

Tree Risk Mitigation

- Short-term Tree Risk Mitigation
 - Immediate actions that can be taken to improve tree structure, health, and lower risk of whole or partial tree failure
- Long-term Tree Risk Mitigation
 - Program additions and improvements that create a better-planned, better-maintained, healthier and more structurally sound community forest

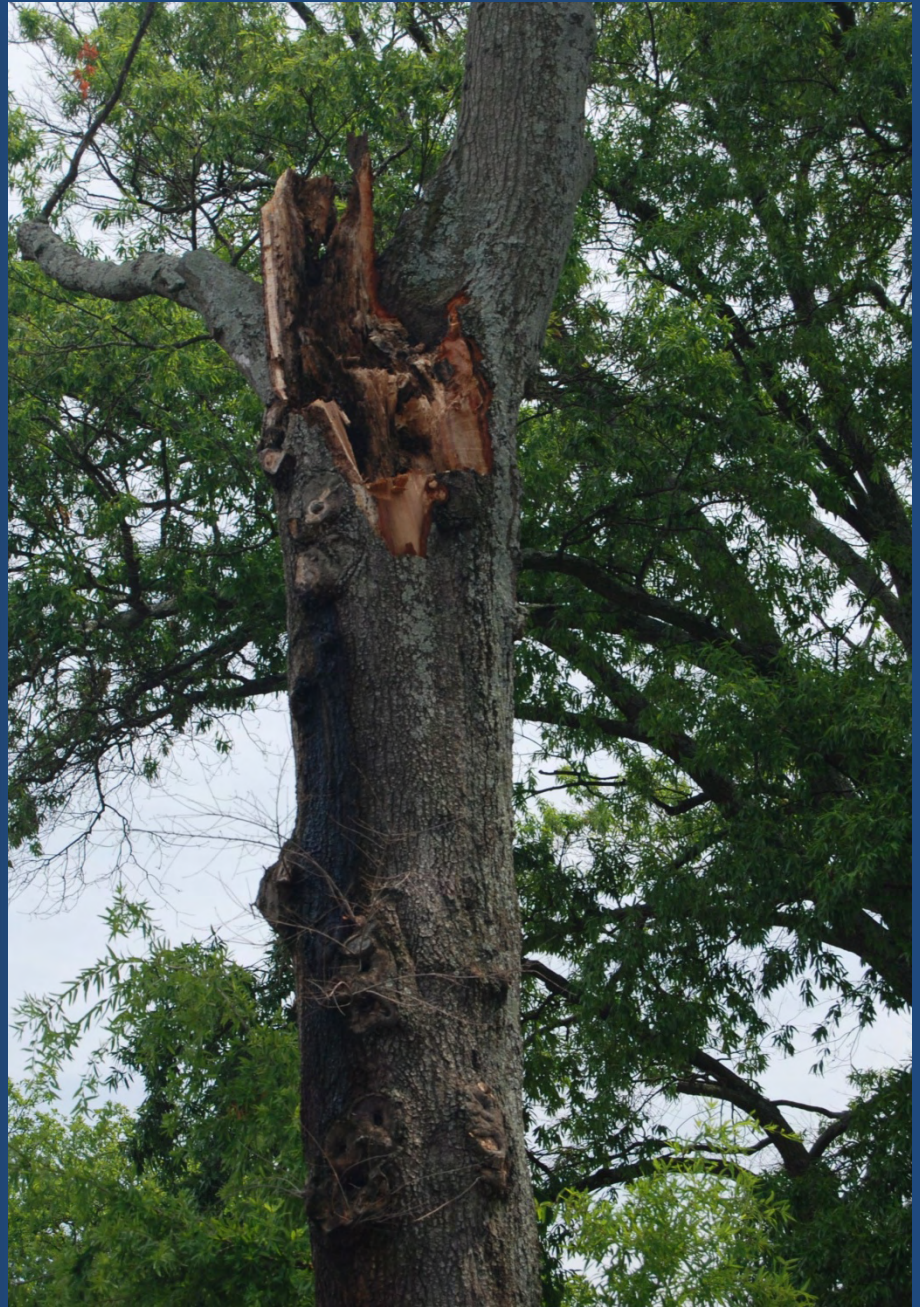
Short-Term Tree Risk Mitigation

- Pruning
- Supplemental support (cabling and bracing)
- Lightning protection systems
- Removal
- Removal of target may also be used to reduce risk

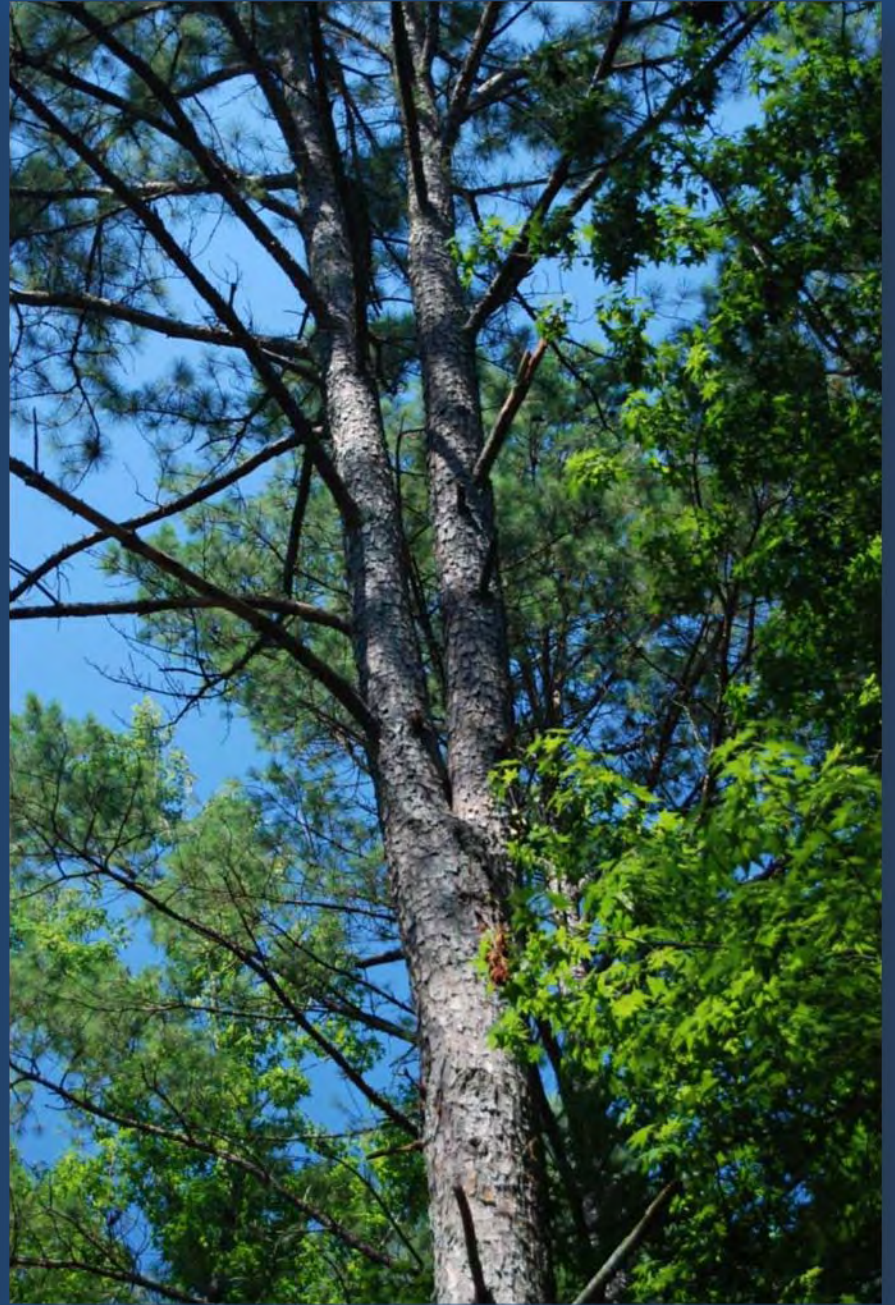














Long-Term Tree Risk Mitigation

- Adopt and implement tree care standards and BMPs:
 - Protection (critical root zone, growing space)
 - Pruning
 - Species, tree and site selection
 - Minimum growing space, above and below ground
 - Planting
 - Mulching

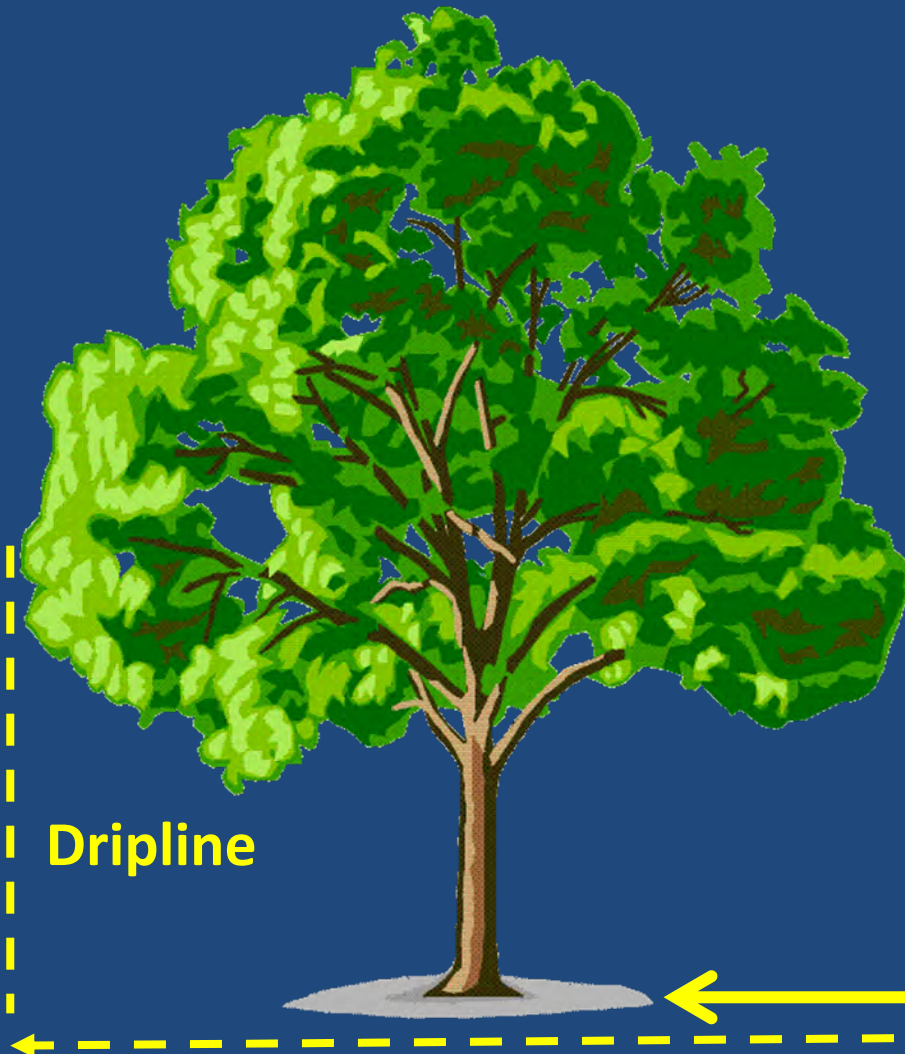


The root plate should be protected to reduce risk of whole tree failure (6 to 8 feet out from the trunk).

All roots should be protected within the critical root zone for tree stability and health.

The critical root zone has a radius of 1.5 feet (1.0 feet) for every 1 inch of trunk DBH, or the dripline, whichever is greater.

A 20 inch DBH tree has a critical root zone radius of 30 feet.



Root Plate

Critical Root Zone with 30 foot radius and 60 foot diameter



Girdling Straps

Wire baskets, strapping,
twine, and burlap
should be removed
from root balls before
planting





Sun Scald

On top of scaffold limbs
of red maple where
pruned for utility line
clearance

The best solution is to
plant the right tree in
the right place to avoid
conflicts with overhead
power lines



Long-Term Tree Risk Mitigation

- Establish routine public tree care programs (especially for street trees and large trees):
 - Inspection
 - Pruning
 - Planting
 - Mulching
 - Irrigation
 - Soil aeration

Long-Term Tree Risk Mitigation

- Adopt a tree ordinance
- Conduct training programs for tree care personnel
- Establish a tree care budget
- Establish a tree bank or alternate program funding mechanisms
- Establish or improve public information and education programs

Equipment and Services

- List equipment and services necessary for effective storm response; include amount or number of units
- Inventory available equipment and services
- Identify who will provide necessary equipment and services
- Identify how shortfalls will be addressed (see MOUs and ARCs)

EQUIPMENT DESCRIPTION	NUMBER OF UNITS NEEDED/AVAILABLE	DEPARTMENT/SOURCE OF SUPPLY
Supervisor Vehicles	/	
Crew Vehicles	/	
Aerial Lift Trucks	/	
Loaders	/	
Chippers	/	
Refuse Packers	/	
Dump Trucks	/	
Barricades	/	
Traffic Safety Cones	/	
Lighting Equipment	/	
Chain Saws	/	
Hand Saws	/	
Pole Pruners	/	
Cell Phones	/	
Portable Radios	/	
Computers/Tablets	/	
GPS Units	/	
Cameras	/	
Clipboards	/	
Data Sheets	/	
DBH Tapes	/	
Safety Vests	/	
Hardhats	/	
Eye Protection	/	
Ear Protection	/	
First Aid Kits	/	
Other	/	
	/	
	/	
	/	

Memoranda of Understanding

- Not binding contracts, but have clearly established expectations
- Outline sharing of personnel, materials, functions, services and equipment
- Executed between the government and those willing and able to provide such resources:
 - Neighboring communities
 - Local agencies
 - Non-profit organizations

Developing MOUs

- Meet with potential partners
- Write out main purpose of agreements
- Detail specific outcomes
- Determine an appropriate timeline
- Include details of functions, services or resources to be provided
- All parties review, sign and authorize
- Review annually and revise as necessary

Advanced Readiness Contracts

- Executed with contractors for services, equipment and materials to be supplied during storm response and recovery
- Legally binding

Developing ARCs

- Execute ARCs with:
 - Equipment rental vendors
 - Debris removal contractors
 - Mulch grinding contractors
 - Tree service contractors
 - Tree nurseries
 - Landscape contractors

Developing ARCs

- Include:
 - Names, addresses and contact information for all parties
 - Contract period with beginning and ending date and mechanism for terminating
 - Detailed description of services
 - Standards to be met while providing service or materials

Developing ARCs

- Include:
 - Purchasing requirements
 - Cost of services and payment schedule
 - Signature of authorized representatives for all parties
 - Date of execution of contract

Communication

- Designated call center
- Primary contact person
- Radios and cell phones
- Utilize computers, tablets and smart phones to access information

Information and Education

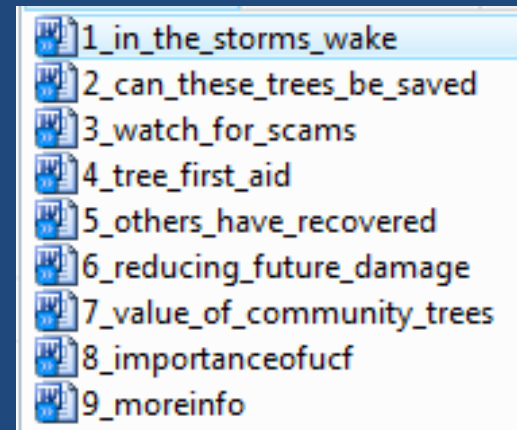
- Internal:
 - Phone calls
 - E-mails
 - Meeting notices, agendas and minutes
 - Cloud-based storage site

Information and Education

- External:
 - Written scripts
 - Recorded public service announcements
 - Press releases and newspaper articles
 - Government websites
 - Neighborhood association websites
 - Facebook page
 - Twitter account
 - Pamphlets and brochures

NADF Storm Toolkit

- National Arbor Day Foundation has a Storm Toolkit that includes:
 - Tree City USA Bulletins
 - Articles in Word format
 - Artwork



Awareness

- Take advantage of established statewide and national awareness weeks and days:
 - Air Quality Awareness Week
 - Fire Prevention Week
 - Hurricane Preparedness Week
 - Severe Weather Preparedness Week
 - Tsunami Awareness Week
 - Flood Awareness Week
 - Heat Awareness Day
 - Lightning Safety Awareness Week

Preparation Record Keeping

- Copies of your latest *Community Forest Storm Mitigation Plan*
- Storm mitigation map
- Storm mitigation team contact information
- Meeting announcements, agendas and minutes
- Memoranda of understanding
- Advanced readiness contracts

Preparation Record Keeping

- Data and cost Information:
 - Program administration
 - Tree canopy assessments
 - Tree risk assessments
 - Tree inventories
 - Tree maintenance activities (pruning, cabling, removal, etc.)

Preparation Record Keeping

- Date, amount and source of volunteer hours for program activities
- Public information scripts, public service announcements and press releases



PART III. STORM RESPONSE

- A. Mobilization
- B. Debris Management
- C. Tree Risk and Damage Assessments
- D. Information
- E. Response Record Keeping
- F. FEMA Public Assistance Grants

The level of response required and amount of damage sustained will depend on storm type, storm intensity and the condition of the community forest. The effectiveness of the response will depend on the level of preparedness.

Mobilization

- Assign responsibility for mobilization (dispatching)
- Begin removal of fallen trees and woody debris as soon as it is safe according to established priorities
- ID areas of need through crew field surveys and calls received by call center
- Follow OSHA rules and regulations

Debris Management

- Debris staging and storage
 - Establish debris staging areas
 - Utilize established debris storage sites
 - Designate a person responsible for coordinating debris staging and storage
- Debris estimation
 - *Public Assistance Debris Management Guide* (FEMA 325, July 2007)
 - *Debris Estimating Field Guide* (FEMA 329, September 2010)

Temporary debris storage site at Sumter
County airport (March 8, 2007)





Tree Risk and Damage Assessments

- Utilize staff, trained volunteers, or Urban Forest Strike Teams to assess tree risk and damage immediately following the storm after roads are cleared and trees can safely be accessed
- Perform a Level 1 risk assessment
- ID trees and stumps that need pruning or removal for further risk mitigation
- Use either GPS based data collection system or paper tally sheets

Tree Risk and Damage Assessments

- Pay particular attention to trees with:
 - Hangers
 - Splitting limbs
 - Leaning trunk with soil broken and heaved opposite the lean
 - Splitting trunks
- Record information needed for FEMA *Public Assistance Grants*
- Some trees may be identified for a Level 2 risk assessment by the tree care manager or other qualified individual

Information

- Focus on:
 - Safety
 - Chainsaw safety
 - Tree risk
 - Post-storm hazards—hangers, leaning trees, downed power lines
 - Debris clean-up
 - Pick-up schedules and procedures
 - Expected clean-up time
 - Type of debris to be collected

Response Record Keeping

- Tree and debris removal call logs
- Debris removal costs
- Debris volume estimates
- Contractor invoices
- Staff hours
- Equipment hours
- Volunteer hours
- Tree damage assessment data and costs
- Number and location of trees pruned and trees and stumps removed...

FEMA Public Assistance Grants

- *Disaster Assistance Policy DAP9580.204
Documenting and Validating Hazardous Trees,
Limbs and Stumps (Appendix B)*
 - Hazardous Trees Documentation
 - Hazardous Limbs Documentation
 - Hazardous Stumps Documentation

Hazardous Trees

Eligibility Criteria: Trees that are leaning such that they are in an imminent state of falling over and trees with broken canopies may pose an immediate threat to life, public health, safety, and improved property. Trees should be six inches or larger in diameter, measured 4.5 feet above ground level.

Hazardous Limbs

Eligibility Criteria: Broken limbs two inches or larger in diameter measured at the point of break that pose an immediate threat to life, public health, or safety, or pose an immediate threat of significant damage to improved property, are eligible for removal.

Hazardous Stumps

Eligibility Criteria: Stumps that are 24 inches or larger in diameter measured 24 inches above the ground and have 50 percent or more of their root ball exposed are eligible for removal on a per-stump basis. Reimbursement for the removal of stumps measuring less than 24 inches in diameter will be based on the reasonable cubic yard prices for vegetative debris. Please see Disaster Assistance Policy DAP9523.11, *Hazardous Stump Extraction and Removal Eligibility*, for additional information on the estimated volume of various size stumps.

Hazardous Trees Documentation

- Spreadsheet showing number of trees removed and size and location of each tree
- Location of each tree with street/road name and GPS coordinates
- Photographs of trees cut flush with the ground and a certification that the trees were 6 inches or larger in diameter
 - Contractor can photograph trees

Hazardous Limbs Documentation

- Spreadsheet showing the location of trees and number of limbs cut on each tree (information on number of hazardous limbs removed per tree is not necessary if removal was contracted for on a per tree basis)
- Certification that the limbs were 2 inches or larger in diameter
- Location including street/road name and GPS coordinates of each tree
- Photographs showing the number of limbs cut (contractor)

Hazardous Stumps Documentation

- *Hazardous Stump Worksheet*
- Number of hazardous stumps removed, locations and sizes
- Quantity of fill material required to fill the remaining hole
- Photographs of the stumps removed may also be submitted (contractor)

PART IV. STORM RECOVERY

- A. Post-storm Mitigation Analysis
- B. Summary of Tree Losses
- C. Inventory of Potential Planting Sites
- D. Tree Species Selection
- E. Tree Replacement Plan
- F. Tree Replacement Partners
- G. Ongoing Tree Risk Mitigation
- H. Information and Education
- I. Recovery Record Keeping

Storm recovery will provide opportunities for strengthening partnerships, improving programs and renewing the community forest.

Post-storm Mitigation Analysis

- After an event, within 30 days after short-term recovery activities are completed, review community forest storm mitigation plan and make necessary changes
- Discuss activities that contributed most to successful mitigation of tree-related damage
- List the areas of need in preparing for future storms

Summary of Tree Losses

- Make an accounting of the total number of public trees lost during the storm
- Summarize the data by species and DBH
- Use the summary to assist in the selection of replacement tree species
- Use the summary as input in developing your tree replacement plan

[illegible][illegible]

••Mature tree size of large, medium, or small

Page _____ of _____

Inventory Date _____

Inventory of Potential Planting Sites

- Replace trees lost on a 1 for 1 basis
- Adopt a goal of maintaining no net loss of tree canopy over the long term
- Inventory potential planting sites
 - Use an inventory spreadsheet in Excel and paper field maps
 - Or, use a GPS tree inventory database
 - Include recommendation for mature tree size

Tree Species Selection

- Tree species should be compatible with the site conditions and above and below ground growing space
- Avoid fast-growing species with weak wood and species with inherent structural defects
 - Bradford pear
 - Red mulberry
 - Siberian elm
 - Hackberry/sugarberry
 - Water oak



ACC Tree Species List

Includes Canopy Area, Recommended Uses, Physical Characteristics, and Environmental Characteristics and Tolerances; also includes tree species not recommended for planting.

Athens-Clarke County Tree Species List

SPECIES COMMON NAME	LATIN NAME	CANOPY AREA FOR DEVELOPMENT CODE		RECOMMENDED USES										PHYSICAL CHARACTERISTICS												ENVIRONMENTAL CHARACTERISTICS AND TOLERANCES									
		Square Feet of Canopy	Canopy Size Category	Level of Use	Large Landscape Areas	Road Frontages - Street	Road Frontages - Yard	Parking Lots	Plazas and Downtown Settings	Buffers	Riparian Zones and Drainage Areas	Utility Corridors	Height Class in Urban Conditions	Crown Class in Urban Conditions	Mature Crown Form	Typical Range of Mature Tree Height	Typical Range of Mature Crown Width	Leaf Type	Leaf Texture	Fall Leaf Color	Flower Color	Flowering Time	Wildlife Value	Excessive Litter	Native Tree to Athens-Clarke Co.	Growth Rate	Average Life Span	Not Effect on Air Quality	Soil Moisture	Drought Tolerance	Preferred Soil pH	Light Requirement	Construction Tolerance	Limitations	Urban Tolerant Tree
Alder, Hazel (Tag)	<i>Alnus serrulata</i>	150	Very Small	P XX	x								S VS	Multi-Stemmed	10-20	10-20	DB M	YE							Y F S	n/a	W	M	ackid	FS G/				X	
Ash, Green	<i>Fraxinus pennsylvanica</i>	1,600	Large	P XX	x	XX	x	x	x				L L	Rounded	60-100	40-50	DB M	MU						X	Y F M	0.090	W	H	si/ao-sl alk	FS G/					
Ash, White	<i>Fraxinus americana</i>	1,600	Large	P XX	x	XX	x	x	x				L L	Rounded	50-80	30-60	DB M	MA						X	Y M M	0.100	M	L	si/ao-sl alk	FS M/S					
Baldcypress	<i>Taxodium distichum</i>	900	Medium	P x	XX				XX	XX			L M	Pyramidal	50-100	20-50	DC F	BR						X	N M L	0.082	M	H	si/ao-sl alk	FS G/				X	
Basswood, American (Linden)	<i>Tilia americana</i>	1,600	Large	C x							x		M L	Irregular	60-100	35-50	DB C	YE	Y		Summer		X	Y F M	0.144	M	L	ao-alk	PS P/A						
Beech, American	<i>Fagus grandifolia</i>	1,600	Large	P XX	x						Ox		L L	Oval	80-100	50-70	DB M	YE						X	Y S L	0.160	M	L	ackid	FS P/A					
Birch, River	<i>Betula nigra</i>	900	Medium	P XX	x	XX	x	XX	XX	XX	O		M M	Pyramidal	50-90	40-60	DB F/M	YE							Y F M	0.117	M	L	ackid	PS G/					
Birch, River 'Heritage'	<i>Betula nigra</i> 'Heritage'	900	Medium	P XX	x	XX	x	XX	XX	XX	O		M M	Pyramidal	50-90	40-60	DB F/M	YE							Y F M	n/a	M	L	ackid	PS n/a					
Blackgum (Tupelo)	<i>Nyssa sylvatica</i>	900	Medium	P XX	x	XX					x		M M	Oval	50-100	20-35	DB M	RE						X	Y S M	-0.053	M	M	si/ao-sl alk	FS G/				X	
Boxelder	<i>Acer negundo</i>	900	Medium	C x							x	O	L M	Rounded	50-75	40-50	DB M	YE						X	Y F S	0.035	W	M	adapt	FS G/					
Buckeye, Bottlebrush	<i>Aesculus parviflora</i>	150	Very Small	P							x		S VS	Multi-Stemmed	15-20	10-15	DB M	YE	W		Summer		X	N M S	n/a	M	L	ao-adapt	SH n/a						
Buckeye, Painted	<i>Aesculus sylvatica</i>	150	Very Small	P x						x	x		S VS	Rounded	15-25	5-15	DB M	YE	P/Y		Spring		X	Y M S	n/a	M	L	ao-adapt	SH n/a						
Buckeye, Red	<i>Aesculus pavia</i>	150	Very Small	P							x		S VS	Rounded	10-15	10-15	DB M	YE	R		Spring		X	N M S	n/a	M	L	ao	PS Mil						
Buckthorn, Carolina	<i>Rhamnus caroliniana</i>	900	Medium	P x	x	x					x		M M	Oval	30-40	10-30	DB M	OR						X	Y M S	n/a	M	M	ao-alk	FS M/S					
Buckthorn, Common	<i>Rhamnus cathartica</i>	900	Medium	L							x		S M	Rounded	20-25	20-25	DB M	YE						X	N M S	n/a	M	H	adapt	FS n/a				X	
Buttonbush, Common	<i>Cephaelanthus occidentalis</i>	150	Very Small	P x							x	x	S VS	Multi-Stemmed	10-15	10-15	DB M	YE	W		Late Summer		X	Y M S	n/a	W	L	n/a	FS G/t						
Catalpa, Southern	<i>Catalpa bignonioides</i>	900	Medium	C x	O		O				x		M M	Rounded	30-40	30-40	DB C	YE	W		Spring		X X	Y F S	0.014	M	M	si/ao-sl alk	FS G/						
Cedar, Deodar	<i>Cedrus deodara</i>	900	Medium	L x									L M	Pyramidal	40-100	40-100	EC F	EV							N M L	-0.031	O	H	ao-sl alk	FS g					
Cedar, Japanese	<i>Cryptomeria japonica</i>	900	Medium	L x		x			x				L M	Pyramidal	40-60	15-20	EC F	EV							N S M	0.084	M	H	ao	FS n/a				X	
Chastetree (Vitis)	<i>Vitis agnus-castus</i>	150	Very Small	P	x	x	x	x			x		S VS	Multi-Stemmed	15-20	10-20	DB M	I	B/L/W		Summer		X	N M S	n/a	M	D	H	ao-alk	FS n/a				X	
Cherry, Black	<i>Prunus serotina</i>	900	Medium	C x	x						x		L M	Oval	50-90	15-50	DB M	YE	W		Early Spring		X	Y F M	0.083	M	M	si/ao	FS Mil						
Cherry Laurel, Carolina	<i>Prunus caroliniana</i>	900	Medium	C	O	x	O	O	XX	O			M M	Oval	20-40	15-25	EB M	EV	W		Spring		X	N M M	n/a	M	H	ao-sl alk	FS G/				X		
Cherry, Japanese Flowering	<i>Prunus serrulata</i>	400	Small	L		x	x	XX	XX				S S	Rounded	20-30	20-30	DB M	OR	P		Spring			N F S	0.013	M	L	ao-alk	FS n/a						
Cherry, Yoshino	<i>Prunus x yedoensis</i>	400	Small	L		XX	XX	XX	XX				S S	Rounded	20-45	20-40	DB M	YE	P/W		Spring		X	N F S	n/a	M	L	ao	FS n/a						
Chestnut, American	<i>Castanea dentata</i>	1,600	Large	N									L L	-	-	-	-							Y											
Chestnut, Chinese	<i>Castanea mollissima</i>	1,600	Large	P x	x								L L	Rounded	40-60	40-60	DB M	BR	W		Summer		X	N S L	n/a	O	M	ao-sl alk	FS n/a				X		
Chinaberry	<i>Melia azadirach</i>	900	Medium	N									M M												N										
Chinquapin, Allegheny	<i>Castanea pumila</i>	400	Small	C x							x		S S	Rounded	10-25	10-25	DB M	BR					X	Y S S	n/a	O	H	n/a	FS P/P						
Cottonwood, Eastern	<i>Populus deltoides</i>	1,600	Large	C x							Ox		L L	Pyramidal	50-100	20-75	DB C	YE					X X	Y F M	-0.708	M	M	si/ao-sl alk	FS G/				X		
Crabapple, Japanese Flowering	<i>Malus floribunda</i>	400	Small	L		x	x	x	XX	XX			S S	Rounded	15-25	15-25	DB M	YE	P		Spring		X	N M S	n/a	M	L	si/ao-sl alk	FS n/a						

Tree Replacement Plan

- Begin replacing trees during the next planting season (December through March in Georgia)
- Spread replacement plantings for heavy tree losses over multiple years
- Number of trees planted annually will depend on resources available:
 - Budgets
 - Donations
 - Staff
 - Volunteer time and labor
 - Trees

Tree Replacement Plan

- Include a schedule for new tree maintenance:
 - Mulching
 - Irrigation
 - Pest management
 - Young tree training pruning
 - Routine inspections

Tree Replacement Partners

- Solicit partners to help with financial, labor and material assistance
- Target local companies, non-profit organizations and private citizens
- You may already have an MOU or ARC with some of these partners

Ongoing Tree Risk Mitigation

- Tree risk management—assessment and mitigation--should be ongoing
- Consider tree risk mitigation in all community forest management activities
- Focus on:
 - Activities that promote tree health
 - Tree pruning
 - Tree and site selection
 - Routine tree maintenance
 - Tree protection

Information and Education

- Provide guidance on tree replanting, maintenance and ongoing mitigation efforts
- Include recognition programs for response teams and storm mitigation partners

Information and Education

- Focus information and education on:
 - Tree and tree canopy loss results
 - Tree planting programs and grants
 - Availability of assistance and materials
 - When and how to hire an ISA Certified Arborist
 - Tree health maintenance
 - Crown restoration pruning
 - Recommended species for planting
 - Tree planting techniques
 - Tree benefits

Professional Assistance

- The GFC provides information on where you can get professional assistance
- Visit www.gatrees.org



The screenshot shows the Georgia Forestry Commission website. The header includes the logo, the text "GEORGIA FORESTRY COMMISSION", the tagline "protecting and conserving Georgia's forests", and links for "ABOUT US", "CONTACT", and "SEARCH". A navigation bar contains links for "Home", "Community Forests", "Forest Management", "Forest Fire", "Forest Utilization", "Reforestation", and "Resources". The main content area is titled "Professional Assistance" and features a "CERTIFIED ARBORIST" logo with the ISA (International Society of Arboriculture) emblem. The text explains that professional assistance should be provided by an arborist who specializes in the care of individual trees. It states that certified arborists are experienced professionals who have passed an extensive examination covering all aspects of tree care and are certified by the ISA. The State of Georgia does not license or certify arborists. A search function is provided to find certified arborists by service area or name. A "Resources" section includes links to "Search for Certified Arborists" and a "2012 List of City and County Arborists". A photograph of an arborist working on a tree is shown on the right side of the page.

GEORGIA FORESTRY COMMISSION *protecting and conserving Georgia's forests* ABOUT US | CONTACT | SEARCH

Home Community Forests Forest Management Forest Fire Forest Utilization Reforestation Resources

Professional Assistance

CERTIFIED ARBORIST
ISA

Professional assistance should be provided by an arborist who specializes in the care of individual trees. Arborists are knowledgeable about the needs of trees and are trained and equipped to provide proper care.

Certified arborists are experienced professionals who have passed an extensive examination covering all aspects of tree care. Arborists are certified by the International Society of Arboriculture (ISA) and display an official logo as identification. At this time, the State of Georgia does not license or certify arborists.

To search our database of certified arborists, select the services and service area where the tree or community is located. You can also search by name for a particular arborist or tree care company.

If you are unsure if you need the services of a certified arborist, look through our [tree care resources](#) or [Ask-the-Arborist](#).

Resources

The following is for information only and **not an endorsement** by GFC.

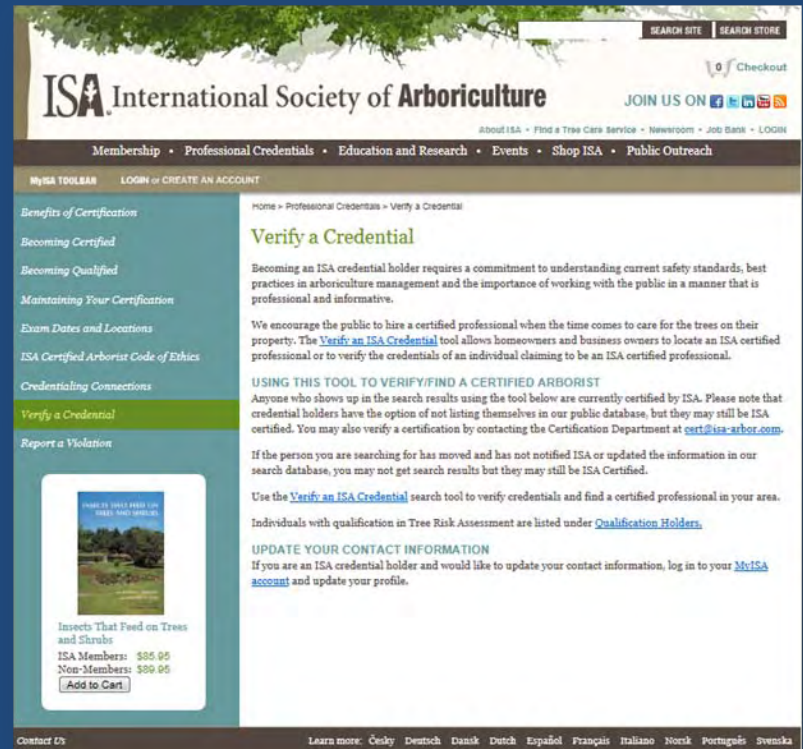
- » [Search for Certified Arborists](#)
- » [2012 List of City and County Arborists](#) - Check this list for your city or county arborist if you have questions or concerns about street or park trees in your neighborhood

Arborists - please send any changes to jscates@gfc.state.ga.us



Hiring an ISA Certified Arborist

- Visit www.isa-arbor.com to search for an ISA Certified Arborist in your area, or to confirm the credentials of an arborist



Information and Education

- Types of programs might include:
 - Recognition programs
 - Field demonstrations
 - Neighborhood workshops
 - Website content
 - Newspaper articles
 - Public service announcements

Recovery Record Keeping

- Data will provide the basis for gaining additional program capacity and improving existing programs
- May be helpful in securing grants for future mitigation projects

Recovery Record Keeping

- Include:
 - Staff hours
 - Equipment hours
 - Contractor invoices
 - Donations by source with contact information
 - Volunteer hours
 - Tree purchase data (nursery, number by species and cultivar) and costs
 - Tree planting data (species, location, date, contractor) and costs
 - Tree survival data (annual results)

Appendices

- Appendix A. Resources
- Appendix B. *Disaster Assistance Policy*
DAP9580.204 Documenting and Validating
Hazardous Trees, Limbs, and Stumps



Thank you!

*To download a copy of
the workbook and template visit
www.gatrees.org
or contact the Sustainable Community Forestry Program Forester
in your area for more information.*