USDA Forest Service
Terrestrial Ecological Unit Inventory

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George T. Robertson, Supervisory Soil Scientist
USDA Forest Service, Southwestern Region
Phoenix, Arizona
“Management activities must be within the physical and biological capabilities of the land, based upon comprehensive, up-to-date resource information and a thorough scientific understanding of the ecosystem’s functioning and response.”

(Land Stewardship in the Next Era of Conservation, 1991)
Outline

• USDA Forest Service National Policy
• Policy Implementation
• Ecosystem Classification
• Integration and Analysis of Biophysical Elements
• Data Management
• Terrestrial Ecological Unit Inventory Features
Policy Direction
(FSM Chapter 1940)

• USDA Forest Service Policy states that ecological units are to be used in natural resource inventory, monitoring, and evaluation; in land management planning; and in making predictions and interpretations for management decisions of National Forest System lands.

• This policy statement is fundamental to the decision making process during NEPA.
Policy Implementation

USDA Forest Service Technical Guide for conducting Terrestrial Ecological Unit Inventory (TEUI) on National Forest System Lands.
Terrestrial Ecological Unit Inventory (TEUI) is defined as the systematic examination, description, classification (soil/vegetation/climate/geomorphic) and mapping of terrestrial ecosystems.
TEUI Technical Guide-Purpose
(Winters et al. 2005)

• Provides specific direction and guidance for conducting TEUI at the landscape and land unit scales on National Forest System lands.

• Provides the standard for development of terrestrial ecological units at the landtype association (LTA), landtype (LT), landtype phases (LTP) levels of the National Hierarchy Framework of Ecological Units.

• Provides a set of national standards, suggested methodologies, and list of criteria for defining, describing, and classifying terrestrial ecological types and units.

• Not intended to replace the correlation process of the National Cooperative Soil Survey (NCSS).
Ecological Type
(Winters et al. 2005)

• An ecological type is defined as a category of land with distinctive combination of biophysical elements. Elements making up an ecological type are climate, geology, geomorphology, soil, and potential natural vegetation.

• Ecological types differ from each other in their ability to produce vegetation and respond to management and natural disturbances.
Ecological map units are designed to spatially identify the location and extent of ecological types.

Capabilities and potentials are derived from measurements and the integration of biophysical elements.
Ecological Classification
(Winters et al. 2005)

- Fundamental to TEUI is an integrated ecological classification system.
- The integrated ecological classification is used to organize the properties and characteristics that exist between biophysical elements.
- This data and information used to integrate the biophysical elements of an ecological type, quantify site productivity and other ecological processes and functions including disturbance.
- Ecological classification greatly improves both map unit design, delineation and interpretation.
### Classification Systems used in Terrestrial Ecological Unit Inventory

<table>
<thead>
<tr>
<th>SOIL</th>
<th>VEGETATION</th>
<th>CLIMATE</th>
<th>GEOMORPHIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order</td>
<td>Formation</td>
<td>Class</td>
<td>Geomorphic Process</td>
</tr>
<tr>
<td>Suborder</td>
<td>Class</td>
<td>Life Zone</td>
<td>Landscape</td>
</tr>
<tr>
<td>Great Group</td>
<td>Series</td>
<td>Sub-Step</td>
<td>Landform</td>
</tr>
<tr>
<td>Subgroup</td>
<td>Sub-Series</td>
<td></td>
<td>Element/Common Landform</td>
</tr>
<tr>
<td>Family</td>
<td>Plant Association</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning and Analysis Scale</td>
<td>Ecological Unit</td>
<td>Scale</td>
<td>Geology</td>
</tr>
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<td>------------------------------</td>
</tr>
<tr>
<td>Ecoregion</td>
<td>Domain</td>
<td>1:30,000,000</td>
<td></td>
</tr>
<tr>
<td>Ecoregion</td>
<td>Division</td>
<td>1:30,000,000 1:7,500,000</td>
<td></td>
</tr>
<tr>
<td>Ecoregion</td>
<td>Province</td>
<td>1:15,000,000 1:5,000,000</td>
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</tr>
<tr>
<td>Subregion</td>
<td>Section</td>
<td>1:7,500,000 1:3,500,000</td>
<td>Geologic Age, Lithology, Stratigraphy</td>
</tr>
<tr>
<td>Subregion</td>
<td>Subsection</td>
<td>1:3,500,000 1:250,000</td>
<td>Surficial Geology, Lithology</td>
</tr>
<tr>
<td>Landscape</td>
<td>Landtype</td>
<td>1:250,000 1:100,000</td>
<td>Primary Lithology, Groups of Secondary Lithology</td>
</tr>
<tr>
<td>Land Unit</td>
<td>Landtype</td>
<td>1:24,000</td>
<td>Secondary Lithology</td>
</tr>
<tr>
<td>Land Unit</td>
<td>Landtype Phase</td>
<td>1:12,000</td>
<td>Secondary Lithology</td>
</tr>
<tr>
<td>Gradient Analysis</td>
<td>Studies that seek to arrange samples in relation to one or more environmental gradients or axes.</td>
<td></td>
<td></td>
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<tr>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
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<tr>
<td>Direct Gradient Analysis</td>
<td>The understanding of the samples in response to direct, measurable, spatial or temporal environmental gradients.</td>
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<tr>
<td>Indirect Gradient Analysis</td>
<td>The arrangement of samples in a sequence, along one or more axes, by comparing their compositional similarity.</td>
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</tbody>
</table>
Example of direct gradient analysis using altitude, life zone, precipitation, soils and PNV.

(Jenny, H. 1980)

Fig. 12.9. Altitude sequence of soils and vegetation in New Mexico. After Carleton et al. (9), U.S.D.A. Forest Service
TEUI Geospatial Toolkit

• Supports the mapping process by providing Geospatial Tools that:
  - Design map unit concepts and stratify landscape in an efficient manner.
  - Attributes polygons
  - Summarize and display map unit and polygon statistics.
  - Assists in quality control/assurance
  - Provides the basis for conducting accuracy assessments
<table>
<thead>
<tr>
<th>Landtypes</th>
<th>Ecological type</th>
<th>Components</th>
<th>Map units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A minimum of three complete integrated plots that represent the concept of the ecological type in the survey area are recorded before an ecological type is added to the descriptive legend. Completed documentation must reflect the geographic and environmental range across which the ecological type is mapped. Representative sites for each ecological type are identified.</td>
<td>A minimum of three complete integrated plots that represent the concept of the component in the map unit are needed. Completed documentation must reflect the geographic and environmental range of the map unit. Integrated plots may be used from transects or traverses within the named map units.</td>
<td>A minimum of three transects with a minimum of 30 sample sites (integrated plots and/or observations) across geographic and environmental range of each map unit are recorded. Completed documentation must reflect the geographic and environmental range of the map unit. Each map unit component must have a complete ecological type description.</td>
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</table>
The **Natural Resource Information System (NRIS)** combines a series of standard corporate databases and computer applications designed to store ecological data and support field-level users.

**NRIS** databases contain basic natural resource and socio-economic data in standard formats built to run within the Forest Service computing environment.

Soil information within the NRIS-Inventory and Mapping (aka TERRA) module is compatible with NASIS.
TEUI Summary of Features

• A system of inventory, classification, mapping and management interpretations for terrestrial ecosystems.

• Relationships and linkages of ecosystem components are easily recognized by different classification systems.

• Concepts of soil-vegetation gradients over various regional climates.

• Simultaneous measurements of vegetation, soil, local geology, production, erosion, etc. at a field inventory level. (Not an overlay of these factors by scientists collecting plot data independently at different times.)
Consistent soil-vegetation correlations at a vegetation series, sub series and plant association taxonomic level coupled with soil classification at the subgroup and family taxonomic level.

TEUI meets or exceeds NCSS standards in describing, classifying and interpreting soils.

Maps at National Forest scale (1:24,000) of ecological information of moderate cost.

Management or planning opportunities and limitations based upon climate, soil and vegetation potentials as presently understood.
TEUI Conclusions

Terrestrial Ecological Unit Inventory = Soil Survey

Terrestrial Ecological Unit Inventory = Ecological Site Description


Questions?