

3526

ECOLOGY OF SHANAHAN HILL AND FERN CANYON

by

John (Jack) W. Schuh

for

Dr. John W. Marr

Botany 545

Dynamics of Mountain Ecosystems

May 26, 1969

INTRODUCTION

The City of Boulder has just recently purchased a tract of land known as the Well's Property that extends along the foothills of the Front Range from Boulder to Eldorado Springs. The purpose of this land is to provide some open space for present and more importantly, future Boulder. I have chosen a small section of this land known as Shanahan Hill for my area of study. It's located just south of Table Mesa (NCAR) and west of the Devils Thumb development area in south Boulder. To be more precise it is in the lower 1/2 of the northwest 1/4 of section 18 of Township 1 south and Range 70 west. It can be found on the Eldorado Springs, Colorado Quadrangle. I have narrowed my study area down even more by using natural and man-made boundaries. My southern boundary is an old fence line that is just south of Shanahan Hill and my western line is formed by a high power line that traverses the Well's Property. I used Fern Canyon for my northern boundary and for my eastern boundary I extended a north-south line from where Fern Creek becomes parallel to the Front Range (a point slightly north of Shanahan Hill). See Map. The history, both geological and historical, plays quite an important role in the ecology of this hill.

As near as I can tell from reading and asking some of my geologist friends, this area is stream dissected piedmont. What happened was that after the Front Range was formed continuous erosion occurred tearing away at the mountains. As the material was carried down from the steep mountain it picked up more velocity and momentum and force due to the steep stream gradient in the mountains. When the streams reached the plains, however, the gradient was greatly lessened and the velocity of the water was greatly decreased. As a result it deposited much of its load and became known as

the Colorado Piedmont. In time the streams cut down so far that they began eroding away the piedmont deposits forming valleys, canyons, hills and mesas out of a once broad gently sloping plain. As a result we now have an area of gently eastward sloping mesas and hills composed of alluvial deposits such as the soil and sandstone rocks on my study area.

The important human history of this area began around 1900 when men settled the area. They utilized the grassland for their livestock and the forests for building their homes which all have had a marked affect on the area, especially the former.

My intention in this study is to analyze the vegetation and processes of the study area and thus determine its ecology. Having this I will use it to determine what I think to be the best use of this land for the Green Belt Project.

METHODS

My main method in this project was observation and noting what I saw. After a short time I broke down my area into distinct stands which had the same characteristics throughout. Then taking one of these stands at a time I studied them closely and noted their floristic makeup, their dominant vegetation and their status - climax or successional - and tried to figure out the major processes going on within the stand.

In some of the stands I measured tree diameters, determined ages by using an increment borer and determined the density of the trees. Since part of my study concerned the affects of man I noted all his affects. The following is what I came up with.

RESULTS

After all my observations and data I have come up with ten stands, some of which are similar but most are quite different. I have drawn a map of my study area and have indicated the stands by numbers. I will now proceed to take these one at a time and describe and analyze each one.

As an ecologist approaches from the east, the first stand he will enter is stand 1. This stand is a fairly open ponderosa pine stand with a good ground cover of grasses and various herbs such as sage, annual weeds and wild flowers. The ponderosa pine generally grows in the rockier areas whereas the grasses and herbs grow in the areas of better soil although they do grow around rocks too. Yucca and prickly pear cactus are also found throughout the stand. In rocky areas of open sunlight and no ponderosas Rhus tridentata is found while Ribes cereum grows in shady areas at the base of the pine trees usually.

As I have inferred above the area is quite rocky and in places there seem to be rock ridges (perhaps formed by a freeze-thaw process like that of alpine tundra) that are dominated by ponderosa pine. Due to decreased grass competition and a ready supply of water in the sandstone aquifers, the pines can make a go of it here. The age class of the trees seemed quite good on first glance with a few good sized seed trees of a 150 or more years old, some of 15" dbh, 8-10" dbh, 5-6" dbh and 2-3" dbh trees. These small trees and the few seedlings present are having a very hard time, however, as evidenced by their contorted shapes and stunted appearance. A sampling of some trees with an increment borer confirmed my conviction about the status of the stand, however. I found no matter if the tree had a dbh of 8" and was forty feet tall or a dbh of 15" and was sixty-five

feet tall they all began growth about fifty years ago which correlates with the settling of the white man in this area. What I propose as to what happened is that prior to man there were fewer trees than now and with the coming of man and his livestock the balance was disrupted. As competition of pines with the grasses was lessened the ponderosas moved out from their rocky habitats into the chewed up and torn up grass areas caused by early overgrazing. Some of the pines grew very fast and overshadowed the slower ones and later ones. There was quite a bit of competition for light and many of the small ones did not make it and thus grew up contorted and twisted with only the very top branches producing leanes. Grazing on this property has existed until just recently as evidenced by the numerous cow piles and the numerous non-palatable weeds like mullein and others on the grass areas. With its addition to Boulder Greenbelt grazing has ceased which in time will result in a long and gradual change back to more grasses and fewer ponderosa pine due to increased competition from the grasses. There will thus be a much more open stand of Pinus ponderosa and grasses.

Stand 2 is to the north of Stand 1 and just south of the northern slope. This is a small area of grasses and Rhus trilobata which grows on the rockier areas near the slope. There are many weeds in this area, especially mullein which is again due to recent overgrazing and a road that cuts through the edge of the stand. The main reason for the absence of trees in this area is an edaphic one. The soil here is finer and deeper than in stand 1. In time this area will eventually have more abundant grasses and fewer weeds since the grazing has stopped.

Stand 3 is a large meadow to the south of stand 1 on a gently sloping "outwash" slope. Soil and rocks have both been eroded away by the creek

and deposited from run-off due to heavy rains from the higher slopes above. As a result the soil is finer and a bit deeper here which generates a grassland type of vegetation with scattered ponderosa pine on the rocky edges of the stand. Right now there are many weeds in the area along with several types of grasses. This stand has been grazed quite heavily as indicated by the great variety of unpalatable weeds, cow dung and, in one case, a juniper tree with the lower branches trimmed to the trunk by livestock or deer. There are a few pines and skunk brush which grow in the rockier areas of the stand. Prickly pear cactus and sage are quite extensive over the stand. Great mullein was also quite extensive before grazing was stopped but this spring young plants could only be found on the steeper and rockier east- and southeast-facing slopes overlooking the road. The future of this meadow is determined by future disturbances but left to nature it should return to a rich grassland meadow with a few scattered Rhus trilobata and Pinus ponderosa.

By following the dirt road northward and westward, one comes upon stand 4 just west of stand 1. Here again we have a meadow arising from the edaphic conditions of the area and the influence of man. The soil here is quite deep and is not nearly as rocky as the surrounding forest stands. Grass is the dominant vegetation in the area with a few Rhus trilobata again in the rockier areas. The influence of man in this stand is quite strong. There is a small man-made watering pond on the eastern end of the stand. Remnants of an old stone and wood building and a stone fence were also found. In the western part of the stand a very distinct area of daisies and an unknown plant occurs and seems to form a dense stand by itself. The boundaries of this area are quite straight and form an almost perfect

square which leads me to believe that this might be the result of some small garden, vegetable or otherwise cultivated by a former inhabitant of the area. This stand has been grazed (except for the garden plot) and has many unpalatable plants such as rabbit brush, mullein, and gum weed along with the short *bouteloua* and *mul henhergia* grasses. In time, however, this whole area should be primarily grassland with a few shrubs and perhaps a *ponderosa* or two on the rocky edges.

To the west of stand 4 is stand 5 which is a very dense *ponderosa* pine stand and in fact reminded me of the denseness of a lodgepole pine stand of the subalpine forest region. On the average there are twenty trees to a 10 x 10 yd. quadrat with only about two size classes, 3 to 4" dbh of 30 feet tall and 6 to 8" dbh of 40-45 feet high. These trees were very contorted and many had only the upper branches leafed out. Many of these small trees were dead and toppled over at ground level. As I moved through the stand, I found several old large stumps which bore scars of fire on their trunks. A rough field count of the rings in one of these stumps reached 150 years old. Taking some tree bores of some of the other trees, I found that the larger trees were about 75 years old and that slightly smaller ones were about 60 years old. Some of these 60 year old trees were only 3 or 4 inches in diameter which attests to the difficult time they have had in this dense stand. A safe conclusion derived from this stand would be that about 75 years ago a crown fire occurred destroying all the *ponderosa* pines. Almost all at once pine was reestablished to give us what we have today. The result will be a gradual thinning due to intense competition for sunlight and space which will eventually produce an open *ponderosa* pine stand with grass and herbs as a ground cover.

The next stand I came across is stand 6 and it is probably the closest example I have as to what the climax vegetation of this area is like. It is located in the southwest corner of my study area and is surrounded by stand 4. This stand somehow was missed by the fire and was overlooked by the grazing livestock since it was separated from them by stand 5 in which there is very little grass. Stand 6 has all age classes of ponderosa pine represented from some very large trees of 18-20" dbh and 70 feet tall to small seedlings which, unlike other stands, are not contorted. The soil is still quite thin and sandy and it results in a typical climax grass understory. There are many opuntia cactus and weeds in the area but there is also quite a bit of grass. In time the soil will improve and grasses will become more abundant which will in turn increase competition with the trees to achieve an even more open stand and a climax stand.

The remainder of my study area extends along Fern Canyon on its path eastward. The first two of these are on the northern slopes of Shanahan Hill. Both occur on very rocky slopes of a steepness that varies from about 50° in the upper part of the canyon to 35-40° in the lower slopes. The upper canyon stand I will designate stand 7. Here the canyon is quite narrow and steep which on the north-facing slope allows for less direct radiation and evaporation. This plus the shade provided by large ponderosas on top of the hill provide very mesic conditions and allows the growth of Douglas fir. Douglas fir is actually doing very well here and establishes a 50-50 ratio with the ponderosa pine. The ground cover is mostly grass and herbs with a few shrubs near the creek bottom. All age classes of both tree species are well represented although the ponderosa seedlings are distorted and having a rough go of it. There is also a start of a mistletoe

outbreak in the ponderosas. As a result I see this near climax stand in possible trouble. If the ponderosas on the ridge die it may result in a decrease of the Douglas fir since more radiation will reach them without the shading affect of the ponderosas. Conditions will become warmer and dryer.

As the canyon heads eastward, it widens, the slopes become slightly more gentle and the Douglas fir gradually fades out due to more xeric conditions. The next stand has more ponderosa depending upon the steepness and rockiness of the slope. There are some areas near the creek where the slope is quite gentle and the soil is quite thick which gives rise to some grass and herb areas before the shrubs and brush associated with the creek is reached. See figure 1.

In some areas of stand 8, especially those areas of Shanahan Hill's slopes which are farther away from Fern Creek, shrubs such as Rhus trilobata and Ribes cereum occupy the lower slopes where the soil is just a bit thicker due to deposition of material washed down from above. This topoedaphic climax seems quite stable and will probably remain for some time.

The last two stands of my study area are associated with the lower meadow below and to the north of Shanahan Hill. This lush grass meadow is a result of both deposition of soil and material from the slopes above and the past deposition by Fern Creek making for a deep, generally fine soil. In stand 9 there are several grasses, herbs and some weeds. Included are yucca, opuntia cactus, sage and some thistles. This area has been heavily grazed just recently but is beginning to recover under protection.

Stand 10 is that stand north of stand 9 along the creek. This is a

very rocky and erosionally unstable area of coarse, loose soil. On the ridge above the creek grow ponderosa, Ribes, juniper trees, skunk brush with a scattering of grasses and herbs in between. On the slope itself, there is mostly Rhus trilobata and Ribes cereum due to the rocky condition and rapid erosion. There are also a few grasses and herbs but not a great many. The status of the ponderosa seems quite good with a few seedlings present near the top of the slope. This stand I suspect will not change very much.

CONCLUSION

The area of Shanahan Hill and Fern Creek features many interesting and different stands and processes that make up the ecology of the area. There are extremes from dry meadows to forests and riverine stands, from near climax to the first stage of secondary succession. If there is a general theme in this study it is the affect of man upon this area. His livestock has caused the ponderosas to increase their denseness, his roads have put an ugly scar on the landscape, his building and cultivating have produced new stands. He has now acquired it through the Green Belt Project so now how should he use it for the benefit of all?

I would like to see this area open only for hiking. It is a beautiful place for nature walks because of its many diverse stands which provide habitats for numerous animals such as deer, rabbits, many birds, a vast variety of insects and amphibians and reptiles. The assortment of wild flowers in this area is tremendous also. One very important resource of this area besides its aesthetic beauty is quietness which will become more and more important as noise pollution increases in mechanized America. Thus motorcycles and trail bikes should be prohibited as well as other motor

vehicles.

The city should preserve this land as much as they can by using well laid out trails to avoid erosion and prohibiting camping and fires to protect the vegetation from excessive trampling and destruction. It will be hard to enforce such restrictions but perhaps in time the people will come to realize what a great natural resource this is and protect it themselves by using it correctly.

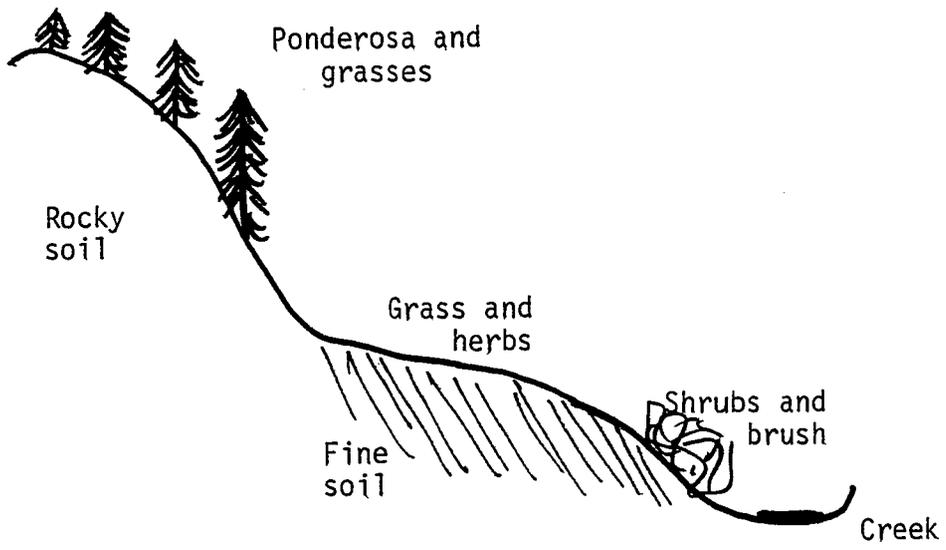


Figure 1.



9-2-18

EOB-3-18

UNIVERSITY OF COLORADO

BOULDER, COLORADO 80302

DEPARTMENT OF BIOLOGY
DIVISION OF ENVIRONMENTAL BIOLOGY

July 28, 1969

Mr. Larry Blick
Assistant City Manager
Boulder Municipal Building
Boulder, Colorado 80302

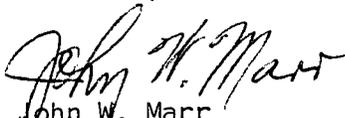
Dear Mr. Blick:

The enclosed study was made by one of my plant ecology students on the "Wells Property" of the Greenbelt Program last spring. This report illustrates the type of product which will come out of the informal cooperative program you so kindly helped me develop for my classes. Unless you find some objections to the procedure, I hope to eventually cover all city park and Greenbelt lands with this type of study.

I will be pleased to have any suggestions for changes which would make these reports more useful to you.

Thank you again for talking to my class about the Greenbelt Program and problems of city management. Your talk was a high point in the semester's activities because it was especially well presented and it gave the students information new to many students who had little information on your activities and projects. You are indeed skillful in presenting this information.

Sincerely,


John W. Marr
Professor

JWM:eg

cc: Mr. Tedesco
Prof. Löve
Prof. Pennak

Elaine, 11/8/02
Do you have
a copy of
the student
paper for
the library
file? I don't
know where
I got it!
Thanks, RT