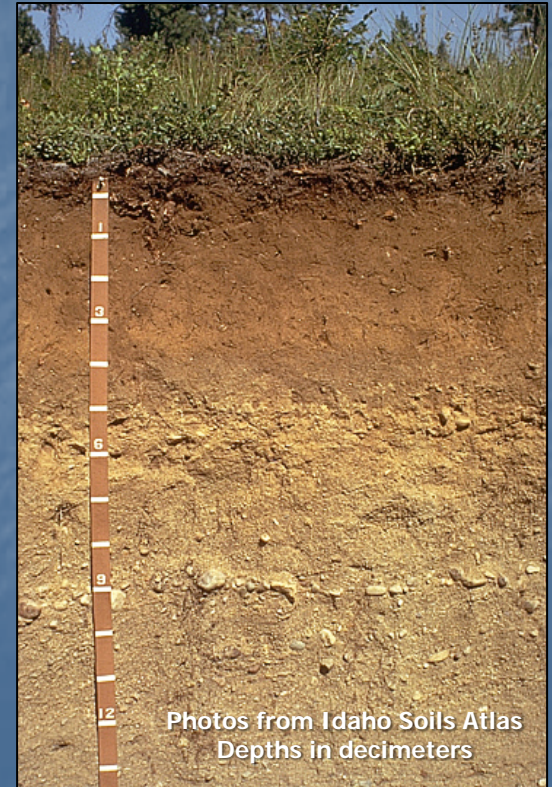


# Soil Survey in Forest Management

## Tools and Interpretation



# National Cooperative Soil Survey

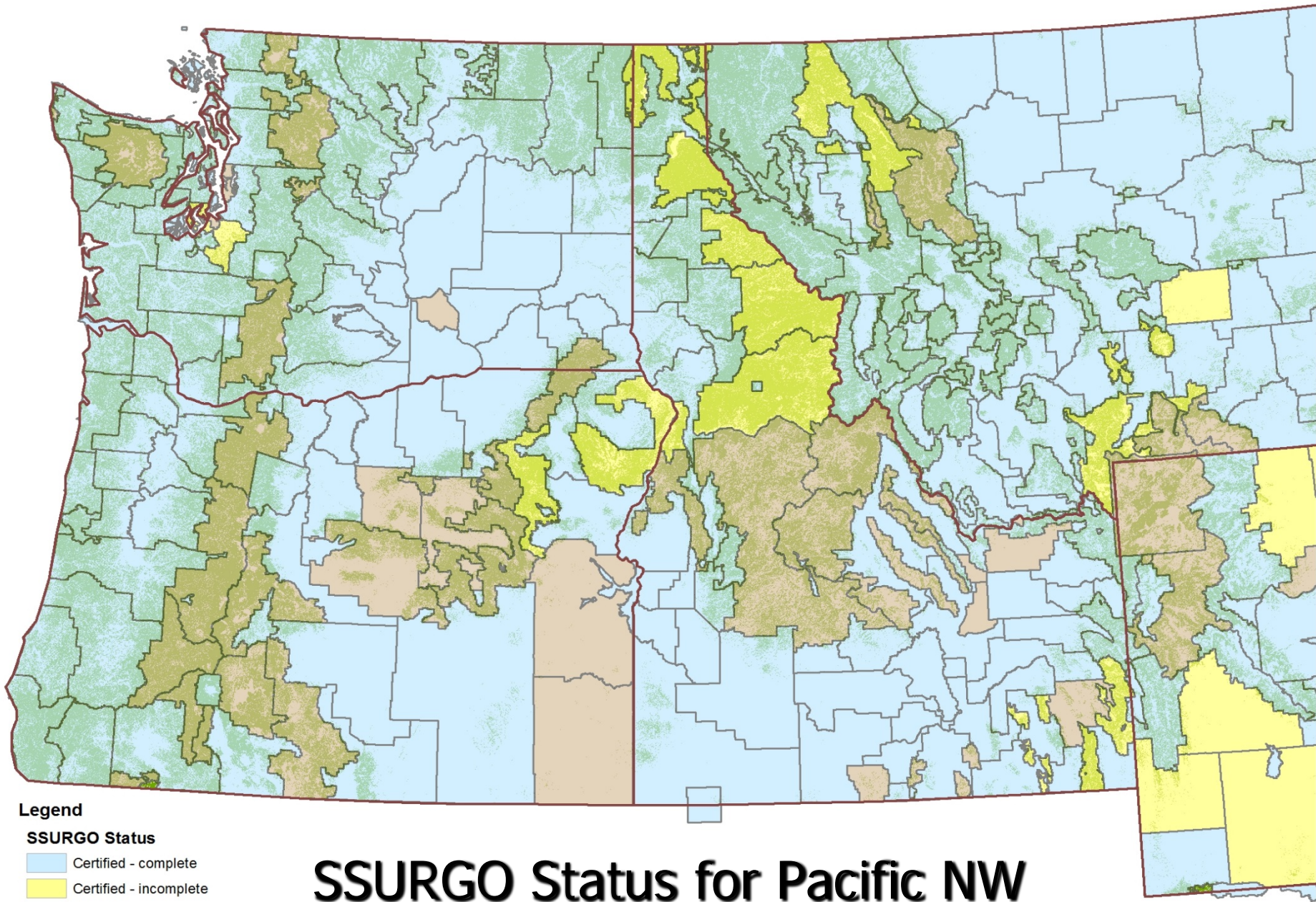
- A nationwide partnership of Federal, regional, State, and local agencies and private entities and institutions.
- This partnership works to cooperatively investigate, inventory, document, classify, interpret, disseminate, and publish information about soils.

# Soil Survey Datasets

- SSURGO – Soil Survey Geographic
  - Most detailed soil survey product
  - Information collected at scales ranging from 1:12,000 to 1:63,360.
  - Some areas, mainly remote areas in the Western US, do not have SSURGO data.

# Soil Survey Datasets

- STATSGO2 – Digital General Soil Map of the United States
  - Broad-based soil inventory at a scale of 1:250,000
  - Created by generalizing more detailed soil survey maps where available. Data from other sources such as geology, climate and vegetation were used in remote areas.
  - Complete coverage for entire U.S.



**Legend**

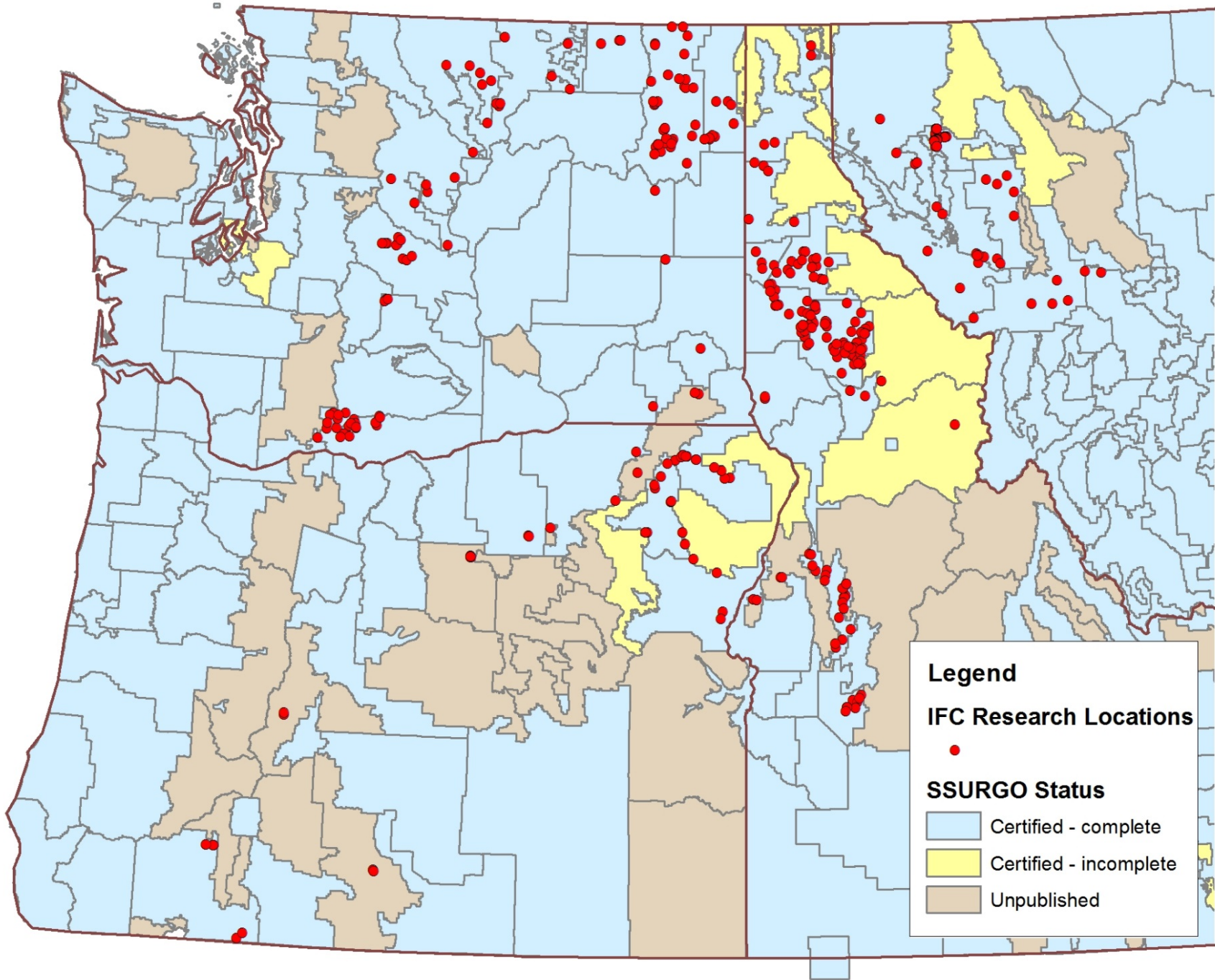
**SSURGO Status**

- Light Blue Certified - complete
- Yellow Certified - incomplete
- Brown Unpublished

**Land Use**

- Green Forestland

# SSURGO Status for Pacific NW



# Soil Survey Information for Forest Management

- Soil physical properties
- Soil chemical properties
- Forest productivity information
- Interpretations for management

# Soil Physical Properties

- Soil texture – percent sand, silt, and clay
- Depth to root-restriction layers such as bedrock or fragipans
- Available water capacity
- Volcanic ash content

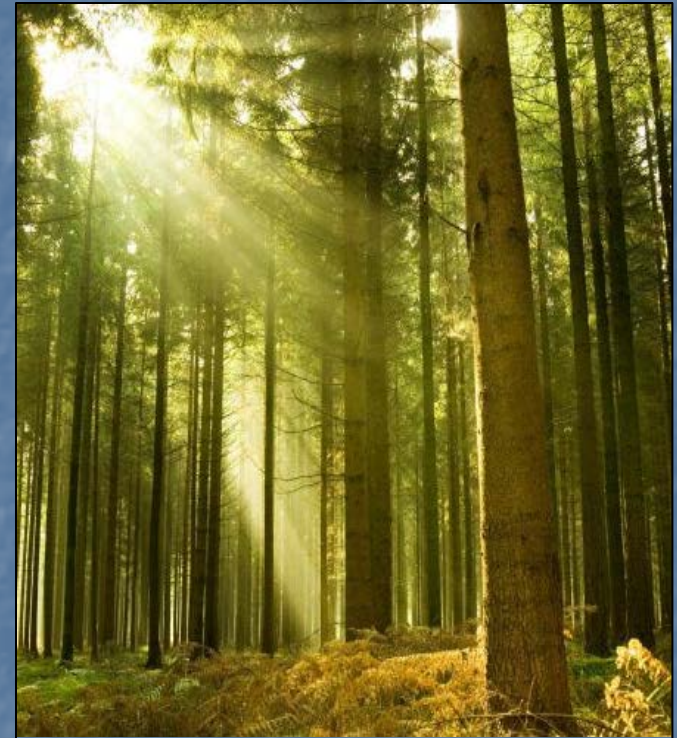


# Soil Chemical Properties

- Organic matter content
- Soil pH
- Cation exchange capacity
- Salinity

# Forest Productivity

- **Site Index** – average height of dominant and codominant trees at a specified base age
- **Wood volume growth rate** – culmination of mean annual increment (CMAI) in cubic feet / acre / year



# Forest Management Interpretation Examples

- Construction limitations for haul roads and log landings
- Harvest equipment operability
- Mechanical site preparation
- Hand and mechanical planting suitability



# Tools for Accessing Soil Survey Information

## ■ Web Soil Survey

- Area of interest (AOI) of up to 100,000 acres
- Quickly create maps and reports of soil properties and interpretations
- Download data for AOI to use in GIS software

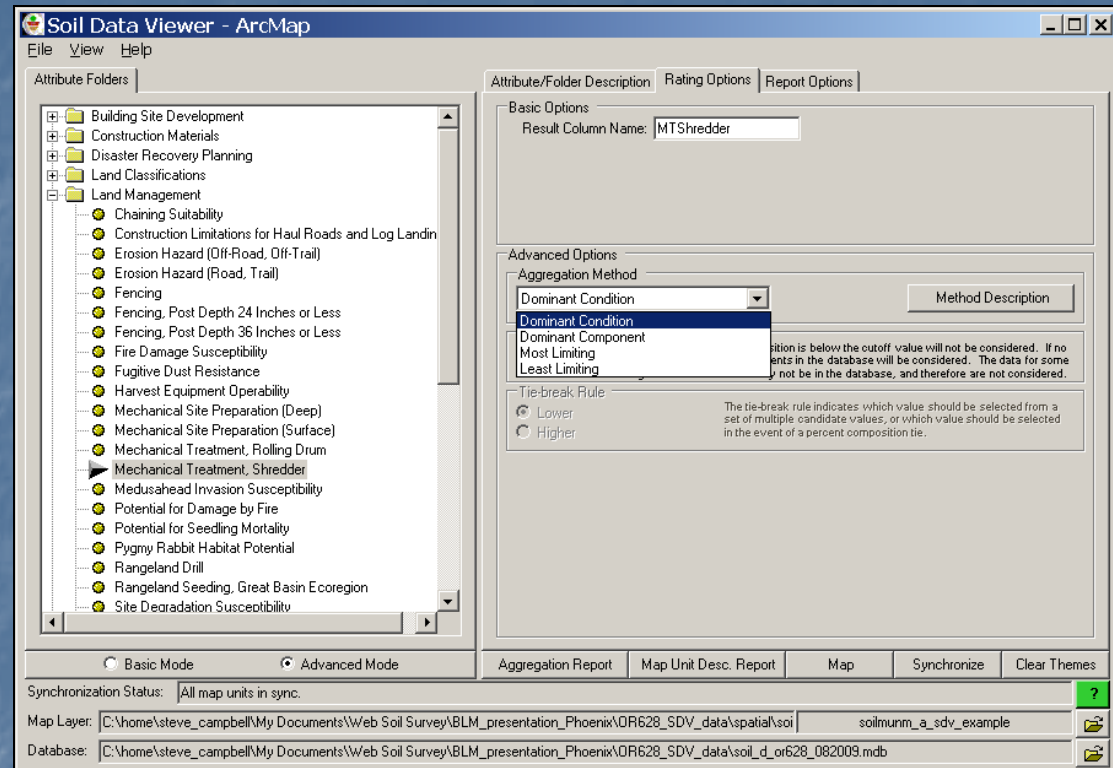


The screenshot displays the Web Soil Survey (WSS) website interface. At the top, there is a banner with the USDA logo (United States Department of Agriculture, Natural Resources Conservation Service) on the left, a ruler, and various soil samples. The text "Web Soil Survey" is prominently displayed in yellow. Below the banner is a navigation bar with links for "Home", "About Soils", "Help", and "Contact Us". The main content area features a search box with the text "Enter Keywords" and a "Go" button, a dropdown menu for "All NRCS Sites", and a "Browse by Subject" section with a link to "Soils Home". A central message reads "The simple yet powerful way to access and use soil data." accompanied by a large green circular button labeled "START WSS". Below this is the text "Welcome to Web Soil Survey (WSS)". On the right, a section titled "I Want To..." lists two options: "Start Web Soil Survey (WSS)" and "Know the requirements for running Web Soil Survey — will Web Soil Survey work in my web browser?".

# Tools for Accessing Soil Survey Information

## ■ Soil Data Viewer

- Extension to ArcMap
- Uses shapefiles and tabular data for individual soil survey areas, downloaded from Web Soil Survey
- Tabular data is in MS Access format



**USDA Natural Resources Conservation Service**  
**Soils**  
United States Department of Agriculture

Topics | **Soil Survey** | Soil Health | Contact Us

You are Here: [Home](#) / [Soil Data Viewer](#)

**Soil Data Viewer**

 [Sign up for E-mail updates on Soil Applications](#)

**Soil Data Viewer** is a tool built as an extension to ArcMap that allows a user to create soil-based thematic maps. The application can also be run independent of ArcMap, but output is then limited to a tabular report.

# Tools for Accessing Soil Survey Information

- **Gridded Soil Survey Geographic (gSSURGO)**
  - Provides complete SSURGO data for entire States
  - Spatial and tabular data are in a single ESRI file geodatabase
  - Soil map unit spatial data are provided in both polygon and 10-meter raster dataset formats.

The screenshot shows the USDA Natural Resources Conservation Service Soils website. The header includes the USDA logo, the text "Natural Resources Conservation Service Soils", and "United States Department of Agriculture". Navigation links include "About Us", "Soil Survey Releases", and "National". A menu bar contains "Topics", "Soil Survey", "Soil Health", and "Contact Us". The breadcrumb trail reads "You are Here: Home / Description of Gridded Soil Survey Geographic (gSSURGO) Database". A "Stay Connected" link is also present. The main heading is "Description of Gridded Soil Survey Geographic (gSSURGO) Database". Under "Quick Links", there are several links: "Introduction", "gSSURGO User Guide (PDF; 3.84 MB)", "FY2016 Release Notes", "SSURGO/gSSURGO ArcTools", "VALU Table Database", "Metadata", "Recommended Data Citations", "Technical Information", "Ordering Information", and "Sample gSSURGO Map Themes". A map titled "Drought Vulnerable Soil Landscapes FY 2016 gSSURGO 10m" is displayed, showing a 10-meter raster dataset of drought-vulnerable soil landscapes. The map includes a legend for "valu1.droughty" with a red color swatch and a scale bar. The legend text reads: "1 - Drought Vulnerable Soil Landscapes (< 8 inches or 152 mm root zone AWG)". The map also shows "Major Land Resource Areas (MLRA) 69 - Nebraska Sand Hills and MLRA 71 - Central Nebraska Loess Hills shown in yellow".

ArcGIS tools for creating maps and reports of soil properties and interpretations with gSSURGO datasets

Tools and user guide can be downloaded from the gSSURGO web site.

### **SSURGO/gSSURGO ArcTools**




Soil Data Management Toolbox (ZIP; 2016-12-30; 5.04 MB)

Development User Guide 3.0 (PDF; 1 MB)

gSSURGO Tools Quick Start Guide (PDF; 2.16 MB)

The Soil Data Development Tools for ArcGIS™ includes the toolset used by USDA-NRCS to create the gSSURGO databases from a Soil Data Mart database snapshot each fiscal year. Tools for creating soil maps and reports are also available. See the Development User Guide and the gSSURGO Mapping Toolset documents for more information.

# Example using gSSURGO for Benewah, Clearwater, and Latah Counties, Idaho combined area

Contents		Preview	Description
Name	Type		
 MUPOLYGON	File Geodatabase Feature Class		
 SAPOLYGON	File Geodatabase Feature Class		
 MapunitRaster_id_10m	File Geodatabase Raster Dataset		

MUPOLYGON – Idaho soil map unit polygons

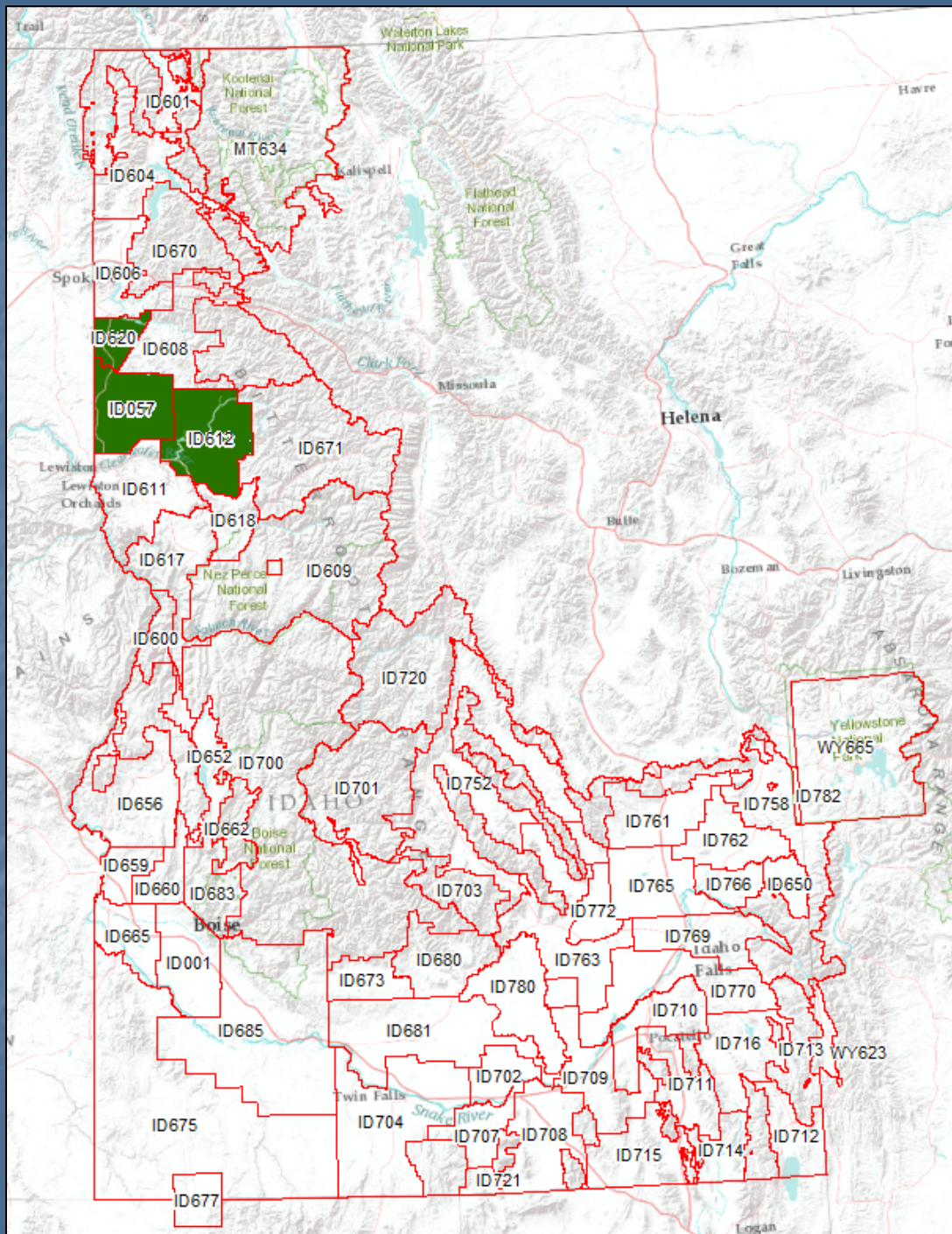
SAPOLYGON – Idaho soil survey area boundary polygons

We'll clip the MUPOLYGON feature class to obtain the soil map unit polygons for the three soil survey areas

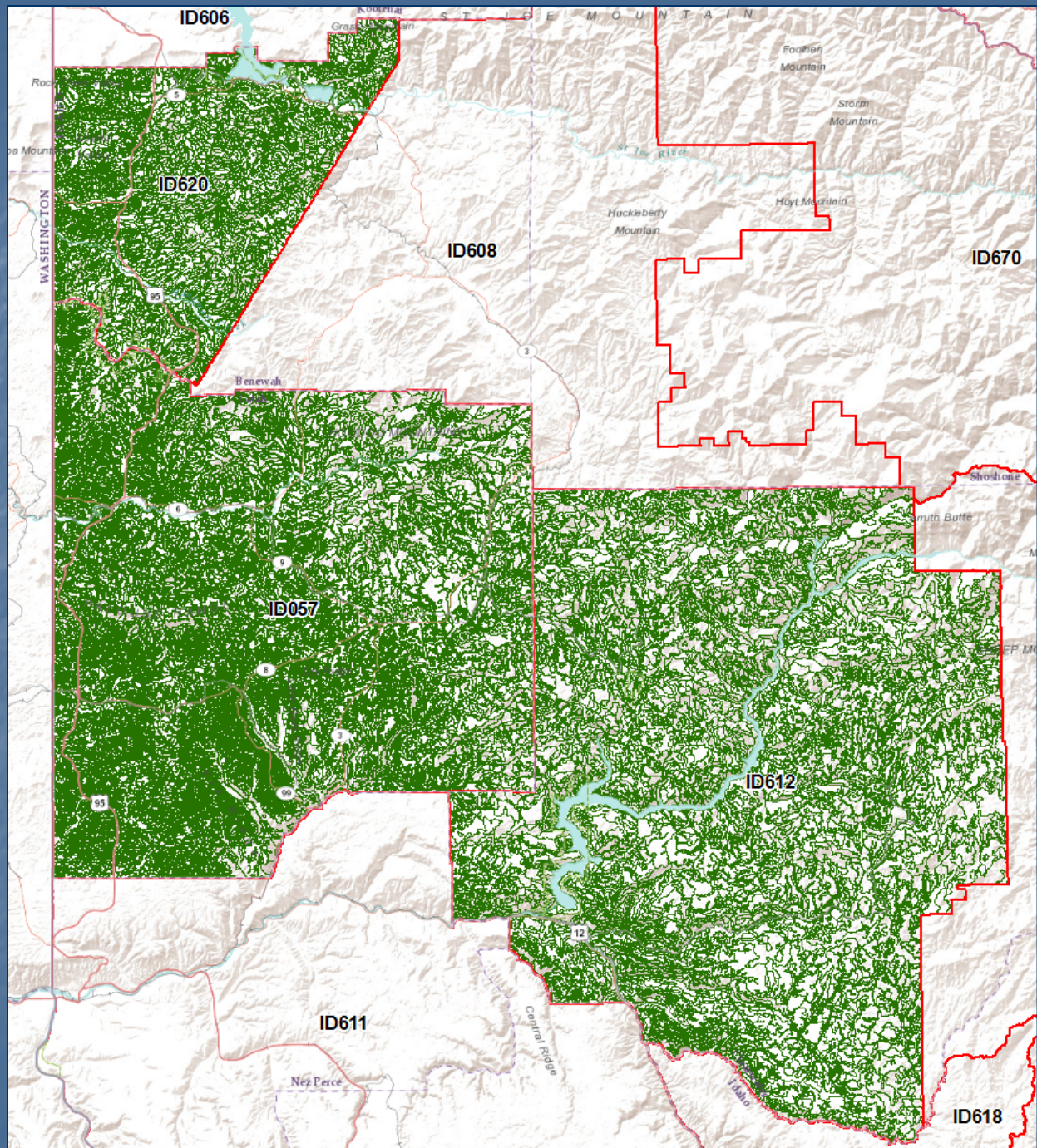


Idaho SSURGO  
soil survey area  
boundaries  
(SAPOLYGON)
















Benewah,  
Clearwater, and  
Latah County soil  
survey areas in  
green



SSURGO soil map unit polygons for Benewah, Clearwater, and Latah Counties



We'll use the Soil Data Development Toolbox to create maps of soil properties and interpretations for forest management.

-   **Soil Data Development Toolbox**
-   Download SSURGO Toolset
-   gSSURGO Database Toolset
-   gSSURGO Mapping Toolset
  -  Identify Dominant Components
  -  List Map Categories
  -  Map Interpretation Reasons
  -  **Map Soil Properties and Interpretations**
  -  Merge Rating Tables
  -  Soil Map Descriptions
  -  Update Layer File Symbology

Tool settings for Tree Site Index for Douglas-fir, weighted average for mapunit, using the Cochran 50-year site index base.

### Map Soil Properties and Interpretations

Map Unit Layer

MUPOLYGON\_ID057\_612\_620

SDV Folder

Vegetative Productivity

SDV Attribute

Forest Productivity (Tree Site Index)

Aggregation Method

Weighted Average

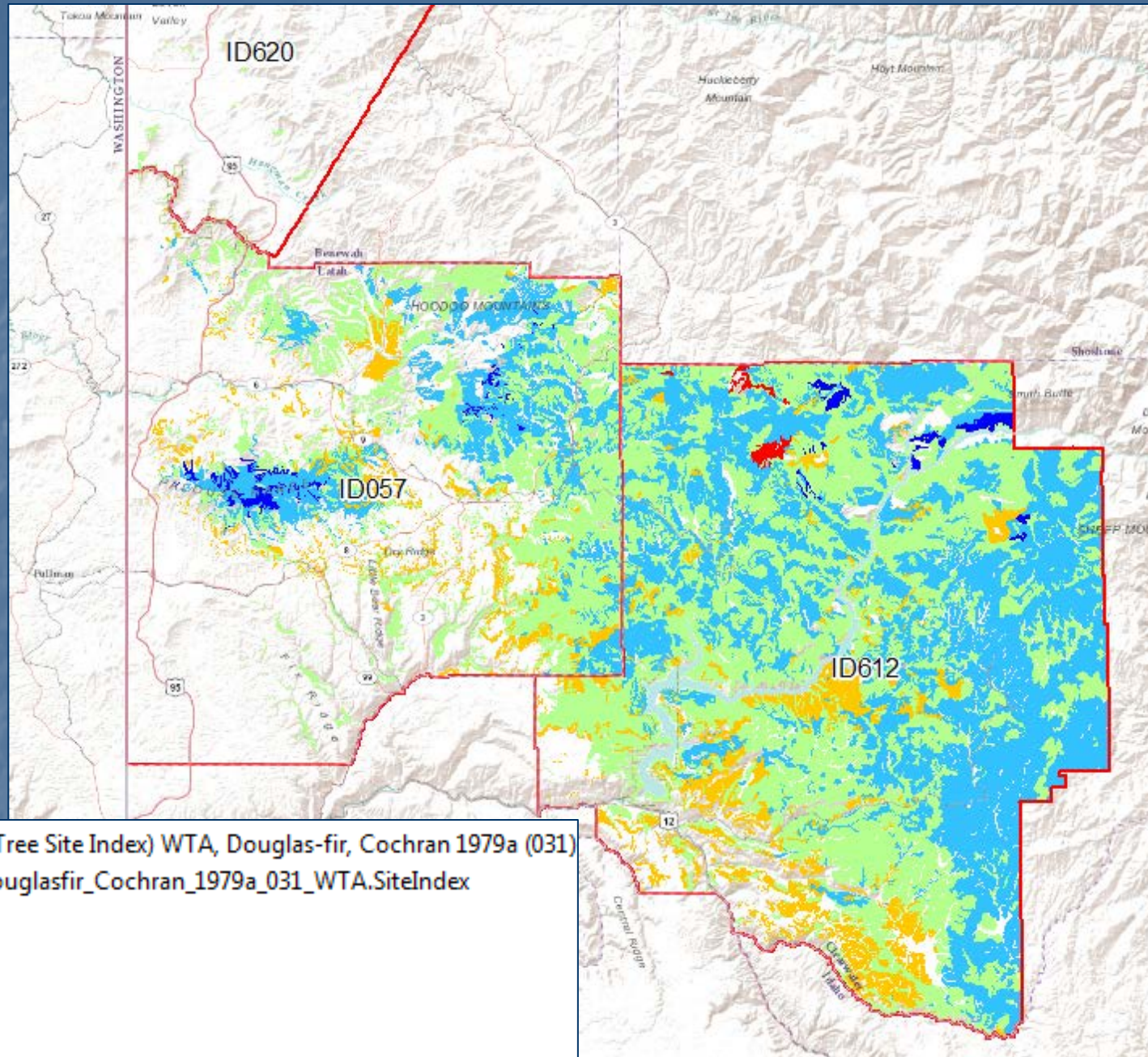
Primary Constraint (optional)

Douglas-fir

Secondary Constraint (optional)

Cochran 1979a (031)

# Douglas-fir site index map, 50- year base



Forest Productivity (Tree Site Index) WTA, Douglas-fir, Cochran 1979a (031)  
SDV\_SiteIndex\_Douglasfir\_Cochran\_1979a\_031\_WTA.SiteIndex

45.0 - 61.0 (ft)

61 - 77.0

77 - 93.0

93 - 109.0

109 - 125.0

The site index attribute table contains the weighted average site index for each soil map unit.

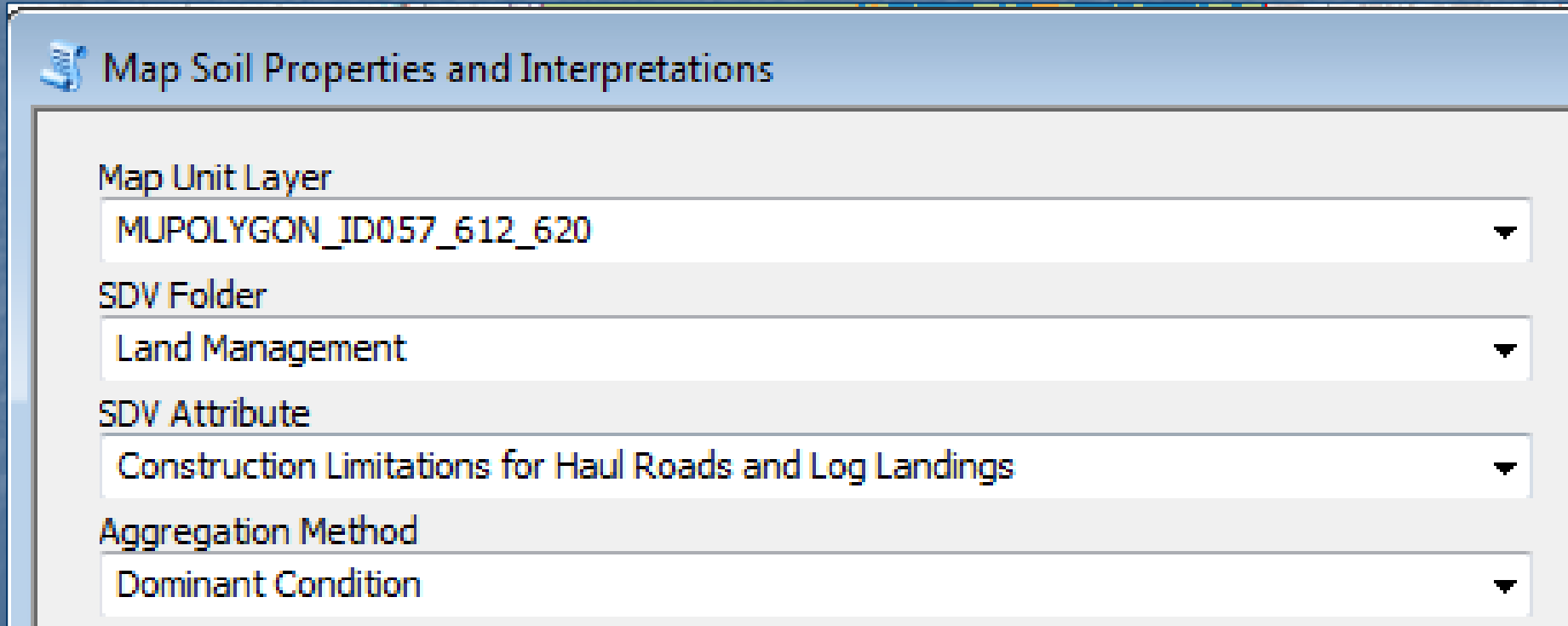
### Table



### Forest Productivity (Tree Site Index) WTA, Douglas-fir, Cochran 1979a (031)

	Shape_Area	COMPACT_R	SITEINDEX
	97511.498829	75	76
	185548.971594	60	85
	116785.407495	80	85
	109393.299898	75	87
	69390.903284	85	86
	127346.703302	99	80
	70819.69003	75	84
	120029.93343	20	97

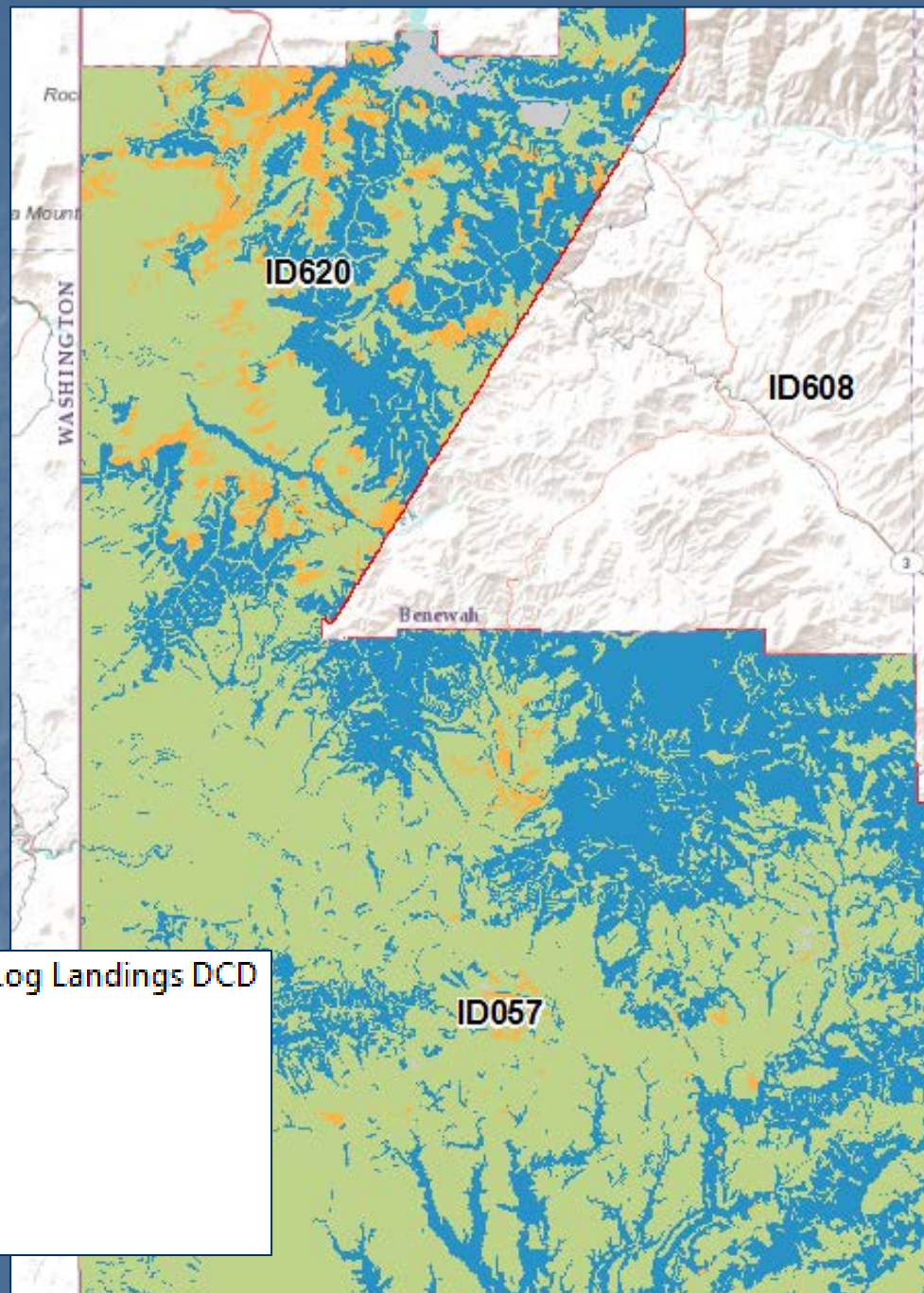
Tool settings for *Construction Limitations for Haul Roads and Log Landings* interpretation with the Dominant Condition aggregation method.



The image shows a software dialog box titled "Map Soil Properties and Interpretations". It contains four dropdown menus for configuring tool settings:

- Map Unit Layer:** MUPOLYGON\_ID057\_612\_620
- SDV Folder:** Land Management
- SDV Attribute:** Construction Limitations for Haul Roads and Log Landings
- Aggregation Method:** Dominant Condition

Rating classes map for the *Construction Limitations for Haul Roads and Log Landings* interpretation



Construction Limitations for Haul Roads and Log Landings DCD

SDV\_CLRoadLndg\_DCD.CLRoadLndg

Severe

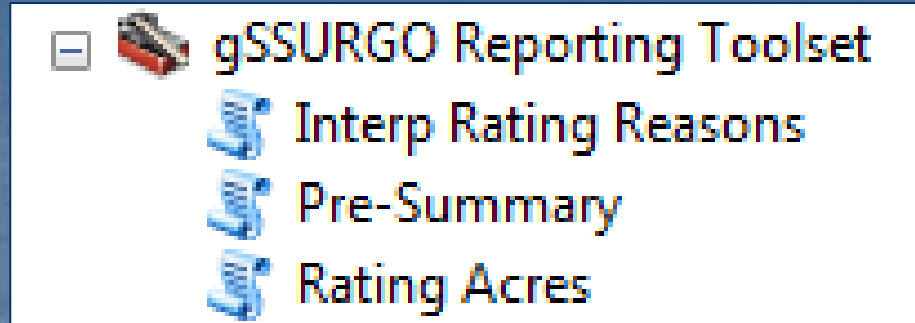
Moderate

Slight

Not rated







Additional tools for creating tabular PDF reports of interpretation rating classes and reasons







SSA	MUSYM MUKEY	MUNAME	COMPNAME	PCT	INTERPHRC
<b>ID001</b>					
	<b>1</b>				
ID001	2496632	Abo silt loam, 0 to 3 percent slopes	Abo	85	Moderate

MUSYM	MUNAME	COMPNAME	LOCALPHASE	PCT	RULENAME	RATING
1	Abo silt loam, 0 to 3 percent slopes	Abo	warm	85	Strength Limitation (1)	0.5
1	Abo silt loam, 0 to 3 percent slopes	Abo	warm	85	Dust PM10 and PM2.5 Generation	0.372

Behind the scenes – the gSSURGO ArcTools create file geodatabase tables and layer files that maintain the map symbology.

Contents	
Name	Type
 SDV_CLRoadLndg_DCD	File Geodatabase Table
 SDV_Data	File Geodatabase Table
 SDV_RoadSuitNS_DCD	File Geodatabase Table
 SDV_SiteIndex_Douglasfir_Cochran_1979a_031_WTA	File Geodatabase Table

Contents	
Name	Type
 gSSURGO_ID.gdb	File Geodatabase
 Construction_Limitations_for_Haul_Roads_and_Log_Landings_DCD.lyr	Layer
 Forest_Productivity_(Tree_Site_Index)_WTA_Douglas-fir_Cochran_1979a_(031).lyr	Layer
 Group_Construction_Limitations_for_Haul_Roads_and_Log_Landings - Rating_Reasons.lyr	Layer

# Questions ???



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