Taming the Jungle:

The quest to reduce vegetation related outages

April 9, 2013

Team Members

Champion

Keith Hardy – VP Distribution

Sponsor

Tom Gwaltney – Director CMC

Core Team

Eli Viamontes – VM Manager
Barry Grubb – West VM Lead
Bill Slaymaker – North VM Lead
Rick Vasquez – South VM Lead
Robert Lozano – East VM Lead
Steve Jolly – Sr VM Comm. Specialist
Kevin Langille – CF VM Specialist
Brad Griese – VM Resource Specialist

Collaborators

Paul Pich – Six Sigma Lead

FPL's value proposition – Vegetation Management's contribution

Great Customer Service
(Improve the Customer Experience)

Best Reliability
(Reduce Vegetation Outages)

Lowest Bill
(Reduce O&M Costs)

Compliance
(Meet FPSC Commitments)

Strengthen our contribution to FPL's value proposition by lowering cost, increasing reliability, and improving customer satisfaction while meeting FPSC commitments

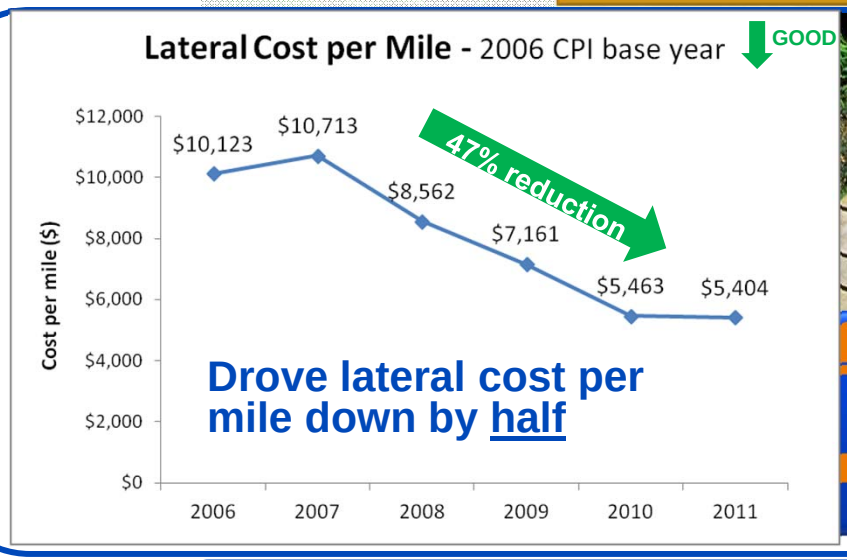
DEFINE * MEASURE * ANALYZE * IMPROVE * CONTROL

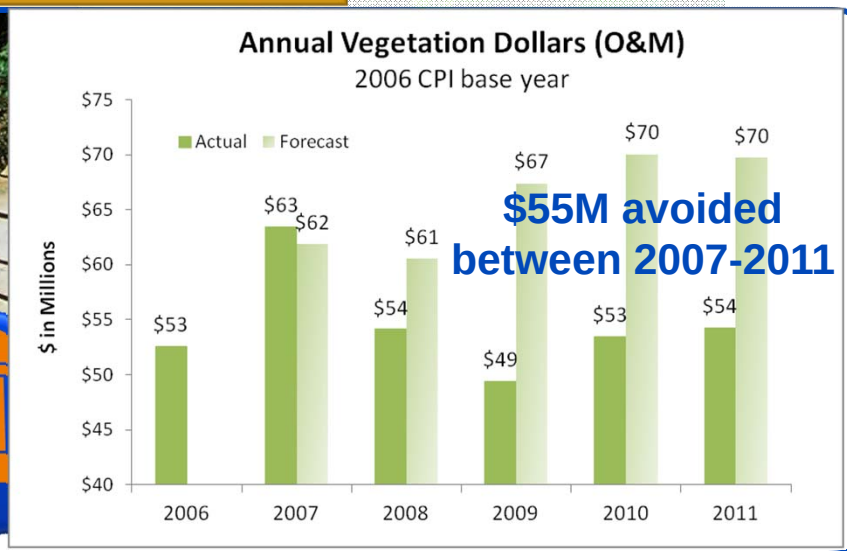
FPSC mandate is to maintain a 3-yr feeder trim cycle and achieve a 6-yr lateral trim cycle

Great Customer Service
(Improve the Customer Experience)

Best Reliability
(Reduce Vegetation Outages)

2006-2011 Background





Reduced lateral cost per mile by 47% and kept spend relatively flat while trimming more miles to meet FPSC lateral mandate

DEFINE * MEASURE * ANALYZE * IMPROVE * CONTROL

OPC 007129
FPL RC-16

In 2012, the team focused on reliability and the customer experience without comprising our cost and compliance position

Great Customer Service
(Improve the Customer Experience)

Best Reliability
(Reduce Vegetation Outages)

2012 "Taming the Jungle"

Lowest Bill
(Reduce O&M Costs)

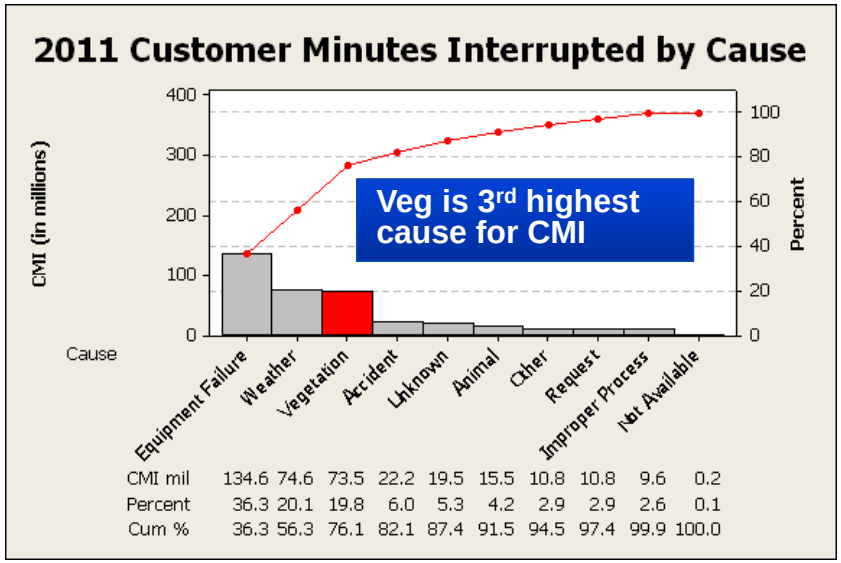
Compliance
(Meet FPSC Commitments)

Reliability is key to customer satisfaction

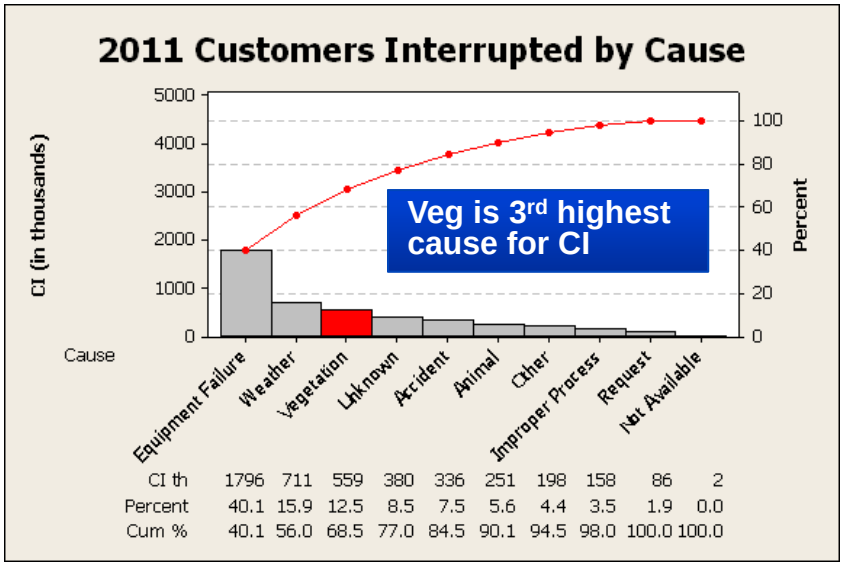
DEFINE * MEASURE * ANALYZE * IMPROVE * CONTROL

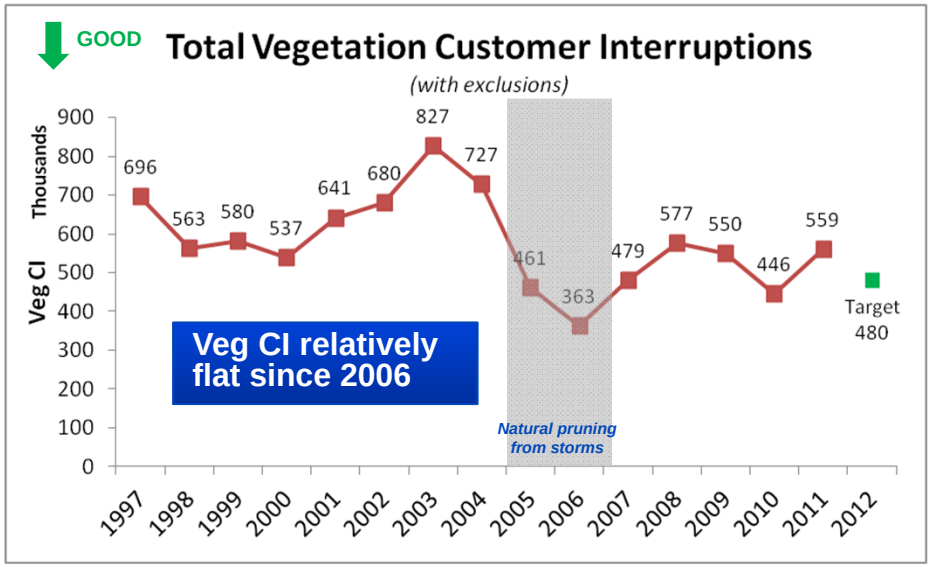
Vegetation is a top driver for Reliability

Customer Minutes Interrupted



Customer Interruptions





Vegetation is the 3rd leading cause for Reliability and customer interruptions have been relatively flat since 2006

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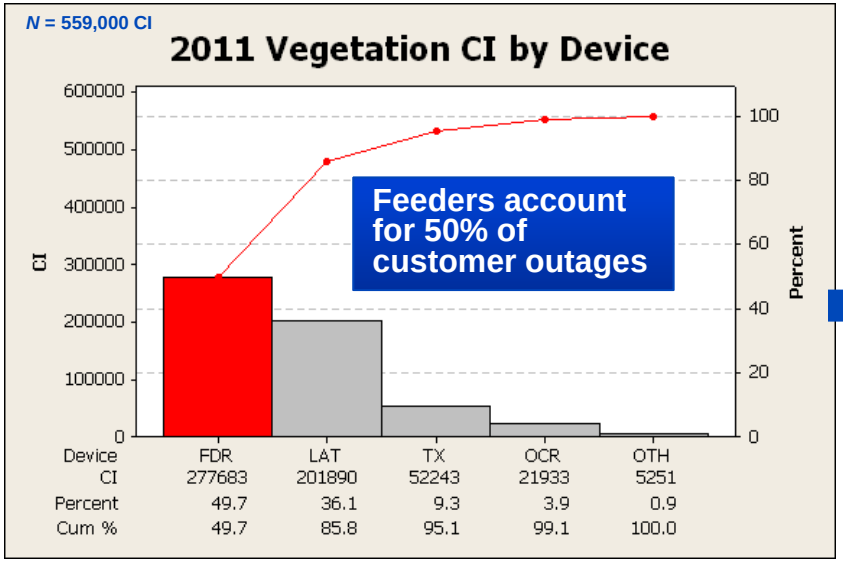
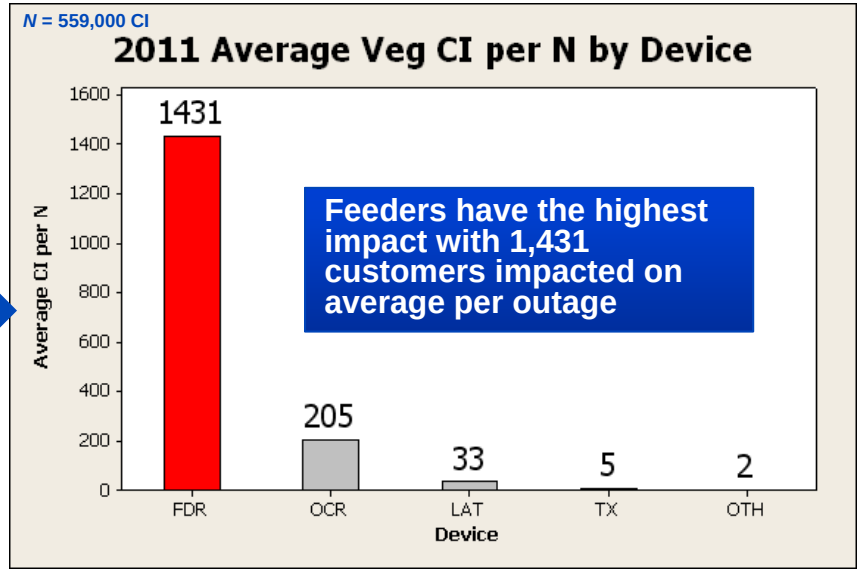
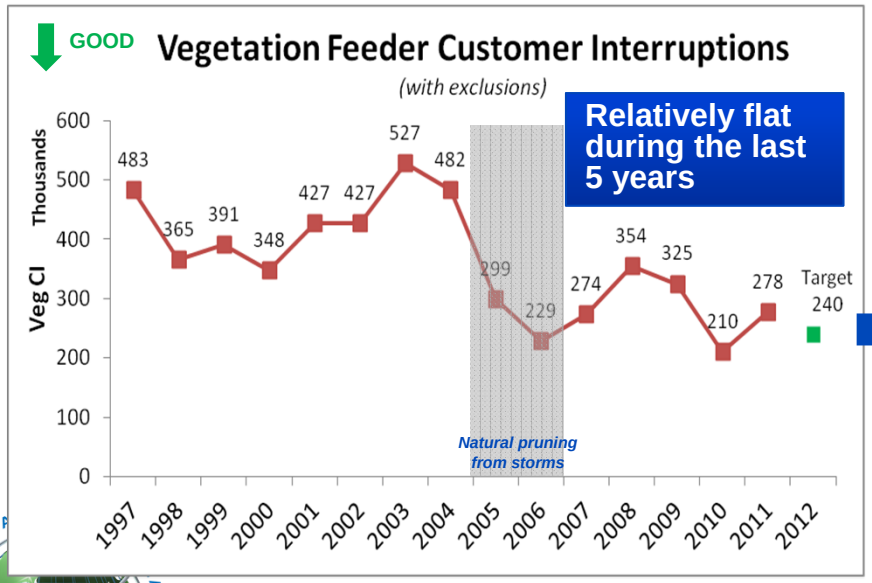
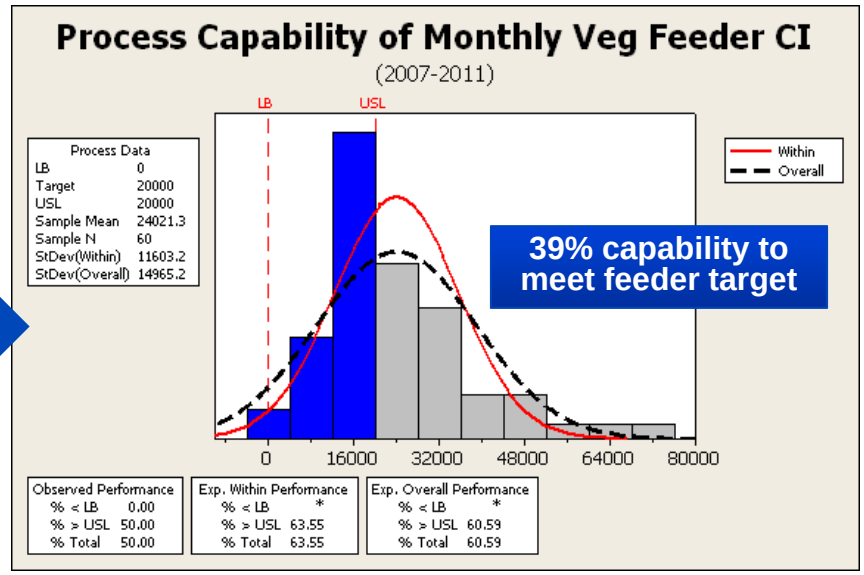
Feeders present the biggest opportunity for improvement









39% capability to meet feeder customer interruption target

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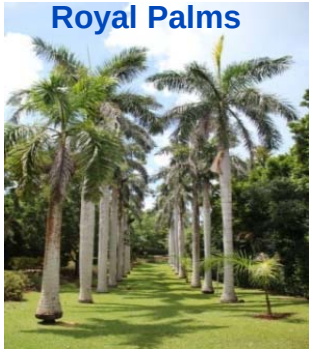
Pines and Palms are the main drivers for feeders

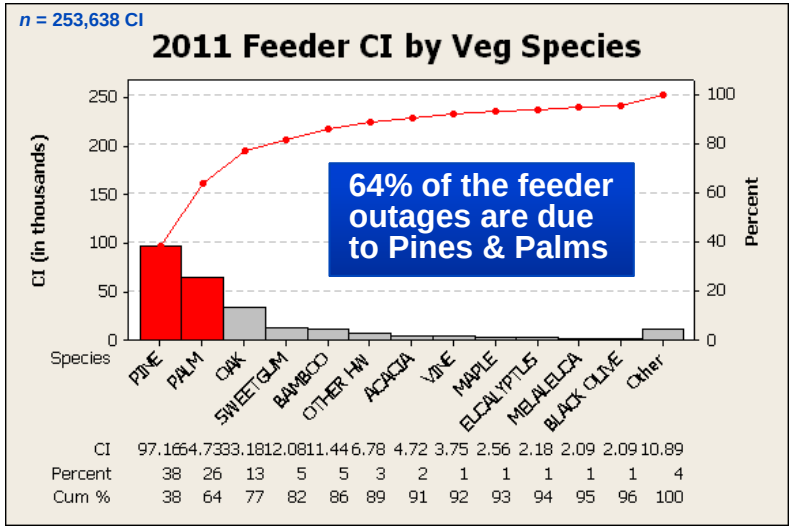
Vegetation Species Analysis

Slash Pines

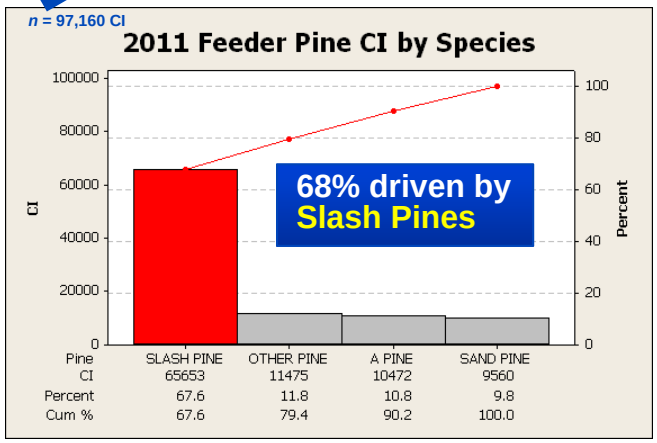
Washingtonia Palms

Royal Palms

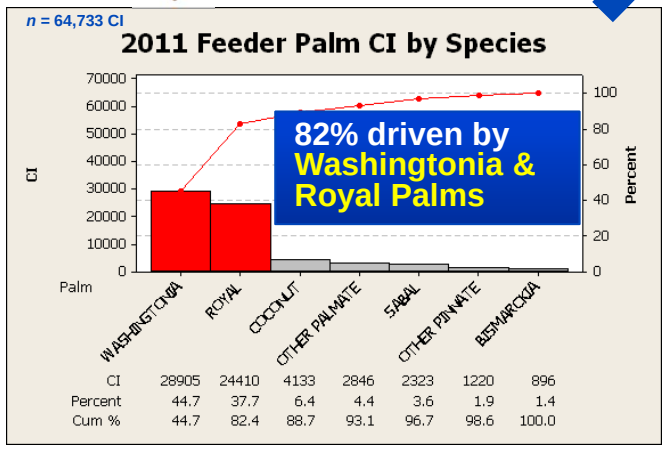




Pines



Palms



Slash Pines, Washingtonia & Royal Palms pose the highest risk to our feeders

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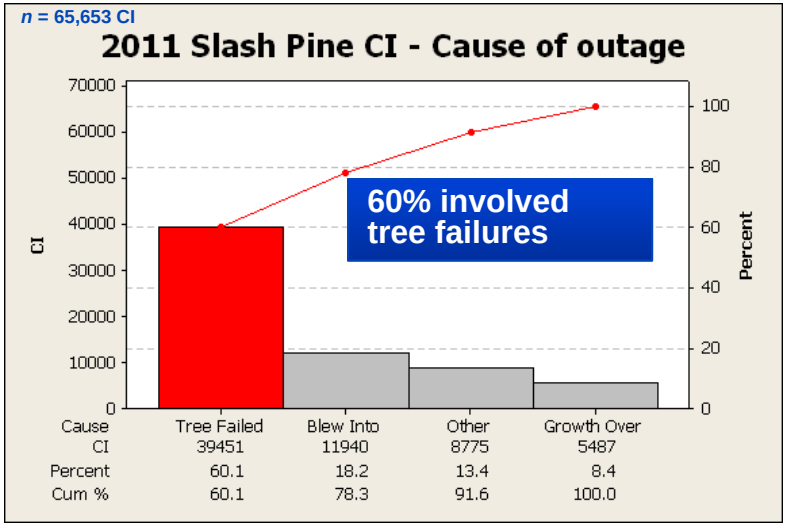
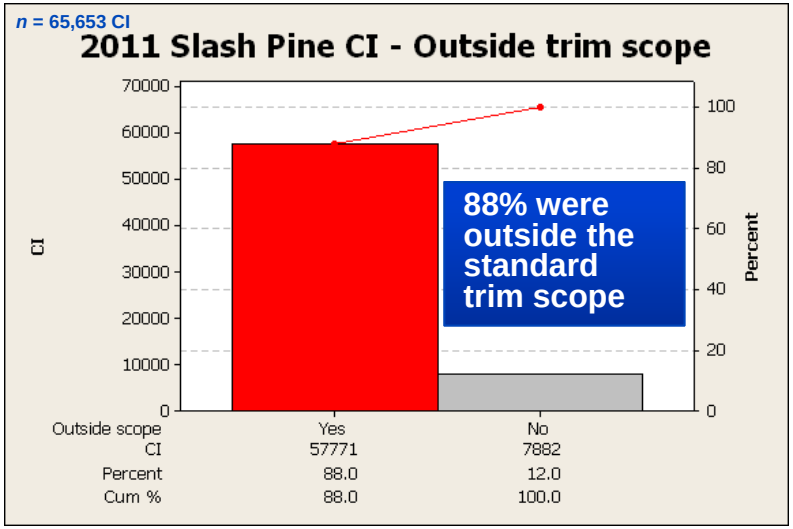
Pine outages have unique characteristics

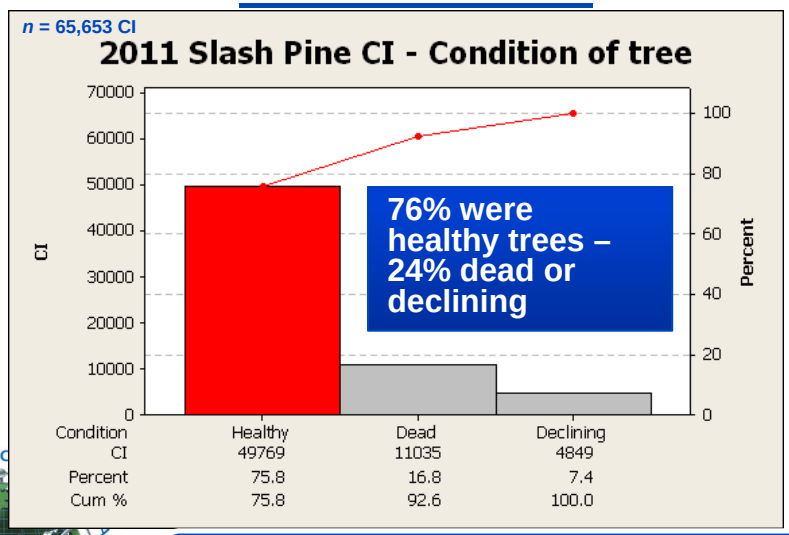
Cause of Outage



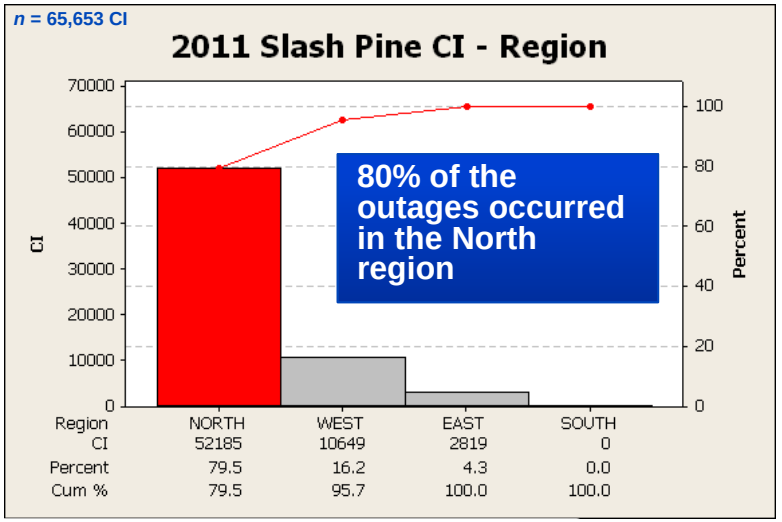
Outside of Trim Scope?



Condition of Tree



Region



Slash Pine outages mainly driven by tree failures outside the standard trim scope in the North region

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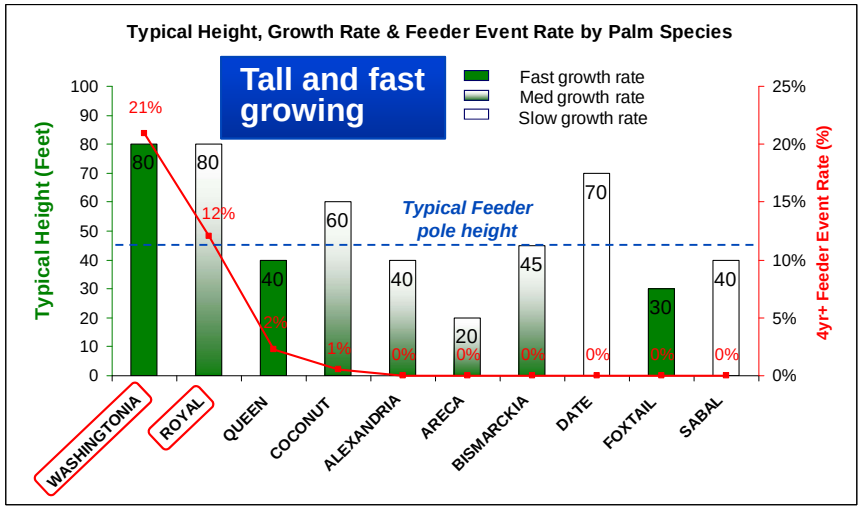
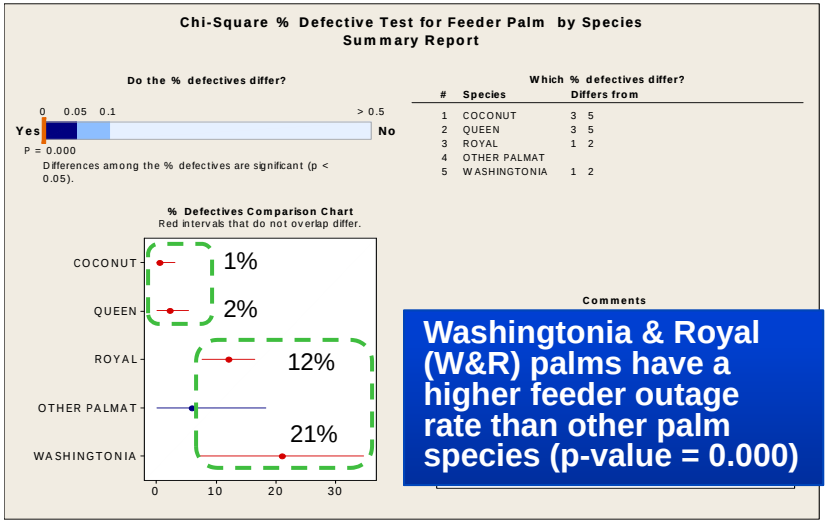
Certain Palm species have higher outage rates

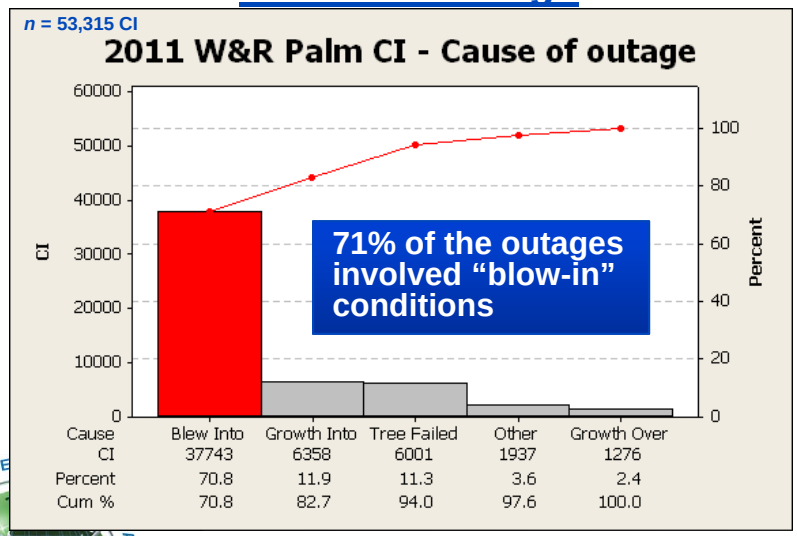
Height & Growth Rate*



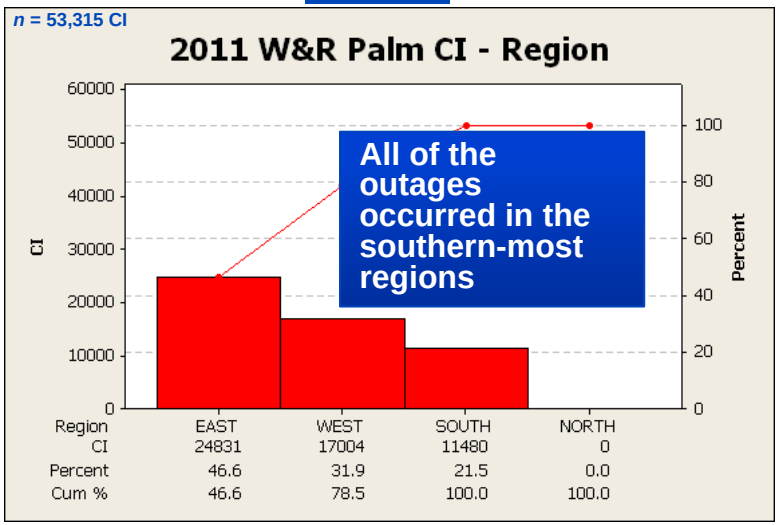
Chi-square % Defective Test



Cause of Outage



Region



Washingtonia & Royal (W&R) Palm outages mainly driven by blow-in conditions in the southern-most regions

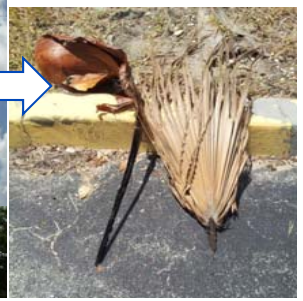
Source: South Florida Water Management District Landscape Handbook

DEFINE * MEASURE * ANALYZE * IMPROVE * CONTROL

Focused analysis on Pines and Washingtonia & Royal Palms

Slash Pines

Washingtonia & Royal (W&R) Palms



Good understanding of field root causes but our current processes were not capable of avoiding these outages

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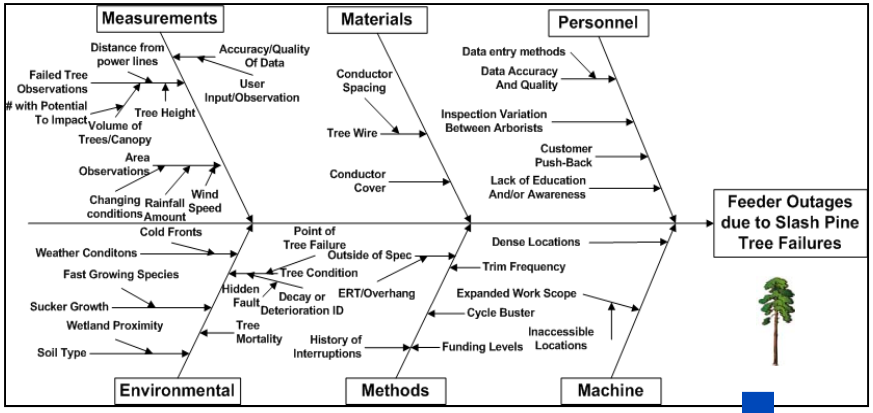
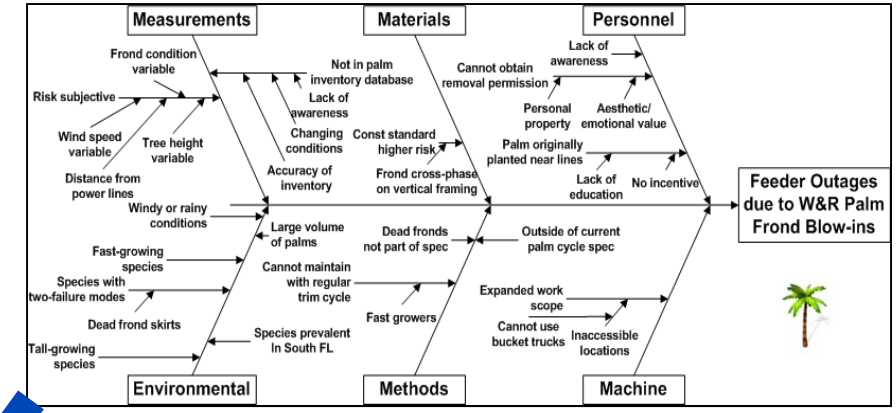
Performed cause & effect analysis to identify root causes

Slash Pine Tree Failures - *Fishbone*



W&R Palm Frond Blow-in - *Fishbone*



C&E Matrix

			Rating of Importance to Customer	10	7	5	
				Impact to reliability	Customer property invasiveness	Impact to cost	Total
	Tree Species	Process Step	Process Input				
1	Slash Pines	Deployment	Difficult to detect/predict tree failure	9	9	9	198
2	Slash Pines	Execution	Off-ROW & overhang outside specs	9	4	1	123
3	Slash Pines	Execution	Large volume of pines	9	0	0	90
4	Slash Pines	Communication	Difficult to remove protected trees	9	0	0	90
5	Slash Pines	Planning	Soil conditions present higher risk	4	4	0	68
1	Washi & Royal Palms	Execution	Dead fronds not in current trim spec	9	9	4	173
2	Washi & Royal Palms	Planning	Palm removal difficult - no incentive	9	4	9	163
3	Washi & Royal Palms	Communication	Unawareness of 2-failure modes	9	4	9	163
4	Washi & Royal Palms	Communication	Palm originally planted near lines	9	1	4	117
5	Washi & Royal Palms	Tracking	Palm inventory not up to date	9	0	4	110
6	Washi & Royal Palms	Planning	Taller, faster growing species	9	1	0	97
7	Washi & Royal Palms	Execution	Large volume of palms	9	0	0	90
8	Washi & Royal Palms	Quality	Dead frond risk subjective	4	4	4	88
10	Washi & Royal Palms	Execution	Inaccessible locations for bucket	1	1	1	22
11	Washi & Royal Palms	Planning	Const. standard poses higher risk	1	1	0	17
Total				1090	294	225	

Pines:

1. Difficult to predict pine tree failures
2. Off-ROW trees & overhang outside of current trim specs

Palms:

3. Unawareness of two-failure mode species
4. Dead fronds not in current trim specs
5. Palm removal difficult – no incentive

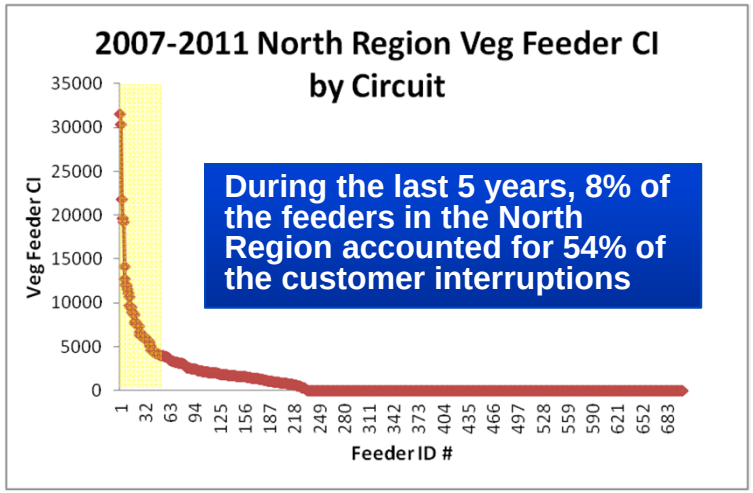
Identified Pine & Palm process gaps using C&E tools

DEFINE * MEASURE * ANALYZE * IMPROVE * CONTROL

Root cause #1: difficult to predict pine tree failures

Countermeasure: Initiated Quarterly Hazard Tree Inspections

- Identified feeders with recurring outages
- Over the past 5 years, 56 feeders (8% of total) accounted for 54% of the feeder CI in the North region
- Assigned 15 arborists & tree crew supervisors to perform hazard tree inspections on these feeders
- The 56 feeders account for 688 miles (15% of total) and were inspected on a quarterly basis
- Identified and worked 2,860 high risk tree conditions



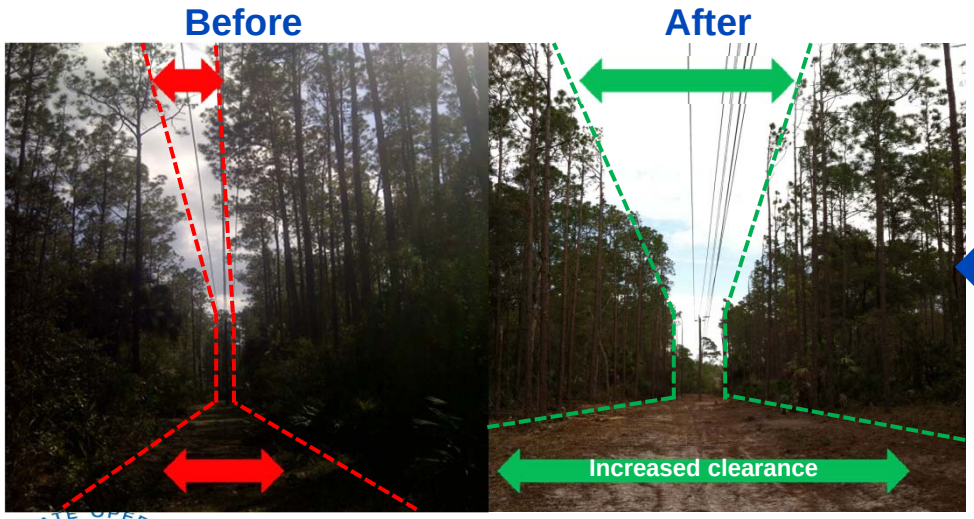
Initiated quarterly Hazard Tree inspections and addressed 2,860 high risk tree conditions in 2012 that could have caused a feeder outage

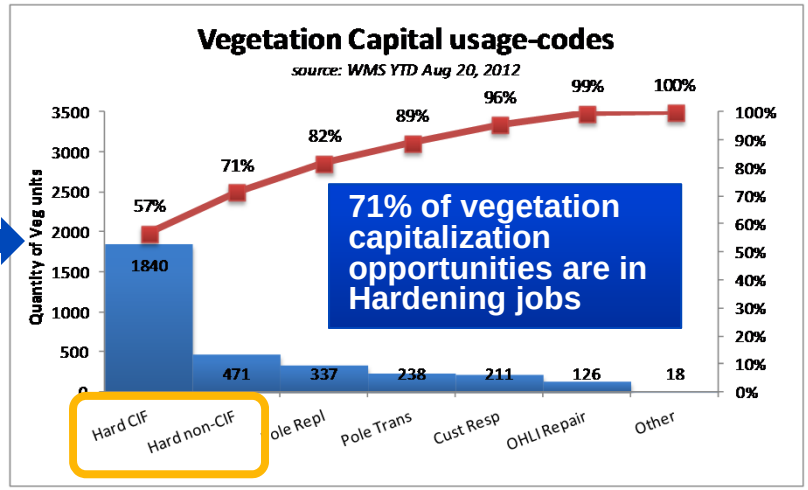
DEFINE * MEASURE * ANALYZE * IMPROVE * CONTROL

Root cause #2: off-ROW pines & overhang outside of specs

Countermeasure: Surgical pine tree & overhang removals/capitalization

- 92% of North Region tree related feeder interruptions were due to conditions outside current trim specifications
- Costly to perform full off right-of-way & overhang removal for all feeder circuit miles ($8K incremental cost per mile)
- In 2012, surgically executed $115K in selected off right-of-way tree & overhang removals on 2,100 NF & CF feeder miles at a cost of $55 per mile
- Leveraged Hardening capital jobs to target reliability improvements and reduce current and future O&M spend.





Performed surgical tree removals and overhang trimming on North & Central Florida feeders and also looked for opportunities to capitalize vegetation work

DEFINE * MEASURE * ANALYZE * IMPROVE * CONTROL

OPC 007139
FPL RC-16

Root cause #3: customers unaware of impact of two-failure mode palm species

Countermeasure: Developed palm fact sheet and performed outreach

Smart Palm Care is Crucial

Regular palm tree maintenance helps ensure resident safety and reduce power interruptions in your area.

One of the most frequent causes of power outages is vegetation – tree branches, palm fronds or other plants coming into contact with power lines. Palm trees and wind-swept fronds are especially problematic.

The most troublesome trees are Washingtonia and Royal palms. They are responsible for 75 percent of all palm-related power problems in Florida! Not only are these two species the tallest palms in the area – often reaching a height of 80 feet or more – they are also among the fastest-growing.

By planting palms in the right places and keeping them properly maintained, you can help reduce power interruptions in your area and prevent potential safety hazards.

Smart maintenance

Proactive pruning helps avoid problems before they occur. In some cases, tree removal may be the only long-term solution to periodic service interruptions. Follow these tips to maintain palm trees safely and effectively in your area:

» **Make safety your top priority.** Never trim vegetation growing near overhead power lines yourself. Use only specially trained line-clearing professionals to trim vegetation near power lines. Check your phone directory or search online to find qualified contractors.

Washingtonia Palms form "skirts" of dead fronds that can sail up to 35 feet into a power line during a storm. This results in electric service interruptions.

» **Address palm trimming and dead frond clearing before storm season.** An annual program will help prevent injury and property damage – and ensure electric service reliability. It can also greatly reduce post-storm cleanup.

- **In collaboration with M&C, a Palm Fact Sheet was developed and distributed to specific municipalities and Home Owner Associations**
  - Purpose is to inform customers of the reliability risk posed by Washingtonia & Royal palms
  - Advised that palm trimming and dead-frond cleaning should be done prior to storm season to reduce impact
- **Examples of Partnerships include:**
  - Miami Management, Inc.
  - Riviera Isles HOA
  - Broward Swap Shop
  - Miami-Dade County (900 palms on Avocado feeders)

Miami Management, Inc.

SWAP SHOP

Riviera Isles MASTER ASSOCIATION

MIAMI-DADE COUNTY

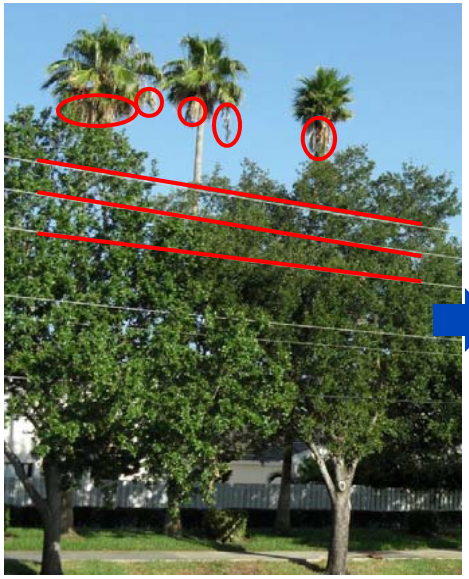
Developed Palm Fact Sheet and educated employees, vendors, and customers on species specific risks

DEFINE * MEASURE * ANALYZE * IMPROVE * CONTROL

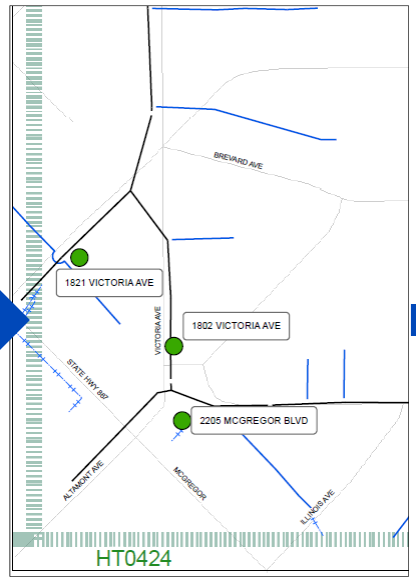
Root cause #4: dead fronds not in current trim specs

Countermeasure: Added dead frond removal criteria to trim specs

Identify at-risk locations



Update palm database



Issue work to field

Reliability risk mitigated

- Washingtonia and Royal palms hold on to dead fronds which can form a 'skirt' and shed during high winds. The fan-like frond has a 'hook' which can catch the feeder primary.
- In addition to mitigating the reliability risk, this results in a cleaner look for the palms. Useful in persuading the HOA to take over this maintenance cleaning prior to storm season.

Developed dead frond removal criteria and incorporated it into palm cycle trim specs. This reduces the potential for palm-caused feeder outages during high wind events

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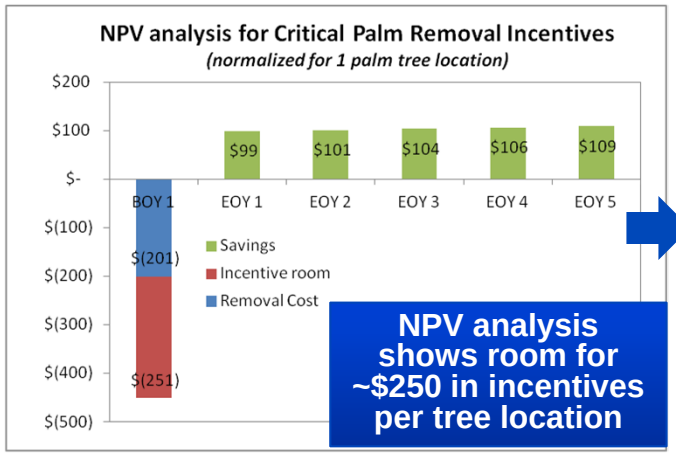
FPL RC-16

Root cause #5: some removals difficult without incentives

Countermeasure: Targeted critical palms and used incentives in negotiations



List of Potential Icentives <$250	Image	Cost (per tree)
Sod replacement		$15
Stump grinding		$50
Utility-friendly Palm replacement Foxtail Palm - 15' height (max 30')		$220
Utility-friendly Tree replacement Crape Myrtle Standard 25gal		$249
Donation - City Tree Fund Incentive - Power One Debit Card		$50-250

- Strategic palm removals provide a cost-effective and permanent solution to vegetation species that cannot be effectively maintained by trimming
- In the State of Florida, trees are considered private/city property depending on land ownership. Signed authorization is required from owner in order to perform a removal
- Objective was to quantify a cost-effective incentive cap to leverage during critical palm removal negotiations on a case by case basis
- Offered cost-effective incentives to customers and partnered with local governments to increase likelihood of obtaining removal permissions

In 2012, secured 266 additional critical palm removals on historically problematic feeders with $25K in incentives (<$100 per tree location on average)

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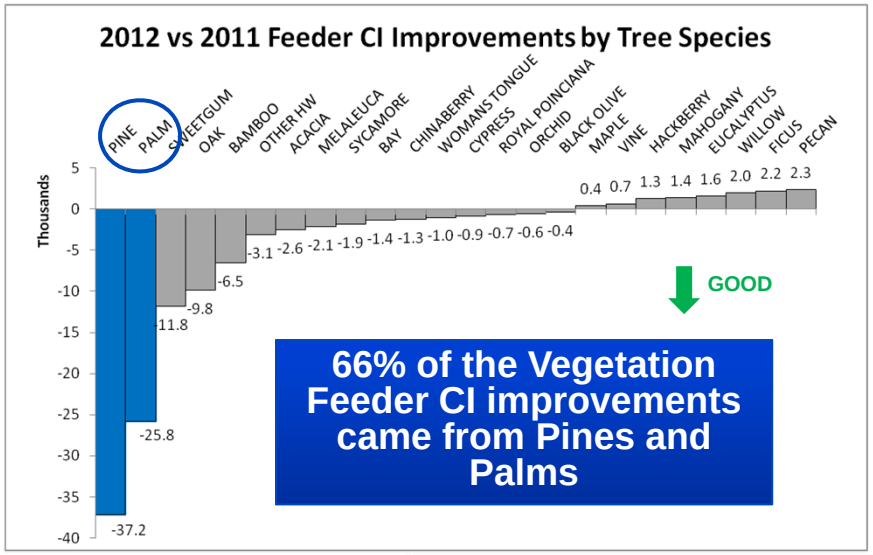
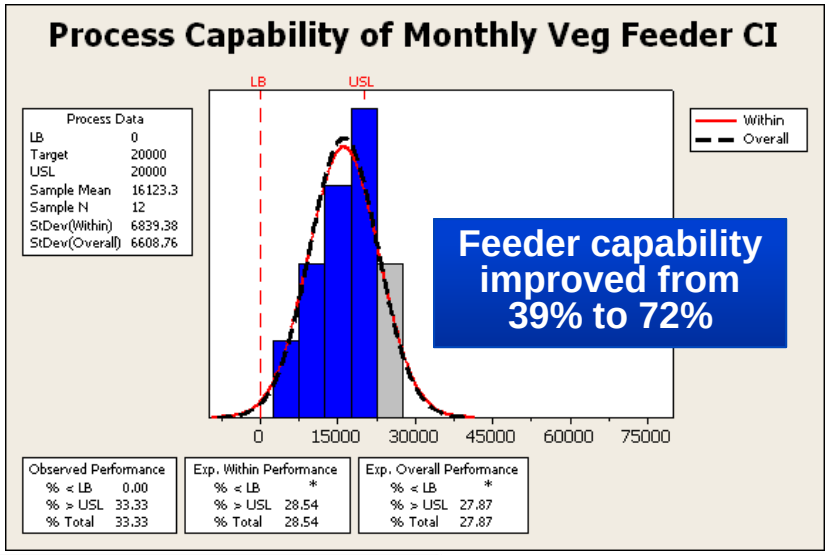
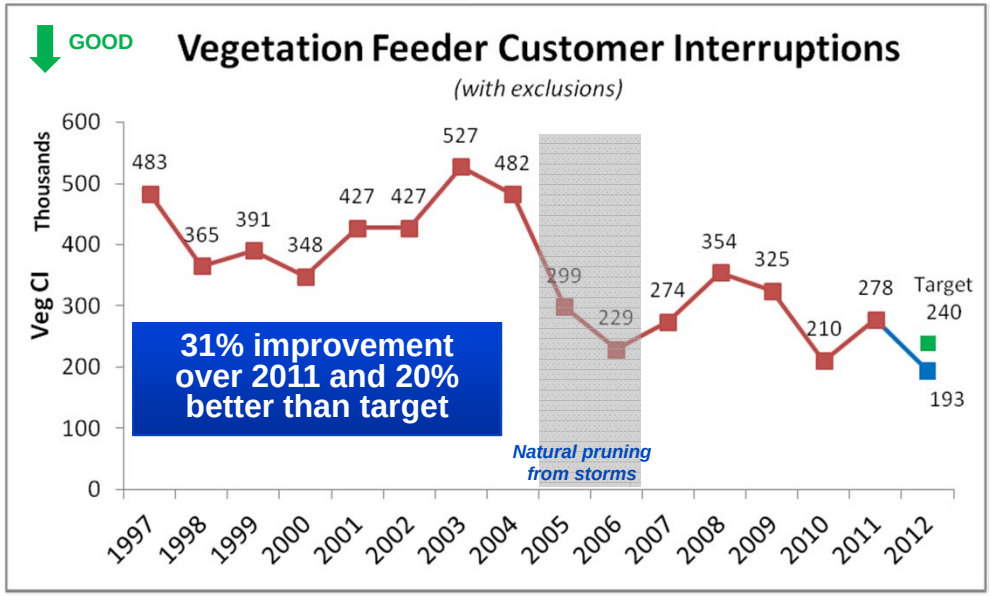
Best ever vegetation related feeder performance



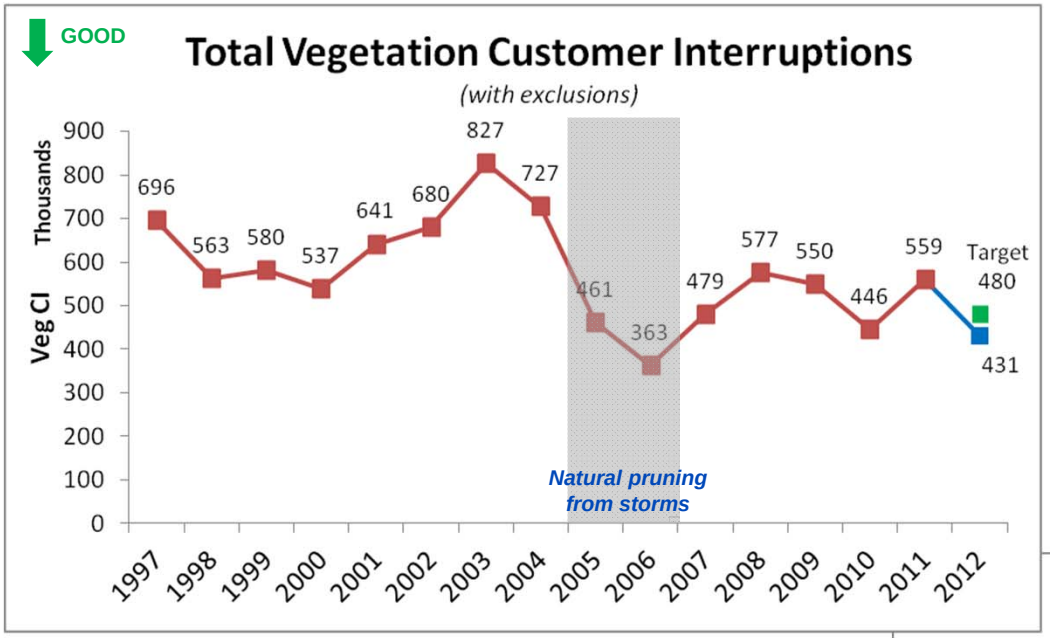




Best ever!

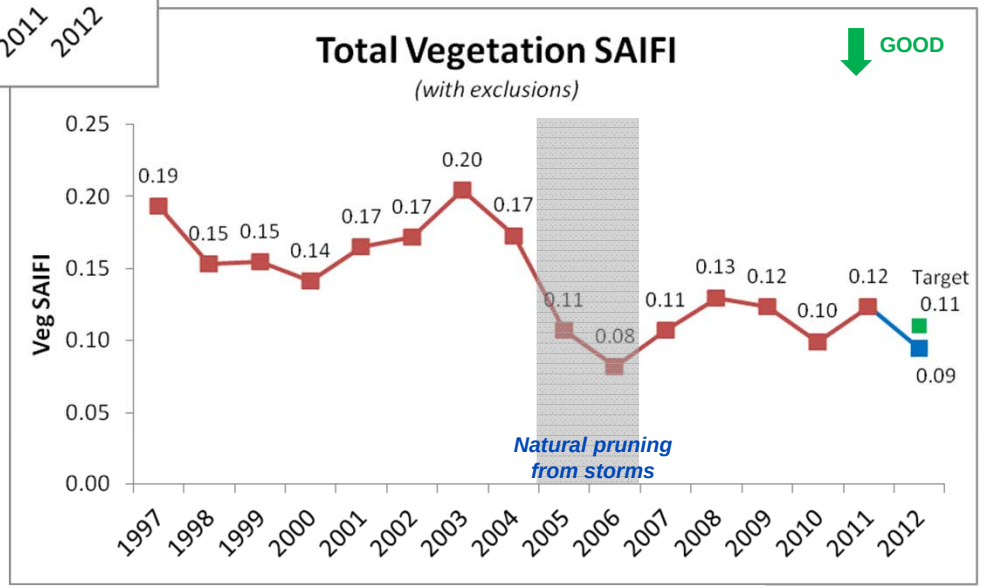
Pine and Palm focus resulted in best ever vegetation related feeder performance

Overall vegetation results best on record since 2006



Achieved the best total Vegetation customer interruption performance since the start of Storm Secure!

128K fewer customer outages vs 2011



Achieved the best overall Vegetation SAIFI since the start of Storm Secure!

0.03 improvement over 2011

Feeder countermeasures drove overall vegetation improvements – contributed to best Dist SAIFI on record

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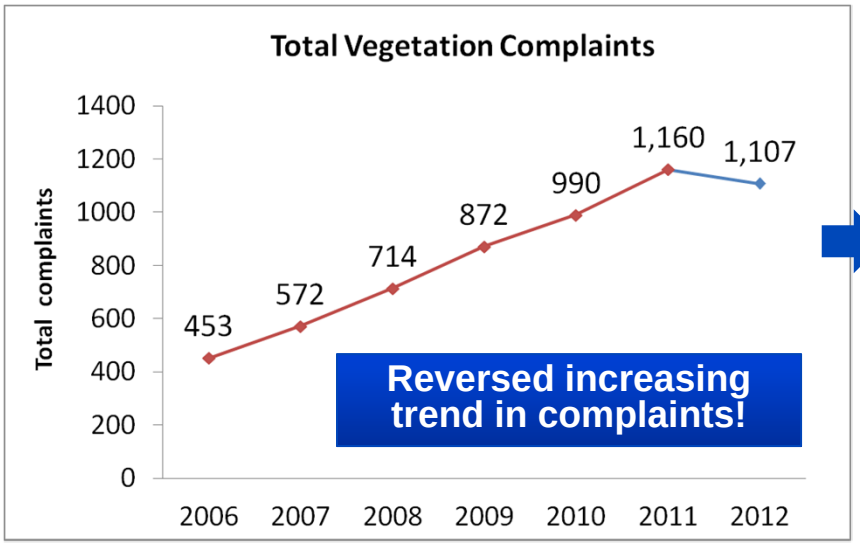
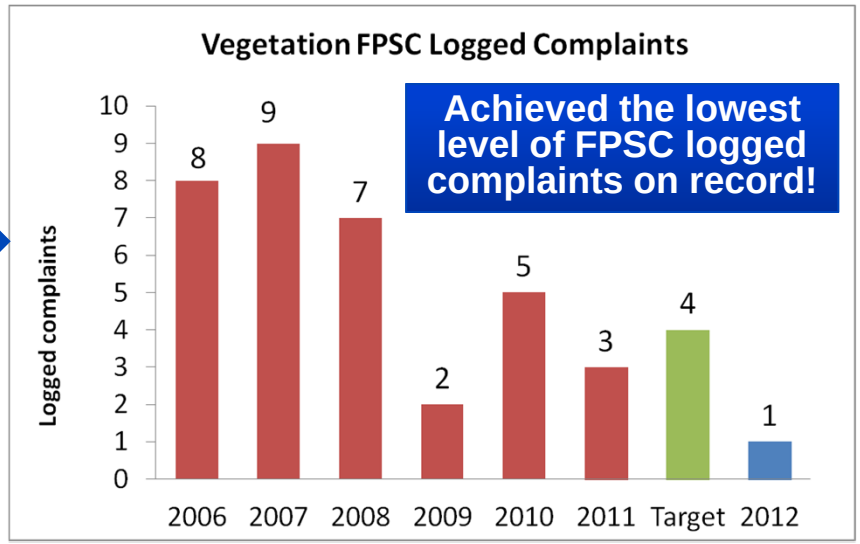
Reversed the trend in total complaints and achieved the lowest FPSC complaint level on record

GOOD





National Arbor Day Foundation

Tree Line USA Utility Award

TREE LINE USA®

Awarded for the 10th consecutive year!

Reduced complaints and improved the Customer Experience

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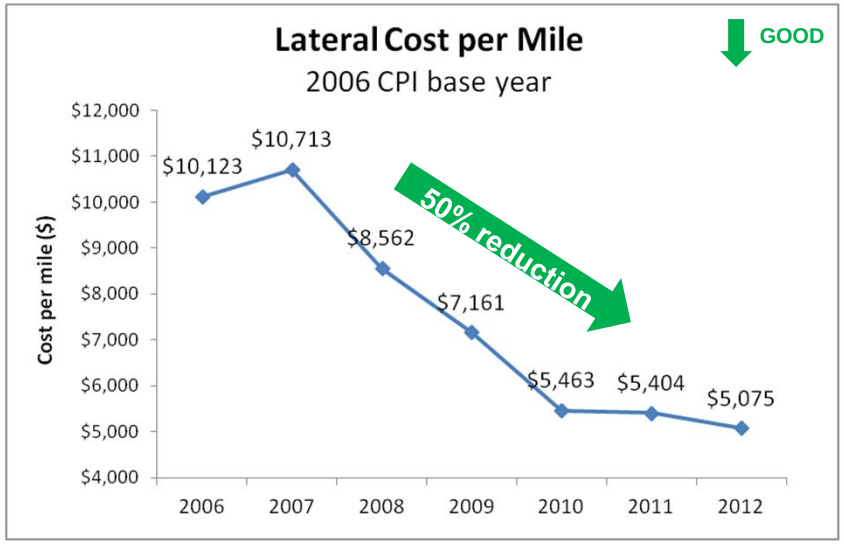
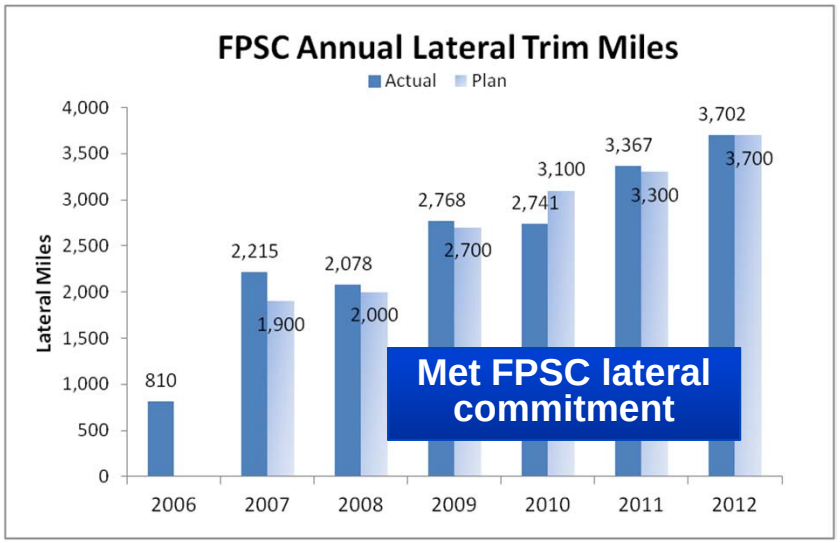
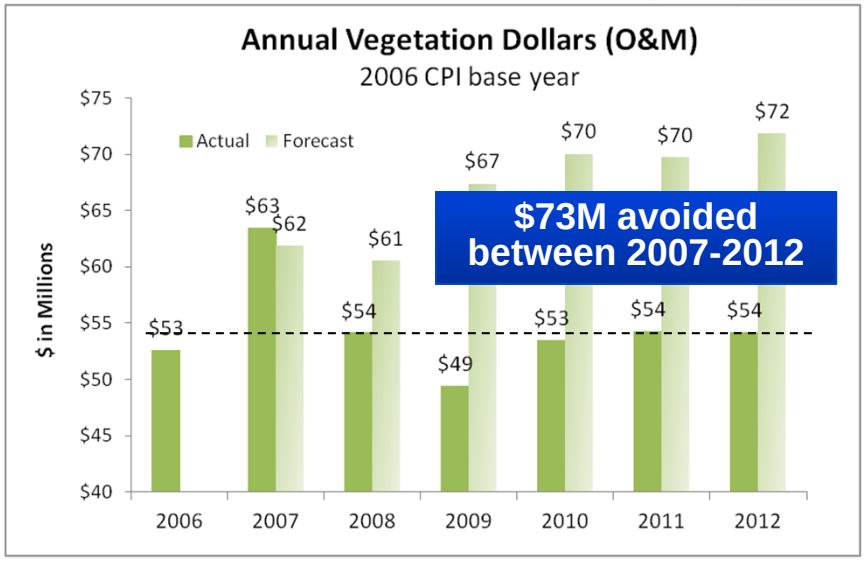
Further reduced the lateral cost per mile which kept overall spend flat while trimming more miles to meet mandate







- Lateral cost per mile down by half since 2006
- Increased lateral miles per PSC mandate
- **$73M** in avoided costs during 2007-2012 period

Overall Vegetation spend remained flat despite an increase in lateral miles to meet FPSC commitment

DEFINE * MEASURE * ANALYZE * IMPROVE * CONTROL

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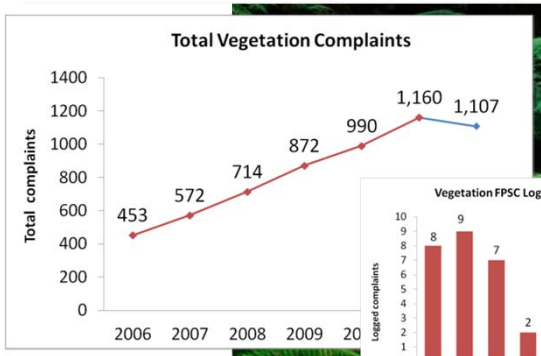
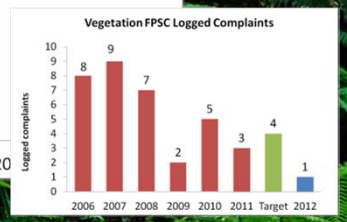
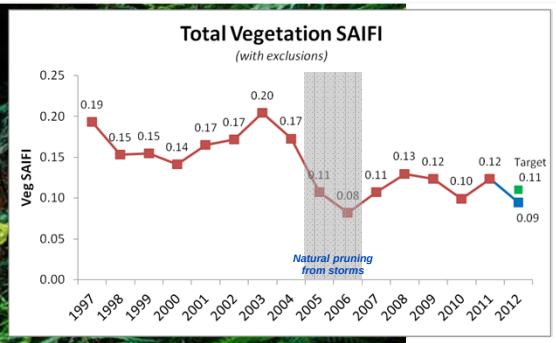
FPL's value proposition – Vegetation Management's contribution

Great Customer Service
(Improve the Customer Experience)

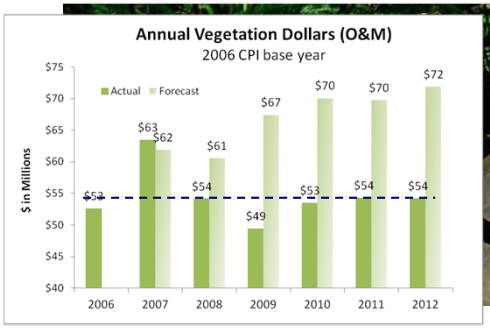




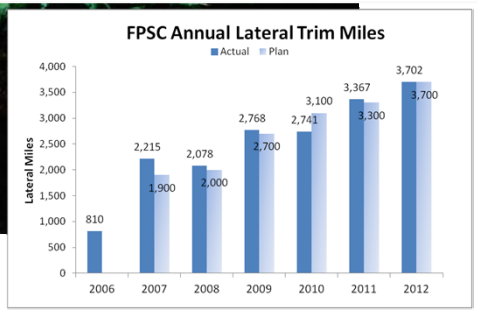
Best Reliability
(Reduce Vegetation Outages)



Lowest Bill
(Reduce O&M Costs)



Compliance
(Meet FPSC Commitments)



Improved the customer experience, managed O&M costs, increased reliability, and met our FPSC commitments

DEFINE * MEASURE * ANALYZE * IMPROVE * CONTROL

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Vegetation Management

Questions?