INTERMOUNTAIN FORESTRY COOPERATIVE

PROGRAM OVERVIEW AND OBJECTIVES

Mark Coleman

IFC Director

University of Idaho
Intermountain Forestry Cooperative

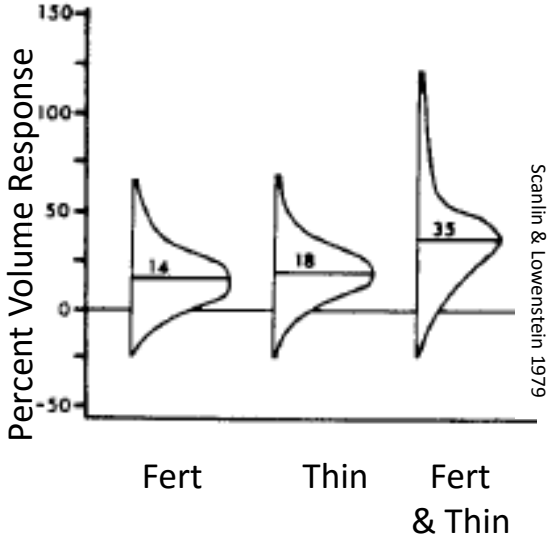
IFC Origins: Lowenstein and Pitkin

Loewenstein, H., Pitkin, F.H., 1963. Responses of grand fir and western white pine to fertilizer applications. Northwest Sci. 37, 23-30.

Loewenstein, H., Pitkin, F.H., 1971. Growth response and nutrient relations of fertilized and unfertilized grand fir. College of Forestry, Wildlife and Range Sciences, Univ, Idaho, p16.

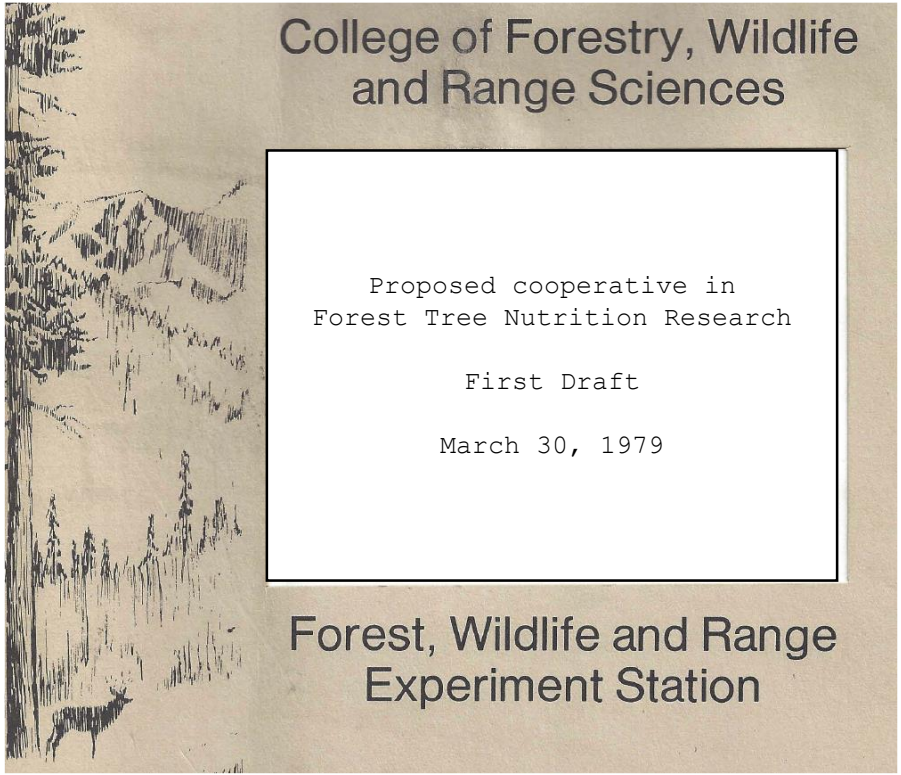
Scanlin, D.C., Loewenstein, H., 1979. Response of inland Douglas-fir and grand fir to thinning and nitrogen fertilization in northern Idaho. In: Gessel, S.P., Kenady, R.M., Atkinson, W.A. (Eds.), Proceedings, Forest Fertilization Conference, Alderbrook Inn, Univ.Wash, Seattle, WA, pp 82-88.

Loewenstein & Pitkin 1971



Scanlin & Lowenstein 1979

IFTNC established 1980



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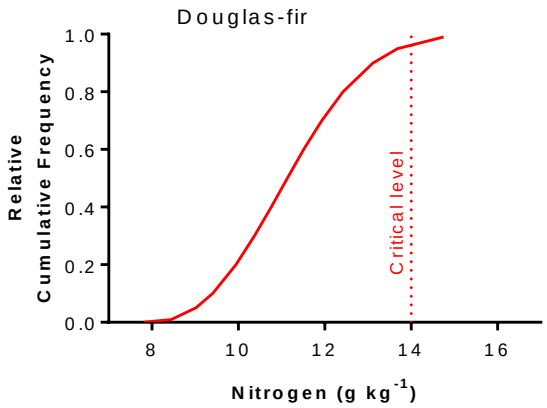
Distribution IFTNC Test Sites, 1980-1982

94 installations in six INW regions

Geographic Region	Installations
Northern Idaho	19
Central Idaho	14
Montana	16
Northeast Washington	17
Central Washington	19
Northeast Oregon	9

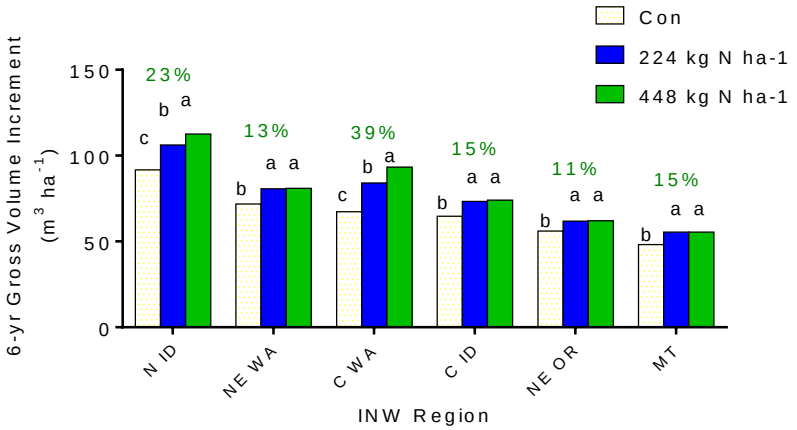
Douglas-Fir Regional N Fertilization Study

Nitrogen frequently limits INW forests



Common N deficiency

foliage N concentration below critical level



Forests typically respond to N fertilization

Moore, Mika and Vander Ploeg 1991. WJAF. 6:94

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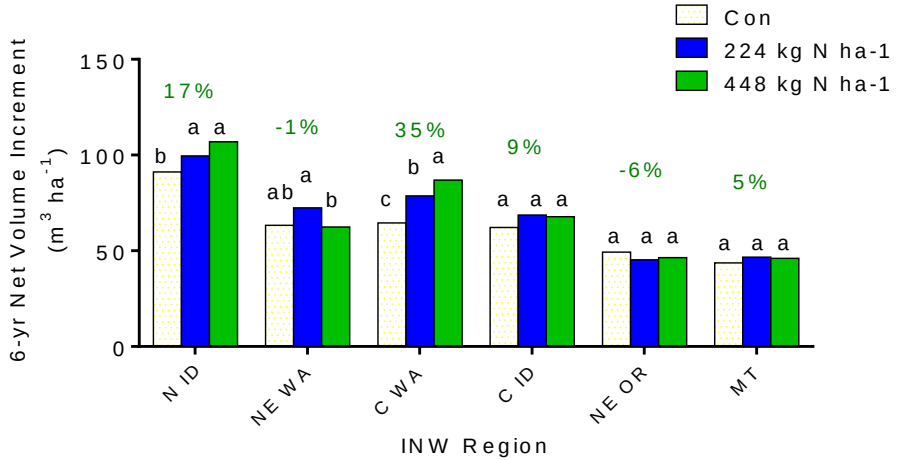
Douglas-Fir Regional N Fertilization Study

N fertilization increases mortality



- Lower net volume responses indicates considerable mortality
- Mortality response is lowest in regions with greatest growth response
- Something besides N is limiting growth: moisture, other nutrients

Moore, Mika and Vander Ploeg 1991. WJAF. 6:94

IFTNC established

1980s | 1990s | 2000s | IFC transition 2010s | 2020s

Projects

- DF Regional N Fertilization Study
- Forest Health Study
- Nutrient Management Study
- Site-Type Initiative
- ?
- Ponderosa Pine study
- Seedling Establishment Study

Outcomes

- Nitrogen deficiency
- Fertilizer response
- Nutrient imbalance (NxK)
- Regional variation in response

Mika & Moore1991. Water Air Soil Pollution 54:477

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Outcomes

- Tested parent material classes
- Tested multiple nutrients
- Co-limited by moisture
- Pest susceptibility

Garrison-Johnston et al 2005. PSW-GTR-198:123

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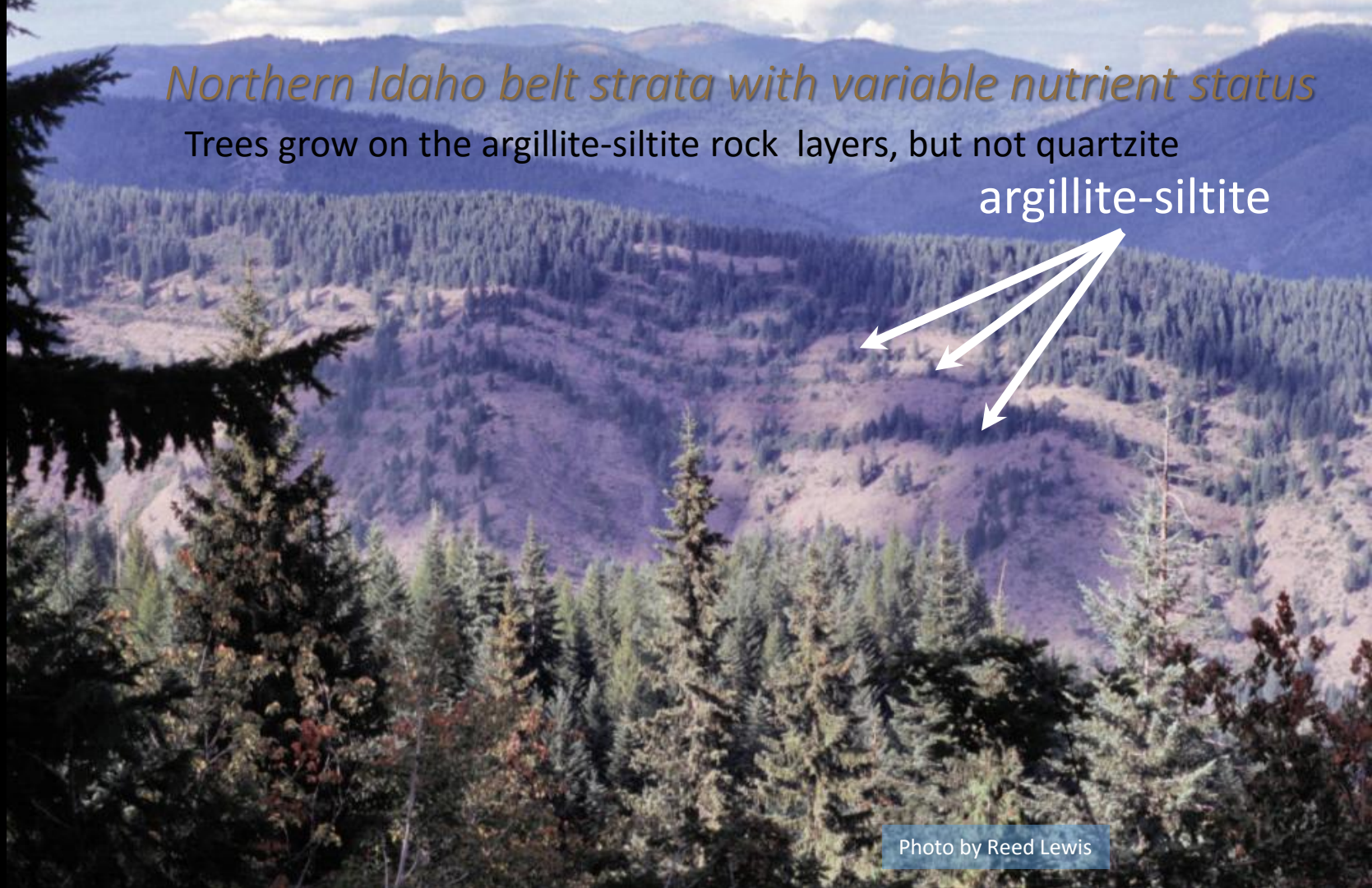
Lacking stands on some site types

Parent Material	Vegetation Series: Douglas-Fir	Grand Fir	Western Red Cedar/ Western Hemlock
Granitic	3	4	2
Basaltic	3	3	3
Metamorphic	0	1	3
Mixed (glacial and alluvial deposits)	2	3	4

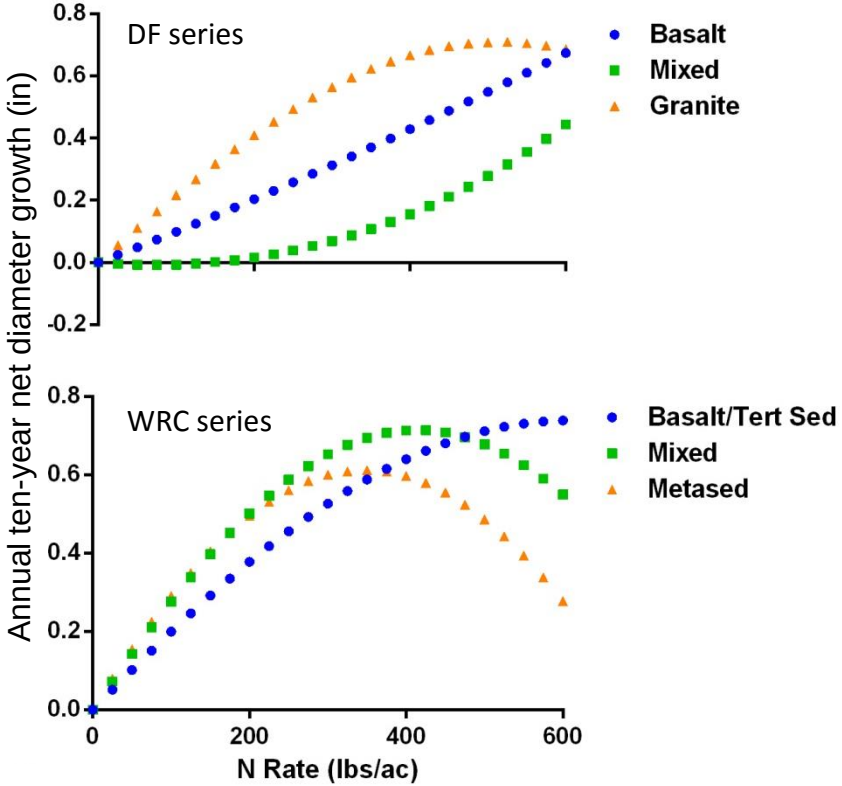
Shaw, Coleman, Kimsey, and Mika. 2014. Intermountain Forest Tree Nutrition Cooperative. Technical Document.


Northern Idaho belt strata with variable nutrient status
Trees grow on the argillite-siltite rock layers, but not quartzite
argillite-siltite
Photo by Reed Lewis

Forest Health & Nutrition Study

Growth response varies among rock type & vegetation series

- Sites supply variable growth resources that also interact with nitrogen nutrition



Shaw et al. 2014. IFTNC. Technical Document.

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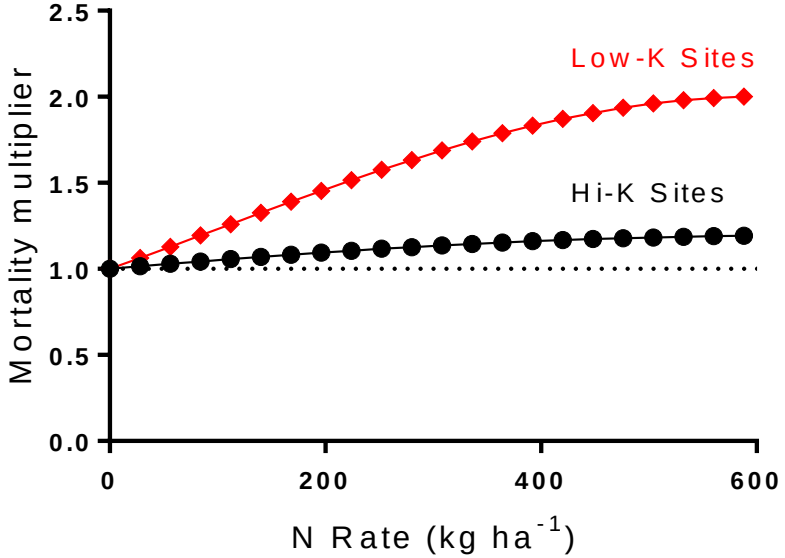
Mortality response depends on initial K status



- Decrease the risk of N-induced mortality by selecting sites with adequate K supply
- Avoid heavily weathered Belt Series metamorphic rocks

Shaw et al. 2014. IFTNC. Technical Document.

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Outcomes

- Missing stands from some site types
- Parent material & veg. series effects
- Fertilizer response period
- Species effects

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Low-risk, cost-effective, late-rotation fertilization

Forest fertilization opportunities

Return on Investment (ROI)	**122%**
Internal Rate of Return (IRR)	**8%**

- Important potential returns from fertilizing forests
- However, it is important to:
  - Recognize which sites to fertilize
  - Time the harvest to capture investment in fertilizer

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Outcomes

- Seedlings don't respond to site amendments
- Value of nursery nutrition
- Effectiveness of vegetation control
- Deficiencies occur at crown closure

Xiao et al 2003 IFTNC Technical Report

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Nutrient Management Study

Harvest impacts on future forest productivity

Basalt; high site

Quartzite; low site

X

Bole Only, High Slash

Whole Tree, Low Slash

X

Vegetation control

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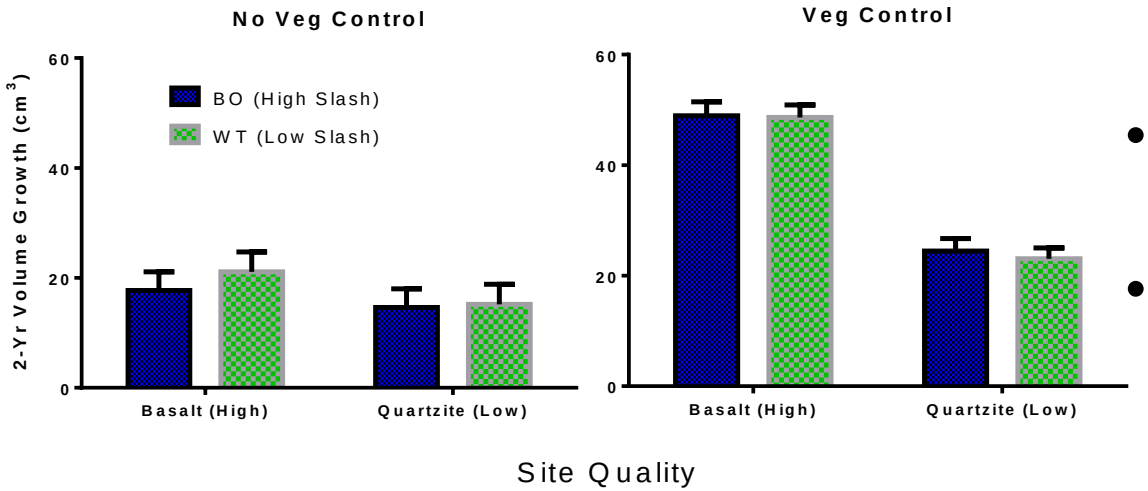
Nutrient Management Study

Two-year volume growth



- Few slash retention effects
- Differences between parent material
- Strong herbicide effects that vary by parent material

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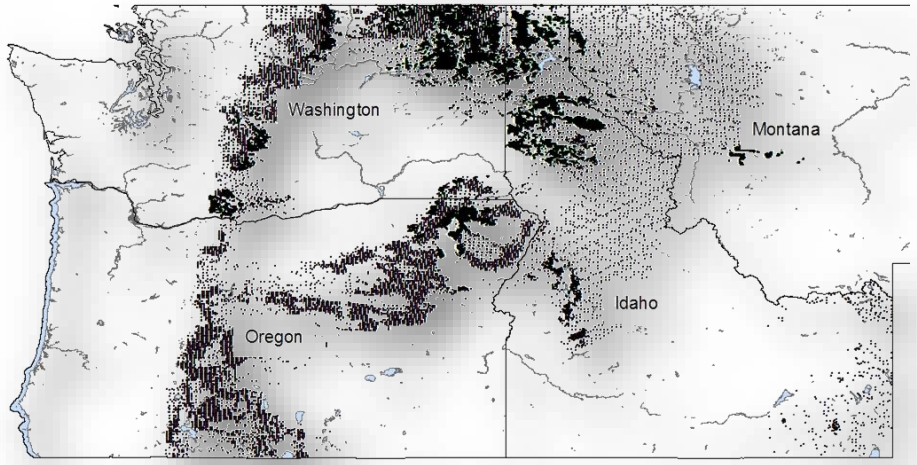
Outcomes

- Site quality affects seedling growth
- Herbicide x site effects
- Soil disturbance monitoring
- Slash seasoning to needle drop

Data assembly

Site Type Initiative

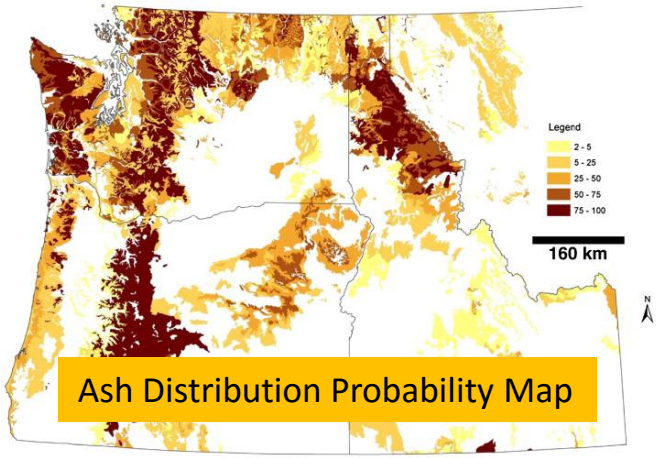
Stand inventory



Dataset:
>110,000 plots
4+ million trees
28 tree species

Cooperator Data Suppliers:
Bennett Lumber, BLM, Forest Capital, Hancock, IDL, Inland Empire Paper, Stimson, USFS-FIA/CVS, WA DNR

Geospatial site information



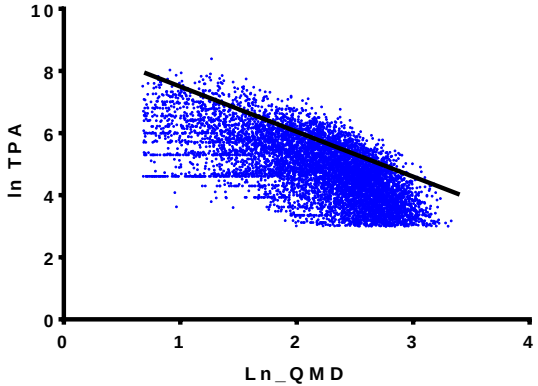
Ash Distribution Probability Map

Associated Input:
Sand/tree level, climate, geology, topography

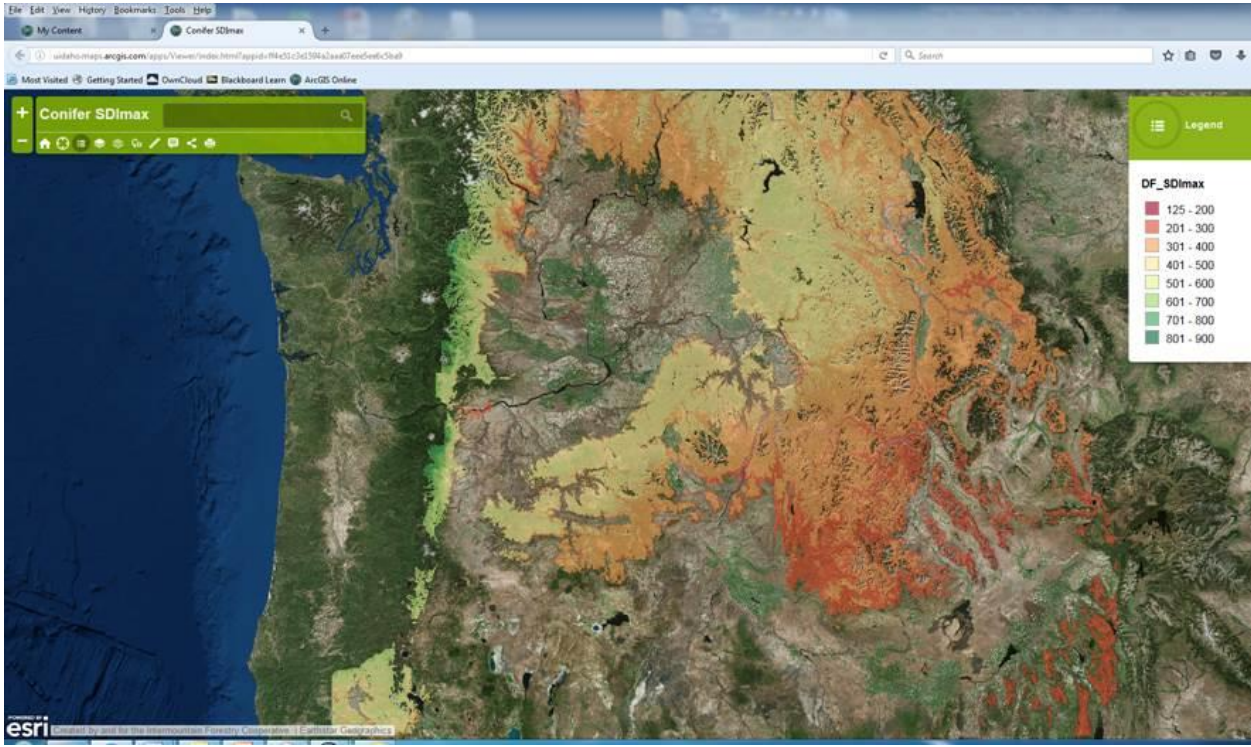
Data analysis and modeling

Site Type Initiative

Stochastic Frontier Regression

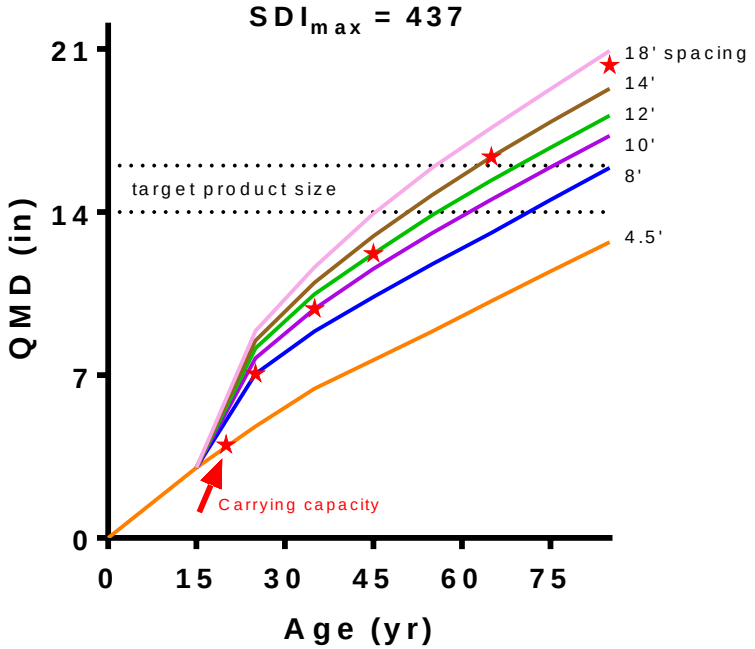


Site-specific stocking guidelines



Thinning prescriptions for highest stand vigor

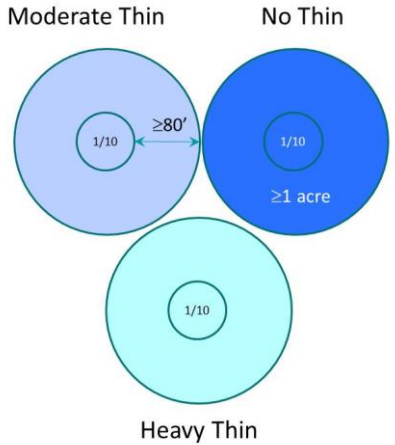
Site Type Initiative

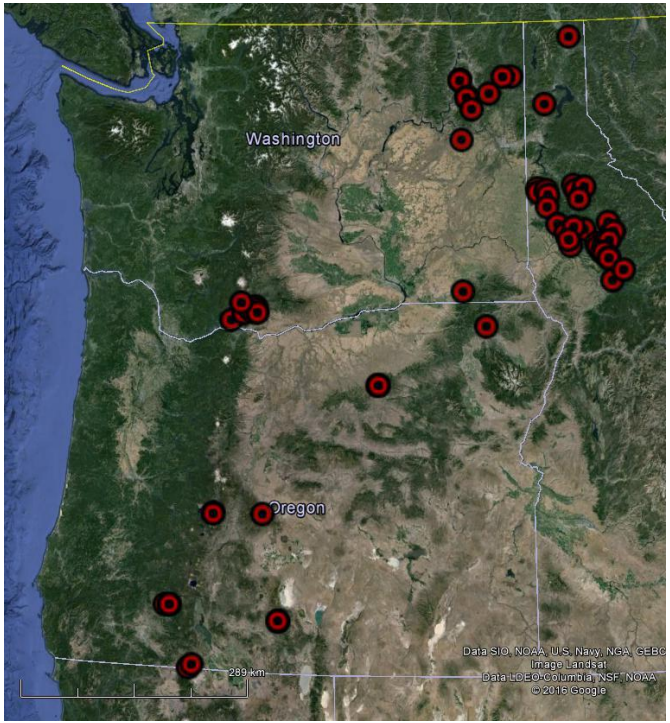


Paired-Plot Density Management project

Site Type Initiative

Regional-scale testing of thinning effects





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Outcomes

- Data assembly
- Modeling and validation
- Paired plot density trials
- Site productivity layers

IFTNC established

IFC transition

1980s 1990s 2000s 2010s 2020s

Projects

DF Regional N Fertilization Study

Forest Health Study

Nutrient Management Study

Site-Type Initiative

?

Ponderosa Pine study

Seedling Establishment Study

Add-on and spin-off studies

Screening trials

Herbicide trials

Post harvest fertilization

Sustainable bioenergy

Thinning studies

Operational fertilization

Orchard protection

Endophyte selection

Volcanic ash

Thinning and growth resources

Geospatial analysis

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Future directions

- Site x genotype interactions
- Fire rehabilitation
- Vegetation control
- Maximum productivity

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Value to IFC members

Research capacity and support

Provide research capabilities

- Required for certification
- Addresses organization-specific management questions
- Cost-effective and nimble

Maintain independence

- Provide documentation for planning process
- Liaison between managers and critics

University support

- Contract administration
- Library access
- Interdisciplinary academic connections

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References

Garrison-Johnston, M.T., Shaw, T.M., Mika, P.G., Johnson, L.R., 2005. Management of Ponderosa Pine Nutrition Through Fertilization. In: Ritchie, et al (Eds.), Proceedings of the Symposium on Ponderosa Pine: Issues, Trends, and Management, October 18 - 21, 2004, Klamath Falls, Oregon, PSW-GTR-198. pp. 123-143.

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Shaw, T., M. Coleman, M. Kimsey, and P. Mika. 2014. Forest health and nutrition study ten-year growth, mortality and foliar nutrition. Intermountain Forest Tree Nutrition Cooperative. Technical Document. University of Idaho, Moscow. 122 p. (IFC Member access only)

Shaw, T. 2015 Site Type Initiative Phase 2 progress report: Second year paired plot density management trials. IFTNC Annual Meeting presentation. http://digital.lib.uidaho.edu/cdm/ref/collection/iftnc/id/3530

Shaw, T. 2015 Management effects project update: Multi-year seedling response to slash loading and vegetation control. IFTNC Annual Meeting presentation. http://digital.lib.uidaho.edu/cdm/ref/collection/iftnc/id/3533

Xiao, Y., Moore, J., Shaw, T., 2003. Growth Responses of Four Conifer Species to Fertilizer and Herbicide. In. Intermountain Forest Tree Nutrition Cooperative, , University of Idaho, Moscow, ID, p. 42. & p. 65.