# Tree Talks: No. 4
# Street Trees: Threats & Solutions

Plainfield, Massachusetts

David V. Bloniarz, Ph.D.
Urban Forester

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Northern Research Station

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# Street Trees: Threats & Solutions

Brooklyn, NY

# Street Trees: Threats & Solutions

Plainfield, MA

# Urban Forestry Framework

## WHY *urban forests?*

**The trees, vegetation and green spaces that make up our urban forests are essential contributors to virtually every measure of community well-being.**

**AIR** — Urban trees remove over **710,000 tons** of air pollution per year in the U.S.[1]

**WATER** — Trees can filter up to **80% of phosphorus** out of stormwater before it can pollute waterways.[2]

**PUBLIC HEALTH** — In New York City, the rate of early childhood asthma is **29% lower** for every 343 trees per square kilometer.[3]

**ENERGY & CLIMATE** — One million mature trees around American residences save approximately **$2 billion** annually in reduced energy costs.[4]

**JOBS & ECONOMY** — The U.S. economic impacts of green industries include **1.6 million jobs**, **$82 billion** in payroll, and **$196 billion** in sales.[5]

**RESILIENCY** — Establishing and adhering to a regular tree maintenance schedule can help **protect cities from extreme weather events**.[6]

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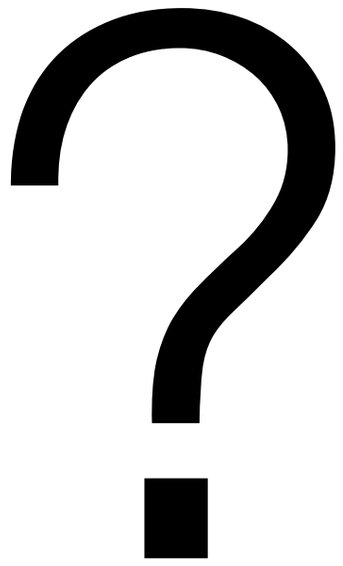
1. Nowak, D., Crane, D., Stevens, J. 2006. Air pollution removal by urban trees and shrubs in the United States. Syracuse, NY: USDA Forest Service, Northeastern Research Station. *Urban Forestry and Urban Greening* 4: 115-123.
2. Bratieres, K., Fletcher, T., Deletic, A., Zinger, Y. 2008. Nutrient and sediment removal by stormwater biofilters: a large-scale design optimisation study. *Water Research* 42(14): 3930-3940.
3. Lovasi, G., Quinn, J., Neckerman, K., Perzanowski, M., Rundle, A. 2008. Children living in areas with more street trees have lower prevalence of asthma. *Journal of Epidemiology & Community Health* 62(7): 647-649.
4. Nowak, D., Stein, S., Randler, P., Greenfield, E., Comas, S., Carr, M., Alig, R. 2010. Sustaining America's urban trees and forests: a Forests on the Edge report. Newtown Square, PA: USDA Forest Service, Northern Research Station. *General Technical Report NRS-62*: 6.
5. Hodges, A., Hall, C., Palma, M., Khachatryan, H. 2013. Economic contributions of the green industry in the United States in 2013. *HortTechnology* 25(6): 805-814.
6. Safford, H., Larry, E., McPherson, E., Nowak, D., Westphal, L. 2013. Urban forests and climate change. USDA Forest Service, Climate Change Resource Center.

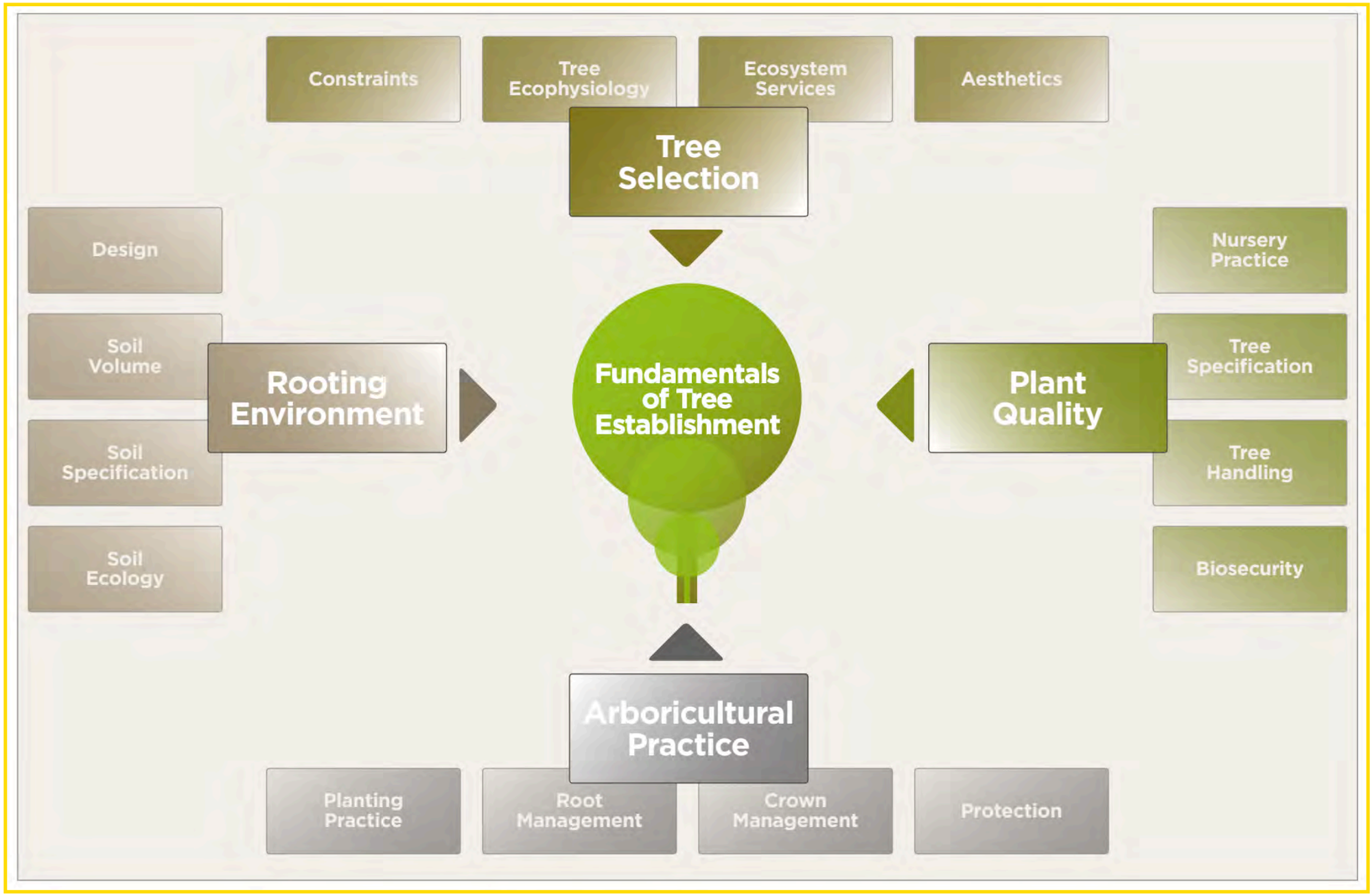

http://www.urbanforestcoalition.org/

# Threats to street trees

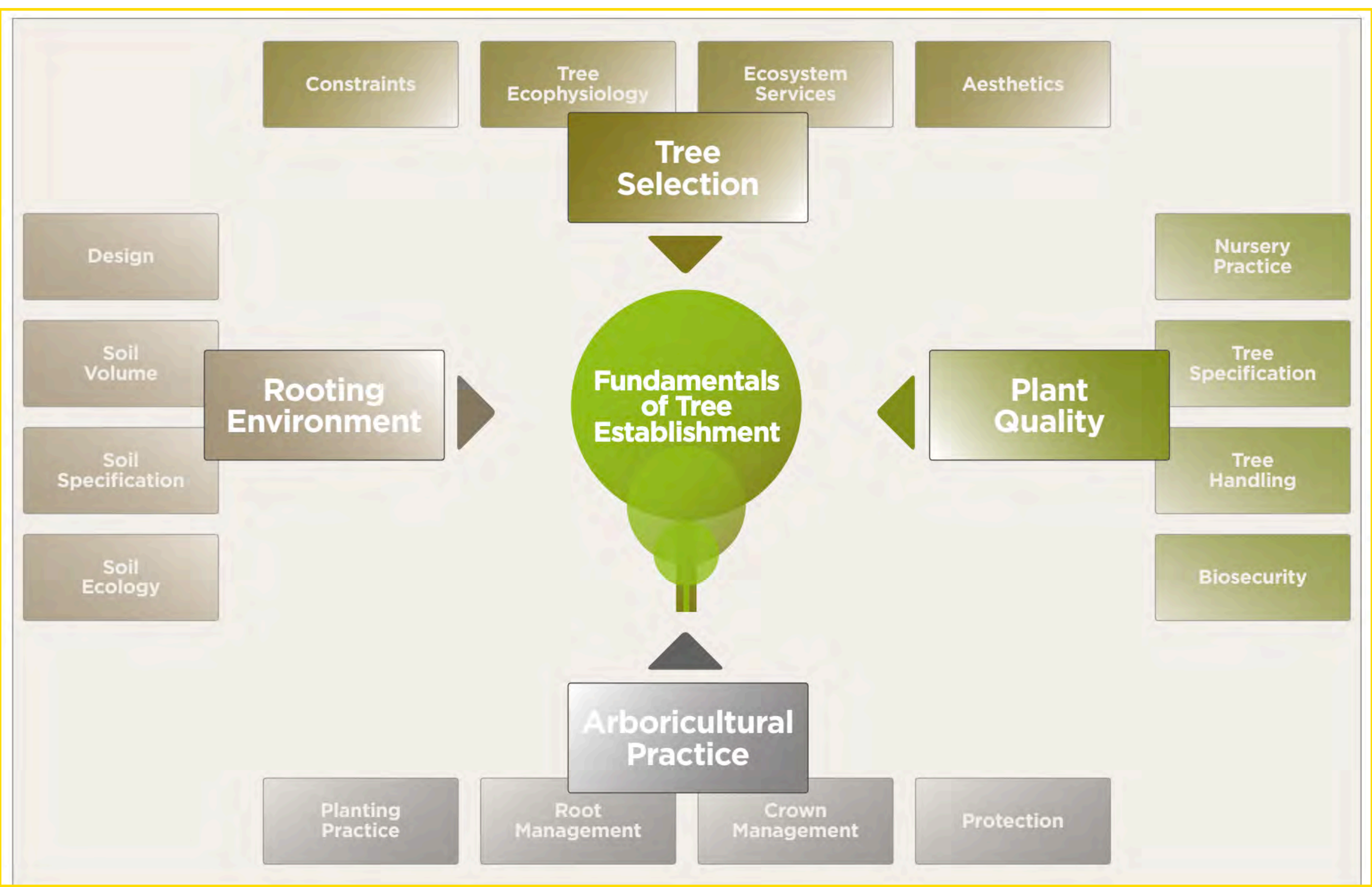


- Poor Species Selection
- Physical Damage
- Compacted Soils
- Root Damage
- Road Salt
- Utility Pruning
- Diseases & Insects
- Invasive Pests
- Economics
- Climate Change

# Tree Establishment Fundamentals




Hirons, A.D. and Thomas, P.A. (2018) Applied Tree Biology. Wiley-Blackwell. Oxford, UK.

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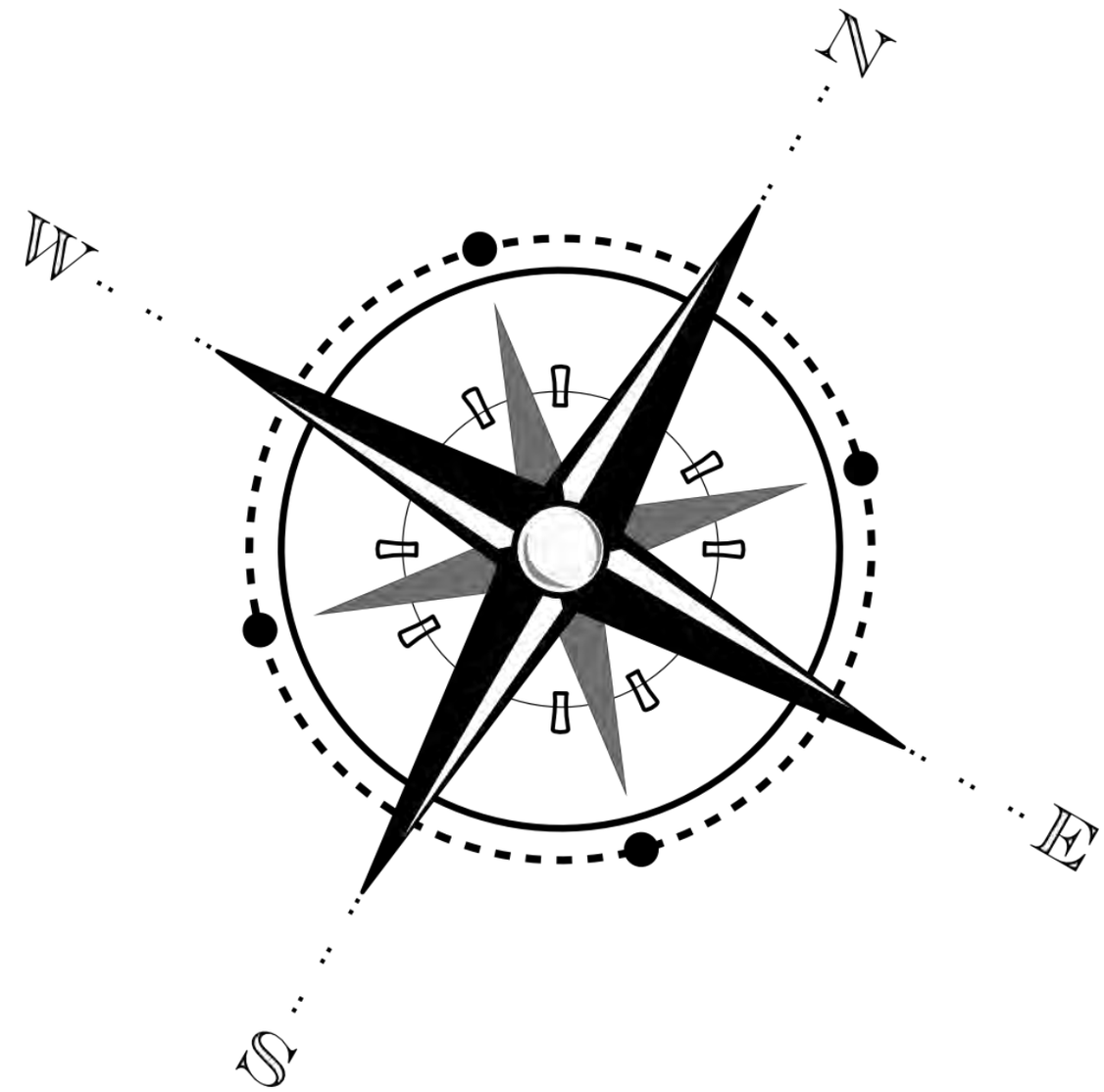
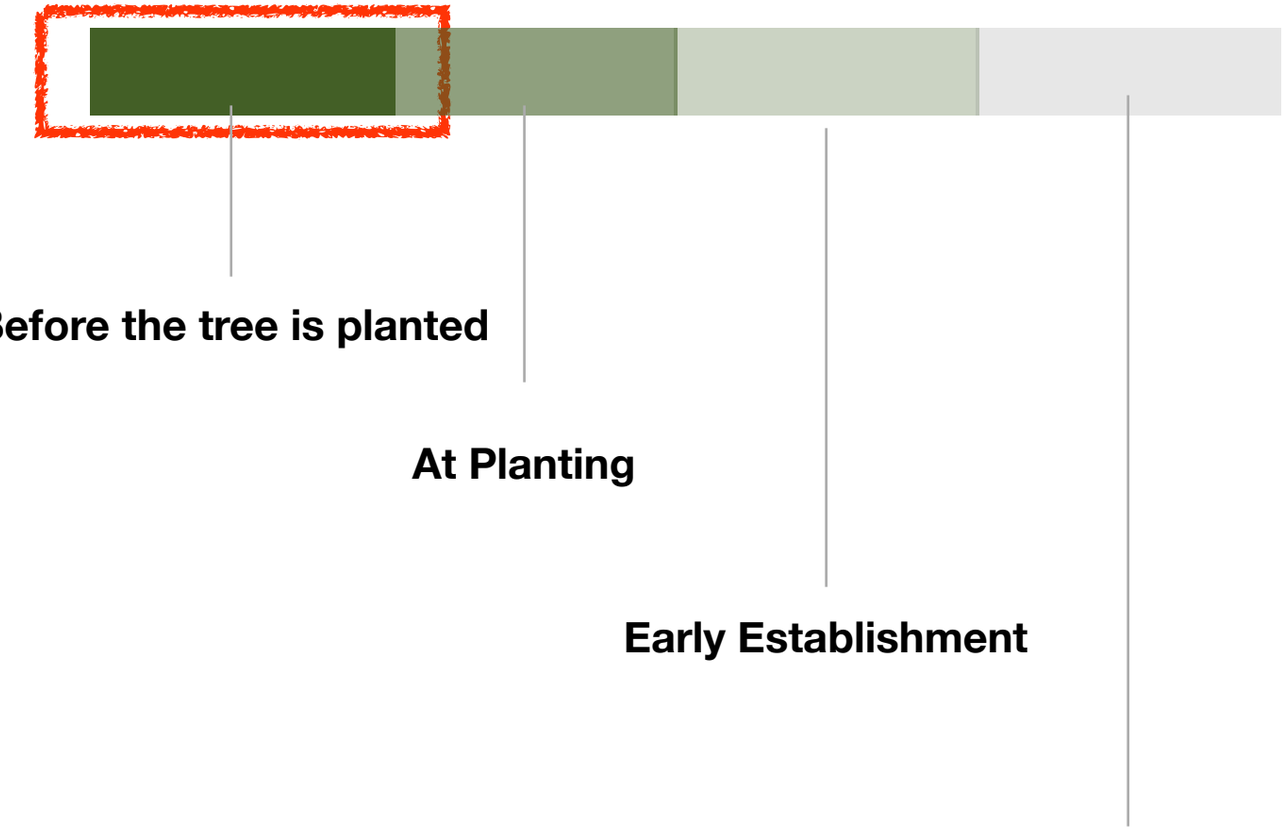
# A few good tools…

- Inventories
- Public Engagement
- Prevention Planning
- Early Detection
- Best Management Practices
- Communication
- Partnerships



# The Maintenance Lifecycle

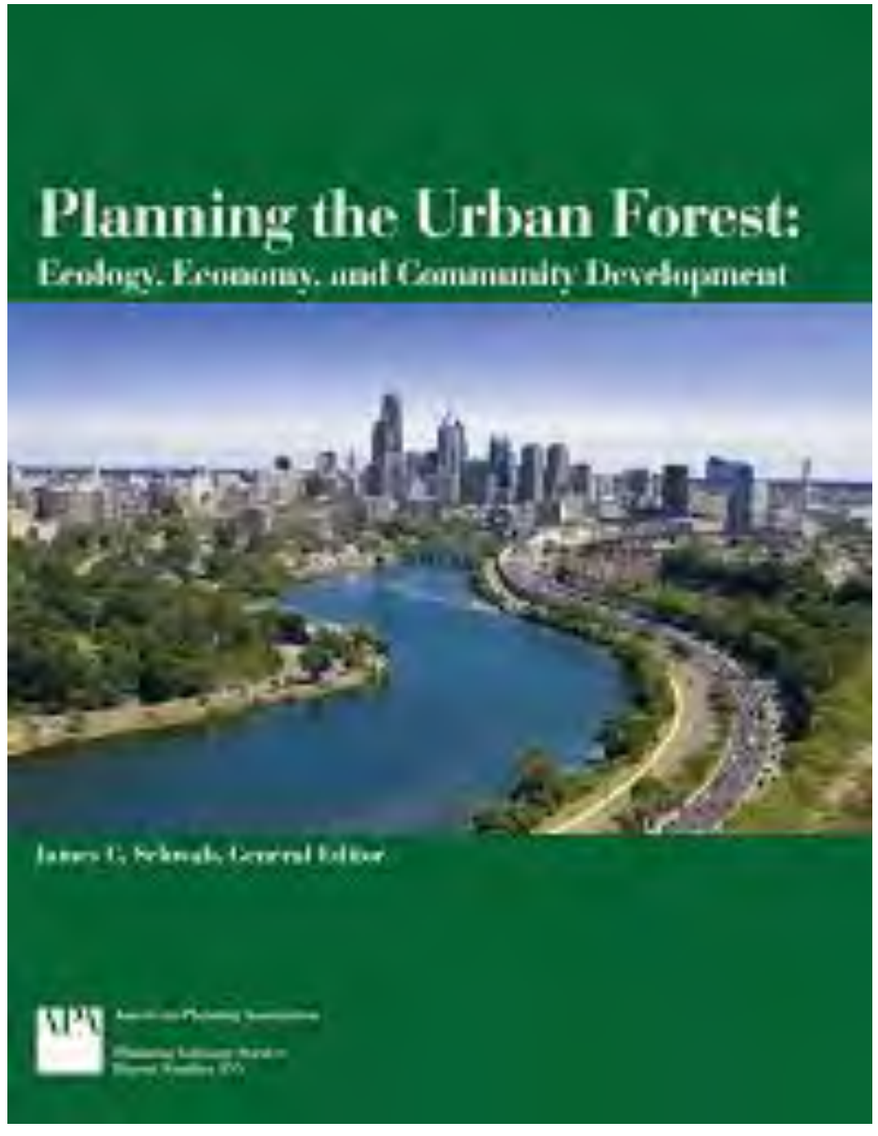


**Before the tree is planted**

**At Planting**

**Early Establishment**

**Mature Trees**




https://www.planning.org/research/forestry/

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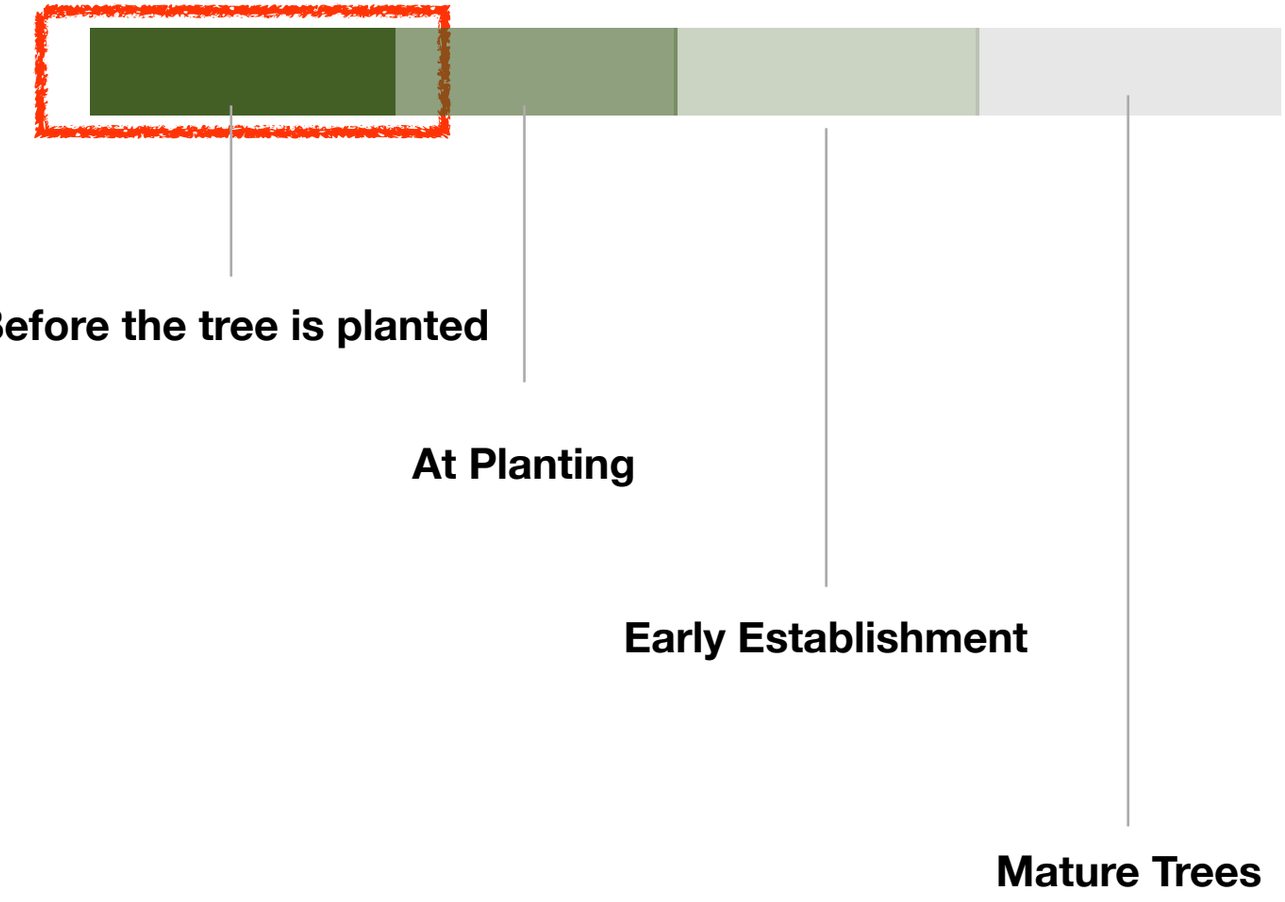

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https://wwv.isa-arbor.com/

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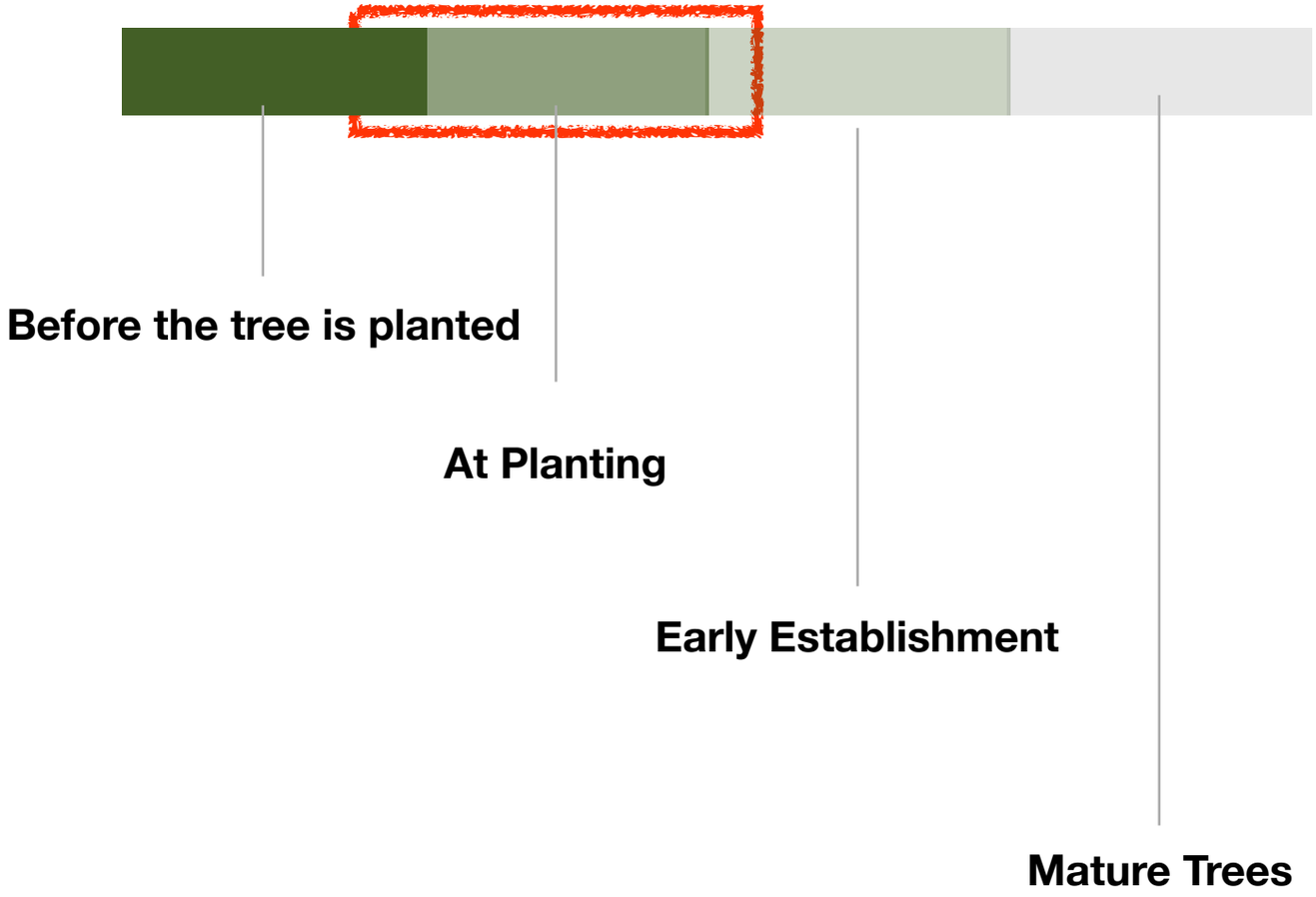

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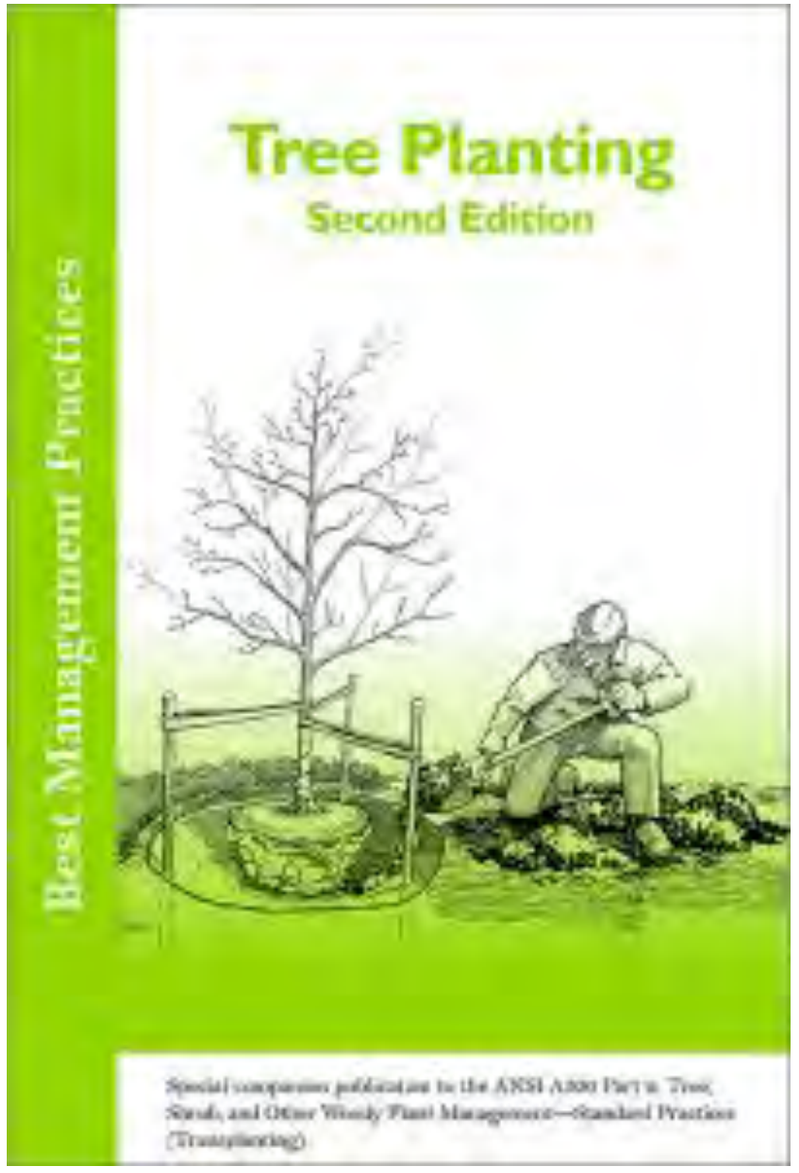


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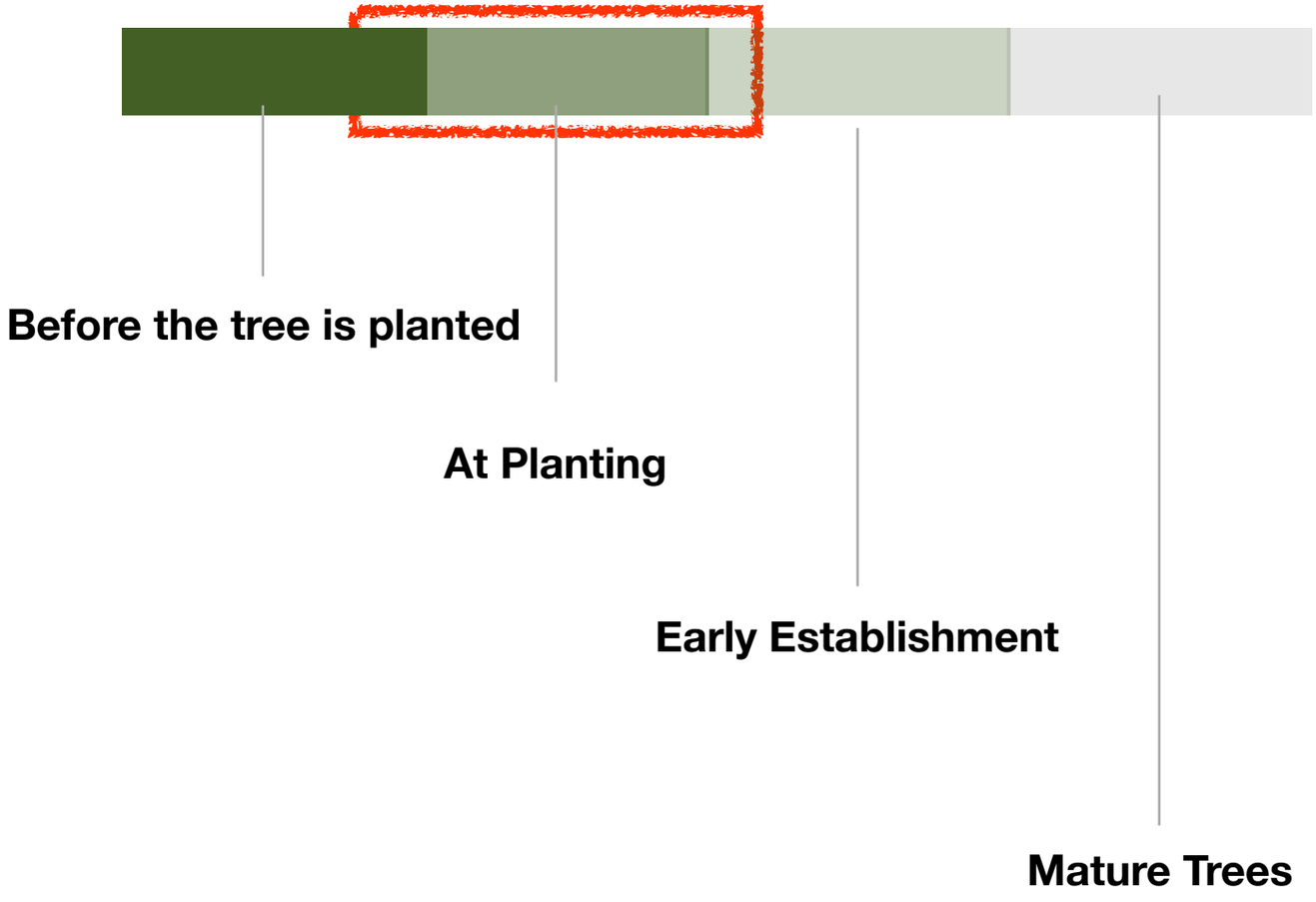


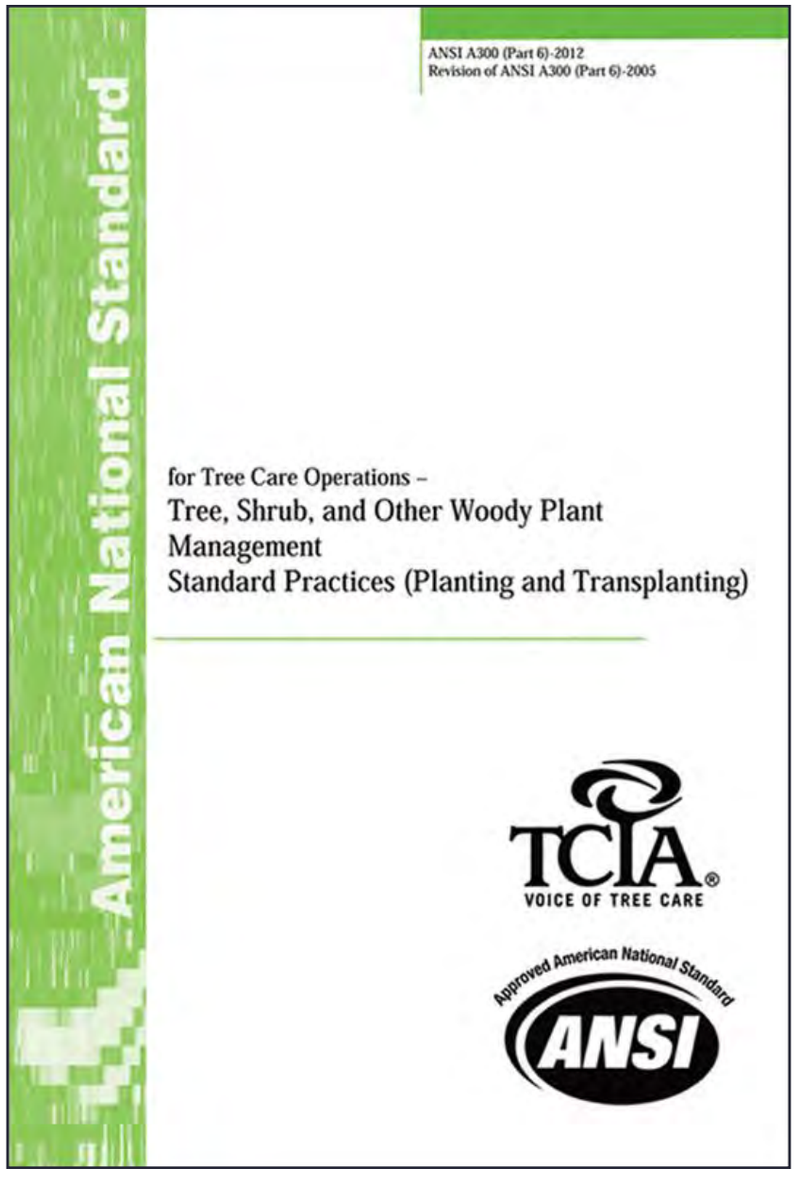


https://www.tcia.com

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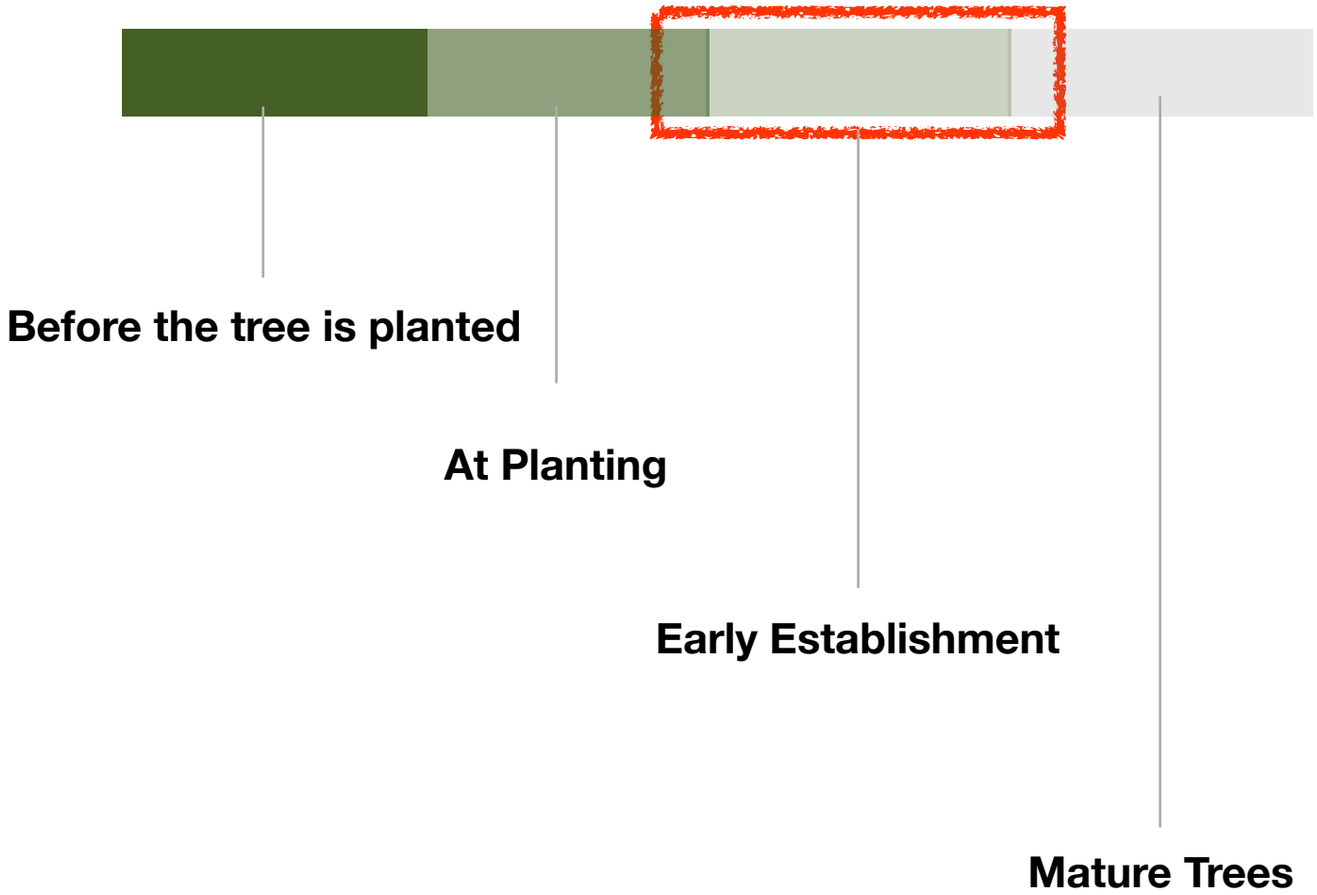

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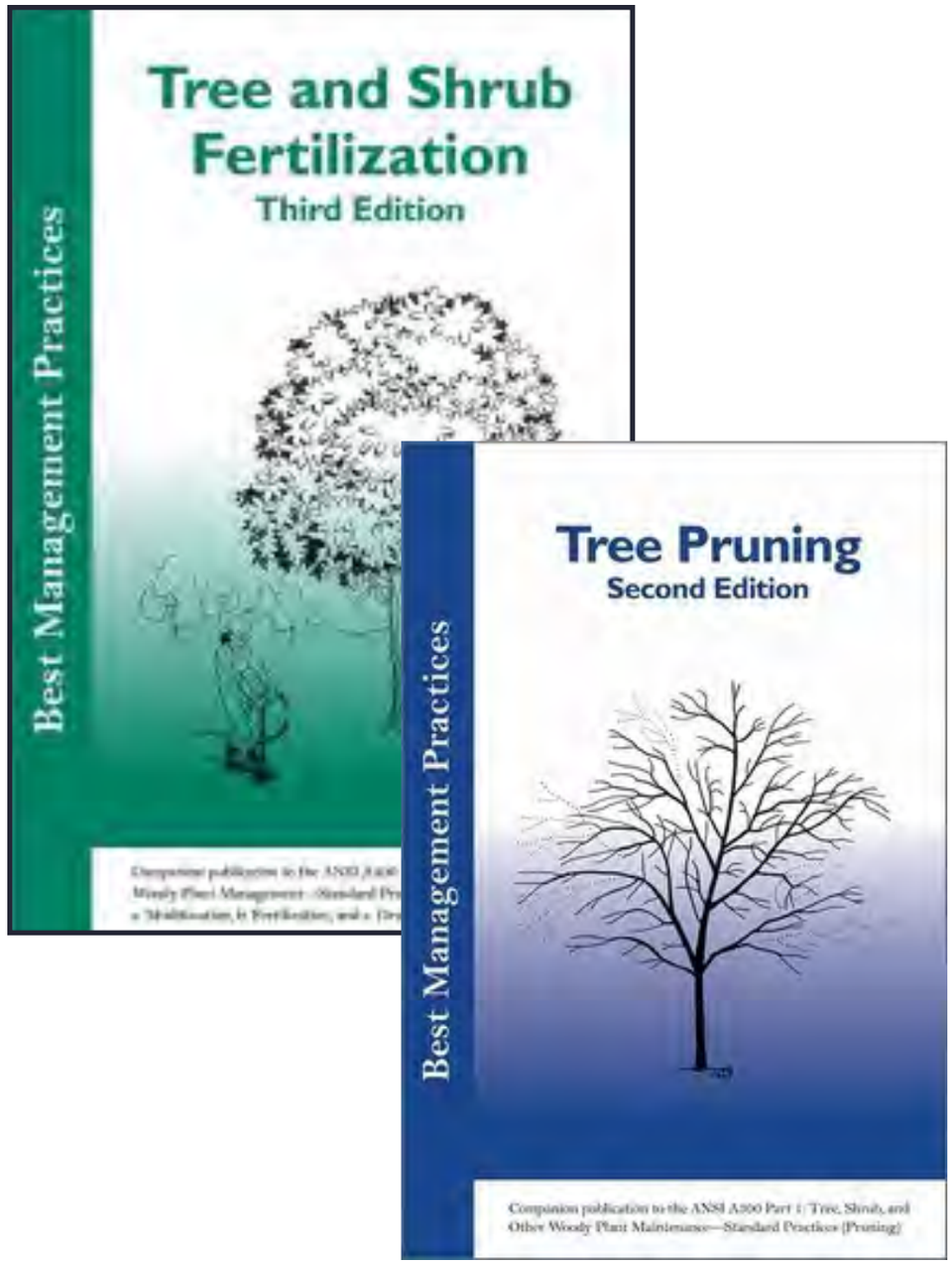


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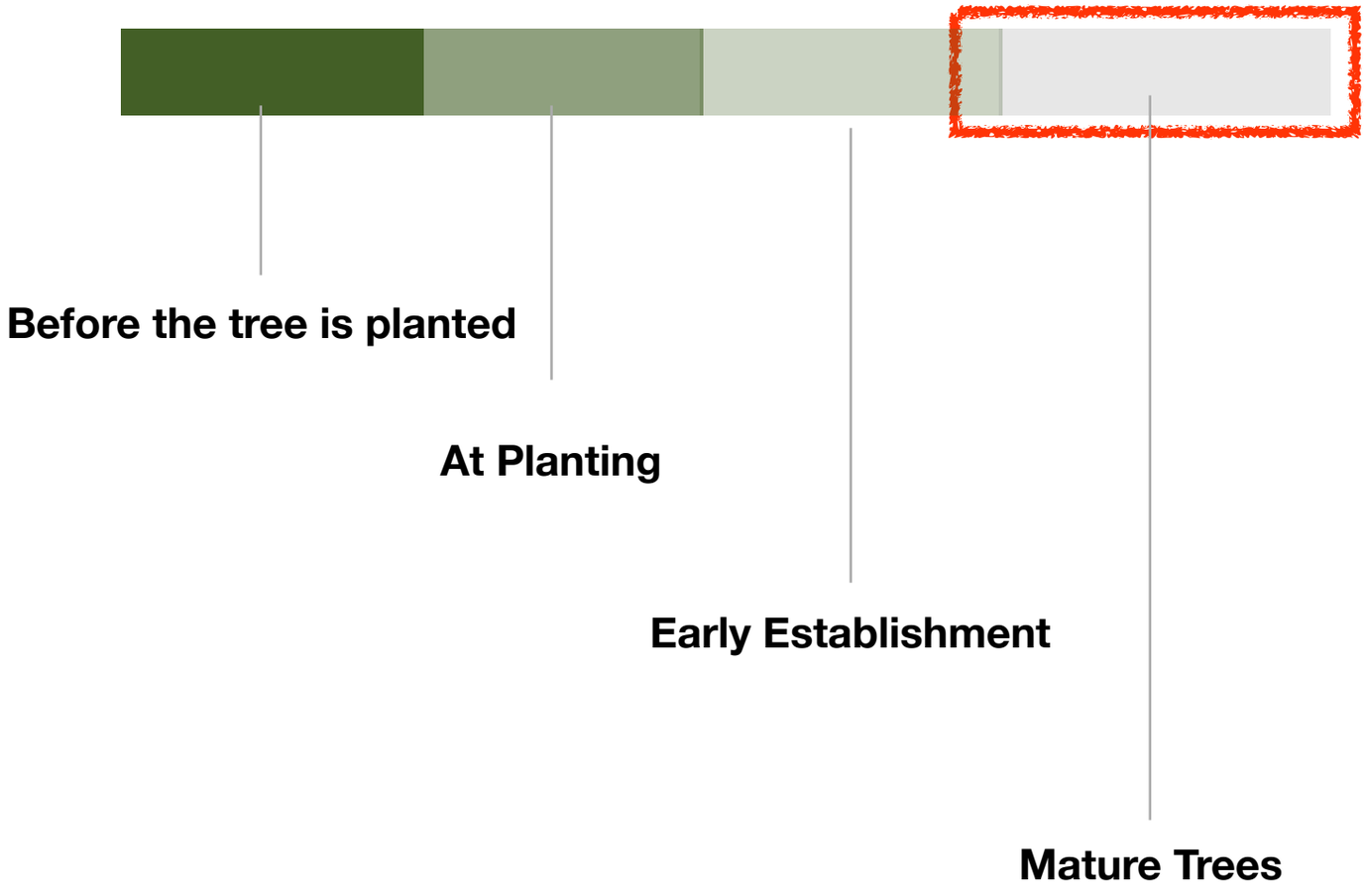

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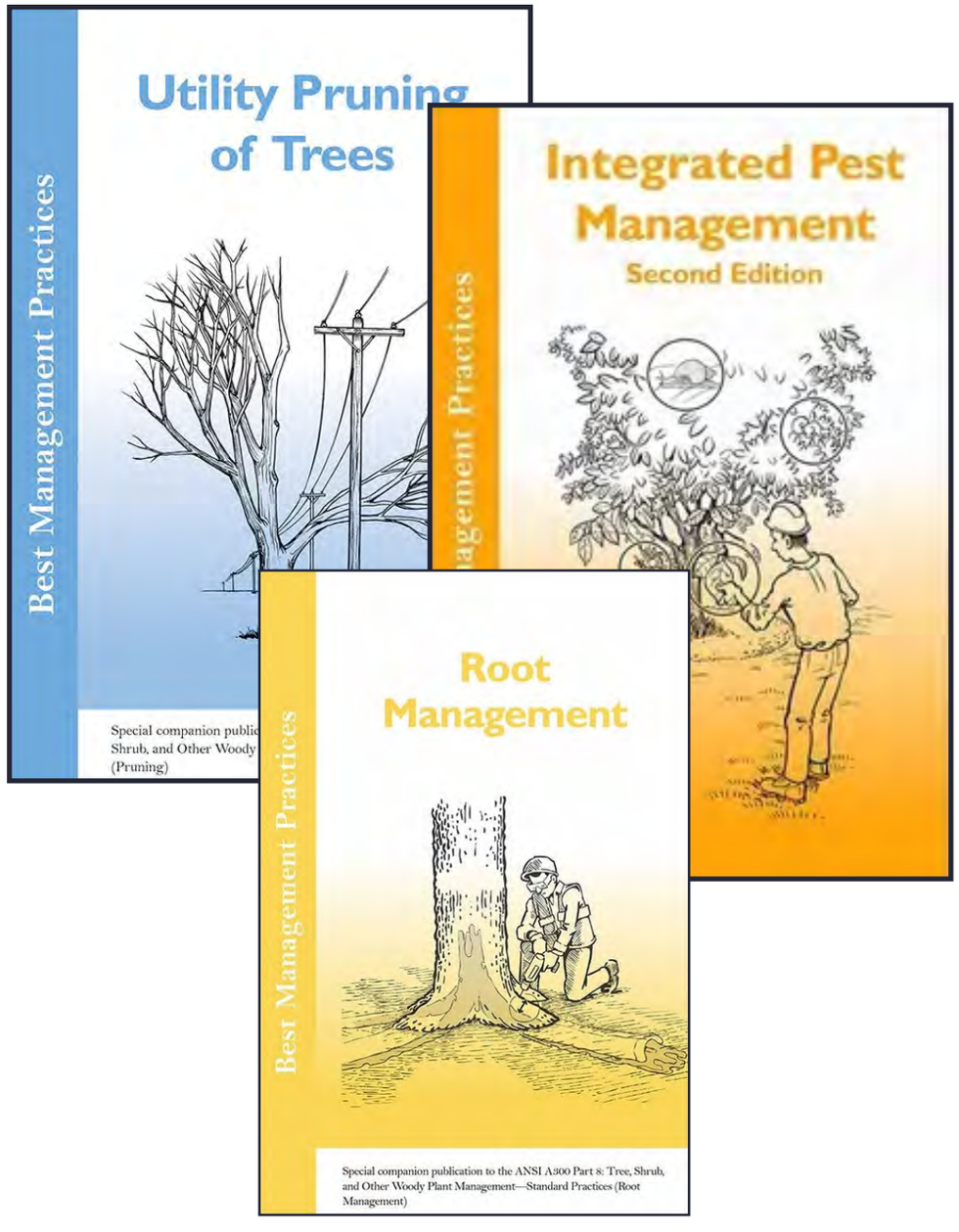


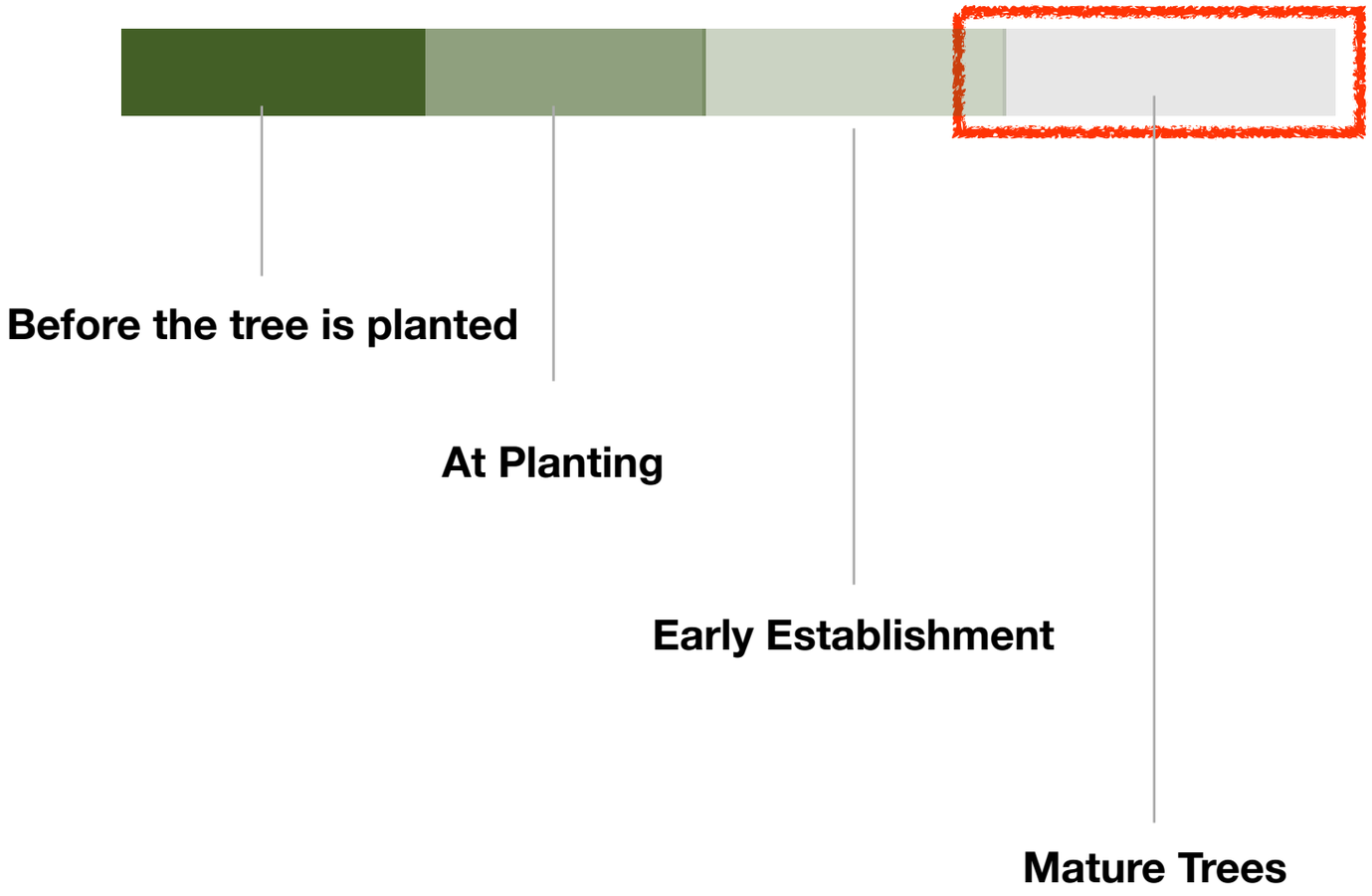

https://www.isa-arbor.com/

# Symptoms of Pests and Disease

- Root decay
- Dead branches in the crown
- Abnormally small or off-color leaves
- Serious trunk lean
- Cracked or mounded soil near the base of the tree
- Differences in color and growth between similar species of tree
- Large cankers - localized, sunken, barkless areas
- Sunburn or sunscaled damage (common in trees that prefer shade planted in full sun areas)

https://pnwisa.org/tree-care/damage/identifying-damage/

# The Maintenance Lifecycle



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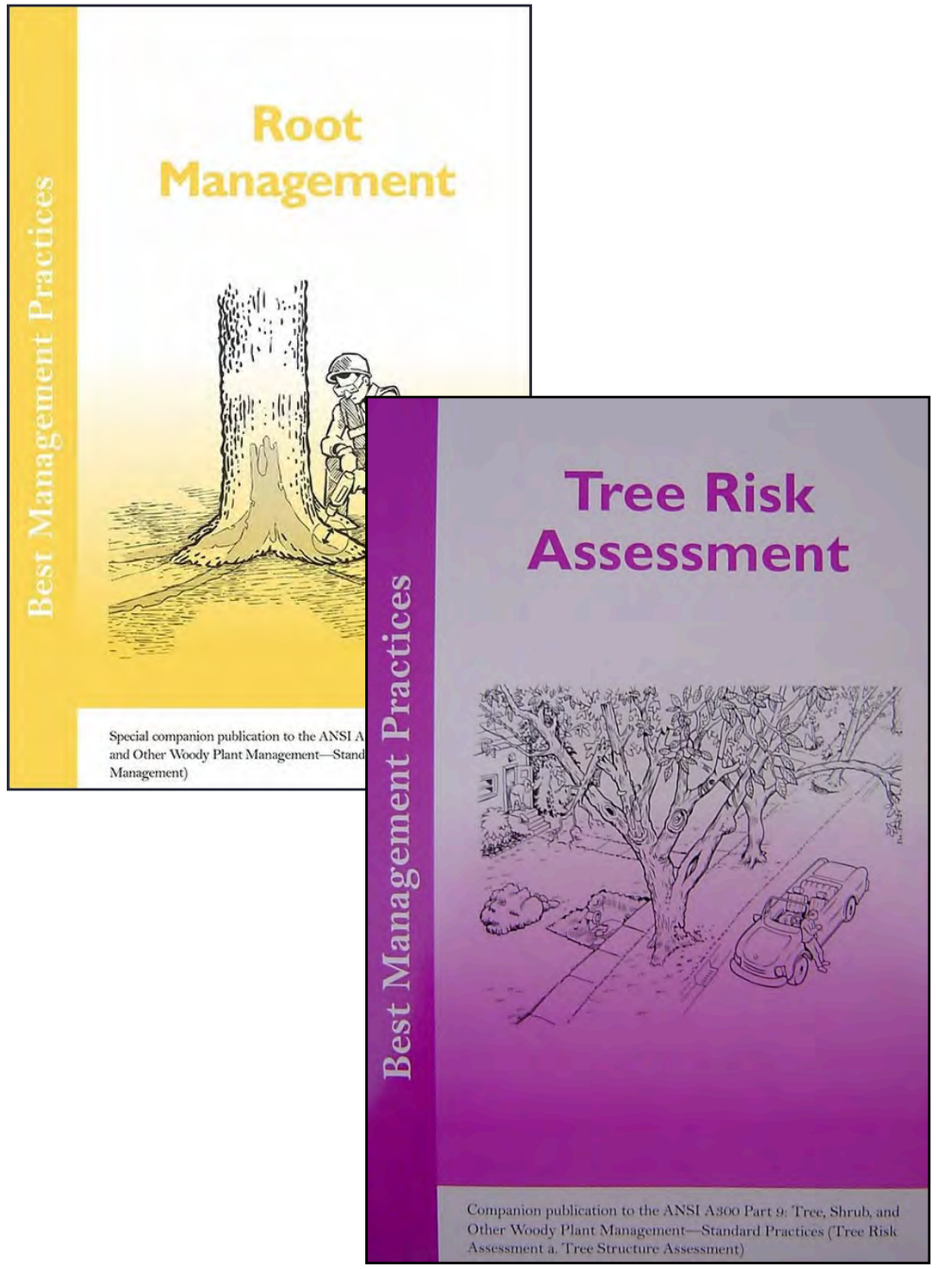


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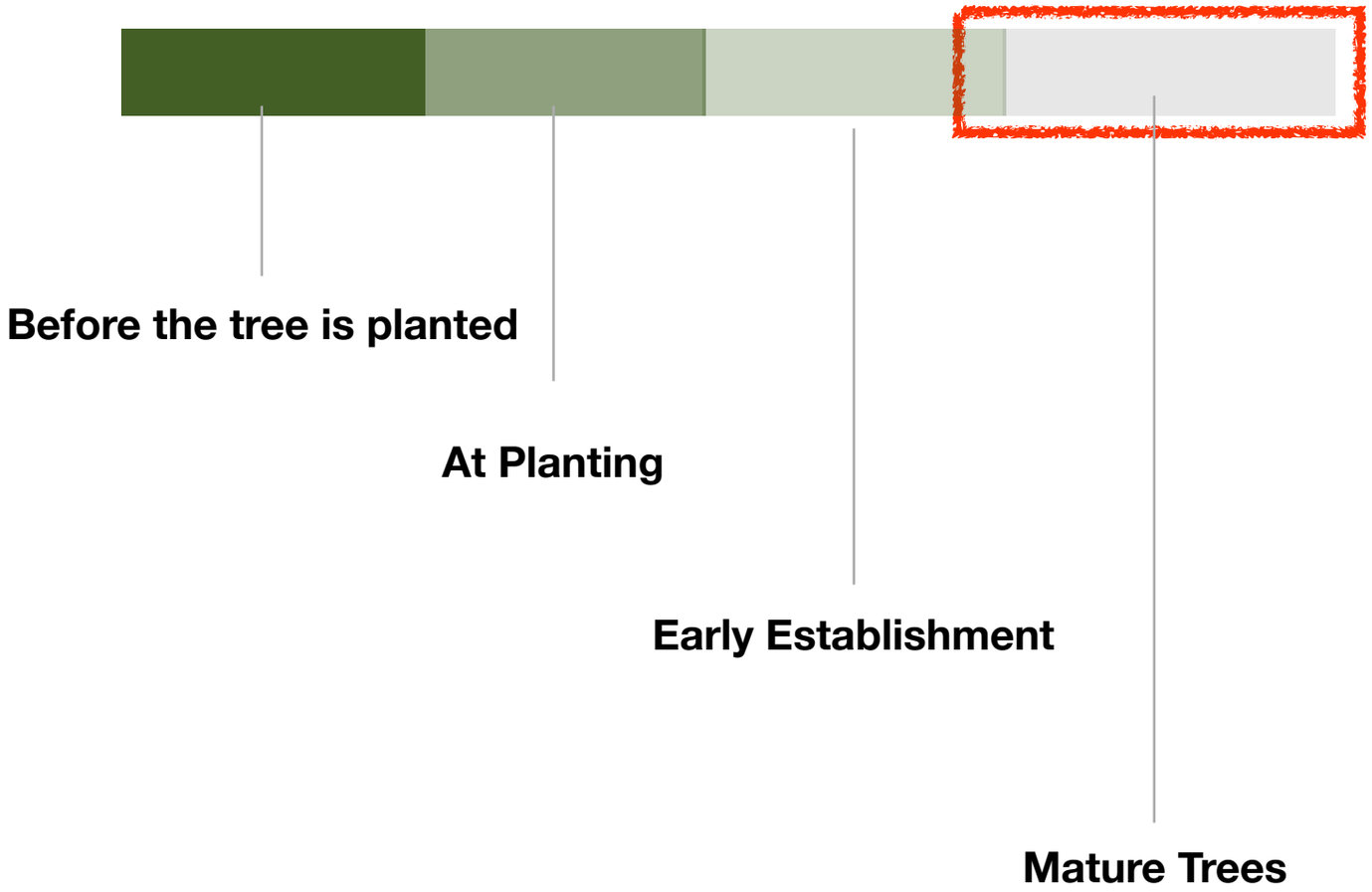

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https://www.itreetools.org

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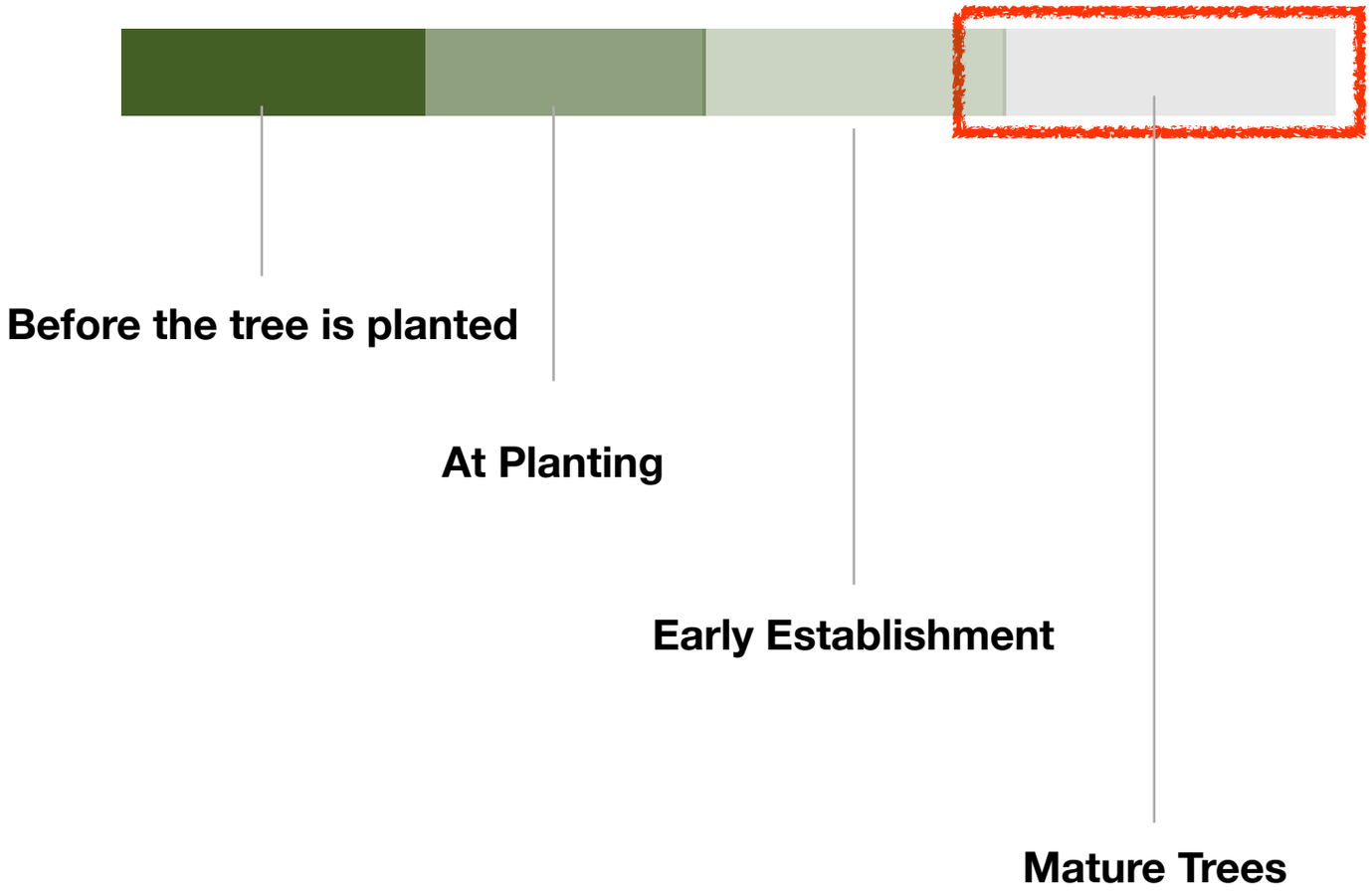
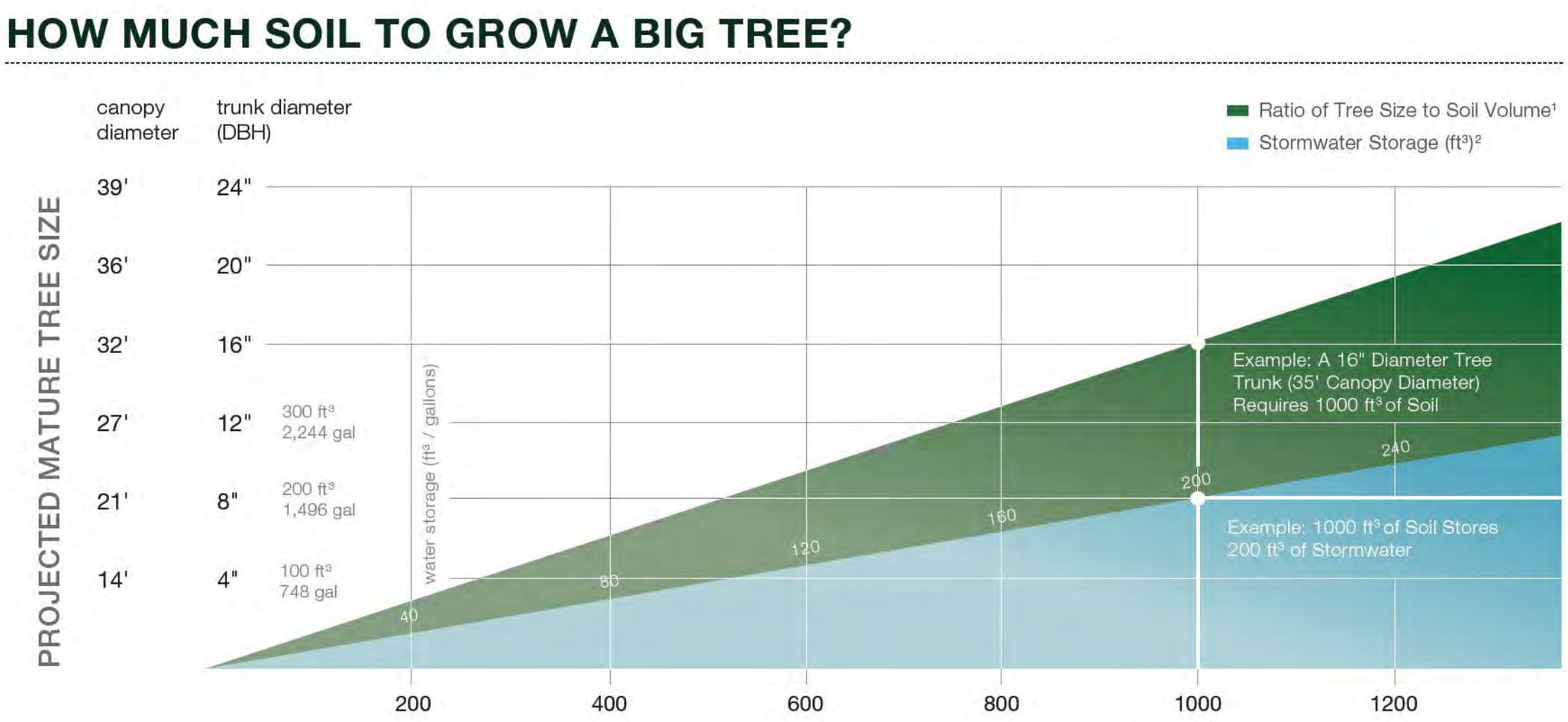



https://www.itreetools.org

# Soil and Street Trees




http://www.deeproot.com/blog/blog-entries/our-recommended-soil-volume-for-urban-trees

# A few good tools…

Probably the most critical factor in tree health and longevity is the provision of enough quality soil for the tree roots. When planning trees into urban projects, it is crucial that the target soil volume is established in the early design stages. This will maximise return on your green investments and ensure they grow quickly into large healthy specimens.

In a natural environment root systems can extend to 3 times the radius of the tree canopy. Probably the simplest way if calculating a minimum required soil volume is to take the projected canopy area of the mature tree, multiplied by a depth of 0.6. The shape of this area can be configured to suit the particular site.

## Soil Volume Calculator

ENTER PROJECTED MATURE CANOPY DIAMETER IN FEET OR METERS:

15.25 **Calculate**

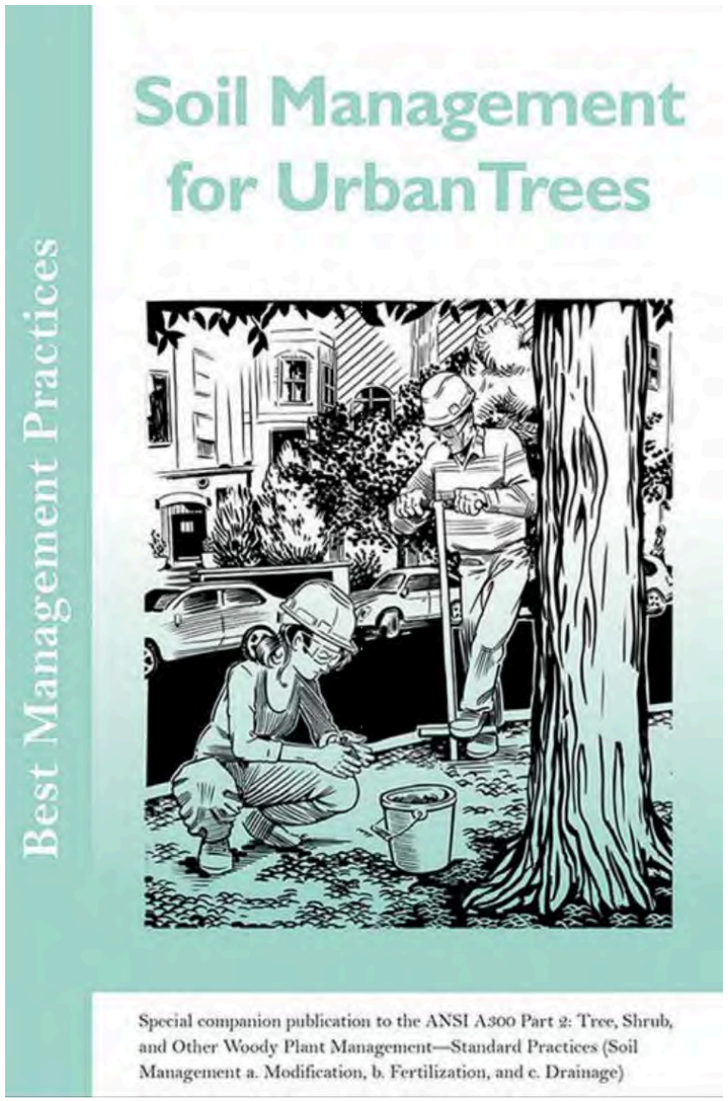
TARGET SOIL VOLUME FOR MY TREE:

3651.231250000000

109.5369375000000

https://www.greenblue.com/na/resources/soil-calculator/

# Soil and Street Trees




Bryant Scharenbroch, E. Thomas Smiley, and Wes Kocher
https://wwv.isa-arbor.com/store/product/863/cid/117/

# Historical Accumulation of Nonindigenous Forest Pests in the Continental United States

BioScience • *December 2010 / Vol. 60 No. 11*

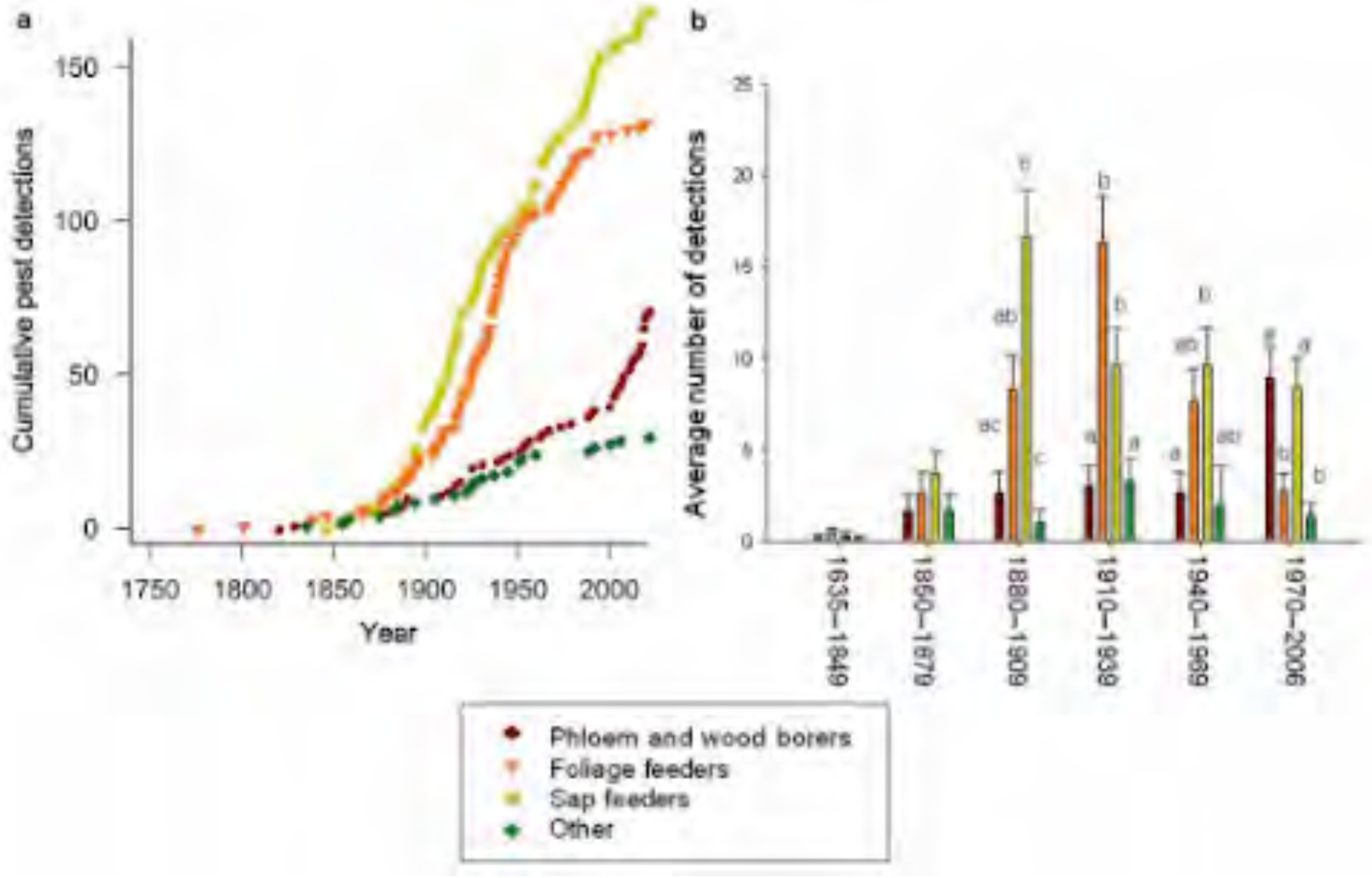
JULIANN E. AUKEMA, DEBORAH G. McCULLOUGH, BETSY VON HOLLE, ANDREW M. LIEBHOLD, KERRY BRITTON, AND SUSAN J. FRANKEL

*Nonindigenous forest insects and pathogens affect a range of ecosystems, industries, and property owners in the United States. Evaluating ter patterns in the accumulation of these nonindigenous forest pests can inform regulatory and policy decisions. We compiled a comprehensive list to assess the accumulation rates of nonindigenous forest insects and pathogens established in the United States. More than 450 nonindi insects and at least 16 pathogens have colonized forest and urban trees since European settlement. Approximately 2.5 established nonindi forest insects per year were detected in the United States between 1860 and 2006. At least 14% of these insects and all 16 pathogens have notable damage to trees. Although sap feeders and foliage feeders dominated the comprehensive list, phloem- and wood-boring insects and feeders were often more damaging than expected. Detections of insects that feed on phloem or wood have increased markedly in recent ye*

# Invasive Pests


www.dontmovewood.org

# Invasive Pests

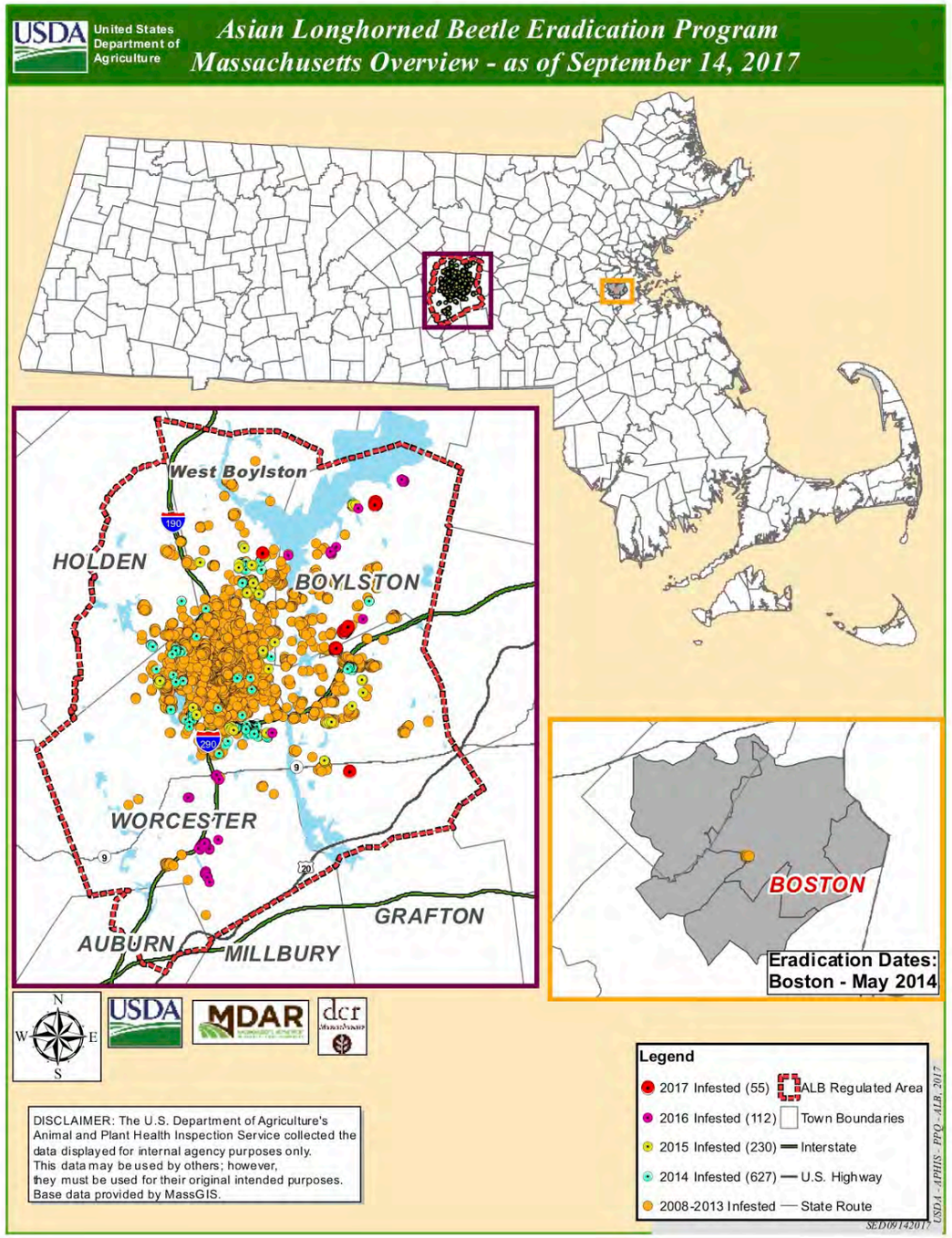


# Invasive Pests

Emerald Ash Borer (EAB)

| State | Base case | | |
|---|---|---|---|
| | Ash trees (1000s) | Ash trees treated or removed (1000s) | Cost (2009 $ millions) |
| Arkansas | 3299 | 492 | 240 |
| Connecticut | 556 | 11 | 4 |
| Delaware | 42 | 41 | 22 |
| Illinois | 5474 | 3497 | 2120 |
| Indiana | 944 | 527 | 333 |
| Iowa | 1149 | 611 | 321 |
| Kentucky | 263 | 228 | 127 |
| Maine | 968 | 531 | 255 |
| Maryland | 940 | 883 | 533 |
| Massachusetts | 811 | 46 | 18 |
| Michigan | 1719 | 353 | 230 |
| Minnesota | 1842 | 583 | 260 |
| Missouri | 4449 | 3111 | 1680 |
| New Hampshire | 518 | 259 | 121 |
| New Jersey | 1435 | 630 | 286 |
| New York | 2047 | 419 | 203 |
| North Carolina | 662 | 185 | 84 |
| Ohio | 1428 | 598 | 376 |
| Pennsylvania | 1850 | 1347 | 786 |
| South Carolina | 85 | 2 | 1 |
| Tennessee | 4485 | 811 | 336 |
| Vermont | 101 | 93 | 52 |
| Virginia and District of Columbia | 1334 | 1126 | 641 |
| West Virginia | 409 | 405 | 237 |
| Wisconsin | 1092 | 988 | 566 |
| Total | 37,902 | 17,777 | 9832 |

# Asian Longhorned Beetle

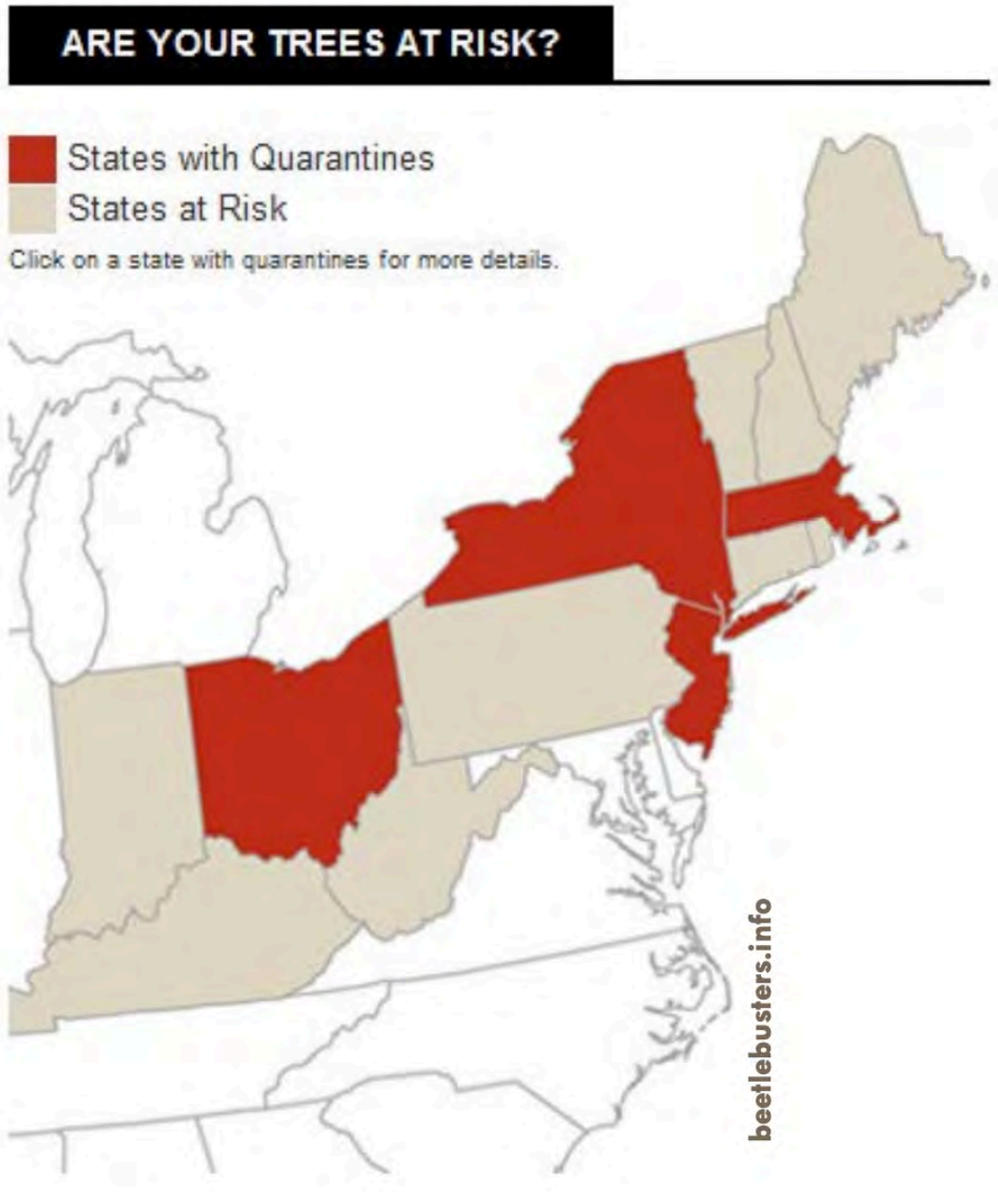


# Asian Longhorned Beetle

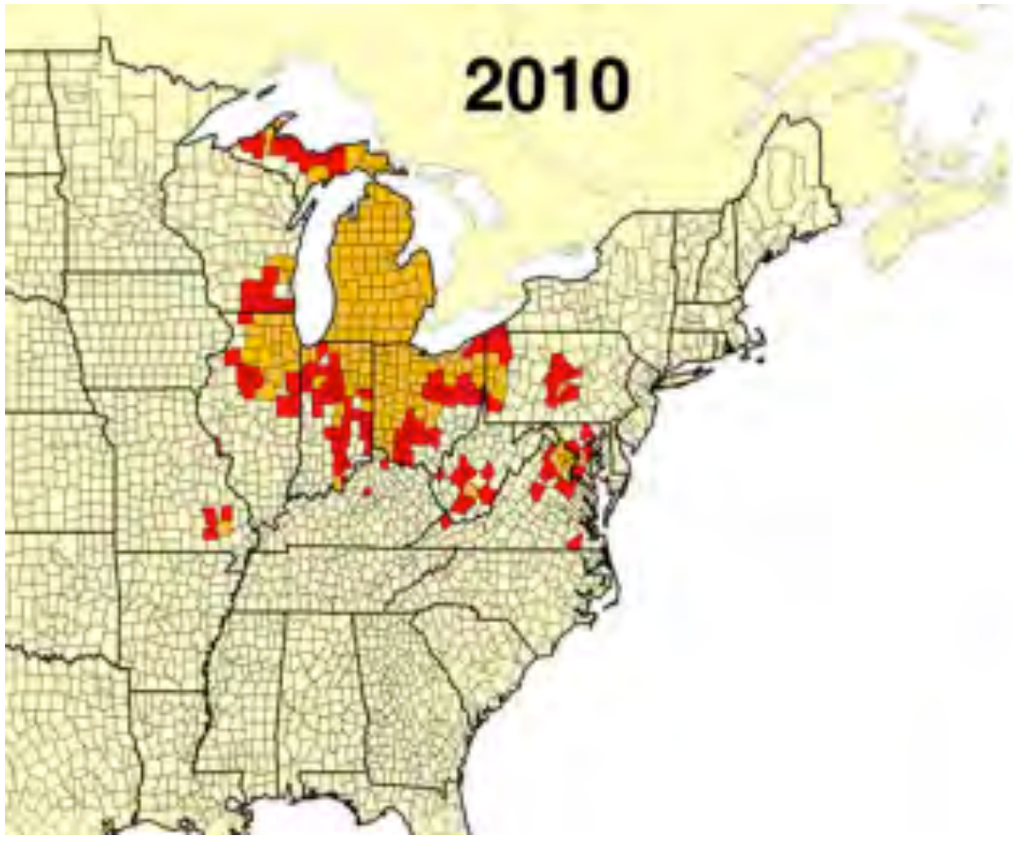
## TREES AT RISK

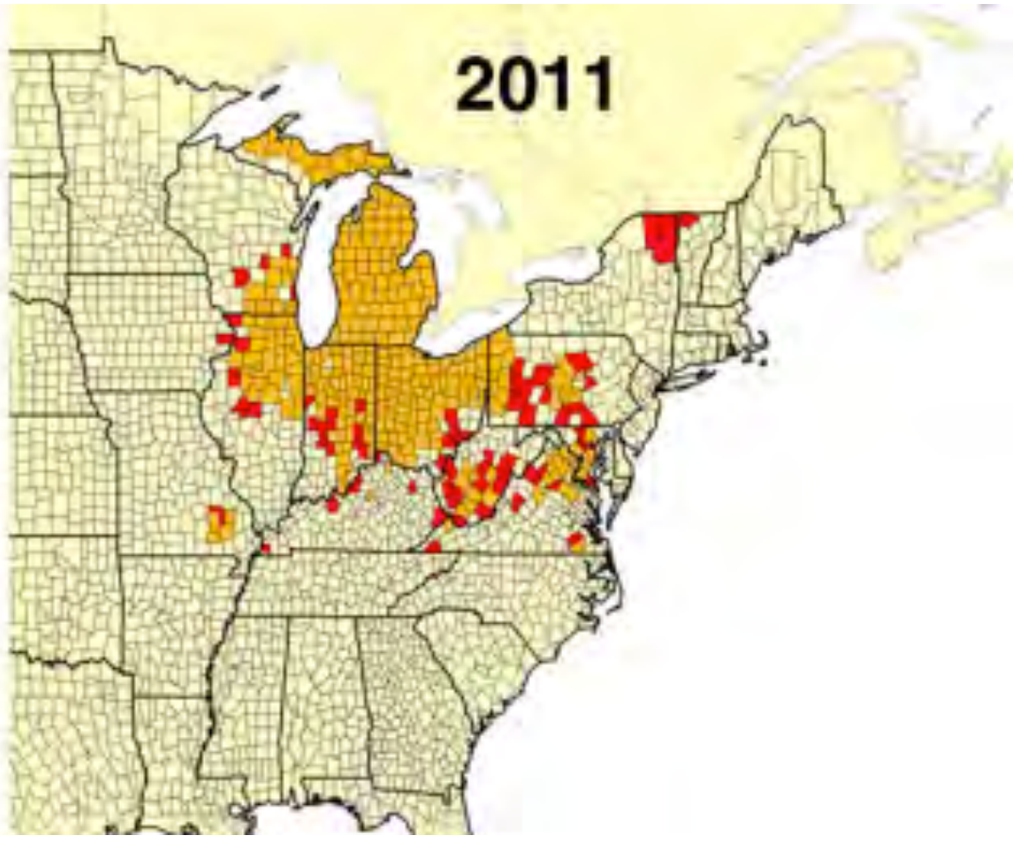
- Ash
- Birch
- Elm
- Goldenrain tree
- Hackberry
- Horsechestnut
- Katsura
- London Planetree
- Maple
- Mimosa
- Mountainash
- Poplar
- Willow

beetlebusters.info



# EAB Planning




http://www.emeraldashborer.info/about-eab.php

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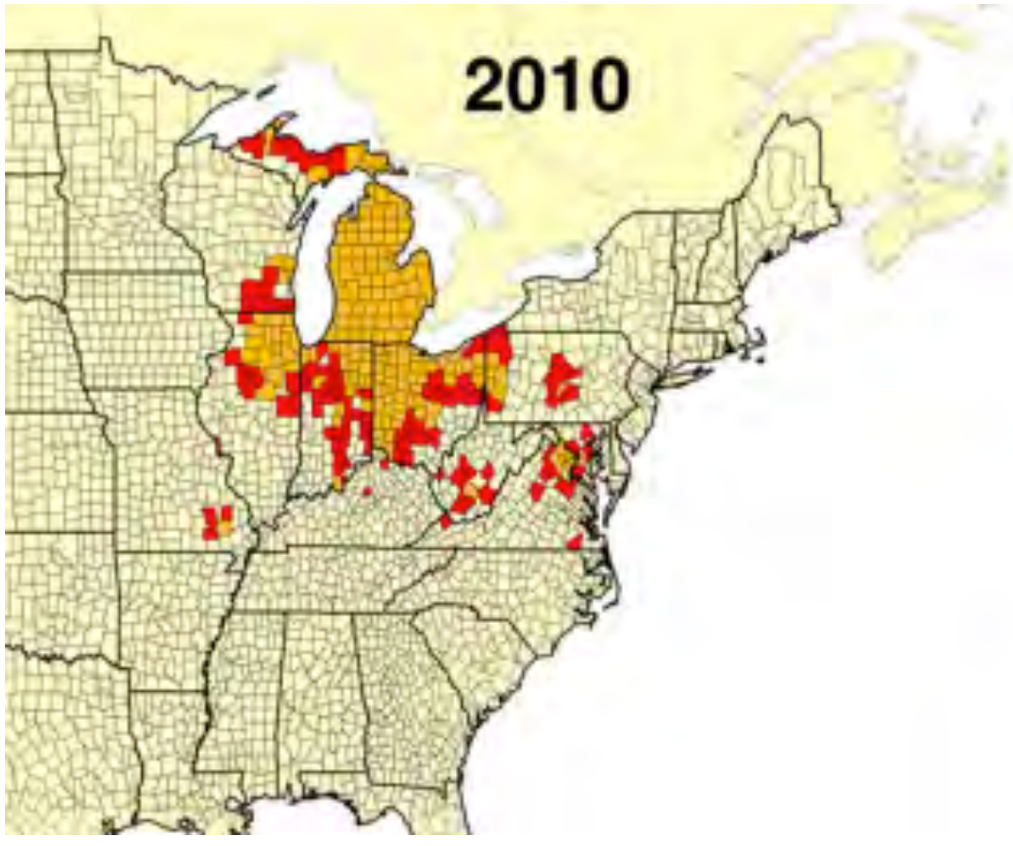


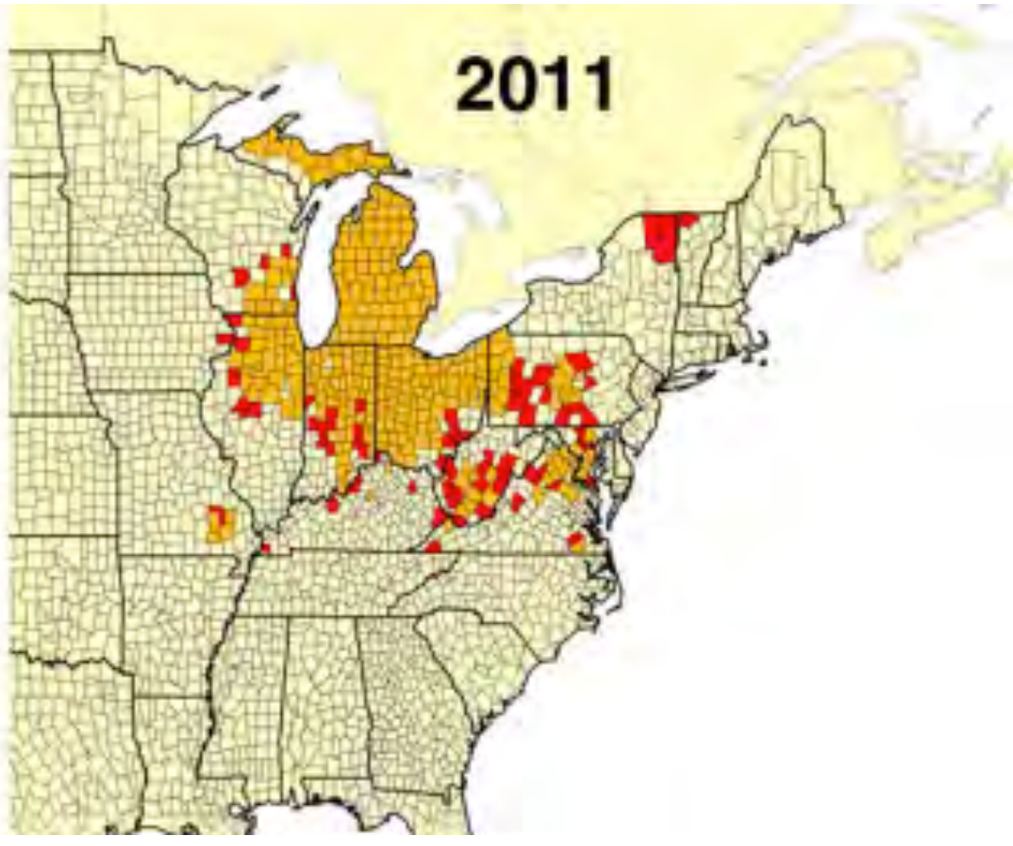


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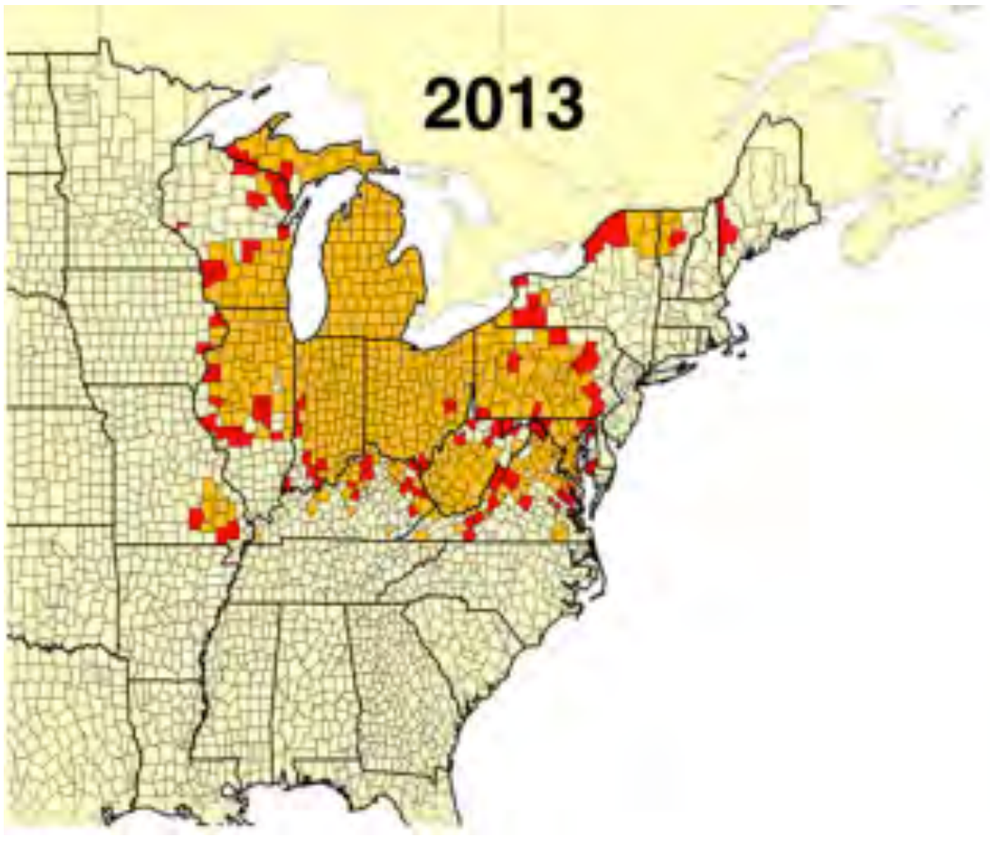


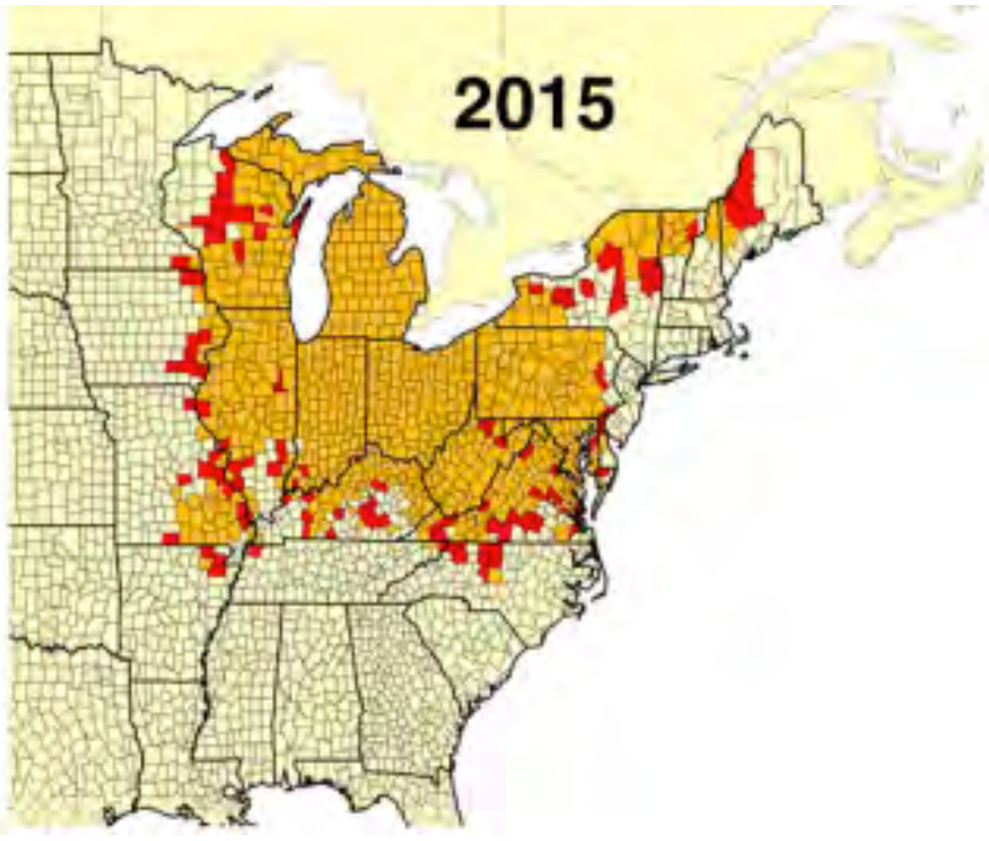


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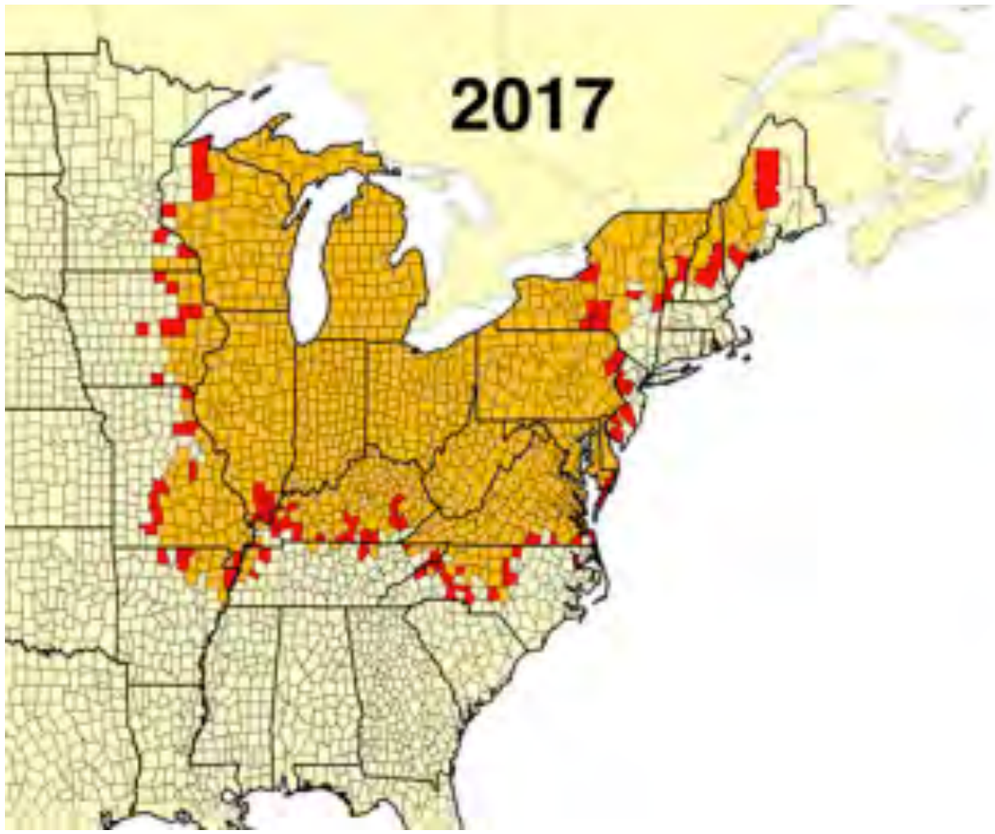


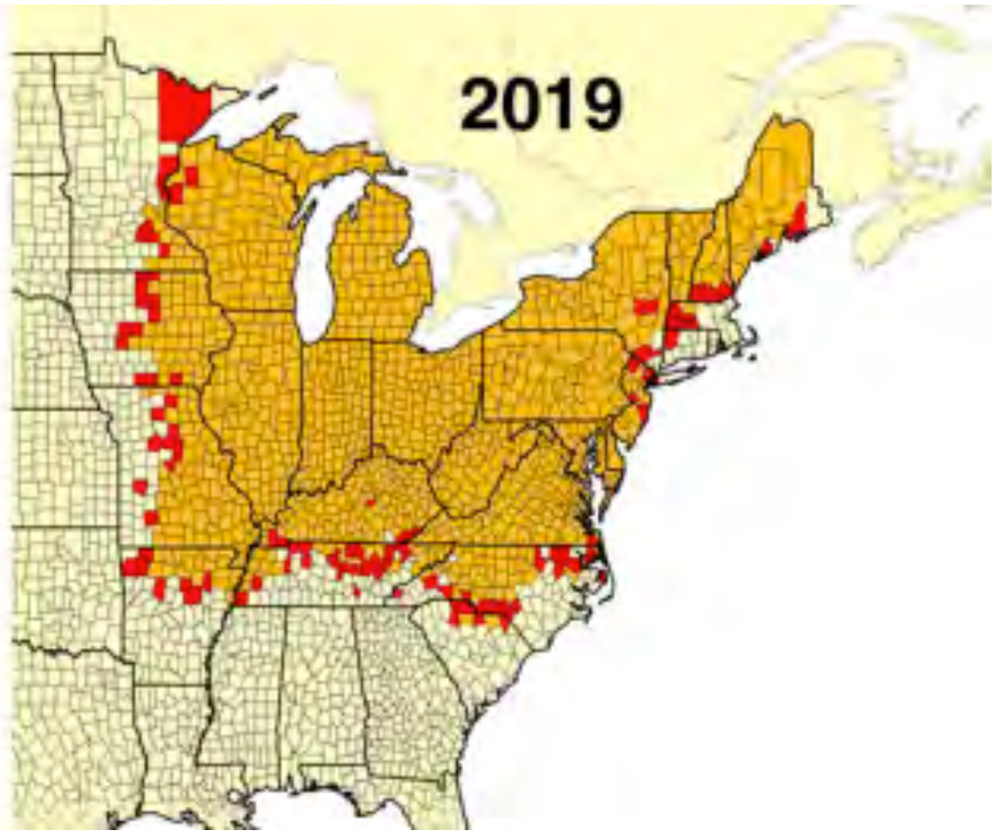


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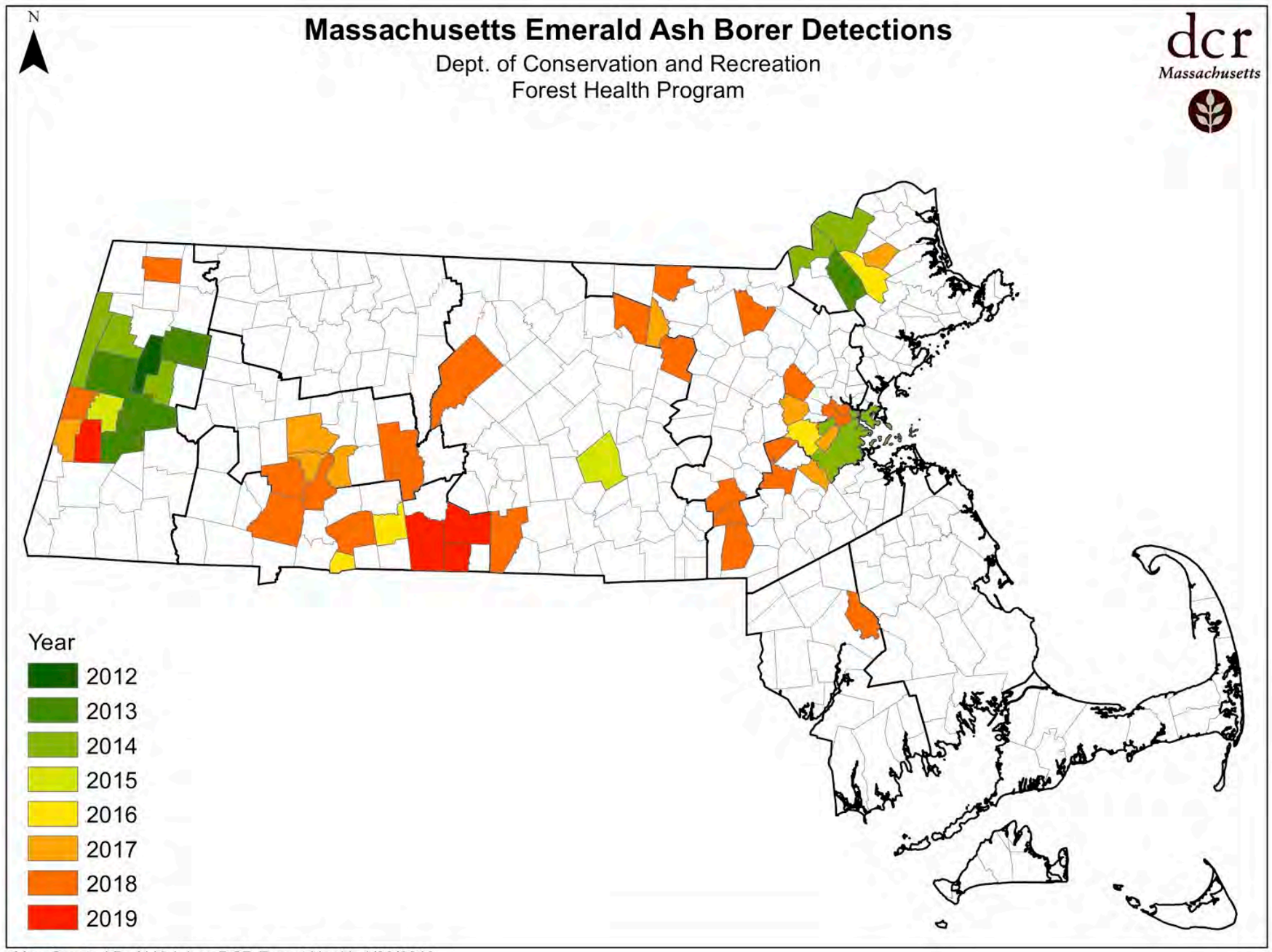


https://www.mass.gov/orgs/department-of-conservation-recreation

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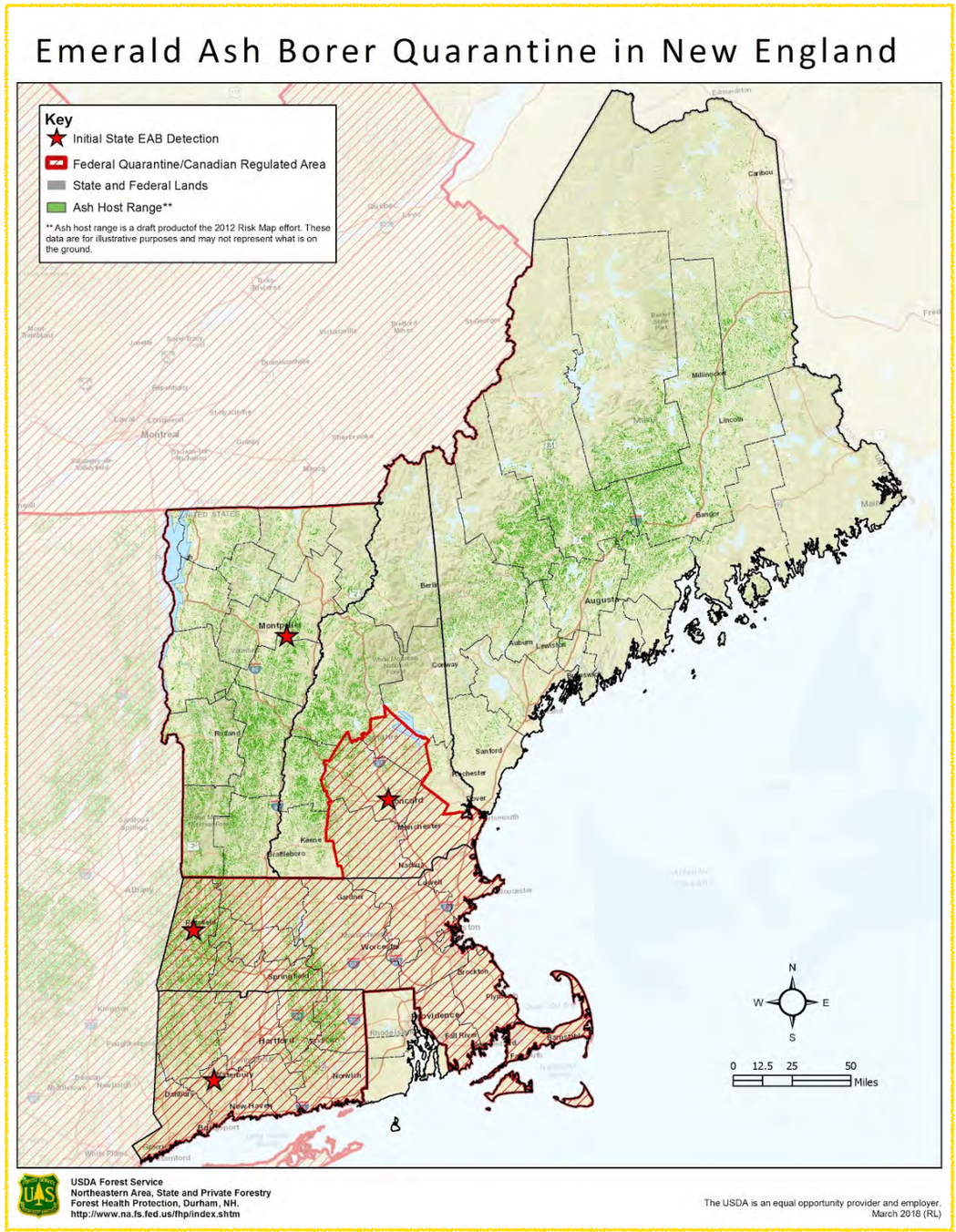


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# EAB Planning

## Emerald Ash Borer Online Course

**Developed by: Eric Wiseman, Sarah Gugercin, Dave Close, and Heather Boyd**

**Funded by: The USDA Forest Service, Forest Health Protection**

The course comprises of six training modules and is hosted on the National Plant Diagnostic Network (NPDN) Training Site. More information about this module


**To take the modules, you must first create a new account (free) on the NPDN website.**

Once you have registered with NPDN, you will be taken to the training module page where you will find the links to the six emerald ash borer modules (or click here).

If you plan to take this course for Continuing Education Units (CEU's), you must receive a 70% on all 5 post-tests.

Once you have successfully completed the tests, a link to the certificate of completion (.pdf) appears above your module scores.

**You must email or send this certificate to your organization in order to receive CEU's.**

Organizations that have approved this course for 1.5 CEU's:

### Related Links

- NPDN
- emeraldashborer.info
- VT Urban Forestry Gateway

### Horticulture Links

- Engaged Department Award
- Hahn Horticulture Garden
- Campus Greenhouses
- Giving to Horticulture
- Master Gardener Program
- Beautiful Gardens®

**Department of Horticulture**
Virginia Tech
301 Saunders Hall (0327)
Blacksburg, VA 24061
540-231-5451
**horticulture@vt.edu**

**Department Head:**
**Dr. J. Roger Harris**

https://www.hort.vt.edu/eab

# Threats to Street Trees


# Climate Change and Storm Events





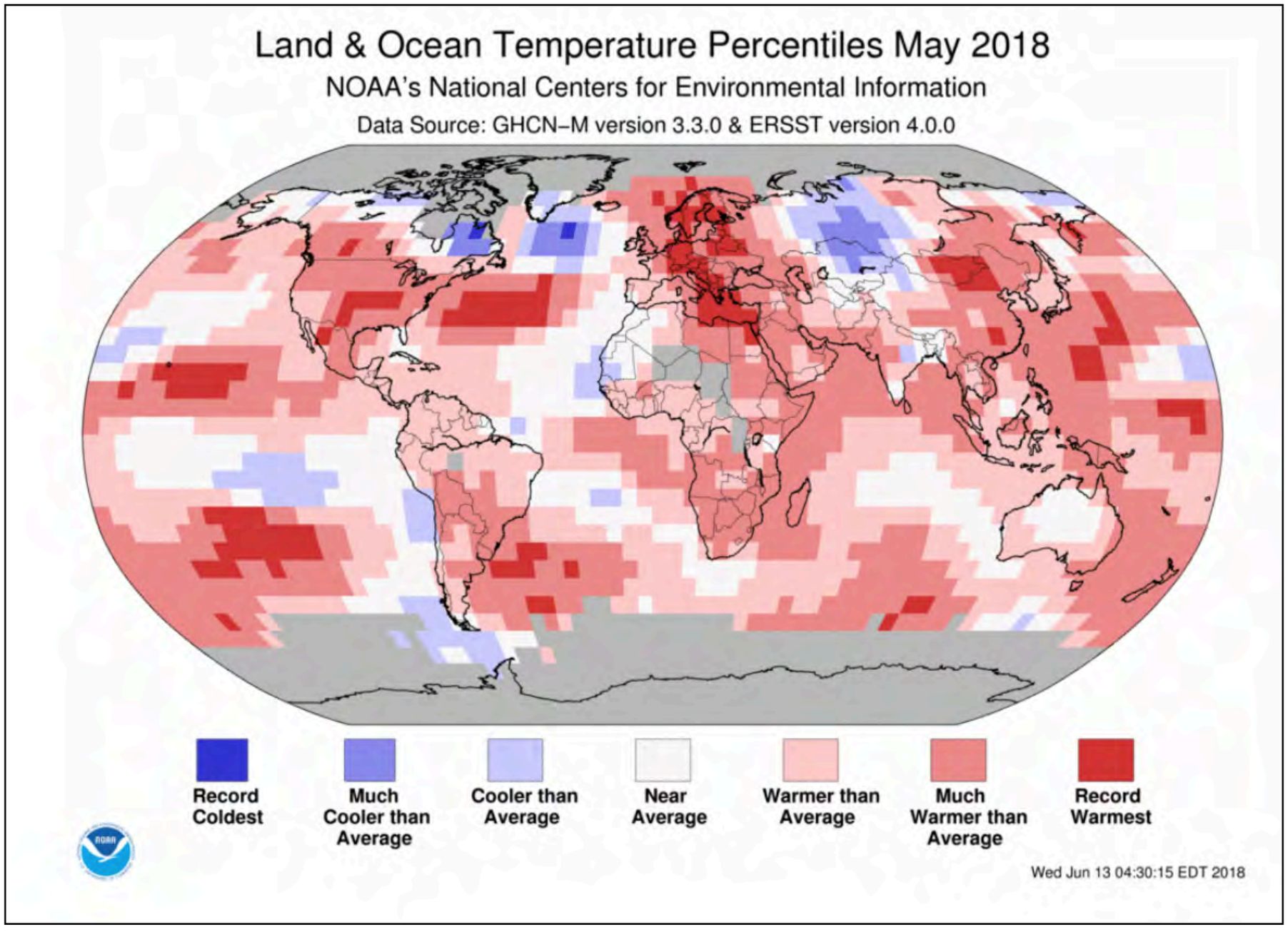
## Climate striker Greta Thunberg nominated for Nobel peace prize



ENVIRONMENT 14 March 2019


**Greta Thunberg was invited to speak at the World Economic Forum in Davos**
FABRICE COFFRINI/AFP/Getty Images

# Climate Change




www.noaa.gov

# Climate Change and Storm Events

TORNADO CENTRAL

## Rare January Tornadoes Touch Down in Ohio and Pennsylvania

By Jonathan Erdman · January 09 2019 10:45 AM EDT · weather.com

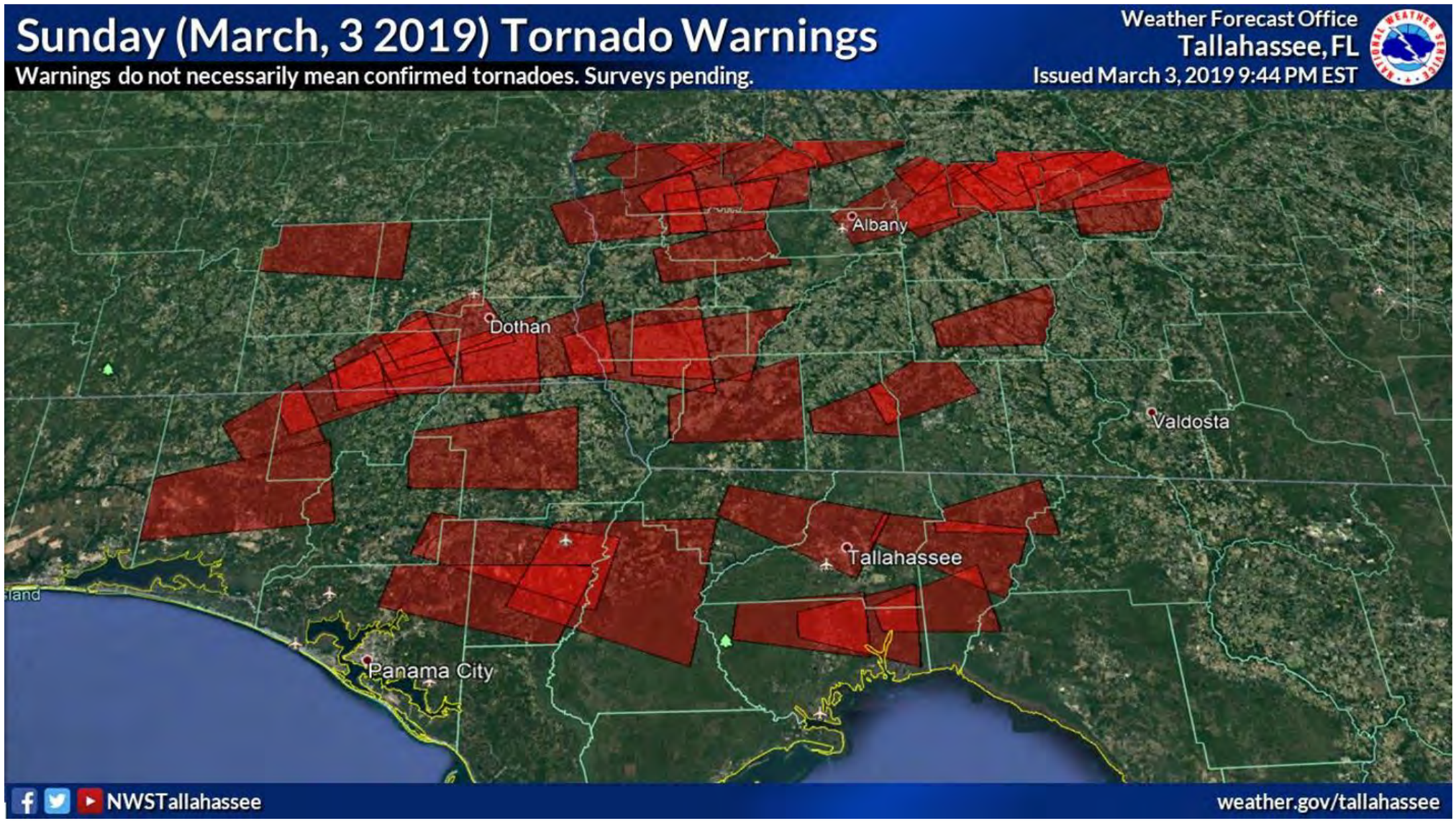

01:55

**Tornado Victims Face Their Losses**

The Weather Channel meteorologist Reynolds Wolf talked to victims of Sunday's deadly tornadoes in Alabama.

http://www.weather.com

# Climate Change and Storm Events




March 3, 2019 - Tallahassee, FL

http://www.noaa.gov

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March 3, 2019 - Tallahassee, FL

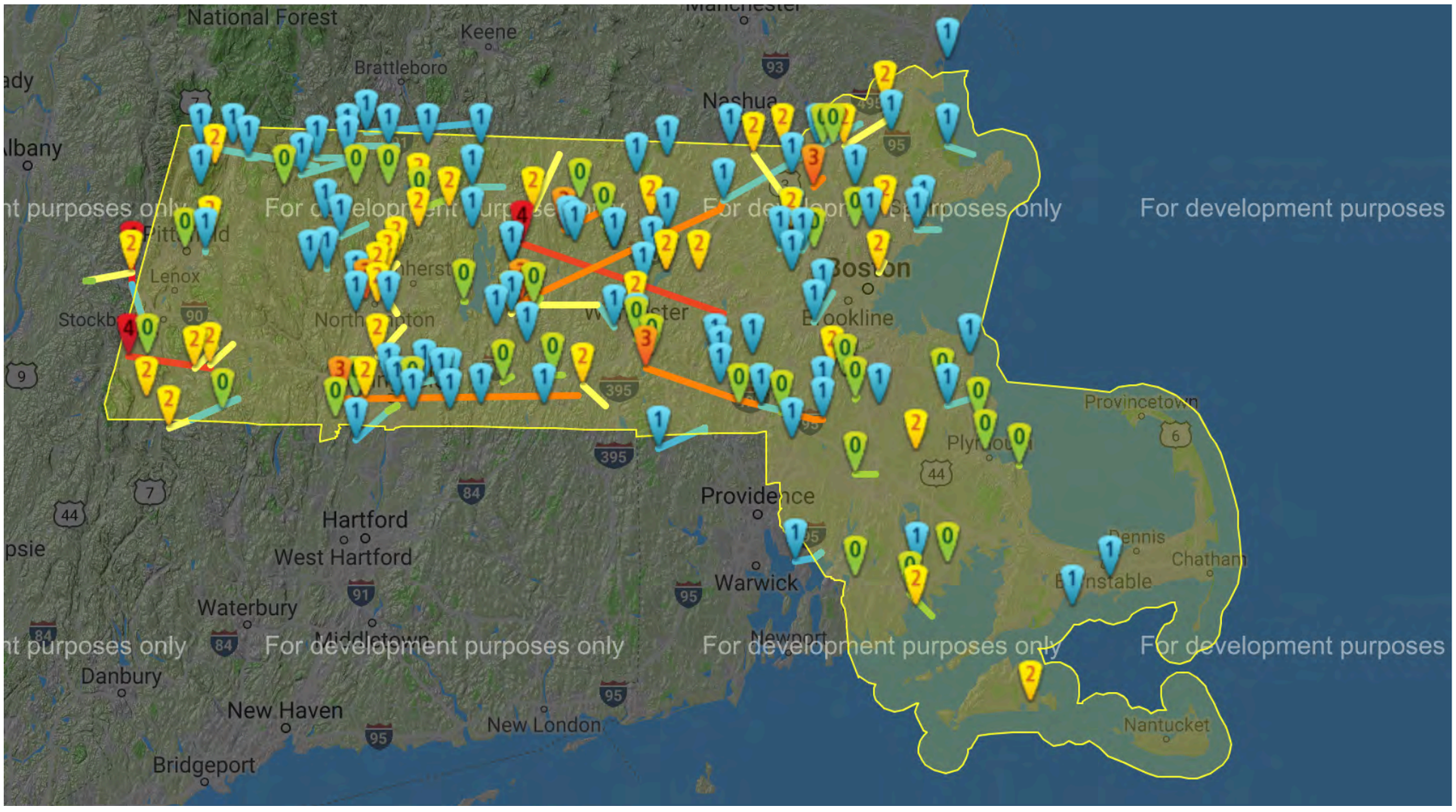
http://www.weather.com

# Climate Change and Storm Events

March 3, 2019 - Lee County, AL

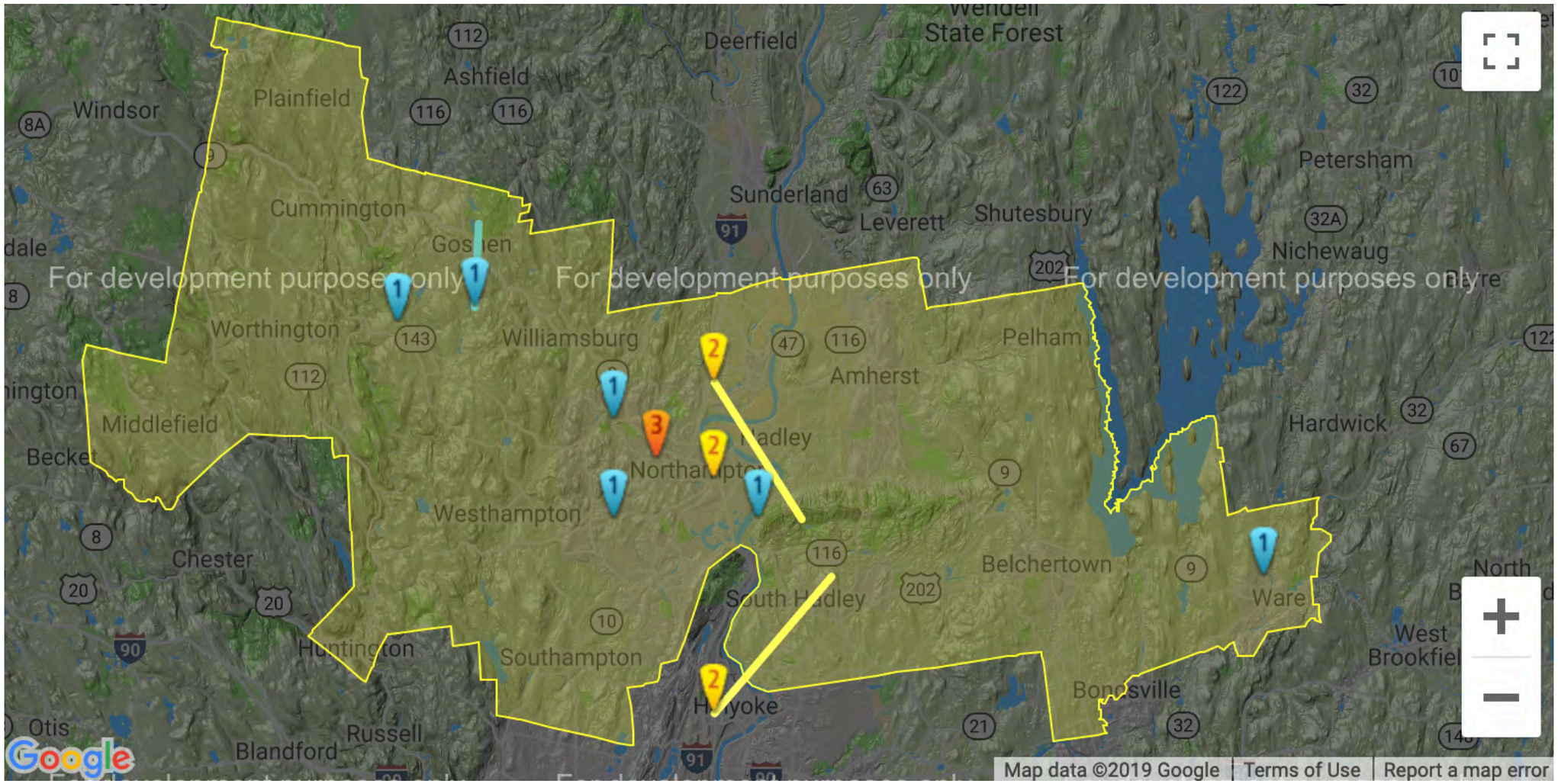
http://www.weather.com

# Climate Change and Storm Events




Massachusetts 1950 - 2019
http://www.tornadohistoryproject.com/

# Climate Change and Storm Events




Hampshire County 1950 - 2019
http://www.tornadohistoryproject.com/

# Climate Change and Storm Events

"All the News That's Fit to Print"

The New York Times

Late Edition
New York: Today, mostly sunny, breezy, warm. High 86. Tonight, clear. Low 65. Tomorrow, mostly sunny, breezy, warm. High 87. Yesterday, high 72, low 62. Details, page C16.

VOL. CXLIV . . No. 50,078 NEW YORK, WEDNESDAY, MAY 31, 1995 60 CENTS

## REPORT TO CLINTON HAS A MIXED VIEW ON MINORITY PLANS

A POLITICAL ASSESSMENT

Principle of Affirmative-Action Is Backed but Some Efforts Are Said to Be Unfai

By ROBERT PEAR

WASHINGTON, May 30 — In a sweeping review of the Government's affirmative-action programs, Clinton Administration officials have concluded that most hiring and other preferences based on race or sex are justified in employment and education. But they found problems with some purchasing programs that reserve Federal contracts for companies owned by blacks or women.

A confidential report prepared for the President by Administration officials catalogues numerous forms of affirmative action and analyzes the reasons for "white male resentment" of those practices.

The report, prompted by Republican criticism of such programs, lays out standards for acceptable affirmative action: race or sex can be considered as "one among several factors." If numbers are used they should be "genuine goals rather than straitjackets or quotas." Affirmative-action plans should be reviewed periodically to see if they are still needed. And the rights of "bystanders," including white men, must be respected.

Administration officials said Mr. Clinton would probably announce his conclusions in a broad thematic speech not yet scheduled, leaving agencies to disclose details of any changes in their programs. If Mr. Clinton proposes changes, they are likely to become a starting point for Republicans in Congress who want to go much further, possibly repealing programs that they say discriminate against white men.

When Mr. Clinton ordered the review in February, he evidently hoped to assuage the concerns of white men. But he and his advisers quickly concluded that they would alienate many blacks, Hispanic Americans and women if they pulled back too far in their support for affirmative action.

A senior Administration official involved in the review said, "We concluded early on that the politics

Continued on Page B6, Column 4



A squatter on a rooftop taunted police officers during an action yesterday that ended with the squatters being evicted from two buildings on East 13th Street in Manhattan. The squatters built barricades of old furniture.

Associated Press

## Riot Police Remove 31 Squatters From Two East Village Buildings

By SHAWN G. KENNEDY

With a show of force befitting a small invasion, the Police Department seized two East Village tenements yesterday, overwhelming a fifteen-hour effort to retake the buildings for nearly nine months.

Using a tankliike armored vehicle and carrying riot gear, hundreds of officers moved in in the city-owned buildings to try to end years of occupation by the squatters, who argued that their long-term presence and efforts to rehabilitate the once-abandoned buildings gave them the right to stay.

The takeover of the two buildings at 541 and 543 East 13th Street occurred about midmorning, many hours after the police first arrived and were met by makeshift barricades consisting of od furniture, appliances and trash containers.

Well before dawn the block between Avenue A and Avenue B was filled with dozens o squatters and their sympathizers, who danced, taunted officers and banged on trash-can lids and street signs. The site, Solity Par blocks from Tompkins Square Park, wsere a violent clash between the police and protesters occurred in the summer of 1988.

The police had also expected a violent conclusion to the eviction process. But while the police had to break through doors that the squatters had welded shut, in the end most of the squatters yielded peacefully. The police arrested 31 people, many of whom tried to form a human chain in front of the buildings, but there were no serious injuries.

The show of force was ordered by city officials in an effort to insure the safety of Buildings Department workers who actually carried out the evictions. Although the city has for months been seeking a court decision that would give them the right to retake five buildings on the block, officials was a more limited ruling last week saying they could evict people from the two buildings because inspectors felt they were in danger of collapse.

At a news conference in the afternoon, Mayor Rudolph W. Giuliani defended the effort. "The fact is you can't occupy city buildings and not

Continued on Page B2, Column 1

## U.S. SET TO OFFER AID TO REINFORCE U.N. BOSNIA TROOPS

### Serbs Now See Peacekeepers As the Enemy

By ROGER COHEN

SARAJIVO, Bosnia and Herzegovina, May 30 — The Bosnian Serbs edged closer today to a formal state of war with United Nations peacekeepers, declaring them an enemy, annulling all agreements with them and threatening the life of a spokesman.

The defiant statement from the Serbs, who released 4 French soldiers but continued to hold more than 320 peacekeeping troops hostage, came as British forces arrived in the Croatian port of Split with a mission to reinforce the United Nations mission in Bosnia by providing it with artillery for the first time.

About 2,000 United States marines and a French aircraft carrier moved closer to the Adriatic coast, 130 miles southwest of Sarajevo, in a show of force that seems unlikely to lead to any immediate action but underscored the gravity of the hostage crisis.

A state of extreme tension prevailed in Sarajevo, with the city's streets largely deserted, water and electricity supplies cut, NATO fighter planes circling overhead and jumpy French soldiers at United Nations base pointing machine guns at any approaching vehicle.

In taking peacekeepers hostage as insurance against further attack since NATO twice bombed a Serbian ammunitions dump last week, the Serbs have also seized at least 4 United Nations tanks, 12 armored personnel carriers and more than 25 armored jeeps. They are thus able to dispatch themselves as peacekeepers with ease.

"They've got what they need to look like a company of peacekeepers," said one United Nations official. "It's very worrying."

Meeting in their stronghold of Pale, nine miles from Sarajevo, the political and military leaders of the separatist Serbs issued a statement accusing he United Nations and NATO of "flagrant interference in

Continuation Page A8, Column 1

## HINTS LARGER ROLE

Door Left Open to Send American Soldiers to Help U.N. Regroup

By ALISON MITCHELL

WASHINGTON, May 30 — United States officials said today that the Clinton Administration was prepared to offer military equipment and logistical support to reinforce United Nations forces in Bosnia. They left open the possibility that Washington might contribute troops for a limited mission to help regroup and move the United Nations forces into safer, more fortified positions.

The comments — carrying the strongest suggestion of a broader United States role in Bosnia to date — came as Western powers began examining ways to strengthen the United Nations force in Bosnia, which now numbers 22,500. The examination comes after NATO air strikes against Bosnian Serb ammunition depots last week, which in turn led to the seizure of more than 320 peacekeepers as hostages by the Serbs.

For more than two years, the Clinton Administration has limited its military role in Bosnia to participation in NATO air strikes and air drops of food and relief supplies. The White House has talked about the use of American troops in only two circumstances: to help a withdrawal of United Nations troops or to enforce a peace agreement by the warring parties.

American officials today repeated the President's opposition to sending troops to join the United Nations operation. But tonight on the "MacNeil/Lehrer News Hour" on PBS, when asked what role 2,000 marines already sent to the Adriatic might have, Defense Secretary William D. Perry said, "They could be part of an extraction operation, if the U.N. called for assistance in excracting some part of the U.N. from a dangerous situation and they came to NATO and asked for the assistance."

Asked if this could lead to American ground forces in Bosnia, he said: "I would say so, except for one one contingency. Even in that commitment, it has to be part of a NATO operation under NATO command and control and we would go to the Congress for support as that before we did."

Earlier in the day the White House spokesman, Michael D. McCurry, said the United States was prepared "to provide a variety of resources

Continued on Page A8, Column 5

## Behind 'Patriots,' A Shared Distrust

Many people in the right-wing Patriots Movement share an all-or-nothing view of America: that government officials are letting constitutional freedoms erode. Many of themhave something else in common — a single, profound experience that helped form the prism through which they see a world of conspiracies.

Article, page A18.

Continued on Page D6, Column 4

## When Young Break the Law, A Town Charges the Parents

By TIMOTHY EGAN

SILVERTON, Ore., May 25 — Municipal Court in this Willamette Valley town of mid-style rhythms is being visited by a new class of offenders: mothers and fathers of the children of Silverson. They are charged, essentially, with being bad parents.

"My son was caught with a cigarette in his mouth," Carlie W. Breck, one of the first of a score people to be cited under this town's Parental Responsibility Law, told the court recently. "That makes me guilty, I guess."

Another parent, Anita Beck was cited after her 15-year-old son was picked up for shoplifting cologne. But unlike Mr. Brock, who agreed to attend "parenting" class as his penance, Mrs. Beck strongly objected to the Silverton ordinance itself. She filed a lawsuit, saying it was unconstitutional to be hauled into court for an offense that somebody else had committed.

Oregon, the first state in the nation to ratiom public health care and to legalize assisted suicide, is now pioneering in juvenile justice. In January, the town of Silverton, population 6,266, passed one of the nation's strongest parental responsibility measures, holding parents accountable for offenses committed by their children under 18.

And this week, the Oregon Legislature passed an act, largely modeled after the Silverton ordinance, that will require parents to keep their children from law breaking — or face a judge who could fine them up to $1,000 or sentence them to classes in parenting, or alcohol or drug abuse.

Variations of the Silverton ordinance are also under consideration in several hundred cities around the nation, part of a movement that holds that most parental supervision is at the core of juvenile crime. What

Continued on Page B7, Column 1

## NO SIGN IN JAPAN OF DEAL ON TRADE

Top Official Says Tokyo Has Run Out of Compromises

By DAVID E. SANGER

TOKYO, May 30 — The senior Japanese politician managing the country's increasingly contentious trade dispute with the United States said today that he had already made "the maximum possible concessions" to Washington, contending that the planned American sanctions would add to job losses in Japan.

The official, Ryutaro Hashimoto, is the Minister of International Trade and Industry and is widely viewed as a leading candidate to become the next prime minister. In a lengthy interview in his office today, Mr. Hashimoto also contended that the Clinton Administration had reneged on previous understandings regarding how the two countries would handle negotiations over automobiles and auto parts.

At the same time, other senior Government officials in Tokyo have indicated that they were all but resigned to seeing the Administration's punitive trade tariffs against $5.4 billion in luxury car imports go into effect as scheduled on June 28. Officials say they expect little or no progress on the issue when President Clinton meets Prime Minister Tomiichi Murayama in mid-June in Canada at the meeting of the seven leading industrial countries. They also say they are pessimistic that talks planned for late June will resolve the dispute before the sanctions bite.

In contrast to past trade disputes with Washington, this time Tokyo appears determined to press its case



Associated Press



Alan E. Schreiber for The New York Times




The New York Times

## In Berkshires, Death and Awe

A tornadothat struck Great Barrington, Mass., on Monday cut a swath of destruction as wide as 700 yards through the Berkshire Hills, killing at least three people. The storm ripped off roofs, overturned headstones and flattened the Great Barrington Fairgrounds. The three people who died, two students and a teacher from a school for emotionally disturbed youth, were killed when their car was lifted off Route 23 and tossed 600 feet into a forest. A seat from the carlanded amid the debris of fallen trees at left. Page A14.

## School Safety Chief Resigns, Urging Job Be Done by Police

By MARIA NEWMAN

After several incidents in the last week involving misconduct by school safety officers in New York City, Zachary Tumin, the executive director of the Division of School Safety, resigned yesterday, saying that the schools lacked the resources to police themselves and that the Police Department should take over the job.

Mr. Tumin turned in his resignation minutes before he was to be suspended for what Schools Chancellor Ramon C. Cortines called a lack of leadership in improving the professional standards of the 2,600 safety officers who patrol the city's 1,100 schools.

In his call for a police takeover, Mr. Tumin joined Mayor Rudolph W. Giuliani, who said last week that the security officers should become a police division — though they would remain unarmed — because of rising violence reported in schools. The resignation is certain to set off a public debate about who should police the schools. The Board of Education president, Carol A. Gresser, said last week that she opposed the Mayor's call for a takeover.

Mr. Tumin's resignation was prompted by the arrest yesterday of Roberto Gomes, Mr. Gomez, 33, a guard at the Newtown High School

Continued on Page B4, Column 4



Alan E. Schreiber for The New York Times




The New York Times

## In Berkshires, Death and Awe

A tornadothat struck Great Barrington, Mass., on Monday cut a swath of destruction as wide as 700 yards through the Berkshire Hills, killing at least three people. The storm ripped off roofs, overturned headstones and flattened the Great Barrington Fairgrounds. The three people who died, two students and a teacher from a school for emotionally disturbed youth, were killed when their car was lifted off Route 23 and tossed 600 feet into a forest. A seat from the carlanded amid the debris of fallen trees at left. Page A14.





## INSIDE





Great Barrington, MA - May 30, 1995

http://www.nytimes.com

# Climate Change and Storm Events


Great Barrington, MA - May 30, 1995

http://www.tornadohistoryproject.com/

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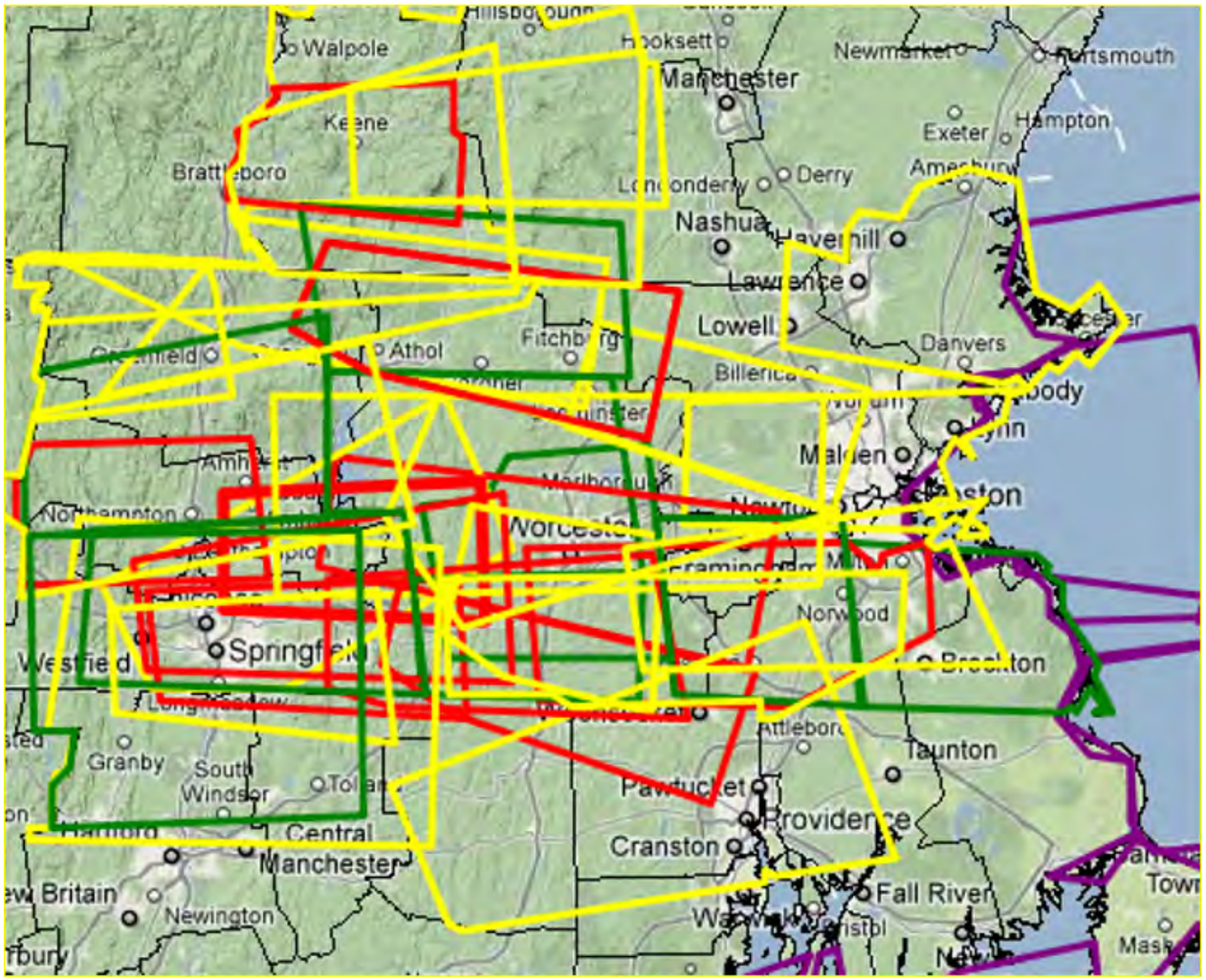
# Climate Change and Storm Events





Springfield, MA - June 1, 2011

# Climate Change and Storm Events


June 1, 2011

http://www.masslive.com

# Climate Change and Storm Events

Monson, MA - June 1, 2011

http://www.masslive.com

# Climate Change and Storm Events

Springfield, MA - June 1, 2011

http://www.masslive.com

# Climate Change and Storm Events

Springfield, MA - June 1, 2011

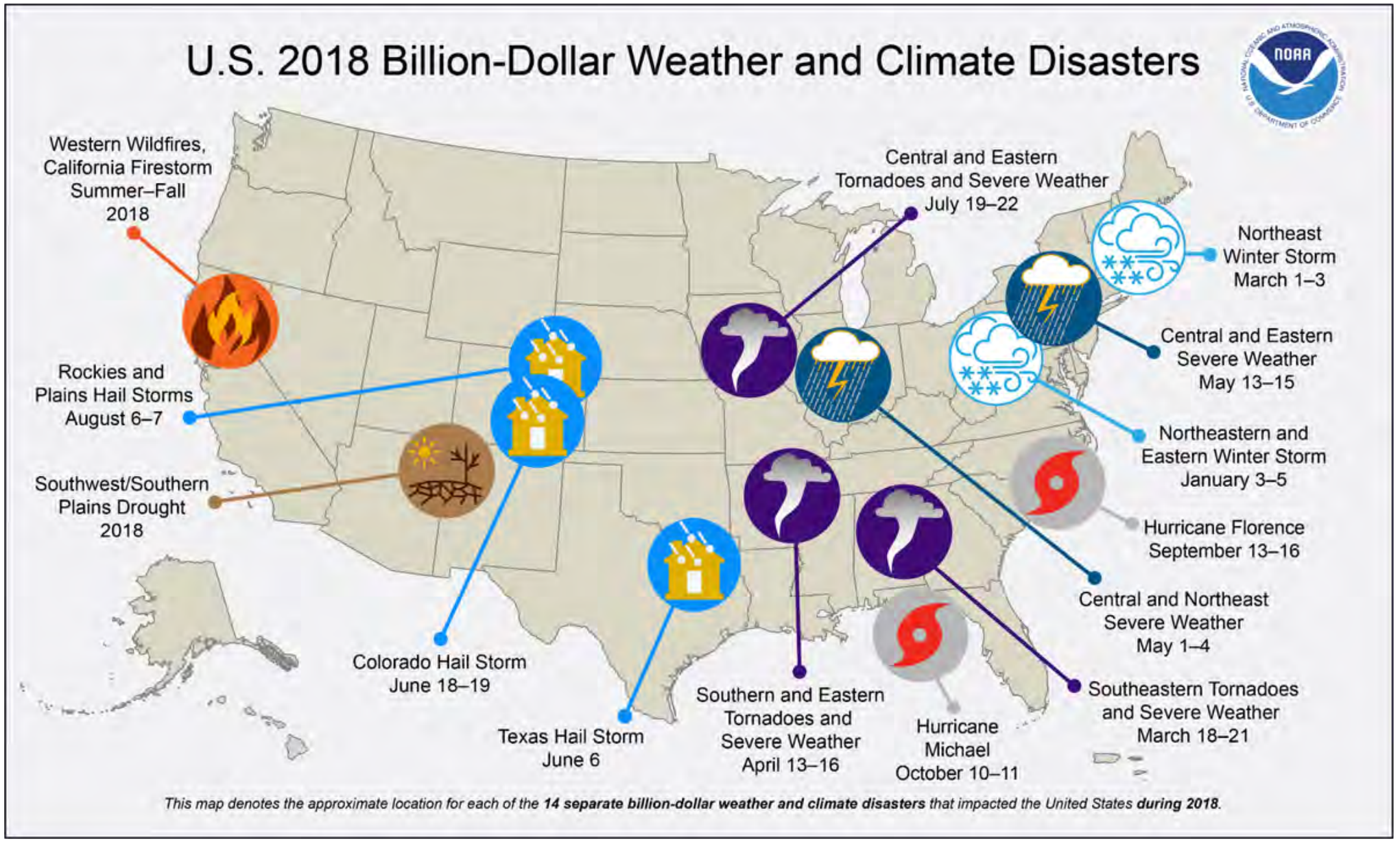
http://www.masslive.com

# Climate Change and Storm Events

After centuries of reclaiming land, paving wetlands and building on floodplains, the Greater New York metro area was returned to its natural footprint, at least temporarily, by Hurricane Sandy in 2012.

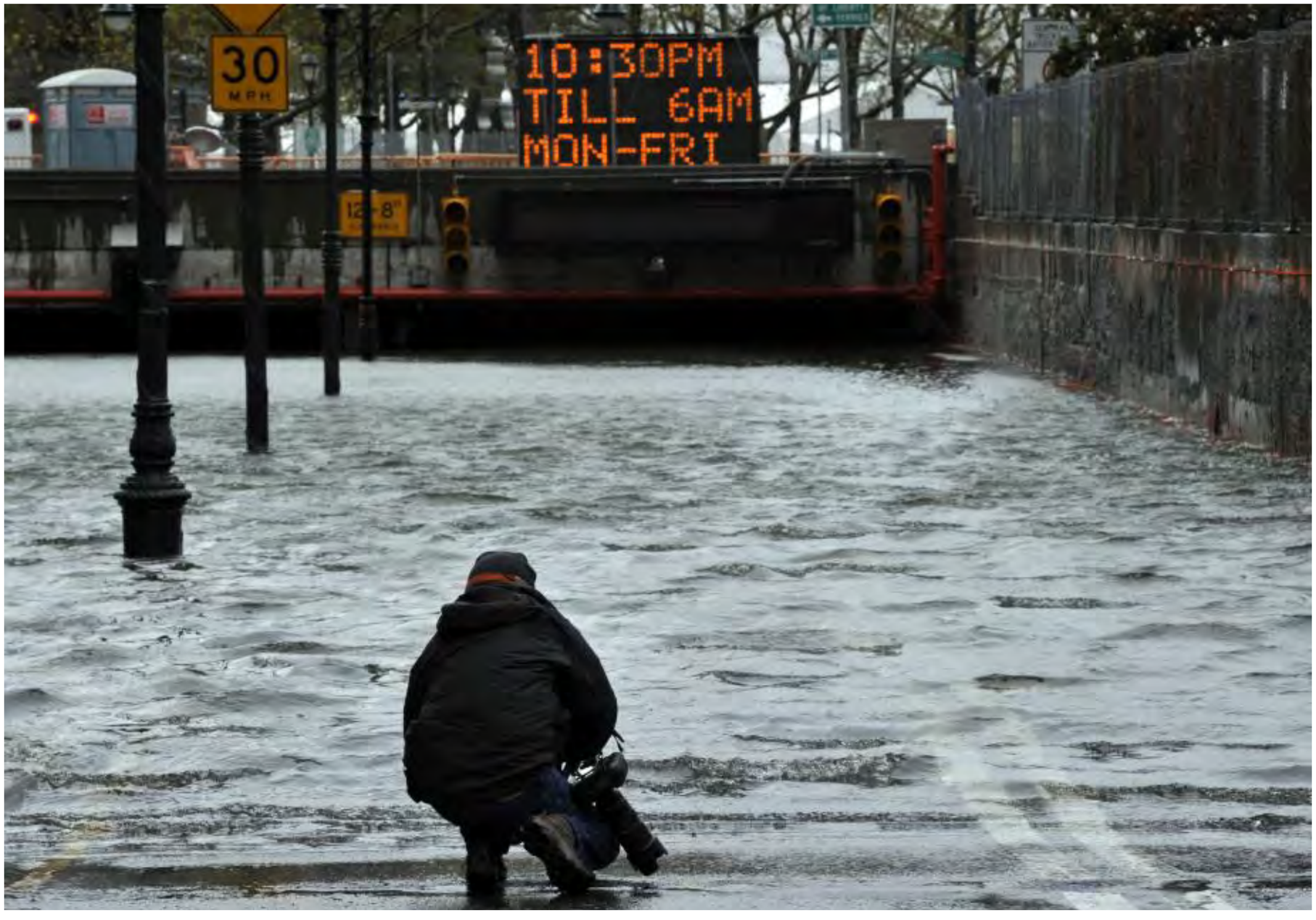
New York photo: Cameron Davidson/Corbis; New York map: G. Schlegel courtesy of wardmaps llc; Hurricane Sandy: NASA Earth Observatory/Robert Simmon/NASA/NOAA/GOES Project Science. Illustration by Dan Bishop/discover

# Climate Change and Storm Events




http://www.noaa.gov

# Climate Change and Storm Events




New York City, October 30, 2012

# Climate Change and Storm Events

## Deluge causes flooding, shuts road in Berkshires

**The Green River rages on Friday at the bend by Mount Hope Park in Williamstown. Massive breaks of ice dammed along the shores as the raging waters swept tree trunks, ice chunks and other debris downstream.**

JENN SMITH - THE BERKSHIRE EAGLE

Berkshire Eagle, January 12, 2018

# Climate Change and Storm Events

New York City, October 30, 2012

http://www.nytimes.com

# Climate Change and Storm Events

## Adams Declares State of Emergency to Deal With Flood Damage

By Jack Guerino

*iBerkshires Staff*

03:49AM / Friday, October 05, 2018

**Print Story** | **Email Story**

ADAMS, Mass. — The Selectmen declared a state of emergency to allow for deficit spending to mitigate damage caused by mid-September rainstorms.

The board unanimously voted the declaration at Wednesday's meeting with hopes that it would also pave the way for possible state funding needed to address the near $2 million in damages.

"It is a document and whether we use it to its fullest or not it opens the door for state aid," Emergency Management Director Richard Kleiner said. "It's a heads-up precautionary thing and some people may say it is like crying wolf, but I rather cry wolf and be prepared."


**Emergency Management Director Richard Kleiner tells the board he'd rather 'cry wolf' with the emergency declaration than miss it out potential state funding.**

On Sept. 12 and 18, the town was hit by severe storms that left substantial flooding damage on Lime, Davis, North Summer, and Charles streets, among others.

Berkshire Eagle, October 5, 2018

# Climate Change and Storm Events

THE WALL STREET JOURNAL.

U.S. Edition ▾ | March 12, 2019 | Print Edition | Video



U.S.

## Irene's Floods Prove Deadly as Water Continues to Rise

*By Jerry A. DiColo, Cameron McWhirter and Emily Steel*

August 30, 2011

Hurricane Irene never packed the catastrophic winds of more famous tropical storms, but by the time its remnants finally blew into Canada Monday, it had proved to be a slow killer, leaving behind a vast swath of shattered communities and dozens of fatalities.

After churning up the Eastern seaboard and then pounding the suburbs of New York City, where the storm made landfall as a weakening hurricane Sunday morning, Irene unleashed torrential rains in Vermont. Rivers overflowed their banks, washed out roads and bridges

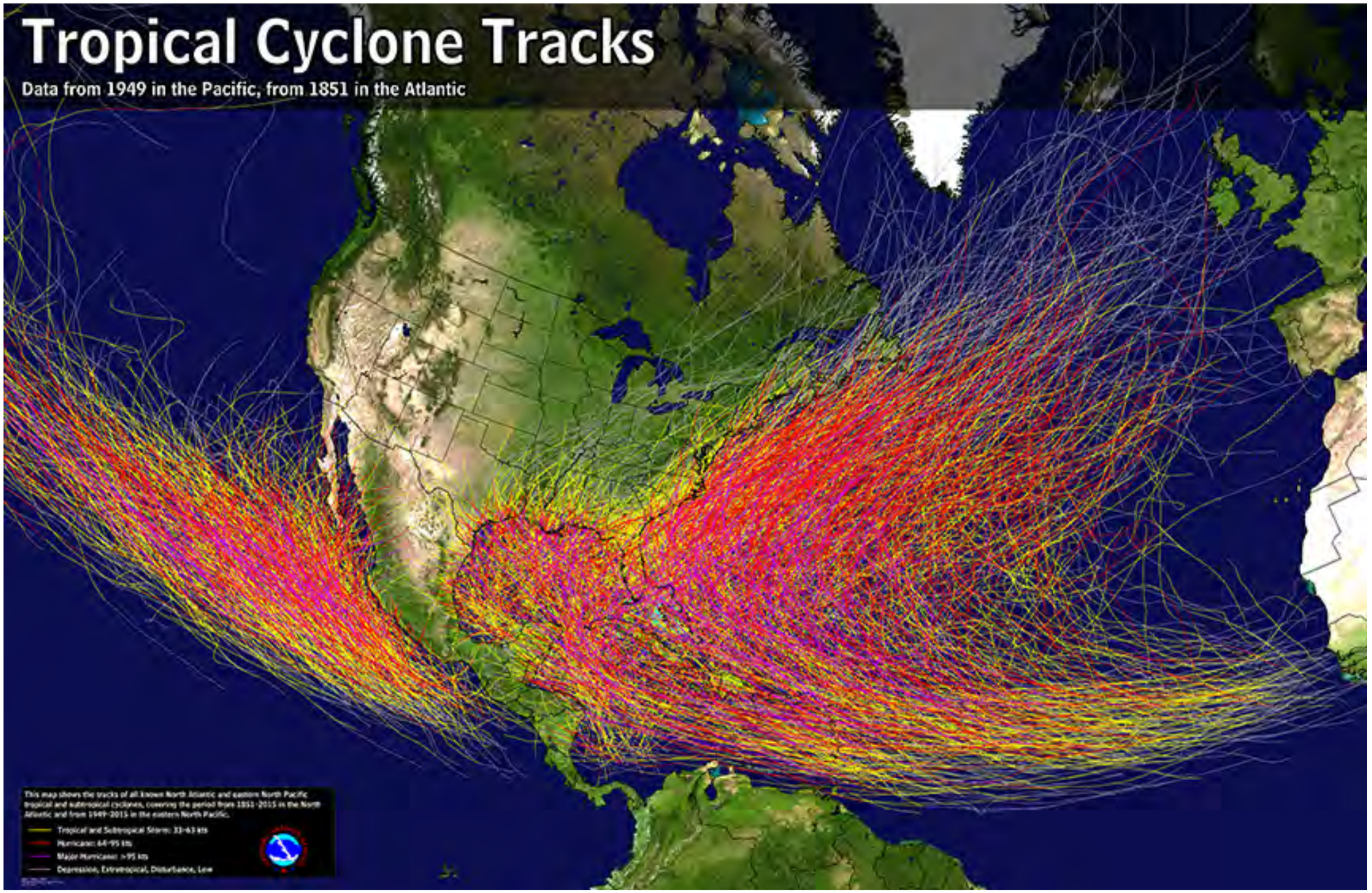
**RELATED VIDEO**


**Adding Up the Cost of Hurricane Irene**

Early estimates suggest Hurricane Irene caused somewhere around $8 billion in damages and business interruptions, and some economists believe the overall economic toll could reach $16 billion. Conor Dougherty has the last on The News Hub.

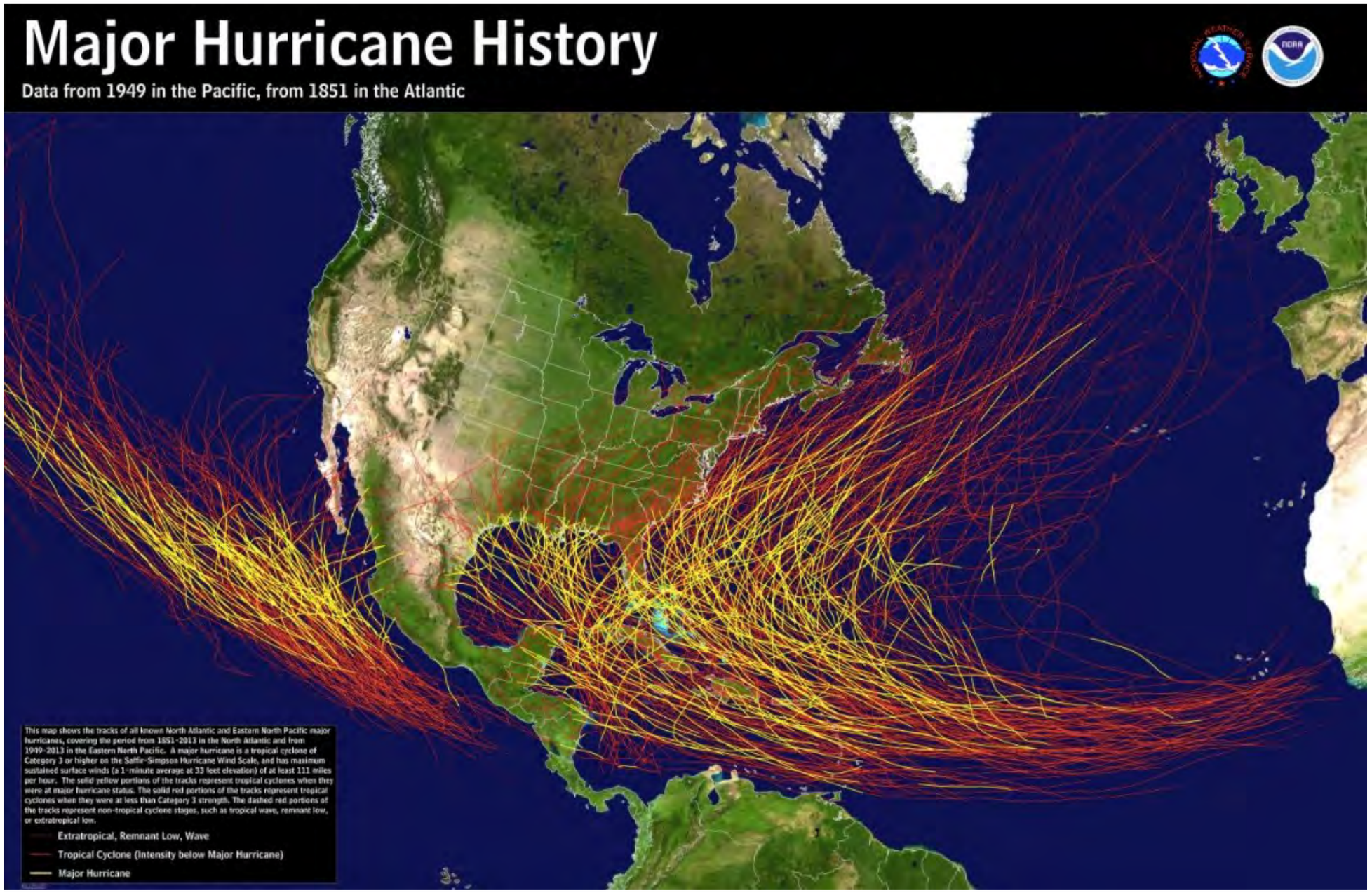
WSJ, August 30, 2011

# Climate Change and Storm Events




NOAA - Nat’l Hurricane Center

# Climate Change and Storm Events



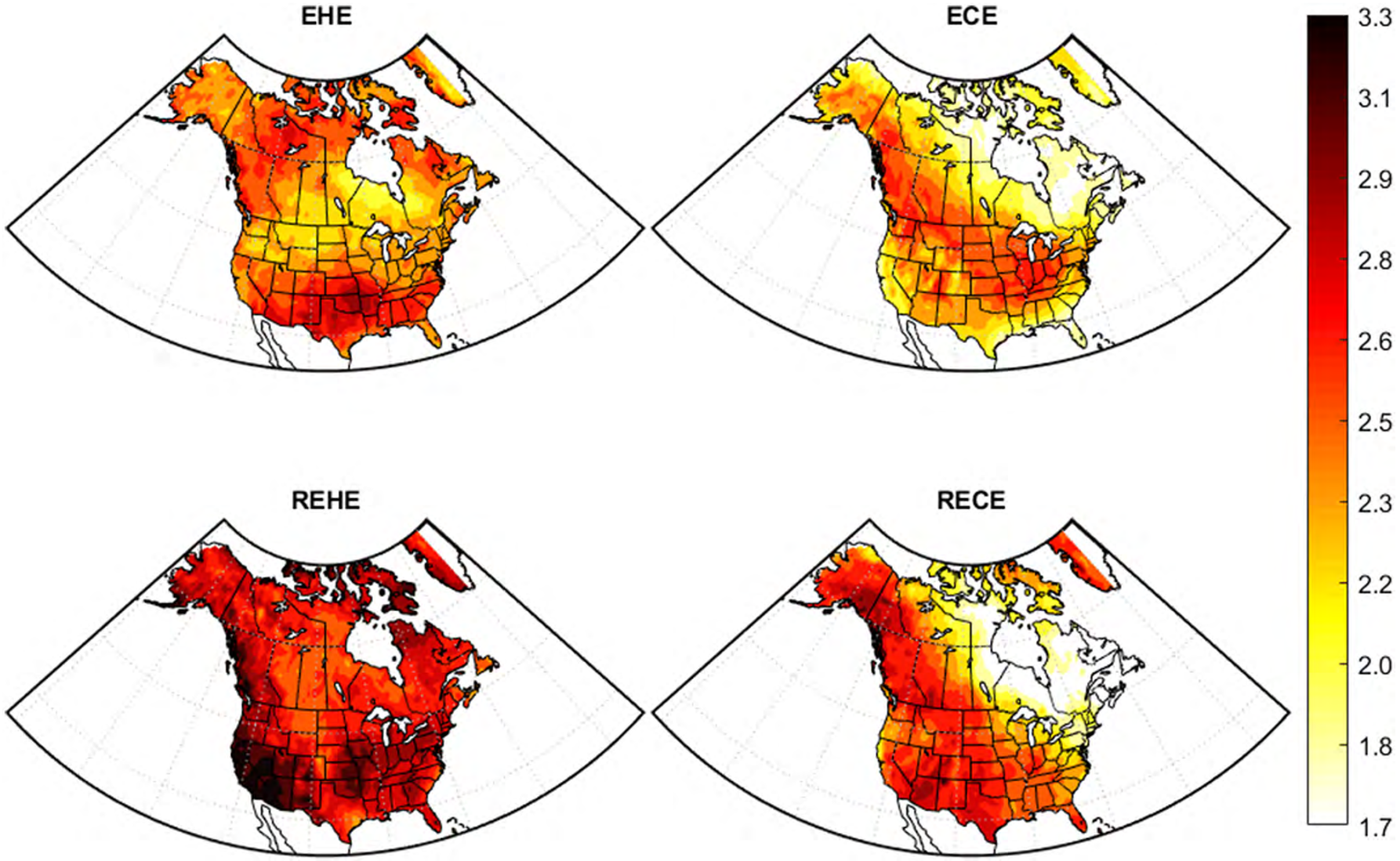

NOAA - Nat'l Hurricane Center

# Climate Change and Drought

https://www.canr.msu.edu

# Climate Change and Drought

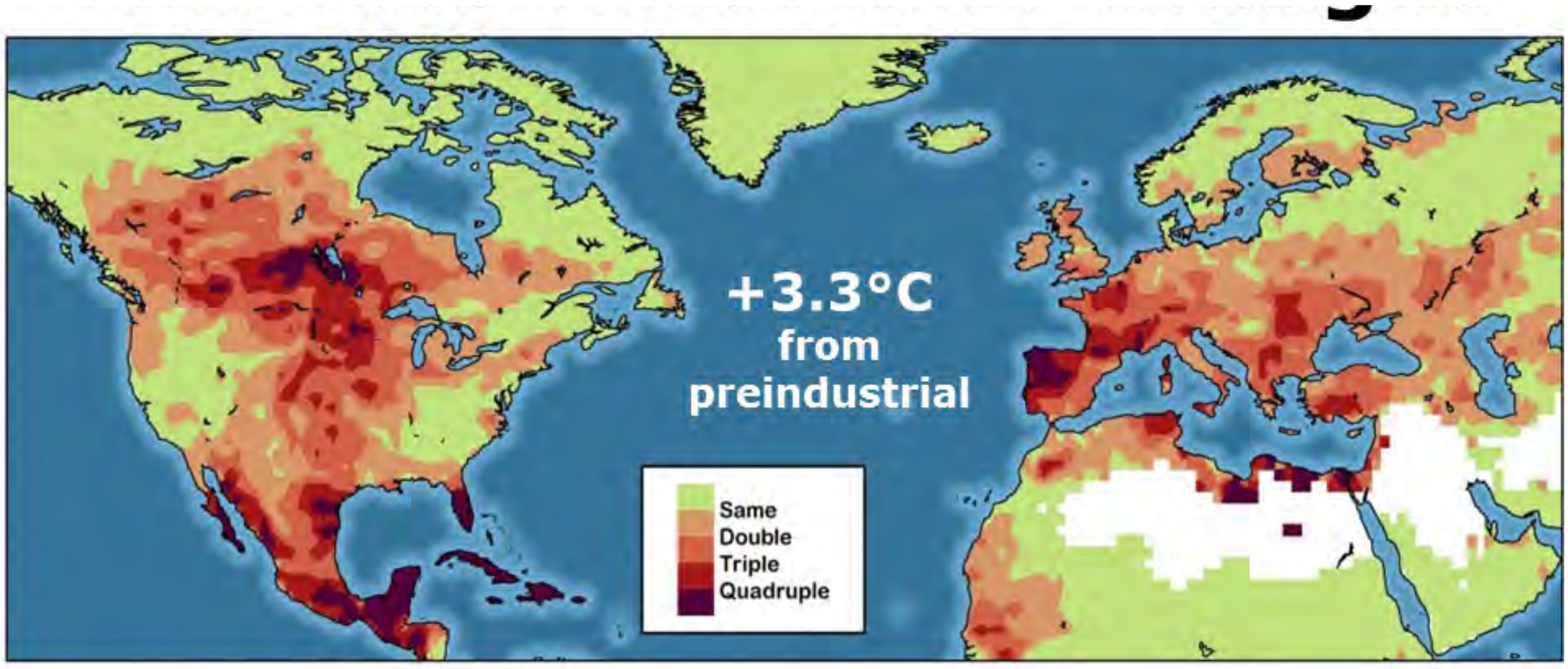
**Mean number of extreme temperature events in days per year.**




**EHE** = excess heat event;
**ECE** = excess cold event;
**REHE** = relative excess heat event;
**RECE** = relative excess cold event.

Journal of Geophysical Research: Atmospheres, Volume: 123, Issue: 21, Pages: 11,889-11,898

# Climate Change and Drought




*Change in the likelihood of summer season drought (defined as a once in ten years event for the late 20th century) by the end of the 21st century, according to multi-decade simulations with the operational model of the European Centre for Medium-range Weather Forecasts (ECMWF) based on the A1b scenario of the IPCC.*

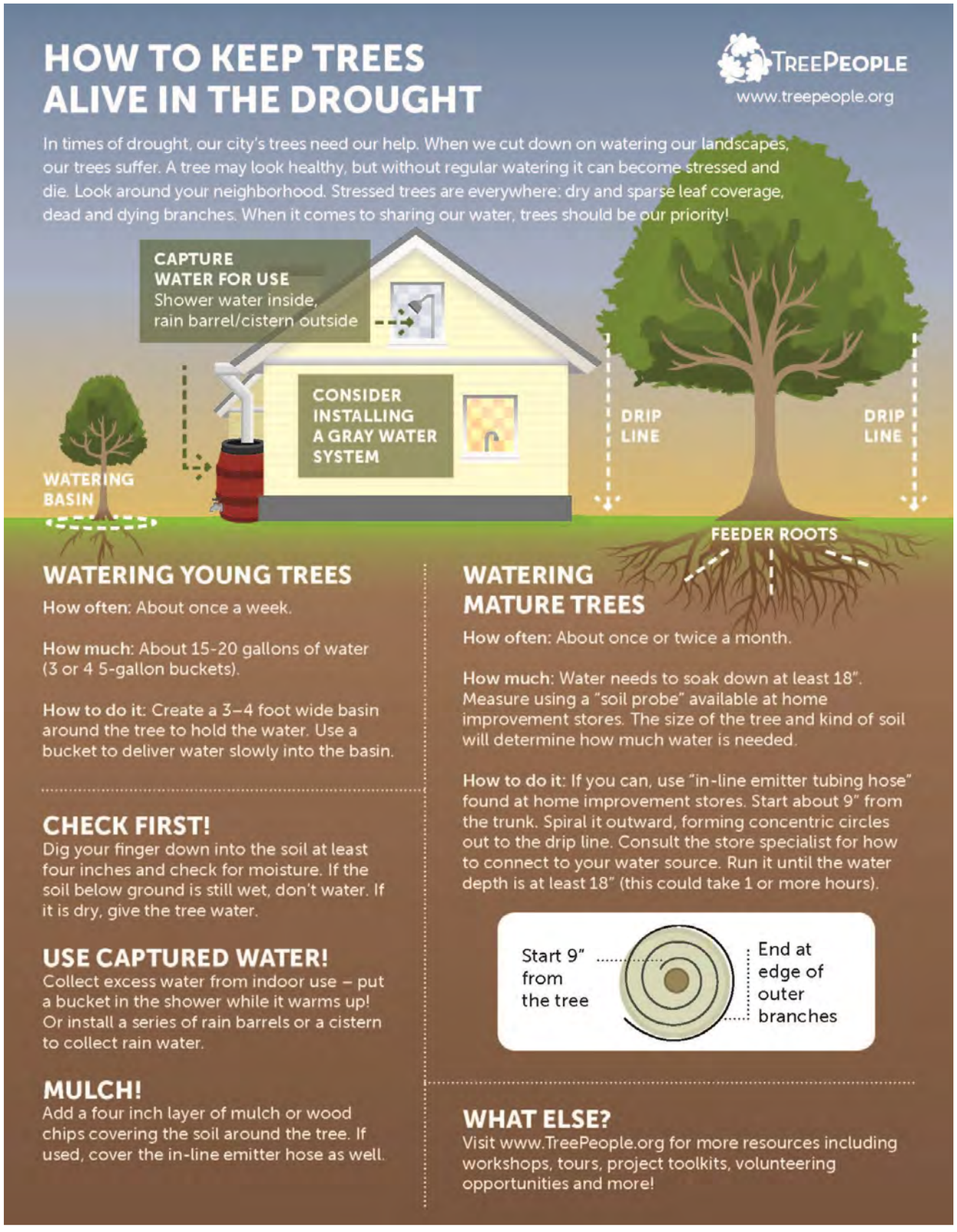
Floods and Droughts in a Changing Climate – Now and the Future
*April 29th, 2011* Paul A. Dirmeyer

# Climate Change and Drought

# Climate Change and Drought

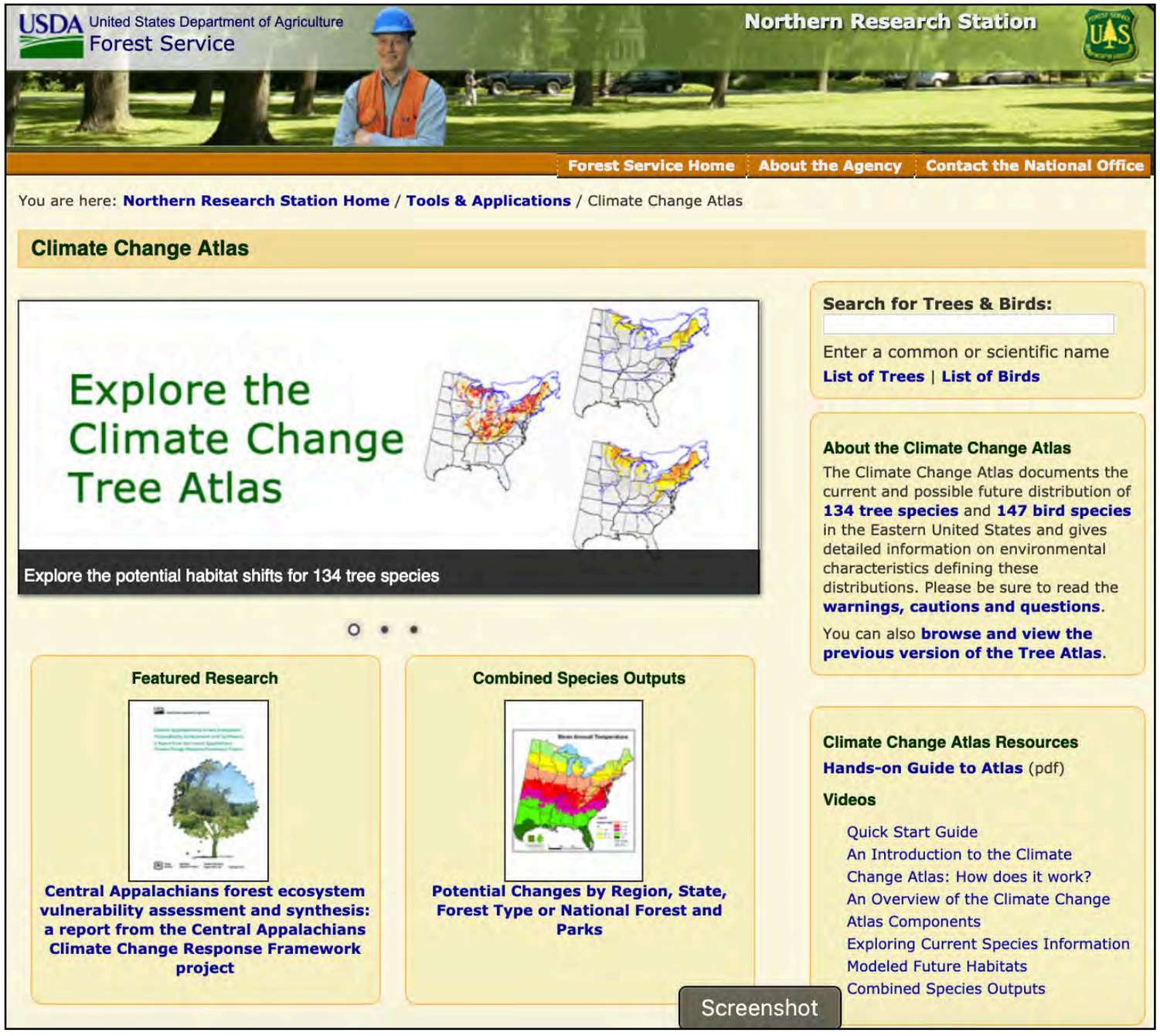
https://www.canr.msu.edu

# Climate Change and Drought



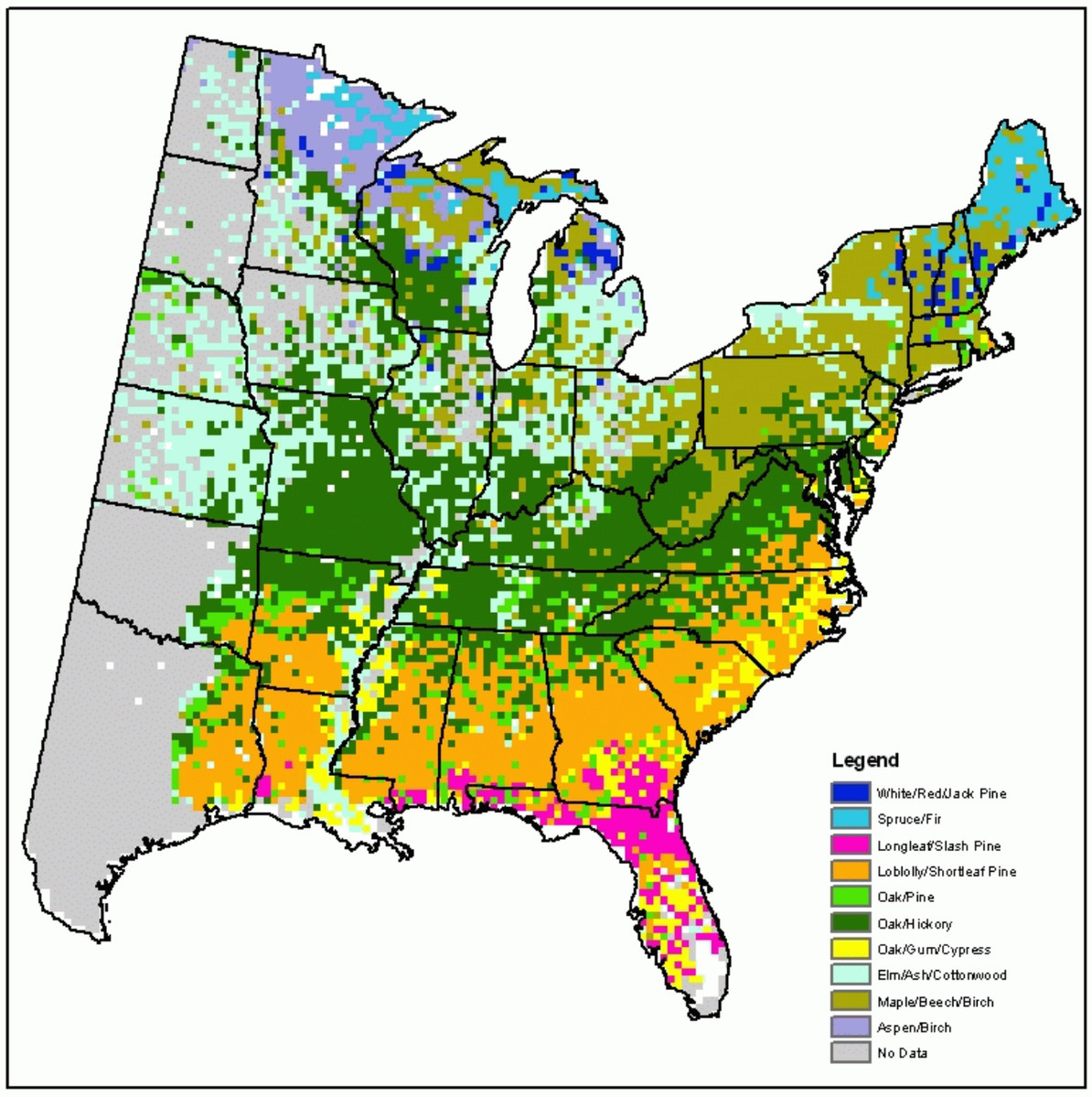

https://www.treepeople.org/action/drought-solutions

# Climate Change and Future Habitats




https://www.nrs.fs.fed.us/atlas/tree/NorthEast_mod_change.html

# Climate Change and Future Habitats




Current FIA (Actual)

https://www.nrs.fs.fed.us/atlas/tree/NorthEast_mod_change.html

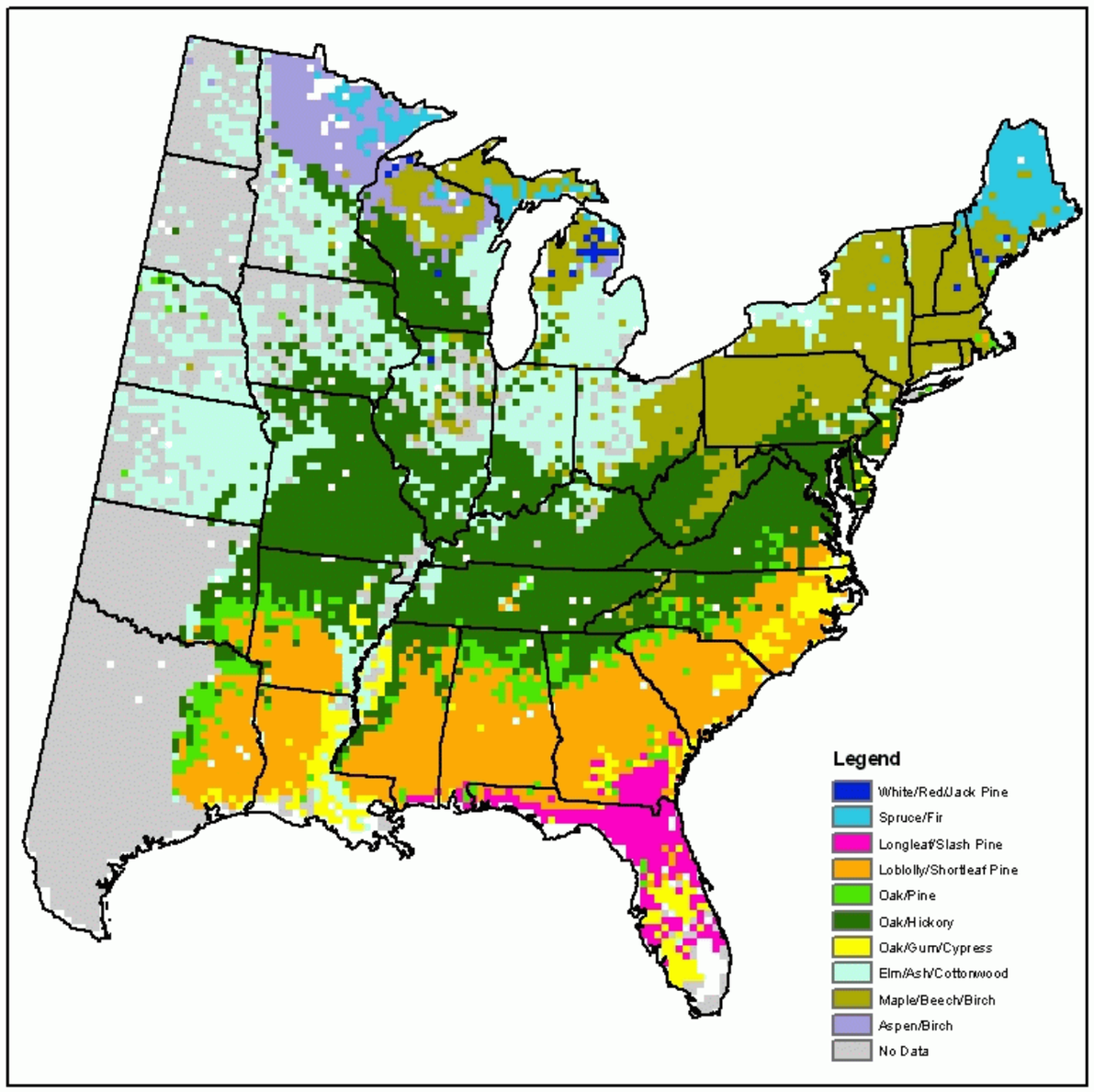
# Climate Change and Future Habitats

## Potential changes in area-weighted Importance Values

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 316 | red maple | Acer rubrum | 21155 | -1616 | -4855 | -6358 | -4277 | -5223 | -10875 | -12677 | -10741 |
| 318 | sugar maple | Acer saccharum | 11967 | -1557 | -2369 | -3998 | -2562 | -3685 | -6356 | -7974 | -6219 |
| 541 | white ash | Fraxinus americana | 8392 | -665 | -1143 | -2569 | -1447 | -2265 | -3208 | -4110 | -3581 |
| 531 | American beech | Fagus grandifolia | 8389 | -2059 | -2676 | -3571 | -2872 | -3636 | -4642 | -5252 | -4752 |
| 762 | black cherry | Prunus serotina | 7744 | -1060 | -2219 | -3232 | -2110 | -2622 | -3681 | -4621 | -4108 |
| 129 | eastern white pine | Pinus strobus | 6079 | -1293 | -1362 | -2298 | -1718 | -1873 | -2752 | -3729 | -2963 |
| 833 | northern red oak | Quercus rubra | 6063 | 492 | 617 | 137 | 408 | 199 | -389 | -1119 | -352 |
| 12 | balsam fir | Abies balsamea | 5830 | -3178 | -3722 | -4378 | -3881 | -4453 | -4632 | -4719 | -4683 |
| 261 | eastern hemlock | Tsuga canadensis | 5409 | -651 | -977 | -1816 | -1203 | -1961 | -2321 | -2741 | -2508 |
| 802 | white oak | Quercus alba | 3910 | 1840 | 3372 | 3657 | 3038 | 3553 | 4306 | 4071 | 4536 |
| 832 | chestnut oak | Quercus prinus | 3876 | 594 | -163 | 295 | 167 | 834 | -399 | -525 | -375 |
| 371 | yellow birch | Betula alleghaniensis | 3348 | -975 | -1439 | -1801 | -1474 | -2029 | -2222 | -2213 | -2224 |
| 97 | red spruce | Picea rubens | 2999 | -1544 | -1725 | -1893 | -1769 | -1923 | -1887 | -1901 | -1949 |
| 837 | black oak | Quercus velutina | 2995 | 1347 | 2989 | 2884 | 2622 | 2563 | 5010 | 4761 | 4912 |
| 621 | yellow-poplar | Liriodendron tuliperfia | 2917 | 970 | -49 | 646 | 440 | 1250 | -205 | -88 | -49 |
| 746 | quaking aspen | Populus tremuloides | 2571 | -1140 | -1206 | -1614 | -1377 | -1815 | -1946 | -2277 | -2104 |
| 375 | paper birch | Betula papyrifera | 2356 | -1087 | -1104 | -1638 | -1284 | -1787 | -1985 | -2142 | -2041 |
| 972 | American elm | Ulmus americana | 2291 | 356 | 2001 | 644 | 946 | 319 | 2976 | 2898 | 2366 |
| 491 | flowering dogwood | Cornus florida | 2046 | 1626 | 1883 | 2556 | 2214 | 2713 | 2133 | 2482 | 2506 |
| 241 | northern white-cedar | Thuja occidentalis | 1896 | -1137 | -1115 | -1321 | -1212 | -1332 | -1266 | -1396 | -1365 |
| 403 | pignut hickory | Carya glabra | 1624 | 841 | 900 | 1150 | 1015 | 1392 | 1218 | 1093 | 1196 |
| 68 | eastern redcedar | Juniperus virginiana | 837 | 1822 | 3393 | 4184 | 3119 | 3543 | 6693 | 6325 | 5807 |
| 602 | black walnut | Juglans nigra | 697 | 738 | 1092 | 1131 | 1006 | 1109 | 1192 | 1112 | 1180 |
| 611 | sweetgum | Liquidambar styraciflua | 697 | 840 | 1179 | 2170 | 1305 | 1482 | 3102 | 4151 | 2945 |
| 317 | silver maple | Acer saccharinum | 599 | 329 | 1745 | 623 | 879 | 374 | 2896 | 2790 | 2243 |
| 131 | loblolly pine | Pinus taeda | 577 | 858 | 843 | 2974 | 1268 | 1883 | 3850 | 6623 | 3705 |
| 521 | common persimmon | Diospyros virginiana | 341 | 468 | 1382 | 1442 | 1053 | 1122 | 2751 | 3784 | 3265 |
| 462 | hackberry | Celtis occidentalis | 176 | 390 | 1445 | 898 | 870 | 590 | 2570 | 2808 | 2302 |
| 110 | shortleaf pine | Pinus echinata | 138 | 591 | 1562 | 3113 | 1502 | 2039 | 5595 | 6912 | 5227 |
| 682 | red mulberry | Morus rubra | 70 | 330 | 1570 | 1053 | 772 | 604 | 3728 | 3946 | 2710 |
| 824 | blackjack oak | Quercus marilandica | 37 | 348 | 1170 | 1798 | 984 | 1288 | 4127 | 4886 | 3751 |

https://www.nrs.fs.fed.us/atlas/tree/NorthEast_mod_change.html

# Climate Change and Future Habitats



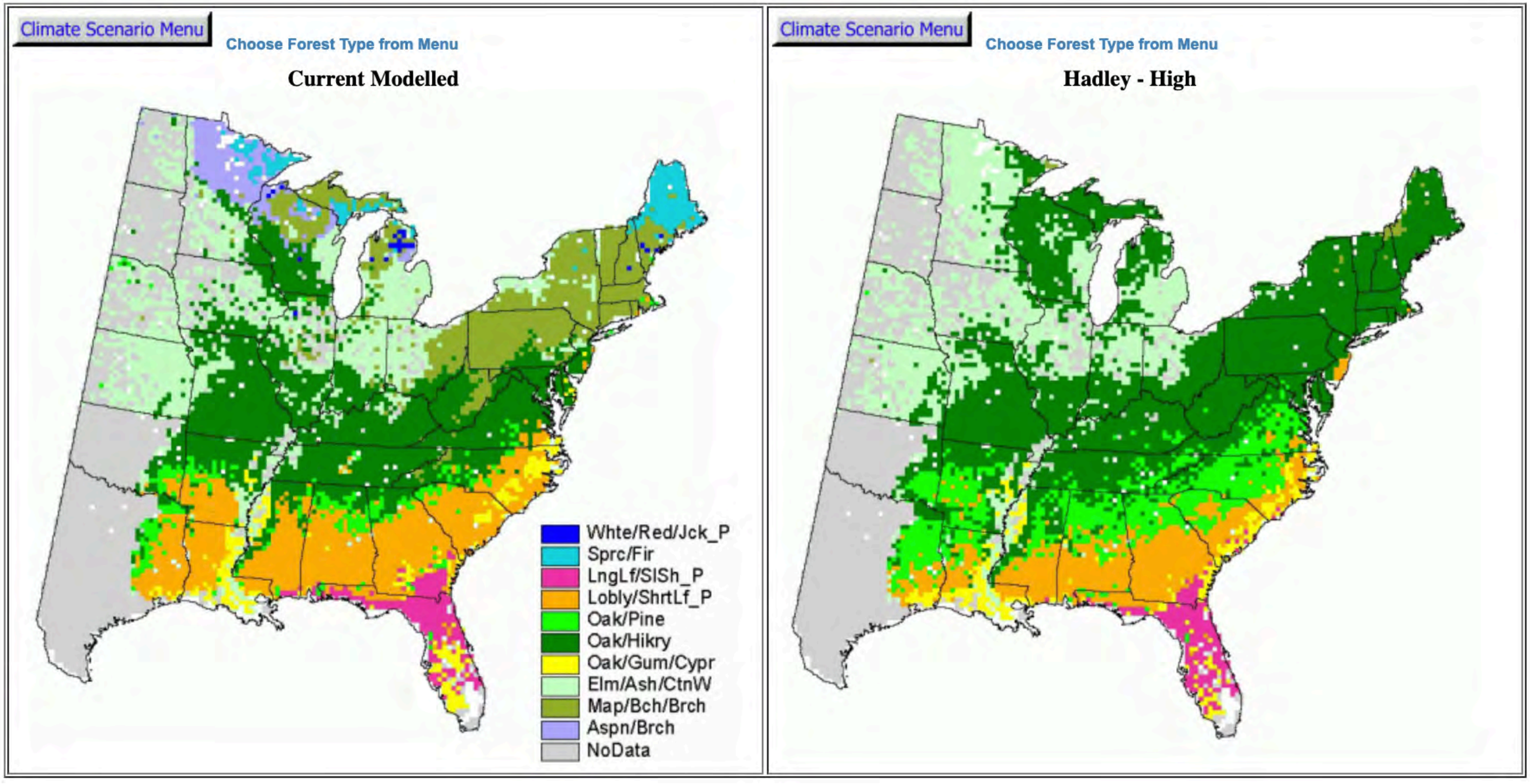

Current Model

**Maple/Beech/Birch:**

black maple (314)
striped maple (315)
red maple (316)
sugar maple (318)
mountain maple (319)
yellow birch (371)
sweet birch (372)
gray birch (379)
blue ash (546)
waterlocust (551)
honeylocust (552)
black walnut (602)
black cherry (762)
black locust (901)
American basswood (951)

https://www.nrs.fs.fed.us/atlas/tree/NorthEast_mod_change.html

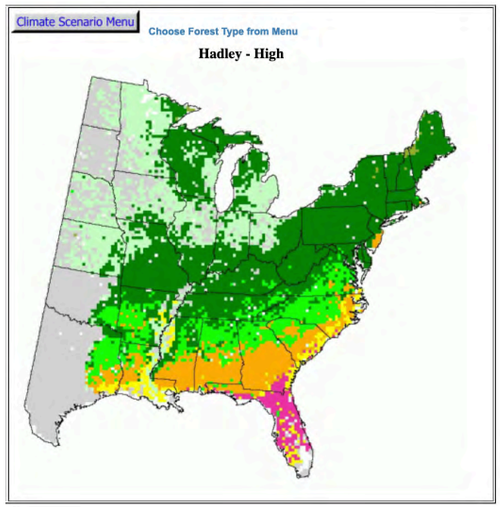
# Climate Change and Future Habitats




## High Emissions Scenario

https://www.nrs.fs.fed.us/atlas/tree/NorthEast_mod_change.html

# Oak/Hickory (Oak/Hikry):



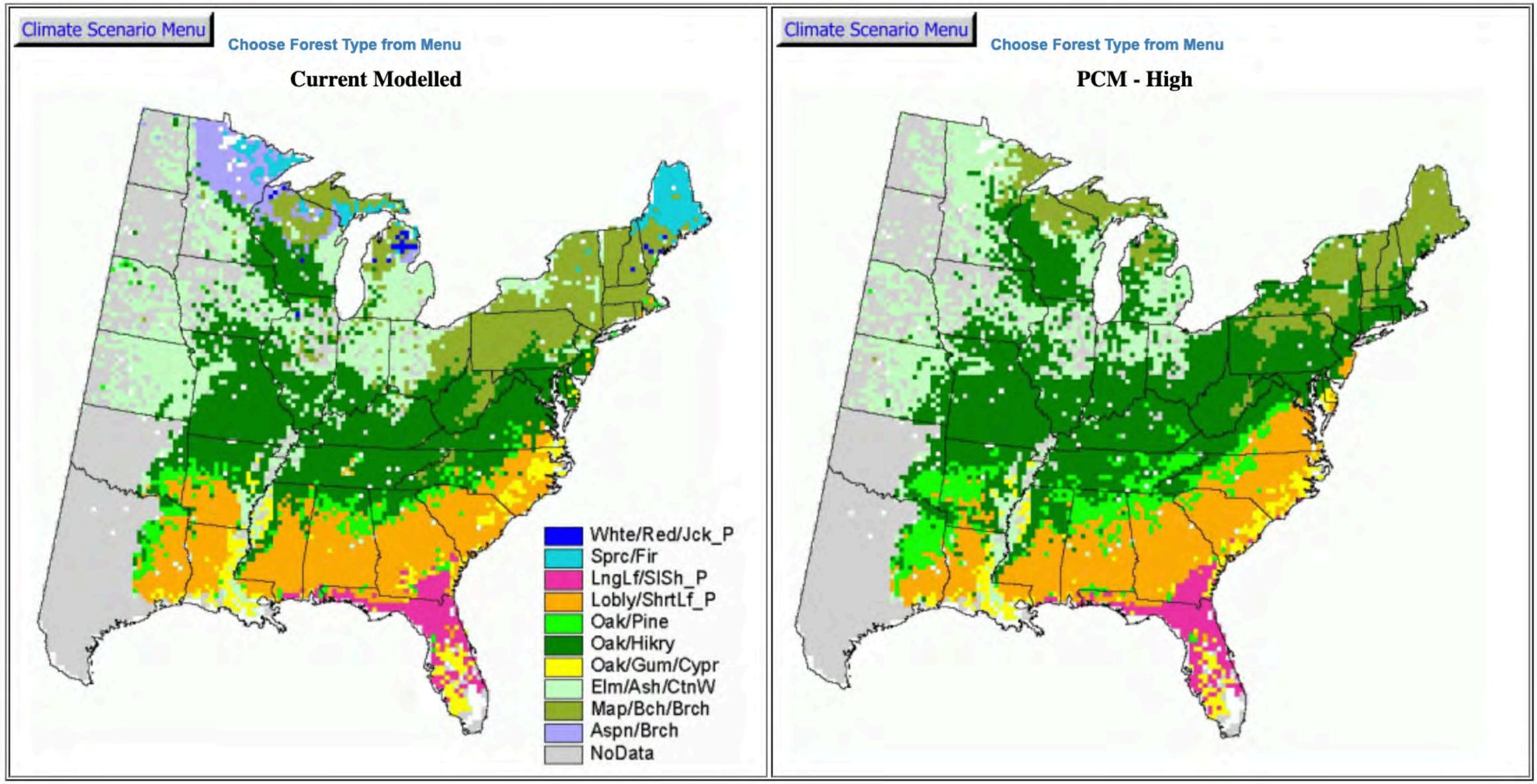

Hadley-Hi

bitternut hickory (402)
shellbark hickory (405)
shagbark hickory (407)
black hickory (408)
common persimmon (521)
black walnut (602)
sweetgum (611)
yellow-poplar (621)
white oak (802)
swamp white oak (804)
scarlet oak (806)
northern pin oak (809)
southern red oak (812)
cherrybark oak (813)

shingle oak (817)
overcup oak (822)
bur oak (823)
blackjack oak (824)
swamp chestnut oak (825)
chinkapin oak (826)
nuttall oak (828)
willow oak (831)
chestnut oak (832)
northern red oak (833)
Shumard oak (834)
post oak (835)
black oak (837)
black locust (901)
sassafras (931)

https://www.nrs.fs.fed.us/atlas/tree/NorthEast_mod_change.html

# Climate Change

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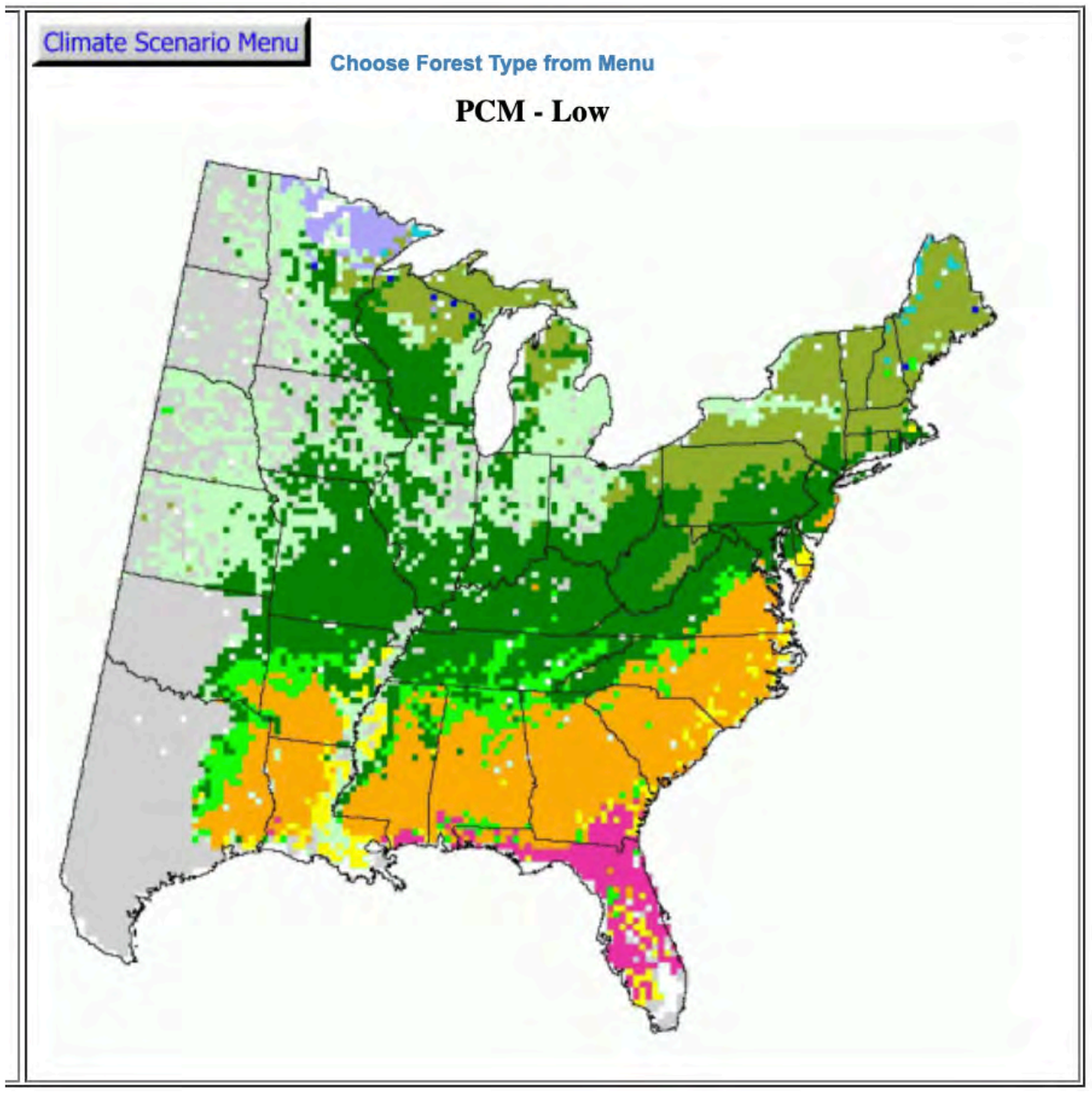
# Climate Change




PCM-Low

**Maple/Beech/Birch:**
black maple (314)
striped maple (315)
red maple (316)
sugar maple (318)
mountain maple (319)
yellow birch (371)
sweet birch (372)
gray birch (379)
blue ash (546)
waterlocust (551)
honeylocust (552)
black walnut (602)
black cherry (762)
black locust (901)
American basswood (951)

https://www.nrs.fs.fed.us/atlas/tree/NorthEast_mod_change.html

# Species Selection

dcr Massachusetts

## Massachusetts Urban & Community Forestry Program

### SELECTING TREES FOR YOUR URBAN AND COMMUNITY FOREST

**Trees and Community Character**

Trees say so much about the character of a community. The choices we make in selecting trees for public landscapes and streetscapes will determine the nuances of that character. Appropriate tree choices can also minimize future maintenance needs and increase the likelihood that trees will reach their mature potential. "Tougher" trees should be matched to less hospitable sites, and large-scale, native, and less abundant species should be used to diversify your community's urban forest.

**Plant the Right Tree in the Right Place!**

This is the most important concept to understand whenever you are considering planting trees. Basically, every tree has certain needs and characteristics (mature size, growth habit, light requirements, soil needs, etc.), and every planting site has characteristics (growing space, obstructions, soils, light patterns, topography, etc.). Before planting any tree, you should do your best to make sure the tree is compatible with the site. Remember to consider the size of the tree at maturity. Visit a local arboretum to see a variety of trees at their mature sizes. You should also visit your local nursery personally and hand-pick the best trees for your community.

**Get to Know the Nuances of Your Community Forest**

A street tree inventory or survey can help you identify what currently exists in your community forest, what species may already be over-planted, and what is lacking. Get to know how street trees grow in your community by observing them in a landscape over different seasons. Make note of attractive mature specimens thriving in town or in a neighboring community, in parks, cemeteries, on golf courses, or in an arboretum. Communities should consider developing their own list of recommended streetscape trees based on the needs and character of the community, the existing environmental conditions, and the capacity for maintenance. There are a host of resources to aid selecting appropriate tree species. Consult some of the publications below. Finally, browse local nursery catalogs to determine availability and visit them early to find the very best tree for your community.

**Additional Resources:**

- Dirr, Michael. Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Propagation and Uses. Stipes Publishing, 2009.
- Dirr, Michael. *Hardy Trees and Shrubs: An Illustrated Encyclopedia*. Timber Press, 1997.
- Planting Trees in Designed and Built Community Landscapes. http://www.na.fs.fed.us/spfo/pubs/uf/plant_trees/planting_trees.htm
- Street Tree Fact Sheets. Penn State College of Agricultural Sciences. 1993.
- International Society of Arboriculture. www.treesaregood.org.

**SOME SUGGESTED STREETSCAPE TREES FOR MASSACHUSETTS**

**Park Trees: (For areas with ample space away from pedestrian and motorized traffic)**

| | | | |
|---|---|---|---|
| Paperbark maple | *Acer griseum* | Black walnut | *Juglans nigra* (n) |
| Japanese maple | *Acer palmatum* | Dawn redwood | *Metasequoia glyptostroboides* |
| Horsechestnut | *Aesculus hippocastanum* | Eastern white pine | *Pinus strobus* (n) |
| Shagbark hickory | *Carya ovata* (n) | Japanese black pine | *Pinus thunbergii* |
| Chinese chestnut | *Castanea mollissima* | American sycamore | *Platanus occidentalis* (n) |
| American beech | *Fagus grandifolia* (n) | White oak | *Quercus alba* (n) |
| Carolina silverbell | *Halesia tetraptera* (syn. *H. carolina*) | Bur oak | *Quercus macrocarpa* (n) |
| | | Japanese stewartia | *Stewartia pseudocamellia* |
| Butternut | *Juglans cinerea* (n) | | |

https://www.mass.gov/service-details/urban-and-community-forestry

# Species Selection

dcr
Massachusetts

## Massachusetts Urban & Community Forestry Program

### SELECTING TREES FOR YOUR URBAN AND COMMUNITY FOREST

**Large Trees: Consider these only in areas with adequate rooting space and without any overhead wires or other obstructions**

| | |
|---|---|
| Red maple | *Acer rubrum* (*,n,w) |
| Sugar maple | *Acer saccharum* (s,n) |
| Red horsechestnut | *Aesculus x carnea* (s) |
| River birch | *Betula nigra* (s,n) |
| Hackberry | *Celtis occidentalis* (*,n) |
| Katsura | *Cercidiphylum japonicum* |
| Turkish filbert | *Corylus colurna* |
| Ginkgo (male only) | *Ginkgo biloba* (*) |
| Honeylocust | *Gleditsia triacanthos var. inermis* (*) (thornless, fruitless) |
| Kentucky coffeetree | *Gymnocladus dioicus* (m) |
| Sweetgum | *Liquidambar styraciflua* (m) |
| Tulip tree | *Liriodendron tulipifera* |
| Cucumbertree | *Magnolia acuminata* |
| Black gum | *Nyssa sylvatica* (n) |
| London planetree | *Plantanus x acerifolia* (w) |
| Sawtooth oak | *Quercus acutissima* |
| Scarlet oak | *Quercus coccinea* (n) |
| Pin oak | *Quercus palustris* (n) |
| Red oak | *Quercus rubra* (n) |
| English oak | *Quercus robur* |
| Japanese pagoda tree | *Styphnolobium japonicum* (*) |
| Korean mountain ash | *Sorbus alnifolia* |
| Bald cypress | *Taxodium distichum* |
| Silver linden | *Tilia tomentosa* |
| Little-leaf linden | *Tilia cordata* (*) |
| American elm | *Ulmus americana* (n, m) Cultivars include 'Homestead', 'Princeton', 'Valley Forge' |

**Medium Trees: (Plant near power lines or other obstructions WITH CAUTION)**

| | |
|---|---|
| Amur maackia | *Maackia amurense* |
| American hornbeam | *Carpinus caroliniana* (n) |
| Yellowwood | *Cladastris kentuckea* (syn. *C. lutea*) |
| Goldenraintree | *Koelreuteria paniculata* |
| American hophornbeam | *Ostrya virginiana* (n) |
| Accolade cherry | *Prunus sargentii* 'Accolade' |
| Sargent cherry | *Prunus sargentii* |
| Kwanzan cherry | *Prunus serrulata 'Kwanzan'* (l) |
| Higan cherry | *Prunus subhirtella* |

**Small Trees: (Appropriate for planting near power lines or small spaces)**

| | |
|---|---|
| Hedge maple | *Acer campestre* (*) |
| Serviceberry | *Amelanchier* sp. (n) |
| Eastern redbud | *Cercis canadensis* |
| Fringetree | *Chionanthus virginicus* |
| Kousa dogwood | *Cornus kousa* |
| Cornelian cherry | *Cornus mas* |
| Washington hawthorn | *Crataegus phaenopyrum* (*) |
| Crabapple | *Malus* sp. (*) |
| Sweet bay magnolia | *Magnolia virginiana* |

**You might also consider planting additional fruit and nut species in open areas or park areas.**

**Invasive Trees (DO NOT PLANT) Illegal to import, propagate, or sell in Massachusetts. (Authorized under General Laws** Chapter 128)

| | |
|---|---|
| Norway maple | *Acer platanoides* |
| Sycamore maple | *Acer pseudoplatanus* |
| Tree of heaven | *Ailanthus altissima* |
| Amur corktree | *Phellodendron amurense* |
| Black locust | *Robinia pseudoacacia* |

**Trees that have shown invasive tendencies**
(Plant with caution. Not recommended for planting where they may spread into natural areas)

| | |
|---|---|
| Amur maple | *Acer ginnala* prohibited in CT and VT |
| Japanese tree lilac | *Syringa reticulata** instances of naturalization in riparian areas in MA, NY, WI, and VT or escape from cultivation MN, NH |

*(Notes: **m**-maintenance issues, **i**-invasive, **s**-requires ample space, **w**-already widely planted, **l**-short longevity, **n**-native to Massachusetts, ***-hardy in stressed sites)*

**Bureau of Forestry**
**Urban & Community Forestry Program**
**Massachusetts Department of Conservation and Recreation**
251 Causeway Street, Suite 600, Boston, MA 02114
www.mass.gov/dcr/

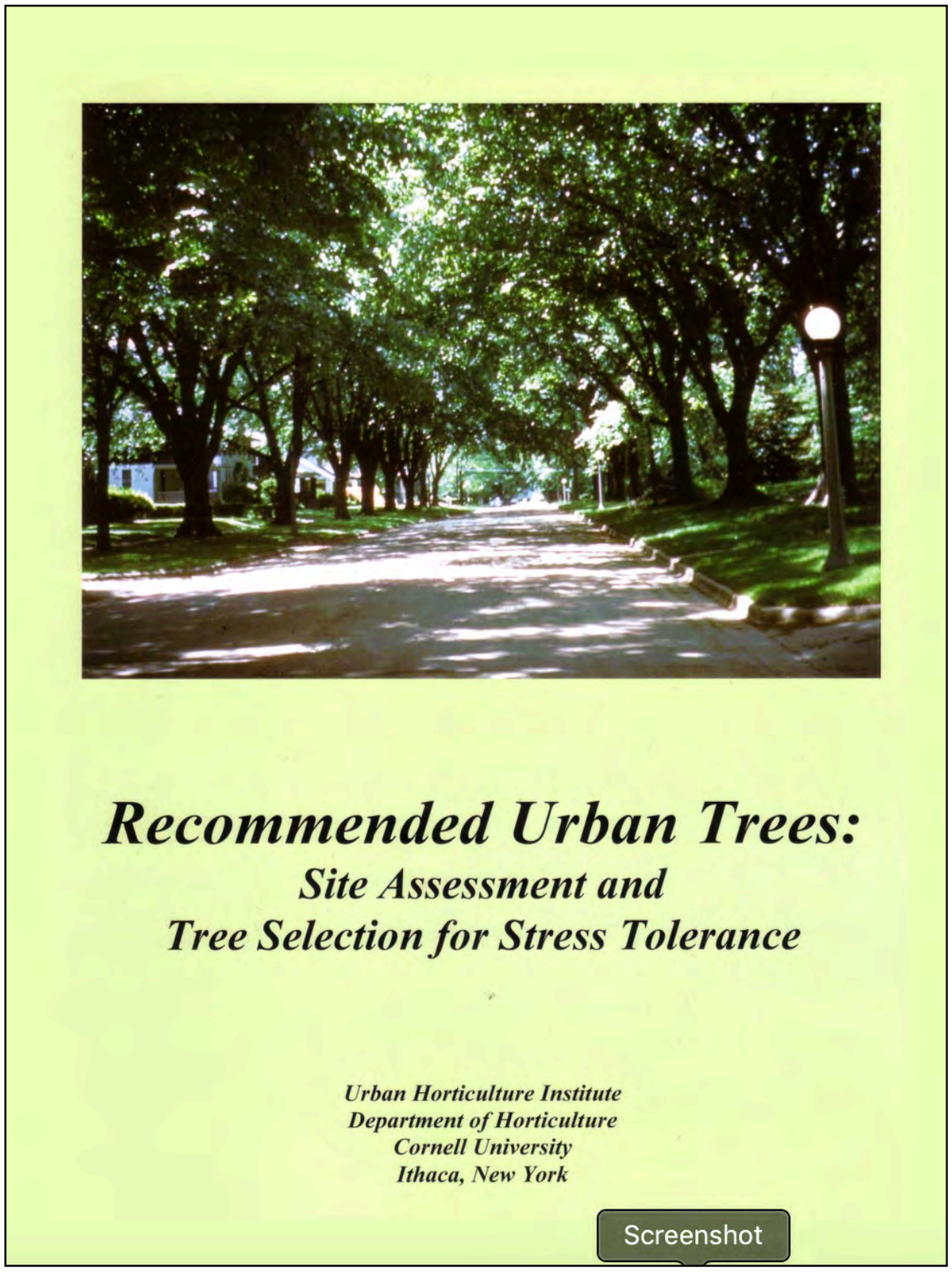
In Partnership with:
USDA Forest Service and
the Massachusetts Tree Wardens' & Foresters' Association



Screenshot

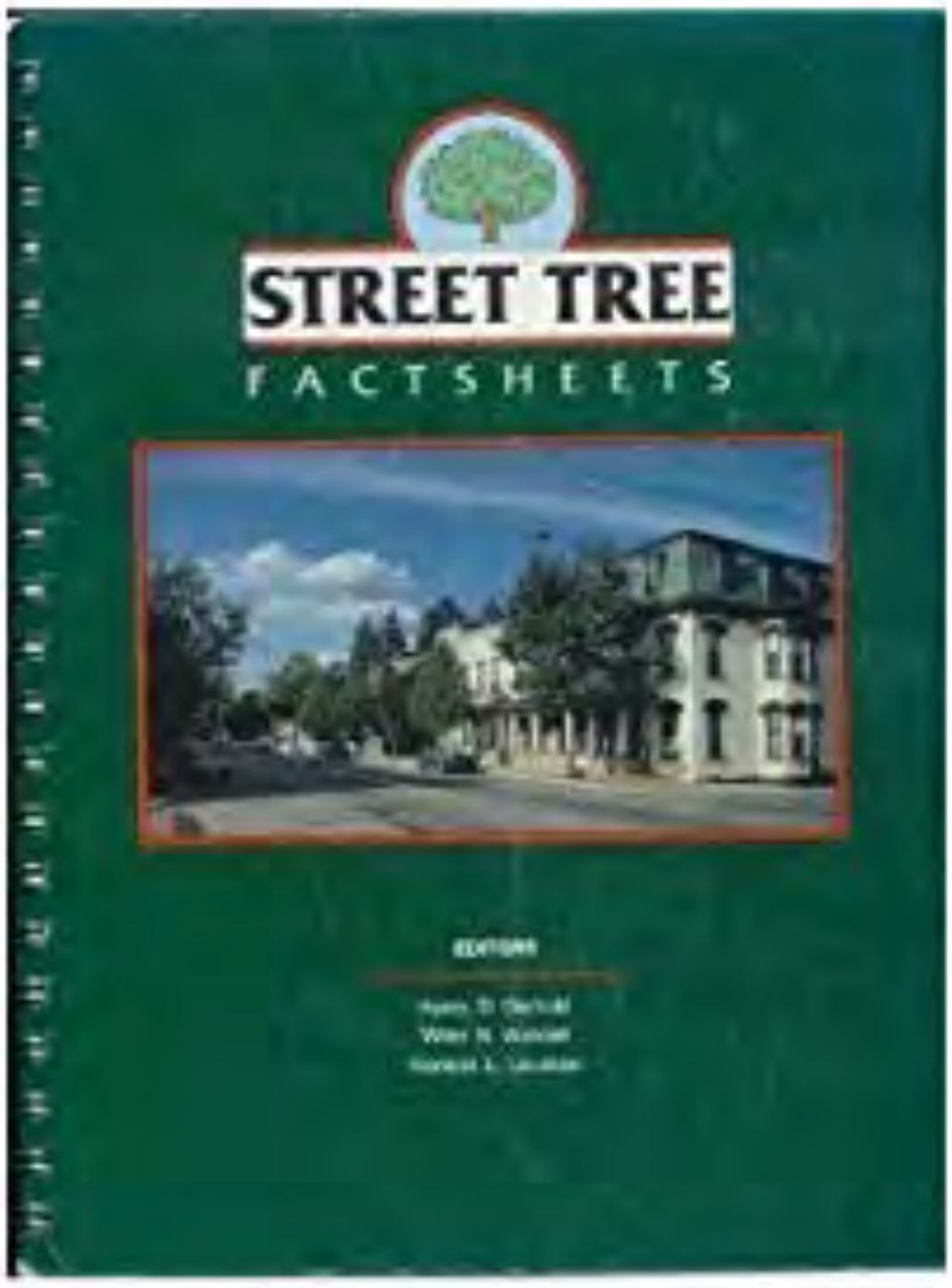
https://www.mass.gov/service-details/urban-and-community-forestry

# Species Selection




http://www.hort.cornell.edu/uhi/outreach/recurbtree/

# Species Selection




https://extension.psu.edu/landscape-tree-factsheets

# Physical Issues

# Physical Issues

# Physical Issues

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# Physical Issues

TWO

**URBAN FORESTRY**

## Mulching (if done right) Benefits Trees and Shrubs!

BY JERRY VAN SAMBEEK | *Research Tree Physiologist, Northern Research Station*

Mulch, as it naturally occurs in forests, has been described as a nutrient rich, moisture absorbent bed of decaying forest leaves, twigs, and branches, teeming with fungal, microbial, and insect life. Trees and shrubs grow faster when mulched with organic mulches such as pine needles, shredded leaves, chipped landscape waste, bark, and grass clippings than when the area under the canopy is kept free of vegetation through tillage or herbicides. Studies have shown that growth of walnut and other fine hardwoods is increased on average 26 to 29 percent over that for hardwoods with bare ground beneath them. Increased tree growth can be nearly double that of trees growing in grasses or weedy vegetation (89% for walnut and 78% for other fine hardwoods).

Mulches do many other marvelous things when applied under trees and shrubs. Reports suggest that the physical effects of organic mulches are much greater than the fertilizer value associated with release of nutrients as mulches decompose. Decomposition increases soil organic matter leading to better soil health, retention of water and nutrients, and increased soil activity by earthworms, fungi, and other soil organisms. Mulches reduce both loss of soil moisture and the impact of raindrops, slow the flow of water over the soil, and increase rates of water infiltration. Mulches also moderate the soil microenvironment damping temperature fluctuations at the soil surface in addition to keeping soil temperatures lower in summer and warmer in winter than under bare ground or turf. Reducing soil temperature extremes can be important as death of tree roots commonly occurs at temperatures greater than 90° F and less than 20° F. Perhaps the best thing about mulching is that it keeps mowers, string trimmers, and other equipment away from tree trunks.

Shawn Fitzgerald, ISA certified arborist and technical advisor at Davey Tree, provided the following five easy mulching tips in a recent blog that I have taken the liberty to expand upon.

1. Choose the right mulch. To save water in the yard and garden, use organic mulch because it breaks down and conditions the soil. Mulching is one of the most effective ways to conserve water to support tree growth--and it's also the easiest. Pine needles (sold as "pine straw") give a good bang for your buck because they retain the most moisture and suppress weeds better than any other mulch. In addition, they don't need to be replenished as often, are attractive on the landscape, create a favorable nutrient balance and are least likely to alter soil pH. Other forest fiber with a good balance of carbon to nitrogen, such as shredded leaves and hardwood bark, also work well. Fine textured mulches such as grass clippings should be mixed with other mulches to keep them from packing and slowing water infiltration. Mulches high in carbon such as paper, sawdust, and wood shavings should be mixed with grass clippings or nitrogen fertilizers. Nonorganic mulches, such as gravel, stone, and manufactured products -- including plastic films and landscape fabrics --can block water and air movement.

2. Ready the space. Before mulching, remove weeds from garden beds and around trees and shrubs to eliminate hours of weeding later in the season.

3. Apply mulch. For most plants and garden beds, apply 2–3 inches of mulch—not so deep as to inhibit soil aeration but still thick enough to block sunlight and minimize emergence of germinating weed seeds. If you have sandy soil, apply an additional inch of mulch. If you're mulching shallow-rooted plants, such as hydrangeas, boxwoods, or azaleas, apply a bit less.

*A freshly mulched pine straw flower bed*

4. Use mulch to mimic the "wild" or the natural condition found in forests. Fitzgerald says cover the plant's entire drip zone, which is as far as the leaves grow out from the trunk or stem, to "mimic the wild." Doing so mirrors the forest condition and allows plants to thrive. When mulching trees, the larger the mulch ring, the greater the benefit to the tree. However, when it comes to tree growth, recent research suggests that maintaining the area along one side of a tree free of grass competition using herbicides or mulch may be as effective as maintaining the entire area under the tree canopy grass free. For newly planted hardwood seedlings, mulching a circle 4' in diameter (12 ft²) or 4' square (16 ft²) is recommended.

5. Avoid "volcano" mulching. Volcano mulching is piling mulch deeper around a tree trunk or plant stem than near the dripline which minimizes air movement into the soil and prevents deep roots from growing. Fitzgerald warns, "Volcano mulching" is one of the worst things you can do to a plant or tree." Mulch should be pulled at least 2-to-6 inches away from the tree trunk, stem, or flare so it remains dry and less vulnerable to infection by root and stem diseases. Mulches should also be pulled away from the tree trunk to minimize cover for mice and voles especially in the winter when they do the most damage.

Watch a related short video on Effective Mulching at the Davey Web site (http://www.davey.com/arborist-advice/video/landscape-tips-effective-mulching/).

https://www.fs.fed.us/nrs/pubs/jrnl/2016/nrs_2016_vansambeek_002.pdf

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https://www.fs.fed.us/nrs/pubs/jrnl/2016/nrs_2016_vansambeek_002.pdf

# Physical Issues

https://www.delta-optimist.com/news/trees-in-ladner-damaged-by-sheer-vandalism-1.1137630

# Physical Issues


https://www.dailytelegraph.com.au/

# Physical Issues Snow, Ice and Salt

http://www.portertreeservicesllc.com/

# Physical Issues Snow, Ice and Salt


http://www.deeproot.com/blog/blog-entries/minimizing-the-effects-of-salting-on-urban-trees

# Physical Issues
# Snow, Ice and Salt

http://www.deeproot.com/blog/blog-entries/minimizing-the-effects-of-salting-on-urban-trees

# Physical Issues Snow, Ice and Salt



***Table 2**. Landscape Plants with Reported Salt Tolerance*

When selecting plants for residential, city, or highway plantings, keep salt tolerance in mind. This table provides the reported salt tolerances of selected trees, shrubs, and vines. The tolerances are for resistance to salt spray, soilborne salt, and salt from other sources (including uncommon or rare sources such as naturally saline water and salts from home plumbing).

Choose your plants carefully, and remember that the degree of injury your plants could suffer depends on many variables. Salt tolerance can vary within the same species, so the information provided here is a relative judgment — there are even conflicting reports about many species. Also, data recorded from different climates or soil types may have questionable application in other areas.

***Key***

T = tolerant
M = intermediate
S = sensitive
— = No information available
* = invasive, not recommended in Indiana

| Plant Name | Salt Spray | Soil-Borne Salt | Other Salt Source |
|---|---|---|---|
| *Abies balsamea* Balsam Fir | M | S | M, S |
| *Abies concolor* White Fir | T | — | — |
| *Acer campestre* Hedge Maple | T, M | — | — |
| *Acer ginnala* Amur Maple | M, S | — | M |
| *Acer negundo* Box-elder | M, S | M | M, S |
| *Acer palmatum* Japanese Maple | S | — | — |
| *Acer pseudoplatanus* Sycamore Maple | T | S | S |
| *Acer rubrum* Red Maple | M, S | S | S |

https://www.extension.purdue.edu/extmedia/id/id-412-w.pdf

# Physical Issues Snow, Ice and Salt

https://www.nrs.fs.fed.us/pubs/55720

# Physical Issues Snow, Ice and Salt

https://www.nrs.fs.fed.us/pubs/55720

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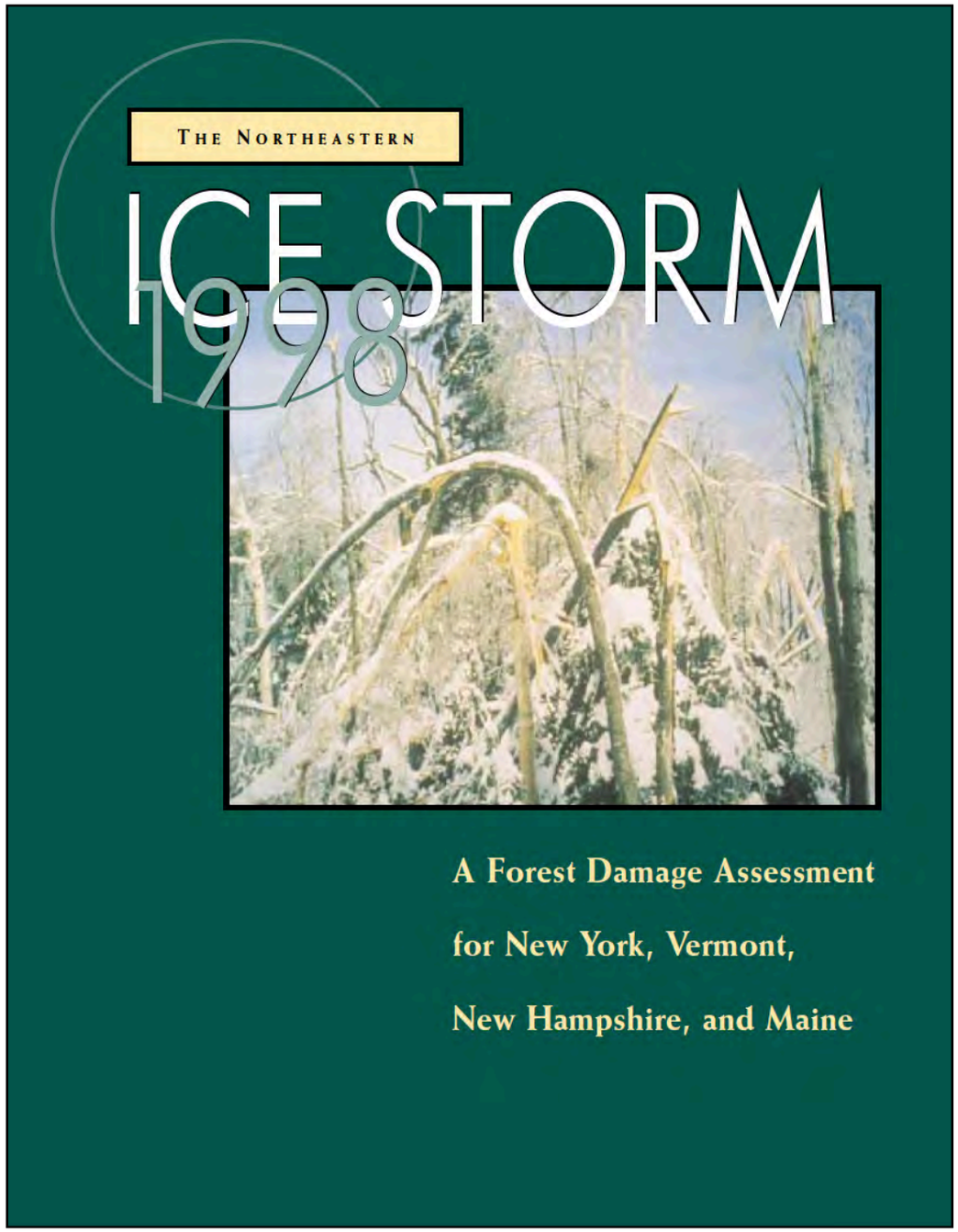
https://www.nrs.fs.fed.us/pubs/55720

# Physical Issues Snow, Ice and Salt




https://www.nrs.fs.fed.us/pubs/55720

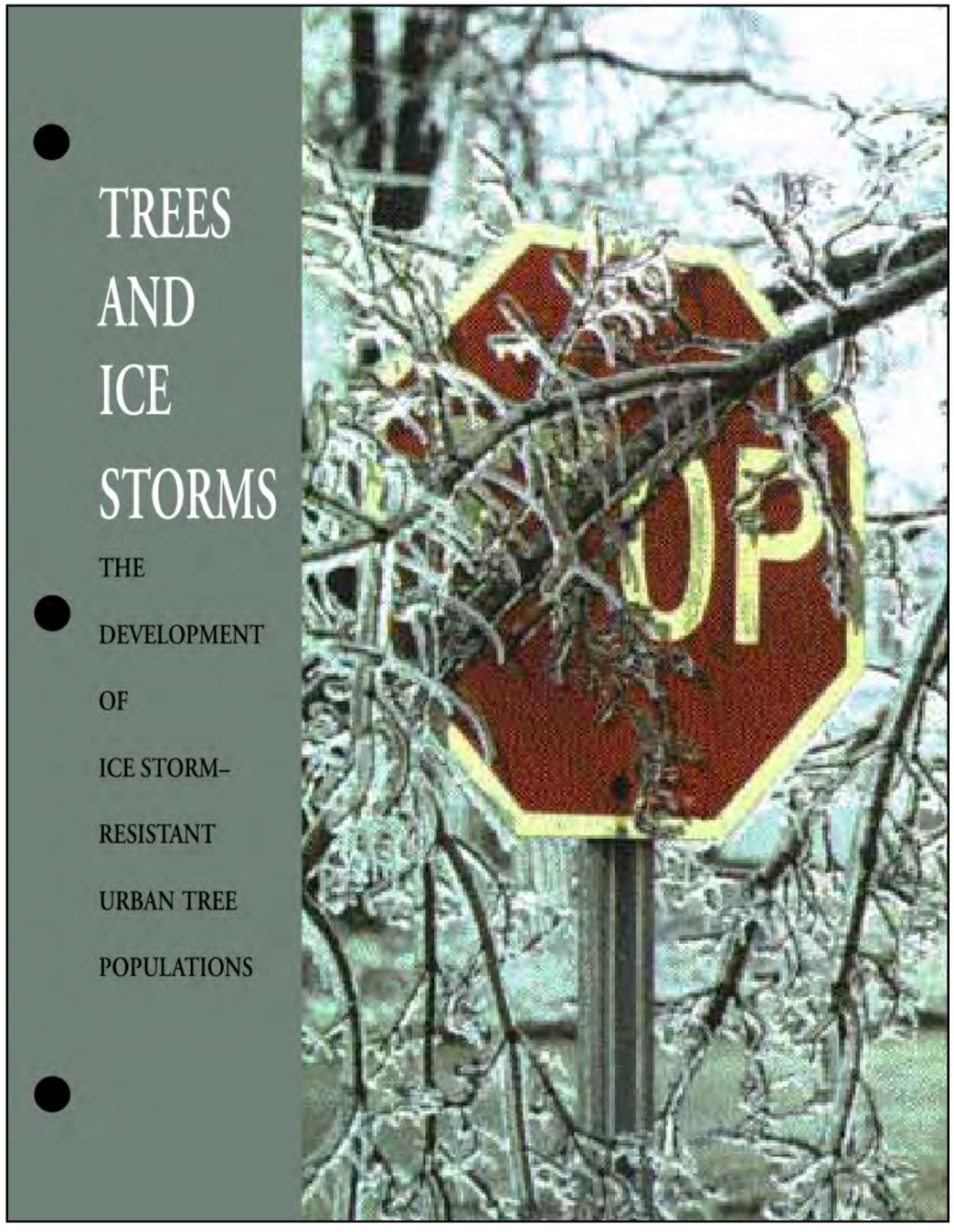
# Physical Issues Snow, Ice and Salt

**Percent of trees sampled with diameter ≥ 5″ in each crown loss category**

| Crown loss | New York | Vermont | New Hampshire | Maine | Region |
|---|---|---|---|---|---|
| No damage (0%) | 44.7 | 59.5 | 49.5 | 54.2 | 51.0 |
| Light/moderate (1–49%) | 28.4 | 24.5 | 27.2 | 28.8 | 27.7 |
| Heavy (50–79%) | 11.4 | 7.6 | 9.3 | 8.4 | 9.5 |
| Severe (80–100%) | 15.5 | 8.4 | 13.5 | 8.6 | 11.8 |

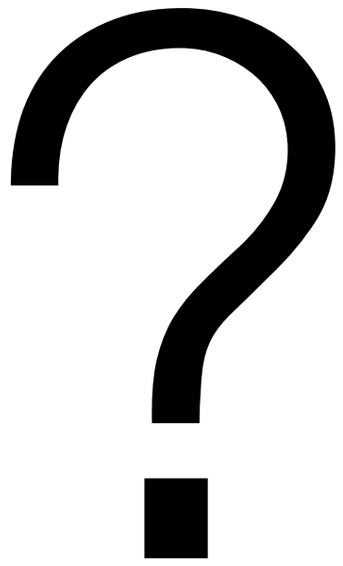
https://www.nrs.fs.fed.us/pubs/55720

# Physical Issues Snow, Ice and Salt




https://www.nrs.fs.fed.us/pubs/55720

# Threats to street trees



- Poor Species Selection
- Physical Damage
- Compacted Soils
- Root Damage
- Road Salt
- Utility Pruning
- Diseases & Insects
- Invasive Pests
- Economics
- Climate Change

# Tree Talks: No. 4
# Street Trees: Threats & Solutions

Plainfield, Massachusetts