

i-Tree Storm Utility: An Introduction



David Bloniarz, USDA Forest Service





www.unri.org/research-documents



Why Prepare?

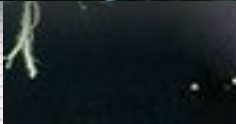




Tornados



Thunderstorms & Wind



Snow

Any Time, Any Place....



My Location
Springfield, MA

Tornado Watch

Expires: 06/02/2011 12:00 AM
Ma . Massachusetts
Counties Included Are

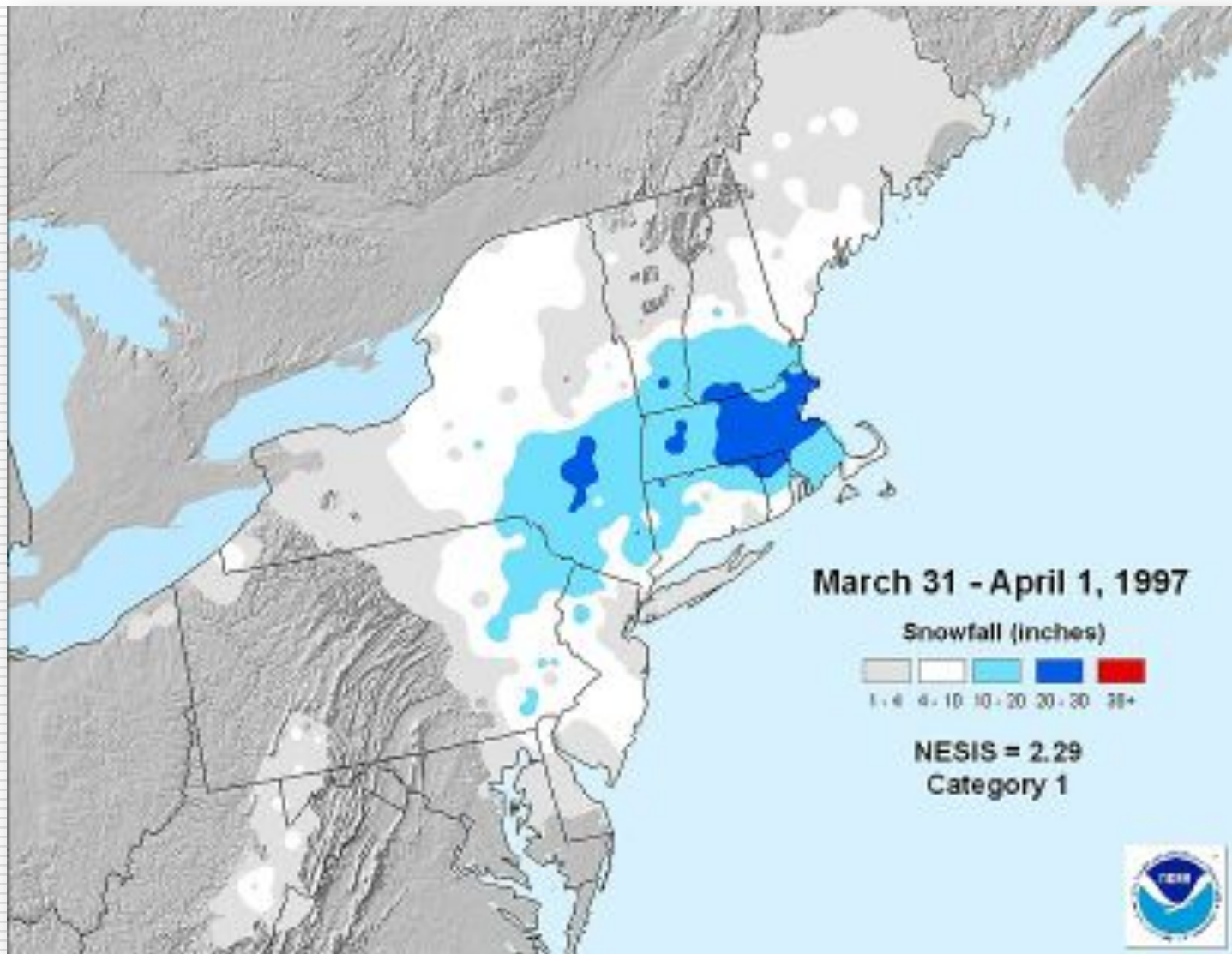
Essex
Hampden
Middlesex
Suffolk

Franklin
Hampshire
Norfolk
Worcester

86°F 

1997 April Fool's Day Blizzard

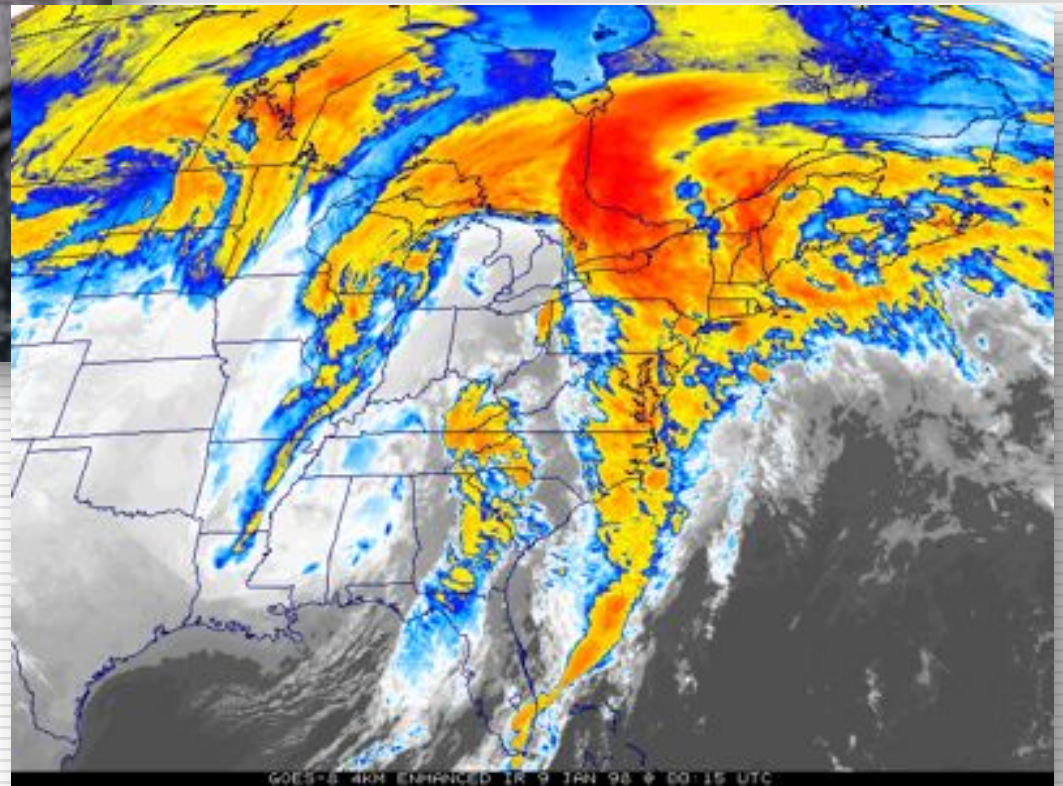


1997 April Fool's Day Blizzard



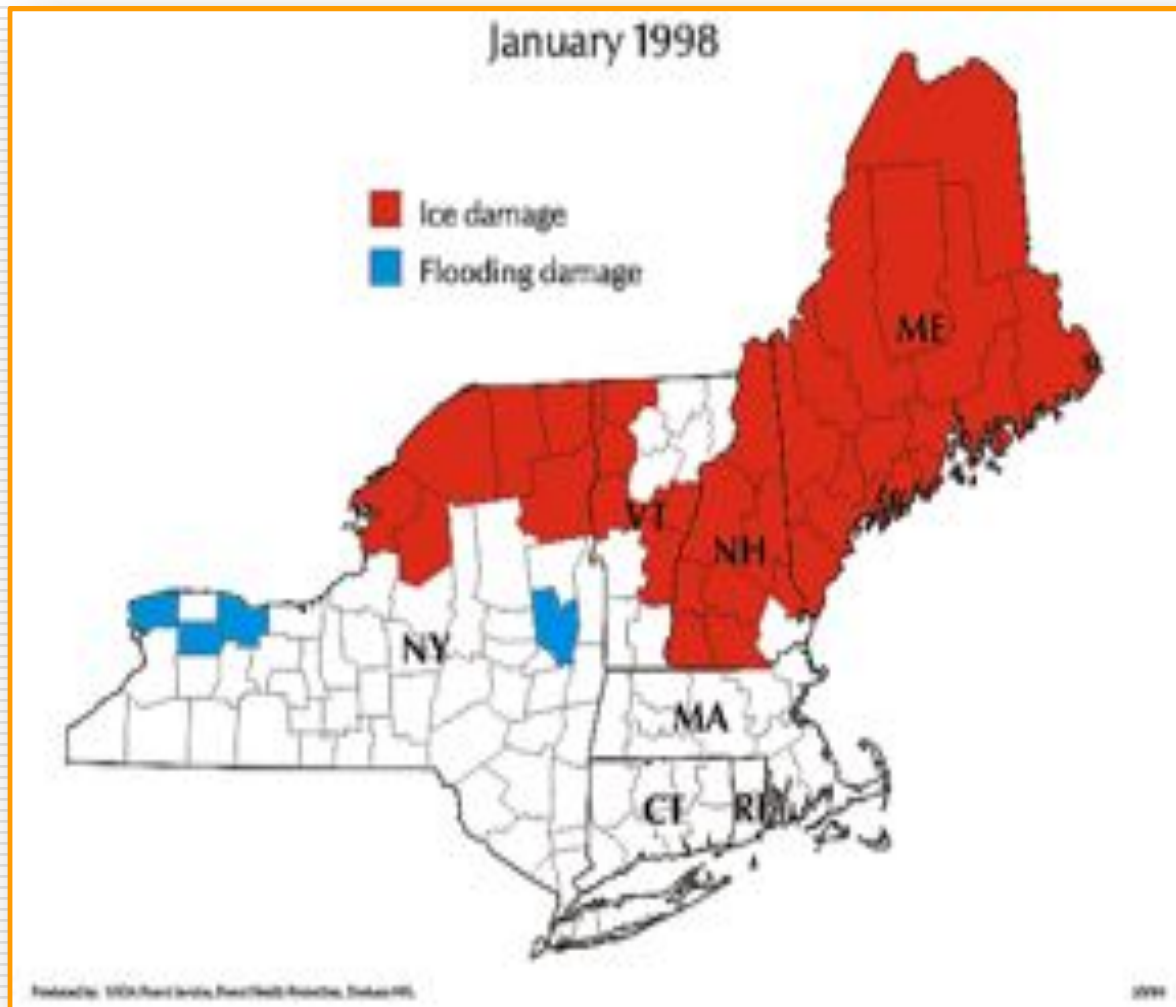
- 700,000 customers Lost Electricity
- Nearly 13% of New England lost power
- Boston's greatest April 24-hr snowfall





1998 Northeast Ice Storm Storm

FEMA Disaster Aid





Tree Damage



Transmission tower outside Montreal

Urban Core Impacts



Downtown
Montréal

Landscape Scale Damage



Central Vermont - January 1998

Historical Tracks of US Hurricanes



Isabel 2003: "A Storm of Trees"



COPING WITH ISABEL: WHAT YOU NEED TO KNOW

13 PAGES OF SPECIAL COVERAGE INSIDE ■ TIPS, CLOSINGS AND INFORMATION ON HOW AND WHERE TO GET HELP/PAGES A20-A21

SATURDAY
September 20, 2003
64 cents
1304 VIA N. 334

The Virginian-Pilot

SERVING HAMPTON, ROADS AND NORTHEASTERN NORTH CAROLINA



More news and content on high
speedway 80, 88

- 1.8 million Dominion customers lost power
- Northern end of Hatteras Village decimated
- At least 17 in four states reported dead



Robert E. Jones, 10, looks up at the sky after the storm. He was in the car when the storm hit. He was not hurt.

SWEPT AWAY



A 10-foot breakaway in all that Hatteras Island left of the Sea Ball Motel in Hatteras Village in the Outer Banks, which were hit by high winds and high waves as the storm made landfall nearby.

THE OUTAGES

"Catastrophic" damage done to power grid, officials say

BY TERRY RYAN
Hatteras Island, N.C. — Hurricane Isabel, which hit the Outer Banks of North Carolina on Saturday, caused catastrophic damage to the power grid, officials say. The storm, which hit the Outer Banks of North Carolina on Saturday, caused catastrophic damage to the power grid, officials say. The storm, which hit the Outer Banks of North Carolina on Saturday, caused catastrophic damage to the power grid, officials say.



Marine's company says it's not clear if the power lines on South Beach Island were hit by the storm.

AFTERMATH Q&A

From downed lines to water, problems Isabel left behind

Q. How will the power come back on?
A. Some people have their own generators, but the power will be restored by the Dominion Energy company. The company says it will be able to restore power to most of the area by Sunday. The company says it will be able to restore power to most of the area by Sunday. The company says it will be able to restore power to most of the area by Sunday.

THE OUTER BANKS

Hatteras Village isolated after hurricane cuts island in half

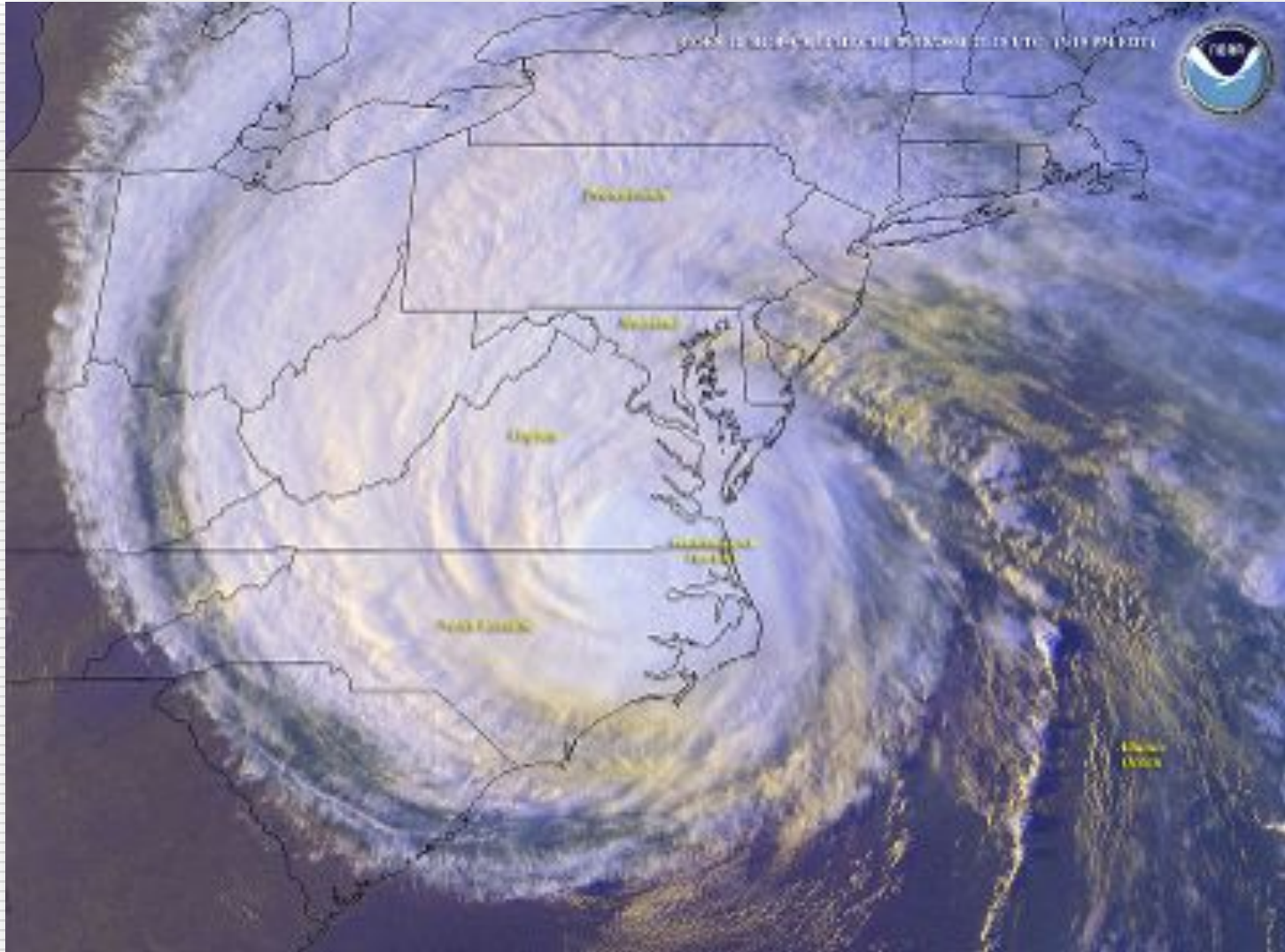
BY TERRY RYAN
Hatteras Island, N.C. — Hatteras Village, N.C., was isolated from the rest of the island after Hurricane Isabel hit the Outer Banks of North Carolina on Saturday. The storm, which hit the Outer Banks of North Carolina on Saturday, caused catastrophic damage to the power grid, officials say. The storm, which hit the Outer Banks of North Carolina on Saturday, caused catastrophic damage to the power grid, officials say.



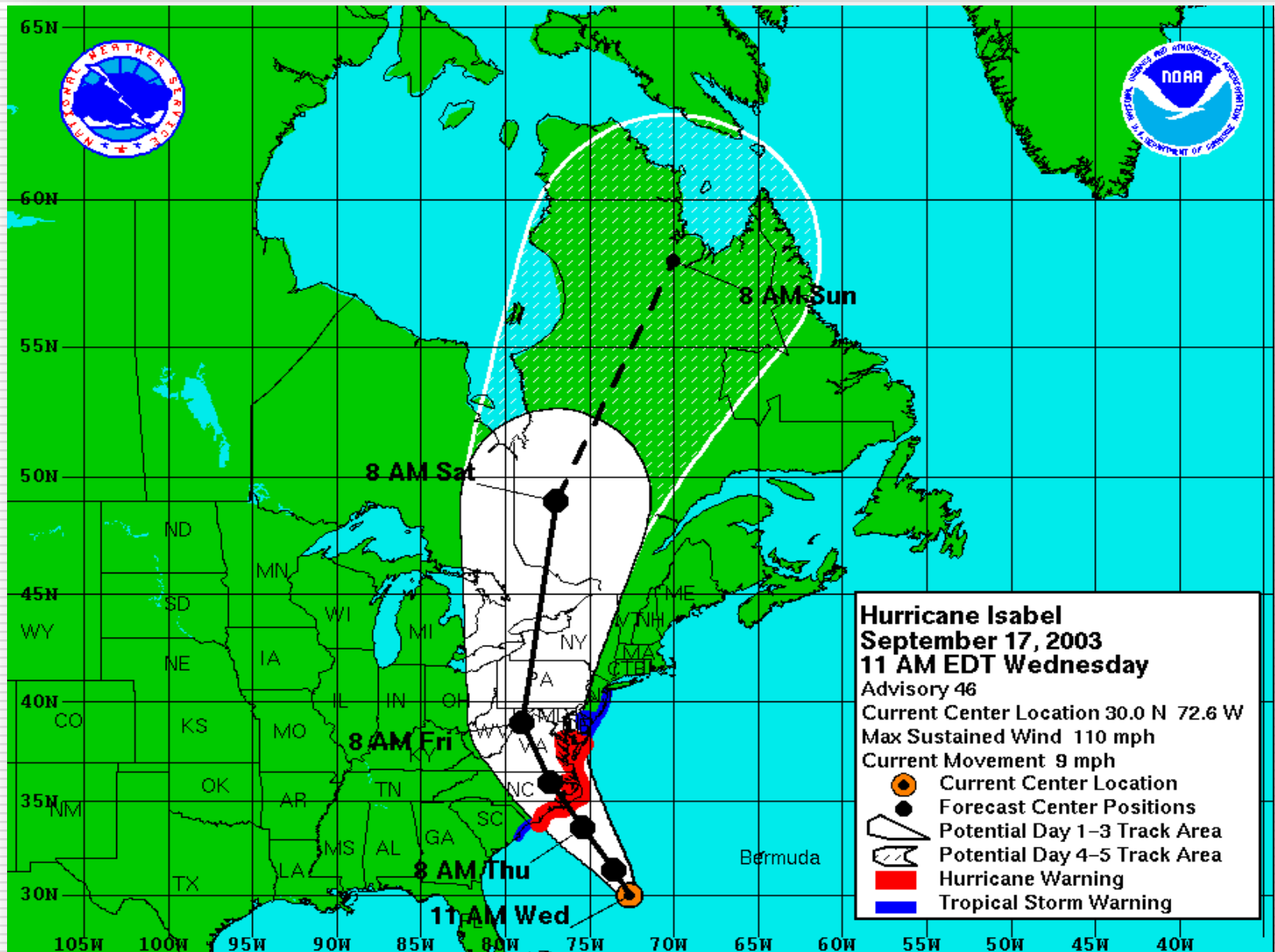
Map showing the location of Hatteras Island and the Outer Banks.

IF YOU'VE BEEN HIT BY ISABEL, PLEASE CALL 1-800-451-1234 FOR MORE INFORMATION. IF YOU'VE BEEN HIT BY ISABEL, PLEASE CALL 1-800-451-1234 FOR MORE INFORMATION. IF YOU'VE BEEN HIT BY ISABEL, PLEASE CALL 1-800-451-1234 FOR MORE INFORMATION.

Isabel 2003: “A Storm of Trees”



Isabel 2003: "A Storm of Trees"



Isabel 2003: “A Storm of Trees”



- Affected Maryland and Washington, DC
- \$945 million (2003 USD, (\$1.13 billion 2011 USD)
- Highest Sustained Winds 60 MpH
- Over 2 million households/businesses lost power

Isabel 2003: “A Storm of Trees”



Isabel “wreaked havoc on the forest of urban and suburban trees... Many of them are so big that, when blown over by tropical storm-force winds, they’re likely to find a power line that was once thought safely distant.”

**- Pat Michaels
Virginia State
Climatologist**

Katrina: Beyond the Trees



Katrina: Beyond the Trees

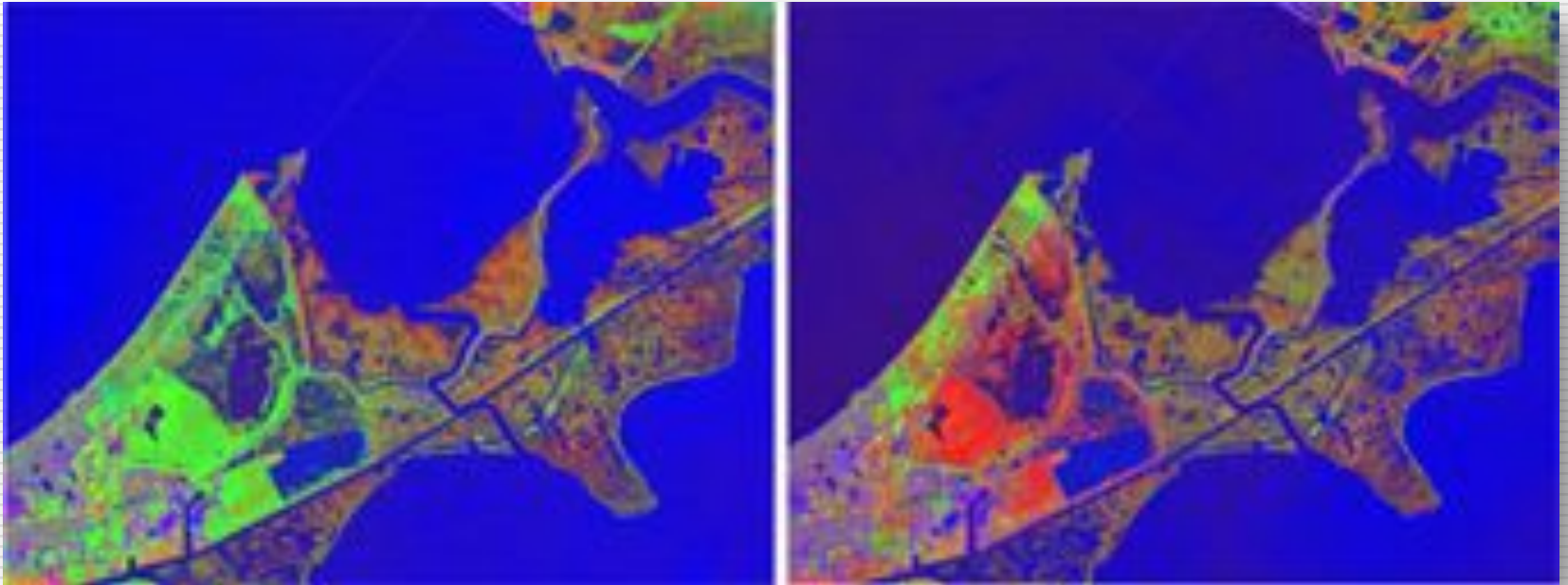


- \$81 Billion in damage
- 1,836 fatalities
- 80% New Orleans submerged
- 3 million without electricity
- 90,000 sq miles declared disaster

Katrina: Beyond the Trees



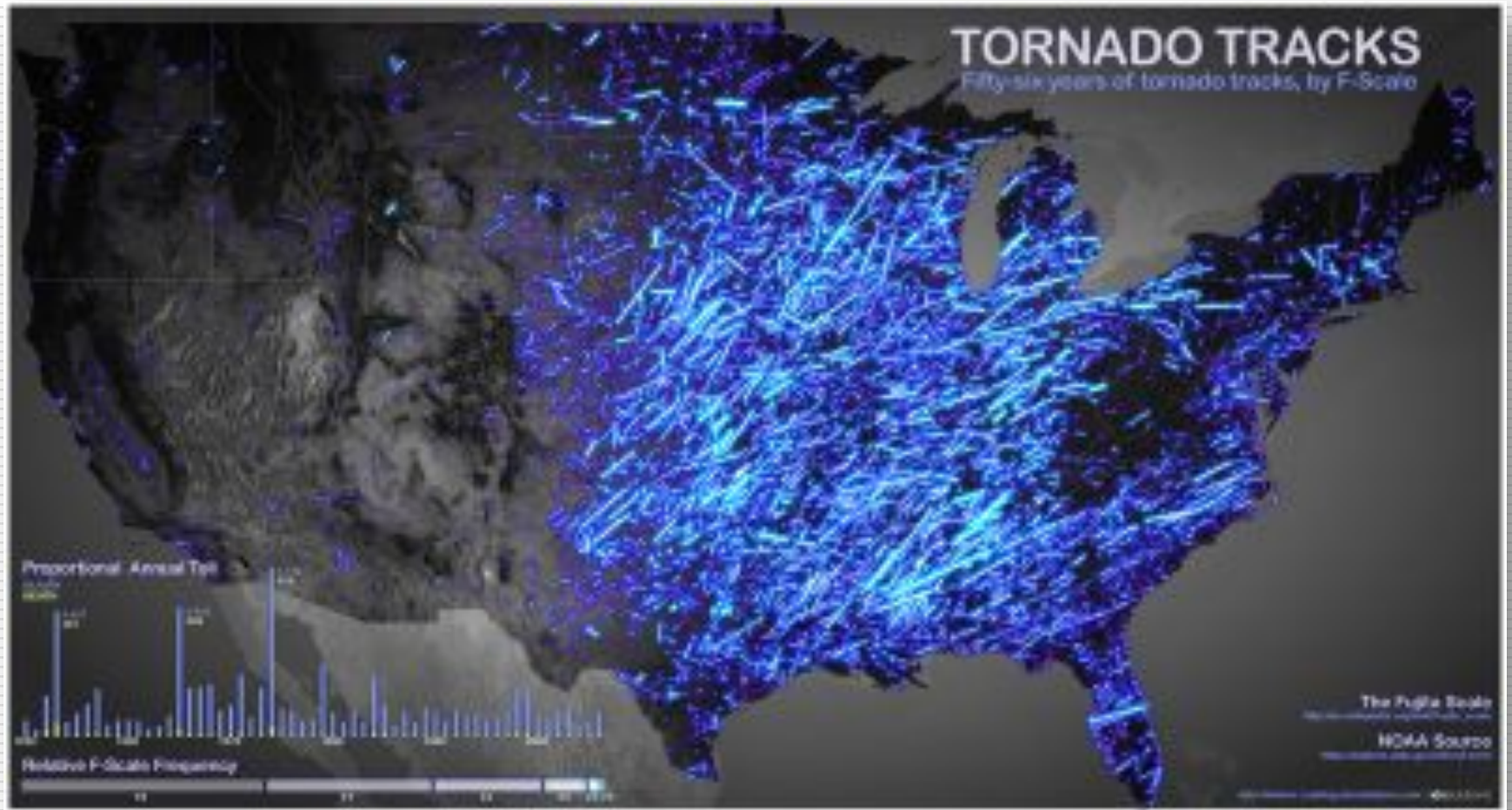
Katrina: Tree Loss



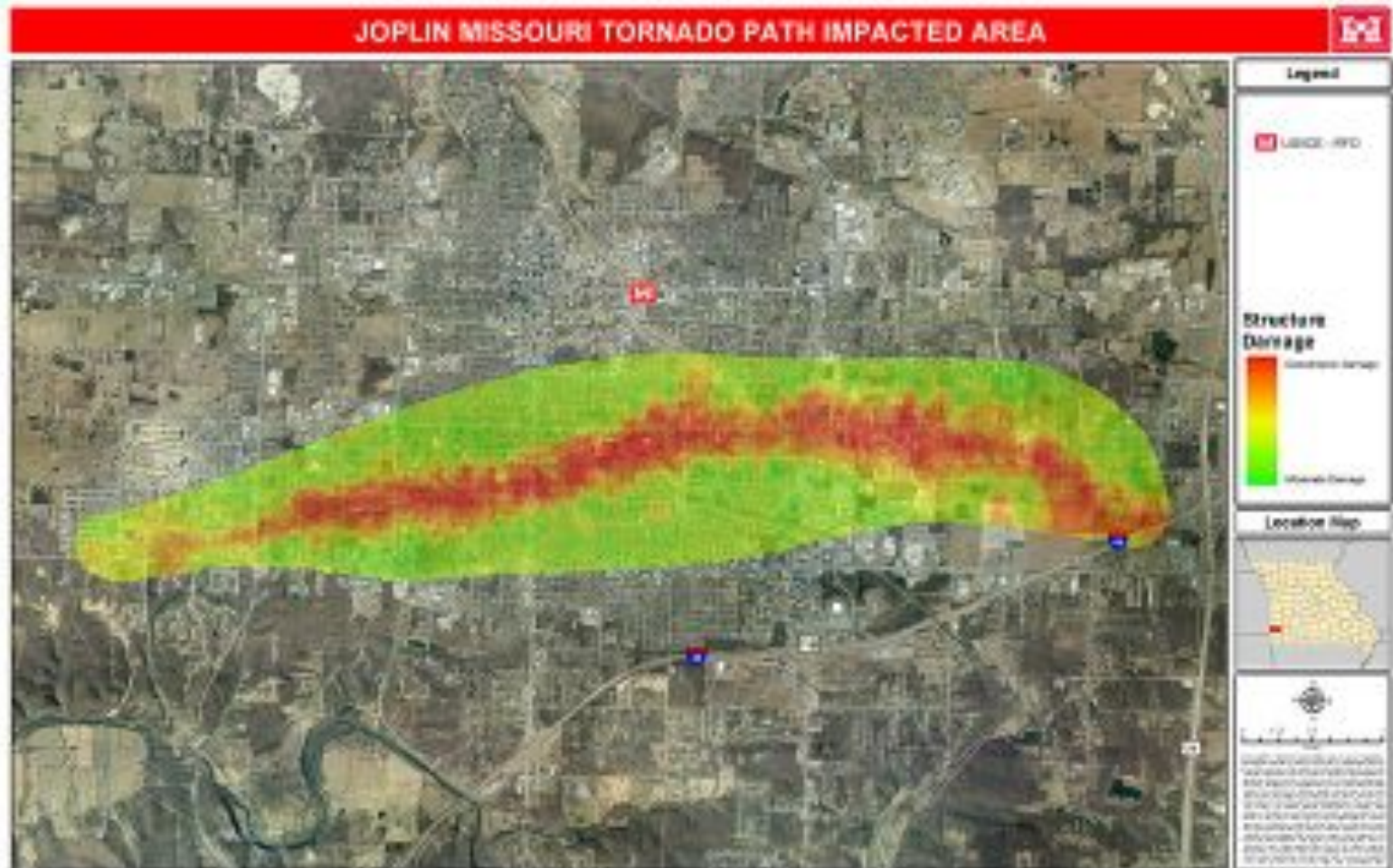
http://www.nasa.gov/mission_pages/hurricanes/archives/2007/katrina_carbon.html

- 5 million acres affected
- 320 million trees lost

Tornado Tracks 1950-2012

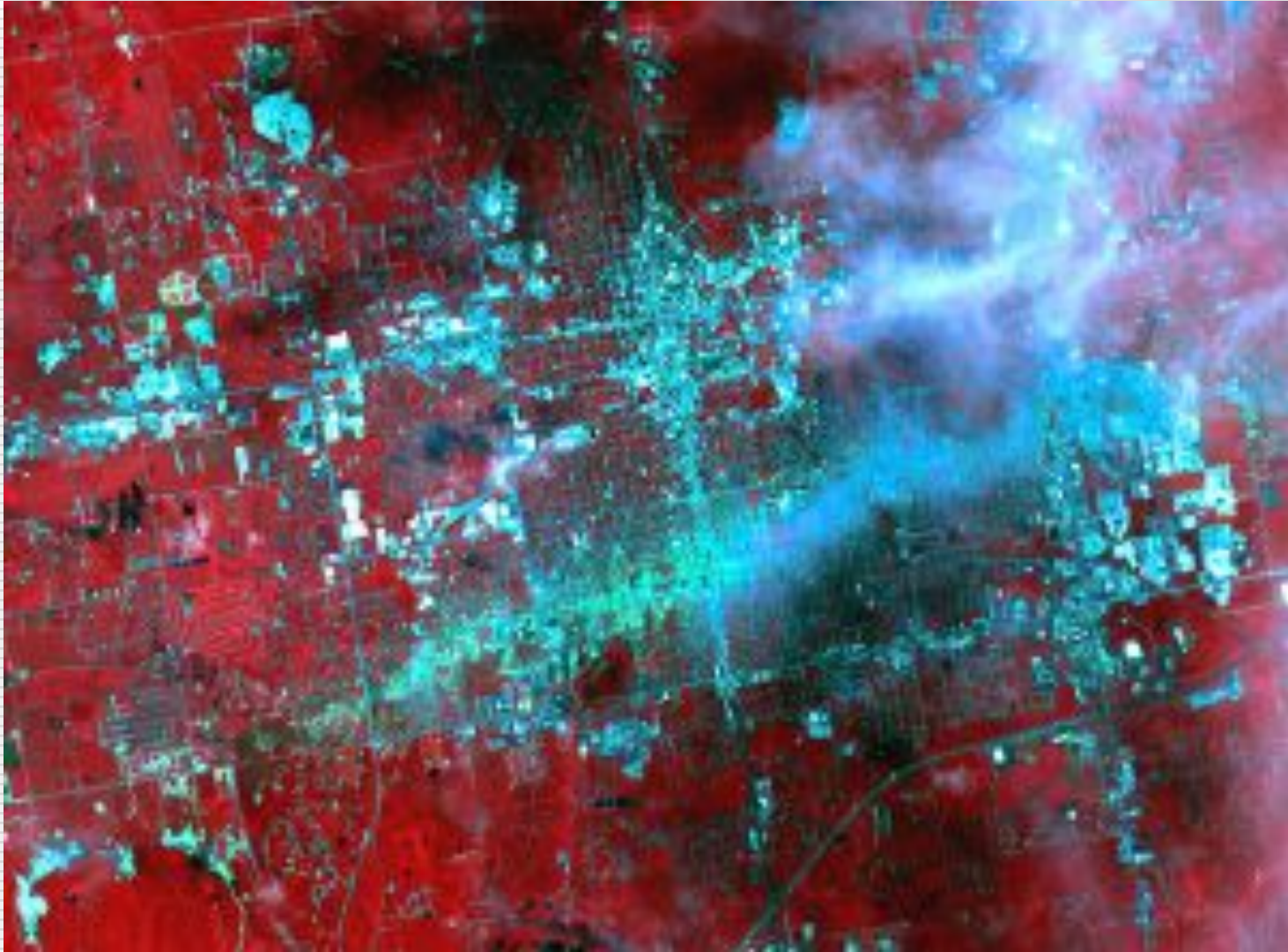


Joplin, MO Tornado Disaster May 22, 2011



Joplin, MO Tornado Disaster

May 22, 2011



Joplin, MO Tornado Disaster


May 22, 2011




Western/Central Massachusetts

June 1, 2011 Tornado




 My Location
Springfield, MA





 Tornado Watch

Expires: 06/02/2011 12:00 AM
Ma . Massachusetts
Counties Included Are

Essex
Hampden
Middlesex
Suffolk

Franklin
Hampshire
Norfolk
Worcester

86°F 

Western/Central Massachusetts June 1, 2011 Tornado



4:30 p.m.

Possible tornado touchdown in Shaker Road area.

6:07 p.m.

Electric company reported to police a tornado on the ground in southwest portion of Westfield.

4:32 p.m.

Amateur radio operator reported tornado on the ground one-half mile from Main Street. Widespread damage.

6:20 p.m.

State Police report tornado in north Springfield area.

5:22 p.m.

State Police report tornado on the ground in Sturbridge on Interstate 84 exit. Cars overturned.

7:25 p.m.

Amateur radio report of a tornado touchdown in Sturbridge at Route 49A.

NOTE: Preliminary information from NOAA as of 10:30 p.m. yesterday.

SOURCES: National Oceanic and Atmospheric Administration ; ESRI; TeleAtlas

PATRICK GARVIN/GLOBE STAFF

Western/Central Massachusetts June 1, 2011 Tornado



Western/Central Massachusetts June 1, 2011 Tornado



Western/Central Massachusetts June 1, 2011 Tornado



'Snowtober Surprise – October 2011



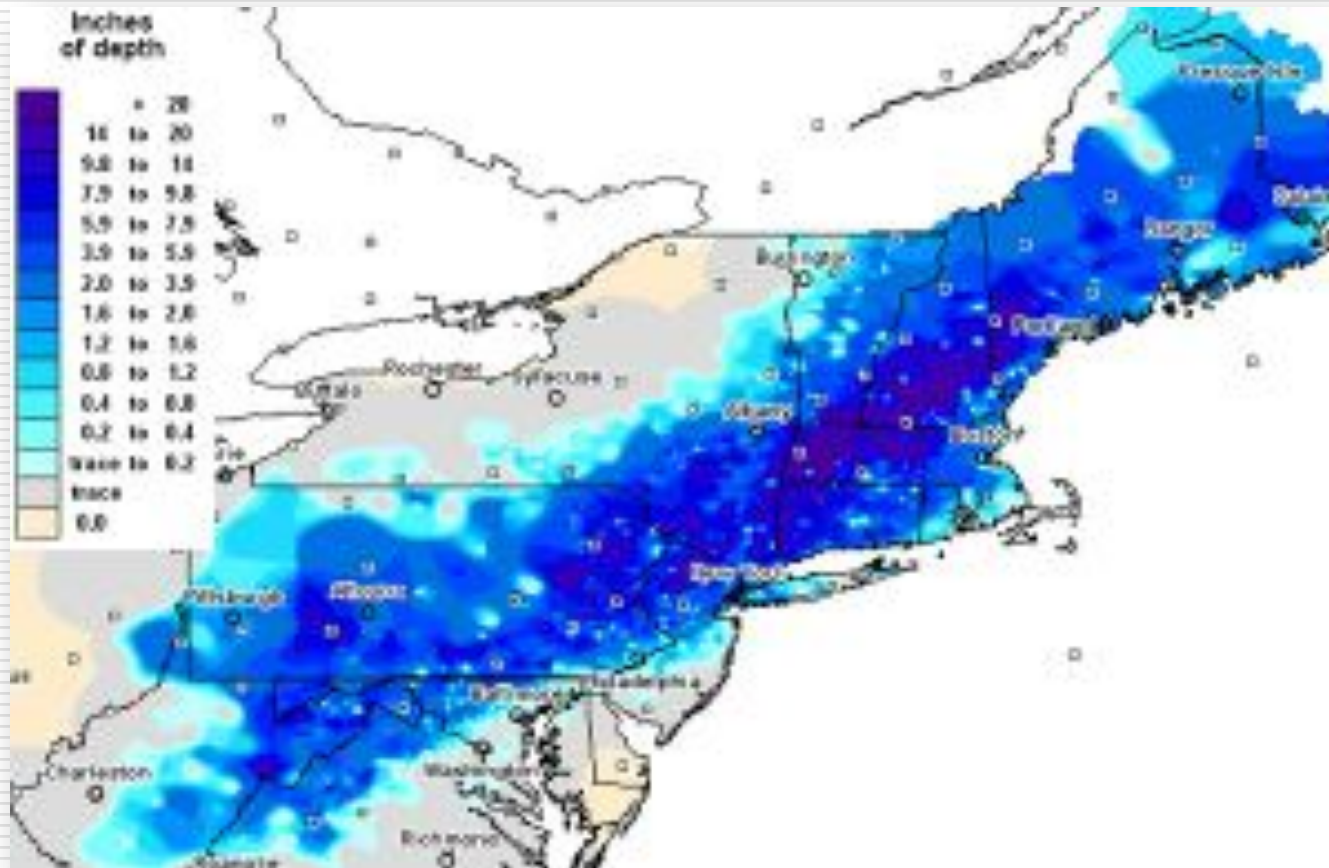
'Snowtober Surprise' – October 2011



'Snowtober Surprise' – October 2011



'Snowtober Surprise – October 2011



'Snowtober Surprise – October 2011



'Hurricane Sandy – October 2012



'Hurricane Sandy – October 2012



'Hurricane Sandy – October 2012

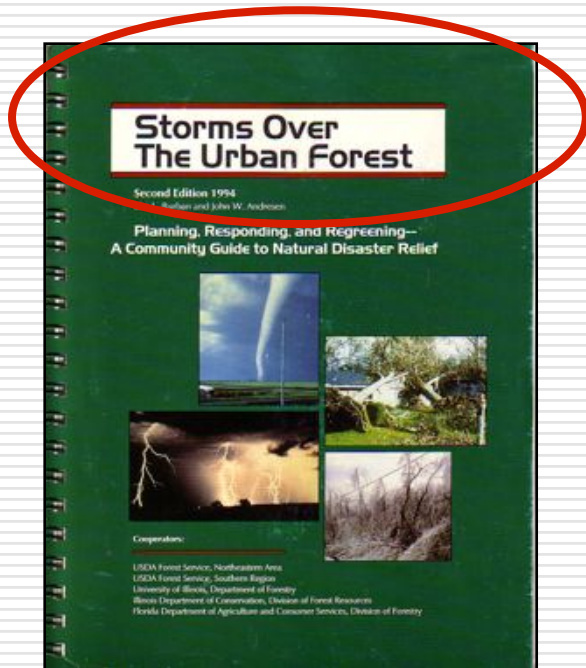


On the ground response and action



On the ground response and action





Tree Emergency Plan Worksheet

For Urban and Community Foresters, Community Leaders, Public Works and Parks Departments, Planners, Councils, and other Public Officials

1. Early Warning System/Weather Forecasting Service — Use an early warning procedure to enhance education, communication with the National Weather Service, a community meteorological firm, a volunteer volunteer weather observer, or the local police department. Make a procedure in place, you should have at least three hours of lead time before most non-sampling weather events.

Staff Lead: _____

Contact Name: _____
 Address: _____
 Phone: _____
 Mobile: _____
 FAX: _____
 Email: _____ Job: _____

Description of services provided: _____

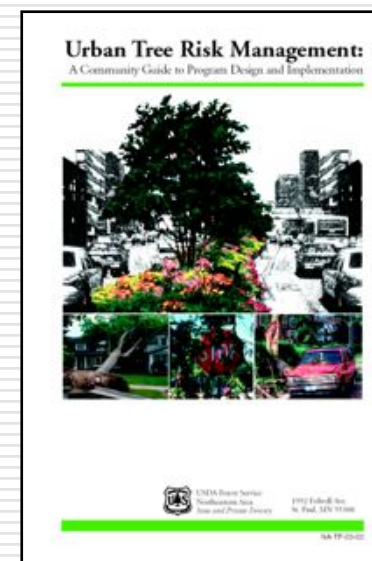
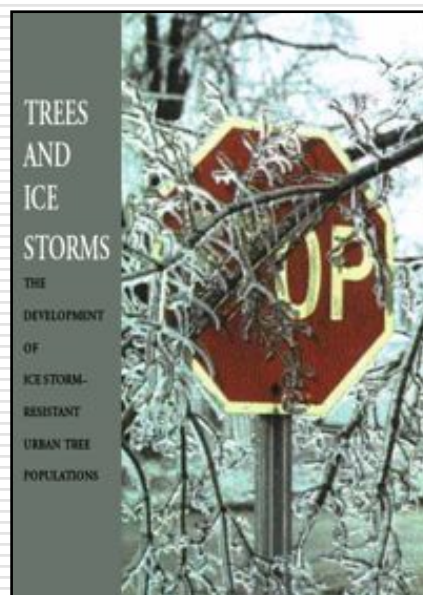
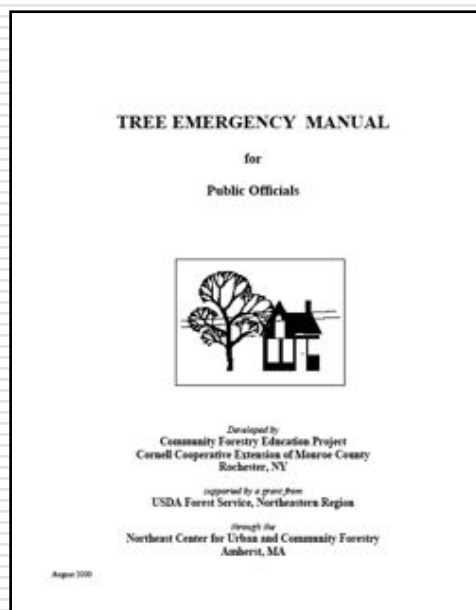
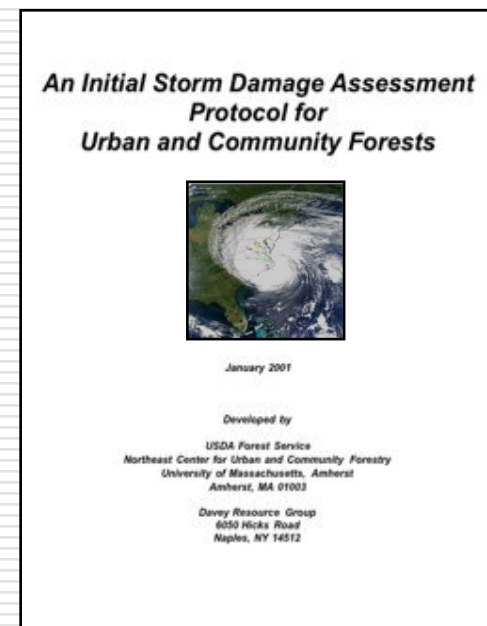
2. Local Emergency Manager — Local contact for a community and responsible for emergency planning and response activities.

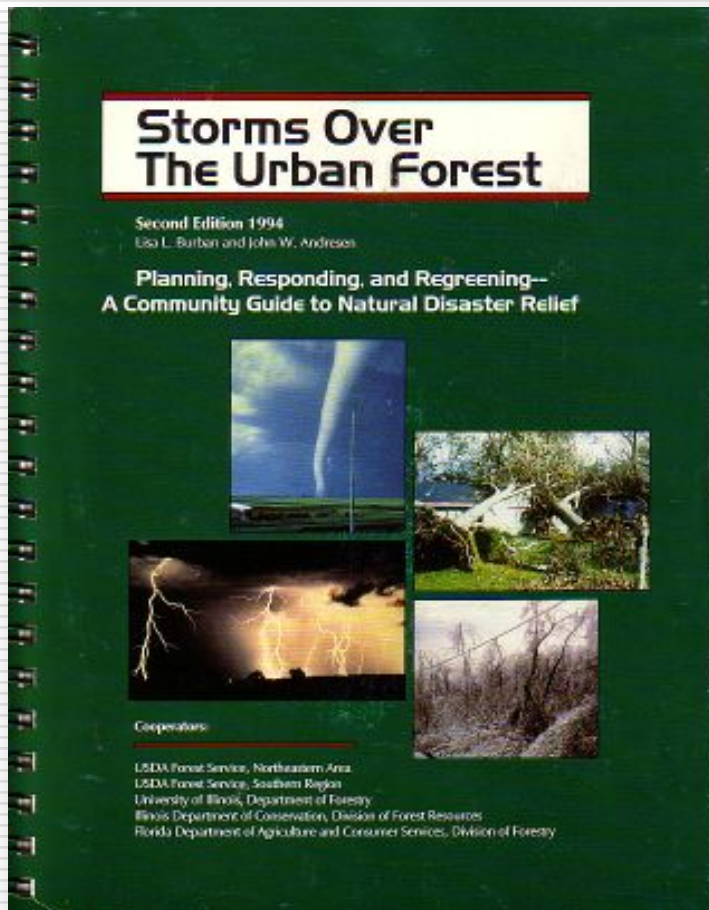
Name: _____ Phone: _____
 Gender: _____ Mobile: _____

3. Public Relations Coordinator — This is the individual responsible for primary public relations, media contacts, crisis information and communications about the natural disaster. (Must have full knowledge of damage, community issues and capabilities, and be able to make decisions).

Name: _____ Phone: _____
 Gender: _____ Mobile: _____

Alternate(s):
 Name: _____ Phone: _____
 Gender: _____ Mobile: _____
 Name: _____ Phone: _____
 Gender: _____ Mobile: _____





Chapter 1 Introduction

Chapter 2 Coping with Natural Disasters

Chapter 3 Preparing for Natural Disasters

Chapter 4 Natural Disaster Alert, Response and Recovery

Chapter 5 Regreening the Community

Chapter 6 Approaches to Working With Disaster Relief Organizations

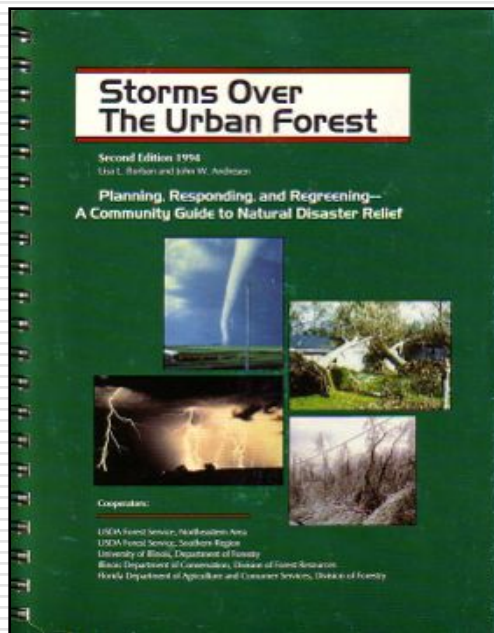
Chapter 7 Tornado Releaf - A Case Study

Chapter 8 Notes from Hurricane Andrew

Chapter 10 References

Chapter 11 Appendix - Key Words

<http://www.na.fs.fed.us/urban>



Tree Emergency Plan Worksheet
For Urban and Community Foresters, Community Leaders, Public Works and Parks Departments, Planners, Councils, and other Public Officials

1. Early Warning System/Weather Forecasting Service — See an early warning procedure to enhance information, communicate with the National Weather Service, a local emergency plan, a volunteer observer weather station, or the local police department. A plan should be in place which alerts three hours of lead time before an emergency weather event.

Staff Lead: _____

Contact Name: _____
Address: _____
Phone: _____
Mobile: _____
FAX: _____
Email: _____ Job: _____

Description of services provided: _____

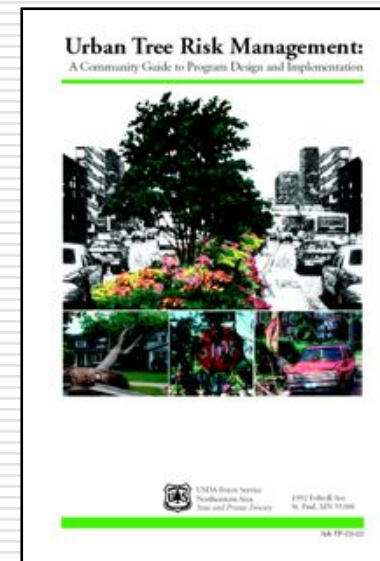
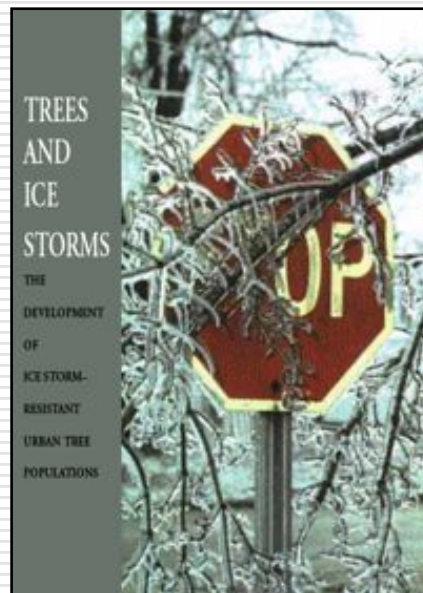
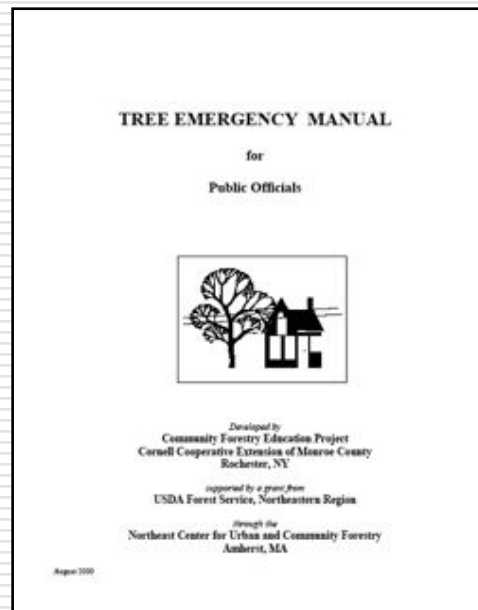
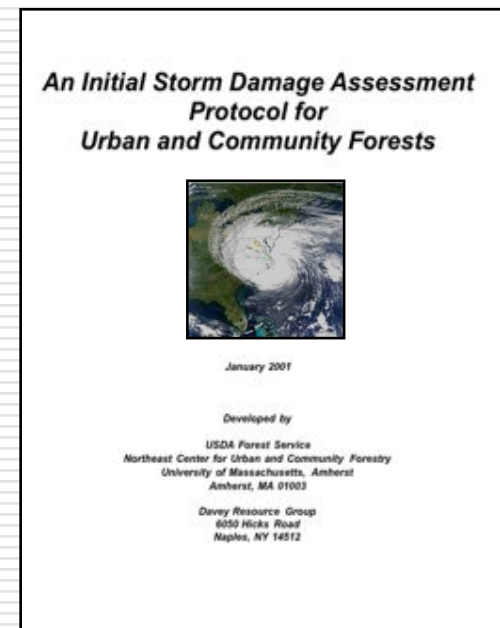
2. Local Emergency Manager — Local contact for a community and responsible for emergency planning and response activities.

Name: _____ Phone: _____
Email: _____ Mobile: _____

3. Public Relations Coordinator — This is the individual responsible for primary public relations, media contacts, crisis information and communications about the natural disaster. (Must have full knowledge of damage, community issues and capabilities, and be able to make decisions).

Name: _____ Phone: _____
Email: _____ Mobile: _____

Alternate(s):
Name: _____ Phone: _____
Name: _____ Mobile: _____
Name: _____ Phone: _____
Name: _____ Mobile: _____



Tree Emergency Plan Worksheet

For: Urban and Community Foresters, Community Leaders, Public Works and Parks
Departments, Planners, Councils, and other Public Officials

1. Early Warning System/Weather Forecasting Service — Use an early warning procedure to enhance mitigation: communicate with the National Weather Service, a consulting meteorological firm, a designated television weather channel, or the local police department. With a procedure in place, you should have at least three hours of lead time before most tree-damaging weather strikes.

Staff Lead: _____

Contact Name: _____

Address: _____

Phone: _____

Mobile: _____

FAX: _____

Email: _____ Web Site: _____

Description of services provided:

2. Local Emergency Manager — Lead contact for a community and responsible for emergency planning and response activities.

Name: _____ Phone: _____

Mobile: _____

Role(s): _____

3. Public Relations Coordinator — This is the individual responsible for primary public relations, media contacts, citizen information and communications about the natural disaster. (Must have full knowledge of damage, community issues and capabilities, and be able to make decisions.)

Name: _____ Phone: _____

Mobile: _____

Alternate(s):

Name: _____ Phone: _____

Mobile: _____

Name: _____ Phone: _____

Mobile: _____

Tree Emergency Plan Worksheet

1. Emergency Call Out Procedure — please contact your fire chief

Name: _____	WFO Contact: _____	Name: _____
		Phone: _____
		Mobile: _____
		Name: _____
		Phone: _____
		Mobile: _____
		Name: _____
		Phone: _____
		Mobile: _____
Name: _____	WFO Contact: _____	Name: _____
		Phone: _____
		Mobile: _____
		Name: _____
		Phone: _____
		Mobile: _____
		Name: _____
		Phone: _____
		Mobile: _____
Name: _____	WFO Contact: _____	Name: _____
		Phone: _____
		Mobile: _____
		Name: _____
		Phone: _____
		Mobile: _____
		Name: _____
		Phone: _____
		Mobile: _____

<http://www.na.fs.fed.us/urban>

11. Procedures for Debris Staging and Removal — Identify where you will stage and process debris. Consider a contract or agreement securing such site. Choose a processing site that is large, flat, well-drained and accessible from the collection truck weights of at least 30,000 per axle. Identify ways to protect adjacent trees or cultural resources during processing. Provide your include underground pipes, electrical, cemetery, foundations, agency facilities, etc. Large parking lots (as needed) to stage debris. Remember to consider noise implications near residential areas. Identify methods to store debris second-hand access and availability to those sites. Make sure the site is large enough for safety considerations (spring debris from job problems). If possible, identify sites nearest to existing parking.

Site 1 - Location: _____
Contact Name/Phone: _____
Phone: _____ Mobile: _____

Site 2 - Location: _____
Contact Name/Phone: _____
Phone: _____ Mobile: _____

Site 3 - Location: _____
Contact Name/Phone: _____
Phone: _____ Mobile: _____

12. Debris and Brush Removal from Private Property — Identify how you will address the issue. A major concern relates to ability to provide property owners to remove brush and debris. Make a decision if the municipal will provide for debris collection. Determine if your city has adequate equipment and staff available to accomplish the total collection task. It is critical that you provide guidelines to residents. Specify the types, amounts and pricing arrangements for the residents that you will accept. One can use local private contractors who must contract with private companies for pricing and removal by providing a list of companies that are bonded, professionally trained and insured.

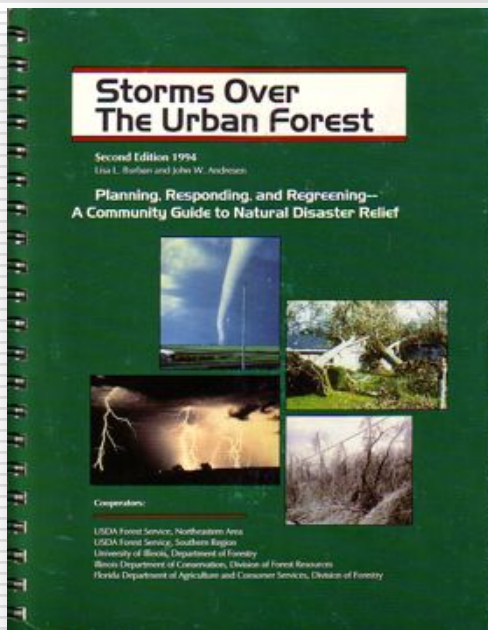
Private Responsibility: _____
Phone: _____ Mobile: _____

Municipal Policy: _____

Major Item Policy: _____

Letting available for sale completed.

<http://www.na.fs.fed.us/urban>



Tree Emergency Plan Worksheet

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Email: _____

Descriptions of services provided: _____

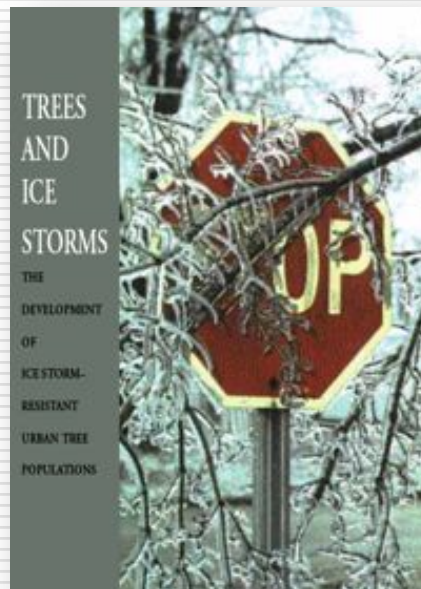
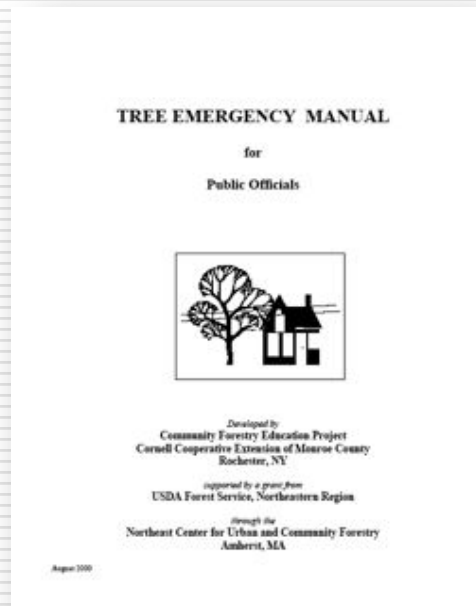
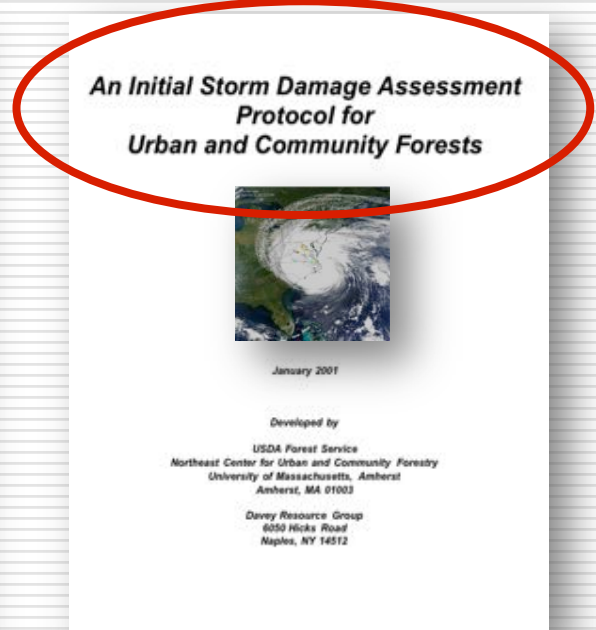
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Name: _____ Phone: _____
Mobile: _____

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Name: _____ Phone: _____
Mobile: _____

Alternate(s):
Name: _____ Phone: _____
Mobile: _____
Name: _____ Phone: _____
Mobile: _____



Estimating Storm Damage Costs



i-Tree

Storm

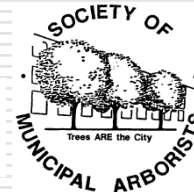
What is i-Tree?

A suite of tools to assess urban vegetation and their ecosystem services and values



Public-Private Partnership

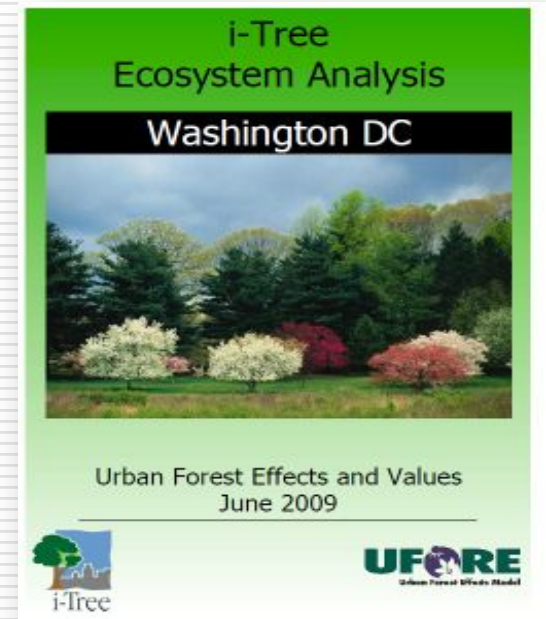
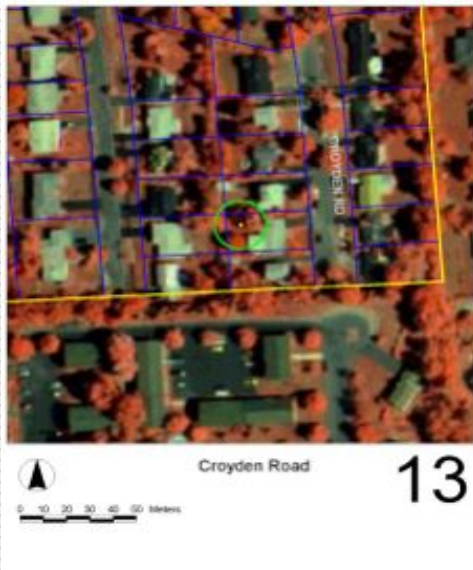
- 🌳 USDA Forest Service
- 🌳 Davey Tree Expert Co.
- 🌳 National Arbor Day Foundation
- 🌳 Society of Municipal Arborists
- 🌳 International Society of Arboriculture
- 🌳 Casey Trees



Goals



- ✿ Simple and low-cost tools and methods to aid in forest planning and management
- ✿ Complete process – start to finish



i-Tree Version 4.0

5 New or Enhanced Tools



i-Tree™

Hydro



i-Tree™

Vue



i-Tree™

Canopy



i-Tree™

Pest



i-Tree™

Design

How Does Storm Work?



- 🌳 Context of Use
- 🌳 Sampling
- 🌳 Data Collection
- 🌳 PDA & Desktop Features

Context of Use



🌳 Planning

- Framed by overall natural disaster plan
 - 🌳 FEMA funding: Pre-Disaster Mitigation Program
 - 🌳 Tree Emergency Plan Worksheet (Burban)

🌳 Recovery

- First 24-36 hours
- Response to state emergency agency



Pre-Storm Survey



Post-Storm Survey



Pre-Storm vs. Post-Storm Sampling and Estimating



Pre-Storm Survey



Post-Storm Survey



Pre-Storm vs.
Post-Storm
Sampling and
Estimating



Post-storm Simple Visual Estimate




Pre-storm Estimate

— (minus)

Visual Estimate

= Estimated Damage

An Initial Storm Damage Assessment Protocol for Urban and Community Forests




January 2001

Developed by

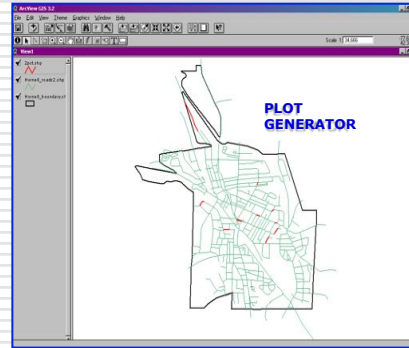
USDA Forest Service
 Northeast Office for Urban and Forestry
 University of Massachusetts
 Amherst, MA 01003

Storm Assessment Group
 600 North Main
 Haverhill, MA 01830



i-Tree

Storm



Random Plots

Page 34

PRE-Storm Field Data Collection Sheet (Updated Areas)

Community Name: _____									
City Street: _____					Post Number: _____				
PCN4 Street: _____					TS Street: _____				
Notes: _____					Field Length (Feet): _____				
PCN Value (Feet): _____					Collectivity: _____				

Complete this section only if the plot is more than one plot observation

Start of plot observation: _____									
End of plot observation: _____									

City Right-of-Way Street (Start of Street to North edge of the street)							PCN x 60° Street			
Dist. (Feet)	Dist. (Feet)	Dist. (Feet)	Dist. (Feet)	Dist. (Feet)	Dist. (Feet)	Dist. (Feet)	Dist. (Feet)	Dist. (Feet)	Dist. (Feet)	Dist. (Feet)
0-12	13-24	25-36	37-48	49-60	61-72	73-84	85-96	97-108	109-120	121-132
8-12		8.2		12.0		8-12				
13-18		8.1		1.0		13-18				
19-24		7.7		1.5		19-24				
25-30		16.2		2.0		25-30				
31-36		12.8		0.0		31-36				
37-42		28.4		40.0		37-42				
43-48		18.0		0.0		43-48				
49-54										

Distances are in pairs that add up to 60 feet. Distances are in the right of way.
Distances are not a study made. Distances are based on estimates to nearest column.
**Data is recorded, does not include any removal (see Protocol).*
**Data is being kept in order to remove a disturbance in subsequent disturbance studies. (Notes: note any disturbance)*

Pre-Storm Sample Survey

Community	Report Date: 5/1/2010																																																																			
Notes: number on log page given and a storm damage Estimate Template was entered in 2008 by the USGS Forest Service and County Revenue Dept. Using post-storm tree observations and a redwood plot																																																																				
Estimate components																																																																				
ESTIMATED COST OF TREE DAMAGE	\$0																																																																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left;">COMMUNITY VALUES</th> </tr> <tr> <td style="width: 80%;"> 1 Great tree damaged or critical, uncommon inventory </td> <td style="width: 20%; text-align: right;"> 1 0 0 </td> </tr> <tr> <td> 1 Small Medium Pruning Catches Pruning Catches at </td> <td style="text-align: right;"> 0 0 0 </td> </tr> </table>		COMMUNITY VALUES		1 Great tree damaged or critical, uncommon inventory	1 0 0	1 Small Medium Pruning Catches Pruning Catches at	0 0 0																																																													
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1 Small Medium Pruning Catches Pruning Catches at	0 0 0																																																																			
DETAILED POST-STORM CALCULATION 1: Removals and Hazard Pruning																																																																				
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th rowspan="2">DDB Class (check)</th> <th colspan="2">On Flight of Work Times</th> <th colspan="2">Tree Pruning</th> <th rowspan="2">Plot Info</th> </tr> <tr> <th>Total of Damaged Trees</th> <th>Removal Time (hours)</th> <th>Total Removal Time (hours)</th> <th>Total Removal Time (hours)</th> </tr> <tr> <td>1-10</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td rowspan="10"> Plot Info Method Air Photo Metric in Flight </td> </tr> <tr> <td>11-20</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>21-30</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>31-40</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>41-50</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>51-60</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>61-70</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>71-80</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>81-90</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>91-100</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Totals</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td style="text-align: right;">\$0.00</td> </tr> </table>		DDB Class (check)	On Flight of Work Times		Tree Pruning		Plot Info	Total of Damaged Trees	Removal Time (hours)	Total Removal Time (hours)	Total Removal Time (hours)	1-10	0	0	0	0	Plot Info Method Air Photo Metric in Flight	11-20	0	0	0	0	21-30	0	0	0	0	31-40	0	0	0	0	41-50	0	0	0	0	51-60	0	0	0	0	61-70	0	0	0	0	71-80	0	0	0	0	81-90	0	0	0	0	91-100	0	0	0	0	Totals	0	0	0	0	\$0.00
DDB Class (check)	On Flight of Work Times		Tree Pruning		Plot Info																																																															
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41-50	0	0	0	0																																																																
51-60	0	0	0	0																																																																
61-70	0	0	0	0																																																																
71-80	0	0	0	0																																																																
81-90	0	0	0	0																																																																
91-100	0	0	0	0																																																																
Totals	0	0	0	0	\$0.00																																																															

Estimating Engine

Form SA
POST Storm Field Data Collection Sheet (Populated Areas)

Community Name: _____									
OH Street: _____						Plot Number: _____			
FIDUC Street: _____						TO Street: _____			
Date: _____						Plot Length (ft/in): _____			
ROW Width (ft): _____						Collected by: _____			
Start of plot description: _____									
End of plot description: _____									

ROW Trees ONLY							ROW + SF Trees		
Tree Removals					Tree Pruning		Dates/Estimates*		
DATE	TYPE	TRUNK DBH (in)	TRUNK HEIGHT (ft)	TRUNK DIRECTION (N, S, E, W)	TRUNK CONDITION (1-5)	TRUNK REMARKS	DATE	TYPE	ESTIMATE
6-12	12	3.2			0.75				0.500
10-18	12	4.2			1.0				171.200
10-24	12	7.7			1.5				291.000
20-08	10	10.2			2.0				351.400
21-06	12	12.5			2.0				401.000
27-02	12	20.6			4.0				521.800
10-12	12	20.8			4.0				601.700
									711.000
*Approximate values entered during survey, per the data collection protocol. Data at left is always first and last but not necessarily right.							Date† Total (L)		
†Circle in RED on map to circle trees to be removed. †Circle in GREEN on map to circle trees to be pruned. †Circle in BLUE on map to circle trees to be removed and replaced.							Average Total (C)		
*Average = Total ÷ number of data measurements									

Post-Storm Survey

Community		Report Date		5/24/2017																																																																											
<p>Notes: numbers on this page were generated by a "Storm Damage Estimator" template as written in 2006 by the USDA Forest Service and Clearing Resources Inc. using ground truth observations of random plots</p>																																																																															
ESTIMATED COST OF TREE DAMAGE		00		<p>Estimate components</p> <table border="1"> <tr><td>Storm Mow Salvage</td><td>0.0</td></tr> <tr><td>Removals</td><td>0.0</td></tr> <tr><td>Total Removals</td><td>0.0</td></tr> <tr><td>Total Removals</td><td>\$0</td></tr> <tr><td>Hazard Prune</td><td>0.0</td></tr> <tr><td>Total Pruning</td><td>0.0</td></tr> <tr><td>Total Pruning Cost</td><td>\$0</td></tr> <tr><td>Total Campfire</td><td>0.0</td></tr> <tr><td>Total Prune to go</td><td>0.0</td></tr> <tr><td>Total Death Cost</td><td>0.0</td></tr> <tr><td>Line Costs</td><td>0.0</td></tr> </table>		Storm Mow Salvage	0.0	Removals	0.0	Total Removals	0.0	Total Removals	\$0	Hazard Prune	0.0	Total Pruning	0.0	Total Pruning Cost	\$0	Total Campfire	0.0	Total Prune to go	0.0	Total Death Cost	0.0	Line Costs	0.0																																																				
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<p>Tree Height of Wag Trees</p> <table border="1"> <tr> <th rowspan="2">DBH Class (inches)</th> <th colspan="2">Tree Diameter</th> <th rowspan="2">Total Number</th> <th rowspan="2">Total Number</th> <th colspan="2">Tree Pruning</th> </tr> <tr> <th>Removal</th> <th>Total</th> <th>Prune</th> <th>Removal</th> </tr> <tr> <td>4 to 10</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>10 to 16</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>16 to 20</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>20 to 24</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>24 to 30</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>30 to 36</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>36 to 42</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>SubTotal</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Total</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </table>						DBH Class (inches)	Tree Diameter		Total Number	Total Number	Tree Pruning		Removal	Total	Prune	Removal	4 to 10	0	0	0	0	0	0	10 to 16	0	0	0	0	0	0	16 to 20	0	0	0	0	0	0	20 to 24	0	0	0	0	0	0	24 to 30	0	0	0	0	0	0	30 to 36	0	0	0	0	0	0	36 to 42	0	0	0	0	0	0	SubTotal	0	0	0	0	0	0	Total	0	0	0	0	0	0
DBH Class (inches)	Tree Diameter		Total Number	Total Number	Tree Pruning																																																																										
	Removal	Total			Prune	Removal																																																																									
4 to 10	0	0	0	0	0	0																																																																									
10 to 16	0	0	0	0	0	0																																																																									
16 to 20	0	0	0	0	0	0																																																																									
20 to 24	0	0	0	0	0	0																																																																									
24 to 30	0	0	0	0	0	0																																																																									
30 to 36	0	0	0	0	0	0																																																																									
36 to 42	0	0	0	0	0	0																																																																									
SubTotal	0	0	0	0	0	0																																																																									
Total	0	0	0	0	0	0																																																																									
<p>Plot Info</p> <table border="1"> <tr><td>Altitude</td><td></td></tr> <tr><td>For Forest Office</td><td></td></tr> <tr><td>Plot ID</td><td>0.00</td></tr> </table>						Altitude		For Forest Office		Plot ID	0.00																																																																				
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Plot ID	0.00																																																																														

Final Damage Estimate

Components



Data Collection- Paper

Form 5A
POST-Storm Field Data Collection Sheet (Populated Areas)

Community Name: _____ Plot Number: _____

ON Street: _____ TO Street: _____

FROM Street: _____

Date: _____ Plot Length (Miles): _____

ROW Width (Feet): _____ Collected by: _____

Start of plot description: _____

End of plot description: _____

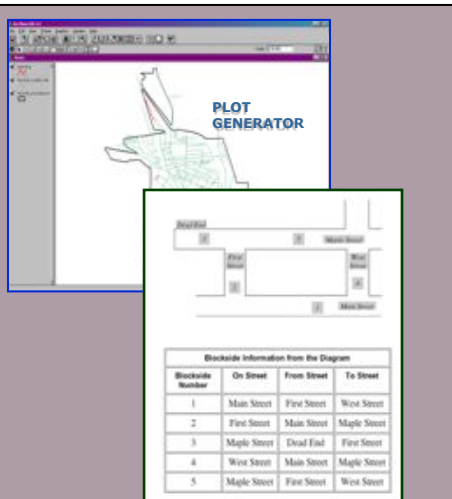
Tree Removals						Tree Pruning						ROW - 50' Trees*					
DBH Class	Number of Trees	Tree Species	Tree Size (inches)	Tree Age (years)	Tree Health (1-5)	DBH Class	Number of Trees	Tree Species	Tree Size (inches)	Tree Age (years)	Tree Health (1-5)	DBH Class	Number of Trees	Tree Species	Tree Size (inches)	Tree Age (years)	Tree Health (1-5)
6-10	3.2					0-25						0-100					
10-15	5.1					26-35						101-200					
15-24	7.7					36-45						201-300					
25-35	10.2					46-55						301-400					
36-45	12.5					56-65						401-500					
46-55	20.4					66-75						501-600					
56-65	28.0					76-85						601-700					
86-95						96-105						701-800					
Total												801-900					
Total C1												Total C2		Total C3			

*Average = Total - number of 100-foot segments x average.

Data Collection- PDA



Sampling Tools



Data Storage & Processing

DBH Class (Inches)	Total of Removal Trees	Removal Time per Tree	Total Hours for Removal	Total of Pruning Trees	Pruning Time per Tree	Total Hours for Pruning
6-10	0	3.2	0	0	0.75	0
10-15	0	5.1	0	0	1	0
15-24	0	7.7	0	0	1.5	0
25-35	0	10.2	0	0	2	0
36-45	0	12.5	0	0	3	0
46-55	0	20.4	0	0	4	0
56-65	0	28.0	0	0	5	0
All Pruned	0	6.2	0	0	2.5	0
Totals	0	0	0	0	0	0

Reporting

Community: _____ Report Date: 5/12/2005

Note: numbers on this page were generated by a "Storm Damage Estimate Template" as revised in 2004 by the USDA Forest Service and Davey Resource Group using your storm field observations of random plots

ESTIMATED COST OF TREE DAMAGE \$0

COMMUNITY VALUES

Check the numbers to the right, and correct if necessary

Street Miles	0
Removal Cost/Tree	\$0
Pruning Cost/Tree	\$0
Brush Cost/job	\$0

Estimate components

% Street Miles Sampled	0
Removals	0
Total Removal Hours	0.0
Total Removal Cost	\$0
Hazard Pruning	0
Total Pruning Hours	0.0
Total Pruning Cost	\$0
Total Canopy Loss	0
Total Brush on jobs	0.0
Total Brush Cost	\$0
Total Cost	\$0

DETAILED POST-STORM CALCULATION 1: Removals and Hazard Pruning

ON-Plot vs. Off-Plot Trees

DBH Class (Inches)	Tree Removal		Tree Pruning		Total Hours for Removal	Total Hours for Pruning
	Total of Removal Trees	Removal Time per Tree	Total of Pruning Trees	Pruning Time per Tree		
6 to 10	0	3.2	0	0.75	0	0
10-15	0	5.1	0	1	0	0
15-24	0	7.7	0	1.5	0	0
25-35	0	10.2	0	2	0	0
36-45	0	12.5	0	3	0	0
46-55	0	20.4	0	4	0	0
56-65	0	28.0	0	5	0	0
All Pruned	0	6.2	0	2.5	0	0
Totals	0	0	0	0	0	0

Plot Info

Mileage

Per Street Miles in Sample

0.00

Components



Form 5A
POST-Storm Field Data Collection Sheet (Populated Areas)

Community Name: _____ Plot Number: _____

ON Street: _____ TO Street: _____

FROM Street: _____ Plot Length (Miles): _____

Date: _____ Collected by: _____

ROW Width (Feet): _____

Start of plot description: _____

End of plot description: _____

Tree Removals										Tree Pruning										ROW - 50' Trees*									
DBH Class	Number of Trees	Species	DBH Class	Number of Trees	Species	DBH Class	Number of Trees	Species	DBH Class	Number of Trees	Species	DBH Class	Number of Trees	Species	DBH Class	Number of Trees	Species	DBH Class	Number of Trees	Species									
6-10	3.2																												
10-15	5.1																												
15-24	7.7																												
25-30	10.2																												
31-36	12.5																												
37-42	20.4																												
43+	20.0																												
Total	78.1																												

*Average = Total - number of 100-foot segments x number.



Data Collection- Paper

Data Collection- PDA

PLOT GENERATOR

Block Number	On Street	From Street	To Street
1	Main Street	First Street	West Street
2	First Street	Main Street	Maple Street
3	Maple Street	Dead End	First Street
4	West Street	Main Street	Maple Street
5	Maple Street	First Street	West Street

Sampling Tools

Data Storage & Processing

DBH Class (Inches)	Total of Removal Trees	Removal Time per Tree	Total Removal Time	Total Pruning Time	Total Pruning Cost	Total Removal Cost	Total Pruning Cost	Total Cost
6-10	0	3.2	0	0	0	0	0	0
10-15	0	5.1	0	0	0	0	0	0
15-24	0	7.7	0	0	0	0	0	0
25-30	0	10.2	0	0	0	0	0	0
31-36	0	12.5	0	0	0	0	0	0
37-42	0	20.4	0	0	0	0	0	0
43+	0	20.0	0	0	0	0	0	0
All Removal	0	6.2	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0

Reporting

Community: _____ Report Date: 5/12/2005

Note: numbers on this page were generated by a "Storm Damage Estimate Template" as revised in 2004 by the USDA Forest Service and Davy Resource Group using your storm field observations of random plots

Estimate components	
% Street Miles Sampled	0
Removals	0
Total Removal Hours	0.0
Total Removal Cost	\$0
Hazard Pruning	0
Total Pruning Hours	0.0
Total Pruning Cost	\$0
Total Canopy Loss	0
Total Brush on jobs	0.0
Total Brush Cost	\$0
Total Cost	\$0

COMMUNITY VALUES

Street Miles	0
Removal Cost/hr	0
Pruning Cost/hr	0
Brush Cost/job	0

DETAILED POST-STORM CALCULATION 1: Removals and Hazard Pruning

ON Street - 50' Trees						Tree Removal		Tree Pruning		Tree Pruning		Tree Pruning		Tree Pruning		Tree Pruning	
DBH Class (Inches)	Total of Removal Trees	Removal Time per Tree	Total Removal Time	Total Pruning Time	Total Pruning Cost	Total Removal Cost	Total Pruning Cost	Total Removal Cost	Total Pruning Cost	Total Removal Cost	Total Pruning Cost	Total Removal Cost	Total Pruning Cost	Total Removal Cost	Total Pruning Cost	Total Removal Cost	Total Pruning Cost
6-10	0	3.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-15	0	5.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-24	0	7.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-30	0	10.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-36	0	12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-42	0	20.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43+	0	20.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All Removal	0	6.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Plot Info

Plot: _____

Per Street Miles in Sample: _____



Sampling Methods

- 🌳 2-3% of blockside mileage
 - Blockside = street segment between road/street corners or ends
- 🌳 Manual Method or Computerized Process
 - Random selection
 - 10 blockside minimum needed for analysis

Sampling Methods



Manual Sampling Method



The Smarter Way



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http://www.geographynetwork.com/explorer/explorer.js?goTo=details&docId=(d993d94-1dd1-11b2-ad9e-c04b54bc66)6ha

Search

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TIGER/Line Files, Redistricting Census 2000



Content Citation:

Title of Content: [TIGER/Line Files, Redistricting Census 2000](#)

Type of Content: Downloadable Data

Content Publisher: U.S. Bureau of the Census

Publication Date: 2000-02-01

Content Description:

Content Summary: The Redistricting Census 2000 TIGER/Line files are an extract of selected geographic and cartographic information from the TIGER data base. The geographic coverage for a single TIGER/Line file is a county or statistical equivalent entity, with the coverage of the entire set of Redistricting Census 2000 TIGER/Line files including all counties and statistically equivalent entities in the United States and Puerto Rico. The Redistricting Census 2000 TIGER/Line files consist of line segments representing physical features and statistical boundaries.

Content Purpose: In order for others to use the information in the Census TIGER data base in a geographic information system (GIS) or for other geographic applications, the Census Bureau releases to the public extracts of the data base in the form of TIGER/Line files.

Content Themes: Administrative and political boundaries

Source of
TIGER/Line
data as
shape files

Geography Network - Download Census 2000 TIGER/Line Shapefiles - Netscape

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Mail AIM Radio Search Bookmarks GoogleSearch GoogleCom AT&T Univers... Agone - Ags... National Weat... NetExpress Te... Time Warner ...

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company information
news events careers about esri

support & solutions
support education & training industry applications partner solutions library

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ArcData

Download Census 2000 TIGER/Line® Shapefiles

You have selected the state of **New York**. If you would like to download one or more data layers for a single county in New York, then select a county from the list below. If you would like to download a single data layer for one or more counties in New York, then select a layer below.

Select by County OR Select by Layer

Steuben Select a Layer

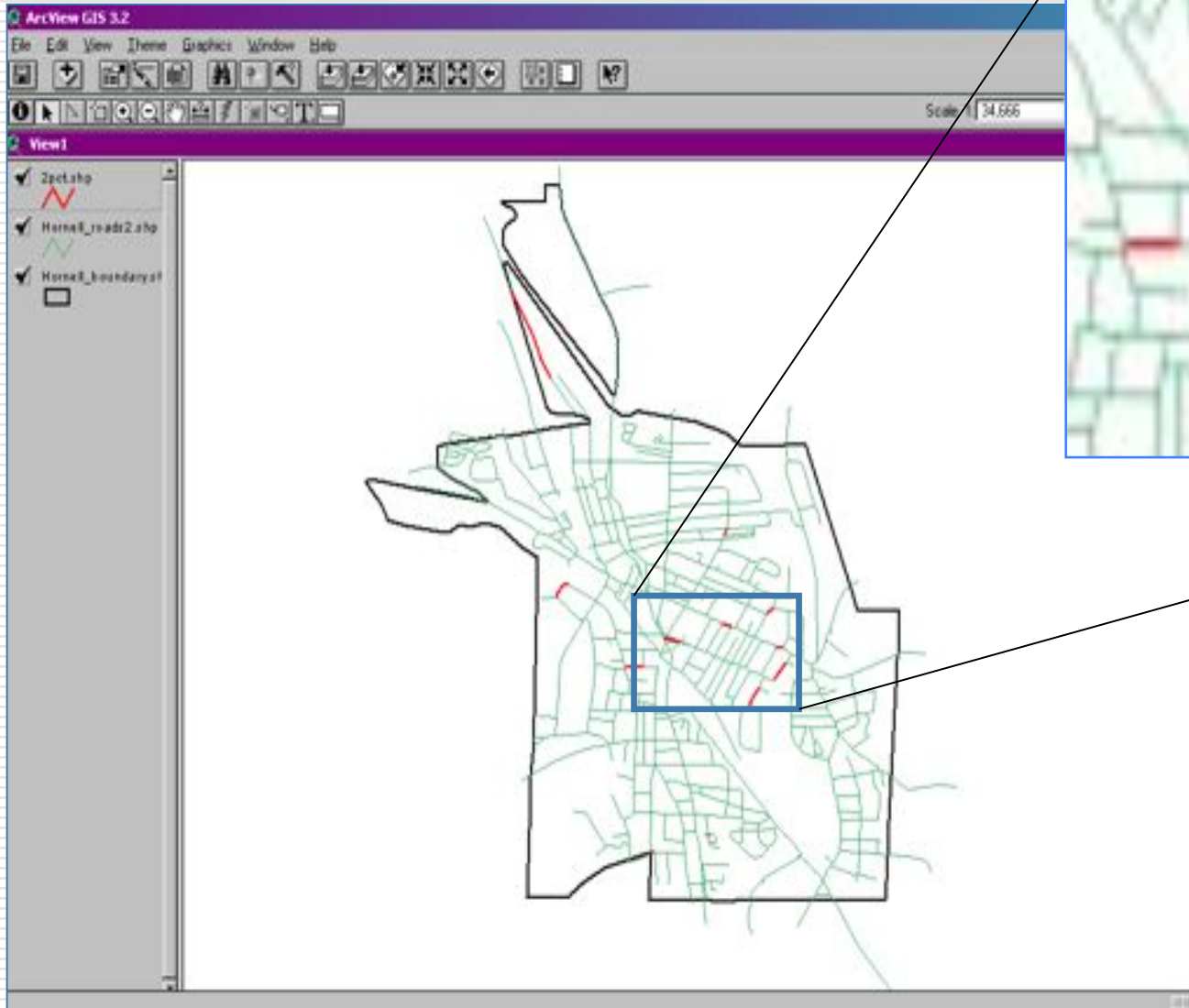
Submit Selection Submit Selection

Technical documentation for PL 94-171 and SF1 data:
[U.S. Census PL 94-171\(PDF\)](#)
[U.S. Census Summary File 1 \(SF1\)\(PDF\)](#)
[ESRI Abbreviated PL 94-171\(PDF\)](#)
[PL 94-171 Quick Reference Guide](#)
[SF1 Quick Reference Guide](#)

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Pick your county

Map of Sample Plots



Components



Form 5A
POST-Storm Field Data Collection Sheet (Populated Areas)

Community Name: _____ Plot Number: _____

ON Street: _____ TO Street: _____

FROM Street: _____

Date: _____ Plot Length (Miles): _____

ROW Width (Feet): _____ Collected by: _____

Start of plot description: _____

End of plot description: _____

ROW Trees ONLY										ROW + 50' Trees*																			
Tree Removals					Tree Pruning					Debris Estimate*					Debris Estimate*														
DBH (inches)	Species	Height (feet)	Condition	Notes	DBH (inches)	Species	Height (feet)	Condition	Notes	DBH (inches)	Species	Height (feet)	Condition	Notes	DBH (inches)	Species	Height (feet)	Condition	Notes										
6-12		3.2			13-18		5.1			19-24		7.7			25-30		10.2			31-42		20.4			43+		20.0		
Total: 701-1000										Total: 701-1000										Total: 701-1000									

*Average = Total - number of 100-foot segments x number.



Data Collection- Paper

Data Collection- PDA

PLOT GENERATOR

Blockside Number	On Street	From Street	To Street
1	Main Street	First Street	West Street
2	First Street	Main Street	Maple Street
3	Maple Street	Dead End	First Street
4	West Street	Main Street	Maple Street
5	Maple Street	First Street	West Street

Blockside information from the Diagram

Sampling Tools

Data Storage & Processing

Plot Number	Community	On Street	From Street	To Street	Plot Length (Miles)	ROW Width (Feet)	Collected by
1	Community A	Main Street	First Street	West Street	0.12	3.2	John Doe
2	Community A	First Street	Main Street	Maple Street	0.15	5.1	John Doe
3	Community A	Maple Street	Dead End	First Street	0.10	7.7	John Doe
4	Community A	West Street	Main Street	Maple Street	0.12	10.2	John Doe
5	Community A	Maple Street	First Street	West Street	0.15	20.4	John Doe

Data Storage & Processing

Reporting

Community: _____ Report Date: 5/12/2005

Note: numbers on this page were generated by a "Storm Damage Estimate Template" as revised in 2004 by the USDA Forest Service and Davis Resource Group using your storm field observations of random plots

ESTIMATED COST OF TREE DAMAGE \$0

COMMUNITY VALUES

Street Miles	Removal Cost/hr	Pruning Cost/hr	Brush Cost/hr
0	0	0	0

Estimate components

Item	Value
% Street Miles Sampled	0
Removals	0
Total Removal Hours	0.0
Total Removal Cost	\$0
Hazard Pruning	0
Total Pruning Hours	0.0
Total Pruning Cost	\$0
Total Canopy Loss	0
Total Brush on jobs	0.0
Total Brush Cost	\$0
Total Cost	\$0

DETAILED POST-STORM CALCULATION 1: Removals and Hazard Pruning

DBH Class (inches)	Tree Removal			Tree Pruning		
	Total of Removal Trees	Removal Time per Tree	Total Hours for Removal	Total of Pruned Trees	Prune Time per Tree	Total Hours for Pruning
6-12	0	3.2	0	0	0.75	0
13-18	0	5.1	0	0	1	0
19-24	0	7.7	0	0	1.5	0
25-30	0	10.2	0	0	2	0
31-42	0	20.4	0	0	3	0
43+	0	20.0	0	0	5	0
All Plots	0	6.2	0	0	2.5	0
Totals	0	0	0	0	0	0

Plot Info

Plot Number: _____

Plot Length (Miles): _____

ROW Width (Feet): _____

Collected by: _____

Reporting



Data Collection

Form 5A
POST-Storm Field Data Collection Sheet (Updated Areas)

Community Name: _____ Plot Number: _____

OH Street: _____ TO Street: _____

Date: _____ Plot Length (ft): _____

ROW Width (ft): _____ Collected by: _____

Start of plot description: _____

End of plot description: _____

ROW Trees ONLY						ROW - SF Trees*	
Tree Number	Tree Species	Tree Height (ft)	Tree DBH (in)	Tree Canopy Area (sq ft)	Tree Canopy Volume (cu ft)	Tree Species	Tree Height (ft)
8-12
12-16
16-20
20-24
24-28
28-32
32-36
36-40
40-44
44-48
48-52
52-56
56-60
60-64
64-68
68-72
72-76
76-80
80-84
84-88
88-92
92-96
96-100
Total							

* For all trees, use the following formula to calculate the canopy volume: $CV = \frac{1}{4} \pi R^2 H$, where R is the radius of the canopy (DBH/2) and H is the tree height.

* For all trees, use the following formula to calculate the canopy area: $CA = \pi R^2$, where R is the radius of the canopy (DBH/2).

* For all trees, use the following formula to calculate the canopy density: $CD = \frac{CA}{Total\ CA}$.

* For all trees, use the following formula to calculate the canopy volume density: $CVD = \frac{CV}{Total\ CV}$.

Data Collection- Paper



Data Collection- PDA

Using i-Tree Storm



- 🌳 Examples of Applied Use
- 🌳 Success Stories
- 🌳 Other Points

Data Collection

Form 5.6
POST-Storm Field Data Collection Sheet (Populated Areas)

Community Name ¹ :			
ON Street:		Plot Number ² :	
FROM Street:			
TO Street:			
Date:			
ROW Width (feet):		Plot Length (feet):	
Collected by:			
Start of plot description:			
End of plot description:			

ROW Trees ONLY						ROW + 50' Trees ³				
Tree Removals			Tree Pruning			Debris Estimate ⁴				
Code Class	Daily Number of Trees cut Tree s	Total # of Trees cut Tree s	Time Per Tree (in hr or min)	Total hours for the removal (# of Trees x Time per Tree)	Total # of Pruned Branches Tree s	Time Per Tree (in hr or min)	Total hours for pruning (# of Branches x Time per Tree)	Diameter at 100' from Trunk (in)	CROWN VOLUME	CRONO TAMING
6-12			3.2			8.75		0-100		
13-18			5.1			1.0		101-200		
19-24			7.7			1.5		201-300		
25-30			10.2			2.0		301-400		
31-36			12.5			3.0		401-500		
37-42			20.4			4.0		501-600		
43+			28.0			6.0		601-700		
Totals								701-800		
								Below ⁵		
								Total CL		
								Average		
								Total C's		

¹ If multiple communities were recorded during set up, list them in same and plot number.

² Plot address as agreed but do not enter down to the edge of the right-of-way.

³ Crown + other crown loss (e.g. crown loss) for the whole plot.

⁴ For plots larger than 100' wide, report average (Crown Loss) or total (Crown Loss) of the remainder of the plot beyond 100' width for some observations.

⁵ Average = Total ÷ number of 100-foot segments examined.



Overview: Pre-storm setup

- Create random sample
 - Before emergency!
 - Use electronic or manual means
- Measure tree density and size class
 - Within ROW
 - Also 50' back from ROW edge
- Take final steps
 - Pre-Storm report form: useful estimate
 - Storage for future use

Data collection: paper forms

- In disaster work, good reason to keep paper as option
 - Electricity not a concern
 - Damage possibility minimal
 - Reduces training needed
- Forms for many different situations
- Copies in User's Manual, or on web

[illegible]

Form 56
POST-Storm Field Data Collection Sheet (Populated Areas)

Community Name ¹ :		Plot Number ² :
ON Street:		
FROM Street:	TO Street:	
Date:	Plot Length (ft/m):	
ROW Width (feet):		Collected by:

Start of plot description:

End of plot description:

ROW Trees ONLY							ROW + 50' Trees ³		
Tree Removals				Tree Pruning			Debris Estimate ⁴		
DBH (in)	Total Number of Removed Trees	Total Adj. Removed Tree ft	Total Hours for Adj. Removed (25 ft Tree = 1 hour per tree)	Total # of Pruned Trees	Total Adj. Pruned Tree ft	Total Hours for Adj. Pruned (25 ft Tree = 1 hour per tree)	Debris (cubic yds)	CROWN LOSS ⁵	CRACK TAPES ⁶
8-12		3.2			8.75		8-108		
12-18		5.1			1.0		121-280		
19-24		7.7			1.5		281-380		
25-30		10.2			2.0		381-480		
31-36		12.5			2.0		481-580		
37-42		20.4			4.0		581-680		
43+		25.0			5.0		681-780		
Total							781-880		
¹ If plot is smaller, use recorded during set up. If different, name and plot number. ² Note all trees as a group that are within 50 feet of the edge of the right-of-way. ³ Check for DBH data using girth tape. Round to the whole plot. ⁴ For plots longer than 1000 feet, report average crown loss or total crown volume of the row along the plot length (DBH data is the preferred data). ⁵ Average = Total ÷ number of 100-foot segments measured.							Extra ⁷		
							Total CL		
							Average		
							Total CY		

Form 57
POST-Storm Field Data Collection Sheet (Rural Areas)

Community Name ¹ :	
ON Road:	Plot Number ² :
Intersection nearest to plot start:	
Approximate distance to intersection:	
Date:	Plot Length (feet):
ROW Width (feet):	Collected by:

Start of plot:

End of plot:

On Right-of-Way Trees (Count trees on both sides of the road)							
Total # of 8-12 DBH Trees	Total Number of 12-18 DBH Trees	Avg. Tree ft per 100 ft of ROW	Total Hours for Adj. Removed (25 ft Tree = 1 hour per tree)	Total # of 19-24 DBH Trees	Total Number of 25-30 DBH Trees	Avg. Tree ft per 100 ft of ROW	Total Hours for Adj. Pruned (25 ft Tree = 1 hour per tree)
		6.2				2.5	
Total							

Debris Estimate ⁴		
DBH of Removed Tree	CROWN LOSS	CRACK TAPES
8-100		
101-200		
201-300		
301-400		
401-500		
501-600		
601-700		
701-800		
800+		
Total CL		
Average ⁵		
Total CY		

¹ If road plot information was recorded during set up, details in same and plot number.

² On rural roads, branches are only recorded for large trees already in tables. Time has been reduced 50% from the urban table, which includes stump removal.

³ On rural roads, time per 100 ft of pruning includes 1 or 2 additional branches per 100 ft. Time is based on 100 ft. Time has been reduced 50% from urban table, and does not include other pruning.

⁴ Check Crown Loss girth tape table to the plot. Use 50% C loss with one or two tables: 0.5 (0-25%), 0.75 (26-50%), 1.0 (51-75%), or 1.5 (76-100%).

⁵ For plots longer than 1000 feet, report average crown loss or total crown volume of the row along the plot length (DBH data is the preferred data).

⁶ Average = Total CL ÷ # of 100-foot segments

Form 5C

POST-Storm Field Data Collection Sheet (Non-linear Maintained Areas)

County/Parish/Utility Name:		District/Sheet:
Survey Area Location:		
Collected by:	Date:	

Measure tree size to replace the prior value		
Test point 1:	Compare to height 1:	Distance 1:
Test point 2:	Compare to height 2:	Distance 2:
Test point 3:	Compare to height 3:	Distance 3:
New street post under number (year)		Marker type:
Other:		

Maintained Trees							
DBH Class	Tree to be Replaced				Tree Preserved		
	Ratio of Trees to be Replaced	Total DBH Maintained (inches)	Total DBH to be Replaced (inches)	Total DBH to be Replaced (inches)	Total DBH Preserved (inches)	Total DBH to be Preserved (inches)	Total DBH to be Preserved (inches)
0-10		3.0				8.15	
10-18		8.1				1.0	
18-24		7.1				1.8	
25-30		18.2				2.0	
31-36		12.5				3.0	
37-42		28.4				4.0	
43+		28.0				8.0	
Total							

FILL IN ONE.....Crown Loss: _____ % OR Cable Yard: _____

* Required post information was recorded during pre-storm setup, so fill in name and post number.

* Estimate Crown Loss with one of these values: 0.5 (0-20%), 1.5 (25-50%), 12.5 (51-70%), and 1.1 (71-100%).

Form 5C

POST-Storm Field Data Collection Sheet (Non-linear Unmaintained Areas)

County/Parish/Utility Name:		District/Sheet:
Survey Area Location:		
Collected by:	Date:	

Measure tree size to replace the prior value		
Test point 1:	Compare to height 1:	Distance 1:
Test point 2:	Compare to height 2:	Distance 2:
Test point 3:	Compare to height 3:	Distance 3:
New street post under number (year)		Marker type:
Other:		

Unmaintained Trees							
Ratio of Trees to be Replaced	Ratio of Trees to be Replaced	Ratio of Trees to be Replaced	Ratio of Trees to be Replaced	Ratio of Trees to be Replaced	Ratio of Trees to be Replaced	Ratio of Trees to be Replaced	Ratio of Trees to be Replaced
Total							

FILL IN ONE.....Crown Loss: _____ % OR Cable Yard: _____

* If tree height information was recorded during pre-storm setup, so fill in name and post number.

* Record only larger trees placed in storm with a full crown, less than the total count in the pre-storm.

* Record crown loss with one of these values: 0.5 (0-20%), 1.5 (25-50%), 12.5 (51-70%), and 1.1 (71-100%).

* Estimate Crown Loss with one of these values: 0.5 (0-20%), 1.5 (25-50%), 12.5 (51-70%), and 1.1 (71-100%).

Data collection: data entry

- Paper forms only
- Easiest to use
Excel's entry form
 - Highlight top row of headers
 - On menu, click
Data → Form
- Can also just start typing at cell A1

The screenshot shows the Microsoft Excel interface with the 'Form Data' dialog box open. The dialog box is titled 'Form Data' and has a list of fields on the left and a 'New Record' button on the right. The fields are: PlotNumber, OnStreet, FromStreet, ToStreet, Dgtel, ROW, Length, CollectedBy, MultiSegment?, Start, End, RuralRoad?, Rural-Tot, ROWTrees, ROW13-18, ROW19-24, ROW25-30, ROW31-36, ROW37-43, ROW43, ORROW13-18, ORROW19-24, and ORROW25-30. The 'New Record' button is highlighted. The background shows an Excel spreadsheet with columns A, C, and D visible. The spreadsheet has a header row with columns A, C, and D, and a data row with columns A, C, and D. The data row has the following values: PlotNumber, OnStreet, FromStreet, ToStreet, Dgtel, ROW, Length, CollectedBy, MultiSegment?, Start, End, RuralRoad?, Rural-Tot, ROWTrees, ROW13-18, ROW19-24, ROW25-30, ROW31-36, ROW37-43, ROW43, ORROW13-18, ORROW19-24, and ORROW25-30.

Data Collection: Desktop Interface

- Manage Users
- Community Values
- Reference Data
 - TIGER
 - manual
- ROW Info
- Export Data



The screenshot displays the i-Tree Storm desktop interface. At the top, there is a logo featuring a green tree and a city skyline, with the text "i-Tree Storm" and "A Storm Damage Assessment Tool". Below the logo, a "Select Analysis:" dropdown menu is set to "Storm". The main window is titled "Setup Questions: i-Tree Storm" and contains several questions for data entry. Questions 1 through 4 have input fields for monetary values or percentages. Questions 5 through 7 have dropdown menus for selecting "unknown", "manual", or "TIGER". Question 8 is a table with three columns: "DORM class", "Removal Hours", and "Pruning Hours". The table lists various tree size classes and their corresponding hours for removal and pruning.

DORM class	Removal Hours	Pruning Hours
8"-12"	5.70	8.70
13"-15"	5.95	1.00
16"-24"	7.70	1.10
25"-30"	10.30	2.00
31"-36"	12.90	3.00
37"-42"	20.40	4.00
43"+	25.00	5.00
REMOVE		
(All Trees)	6.20	2.00

Data Collection: Desktop Interface

Setup Questions: i-Tree Storm

1. What is your cost per CuYd for total debris management?

Help

2. Tree removal

Hourly rate?

3. Tree pruning

Hourly rate?

4. What is the street mileage of all roads you manage?

Help

5. What was the source of your tree density numbers?

6. What sampling method did you use?

7. How did you get your post-storm information?

8. How many hours does it take to remove and prune a tree for each size class?

DBH class	Removal Hours	Pruning Hours
6-12	3.70	0.75
13-18	5.10	1.00
19-24	7.70	1.50
25-30	10.20	2.00
31-36	12.50	3.00
37-42	20.40	4.00
43+	28.00	5.00
Rural (All Trees)	6.20	2.50

Data Collection: Desktop Interface

Setup Questions: I-Tree Storm Hurricane Adaptation (Beta)

1. What is your cost per CuYd for total debris management?

Help

2. Will you calculate tree removal separately from debris?

No

Help

3. Will you calculate tree pruning separately from debris?

No

Help

4. What is the street mileage of all roads you manage?

0.0

Help

5. Which debris rate do you want to use?

Medium

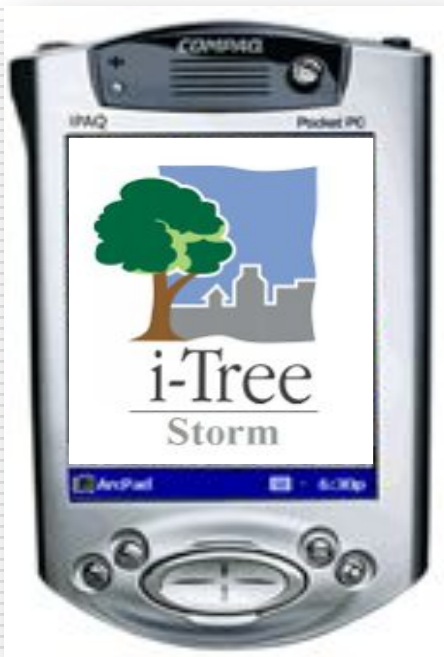
Help

6. How many hours does it take to remove and prune a tree for each size class?

DBH class	Removal Hours	Pruning Hours
6-12	3.70	0.75
13-18	5.10	1.00
19-24	7.70	1.50
25-30	10.20	2.00
31-36	12.50	3.00
37-42	20.40	4.00
43+	28.00	5.00
Rural (All Trees)	6.20	2.50

PDA Setup Interface

- 🌳 Management of process, data and applications
- 🌳 Simple, intuitive



Overview: Post-storm work

- Revisit sample segments
 - Storm or Hurricane: choose estimation method
 - Indirect by average crown loss class
 - 0-25%, 26-50%, etc.
 - Loss category images available from FS
 - All trees within 50' of ROW
 - Direct as CY of debris
 - Only trees within ROW
 - Hazard pruning by size class
 - Hazard removal by size class
- Enter data, report results

Overview: validity

- Peer reviewed sampling protocols
- Also: storm type factor
 - Tested for ice storms
 - Low variance
 - 2% sample got within 5% of true value in field test
 - Not tested for wind storms
 - Larger variance
 - May affect required sample size
- Area of ongoing i-Tree research

Estimating Engine

i-Tree Storm



Community: Burlington

Report Date:

22-Jul-09

This report was generated by i-Tree Storm v3.0.

Source: <http://www.itreetools.org>

COMMUNITY VALUES			Sampling
Correct numbers to right as needed	Street Miles	125.0	TL
	Removal Cost/hr	\$55.00	
	Pruning Cost/hr	\$55.00	
	Brush Cost/cu yd	\$15.00	
Based on Sample Data	Tree density per 100' (ROW + 50')	5.6	1.6%
			No. Samples
Precision Level *	Low		20

* Precision Level indicates overall reliability of input data (see User's Manual)

STORM DAMAGE COST ESTIMATE	\$10,079,769	
Component	Estimate	± SE *
Removals	94,240	832
Total Removal Hours	94,240	10,852
Total Removal Cost	\$5,183,174	\$596,865
Hazard Prune	7,100	665
Total Pruning Hours	14,769	1,407
Total Pruning Cost	\$812,322	\$77,307
Total Debris cu yds	272,385	27,155
Total Debris Cost	\$4,084,273	\$407,325

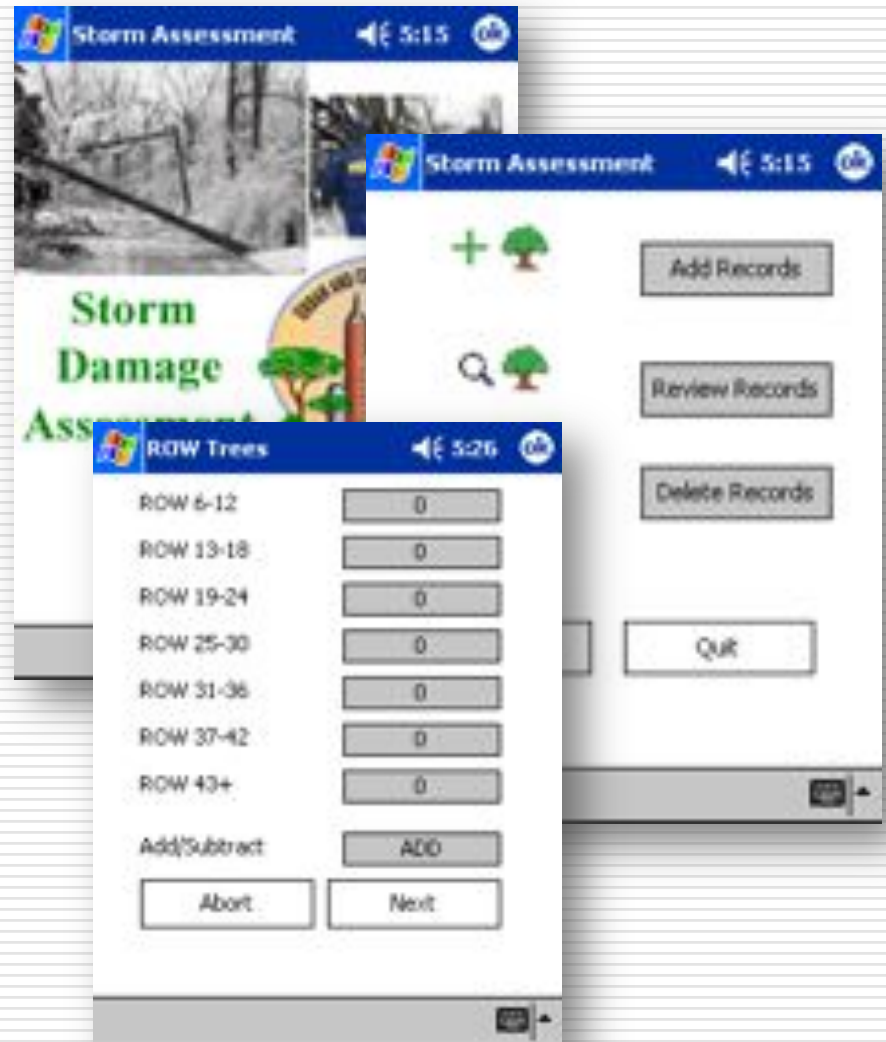
* SE of Total Debris cu yds is calculated only on direct CY estimates; crown loss estimates are ignored

DETAILED POST-STORM CALCULATION: Hazard Removal and Pruning

DBH Class (inches)	ON Right-of-Way Trees							
	Hazard Tree Removal				Hazard Tree Pruning			
	Total of Removal Trees	Removal Time per Tree	Total Hours for Removal	Total Hours SE	Total of Prune Trees	Hazard Prune Time per Tree	Total Hours for Hazard Prune	Total Hours SE
6-12	9	3.70	33.3	±19.11	8	0.75	6.0	±1.35
13-16	29	5.10	147.9	±29.67	26	1.00	26.0	±5.76
19-24	25	7.70	192.5	±38.47	24	1.50	36.0	±7.87
25-30	31	10.20	316.2	±56.31	23	2.00	46.0	±10.02
31-36	24	12.50	300.0	±52.68	12	3.00	36.0	±9.36
37-42	12	20.40	244.8	±103.76	12	4.00	48.0	±11.48
43+	9	28.00	252.0	±99.33	7	5.00	35.0	±6.73
All Rural	0	6.20	0.0	±0.00	0	2.50	0.0	±0.00
Totals	139		1490.7	±171.20	112		233.0	±22.20

Data collection: PDA

- Installed on handheld through Start menu
- Data uploaded automatically during synchronization



Data collection: PDA

- Installed on handheld through Start menu
- Data uploaded automatically during synchronization



Reference data (plots)

- TIGER
 - Can upload sample TIGER/Line data
 - Same process as described before
- Manual
 - Can do own sample from map
 - Must be random
- For both, recommended
 - 2% of blocksides
 - 30 minimum (maximum?)

Estimating Costs

i-Tree Storm



Community: **Burlington**

Report Date:

22-Jul-09

This report was generated by i-Tree Storm v3.0.

Source: <http://www.itreetool.org>

COMMUNITY VALUES			Sampling
Correct numbers to right as needed	Street Miles	125.0	TL
	Removal Cost/hr	\$55.00	
	Pruning Cost/hr	\$55.00	% Street Miles
	Brush Cost/cu yd	\$15.00	1.6%
Based on Sample Data	Tree density per 100' (ROW + 50')	5.6	No. Samples
Precision Level *	Low		20

* Precision Level indicates overall reliability of input data (see User's Manual)

STORM DAMAGE COST ESTIMATE	\$10,079,769	
Component	Estimate	± SE *
Removals	94,240	832
Total Removal Hours	94,240	10,852
Total Removal Cost	\$5,183,174	\$506,865
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Total Debris cu yds	272,385	27,199
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DETAILED POST-STORM CALCULATION: Hazard Removal and Pruning

DBH Class (inches)	ON Right-of-Way Trees							
	Hazard Tree Removal				Hazard Tree Pruning			
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18-24	25	7.70	192.5	±38.47	24	1.50	36.0	±7.87
25-30	31	10.20	316.2	±56.31	23	2.00	46.0	±10.02
31-36	24	12.50	300.0	±52.68	12	3.00	36.0	±9.36
37-42	12	30.40	364.8	±103.78	12	4.00	48.0	±11.48
43+	9	28.00	252.0	±89.33	7	5.00	35.0	±8.73
All Rows	0	6.20	0.0	±0.00	0	2.50	0.0	±0.00
Totals	139		1480.7	±171.20	112		233.0	±22.20

i-Tree Storm

Community: Burlington

Report Date:

22-Jul-09

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Correct numbers to right as needed	Street Miles	125.0	TL
	Removal Cost/hr	\$55.00	
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	Brush Cost/cu yd	\$15.00	1.0%
Based on Sample Data	Tree density per 100' (ROW + 50')	5.6	No. Samples
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STORM DAMAGE COST ESTIMATE

\$10,079,769

Component	Estimate	± SE *
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Total Debris cu yds	272,285	27,155
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DETAILED POST-STORM CALCULATION: Hazard Removal and Pruning

DBH Class (inches)	ON Right-of-Way Trees							
	Hazard Tree Removal				Hazard Tree Pruning			
	Total of Removal Trees	Removal Time per Tree	Total Hours for Removal	Total Hours SE	Total of Prune Trees	Hazard Prune Time per Tree	Total Hours for Hazard Prune	Total Hours SE
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13-18	29	5.10	147.9	±29.67	26	1.00	26.0	±5.76
19-24	25	7.70	192.5	±38.47	24	1.50	36.0	±7.87
25-30	31	10.20	316.2	±58.31	23	2.00	46.0	±10.02
31-36	24	12.50	300.0	±52.68	12	3.00	36.0	±9.36
37-42	12	20.40	244.8	±103.76	12	4.00	48.0	±11.48
43+	9	28.00	252.0	±99.33	7	5.00	35.0	±6.73
All Range	0	8.20	0.0	±0.00	0	2.50	0.0	±0.00
Totals	139		1490.7	±171.20	112		238.0	±22.20



Storm User's Manual

Storm User's Manual

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i-Tree
Storm

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i-Tree
Storm

What kinds of storms do you anticipate? Ice storms, hurricanes and floods, smaller-scale disasters?

Different disaster types present different damage and debris profiles, requiring some adjustment to the use of Storm.

Ice Storms: Ice storms tend to have relatively widespread and uniform damage, and the debris is almost exclusively vegetative. Furthermore, the ice-laden debris usually remains at its initial landing place and is not moved around by natural forces. These characteristics permit quick, accurate estimates of potential and actual damage and costs from a small random sample.

What Type of Storm?

Hurricanes and floods: Hurricanes and many floods also produce widespread damage, and Storm will work well to produce a quick estimate of actual damage and costs. A Hurricane Adaptation has been incorporated into Storm that makes use of actual data and practices from a 10% random sample of communities in Florida following the 2004-2005 hurricane seasons. For pre-storm assessments, the Hurricane Adaptation version (beta) predicts average vegetative debris loads based on street mileage and a choice of three damage levels. Because general averages are used, the estimates tend to be more accurate at the larger scale than at the very local level.

What Type of Storm?

Smaller-Scale Disasters: Smaller-scale disasters, including tornados, derechos (straight-line storms associated with thunderstorms), and some floods, present sampling problems since they affect smaller areas. To estimate the damage caused by smaller-scale disasters, the following procedure may be used:

Determine the rough geographic area affected by the disaster. It may be necessary to assess this based on a quick survey of the area, for example, by driving toward the area from different directions and noting where the damage begins, or by using aerial data if available.

Draw a boundary around the affected area on a street map or in the GIS file used for sampling.

Determine the total street miles in the affected area using the scaled map or standard GIS tools.

Establish a suitable sample of the street segments in the area.

What Type of Storm?

Hurricane Adaptation users must also decide: Will you separate estimates for tree removal and tree pruning from estimates of debris removal?

The data collection protocol differs slightly depending on whether you will bid out emergency work in a lump sum for debris (including pruning and removal), or instead break it up by handling the emergency tree pruning and/or removal with a different contract.

Hurricane Considerations

Does your community include rural (unpopulated) roads?

Data collection for rural roads differs slightly from data collection in populated areas. This is mainly because in populated areas FEMA will reimburse costs for debris that can be hauled to the curbside by residents, so trees 50 ft beyond the right-of-way are included in estimations of potential debris. There are manual forms specifically for rural areas and rural plots can be identified in the plot list and PDA.

Rural Roads?

Will you collect data using (a) the i-Tree Storm PDA tool, (b) paper forms for manual data entry, or (c) a non-i-Tree platform?

The Storm software package includes a PDA application for use in data collection. Significant updates have been made for i-Tree v. 3.0, and the PDA application now works seamlessly from within Storm. The program will work with Pocket PC devices running Window's Mobile 2003 (or later).

If your community lacks funding to support the use of PDAs or you simply prefer to use an alternate method, that's no problem. Data collection can be conducted using the paper forms in the Appendix, spreadsheets, etc. If you use the paper forms, data can later be entered directly into Storm's Excel Template. If you would like to use a non-i-Tree platform, look over the data requirements on the forms to get an idea of what is needed. It's a good idea to have the paper forms ready no matter what your decision, as storm-related power outages are likely.

Data Collection Method?

i-Tree Storm

Community: Burlington

Report Date:

22-Jul-09

This report was generated by i-Tree Storm v3.0.

Source: <http://www.itreetools.org>

COMMUNITY VALUES			Sampling
Correct numbers to right as needed	Street Miles	125.0	TL
	Removal Cost/hr	\$55.00	
	Pruning Cost/hr	\$55.00	
	Brush Cost/cu yd	\$15.00	
Based on Sample Data	Tree density per 100' (ROW + 50')	5.6	1.0%
			No. Samples
Precision Level *	Low		20

* Precision Level indicates overall reliability of input data (see User's Manual)

STORM DAMAGE COST ESTIMATE

\$10,079,769

Component	Estimate	± SE *
Removals	94,240	832
Total Removal Hours	94,240	10,852
Total Removal Cost	\$5,183,174	\$508,885
Hazard Prune	7,100	685
Total Pruning Hours	14,769	1,407
Total Pruning Cost	\$812,322	\$77,307
Total Debris cu yds	272,285	27,155
Total Debris Cost	\$4,084,273	\$407,325

* SE of Total Debris cu yds is calculated only on direct CY estimates; crown loss estimates are ignored

DETAILED POST-STORM CALCULATION: Hazard Removal and Pruning

DBH Class (inches)	ON Right-of-Way Trees							
	Hazard Tree Removal				Hazard Tree Pruning			
	Total of Removal Trees	Removal Time per Tree	Total Hours for Removal	Total Hours SE	Total of Prune Trees	Hazard Prune Time per Tree	Total Hours for Hazard Prune	Total Hours SE
6-12	9	3.70	33.3	±19.11	8	0.75	6.0	±1.35
13-18	29	5.10	147.9	±29.67	26	1.00	26.0	±5.76
19-24	25	7.70	192.5	±38.47	24	1.50	36.0	±7.87
25-30	31	10.20	316.2	±58.31	23	2.00	46.0	±10.02
31-36	24	12.50	300.0	±52.68	12	3.00	36.0	±9.36
37-42	12	20.40	244.8	±103.76	12	4.00	48.0	±11.48
43+	9	28.00	252.0	±99.33	7	5.00	35.0	±6.73
All Range	0	8.20	0.0	±0.00	0	2.50	0.0	±0.00
Totals	139		1490.7	±171.20	112		238.0	±22.20

Wrap-Up



- 🌳 Questions
- 🌳 Discussion
- 🌳 Other Points
- 🌳 www.itreetools.org



www.unri.org/research-documents

i-Tree Storm Utility: An Introduction



David Bloniarz, USDA Forest Service

