THE ADVANCEMENT OF NATIVE SHRUBS INTO NON-NATIVE GRASSLANDS IN LA JOLLA VALLEY CA



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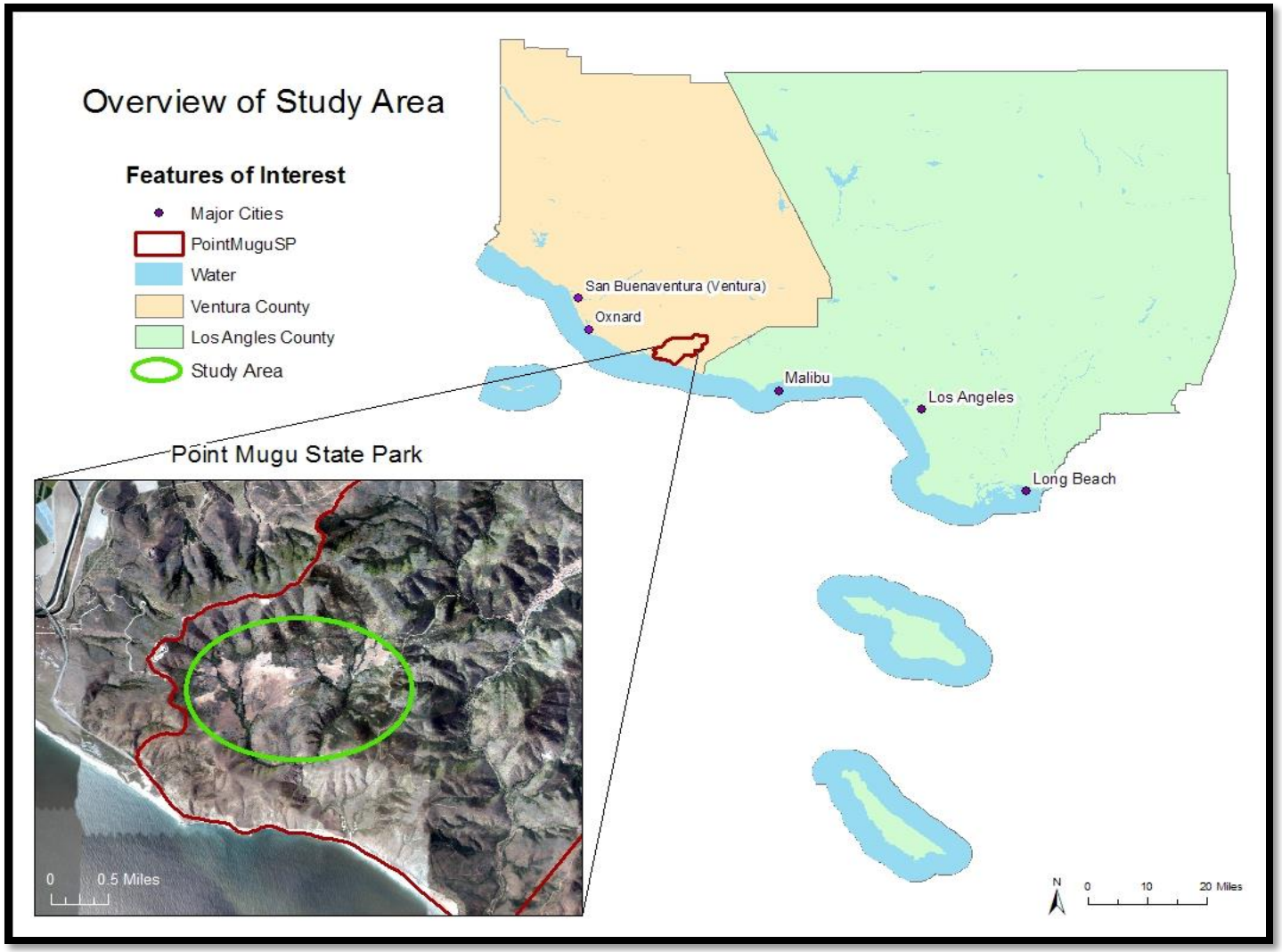
SCAS 2013

INTRODUCTION



Type Conversion

Diverse Plant Community

A (Homogenous) Non-Native Grassland

Is there a driving force behind this?

Types of Disturbances

Photo Credit: LA Times

Objectives of the Study

- Geosciences Diversity Enhancement Program's (GDEP) Results
  - Eliminate fire, soil composition, slope, and aspect
  - Expand on studies about advancing boundaries and pioneer species

Samantha's Results:

Recovery vs. Stable: Leading Native Species							
	Artemesia californica	*Eriogonum fasciculatum*	*Baccharis pilularis*	*Mimulus aurantiacus*	*Nassella pulchra*	*Melica imperfecta*	Other
Recovery	31	13	6	10	13	8	39
Stable	7	3	0	2	4	0	35
Chi Square Probability	0.00010	0.01242	0.01431	0.02092	0.02905	0.00468	Difference ≥ 0.05

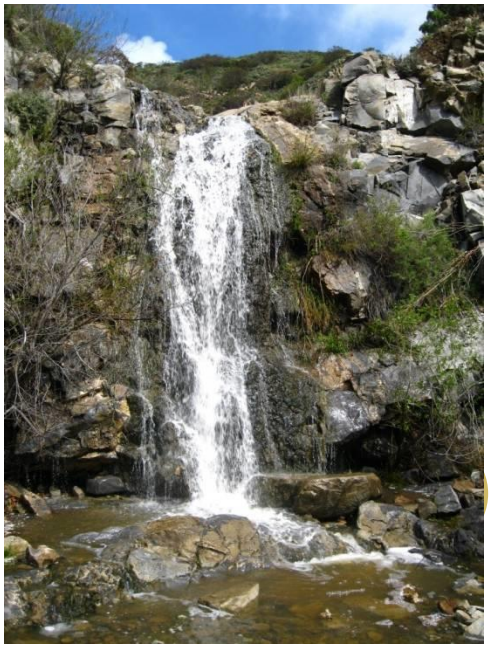
Nancy's Results:

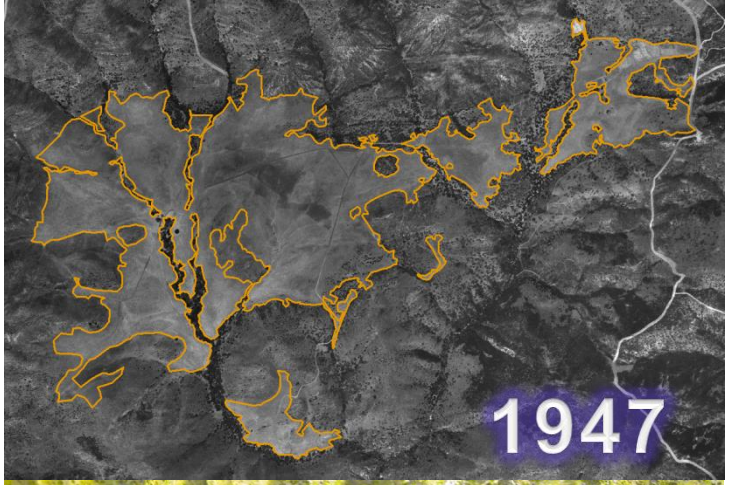
Time	CSS loss	CSS recovery	NET GAIN	YEARS	LOSS/YEAR	GAIN/YEAR	NETGAIN/YEAR	GAIN/LOSS
1947-1970	116,551	430,659	314,108	23	5,067	18,724	13,657	3.70
1970-1983	139,370	353,918	214,548	13	10,721	27,224	16,504	2.54
1983-2000	182,618	260,866	78,248	17	7,940	11,342	4,603	1.43
1947-2000	88,051	674,955	586,904	53	6,773	12,735	11,074	7.67

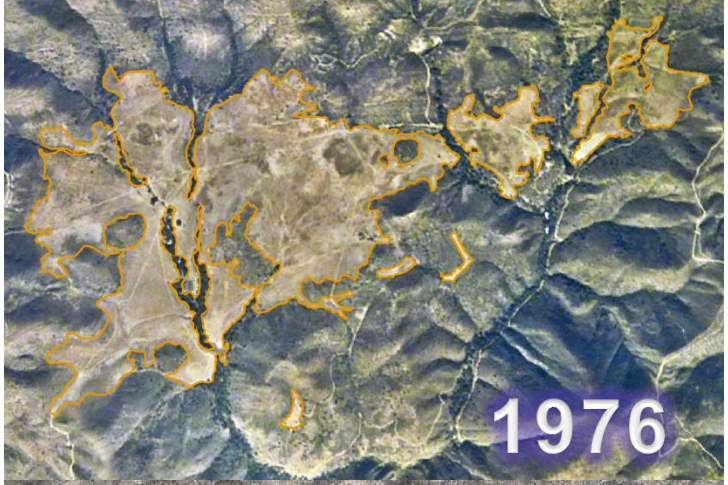
All units are in square meters.

Objectives of the Study

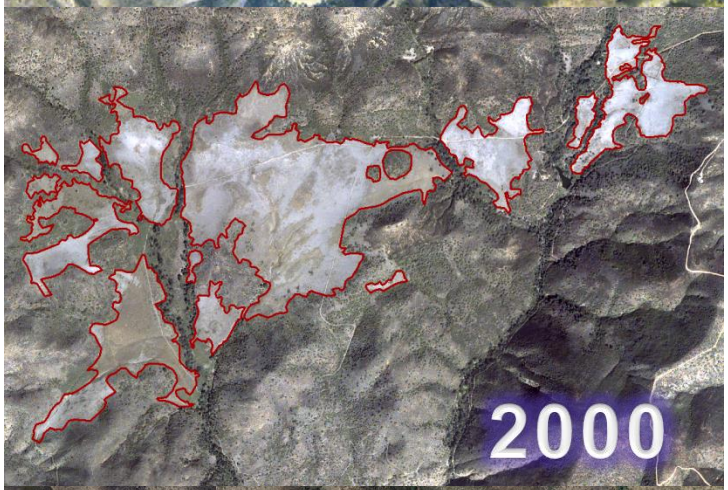
- Analyze advancing boundaries of CSS
  - Incorporate more aerial images
  - Digitize advancing boundaries
  - Choose boundaries for field work
    - 17 boundaries with 2 points each = 34 points total
- Identify, if any, pioneer species in the grasslands
  - Broaden the sampling range
  - Belt versus quadrat method
  - Determine if results are significant
    - Chi Square Analysis
    - Spearman's Rank Order Correlation

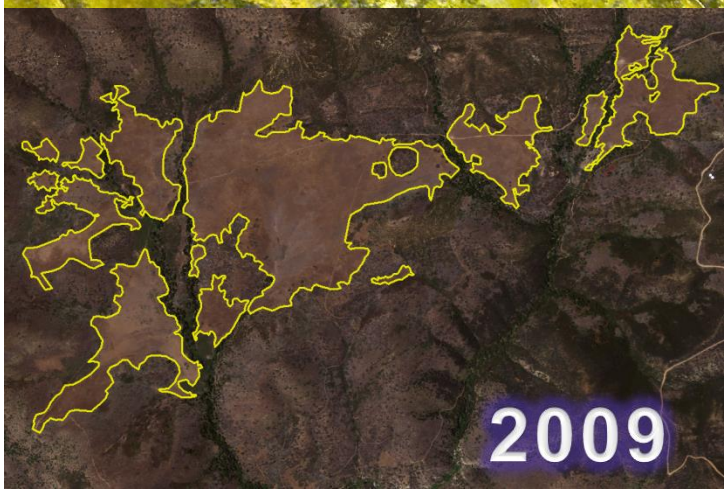


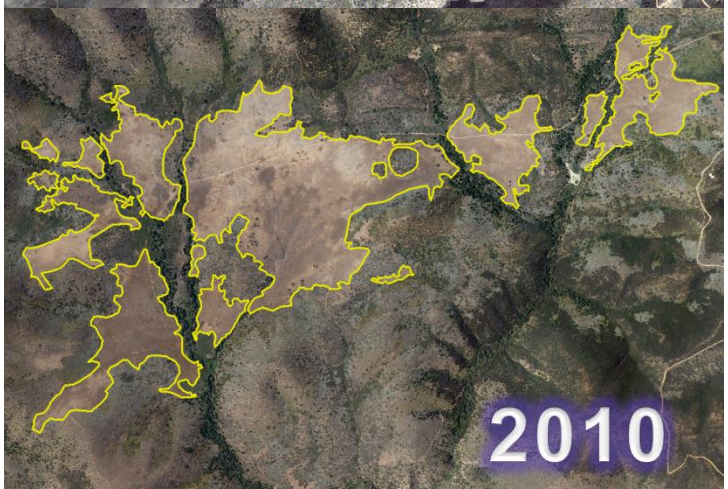

1947


1976


1983

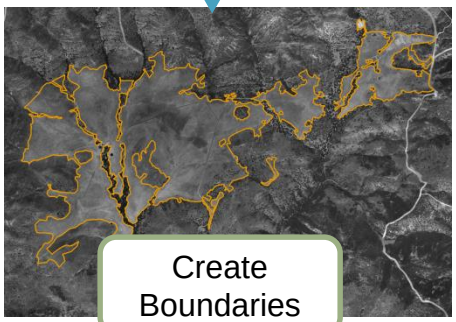

2000


2009


2010

Obtain Imagery

Georeference



Create Boundaries

Convert Features to Raster

Reclass

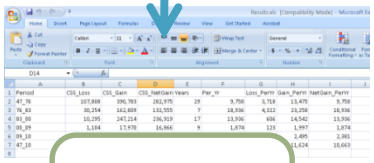
Raster Map Algebra

Reclass Again! Party!

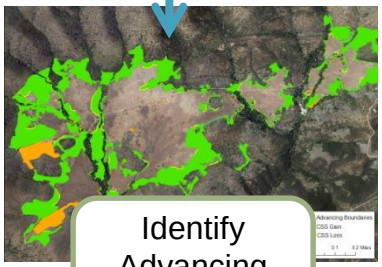
Convert Rasters to Polygons

Add Field for Square Meter

Calculate Geometry



Record Statistics



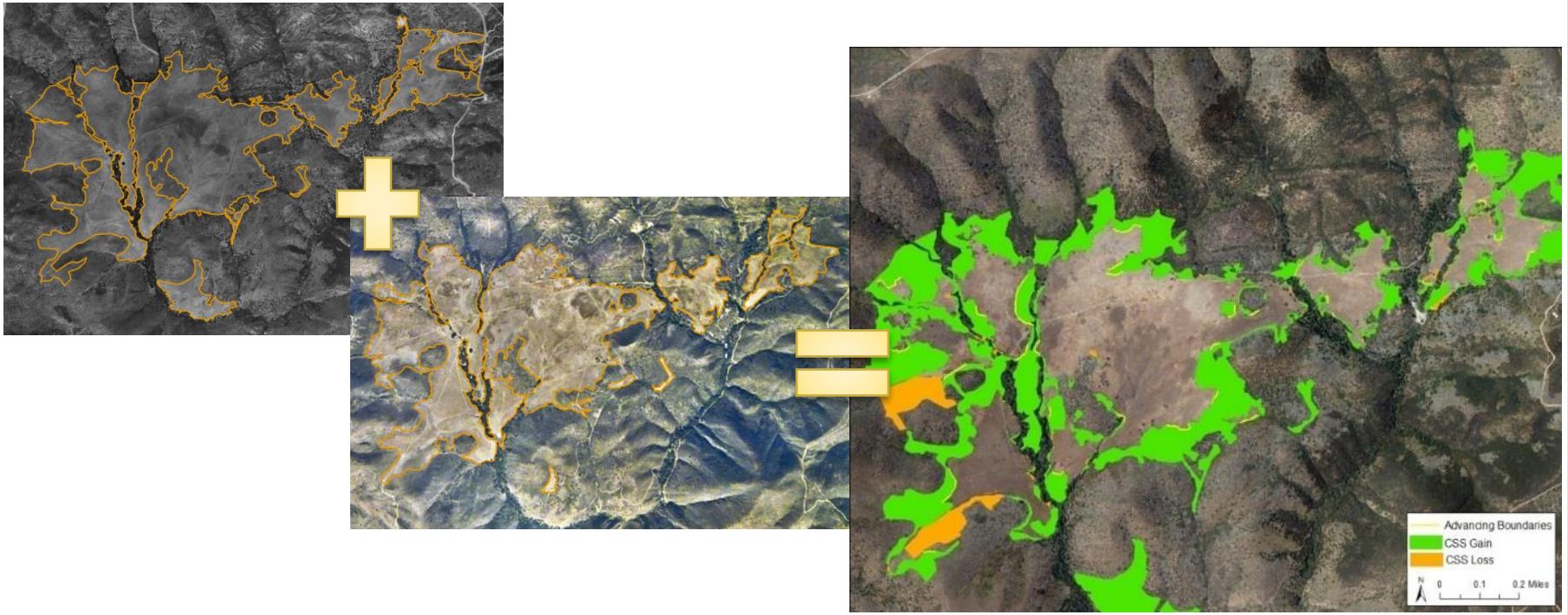
Identify Advancing Boundaries

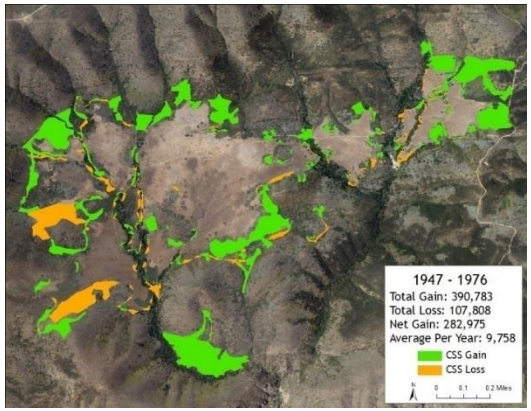
Create Boundary Shapefile

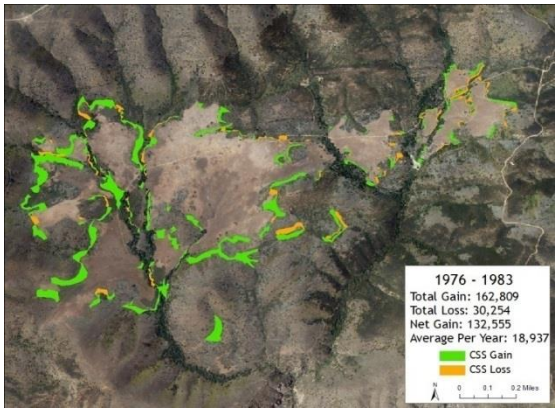
Field Work!

Upper left Photo Credit: Dan Samson

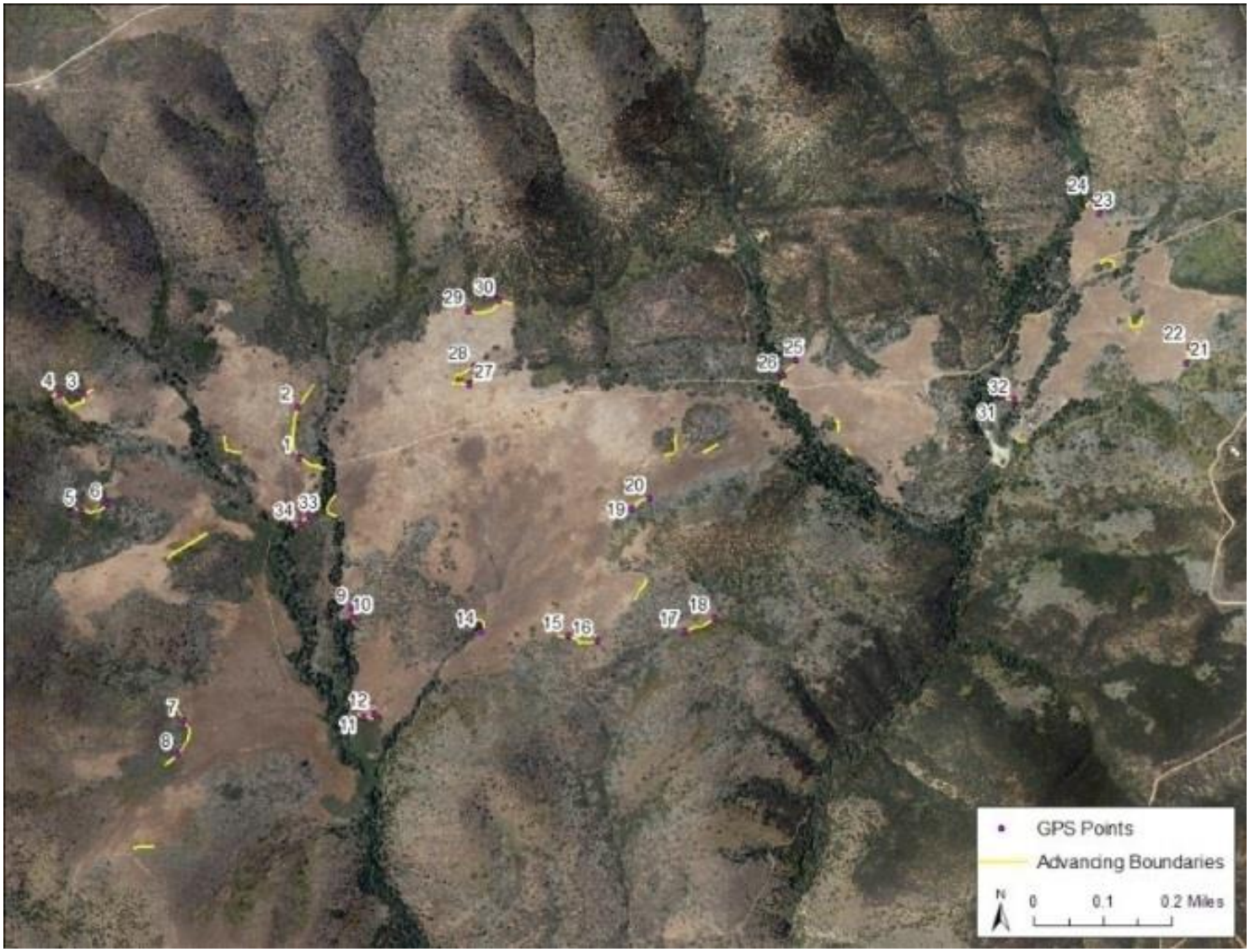
Identify Advancing Boundaries







Identify Advancing Boundaries



Field Work

Navigate to Points with GPS

Verify and Record Points

Measure a 40 meter Transect

Record Vegetation at 1m Intervals with Belt

Total Amount of Data Collected:

1 transect = 40 measurements * 9 belt measurements = 360 readings

30 transects = 360 readings * 30 transects = 10,800 measurements total

Statistical Analysis

- Chi Square Analysis
  - Distance and Diversity
    - Determine if there is a significant relationship between distance from the boundary and species type
- Spearman's Rank Order Correlation Coefficient
  - Distance and Maturity
    - Determine if there is a significant relationship between distance from the boundary and species maturity, as indicated by height.

Results: Chi Square Analysis

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	X^2			Enter data in yellow cells												
2		Dirt		Purple Sage		Coyote Brush		CA Sage Brush		*		Cell	O	O sq.	E	O sq./E
3		a		b		c		d								
4	Obs	90	1	39	1	96	1	46		271		a	90	8100	93.887	86.274
5	Exp	*93.887*		*42.989*		*88.728*		*45.396*				b	39	1521	42.989	35.381
6		e		f		g		h				c	96	9216	88.728	103.868
7	Obs	71	2	31	2	92	2	28		222		d	46	2116	45.396	46.612
8	Exp	*76.911*		*35.216*		*72.685*		*37.188*				e	71	5041	76.911	65.543
9		i		j		k		l				f	31	961	35.216	27.289
10	Obs	54	*3.000*	55	3	29	3	34		172		g	92	8464	72.685	116.447
11	Exp	*59.589*		*27.284*		*56.315*		*28.812*				h	28	784	37.188	21.082
12		4		n		o		p				i	54	2916	59.589	48.935
13	Obs	58	*4.000*	0	4	41	4	24		123		j	55	3025	27.284	110.870
14	Exp	*42.613*		*19.511*		*40.272*		*20.604*				k	29	841	56.315	14.934
15												l	34	1156	28.812	40.122
16	*	273		125		258		132		788		m	58	3364	42.6	78.943
17												n	0	0	19.5	0.000
18												o	41	1681	40.3	41.742
19												p	24	576	20.6	27.956
20																
21																865.998
22															X^2_{calc}	77.998
23															*alpha*	0.001
24		Percentage of expected counts < 5						0.00 %							df	9
25		(if > 20%, collapse data rows)													X^2_{crit}	27.877
26		Number of expected counts ≤ 2						0							prob	0.000
27		(if there are any, collapse rows)														
28																

Results: Chi Square Analysis

Species: Distance:	Dirt	Purple Sage	Coyote Brush	CA Sage Brush	Totals
1 – 5 m	90	39	96	46	271
6 – 10 m	71	31	92	28	222
11 – 15 m	54	55	29	34	172
16 – 20 m	58	0	41	24	123
Totals	273	125	258	132	788

Sum(Obs^2/E)	X^2 calc	Alpha
865.998	77.998	0.05

Degrees of Freedom	X^2 crit	Prob. Value
9	16.919	<0.001

What does this mean?

- There is a significant relationship between the species observed and the distance from the CSS boundary.

Results:
Spearman's Ranks Correlation Coefficient

Species	Avg. Distance from Boundary (m) & Rank Distance	Avg. Height (m) & Rank Height	Difference between Ranks (d)	D^2
Dirt	1: 17.5 – 20	1: 1.75 - 2		
CA Sagebrush	2: 15 – 17.5	2: 1.5 - 1.75		
Coyote Brush	3: 12.5 - 15	3: 1.25 - 1.5		
Purple Sage	4: 10 – 12.5	4: 1 - 1.25	= Rank	
Ashy Leafed	5: 7.5 - 10	5: 0.75 - 1	Distance –	= d ^2
Buckwheat	6: 5 – 7.5	6: 0.5 - 0.75	Rank Height	
Arroyo Lupine	7: 2.5 - 5	7: 0.25 - 0.5		
Laurel Sumac	8: 0 – 2.5	8: 0 – 0.25		
Sticky Monkey Flower				

Example: Transect 7, Purple Sage

- Average Rank Distance: 6
- Average Rank Height: 4

Results:
Spearman's Ranks Correlation Coefficient

Species	Avg. Distance from Boundary (m)	Rank Distance	Avg. Height (m)	Rank Height	Difference Between Ranks (d)	D^2
Dirt	8.29	6	0	8	-2	4
CA Sage Brush	7.81	7	1.14	4	3	9
Coyote Brush	7.37	4	0.77	5	-1	1
Purple Sage	4.62	6	0.82	5	1	1
Ashy Leafed Buckwheat	9.5	3	1.6	2	1	1
Arroyo Lupine	14	4	0.33	7	-3	9
Laurel Sumac	15.5	5	0.6	6	-1	1
Sticky Monkey Flower	1	8	0.75	6	2	4

Results: Spearman's Ranks Correlation Coefficient

	Sum of d^2	R	Degrees of Freedom	Significance
With Dirt	30	0.64	6	>5%
Without Dirt	26	0.54	5	>5%

What does this mean?

- Both R values suggest a positive correlation.
- Significance levels are greater than 5%, so we have to reject the hypothesis.

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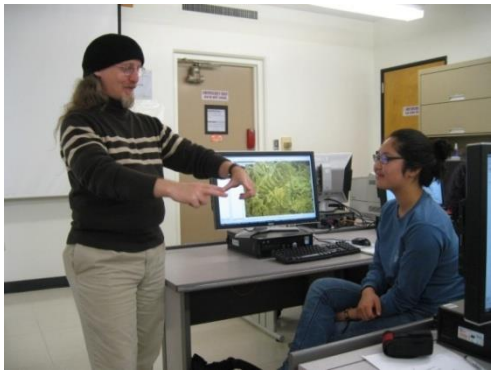




Thank you!

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Questions?