Quantifying the impact of pine decline in the southeastern United States

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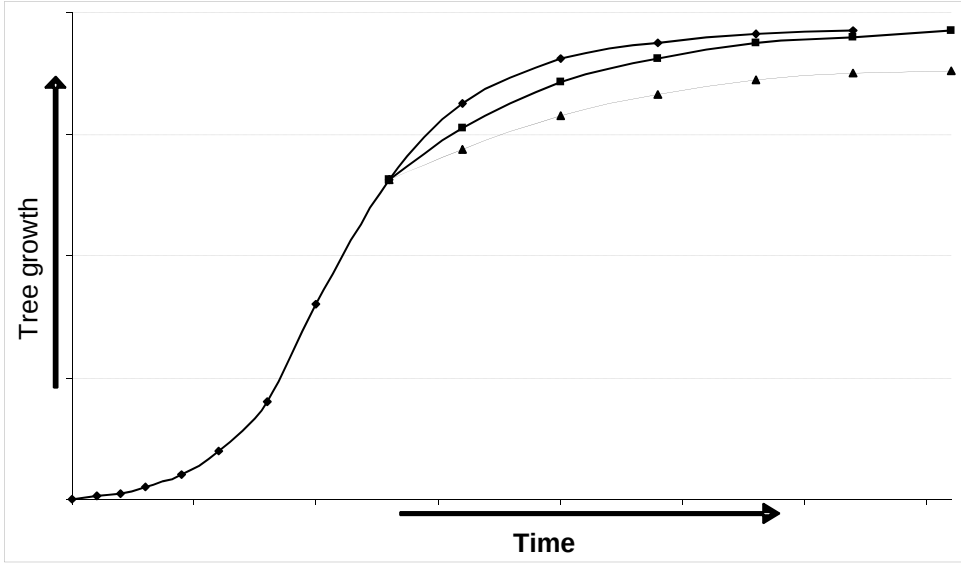
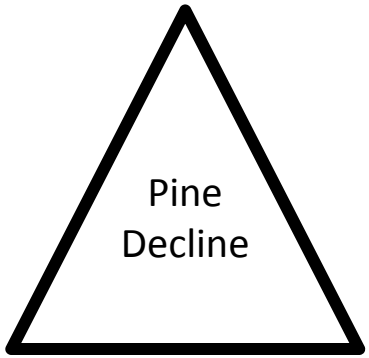
Introduction

- Southern pine decline
- *Leptographium terebrantis*
- Forest productivity



Pathogen: *Ophiostomatoid* fungi

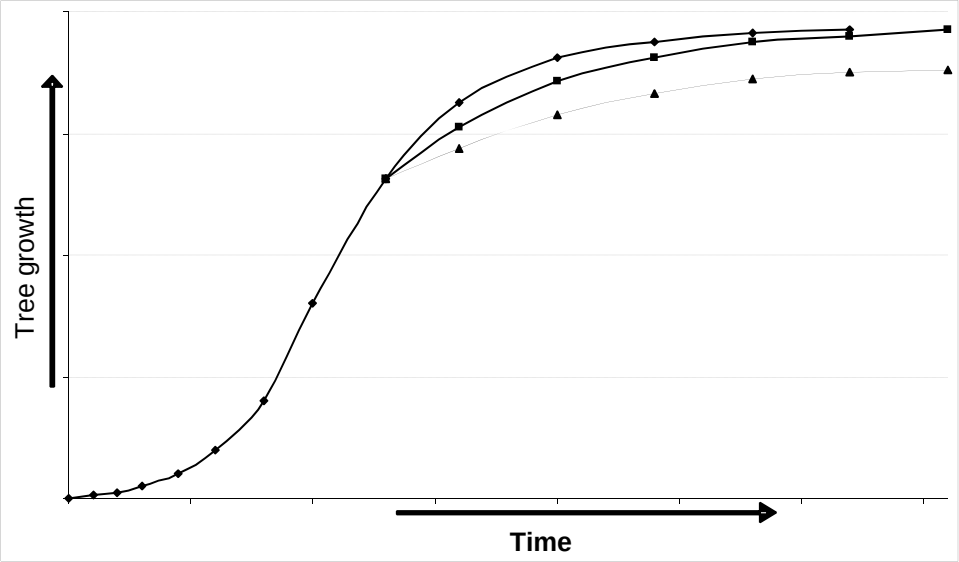


Host:
Loblolly pine

Environment

Long term goal

To quantify the impact of pine decline on forest productivity so as to enable forest managers to make accurate predictions and appropriate management decisions about commercial stands that are affected by certain pest and pathogens



Objectives

1. Quantify the impact of fungal root infection on tree and plantation productivity and investigate the early detection potential of a subset of variables.

2. Determine the threshold level of fungal root infection required to cause growth reductions and mortality of plantation trees.

3. Examine the role of fungal root infection and its interaction with the water, nutrient, and carbon relations of plantation trees to determine the cause(s) of tree mortality and growth losses by the pine decline process.

4. Determine the impact of fungal root infection on the behaviour of bark beetles and other pests within affected stands.

Experimental approach

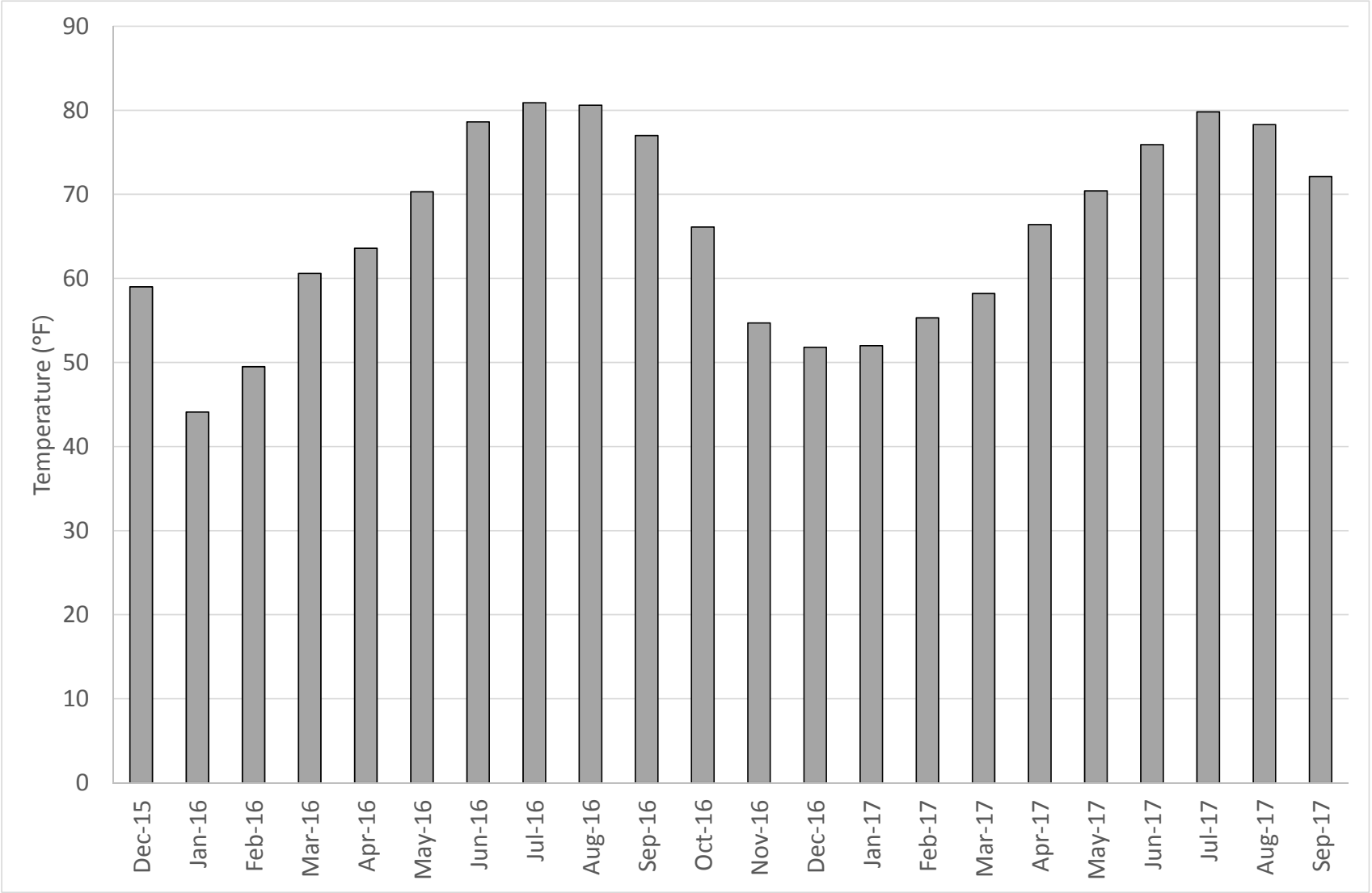
- Site characteristics
- Tree and plot growth measurements
- Physiological measurements
- Insect population data
- Foliar and soil nutrition
- Inoculation methods
- Field and laboratory methods

Site Characteristics

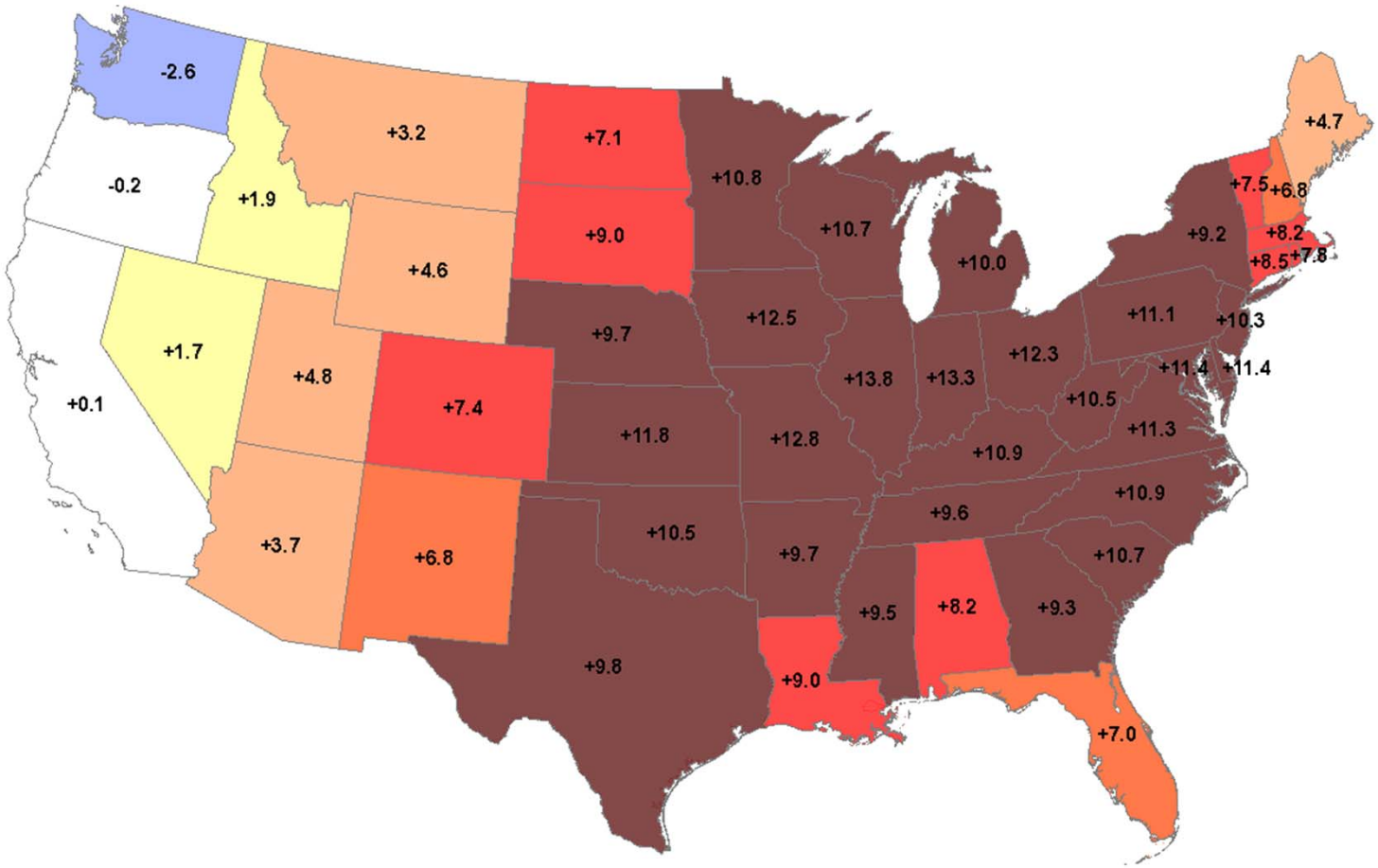
Site Characteristics

Experiment Site Soils

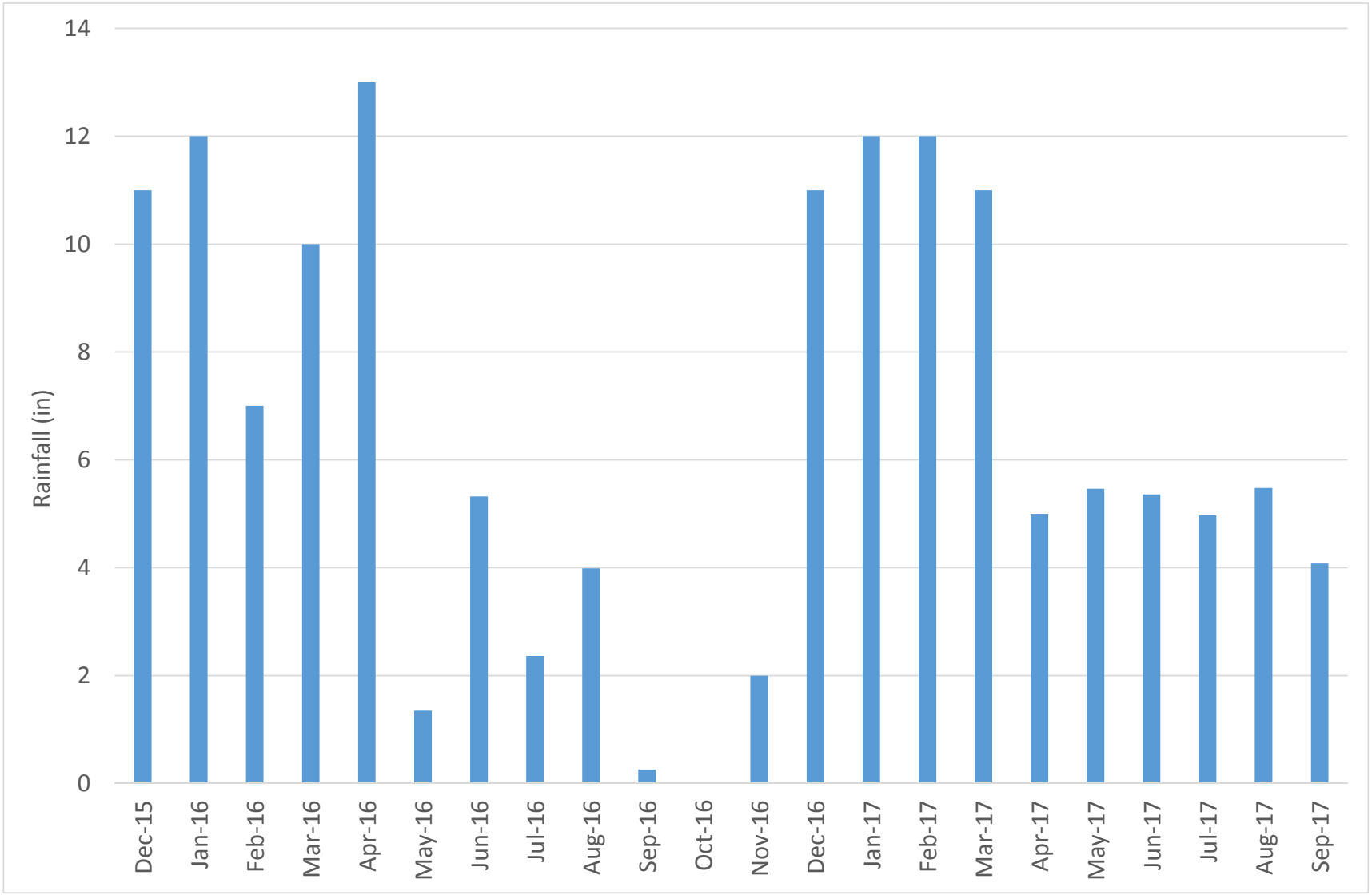
Temperature



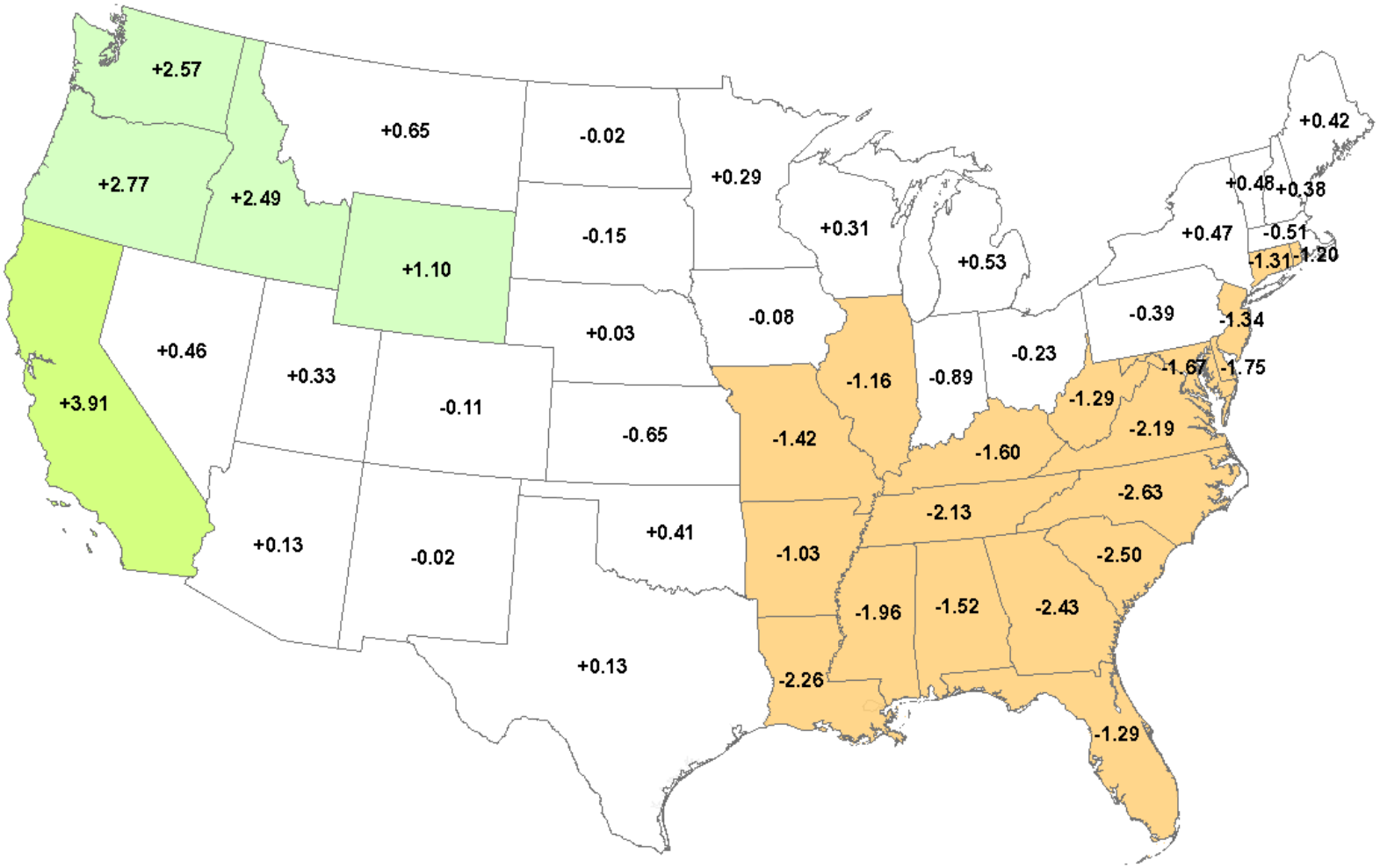
Statewide abnormalities for February 2017 using a 100 year average for maximum temperature (°F)



Rainfall

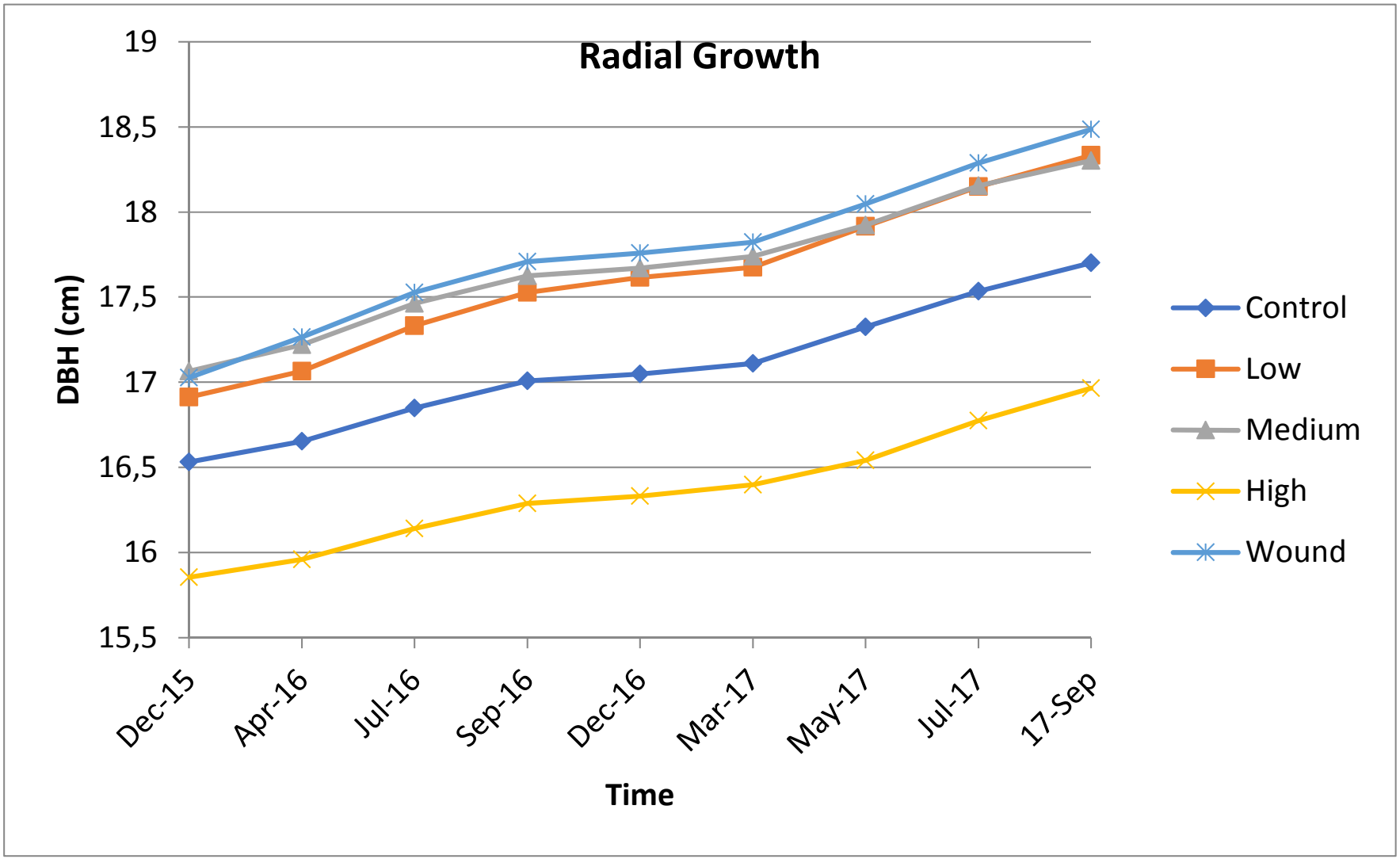

Rainfall (in)
14
12
10
8
6
4
2
0
Dec-15
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17

Statewide abnormalities for February 2017 using a 100 year average for precipitation



Tree and plot growth measurements

Tree and plot growth measurements

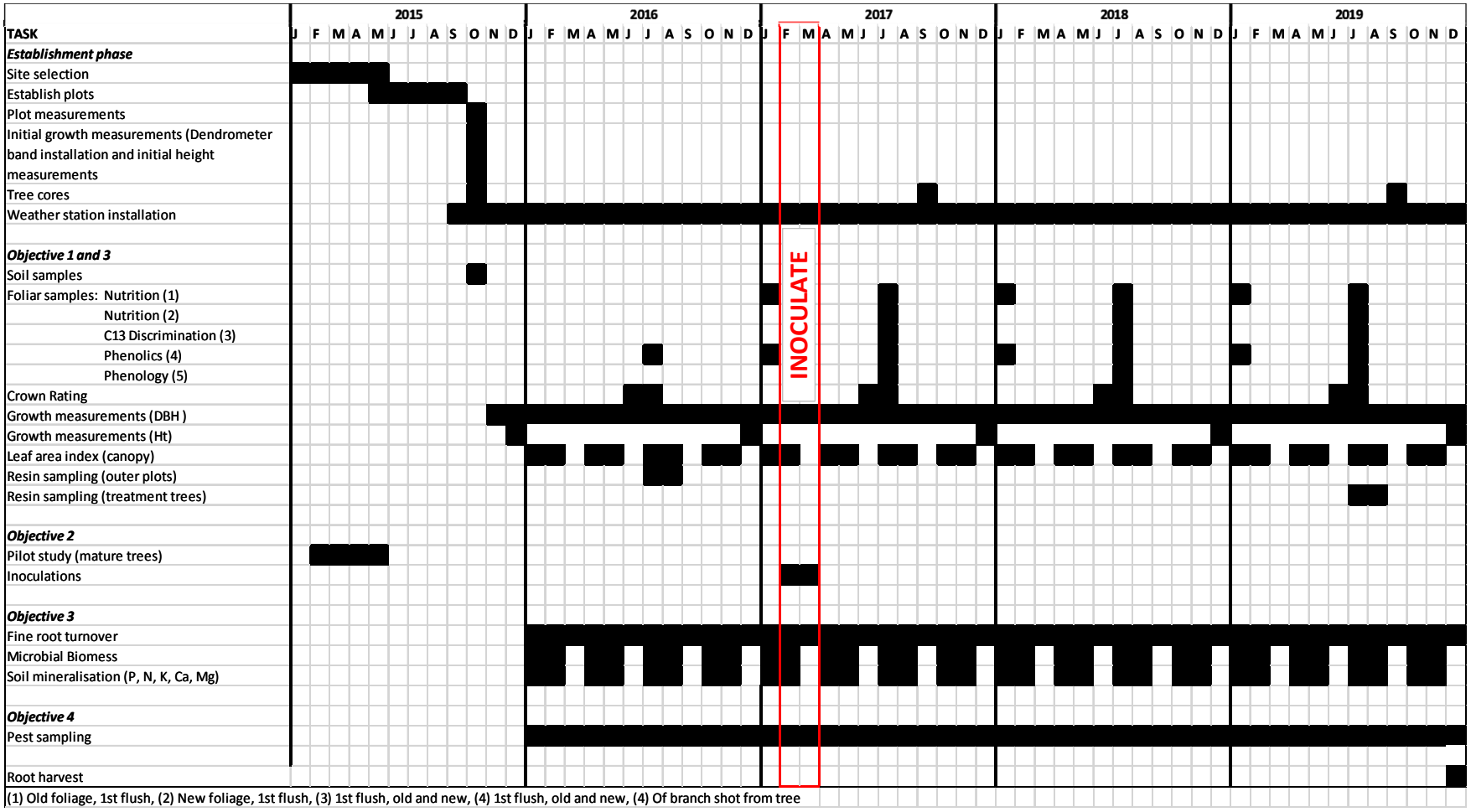

Radial Growth
DBH (cm)
19
18,5
18
17,5
17
16,5
16
15,5
Dec-15
Apr-16
Jul-16
Sep-16
Dec-16
Mar-17
May-17
Jul-17
17-Sep
Time
Control
Low
Medium
High
Wound

Physiological measurements

Physiological measurements

Insect population

Timeline


2015
2016
2017
2018
2019
J F M A M J J A S O N D
TASK
Establishment phase
Site selection
Establish plots
Plot measurements
Initial growth measurements (Dendrometer band installation and initial height measurements
Tree cores
Weather station installation
Objective 1 and 3
Soil samples
Foliar samples: Nutrition (1)
Nutrition (2)
C13 Discrimination (3)
Phenolics (4)
Phenology (5)
Crown Rating
Growth measurements (DBH)
Growth measurements (Ht)
Leaf area index (canopy)
Resin sampling (outer plots)
Resin sampling (treatment trees)
Objective 2
Pilot study (mature trees)
Inoculations
Objective 3
Fine root turnover
Microbial Biomess
Soil mineralisation (P, N, K, Ca, Mg)
Objective 4
Pest sampling
Root harvest
INOCULATE
(1) Old foliage, 1st flush, (2) New foliage, 1st flush, (3) 1st flush, old and new, (4) 1st flush, old and new, (4) Of branch shot from tree

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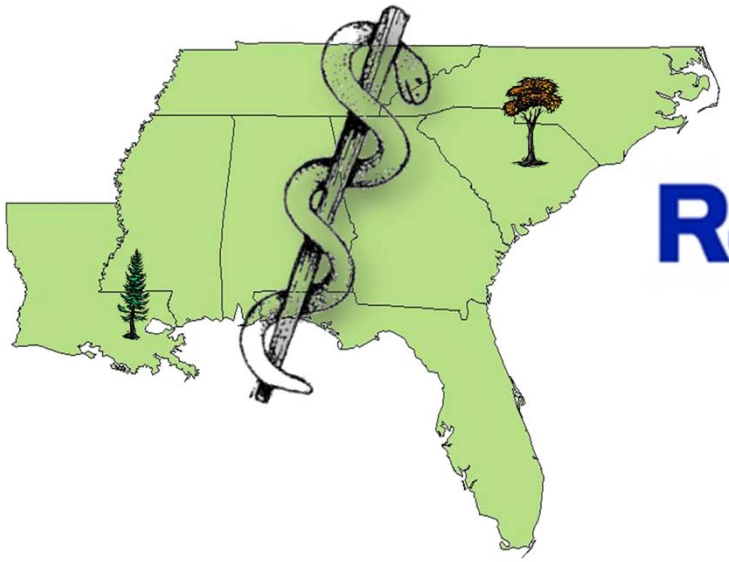

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