Soil Survey in Forest Management

Tools and Interpretation

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Photos from Idaho Soils Atlas
Depths in decimeters
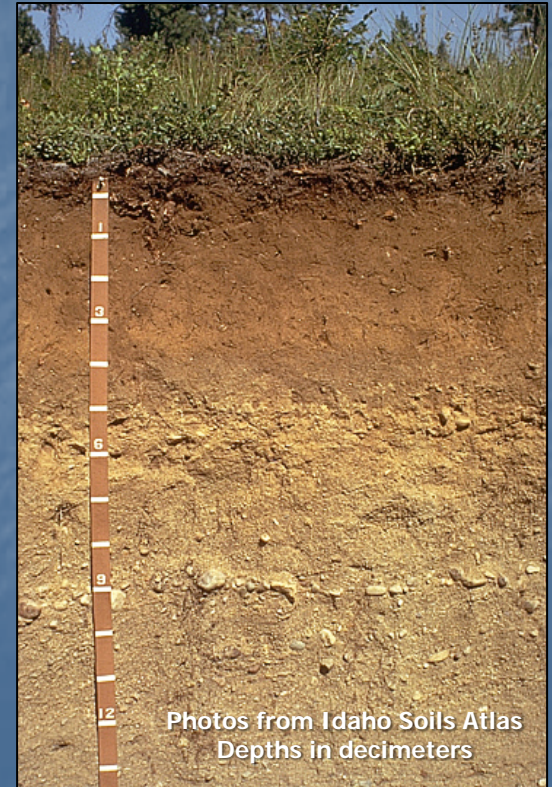
National Cooperative Soil Survey

- 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.

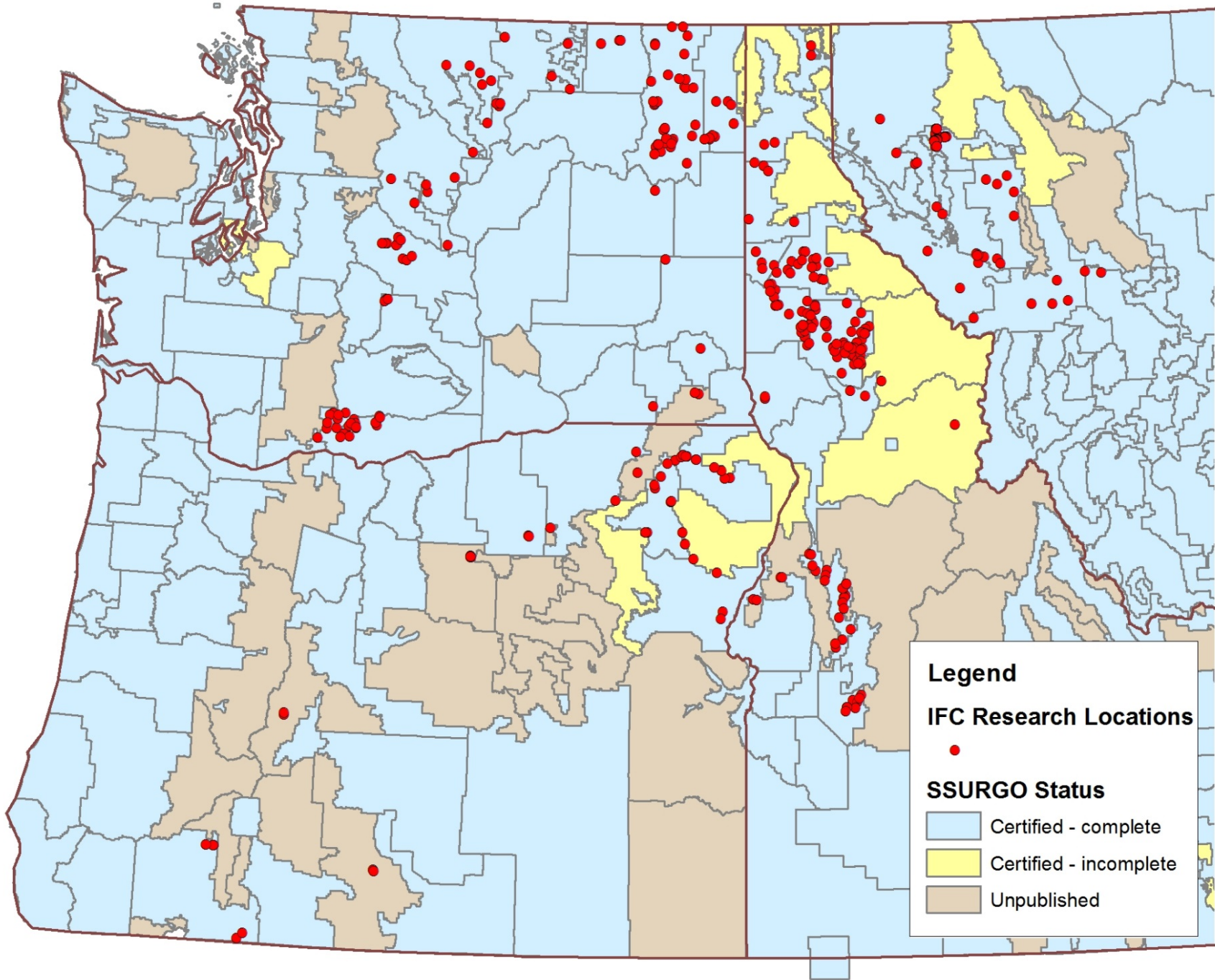 - Complete coverage for entire U.S.
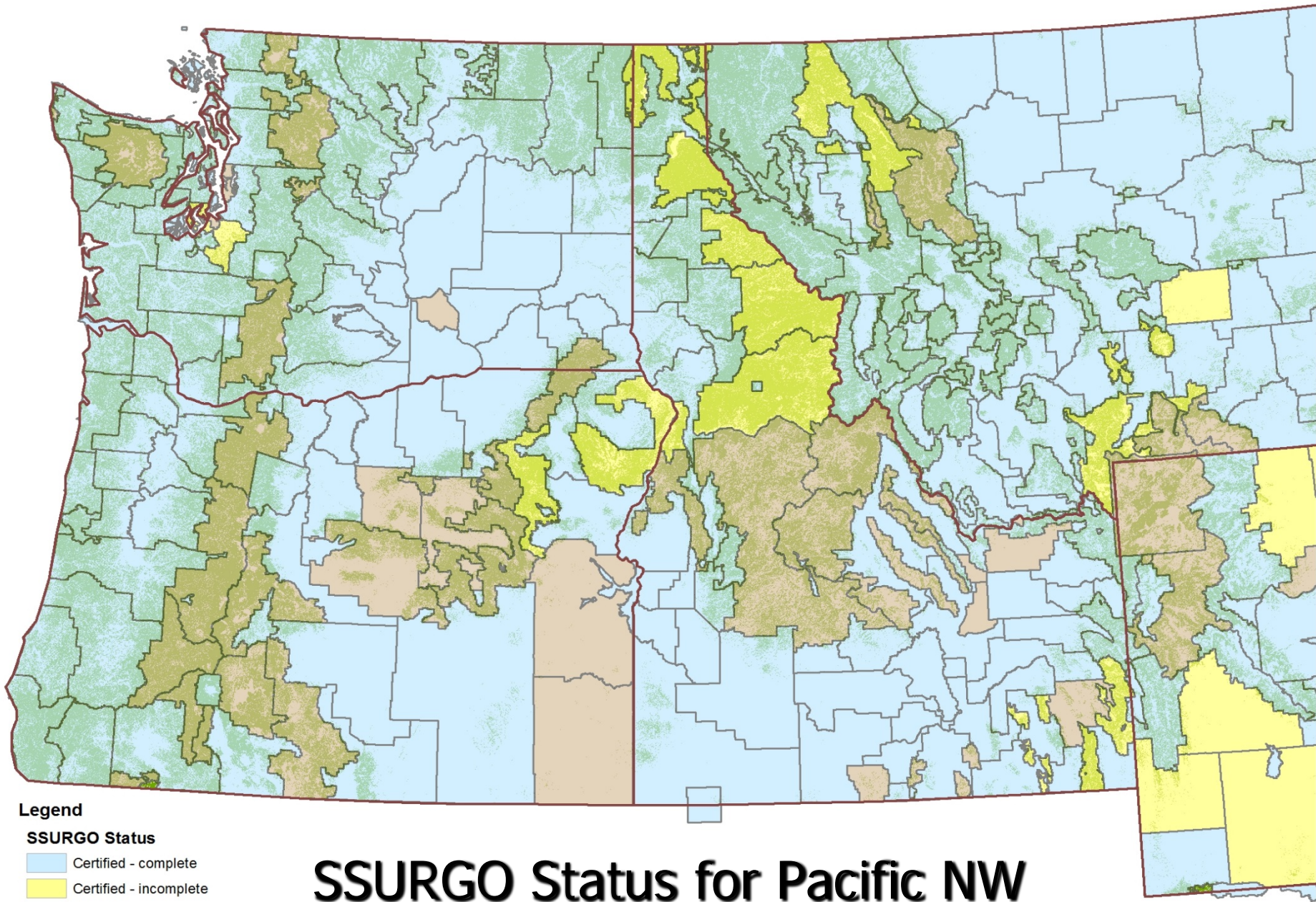
Legend

SSURGO Status
- Certified - complete
- Certified - incomplete
- Unpublished

Land Use
- Forestland

SSURGO Status for Pacific NW

Legend

IFC Research Locations
●

SSURGO Status

Certified - complete

Certified - incomplete

Unpublished

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
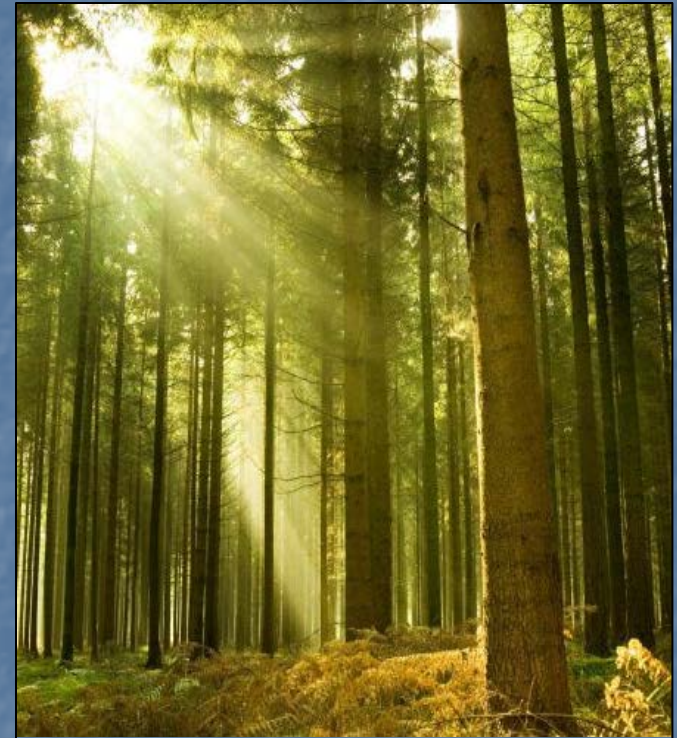
Forest Management Interpretation Examples

- 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

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

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.

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
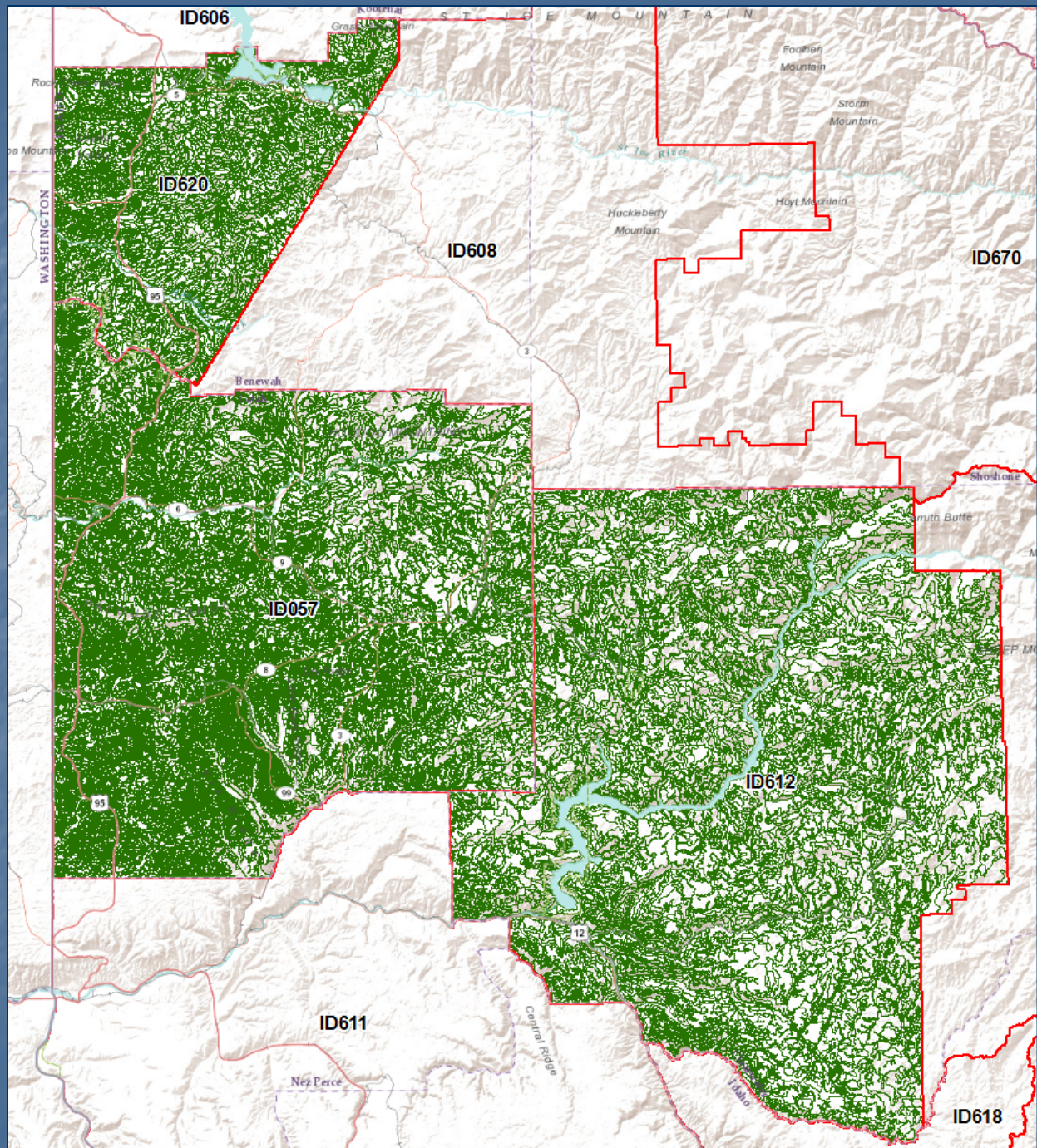
Idaho SSURGO soil survey area boundaries (SAPOLYGON)

Benewah, Clearwater, and Latah County soil survey areas in green
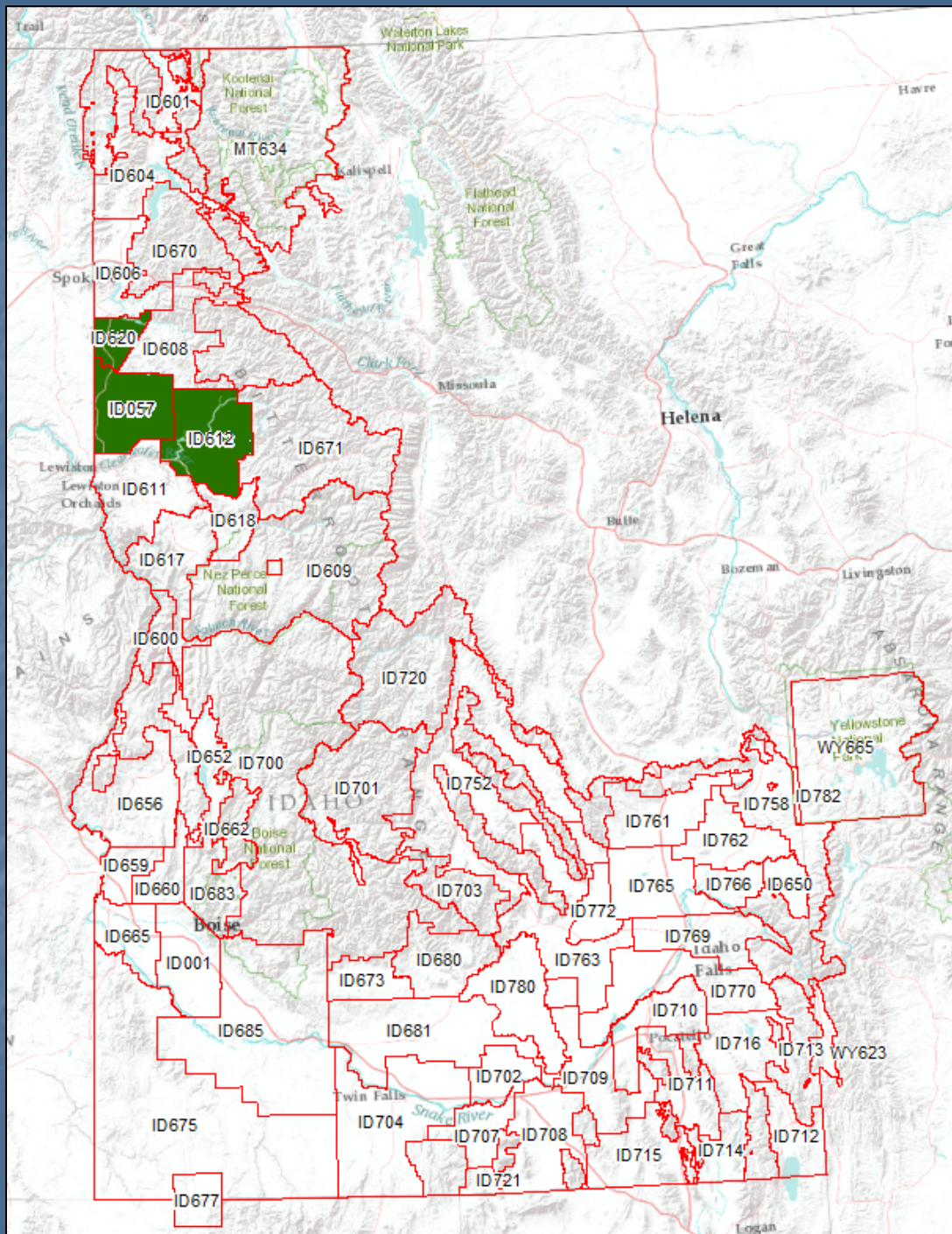
SSURGO soil map unit polygons for Benewah, Clearwater, and Latah Counties

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

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
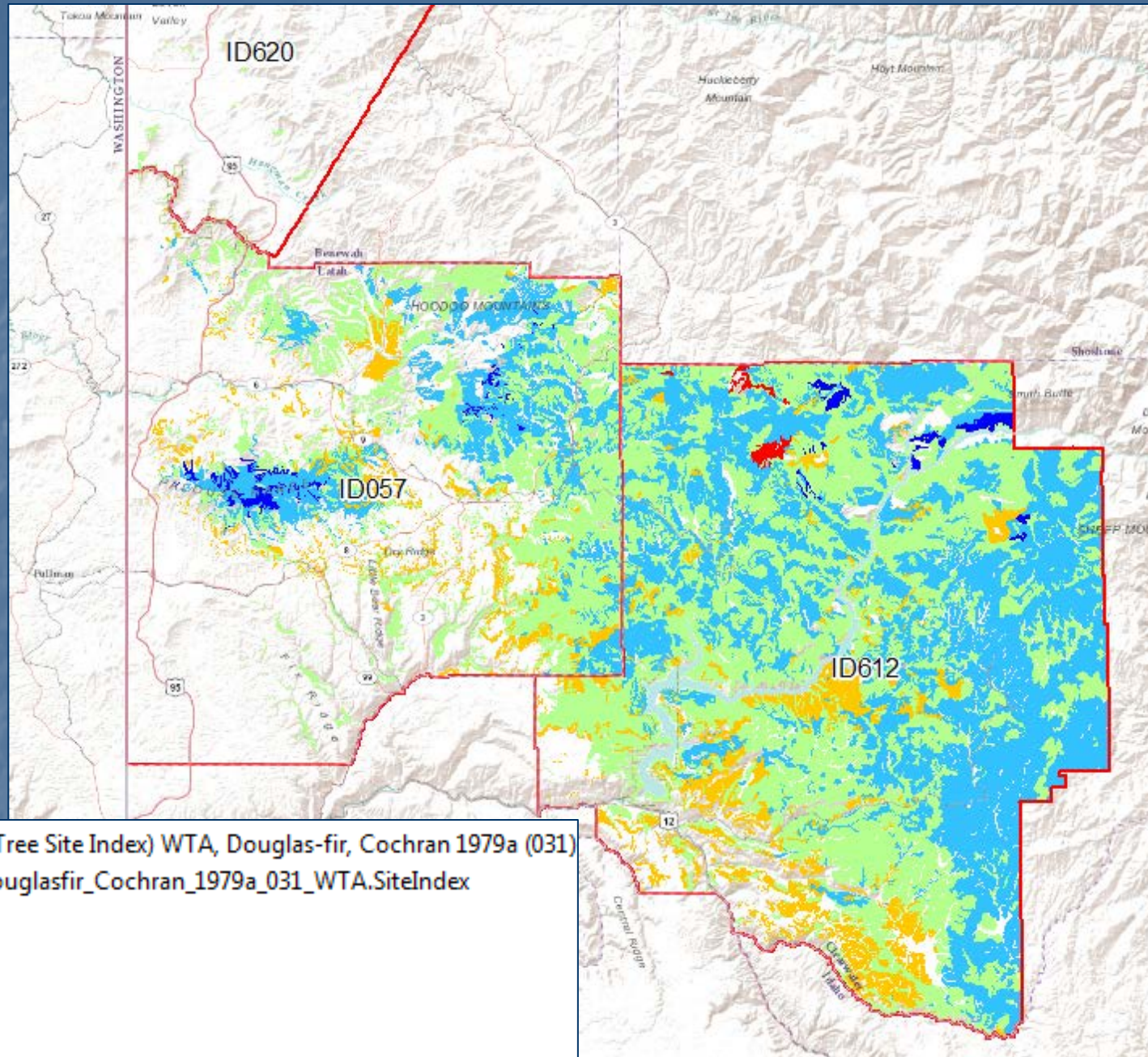
Forest Productivity (Tree Site Index) WTA, Douglas-fir, Cochran 1979a (031)
SDV_SiteIndex_Douglasfir_Cochran_1979a_031_WTA.SiteIndex
- 45.0 - 61.0 (ft)
- 61 - 77.0
- 77 - 93.0
- 93 - 109.0
- 109 - 125.0

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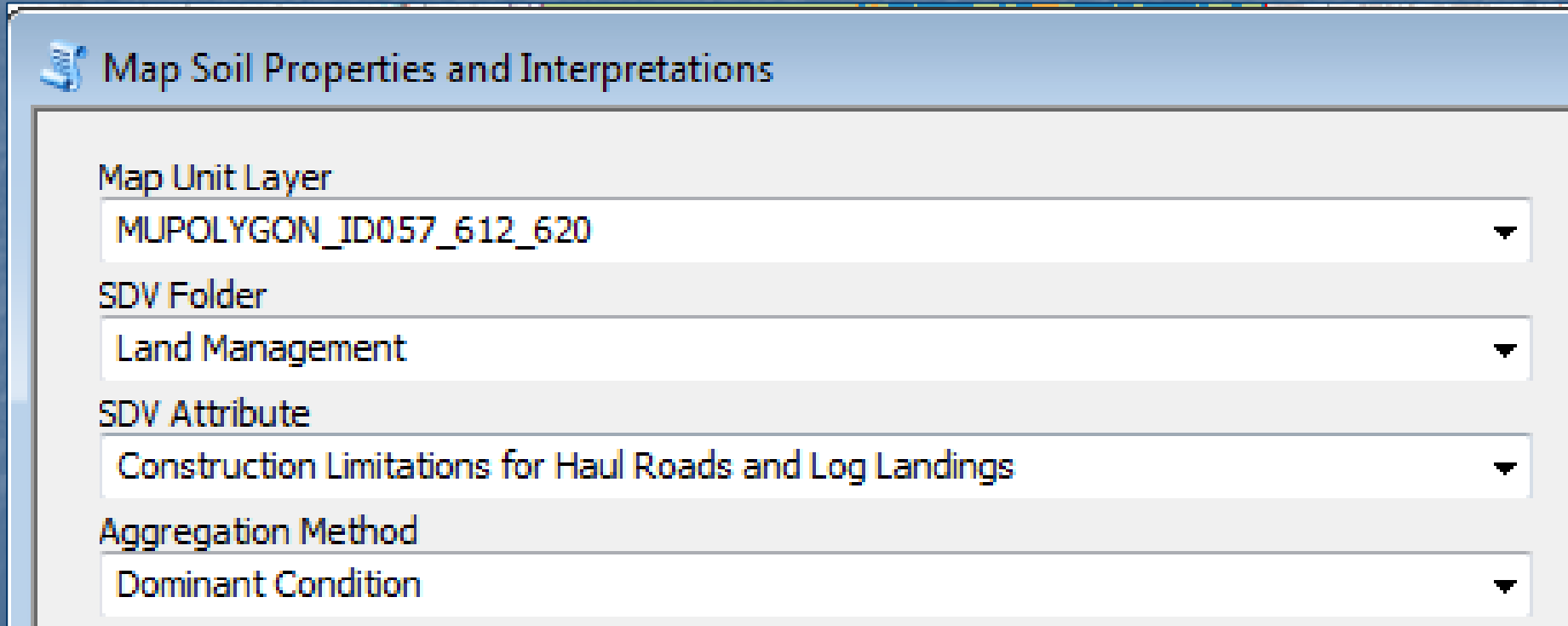
Table

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

Shape_Area	COMPPCT_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

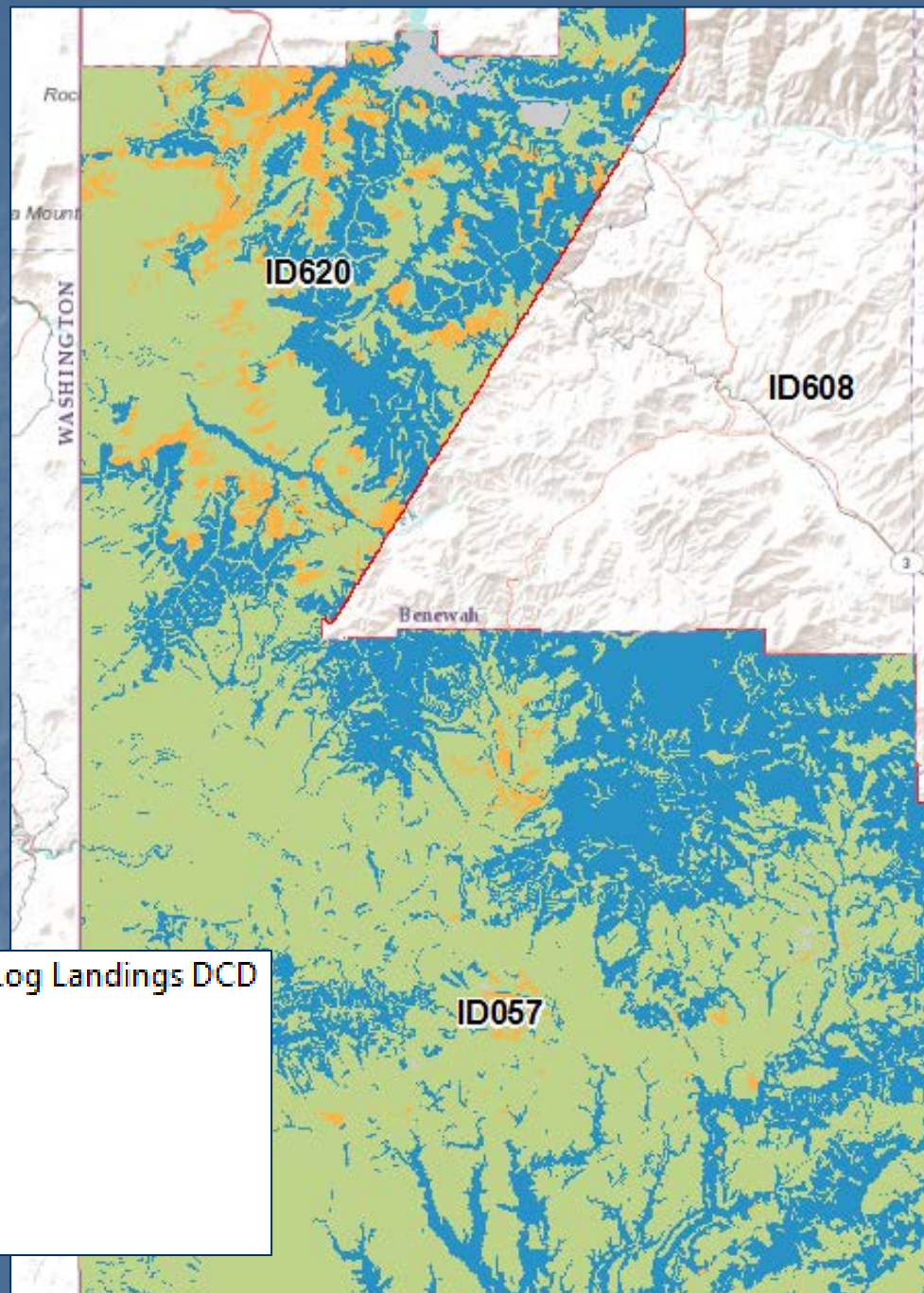Tool settings for *Construction Limitations for Haul Roads and Log Landings* interpretation with the Dominant Condition aggregation method.

Map Soil Properties and Interpretations

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
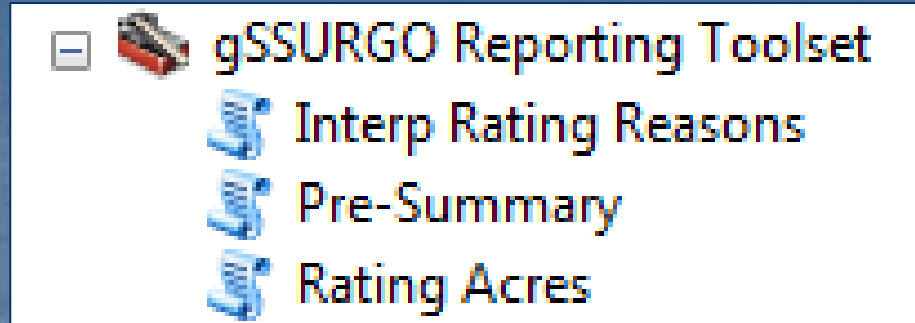SDV_CLRoadLndg_DCD.CLRoadLndg
- Severe
- Moderate
- Slight
- Not rated

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

gSSURGO Reporting Toolset
- Interp Rating Reasons
- Pre-Summary
- Rating Acres

SSA	MUSYM	MUKEY	MUNAME	COMPNAME	PCT	INTERPHRC
ID001						
	1					
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	Preview	Description

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	Preview	Description

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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