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A Summer's Work on a Forest Service Experiment Station

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The question often comes up in the mind of the student of Forestry, as to what branch or phase of his profession he will specialize in. During the last few years the growth of Forestry as a profession has been rapid and from the comparatively limited field of a few years ago, it has developed into an occupation of many and broad possibilities. The lumberman is coming to see that his timber supply will become exhausted unless closer utilization is practised. The steam and electric railroads and the telephone and telegraph companies are beginning to realize the great saving that will be effected by the use of preservative treated wood. The cities are becoming aware of the value of their park and shade trees and the necessity of conserving them. The Government Forest Service attracts perhaps more men of the forestry profession than does any other single field of activity. One of the most important as well as interesting branches of Forest Service work is that carried on at the various Government Experiment Stations.

A field season spent in practical work gives a student an opportunity to judge of the possibilities his training offers. A summer spent on experimental work gives one a glimpse of the value and economic application that such work has. The Utah Experiment station, located near Ephraim, Utah, on the Manti National Forest, is typical of this kind of work.

It seems to be the accepted view of some, who view the forest from a lumber producing standpoint solely, that the grazing industry is a necessary evil, rather than one of great importance. That this idea is erroneous can readily be seen, from the fact that approximately one-half the revenue derived from the forest service is secured from grazing fees.

The live stock industry is one of the main sources of wealth in the locality of the Utah Experiment Station. The Manti National Forest forms the summer range for a large number of sheep and cattle. The lumber industry is of less importance, the revenue received from grazing fees much exceeding that obtained from timber sales.

Before this region was converted into a national forest reserve, it was grazed as were many other localities in the western country, ruthlessly and with no thought of the future value of the range. Each owner was desirous of securing the best grazing ground for his flock of sheep and the consequent struggle which ensued

was detrimental not only to the stock but to the range as well. The inevitable result of this practice was that the range became overgrazed. It was to remedy this state of affairs that this section of the country was made into a forest reserve.

In order to determine how best to restore the depleted range, experimental studies were begun. The studies are carried on in what is known as the spruce-fir type at an elevation of from 8,000 to 10,000 feet. The top of the ranges are well rounded and are covered with vegetation. The areas where experimental studies are carried on are places that have been overgrazed in the past. Vegetative reproduction is less vigorous here and as a result much erosion has taken place.

Restoration of the range to its original productive capacity with the least economic loss from non-use is desired. This, as shown in the "Natural Revegetation of Range Lands Based Upon Growth Requirements and Life History of the Vegetation," by A. W. Sampson, is best secured by the deferred system of grazing, "which aims at a rotation in the time of using each portion of the range, each year allowing an area to reach seed maturity before it is cropped, but grazing after that period, in order to avoid loss of forage through non-use and to assist reproduction by trampling in the seed." In carrying out this policy grazing is restricted from the areas upon which experiments are carried on until August 20, when the seeds of most of the forage plants have ripened. Revegetational studies to best determine the method of retaining the valuable forage plants, which are the first to disappear when overgrazing is practiced, are made. These studies include a life history study of the most important forage plants.

The collection of a plant herbarium is carried on in connection with this work. The plants are collected as they reach maturity. Three specimens of each species are collected. One specimen is kept for the Experiment Station, one for the supervisor's herbarium and one specimen is sent to the Washington office. In collecting specimens the following points are observed: (1) date of collection; (2) botanical name; (3) common name; (4) exact locality where collected; (5) altitude; (6) slope; (7) soil character; (8) associated species; (9) classes of stock grazing the plant as forage; (10) value as a forage plant; (12) abundance; (13) distribution.

At an elevation approximately the same as where the experiments are carried on, climatological records are kept. These include a daily record of the temperature secured from a thermograph and the variations in temperature by the maximum and minimum thermometers. Readings are made of the soil temperature at 6, 12 and 18 inches, of the humidity, of the evaporation and of the wind velocity. The amount of precipitation and ex-

tent of sunshine each day are recorded. A correlation between these factors and plant growth may then be drawn.

The San Pete valley, into which Ephraim canyon opens, is dependent for its water supply, to grow its crops, upon the water that flows down from the mountains above. A large part of this moisture comes from the snow, which melts off slowly during the summer and maintains a constant supply. The success of the farm crops is dependent upon a plentiful supply of moisture during their growing period. Wherever a forest cover is removed from a steep slope the result will be heavy erosion and frequent floods. The removal of the forest cover allows the moisture to run off rapidly and very little of it is able to find its way into the soil. A vegetative cover will tend to check erosion in the same manner as does the humus and litter in a forest floor. Overgrazing will cause a less dense vegetative ground cover.

In order to afford a comparison between the amount of run-off and erosion upon a grazed and ungrazed area, experimental plots, typical of the locality, are grazed for a number of years. During that time a complete record is kept of total precipitation, rain and snow, and the amount of run-off and erosion. All the precipitation that falls on these experimental areas flows over a weir where it is recorded by means of a float and gage. The sediment settles to the bottom of receiving tanks where it is measured. At the end of a certain interval the area will be closed from grazing and the records continued. A comparison of the results secured will show the value of a vegetative cover in preventing erosion and heavy floods.

About all the timber in this region important from an economic standpoint is found between 5,500 to 9,000 feet in elevation. Between these elevations are included three of Merriam's climatic zones; namely the Upper Sonoran zone, the Transition zone and the Canadian zone.

The Upper Sonoran zone (*Pinon cedar type*) extends from 5,540 to 6,500 feet in elevation. The characteristic flora of this type is pinon pine (*Pinus edulis*), western yellow pine (*Pinus ponderosa*) found along the stream courses, single leaf pinon. (*Pinus monophylla*), two junipers (*Juniperus utahensis*) (*Juniperus scopulorum*), narrow leaf cottonwood (*Populus angustifolia*), scrub oak, (*Quercus Gambellii*), sagebrush (*Artemesia tridentata*), rabbit brush (*Chrysothamnus nauseosus*).

The Transition zone (Oak type) extends from 6,500 to 7,500 feet. The important species are western yellow pine, Colorado blue spruce (*Picea Parryana*), Douglas fir (*Pseudotsuga taxifolia*), white fir (*Abies concolor*), Rocky Mountain birch (*Betula fontinalis*), maple (*Acer grandidentatum*), scrub oak, bitter brush

(*Purshia tridentata*), manzanita (*Arctostaphylos uva-ursi*) and mountain mahogany. (*Cercocarpus parvifolius.*)

The Canadian zone (Douglas fir type) lies between 7,500 and 9,000 feet. The important plants of this zone are Douglas fir, White fir, Colorado blue spruce, balsam fir (*Abies lasiocarpa*), common juniper (*Juniperus communis*), limber pine, (*Pinus flexilis*), quaking aspen (*Populus tremuloides*), *Acer grandidentatum,* Rocky Mountain maple (*Acer glabrum*), chokecherry (*Prunus melanocarpa*), wolfberry (*Symphori carpos occidentalis*) and mountain maple (*Pachystima myrsinites*).

Coniferous plantations are located in various parts of these zones. They are planted in different sites and on different soil with varying conditions of shade. Examinations of these are made one in the Spring and one in the Fall. The examination consists in plotting the species on a chart and noting the number living, dead or missing, their condition, weak or vigorous and the amount of growth the preceding season.

Aspen and coniferous reproduction studies, seed collection, nursery work, collecting soil samples, collection of an herbarium, the laying out of sample experimental plots and other special studies are some of the other phases of experimental work.

A field season spent at experimental work is a profitable one. It is instructive because it requires close application and a regard for detail. It serves to develop originality in treating with unexpected problems and it is interesting because of the very nature of the work itself.