

# **Nutrition Effects on Future Forest Productivity The Nutrient Management Study**



**Canus**



**Lovell Valley**



**Ruby Bugs**

**Intermountain Forest Tree Nutrition Cooperative**

**Terry M. Shaw**

# Nutrition Effects on Future Forest Productivity

## Background

Began 1998-2000 - IFTNC **Nutrient Budget Model**

IFTNC developed a three phase **Nutrient Management** experimental design on the effects of nutrient removal on future forest productivity.

**Phase I** – Retrospective Studies – X-Forest, Coram and Bertha Hill

- Findings – Gained important information and insight, but results varied and were inconclusive.

**Phase II** – Harvest Studies – 2007 Scared Turkey, UI Experimental Forest, and Rye on Ham

- Findings – Gained more important information and insight, in progress.

**Phase III** – Harvest by Site Quality Studies–Canus, Lovell Valley, and Ruby Bugs

- IFTNC Site Type Research – “Good Rock vs Bad Rock”
- Other Studies - Harvest effects on long term productivity may be dependent on site type

# Nutrient Management - Harvest by Site Quality

## Objective

To evaluate the effects of forest management operations and develop guidelines on forest nutrient status and forest productivity by various site types.



# Nutrient Management – Harvest by Site Quality

## Design

### Harvest Treatments

**Bole Only or Whole Tree – Either nutrient biomass retention or removal**

### Site Selection

**“Good Rock (Basalt) or Bad Rock (Quartzite)”- Either good or poor nutrient productivity – 6 sites total (3 on good and 3 on bad)**

**Adequate “moist” soil moisture (Xeric-Frigid, Dry Grand Fir)**



# Nutrient Management – Harvest by Site Quality

## Pre-Harvest Site Assessment

### Stand Mensurational and Nutrient Biomass Characteristics

- Species Composition, Density, Volume, Site Index,
- Overstory Biomass and Nutrient Content

### Down Woody Nutrient Biomass and Forest Floor Estimates

### Soil Nutrient Status and Profile Description



# Nutrient Management – Harvest by Site Quality

## Site and Stand Characteristics

<b>Site</b>	<b><u>Region</u> Ownership</b>	<b>Site Index</b>	<b>Rock Type</b>	<b>Site Height</b>	<b>QMD</b>
<b>Canus</b>	<b><u>N.E. Oregon</u> Forest Capital</b>	<b>73</b>	<b>Ash/Loess/Basalt</b>	<b>86</b>	<b>11.9</b>
<b>Lovell Valley</b>	<b><u>N. Idaho</u> Idaho Dept. of Lands</b>	<b>77</b>	<b>Loess/Quartzite</b>	<b>68</b>	<b>11.6</b>
<b>Ruby Bugs</b>	<b><u>N. Idaho</u> Potlatch</b>	<b>69</b>	<b>Loess/Ash/Quartzite</b>	<b>80</b>	<b>13.2</b>

# Nutrient Management – Harvest by Site Quality

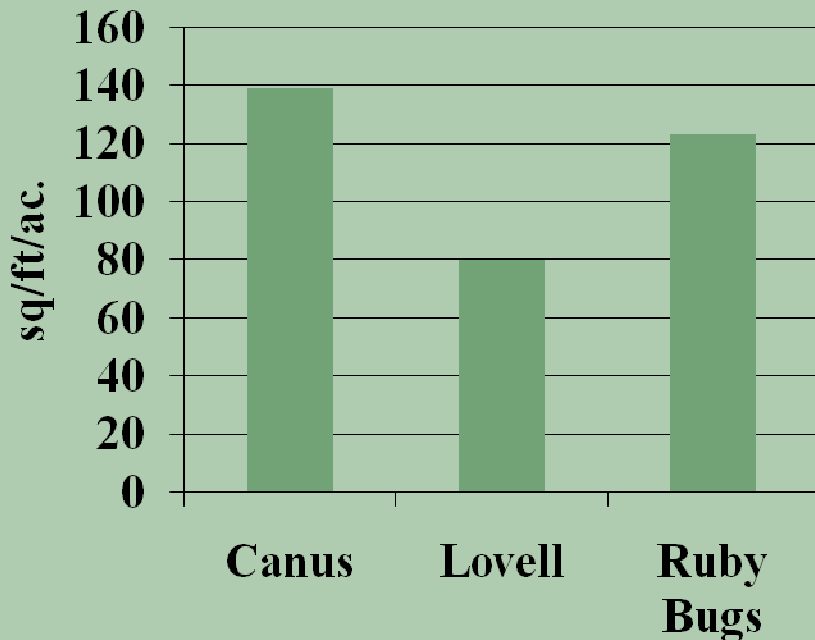
## Stand Species Composition (% Basal Area)

<b>SITE</b>	<b>DF</b>	<b>GF</b>	<b>WL</b>	<b>PP</b>	<b>LP</b>
<b>Canus</b>	<b>34</b>	<b>56</b>	<b>9</b>	<b>1</b>	<b>-</b>
<b>Lovell Valley</b>	<b>37</b>	<b>40</b>	<b>12</b>	<b>11</b>	<b>-</b>
<b>Ruby Bugs</b>	<b>67</b>	<b>4</b>	<b>-</b>	<b>12</b>	<b>17</b>

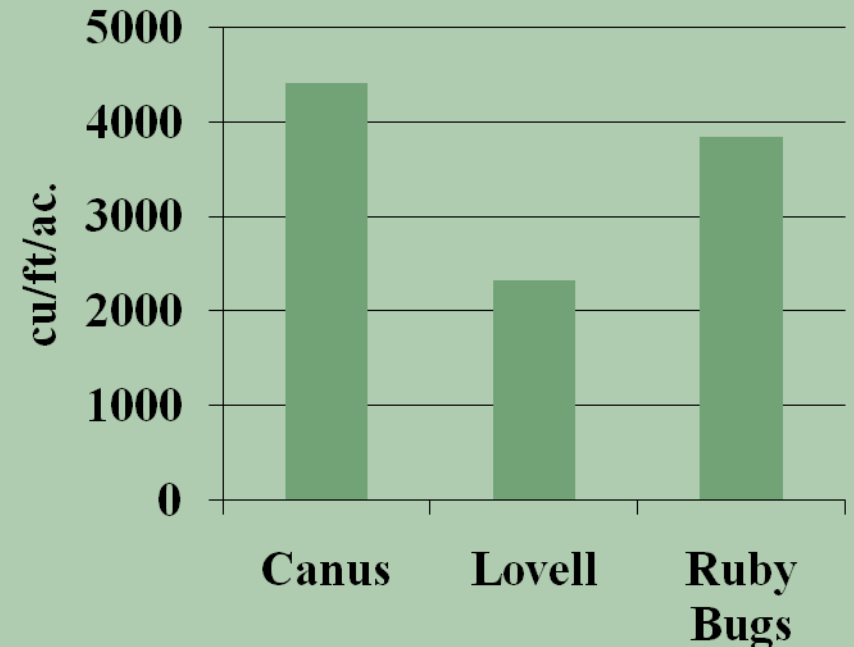
# Nutrient Management – Harvest by Site Quality

## Stand Characteristics

### Basal Area by Site



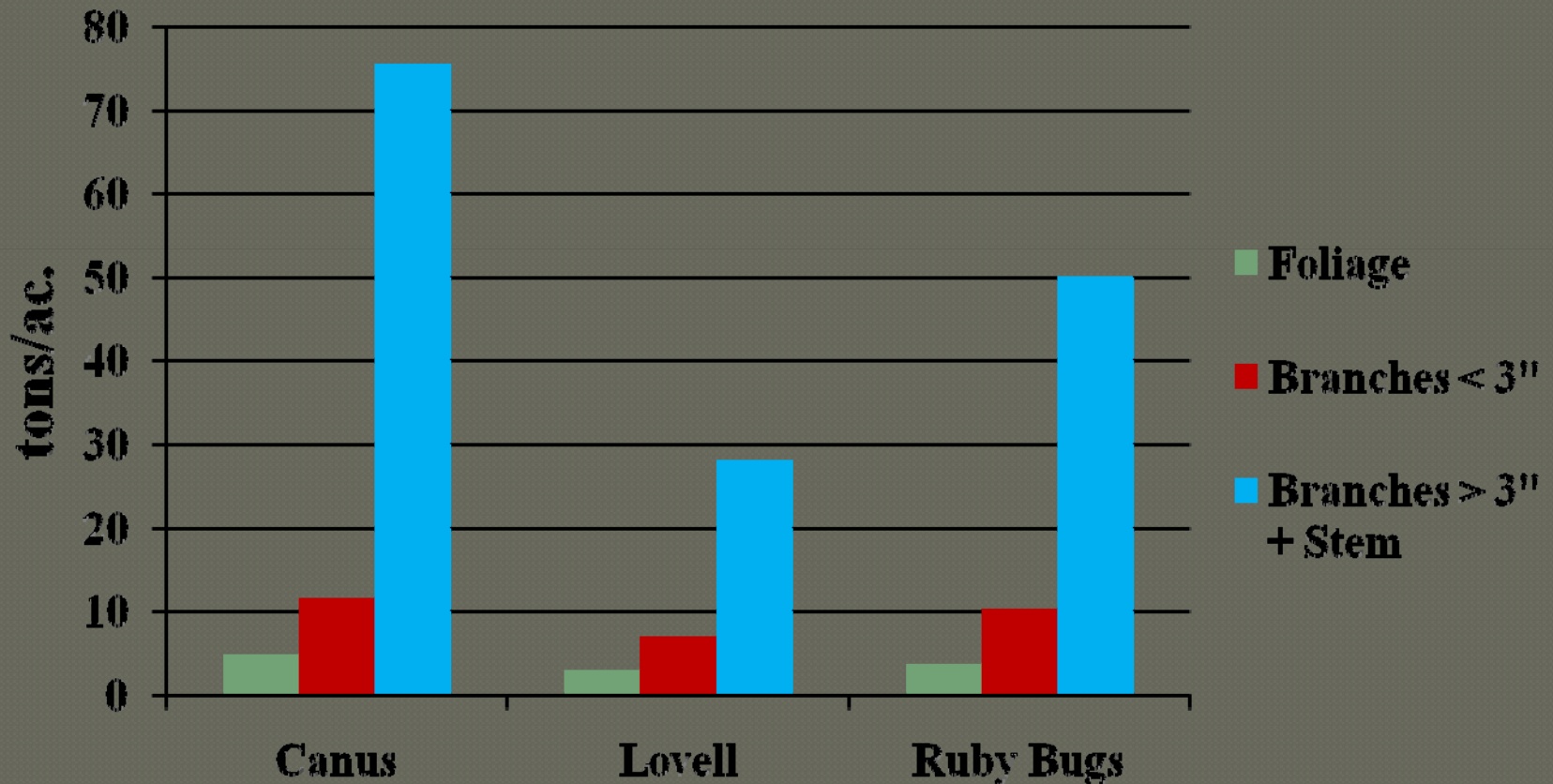
### Cubic Volume by Site





# Nutrient Management – Harvest by Site Quality

## FVS Projected Standing Live Biomass



# Nutrient Management – Harvest by Site Quality

## Harvest Systems



**Canus & Ruby**



**Lovell**



**Canus & Ruby**



**Ruby**



**Lovell**

# Nutrient Management – Harvest by Site Quality

## Post Harvest Treatment Site Assessment

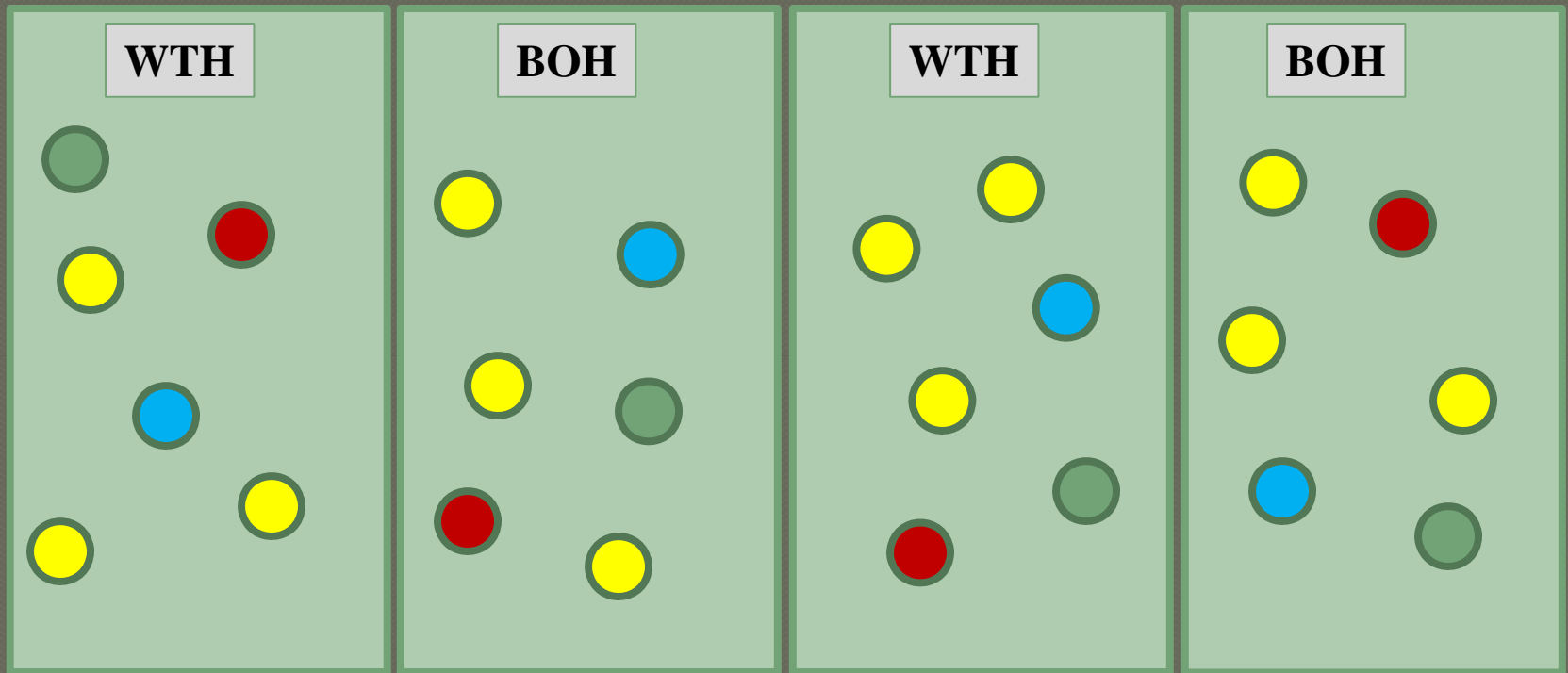
**Coarse Woody Debris (CWD) Nutrient Biomass Retention  
Estimates**





**Forest Floor and Soil Disturbance Evaluations**

**Surface Soil Nutrient Chemistry and Fluxes**



# Nutrient Management – Harvest by Site Quality



-  Core Biomass
-  Core Biomass w/ Veg. Control
-  Low Biomass
-  Low Biomass w/ Veg. Control

## Harvest Treatment

Whole-Tree (WTH)

Bole-Only (BOH)

# Nutrient Management – Harvest by Site Quality



Whole-Tree



Bole-Only



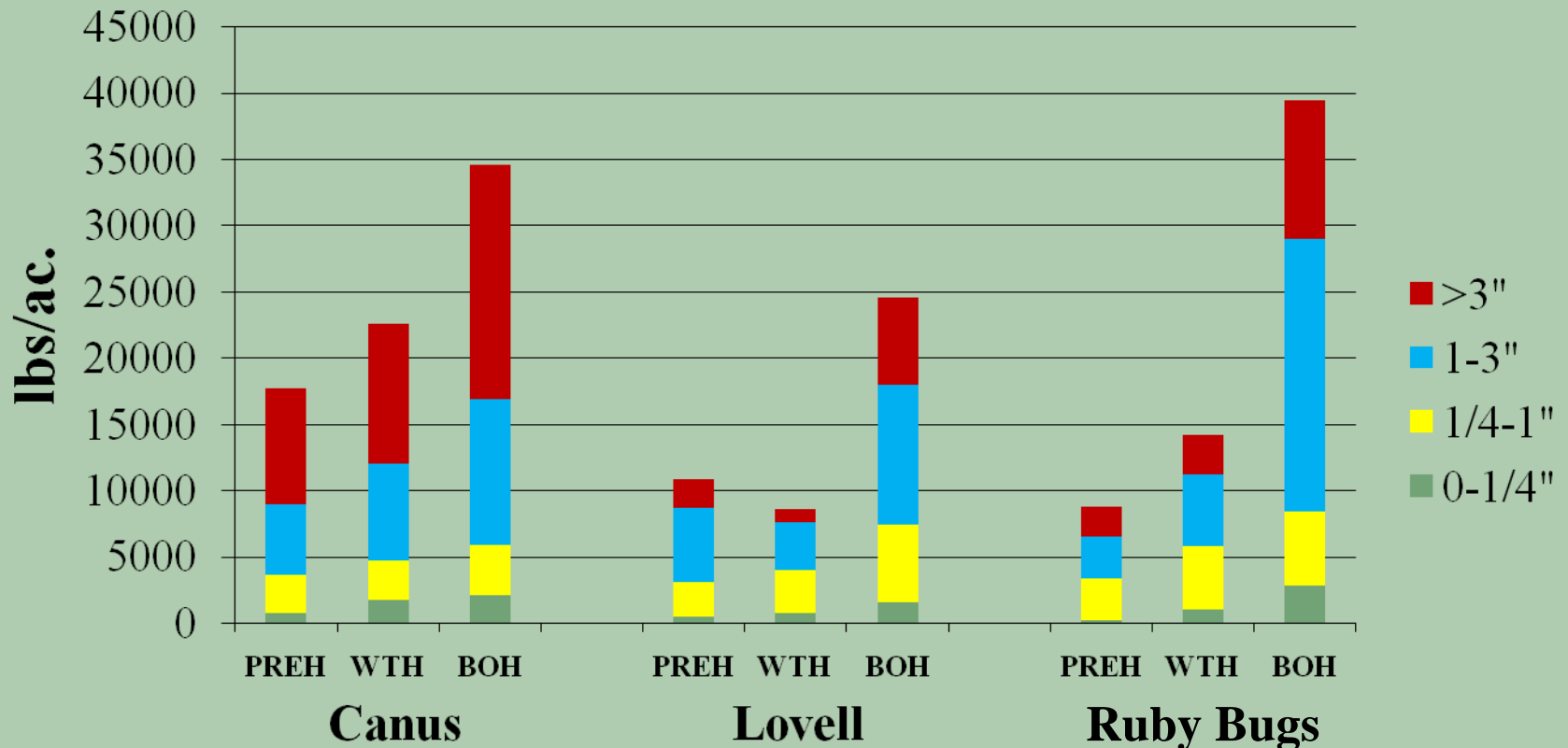
Low Biomass



Residual Slash

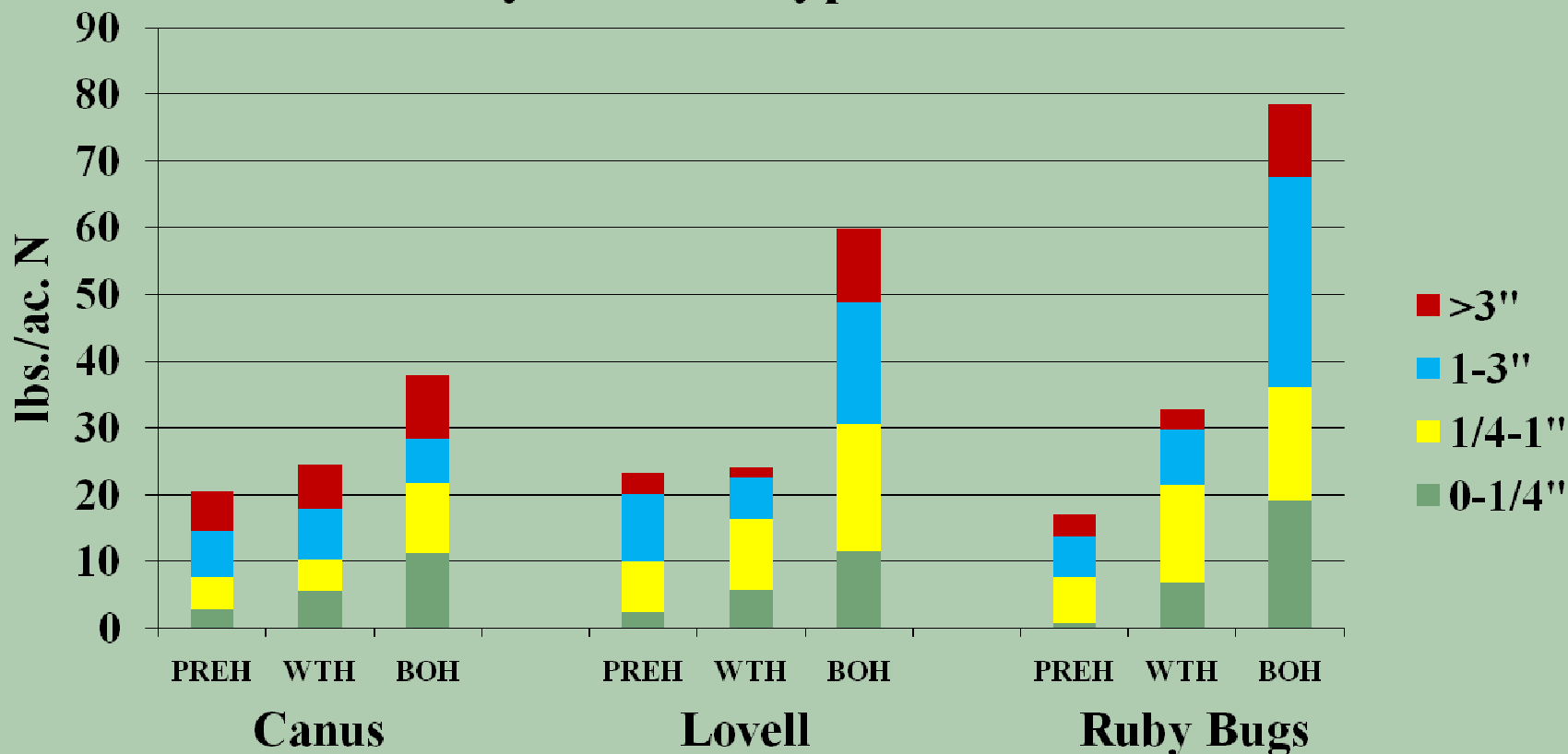
# Nutrient Management – Harvest by Site Quality

## CWD Biomass Retention By Harvest Type and Site



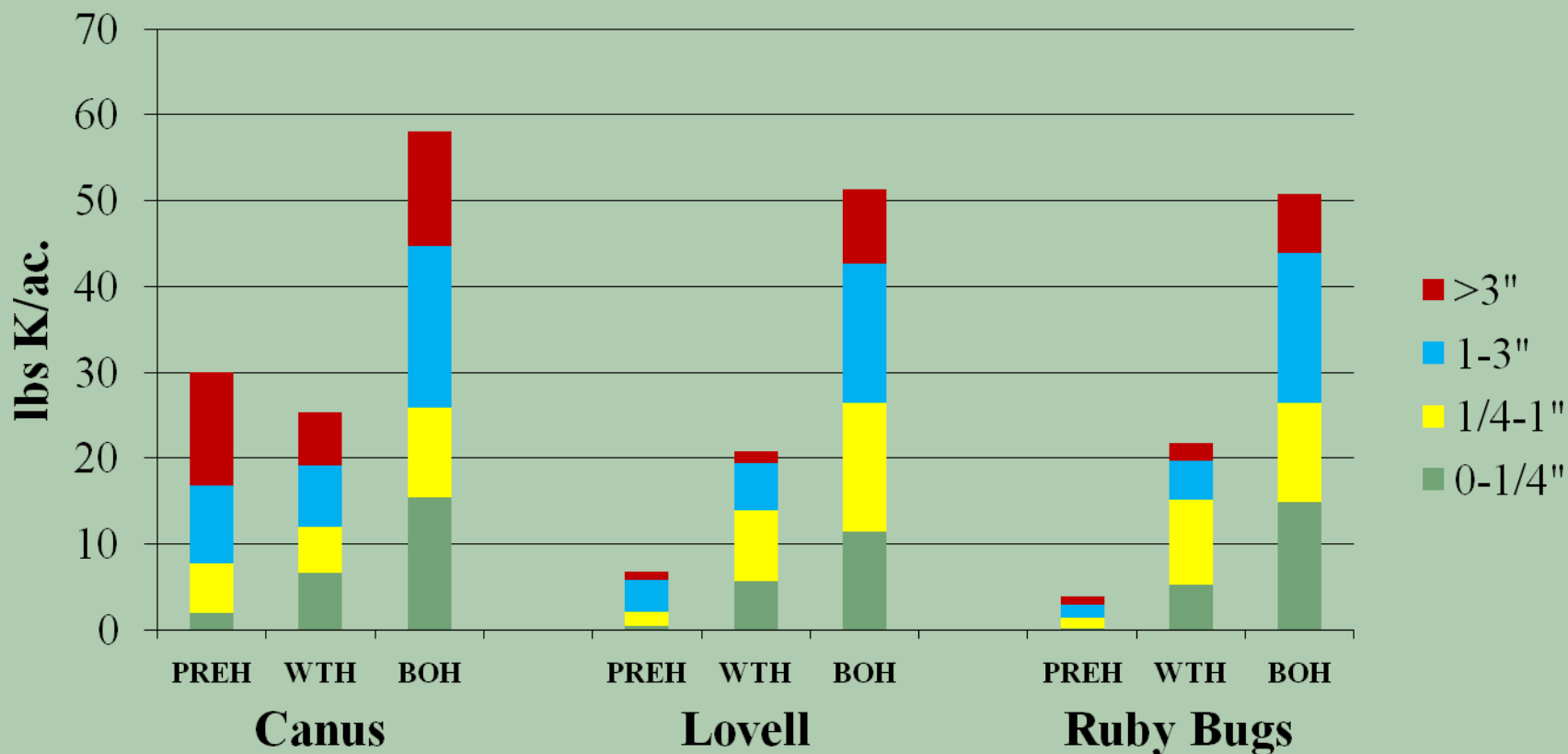
# Nutrient Management – Harvest by Site Quality

## CWD Nitrogen Retention By Harvest Type and Site



# Nutrient Management – Harvest by Site Quality

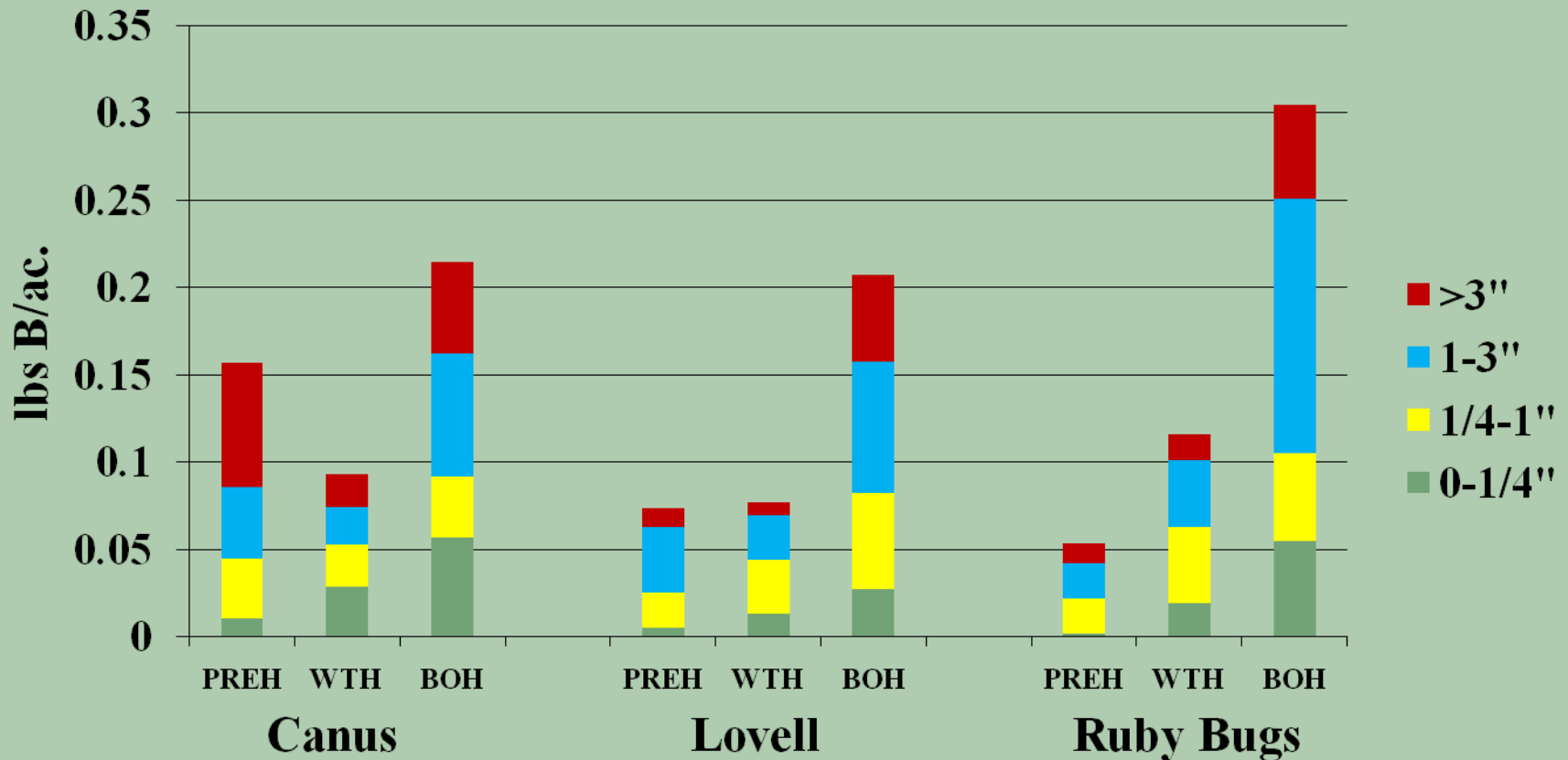
## CWD Potassium Retention By Harvest Type and Site





# Nutrient Management – Harvest by Site Quality

## CWD Boron Retention By Harvest Type and Site



# Nutrient Management – Harvest by Site Quality

**Stand Foliage Nitrogen by Site**  
Based on FVS Biomass Projections and Upper Crown  
Current Foliar Concentrations



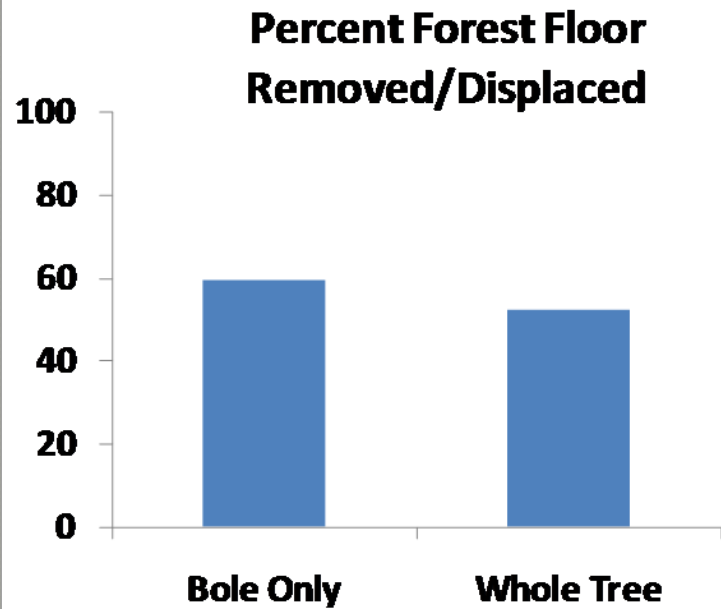
# Nutrient Management – Harvest by Site Quality

**Stand Foliage Boron by Site**  
Based on FVS Biomass Projections and Upper Crown  
Current Foliar Concentrations



# Nutrient Management – Harvest by Site Quality

## Soil Site Disturbance



# Nutrient Management – Harvest by Site Quality

## TIME TABLE AND FUTURE WORK

### Additional Nutrient Management Sites

“Slice Above” – WA DNR – NE WA  
Recon and Boundaries Established  
Sale April 27<sup>th</sup>  
Harvest ? – 2010 or 2011  
Dry Grand Fir – Quartzite

**SITES NEEDED!!!**

**\*\*\*2 Grand fir – Basalt\*\*\***

Spring 2010 - Plant Canus

Summer 2010 Vegetation Control  
Lovell Valley and Ruby Bugs

2010-2011 Pre-select & Establish  
Additional Sites

Spring 2011 - Plant Lovell and Ruby  
Bugs

Assess Long-Term Nutrient and  
Growth Productivity