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**SOIL CONSERVATION SURVEY
HANDBOOK**

By

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Soil Conservation Service



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INTRODUCTION

Soil conservation in its broadest sense implies permanent maintenance of the productive capacity of the land. The achievement of soil conservation not only requires that the land be used for the purpose for which it is best suited, but also necessitates the adoption of such soil conservation practices as are required for each kind of land.

¹ Mention should be made of the work of Glenn L. Fuller, under whose direction previous handbooks were prepared, and of A. E. Kopher, A. H. Paschall, and J. G. Steele. Many others have made contributions.

APPENDIX

FACTORS USED IN GROUPING SOILS

After soils have been mapped according to series and types, it is sometimes desirable to simplify the classification by arranging them in groups. Such groupings may be made to show not only broad features of resemblance but also marked differences.

The following are some of the factors that should be considered in grouping soil types:

1. External features:

Site: Upland or lowland.

Original vegetation: Timbered or grass.

Relief: Favorable or unfavorable for erosion control.

Drainage: Well-drained, poorly drained, or imperfectly drained.

2. Physical and chemical character of the soil horizons:⁶

Reaction: Neutral; mildly, strongly, very strongly alkaline; slightly, medium, strongly, very strongly, or extremely acid. State also if calcareous.

Salts and alkali.

Texture: Light, medium, heavy.

Structure: Granular, prismatic, columnar, nutlike, platy, crumb, fragmental, or phylliform.

Consistence: Loose, compact, mellow, friable, crumbly, plastic, sticky, hard, cemented.

Permeability: Favorable or unfavorable.

Moisture retention: Favorable or unfavorable.

3. Susceptibility to erosion:

Water erosion: Slight, moderate, severe.

Wind erosion: Slight, moderate, severe.

4. Present productiveness: High, medium, low.

METHOD OF STATING SOIL DEPTHS AND SLOPE LIMITS

Confusion has occasionally arisen in stating the results of measurements, particularly the depth of soil horizons and the limits of slope groups. In order to secure uniformity the word "to" should be interpreted as meaning to and not beyond the value stated. In describing a soil horizon, the distance from the soil surface to the upper and lower limits of the horizon should be stated. For example, one horizon may be from 0 to 2½ inches, the next from 2½ to 4, and so on. If there are transition layers or any zones that are not sampled for any reason, that fact should be noted.

In establishing slope groups, limits are set up in the following manner: Group A, less than 2 percent; group B, 2 to 5 percent; and group C, 5 to 12 percent. In order that these limits of slope groups may be applied uniformly, land with a dominant slope of less than 2 percent should be mapped in group A. Land with a dominant slope of 2 percent and any area with a slope greater than 2 percent but less than 5 percent would be mapped in group B, and a 5-percent slope would be mapped in group C.

SYMBOLS

Standard symbols for soil conservation survey base maps are shown in plates 1 to 4. Styles of lettering suitable for field sheets are given in plate 6. In plate 5 there is given a group of miscellaneous symbols that includes those for the

⁶These and other terms are defined in the following publication: U. S. DEPARTMENT OF AGRICULTURE. SOILS AND MEN. U. S. Dept. Agr. Yearbook 1938: 1162-1180. 1938.

designation of isolated gullies, cutting along banks of streams, and small detrimental deposits of erosional debris. In general, the symbols used follow those approved by the Federal Board of Surveys and Maps. Special symbols may be used to show additional features, but they must first be approved by the inspector and incorporated in the survey plan. Symbols and lettering on all maps must be distinct and legible. The ink used should be of a type that adheres to the paper and does not flake off. Inks containing dyes are available that will adhere to photographs but that cannot be erased without removing part of the paper.

If the project boundary occurs near a road or railroad and crosses back and forth, the surveyor should show all detail of the base map between the boundary line and the road or railroad, as indicated in figure 3.

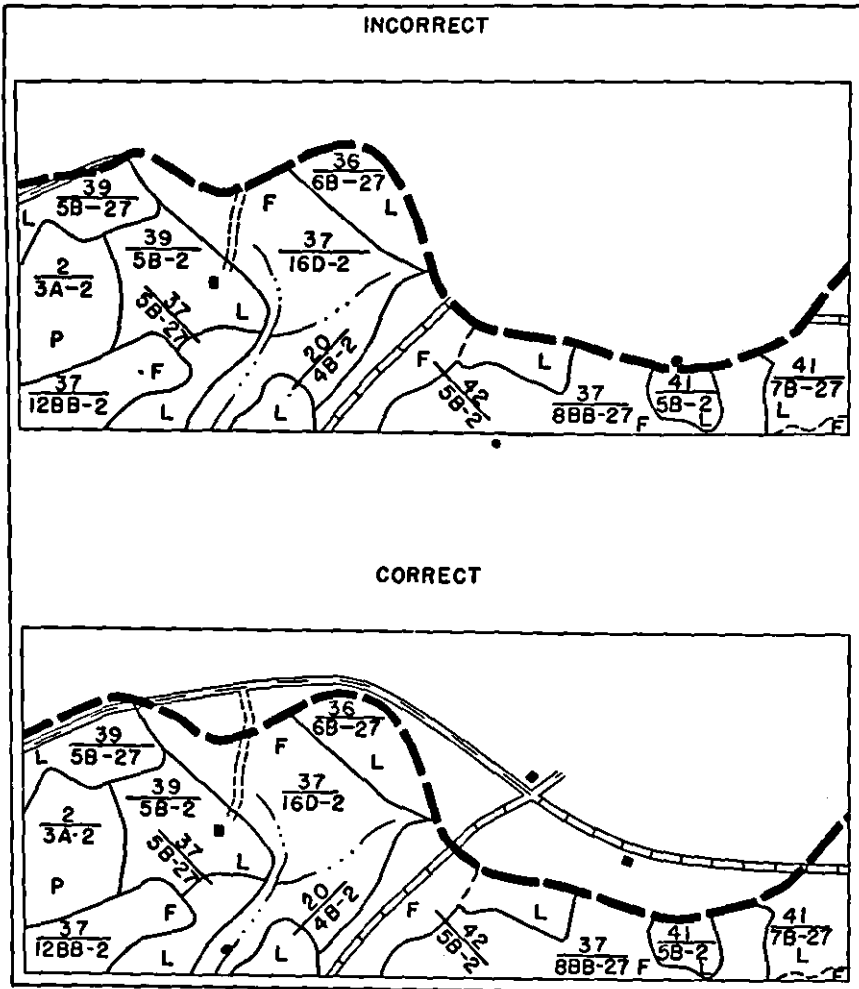


FIGURE 3.—Method of showing base-map detail along project boundary.

On detailed surveys permanent fences that do not coincide with other lines will be indicated by small black crosses on a fine broken black line, as shown in plate 5. Fences bordering highways, railroads, or other works may be indicated by using small v's along the structure symbol as illustrated with the dirt-road symbol. Fences that coincide with conservation survey boundaries, land use boundaries, or farm boundaries will be indicated by black crosses on such boundary lines. In areas affected by wind erosion, deep drifts along fences may be indicated as shown under Miscellaneous in plate 5. To indicate the depth of the drift and to mark those drifts that require leveling or other treat-

ment, the appropriate wind-erosion symbol may be used, as given in the example in plate 5.

Farm boundaries are to be shown only if there is a definite need for them, as on soil conservation districts, and if it has been determined that they can be shown to best advantage by the soil surveyor. If shown, they are to be indicated by red lines, except possibly on surveys for which the field sheets are to be reproduced by photography. On such surveys adoption of some other distinctive line may be advisable.

On all maps, including aerial photographs, occupied houses will be indicated by solid black squares, unoccupied houses by open squares.

CLASSIFICATION OF FORAGE TYPES ON RANGE SURVEYS

For making range surveys, 18 forage types have been recognized. On conservation surveys these types may be mapped, if approved in the survey plan, to indicate cover on range lands in greater detail than is provided on pages 13-14. The following instructions for mapping forage types have been adopted by an inter-agency conference that included the Soil Conservation Service.⁷

TYPE DESIGNATIONS

Types will be indicated by the proper type number followed by standard symbols to indicate the dominant species. Types containing a timber overstory will carry the principal timber species symbol after the type numbers. The number and symbols should give an accurate picture of the principal species.

Types will be designated according to aspect. For instance, if the type is predominantly a grass type with scattering timber, it will be shown as type 1 (grassland) followed by the timber symbol. The conspicuous or most important species or genus symbol will be shown first, followed by the minor species. Unless exceptional conditions prevail not more than three symbols will be shown in a designation. If less than three species are prominent the number of symbols should be reduced accordingly.

SYMBOLS

Symbol lists for trees, shrubs, and herbaceous vegetation should be devised and standardized for regions. Symbols for all common and widely distributed genera and species should preferably be standardized for the entire range area.

The governing principle will be a three letter symbol—all capitals for the genus symbol and one capital and two lower-case letters for species. The genus symbol should, except for trees, consist of the first three letters of the genus name. In case of conflict the most common genus will carry the second or third letter changed to remove the conflict.

Species symbols will consist of the first letter of the Latin generic name, followed by the first two letters of the specific name. In case of conflicts the same rule will be applied as for removing conflicts in generic symbols. If the species determination is unimportant or if the species cannot be readily identified the genus symbol may be used. If there is a difference in forage value or general characteristics between species in the same genus, the species symbol should always be used.

TYPE DESCRIPTIONS⁸

1. Grassland.—Grassland other than meadow and secondary meadow. Perennial grasses predominate and determine the aspect although weeds and browse may be present.

⁷ INTER-AGENCY RANGE SURVEY COMMITTEE. INSTRUCTIONS FOR RANGE SURVEYS AS FORMULATED BY THE INTER-AGENCY RANGE SURVEY COMMITTEE AND ADOPTED BY THE WESTERN RANGE SURVEY CONFERENCE, pp. 20-26. April 24, 1937. [Mimeographed.] [Quoted with slight editorial changes.]

⁸ Type descriptions were developed by the Forest Service and have been used by them since 1914. In 1937 these descriptions with slight modifications were adopted as standard by the following agencies: Agricultural Adjustment Administration, Forest Service, Resettlement Administration (now Farm Security Administration), and Soil Conservation Service, of the Department of Agriculture, and the Bureau of Indian Affairs and Division of Grazing, of the Department of the Interior.

Examples of type are: Grama-buffalo grass, bunch grass, wheatgrass-sedge, alpine grassland, bluestem.

2. Meadow.—Areas where sedges, rushes, and moisture-enduring grasses predominate. Two classes of meadow are recognized:

2W. *Wet meadow or marsh*.—Meadow areas that are characterized principally by sedges and that remain wet or moist throughout the summer.

2D. *Dry meadow or flood plain*.—Meadow areas that are dominated by grasses rather than sedges and that occur as moist meadowlike areas in open timber or intermittent meadows, both of which become moderately dry by midsummer.

3. *Perennial forbs (weeds other than desert weeds)*.—All untimbered areas where perennial weeds predominate over other classes of vegetation. There is very little true weed type, as a weed cover is usually temporary in character and is soon replaced by a more permanent vegetation if the disturbing factor is removed. If there is no great predominance of the weeds over the grass or brush vegetation and if it is possible to judge that the weed predominance is due to some unnatural factor, the weeds should be disregarded in designating the type and the more stable vegetation should be used as an index. The weeds will then be cared for in the subtype.

4. *Sagebrush*.—All untimbered lands where sagebrush or shrubby species of similar appearance predominate. The sagebrush lands usually differ in range values and in season of grazing from the areas that are classified as browse. Areas dominated by shrubby species of sagebrush, including big sagebrush (*Artemisia tridentata*), shall be classed as subtypes, as, for example, *Artemisia filifolia*, *A. cana*, and *A. tripartita*. Other shrubby species such as *Chrysothamnus* should be designated as subtypes when they become dominant in sagebrush areas.

The sagebrush and the browse types are sometimes difficult to distinguish from the grass and weed types if aspect rather than the dominant class of forage is used as the distinguishing characteristic. Sagebrush may form only 15 percent of the total vegetation of a type and still its aspect may be that of a sagebrush type. It may prove desirable, in a given region, to decide on a certain percentage, such as 20, of all the vegetation in the type as the minimum proportion of sagebrush that may be present if the area is still to be classified as type 4, provided, of course, that it does not already have the aspect of some other type. The same will hold true of the browse type.

5. *Browse-shrub*.—All untimbered lands where browse, except sagebrush or its subtypes, gives the main aspect to the type or is the predominant vegetation. It usually occupies the transition zone of the lower mountain slopes, foothills, and plateau areas. Examples of subtypes are mountain-mahogany, bitterbrush, willows, *Ceanothus*-manzanita, and California chaparral.

6. *Conifer*.—All range land in coniferous timber supporting grasses, weeds, or browse, either singly or in combination, except as provided under types 7 and 9. The forage may vary from a pure stand of pinegrass or some other grass to a pure stand of weeds or browse. It usually, however, consists of grasses, weeds, and browse, and the proportion of each species varies so widely that it is not thought advisable to attempt a division into types. These variations can best be represented by subtypes.

7. *Waste*.—All areas of dense timber and brush that have no value for grazing or have such slight value that they cannot be used economically, owing to either denseness of standing or down timber or sparseness of forage growth. Large areas of very sparse forage, unless within easy reach of a better type, shall be classified as waste because of the impracticability of running stock over so large an area to get such a small amount of feed. This type also includes areas not strictly in timber or brush and not barren that are so rough or inaccessible as to make their future use improbable.

The subtype designations generally encountered in this type are: 7T, Waste in dense timber; 7D, waste in down timber; 7B, waste in brush; 7R, waste areas where rocky character prevents use; and 7I, permanently inaccessible areas. Principal species of timber should be shown by symbols.

8. *Barren*.—All areas on which there is naturally no vegetation, or virtually none, including intermittent lake beds, saline flats, active sand dunes, shale, rock slides, and lava flows. Areas that have been denuded by overgrazing should not be confused with areas naturally barren. Areas containing only annuals for a part of the year should not be shown under 8, although these may be without vegetation for the remainder of the year.

9. Pinon-juniper.—Pinon, juniper, pinon-juniper, and digger pine. The character of the range in this type as to location, grazing capacity, and management is sufficiently distinct from the conifer type to justify a separate type. The forage may vary from a pure stand of grasses, weeds, or browse to a combination of any two or all. These variations can best be shown by subtype designations.

10. Broadleaf trees.—All range in deciduous timber. The combination of grasses, weeds, and browse, and the proportion of individual species will vary as in other types.

The principal subtypes are: Aspen, cottonwood, oak, birch, alder, and ash-elm, when they occur in tree form.

11. Creosote.—Areas where creosotebush (*Covillea tridentata*) constitutes the predominant vegetation.

12. Mesquite.—Areas where various species of the mesquite (*Prosopis*) give the characteristic aspect or constitute the predominant vegetation.

13. Saltbush.—Areas where the various salt desert shrubs of the *Atriplex* family form the predominant vegetation or give the characteristic aspect. There is sufficient significant difference in the range value and the use of saltbush areas to justify their separation from other desert or semidesert shrub types.

14. Greasewood.—Areas where greasewood (*Sarcobatus*) is the predominant vegetation or gives the characteristic aspect. This type usually occupies valley floors subject to overflow during flood periods or areas underlain with ground water at shallow depths where the soil is more or less saline. It is sufficiently different from other desert shrubs to justify an exclusive type.

15. Winterfat.—Areas where winterfat (*Eurotia*) gives a characteristic aspect or constitutes the predominant vegetation. Though commonly associated with other semidesert shrubs, the occurrence of this plant in Utah and Nevada as a type character is of sufficient extent to justify a separate type.

16. Desert shrub.—A general type that includes areas where other desert shrubs aside from those separated into individual types constitute the predominant vegetation or give the characteristic aspect. This type includes several genera that are quite distinctive in type habit, such as blackbrush (*Coloogyne*), coffeeberry (*Simmondsia*), catclaw (*Acacia, Mimosa*), gray molly (*Kochia*), hop-sage (*Grayia spinosa*), spiny horsebrush (*Tetradymia spinosa*), and little rabbitbrush (*Chrysothamnus stenophyllus*), but pure types of each are so limited in extent as not to justify a separate type. The plant symbols used will be sufficient to indicate the predominant species present.

17. Half shrub.—Areas where half shrubs constitute the dominant vegetation or give the characteristic aspect. Half shrubs are semiwoody perennials of low stature such as *Aplopappus, Gutierrezia, Artemisia frigida*, and *Eriogonum wrightii*. They commonly consist of a woody caudex from which herbaceous stems are produced that die back annually. These genera are sufficiently distinctive in habitat and of wide enough extent in certain localities to justify a separate type.

18. Annuals (weeds or grasses).—Areas in which annual weeds or annual grasses constitute the dominant vegetation. Both transitory stages and semipermanent conditions should be included, as for example: Russian-thistle, downy chess (*Bromus tectorum*), and desert weeds. The plant symbols used will be sufficient to indicate the predominant species present.

Abandoned lands.—Abandoned lands should be classified according to aspect. The boundaries should be hachured on the map.

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