Ecological Sites: Introduction, Overview, and History

August 30, 2018 | Jamin Johanson, NRCS Ecological Site Specialist | Dover-Foxcroft, Maine
Ecosystems serve human needs…

- Regulating services – clean air, water, etc.
- Provisioning services – food, timber, fiber, etc.
- Supporting services – soils, nutrient cycling, etc.
- Cultural services – aesthetics, recreation, etc.

…and Ecological Sites catalogue ecosystems.
Ecological Sites – Purpose

We value access to reliable ecological information

ES work is a process of gathering, organizing, and delivering ecological information in a useful format for resource management.
Historical Context & Current Efforts

Originated in semi-arid rangelands
- Obvious site distinctions
- Less resilient ecosystems
- State-and-Transition Models

Current nationwide effort
- All land types and uses
- Provisional ES concepts to be completed by 2020 (for all major soil mapunit components)
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  (for all major soil map unit components)
Ecological Sites – Definition

An ecological site is:

1. A conceptual division of the landscape…
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2. Based on recurring patterns in soils, geology, climate, topography, hydrology, etc…
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1. A conceptual division of the landscape…
2. Based on recurring patterns in soils, geology, climate, topography, hydrology, etc…
3. That differs from other ecosystems…
   a. In its ability to produce distinctive kinds and amounts of vegetation,
   b. In its response to management and disturbance.
Example ES concepts

- **Cedar/Red maple Bottom**: (Cedar, Red spruce, Brown ash, Red maple)
- **Cedar/Spruce Toeslope**: (Cedar, Red spruce, Brown ash, Red maple)
- **Mixedwood Toeslope**: (Yellow birch, Maple, Fir, Red spruce, Cedar)
- **Hardwood Footslope**: (Yellow birch, Maple, Beech, Hemlock)
- **Hardwood Backslope**: (Beech, Birch, Maple, Beech, Hemlock)
- **Mixedwood Backslope**: (Beech, Maple, Red spruce, Fir)
- **White pine Shoulder**:
- **Spruce/Fir Summit**: (& Red maple)
- **Black Spruce/Heath shrub Rock Pocket**: (& White pine)
- **Red Spruce Shoulder**: (& White birch)
- **Protected Concave site**: (Sugar maple, White ash, Yellow birch, Beech)

- **Wonsqueak Buckspout**: Very poorly drained, deep organic soils
- **Monarda Burnham**: Poorly to very poorly drained, deep organic over mineral soils
- **Monarda Telos**: Somewhat poorly to poorly-drained, deep to very deep dense till soils
- **Telos Chesuncook**: Moderately well to somewhat poorly drained, deep to very deep dense till soils
- **Chesuncook Elliottsville**: Moderately well to well drained, moderately deep to deep dense till soils
- **Elliottsville Monson**: Well to somewhat excessively drained, moderately deep to shallow desic till soils
- **Monson Abram**: Somewhat excessively to excessively well drained, shallow to very shallow over bedrock
- **Abram Knob Lock**: Excessively well drained, very shallow pockets of organic soil with mineral soil
- **Knob Lock Rock Outcrop**: Well drained, shallow to moderately deep organic over mineral soil
- **Hogback Rawsonville**: Moderately well drained, very deep, very dark mineral soil
- **Enriched till**:
Example ES concept: Loamy Till Swamp (Cedar)

- **Cedar** / Red maple Bottom
  - Cedar / Spruce Toeslope
    - (Cedar, Red spruce, Brown ash, Red maple)
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  - (Sugar maple, White ash, Yellow birch, Beech)

- **Organic Soil**
- **Mineral Soil**
- **Dense Till**
- **Bedrock**

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Example ES concept: Loamy Till Swamp (Cedar)

Site Concept: loamy dense till soils on toeslopes, poorly and very poorly drained. Compacted soil layer < 35 inches below the soil surface perches water year-round. Pit and mound topography, often ponded. Northern white cedar dominates.

State 1. Reference / Current Potential
- 1.1 Northern White Cedar Mature Forest Phase: Mature cedar dominates overstory, diverse understory
- 1.2 Canopy Gaps and Seeps Phase: Diverse herbs dominate in patches associated with canopy gaps and/or seeps.
- 1.3 Early-successional Forest Phase: Balsam fir, grey birch, red maple, and/or cedar saplings
- 1.4 Mid-successional Forest Phase: 50-100 year old cedar dominates as fir and hardwoods die out

State 2. Ponded
- 2.1 Open Water Phase: Water ponds on soil surface, killing trees [snags common] and most other vegetation.
- 2.2 Emergent Wetland Phase: Cattails, bulrushes, and other emergent species dominate shallow pond.

State 3. Transitional Marsh
- 3.1 Wet Herbaceous Meadow Phase: Diverse herbs and Carex spp. dominate
- 3.2 Shrub Swamp Phase: Speckled alder and similar shrubs co-doninate with ferns, sedges and other herbs.

State 4. Pasture
- 4.1 Pasture or Hay land: Cleared and cultivated fields of mostly perennial herbaceous species.
Four Parts of an ESD: 1) Site Concept

- Name & Number
- Extent Map
- Physiography
- Climate
- Hydrology
- Soils
- Reference Plant Community

**Site Concept**

This site occurs on relatively flat to gently sloping (0-4%) or on terraces, where groundwater saturates the soil for much of the growing season and sometimes emerges at the surface. Small seepage rivulets are often evident. Soils formed in lodgment till and are poorly to very poorly-drained. Soil textures are loamy with a mucky peat surface, and a densely compacted horizon within 15-35 inches of the soil surface. The water table is usually within 12 inches of the soil surface in spring, and rises somewhat in late summer and fall. This site often has pit and mound topography, with ponding and thick organic matter accumulation in the pits, and drier soil conditions with thinner organic matter on the mounds where most trees are rooted. The reference state is characterized by abundant Northern white cedar.

**MLRA Notes**

MLRA Notes (MLRA 143), known as the Northeastern Mountains, covers approximately 23 million acres of mountains, hills, and valleys in northern Maine, New Hampshire, Vermont, New York, and Massachusetts. The area is sparsely populated, with less than five percent of the land area developed for agriculture, residential, and urban development. About 90 percent of the area is forested, most of which is actively managed for timber. Elevations are mostly between 1,000 and 4,000 feet, with a few isolated peaks more than 5,000 feet above sea level. The present day mountains are the remnants of a much larger ancient range that has been eroding for approximately 500 million years. Bedrock consists of mostly very old metamorphic rock (gneiss, schist, slate, marble, quartzite, etc.) with younger intrusions of igneous rock (e.g., granite and granodiorite) from the Triassic and Cretaceous periods. MLRA 143 differs somewhat geologically from the Triassic and Cretaceous periods. MLRA 143 differs somewhat geologically from the Triassic and Cretaceous periods.
Four Parts of an ESD: 2) Community Dynamics

- State-and-Transition Model
- State and Community Narratives
- Plant Production and Cover Tables
- Community Photos
- Transition Narratives
Four Parts of an ESD: 3) Interpretations

- Animal Community
- Wood Products
- Recreation
- Hydrology
- Other

4) Supporting Information

- Crosswalk to Other Classifications
- Associated & Similar Sites
- Inventory Data Plots
- Citations & Contributors
An Organizational Framework for Ecological Information

Spatial context for observations
- Ecological Site classification (ESD)

Temporal context for observations
- Ecological States and Transitions (STM)

Informed decision-making
- Ecosystem Services (Interpretations)
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Temporal context for observations
Informed decision-making

**Based on the assumption that ecosystems with similar soils, climate, hydrology, etc. usually produce similar ecological communities and dynamics over time.**
ESDs for Restoration & Conservation

**Conservation & Restoration Projects**
- Project area
- Identify concerns
- Available resources
- Project objectives

**Inventory**
- Ecosystem types (site potential – ES)
- Site history & current state (STM)

**Decision Support**
- Formulate alternatives
- Compare alternatives (ecosystem services – STM & Interpretations)
- Decide & plan project

**Ecological Site Information**

**Implement & Assess**
- Execute plan
- Monitor (ES)
- Assess effects (STM)

Document new knowledge
Collaboration is Key
Ecological Sites for Wetland Areas

Relatively new effort
New concepts are under development
*Hydrology as primary ecological driver
Thank You

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Accessing Soil & Ecological Information

Soil Data Explorer Tab

1) Define your area of interest

Accessing Soil & Ecological Information

Ecological Site Assessment Tab

2) Explore ecological site info