

# Christmas Tree Fertilization

Chal Landgren, OSU Extension  
Christmas Trees Specialist

NWSOMA 2016

# Christmas Tree Fertilization



- Background
- Testing-Soil and Foliar-  
Where, how, when?
- Interpretation of Results
- Foliar fertilization
- Seed orchard ideas from  
Christmas trees



By using soil  
and needle  
analyses we are  
predicting the  
future based  
on current  
measurements





**CHRISTMAS  
TREE  
NUTRIENT  
MANAGEMENT  
GUIDE**

**WESTERN OREGON  
AND WASHINGTON**

**Available  
free on-line  
EM 8856-E**

**Summary of  
work from  
1983-2009**

**Thanks to  
John Hart**



# Soil and Needle Testing



# Soil is a result of:

- Parent material
- topography
- time
- Climate (water and temperature)
- Organisms-bacteria to humans





# Soil Tests and Christmas Tree Growth

- Recommendations that provide economic changes in tree growth are difficult to make from a soil test
- Very low phosphorus soil test results from Oregon or Washington don't indicate a need for P fertilizer
- Very low potassium soil test results from Oregon or Washington usually indicate a need for potassium application

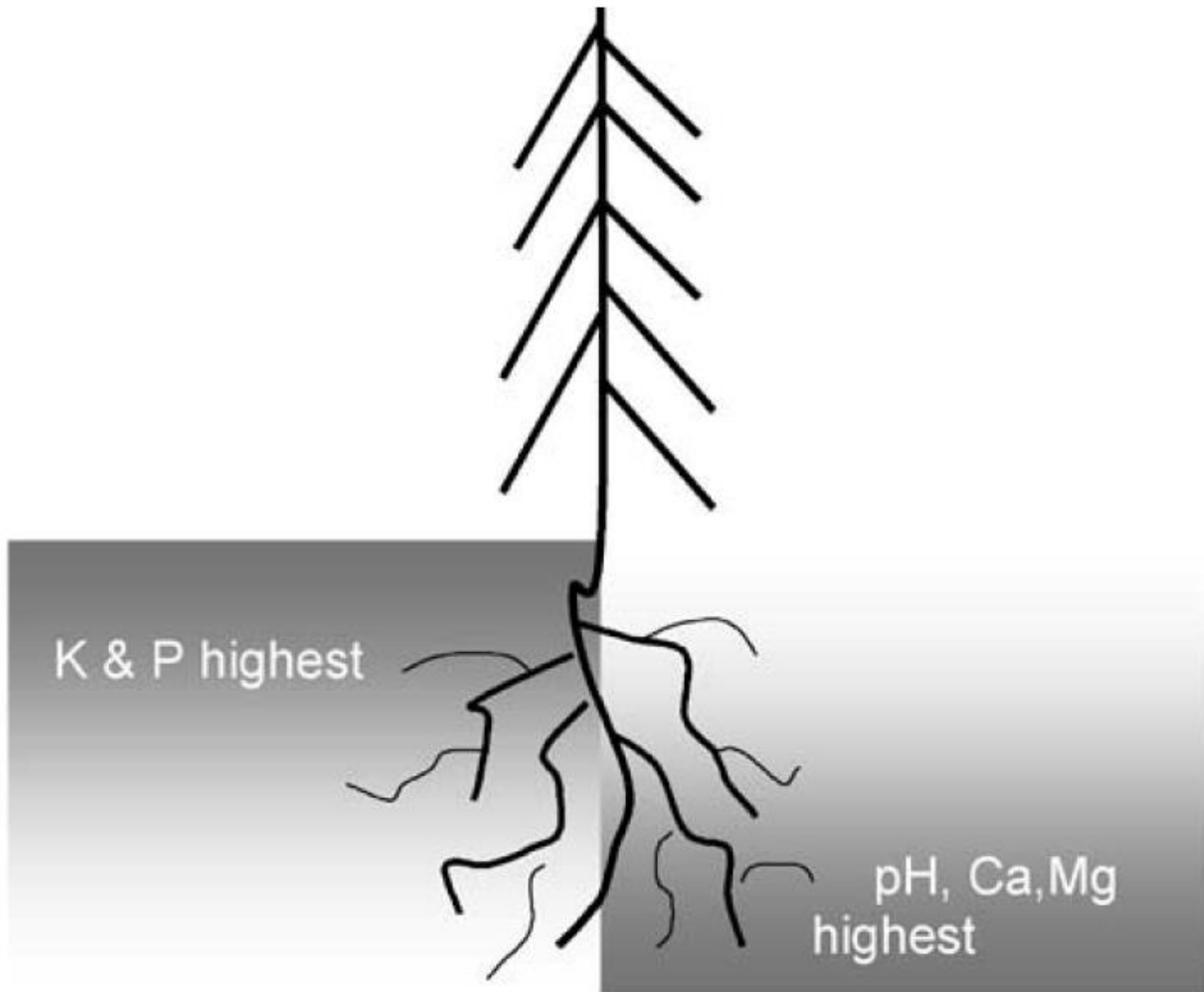




Table 1.—Nutrient mobility in soil and plants.

<b>Nutrient</b>	<b>Relative soil mobility<sup>a</sup></b>	<b>Mobility in plants</b>
Nitrogen (N)	1	mobile
Phosphorus (P)	5	mobile
Potassium (K)	4	mobile
Sulfur (S)	3	not mobile
Calcium (Ca)	5	not mobile
Magnesium (Mg)	5	mobile
Boron (B)	2	not mobile
Copper (Cu)	5	not mobile
Chlorine (Cl)	1	not mobile
Iron (Fe)	5	not mobile
Manganese (Mn)	5	not mobile
Zinc (Zn)	5	not mobile

<sup>a</sup>1 = highest mobility (easily moved with water)

5 = immobile (does not move).



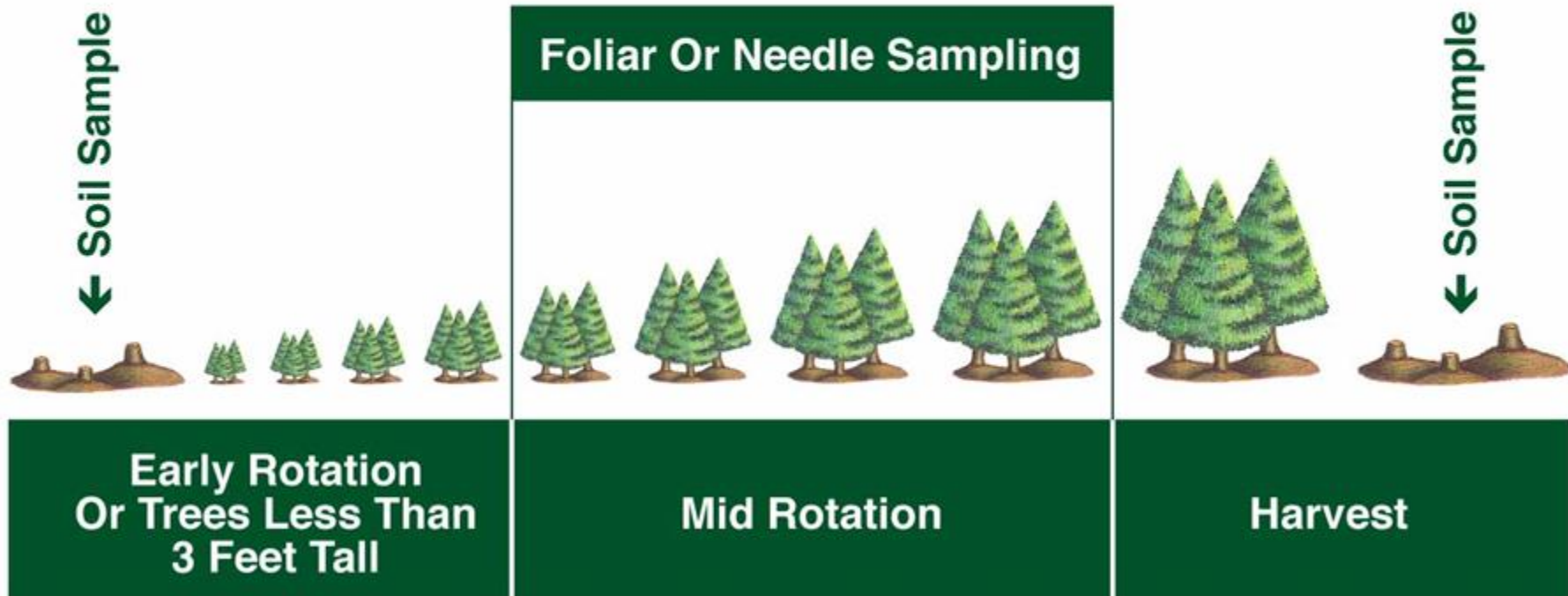


# Soil Sampling

- Multiple locations
- Stratify depth
  - 0-2"
  - 3-8"
  - 9-16"



# Nutrient Assessment For Christmas Tree Production



<b>Nutrient</b>	<b>Test value</b>	<b>Rate</b>	<b>Comments<sup>a</sup></b>
<b>Phosphorus (P)</b>	<b>(ppm)</b>	<b>(lb P<sub>2</sub>O<sub>5</sub>/acre)</b>	
	0–10	180	Bray
	11–15	90	
	above 15	Adequate; monitor foliar P	
<b>Potassium (K)</b>	<b>(ppm)</b>	<b>(lb K<sub>2</sub>O/acre)</b>	Ammonium acetate extractable
	below 75	100–200	
	above 75	Adequate; monitor foliar K	
<b>Soil pH</b>	<b>(pH)</b>	<b>(ton lime/acre)</b>	
	below 5	Add lime according to SMP buffer test (Table 5, page X)	See “Magnesium” to determine whether dolomitic lime is needed
	5–5.6	Consider adding 1–1.5 ton lime/acre	See “Magnesium” to determine whether dolomitic lime is needed
	above 5.6	No lime needed	

## Comments

- P-Some labs report Mehlich P, or Olsen
- No N
- S- soil test not effective
- OM test may be useful

Table 5.—Lime requirement based on SMP buffer test.

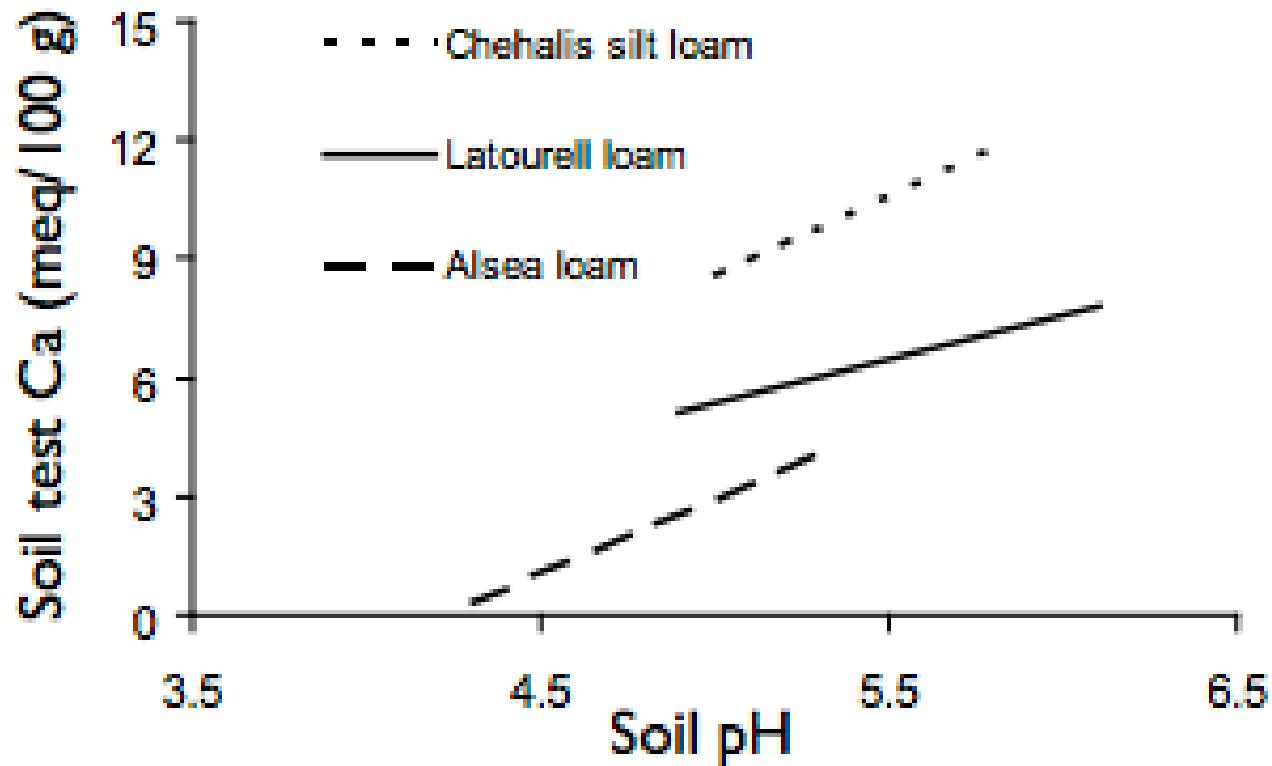
<b>SMP buffer</b>	<b>Lime needed to raise pH of surface 6 inches of soil to 5.6 (ton/acre)<sup>a</sup></b>
4.8–5.0	5–6
5.1–5.3	4–5
5.4–5.6	3–4
5.7–5.9	2–3
6.0–6.2	1–2
6.3–6.5	0
6.6	0



<b>Calcium (Ca)</b>	<b>(meq/100 g soil)</b>	<b>(ton lime/acre)</b>	Ammonium acetate extractable
	soil Ca below 5 meq/100 g soil and pH below 5.0	Add lime as indicated by SMP buffer test (Table 5, page X)	See “Magnesium” to determine whether dolomitic lime is needed
	soil Ca below 5 meq/100 g soil and soil pH between 5.0 and 5.5	1	See “Magnesium” to determine whether dolomitic lime is needed
	Soil Ca above 5 meq/100 g soil and soil pH above 5.5	Monitor foliar Ca and Mg	
<b>Magnesium (Mg)</b>	<b>(meq/100 g soil)</b>	<b>(ton dolomite/acre or lb Mg/acre)</b>	Ammonium acetate extractable
	soil Mg below 0.4 meq/100 g soil and pH below 5.5	Add 1 ton dolomitic lime/acre	
	soil Mg below 0.4 meq/100 g soil and pH above 5.5	Apply 100–200 lb Mg/acre	Supply Mg as K-Mag or Epsom salts

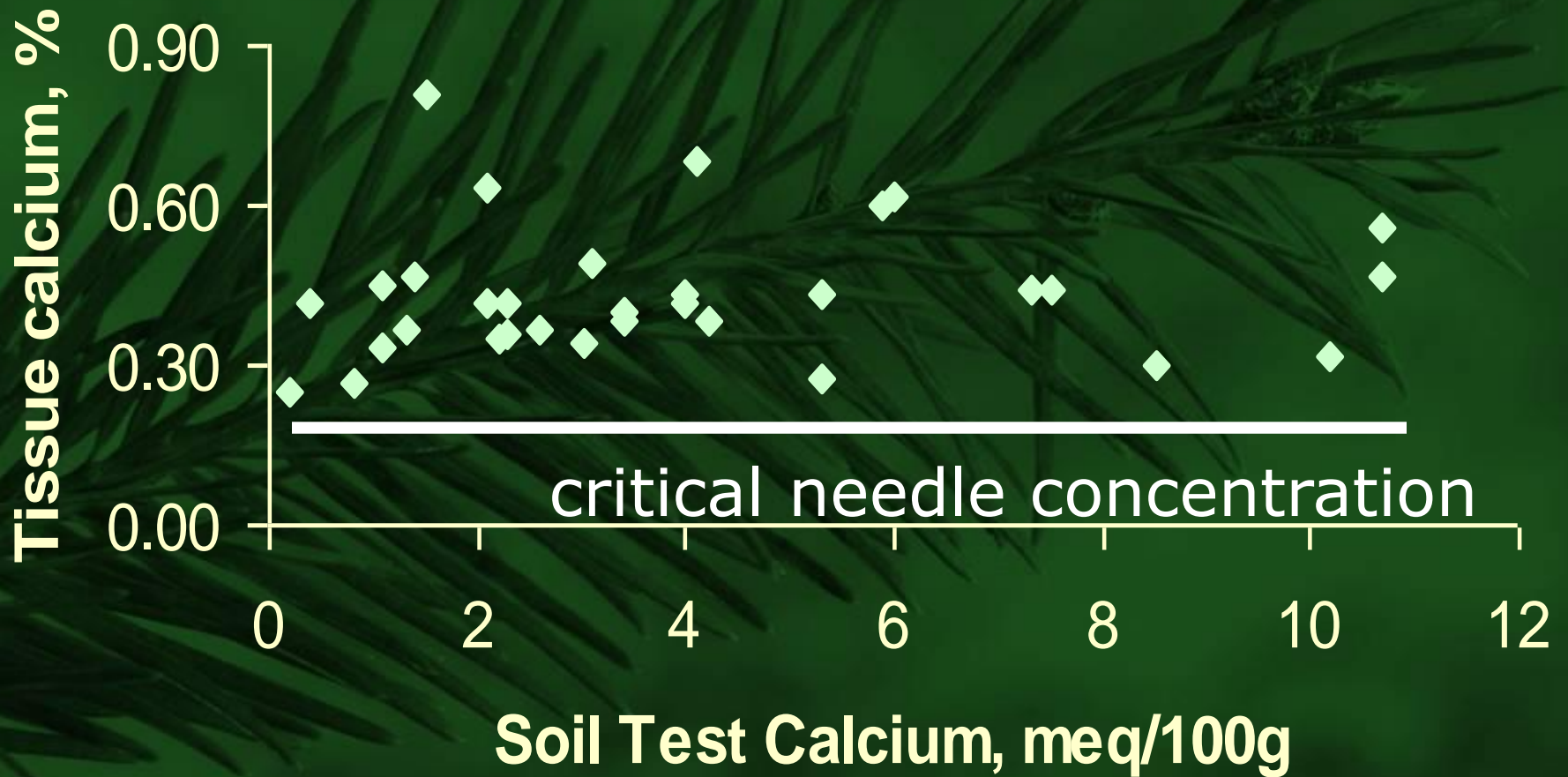
## Comments

- Ca- 5 meq/100 g = 1000 ppm
- Mg-.4 meq/100 g = 92 ppm
- Boron- Ave .7-1.5 ppm



*Figure 14. Soil pH and calcium (ammonium acetate extractable method) from three noble fir plantations. N was applied at the rate of 135 lb/a for 2 years, 225 lb/a for 3 years, and 450 lb/a in the year before harvest.*

# Poor relationship between tissue and soil







# The answer for any soil test or needle analysis is

Yes

No

Maybe

# Tissue or Needle Sampling







Cost is \$10-30/Sample.

Sample areas of concern-separately

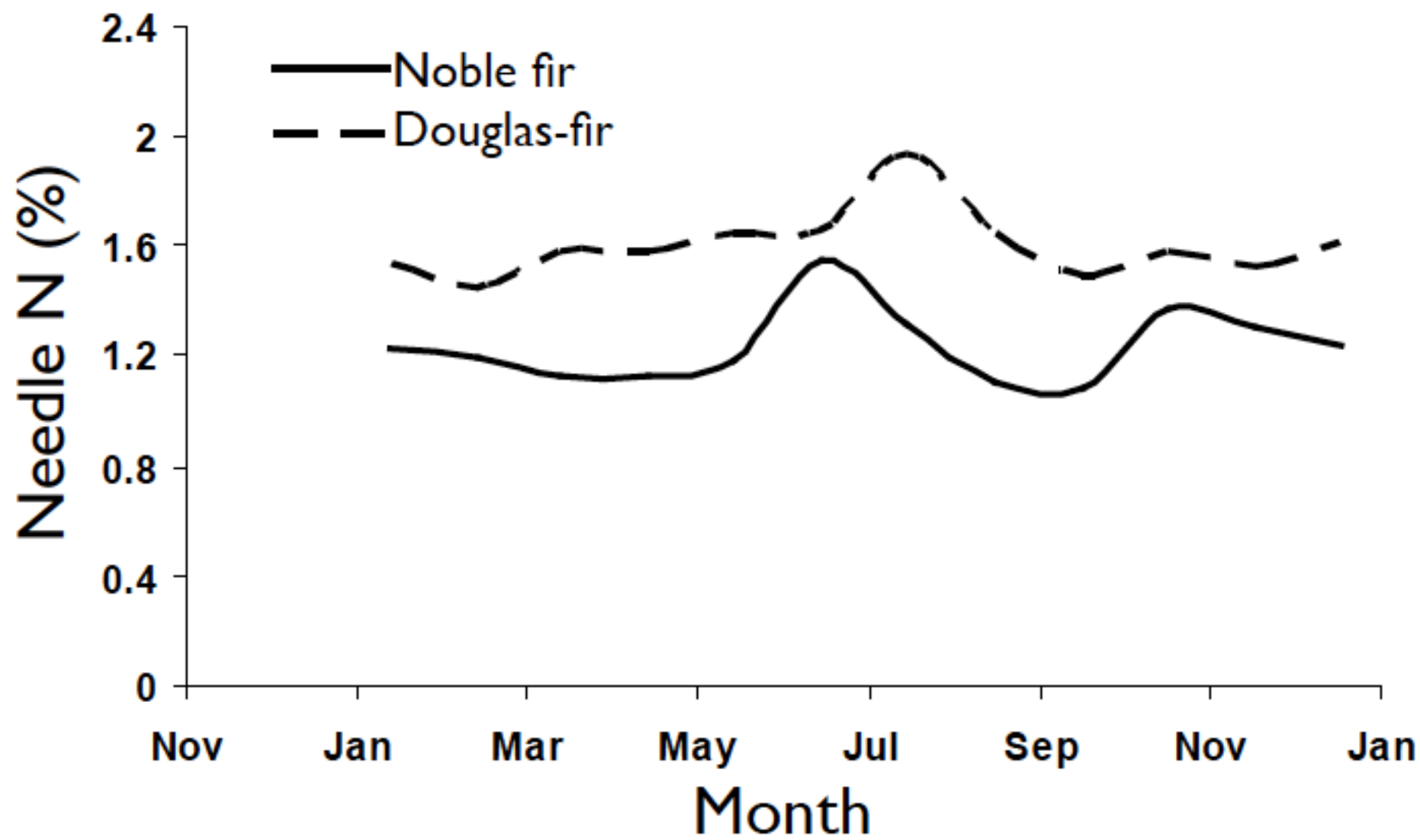
Use multiple "healthy" trees for samples

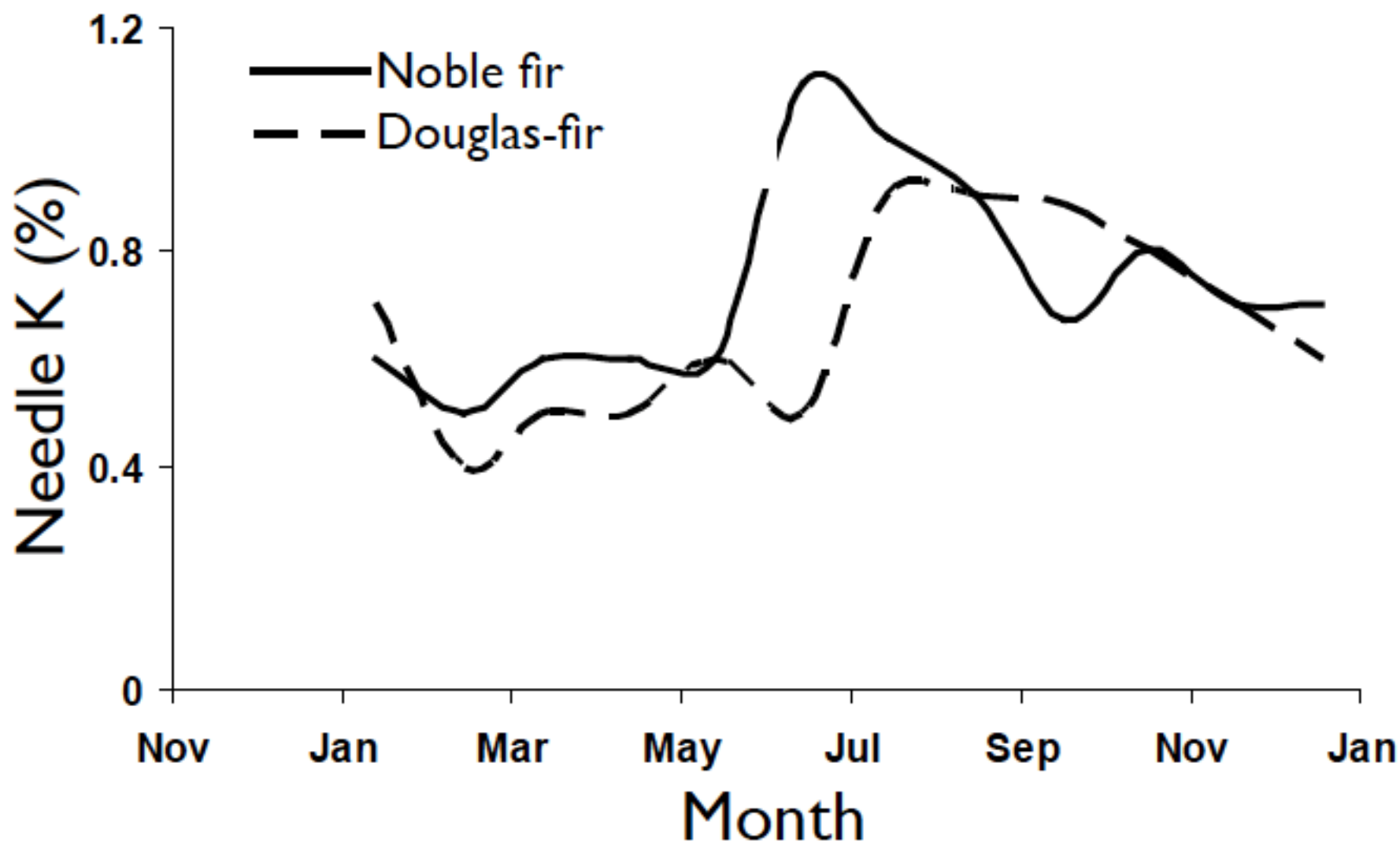


# Taking a needle sample

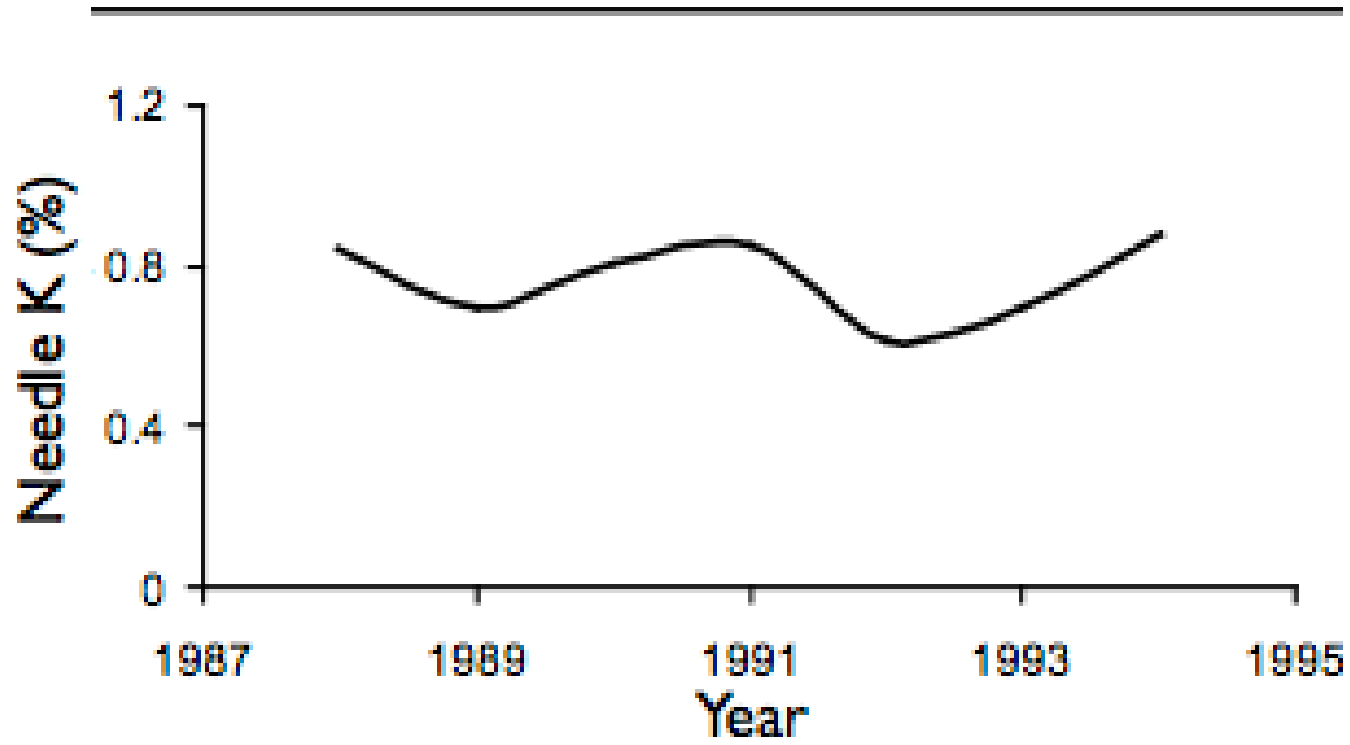
When to sample  
what to sample











# How to sample

Upper 1/3 tree

Do not sample  
leader

Do not sample  
second flush  
growth



# How to sample

Current season needles  
Pinch 5 to 8 needles from  
6 to 8 locations per tree  
Repeat for 20 to 30 trees





# Collect 2 to 3 ounces of needles





# Using needle nutrient data

Are results “bio-logical”?

Interpret with tree growth or vigor tree

Table 9.—Adequate Christmas tree needle nutrient concentration for Douglas-fir and Noble fir Christmas tree production in western Oregon.

	<b>Douglas-fir</b>	<b>Noble fir</b>
<b>Macronutrient</b>	(%)	(%)
Calcium (Ca)	0.25	0.25
Magnesium (Mg)	0.07	0.07
Nitrogen (N)	1.6	1.4
Phosphorus (P)	0.15	0.15
Potassium (K)	0.6	0.6
Sulfur (S)	0.06	0.06
<b>Micronutrient</b>	(ppm)	(ppm)
Boron (B)	15	15
Copper (Cu)	3	3
Iron (Fe)	unknown	unknown
Manganese (Mn)	25	25
Zinc (Zn)	10	10

# BROOKSIDE LABORATORIES, INC.

\*\* PLANT TISSUE ANALYSIS \*\*

Roseburg Forest Products  
34937 Tennessee Rd  
Lebanon, OR 97355

File Number: 75433  
Date Received: 02/08/2016  
Date Reported: 02/09/2016

Submitted By: Home Office

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Lab Number	0987
Location	RT
Description	

Plant Part	Leaves/Middle
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## PERCENTAGES (%)

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NITROGEN	(N)	1.97
PHOSPHORUS	(P)	0.192
POTASSIUM	(K)	0.64
CALCIUM	(Ca)	0.58
MAGNESIUM	(Mg)	0.153
SULFUR	(S)	0.106

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## PARTS/MILLION (ppm)

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BORON	(B)	18.5
IRON	(Fe)	97.9
MANGANESE	(Mn)	86.2
COPPER	(Cu)	3.3
ZINC	(Zn)	13.8
ALUMINUM	(Al)	86.3

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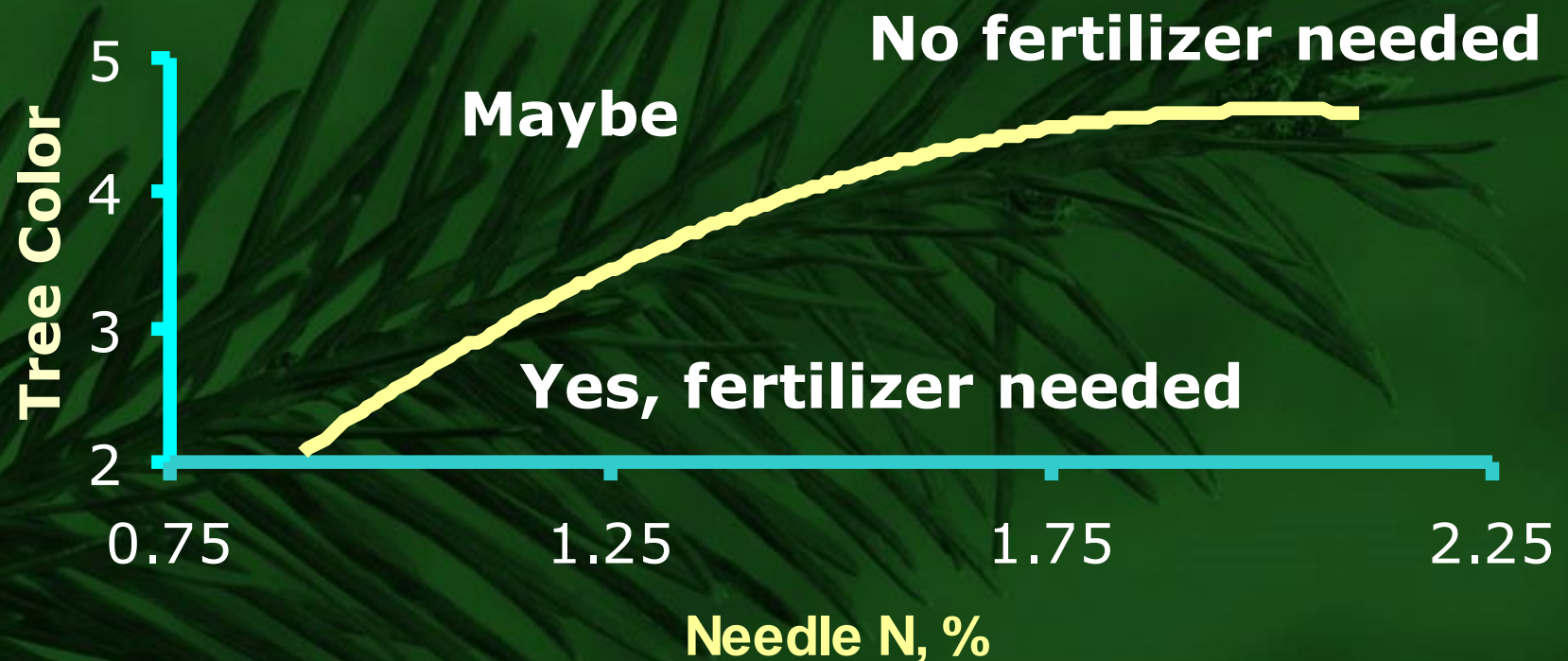
# Soil and needle testing are part of a Nutrient Management Program

If the prior  
test was  
Christmas  
trees- they  
should be  
happy!





# Douglas Fir color and N concentration



# Foliar Fertilization Greenhouse





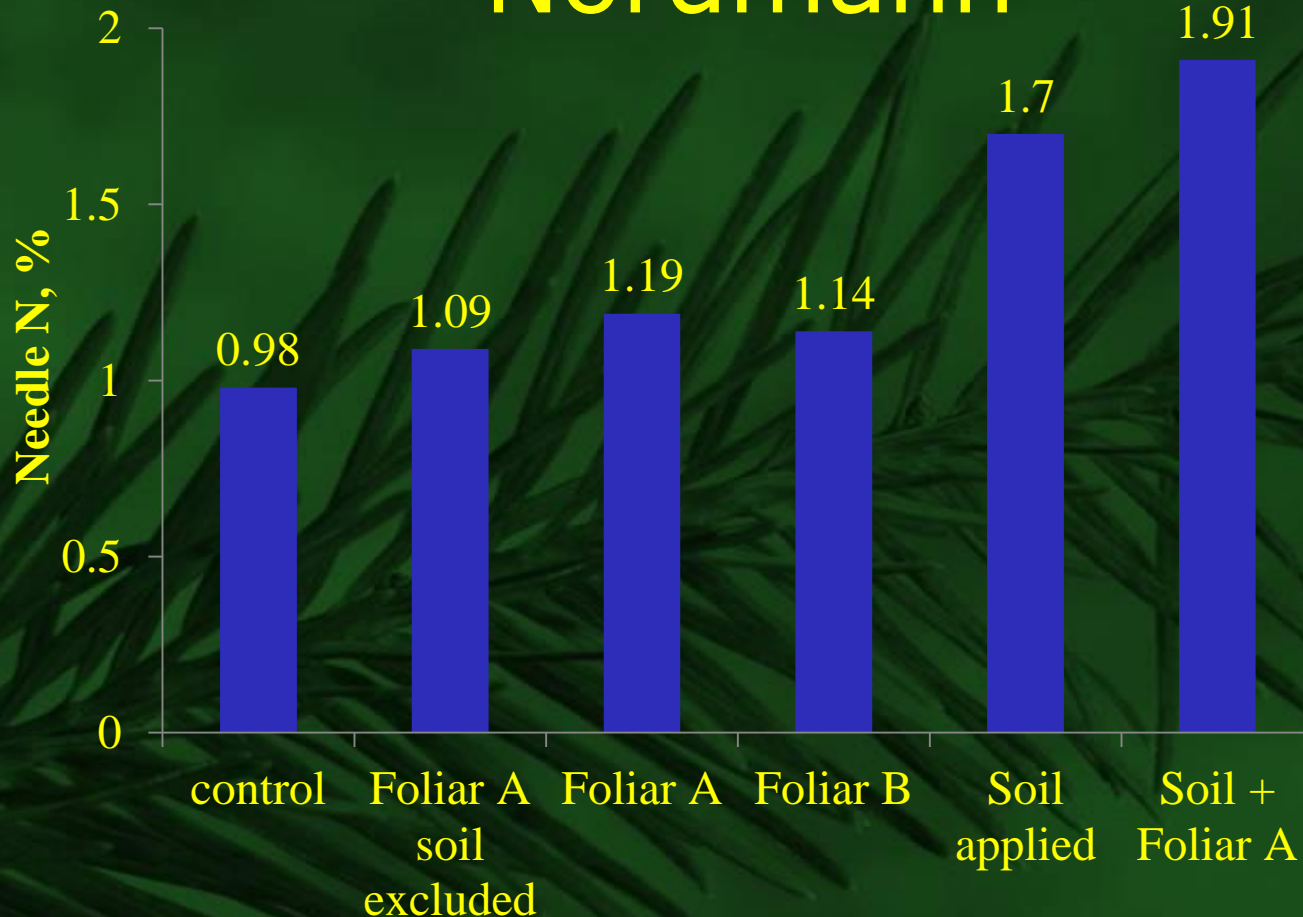
# Foliar Fertilization

## Treatments

- **No Fert.**
- **Controlled Release (CRF)-12 month (18-5-9)**
- **Foliar only – Helena & Wilbur-Ellis product- 2 applic.**
- **Foliar with exclusion- 2 applic**
- **CRF + Foliar (2 applic)**



# Foliar Fertilization- Nordmann





# Field Trials





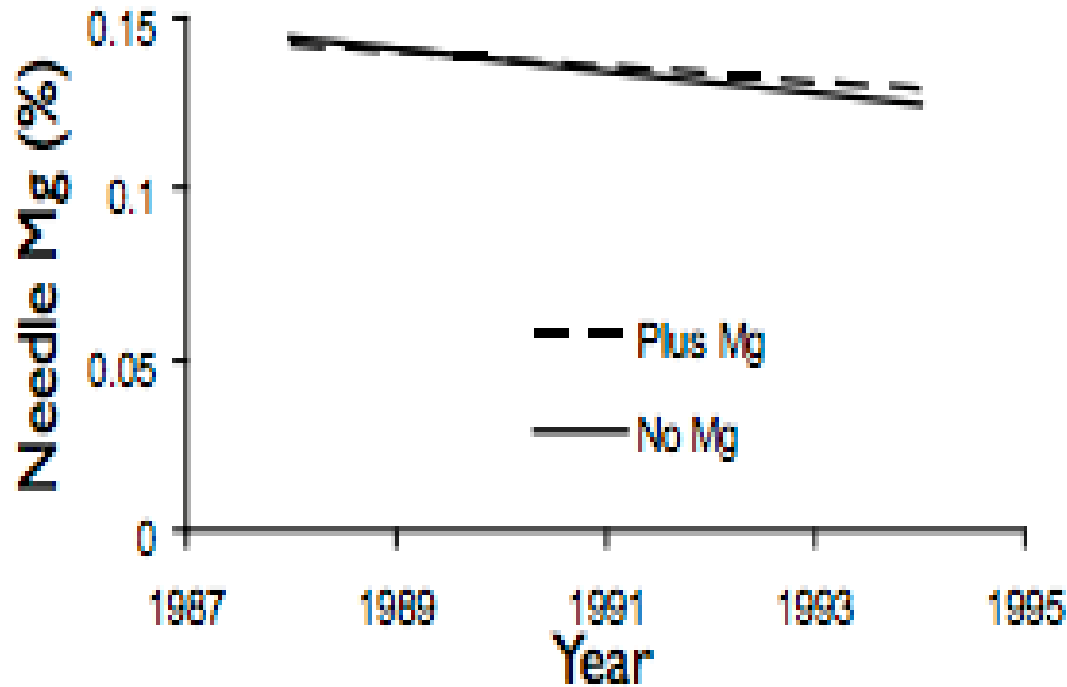
# Transferring some Christmas tree nutrient management lessons to seed orchards

How much material to apply

When the material should be applied

The source to use and

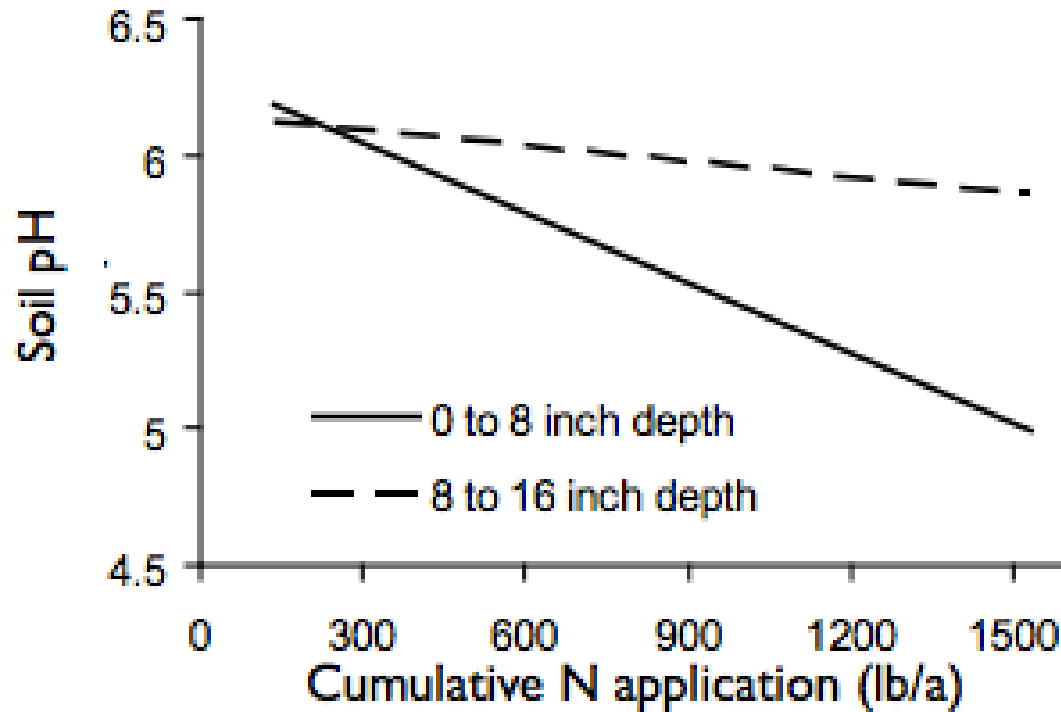
Method of application



Conditions- Soil test mg 60 ppm (low)  
Added 28 lbs./ac of Mg for 6 years  
(.07 our listed critical level)



# Impacts of N applications





## Where does the fertilizer go?

Have you wondered how much fertilizer N is taken into a Christmas tree? To answer this question, researchers monitored N as it moved through soil and trees with  $^{15}\text{N}$ , a nonradioactive isotope that can be easily distinguished from the common form  $^{14}\text{N}$ .

After 1 year, they found the following:

- Trees took up 21 percent of the N. Thirty percent went into storage in the soil, and about half (49 percent) was lost from the site.
- The N losses occurred in the fall and winter, presumably from leaching and denitrification.
- N is also lost as the trees are harvested. The study estimated that approximately 178 lb N/a is removed via harvest (900 trees/acre removed).
- Most of the N used by the tree was supplied from N stored in the soil rather than from the fertilizer application (68 percent versus 32 percent).
- Fertilizer applied in previous years had little impact on N uptake and loss.



# Summary

There will always be new untested fertilizer products- test first

Conifers are different than tomatoes

Nutrients may not be the problem

Use soil and foliar tests over time to avoid “issues”

Weird things happen when pH drops below 5.0. Plan ahead!



# Questions?



# Result of soil or needle test

Maybe- sometimes a fertilizer (nutrient) application produces a positive biological and economic change and sometimes it doesn't as the soil or needle test is "medium"









Check with your  
local Extension  
Service office for  
Soil Sampling  
instructions

**NWSOMA**

**Downstairs**