Particulars of Forest Ecological Sites

National Cooperative Soil Survey Annual Conference

DULUTH, MN
June 2015

CRAIG BUSSKOHL
NRCS SSD Forester
TOPICS

Introduction (lite) to Ecological Sites (ES)
Forest Sites- different?
Vegetation Classification options
National Vegetation Classification (NVC)
Example
Forest Ecological Site Descriptions
DISCUSSION
OBJECTIVE:
Provide Time For Discussion Of Topics (MORE) PARTICULAR To Forestland ESs With a Focus On VEGETATIVE COMMUNITY Options for PROVISIONAL ESs
Each Area/MLRA/LRU Is a Bit Different in Available Data, but .... ....Vegetative Questions and Options Seem to be A (the?) Hang-up In Getting (at least) PROVISIONALS Set Up in Some Places.
A Wee Bit of Introduction to Ecological Sites

And their Descriptions
1st: the ECOLOGICAL SITE

An ECOLOGICAL SITE (ES) is a distinctive kind [characterization] of land with specific physical characteristics that differ from other kinds of land in its “ability to produce a distinctive kind and amount of vegetation” (NFM)

"Forestland landscapes are divided into Ecological Sites for the purpose of inventory, evaluation and management. . . “
ESD’s are Ecological Site Descriptions
TEUI DEFINITION: ECOLOGICAL TYPE

An ecological type is a category of land with a distinctive combination of landscape elements, differing from other types in the kind and amount of vegetation it can produce and in its ability to respond to management actions and natural disturbances.
NRCS Forest Ecological Sites

The Ecological Site Information System (ESIS) is available on the NRCS at this website:

http://esis.sc.egov.usda.gov/ESIS/
So What’s So SPECIAL about FOREST Ecological Sites?

NOTHING!

Sort of...

Well, YES... there is that Vegetative Type thing... -TREES-... and often multiple species, and multi-storied, understory....
What Factors Combine to Produce a Unique ES?

Soils are a result of five major influences working together....

- Parent Material
- Topography
- Biota (including vegetation)
- Climate
- Time
PLANT COMMUNITIES ASSOCIATED WITH A SITE

DESIRED = Plant Associations (Overstory/Understory Species)

REALITY = Higher Level Grouping to Start
The Easy Stuff is... 'Easy'

- 'Easy' = rocky [Shallow; outcrop]; wet [Bog; Poorly drained within Well drained]; Unique-to-Site Plants or perhaps wildlife

- Often, it seems harder to characterize the more mundane
But What Do We Do With THIS?!
A Bit More Complex

Trees and Associated Vegetation can Indeed BE....

A Bit More Complex

Than a Typical Desert or Grassland/Shrub Range Site
SOUTHWEST MONTANA, BUT....

Just Add Water
NRCS Forest Ecological Sites

REFERENCE Community:
“Historic [Climax*] Plant Community”

This is the plant community that existed in “Pre-European” times. This community was in dynamic equilibrium with the environment. It serves as a “benchmark” site to the ESD.
NRCS Forest Ecological Sites

"State and Transition Models"

Reference State

Reference Community

HCPC

Community phase

Community phase

This line represents a transition to another state contained within the Ecological Site.

Community pathway: Time, disturbances, natural mortality, etc.
NRCS Forest Ecological Site Description

**UNITED STATES DEPARTMENT OF AGRICULTURE**
**NATURAL RESOURCES CONSERVATION SERVICE**

**ECOLOGICAL SITE DESCRIPTION (New Format Report)**

**ECOLOGICAL SITE CHARACTERISTICS**

- **Site Type:** Forestland
- **Site Name:** Cool Xeric Conifer Lowland Mountain (Douglas Fir Cool Dry Coniferous)
  - *Pseudotsuga menziesii* + *Calocedrus decurrens* 
  - *Douglas Fir + Ponderosa Pine*
- **NRCS HD:** 0945 72480/0000
- **Water Level Resource Area:** 84336/Southern Baja Mountains

**Climatic Features**

- Cool Xeric Winters, Warm Dry Summers
- Elev: 2,500 ft

<table>
<thead>
<tr>
<th>Climate</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precip.: Min</td>
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<td>0.0</td>
</tr>
<tr>
<td>Precip.: Max</td>
<td>30.0</td>
<td>83.0</td>
</tr>
<tr>
<td>Temp. Min</td>
<td>51.8</td>
<td>32.8</td>
</tr>
<tr>
<td>Temp. Max</td>
<td>98.1</td>
<td>40.1</td>
</tr>
</tbody>
</table>

**NRCS Forest Ecological Site Mapunits**

- PSME/CARU Soil Mapunits

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*1 inch equals 0.57 miles*
NRCS ECOLOGICAL SITE DESCRIPTION

AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

ECOLOGICAL SITE DESCRIPTION (New Format Report)

ECOLOGICAL SITE CHARACTERISTICS

Site Type: Forestland

Site Name: Cool Neric Coarse Lomy Mountainsides (Douglas Fir Cool Dry Grass)

Pseudotsuga menziesii - Calamagrostis rubescens //
(Douglas fir - pinegrass //)

Site ID: 1043AY001WA

Major Land Resource Area: 043A-Northern Rocky Mountains

Climatic Features
Cool Moist Winters. Warm Dry Summers.

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frost-free period (days):</td>
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<td>Freeze-free period (days):</td>
<td>0</td>
</tr>
<tr>
<td>Mean annual precipitation (inches):</td>
<td>14.0</td>
</tr>
</tbody>
</table>
AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

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<table>
<thead>
<tr>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>120</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14.0</td>
<td>30.0</td>
</tr>
</tbody>
</table>
WHAT TO DO IF WE DON'T FEEL THERE IS ENOUGH DATA TO NAIL DOWN PLANT ASSOCIATION?

START WITH HIGHEST LEVEL OF PLANT COMMUNITY THAT IS WELL SUPPORTED
WHAT TO DO IF WE DON'T FEEL THERE IS ENOUGH DATA TO NAIL DOWN PLANT ASSOCIATION?

»START WITH HIGHEST LEVEL OF PLANT COMMUNITY THAT IS WELL SUPPORTED
We Usually Tend to Dive Into Details First
NVC Partners
FGDC Vegetation Subcommittee
Overview

- Like all biological systems, plant communities are temporally and spatially dynamic; they change at all possible scales.

- Dynamism in vegetation is defined primarily as changes in species composition and/or vegetation structure, as seen in this second year post-fire plant community.
Goals of National Vegetation Classification (NVC) Standard

- Define and adopt standards for vegetation data collection and analysis
- Facilitate inter-agency collaboration and inter-agency product consistency
- Foster accuracy, consistency, and clarity in the structure, labeling, definition and application of a systematic vegetation classification for the U.S.
- Establish a national set of standards for classifying existing vegetation
- Develop minimum metadata requirements
- Collaborate between state, federal and international efforts
How does the NVC Classify Vegetation

- The NVC vegetation classification is based on a combination of:
  - growth forms, as these respond to climate, elevation, substrates, etc, and
  - species, both dominant and diagnostic, as these reflect biogeographic and ecologic relations.

- The classification is hierarchical and incorporates the physiognomic (top 3 levels), general floristic-biogeographic (mid 3 levels), and detailed floristic (lowest 2 levels) criteria, guiding all criteria by ecological considerations.
Classifying vegetation at continental to subregional scales

- Developing a consistent national vegetation classification system is crucial in modeling vegetation-environment interactions.

- Currently, there is a strong drive to model local, regional and global vegetation changes in response to global climate change, particularly changes in temperature, precipitation and disturbance regimes.
## NVC Hierarchy

<table>
<thead>
<tr>
<th>Vegetated</th>
<th>Natural Vegetation</th>
<th>Cultural Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level 1 Formation Class</td>
<td>Level 1 Cultural Class</td>
</tr>
<tr>
<td></td>
<td>Level 2 Formation Subclass</td>
<td>Level 2 Cultural Subclass</td>
</tr>
<tr>
<td></td>
<td>Level 3 Formation</td>
<td>Level 3 Cultural Formation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level 4 Cultural Subformation</td>
</tr>
<tr>
<td>Middle</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level 4 Division</td>
<td>Level 5 Cultural Group</td>
</tr>
<tr>
<td></td>
<td>Level 5 Macrogroup</td>
<td>Level 6 Cultural Subgroup</td>
</tr>
<tr>
<td></td>
<td>Level 6 Group</td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level 7 Alliance</td>
<td>Level 7 Cultural Type</td>
</tr>
<tr>
<td></td>
<td>Level 8 Association</td>
<td>Level 8 Cultural Subtype</td>
</tr>
<tr>
<td>Non-vegetated</td>
<td>Not included in the USNVC</td>
<td></td>
</tr>
</tbody>
</table>
**Example for Natural Vegetation**

<table>
<thead>
<tr>
<th>Hierarchy – Natural Vegetation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Upper</strong></td>
<td></td>
</tr>
<tr>
<td>Level 1 – Formation Class</td>
<td>Shrubland &amp; Grassland [<em>mesomorphic</em>]</td>
</tr>
<tr>
<td>Level 2 – Formation Subclass</td>
<td>Temperate &amp; Boreal Shrubland &amp; Grassland</td>
</tr>
<tr>
<td>Level 3 – Formation</td>
<td>Temperate Grassland &amp; Shrubland</td>
</tr>
<tr>
<td><strong>Middle</strong></td>
<td></td>
</tr>
<tr>
<td>Level 4 – Division</td>
<td>Great Plains Grassland &amp; Shrubland</td>
</tr>
<tr>
<td>Level 5 – Macrogroup</td>
<td>Tallgrass Prairie Grassland &amp; Shrubland</td>
</tr>
<tr>
<td>Level 6 – Group</td>
<td>Tallgrass Mesic Prairie Grassland</td>
</tr>
<tr>
<td><strong>Lower</strong></td>
<td></td>
</tr>
<tr>
<td>Level 7 – Alliance</td>
<td>Big Bluestem – Indian grass Grassland</td>
</tr>
<tr>
<td>Level 8 – Association</td>
<td>Big Bluestem – Indian grass / Gayfeather Grassland</td>
</tr>
</tbody>
</table>
Section of NVC Explorer for Pennsylvania

Search Results
487 records matching the following criteria:
States Selected: PA
Database Fields Searched: Scientific Name, Colloquial Name, Translated Name, Synonymy, Floristics, Concept Type
USNVC Utility for EcoSites

The Alliance/Association levels of classification reference plots and locations will be particularly helpful for identifying plant communities which can be identified with different 'states' in the State and Transition Model of the ESD.
TIMELY PROJECT & PAPER

- IRELAND & DROHAN 2015

- “Rapid Delineation of Preliminary Ecological Sites Applied to Forested Northern Appalachian Landscapes”

- TERRESTRIAL FOREST STAND TYPES based on Pennsylvania Natural Heritage Program

- 19 Common Terrestrial Forest Communities Cover ~ 88% Land Area
FOREST TYPES
Pennsylvania Natural Heritage Program

TOP 4 IN STUDY AREA

• Dry Oak- Heath Forest
• Northern Hardwood Forest
• Red Oak-Mixed Hardwood Forest
• Dry Oak- Mixed Hardwood Forest
Land of Map Units of Complexes
And Mixed Grass, Shrub and Forest Sites
<table>
<thead>
<tr>
<th>Hierarchical Planning and Analysis Levels</th>
<th>National Hierarchical Framework of Ecological Units¹</th>
<th>NRCS Soil Geography Hierarchy³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continental and Region (Ecoregion)</td>
<td>Domain, Division, and Province (1:5,000,000-1:30,000,000)</td>
<td>Land Resource Region (LRR) (1:7,500,000), Climate zones</td>
</tr>
<tr>
<td>Subregion</td>
<td>Section (1:3,500,000) and Subsection (1:250,000)</td>
<td>Major Land Resource Area (MLRA) (1:3,500,000), Land Resource Unit (LRU)/Common Resource Area (CRA) (1:1,000,000), General Soil Map (1:250,000)</td>
</tr>
<tr>
<td>Landscape (watershed—5th unit of Hydrologic Unit Code)</td>
<td>Landtype Association (1:60,000)</td>
<td>Soil-geomorphic systems</td>
</tr>
<tr>
<td>Land Unit (subwatershed—6th unit of Hydrologic Unit Code, grazing allotment, farm/ranch)</td>
<td>Landtype (1:24,000)</td>
<td>Detailed Soil Map (1:24,000)</td>
</tr>
<tr>
<td>Individual Sites</td>
<td>Sampling plot</td>
<td>Soil Pedon</td>
</tr>
</tbody>
</table>

From: Draft Interagency Ecological Site Handbook
USE AND VEGETATION: These soils are used for watershed, wildlife habitat, timber production, livestock grazing and recreation. The native vegetation is grand fir, Engleman spruce, Douglas fir, western larch, ponderosa pine, lodgepole pine, twinflower, big huckleberry, baldhip rose, prince's pine, queen's cup beadelily, roundleaf violet, rattlesnake plantain, western meadowrue, white-vein pyrola, sidebells pyrola, pathfinder, western hawkweed, pinegrass and northwestern sedge.
CLASSIFICATION OF THE NATURAL COMMUNITIES OF NORTH CAROLINA  
Third Approximation

Introduction ........................................................................................................................................... 1

TERRESTRIAL SYSTEM

high mountain communities

Fraser Fir Forest .................................................................................................................................. 9
Red Spruce--Fraser Fir Forest .................................................................................................................. 12
Grassy Bald .......................................................................................................................................... 16
Heath Bald ........................................................................................................................................... 19
High Elevation Red Oak Forest ............................................................................................................. 21
Montane White Oak Forest .................................................................................................................... 24
Northern Hardwood Forest
   Typic Subtype ................................................................................................................................... 26
   Beech Gap Subtype .............................................................................................................................. 29
Boulderfield Forest ................................................................................................................................ 31

The survey sponsors annual "pulse" events where the core scientists and volunteers botanists from across the region study a portion of North Carolina intensively for a 10-day period. Data collection methods are standardized and are now widely employed across the Southeast. Data collected by the survey are archived in standard format and are available to government agencies and conservation organizations upon request.

**Organizers and contact information**

Robert K. Peet (UNC Chapel Hill) -- Chair  
Thomas Wentworth (NC State Univ.) -- Secretary  
Mike Schafale (NC Natural Heritage Program) -- Site selection and community classification  
Alan Wealsley (NC Botanical Garden) -- Floristics, plant identification, and taxonomic standards  
Michael Lee (UNC Chapel Hill) -- Database administrator, programmer
NRCS Forest Ecological Sites and those DESCRIPTIONS

Goals in the Development of ESD’s:
(As stated by Frank (Gariglio), agreed and tweaked by Craig (Busskohl) and shared by many)

- ESD’s will be useful for our internal NRCS customers

- ESD’s will be useful for our external customers
  - Forest industry
  - County appraisers
  - Partner groups
  - Forest consultants
  - University and research foresters
  - LANDOWNERS

¹ Ecological Site Description
ECOLOGICAL DYNAMICS:

State and Transition Diagram: (example)

Clay Loam 081CY357
Provisional

1. Grassland Savannah State
   Tall Grasses, <15% Tree Canopy
   \[\text{R2A} \rightarrow \text{T1A}\]

2. Shortgrass/Tree State
   Short/mid grasses, 15-30% Tree canopy.
   \[\text{R2B} \rightarrow \text{N1C}\]

3. Shrubland / Tree State
   >25% tree/shrub canopy
   \[\text{T2A} \rightarrow \text{T4B} \rightarrow \text{T3A}\]

4. Converted Land State
   Mid grasses
BURNING ACROSS THE VEG COMMUNITY SPECTRUM
What changes here? Effect of climate change?
#1 Take Home (at least for Provisionals)

Identify the highest level of vegetative community for which you have documentation/support. Work down if possible.
#2 Take Home

Don’t Worry (you may be Happy, but Keep on Keeping On*)
?QUESTIONS? DISCUSSION