CALIFORNIA STATE BOARD OF FORESTRY

TECHNICAL RULE ADDENDUM NUMBER 1

Revised
February 1, 1990

Procedure for Estimating Surface Soil Erosion Hazard Rating

Note: The procedure noted in this addendum is to be used in application of rules 14 CCR 912.5, 932.5 and 952.5.

Introduction

The purpose of this addendum is to guide calculation of the surface soil erosion hazard rating.

Determination of the Surface Soil Erosion Hazard Rating

The proposed rating system form [form is attached to addendum] for use in making the Erosion Hazard Rating has been prepared in a manner to allow the RPF to make an assessment of each of the erosion factors. These factors which are significant determinats in erosion hazard include:

(1) The inherent characteristics of the soil, including soil texture, depth to restrictive layer or bedrock, and percent of coarse surface fragments.

(2) Slope of the land surface.

(3) Protective vegetative cover.

(4) Precipitation characteristics.

Each of the factors has been weighed in relation to: (1) the within-factor range; and (2) the relative importance between factors. These relative weights have been field tested, checked against various soil series of generally known erosion hazard, and compared to the accepted theoretical basis of the erosional process.

In order to complete the hazard rating form, the user shall estimate the level for each factor and sum the ratings. This sum is then used to determine the proper adjective. As an aid to the user in selecting the proper level for each factor, the discussions and descriptions have been provided in Appendix I.

APPENDIX I

I. Soil Factors: Soil factors are rated individually.

A. Soil Textures

1. Detachability

Detachability refers to the ease or difficulty with which soil materials are dispersed or detached by rain-drop impacts and/or overland flow water. Soil detachability and texture are closely related.

Soil texture refers to a range, percentage by weight, of soil fractional particle sizes of sand, silt, and clay which make up the natural soil material. Various specific size range percentages have been established for the existing soil textural classes. For example, sandy loams, loams, or clay textural classes.

(a) Field Determination of Soil Texture Class

Soil material used for textural determinations is that material which passes 2mm sieve. Field sample should be spread out in palm of hand and all course fragments over 2mm in size (approximately 1/10 of an inch) separated from the 2mm size material. Ocularly estimate percent of coarse fragment material. Also estimate total percent of surface occupied by stones, boulders, and rock fragments; add this percent to the total percentage of coarse fragments. Make soil textural determination on material estimated to pass the 2mm sieve.

The determination of soil class is made mainly by feeling the soil with the fingers, sometimes supplemented by examination under the hand lens. Moist soil feels different to the fingers than dry soil.

The following descriptions can be used when making such textural determinations by feel.

Sand: Sand is loose and single grained. The individual grains can readily be seen or felt. Squeezed in the hand when dry, it will fall apart when the pressure is released. Squeezed when moist, it will form a cast, but will crumble when touched.

Sandy Loam: A sandy loam is a soil containing much sand, but which has enough silt and clay to make it somewhat coherent. The individual sand grains can readily be seen and felt. Squeezed when dry, it will form a cast which will readily fall apart, but if squeezed when moist, a cast can be formed and will bear careful handling without breaking.

Loam: A loam is a soil having a relatively even mixture of different grades of sand and of silt and clay. It is fairly smooth and slightly plastic, with a somewhat gritty feel. Squeezed when dry, it will form a cast that will bear careful handling, while the cast formed by squeezing the moist soil can be handled quite freely without breaking.

Silt Loam: A silt loam is a soil having a moderate amount of fine grades of sand and only a small amount of clay, over half of the particles being of a size called "silt". When dry, it may appear cloddy, but the lumps can be readily broken, and when pulverized it feels soft and floury. When wet the soil readily puddles. Either dry or moist, it will form casts that can be freely handled without breaking, but when moistened and squeezed between thumb and finger, it will not "ribbon", but will give a broken appearance.

Clay Loam: A clay loam is a fine-textured soil which usually breaks into clods or lumps that are hard when dry. When the moist soil is pinched between the thumb and finger, it will form a thin "ribbon" which will break readily, barely sustaining its own weight. The moist soil is plastic and will form a cast that will bear much handling. When kneaded in the hand it does not crumble readily, but tends to work into a compact mass.

Clay: A clay is a fine-textured soil that usually forms very hard lumps or clods when dry and is quite plastic and usually sticky when wet. When the moist soil is pinched out between the thumb and fingers, it will form a long flexible "ribbon".

(b) Rating Factor Determination

As indicated previously, there is a strong correlation between soil texture and detachability. For example, the coarse sandy loams, etc. are, for the most part, single grained and normally easily detached. The fine clayey-textured soils on the other hand, are detached with difficulty. Using these relationships, rather than requiring an empirical field test for determining detachability, the following subjective Table 1 relating soil texture classes to detachability values is provided as part of the rating system. The common soil textural classes found in each of the broad texture groups have been assigned values. The user can select the detachability which best fit the surface soil textural class.

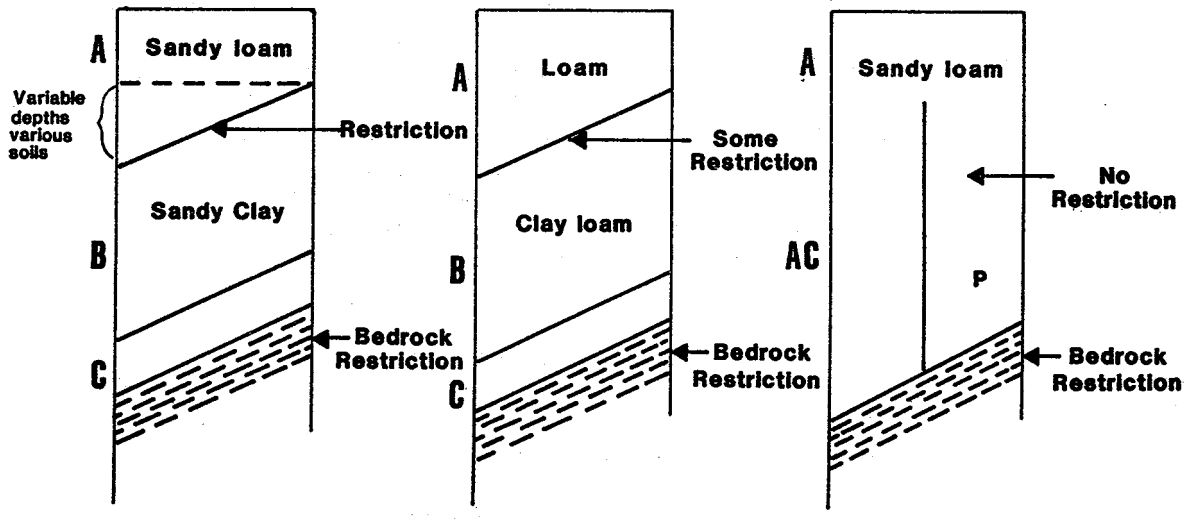
B. Depth to Restrictive Layer or Bedrock

This is related to the changes in soil permeability as well as to the depth of bedrock. For example, a soil profile having a sandy loam surface layer and a sandy clay subsoil would have restriction to water movement through the profile at the upper section of the sandy clay layer (Figure 1.).

Figure 1.

Examples of Various Soil Profile Configurations

Soil Profile Diagramatic Sketches.



A soil profile having a loam-textured surface soil underlain by a clay loam or clay subsoil would also be restrictive to water movement at the upper section of the clay loam or clay subsoil.

Should there be no obvious soil textural difference between the surface of the soil to the underlying bedrock, then the depth to the bedrock would be the restrictive difference.

Existing soil survey maps and report information, as well as close examination of existing road cuts of the area in question or an actual excavated soil pit will reveal the information required.

C. Surface Coarse Fragments Including Rocks or Surface Stones

The degree of surface coarse fragments or surface rockiness or stoniness has a pronounced effect on surface erosion in reducing rain-drop impact as well as reducing the erosion potential of overland flow.

II. Slope Factor

Other than the inherent properties of soil, the slope factor is one of the most important of the erosion factors. The kinetic energy attributed to overland water is direct relation to velocity and volume. For the purpose of EHR determinations, general slope characteristics are considered in making slope measurements. For example, a generally smooth mountainside slope is measured by taking the predominant slope and length condition.

III. Vegetative Cover

- This refers to all organic material both living and dead which protects soils from rain-drop impact and/or overland flow, e.g., overstory vegetation, the understory of younger and smaller trees and shrubs, the ground cover of forbs, and grasses, and the litter, duff, slash and stumps. The vegetative factor is an estimate of the residual organic material likely to exist in the area immediately after timber operations. All roads, landings and skid trails are included as part of the disturbed area. Where a Timber Harvesting Plan includes a Site Preparation Addendum, the vegetative cover used in calculating the erosion hazard rating shall be based on the amount of vegetative cover reasonably expected to be present immediately following completion of site preparation activities.

IV. Rainfall

This refers to rainfall intensity based on a two-year return period. Attached is a rainfall intensity map of California. The information was taken from Technical Paper No. 28, U.S. Weather Bureau. This presented only as a guide. Should more localized information be available for a specific area, it should be used, especially to adjust for snowfall conditions.

TABLE 1

Soil Textural classes and Associated Suggested Ratings [1,2,3]

Broad Class	Texture	Rating
Coarse	Sands	30
	Loamy Sands	27
	Sandy Loams	23
	Fine Sandy Loams	20
Medium	Loams	17
	Silt Loams	14
	Silty Clay Loams	11
Fine	Clay Loams	8
	Clays	5
	Extremely Fine Clays	1

1 The amount of organic matter incorporated with the soil mass has an effect on the ease or difficulty of soil particle detachment.

2 Also, nonwettable or difficult to wet soils will resist detachment. This phenomenon is lessened with continual wetting.

3 It is not unusual for soils to become nonwettable within the surface layer following a wildfire or broadcast burning where spot areas have burns too hot.

2. Permeability

This is a measure of the rate at which water moves through soil. On a broad basis, soil textural classes can be used to estimate permeability and the associated factor.

TABLE 2

Soil Textures and Associated Permeabilities and Rating Factors

Soil Texture	Permeability	Factor
Sands, Loamy Sands, Sandy Loams, Fine Sandy Loams	Rapid	1
Loams, Silt Loams, Silty Clay Loams	Moderate	2-3
Clay Loams, Clays, Extremely Fine Clays	Slow	4-5

ESTIMATED SURFACE SOIL EROSION HAZARD
RM-87 (4/84)

STATE OF CALIFORNIA
BOARD OF FORESTRY

SOIL FACTORS				FACTOR RATING BY AREA		
A. SOIL TEXTURE	Fine	Medium	Coarse	A	B	C
1. DETACHABILITY	Low	Moderate	High			
Rating	1-9	10-18	19-30			
2. PERMEABILITY	Slow	Moderate	Rapid			
Rating	5-4	3-2	1			

B. DEPTH TO RESTRICTIVE LAYER OR BEDROCK

	Shallow	Moderate	Deep			
	1"-19"	20"-39"	40"-60" (+)			
Rating	15-9	8-4	3-1			

C. PERCENT SURFACE COARSE FRAGMENTS GREATER THAN 2 MM IN SIZE INCLUDING ROCKS OR STONES

	Low	Moderate	High				FACTOR RATING BY AREA		
	(-) 10-39%	40-70%	71-100%						
Rating	10-6	5-3	2-1				A	B	C
					SUBTOTAL ⇨				

II. SLOPE FACTOR

Slope	5-15%	16-30%	31-40%	41-50%	51-70%	71-80% (+)			
Rating	1-3	4-6	7-10	11-15	16-25	26-35			

III. PROTECTIVE VEGETATIVE COVER REMAINING AFTER DISTURBANCE

	Low	Moderate	High			
	0-40%	41-80%	81-100%			
Rating	15-8%	7-4	3-1			

IV. TWO-YEAR, ONE-HOUR RAINFALL INTENSITY (Hundredths Inch)

	Low	Moderate	High	Extreme			
	(-) 30-39	40-59	60-69	70-80 (+)			
Rating	1-3	4-7	8-11	12-15			
				TOTAL SUM OF FACTORS ⇨			

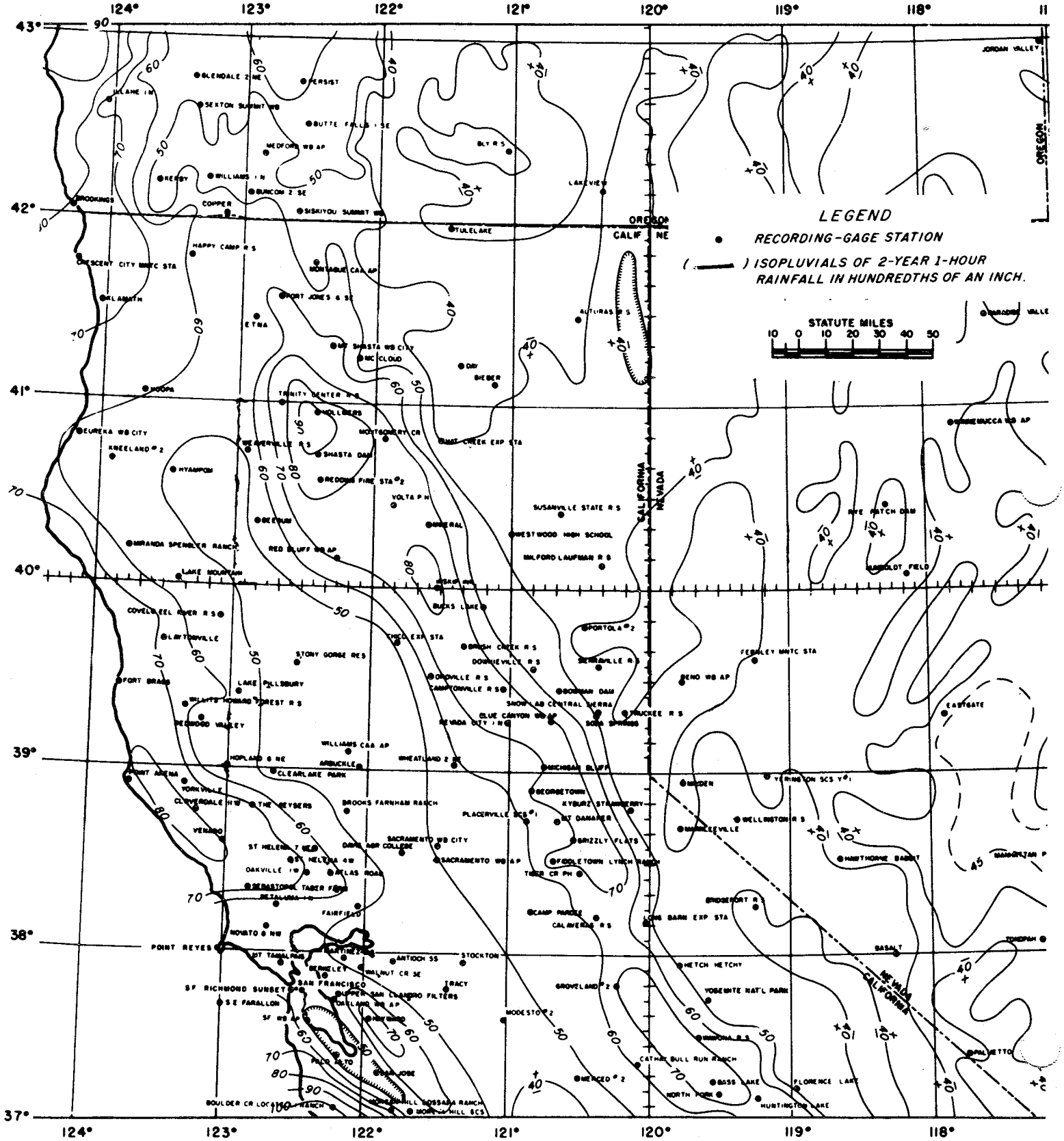
EROSION HAZARD RATING

<50	50-65	66-75	>75			
LOW (L)	MODERATE (M)	HIGH (H)	EXTREME (E)			
			THE DETERMINATION IS ⇨			

7540-130-0435

2-YEAR 1-HOUR RAINFALL

NORTHERN CALIFORNIA



2-YEAR 1-HOUR RAINFALL

SOUTHERN CALIFORNIA