Larry, It may be a bit ~~crude~~ crude. Caveat Emptor

SUNDOWN ON THE NORTHCOAST: A LOOK AT THE COASTAL SCRUB COMMUNITY OF SANTA CRUZ COUNTY

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Brock Dolman

ABSTRACT

A modified toe point was used to characterize the coastal scrub community of Santa Cruz County for subsequent re-creation in the NPA. The community can be characterized as a *Baccharis pilularis* dominated community, with *Eriophyllum staechadifolium*, *Artemisia californica*, *Erigeron glaucus*, and *Eriogonum latifolium*. Numerous factors, such as soil type, substrate, wind/salt spray regime, water, and human disturbance patterns, were identified. Further studies of environmental factors are recommended to identify their actual influence upon the structure of isolated plant communities. The complexity found in this study illustrates the independent nature of separate locality as a function of the interaction of environmental factors.

INTRODUCTION

The UCSC Arboretum is in the process of creating a Native Plant Area (NPA) under the guidance of Grey. A north-south transect of coastal Californian vegetation types from the Oregon border to the Mexican border will be recreated in a 1/2 mile strip of meadow near the Arboretum. Plant communities from the pacific shore to the coastal mountains will be represented. Although the plant species of many of these communities are well documented, Thomas (1961), Munz (1963), Holland (1977), and Barbour (1977). The actual percent composition and plant/plant interactions are less well documented, especially for coastal Santa Cruz County.

The purpose of this study was to provide the NPA with a working model of the local Santa Cruz County coastal scrub as well as to develop a consistent methodology for vegetation sampling for future NPA studies in other community types.

From a theoretical perspective, the study looked at the problems of trying to delineate a community. Specifically, does a community exist? If it does, what are its boundaries? What are its characteristics? These questions were not directly addressed in the study, but the answer to them were at least somewhat implied by the decisions made while conducting the study as well as in the questions which were directly addressed by the study.

The area under study was the narrow coastal strip from the Pajaro River to Waddell Creek, essentially all of coastal Santa Cruz County. The northern part of the study area, from the San Lorenzo River to Waddell Creek, consists of the last of a series of marine terraces or benches which extend up the side of Ben Lomond Mountain. The southwest flank of the steep mountain is drained by numerous rivers/creeks which cut through the flat terraces creating a topography of flat coastal bluff broken up by rugged but small canyons and gorges. What little beach is present is narrow and often rocky(Warrick, 1981 ***). The southern portion, from San Lorenzo River to Pajaro River is a coastal plain/ Marine terrace whose slope is much more gentle. The topography is coastal bluff cut by fewer and less rugged canyons. The beaches are sandy and extensive. The very southern portion of the study area is dominated by sand dunes and very little bluff area.

The Bluff area to the north is used for agriculture with some residential buildings and one small town, Davenport. Highway one(four lanes) runs north to south usually from 100 meters to 500 meters from the waters edge. The south portion has major urban development close to the San Lorenzo, grading into agriculture farther south.

MATERIALS AND METHODS

Potential coastal scrub sites were located by using a vegetational map of Santa Cruz County (Gerin and Strauss, 1976) overlaid upon a USGS topographical

maps of Santa Cruz County. We limited our survey to only those sites less than 400 meters inland of the waters edge. A ground reconnaissance revealed many map sites inappropriate due to lack of indicator species, and/or anthropogenic habitat destruction. Indicator species were defined by comparing northern coastal scrub community plant lists found in Munz (1963), Holland (1977), Thomas (1961) and Barbour (1977).

The following plants were determined to be indicators of northern coastal scrub: *Baccharis pilularis* ; *Eriophyllum staechadifolium* ; *Artemisia californica* ; *Erigeron glaucus*; *Eriogonum latifolium* ; *Dudleya farinosa*

The following plants were defined as disturbance pioneer species; *B. pilularis* ; *Toxicodendron diversilobum* ; *Achilla millefolium*; *Rubus ursinus*

The data were collected in late November (11/15 - 11/26) so spring annuals and other herbaceous plants were not surveyed, the focus was on woody shrubs including some perrennial herbs and some succulents.

Ten final sites were selected for sampling (a total of 876 observations). Site number seven was determined not to be coastal shrub and was deleted and the rest of the sites were renumbered (776 total observations).

The final sites centered mostly on the northern portion of the study area due to the ecological destruction in the south

Data were collected using a modified toe point system with a two meter pace. The closest plant to the point as well as nearest neighbor plant of a different species was also noted. Field notes were taken of parameters such as wind , obvious soil type, slope etc. Extremely dense stands of T. *diversilobum* made a few toe point transects impractical from a health perspective. In these cases the vegetation was sampled using a two meter stick held out perpendicular to

vegetations edge to indicate each data point. As a result, the actual percent composition of *T. diversilobum* was most certainly underrepresented within this survey. We felt this was justified as the NPA has no intentions of purposely planting out *T. diversilobum*.

RESULTS

As shown in figure 1, Northern coastal scrub is characterized by the predominance of *E. pilularis*, with the remaining species exhibiting a gradual decline in percent composition. Three of the northern coastal scrub indicator species, *E. staechadifolium*, *A. californica* and *E. glaucus* represented a large percentage of the overall plant composition. The remaining two indicator species, *E. latifolium* and *D. farinosa* were slightly less prominent. The three remaining predominant species, *T. diversilobum*, *R. ursinus*, and *A. millefolium* have been categorized as disturbed site pioneer species. Notice that *E. pilularis* is both an indicator and pioneer species.

The complexity illustrated by Figure 2 represents more accurately the diversity found within the northern coastal scrub community. The number of species present and their percent composition varies dramatically between each site. The composite column is a visual reference showing the percent composition for an average northern coastal scrub community in Santa Cruz County (see Figure 1). Notice that in all sites two or three ~~plants~~ species were responsible for a large percentage of the composition, with two ~~plants~~ species equaling at least 50% composition in all nine sites.

Site 1 BAPI/ACMI	Site 6 ACMI/HAER
Site 2 BAPI/TODI	Site 7 ERGL/ERST

Site 3 BAPI/ARCA

Site 4 BAPI/MIGU

Site 5 BAPI/ERGL

Site 8 ARCA/TODI

Site 9 ERLA/RUUR

Field notes and site description were summarized for the nine sites as follows: See Figure 3

SITE 1: The Waddell Creek site was a disturbed road bed near the beach. The vegetation was unevenly distributed with an approx. canopy height of 1-1.5m. The dominant plant species were *B. pilularis*, and *A. millefolium*. This site appeared to be in a state of early succession. In June of 1992 this site is slated to be bulldozed as part of a wetlands expansion/rehabilitation project by the State Parks Department.

SITE 2: This Greyhound rock site was located on a table bluff, which had been heavily impacted by numerous foot trails. The approx. 1 m high islands of vegetation were dominated by *B. pilularis* and *T. diversilobum*. *A. californica* was conspicuously absent.

SITE 3: This site was south of site 2 on a table bluff, separated by a steep ravine 20m wide. The vegetation canopy tended to be 0.5m, high decreasing in height towards the cliff edge. *B. pilularis* and *A. californica* were the dominant species.

SITE 4: This site was southeast across highway 1 from site 3. The transect encompassed a steep, dry and rocky ravine. The canopy height was approx. 2m at the base and decreased continually up slope. The dominant plants found were *B. pilularis, M. guttatus,* and *A. californica.*

SITE 5: This site was located north of Scott Creek on a large sloping table bluff of derelict agricultural land. The substrate tended to be rocky/sandy, and appeared to have been wind swept. The canopy height was approx. 0.5m. The dominant plant were *B. pilularis, A. californica,* and *E. glaucus.*

SITE 6: This site was located southeast of the mouth of Scott Creek east of Highway 1. Sand was the predominant substrate found at this site. ~~Note that~~ The canopy was reduced to a low ground cover and there were constant winds. *A. millifolium* and *H. erikoides* predominated at this unusually diverse site.

SITE 7: This site was located south of Scott Creek on the distinct edge of a coastal cliff. Again the wind was constant and again the canopy was reduced to a low groundcover. The species diversity was restricted with *E. glaucus* and *E. staechadifolium* accounting for 77% of the species composition.

SITE 8: This site was located just south of Majors Creek just inland from Red, White, and Blue beach. The location was primarily a dry sloping table bluff, which was somewhat protected from the direct winds. The canopy was approx. 1-1.5 m high. The primary plants found were *T. diversilobum* and *A. californica.*

SITE 9: This site was located along the cliffs in the Seascape housing development. This site was extremely reduced and disjunct due to numerous anthropogenic disturbances. This site was the southern most coastal scrub site of any real size found during this survey. *R. ursinus* and *E. latifolium* represented 78% of the species at this locality. At the time of data collection, within 100m of the sample site, a larger coastal scrub site was being bulldozed to create roads and housing platforms. Site 9 at this time no longer exists.

CONCLUSIONS

The average community as represented by figure 1 should be sufficient for the UCSC Arboretum to recreate a facsimile of local northern coastal scrub in their Native Plant Area. A further survey and compositional analysis should be done for spring annuals and herbs to complete the picture.

It is well advised to consider that this model is a gross simplification of the complexities actually found in the field. This observation agrees with the comments of Barbour et al (1977) concerning coastal scrub communities. Figure 2 shows some of the complexities encountered in the field. The nine distinct yet geographically close sites have very different species composition as well as different apparent levels of diversity. Field notes allowed for some understanding of these differences but more in- depth, specific studies are needed before any definite conclusions can be made.

Some of the observed environmental factors were: soil or substrate; water as ocean spray(with salt), fog and/or rain; wind; and, anthropogenic disturbances.

The observed effects were seen in different canopy height , density of plant cover, successional stage, and most graphically with the different species composition.

In sites 1 , 5 and 6 the substrate was unusual enough to note. The old roadbed of site 1 and the attendant tar gravel and leftover wood etc. seems to have affected the composition in that the two major species are both disturbance pioneer species. The roadbed leftovers might also account for the uneven distribution of the vegetation. The rocky/sandy soil of site 5 seems to have generated a completely different species composition than site 6 which also had sandy soil although site 6 had much more sand and not as many rocks. Other factors, too, undoubtedly contributed to the difference. The dominant vegetation of site 6 (*A. millefolium* and *H. ericoides*) was similar to other sandy sites which were rejected for study due to lack of any indicator species.

The Wind had the most apparent effect on the height of the plants as seen in sites 5, 6 and 7 with their wind exposure and low plant height as well as in sites 4 and 8 with their sheltered plants and chest-high growth. Again all the windy sites had quite different composition and no generalizations can be drawn between wind regime and species present.

Lack of water probably had something to do with the presence of *M. guttatus* at site 4 as it is a more dry chaparral type species. Site 8 was also inland and dryer than the others and had the more arid type species *A. californica*. The salt water blown in on the wind may have induced the low growth and low diversity of site 7.

Anthropogenic disturbances were manifested by the presence of pioneer species and the early successional state of site 1 as well as by the strong showing of the pioneer species *E. ursinus* in site 9. It was interesting to note that both these sites are slated to be destroyed by further development in the near future. Also, most of the other sites are small islands surrounded by major human disturbances

such as agriculture and housing and this undoubtedly affects their species composition.

In general the results of this study highlight the extreme difficulty of defining plant communities. It may be useful in a broad communication sense to pigeonhole various forms of vegetation as a specific "type." Yet, it must be kept in mind that each specific site is inherently different as a result of its unique environmental factors thus "different" communities tend to grade into one another and the idealized "community" can not be found.

REFERENCES

Barbour, M. G. and J. Major, eds. 1977. Terrestrial Vegetation of California. John Wiley and Sons, New York.

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Holland, V. L. 1977. " Major Plant Communities of California." in Native Plants: a Viable Option. California native plant society special publication number 3.

Munz, D. A. and D. D. Keck. 1963. A California Flora. University of California Press, Berkeley, CA.

Thomas, J. H. 1961. Flora of the Santa Cruz Mountains. Stanford University Press, Stanford.

land use-land cover map prepared by Beth Gerin and Steve Stauss in 1976 for the Santa Cruz county office of watershed management.

APPENDIX 1

Scientific name	Code Name	Common Name
Achillea millefolium	ACMI	Yarrow
Anaphalis margaritacea	ANMA	Pearly everlasting
Artemisia californica	ARCA	Coastal sagebrush
Artemisia pychnocephala	ARPY	Dune sagebrush
Baccharis pilularis	BAPI	Coyotebush
Dudleya farinosa	DUFA	Seaside Dudleya
Erigeron glaucus	ERGL	Seaside daisy
Eriogonum latifolium	ERLA	Coastal buckwheat
Eriophylum staechadifolium	ERST	Lizard tail
Fragaria chiloensis	FRCH	Beach strawberry
Happlopappus ericoides	HAER	Mock heather
Lupinus arboreus	LUAR	Bush lupine
Mimulus guttatus	MIGU	Monkey flower
Pteridium aquilinum	PTAQ	Braken
Rhamnus californica	RHCA	Coffee berry
Rubus ursinus	RUUR	Wild blackberry
Satureja douglasii	SADO	Yerba buena
Scrophularia californica	SCCA	Figwort
Toxicodendron diversilobum	TODI	Poison oak

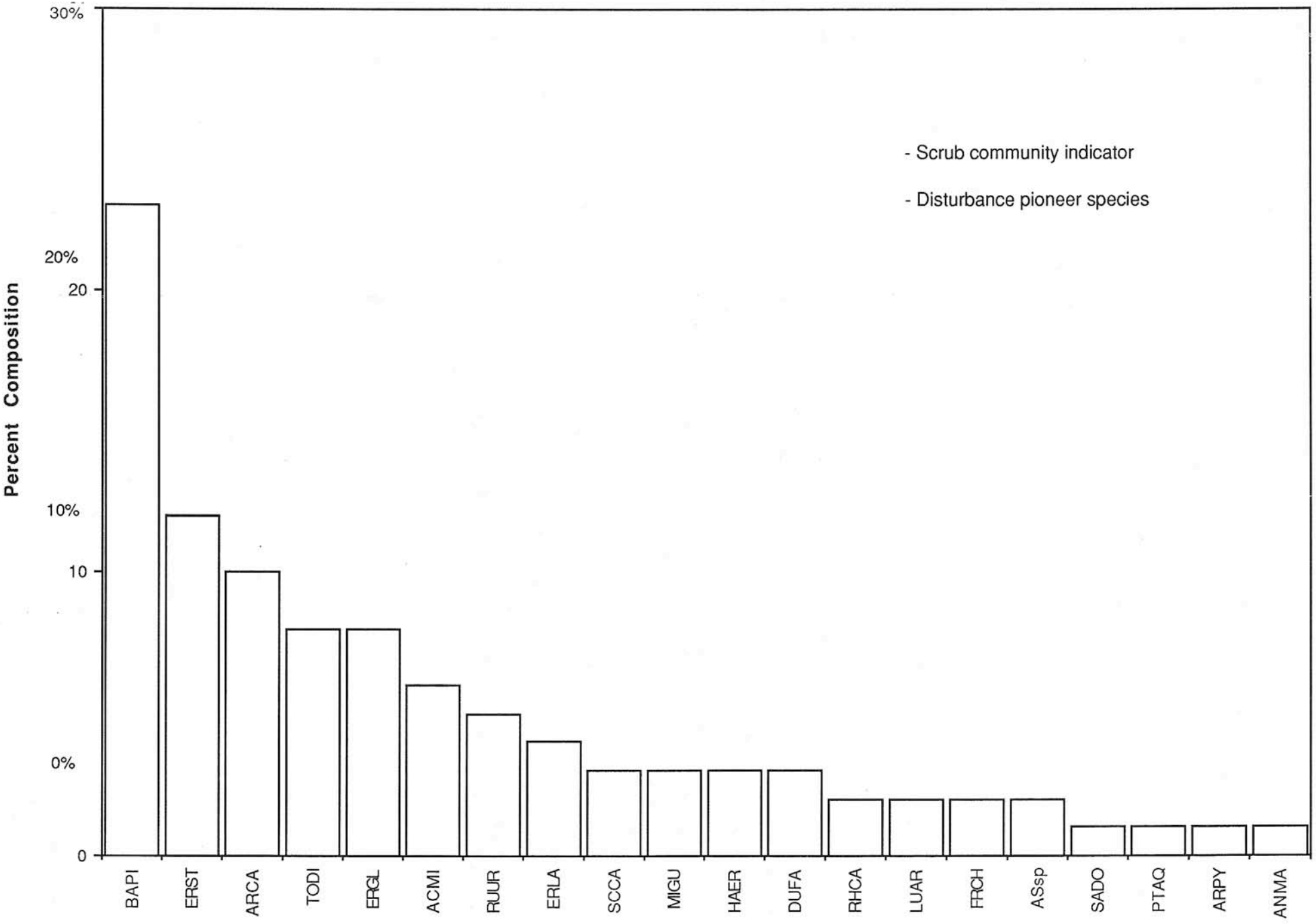

Figure 1. Number of plants as percent composition for an "average" coastal scrub community in Santa Cruz County (Pajaro River to Waddell Creek
Data collected Nov. 15th to Nov. 26th, 1991.

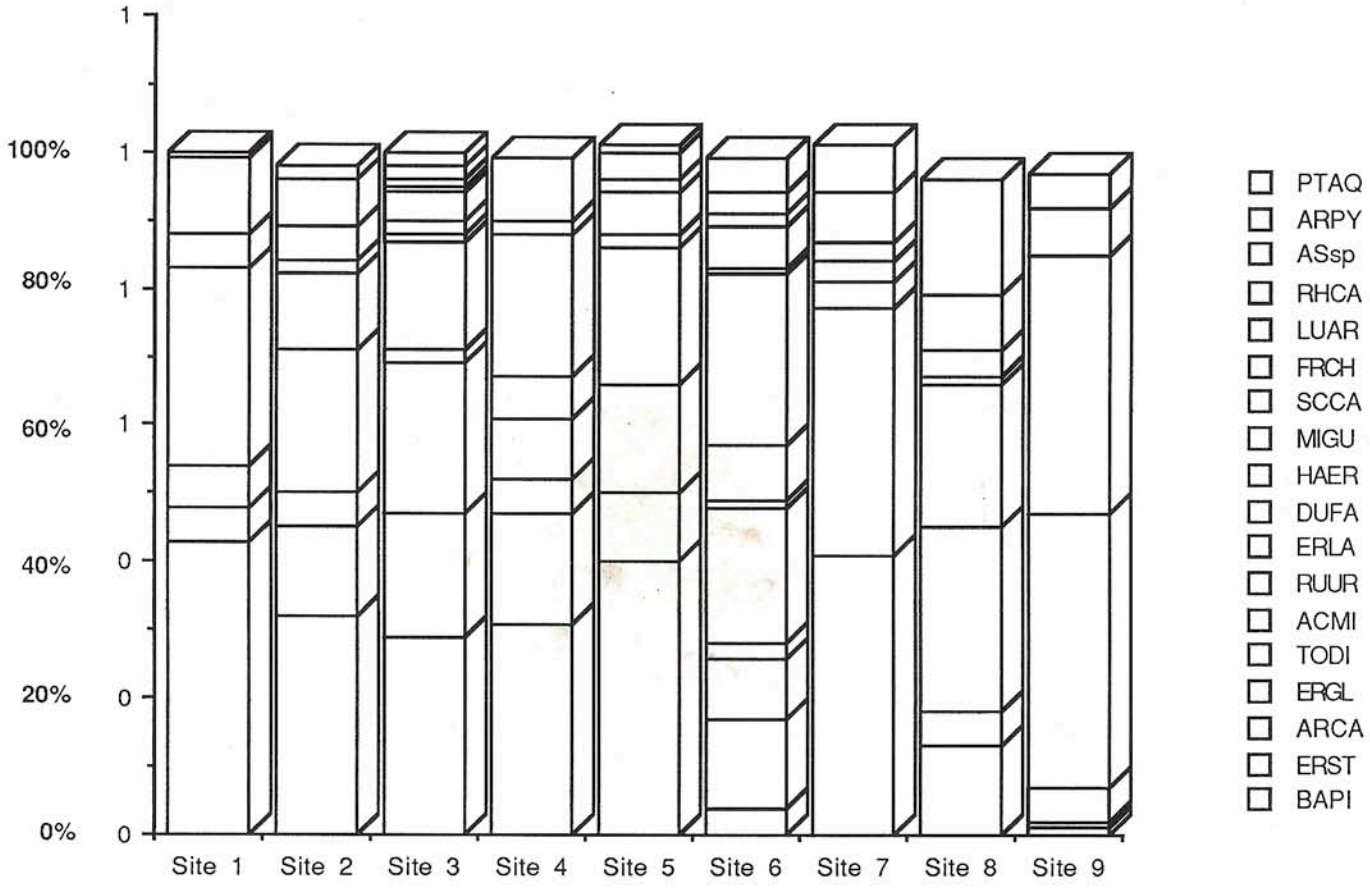

Figure 2. Percent composition plant of species found at nine coastal bluff scrub sites from the Pajaro river to Rancho del Oso, Santa Cruz county, Ca. Data were collected between Nov. 15 and Nov. 26. 1991.

Jacob Pollock
1991, UCSC
Survey of Coastal Scrub of Santa Cruz County
Percent Relative Occurrence

Number of points	84	100	100	100	100	100	75	75	42	
Reported Site #	1	2	3	4	5	6	7	8	9	Avg.
ACMI	29%		1%			20%				
ANMA								1%		
ARCA	6%		22%	16%	16%			27%	1%	9.8
ARPY						3%	7%			
BAPI	43%	32%	29%	31%	40%	4%		13%	1%	21.4
DUFA			4%	6%	2%	8%	3%		7%	
ERGL		5%	2%		20%	9%	36%			
ERLA		2%	2%	9%		1%	4%		38%	
ERST	5%	13%	18%		10%	13%	41%	5%		11.7
FRCH		7%				6%	3%			
HAER						25%				
LUAR	1%		1%			2%	7%	8%		
MIGU (MIAR)			1%	21%						
PTAQ		2%	2%			5%			5%	
RHCA		2%	2%	9%						
RUUR	5%	11%			6%			1%	40%	
SADO	1%					1%		1%		
SCCA	11%	5%		2%	4%	1%		4%		
TODI		21%	16%	5%	2%	2%		21%	5%	8
unknown								17%		
	101%	100%	100%	99%	100%	100%	101%	98%	97%	

Larry Ford

From: "Jacob Pollock" <pollock@ucsc.edu>
To: "Larry Ford" <ford.l.d@att.net>
Cc: <brock@oaec.org>
Sent: Tuesday, February 25, 2003 11:12 PM
Subject: Re: coastal scrub vegetation

Larry,

Mimulus aurantiacus of course. I don't know what I was thinking at the time.

Each site was had 100 points (except where we ran out of room) and two plants were recorded at each point: the focal plant and the nearest neighbor. However, the data you have only use the focal plant. Thus there are 100 observations at each site (except where we ran out of room). The % compositoin is the number of occurances (as the focal plant) divided by the actual number of observation points.
I think we went in a straight line and I have checked several of the sites we walked and it appears likely we did survey 200 meters at each site (exact number of points are in attached excel file. they are taken from a data summary.)

I cannot find a copy of the charts so I don't know if the data I have attached jive with the chart I gave you. Let me know of any differences. If it is not too much trouble, can I have a copy of the charts back at some time in thje future just so I can check them. Also, I would be grateful for a copy of the section you write when it is done if that is possible.

sent 3-3-03

Any comments Brock?

Take care,

Jacob

At 05:27 PM 2/20/2003, you wrote:
>Hi Jacob. Yes, I did get your report; my wife picked it up that day.
>Thanks very much.
>
>Fun to read the report, and know it was to serve the UCSC Arboretum. It was
>allot of good work.
>
>I didn't realize you limited yourselves to the far coastal zone within 400
>meters of the water's edge; that is narrow considering the type extends to
>the inner coast ranges. I wish I had time to survey coastal to far inland
>transects at several places up and down the coast from SLO to Oregon. There
>are many significant variations and sub-types reported.
>
>A few questions...
>
>Your report lists Mimulus guttatus, which is an herbaceous annual or

>rhizomed perennial. I wonder if you meant to list Mimulus aurantiacus
>(sticky monkey flower), which is a shrub. The methods section says no
>herbaceous species were surveyed. The latter species is more commonly found
>as a co-dominant in NCS.
>
>I understand your sampling method used some kind of toe-points on a transect
>with a 2-meter interval. From the number of observations (776) at nine
>sites, I assume you sampled at 86 points per site (776/9=86), and that you
>walked a line extending 172 meters at each site (86x2=172). Alternatively,
>you might have sampled at 43 points per site (two species recorded at each
>point 776/9/2=43) on a 86 meter transect. Which numbers are right? Were
>transects straight lines? Were the number of points the same on each
>transect? I'm curious because that is an unusually long transect if
>straight. The length of transect is important in finding the different
>scales to reveal size of patches and intra-regional composition differences.
>
>The methods indicate you identified two shrubs (or other perennial or
>succulent) for each point. I assume the 172 resulting species per site were
>then used to find the percent composition, e.g. 10 Arca over 172
>observations = 5.8%.
>
>For my NCS chapter, I would like to cite your paper and include the
>composition percentages for each species in the "average community." For
>now, you've given me what I need.
>
>Do you want back any or all of the documents you left for me in the manila
>envelope?
>
>Thanks very much, Larry
>_____
>Lawrence D. Ford, Ph.D.
>Felton, CA
>831-335-3959
>
>----- Original Message -----
>From: "Jacob Pollock" <pollock@ucsc.edu>
>To: "Larry Ford" <ford.l.d@att.net>
>Sent: Wednesday, February 19, 2003 5:20 PM
>Subject: Re: coastal scrub vegetation
>
>
> > Larry,
> >
> > Did you get the report? What do you think?
> >
> > Jacob

Jacob Pollock
Environmental Studies Department

Mail:
UC Santa Cruz
mail stop: ENVS