# TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE Boise, Idaho SOIL CONSERVATION SERVICE

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## CORRELATING SOILS WITH POTENTIAL NATURAL PLANT COMMUNITIES

-- LET'S COMMUNICATE --

by

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Cooperative effort by the range conservationist and soil scientist during all stages of a soil survey is needed to develop sound soil and ecological site data. The roles and responsibilities of the range conservationist and soil scientist need to be understood by each other in order for them to communicate properly.

The range conservationist should become familiar with soil survey techniques, logistics, terminology, and guidelines. The soil scientist should become familiar with the ecological site concept, potential natural plant communities, present plant communities, techniques, guidelines, and terminology the range conservationist uses. This will help the communication to be complete so proper correlation of soils into ecological sites is achieved.

The use of a range conservationist in this text does not exclude the role of the forester, wildlife biologist or other specialist in the correlation process. The team effort of all resource specialists is implied when "range conservationist" is used.

### Roles and Responsibilities

The soil scientist identifies, evaluates, and maps soils in the survey area.

When starting a soil survey, the soil scientist becomes familiar with the area by making a preliminary field study and reconnaissance. Temperature and precipitation zones, elevation ranges, geology, and vegetation are studied and evaluated. Maps, aerial photographs, previous soil mapping of the area, and mapping data from surrounding areas are collected and reviewed. The process of interpreting landscapes and identifying the major soil taxa is started. The field reconnaissance is normally well along before a soil mapping unit legend is developed and soil mapping proceeds.

The soil scientist uses a soil classification system ('soil taxonomy') to identify soils. This system recognizes many of the different characteristics of soils, but it is important to understand that it is man created. The modal concepts of soil taxa and their range of characteristics are established, using the guidelines of the system but with professional judgment in the field.

The range conservationist identifies the potential natural plant communities in the soil survey area and correlates them with the soils and other environmental factors to establish ecological sites.

Soil, potential natural vegetation, climate, topography, and natural animal life are all components of an ecological site. The potential natural plant community of an ecological site is the one adapted to that site's particular combination of environmental components.

To determine the potential natural vegetation, the range conservationist studies undisturbed areas (climax), areas in high ecological condition, and present vegetation. Reviews are made of research data, early historical accounts, and botanical literature of the area.

The criteria used to differentiate one ecological site from another are:

1. Significant differences in the species or species groups that are dominants of the potential natural plant community. (This factor compares to the habitat type concept that is being used to classify potential plant communities.)

2. Significant differences in the proportions of species or species groups that are dominants of the potential natural plant community.

3. Significant differences in the average total annual production of the potential natural plant community. (Items 2 and 3 can recognize some of the variations that occur within a habitat type.)

Any differences in these criteria, either singly or in combination, great enough to indicate a different use potential or to require different management, are basis for establishing an ecological site. The ecological sites for the survey area are described. The site description is considered an approximation, subject to change as additional or new data becomes available.

The modal concept and range of characteristics of the potential natural vegetation component of an ecological site are established by interpreting available data and by using professional judgment in the field, just as the soil scientist does in identifying soils.

When the potential vegetation is absent, it becomes much more difficult to identify the ecological site. The soil can be an important key in making the site identification. Potential natural vegetation can be studied on a soil and the information extrapolated to areas of similar soils where there are no remanents of the potential natural vegetation in existence.

The need is apparent for the soil scientist and range conservationist to work together from the start of the soil survey if the ecological sites are to be identified, described, and correlated in a meaningful and useable manner.

## Working Together

The range conservationist and soil scientist should start cooperating in the preplanning stages of a soil survey and develop the work plan together. It is here that the survey objectives, kind of survey, and schedules are determined. Mapping units, kinds of soil taxa, field procedures, minimum size of mapping delineation and map scale are also determined.

It is essential also to work together during the field reconnaissance. The reconnaissance helps the soil scientist determine where and how many detailed soil profile descriptions are needed. It will guide the range conservationist in determining projected needs for collecting plant production and composition data. The soil scientist/range conservationist team can pick locations on the important landscapes that best represent the modal concepts for the various soils and potential natural plant communities.

Experience has shown that if a joint reconnaissance study of the soil survey area is made, soil and plant community analysis will have a better chance of taking place toward the center of soil series and potential plant communities rather than in transition zones.

Apparent soil and ecological site boundaries can be determined during the reconnaissance. Areas that will need further evaluation can be identified, i.e., two distinctly different potential natural plant communities occurring on what appears to be one soil series. Previous decisions on soil mapping units and their composition can be refined or updated if needed to meet the objectives of the soil survey

## Correlation Principles

Soils occur as uniform bodies in landscapes until there is a change in land form, parent material, or other soil-forming properties. At the point of change, there may be a transition from one soil to another. This transition also occurs with plant communities and can be very gradual or abrupt.

Disagreement between range conservationists and soil scientists occurs when a range conservationist says there are two different potential natural plant communites so there must be two different soils, but the soil scientist says that the same soil series is occurring within both plant communities. In actuality, the problem is not one of disagreeing but of understanding from which base one is speaking.

The range conservationist is really saying that, "The environment has changed, and there are two different potential natural plant communities. The change in the soil may be minute and/or subtle. A combination of <u>all</u> the factors associated with the potential plant community is resulting in the difference." The soil scientist is really saying, "According to the criteria (soil taxonomy) I am working with, this is the same soil series."

They may both be right. The confusion can be overcome when the soil scientist and range conservationist work together as a team and learn the survey area together instead of each drawing independent conclusions.

The soil sicentist must map soils (not vegetation). He uses all the factors he can, including <u>vegetation</u>, geology, parent material, land forms, etc., to help identify and map soils. When a soil series appears to have more than one potential natural plant community, the soil scientist and range conservationist must evaluate the reasons for the differences. There may be a slight change in soil physical properties, soil chemistry, microclimate, aspect, or other changes in the environment. It could be any one of or a combination of these factors causing the difference. These changes may not be great enough to identify a different soil series or taxonomic unit according to existing soil taxonomy.

When the factor(s) have been determined, the soil series (or taxonomic unit) can be subdivided into phases if needed. For example, one area may be a drier site than that considered normal for the soil series, so a dry phase of the series and a dry phase soil mapping unit could be established. One potential natural plant community would be correlated to the soil series, and the other one to the series phase. More than one series phase may be needed in some situations.

The soil scientist may not be able to answer all of the range conservationist's questions for soil and potential natural plant community correlation until he has documented and studied the soils in the survey area. He should not be expected to. Out of the team effort will come the needed answers, slowly at first, but adequate in time to complete the correlation at the end of the survey.

The soil identification process lends itself to the correlation process as illustrated by the following steps:

1. Classify soils to family level (separates many potential natural plant communities).

2. Identify soil series within soil families (separates additional potential natural plant communities).

3. Establish phases of the soil series (will account for most of the soil-potential natural plant community correlation).

4. Recognize that within a soil series phase there could be micro-environmental factors that result in different potential natural plant communities. This can be especially true in more arid climates. If significant for management or use, these plant communities should be recognized and the ecological sites described and how and where they occur within the soil series phase explained.

If desired level of soil classification for the survey is the soil family, phases of soil families can be used to complete the ecological site correlation.

The documentation (profile descriptions) the soil scientist obtains for these different steps, combined with the plant community data gathered by the range conservationist, will provide the base for the ecological site identification and description. It can be useful to record this field data on a table (see example attached). This can help organize field data to complete the correlation and serves as a data base to develop soil mapping unit and ecological site descriptions.

Scheduling Manpower

The amount of soils-range (and other specialists) team time needed must be developed for each soil survey. Here are some general guidelines:

Participation by the range conservationist must be a continuing process throughout the survey schedule. Participation only in the formal field reviews is not adequate in most situations. Normally, more team time is needed during the planning and reconnaissance than later in the survey, but the correlation must continue throughout the entire survey.

Even the best intentions by range conservationists and soil scientists to work together can sometimes be thwarted. Sufficient time must be scheduled and spent to accomplish the objective of providing technically sound ecological site data in the soil survey report.

## INSTRUCTIONS FOR ECOLOGICAL SITE CORRELATION TABLE

1. Ecological Site - Site name.

2. Potential Natural Plant Community - Habitat type.

3. Soil - Group by classification, series within classification, phase of series, and soil pit numbers (profile descriptions).

4. Present Vegetation & Condition - Existing vegetation type and ecological condition.

5. Production - Air dry, total herbage production, of soil pit area or sample site, if available. Record in lbs/ac.

6. Parent Material of Site

7. Slope in %

8. Precipitation - Estimated or known precipitation.

9. Physiography - Position of the soil in the landscape.

10. Relief - Relief of the soil, i.e., convex, concave, etc. Consider the micro relief the soil actually occurs in, not the broad relief of a mapping unit.

11. Elevation - Determine from Quad Sheet or altimeter.

12. Aspect - Indicate N, NW, W, SW, etc.

13. pH - Salt or Alkali - Get from chemical analysis or soil-lab data.

14. Texture - Sil, cl, grl, etc. Use SCS Soils Handbook abbreviations.

15. Roots - Depth at which most root penetration stops.

16. Depth to:

    Bedrock - Indicate depth and nature of bedrock, i.e., fractured or solid.
    Hardpan - Indicate depth and strength of pan, i.e., weak moderate, or strong (wk, mod, strg).
    Clay B - Indicate depth and % clay.
    Lime or Salt - Indicate depth to lime or salt accumulation.
    Coarse Fragments - Indicate depth to coarse fragments > 50% by volume in soil profile (depth to 35-50% coarse fragments by volume may be significant in some soils). It is helpful to indicate percent coarse fragnemts also.

- If a factor is not significant, dash or put NS in column.
- If other factors are needed, replace non-significant one with the one that is needed or add to table.
- If data is unavailable or Soils 232 is incomplete, put Incom. in those columns so affected until data becomes available.

# E C O L O G I C A L   S I T E   C O R R E L A T I O N   T A B L E

| ECOLOGICAL SITE | POTENTIAL NATURAL PLANT COMMUNITY | SOIL & 232Ø | PRESENT VEGETATION & CONDITION | PRODUCTION LBS/AC | PARENT MATERIAL | PER-CENT SLOPE | PRE-CIPI-TATION | PHYSIOGRAPHY | RELIEF | ELEVATION | ASPECT | pH SALT OR ALKALI | TEXTURE | ROOT PENE-TRATION | DEPTH TO: BEDROCK | DEPTH TO: HARDPAN | DEPTH TO: CLAY B | DEPTH TO: LIME OR SALT | DEPTH TO: > 50% COARSE FRAGMENTS | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Durixerollic Calciorthid SKMF: | | | | | | | | | | | | | | | | | | |
| Saline Gravelly 8" ppt | ATCO/ORHY " | Challis Series CH-77-1 | atco/spcr PC | 290 | dolomite, alluvium,) quartz ) | 2 | 7 | Alluvial fan | Slight convex | 5300 | NW | Mod-strong* | vgrl | - | NS | 10" wk | - | 10-15"* | 85% @21" | |
| " | " | CH-77-2 | atco/stco4 GC | 460 | " " | 4 | 7 | " " | Slight concave | 6140 | NW | " " | loam | - | NS | 15" wk | - | " | 65% @11" | |
| " | " | CM-77-18 | atco/poa FC | 440 | " " | 4 | 7 | " " | Smooth | 6000 | SW | " " | grl | - | NS | 10" wk | - | " | 45% @ 4" | |
| " | " | CM-72-20 | atco/poa FC | 380 | " " | 4 | 7 | " " | Slight convex | 6000 | W | " " | grl | - | NS | 15" wk | - | " | 70% @ 8" | |
| Gravelly loam | ARTRW/AGSP | Sparmo Series | | | | | | | | | | | | | | | | | | |
| 8-11" ppt | " | CJ-77-14 | artrw/pone PC | 300 | mixed dolomite | 5 | 10 | Alluvial fan | - | 6300 | S | - | vgrl | - | NS | 18" wk | - | Incomplete | 60% @8" | ) |
| " | " | CM-77-37 | artrw/stco4 FC | 380 | claystone | 15 | 10 | Hill | Concave | 6700 | SW | - | grl | - | NS | 15" wk | - | " | 50% @7"/80% @15" | )This |
| " | " | CJ-77-15 | artrw/agap GC | 610 | mixed dolomite | 10 | 10 | Alluvial fan | - | 6400 | SE | - | grl | - | NS | 35" wk | - | " | 65% @6" | )series |
| " | " | CM-77-51 | artrw/pose FC | 350 | mixed | 5 | 10 | " " | Smooth | 6400 | SE | - | grl | - | NS | 21" wk | - | " | 50% @9"/60% @21" | )may |
| Incomplete | Incomplete | CJ-77-30 | artrt/pose FC | 400 | mudstone | 4-20 | 10 | Foothill | - | - | S | - | grl | - | NS | Incom. | - | " | 60% @5" | )just |
| Gravelly loam | ARTRW/AGSP | CH-77-39 | artrw/agap FC | 460 | limestone, alluvium | 15 | 10 | Alluvial fan | Smooth | 6700 | NE | - | 1 | - | NS | " | - | " | - | )be a |
| 8-11" ppt | " | CH-77-17 | artrw/pose PC | 340 | mixed alluvium, dolomite | 5 | 10 | " " | Convex | 6880 | NW | - | grl | - | NS | 12" wk | - | " | 50% @4" | )moist )phase |
| " | " | CH-77-13 | artrw/agap GC | 580 | mixed alluvium, dolomite, loam | 3 | 10 | " " | Convex | 7000 | NW | - | grl | - | NS | 15" wk | - | " | 55% @12" | )of )Challis |
| " | " | CH-77-4 | artrw/sihy FC | 360 | " " | 3 | 10 | Drainage Way | Convex | 6500 | NW | - | grl 1 | - | NS | Incom. | - | " | 85% @15" | ) |

* Estimated - lab data not yet available

NOTE: Any columnar or ledger paper can be used for this table.