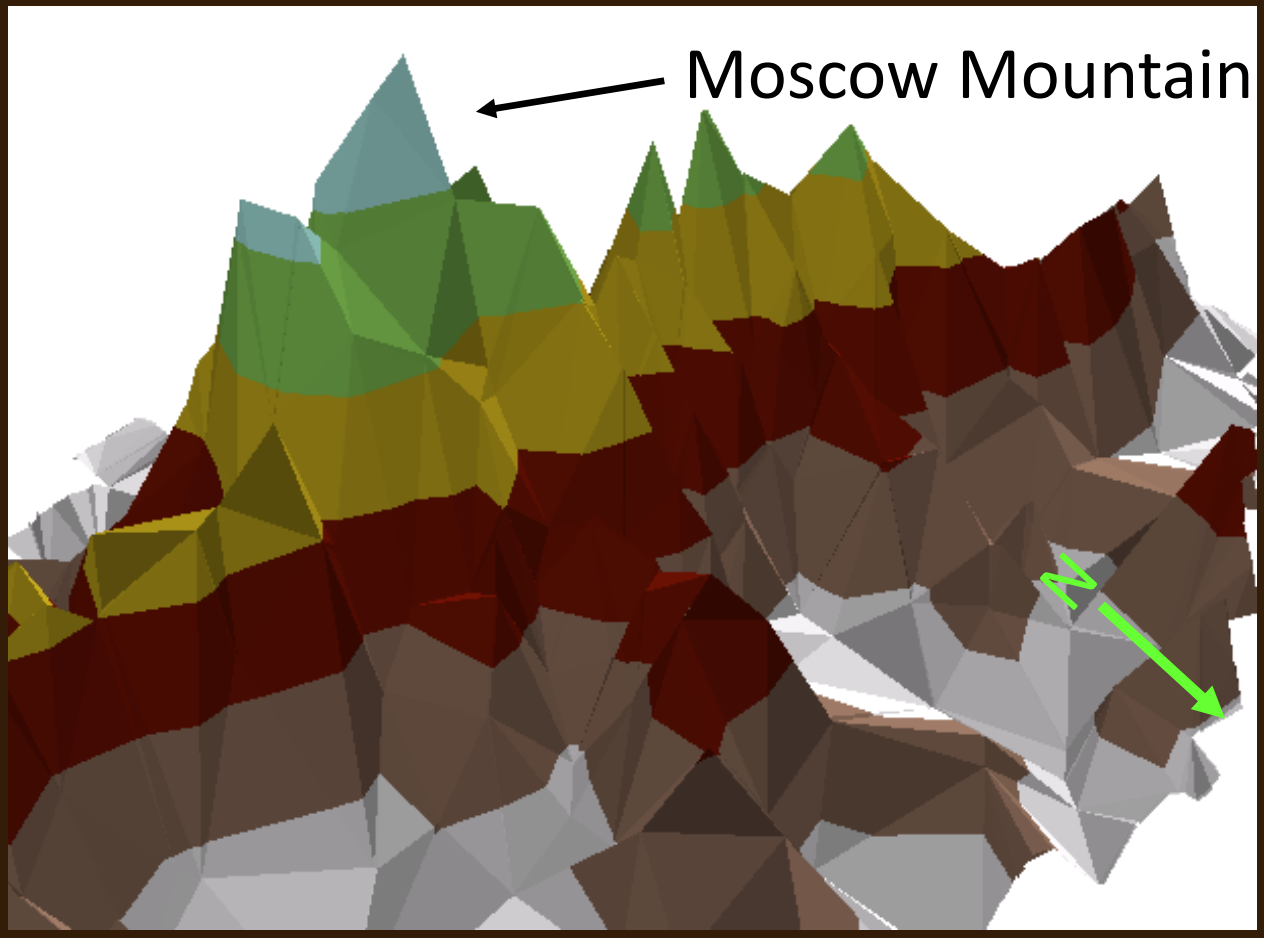
Developing Geospatial Site Type Classification Systems for Forest Nutrition Management



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Agenda 2020 Collaborative Team

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Principal Investigator: Deborah S. Page-Dumroese

Potlatch Corporation: John Mandzak

Natural Resources Conservation Services: Dave Hoover, Bruce Knapp, Brian Gardner

Idaho Geologic Survey: Reed Lewis

Intermountain Tree Nutrition Cooperative: Mark Coleman, Mark Kimsey

University of Idaho: Asc. Professor: Paul Gessler

Forest Capital Partners LLC: Kennon McClintock

The outside funding for the project:

Affiliate members

American Forest & Paper Association

U.S. Department of Energy (DOE)

USDA/Forest Service

National Science Foundation

Much of the groundwork for funding was done by Debbie Page-Dumroese and Mark Kimsey.

Dokuchaev 1880's

- Vegetation latitude zones
  - Similar climate
  - Similar soil
  - Development of soil forming factors

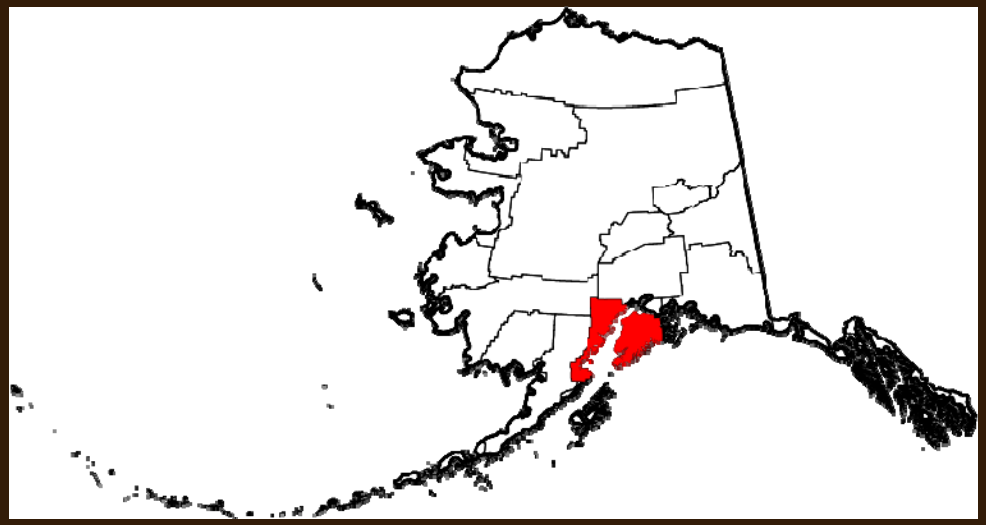
Hans Jenny developed the theory of soil forming factors and the functional conceptual model

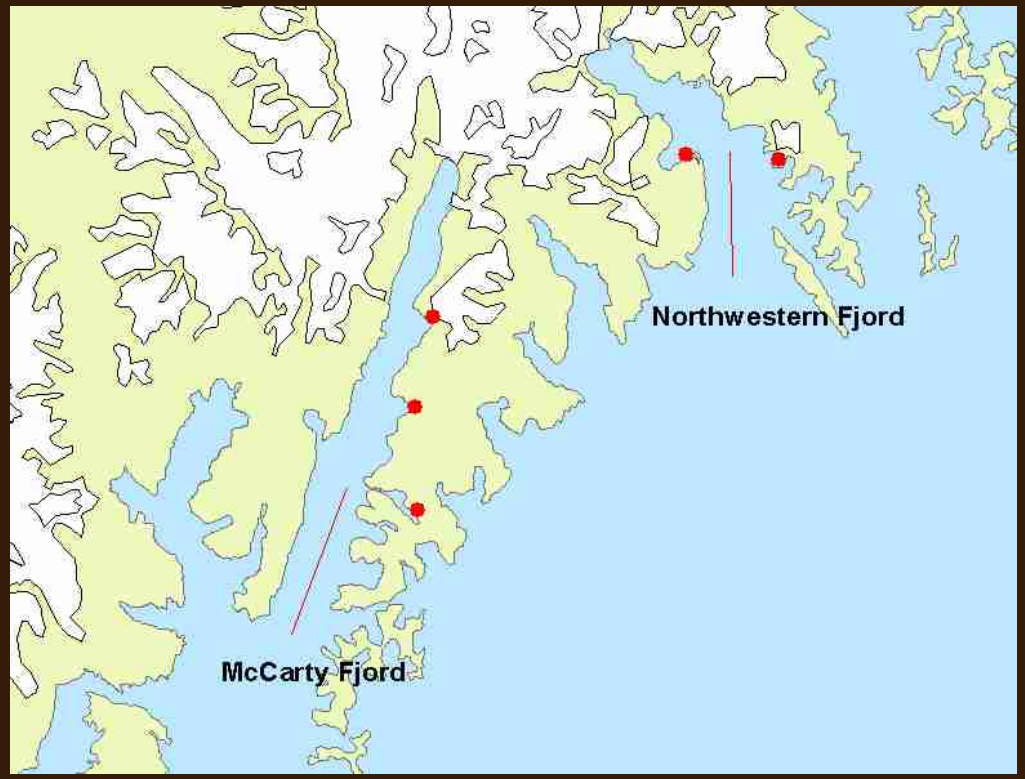
Soil = f(cl,o,r,p,t)

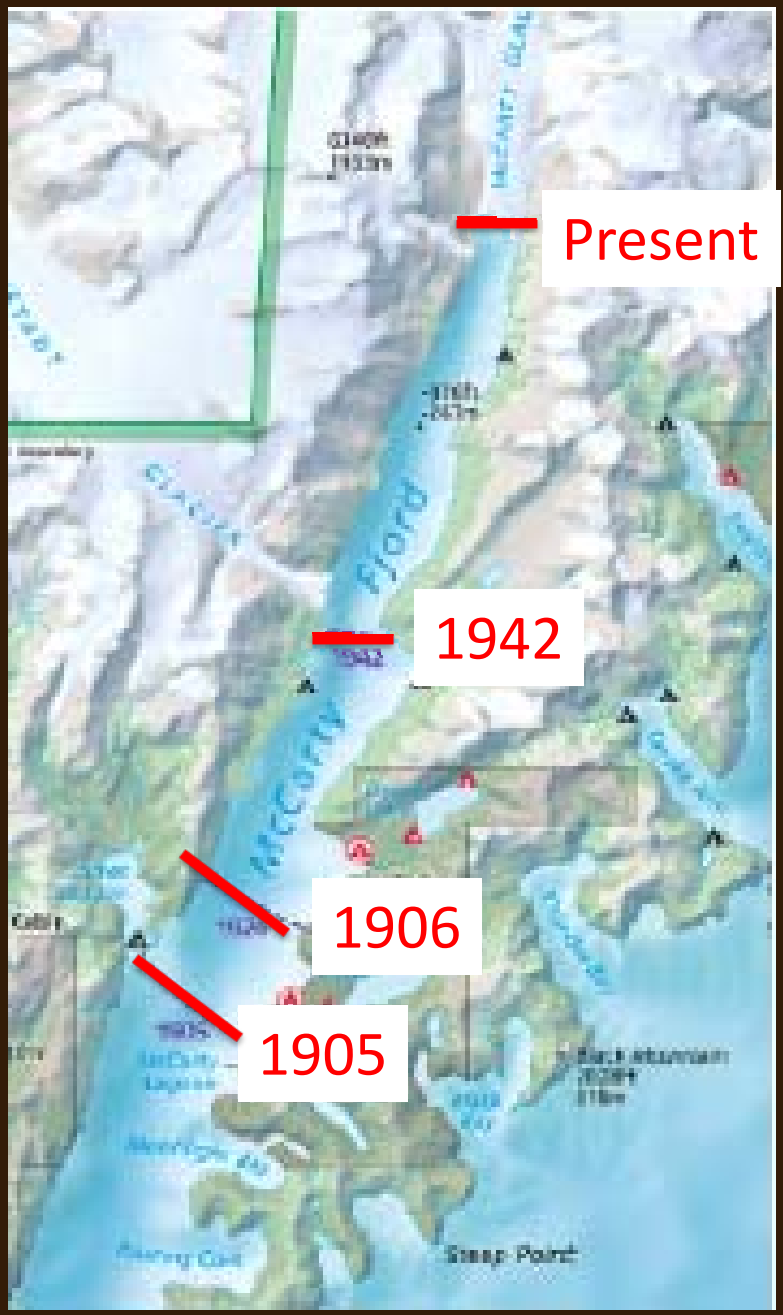
- cl = Climate
- o = Organism
- r = Relief
- p = Parent Material
- t = Time

Considering all are equal except one variable

Factors of Soil Formation (Jenny, 1941)




Northwestern Fjord
McCarty Fjord


Present
1942
1906
1905
McCarty Fjord
Steep Point

Present

1942

1905

The interaction between these (cl,o,r,p,t) factors can relate to geographical variation in soil development and vegetation types

Mimulus pardalis heavy mineral serpentine soil

http://people.exeter.ac.uk/MRMacnai/pardalis.jpg

Previous Research

Good rocks versus bad rocks

Forest productivity management:

<u>Root Disease</u>

- Bad Rocks = metasedimentary
  - quartzite
  - siltite argillites
- Moderate Rocks =
  - Granitic parent material
- Good rocks =
  - Basalt parent material

Moore et. al 1997

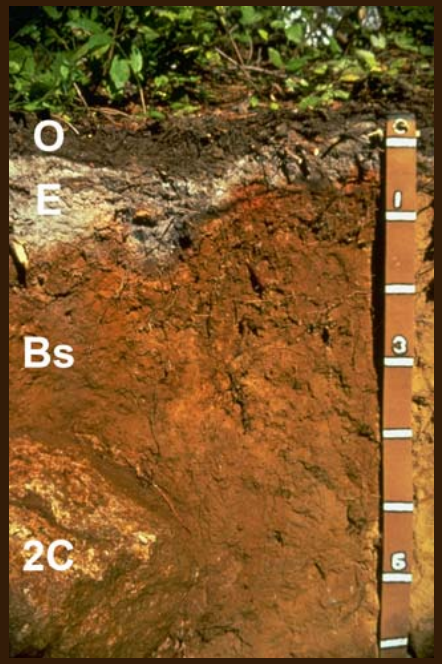
Example: metasediments and tree mortality

- High Mortality
  - Western white pine
  - Douglas-fir
  - western red-cedar
- Low Mortality
  - Grand fir
  - Western hemlock
  - Western larch

- Management must consider vegetation and geology.

Site Type Concept

forest productivity is often controlled by the nutrient supply capacity of soils.



This varies due to a complex mix of geologic and surficial materials (e.g. soil parent materials) and is further modified by climatic variables that vary by spatial extent and geographic location.

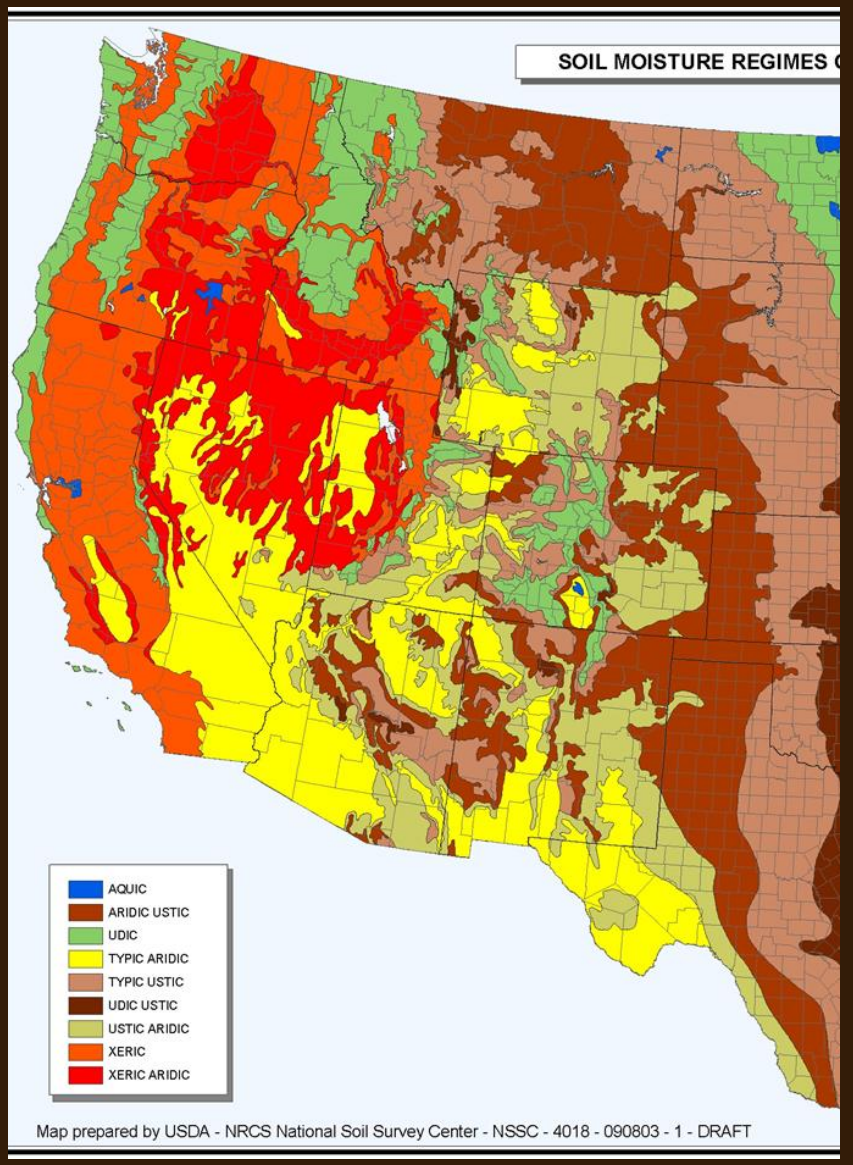
Inland Northwest Soil Parent Materials Include:

Rock Types	**Surficial Deposits**
Granite	Volcanic Ash
Basalt	Tertiary Sediments
Mixed Glacial, Lacustrine	Glacial , Alluvial
Alluvium	Lacustrine
Metamorphic, Metasediments	Loess

Digital geospatial data layers (maps) now exist for the region

Relevance:

- Identify a wide array of site types based on forest productivity across the inland northwest.
- Develop simplified site type models based on silvicultural prescriptions?
- Modern day tools can integrate models into a geospatial context.
- Develop geospatial accessible products for enhancing silvicultural prescriptions.



Objective:

Integrate digital geospatial data layers available through collaborating agencies to develop site type characteristics

- Define management regimes
  - Stand productivity
  - Response to amendments
  - Past field research Data
  - Install new research plots

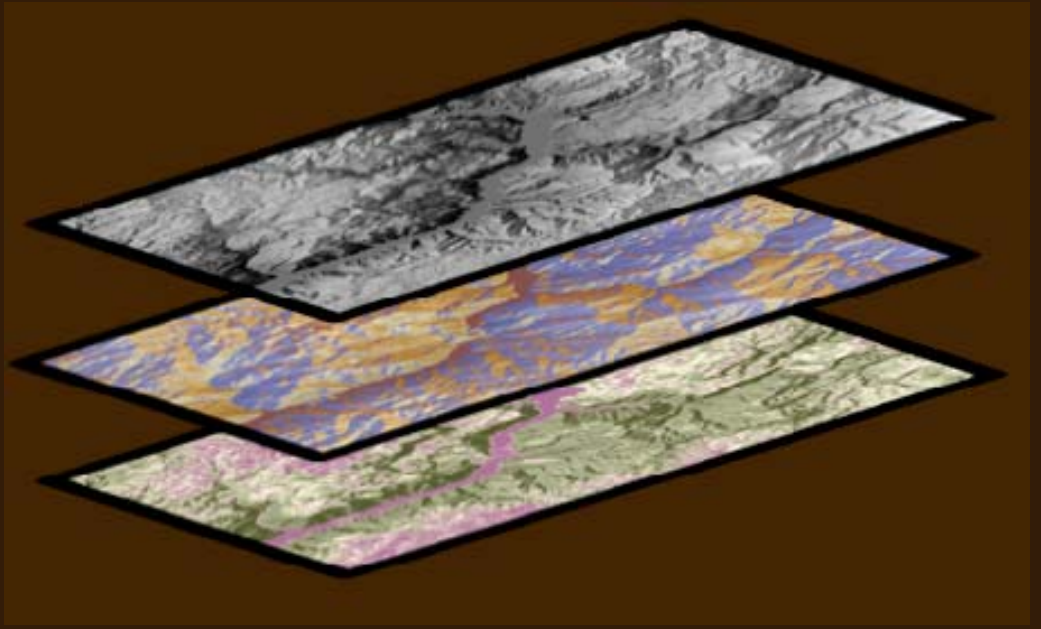
- Prepare management tools from available data refine management recommendations from research.

Methods: Data Compilation

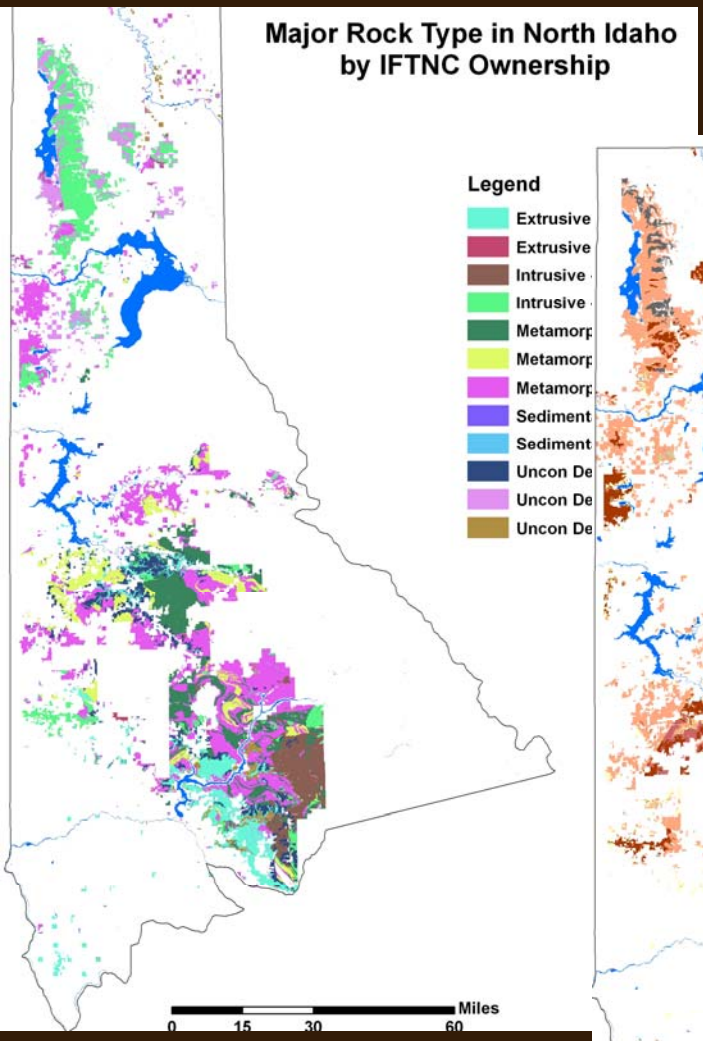
Idaho Geologic Survey: Geology and surficial materials

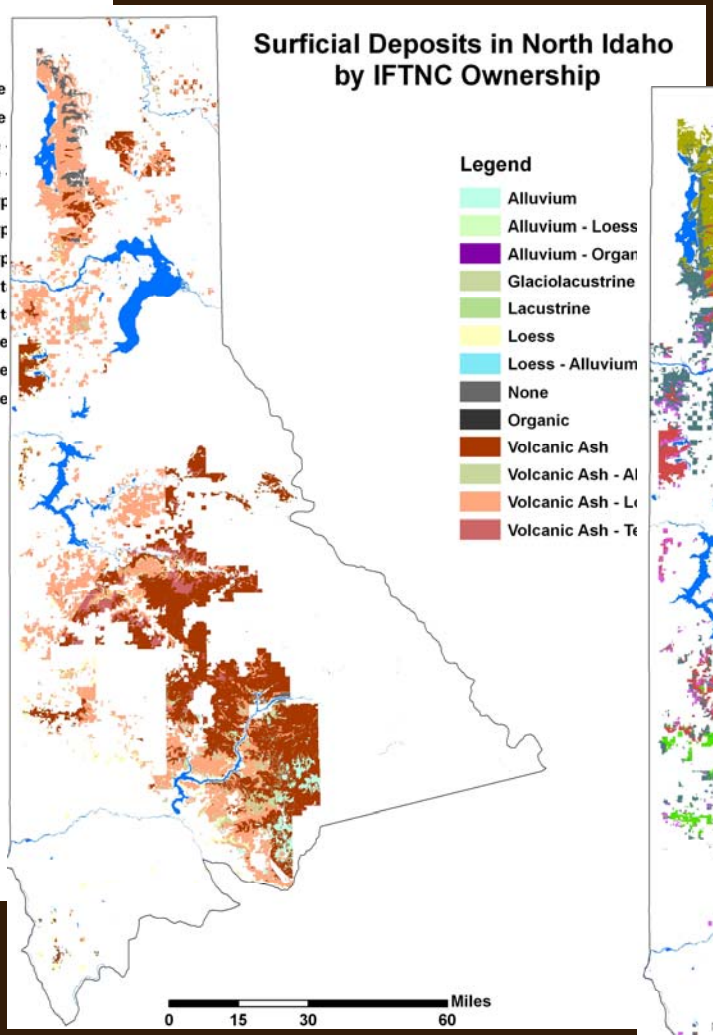
Natural Resources Conservation Service: Digital soil maps and derived moisture and temperature regimes from SSURGO

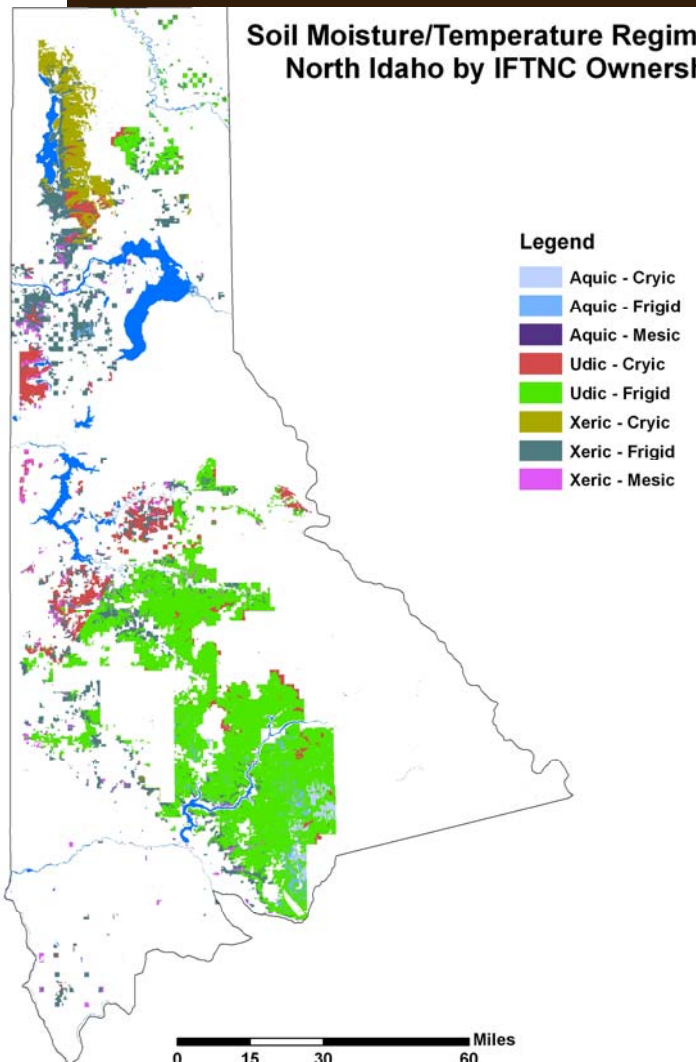
Intermountain Tree Nutrition Cooperative: Screening Trial Data



Stratification to Define Preliminary Site Types







Acreage of Forest Land

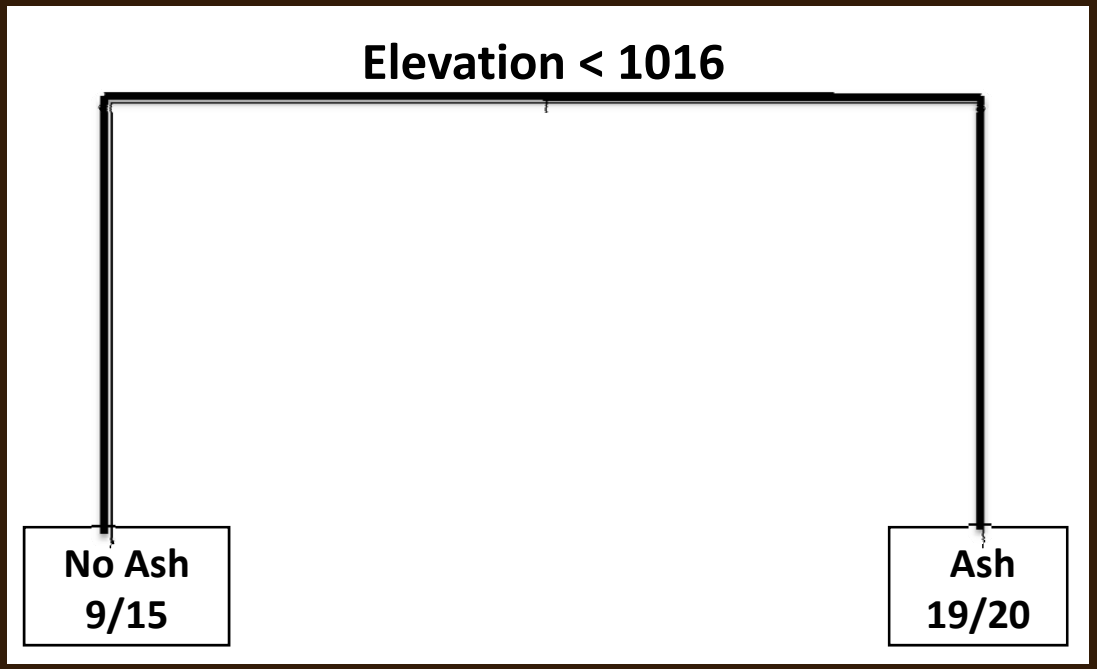
NORTH IDAHO	Soil Moisture - Temperature Regime							
	Aq-Cr	Aq-Fr	Ud-Cr	Ud-Fr	Xe-Cr	Xe-Fr	Xe-Me	
Extrusive - High				90,712		37,757	8,299	**136,768**
Intrusive - High	14,478	7,266		78,316				**100,060**
Intrusive - Medium			26,902	55,284	85,785	66,170	7,381	**241,522**
Metamorphic - High			6,855	**179,774**		6,316		**192,945**
Metamorphic - Medium			65,565	**299,527**		68,462	22,939	**456,493**
Metamorphic - Low			32,505	65,755		19,382	5,569	**123,211**
Unconsolidated Deposits - High		5,236		75,350		19,887		**100,473**
Unconsolidated Deposits - Medium				20,252				**20,252**
Unconsolidated Deposits - Low		5,967		23,034	24,322	61,413		**114,736**
Total Acres	**14,478**	**18,469**	**131,827**	**888,004**	**110,107**	**279,387**	**44,188**	**1,486,460**

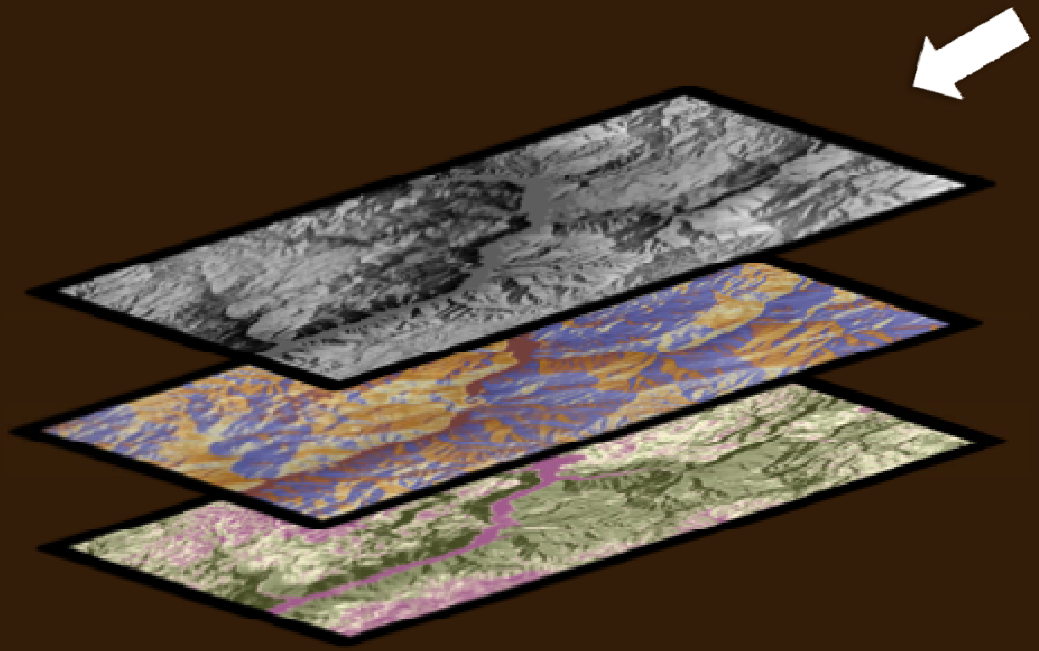
Installation of new research plots based on missing site types for Douglas-Fir

	Soil Moisture - Temperature Regime							
DOUGLAS-FIR	Aq-Cr	Aq-Fr	Ud-Cr	Ud-Fr	Xe-Cr	Xe-Fr	Xe-Me	
Extrusive - High				3				4
Intrusive - High				4				4
Intrusive - Medium								0
Metamorphic - High				6				6
Metamorphic - Medium				7				7
Metamorphic - Low				2				2
Unconsolidated Deposits - High				1				1
Unconsolidated Deposits - Low								0
Total Installations	0	0	0	23	1	0	0	24

Compilation of data

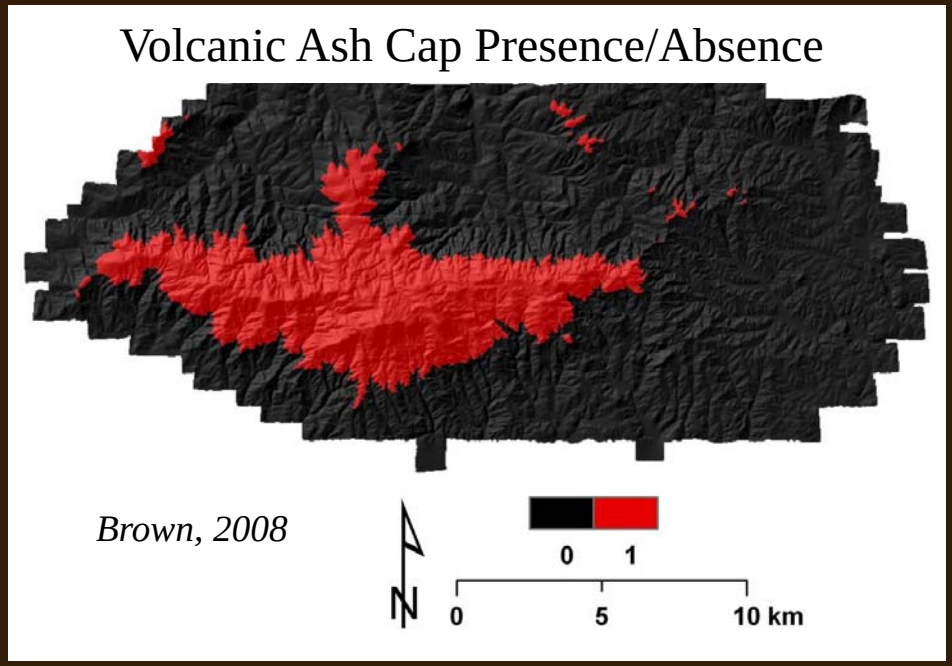
- Field Data
- Lab Data
- Statisitcal Modeling
- Models integrated into GIS
- Field Assesment
- Models Modification

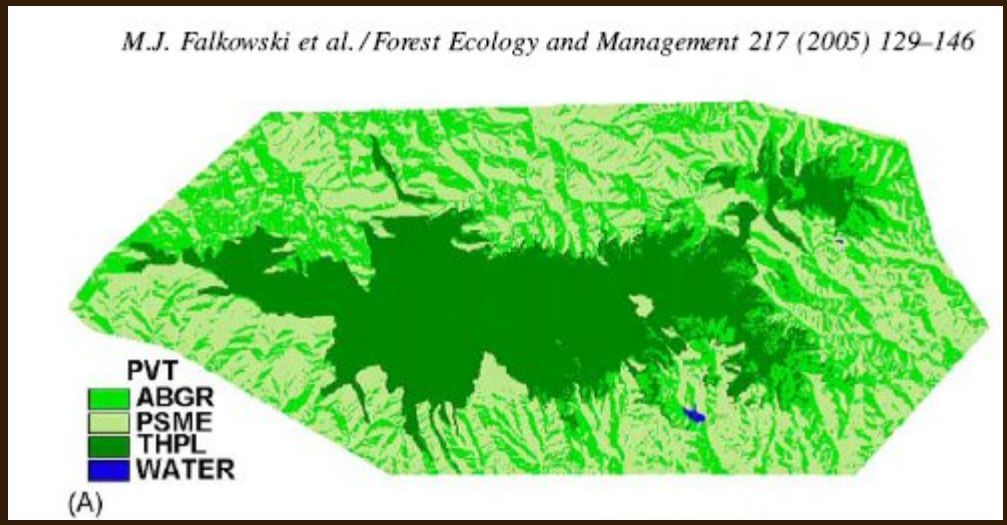




Geospatial Available Data

- Define soil-site characteristics.
- Improve soil conservation activities
- Enhance forest health and productivity for the major conifer species





Work Plan:

July to December 2008

- Develop geospatial data layers
- Integrate site productivity data
- Identify sampling gaps
- Install new screening trials
- Soil temp & moisture characterization
- Recruit new graduate student

January to June 2009

- Continue soil characterization
- Complete new screening trials

July to December 2009

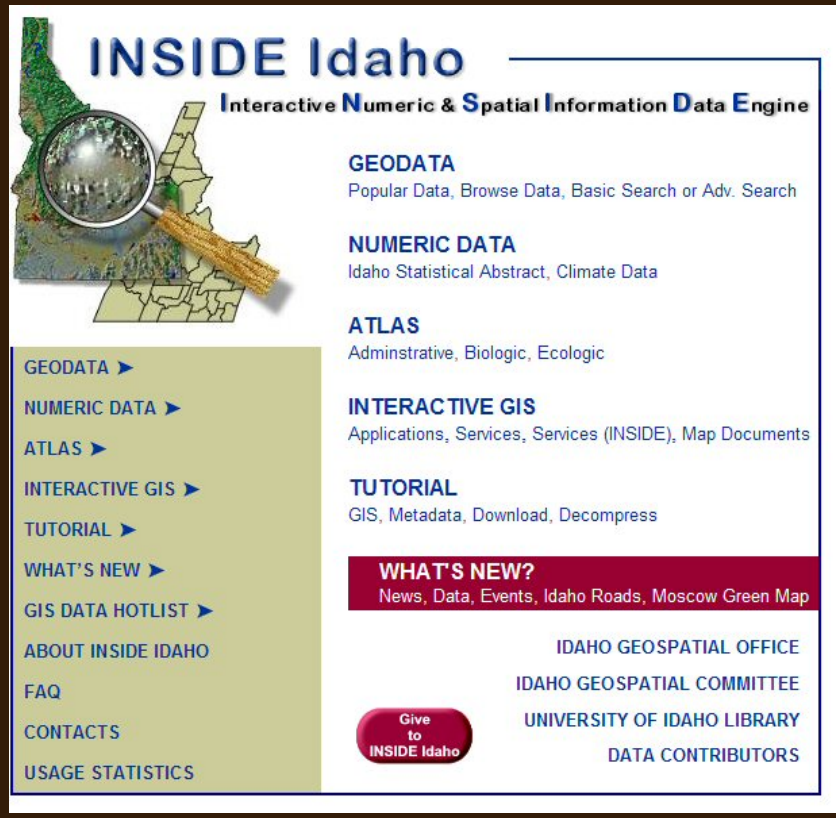
- Measure growth response and foliar nutrients
- Complete data collection from 2008 trial
- Analyze plot data for further soil characterization

January to June 2010

- Final report
- Conduct field tours
- Present ongoing results

July to December 2010 –

- Refine site type
- Enhance site type classification



January to June 2011 –

- Analyze and report all results
- Complete PhD thesis
- Publish maps & datasets; web access via INSIDE
- Present to regional constituents
- Conduct field tours
- Plan new research

http://cain.ice.ucdavis.edu/repository/SbSoil/S25.jpg