

Development of Statewide Ecological Landtypes in Missouri

Tim Nigh , Kyle Steele , Fred Young , Dennis Meinert , John Kabrick 

Ecological Classification In Missouri

Introduction

The conservation of Missouri's rich array of native plant and animal species requires the maintenance and enhancement of the native ecosystems they depend on. In addition, land managers in Missouri are often charged with the difficult task of managing resources from a multiple-use perspective. An ecological classification system (ECS) is a framework that allows natural resource managers to identify, map, and describe land with similar physical and biological characteristics at scales suitable for natural resources planning and management.

What We Have Done

Since 1998, the Missouri ECS Project has been working to apply the USFS National Hierarchical Framework of Ecological Units toward ecological land mapping in Missouri. This is a systematic method for classifying and mapping the earth's surface based on ecological associations at various geographic scales. The Section, Subsection and Landtype Association levels have already been described in the *Atlas of Missouri Ecoregions* (Nigh and Schroeder 2002). This work has already been used as the framework for the MDC Comprehensive Wildlife Strategy and other ecological planning efforts in Missouri (e.g., The Nature Conservancy, and American Bird Conservancy). The next and final ecological units to be mapped and described are Ecological Landtypes (ELTs).

USFS National Hierarchical Framework of Ecological Units

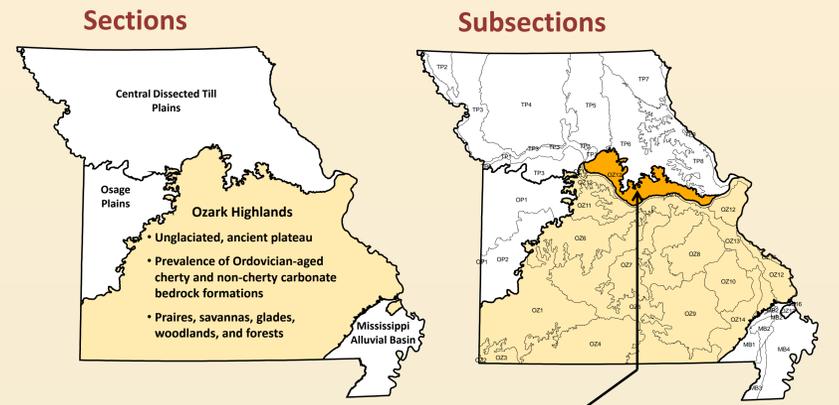
Scale	Ecological Units	Spatial Extent	Major Differentiating Criteria	Example: Missouri and Outer Ozark Border Types
Ecoregion	Domain	Subcontinental 1,000,000 sq. mi.	Continental and Regional Climate Zones; Broad Soil and Vegetation Lifeform patterns.	Humid Temperate Domain
	Division	Multiple State 100,000 sq. mi.		Hot Continental Division
	Province	Multiple State 10,000 sq. mi.		Eastern Broadleaf Forest
Subregion	Section	Regions 1,000 sq. mi.	Regional/Subregional Precip. and Temp.; Geomorphology;	Ozarks Highlands Section
	Subsection	Subregions 10-100s sq. mi.	Major Soil Great Groups; Potential Vegetation Formations.	Outer Ozark Border Subsection
Landscape	Landtype Association (LTA)	Landscape 1,000s acres to 10s sq. mi	Local Climate; Landform/Topography; Geologic Parent Materials; Soil Associations; Potential Vegetation Alliances.	Boonslick Oak Woodland/Forest Hills LTA
	Landtype (ELT)	Site 1-100s acres	Landform/Topographic Position; Geologic Parent Materials; Soil Series; Potential Vegetation Associations.	Protected Dry-Mesic Till Backslope Woodlands ELT
Land Unit	Landtype Phase (ELTP)	Site <100 acres		Protected Alfic Till Backslope, Dry Clayey ELTP



The *Atlas of Missouri Ecoregions* provides the framework for mapping and describing ELTs.

Missouri ECS Hierarchy

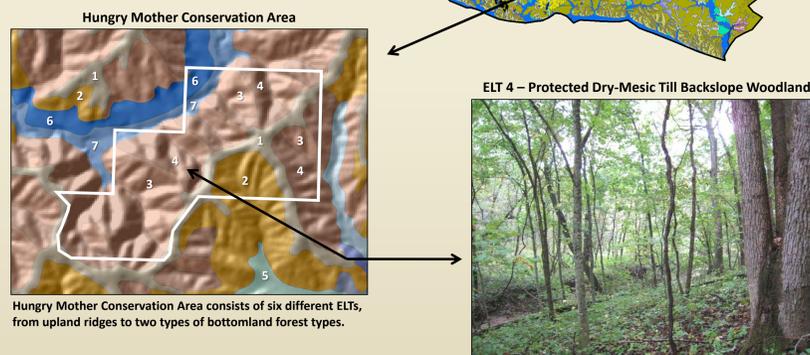
Large ecoregions (Sections and Subsections) are further subdivided into landscapes (Landtype Associations) and finally into site-scale units (Ecological Landtypes).



Landtype Associations (LTAs)



Ecological Landtypes (ELTs)



ELT Legend – Hungry Mother CA

ELT # and Name	Parent Material	Landform	Soil Series	Nelson Community	Comments
1) Loess over Till Upland Woodlands	loess/till	ridge and gentle backslope complex	Hatton	Dry-Mesic Loess/Glacial Till Woodland	Mixed oak overstory.
2) Glacial Till Upland Woodlands	till	ridge and gentle backslope complex	Keswick, Lindley	Dry-Mesic Loess/Glacial Till Woodland	Composition variable with slope position.
3) Exposed Dry-Mesic Till Backslope Woodlands	till	exposed backslope	Keswick, Lindley, Winnegan	Dry-Mesic Loess/Glacial Till Woodland	Fewer and shorter trees with less dense canopy than protected slope; greater ground flora diversity.
4) Protected Dry-Mesic Till Backslope Woodlands	till	protected backslope	Keswick, Lindley, Winnegan	Dry-Mesic Loess/Glacial Till Woodland	Lower slope positions often have forest inclusions.
5) Wet Narrow Floodplain Forests	loamy alluvium	narrow floodplain	Belknap, Fatima, Freeburg, Haymond	Riverfront Forest	Upland waterways.
6) Dry High Floodplain Forests	loamy alluvium	high floodplain	Fatima, Haymond, Haynie	Mesic Bottomland Forest	Good drainage, may be water-limiting some years.
7) Wet High Floodplain Forests	loamy alluvium	high floodplain	Belknap, Blake, Coland, Dockery, Freeburg	Wet-Mesic Bottomland Forest	Wet due to poorer drainage.

Management Applications And Products

An understanding of parent materials, landforms, and soils as it relates to vegetation can be of great benefit to land managers. ELTs help us understand how these ecosystem attributes vary within and among regions, and can be a dynamic influence in helping to develop sound management goals and objectives. There are many ways in which this work can be used. Silviculture, resource planning, natural community management, ecosystem restoration, private lands conservation, and scientific research can all benefit when considering ELTs.



ELTs compartmentalize forest site productivity, define stand mapping units, increase a forester's understanding of species-site relationships, and help understand appropriate regeneration strategies.

ELTs can help us to understand, manage, and restore native ecosystems. An understanding of the physical factors associated with Missouri's native landscapes is imperative in order to manage our great diversity of natural communities in the state.

ELTs can be used to develop long-term area plans for Conservation Opportunity Areas, federal lands, conservation areas, state parks, and other public lands.

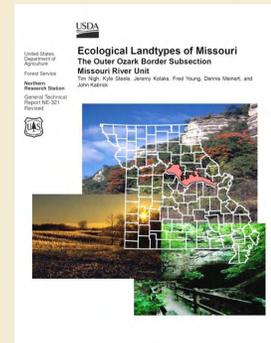
ELTs can be used to assign appropriate conservation-related cost-share programs, such as: bottomland tree plantings, timber stand improvement, grassland plantings, and woodland restoration activities.

ELTs can help in scientific research. Ecological dynamics can be more clearly observed and better understood when replicating or blocking by ecological units, such as ELTs. Considering ELTs may likely help to lower the variance in statistical experiments.

Where Can You Get Missouri ELT Data?

By late 2010, ten separate subregional reports will be peer-reviewed and published as US Forest Service General Technical Reports. These reports will include full color maps and legends, and descriptions of soils, landforms, geology, and natural communities. In addition to the report, a DVD will be included with a GIS project that includes all associated geo-spatial data for each subregion. Reports by subregion will include:

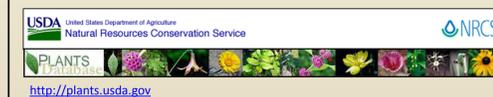
- Central Dissected Till Plains
- Outer Ozark Border
- Loess Hills
- Springfield Plain
- Claypan Till Plains
- Ozark Highlands
- Mississippi River Hills
- St. Francis Knobs and Basins
- Osage Plains
- Mississippi River Alluvial Basin



Relevance to NRCS "Ecological Sites"

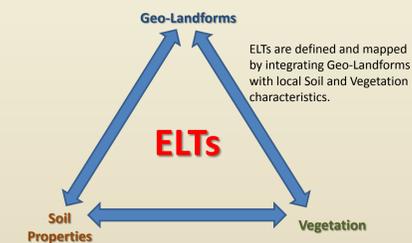
The ECS team is working with the Natural Resources Conservation Service (NRCS) in Missouri and surrounding states to develop a similar classification scheme called "Ecological Site Descriptions (ESDs)." The general goal of their work coincides with the Missouri ECS hierarchy. As such, we have developed a method to make ELTs synonymous with NRCS ESDs. As a result, Missouri is part of a nationwide effort to describe and map management-scale ecological site conditions, to be used as a basis for guiding NRCS cost-share programs.

- ELT/ESD information will also be available via the NRCS Web Soil Survey, [USDA Ecological Site Information System](http://plants.usda.gov) website, and the [USDA NRCS Plants Database](http://esis.sc.egov.usda.gov) website.



What Are Ecological Landtypes?

Ecological Landtypes are the most detailed scale of land units within the ECS framework (i.e., 10-100s of acres). These are site-scale or management-scale units that define local ecosystems or communities that exist within a given landscape. Specifically, ELTs recognize variations in landforms, topography, soils, and ecological disturbance factors that ultimately affect the potential vegetation associations within an area.



Project Methods

Currently, the ECS team is using the National Cooperative Soil Survey as a basis to describe ELTs in Missouri. Using ArcGIS, original 1:24,000 soil survey map units are first grouped by landform type and parent material, and then further grouped by soil properties selected based on their influence on vegetation (e.g., rooting restrictions, flooding, etc.). In addition, some polygons are further delineated using differences in aspect (for strongly sloping backslopes) and landform (e.g. soils that are mapped on multiple landforms) within soil map units. Based on these spatial assemblages, ELTs and natural communities are applied using field verification, historical vegetation information, and professional judgment.

Properties used to Define ELTs

Parent Material	Landform	Root Restriction	Base Saturation	Wetness	Soil Texture	Flooding	Ponding	Community Type
<ul style="list-style-type: none"> Loess Loess over Till Loess over Residuum Till Shale Chert Limestone/Dolomite Sandstone Alluvium: Gravelly, Sandy, Coarse Loamy, Loamy, or Clayey 	<ul style="list-style-type: none"> Summit Summit/Ridge Cmplx. Ridge Exposed Backslope Protected Backslope Footslope Terrace Narrow Floodplain High Floodplain Low Floodplain 	<ul style="list-style-type: none"> Claypan Fragipan Shallow to Bedrock Variable Depth Deep 	<ul style="list-style-type: none"> Mollic (↑ base) Alfic (↔ base) Ultic (↓ base) 	<ul style="list-style-type: none"> Dry Wet 	<ul style="list-style-type: none"> Clayey Loamy Coarse Loamy Sandy Skeletal 	<ul style="list-style-type: none"> Frequent Occasional Rare None 	<ul style="list-style-type: none"> Yes No 	<ul style="list-style-type: none"> Prairie Savanna Glade Woodland Forest

Conclusion

The Missouri Ecological Classification System is a framework that can help drive resource planning and management at a variety of scales, from ecoregion (Section and Subsection), to landscape (Landtype Association), and finally to the site scale (Ecological Landtype). Mapping and describing Ecological Landtypes is the final stage in completing the Missouri ECS. Using practical physical and biological factors, such as landforms, geologic parent materials, soils, and vegetation, ELTs can be mapped and can help guide multiple-resource management activities. It is our hope that land managers will use these products to help guide their efforts in managing Missouri's native ecosystems.

Acknowledgements

We thank Tony Spicci (MDC), Jeremy Kolaks (currently IN DNR), Dave Diamond (MoRAP), Jim Harlan (MU), Julie Fleming (MDC), Chris Wieberg (MDC), Frank Thompson (USFS), NRCS Soil Scientist crew, our seasonal field technicians, and all the great former Missouri DNR Soil Scientists. And a special thanks to the MDC Resource Science Division as a whole for supporting and funding this project.