SECTION 2 – NATURAL RESOURCES INFORMATION

1. Soils

Soil Interpretations

Cropland Interpretations

Information in this subsection can be used to plan the use and management of soils for crops or pasture. Conservation planners and others using this information can evaluate the effect of crop management systems on productivity and on the environment in all or part of the county. This information can be used to maintain or create a land use pattern that is in harmony with the natural soil.

This subsection contains the following:

Erosion Factors

- Soil Erodibility Factors (**Kw** and **Kf)**
- Soil-Loss Tolerance (**T**) Value
- Wind Erodibility Groups (**I**)

Hydrologic Soil Groups

Important Farmlands

- Prime Farmland List
- Unique Farmland List
- Additional Farmland of Statewide Importance

Land Capability Classification and Crop Yield Estimates

Land Evaluation and Site Assessment (LESA)

Soil Erodibility Factors Kw and Kf and Soil-loss Tolerance (T) Value

Soil Erodibility Factor (K)

The soil erodibility factor (K) is a measure of the rate at which a soil will erode. Values are expressed as tons of soil loss per acre per unit of the rainfall factor

(R) from continuous fallow (three years or more) on a 9 percent slope, 72.6 feet long. Thus, the K factor reflects the rate that soil erodes when other factors affecting erosion are constant. Soil properties that influence erodibility by water are: (1) those that affect infiltration rate, movement of water through the soil, and water storage capacity; and (2) those that resist dispersion, splashing, abrasion, and transporting forces from rainfall and runoff. Soil properties that are most important are percent silt plus very fine sand, organic matter, percent sand coarser than very fine sand, structure, and permeability.

There are two values in the database—Kw and Kf. Kw considers the whole soils including rock fragments (> 2 mm). The Kf value considers only the fine earth fraction of the soil (2 mm or less). The values are the same for soils lacking particle sizes greater than 2 mm (gravel). The soil erodibility factors are used in the Revised Universal Soil Loss Equation Factors (RUSLE), which predicts sheet and rill erosion rates. This soil-loss prediction procedure is useful to guide the selection of practices for soil and water conservation. The procedures for using RUSLE are in Section I of the FOTG, and in Agriculture Handbook No. 703.

Soil Loss Tolerance (T)

The soil loss tolerance (T factor) is defined as the maximum amount of erosion at which the quality of a soil as a medium for plant growth can be maintained. This quality of the soil to be maintained is threefold in focus. It includes maintaining (1) the surface soil as a seedbed for plants, (2) the atmosphere-soil interface to allow the entry of air and water into the soil and still protect the underlying soil from wind and water erosion, and (3) the total soil volume as a reservoir for water and plant nutrients, which is preserved by minimizing soil loss. The classes of T factors are 1, 2, 3, 4, and 5 tons of soil loss per acre per year.

Soil loss tolerances commonly serve as objectives for conservation planning on farms. These objectives assist in the identification of cropping sequences and management systems that will maximize production and also sustain long-term productivity. T factors represent the goal for maximum annual soil loss.

Conservation objectives for soil loss tolerance include maintaining a suitable seedbed and nutrient supply in the surface soil, maintaining an adequate depth and quality of the rooting zone, and minimizing unfavorable changes in water status throughout the soil. A single T factor is assigned to each map unit component.

The T factor is assigned to soils without respect to land use or cover. T factors are assigned to compare soils and do not imply differences to vegetation response directly. Many of the factors used to assign a T factor are also important to vegetation response, but the T factor is not assigned to imply vegetation sensitivity.

General Guide for Assigning T Factors

Soil loss tolerance "T" is assigned according to properties of root limiting subsurface soil layers. The designation of a limiting layer implies that the material above the layer has more favorable plant growth properties. As limiting or less favorable soil layers become closer to the surface, the relative ability of a soil to maintain its productivity through natural and managed processes decreases.

Criteria for assigning "T" are estimated from:

1. The severity of physical or chemical properties of subsurface layers.

2. The climatically influenced properties of soil moisture and temperature.

3. The economic feasibility of utilizing management practices to overcome limiting layers or conditions.

The following general guide was used with specific soil properties and conditions to write criteria statements for programming "T" factors at Iowa State University Statistical Laboratory.

Depth to limiting layer (inches)	Annual Soil Loss Tolerance in Tons/Acre		
	Group 1	Group 2	Group 3
0 - 10	1	1	3
10 - 20	1	2	3
20 - 40	2	3	4
40 - 60	3	4	4
>60	5	5	5

Group 1--The limitations are significant or have permanent layers of root limitation.

Group 2--The limitations are of moderate root restriction, or have a less than permanent loss to productivity in a given climate.

Group 3--The limitations can be overcome in a given climate, through natural or managed processes to achieve the productivity level of the non-eroded soil.

The K factors and T factor are available on the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) in the *Physical Properties* table report.

Wind Erodibility Groups

A wind erodibility group (WEG) is a grouping of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to blowing. The Wind Erodibility Index (I), used in the Wind Erosion Equation, is assigned using the wind erodibility groups.

There is a close correlation between soil blowing and the size and durability of surface cloddiness, rock fragments, organic matter, and calcium carbonate content. The soil properties that are most important with respect to soil blowing are (1) soil texture, (2) organic matter content, (3) calcium carbonate content, (4) rock fragment content, and (5) aggregate stability. Soil moisture and the presence of frozen soil also influence soil blowing.

Estimates. Soils are placed into wind erodibility groups on the basis of the properties of the surface layer. The wind erodibility index values are assigned because of the difficulty in directly measuring I values. The conditions necessary for the measurement of I rarely exist in the field since crop management factors affect the surface properties of the soil. The chart on the following page shows the guidelines for determining WEG.

The wind erodibility groups (WEG) and wind erodibility index (I) are available on the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) in the *Physical Properties* table.

Hydrologic Soil Groups

The Hydrologic Soil Group, designated A, B, C, or D, is a group of soils that, when saturated, have the same runoff potential under similar storm and cover conditions. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to seasonally high water table, intake rate, and permeability after prolonged wetting, and depth to very slowly permeable layer. The influences of ground cover and slope are treated independently---not in hydrologic soil groups.

In the definitions of the classes, infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. Transmission rate is the rate at which water moves in the soil and is controlled by properties of the soil layers.

Hydrologic Soil Group A

Soils having high infiltration rates even when thoroughly wetted, consisting chiefly of deep, well-drained to excessively drained sands or gravels. These soils have a high rate of water transmission. (Low runoff potential)

Hydrologic Soil Group B

Soils having moderate infiltration rates when thoroughly wetted, consisting chiefly of moderately deep or deep, moderately well or well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Hydrologic Soil Group C

Soils having slow infiltration rates when thoroughly wetted, consisting chiefly of (1) soils with a layer that impedes the downward movement of water, or (2) soils with moderately fine or fine textures and slow infiltration rate. These soils have a slow rate of water transmission.

Hydrologic Soil Group D

Soils having very slow infiltration rates when thoroughly wetted, consisting chiefly of (1) clayey soils with high swelling capacity or potential, (2) soils with a high permanent water table, (3) soils with a claypan or clay layer at or near the surface, and (4) shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission. (High runoff potential)

The Hydrologic Soil Groups are on the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) in the *Water Features* table.

Important Farmlands

Prime Farmland - General Criteria

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land but not urban built-up land or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods.

In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season,

acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding. (Specific criteria are available for prime farmland in the field office LESA Handbook).

Unique Farmland - General Criteria

Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods. (Specific criteria are available for unique farmland in the field office LESA Handbook).

Additional Farmland of Statewide Importance

This is land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable.

The Prime and Important Farmland report is included on the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) under *Land Classification* then *Farmland Classification.*

Land Capability Classification and Predicted Crop Yields

Land capability classes show, in a general way, the suitability of soils for most kinds of field crops. The groupings are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The groupings do not take into account major and generally expensive land forming that would change slope, depth, and other characteristics of the soil; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management. Those familiar with the capability classification can infer from it much about the behavior of the soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of soils for range, forestry, or for engineering uses. In the capability system, all kinds of soils are grouped at three levels: the *capability class, subclass, and uni*t. The capability unit is a grouping of soils into a defined management unit that is not used.

Capability Classes

These classes are designated with numbers 1 through 8. The capability classes indicate progressively greater limitations and narrower choices for practical use as the class numbers increase. Capability classes are defined as follows:

- **Class 1** soils have few limitations that restrict their use.
- **Class 2** soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
- **Class 3** soils have severe limitations that reduce the choice of plants, or require special conservation practices, or both.
- **Class 4** soils have very severe limitations that reduce the choice of plants, or require very careful management, or both.
- **Class 5** soils are not likely to erode but have other limitations, impracticable to remove, that limit their use largely to pasture, range, woodland or wildlife.
- **Class 6** soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, range, woodland, or wildlife.
- **Class 7** soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, range, woodland, or wildlife.
- **Class 8** soils and miscellaneous areas have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to esthetic purposes.

Capability Subclasses

Capability subclasses are soil groups within one class; they are designated by adding a small letter - **e, w, s, or c** - to the class numeral, for example, 2e. The letter **e** shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; **w** shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); **s** shows that the soil is limited mainly because it is shallow, droughty, or stony; and **c** shows that the chief limitation is climate that is too hot, too cold, or too dry for production of many crops.

In Class 1 there are no subclasses because the soils of this class have few limitations. Class 5 can contain only the subclasses w, s, and c because the soils

in Class 5 are subject to little or no erosion though they have other limitations that restrict their use largely to pasture, range, woodland, or recreation.

Capability classes and subclasses are given for both irrigated and nonirrigated conditions if the soils are commonly irrigated. Nonirrigated is assumed if only one class is given. See Agriculture Handbook No. 210 – *Land Capability Classification* for additional explanations.

The Land Capability Classification report is available on the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) under *Land Classification* then *Land Capability Classification*

Crop Yields

The average yields per acre that can be expected of the principal crops under a high level of management are presented in the following table. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, or green manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change. Absence of a yield indicates that the soil is not suited to the crop or the crop is generally not grown on the soil.

The Crop Yield reports are available on the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) under *Vegetative Productivity*

Land Evaluation and Site Assessment

The Land Evaluation and Site Assessment (LESA) system helps state and local officials make sound decisions about land use.

Land Evaluation (LE)

In agricultural land evaluation, soils are rated and placed into groups ranging from the best to the least suited for a specific agricultural use, such as cropland, forestland, or rangeland. Then, a relative value is determined for each group. For example, the best group may be assigned a value of 100, while all other groups are assigned lower values. The land evaluation is based on data from the National Cooperative Soil Survey—often called the largest and most valuable natural resource database in the world.

Site Assessment (SA)

Site assessment involves three major areas:

Non-soil factors related to agricultural use of a site.

Factors related to development pressures.

Other public values of a site.

Each factor selected is assigned a range of possible values according to local needs and objectives. This process provides a rational, consistent, sound basis for making land use decisions.

LEs for counties are available through the State Soil Scientist.