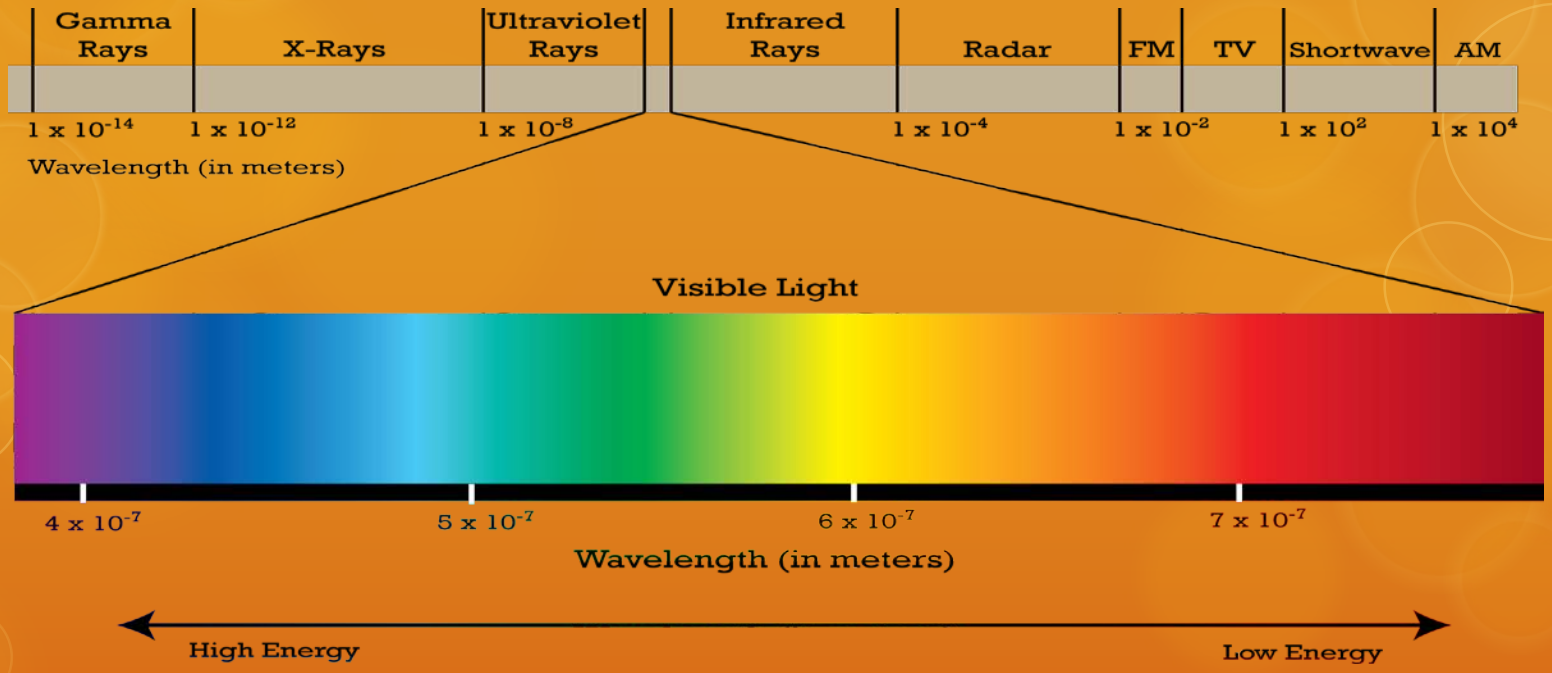
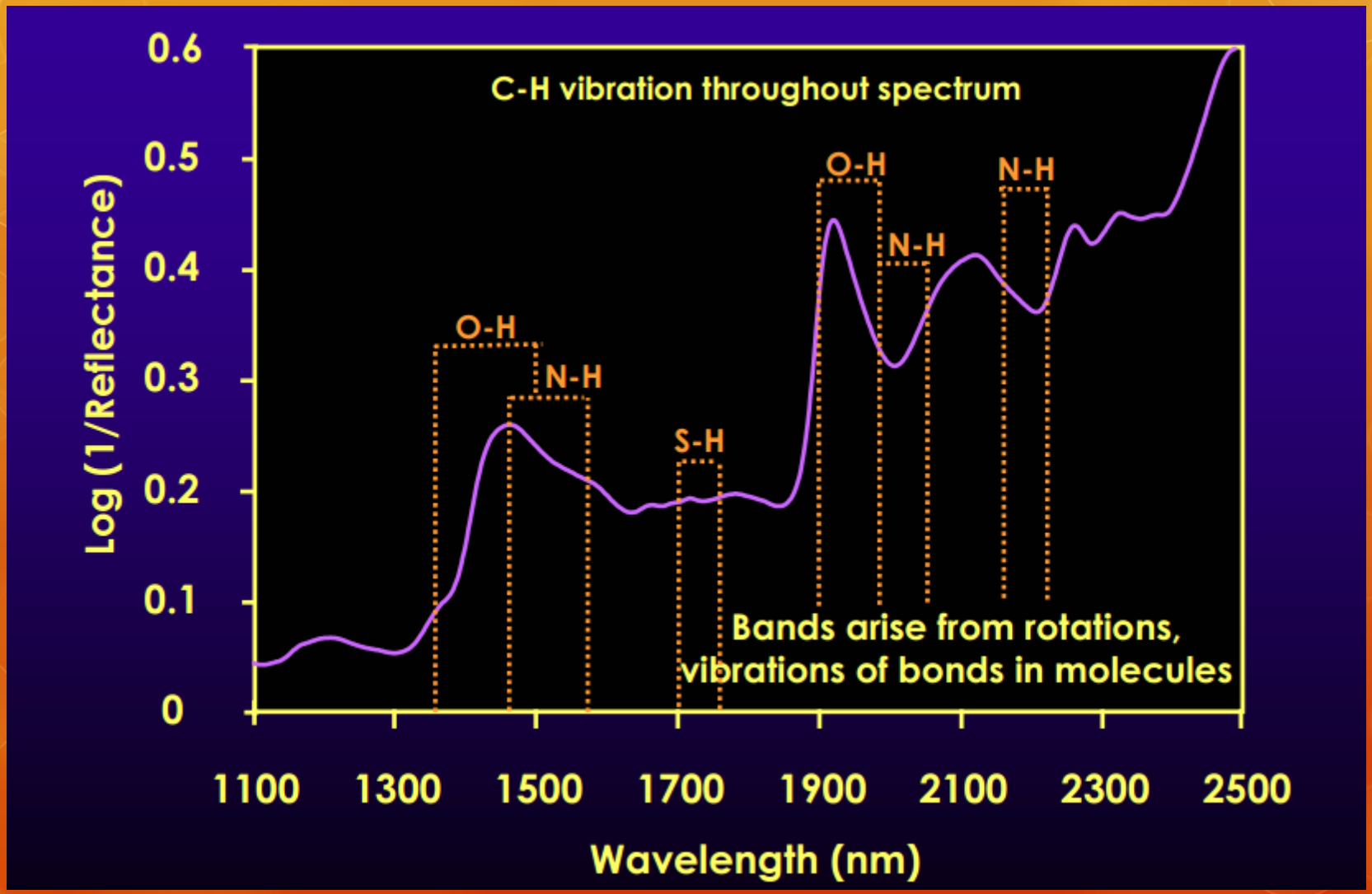


Using near infrared (NIR) imagery to determine freeze injury on pine seedlings

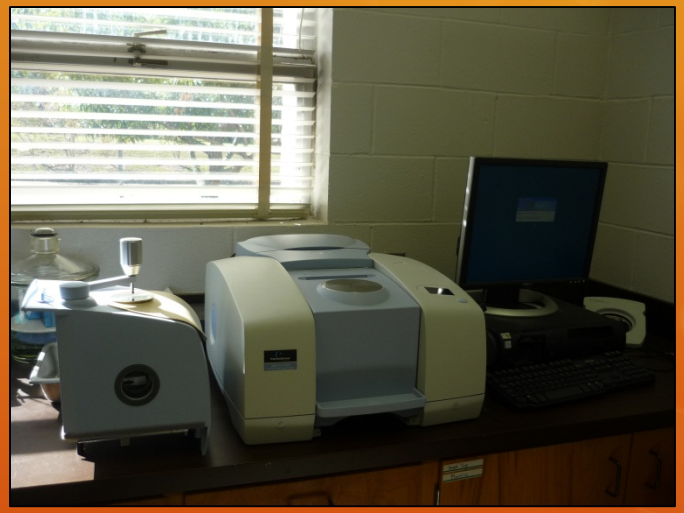
Scott Enebak, Brian Via, Tom Starkey and Ryan Nadel

Auburn University – School Forestry & Wildlife Sciences

NIR spectrum of Typical Wood Sample

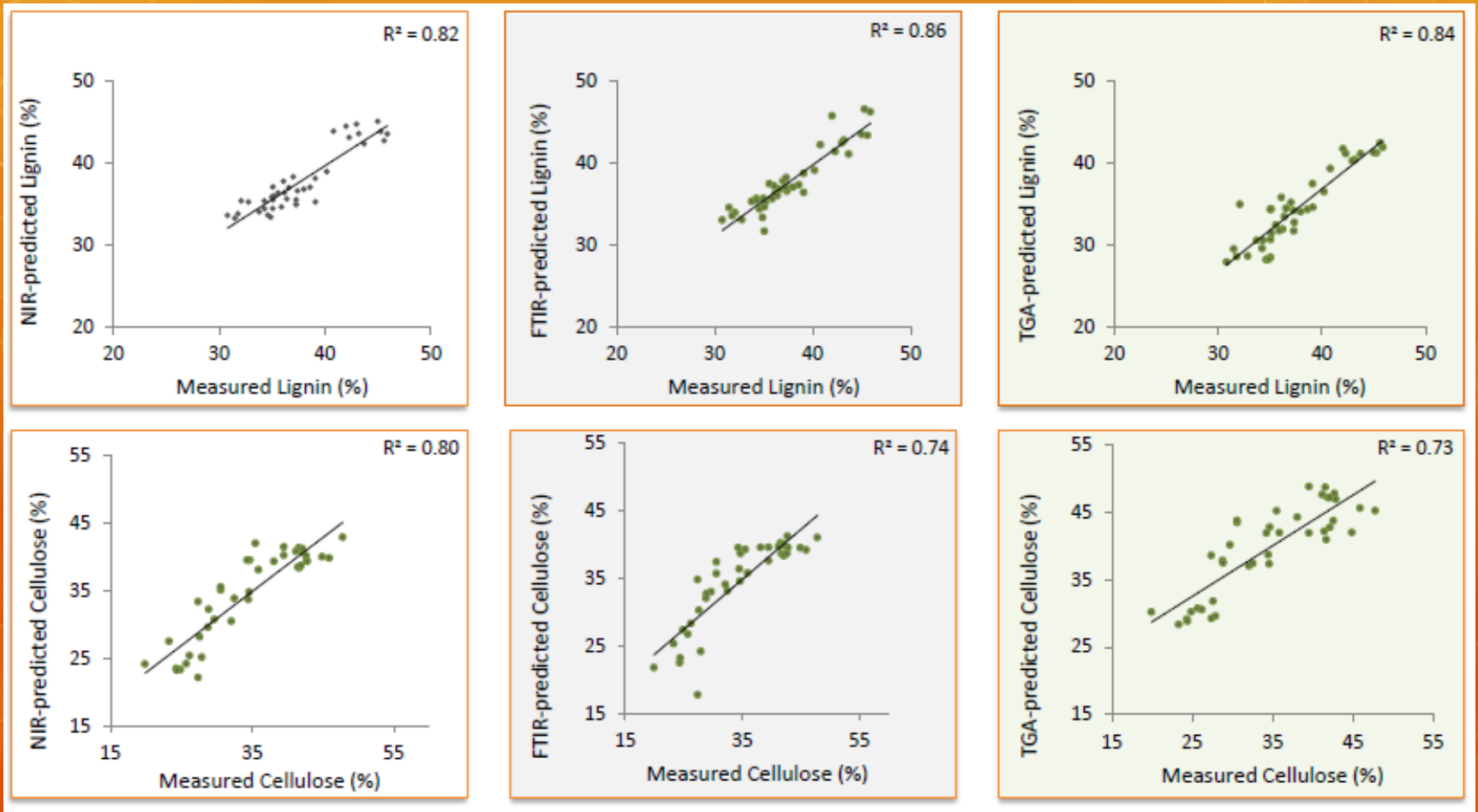


NIR is Practical for Analyzing Genetic Families

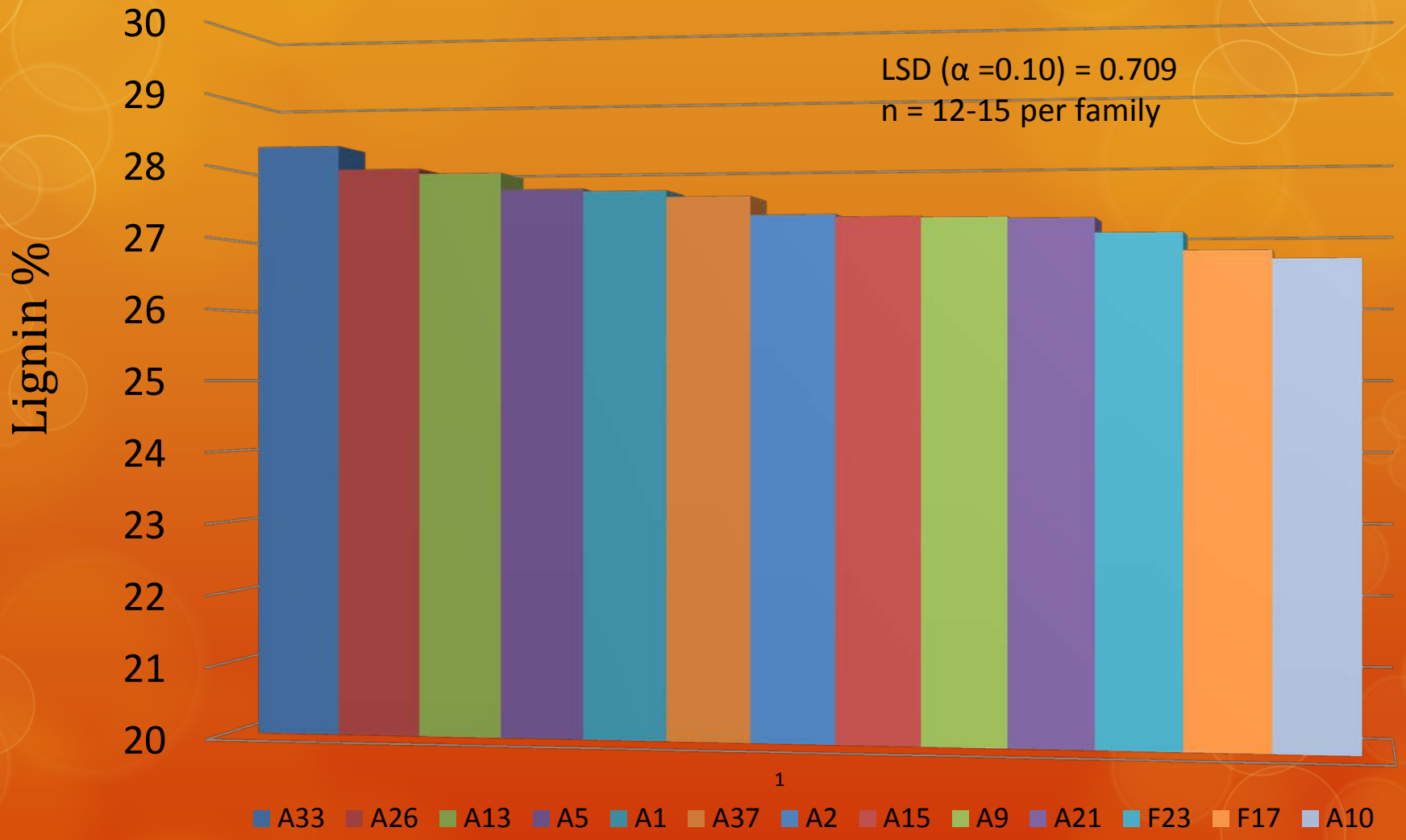


Cellulose, Extractives, Lignin, Hemicellulose

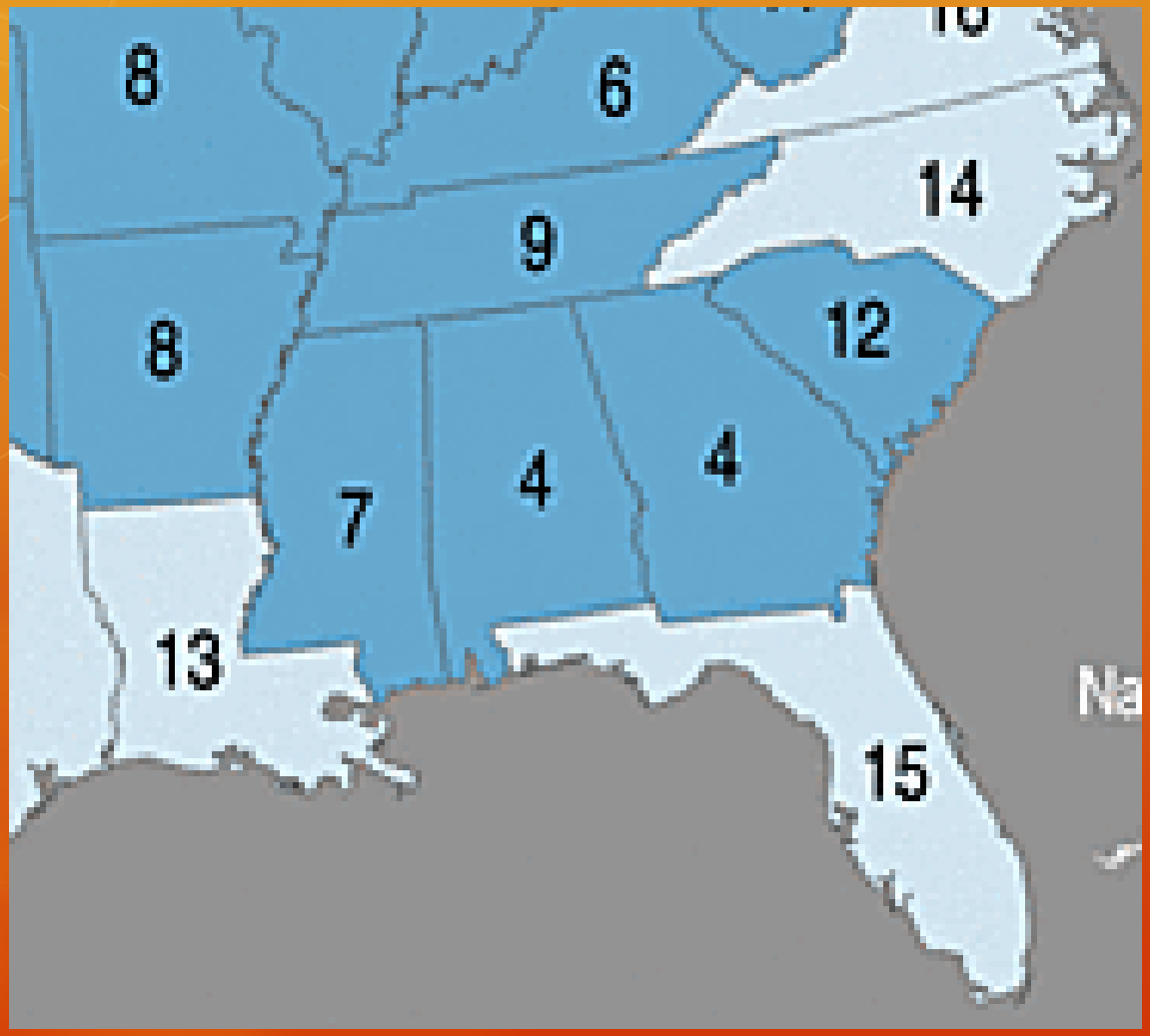
Comparison of NIR to FTIR and TGA for Wood Chemistry?



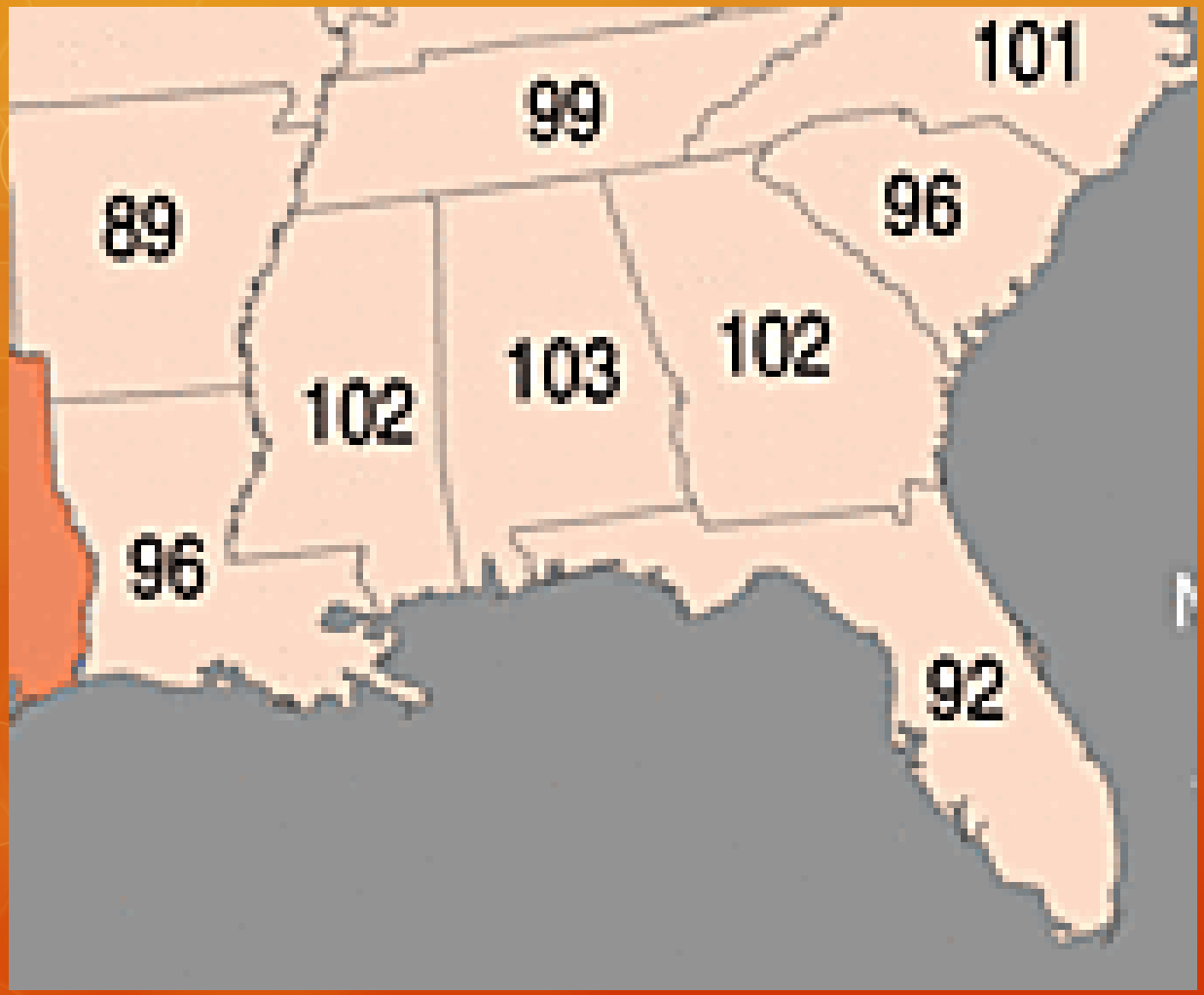
Using Near Infrared to Measure Lignin Content of Genetically Improved Families.



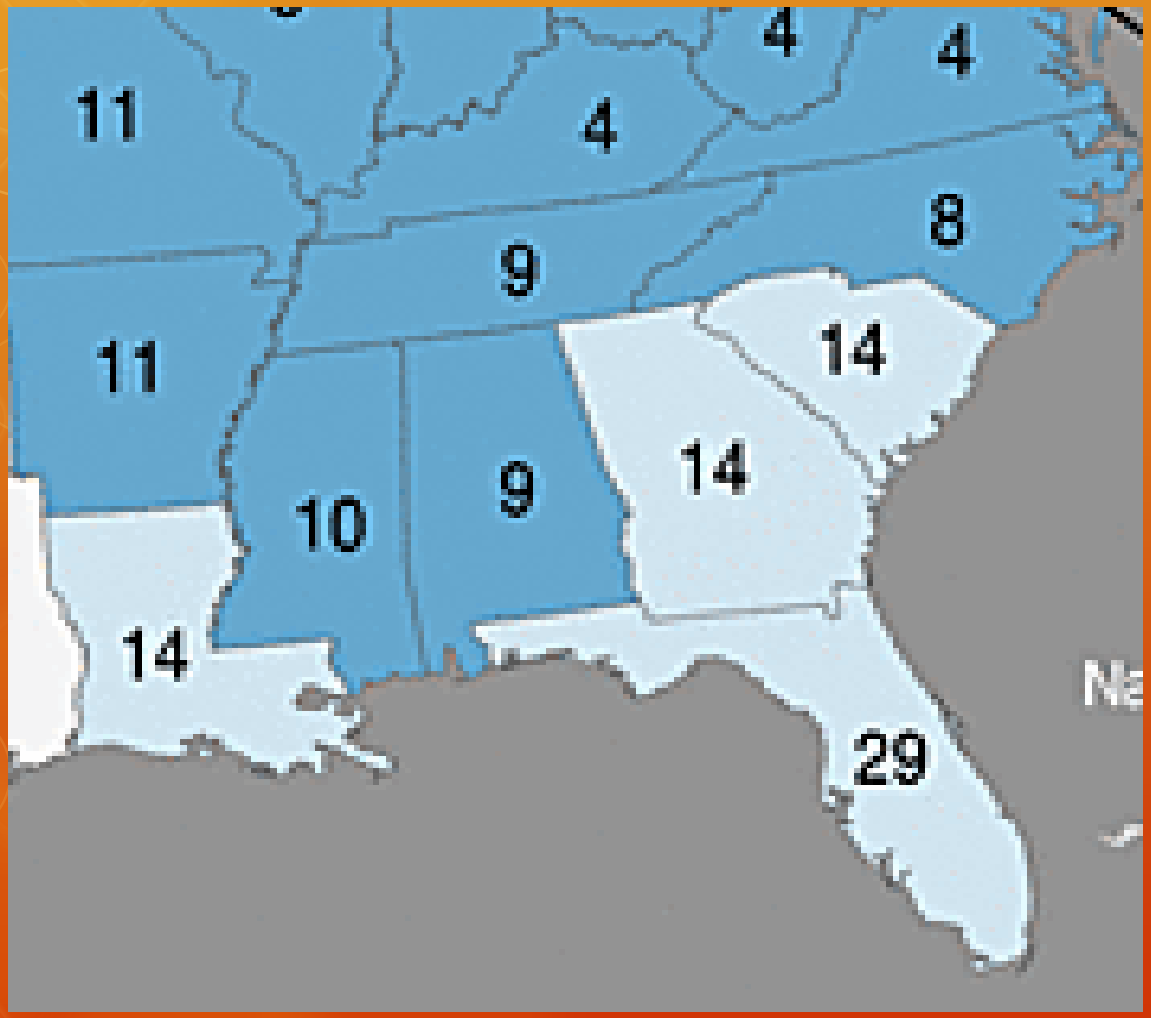
In the southeast US: November, 2014 – 7th coldest in 119 years

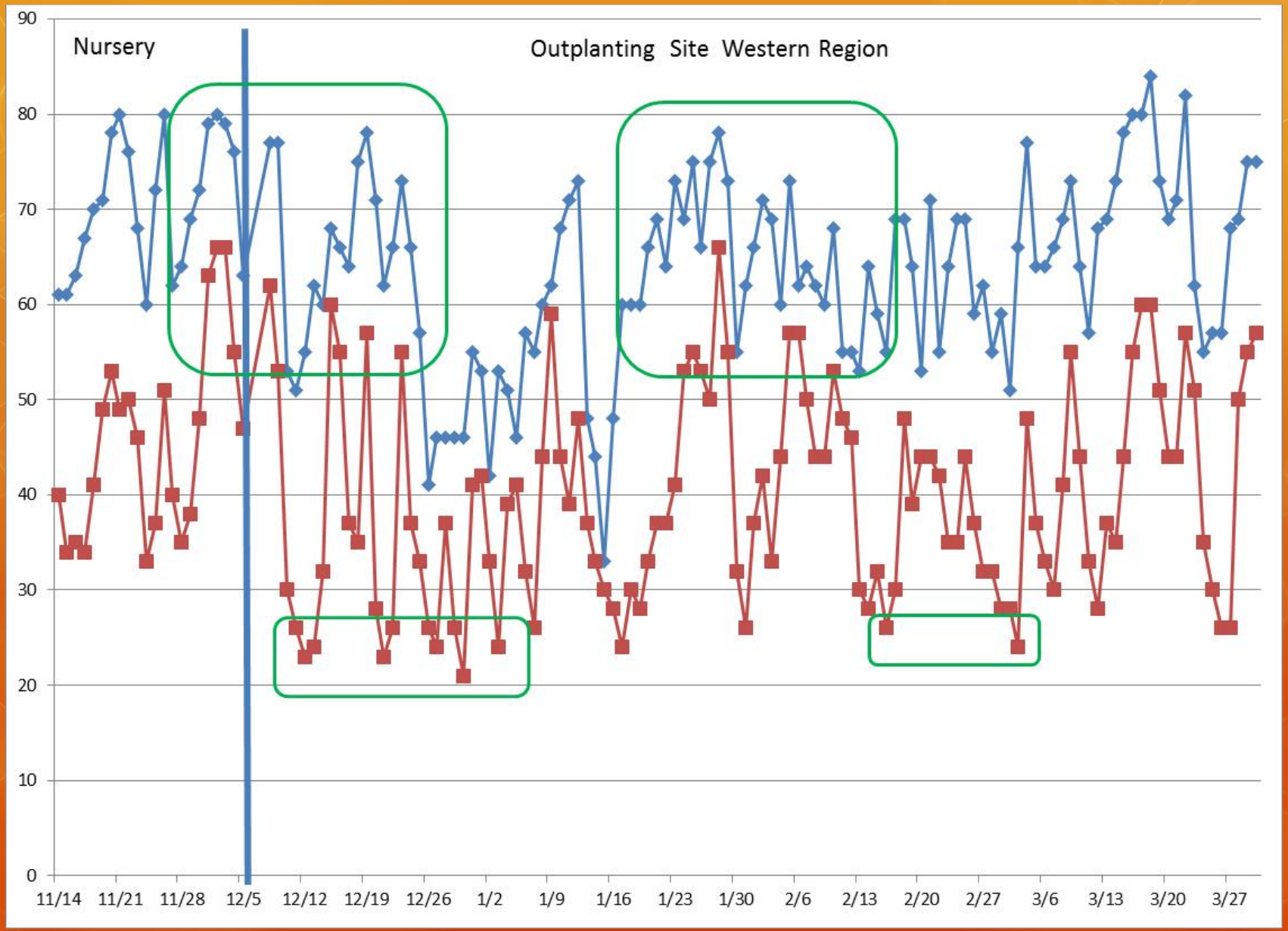


In the southeast US: December, 2014–99th warmest in 119 years



In the southeast US: February, 2015 – 10th coldest in 120 years




Nursery
Outplanting Site Western Region
90
80
70
60
50
40
30
20
10
0
11/14
11/21
11/28
12/5
12/12
12/19
12/26
1/2
1/9
1/16
1/23
1/30
2/6
2/13
2/20
2/27
3/6
3/13
3/20
3/27

“Normal” Freeze Injury

Freeze Injury 2013 - Recovery

Auburn University
Southern Forest Nursery Management Cooperative

RESEARCH REPORT 08-02

WARM NIGHTTIME TEMPERATURES AFFECT THE ABILITY OF LOBLOLLY PINE (*PINUS TAEDA*) SEEDLINGS TO TOLERATE FREEZING

by
David B. South, Tom Starkey, M. Anisul Islam and Douglass F. Jacobs

INTRODUCTION

Nursery seedlings that undergo a hard freeze might result in poor outplanting performance if the roots have been injured by a freeze (Carlson 1985; Lantz 1985; Rowan 1985; Cameron RA and Lowerts GA 2007). In some cases, injury from a freeze will be increased if seedlings are grown at high seedbed densities (Dierauf and Olinger 1979). In contrast, top-pruning can increase freeze tolerance (South et al. 1993). Freeze injury is also affected by genotype (Kolb et al. 1985;

Can NIR be used to measure / identify freeze injury in seedlings?

- NIR is used to classify products and evaluate quality
  - Wines, fruits, herbs, olive oils
  - Identify Eucalyptus clones
  - Dairy & Eggs

Sensitive & Tolerant Families

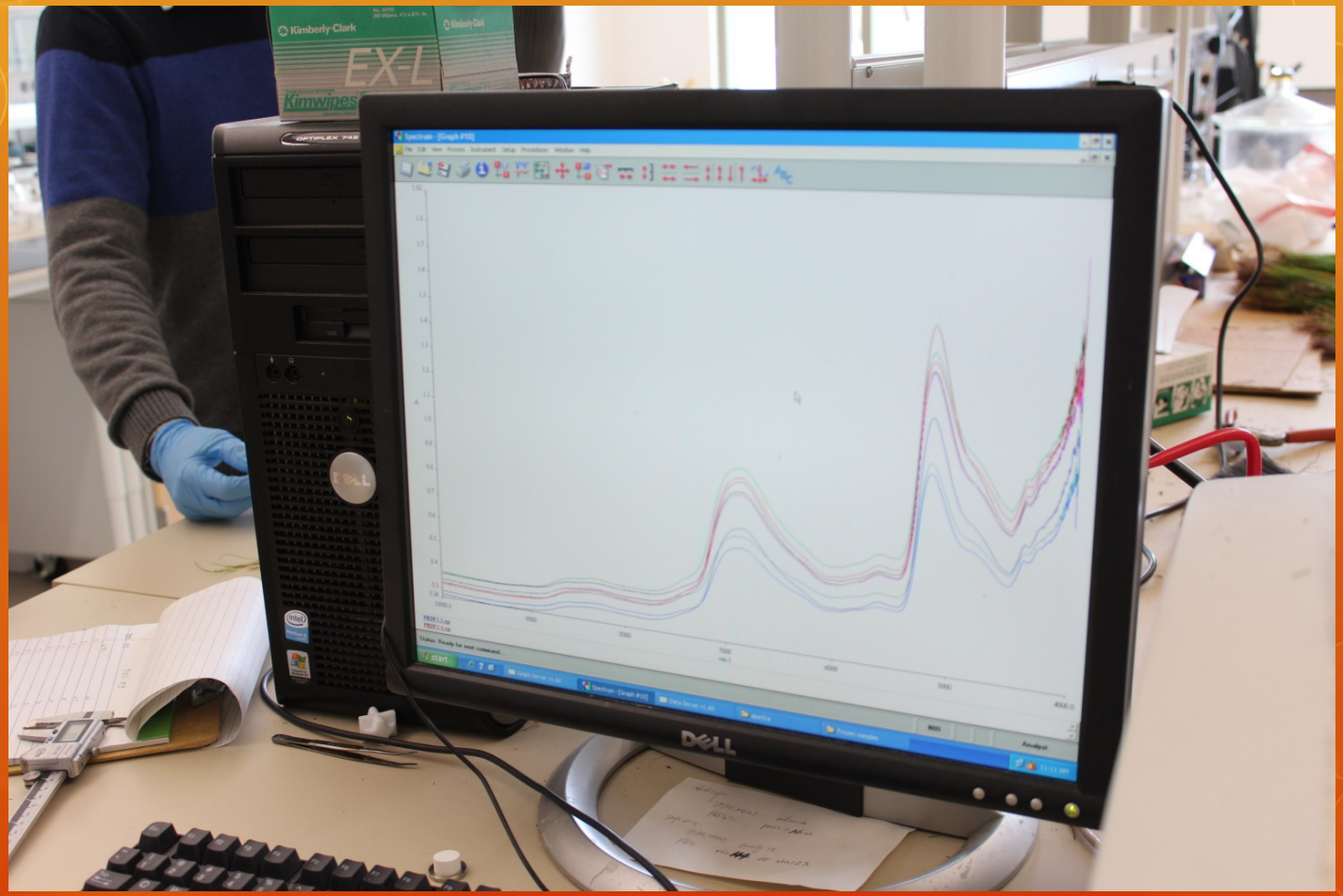
Freeze Event: 1, 3 and 6 hrs

Roots clipped, small portion of stem exposed

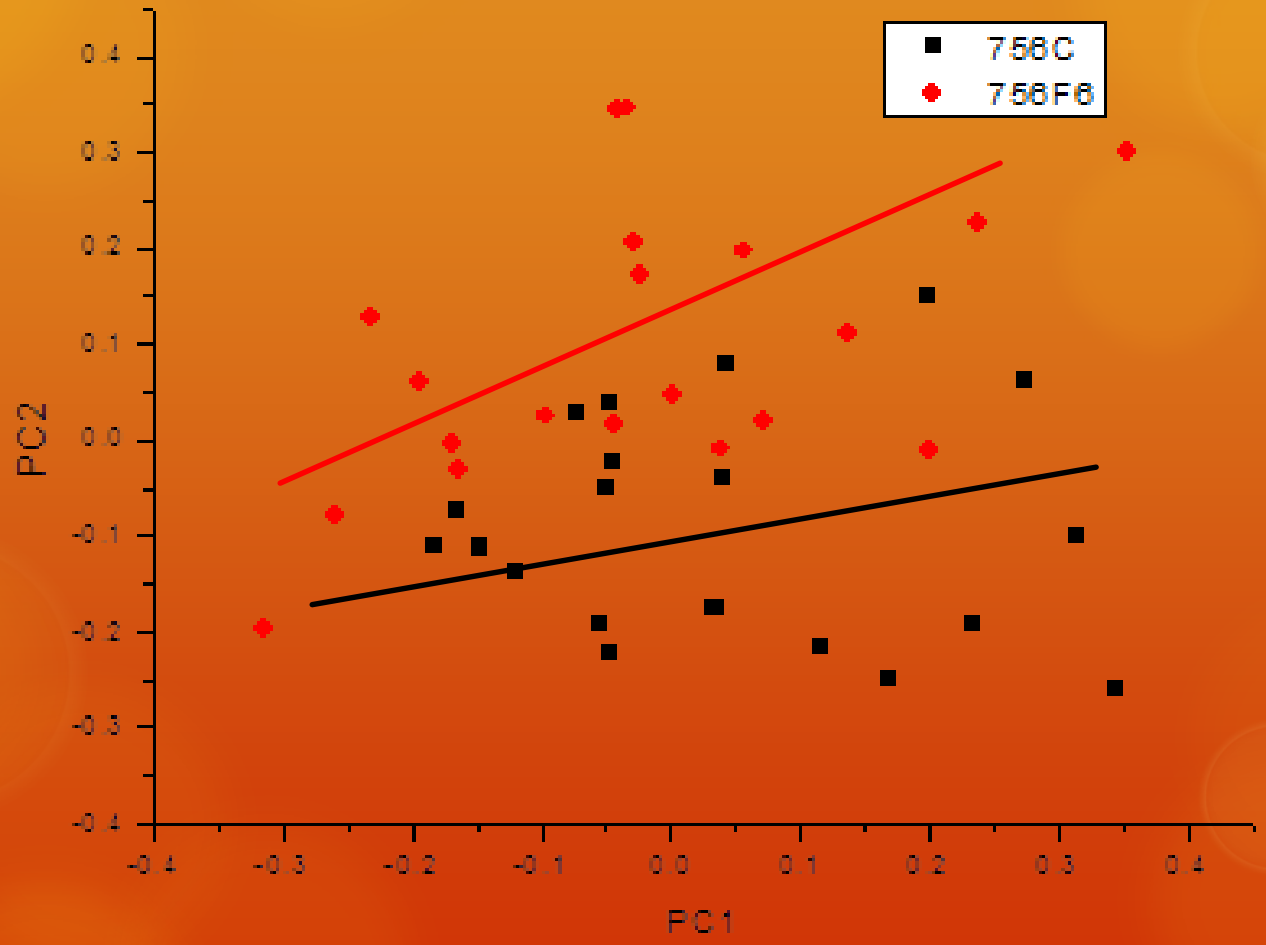
Stem held to NIR scanner

Software scans spectroscopy of stem

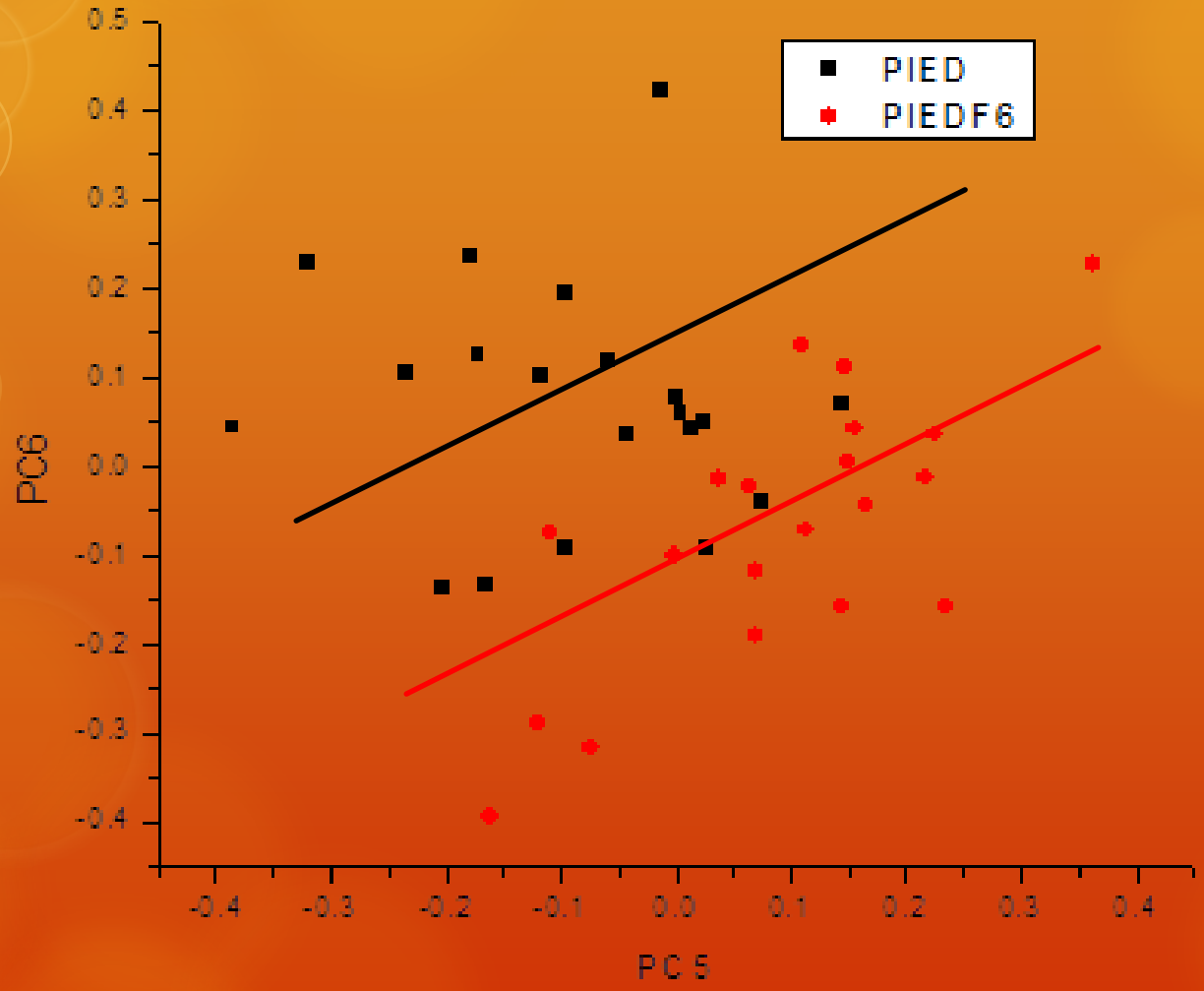
Series of samples – Calibration curves can be made



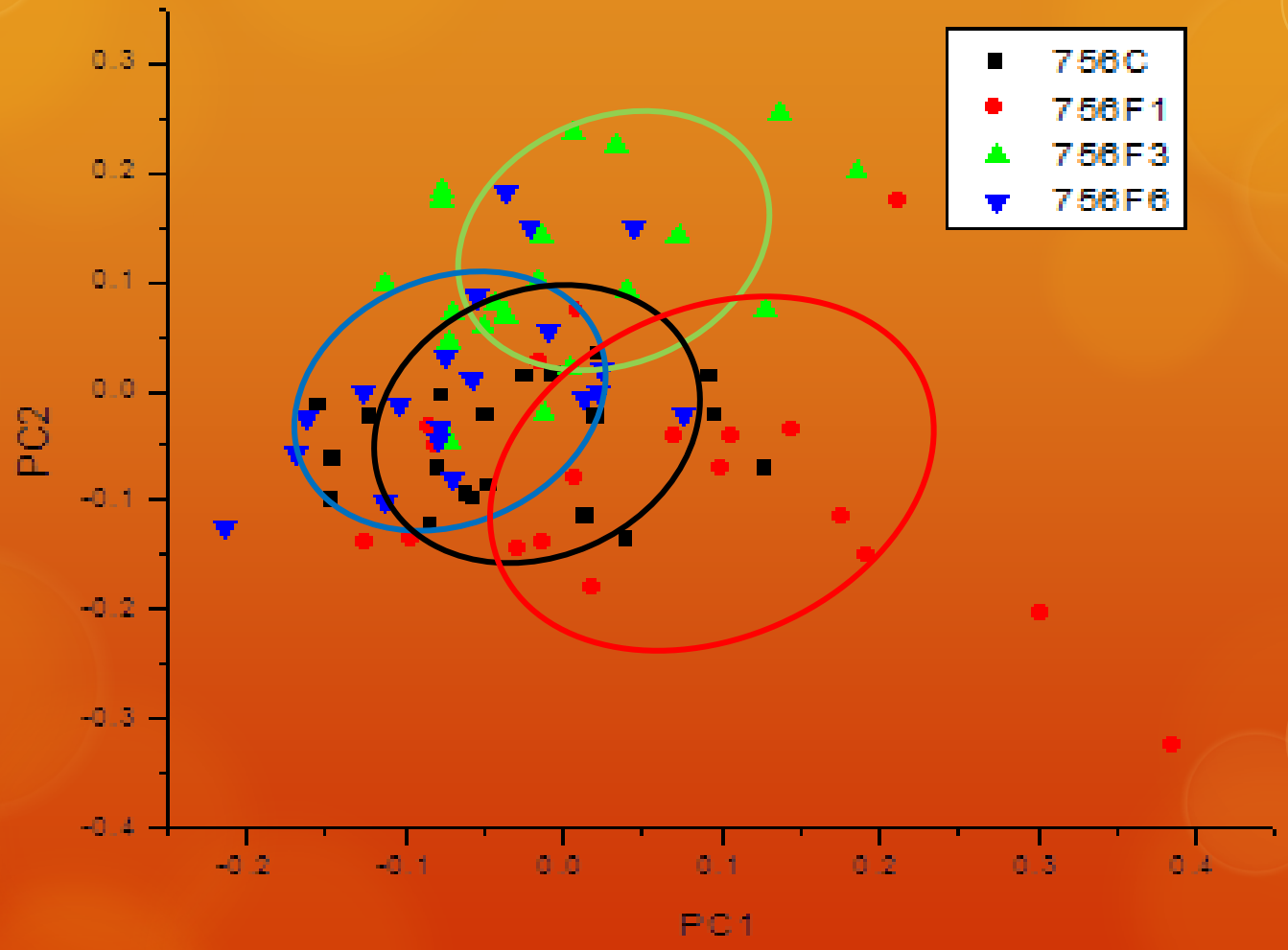
756 Family: Control & 6 hr



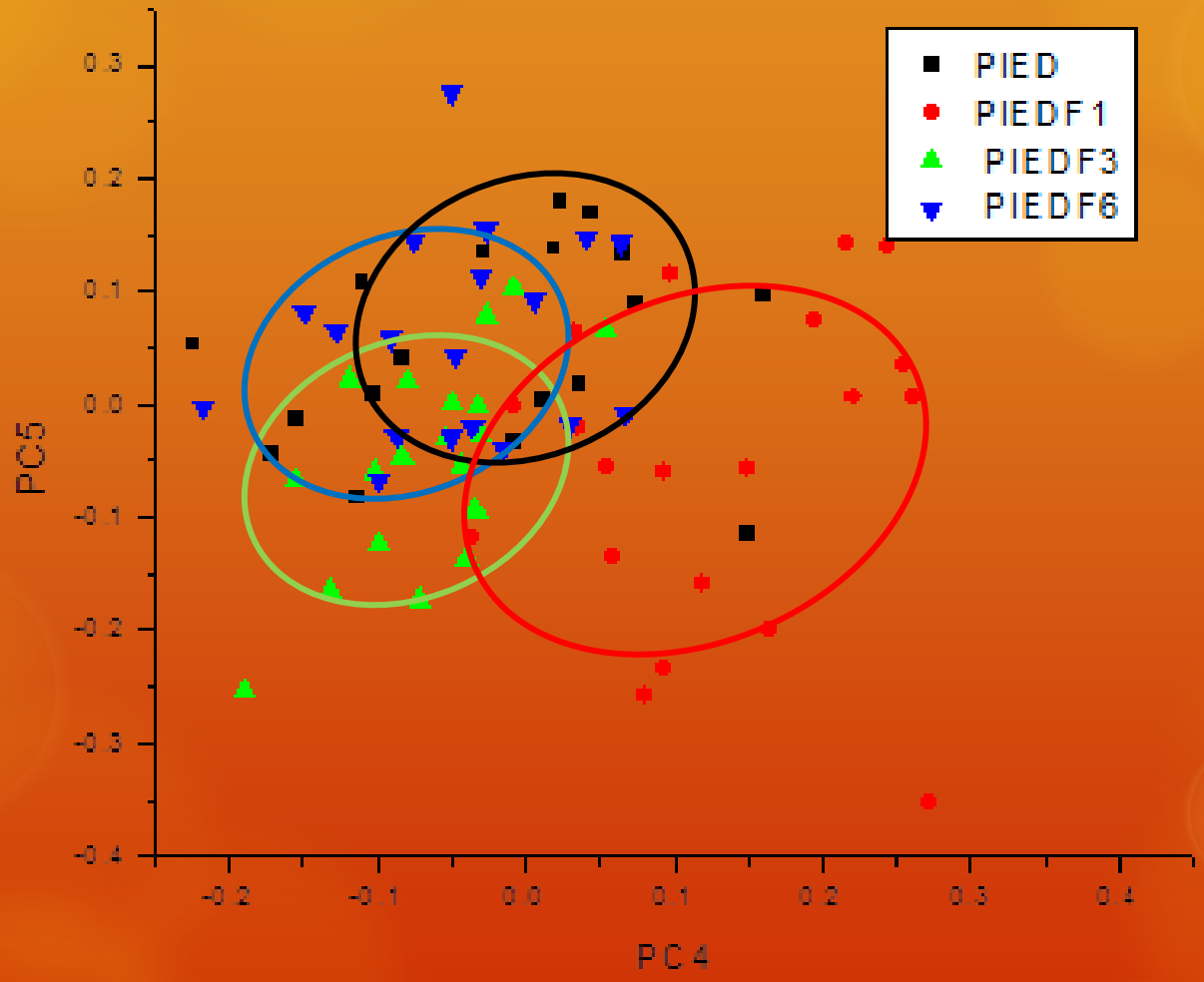
Piedmont Family: Control & 6 hr



756 Family: Control, 1, 3 & 6 hr



Piedmont Family: Control, 1, 3 & 6 hr



NIR Freeze Project

- **PhD student working on project**
- **Funded in part by SFWS**
- **Examine specific wavelengths**
  - **Sugars, Hemicellulose, Cellulose, Lignin**
- **Key on cell products produced when freeze injury occurs**
- **Tighten up curve for more precise answer**
- **“Have the seedlings been subjected to a damaging freeze”?**