

# Implementation of the Terrestrial Ecological Unit Inventory Geospatial Toolkit for National Forest Lands in the Southwestern USA



Keys to
Soil Taxonomy
Eleventh Edition, 2010

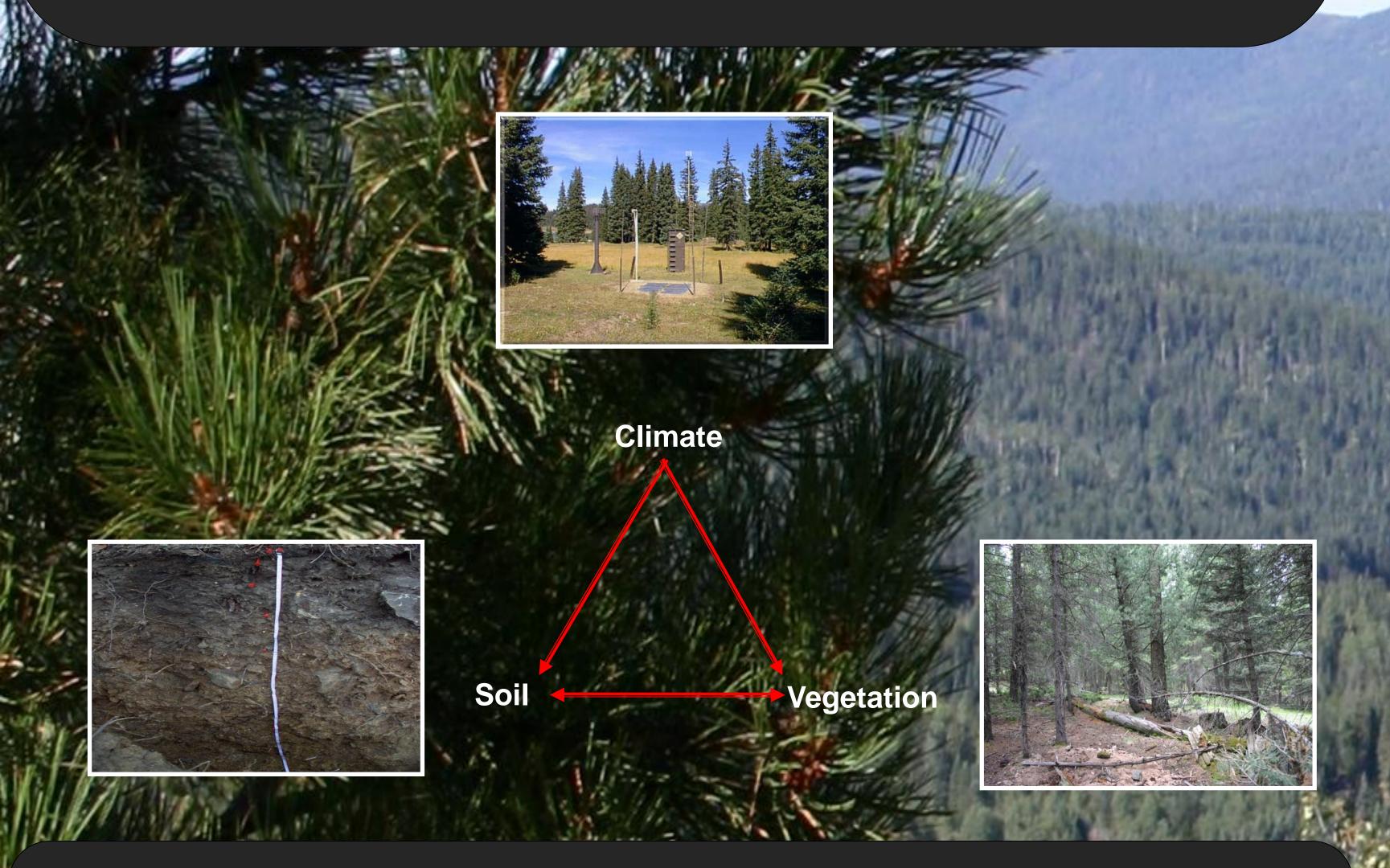
M.A. Casillas<sup>1</sup>, Koehler N.L.<sup>2</sup>, Robbie, W.A.<sup>3</sup>, Robertson, G.T.<sup>1</sup>, Strenger, S.H.<sup>3</sup>

<sup>1</sup>Southwestern Region USDA Forest Service, 2324 E. McDowell Rd, Phoenix, AZ 85006, mcasillas@fs.fed.us, grobertson@fs.fed.us, <sup>2</sup>Southwestern Region USDA Forest Service 3005 Camino del Bosque, Silver City, NM 88061, nkoehler@fs.fed.us, sstrenger@fs.fed.us, sstrenger@fs.fed.us.

#### Terrestrial Ecological Unit Inventory (TEUI)

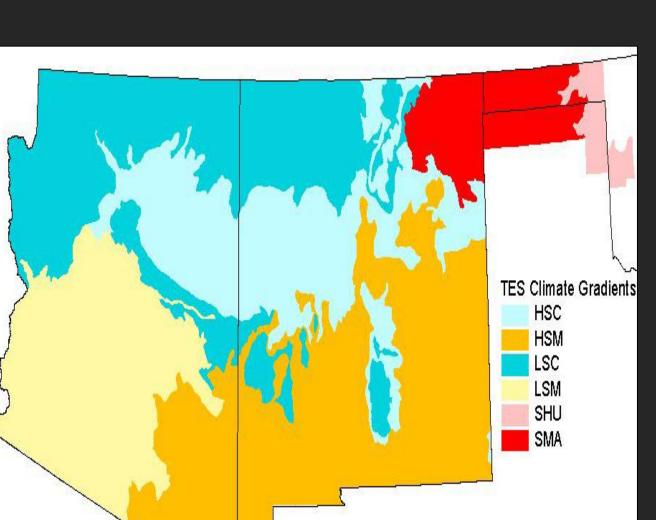
**Terrestrial Ecological Unit Inventory** (TEUI) is defined as the systematic description, classification (soil, vegetation, climate, geomorphology and geology), mapping, and interpretation of ecological types (Winthers, et.al, 2005; USDA 1986).

Ecological types are categories of land with distinctive (i.e., mappable) combination of landscape elements. The elements making up an ecological type are climate, geology, geomorphology, soils, and potential natural vegetation. Ecological types differ from each other in their ability to produce vegetation and respond to management and natural disturbances. (Winthers, et.al, 2005)



This diagram indicates that both soil and vegetation are directly influenced by climate; soil supports vegetation; and vegetation acts upon the soil. The product of these complex interactions defines a terrestrial ecosystem (Whitford, W.G., 2002; USDA 1986).

#### Climate Classes Used in TEUI



**Ecological Gradient Descriptions** 

**LSC** -- Low sun cold has >50% of annual precipitation occurs in low sun period, October-March. Soil temperature regime is frigid.

**HSC** -- high sun cold has >50% of annual precipitation occurs in high sun period, April-September. Soil temperature regime is frigid.

**HSM** -- High sun mild has >50% of annual precipitation occurs in high sun period, April-September. Soil temperature regime is mesic.

**LSM** -- Low sun mild has >50% of annual precipitation occurs in low sun period, October-March. Soil temperature regime is mesic.

SMA -- Semi-arid; higher elevation plains that are drier (ustic soil moisture regime)

and colder (mesic soil temperature regime).

SHU -- Subhumid; lower elevation plains that are wetter (Udic ustic soil moisture)

## regime) and warmer (thermic soil temperature regime).

**Current TEUI Efforts in the USDA Forest** 

Gila National Forest

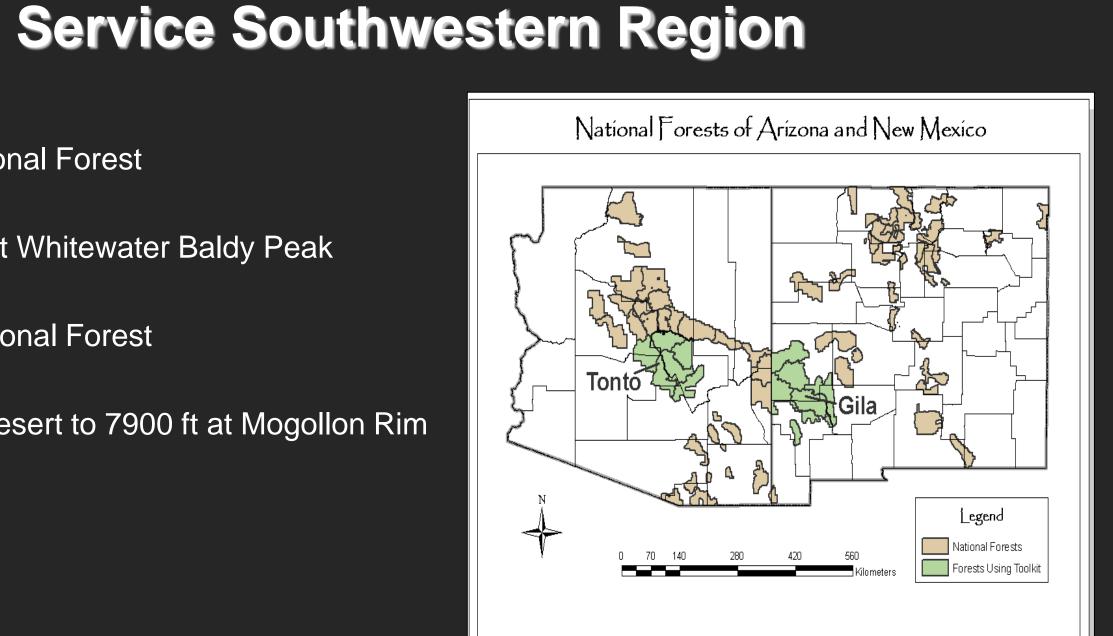
Extent: ~3.3 million acres

Elevation: 4200 ft to 10,770 ft at Whitewater Baldy Peak

Tonto National Forest

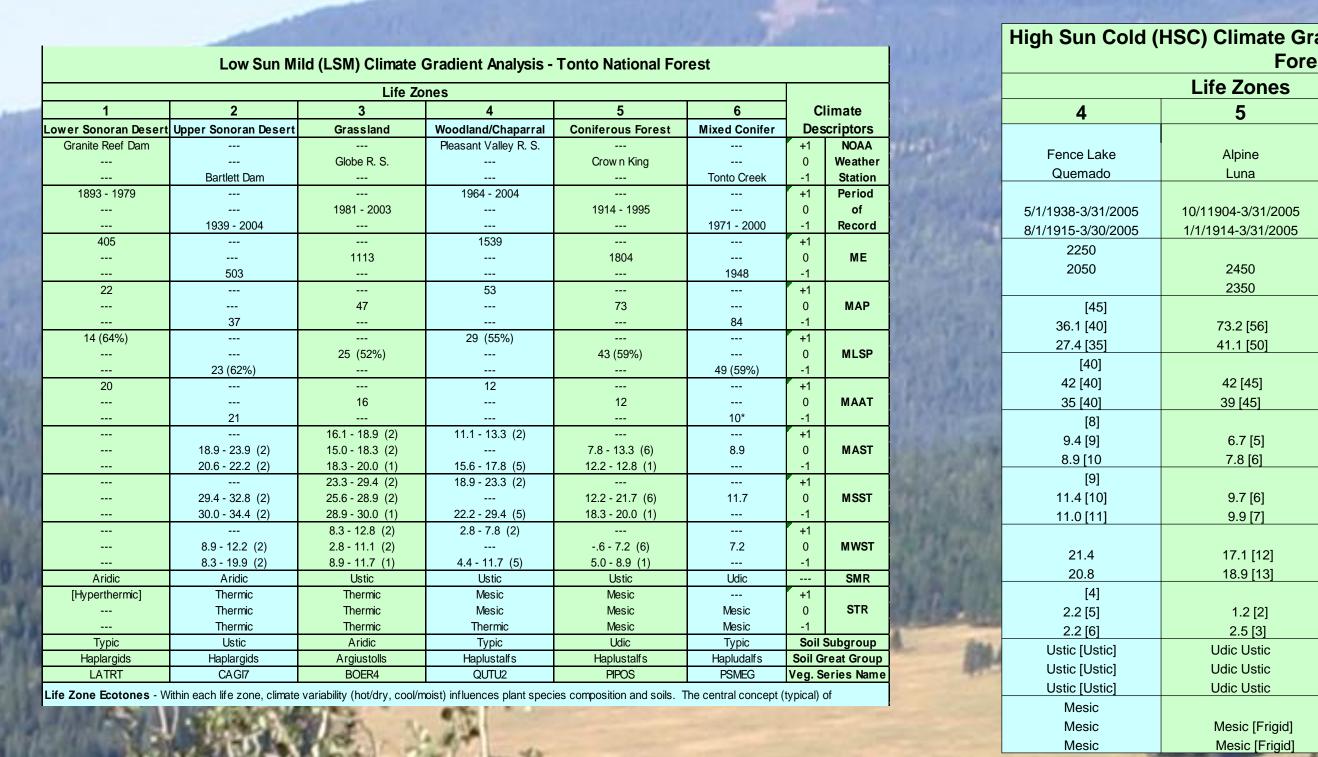
Extent: ~3 million acres

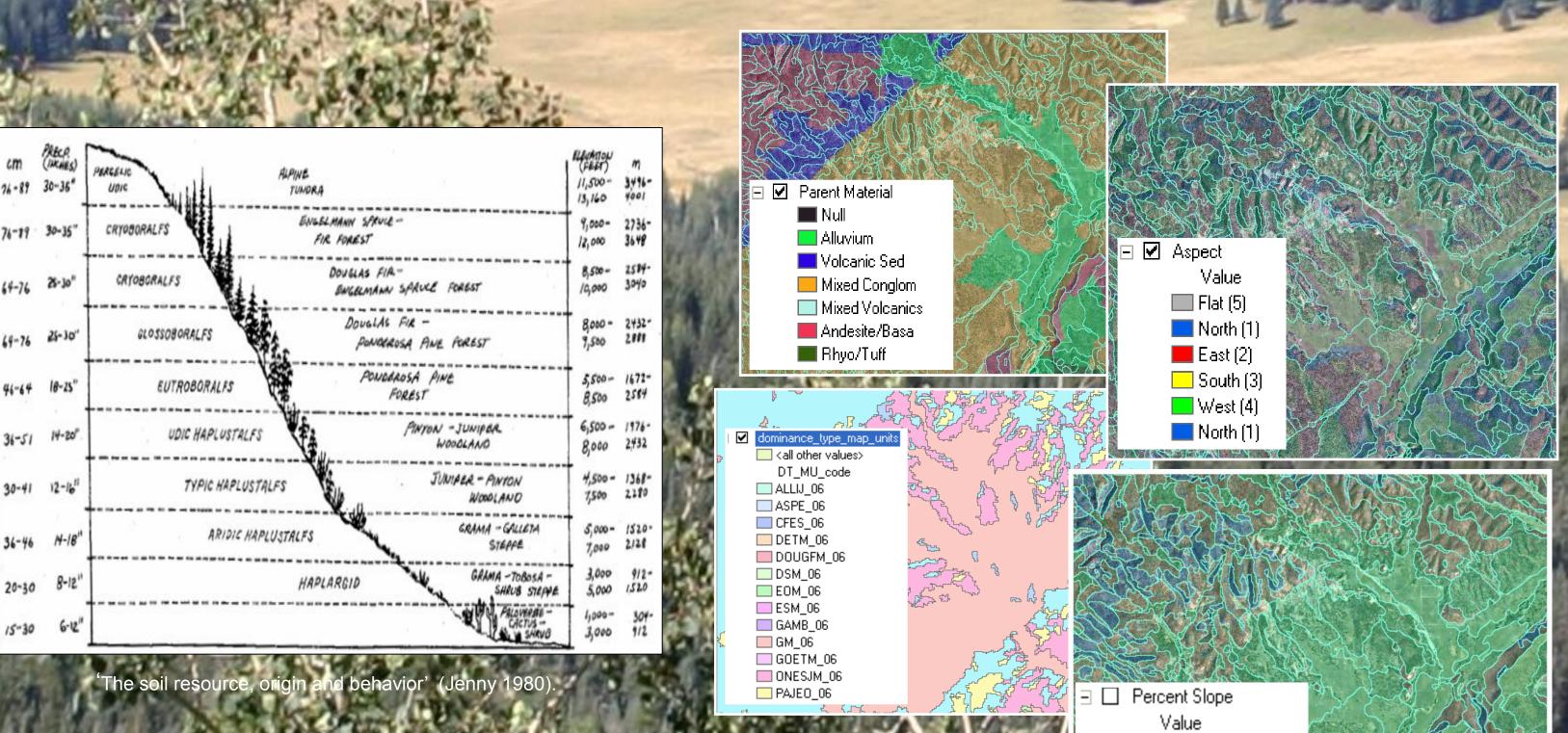
Elevation: 1300 ft in Sonoran desert to 7900 ft at Mogollon Rim Visitors annually: ~5.8 million



#### **TEUI Gradient Analysis**

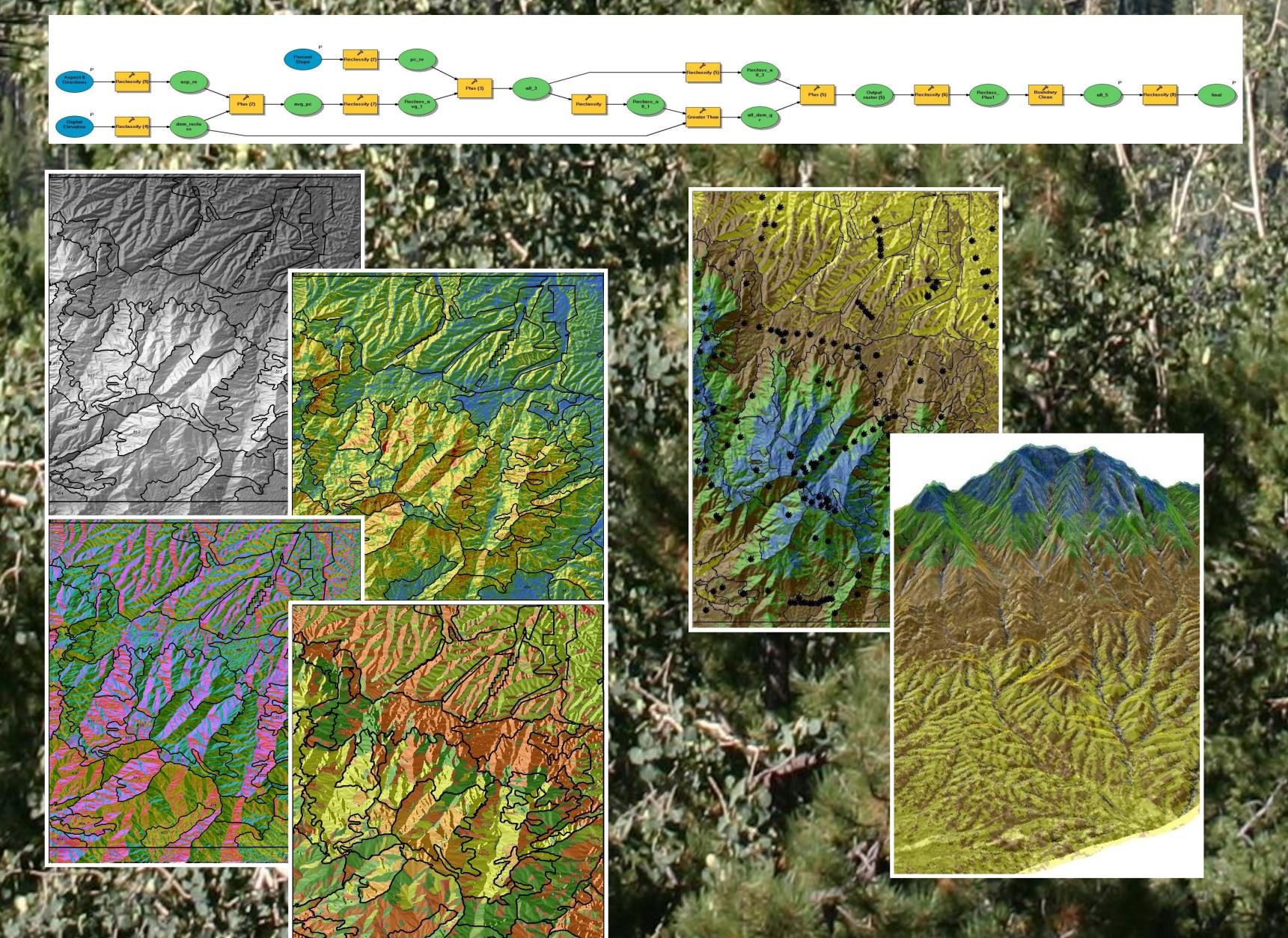
Gradient Analysis is a study that seeks to arrange samples in relation to one or more environmental gradients or axis. Ecological data as well as climate data from NOAA Weather Stations is used to define life zones that occur along an elevation continuum ranging from low elevation; hot, dry arid and semi-arid desert scrub to high elevation; cool, wet, upper montane coniferous forests (USDA 1986)





### The Tonto National Forest Gradient Model

40.00000001 - 80



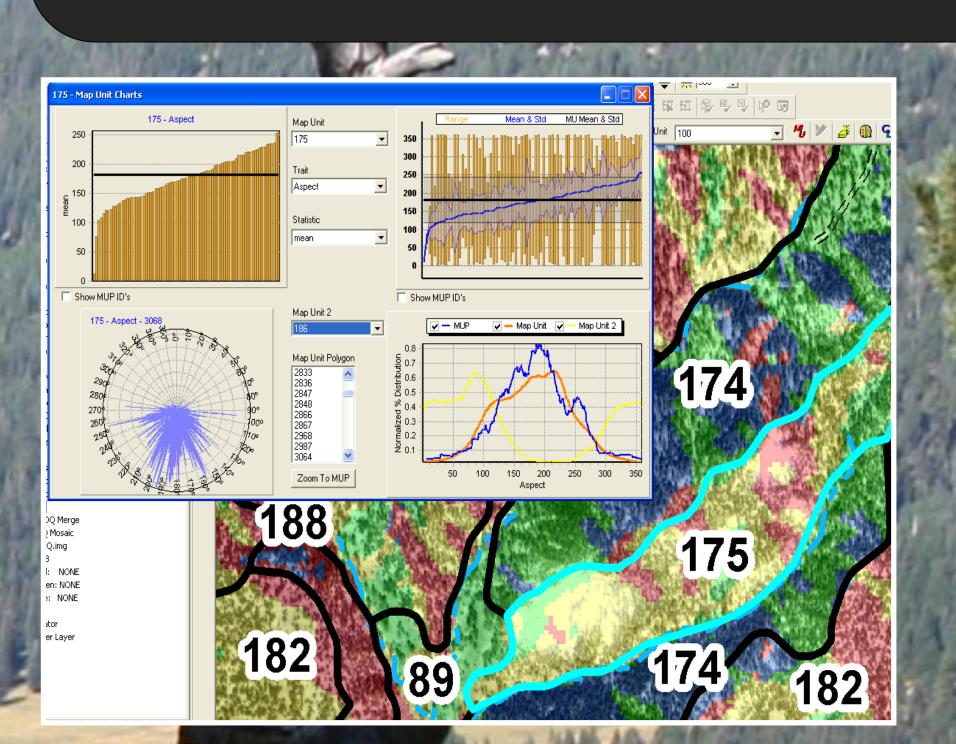
Objective: Analyze the variability of ecological types within and between ecological map units

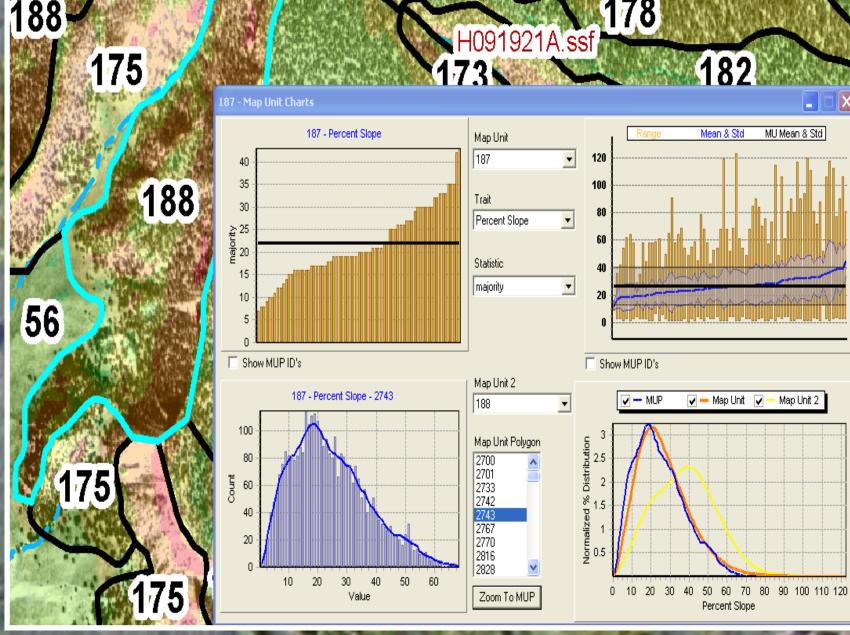
#### Terrestrial Ecological Unit Inventory (TEUI) Geospatial Toolkit

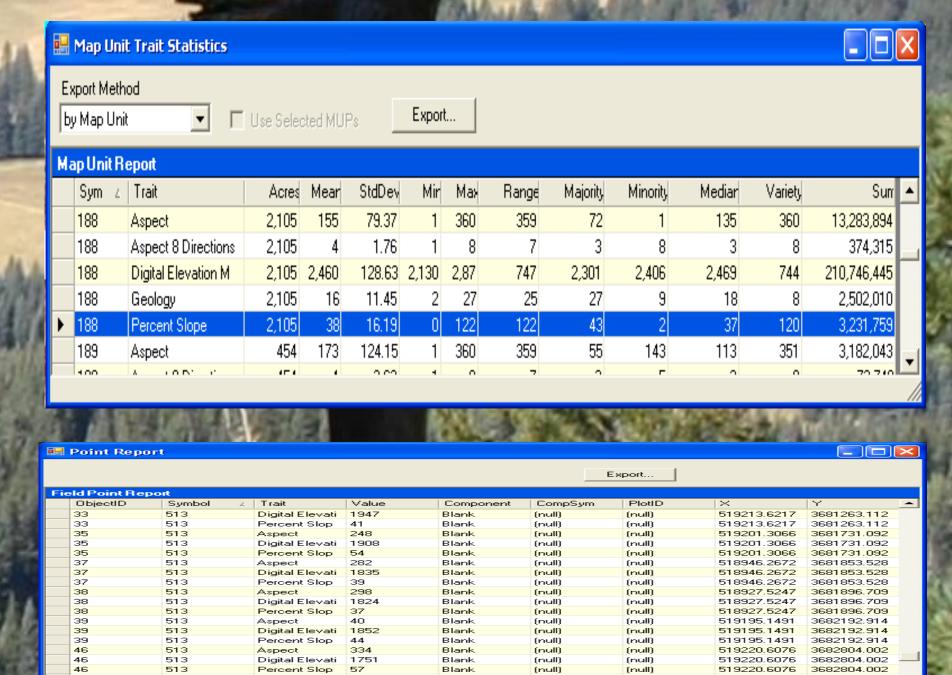
•Terrestrial Ecologic Unit Inventory – Geospatial Toolkit (TEUI-Geospatial Toolkit) is an ArcMap extension developed by the Forest Service Remote Sensing Applications Center

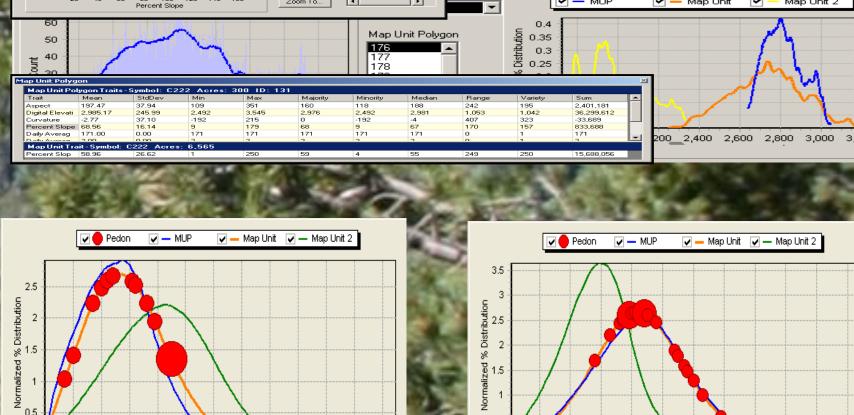
• (RSAC 2006).

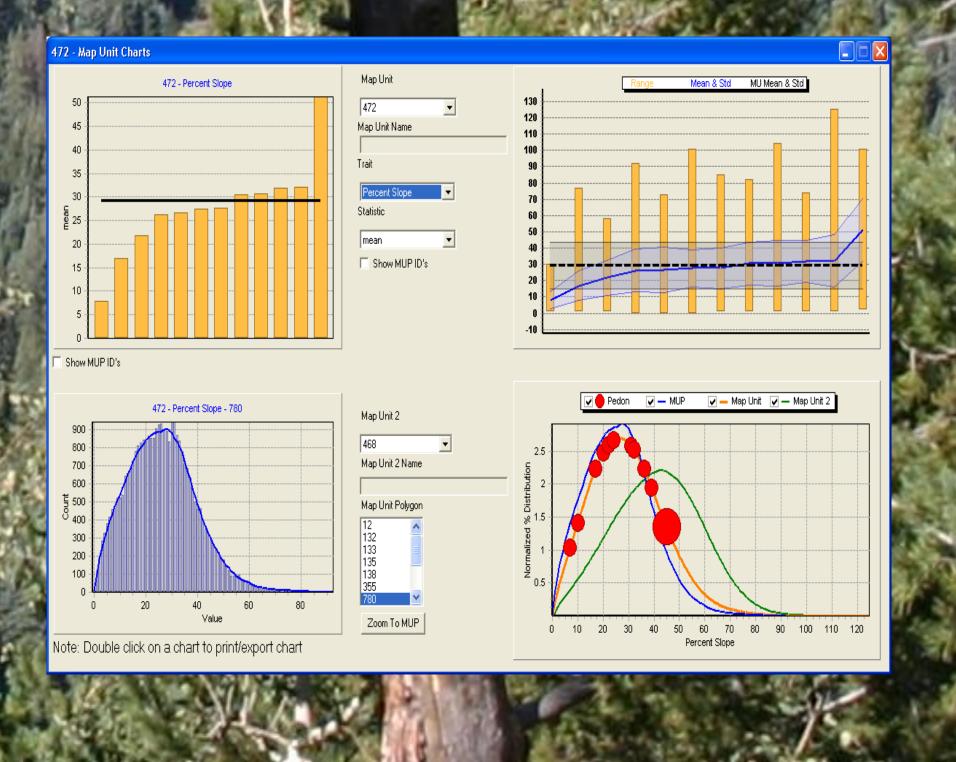
For more information or to TEUI Geospatial Toolkit was the part of the par

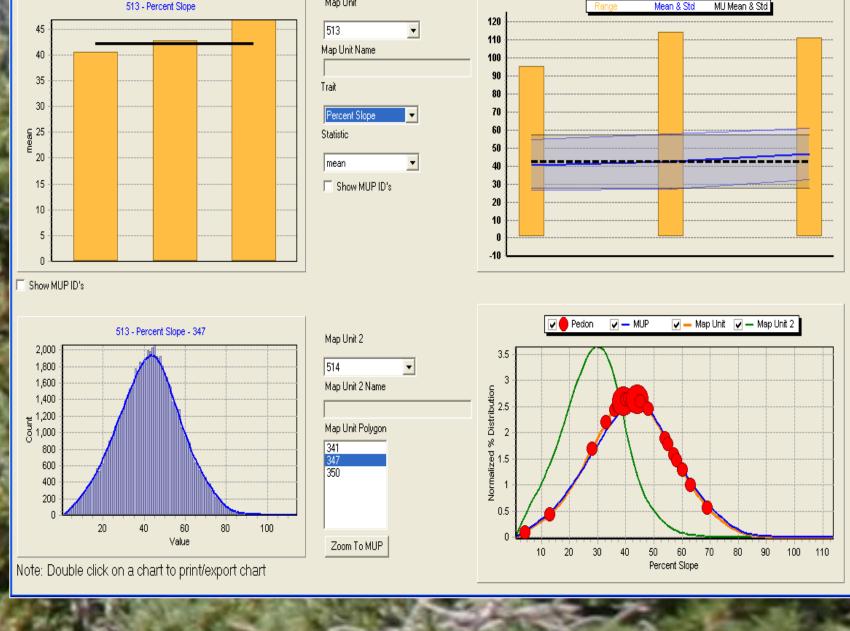












#### References:

Daley, R., and Fisk, H. 2005. "Summary of the May 31 – June 3, 2005 Pre-release workshop for the US Forest Service's Terrestrial Ecological Unit Inventory (TEUI) Geospatial Toolkit for ArcMap." Accessed on August 26<sup>th</sup>, 2008 and available at: http://fsweb.rsac.fs.fed.us/documents/0038-RPT04.pdf

Fisk, H. 2007. "Creating natural segments using eCognition." Accessed on August 26th, 2008 and available at: <a href="http://166.2.126.235/DataDoors/DataDoors%20Pamphlet\_v3.pdf">http://166.2.126.235/DataDoors/DataDoors%20Pamphlet\_v3.pdf</a>

Jenny, H. 1958. Role of the plant factor in the pedogenic functions. Ecology Vol. 39. p. 6-16.

Jenny, H. 1980. The soil resource, origin and behavior. Ecological Studies Vol. 37. Springer-Verlag, New York. 377 pp.

Gauch, H. G. 1982. Multivariate analysis in community ecology. Cambridge University Press. 298 pp

RSAC. 2006. "Terrestrial Ecological Unit Inventory (TEUI) – Geospatial Toolkit Mission Statement". Accessed on August 26th, 2008 and available at: <a href="http://fsweb.rsac.fs.fed.us/geospatialtoolkit/">http://fsweb.rsac.fs.fed.us/geospatialtoolkit/</a>

USDA Forest Service. 1986. Terrestrial ecosystem survey handbook. USDA Forest Service, Southwestern Region, Albuquerque, NM.

Winthers, E., Fallon, D., Haglund, J., DeMeo, T., Nowacki, G., Tart, D., Ferwerda, M., Robertson, G., Gallegos, A., Rorick, A., Cleland, D.T., Robbie, W. 2005. Terrestrial Ecological Unit Inventory technical guide. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office, Ecosystem Management Coordination Staff. 245 p.

Whitford, W. 2002. Ecology of Desert Systems. Academic Press, London.