

Ecological Site and State-and-Transition Model Development



<http://usda-ars.nmsu.edu/esd.html>

Ecological sites are based on soil map unit components of the National Cooperative Soil Survey. They are classes of land defined by recurring soil, landform, geological, and climate characteristics. Ecological sites recur on similar soil components within either a Major Land Resource Area (MLRA) or Land Resource Unit (LRU, both are types of climate/physiographic regions).

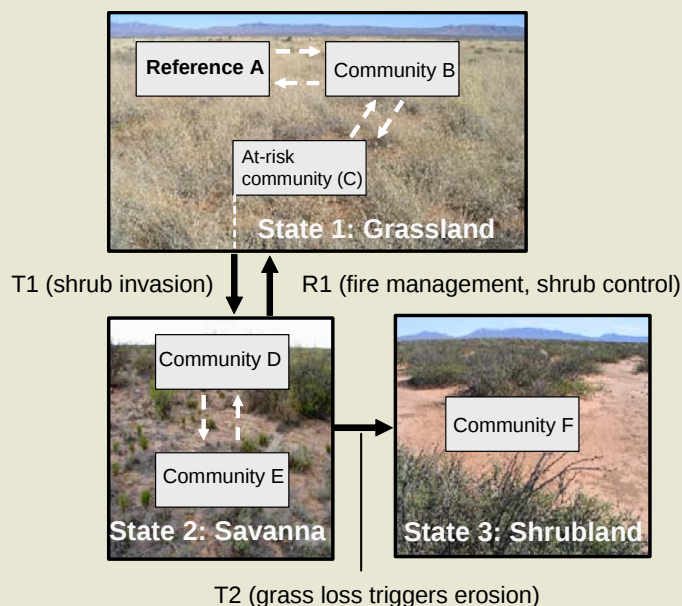
Ecological sites differ in:

- Plant production, species composition and dynamic soil properties at reference conditions
- Ecosystem services provided
- Responses to management
- Processes of degradation and restoration

Each ecological site can be observed in one or more alternative states.

State and transition models (STMs) describe changes in plant communities and associated dynamic soil properties that can occur on an ecological site. The causes of change, the constraints to reversibility of the change, and the management interventions needed to prevent or initiate change are described. Crossing into alternative states indicates that energy-intensive restoration actions will be needed to recover previous plant communities and ecological services.

Together, ecological sites and STMs provide spatially-explicit information about potential plant communities and the potential trajectories of change for landowners and agencies.



State and transition models are simple diagrams that organize large amounts of data and local knowledge. Dashed arrows are community pathways, solid arrows are transitions (with examples of processes). Big boxes are states, little boxes are community phases. The *at-risk of transition* and *reference* phases are highlighted. The diagram is only a summary of the information.



Ecological site maps can be created by classifying soil map units to the dominant ecological sites occurring within them, or ecological site associations can be mapped.



— Ecological site associations — Ecological states

Alternative state maps can then be created by mapping states within ecological site map units using remotely-sensed imagery.

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Ecological site descriptions

Ecological site descriptions (ESD) are reports that describe the:

- Biophysical properties of ecological sites
- Vegetation and surface soil properties of reference conditions that represent either
 - a) Pre-European vegetation and historical range of variation (in the United States)
 - b) Proper functioning condition or potential natural vegetation
- State-and-transition model graphics and text
- A description of ecosystem services provided by the ecological site and other interpretations

Where do I find ESDs?

The national set of Ecological Site Descriptions (ESDs) is a work in progress, so do not be surprised to find that they do not exist or are not complete for your area. Further, a process for efficiently locating ESDs for a land area is still being refined.

Our current recommendation is to start with the SoilWeb Online Soil Survey Browser from the California Soil Resource Lab. Useful tools include cell-phone based location-specific soil queries (that is, what soil and ecological site am I standing on?).
<http://casoilresource.lawr.ucdavis.edu/drupal/node/902>

1. Click either Google Maps or Google Earth link.
2. Zoom in to view detailed (SSURGO) soil map unit lines. Allow sufficient time to let the soil map load.
3. Click on the soil map unit code of interest.
4. Click on the soil map unit component name that best matches the location of interest.
5. Under "Land Classification", select Ecological Site Description to view the ESD report.

The Ecological Site Information System can be accessed directly here -

<http://esis.sc.egov.usda.gov/Welcome/egReportLocation.aspx?type=ESD>

You need the MLRA code number to locate a set of ecological sites for a broad geographic region. That code number can be found at <http://www.cei.psu.edu/mlra/>

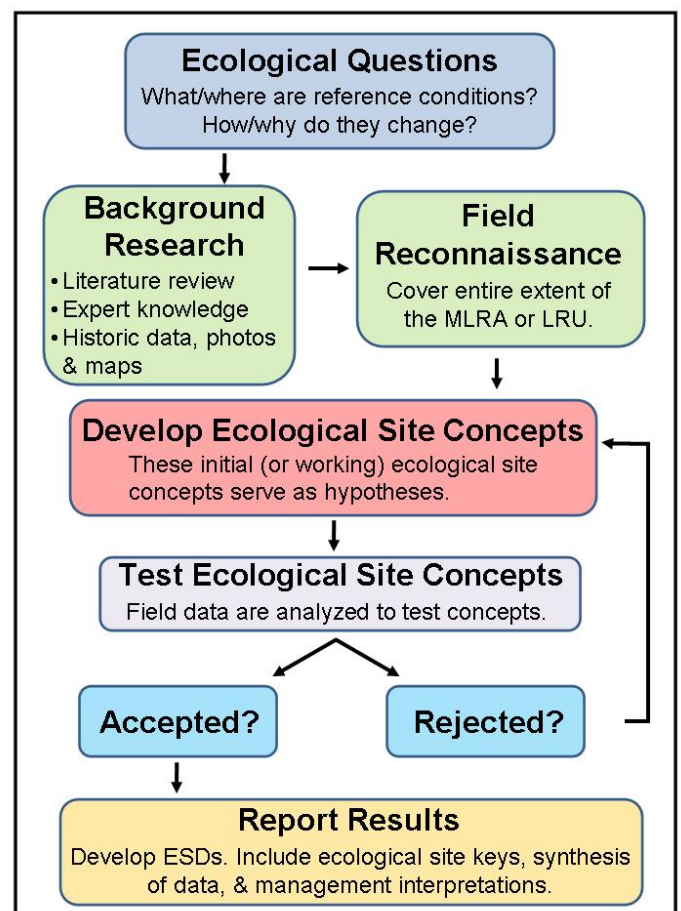
How are ESDs developed?

The following information types are integrated to develop a set of ESDs:

- plant-soil inventory data
- long-term experimental or management studies
- historical reconstructions
- local knowledge

See a recent Rangelands special issue (December 2010) for details

<http://www.srmjournals.org/toc/rala/32/6>.



ESDs: management tools

ESDs can be used for:

- Identifying possible plant communities
- Recording past plant communities
- Long-term management planning for landscapes
- Determining optimal seed mixtures
- Learning indicators that place rangelands at risk of undesirable changes