

# Nutrient Management

Effects on Future Forest Productivity  
Overview & Progress



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# Overview

- ▣ IFTNC core experiment
- ▣ Harvest effects on long-term site productivity
  - ▣ Nutrient Retention & Removal
    - ▣ Bole only vs. Whole Tree
  - ▣ Harvest effects on:
    - ▣ Overstory nutrient retention
    - ▣ Soil nutrient supply
    - ▣ Seedling growth, vigor, mortality
    - ▣ Future volume increments

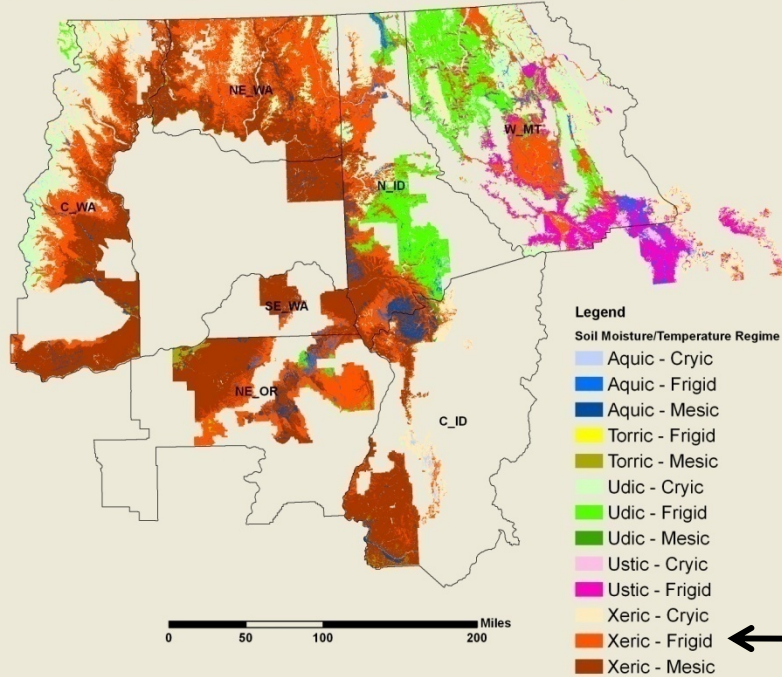


# Site Selection

- ▣ Good Rocks vs. Bad Rocks
  - ▣ Basalt – Quartzite
- ▣ Adequate Site Moisture
  - ▣ ABGR Vegetation Series
  - ▣ LIBO or drier Habitat Type
  - ▣ Soil Moisture – Temperature Regimes used as proxy
    - ▣ Xeric – Frigid

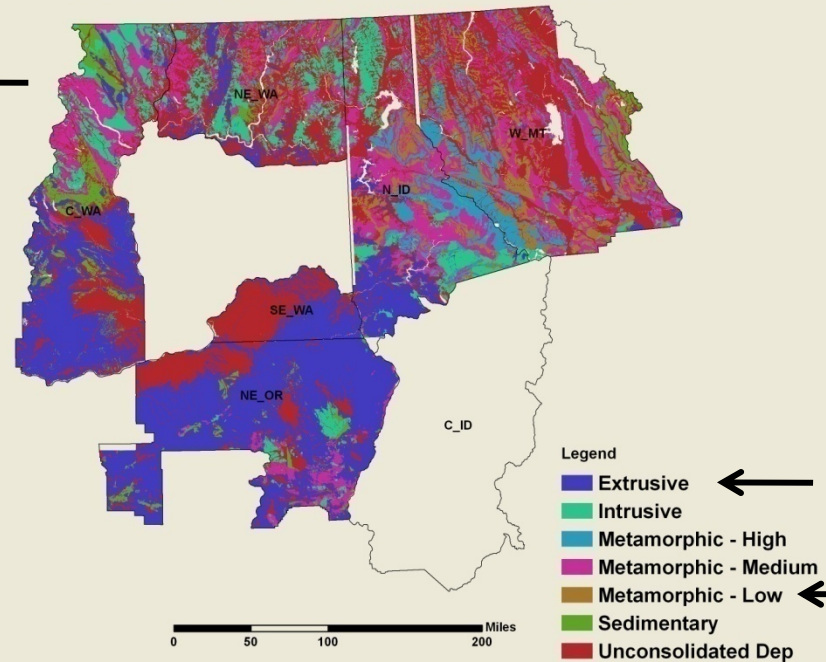


NRCS - IFTNC Soil Moisture-Temperature Regimes Across the Inland Northwest



Intersect geospatial NRCS soil survey and USGS geology layers

USGS - IFTNC Major Rock Types Across the Inland Northwest



Field Site Locations:

- 1) Canus – Forest Capital Basalt
- 2) Lovell Valley – IDL Quartzite



# Site Installation

- ▣ Pre-Harvest Site Characterization
  - ▣ Stand Cruise
    - ▣ Species, DBH, HT, TPA, SI
    - ▣ Fed into the IFTNC FVS-Nutrient Calculator for total overstory biomass and nutrient content
  - ▣ CWD and Forest Floor survey & collection
  - ▣ Soil profile description and collection



# Site Installation

## ▣ Post-Harvest Site Characterization

▣ Harvest Volume estimation



▣ Fresh CWD survey

▣ Soil – Forest Floor disturbance classification



# Long-Term Monitoring

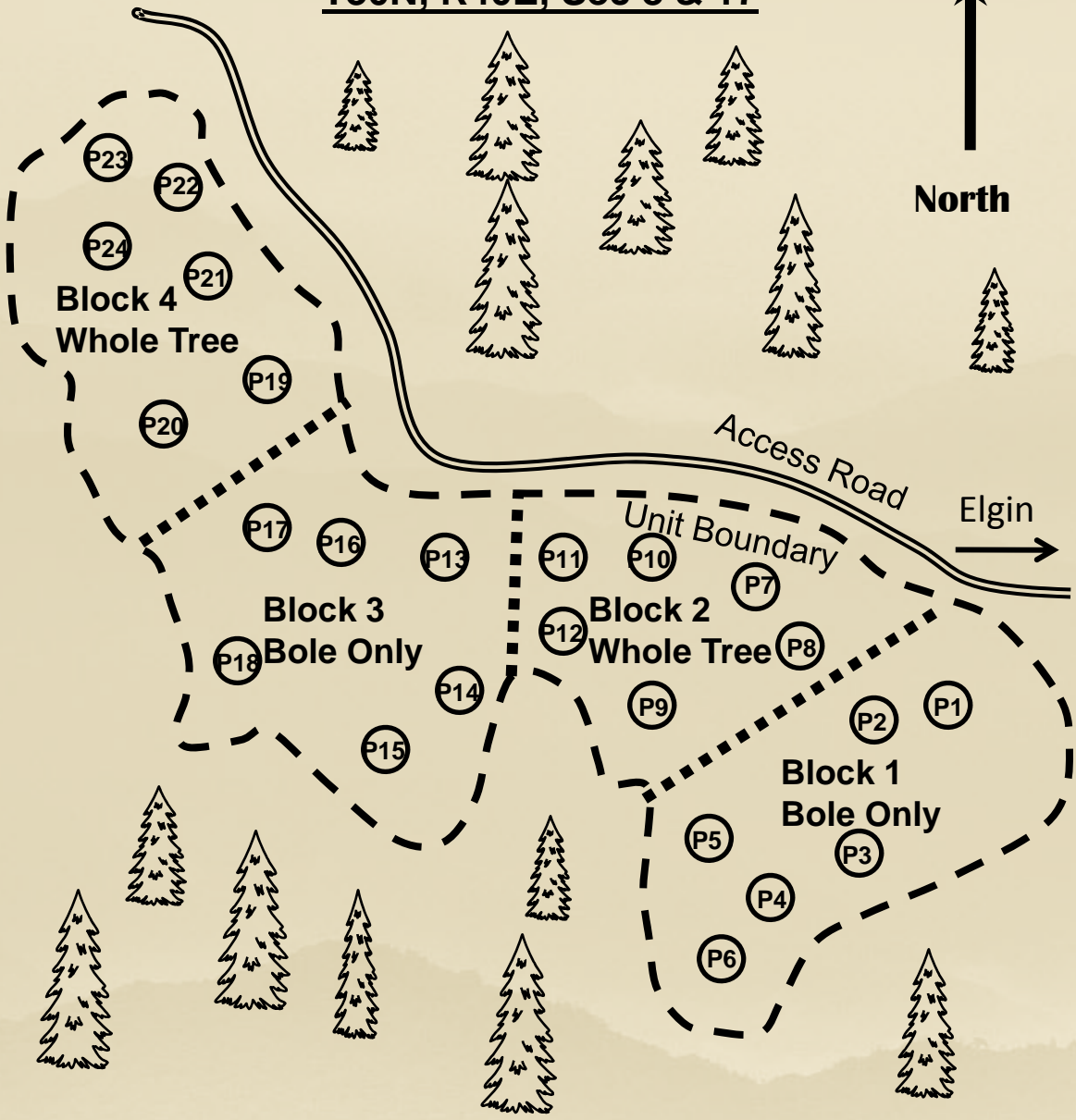
## ■ Permanent Plot Establishment

- 2 blocks per treatment
- 3 – 1/20<sup>th</sup> ac circular plots per block
- Additional 1/20<sup>th</sup> ac plots established per block for cooperator add-on experiments
  - Site prep, weed & feed, biomass utilization
- Douglas-fir selected as common species across field sites
- Plots planted at 400 TPA



# Canus Nutrient Management Research Site

T30N, R40E, Sec 8 & 17





# Long-Term Monitoring

## ▣ Permanent Plot Measures

- ▣ Diameter/Height growth
- ▣ Current year foliar nutrition
- ▣ Surface soil chemistry and nutrient flux
  - ▣ Standard & Ion Exchange Resins
- ▣ Soil – Site climate
  - ▣ 4-hr measures of air/soil temp, precipitation, soil moisture
- ▣ Monitor intervals: 1, 3, 5, 10, 15, 20, 25 yrs



# CANUS Baseline Information

- ▣ Field Verified – Summer 2008
  - ▣ ABGR/CLUN – Basalt w/ash cap
- ▣ Pre-Harvest Site Characterization – Oct. 2008
- ▣ Whole Tree & Bole Only Harvest – Nov. 2008
- ▣ Post-Harvest Site Characterization – Nov. 2008



# Canus Harvest Equipment



## Bole Only:

- Track Feller Buncher
- Track Grapple Skidder

## Whole Tree:

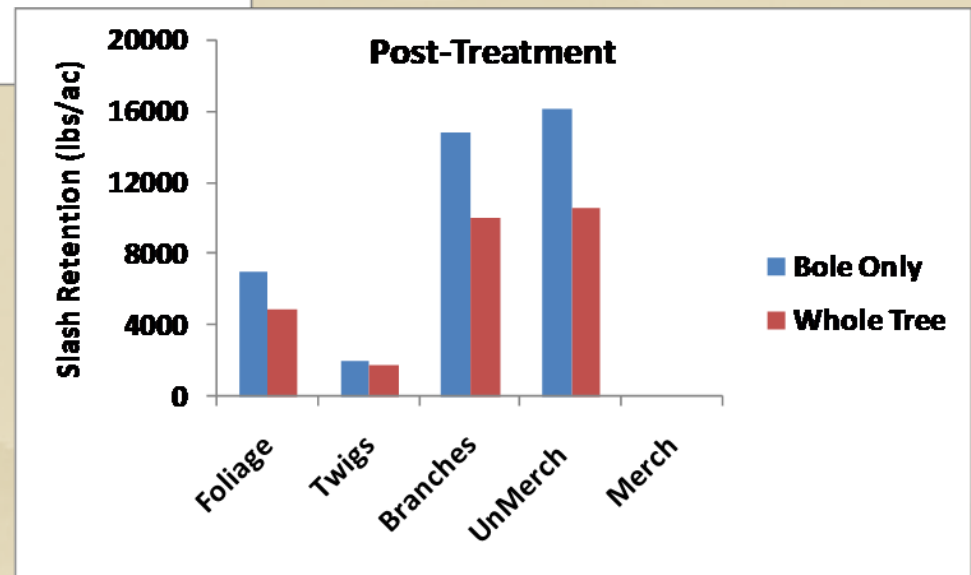
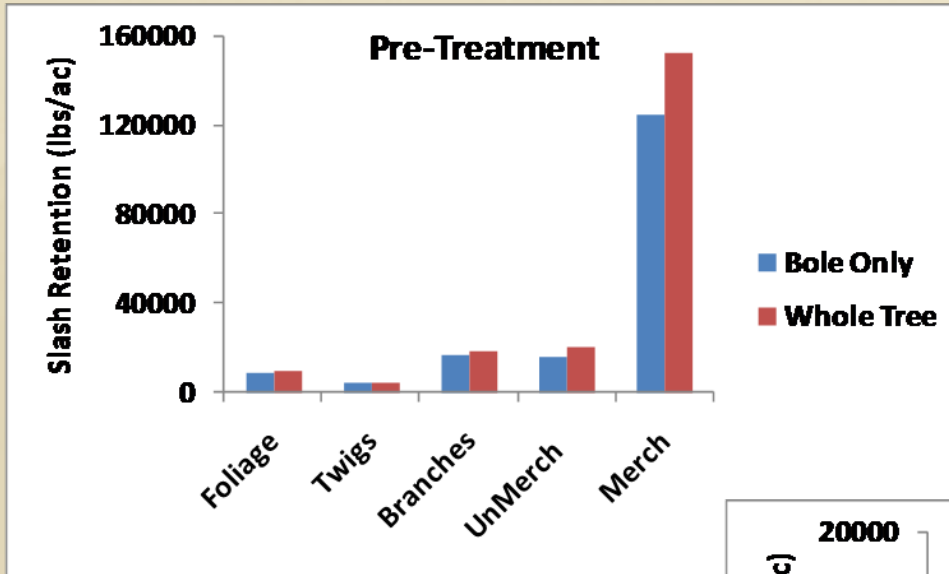
- Track Harvester
- Track Grapple Skidder
- Slide Boom Delimber



# Harvest Effects on Site Nutrient Retention

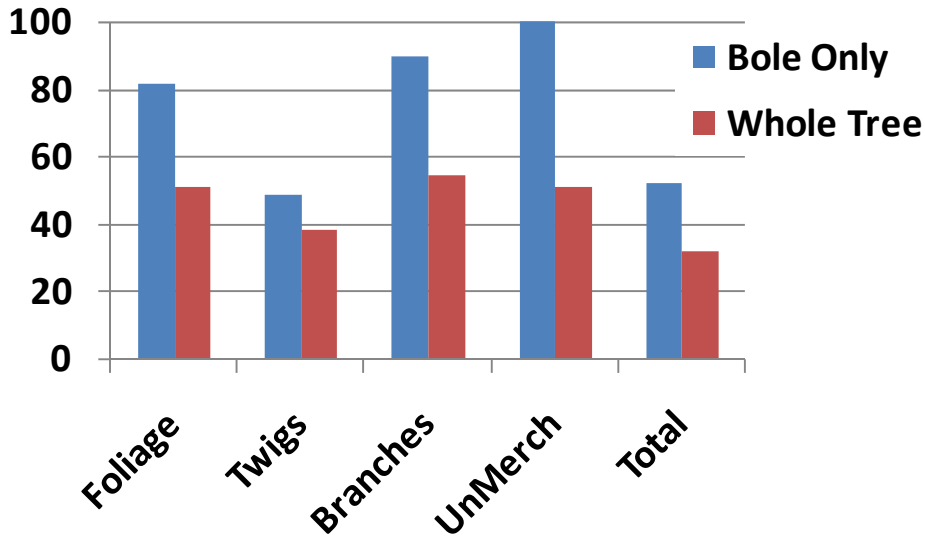


# Slash Retention

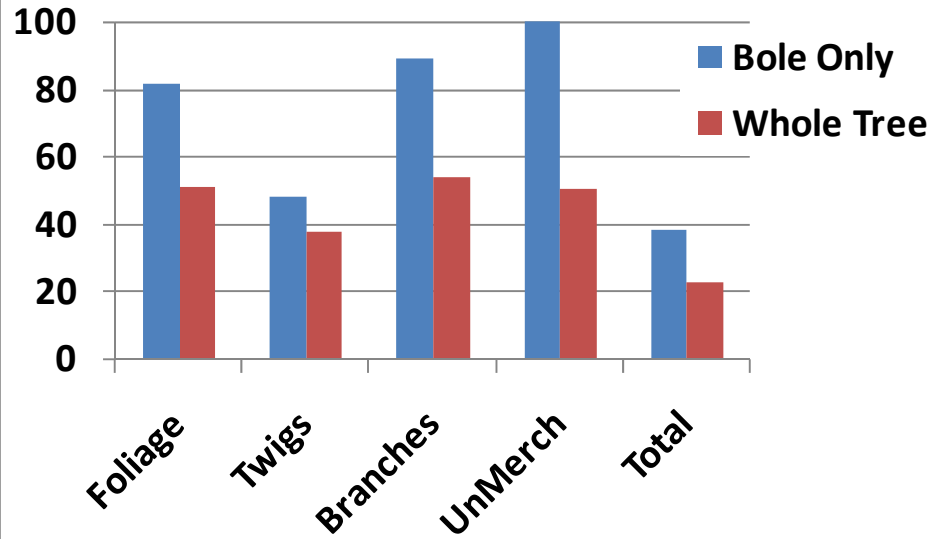


# Overstory Nutrient Retention

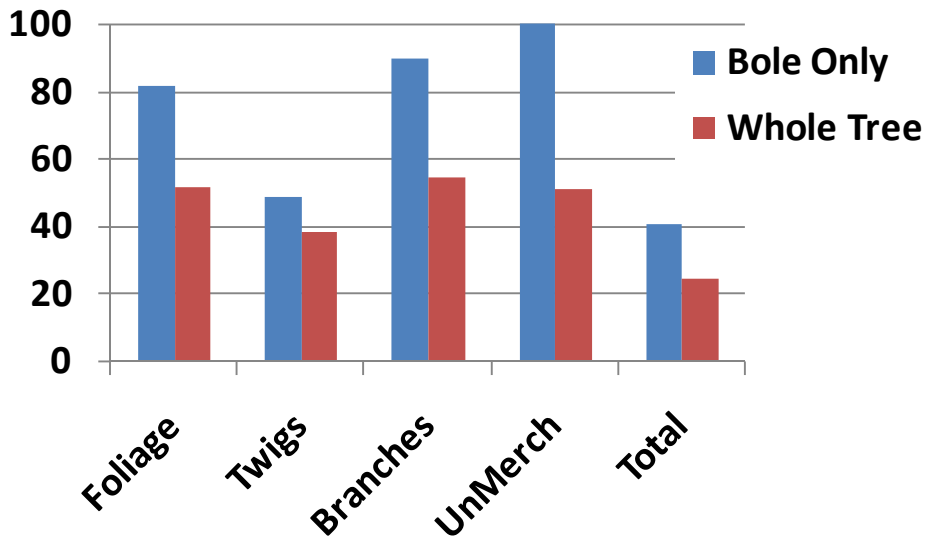
## Percent N Retention



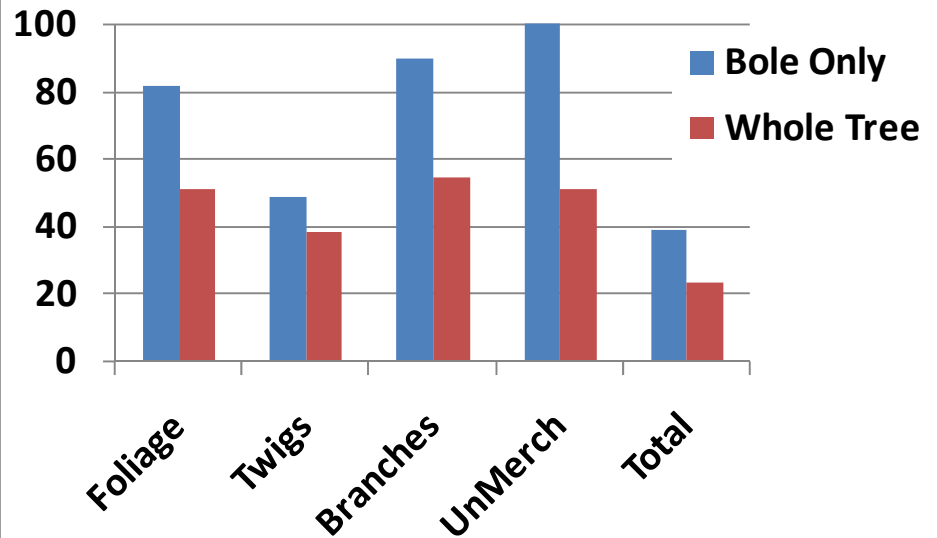
## Percent K Retention



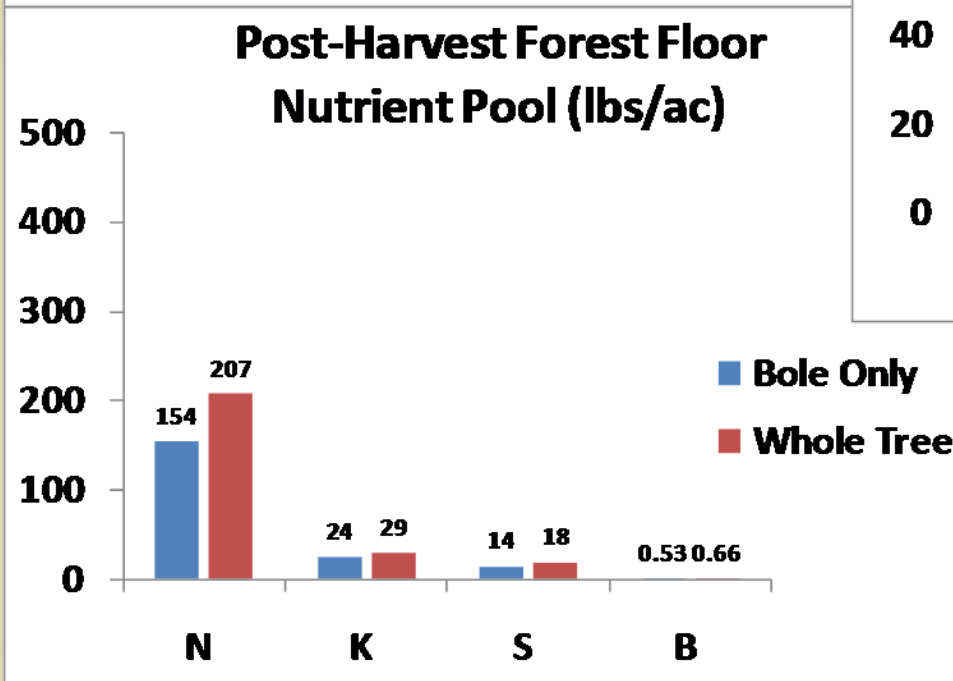
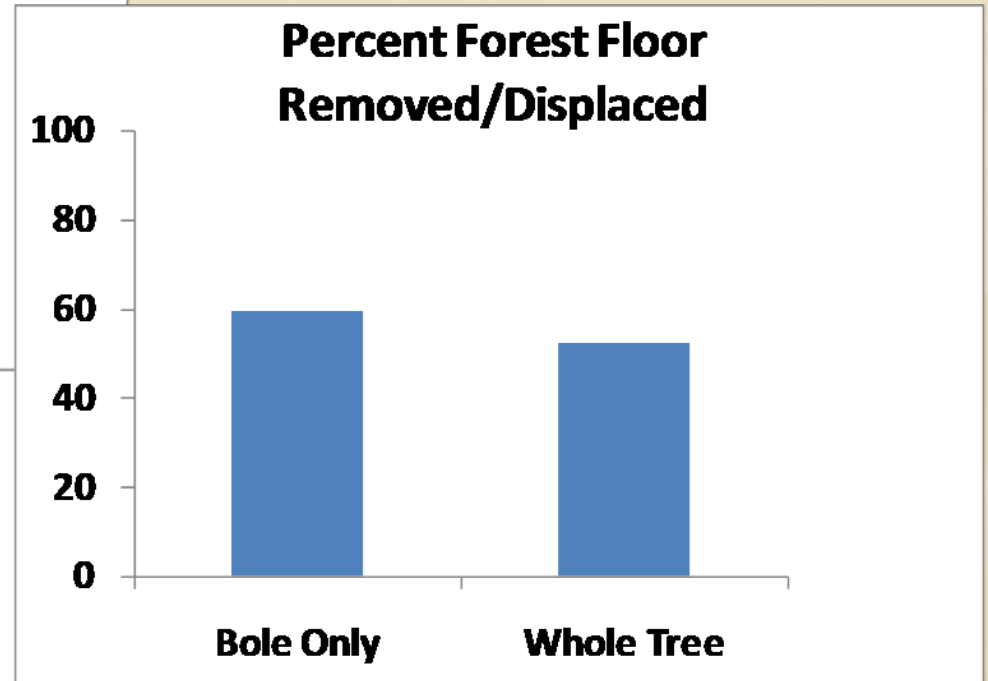
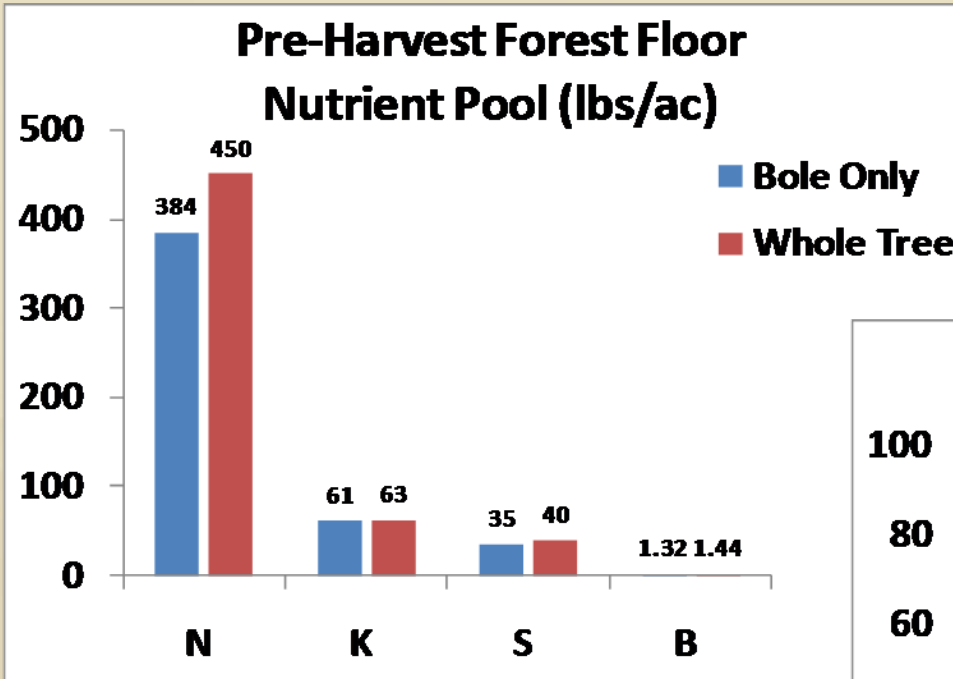
## Percent S Retention



## Percent B Retention



# Forest Floor Disturbance



# Early Take Home Points from Canus

- Bole Only systems retained ~ 65% more site biomass over Whole Tree
- On average, Bole Only retained 42% of overstory N, K, S, B compared to 25% for Whole Tree
- Maximize slash retention through breakage, harvest timing
  - Messy whole tree may retain similar levels of overstory nutrients as bole only





# Early Take Home Points from Canus

- Site disturbance was slightly higher on bole only – more track skidder passes
- Over 50% of forest floor nutrients displaced
  - N,S,B forest floor content is comparable to overstory content
- Minimize forest floor disturbance by making less passes, using forwarders, or implement winter harvests



# Early Take Home Points from Canus

- ▣ Ash cap soils are highly susceptible to displacement
  - ▣ Especially when using track equipment
- ▣ Hazard rate ash soils as sensitive
  - ▣ Utilize winter harvests where possible



# Future Work

- ▣ Complete pre-harvest characterization of Lovell Valley (IDL) – April 2009
- ▣ Harvest Lovell Valley – Summer/Fall 2009
- ▣ Pre-select additional Nutrient Management sites – Summer/Fall 2009
  - ▣ In contact with:
    - ▣ Washington DNR
    - ▣ USFS
    - ▣ Bennett
    - ▣ Stimson



To be continued ....

