Storie Index Soil Rating

R. Earl Storie is Professor Emeritus, Soils and Plant Nutrition and former Soil Technologist in the Experiment Station, Berkeley.

The Storie Index

This method of soil rating, known as the Storie Index, is based on soil characteristics that govern the land's potential utilization and productive capacity. It is independent of other physical or economic factors that might determine the desirability of growing certain plants in a given location.

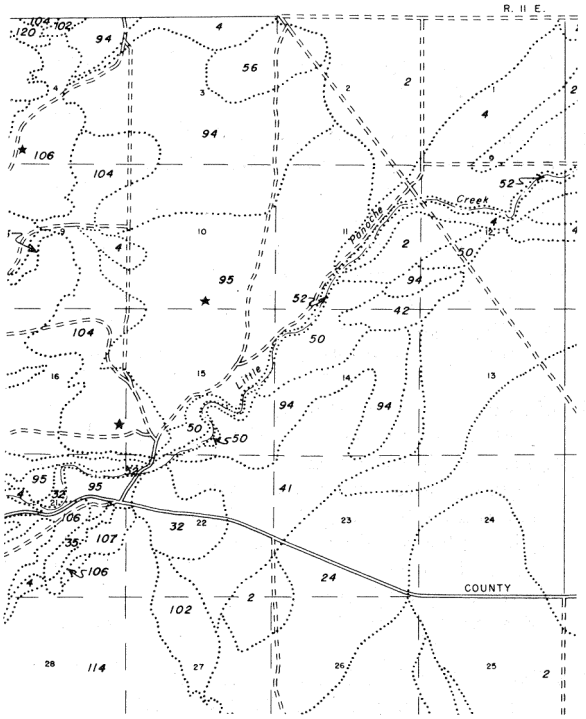
Essentially the present revision sets up a new factor C to evaluate slope; the original factor **C** is now designated as factor **X.**

Percentage values are assigned to the characteristics of the soil itself, including the soil profile (factor **A);** the texture of the surface soil (factor B); the slope (factor C); and conditions of the soil exclusive of profile, surface texture, and slope—for example, drainage, alkali content, nutrient level, erosion, and microrelief (factor **X).** The most favorable or ideal conditions with respect to each factor are rated **at 100** per cent. The percentage values or ratings for the four factors are then multiplied, the result being the Storie Index rating of the soil.

The characteristics of the **soil** profile (factor **A)** are essentially the features of the subsurface layers. For California purposes the soils have been divided into nine profile groups.* For example, soils that are deep and readily pervious to roots and water (listed in profile group I in the soil-rating chart) are rated at 100 per cent. Profiles with dense clay subsoils (listed in profile group IV on the soil-rating chart) are rated lower. Primary or residual soils (listed in profile groups VII, VIII, and IX) are rated in accordance with the depth to bedrock.

Next, the soils are rated on the basis of the texture **of** the surface soils (designated as factor **B).** Medium-textured soils, such as the loams and the silt loams, are rated highest; the extremes in texture, such as sands and clays, lower.

Rating of the slope of the land is considered in factor **C.** Nearly level or gently sloping land is rated at 100 per cent. **As** the slope increases, the rating for this factor decreases. **As** shown in the soil-rating chart, single letters are used to indicate simple slopes, and double letters to indicate compound slopes. The percent slope expresses the number of feet rise or fall for 100 feet horizontal distance.



Conditions exclusive of profile, soil texture, and slope are considered in factor **X** on the soil-rating chart. These conditions consist of drainage, alkali or salt content, general nutrient level, acidity, erosion, and microrelief (surface regularity). If two or more conditions exist that are listed under factor **X,** the ratings for each are treated independently; that is, they are multiplied in order to secure the factor X rating.

* Storie, **R.** Earl, and Walter **W.** Weir, ***Manual** for Identifying and Classifying California **Soil** Series,* 1948, with Supplement, **1958.** Published by Associated Students' Store, Univ. **of** Calif., Berkeley.

Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA

SPECIAL PUBLICATION
3203

REVISED DECEMBER **1978**

SOIL-RATING CHART

(Storie Soil Index rating = factor A x factor B x factor C x factor X)

FACTOR A—Rating on character of Physical profile

	per cent
I. Soils on recent alluvial fans. flood plains. or other secondary deposits having undeveloped profiles	100
x-shallow phases (on consolidated material). 2 feet deep	**50–60**
x-shallow phases (on consolidated material). 3 feet deep	70
g-extremelygravelly subsoils	**80–95**
s-stratified clay subsoils	**80–95**
II. Soils on young alluvial fans. flood plains. or other secondary deposits having slightly developed profiles	**95–100**
x-shallow phases (on consolidated material). 2 feet deep	**50–60**
x-shallow phases (on consolidated material). 3 feet deep	**70**
g-extremely gravelly subsoils	**80–95**
s-stratified clay subsoils	**80–95**
III. Soils on older alluvial fans. alluvial plains. or terraces having moderately developed profiles (moderately dense subsoils)	**80–95**
x-shallow phases (on consolidated material). 2 feet deep	40–60
x-shallow phases (on consolidated material). 3 feet deep	**60–70**
g-extremely gravelly subsoils	**60–90**
IV. Soils on older plains or terraces having strongly developed profiles (dense clay subsoils)	40-80
V. **Soils** on older plains or terraces having hardpan subsoil layers	
at less than 1 foot	**5–20**
at 1 to 2 feet	**20–30**
at 2 to 3 feet	**30-40**
at 3 to 4 feet	40–50
at 4 to 6 feet	50–80
VI. Soils on older terraces and upland areas having dense clay subsoils resting on moderately consolidated or consolidated material	40–80
VII. Soils on upland areas underlain by hard igneous bedrock	
at less than 1 foot	**10–30**
at 1 to 2 feet	**30–50**
at 2 to 3 feet	**50–70**
at 3 to 4 feet	70–80
at 4 to 6 feet	**80–100**
at more than 6 feet	**100**
VIII. Soils on upland areas underlain by consolidated sedimentary rocks	
at less than 1 foot	**10–30**
at 1 to 2 feet	**30–50**
at 2 to 3 feet	**50–70**
at 3 to 4 feet	**70–80**
at 4 to 6 feet	**80–100**
at more than 6 feet	100
IX. Soils on upland areas underlain by softly consolidated material	
at less than 1 foot	20-40
at 1 to 2 feet	40–60
at 2 to 3 feet	**60–80**
at 3 to 4 feet	80–90
at 4 to 6 feet	**90–100**
at more than 6 feet	100

FACTOR B---Ratingon basis of surface texture

	per cent
Medium-textured:	
fine sandy loam	100
loam	100
silt loam	100
sandy loam	95
silty clay loam, calcareous	95
silty clay loam. noncalcareous	90
clay loam. calcareous	95
clay loam. noncalcareous	85—90
Heavy or fine-textured:	
silty clay. highly calcareous	70—90
silty clay. noncalcareous	60—70
clay. highly calcareous	**70—80**
clay. noncalcareous	50—70
Light or coarse-textured:	
coarse sandy loam	**90**
loamy sand	80
very fine sand	80
fine sand	65
sand	60
coarse sand	*30-60*

Gravelly:

gravelly fine sandy loam	70-80
gravelly loam	60–80
gravelly silt loam	60–80
gravelly sandy loam	50–70
gravelly clay loam	60–80
gravelly clay	40–70
gravelly sand	20–30

Stony:

stony fine sandy loam	70–80
stony loam	60–80
stony silt loam	60–80
stony sandy loam	50–70
stony clay loam	50–80
stony clay	40-70
stony sand	10-40

FACTOR C---Rating on basis of slope

	per cent
A—Nearly level (0 to 2%)	100
AA---Gently undulating (0 to 2%)	95–100
B---Gentlysloping(3 to 8%)	95–100
BB---Undulating (3 to 8%)	85–100
C---Moderately sloping (9 to 15%)	80–95
CC---Rolling (9 to 15%)	80–95
D---Strongly sloping (16 to 30%)	70–80
DD---Hilly (16 to 30%)	70–80
E—Steep (30 to 45%)	30–50
F---Very steep (45% and over)	5–80

FACTOR X---Rating of conditions other than those in factors A, B and C

	per cent
Drainage:	
well-drained	100
fairly well drained	80–90
moderately waterlogged	40–80
badly waterlogged	10-40
subject to overflow.	variable
Alkali:	
alkali-free	100
slightly affected	60–95
moderately affected	30–60
moderately to strongly affected	15–30
strongly affected	5–15
Nutrient (fertility) level:	
high	100
fair	95–100
poor	80–95
very poor	60–80
Acidity: according to degree	80–95
Erosion:	
none to slight	100
detrimental deposition	75–95
moderate sheet erosion	80–95
occasional shallow gullies	70–90
moderate sheet erosion with shallow gullies	60–80
deep gullies	10–70
moderate sheet erosion with deep gullies	10–60
severe sheet erosion	50–80
severe sheet erosion with shallow gullies	40–50
severe sheet erosion with deep gullies	10–40
very severe erosion	10-40
moderate wind erosion	80–95
severe wind erosion	30–80
Microrelief:	
smooth	100
channels	60–95
hogwallows	60–95
low hummocks	80–95
high hummocks	20–60
dunes	10–40

Soil Grading

For simplification. six soil grades have been set up in California by combining soils having ranges in index rating as follows:

Grade 1 (excellent): Soils that rate between 80 and 100 per cent and which are suitable for a wide range of crops. including alfalfa. orchard. truck. and field crops.

Grade 2 (good): Soils that rate between 60 and 79 per cent and which are suitable for most crops. Yields are generally good to excellent.

Grade 3 (fair): Soils that rate between 40 and 59 per cent and which are generally of fair quality. with less wide range of suitability than grades 1 and 2. Soils in this grade may give good results with certain specialized crops.

Grade 4 (poor): Soils that rate between 20 and 39 per cent and which have a narrow range in their agri cultural possibilities. For example. a few soils in this grade may be good for rice. but not good for many other uses.

Grade 5 (very poor): Soils that rate between 10 and 19 per cent are of very limited use except for pasture. because of adverse conditions such as shallowness. roughness. and alkali content.

Grade 6 (nonagricultural): Soils that rate less than 10 per cent include. for example. tidelands. riverwash. soils of high alkali content. and steep broken land.

Rating the Soil for a Tract of Land

The index for each soil type in the tract is calculated separately, and then *a* rating for the entire tract is obtained by weighing each soil index according to the proportion of the acreage of that soil in the tract. As an example, using the soil map on the back page the rating of the tract is determined as follows:

1. Index for the area Y1-A (Yolo loam, nearly level): This is a recent alluvial soil, deep, smooth, well drained.

	Rating in per cent
Factor **A:** Yolo series, profile group **I**	100
Factor B: loam texture	**100**
Factor C: slope A, nearly level	100
Factor **X:** no other modifying factors	**100**

Indexrating=100%x100%x100%x100%=100%

2. Index for Ac-BB (Antioch clay loam, undulating): This is a claypan terrace soil with undulating topography.

	Rating in per cent
Factor **A:** Antioch series, profile group **IV**	**60**
Factor B: clay loam texture	85
Factor C: undulating topography	95
Factor **X:** no other modifying factors	100

Index rating = **60%** x 85% *x* 95% *x* 100% =48%

3. Index for Acl-CC (Altamont clay loam, rolling): This **is** *a* brown upland soil from shale parent material; redrock at a depth of 3 feet. Rolling topography, moderate sheet erosion, with occasional gullies.

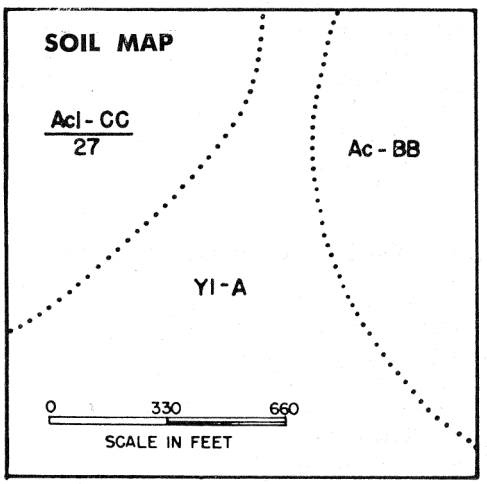
	Rating in per cent
Factor **A:** Altamont series, profile group VIII	70
Factor B: clay loam texture	85
Factor C: rolling topography	90
Factor **X:** moderate sheet erosion with shallow gullies	70

Index rating = 70% x 85% *x* 90% x 70% = 37%.

4. The index for the entire tract shown on the map may then be calculated according to the acreage **of** each soil, as follows:

	Index		Acreage		
Yolo loam	100	*x*	10	=	1,000
Antioch clay loam	48	*x*	5	=	240
Altamont clay loam	37	*x*	5	=	185
			20		1,425

Index rating for the tract = $\frac{1,425}{20}$ = 71%.



MAP SYMBOL	SOILS	ACREAGE	INDEX
Y1-A	YOLO LOAM	10	100
Ac-BB	ANTIOCH CLAY LOAM	5	48
Acl-CC 27	ALTAMONT CLAY LOAM	5	37

THIS LEAFLET is a revision of the soil-rating chart published originally by the author in Bulletin 556, *An Index for Rating the Agricultural Value of Soils,* **1933,** and later **in** the revised edition **of 1937,**

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture, James B. Kendrick, Jr., Director, Cooperative Extension, University of California.

2m–12/78–HS/LAM