Disturbed Coastal Sage Scrub Habitat
- SDMMP Covered Species and Grazing



New Literature on Ecological Site Descriptions (ESDs) and State-and-Transition Models (STMs)

- An Inductive Approach to Developing Ecological Site Concepts with Existing Monitoring Data
  - (Heller, A., N. P. Webb, B. T. Bestelmeyer, C. W. Brungard, and Z. M. Davidson. 2022. An Inductive Approach to Developing Ecological Site Concepts with Existing Monitoring Data. Range Ecology & Management. Vol. 83. Pp. 133-248. https://doi.org/10.1016/j.rama.2022.03.009)

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Conceptual Models

1. Determine grazing impacts to:

- Grassland/shrubland plants (native/exotic)
- Sage scrub habitat maintenance
- Wildlife and MSP species habitat
- Critical fuel loads

2. Role of ecological sites

3. Final grazing monitoring plan

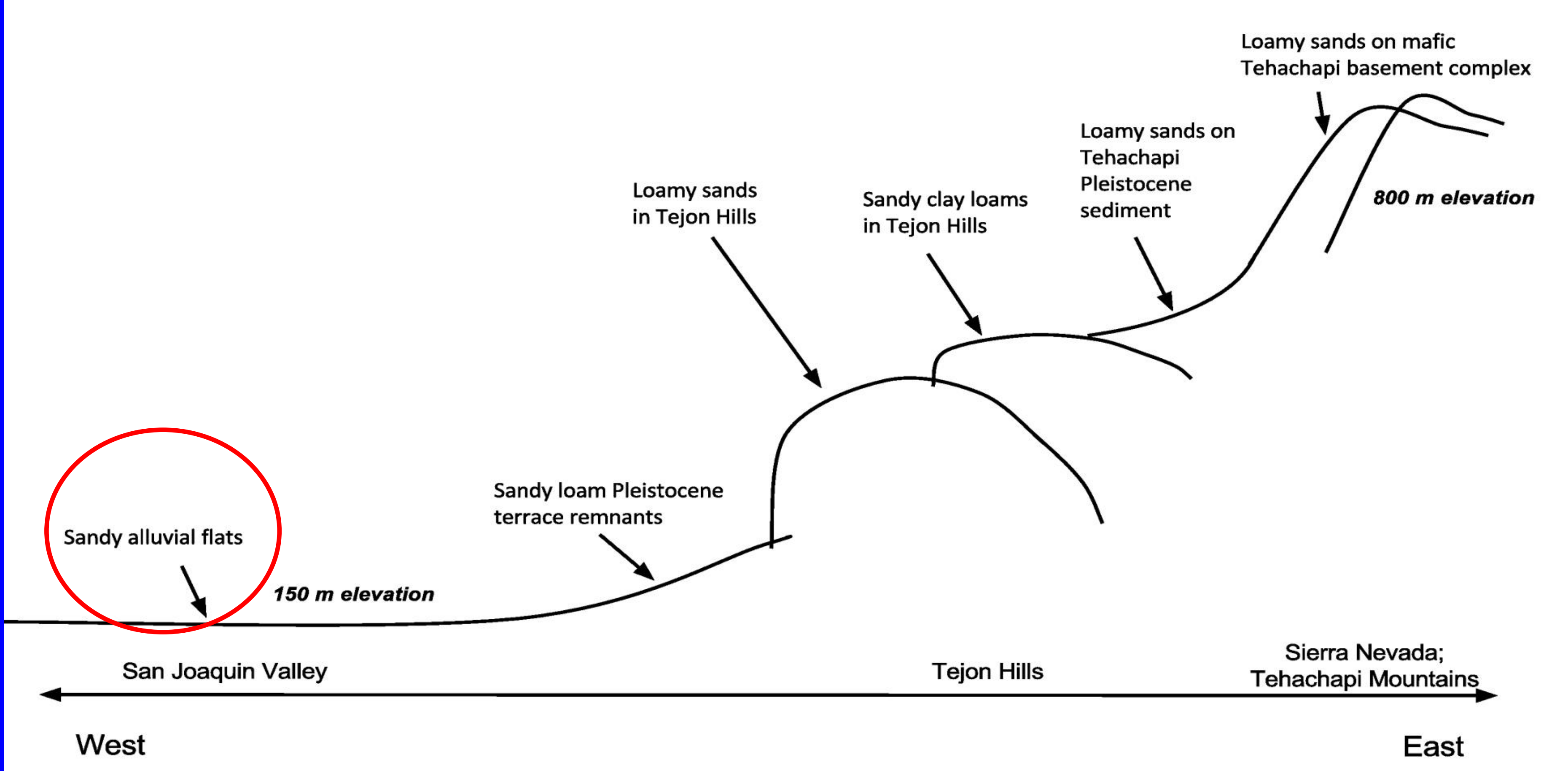
Ecological Site Definition

"An assemblage of land units within a singular climate, with similar topographic and soil characteristics that support similar potential vegetation and respond similarly to management"

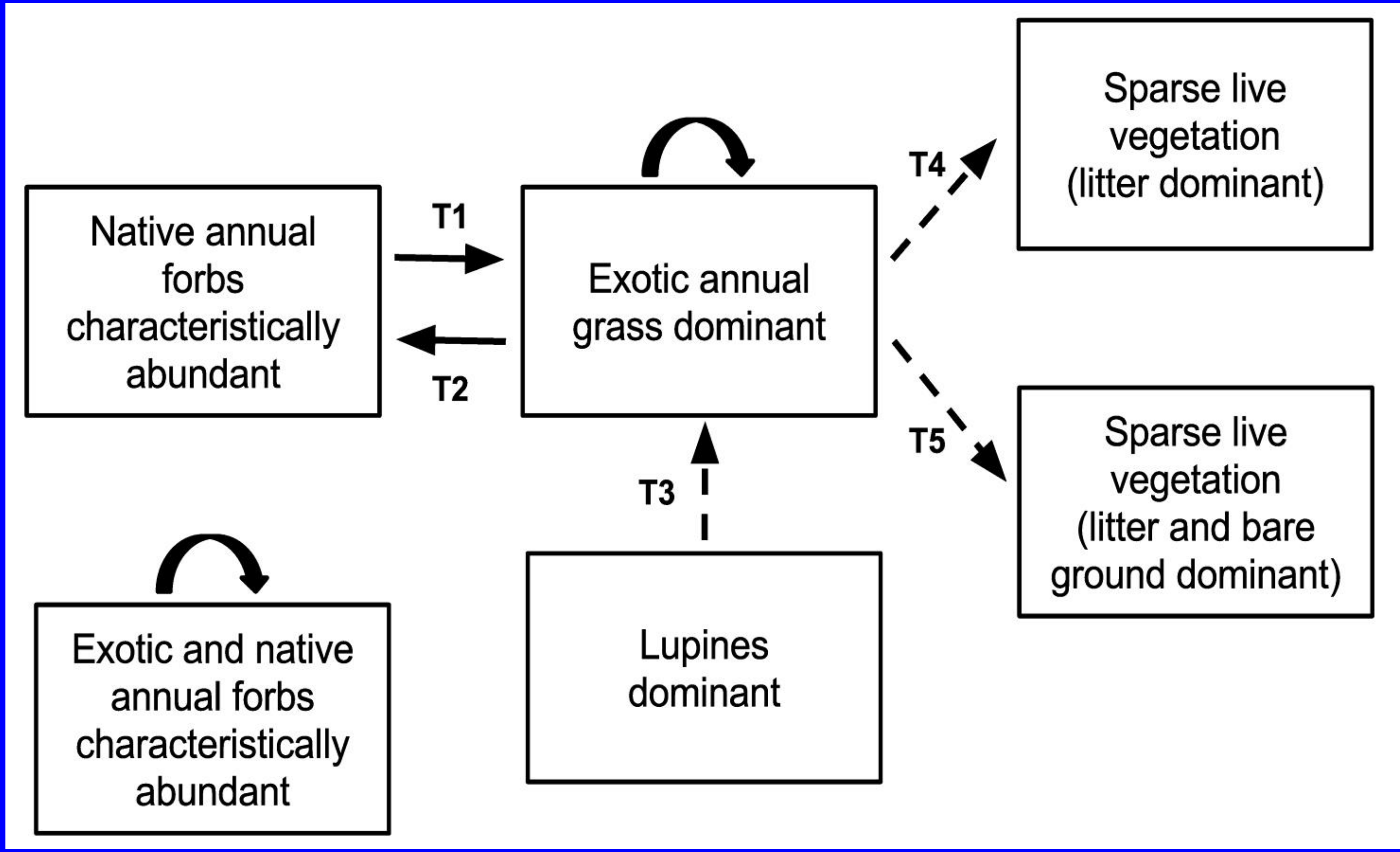
Drivers of Biodiversity on Managed Rangelands

Spatial Scale	Area	Primary Drivers
Ecological Site	10,000 Acres	Geology and Soils, Land Conversions, Climate Change
Ranch	1,000 Acres	Soils and Geology, Economics, Ecosystem Services, Weather, Land Conversions
Pasture	100 Acres	Soils, Habitat Loss, Fire, Grazing practices, Invasives, Residual Dry Matter

Ecological Sites in the Tejon Hills



State-and-Transition Model
Sandy Alluvial Flats



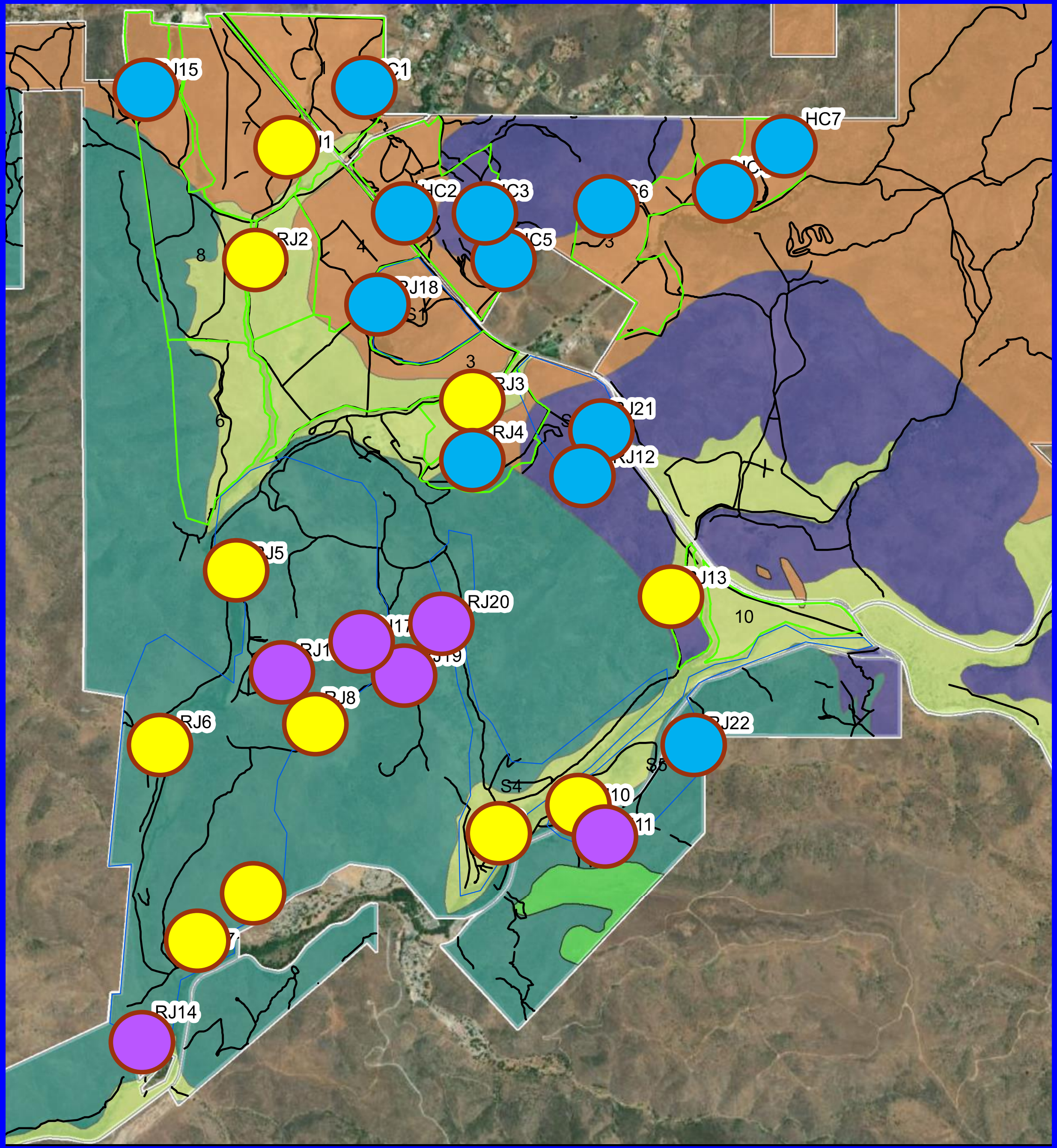
Alluvial sites; all geology types

Hilly sites; granitic and gabbro geology

Hilly sites; metavolcanic geology

Geology

- Cuyamaca Gabbro
- Fanglomerate
- Granitoid rocks
- Santiago Peak Volcanics
- Terrace deposits
- Young alluvium



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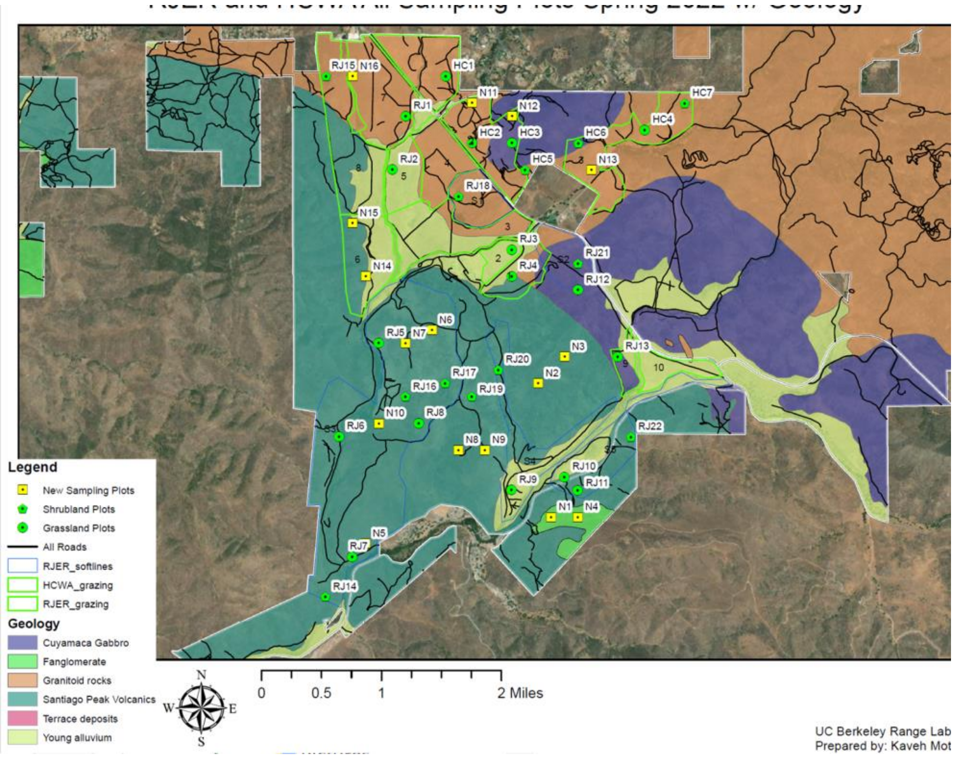
Site Visits

Kaveh Motamed, UCB/LDFord
Associate Rangeland Manager

Fall 2021

- Establish monitoring plots
- Establish a sampling approach
    - SANDAG, CDFW, and John Austel (Rancher)
- Data collection
    - Site characteristics
    - Residual dry matter (RDM)
    - Soil (chemical analysis & phytoliths)



Spring 2022

- Additional monitoring plots
- Composition monitoring
    - % cover
    - Species richness
- Spring biomass monitoring

Other Visits

- Discuss ranch operations with J. Austel
- Evaluate production and phenology
- Observe grazing practices and impacts
- Observe wildlife

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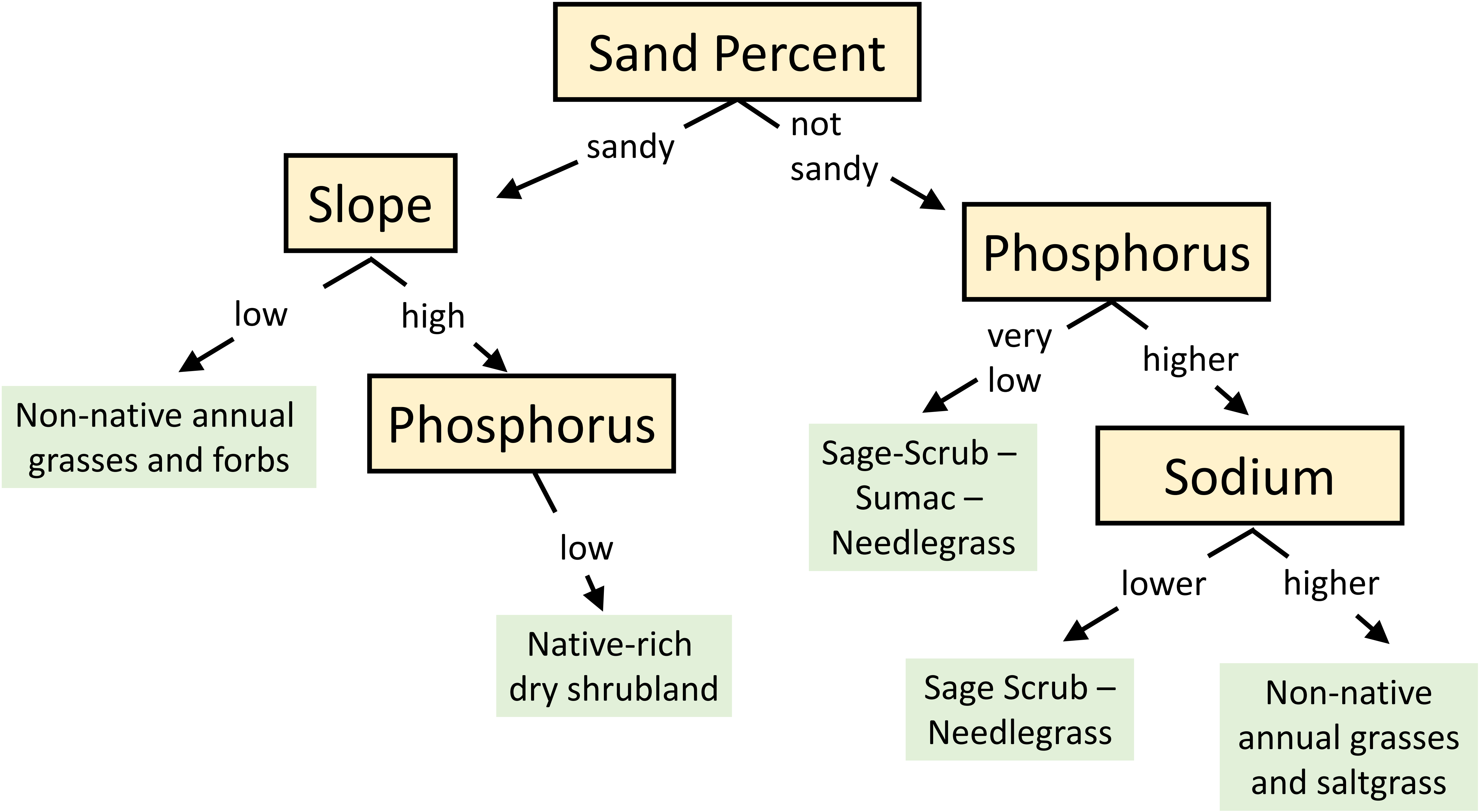
Preliminary Results


Sand Percent
sandy
not sandy
Slope
low
high
Non-native annual grasses and forbs
Phosphorus
low
Native-rich dry shrubland
Phosphorus
very low
higher
Sage-Scrub – Sumac – Needlegrass
Sodium
lower
higher
Sage Scrub – Needlegrass
Non-native annual grasses and saltgrass

Ecological Sites

Ecological Site	**Landform**	**Sand (%)**	**Nitrogen**	**Phosphorus**	**Potassium**	**Sodium**
1. Low-slope, alluvial site	Low-slope, valley-bottoms	52%	High	High	High	High
2. Hilly Granitic/Gabbro Site	Hills	75%	Moderate	Moderate	Low	Low
3. Hilly metavolcanic site	Hills	40%	Moderate	Very low	Moderate	Moderate

Preliminary Results Ecological Sites

- 1 — Alluvial sites; all geology types
- 2 — Hilly sites; granitic and gabbro geology
- 3 — Hilly sites; metavolcanic geology

Geology

- Cuyamaca Gabbro
- Fanglomerate
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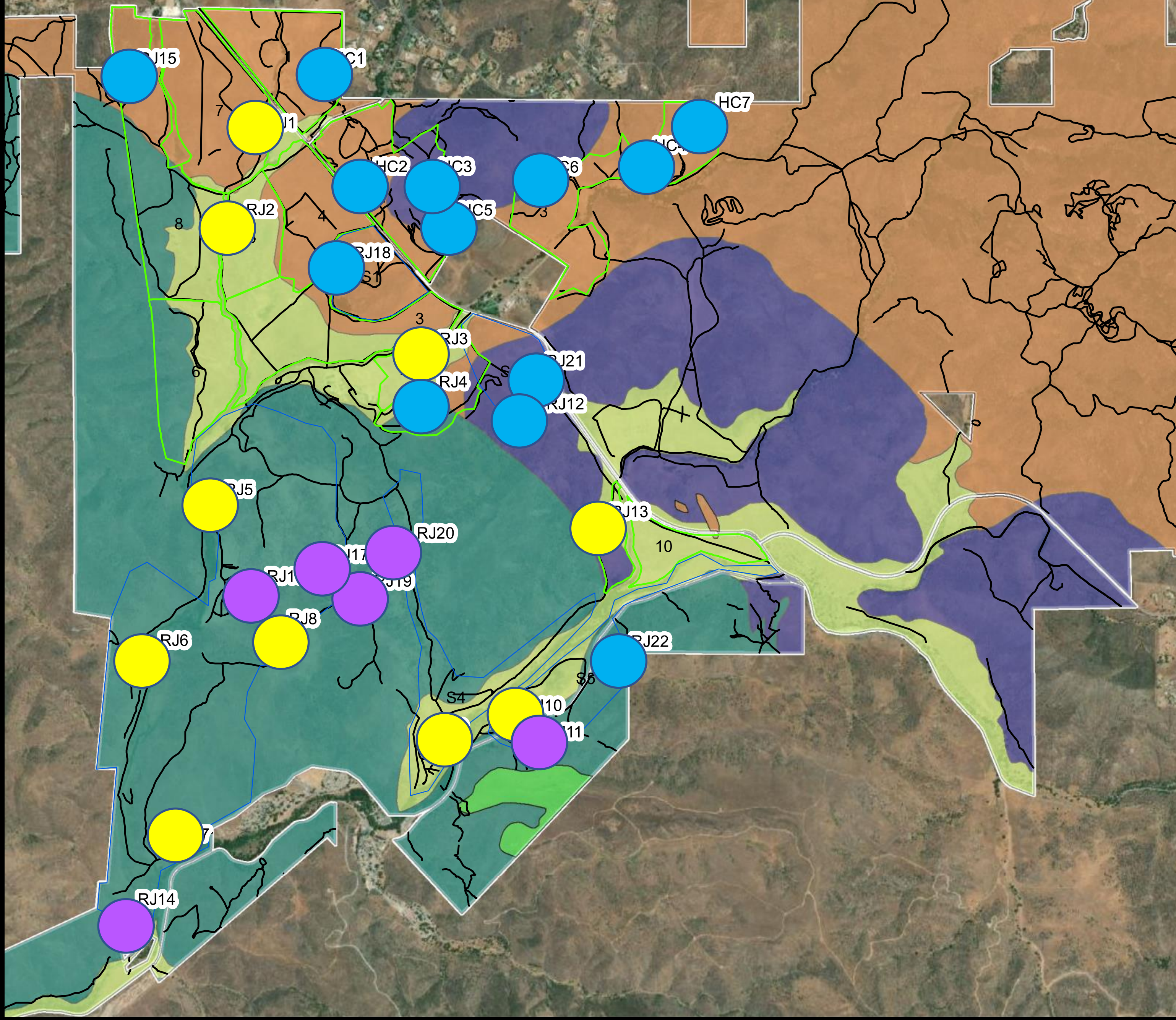
- Terrace deposits
- Young alluvium



0 0.5 1 2 Miles

Preliminary Vegetation 'States'

- Methods:
  - Hierarchical cluster analysis to define patterns
  - Based on species occurrence not cover
- Five different 'States' across 32 plots
  - 3 shrub states
  - 2 grassland states
- Relatively consistent species occurrence within states
- Different composition and structure between states

Characteristics of the five states

Vegetation State	Common/Dominant Species	Bare Ground	Spring Herbaceous Biomass
1. Non-native annual grasses and forbs	Wild oats, filaree, fiddle necks, lupines	17%	1900 lbs/acre
2. Non-native annual grasses and saltgrass	Rip-gut brome, wild oats, bindweed, purple false brome	10%	2400 lbs/acre
3. Native-rich dry shrubland	CA sagebrush, CA buckwheat, Bahiopsis, Mirabilis, dodder	33%	500 lbs/acre
4. Sage scrub – Needlegrass	CA Sagebrush, CA buckwheat, red brome, spike moss, pygmy weed, needlegrass	11%	3000 lbs/acre
5. Sage scrub – Sumac – White Sage -- Needlegrass	CA Sagebrush, Sumac, white sage, needlegrass	6%	1300 lbs/acre

State 1. Non-native annual grasses and forbs


23 Mar 2022, 10:50:19


22 Mar 2022, 10:47:24

State 3.
Native-rich dry shrubland


S
SW
180
240
10
(T) 32°41'56"N, 116°52'21"W ±13ft
21 Mar 2022, 13:

State 5. Sage scrub – Sumac – White Sage – Needlegrass

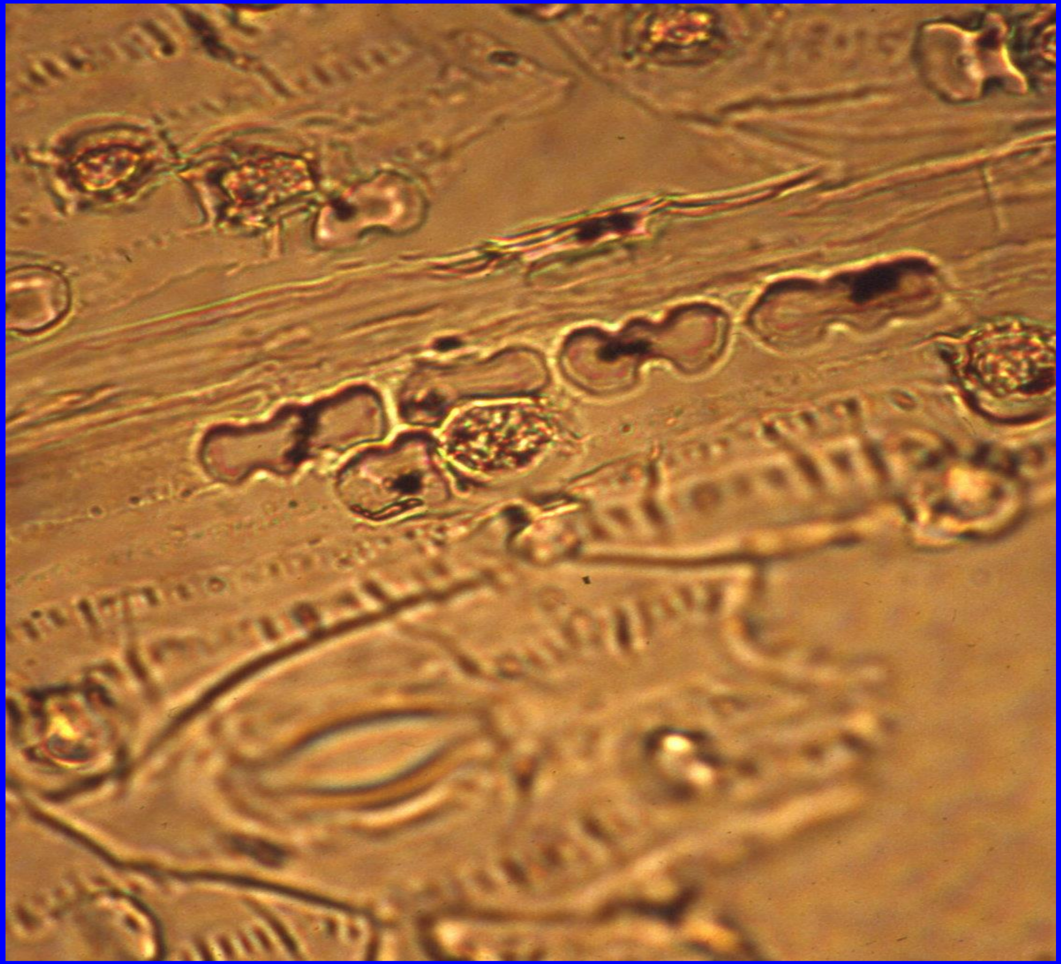
Overview of Ecological Site and Vegetation State Results

- Landscape variables account for much of the variation in vegetation
- Three ecological sites encapsulate major differences in soils, topography, and landforms
- Across these three ecological sites, we have described 5 preliminary vegetation states.
  - Some states are strongly related to ecological sites, others not
- There are key differences in biodiversity and herbaceous fuels in each of the states, including between shrub states
  - This has implications for how grazing may affect our three study goals

Chemistry and Phytoliths

- Mixed shrubs, native perennial, and exotic annual grasses in a grazed pasture at Jamul

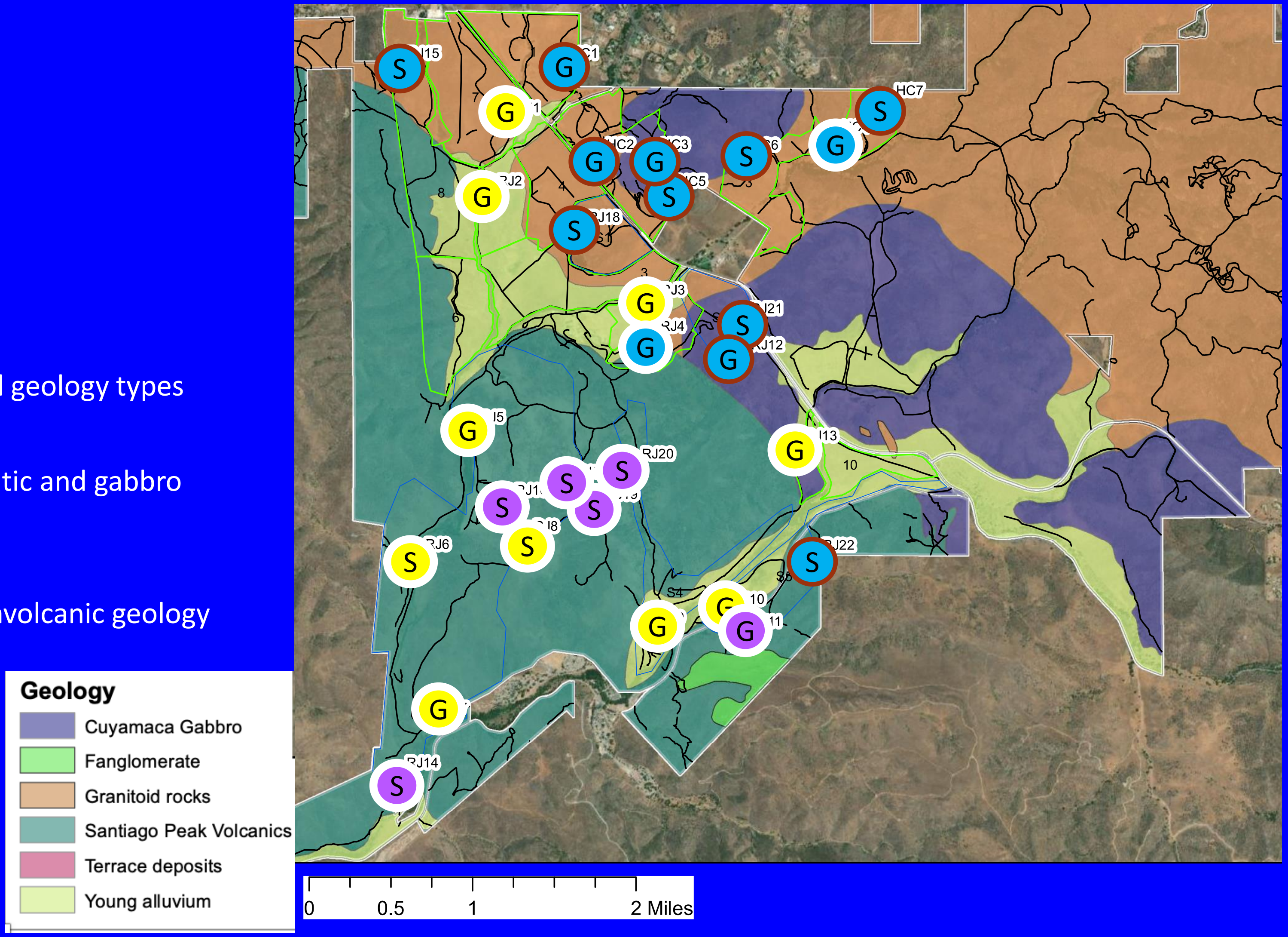
Dumbell-shaped opal phytoliths in *Nassella lepida* leaf



Alluvial sites; all geology types

Hilly sites; granitic and gabbro geology

Hilly sites; metavolcanic geology



UC Berkeley Range Lab 202
Prepared by: Kaveh Motame

Comments

1) Biological diversity and its potential drivers are dependent upon spatial and temporal scale.
2) Arid grass dominated systems tend towards non-equilibrium types: only a limited set of drivers are subject to management intervention.
3) Ecological Site Descriptions and associated State-Transition models are a useful framework for promoting, planning, and evaluating biodiversity drivers but are hampered in California by funding.

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Next steps:
Fuels characterization

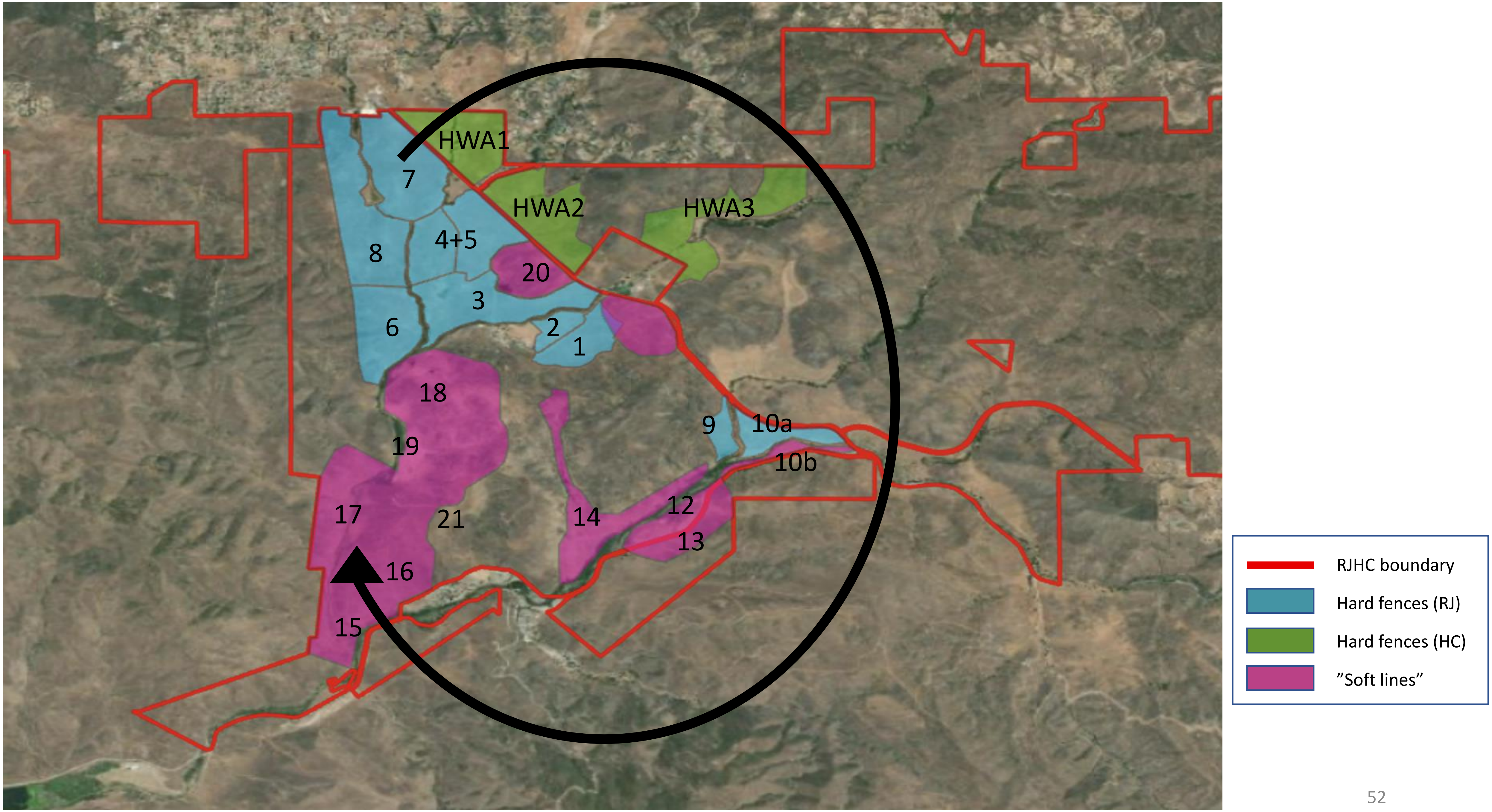
Matthew Shapero, M.S.
California Certified Rangeland Manager (Lic #M125)

1. **How effective is grazing at reducing fire risk?**

    - <u>Objective 1:</u> To reduce flammable non-native herbaceous fuels to protect preserve from fire ignitions and spread.
    - <u>Objective 2:</u> To reduce native and non-native fuel loads in a fuel break to protect preserve from fire.

2. Can grazing effectively enhance disturbed native grassland and forbland habitats?

3. Can grazing enhance disturbed native coastal sage scrub habitat?


HWA1
HWA2
HWA3
7
8
4+5
20
3
6
2
1
18
19
9
10a
10b
17
21
14
12
13
16
15
RJHC boundary
Hard fences (RJ)
Hard fences (HC)
"Soft lines"

Grazing Chart

Year 2021-2022

Pastures	Acres	October				November				December				January				February				March			
1	70																	2/5	2/16						3/26
2	30																								
3/4/5	328	9/24						11/24												2/16			3/12		
6	128																								
7	162															1/15	2/5								
8	200																	2/5	2/16						
9	30																			2/16	2/25				
10	54																					2/25		3/26	
11																									
12																									
13		10/1											12/31												
14																									
15									11/24		12/15														
16												12/15					2/5								
17																								3/12	3/29
18																									
19																									
20														12/31	1/15										
21																									
HWA1	123																								
HWA2	144																								
HWA3	163																								
Total	1432																								

Pastures	April				May				June				July				August				September				AUD	AUD/acre
1	4/2				5/1					6/11															1349	19
2																									1692	56
3/4/5											6/11	7/2													11768	36
6																									0	0
7		4/2																							2100	13
8													6/26	7/15											4052	20
9																									2150	72
10																									3900	72
11													7/2													
12																										
13																										
14																										
15																										
16																										
17																										
18				4/22				5/28																		
19																										
20																										
21																										
HWA1	3/29		4/22																						3312	27
HWA2									5/28			6/26													4002	28
HWA3															7/15											0

	October–January	February	March	April	May	June	July	August	September
Supplement or feed									
Type and amount	16% Natural Protein (1#/hd/day)								

Type of animals	**No.**	**AUs**																						
Cows	130	130	130	130	130	130	130	130	130	130	130	130	130	130	138	138	138	138	138	138	138	138	138	138
Yearlings	70	52.5	70	52.5	70	52.5	70	52.5	70	52.5	70	52.5	70	52.5	0	0	0	0	0	0	0	0	0	0
Stockers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	28	56	28	56	28	56	28	56	28
Bulls	8	10	8	10	8	10	8	10	8	10	8	10	8	10	11	13.75	11	13.75	11	13.75	11	13.75	11	13.75
Total	**208**	**192.5**		**192.5**		**192.5**		**192.5**		**192.5**		**192.5**		**192.5**	**205**	**179.75**		**179.75**		**179.75**		**179.75**		**179.75**

	October	November	December	January	February	March	April	May	June	July	August	September
Remarks:						20 steers to feedlot (3/26)						

"AUs," or Animal Units, are calculated as follows: Mature Cow (x1), Yearlings (x0.75), Bull (x1.25), Stockers (x0.5)
"AUDs" -- Animal Unit Days

Ongoing and future tasks during the grazing years (2021-2024)

- Continue to document spatial and temporal patterns of grazing
  - Grazing chart (J. Austel)
  - “In” and “out” photo point monitoring (J. Austel)
  - Forage production (Spring ‘22) and RDM monitoring (Fall ’21, ‘22)
  - Fine-tune pasture fence line spatial records

- Use grazing records, Fall RDM biomass data, and modeled daily intake figures to calculate reduction of non-native herbaceous fuels (Ratcliff et al., 2022)

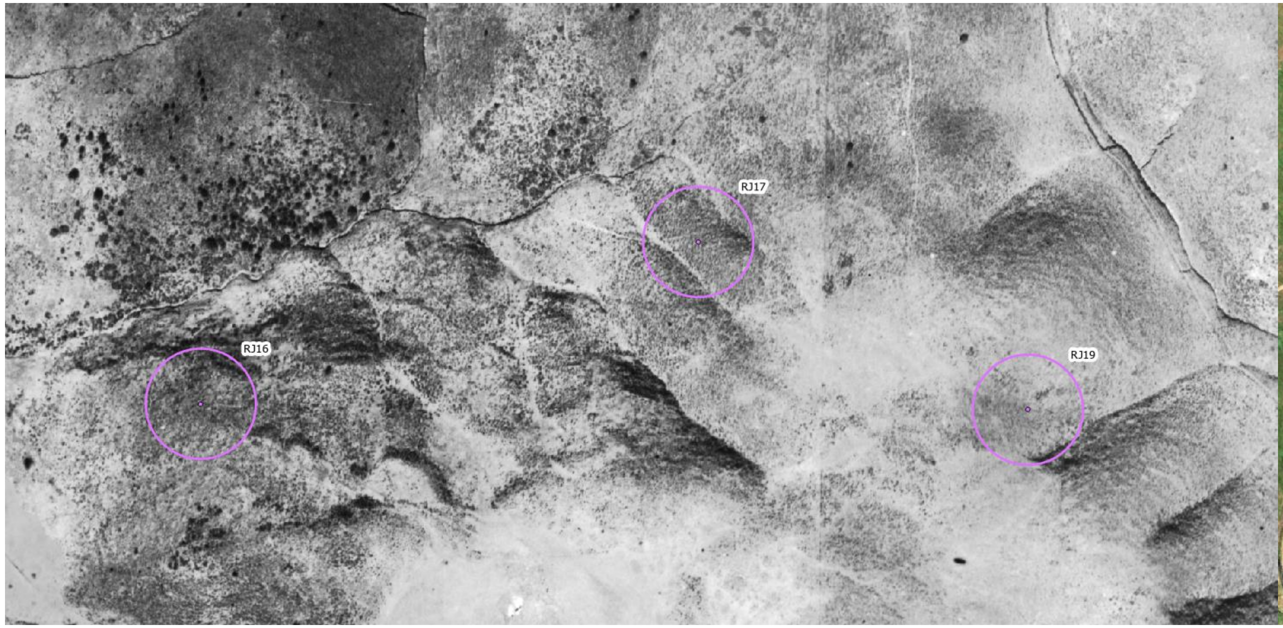
- Use measured RDM biomass data to draw conclusions about anticipated fire behavior (Shapero et al., *in press*)

- Produce “heat map” of Rancho Jamul-Hollenbeck Canyon to communicate extent and intensity of fuel reduction through grazing

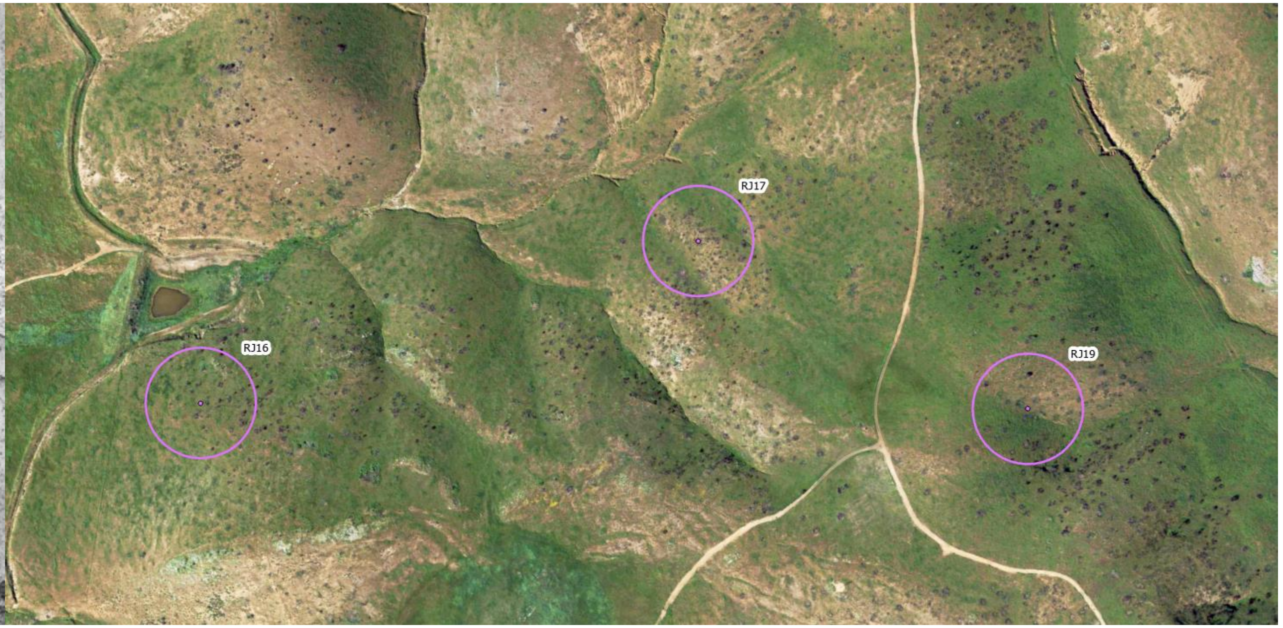
- Discuss viability of small-scale experimentation with grazing and prescribed fire to directly address “effectiveness” question in both grassland and shrubland habitats.

Spatial analysis of long-term change

Joyce Qiao
UC Berkeley, Masters Student in Range Management

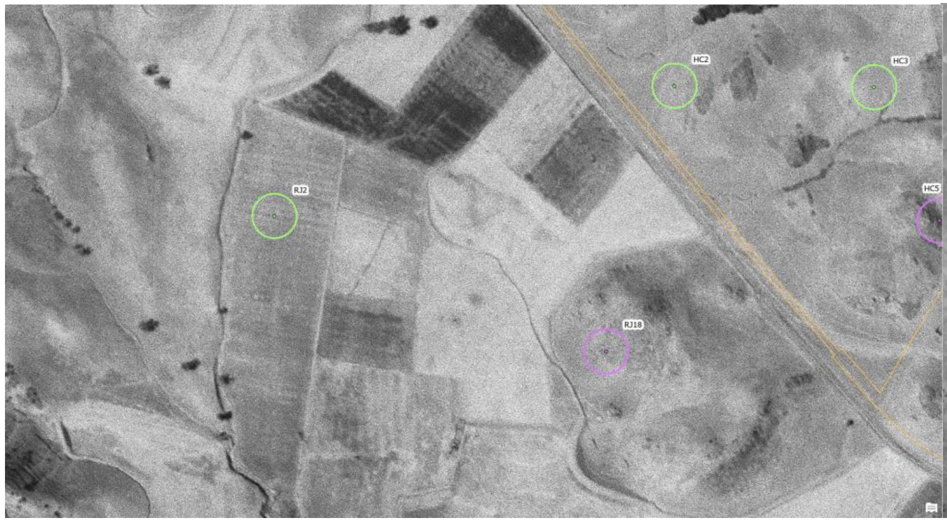


1928 County Historical (1ft)
Month unknown

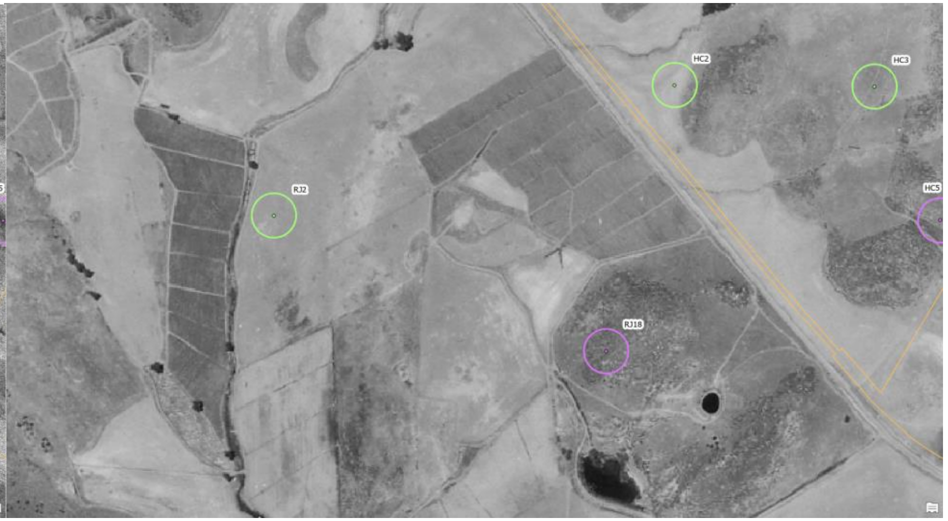


2008 SANDAG (1ft)
Jan-Feb

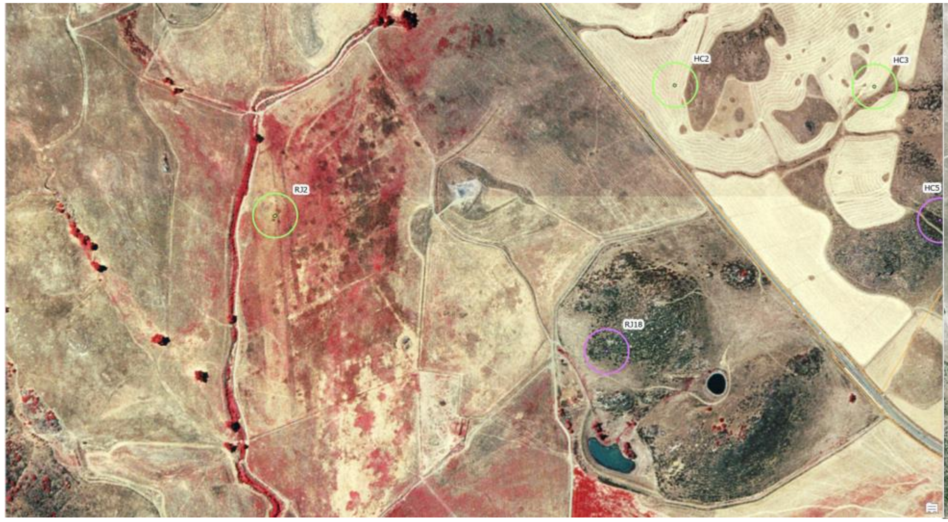
Historical land management & use: grazing, agriculture



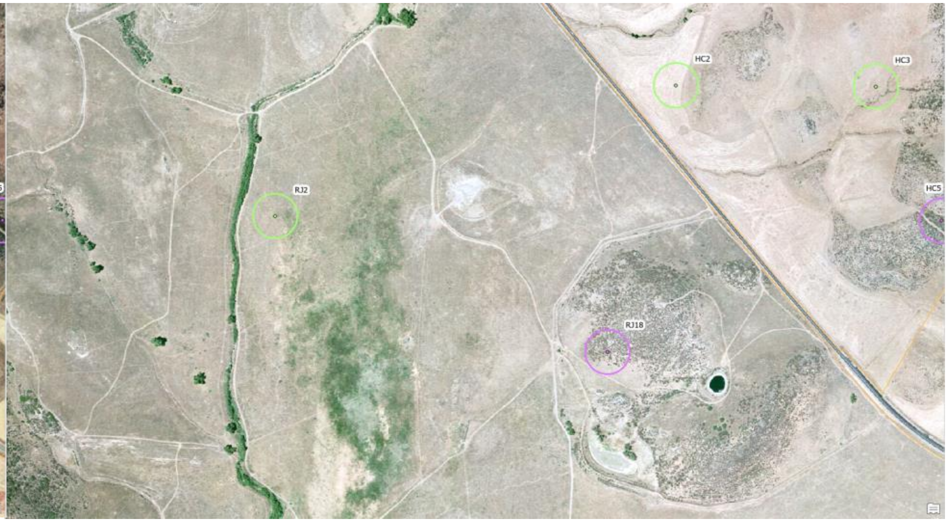
1956 Earth Explorer (1.8ft)
September



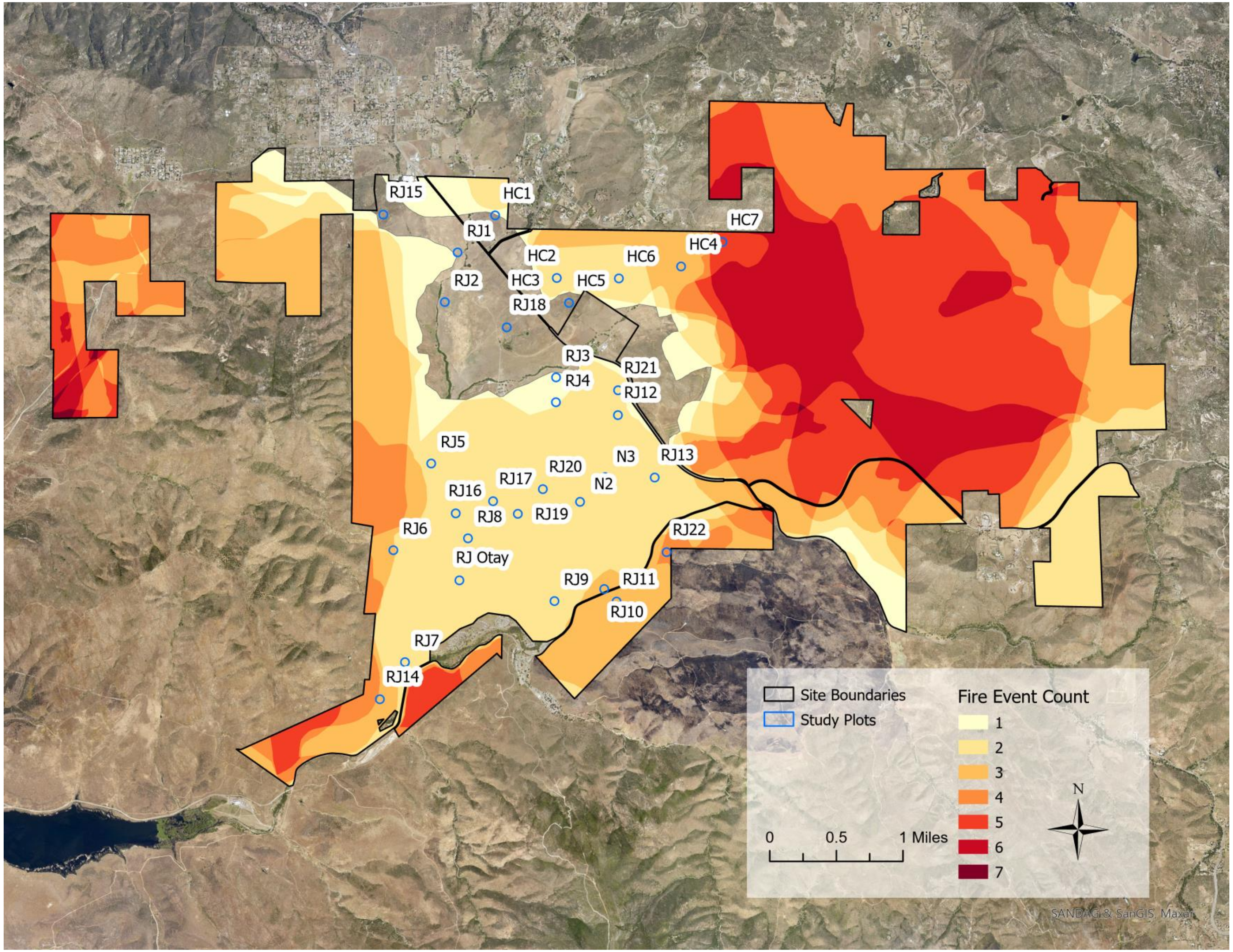
1989 County Historical (9.59ft)
May



1996 SANDAG (?ft)
Color-Infrared only; Month unknown



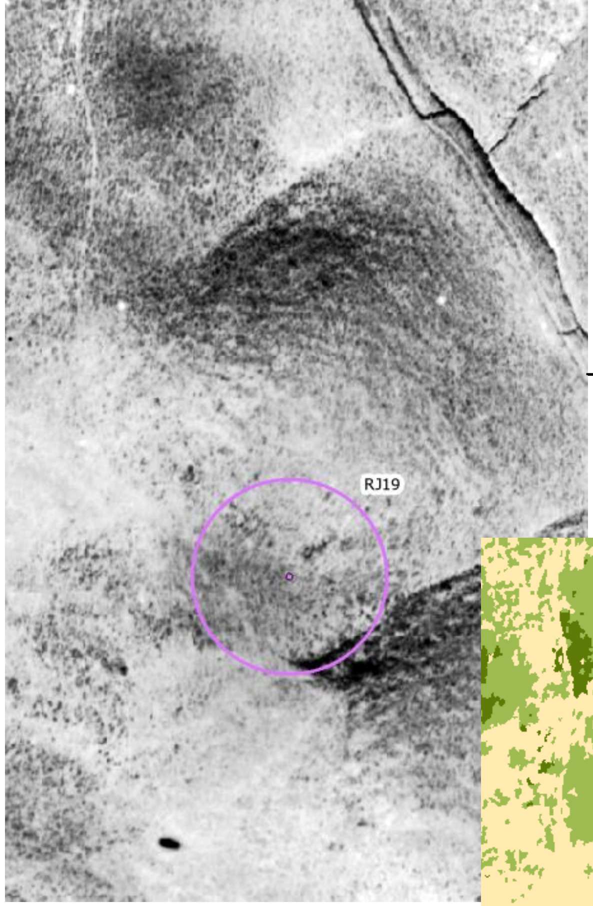
2000 County Historical (2ft)
Month unknown



Fire History

Fire frequency: Cal-FIRE Perimeters 1910-2017 (31 total fire events)
Aerial imagery: Spring 2017 SANDAG (9in)

Shrub cover
ex: classifying *Malosma laurina*



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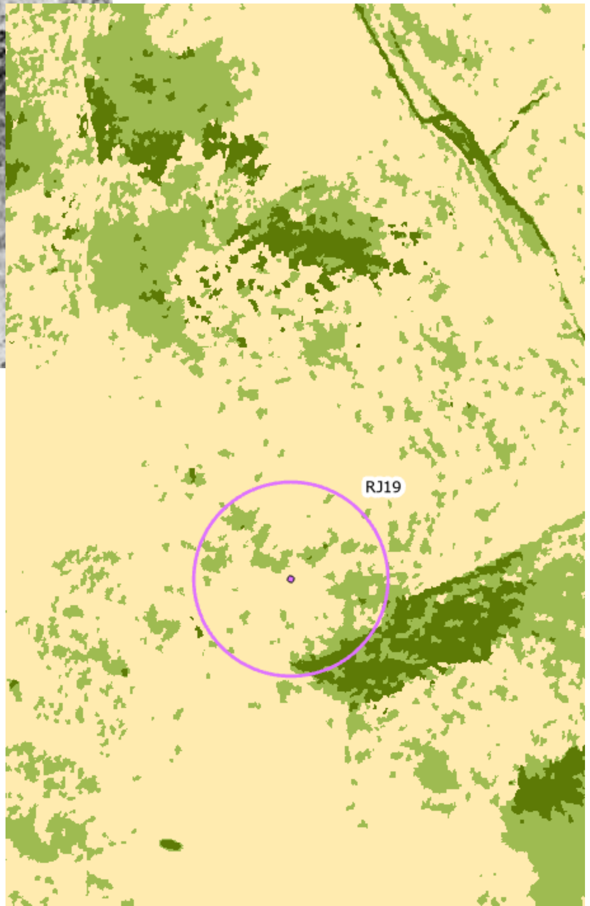

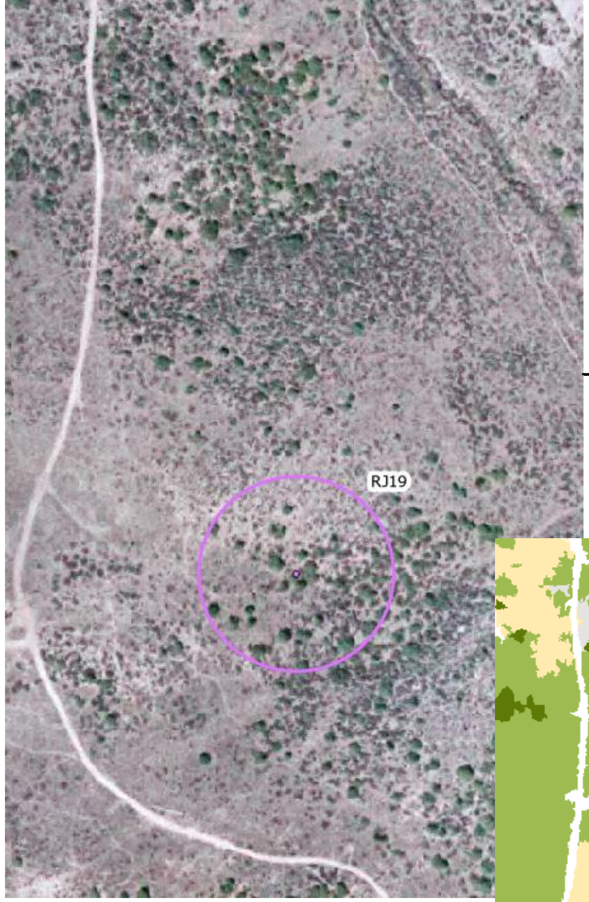

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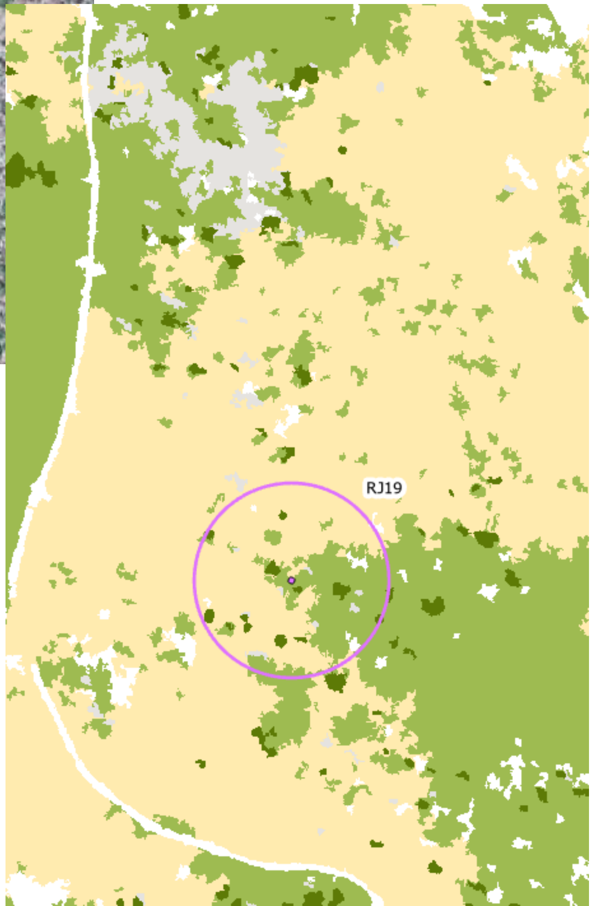

Class_name
- Grassland
- MALA shrub
- Non-MALA Shrub
- Shadow / Litter

Incorporating Grazing

- Baseline understanding of Ecological Sites, Vegetation States/Transitions under current grazing operations
  - Working with John to better understand his operations and monitoring
- Develop hypotheses on system responses based on evaluation of existing ranching operations and historical information (e.g., aerial photography, USGS data, fire history)
- Use baseline data to prioritize sites, revise hypotheses, and refine data collection

Discussion