McNAUGHTON REVISITED - TWENTY YEARS LATER

Jasper Ridge Docent Training Research Project

Brenda Butner
Toni Corelli

Under the direction of
Nona Chiarello

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INTRODUCTION

In 1960 Dr. S. J. McNaughton (1968) undertook a study at Jasper Ridge to determine the effects of soil type and exposure on composition, density, biomass productivity and stability of grasslands. He compared sandstone with non-sandstone substrates and four slope aspects within these substrates. These exposures represented a moisture gradient. Southwest was the driest, southeast and northwest next and northeast was the wettest. We are studying the succession on the sites as determined by the changes that have taken place in the twenty years since McNaughton's research.

A brief review of McNaughton's findings indicate that there are major differences between serpentine and non-serpentine species. On both substrates the principal species were grasses. The only non-grassy species regularly occurring was California poppy (*Eschscholzia californica*). On the serpentine substrate sites purple needlegrass (*Stipa pulchra*) dominated followed by Soft chess (*Bromus mollis*). On serpentine Ripgut grass (*Bromus rigidus*) was dominant followed by Soft chess and Wild oat (*Avena fatua*).

He found that the serpentine grasslands were more diverse than the non-serpentine. This occurred perhaps because the many rock outcrops in serpentine provides more microhabitat diversity. The moisture gradient was an important factor in species composition, but as the sites became drier the substrate was less important. He concluded that the "Jasper Ridge grasslands are a system of inter-acting populations and the 'balance among populations shifts with change in environment so that the vegetation is a pattern of populations corresponding to the pattern of environmental gradients."

In the current study we asked several questions:

1. Have there been changes in the biomass and floristic compostion of the grasslands in the past twenty years?

2. Assuming such changes, did they take place on both serpentine and non-serpentine substrates?

3. Are there new species which were not found in McNaughton's study and conversely have any of his species disappeared?

4. Do the changes represent a change in ratio of annuals to perennials?

The composition of the grasslands prior to the introduction of grazing is controversial. It is thought that medium to tall perennial bunchgrasses such as purple needlegrass scattered among smaller species predominated. Perennials were thought to be more dominant in the Coast Range hills and annuals in the valleys. Now, annual grasses with mostly introduced species are dominant. (Vankat, 1979).

5. Speculatively, to what could these changes be attributed?

At the time of McNaughton's study it was five years since cattle grazing had ceased at Jasper Ridge. It is now 25 years. McNaughton felt that because annual communities, by their nature of yearly regrowth, would adjust rapidly to prevailing habitat. He concluded that the communities at the time of his study were probably representative of California grasslands which had always been free of disturbance though they may not have yet been stable.

6. Could other factors be involved? Possibilites might include: climatic oscillation, changes in herbivore population perhaps reflecting changes in predator population and lack of fire.

METHODS AND MATERIALS

In establishing our methods and site selection we attempted to follow those of McNaughton's as closely as possible. Eight plots were selected, a southwest, southeast, northwest and northeast exposure each on serpentine substrate and non-serpentine (Fig. 1). The sandstone grassland substrate as labelled in McNaughton's study has be re-established to be

greenstone. We have thus labelled it as non-serpentine. Photographs which were printed in the original study were used as starting points for the plot selection. The serpentine plots were established on Area H.

On each plot two five meter transects were established, one parallel and one perpendicular to the slope, bisecting each other at midpoint (Fig. 2). Each plot was visited twice. On the first visit ten quadrats, measuring 4 cm on each side, were marked along each transect (a total of twenty per plot). Recording were made of plant species and the number encountered of each species for each quadrat. This will then be used to determin floristic composition by computing each species as a percentage of the total.

On the second visit we harvested the plots. In addition to the ten quadrats marked on each transect, an additional forty (a total of 50 per transect of 100 per plot) were harvested. In the lab the specimens were sorted according to species, being careful to include the current years litter. The specimens were then dried and weighed. This is considered to be the biomass. Each species contribution to the total biomass can then be expressed as a percentage of the total biomass.

REFERENCES CITED

McNaughton, S.J. 1968. Structure and function in California grasslands. Ecology 49 (3): 962-972.

Vankat, John L. 1979. The natural vegetation of North America. John Wiley & Sons, New York. 170-171.

1. Substrate

Serpentine

Non-serpentine

2. Slope aspect

Southwest - Driest

Southeast -

Northwest -

Northeast - wettest

FIG. 1 PLOT SELECTION CRITERIA - A TOTAL OF 8 PLOTS

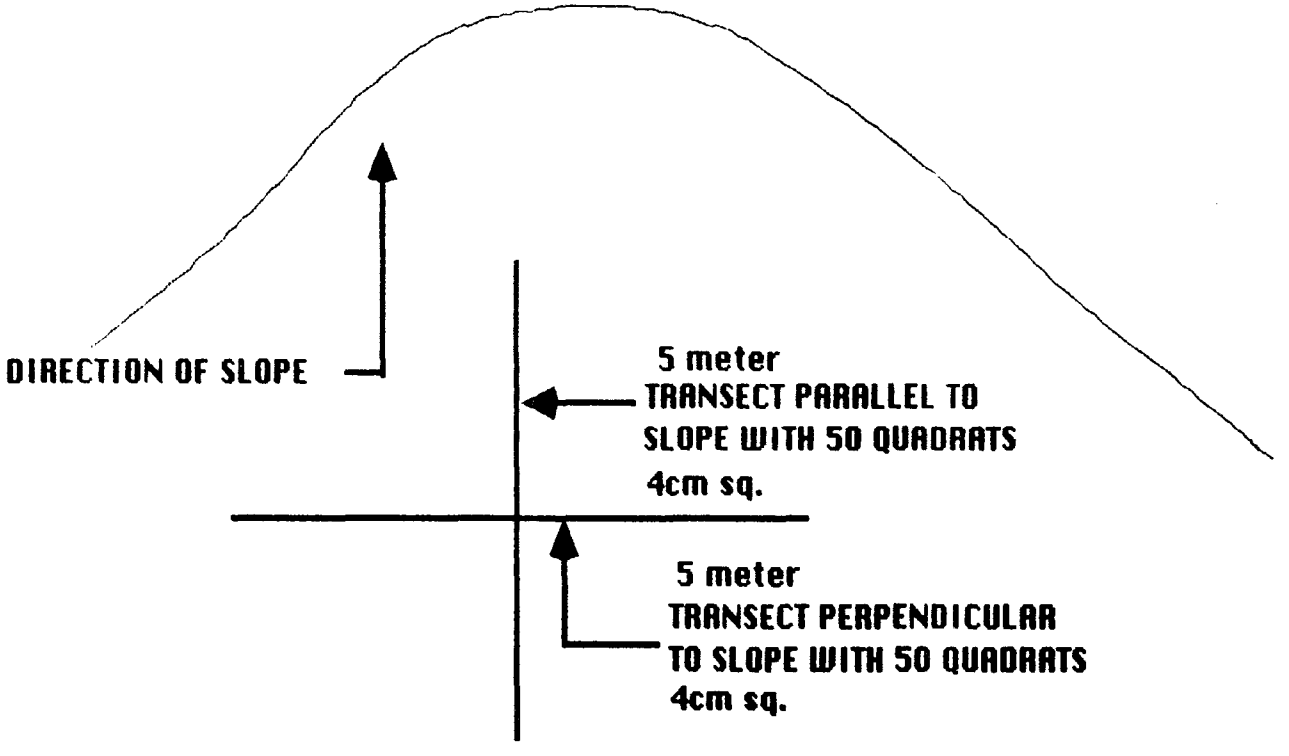

FIG. 2 LAYOUT OF TRANSECT LINES ON SLOPE