Influence of varying environmental conditions on canopy species recruits from four Everglades plant communities

Jeremy May and Steve Oberbauer

Hurricane Impacts on Communities

Damage is widespread but mortality is low (Armentano et al 1995; Ugarte et al 2006)

Damage is also heterogeneous depending on structure (Duever et al 1986; Ugarte etal 2006; Armentano et al 1995)

Defoliation increases available light and nutrients in the understory (Battaglia et al 2001; Carlton and Bazzazz 1998; Fernandez and Fetcher 1991; Bowden et al 1993; Harmon et al 1995; Carlton and Bazzazz 1998; Xu et al 2004)

Hypotheses

What factors primarily influence seedling growth in the understory and how quickly do seedlings recover from hurricane impacts?

1. Varying light intensity and available soil nutrient levels will alter growth rates and biomass allocation toward the limiting resource (available light or soil nutrients), thus altering their survivability toward regenerating the canopy.

2. Recruits within the plasticity response treatment group will be affected in their growth and through leaf biomass loss shortly after hurricane simulation, however, they will recover quickly with increased growth rates simulating the role of growing toward canopy regeneration.

Species Selection

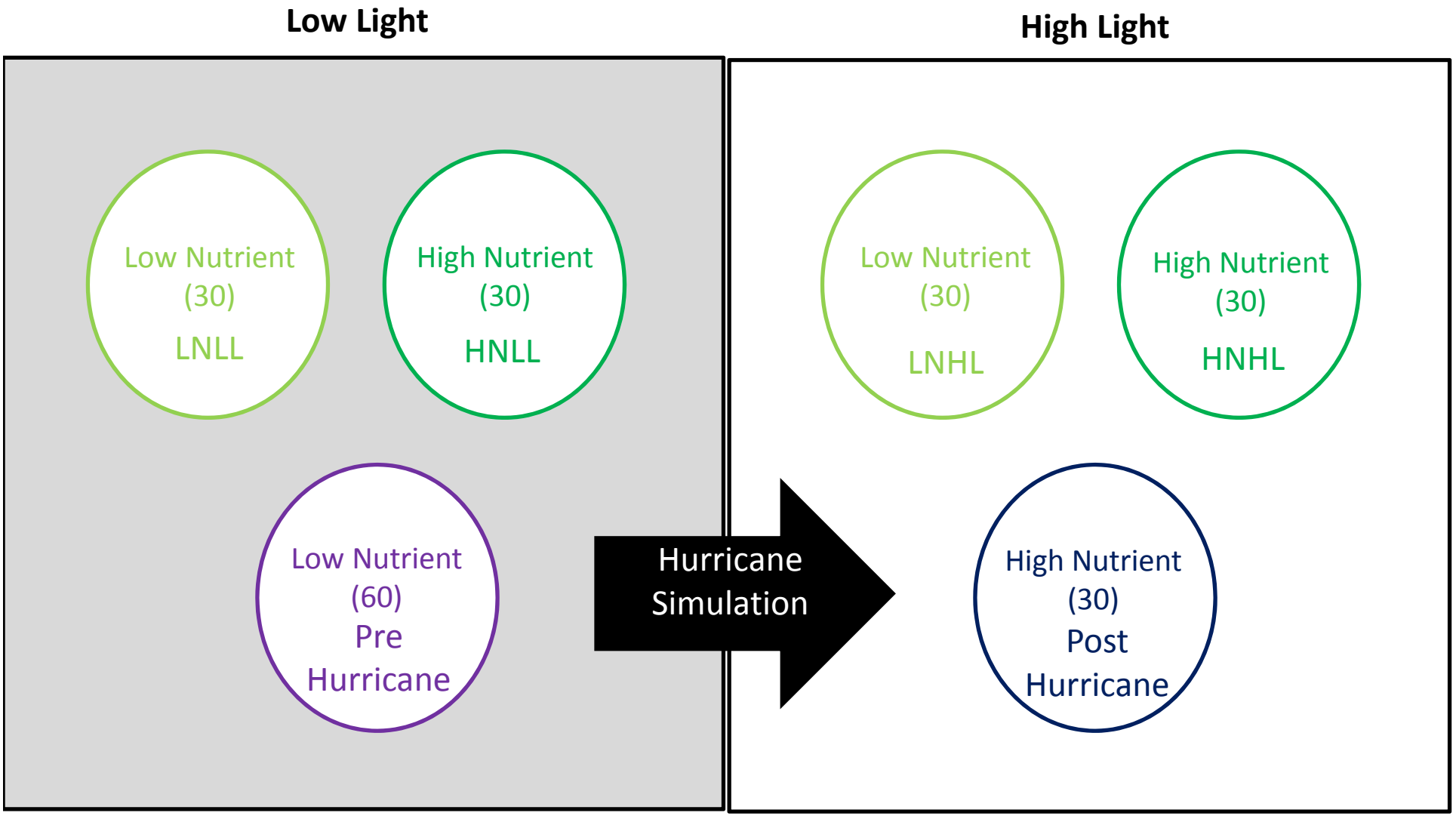
Taxodium distichum

Pinus elliottii

Bursera simaruba

Quercus virginiana

Treatment Design



Light and Nutrient Manipulation

-Seeds and seedlings of each species were collected from Dade County

-Planted in tall tree pots containing 20% sand, 40% top soil, 40% peat

-FIU Shadehouse was used to manipulate light (50%)

-Low nutrient was water, nutrient addition was a rate of 1.5g P and 3g N/ liter (Wang et al 2013)

-Plants were watered weekly with treatment and bi weekly with water (all treatments)

-Treatments ran for 16 weeks (8 weeks PreHurricane and 8 weeks PostHurricane)

-Measured weekly for growth rate and harvested for biomass at end

Results

Light/Nutrient Manipulation

Growth Rates

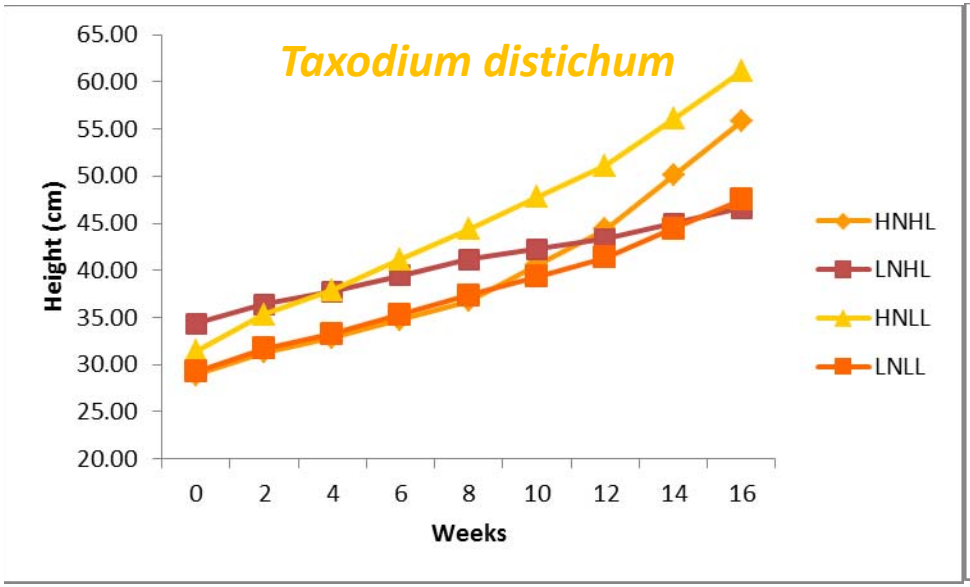
Biomass

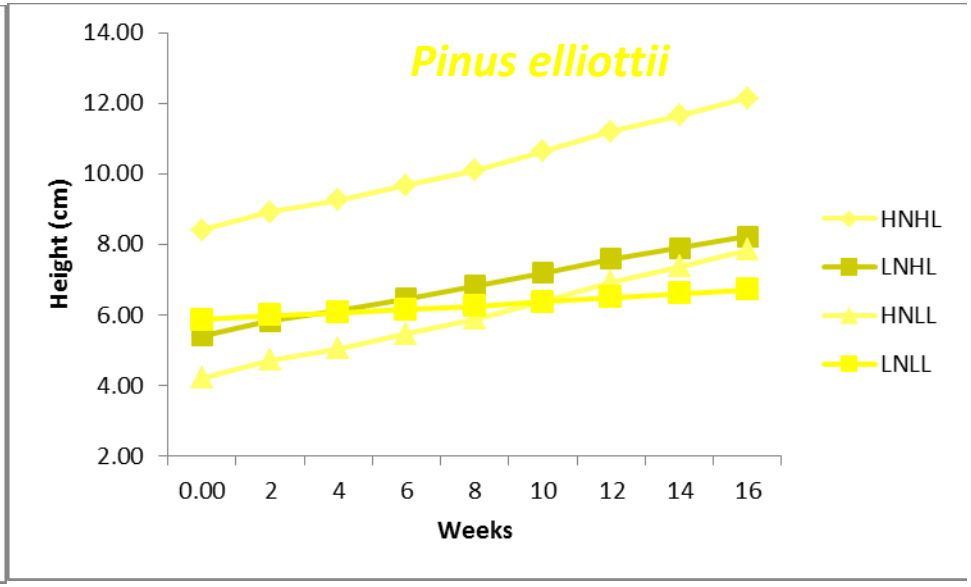
Simulated Hurricane

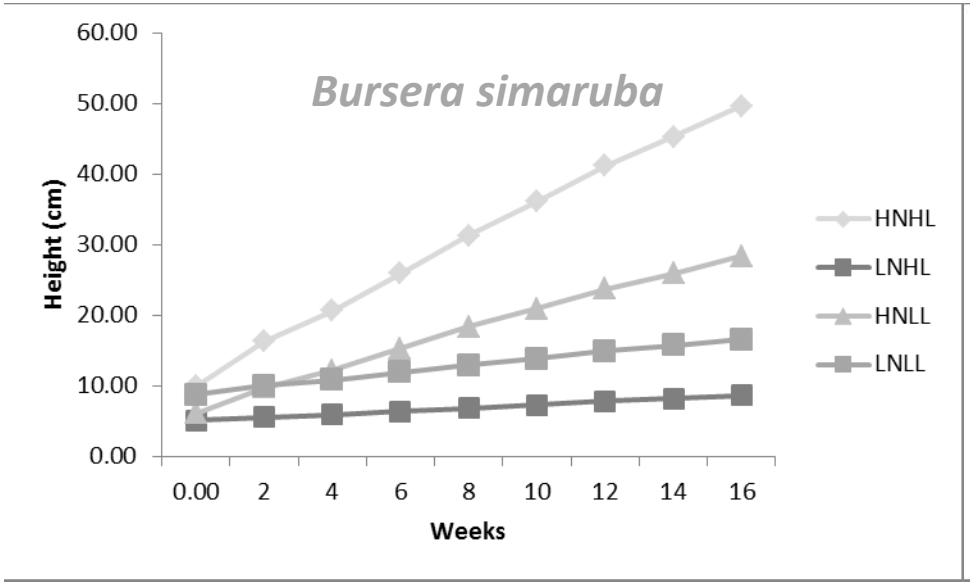
Growth Rates

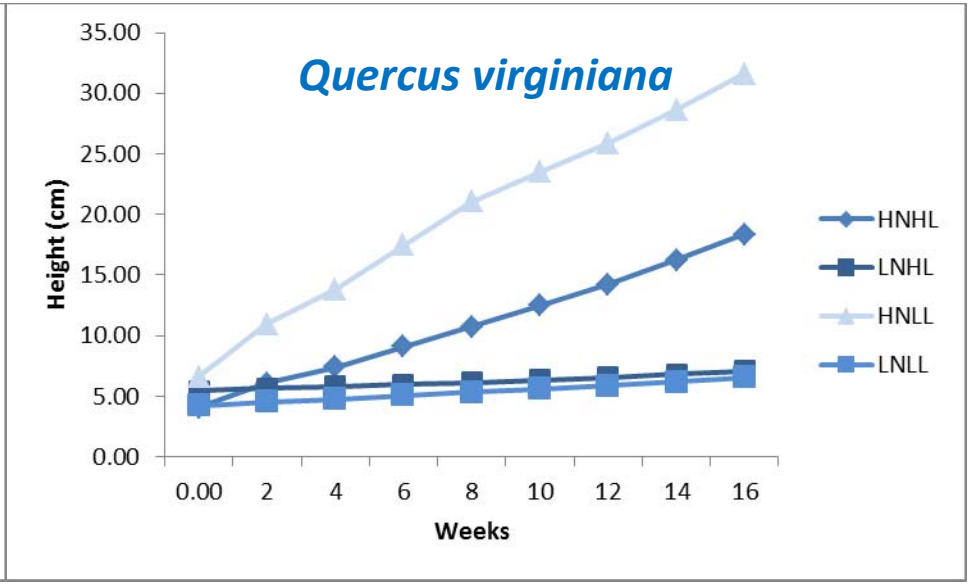
Biomass

Growth Rates









Results

Light/Nutrient Manipulation

Growth Rates

Nutrients play a larger role than light

Pinus elliottii and ***Bursera simaruba*** had highest growth rates in HNHL

Quercus virginiana or ***Taxodium distichum*** had highest growth rates in HNLL

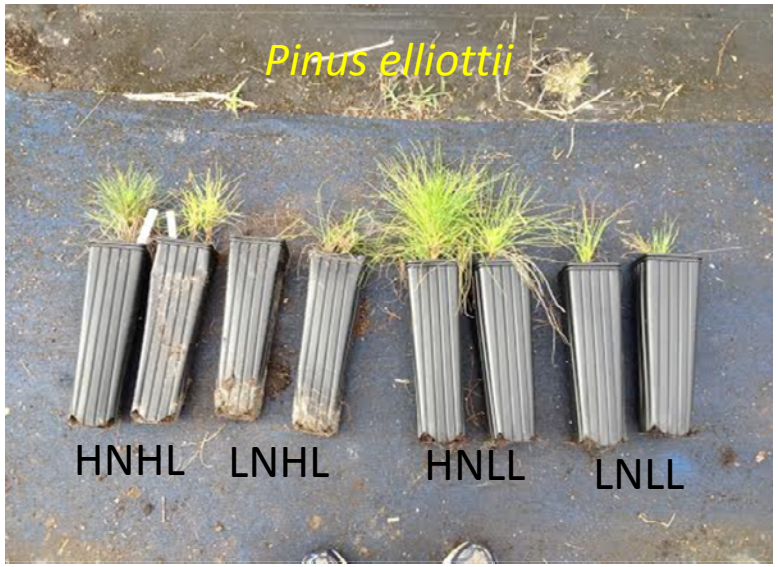
Biomass

Simulated Hurricane

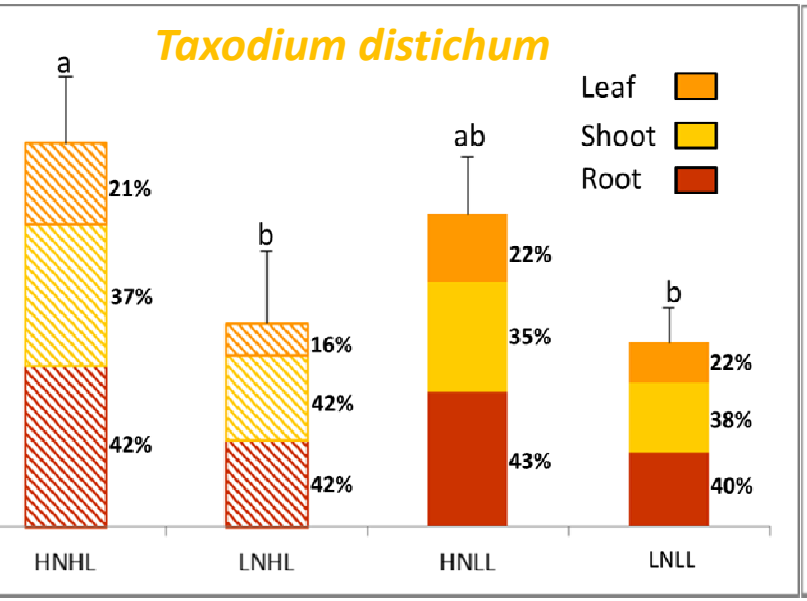
Growth Rates

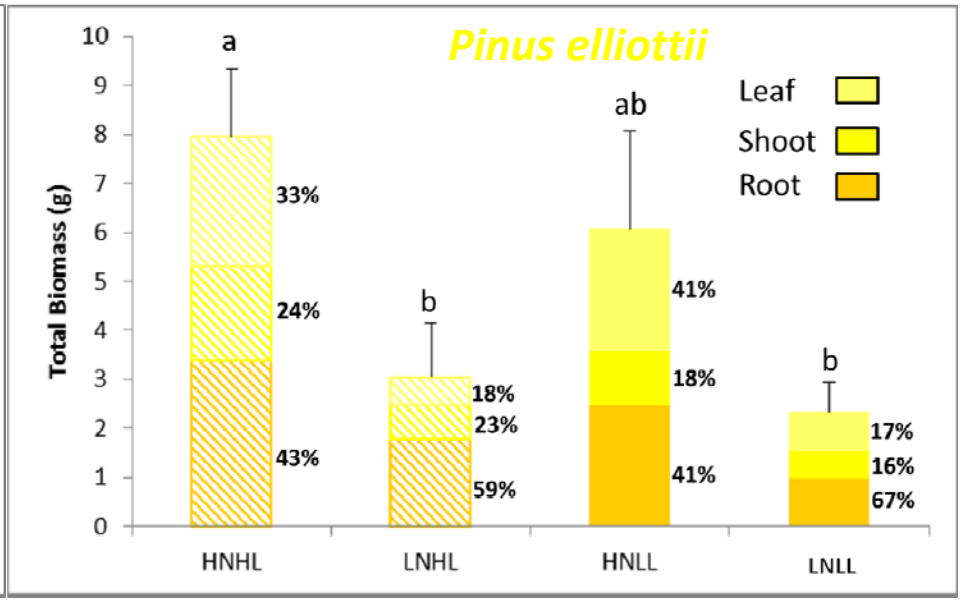
Biomass

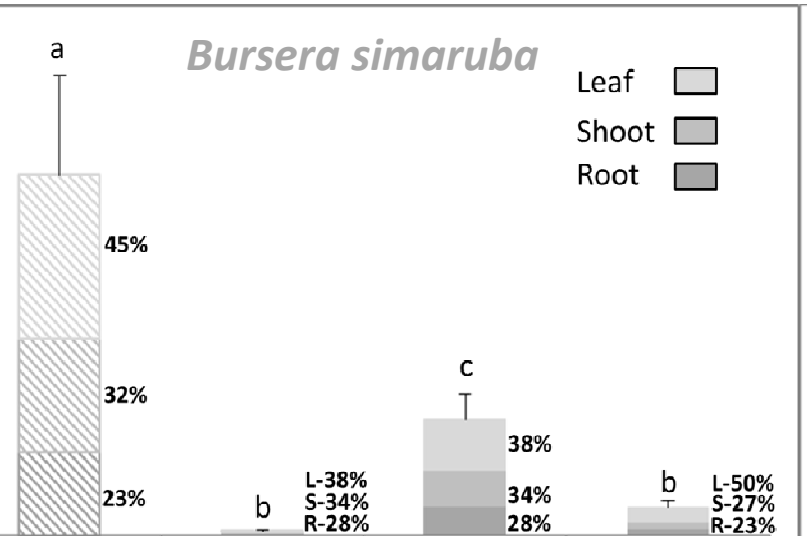
Total Biomass

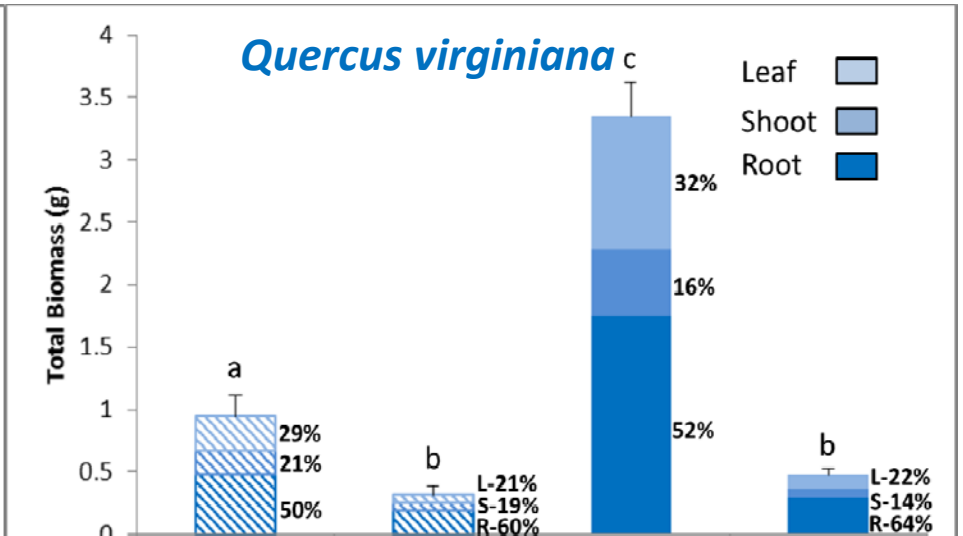


Total Biomass









Results

Light/Nutrient Manipulation

Growth Rates

rients play a larger role than light

us elliottii and *Bursera simaruba* highest growth rates in HNHL

ercus virginiana or *Taxodium ichum* had highest growth rates in LL

Biomass

Nutrients increased total biomass more than light

Taxodium distichum and *Bursera simaruba* had consistent allocation across treatments

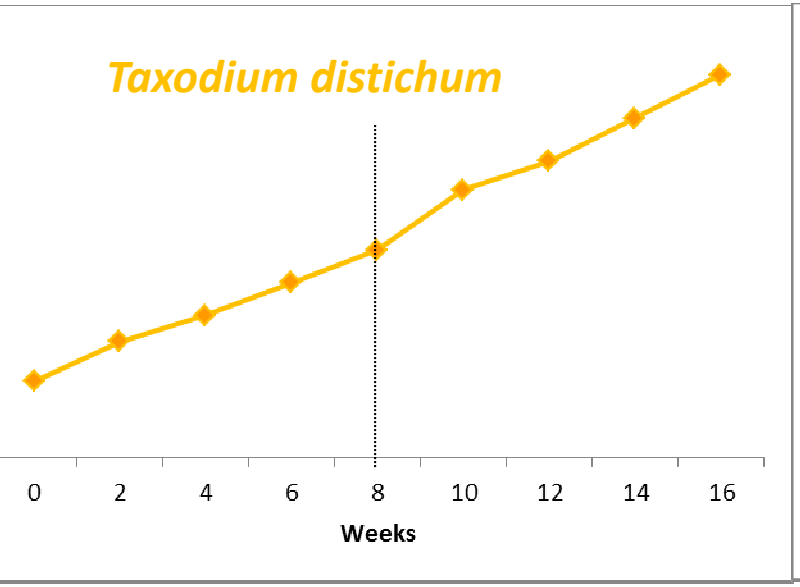
Pinus elliottii and *Quercus virginiana* allocated more to roots in low nutrient conditions

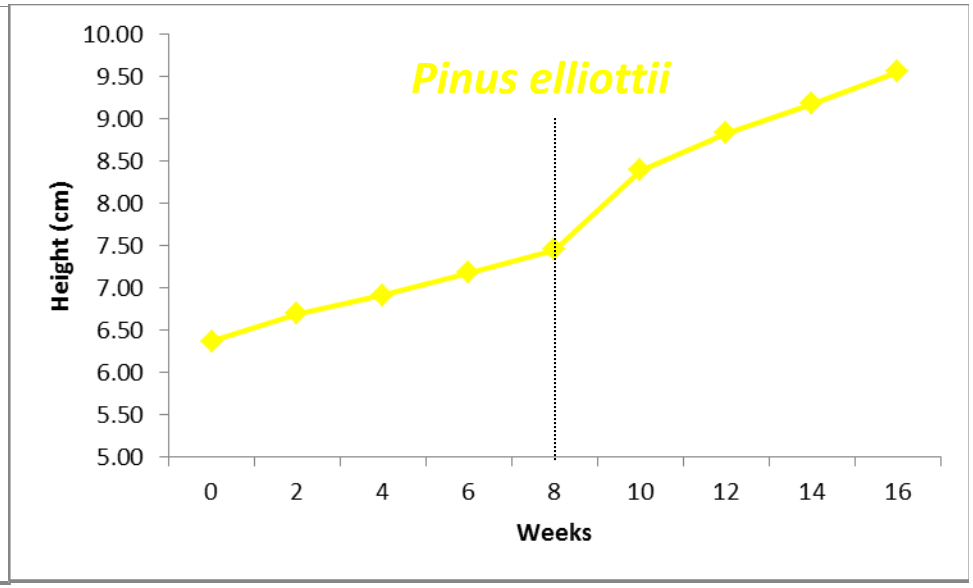
Simulated Hurricane

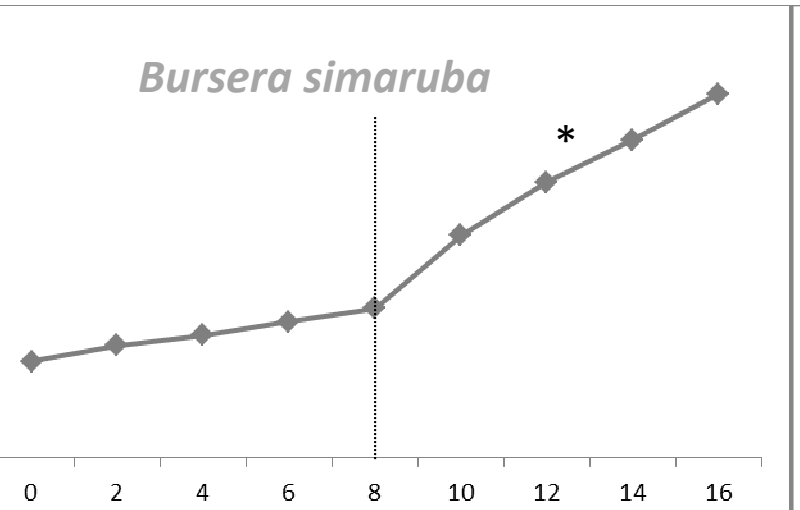
Growth Rates

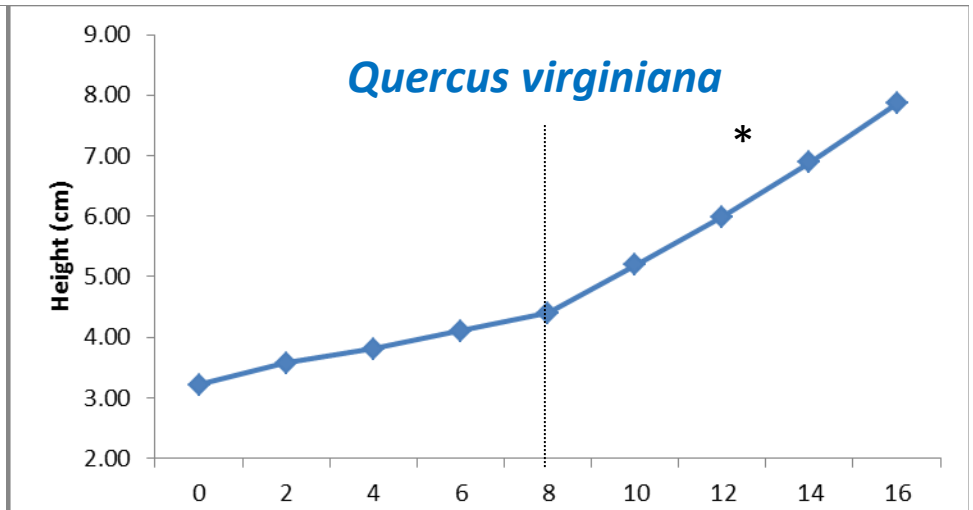
Biomass

Simulated Hurricane Treatment









Results

Light/Nutrient Manipulation

Growth Rates

rients play a larger role than light

us elliottii and *Bursera simaruba* highest growth rates in HNHL

ercus virginiana or *Taxodium ichum* had highest growth rates in LL

Biomass

Nutrients increased total biomass more than light

Taxodium distichum and *Bursera simaruba* had consistent allocation across treatments

Pinus elliottii and *Quercus virginiana* allocated more to roots in low nutrient conditions

Simulated Hurricane

Growth Rates

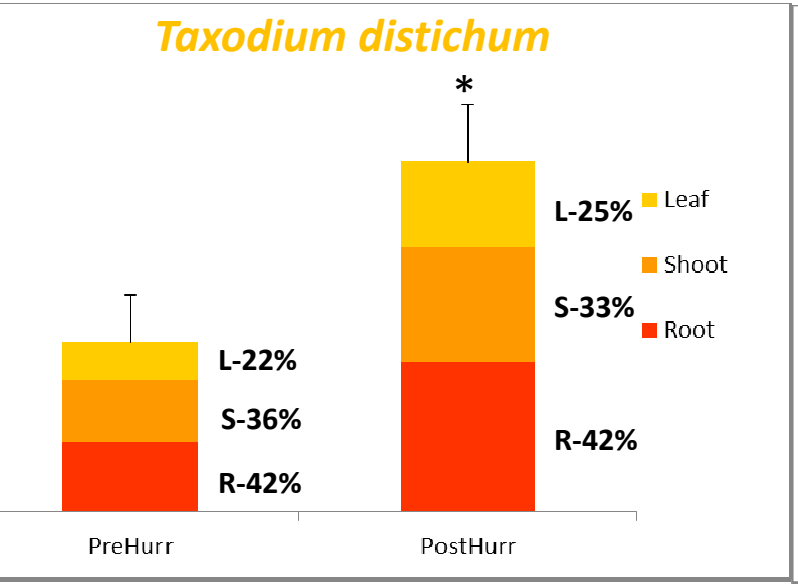
pecies showed a “bump” in growth at time of hurricane treatment

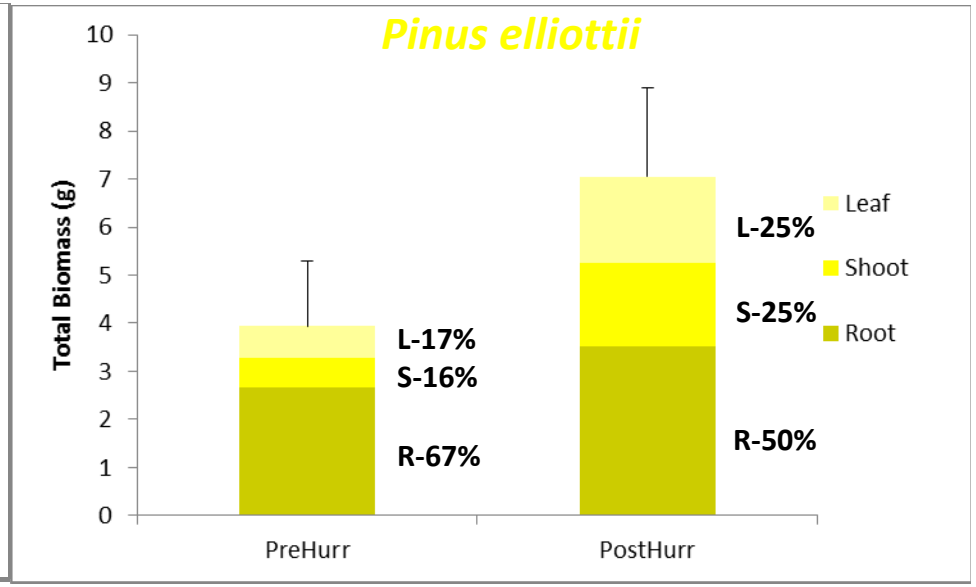
dium distichum and *Pinus elliottii* ed off to rates similar to pre-hurricane

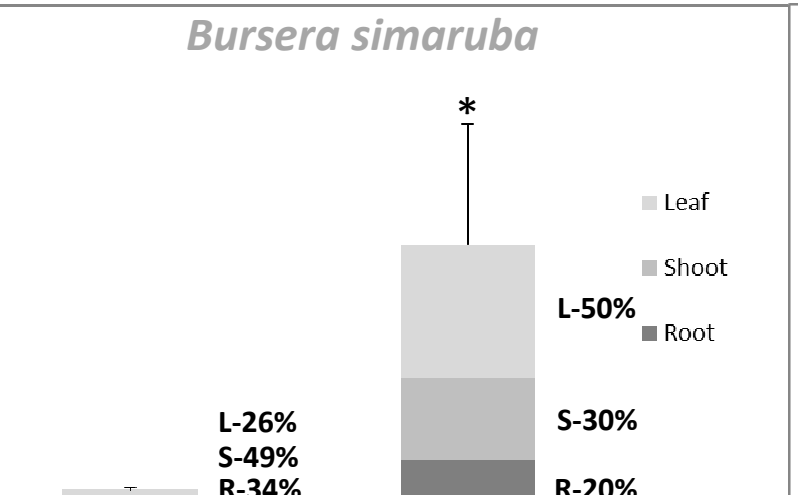
era simaruba and *Quercus virginiana*

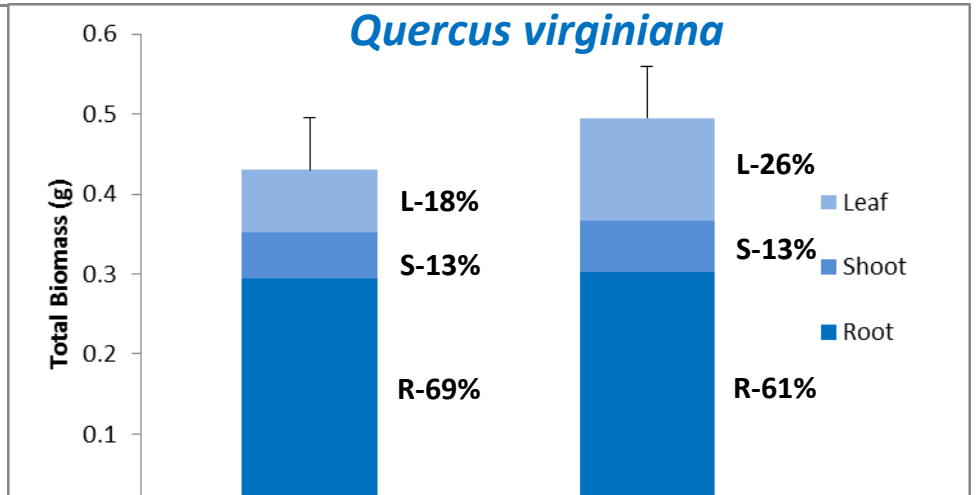
Biomass

Hurricane Treatment Total Biomass









Results

Light/Nutrient Manipulation

Growth Rates

rients play a larger role than light

us elliottii and *Bursera simaruba* highest growth rates in HNHL

ercus virginiana or *Taxodium ichum* had highest growth rates in LL

Biomass

Nutrients increased total biomass more than light

Taxodium distichum and *Bursera simaruba* had consistent allocation across treatments

Pinus elliottii and *Quercus virginiana* allocated more to roots in low nutrient conditions

Simulated Hurricane

Growth Rates

ecies showed a “bump” in growth at time of hurricane treatment

dium distichum and *Pinus elliottii* ed off to rates similar to pre-hurricane

era simaruba and *Quercus virginiana*

Biomass

Individuals harvested pre-hurricane were similar to those in low nutrient conditions

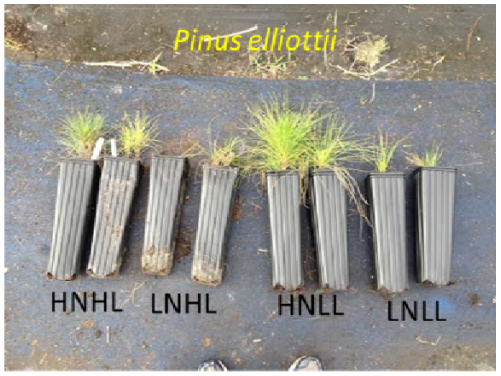
Bursera simaruba and *Taxodium distichum* were able to take advantage of post hurricane conditions

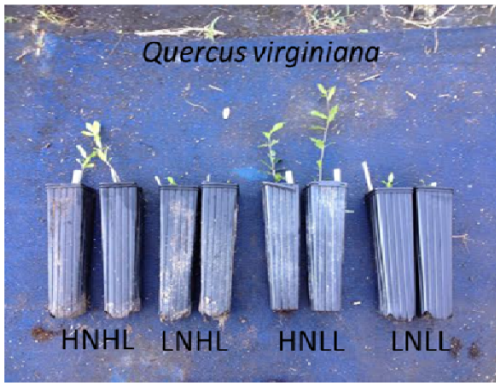
Conclusions

eased nutrient levels had a larger
ct on growth rates and biomass
pared to light levels

rations in biomass allocation
ng tissue types was species
ific

sera simaruba and ***Quercus iniana*** were able to adapt to
-hurricane conditions most
ctively





Future Work

-Analyze photosynthesis data
-Nutrient analysis

Thanks

J Agroecology Program and Scott Zona

y committee:
eve Oberbauer
zanne Koptur
vin Whelan
nnifer Richards
ke Ross

Labmates (past and present):
Paulo Olivas
Jonathan Moser
Justin Cummings
Roxaneh Khorsand Rosa
Nathan Healey
Jose Luciani

e O'Brien USDA Forest Service

ecial Thanks to Max Olzsack and Edy Cicilio

Questions?