

“I See... Using Visuals Through GIS and CMMS for better Maintenance Decisions”

April 2015

- Introduction
- Evaluation
- Systems & business process implementation
- Result & future expectations

John W. Lyons, P.E. PSM,
Director of Public Works
Hillsborough County Florida



County General Facts

- 1,266 square miles
- Population of 1.2 million
- Three incorporated cities
- 3,217 centerline road miles
- 10th largest port in the United States
- APWA Accredited
- Both urban and rural areas



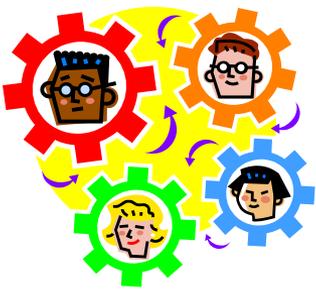
Goals were to identify opportunities for improving Operations and Maintenance

- ✓ **Investigate and Document Current Operations** to justify needed resources for levels of service
- ✓ **Identify Opportunities and Recommendations** for Improvement
- ✓ **Establish a “business like” approach** of performing maintenance, and document this innovative way to manage the agency’s infrastructure

We Changed the Way We Did Business!

- Focused on the “green, growing and flowing” work which was 70-80% of total
- Better planning, establishment of specific goals
- Optimized yards and share resources
- Established spatial based routines
- Cleanup backlog and group work
- Short term scheduling



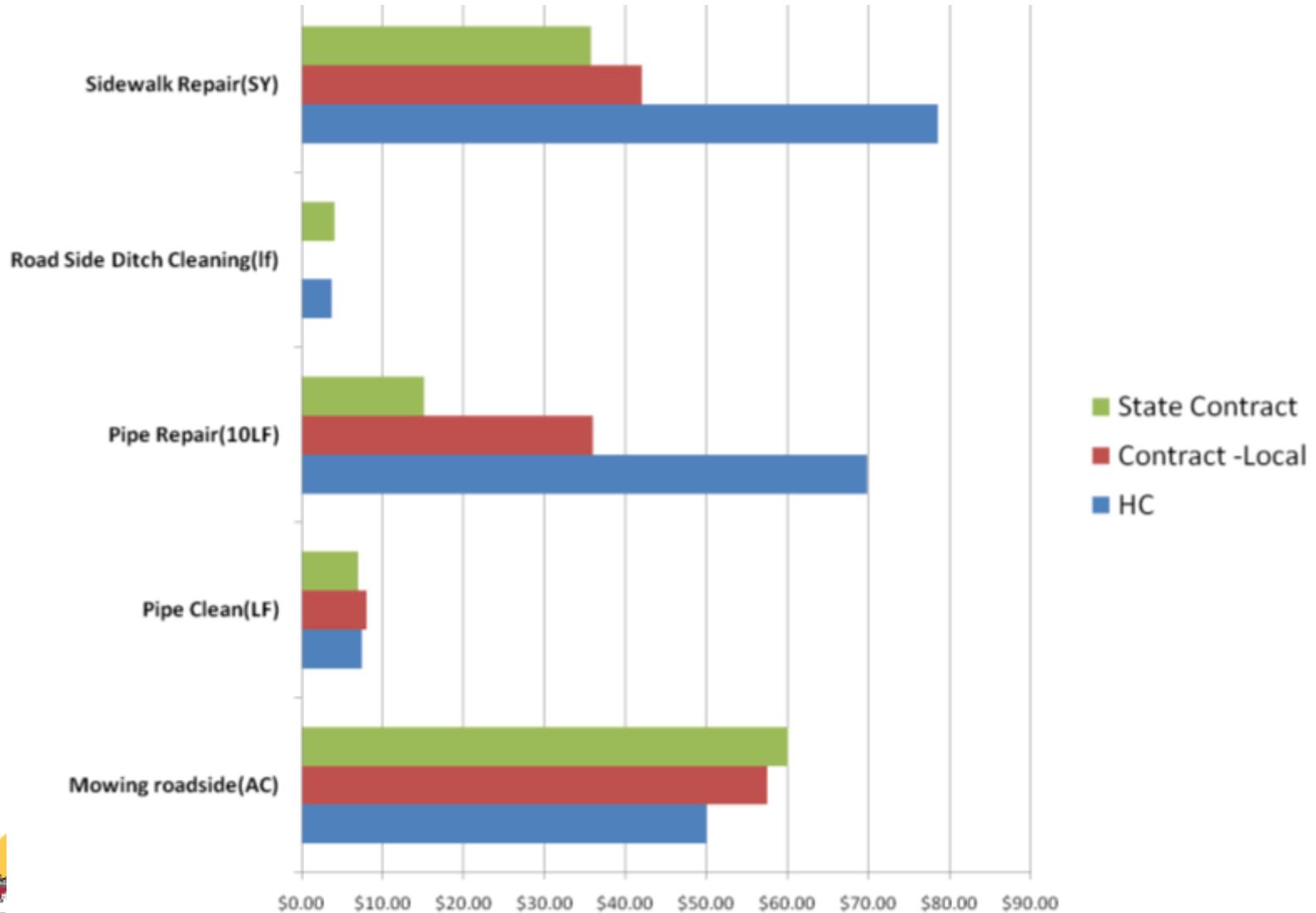


Involvement and a Lot of It!

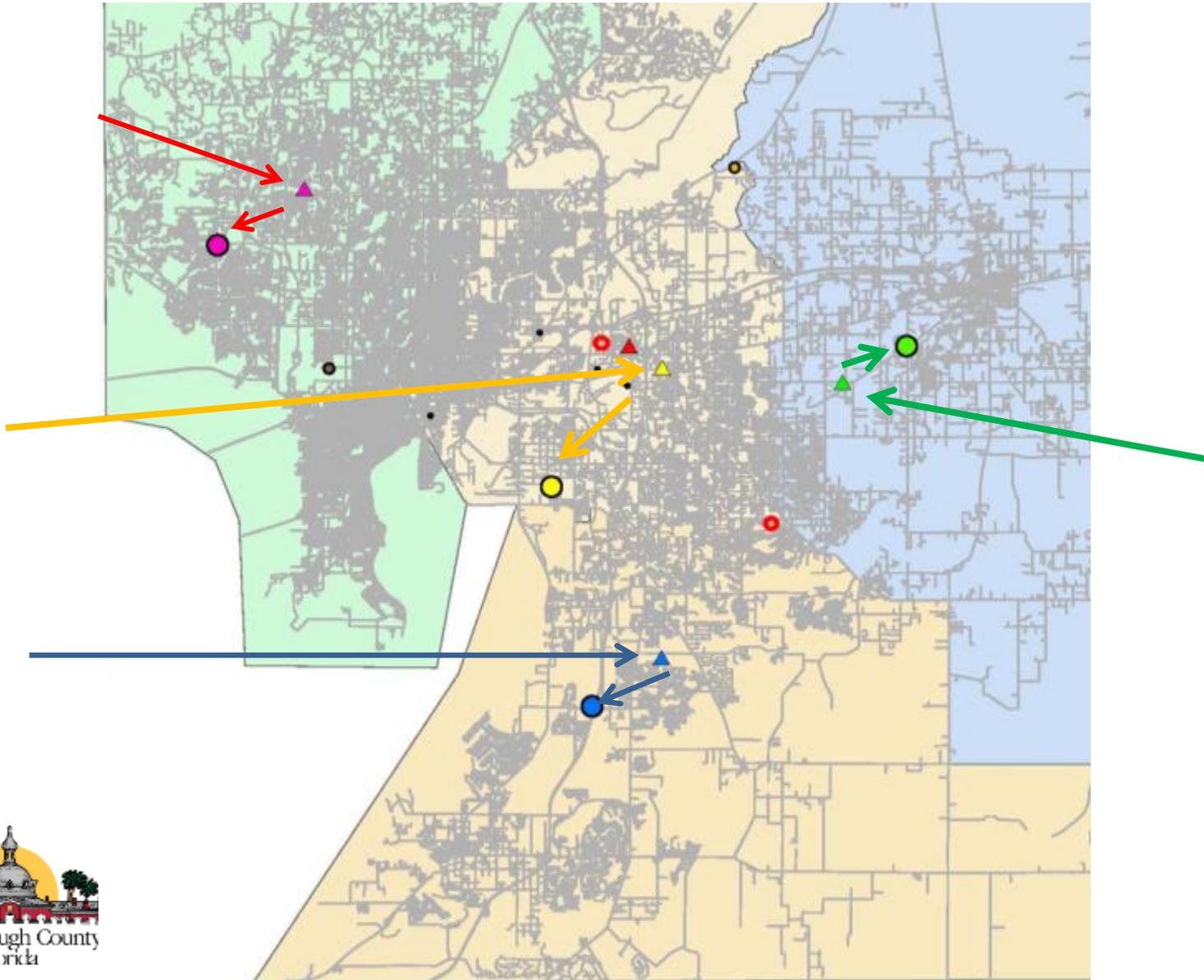
- 16 presentations 4 @ the four yards – start, finding, recommendations and implementation plan
- Field observation of all work by all 200+ employees
- Interviews with all supervisors, managers and crew leaders
- Deliverables (4) review by two committee
- Employee review of 2 working papers and draft report



Cost Comparison

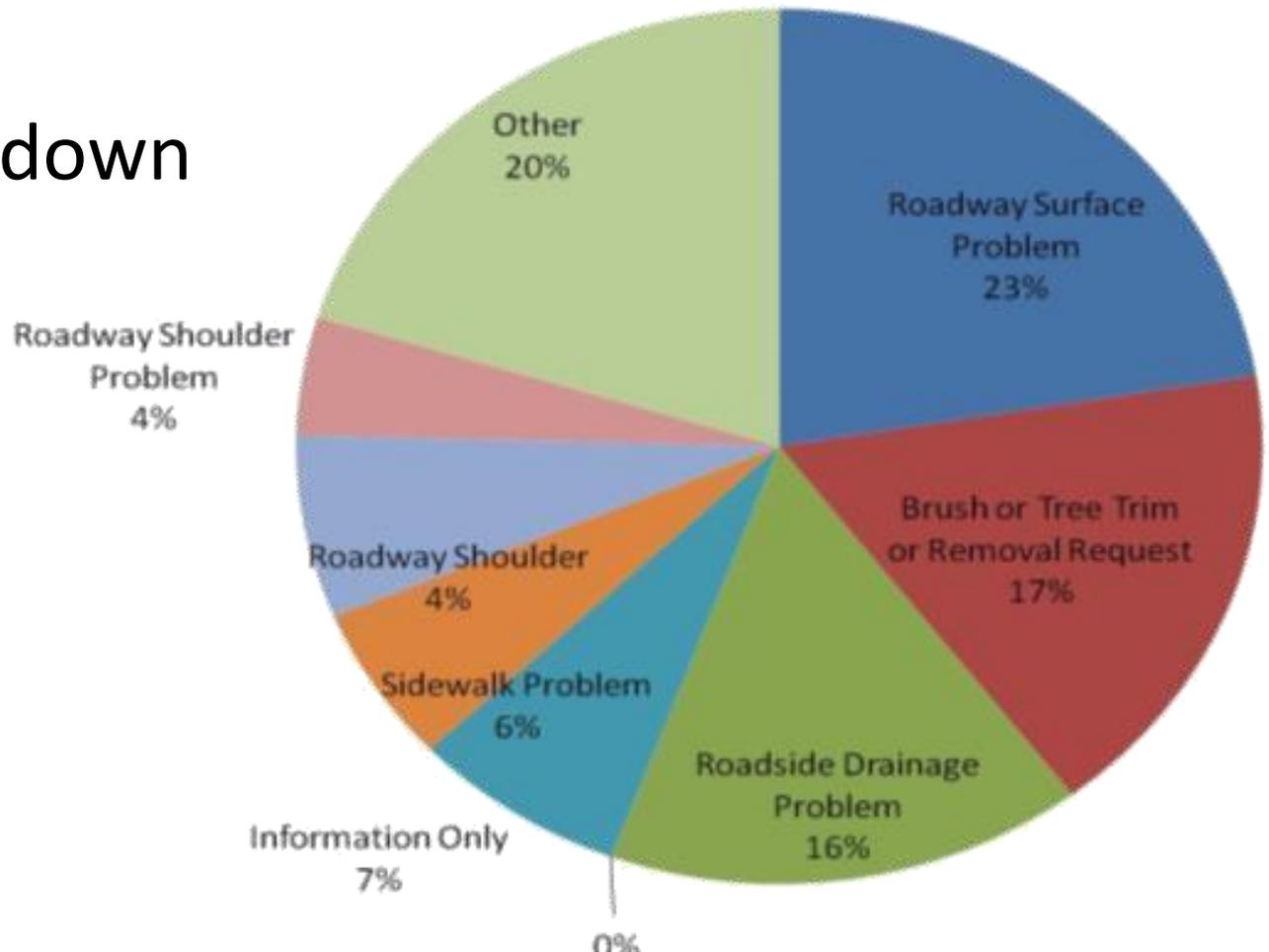


Maintenance Yard Location Modeling



Work Assignments and Service Requests

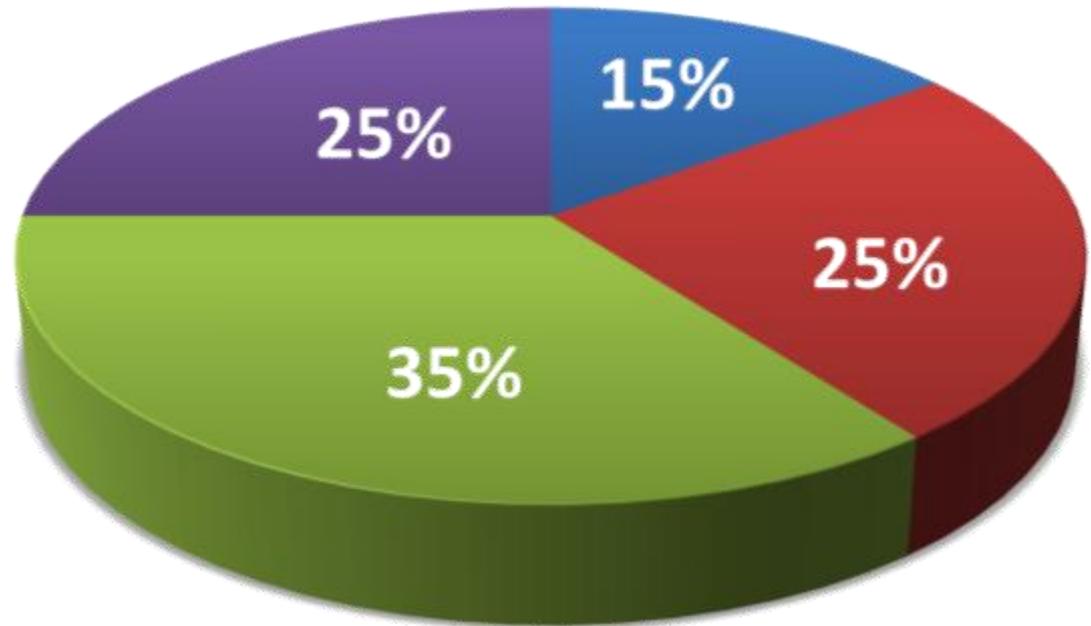
- Call center 13,000 -19,000 a year with TMD getting 53%
- 4 years breakdown



The Game Plan for Improvement...

86 opportunities for improvement, with 68 recommendations.

- 10 General
- 17 Planning
- 24 Organizing
- 17 Directing/Controlling



Putting the Team Together

- Strong and positive Project Manager
- Establishment of Management Working Committee
- Establish of employee teams with complementary skills

Establish Business Processes and Systems

- Identify what you own
- Identify work activities and guidelines
- Short term scheduling

Implementation Includes Four Phases of Maintenance Management

Planning
Organization
Directing
Control

Let's see how this works!!

Planning

Work Guidelines

- **Activities**
- **Assets**
- **Resource Data**

Inventory

What we know
or can be developed

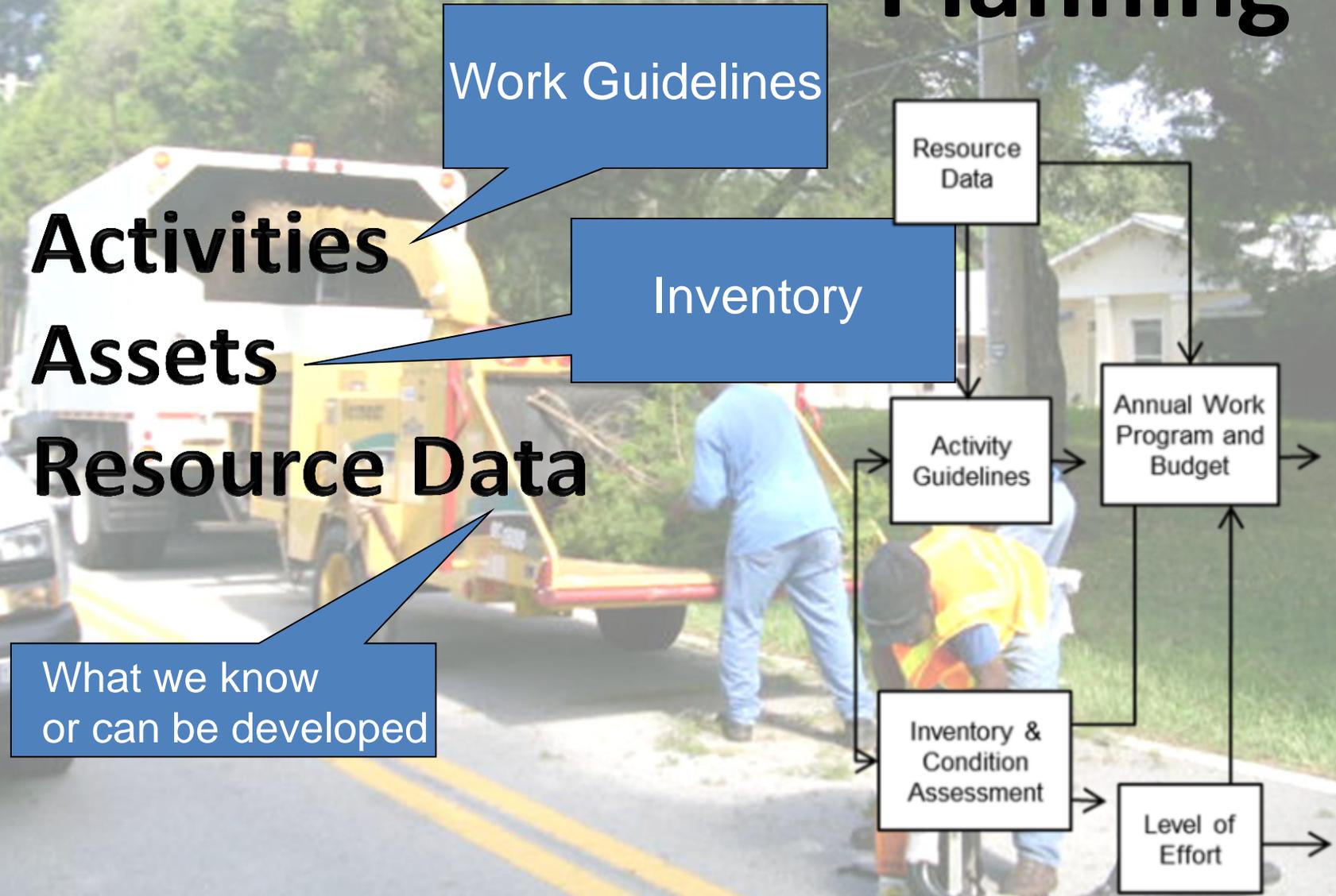
Resource Data

Activity Guidelines

Annual Work Program and Budget

Inventory & Condition Assessment

Level of Effort



Activity List and Guidelines

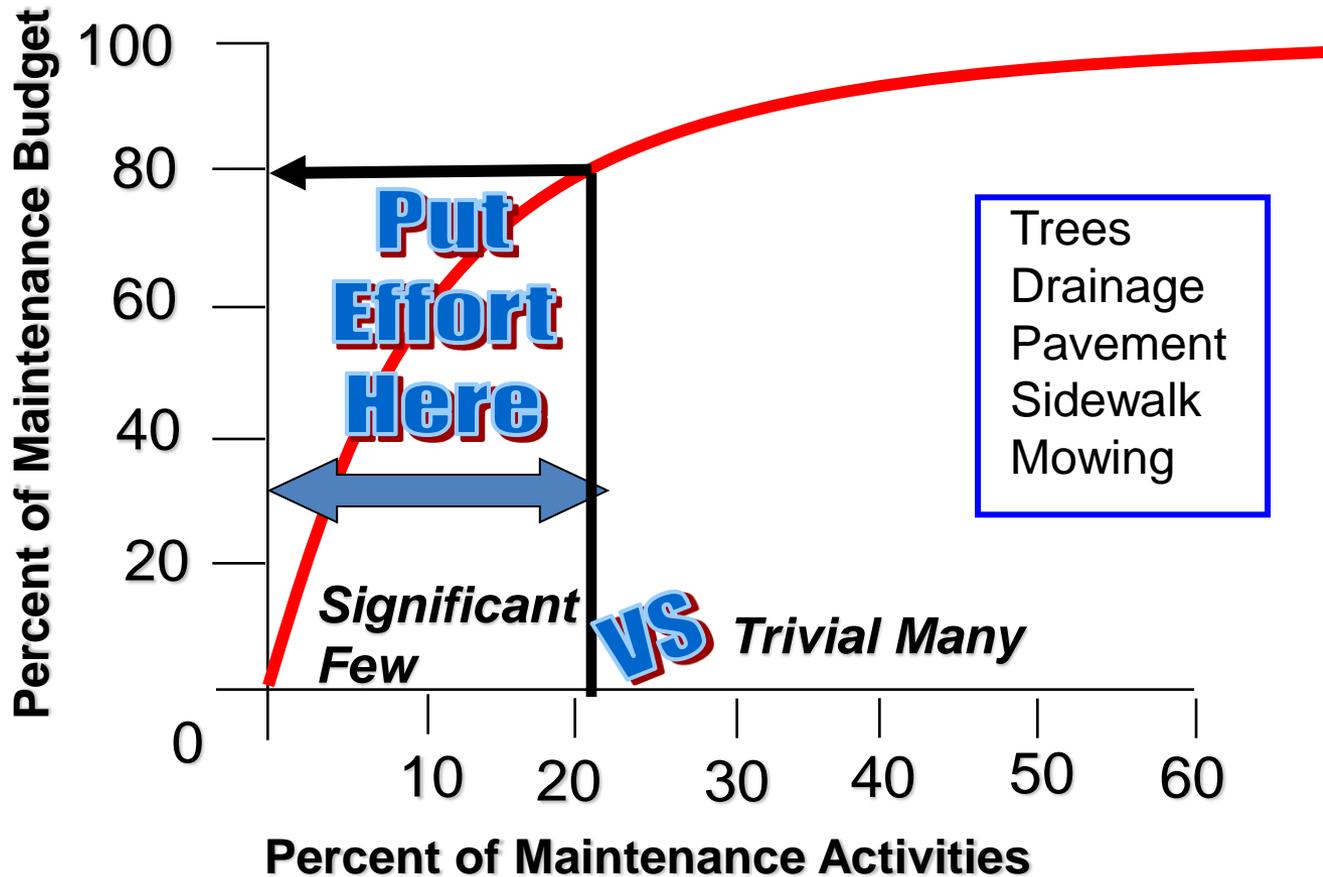
ACTIVITY GUIDELINE MAINTENANCE MANAGEMENT SYSTEM												
Public Works - Transportation Maintenance Division												
Activity Guideline											PROGRAM	
WORK ACTIVITY											CODE	
TREE AND BRUSH TRIM											12	
TREE AND BRUSH TRIM											1207	
DESCRIPTION OF WORK												
All work associated with cutting, trimming or pruning of trees and vegetation from County right-of-way or County property. The Work is performed in an effort to provide overhead height clearance over roadways or sidewalks, where they present a hazard, interfere with proper drainage, obstruct traffic site distance, or to promote successful maintenance programs.												
LADDER DISTRIBUTION												
PLANNING CRITERIA	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
	0	0	0	0	0	0	0	0	0	0	0	0
Trim or prune when height over roadways is less than 14 feet 6 inches – trim to fifteen (15) feet. For sidewalks, trim or prune when height over sidewalks is less than 8 feet – trim to ten (10) feet. Schedule work on an area basis, except for sight obstructions and emergencies.												
RESOURCE REQUIREMENTS			WORK METHOD						CHECK POINTS			
Resource	Qty		1. Identify brush, trees, or vegetation to be trimmed						- Use PPE			
2 – Labor			2. Obtain all permits and right of entry forms as needed						- Maintain proper clearance			
STW-1			3. Notify adjacent property owners according to TMD policy						- When practical, natural shape and structure of the tree should be maintained			
ATW-1			4. Mobilize equipment.									
TW- 2*			5. Establish work area, traffic control and safety procedures.									
Avg Crew Size: 4-6			6. Perform trimming.									
*additional staff for MOT may be needed			7. Chip brush and limbs using chipper equipment.									
2 – Equipment			8. Wood chips may be evenly distributed in designated areas within the County right-of-way; authorization must be obtained in writing to place chips on private property									
Blower-1			9. Report any damage to turf, curbs, sidewalks, pavement, signs or structures, mail boxes, appurtenances, etc.									
Brush cutter 1			10. Clean up and remove all excess material and other debris.									
Trailer mounted chipper-1			11. Load debris and materials and haul to approved disposal site									
Bucket truck-1			12. Remove all equipment and work area traffic control devices									
Chain saw- 1-3			13. Document work including resources used and work accomplishment.									
Crew truck-1			14. Travel to next job site and repeat steps 5-13.									
Flatbed truck 5			15. Perform end of use cleaning, fueling and servicing of equipment.									
Loader-1			16. Return to yard and fuel rolling stock at the end of the day.									
Pole saw-2												
3 – Material												
Results												
Trees are aesthetically pleasing, not obstructing sight and safe to the public. Clearance over road 14'-6"; Clearance over sidewalk 8'.												
Asset Inventory Item – Units			Avg Daily Production - Units			Effort						
0 MILE			3,000 LF									

- Description on Work
- Planning Criteria
- Work Method
- Required Resources
- Quality
- Average Daily Production (ADP)



Impact that the “Significant Few” Work Activities Have on Maintenance Workload

Realize!



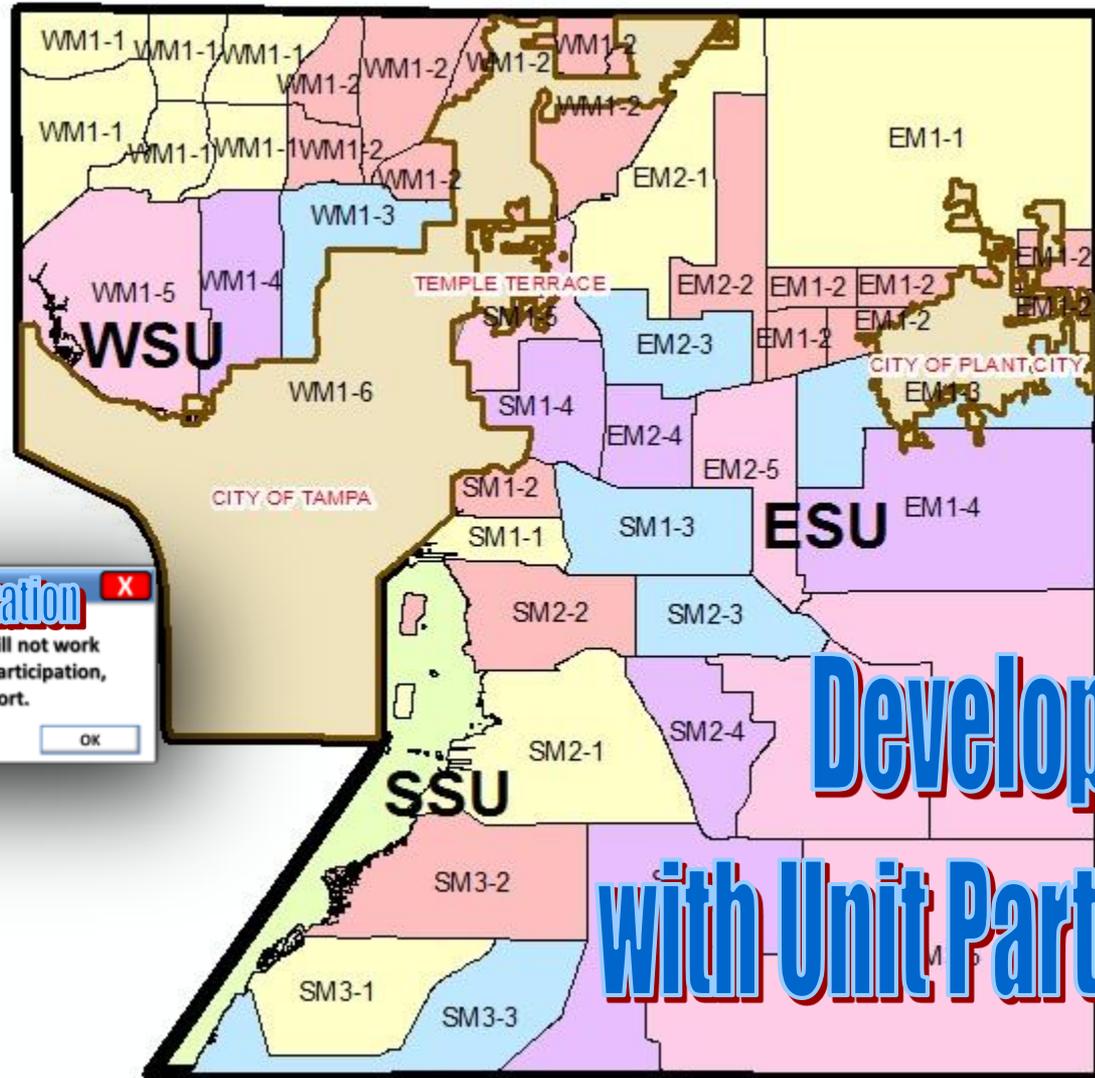
Resource Data – Use GIS to help Establish Routines

- Tree Trimming
- Flat Ground Mowing
- Slope Mowing
- Hand Mowing
- Sidewalks
- Pipes, Canals, and Ditch

**Routines Ready
To Be
Installed in CMMMS**



Resource Data - Created Blocks For Efficient Execution

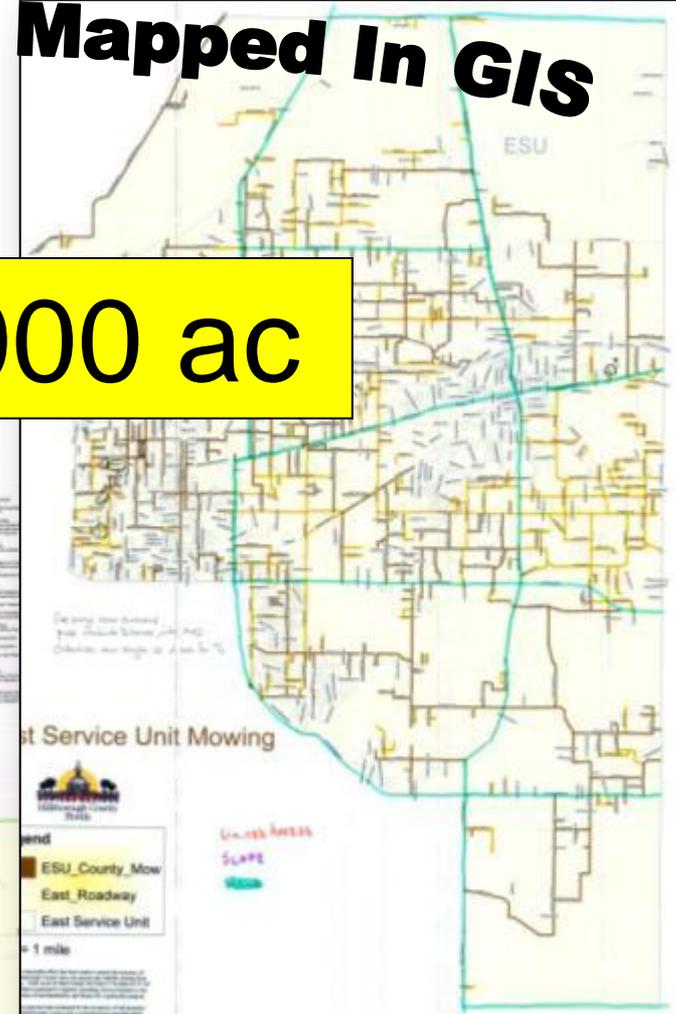
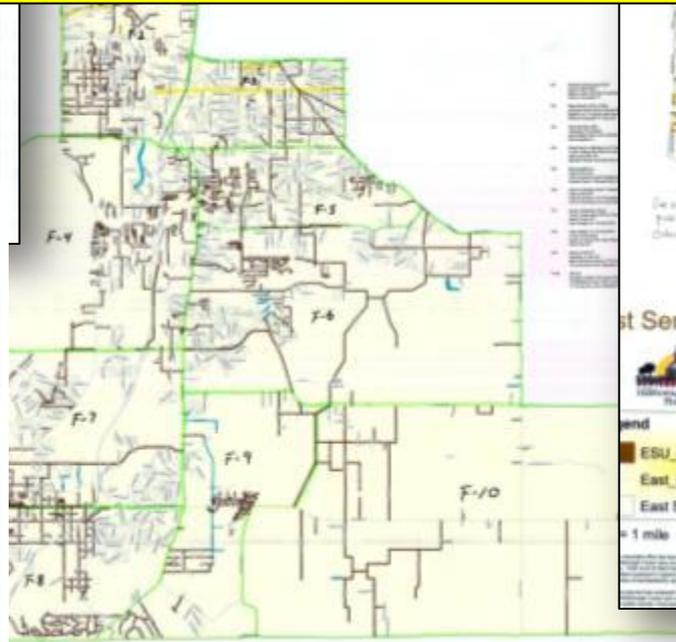
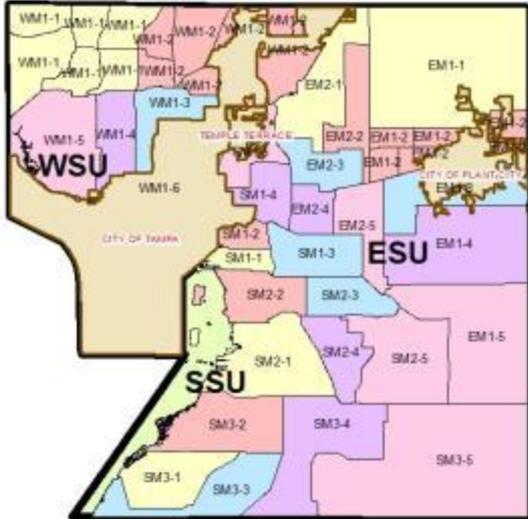


**Developed
with Unit Participation**

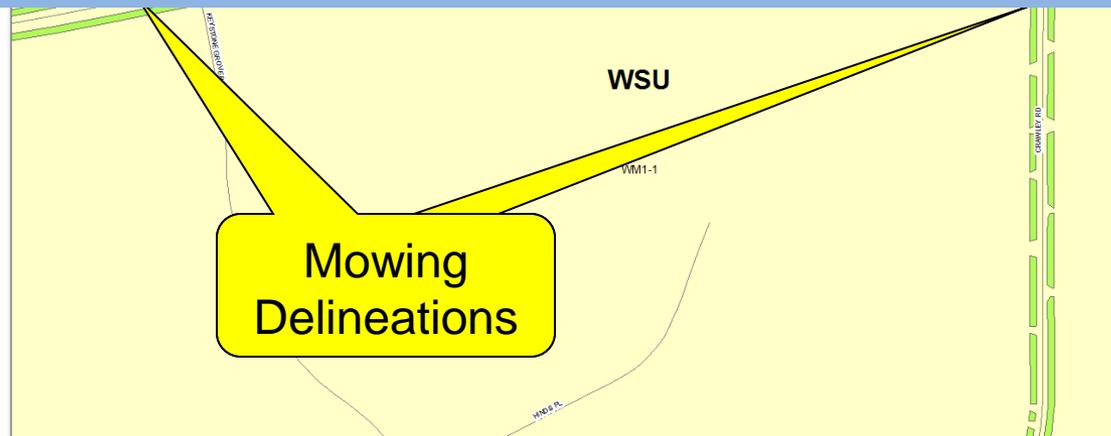
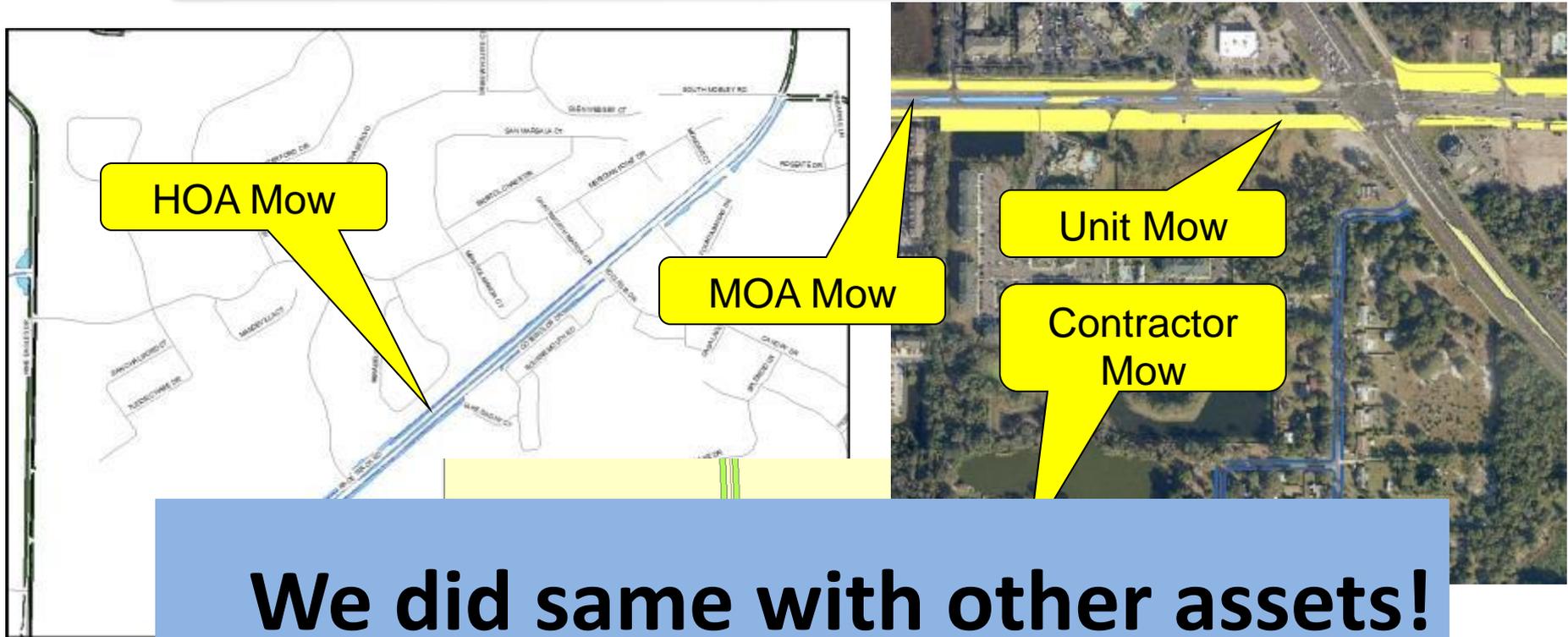
Mowing Blocks Within Unit Areas

Contractor And Unit Areas Mapped In GIS

10 Cycles = 54,000 ac



Mowing Areas Delineated in GIS

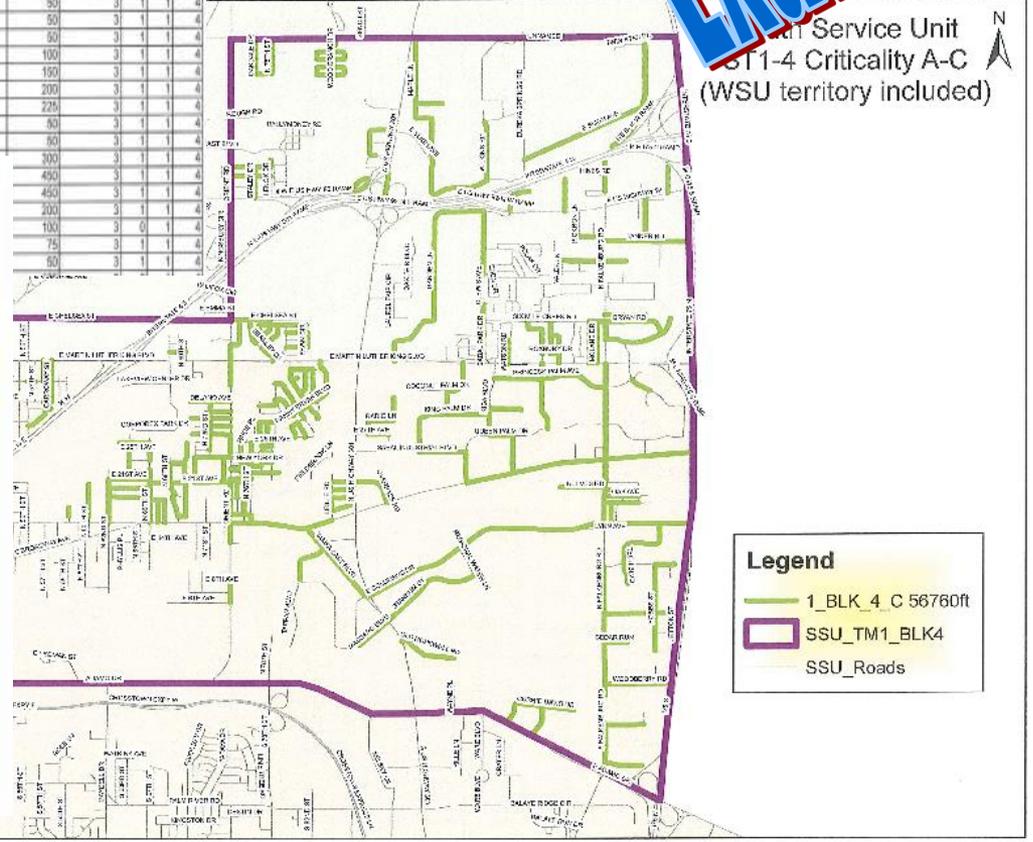
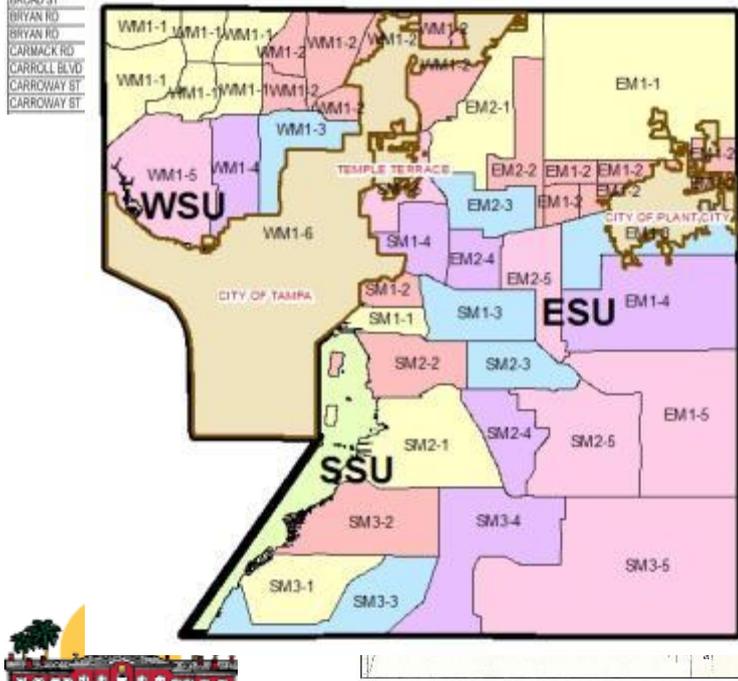


Operations Blocks With Tree Trimming

STREET	IRE_SEQ_ID	STREET_ID	SEGMENT_NO	FRSTNM	TOSTNM	CRITICALITY	FOOTAGE	CREW_SIZE	MOVT	Area	Block
ADAMS ST	32995	1415		90 E COLUMBUS DR	LAKE AVE	C	150	3	1	1	4
ALPINE AVE	32478	14190		50 BEECHWOOD BLVD	CORAL DR	C	300	3	1	1	4
ALPINE AVE	32478	14190		70 CORAL DR	BRADY DR	C	100	3	1	1	4
AMBERMIST DR	32478	14190		70 CORAL DR	BRADY DR	C	150	3	1	1	4
AMBERMIST DR	32478	14190		70 CORAL DR	BRADY DR	C	50	3	1	1	4
ANTHONY ST	32478	14190		70 CORAL DR	BRADY DR	C	200	3	0	1	4
ANTHONY ST	32478	14190		70 CORAL DR	BRADY DR	C	100	3	0	1	4
ARGON DR	32478	14190		70 CORAL DR	BRADY DR	C	300	3	1	1	4
ARIZONA DR	32478	14190		70 CORAL DR	BRADY DR	C	200	3	1	1	4
BALDWIN AVE	32415	12748		75 N 72ND ST	ORIENT RD	C	100	3	1	1	4
BAPTIST CHURCH RD	27829	13256		80 E US HIGHWAY 92	DEAD END	C	225	3	1	1	4
BEECHWOOD BLVD	32478	14190		70 CORAL DR	BEECHWOOD PL	C	150	3	1	1	4
BEECHWOOD BLVD	32478	14190		70 CORAL DR	BEECHWOOD PL	C	250	3	1	1	4
BEECHWOOD BLVD	32478	14190		70 CORAL DR	BEECHWOOD PL	C	50	3	1	1	4
BEECHWOOD BLVD	32478	14190		70 CORAL DR	BEECHWOOD PL	C	100	3	1	1	4
BEECHWOOD BLVD	32478	14190		70 CORAL DR	BEECHWOOD PL	C	50	3	1	1	4
BEECHWOOD PL	32478	14190		70 CORAL DR	BEECHWOOD PL	C	50	3	1	1	4
BERKLEY DR	27378	14189		100 WALUS PL	E CHILSEA ST	C	50	3	1	1	4
BERKLEY DR	27378	14189		100 WALUS PL	E CHILSEA ST	C	100	3	1	1	4
BRECKENRIDGE PARK DR	27188	275		80 E MARTIN LUTHER KING BLVD	EMPIRE PL	C	600	3	1	1	4
BRECKENRIDGE PARK DR	27188	275		175 BRECKENRIDGE PKWY	BRECKENRIDGE PKWY	C	150	3	1	1	4
BRECKENRIDGE PARK DR	27217	275		75 BRECKENRIDGE PARK DR	BRECKENRIDGE PARK DR	C	200	3	1	1	4
BRECKENRIDGE PKWY	27189	12826		125 BRECKENRIDGE PKWY	BRECKENRIDGE PARK DR	C	225	3	1	1	4
BRECKENRIDGE PKWY	27184	12829		100 BRECKENRIDGE PKWY	BRECKENRIDGE PKWY	C	50	3	1	1	4
BRECKENRIDGE DR	32439	14197		50 BRISTWOOD DR	PATINA DR	C	50	3	1	1	4
BROAD ST	32478	14190		70 CORAL DR	BEECHWOOD PL	C	300	3	1	1	4
BRYAN RD	32478	14190		70 CORAL DR	BEECHWOOD PL	C	450	3	1	1	4
BRYAN RD	32478	14190		70 CORAL DR	BEECHWOOD PL	C	450	3	1	1	4
CARMACK RD	32478	14190		70 CORAL DR	BEECHWOOD PL	C	200	3	1	1	4
CARROLL BLVD	32478	14190		70 CORAL DR	BEECHWOOD PL	C	100	3	0	1	4
CARROWAY BT	32478	14190		70 CORAL DR	BEECHWOOD PL	C	75	3	1	1	4
CARROWAY BT	32478	14190		70 CORAL DR	BEECHWOOD PL	C	50	3	1	1	4

**Street List To Go
with Work Scope**

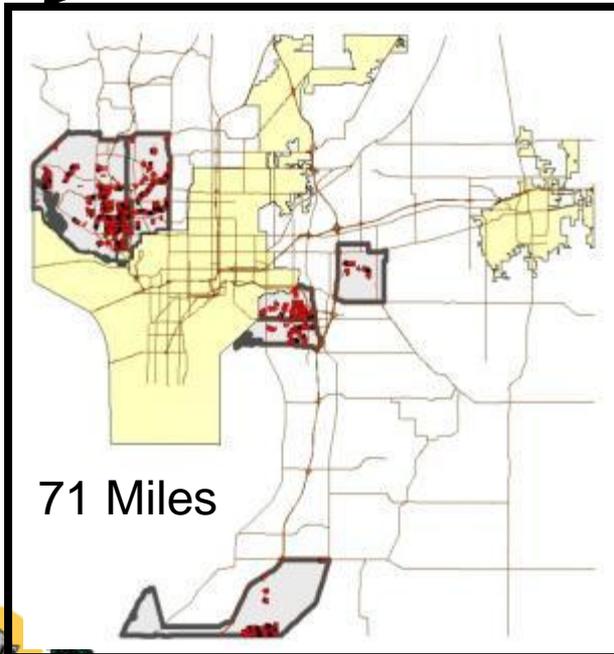
Example



Ditch and Canal Cleaning

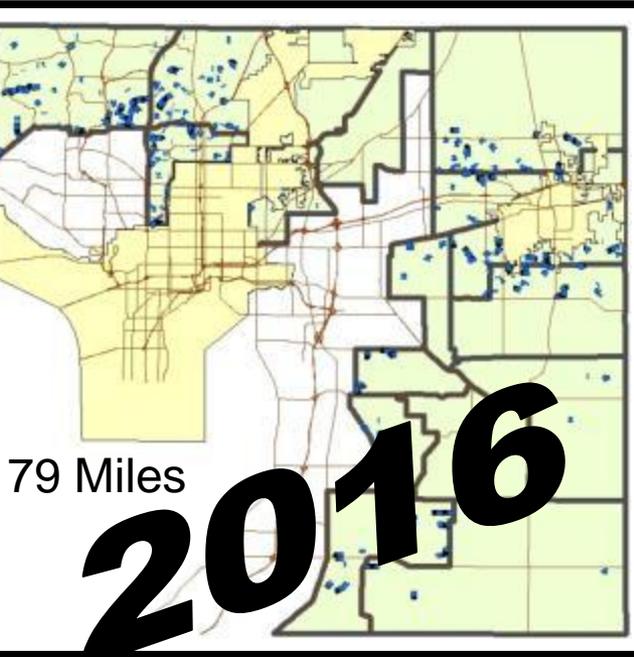
Canals Mapped and Arranged
Into Aggregated Operations
Blocks For Execution By Units

2014



63 Miles

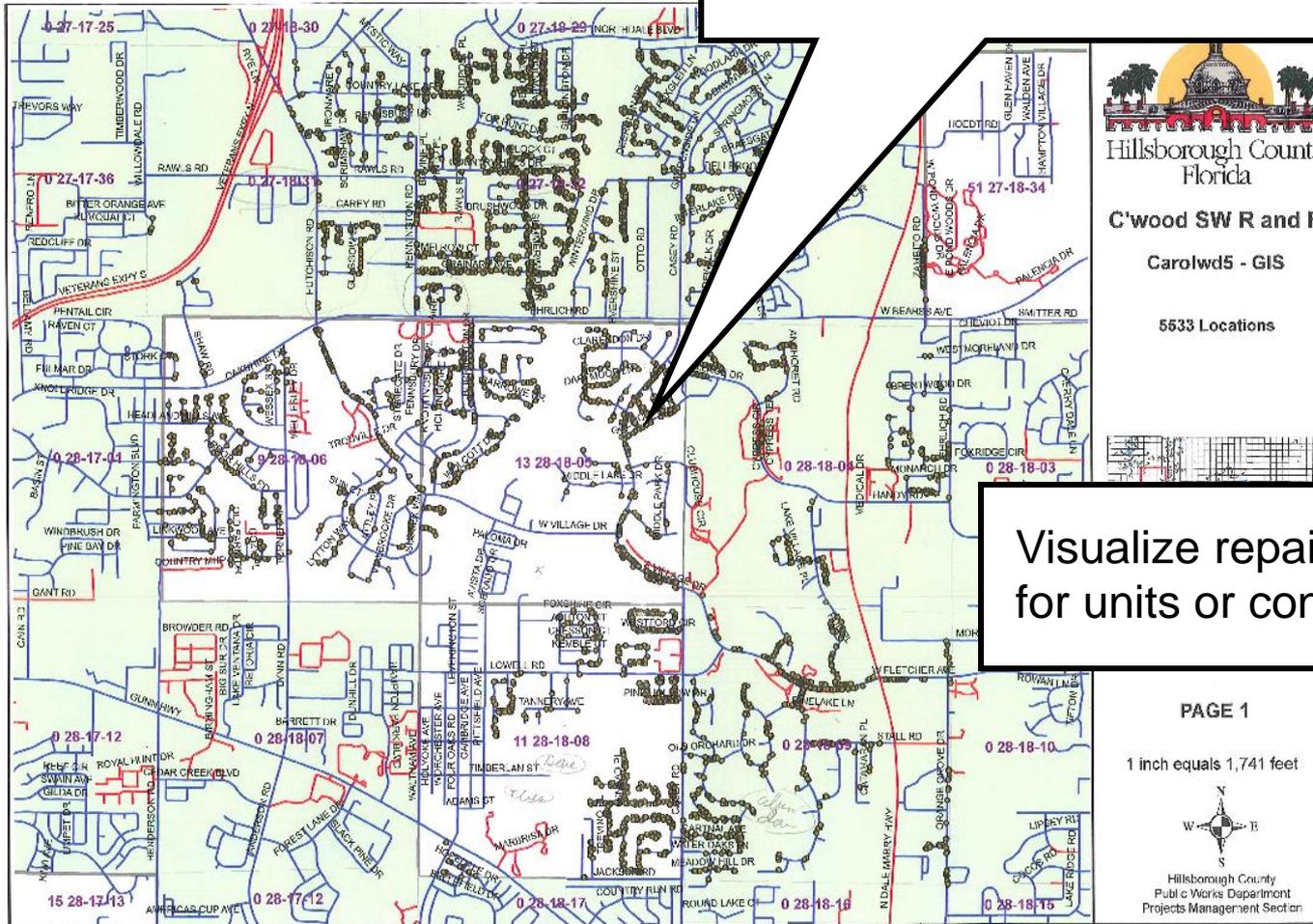
2015



2016

Sidewalk Maps

Broken Sidewalks Identified and mapped with GPS



Visualize repair work planned for units or contractors

**ACTIVITY GUIDELINE
MAINTENANCE MANAGEMENT SYSTEM**

P&M Works - Transportation Maintenance Division

WORK ACTIVITY	TIME AND DURATION	PROGRESS	
		DATE	TIME

DESCRIPTION OF WORK

RESOURCE REQUIREMENTS

RESOURCE	UNIT	QUANTITY	REMARKS
1. Labor	Day		
2. Equipment			
3. Materials			
4. Other			

WORK METHOD

1. Obtain work order or request for maintenance
2. Obtain all permits and signs as they become needed
3. Notify adjacent property owners according to TDD policy
4. Mobilize equipment
5. Execute work as per staff's level of priority
6. Perform mowing
7. Data input and file using image equipment
8. Check compliance to every step listed or designated
9. Check out all City property and equipment used by department or bring to place of origin
10. Report any damage to truck, tools, equipment, personnel

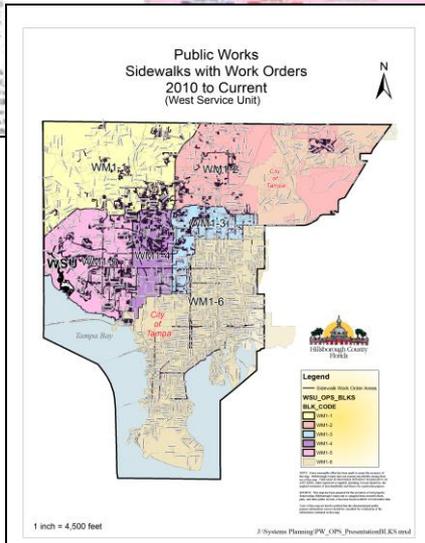
TRAFFIC SIGNALS

We Evaluated....

- Assets
- Criticality
- Condition
- Scope
- Resources Available

And We Were Able to Plan...

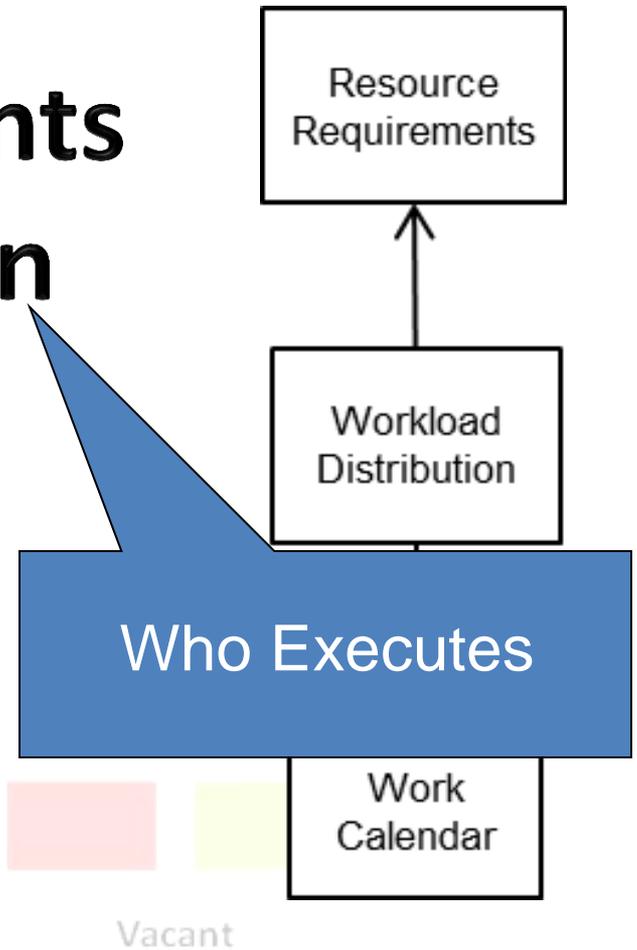
- Who Will Do The Work
- What Work Is to Be Done
- When Will It Be Done
- Location
- Cost



Organizing



- Resource Requirements
- Workload Distribution
- Organization



Roles and Responsibilities

- **Routine Repair and Maintenance**- Work scheduled and place on a routine
- **Response**- Work that pulls crews off schedule
- **Systems**- Inspection and work identification, key support of CMMS processes



Triggers and Staff Responsibility

Criticality	Trigger/Action	Staff Responsibility
1- <u>Emergency</u>	Insert in schedule	Primarily Response Crews
2- <u>Less than two weeks</u>	Insert in schedule	Response Crews and others as needed
3- <u>Two weeks</u>	Place in next Two Week Schedule	Routine Maintenance & Repair Crews
4- <u>Routine cycle</u>	Place in Routine Schedule	Routine Maintenance & Repair Crews
5- <u>Annual Plan</u>	Estimate Date (Backlog)	Crews and/or contract as required

Response Crews

Routine Maintenance & Repair Crews

& Repair Crews

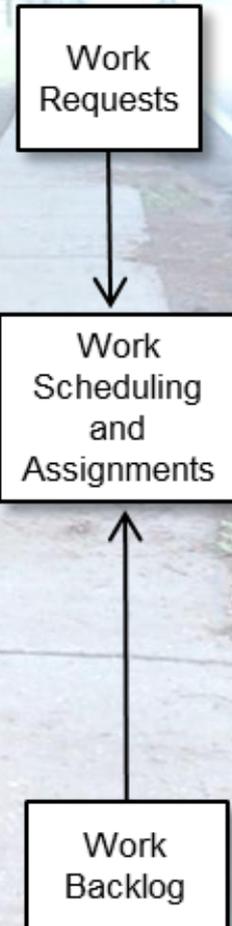
Tasks – Planning or Calls

Directing

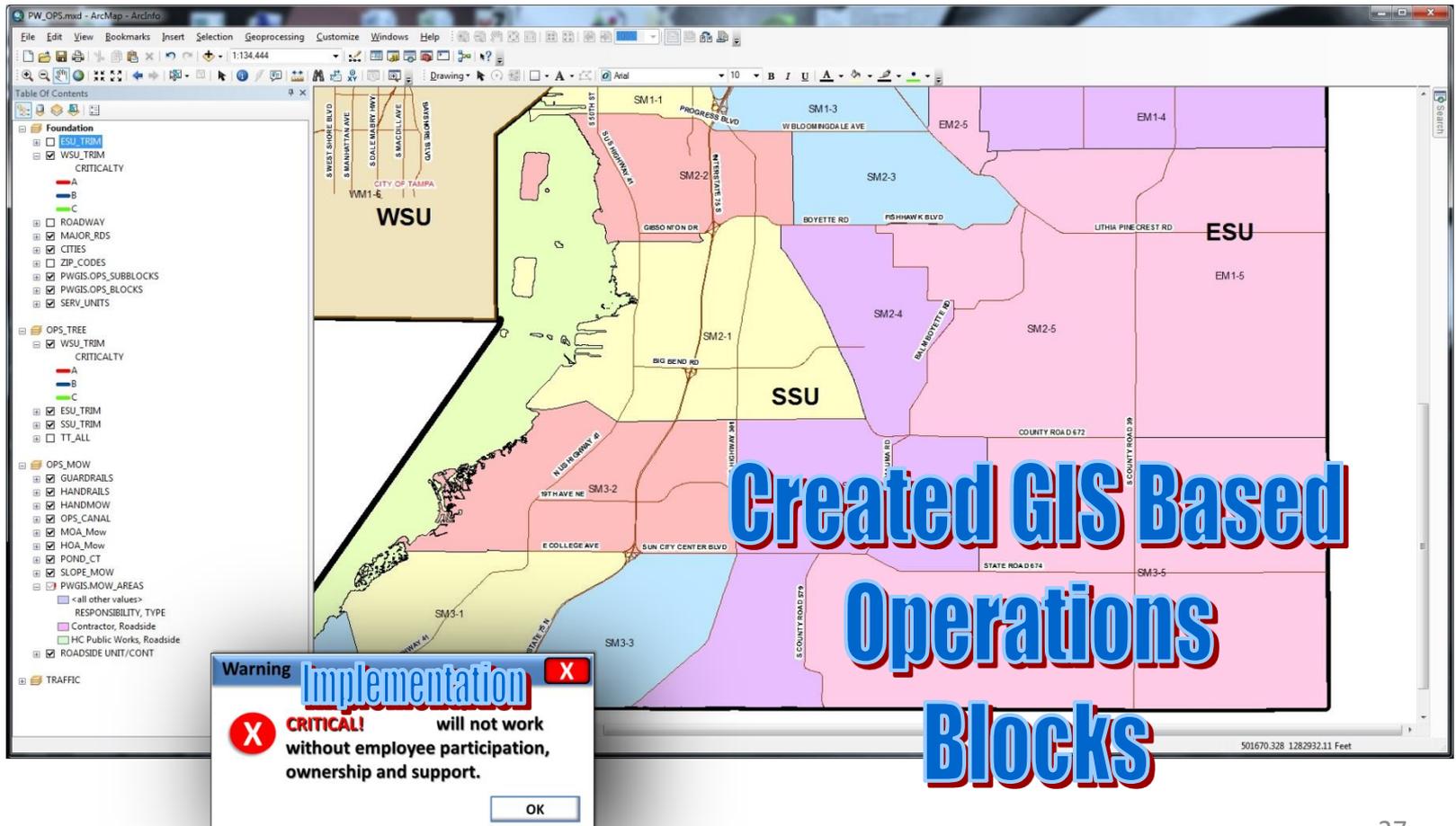
- **Work Request/Orders**
- **Work Scheduling**
- **Backlog**

Work Plan (Two weeks)

Work Queue (Longer Term)



Operations Blocks Created For Efficient Execution by Units or Contractors



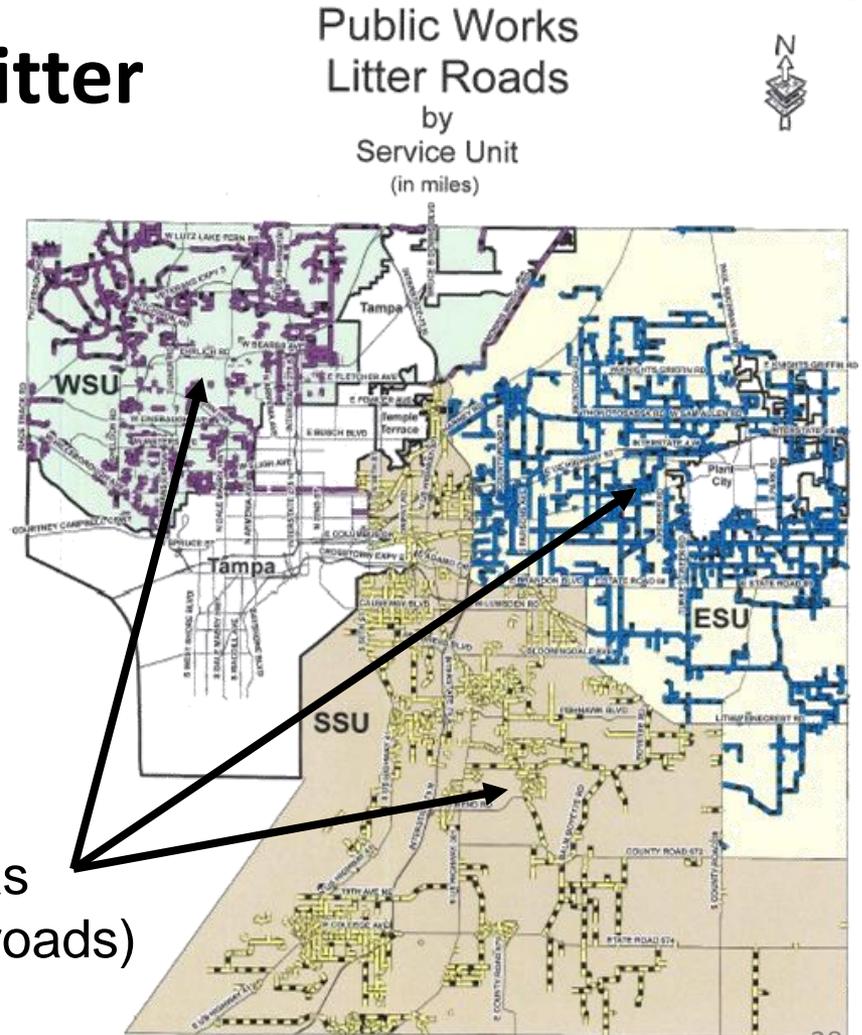
Organization – Resources

Litter Pickup – Contractors and Volunteers and

CSW

- Litter pickup Roads for Litter Contractor

- Same Rural (unit) Mowing Routes
- Helps increase the ability of units to meet 8 mow cycles/year

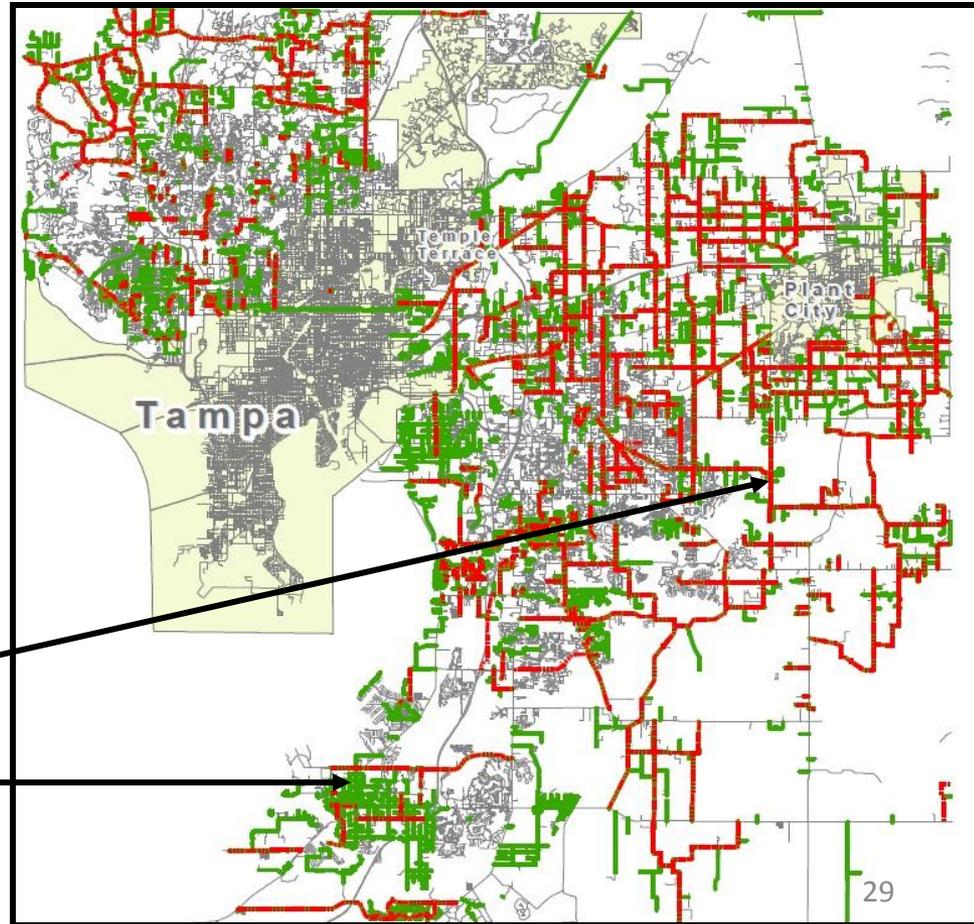


Contractor Areas
(same as unit mow roads)

Organization – Resources

Vegetative Spraying

- **Roadways According to Rural (Unit) Roads**
 - A) Obstacle Spraying
 - B) Retardant Spraying
 - Rural Roads Only
 - Focused upon enhancing Unit Production



Spray and Mow

Mow Only

Video Bi Weekly Scheduling Meeting

South Service Unit
BI-Weekly Scheduling

Schedule Dates: 04/07/13 to 04/20/13

Planned By: Brenda Kahn
Approved By: _____

Group: Routine Maint.- Mowing & Trees

Label Type	Unit	Rate	Total Hours
General Crew Leader	1	80	80
Senior Crew Leader	3	80	240
Senior Transportation Worker	4	80	320
Advanced Transportation Worker	4	80	320
Transportation Worker	6	80	480
Trades Helper	1	80	80
OT	1	80	80
Holiday	1	80	80
Leave	1	80	80
Medical	1	80	80
TOTAL PEOPLE	19		
TOTAL PERSON HOURS AVAILABLE			1440

Activity Code	Work Order Number	Location	Priority	Crew Size	Task Hours	Total Person Hrs	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	THU	FRI	SAT	
1202	379443	SM - Team 3 Block 5		3	80.00	240		X	X	X	X				X	X	X	X		
1203	378685	SM - Team 3 Block 1		1	80.00	80		X	X	X	X				X	X	X	X		
1203	379444	SM - Team 1 Block 1		1	80.00	80		X	X	X	X				X	X	X	X		
1201	379453	SM - Team 3 Block 1		3	80.00	240		X	X	X	X				X	X	X	X		
1200	377615	ST-3 Block 5		3	40.00	120		X	X	X	X				X	X	X	X		
1300	372507	Bryan Road	(4)	4	10.00	40		X												
1504	379062	S. CR 39	(4)	4	10.00	40				X										
1206	377073	Altamunda Av	(3)	4	8.00	32									X					
1206	367346	419 Morningstar Drive	(4)	4	10.00	40		X												
1208	377111	W. Shal Point Road	(4)	4	5.00	20						X								
1208	377820	CR 672	(4)	4	5.00	20							X							
1206	370845	Doans Loop	(4)	4	10.00	40													X	
1205	378656	West Brook Av	(4)	2	7.00	14										X				
1206	377119	Bryan Road	(4)	4	10.00	40		X												
1504	378042	S. CR 39	(4)	3	4	12				X										
1503	378275	Colonial Estates Lane	(4)	4	5	20									X					
1503	378266	Timberline Road	(4)	4	20	80									X					
1203	379008	Camden Field Pkwy	(4)	1	19	19		X												
1000	378703	Bi-Weekly		3	3	3													X	
1000	378703	Safety @ SSU		23	4	92					X								X	
1003	378702	Oversighting the crews Jobs		1	80	80		X	X	X	X				X	X	X	X		
1205	377620	Maudell Drive	(4)	4	10.00	40														
1205	377508	Maple Lane	(4)	5	40.00	200														
1203	378052	Pa Drive	(4)	1	10.00	10														

Video

Jeff Thurman (LAC) Roger_SysP

WGU

Chat (Everyone)

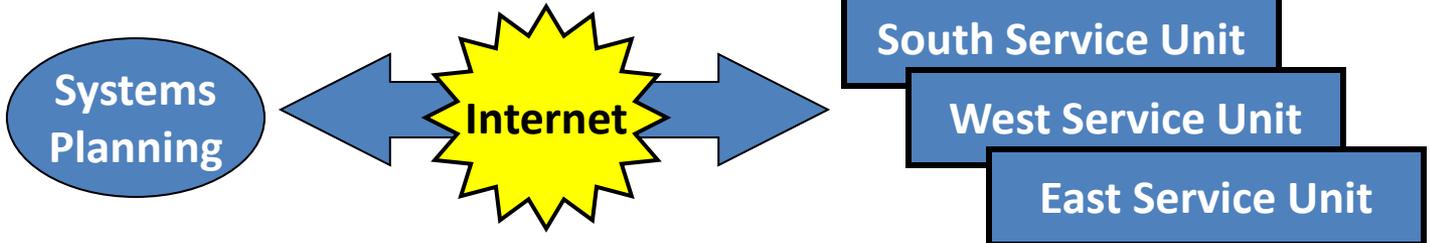
GoToMeeting
by CITRIX®

Attendees (4)

Hosts (1)

HTVonline.org Connect

Presenters (3)



Control - Mowing

Two Week Work Plan

- Turf Management Cycles –**
12 cycles per year minimum. Gateway roads could be 12-15 cycles or more.

- Contractors to mow –**
750 ac every two weeks

Contractor Turf Management Cy

Month	J	F	M	A	M	J	J	A	S	O
Mow		X	X	X	X	2X	2X	2X	2X	>
Litter	X	X	X	X	X	X	X	X	X	X
Right of Way Insp.	X	X	X	X	X	X	X	X	X	X
TM Cycles	X	X	X	X	X	X	X	X	X	X





- Units to Mow –**
Minimum 8 cycles per year

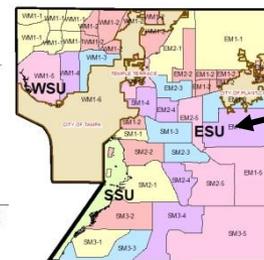
- Litter pickup –**
1,281 mi per two weeks

- Spraying –**
Two cycles of each treatment per year

Unit Turf Management Cycles

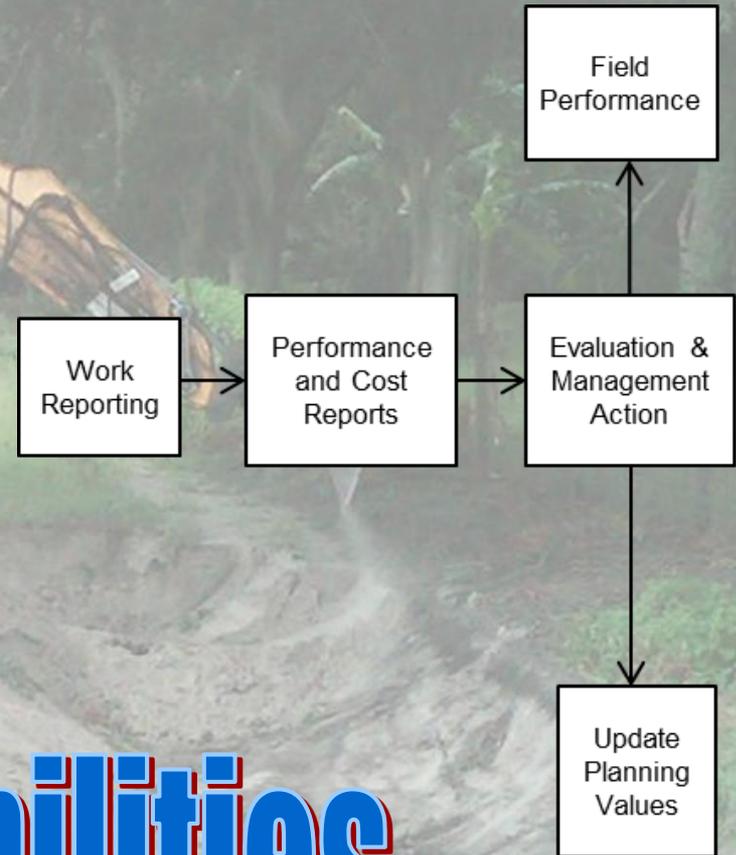
Month	J	F	M	A	M	J	J	A	S	O	N	D
Mow	H	X	X	X	X	X	X	X	X	X	H	
Spray Obstacle			X	X			X	X				
Spray Retardant				X				X				
Litter	X	X	X	X	X	X	X	X	X	X	X	
Right of Way Insp.	X	X	X	X	X	X	X	X	X	X	X	
TM Cycles	X	X	X	X	X	X	X	X	X	X	X	

Each mowing block takes two weeks



Improving/Controlling

- Work Reporting
- Performance and Costing Analysis
- Management Action



New CMMS Capabilities

Controlling - Work Reporting - CMMS

Monthly Plan vs. Plan Actual Meeting

(Web) MaintStar - Work Planning: User: COXW
 Menu SetupMenu MainMenu Dashboard Printer Window Help

Work Status Report

Condition Work Status (PTD/YTD) Work Calendar Overview

06/23/14
Page 1 of 1

Hillsborough County
 Work Status Report by Administrative System
 02/01/14 - 02/28/14

Person Days

Detail / Summary Adm. System / Program / Activity	Wk Unit	This Period		This Period		Total Cost		Unit Time/hr		Unit Cost		Labor Days		Work Qty	
		Plan	Days	Act	Qty	Plan	Actual	Period	Period	Period	Period	Annual	Y-T-D	Annual	Y-T-D
12 - MOWING & TREES															
1201 - MOWING BY HAND	SY	2.5	0.0	2275.0	0.0	\$584	\$0	0.010		\$0.26		30.4	0.9	27310.3	120.0
1202 - ROADSIDE MOW	AC	85.6	102.9	229.9	524.2	\$34,572	\$25,314	3.720	1.963	\$15	\$48.29	4277.7	284.1	11496.2	1681.9
1203 - SLOPE MOWING	LF	10.4	0.4	124950.0	210.0	\$3,720	\$110	0.00		\$0.52		125.0	21.7	1500000.0	32599.0
Program 12 TOTAL		98.5	103.3			\$38,876	\$25,424					4433.0	306.7		
0000114 - TOTAL		98.5	103.3			\$38,876	\$25,424					4433.0	306.7		

Cost



Business and System Processes

Develop Plans, Priority and LOS for Assets

Plan

Control

Organize

Schedule

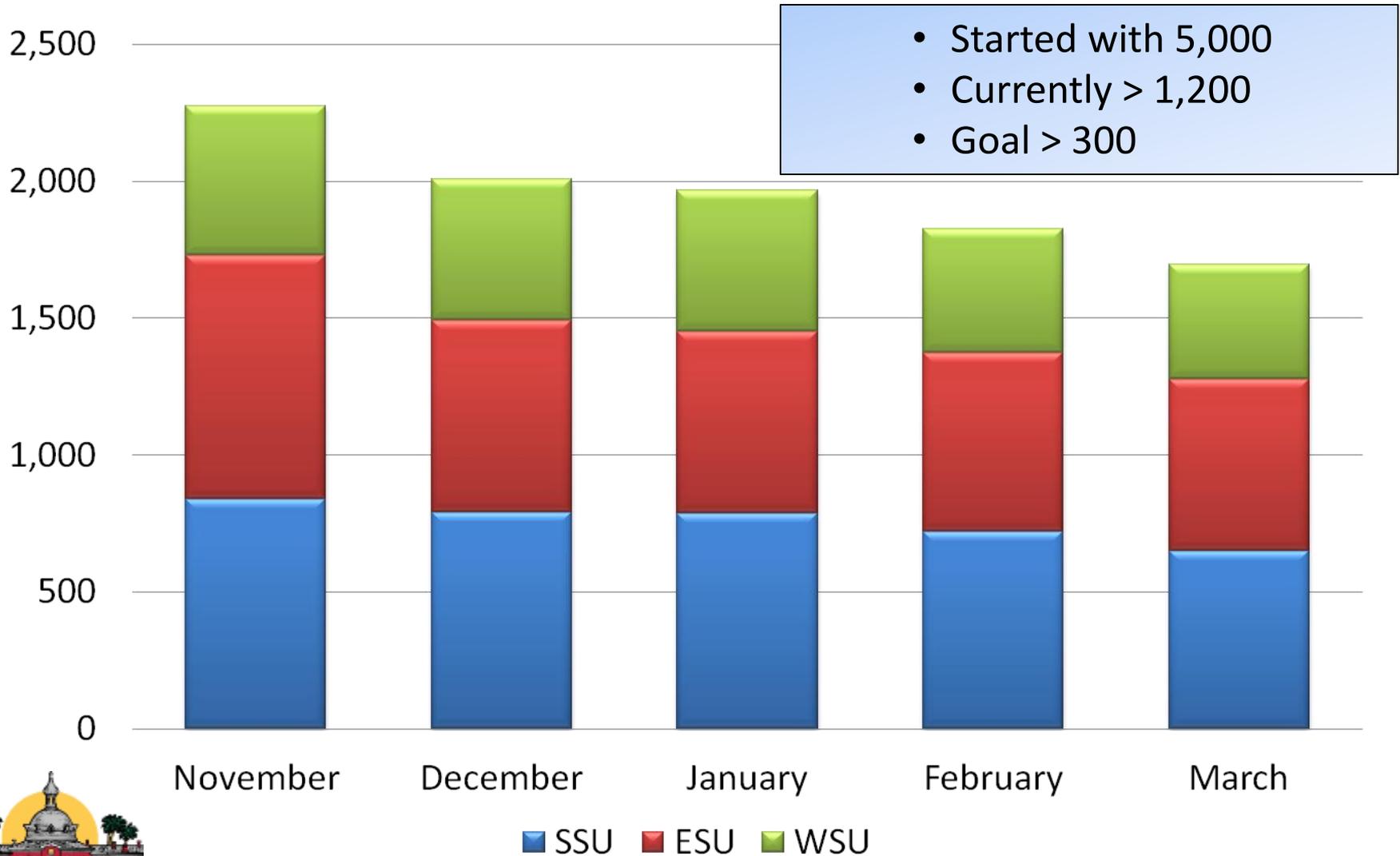
Organize/Assign the Limited Resources

Monitor the Results vs.
Expectation and Adjust

Improvement!

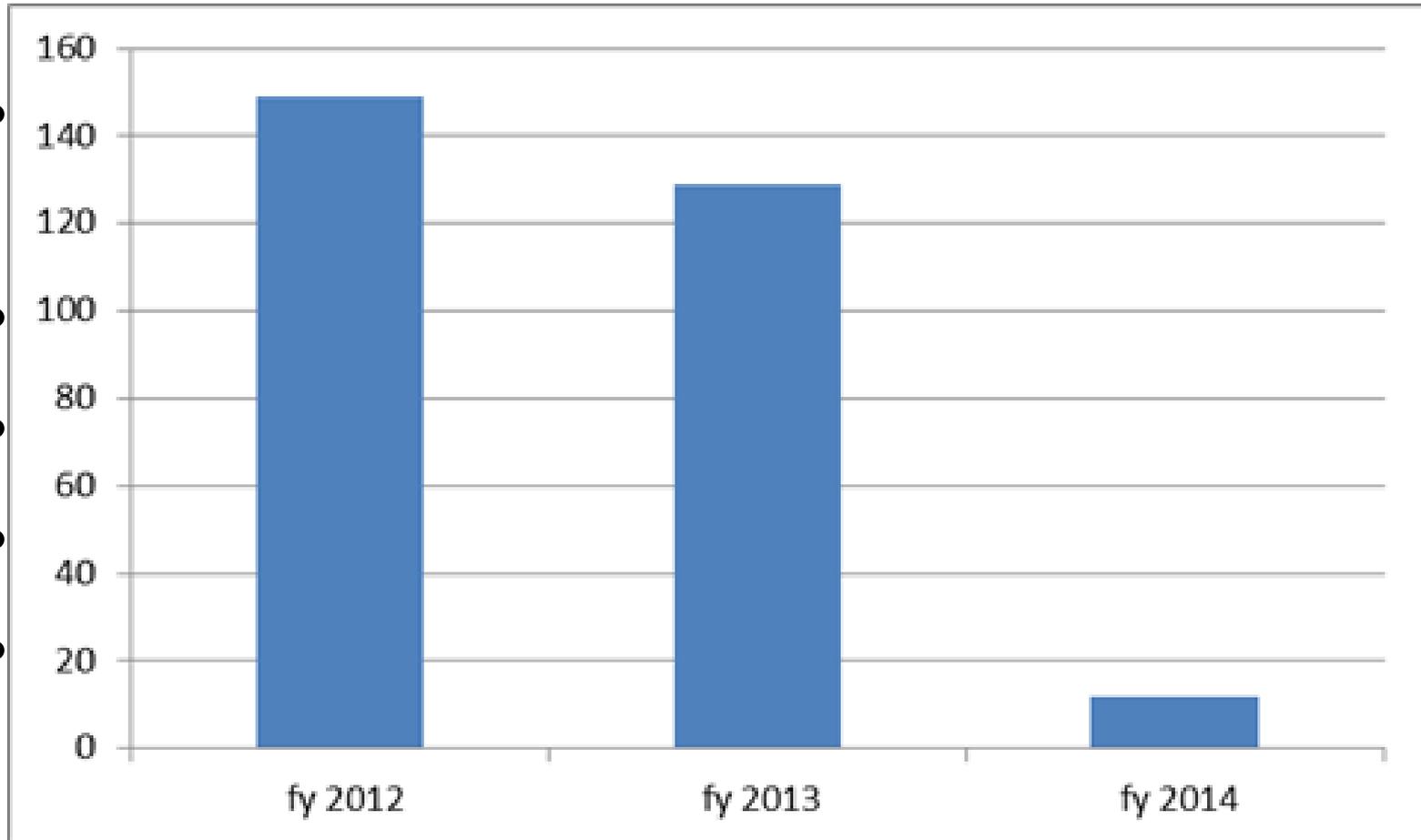
Construct Short Term Scheduling to Apply Resources

Reduced Backlog



Results

Citizen Request for Mowing



Further Results

- Reduction of a maintenance yard no reduction of service
- Reduction of staff by 7% yet more work done
- Major activities(mowing, trees, ditches) from 20% planned to 80% planned
- Mowing cycles have increased from <3 to >8
- Routines for all major activities
- Acknowledgement of success at 3 national APWA conferences and 3 Florida ones, staff awards and articles
- **Independent Audit “** The Department is transforming field operations in a positive way, and plans exist to expand this success..... *“Clifton Larson Allen LLP*

Lessons Learned

- Established expectations with feedback at all levels
- Training and use of current technology at all levels
- Business processes and technology to match needs
- Empowerment & involvement of employees at all levels
- Focuses maintenance on extending the useful life of assets;
- Routine and preventative maintenance programs established
- Staff challenged to innovate and seek operational efficiencies
- Document success and give credit

What next?

- Engage Sr. Leadership to utilize
- Fully implement recommendations
- Align organization and other groups – MC, Traffic and Solid Waste
- Establish & implement business processes and technology
- Guide, coach and direct staff
- Obtain improvement & document
- Continuously work to improve

Questions

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