ECOLOGICAL CONSTRAINTS TO MANAGEMENT OF CENTRAL OREGON RANGELANDS: ENJOYING ITS PRODUCTS AND VALUES

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Central Oregon rangelands are expansive and diverse. Residents and visitors alike can find spectacular views and places of solitude. Central Oregon rangelands provide habitats for wildlife, places to graze livestock, water for fish, recreation, and irrigation. While the environment may seem harsh, central Oregon rangelands are vital to the cultures, economies, and communities of the area. Central Oregon rangelands are the product of the combination of environmental factors that determine the products and values that can be expected with and without active management. It is important to understand these environmental factors since they form constraints on what can be found in the area.

WHAT ARE THE ECOLOGICAL CONSTRAINTS TO MANAGEMENT OF CENTRAL OREGON RANGELANDS?

The ecological constraints to management of central Oregon rangelands are made up of the climate, soils, vegetation, and history of the area. Central Oregon rangelands are a result of the combination of these factors in time and space. As any one factor changes over time, the landscape changes accordingly.

The discussion of this paper is given in the context of "The Ecological Provinces of Oregon: A Treatise on the Basic Ecological Geography of the State" by E. William Anderson, M. Borman and W. Krueger, May 1998. Central Oregon is composed of primarily three ecological provinces, Mazama, John Day and High Desert. Within each of these three provinces, one or more of these factors are different.

CLIMATE

Climate is the make up of weather patterns over time. Primarily precipitation and temperature are the parts that create an area's climate. Precipitation in the area varies from 7 to 40 inches on an annual basis. Within the region, winter precipitation makes up 50 to 60 percent of the annual total, spring moisture accounts for 20 to 30 percent with little or no rain occurring during the summer months. Vegetative growth is dependent on stored soil moisture and limited to spring when growing conditions (i.e. temperature) are favorable and moisture is available.

Precipitation is highly variable from year to year. In a review of annual rainfall records for Prineville, Oregon, average annual rainfall is 10 inches. Variation around that average is significant. In a review of precipitation records of the last 81 years, 1991 was the driest with 3.5 inches of annual rainfall and the mid-1950's had the wettest year with 16.3 inches of precipitation. Within these 81 years, 41 years were dryer than the average, 34 years were wetter than the average, and only 6 years produced an "average" rainfall amount.

Temperature is highly variable, both during the year and within season. Temperature ranges in the region from a minus 20 to 100 plus degrees F. A farmer from Prineville is quoted as saying "Central Oregon is blessed with 88 days of growing season, the problem however is that they are not consecutive". A review of the weather records would indicate that this statement is true. Freezing temperatures that would affect plant growth, 25 – 28 degrees F or lower, have been recorded for every night of the summer.

SOILS

The soils of the Mazama, John Day, and High Desert ecological provinces are uniquely different from each other. This difference expresses itself in the composition of plant communities, available soil moisture for plant growth, and site fertility.

Mazama Soils

Pumice sands and volcanic ash characterize Mazama soils, large soil particles whose origins stem from Mt. Mazama when it erupted approximately 6500 years ago. Soil depths range from 8 inches to 15 feet. Because of the large soil particle size, there is a corresponding large pore size between soil particles. This characteristic benefits water infiltration (well-drained soils) and limits soil water evaporation. Even areas of low precipitation within this province have relatively high water availability for plant growth.

Because of this water-soil relationship, we find plant species growing in dryer areas than we would normally find them. An example of this is Idaho fescue growing in a 10-inch precipitation zone. Typically we would not find this species in these dryer sites; instead we would find bluebunch wheatgrass or Thurber's needlegrass dominating this site in any other soil type.

Soil fertility is relatively high in the upper weathered pumice soil profile but less or non-existent deeper in the unweathered pumice profile. Very little plant root development can be found in these deeper profiles. In this province, vegetative communities are more a reflection of the differences in climatic factors than with differences in soil factors. Because of the pumice layer, soils are relatively uniform across the Central Oregon portion of the province.

Because of this soil uniformity, it is believed that juniper is a climax species within this province in the area from about Redmond to around Bend, east to about Hampton. Juniper stands within this province have of trees of very old age and have all age classes represented within the stands.

John Day Soils

The John Day Province is marked by a landscape of highly dissected, steep hillsides with extensive plateaus and valleys. While at first glance the soils of the John Day province would appear to have been formed from basalt bedrock, the soils of this province are made up primarily of sedimentary or tuffaceous materials. Basalt flows provide a cap to the nonstony sedimentary materials. Weatherization of these flows provides the rock found on many hillsides.

Soils are generally high in clay content. Red and green clays mark the John Day province. Because of the fine-textured soils in this province, they are highly susceptible to water erosion. Due to the high clay content, soils experience frost heaving in the winter and cracking in the summer.

The clayey sediments of the John Day province are usually calcareous. Western juniper has an affinity for calcium. This soil characteristic is part of the explanation for the expansive spread of western juniper within this ecological province.

High Desert Soils

Anderson, et.al., describe the soils of the High Desert ecological province as being formed from parent materials mainly through water action. The landscape is made of large and small internally drained basins, surrounded by extension terraces formed from ancient lakes.

Soils are highly variable in this province, ranging from deep loam to shallow clays. These soils may be highly alkaline, calcareous, or neutral. Vegetative production in this province is primarily limited by low precipitation and cold temperatures during the spring growing season when there is most likely to be favorable moisture conditions.

VEGETATION

E.R. Jackman wrote in "The Oregon Desert" that plants in the desert areas of Oregon have developed under rules of survival. In his book, Jackman indicates that these rules of survival include that the plant be predominately gray in color, that they are unattractive to animals, and that they have developed moisture saving devices.

In looking at the landscapes of central Oregon's rangelands, they are predominately gray in color, gray-green, gray-blue, or mostly gray. Sagebrush is dusty gray, juniper is gray-blue, green rabbitbrush is gray-green, and gray rabbitbrush is gray.

Plants have developed defensive mechanisms for protection against herbivory. These protective mechanisms include chemical based devices (being astringent, bitter, or poisonous), or have physical characteristics that affect the eating quality (woolly leaves or resins), or cause physical harm to the animal (thorns or awns).

Finally, plants have developed some form of moisture saving device. Leaves may be rolled like Idaho fescue, or modified (scale-like) to protect stomates (small openings in the leaf tissue). An example of a plant with a modified leaf is juniper. Other moisture saving strategies include buried crowns, small leaves or leaves with smooth margins as apposed to serrated or highly dissected margins, large stem to leaf ratio, hard seeds, or completion of a life cycle as an annual. Plants that have developed the ability to live in low precipitation areas are generally small, have reduced leaf surface area, and have short growing periods.

TIME

Time is an important factor in the development of rangelands. Time allows vegetation to express itself. Time allows for the variation of season. Some plants are growing when others are dormant.

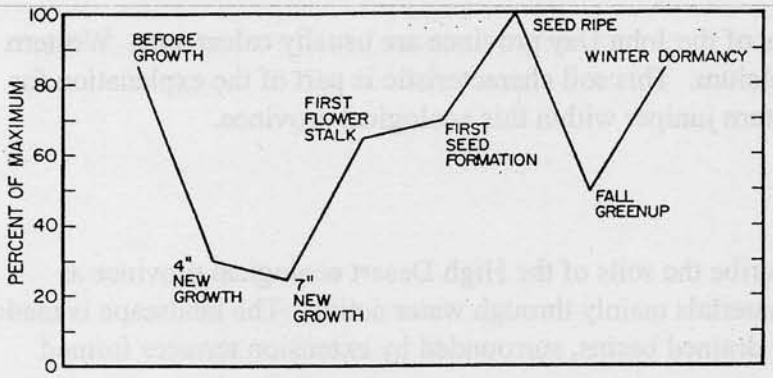

Figure 1. Available energy in roots of bluebunch wheatgrass at varying stages of maturity.

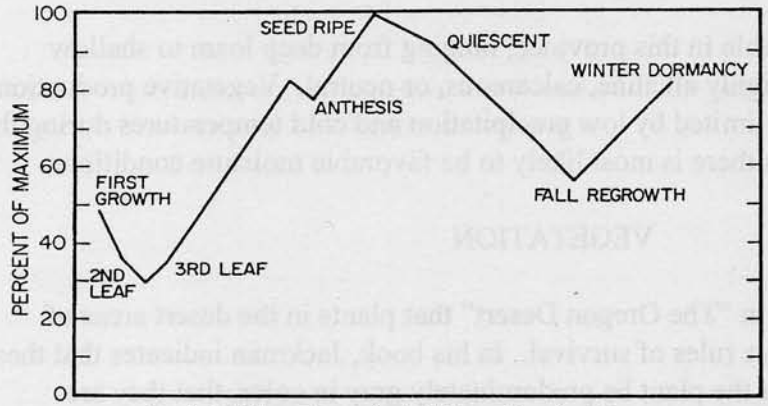

Figure 2. Available energy in roots of squirreltail at several stages of maturity.

Figure 1,2: General phenology and energy flow of bluebunch wheatgrass and bottlebrush squirreltail.

Some plants are flowering while others are already replenishing their root reserves. Figure 1 is a generalized phenology and energy flow of two grasses, bluebunch wheatgrass (top) and bottlebrush squirreltail (bottom) and how they compare throughout the year for initiation of growth, flowering, seed development, and dormancy. Seasonality changes a plant's palatability and therefore its likelihood to be grazed. As a plant becomes more mature, it becomes less palatable, less nutritious, and, therefore, less likely to be grazed.

Time accounts for the annual fluctuations that a site experiences. Earlier in this paper, we discussed the annual variation in precipitation for Prineville. Vegetative expression will be different depending on whether spring is cool or warm and wet or dry.

Time is also geological in nature. As mentioned earlier, much of the parent material in the John Day province is sedimentary. It has been a long time since we had enough moisture in central Oregon to allow that type of soil formation to occur.

Time also allows for vegetation to respond to the history of the site. Fire, drought, grazing, and/ or some other event(s) has had some impact on the landscape. Soils, vegetation, and microclimates are impacted by these events. Frequency of the event(s) and the duration of time between events have a significant impact on the make-up of the plant community and its productivity.

SO WHAT ARE THE ECOLOGICAL CONSTRAINTS TO MANAGEMENT OF CENTRAL OREGON RANGELANDS?

The ecological constraints to management of central Oregon rangelands are made up of the climate, soils, vegetation, and history of the area. Central Oregon rangelands are represented by diverse ecological provinces that in turn contain a variety of landscapes and vegetative communities. These combinations of vegetation, soils, climate, and time determine the products and values the land can produce. That knowledge provides us with the opportunity to enjoy its products and values.

LITERATURE CITED:

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