



USDA Forest Service Terrestrial Ecological Unit Inventory

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“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**



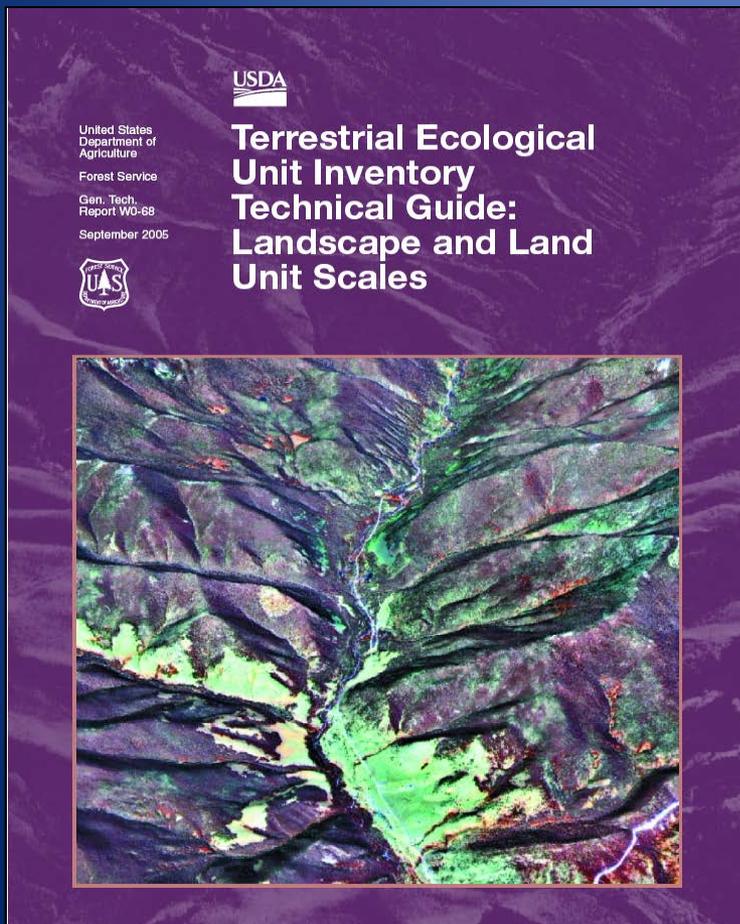
Policy Direction

(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.**

Terrestrial Ecological Unit Inventory Technical Guide: Landscape and Land Unit Scales

(Winters et al. 2005)



Policy Implementation

USDA Forest Service Technical Guide for conducting Terrestrial Ecological Unit Inventory (TEUI) on National Forest System Lands.



Terrestrial Ecological Unit Inventory

(USDA Forest Service, Southwestern Region, TESH 1986)

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

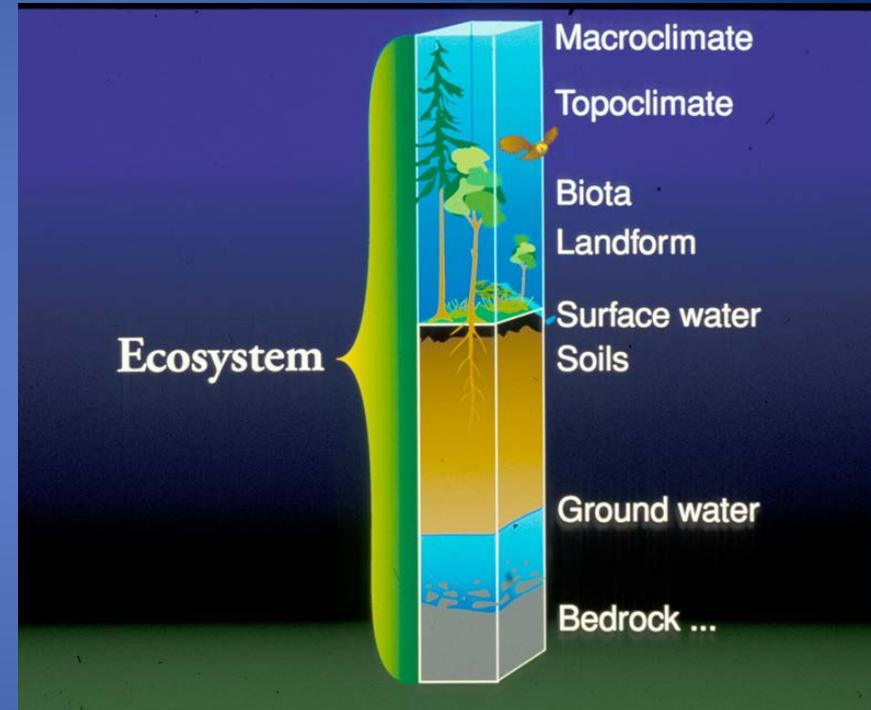
(Winters et al. 2005)

- 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.

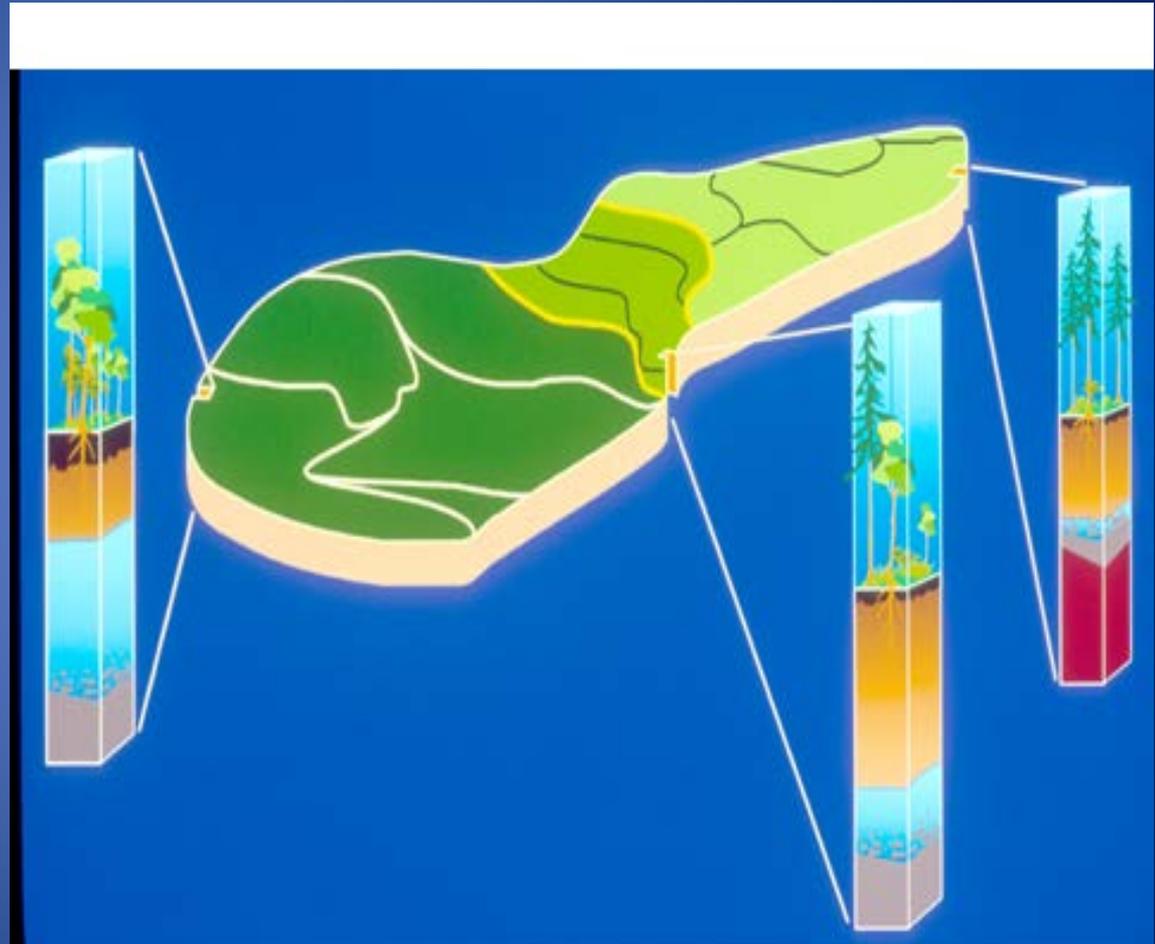


Ecological Map Unit

(Winters et al. 2005)

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

SOIL	VEGETATION	CLIMATE	GEOMORPHIC
Order	Formation	Class	Geomorphic Process
Suborder	Class	Life Zone	Landscape
Great Group	Series	Sub-Step	Landform
Subgroup	Sub-Series		Element/Common Landform
Family	Plant Association		

National Hierarchical Framework of Ecological Units

(Cleland et al. 1997)

Planning and Analysis Scale	Ecological Unit	Scale	Geology	Geomorphology	Soils	Potential Natural Vegetation
Ecoregion	Domain	1:30,000,000	-----	-----	Soil Orders	Broad Climatic Zones (Humid Tropical, Humid Temperate)
Ecoregion	Division	1:30,000,000 1:7,500,000	-----	-----	Phases of Soil Orders	Vegetation Affinities (Forests, Prairies)
Ecoregion	Province	1:15,000,000 1:5,000,000	-----	-----	Phases of "similar" Soil Orders	Dominant PNV (Kuchler, 1964) (Bering Tundra)
Subregion	Section	1:7,500,000 1:3,500,000	Geologic Age, Lithology, Stratigraphy	Geomorphic Province	Phases of Soil Great Groups, Subgroups	PNV "Series" Groupings
Subregion	Subsection	1:3,500,000 1:250,000	Surficial Geology, Lithology	Geomorphic Process	Phases of Soil Orders Great Groups, Subgroups	PNV Formation, Series
Landscape	Landtype Association	1:250,000 1:100,000	Primary Lithology, Groups of Secondary Lithology	Geomorphic Process, Subprocess Types	Phases of Soil Great Groups, Subgroups	Series, Subseries
Land Unit	Landtype	1:24,000	Secondary Lithology	Landforms, Element Landform, and Morphometry	Phases of Soil Subgroups, Families,	Subseries, Plant Associations
Land Unit	Landtype Phase	1:12,000	Secondary Lithology	Landforms, Element Landform, and Morphometry	Phases of Soil Series	Plant Associations, Plant Association Phases

Gradient Analysis

Studies that seek to arrange samples in relation to one or more environmental gradients or axes.

Direct Gradient Analysis

The understanding of the samples in response to direct, measurable, spatial or temporal environmental gradients.

Indirect Gradient Analysis

The arrangement of samples in a sequence, along one or more axes, by comparing their compositional similarity.

Example of direct gradient analysis using altitude, life zone, precipitation, soils and PNV.

(Jenny, H. 1980)

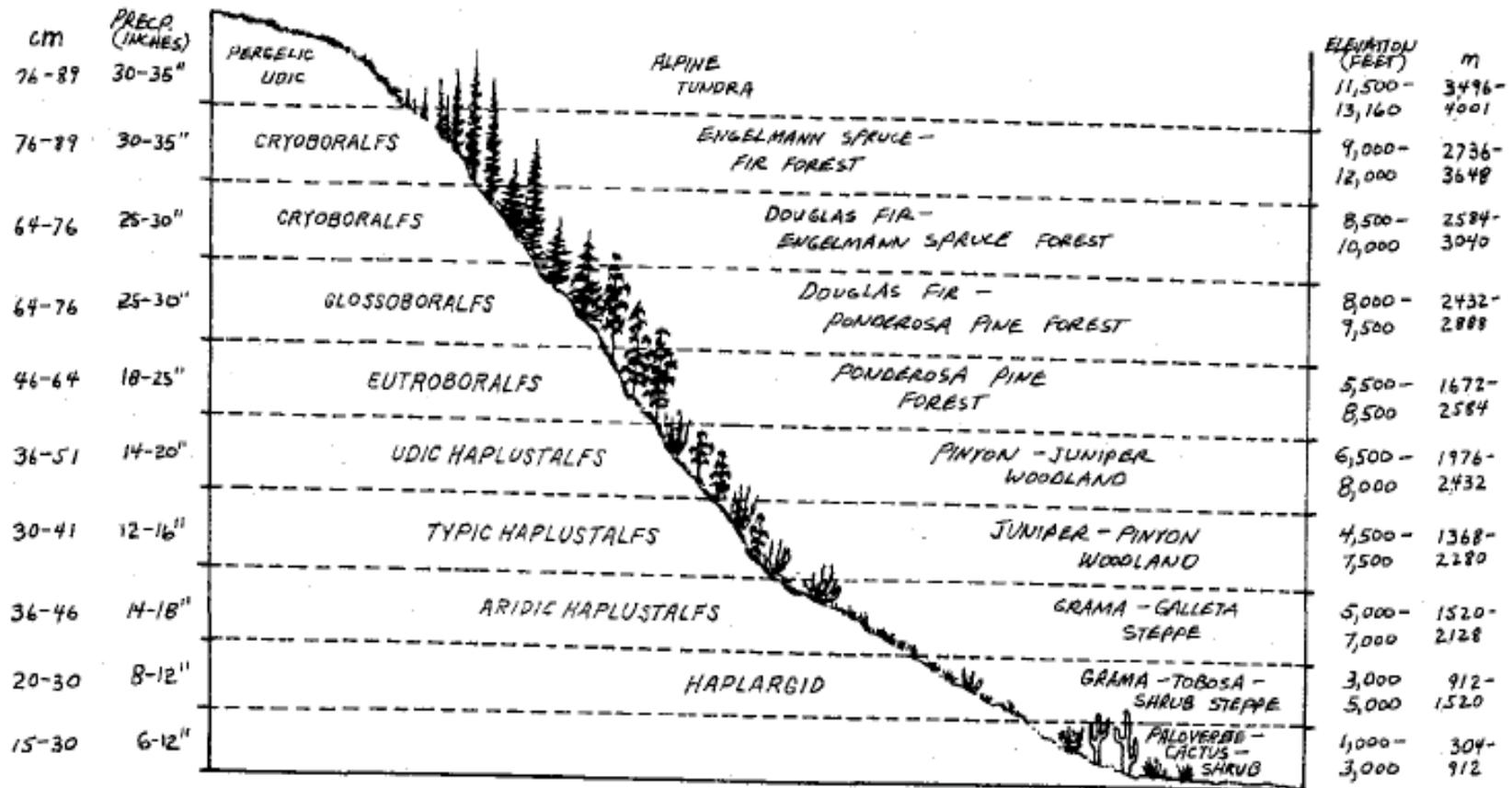


Fig. 12.9. Altitude sequence of soils and vegetation in New Mexico. After Carleton et al. (9), U.S.D.A. Forest Service

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



Minimum Levels of Documentation for Landtypes

(Winters et al. 2005)

Landtypes	Components	Map units
<p data-bbox="214 461 484 501">Ecological type</p> <p data-bbox="185 546 624 1372">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.</p>	<p data-bbox="726 546 1180 1208">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.</p>	<p data-bbox="1277 546 1760 1265">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.</p>

Natural Resource Information System

- 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.)**

TEUI Summary of Features Con't

- **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**

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Questions?

