

# Soil-Vegetation Survey Information in Range Management Planning and Administration<sup>1</sup>

L. T. BURCHAM AND R. EARL STORIE<sup>2</sup>

## ABSTRACT

Since 1947 the State of California has been conducting a soil-vegetation survey—an inventory of the vegetative cover and underlying soils of the wild land areas of the state. This soil-vegetation survey is a particularly remunerative source of much information on the physical factors that affect the business of ranching. Practical applications of this information are discussed herein; a review of specific cases illustrates the value of these surveys in range management planning and administration. These cases also demonstrate that soil-vegetation surveys are a practical tool for both the rancher, and the range technician in public service or private enterprise. They are an extremely effective means of conveying information, and have a great potential for developing interest in, and an incentive for, better range management.

A RANCHER operates a manufacturing business—he manufactures meat, wool, and other animal products from his range forage, through the medium of his livestock. Like the manager of any other manufacturing concern, he must have a sound plan of operation if he is to reap the maximum reward of his efforts. To do an effective job of planning and managing, he must continually collect, evaluate, and apply many kinds of information about various factors which affect his operation. Information required by the rancher, for his long range planning and his day-to-day operations may be segregated into three categories:

physical factors, economic factors, and social factors. We will confine our attention to the physical factors. And we are thinking, too, about livestock production on the open range—or at least under extensive management practices—rather than under fence and on irrigated pastures.

## Physical Factors on Which Information Is Needed

To do an efficient job of planning and operating his business, the rancher must have detailed and accurate information about his own range. The physical factors with which he deals include weather and climate, topography, soils, plant cover and its productivity, water supplies, and plant and animal pests. Each of these factors may affect such things as the class of livestock grazed; their seasonal movements on the range; their utilization of various kinds of forage, as well as the total amount produced; management and herding practices which must be employed; and time of marketing the livestock. Information is needed on location, nature, and extent of special problem areas, prospects for range improvement on various portions of the ranch, and many other physical factors involved in a successful ranching venture. The effect of these factors upon the business must be determined within as narrow limits as possible.

The need is evident for drawing upon all available sources for information on these factors.

## Soil-Vegetation Surveys as Sources of Information

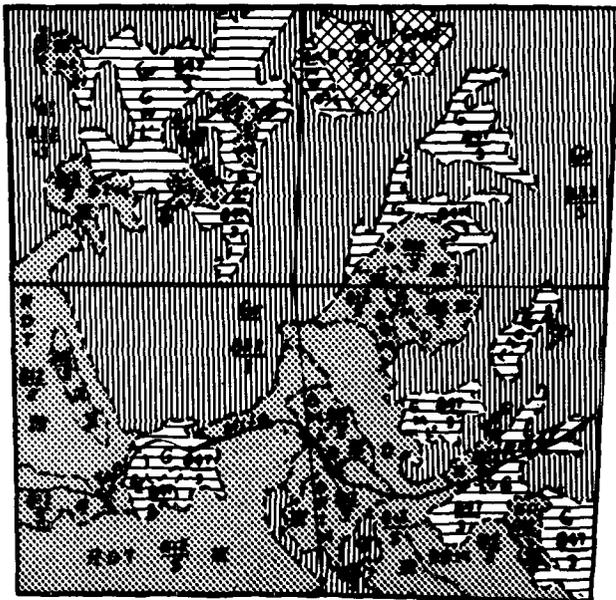
Since 1947 the State of California has been participating in an inventory of the vegetative cover and underlying soils of the upland areas of the state; this Soil-Vegetation Survey is financed through appropriations to the California Division of Forestry.<sup>3</sup>

The Soil-Vegetation Survey is designed to obtain basic information on the kind and distribution of soils and natural vegetation, their characteristics, and their potential uses, as an aid in better management of our wild lands. Much of the survey information has direct application in

<sup>1</sup>Contribution from California Division of Forestry, Sacramento, California, and Department of Soils, University of California, Berkeley, Calif. Presented before Div. V-A, Soil Science Society of America, Davis, Calif., Aug. 18, 1955. Received Oct. 24, 1955. Approved July 30, 1956.

<sup>2</sup>Senior Forest Technician (Range Improvement), California Division of Forestry; and Professor of Soils and Plant Nutrition, Department of Soils and Plant Nutrition, University of California, Berkeley, respectively.

<sup>3</sup>California State Legislature, Chapter 1538, Statutes of 1947. Details of this survey are given in "The Soil-Vegetation Survey of California" by R. A. Gardner and A. E. Wieslander, in this series.



SOIL SERIES

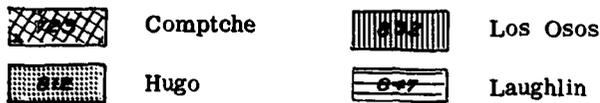
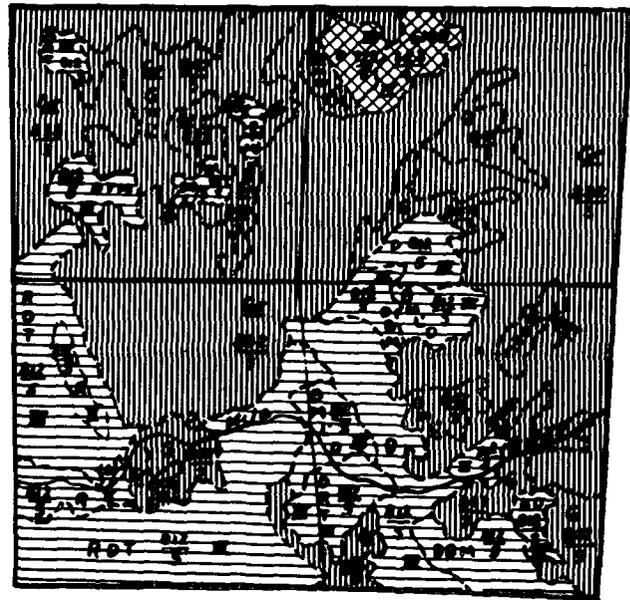


Figure 1.—The location, nature, and extent of the several kinds of soil on a given ranch can be determined from soil-vegetation maps. With appropriate interpretative aids, the maps yield information on the principal soil characteristics.

wild land management problems; additional values accrue when the data are interpreted with specific uses in mind, such as would be the case with a rancher.

Soil-vegetation surveys are a particularly remunerative source of information about many of the physical factors affecting ranching. From them the rancher can determine the location, nature, and extent of the several kinds of soils on his ranch (figure 1). With appropriate interpretation of the principal soil characteristics such as texture, water-holding capacity, permeability, fertility, and erodibility, this information has direct application in formulating many ranching decisions. For example, a portion of range having a clay-textured soil may not be suitable for late winter or early spring use because the soil remains so moist that grazing animals damage the forage and compact the soil by trampling; another portion with a predominantly sandy loam texture may be quite favorable for use during this period. But the area of fine-textured soil may be more valuable for use later in the season when feed on the the sandy soil is dry.

Soil-vegetation surveys provide information on relative suitability of the different soils on a ranch for forage production and range use (figure 2), constituting an important basis for estimating potential productivity and present or future grazing capacity. They are of value in assessing possibilities of range improvement, and in determining the feasibility of practices such as clearing, reseeding, fertilizing, or the desirability of other measures (figure 3). In appraising the feasibility of range improvement practices, both physical and economic aspects are important: from



SUITABILITY FOR FORAGE PRODUCTION

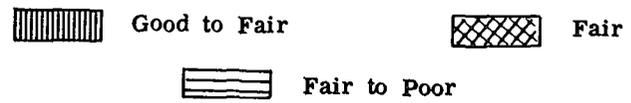
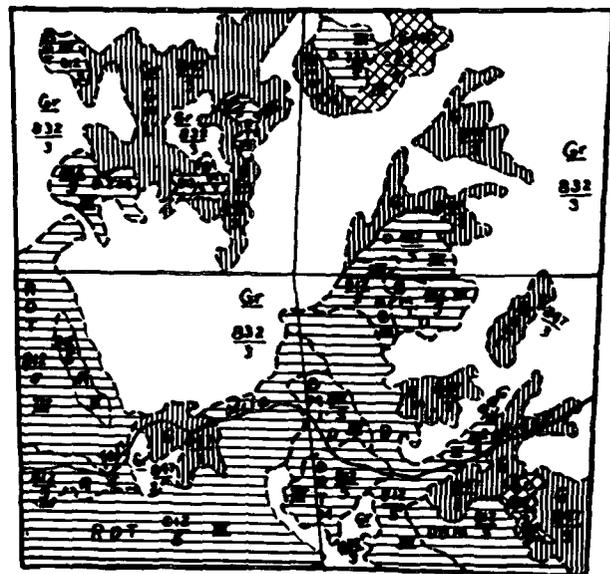


Figure 2.—Soil-vegetation surveys provide information on the relative suitability of the different soils for forage production.



POSSIBILITY OF CLEARING FOR RANGE IMPROVEMENT

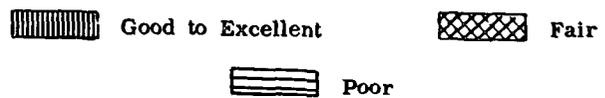
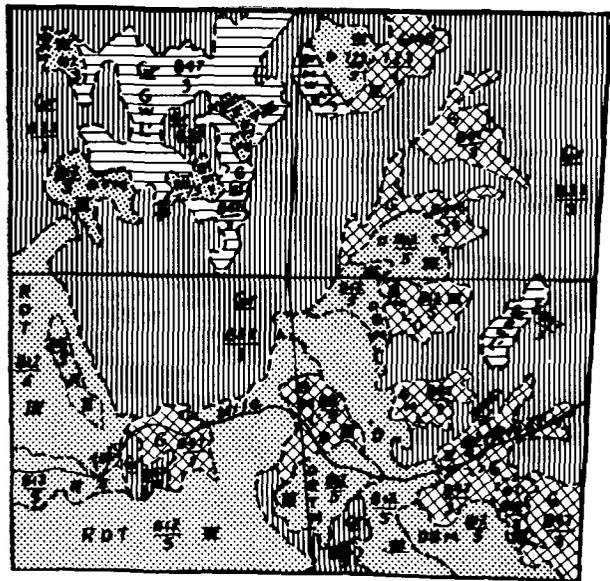


Figure 3.—Information from soil-vegetation surveys will aid materially in determining possibility of clearing woody vegetation, and other range improvement practices.



NATURAL VEGETATION

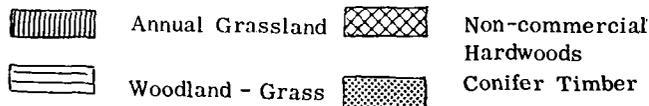


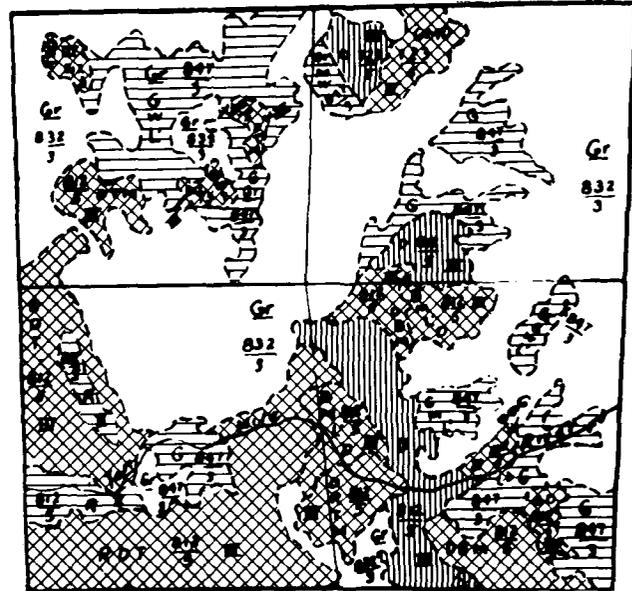
Figure 4.—The soil-vegetation map provides a valuable basic record of the dominant vegetation and its distribution on the range unit. Such a record can serve in many ways as an aid in planning.

the physical standpoint it may be possible to clear woody vegetation from a certain area of land; but if it has a shallow, infertile soil such as those of the Henneke series, clearing may not be practicable because it will not yield an economic return on the investment required. Soil-vegetation surveys are of significant value in making decisions of this nature.

The slope class symbols enable the rancher to determine the slope gradient of various portions of his ranch, within broad limits. This information will help him evaluate effects of topography on forage production, on accessibility of forage to livestock, proper season of use, and on soil erosion.

The rancher has a particular interest in the plant cover on his range. The soil-vegetation maps provide a valuable record of the dominant vegetation and its pattern of distribution over the range unit (figure 4). These records are helpful in appraising past history of range use and some of its relationships to present condition. The maps also provide information which may be used in determining the amount, composition, and physical characteristics of the plant cover.

Information from soil-vegetation maps may help determine areas in need of revegetation; suitability of various parts of the ranch for different classes of livestock; proper season of use; and rate of stocking with respect to erosion hazard or other kinds of deterioration. If a rancher wishes to clear brush from a portion of his ranch for range improvement the soil-vegetation map will furnish information on the sprouting characteristics of the brush species that will assist in evaluating the need for follow-up measures, and the kind of measures to apply—or the



SPROUTING CHARACTERISTICS OF WOODY VEGETATION



Figure 5.—Information on sprouting characteristics of woody vegetation available on soil-vegetation maps will assist the ranch manager in selecting appropriate methods for clearing, and in evaluating the need for follow-up measures.

methods to be used in the clearing process itself (figure 5). Some indication is given on location, nature, and extent of poisonous or objectionable plants, and the possibilities of their control. Relative values of the woody vegetation as browse for cattle, sheep, horses, and goats are given, which together with other information, are of definite value in formulating sound range management plans.

Soil-vegetation maps provide certain information on location, nature, and extent of sources of water, their relationship to the forage supply, and something of the need for, and possibilities of, developing additional supplies.

The ranch operator can turn to the soil-vegetation maps for an appreciable amount of information on miscellaneous factors such as location and nature of special problem areas, assistance in planning location of fences, salting grounds, and other range developments.

#### Applications of Soil-Vegetation Survey Information

As an example of the manner in which the information from the soil-vegetation survey may be applied to a practical situation let us suppose that a given rancher has an area of brush-covered land that he wishes to clear for range use. The vegetation type map, as made in the course of the usual range survey, shows it is dominated by a relatively uniform stand of typical chaparral—principally manzanitas (*Arctostaphylos* spp.), chamise (*Adenostoma fasciculatum*), and scrub interior live oak (*Quercus wislizenii*), but with some old blue oaks (*Quercus douglasii*) on parts of it (figure 6, lower left). From a consideration of vegetation, topography, and related surface evidence it

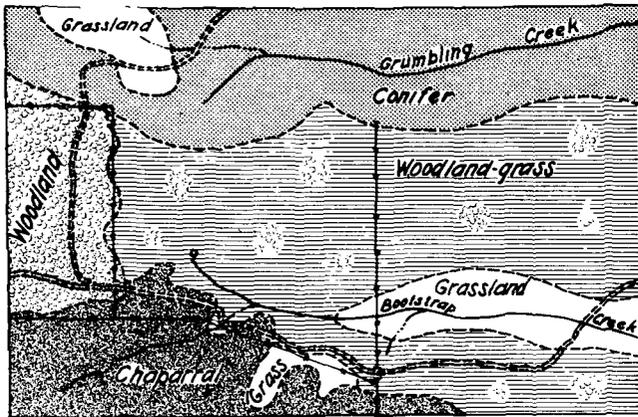


Figure 6.—The range type map, made as a part of the usual range survey, indicates characteristics of the dominant vegetation, and shows other information necessary in planning ranch management.

appears the area may be relatively homogeneous. However, the soil-vegetation map, while agreeing basically with the vegetation, shows that soils of three different series—Laughlin, Los Gatos, and Maymen—underlie this portion of the range (figure 7). It now becomes obvious that the area of Laughlin soil once was dominated by a woodland-grass plant cover: the chaparral has invaded as a result of disturbances, and the old blue oaks are a relict of the original vegetation. Since this soil has a fair to good suitability for range forage production it should repay the cost of at least moderately intensive rehabilitation measures. The Los Gatos soil is shallower and less suitable for range forage production; but some range improvement work can be done on the most favorable portions—along the margins of the grassy stringers, for example—where the investment can be kept reasonably low. The Maymen soil, typically associated with a chaparral cover, has a very poor suitability for forage production and range use: on it, together with the less favorable areas of Los Gatos soil, any attempts at clearing for livestock production should be made very cautiously, and on a trial-and-error basis.

Another typical situation encountered in the field, particularly in the Northern Coast Ranges, is where a natural prairie lies in juxtaposition to a stand of conifer timber (figure 6, upper left). In this case the rancher is interested in clearing the timber and converting the land to forage production. Being under the common—but mistaken—impression that the soil is identical under both the prairie and the conifer timber, he sees no reason why such a project is not feasible. Recourse to the soil-vegetation map (figure 7, upper left) shows that the natural prairie is on a body of Los Osos soil, one of the better forage-producing soils of the North Coast, well adapted to range use, and typically found in association with these prairies. The conifer timber is underlain by a soil of the Hugo series. East of the prairie this soil averages more than 5 feet in depth and is rated excellent for timber production (timber site II). South and west of the prairie the Hugo soil is considerably shallower and is less favorable for sustained yields of timber (timber site III); in addition, an appreci-

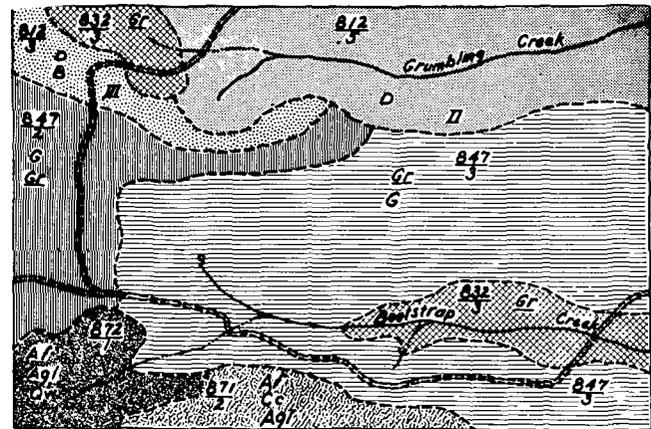


Figure 7.—Soil-vegetation map of the same range unit as shown in figure 6. The different soil series and their associated vegetation are delimited, and their relationships indicated. The soil series shown are: 812—Hugo; 832—Los Osos; 847—Laughlin; 871—Los Gatos; 872—Maymen.

able amount of Oregon white oak (*Quercus garryana*) is intermixed with the conifers. With the soil distinctions evident, the rancher reaches the conclusion that the natural prairie is an entity distinct from the adjacent timbered areas, with a high natural suitability for forage production. The land to the east of it probably will yield the highest economic return if managed for sustained timber production, but it will afford some short-term grazing following periodic harvests of timber. An alternative is afforded with respect to the area to the south and west of the prairie—it may be left for timber production and managed on an extensive basis; or clearing and conversion to range use may be done within the limitations imposed by economic considerations. Having this information at his command the rancher may proceed with development of his management plan.

The foregoing discussion has stressed the values of soil-vegetation survey information to the individual rancher. Many of our ranchers have had some training in agricultural colleges or similar institutions and sufficient practical experience to have a general familiarity with soil and vegetation maps. In a majority of cases, however, best use will be made of soil-vegetation maps when they are interpreted by technical personnel. Frequently the rancher will obtain his information from the maps through the assistance of a range technician, soils technologist, extension specialist, or other person, who is working either as a private consultant or in public service. In those situations, soil-vegetation maps will inform such an intermediary just as effectively as they would a rancher. To the latter person—or to the new owner of a ranch—they will be even more valuable. They will provide, or furnish an effective substitute for, many of the details which the rancher acquires through years of intimate association with the land from which he draws his livelihood. Soil-vegetation maps are an extremely effective means of conveying information to the ranch administrator; they have a great potential for developing interest in, and creating an incentive for, better range management.