



# **Vegetation Reliability Analysis**

**April 11, 2012**

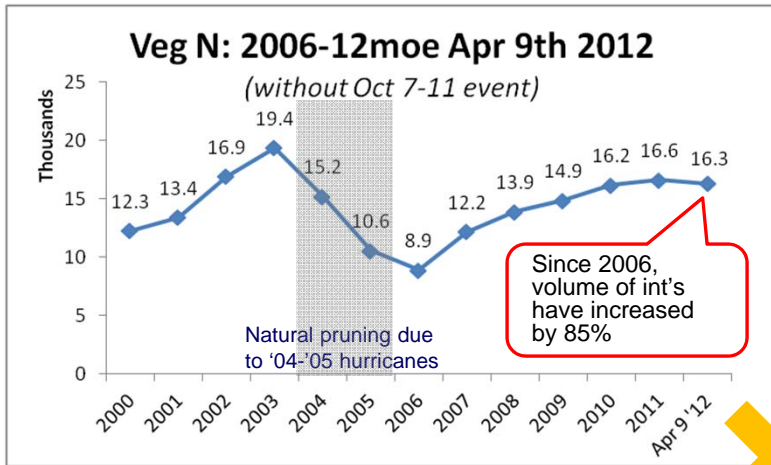
**Vegetation Management**

# Executive Summary

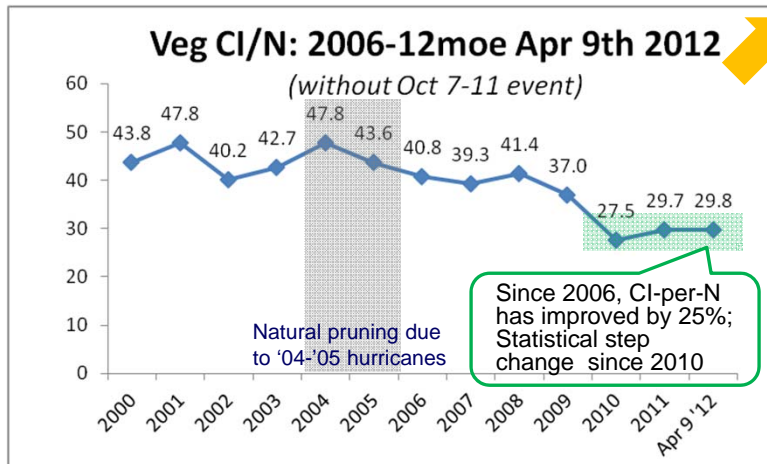
- Since 2006, CI has increased by 39% driven by an increase in the volume of outages after “hurricane pruning” but partially offset by improved CI prioritization.
- Recent CI performance is better than 2003, 2008 & 2009 peaks. Statically significant step-change in prioritization (CI/N) occurred in 2010.
- Backbone (feeder & ocr) outages “outside of trim scope” & circuit body (lateral & below) outages “within trim scope” are the main drivers.
  - Using 2011 St. Augustine wind data, both types of outages tend to pickup during gusts of approx. 35mph or higher.
- Backbone outages “outside of trim scope” are concentrated in North Florida and Central Florida areas while circuit body outages “within trim scope” are scattered.
  - “Out of trim scope” outages in the North Region typically involve healthy pine trees that fail several feet from the power lines and are challenging to identify before an outage occurs.
  - Targeted ERT projects and hazard tree assessments on repeat priority feeders are in place to counter “out of scope” backbone outages in NF & CF. Exploring technologies to help with tree failure prediction capabilities.
- “Trim scope” specifications are primarily driven by two components: NESC Rule 218 & ANSI A-300.
  - Per ANSI, line clearance should not remove more than 25% of the tree canopy in one year.
  - Based on this, the clearance for Primary is 8 to 12 feet and the clearance for Secondary & Neutral is 4 to 6 feet. The range depends on the species and its re-growth rate.
  - Municipalities have adopted ANSI as ordinance and, in the past, have requested VM to temporarily stop all line clearing activities when in violation of ANSI or when questioning trimming standards.
  - Cities include: Coral Gables, Plantation, Pinecrest, Coconut Grove, Palm Beach, and recently Village of El Portal
  - 6-year circuit body cycle ramp-up, new lateral selection methodology, and special initiatives such as substation trimming are in place to counter “within trim scope” circuit body outages. Consideration should be given to decrease the lateral cycle.

# How are Vegetation outages trending?

## Prevention (N)



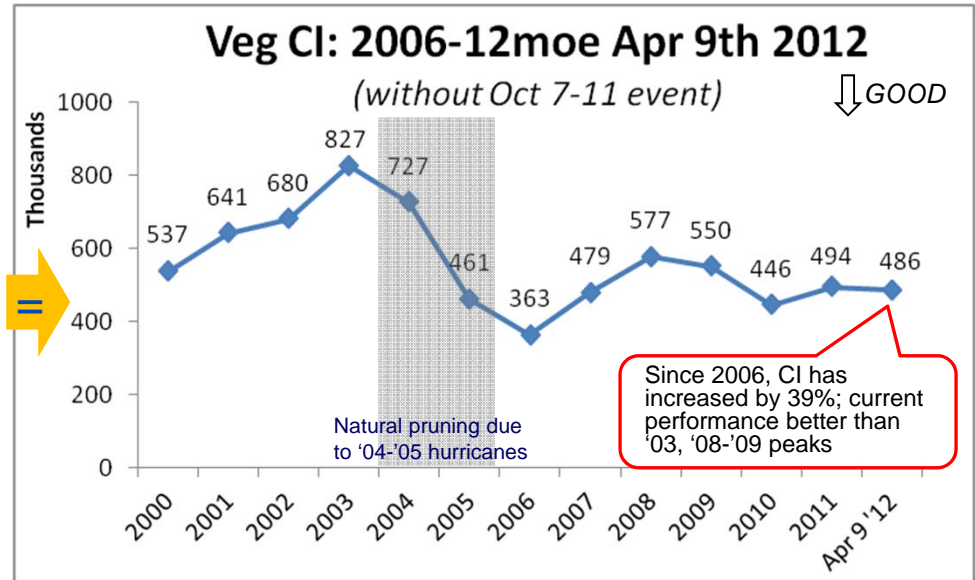
## Prioritization (CI/N)



X =

- Data excludes Oct 7-11, 2011 event
- $CI = N \times CI/N$   
(Impact) (Prevention) (Prioritization)

## Impact (CI)



Since 2006, CI has increased by 39% driven by an increase in the volume of outages after “hurricane pruning” but partially offset by improved CI prioritization. Recent CI performance is better than 2003, 2008 & 2009 peaks.



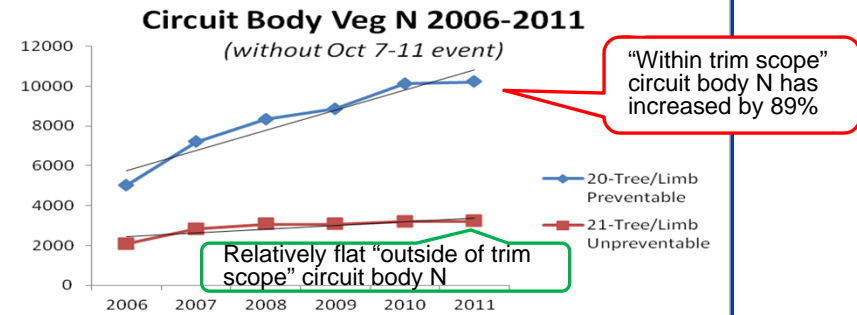
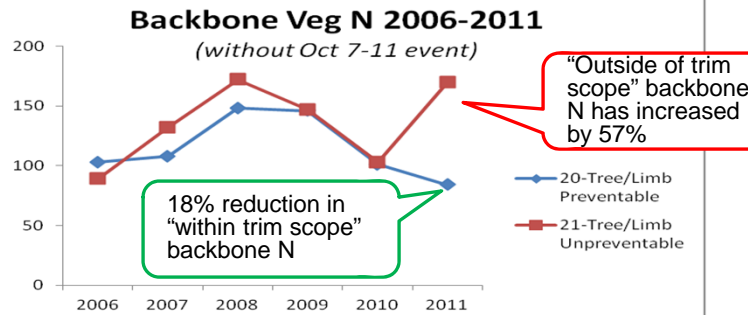
# What types of outages are driving performance (since 2006)?

- Tree/Limb outages account for 95% of the CI (remaining 5% vines/grass).

## Backbone (Feeder & OCR)

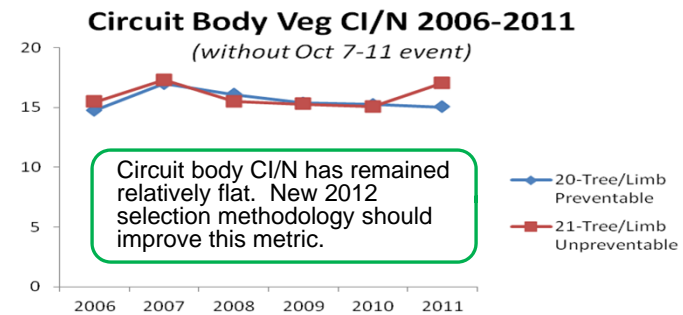
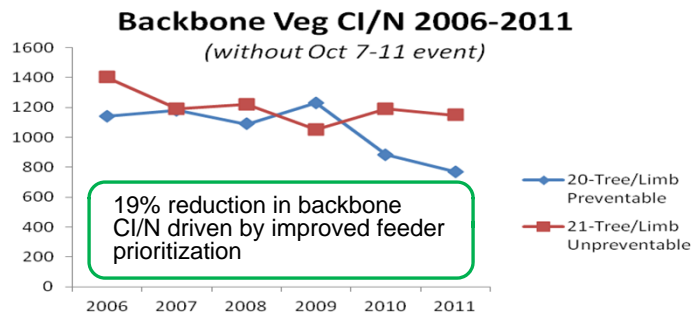
## Circuit Body (Lateral & below)

N  
(Prevention)



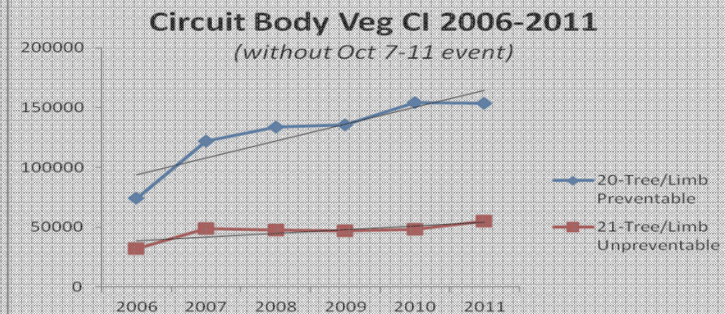
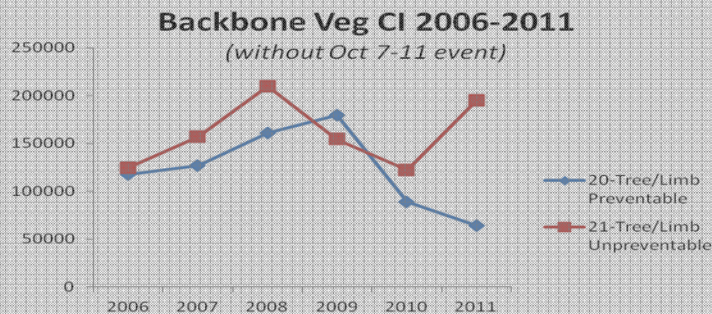
X

CI/N  
(Prioritization)



II

CI  
(Impact)



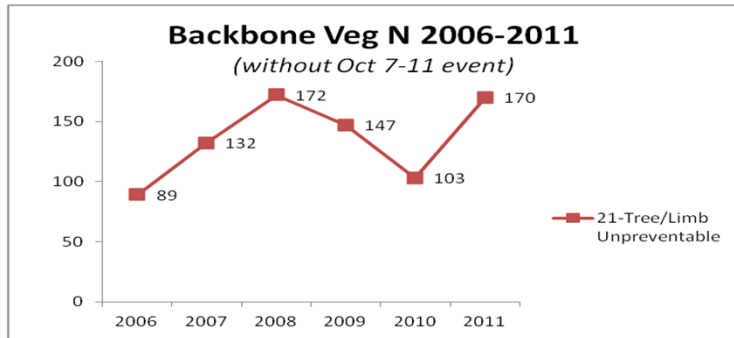
Backbone outages "outside of trim scope" & circuit body outages "within trim scope" are the main drivers



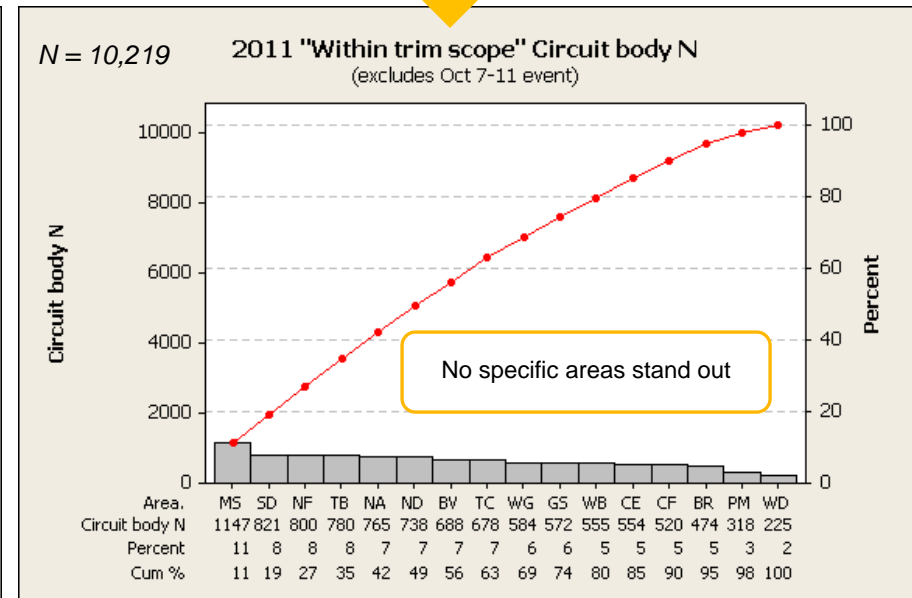
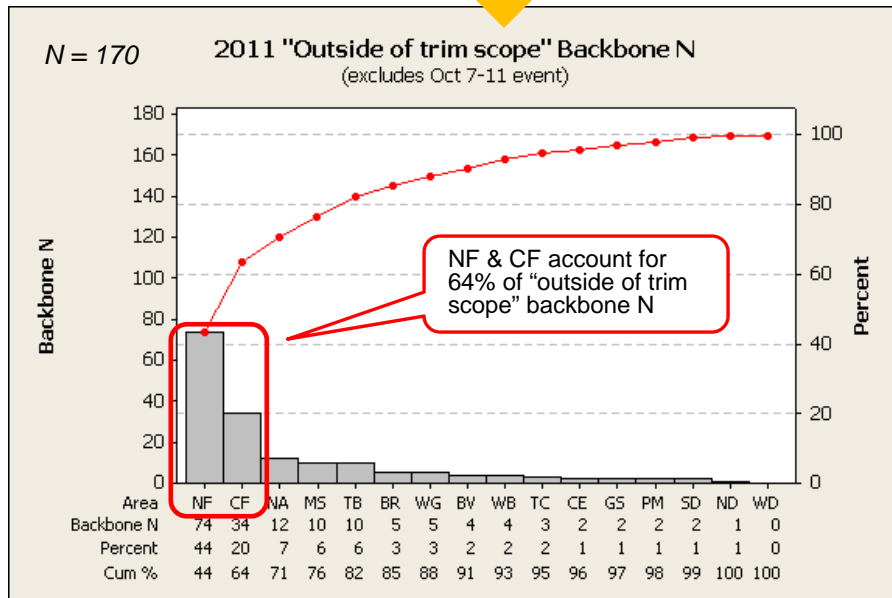
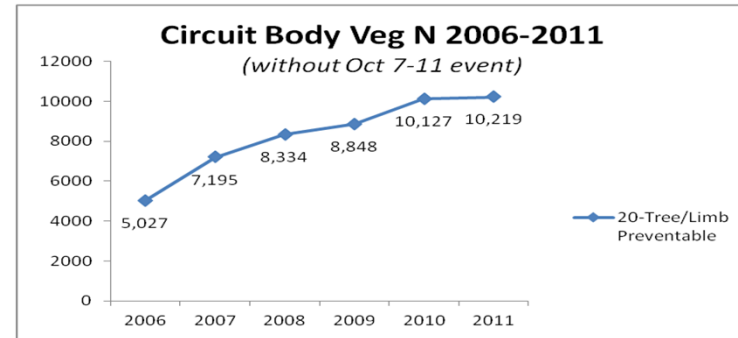
# Where do these outages occur?

## “Outside of trim scope” Backbone

N  
(Prevention)



## “Within trim scope” Circuit Body



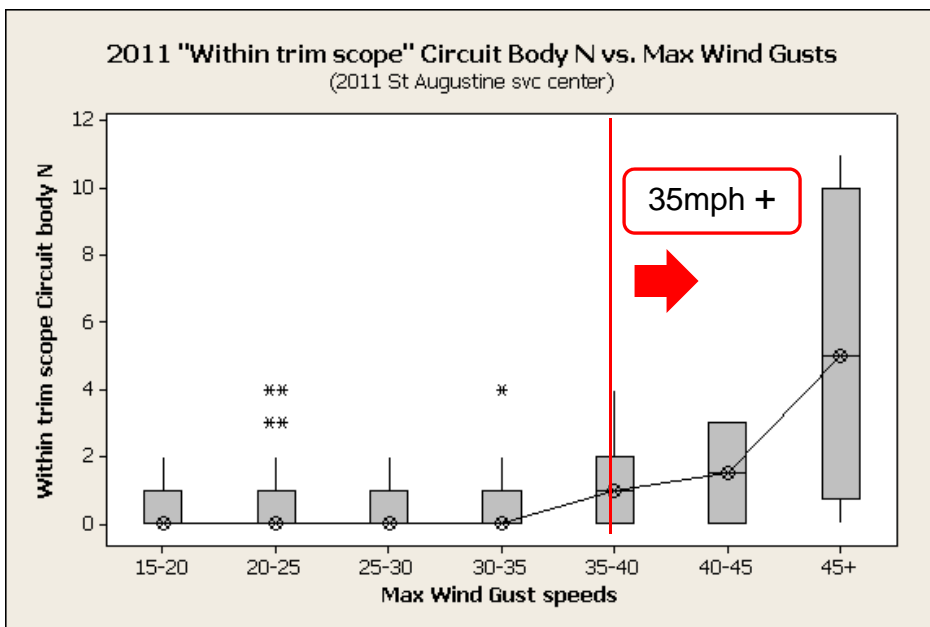
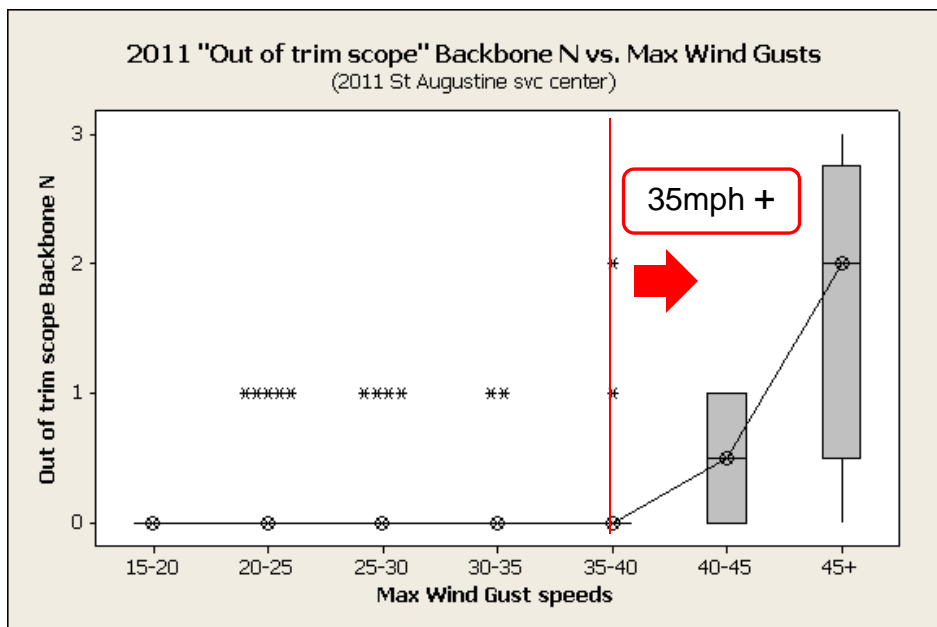
**Backbone outages “outside of trim scope” are concentrated in NF/CF while circuit body outages “within trim scope” are scattered**



## How prone are these outages to wind? (using St. Augustine wind sample data)

### “Outside of trim scope” Backbone

### “Within trim scope” Circuit Body

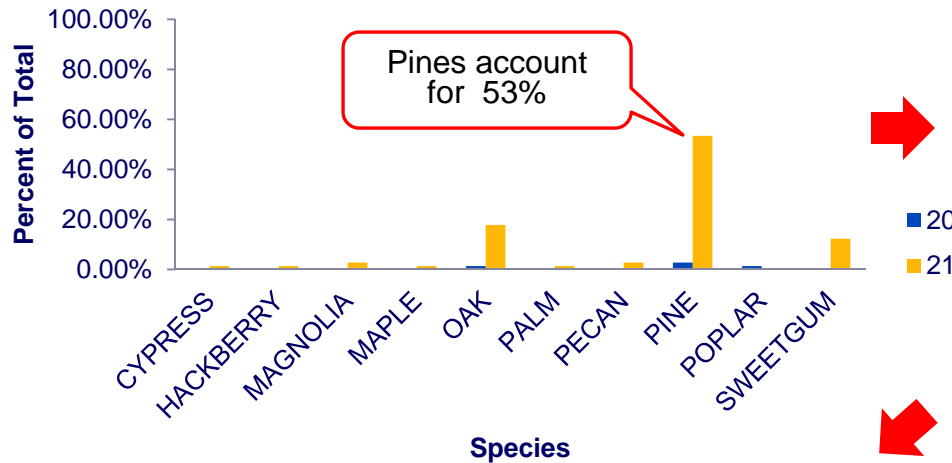


**Using 2011 St. Augustine wind data, both types of outages tend to pickup during gusts of approx. 35mph or greater**

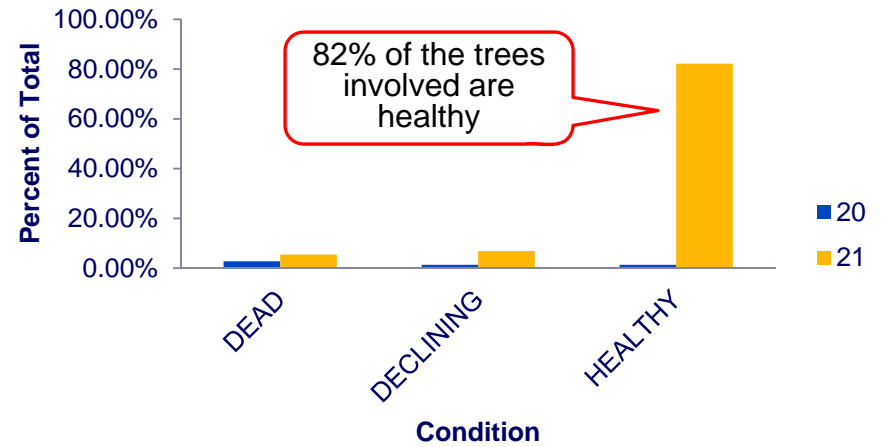


# What characteristics drive “out of trim scope” backbone N?

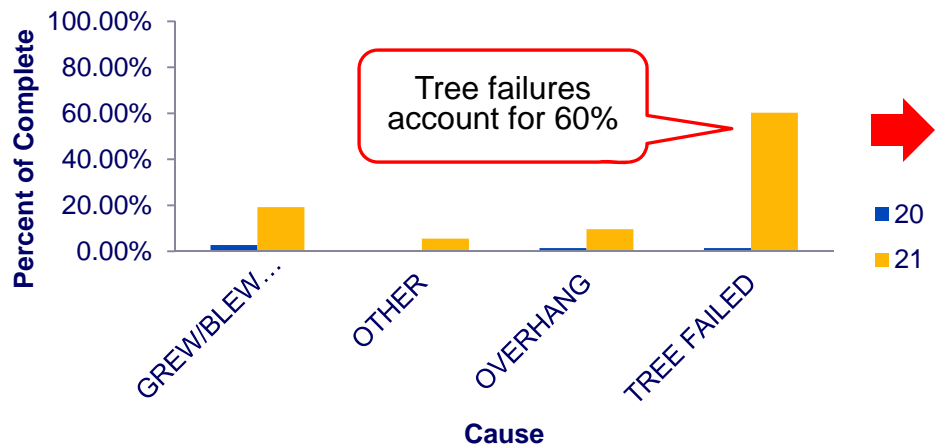
## 2011 North Region Fdr N - Species



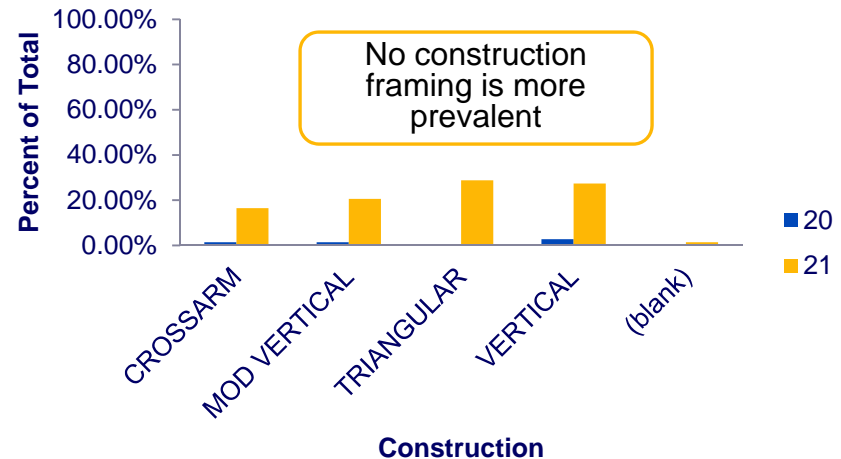
## 2011 North Region Fdr N - Condition



## 2011 North Region Fdr N - Cause



## 2011 North Region Fdr N - Const.



“Out of trim scope” outages in the North Region typically involve healthy pine trees that fail several feet from the power lines and are challenging to identify before an outage occurs.





# Examples of “out of trim scope” outages





# What standards drive our “trim scope” specifications?

Clearance standards are primarily driven by two components:

## National Electric Safety Code (NESC) rule 218:

- Which takes into account such factors as growth rates and combined movement of trees and conductors under normal wind conditions.

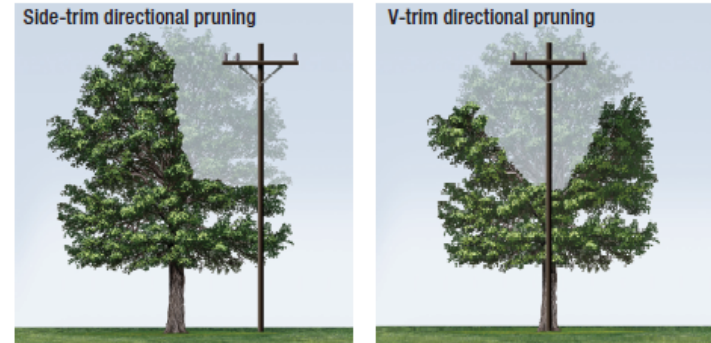
## American National Standards Institute (ANSI) A-300:

- Pruning Standards, which dictate, through form, growth rate, and location of tree, where and how pruning cuts will be made.
- Rule 5.5.3: **No more than 25%** of the foliage should be removed within an annual growing season.

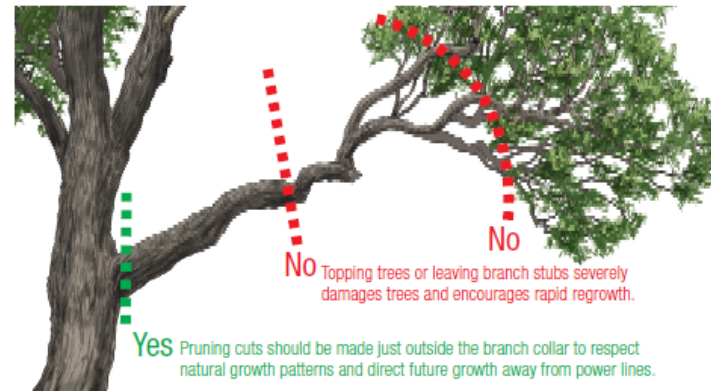


**Clearance for Primary: 8 to 12 feet**

**Clearance for Secondary & Neutral: 4 to 6 feet**



Proper pruning for tree health



**Per ANSI A-300 standard, line clearance should not remove more than 25% of the tree canopy**

## Why is ANSI A-300 important?

### Many municipalities have adopted ANSI A-300 standard as ordinance

- If more than 25% of the canopy is removed, cities may complain or stop work.
- This has occurred in Coral Gables, Plantation, Pinecrest, Coconut Grove, Palm Beach, and recently in the Village of El Portal as part of the Miami Shores sub project.

#### Miami-Dade County code:

*“...pruning is done according to the most recent American National Standards (ANSI) A-300 Standard Practices for Tree Care Operations...excessive pruning which results in the effective destruction of a tree constitutes a violation of...the Environmental Code of Miami-Dade County”*

*“...ordered to **stop all land clearing and construction** until you have complied with Section 24.49. Furthermore, you may be required to **pay penalties** for each violation and replace tree canopy.”*

#### Palm Beach County code:

*“A maximum of one fourth (0.25) of tree canopy may be removed from a tree within a one (1) year period, provided that the removal conforms to the standards of crown reduction, crown cleaning, crown thinning, crown raising, vista pruning, and crown restoration pruning techniques. All **pruning shall comply** with the American National Standards Institute, **ANSI 300**”*

*“A tree which is pruned in excess of these requirements shall be **fined and/or replaced with a tree** that meets the minimum requirements...”*

**In the past, some municipalities have requested VM to temporarily stop all line clearing activities when in violation of ANSI**





# Appendix

## The Beaufort Scale of wind strength

- 0-3 mph tree leaves don't move
- 4-7 mph tree leaves rustle
- 8-12 mph leaves and twigs in constant motion
- 13-18 mph small branches move
- 19-24 mph small trees sway
- 25-31 mph large branches sway
- 32-38 mph whole trees sway
- 39-46 mph twigs break of trees
- 47-54 mph branches break of trees
- 55-63 mph some trees blown down
- 64-74 mph widespread damage to trees
- >74 mph severe and extensive damage