INTERMOUNTAIN FORESTRY COOPERATIVE

PROGRAM OVERVIEW AND OBJECTIVES

Mark Coleman
IFC Director


Proposed cooperative in Forest Tree Nutrition Research

First Draft

March 30, 1979
Distribution IFTNC Test Sites, 1980-1982

94 installations in six INW regions

<table>
<thead>
<tr>
<th>Geographic Region</th>
<th>Installations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Idaho</td>
<td>19</td>
</tr>
<tr>
<td>Central Idaho</td>
<td>14</td>
</tr>
<tr>
<td>Montana</td>
<td>16</td>
</tr>
<tr>
<td>Northeast Washington</td>
<td>17</td>
</tr>
<tr>
<td>Central Washington</td>
<td>19</td>
</tr>
<tr>
<td>Northeast Oregon</td>
<td>9</td>
</tr>
</tbody>
</table>
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
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
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

<table>
<thead>
<tr>
<th>Projects</th>
<th>1980s</th>
<th>1990s</th>
<th>2000s</th>
<th>2010s</th>
<th>2020s</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF Regional N</td>
<td>Forest Health Study</td>
<td>Nutrient Management Study</td>
<td>Site-Type Initiative</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>Fertilization Study</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ponderosa Pine study</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seedling Establishment Study</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Outcomes**

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

Lacking stands on some site types

<table>
<thead>
<tr>
<th>Parent Material</th>
<th>Vegetation Series</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Douglas-Fir</td>
<td>Grand Fir</td>
<td>Western Red Cedar/ Western Hemlock</td>
<td></td>
</tr>
<tr>
<td>Granitic</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Basaltic</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Metamorphic</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Mixed (glacial and alluvial deposits)</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Northern Idaho belt strata with variable nutrient status

Trees grow on the argillite-siltite rock layers, but not quartzite
Growth response varies among rock type & vegetation series

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

Forest Health & Nutrition Study

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

Projects

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

Outcomes

- Missing stands from some site types
- Parent material & veg. series effects
- Fertilizer response period
- Species effects
Low-risk, cost-effective, late-rotation fertilization

Forest fertilization opportunities

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

<table>
<thead>
<tr>
<th>Return on Investment (ROI)</th>
<th>122%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Rate of Return (IRR)</td>
<td>8%</td>
</tr>
</tbody>
</table>
Projects

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

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
Nutrient Management Study

Harvest impacts on future forest productivity

Basalt; high site  Quartzite; low site  Bole Only, High Slash  Whole Tree, Low Slash

Vegetation control

University of Idaho
Intermountain Forestry Cooperative
Nutrient Management Study

Two-year volume growth

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

Shaw 2015 IFTNC Meeting Presentation
Projects

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

Outcomes

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

IFTNC established
1980s
1990s
2000s
IFC transition
2010s
2020s

Garrison-Johnston 2009 IFTNC Annual Meeting presentation
Data assembly

Site Type Initiative

**Stand inventory**

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

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

**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**

Kimsey 2014 IFTNC Meeting Presentation
Data analysis and modeling

Site Type Initiative

Stochastic Frontier Regression

Site-specific stocking guidelines
Thinning prescriptions for highest stand vigor

Site Type Initiative

\[ \text{SDI}_{\text{max}} = 437 \]

Age (yr)

QMD (in)

0 15 30 45 60 75

0

7

14

21

18' spacing
14'
12'
10'
8'
4.5'

Carrying capacity

Target product size
Paired-Plot Density Management project

Site Type Initiative

Regional-scale testing of thinning effects
Projects

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

Outcomes

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

University of Idaho

Intermountain Forestry Cooperative
<table>
<thead>
<tr>
<th>Projects</th>
<th>1980s</th>
<th>1990s</th>
<th>2000s</th>
<th>IFC transition</th>
<th>2020s</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF Regional N Fertilization Study</td>
<td>Forest Health Study</td>
<td>Nutrient Management Study</td>
<td>Site-Type Initiative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ponderosa Pine study</td>
<td>Seedling Establishment Study</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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
Future directions

- Site x genotype interactions
- Fire rehabilitation
- Vegetation control
- Maximum productivity
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
INTERMOUNTAIN FORESTRY COOPERATIVE

Projects

- DF Regional N Fertilization Study
- Forest Health Study
- Nutrient Management Study
- Site-Type Initiative
- ?

Timeline:
- IFTNC established in 1980s
- Ponderosa Pine study
- Seedling Establishment Study
- Fertilization Study
- Forest Health Study
- Nutrient Management Study
- Site-Type Initiative
- IFC transition
- 2020s?
References


