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# Ecological Sites: Introduction, Overview, and History

August 30, 2018 | Jamin Johanson, NRCS Ecological Site Specialist | Dover-Foxcroft, Maine

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## 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.

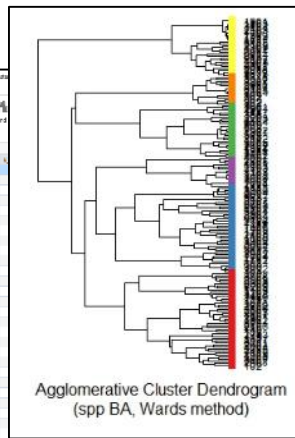
Field data collection sheet with columns for various parameters and handwritten entries.

gathering...



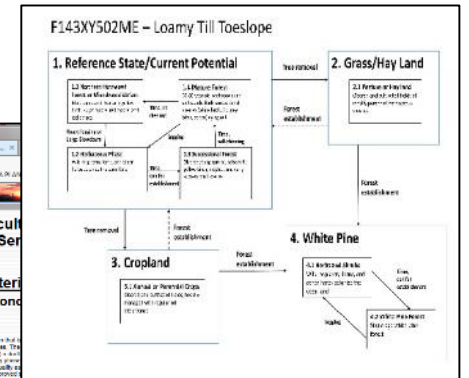
organizing...

Screenshot of a data management software interface showing a list of ecological sites with columns for ID, Name, and other attributes.



delivering...

Ecological Site Description document header and content, including site name, location, and description.

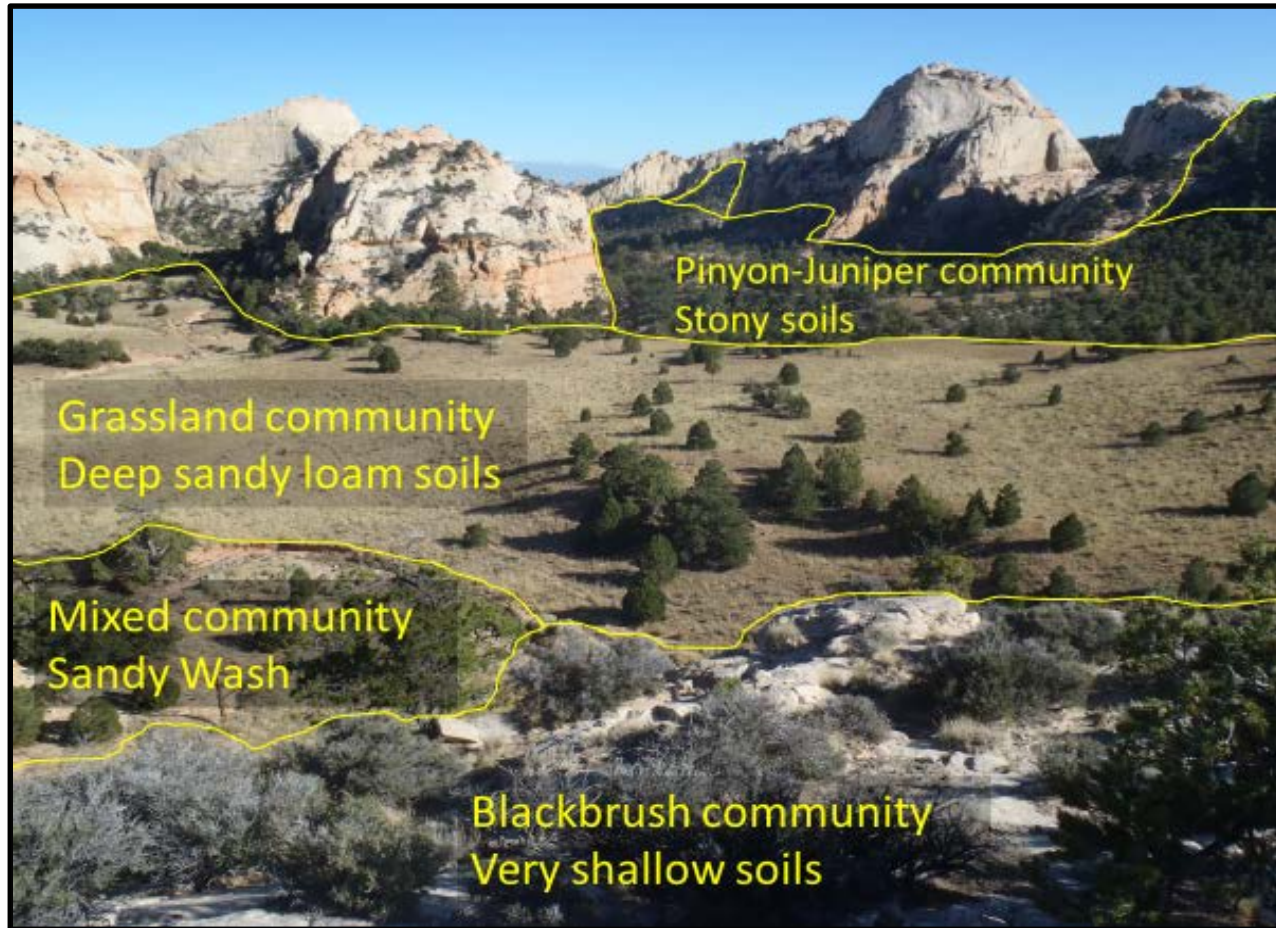


Natural Resources Conservation Service





# Historical Context & Current Efforts



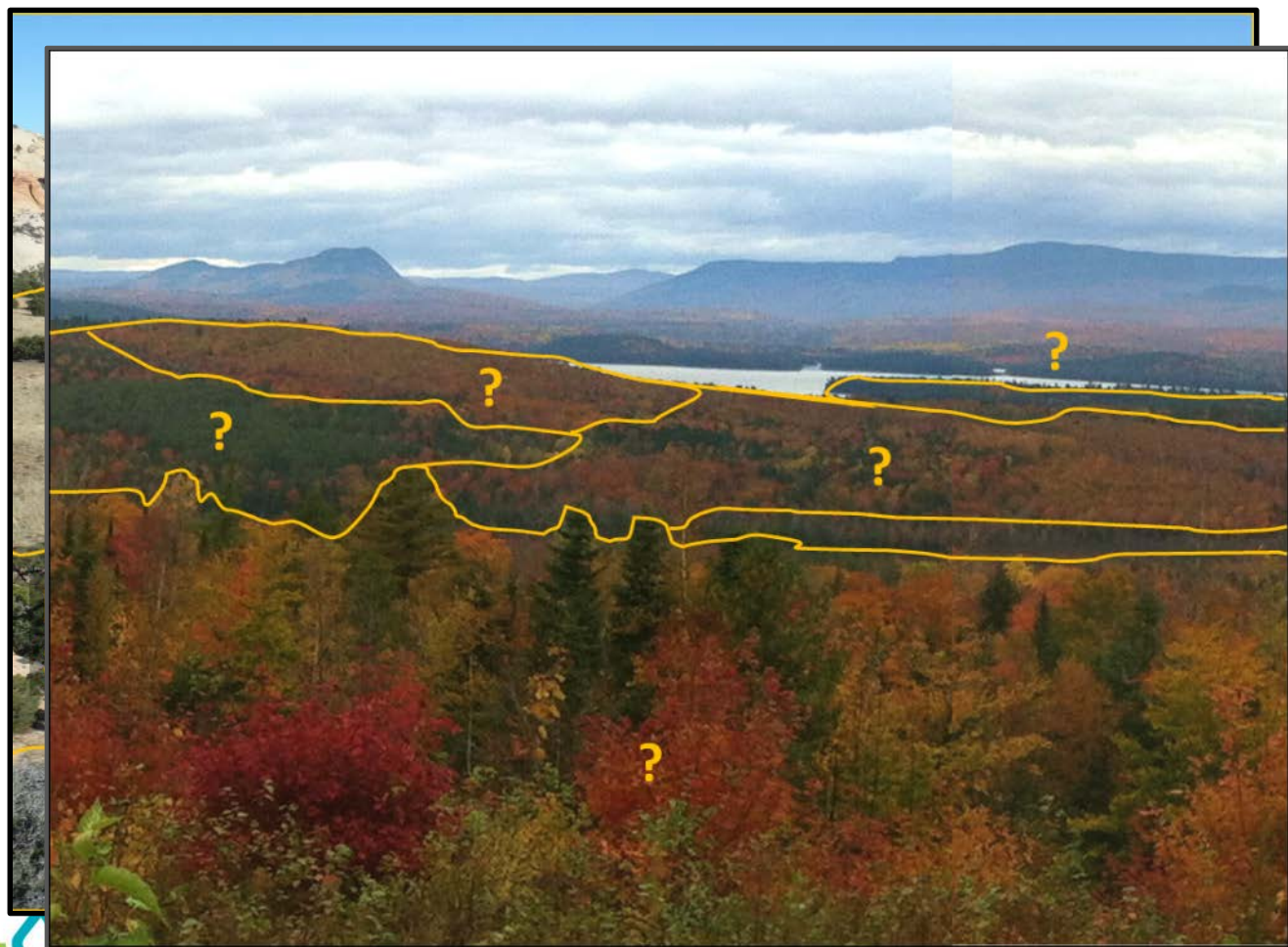
## Originated in semi-arid rangelands

- 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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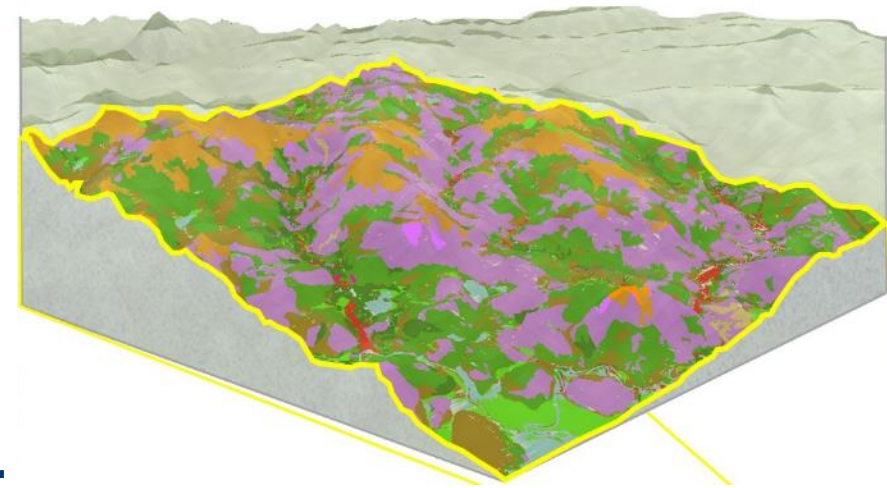


# Ecological Sites – Definition

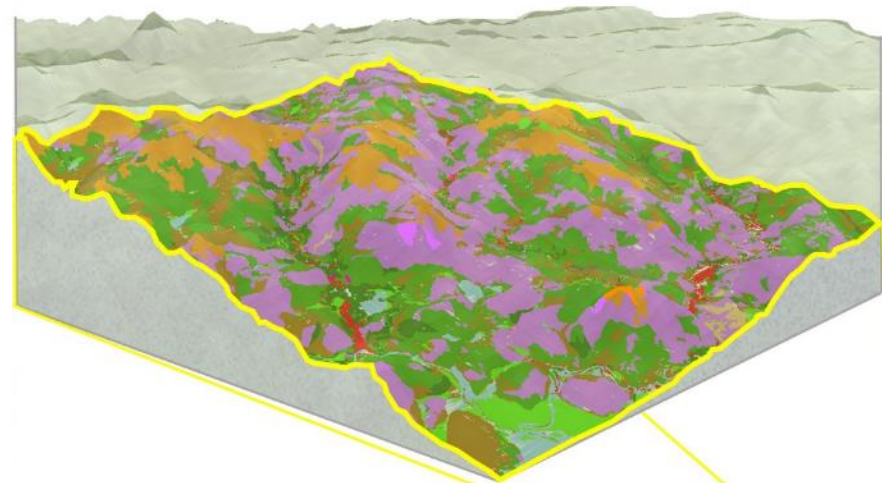


**An ecological site is:**

1. A conceptual division of the landscape...



# Ecological Sites – Definition

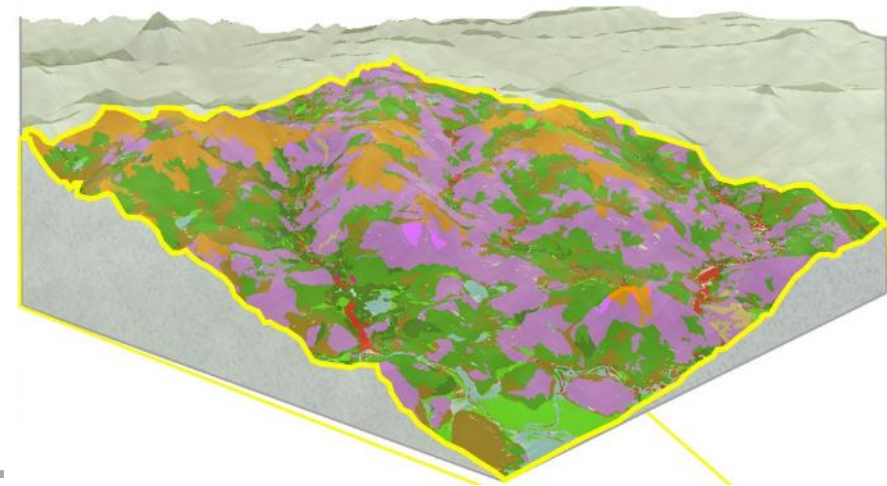


## An ecological site is:

1. A conceptual division of the landscape...
2. Based on recurring patterns in soils, geology, climate, topography, hydrology, etc...



# Ecological Sites – Definition



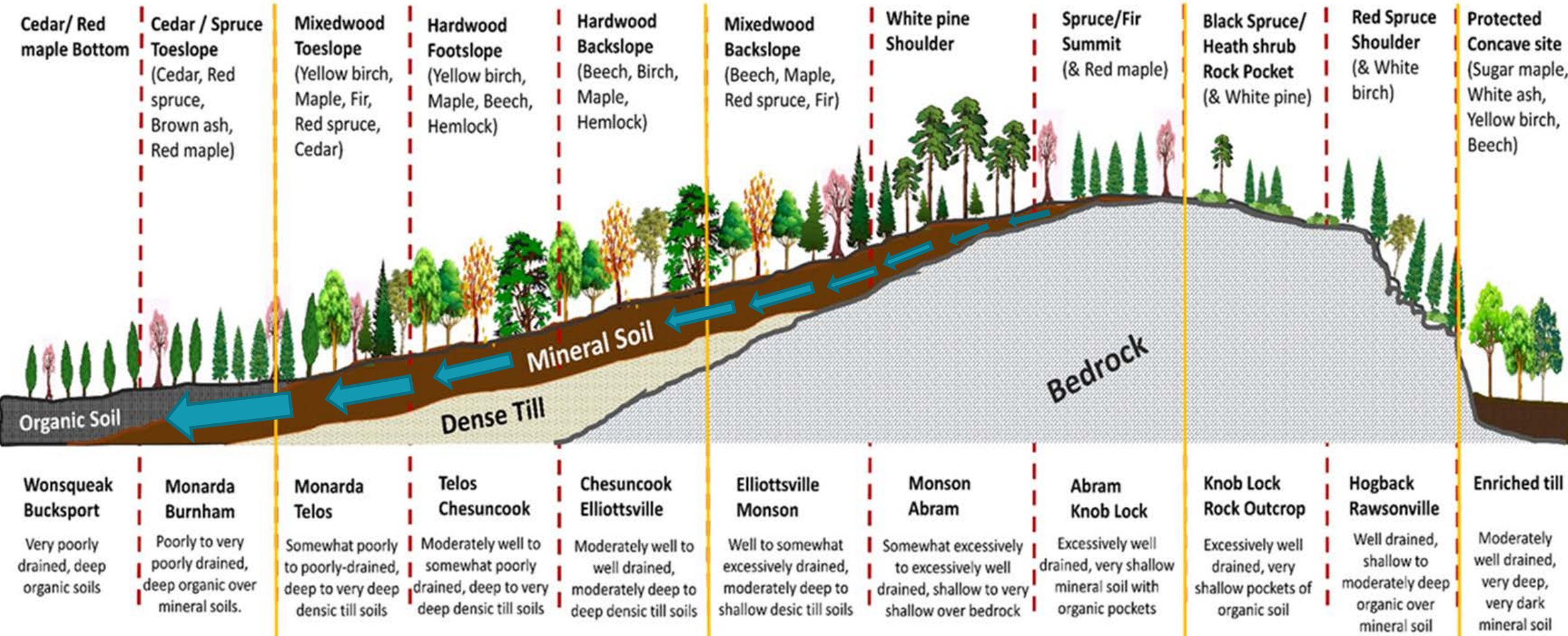
## An ecological site is:

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.



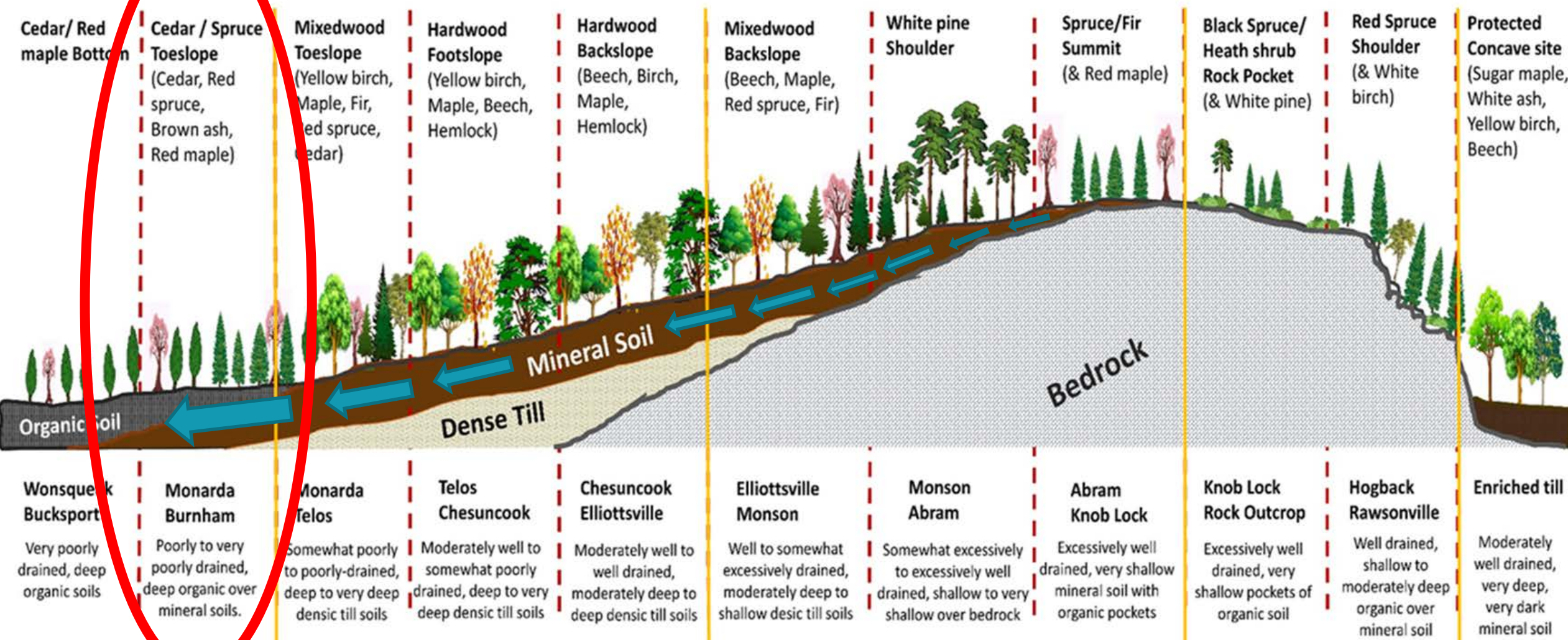


# Example ES concepts





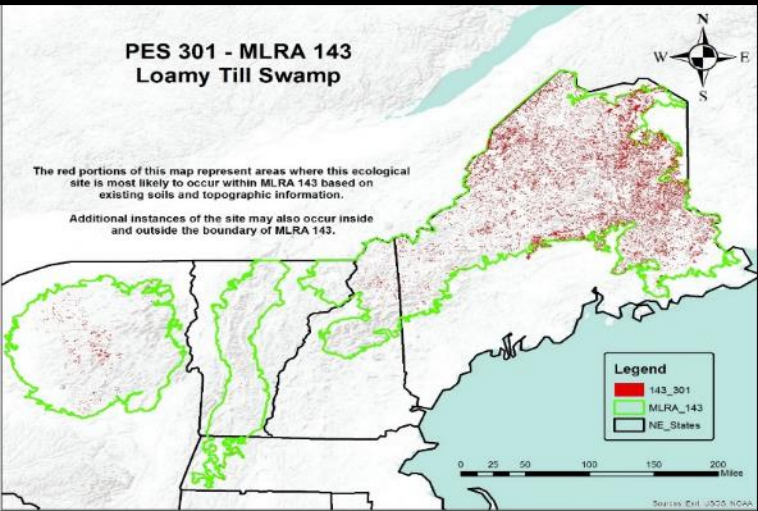
# Example ES concept: Loamy Till Swamp (Cedar)



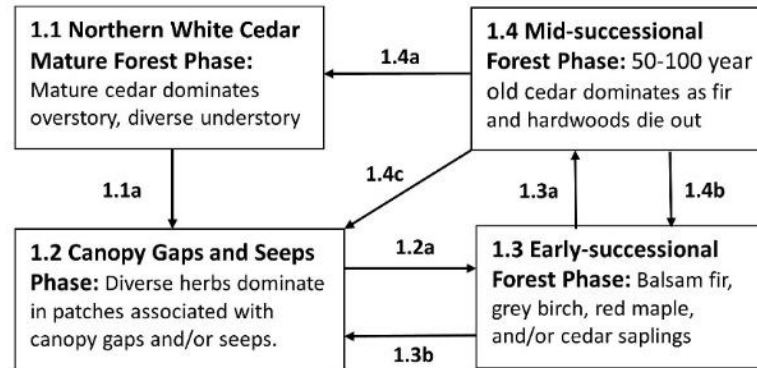


# Example ES concept: Loamy Till Swamp (Cedar)

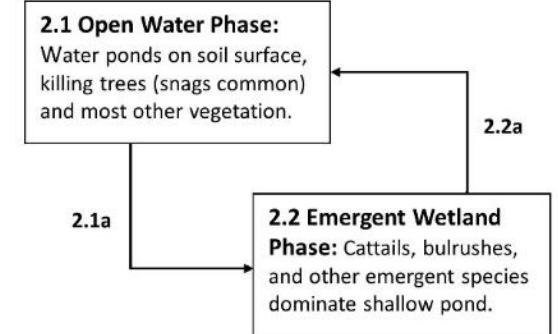
Site Concept: loamy dense till soils on toeslopes, poorly and very poorly drained. Compacted soil layer < 35 inches below the soil surface perches water year-round. Pit and mound topography, often ponded. Northern white cedar dominates.



## State 1. Reference / Current Potential



## State 2. Ponded



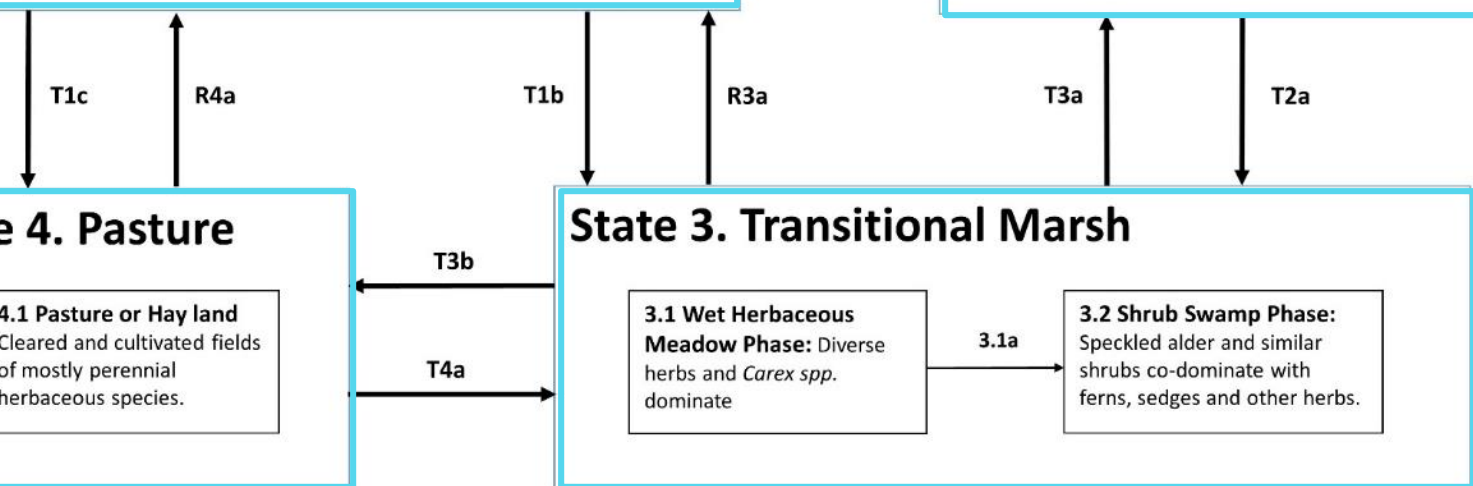
## State 4. Pasture

**4.1 Pasture or Hay land**  
Cleared and cultivated fields of mostly perennial herbaceous species.

## 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-dominate with ferns, sedges and other herbs.



# Four Parts of an ESD: 1) Site Concept

## United States Department of Agriculture Natural Resources Conservation Service Ecological Site Description

### SECTION 1. GENERAL SITE INFORMATION

#### Ecological Site Identification and Concept

**Site Stage:** Provisional

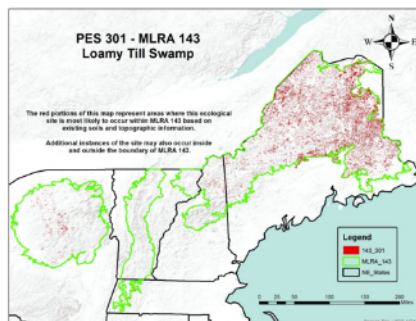
**Site Name:** Loamy Till Swamp

***Thuja occidentalis***  
(Northern white cedar)

**Site ID:** F143XY30IME

**Site Type:** Forestland

**Major Land Resource Area:** 143 –  
(Northeastern Mountains)



#### Ecological Site Concept

This site occurs on relatively flat to gentle slopes (0-8%) or on toeslopes, 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 ~35 inches of the soil surface. The water table is usually within 12 inches of the soil surface in spring, and lowers 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.

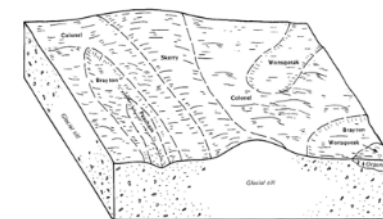
**MLRA Notes:** MLRA 143, known as the Northeastern Mountains, covers approximately 23 million acres of mountains, hills, and valleys in northern Maine, New Hampshire, Vermont, New York, and Massachusetts. The area is sparsely populated, with less than five percent of the land area developed for agriculture, 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 to 4,000 feet, with a few isolated peaks more than 5,000 feet above sea level. The present day mountains are but 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

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



#### Soil Features

The soils of this site are poorly- and very poorly-drained with a high water table in the spring. They formed in lodgment till derived from granite, mica schist, phyllite and similar parent materials. They have a characteristic mucky-peat surface horizon, underlain by loamy till and a densely-compacted till layer 5-35 inches below the loamy till material. Soil textures are usually silt loam, fine sandy loam, or loam, with few rock fragments. The dense horizon is typically loamy in texture and may have up to 30% rock fragments by volume. This site occurs on soils with wide-ranging soil pH, but is most likely to occur where soil pH is between 5.0 and 6.5.



#### Parent materials

**Kind:** Lodgment till, Organic material

**Origin:** Mica schist, Granite, Phyllite

**Surface texture:** (1) Silt loam

(2) Fine sandy loam

(3) Loam

**Subsurface texture group:** Loamy

	Minimum	Maximum
<b>Surface fragments &lt;=3" (% cover):</b>	0	0
<b>Surface fragments &gt;3" (% cover):</b>	0	3
<b>Subsurface fragments &lt;=3" (% volume):</b>	0	20
<b>Subsurface fragments &gt;3" (% volume):</b>	0	10
<b>Drainage class:</b> Poorly drained to very poorly drained		

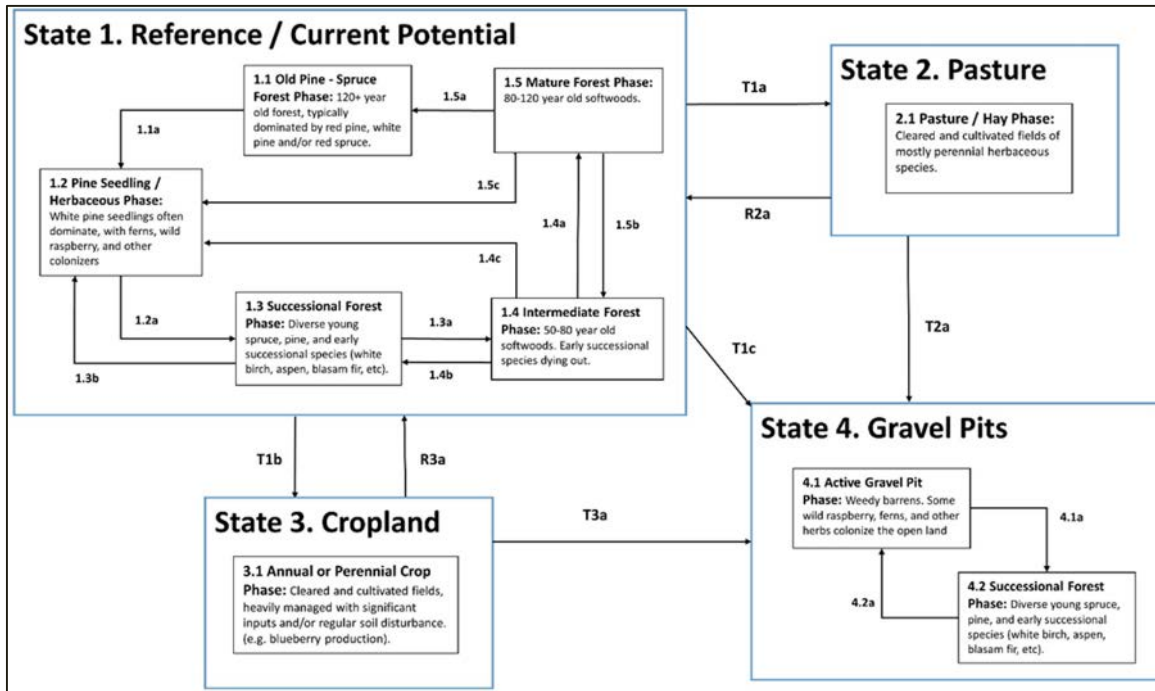
	Minimum	Maximum
<b>Depth (inches):</b>	5	35
<b>Available water capacity (inches):</b>	4.00	13.00
<b>Electrical conductivity (mmhos/cm):</b>	0	0
<b>Sodium adsorption ratio:</b>	0	0
<b>Calcium carbonate equivalent (percent):</b>	0	0
<b>Soil reaction (1:1 water):</b>	3.2	7.8





# 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



**Forest Overstory Species**

Plants Code	Common Name	Scientific Name	Plant Type	Nativity	Live Canopy Height (top)	Cover Range	DBH Range (cm) -
ABBA	balsam fir	<i>Abies balsamea</i>	T	N	>10m	0.5-10%	14.3
ABBA	balsam fir	<i>Abies balsamea</i>	T	N	5-10m	1-50%	
ACRU	red maple	<i>Acer rubrum</i>	T	N	>10m	2-5%	
ACRU	red maple	<i>Acer rubrum</i>	T	N	5-10m	2-50%	
BEAL2	yellow birch	<i>Betula alleghaniensis</i>	T	N	<5m	1-2%	
FRNI	black ash	<i>Fraxinus nigra</i>	T	N	>10m	1-2%	
FRNI	black ash	<i>Fraxinus nigra</i>	T	N	>15m		
THOC2	northern white cedar	<i>Thuja occidentalis</i>	T	N	>15m	~85%	
FRNI	black ash	<i>Fraxinus nigra</i>	T	N	5-10m	<1%	
PIMA	black spruce	<i>Picea mariana</i>	T	N	>10m	2-5%	
PIST	white pine	<i>Pinus strobus</i>	T	N	>10m	0-5%	
POGR4	bigtooth aspen	<i>Populus grandidentata</i>	T	N	>10m	2-5%	
THOC2	northern white cedar	<i>Thuja occidentalis</i>	T	N	>10m	25-75%	10.2-16.5
THOC2	northern white cedar	<i>Thuja occidentalis</i>	T	N	<5m	1-10%	5.7-9.6

**Forest Understory Species**

Plants Code	Common Name	Scientific Name	Plant Type	Nativity	Live Canopy Height (top)	Cover Range
ABBA	balsam fir	<i>Abies balsamea</i>	T	N	2-5m	2-25%
ACPE	striped maple	<i>Acer pensylvanicum</i>	T	N	<1m	trace
ACPE	striped maple	<i>Acer pensylvanicum</i>	T	N	1-2m	1-2%
ACRU	red maple	<i>Acer rubrum</i>	T	N	<1m	<1%
ACRU	red maple	<i>Acer rubrum</i>	T	N	2-5m	0.5-5%
ACSP2	mountain maple	<i>Acer spicatum</i>	T	N	1-2m	2-5%
ALIN2	gray alder	<i>Alnus incana</i>	S	N		
ABBA	balsam fir	<i>Abies balsamea</i>	T	N	~5m	0-10%
FRNI	black ash	<i>Fraxinus nigra</i>	T	N		
AMSA	roundleaf serviceberry	<i>Amelanchier sanguinea</i>	S	N	1-2m	0.5-1%
ARNU2	wild sarsaparilla	<i>Aralia nudicaulis</i>	H	N	<1m	trace-2%
ATFI	common ladyfern	<i>Athyrium filix-femina</i>	F	N	<1m	2-5%
DRCA1	spinulose woodfern	<i>Dryopteris carthusiana</i>	F	N	<1m	
GLME2	melic mannagrass	<i>Glyceria melicaria</i>	G	N		



# Four Parts of an ESD: 3) Interpretations

## Inventory Data References by Plot

Data Source	ID	Year	State	County Code	County
B. Engstrom	POI #5, <a href="#">Nulhegan Mainstream Flats</a>	2015	VT	50009	Essex
A. Cutko	Cedar <a href="#">Seep</a> , Rocky Variant #4	2015	NH	33007	Coos
J. Johanson	Transect 030, Plot 09	2015	ME		
J. Johanson	Transect 014, Plot 03	2015	ME		
J. Johanson	<a href="#">Transect 014</a> , Plot 01	2014	ME		

## Other Inventory Data Sources:

Data Source	Number of Records	State / Phase	Sample Period	State	County
J. Johanson	1	1.4	2015	ME	

## Relationship to Other Classification Systems

National Vegetation Classification associations aligned with this ecological site include:

- CEGLO06175: [Thuja occidentalis](#) - ([Picea rubens](#)) / [Tiarella cordifolia](#) Swamp Forest (reference state)
- CEGLO06193: [Chrysosplenium americanum](#) Seepage Meadow (Phase 1.3)
- CEGLO06158 [Alnus incana](#) ssp. [rugosa](#) - [Ilex mucronata](#) / [Sphagnum](#) spp. Acidic Peatland (in part) (Phase 2.1)
- CEGLO06571 [Spiraea tomentosa](#) - [Rubus](#) spp. / [Phalaris arundinacea](#) Wet Shrubland (Phase 2.2)
- CEGLO06107 [Dactylis glomerata](#) - [Phleum pratense](#) - [Festuca](#) spp. - [Solidago](#) spp. Ruderal Meadow (Phase 4.1)

This site includes the following state natural heritage program types:

- Northern White Cedar Seepage Forest ([Sperduto](#) and Nichols 2004)
- Evergreen Seepage Forest ([Gawler](#) and [Cutko](#) 2010)
- Northern White Cedar Sloping Seepage Variant of Northern White Cedar Swamp (Thompson and Sorenson 2000)
- Seep (Thompson and Sorenson 2000)

This Ecological Site is roughly coincident with the US Forest Service 2005 Subsections M211Af (Connecticut Lakes), M211Ae ([Mahoosic Rangely Lakes](#)), M211Ad (White Mountains), and the western portions of M211Ag (Western Maine Foothills). It is fully contained within Northern Appalachian / Boreal Forest Ecoregion of The Nature Conservancy.

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

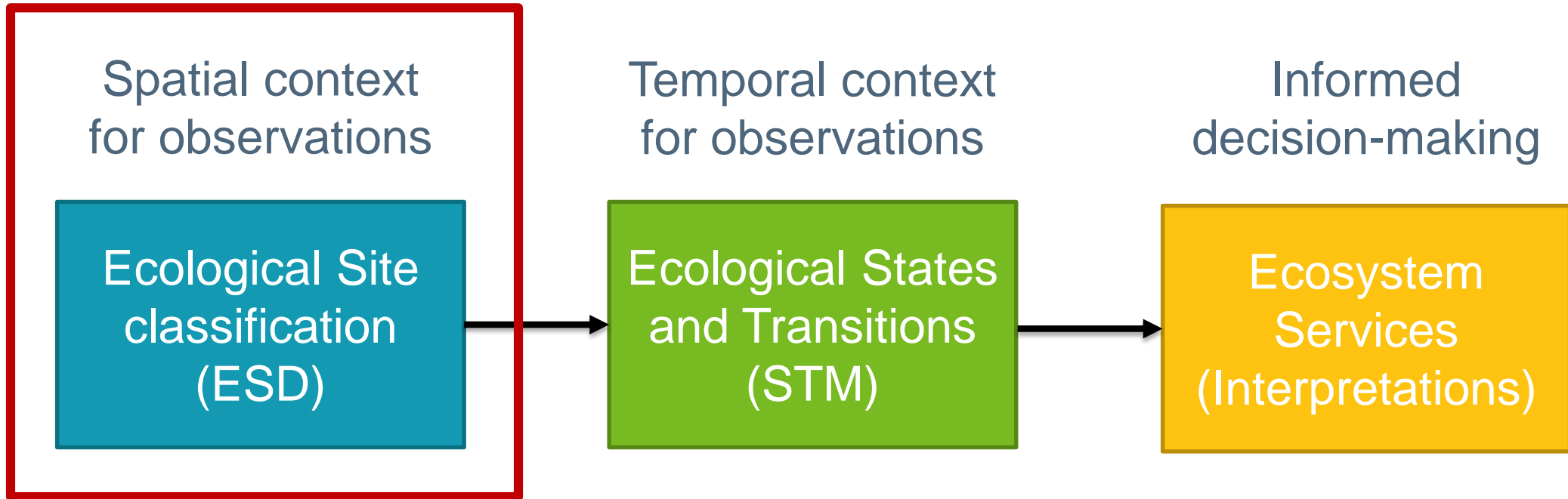
## 4) Supporting Information

- Crosswalk to Other Classifications
- Associated & Similar Sites
- Inventory Data Plots
- Citations & Contributors

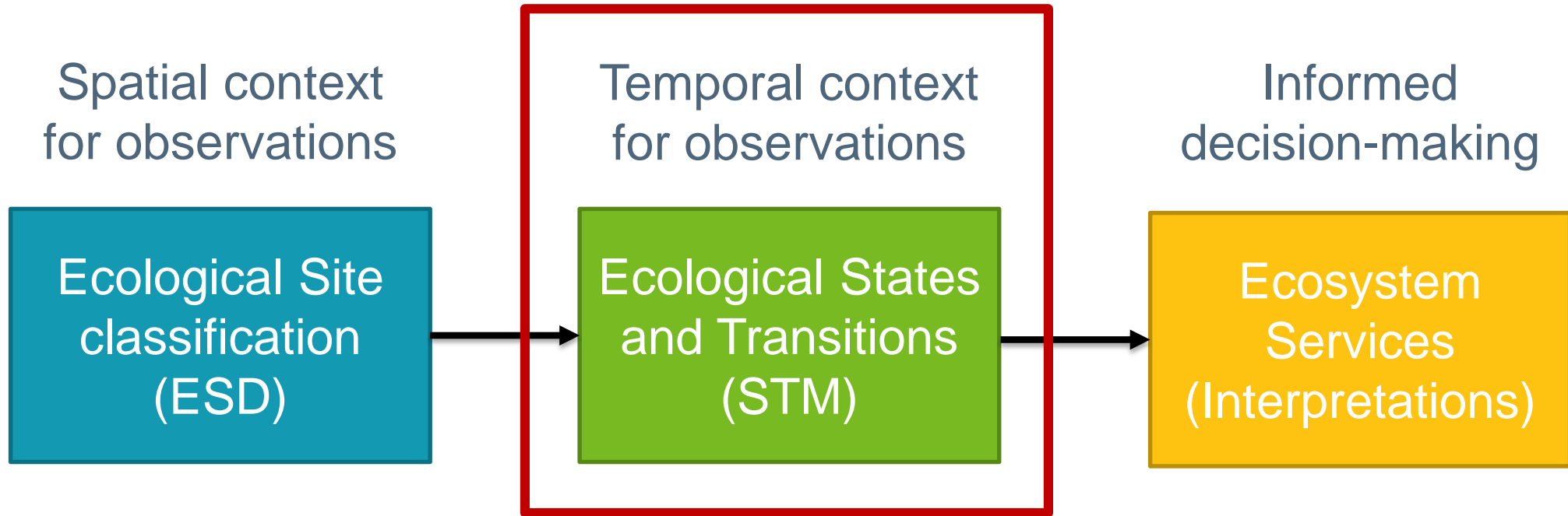




# An Organizational Framework for Ecological Information

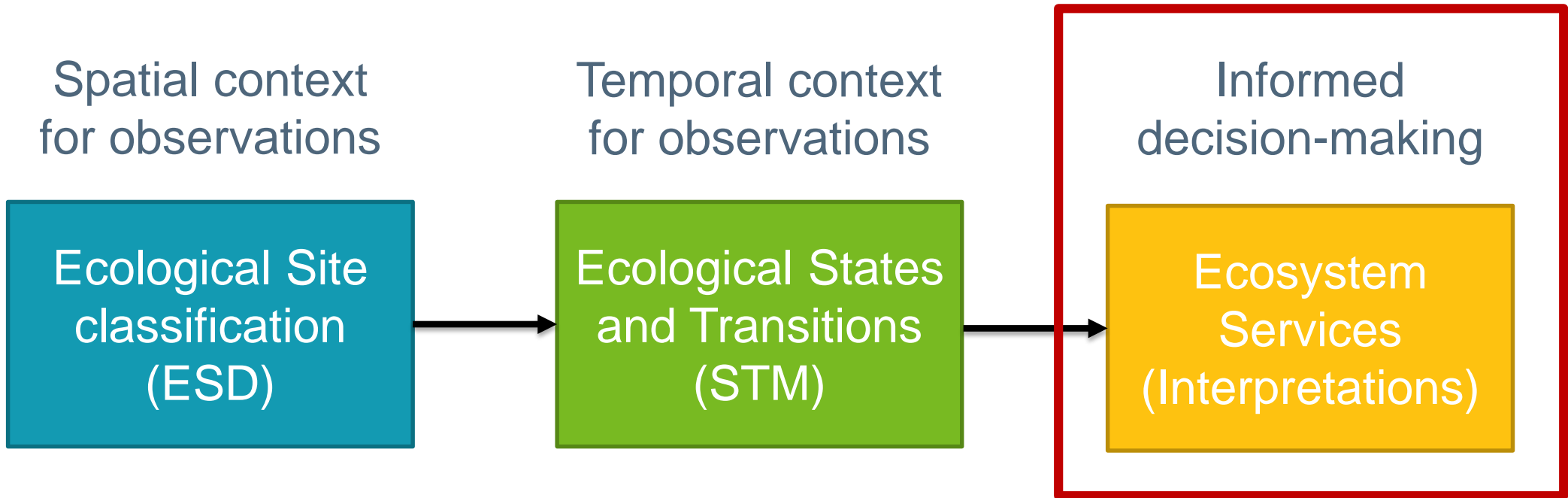


# An Organizational Framework for Ecological Information





# An Organizational Framework for Ecological Information



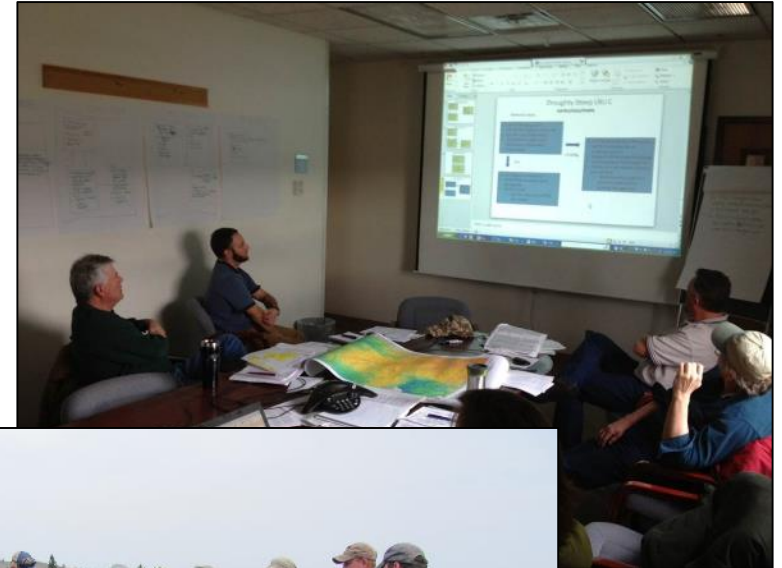
\*\*Based on the assumption that ecosystems with similar soils, climate, hydrology, etc. usually produce similar ecological communities and dynamics over time.







# 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

The screenshot displays the USDA Web Soil Survey application. A yellow arrow points to the 'Soil Data Explorer' tab in the top navigation bar. The interface includes a search bar, a list of ecological sites, and a map of a forestland area. The map shows various soil types and ecological sites, with a legend on the left side. The 'Soil Data Explorer' tab is highlighted, and the map shows a detailed view of a forestland area with various soil types and ecological sites. The map is titled 'Map - Dominant Ecological Site - Forestland'. The left sidebar contains a search bar, a list of ecological sites, and a legend. The 'Soil Data Explorer' tab is highlighted in the top navigation bar. The map shows a detailed view of a forestland area with various soil types and ecological sites. The legend on the left side includes options for 'Plant Community Photos', 'Plant Community Description', 'Vegetation Tables', and 'Cover Tables'. The 'Cover Tables' section is checked, and the 'Soil Surface Cover' option is also checked. The map shows a detailed view of a forestland area with various soil types and ecological sites. The legend on the left side includes options for 'Plant Community Photos', 'Plant Community Description', 'Vegetation Tables', and 'Cover Tables'. The 'Cover Tables' section is checked, and the 'Soil Surface Cover' option is also checked. The map shows a detailed view of a forestland area with various soil types and ecological sites. The legend on the left side includes options for 'Plant Community Photos', 'Plant Community Description', 'Vegetation Tables', and 'Cover Tables'. The 'Cover Tables' section is checked, and the 'Soil Surface Cover' option is also checked.

<https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>



# Accessing Soil & Ecological Information

Ecological Site Assessment Tab

2) Explore ecological site info

The screenshot shows the USDA Web Soil Survey interface. A yellow arrow points to the 'Ecological Site Assessment' tab. The interface displays search results for 'Eastern white pine-Green ash/Dwarf red blackberry/Jewelweed'. The results include three photos of the site, a detailed description of the plant community, and a table for 'Soil Surface Cover'.

**Soil Surface Cover Table:**

Cover Type	Minimum	Maximum
Basal cover - Grass/grasslike	-	1.000%