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ESP/GEOG 330-- Chesebro Canyon Group Field Project

Introduction:

For the last 200 years, California Sage Scrub (CSS) has been in decline. It is considered to be one of the most threatened habitat types in the Northwestern United States. Chesebro Canyon, located in the Santa Monica Mountains of Southern California, is one of these habitats experiencing a steady decline in CSS.

CSS is a scrub vegetation dominated by smaller shrubs and subshrubs. A scrub is any vegetation association that is dominated by the shrub (woody plant with several stems) lifeform. CSS is also significantly smaller than chaparral, sitting at about shin height. Subshrubs are smaller and more woody at the bottom with herbaceous growth throughout.

Very little CSS has gone undisturbed by invasive species. Unfortunately, a combination of activities such as anthropogenic removal resulting in fragmentation, fires, cattle grazing and competition from invasive grasses have led to a significant decrease in CSS. The decrease in CSS has heavily affected its gene flow, seed dispersal, and its ability to adapt to climate and non-climate stressors. Many animals, including but not limited to, the cactus wren, PV blue butterfly, and California gnatcatcher have been affected by the decrease in CSS because they depend on it for survival.

The decrease in CSS has led many people to begin conservation efforts including shifts in land-use policies, fire control policies, study focus areas and general habitat conservation strategies (Eckhardt, 2006, 70-73). Generally speaking, CSS habitats are naturally adapted to drought and are able to recover from disturbances, but the stressors (listed above) alter its ability to do so.

Sage scrub habitats have also adapted to wildfires. However, the increasing fire frequencies, due to anthropogenic ignitions, creates more favorable conditions for invasive species to take over, and in turn prevents the further growth of CSS (EcoAdapt, SoCal Sage Scrub Habitats, 2017). Most CSS plants resprout poorly after being burned. Seedlings must establish themselves from a prefire seed cache, or germinate from seed dispersal widely by wind (Minnich, Riverside CSS Decline, 1998). There have been many efforts to restore CSS, but not many have been successful. Part of the reason for this has to do with the lack of resources made available to small, non-profit volunteer organizations. Conservancies have used strategies such as trying different soil treatments, different palettes of plant species, various irrigation systems, and a lot of weeding (Rodrigue, Symposium on CSS, 2013).

Response to Reading:

In 2005, Scott Eckhardt, a recent graduate student at CSULB, collected data in Chesebro Canyon on different CSS restoration areas. He wanted to compare these areas based on fire succession to see whether or not the CSS was being restored in response. He collected his data through aerial photos and based his thesis on comparing CSS to see if it was declining or restoring. He transected eight different areas in Chesebro that showed signs of restoration. The data we collected was in response to furthering his research to see how they compare.

Data & Methods

Data was collected at Chesebro Canyon in order to further study the work done by Scott Eckhardt. We went about conducting our data collection by transecting areas based on 20 meters, with 1 meter increments for each point. During our time out at Chesebro, we stopped at 5 different locations to test the CSS and invasive species boundaries. Our null hypothesis was that CSS species are expanding into other territories and our working hypothesis was that the CSS species are not expanding into other territories. Scott Eckhardt's data was used to question if fire frequency played a factor into CSS growth or regression. His data also questioned whether or not grazing played a factor into CSS restoration. We conducted our data to analyze these two factors.

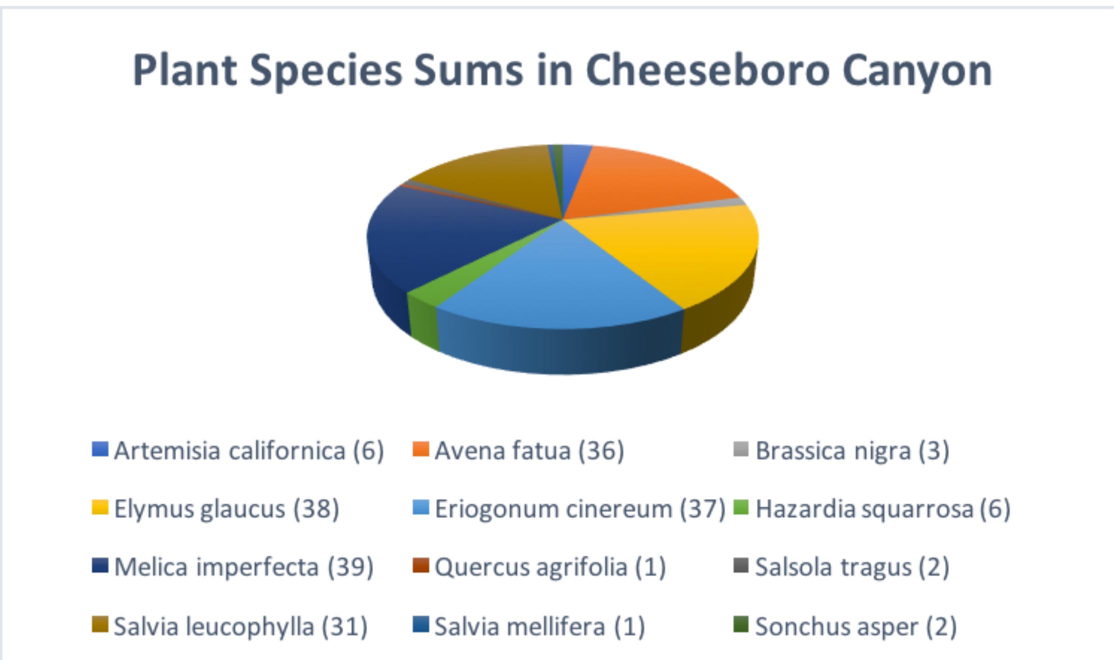
In terms of procedure, we had a group of four people, all having different tasks at each transect point. Two people held the transect tape, one person recorded the plant species, and the last person identified the plant species at each one meter mark. After completing one transect line, we ran a parallel line running against the previous one. We did this for all five transect points and recorded them separately.

Some of the issues that arose from data collection included the amount of physical labor required to go out and collect data. The hills in Chesebro had steep inclines and the transect areas were very spread out. We eventually ran out of water and had to correctly proportion our reserves. Also, the GPS tech that we had was glitchy and did not work to the best ability when needed. One way we troubleshooted this issue was by double-checking the coordinates with other cell phones (GPS units). Some of us got pricked and cut, but it was all in the name of CSS restoration. We sampled some plants that were unidentifiable by using pictures and consolidating research websites.

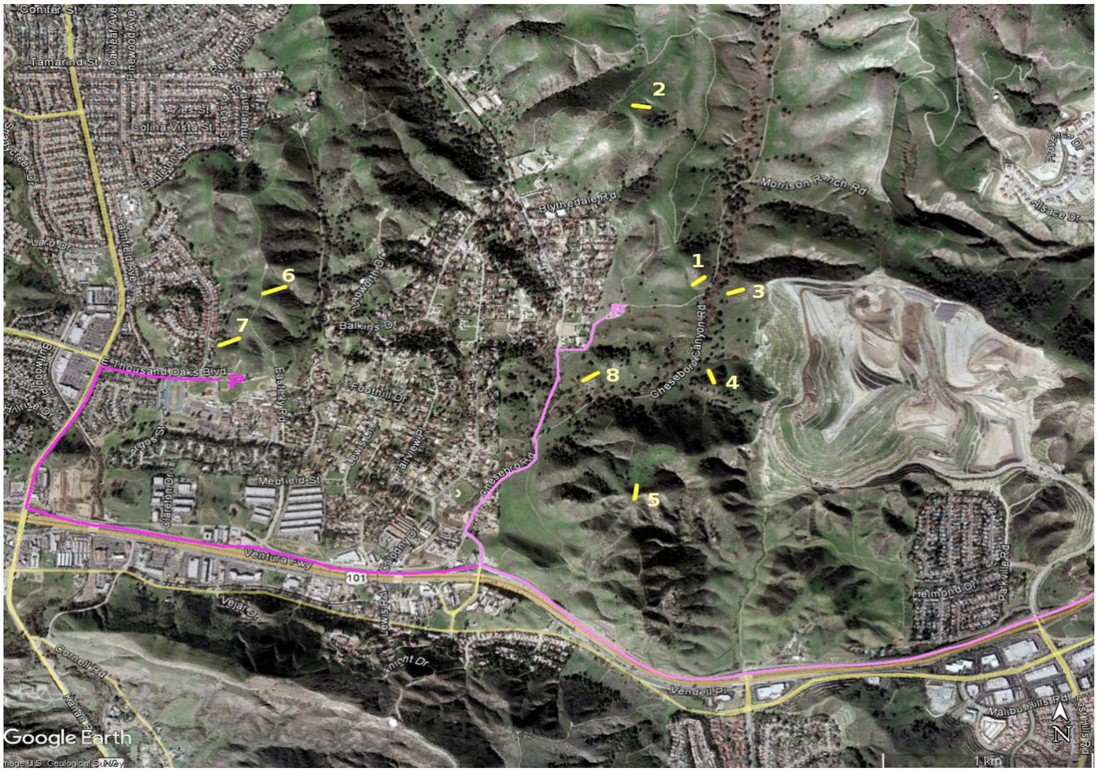
Spring 2018 Transecting Map

Results:

Our results were compared to Scott Eckhardt's data on the tables below. Scott's Data was concluded to have mostly *Artemisia californica (25),* following *Isocoma menziesii (13), Salvia leucophylla (13)*, *Salvia mellifera (9), Eriogonum (8),* and exotic grasses (1). The five most common plant species from our data collection were *Melica imperfecta (39), Elymus glaucus (38), Eriogonum cinereum (37), Aventa fatua (36) & Salvia leucophylla (31).*



Scott Eckhardt's Map



<u>Scott Eckhardt's Data</u>

Species	Transect 1	Transect 3	Transect 4	Transect 5	Transect 8	Sum Totals
Artemisia californica		7	7	5	6	25
Eriogonum cinereum	8					8
Exotic grasses		1				1
Isocoma menziesii		1	7	5		13
Malacothamnus fasciculatus						0
Marrubium vulgare						0
Salvia leucophylla			3	4	6	13
Salvia mellifera	4	5				9

Spring 2018 Data

Species	Transect 1	Transect 3	Transect 4	Transect 5	Transect 8	Sum Totals
Artemisia californica		3			3	6
Avena fatua				36		36
Brassica nigra		3				3
Dirt				4	4	8
Elymus glaucus	3	32	3			38
Eriogonum cinereum	33				4	37
Hazardia squarros	4	2				6
Melica imperfecta			39			39
Quercus agrifolia		1				1
Salsola tragus	2					2
Salvia leucophylla					31	31
Salvia mellifera		1				1
Sonchus asper				2		2

Due to our very small sample size, we decided to perform a chi-square analysis for two transects (3 and 8) combined with Eckhardt's data. We chose transects 3 and 8 because those had the highest sums among the rest of the transects. Combining both of our numbers gave us larger observed values, which in turn resulted in large enough expected values. Our numbers alone resulted in extremely low expected values that could destabilize the data. With the combined numbers, here were the results:

X^2	Enter data and *alpha* in yellow cells only		
VAR 1	TRANSECT 3	TRANSECT 8	*
	Artemisia californica	*Artemisia californica*	
Obs	10	9	19
Exp	3.393	15.607	
	Salvia leucophylla	*Salvia leucophylla*	
Obs	0	37	37
Exp	6.607	30.393	
*	10	46	56

Outputs in blue cells				
Cell	O	O sq.	E	O sq./E
Artemisia californica	10	100	3.393	29.474
Artemisia californica	9	81	15.607	5.190
Salvia leucophylla	0	0	6.607	0.000
Salvia leucophylla	37	1369	30.393	45.043
				79.707
			X^2_{calc}	23.707
			alpha	0.05
			df	1
			X^2_{crit}	3.841
			prob	0.000
			Yule's Q	1.000
			k (min r or c)	2
			(effect size measure) Cramér's V	0.651

Yate's X^2 (over)correction for continuity	20.255
prob (Yates)	0.000
Pirie-Hamden X^2 correction for continuity)	23.643
prob Pirie-Hamden	0.000

We came across three invasive species in Chesebro Canyon: *Salsola tragus, Avena fatua,* and *Brassica nigra. Salsola tragus* only appeared in transect 1, twice. *Avena fatua* showed up 36 times in transect 5. *Brassica nigra* only showed up 3 times in transect 3. Unfortunately, Eckhardt's data did not account for these invasive species, so we cannot do a direct comparison.

Conclusion:

For those who wish to further study why CSS is expanding in some areas, we recommend more data to be collected. Further research should include a larger sample size, collection of data via transects and quadrats, and finally, identifying the amount of time between fire occurrences would help determine the recovery rate of CSS . This information could then be used to compare the boundaries and trends of other locations attempting to restore native CSS. By utilizing our data in addition to Eckhardt's data, CSS trends can be further studied and understood in the Chesebro Canyon area.

Work Cited

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Chesebro Canyon Research Statement

California Sage Scrub (CSS), once in abundance, is now experiencing a steady decline. In some areas, California Sage Scrub is showing signs of very slow regrowth following the invasion of exotic species. Chesebro Canyon, located in the Santa Monica Mountains of Southern California, is currently experiencing various regions of slow growing CSS. Research was conducted in these areas to determine why some areas exhibit CSS growth amidst a decline of CSS as a whole. Referring to a study conducted in 2005 by Scott Eckardt, we returned to these sites to gather a census of CSS and determine if these patches are in fact expanding, stagnant or retreating in comparison with Eckhardt's data.