

## Our Changing Climate: Impact and Projections

Dan Herms,  
The Davey Tree Expert Company  
Kent, OH

dan.herms@davey.com



---

---

---

---

---

---

---

---

## 10 warmest years in the instrument record (16 of 17 have occurred since 2000)

1. 2016
2. 2017
3. 2015
4. 2014
5. 2010
6. 2005
7. 2013
8. 2007
9. 2009
10. 1998



Source: NASA

---

---

---

---

---

---

---

---

## Glacier National Park



Number of glaciers in 1910: 150  
Today: 24

Grinnel Glacier, 1926 and 2008

[http://www.signoeditoresfotografia.es/wp-content/uploads/2015/10/GrnRock2\\_1926\\_Etrod\\_LUM486-X0\\_114-017\\_c\\_L.jpg](http://www.signoeditoresfotografia.es/wp-content/uploads/2015/10/GrnRock2_1926_Etrod_LUM486-X0_114-017_c_L.jpg)

---

---

---

---

---

---

---

---

## Climate Change at Thoreau's Walden Pond



"We determined that plants bloomed seven days earlier on average than they did in Thoreau's times."

Miller-Rushing & Primack. 2008. Global warming and flowering times in Thoreau's Concord: a community perspective. *Ecology* 89:332-341.

---

---

---

---

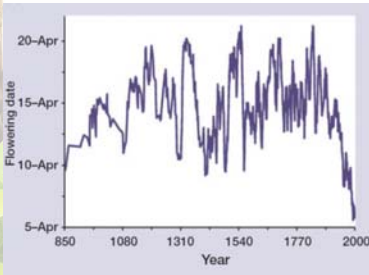
---

---

---

---

## 1150 Year Record of Cherry Blossom Phenology in Kyoto, Japan



Miller-Rushing et al. 2012. *Front. Ecol. Environ.* 10: 285-290

---

---

---

---

---

---

---

---

## Phenology: black vine weevil emerging 2-3 weeks earlier than 1970s



D.G. Nielsen, Ohio State University



Gina Penny



Multiflora rose, *Rosa multiflora*

---

---

---

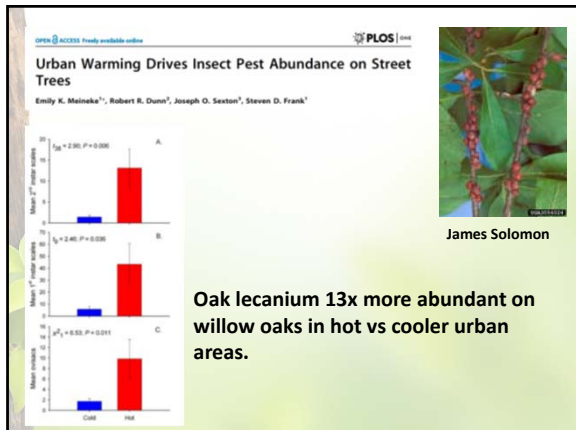
---

---

---

---

---




---

---

---

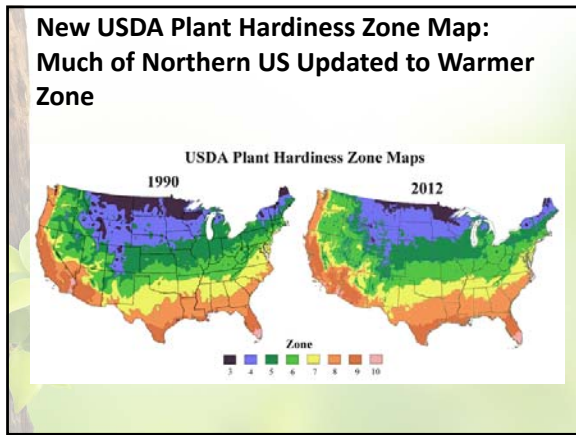
---

---

---

---

---




---

---

---

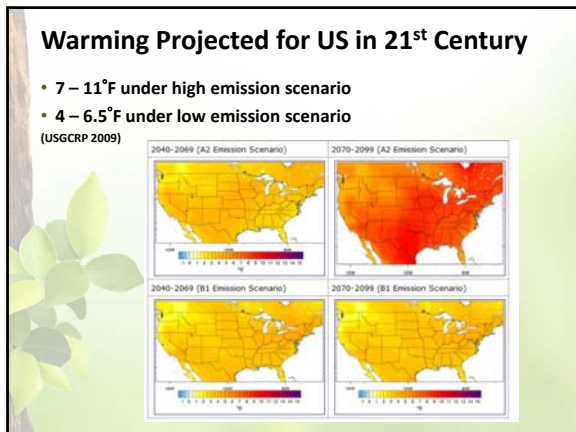
---

---

---

---

---




---

---

---

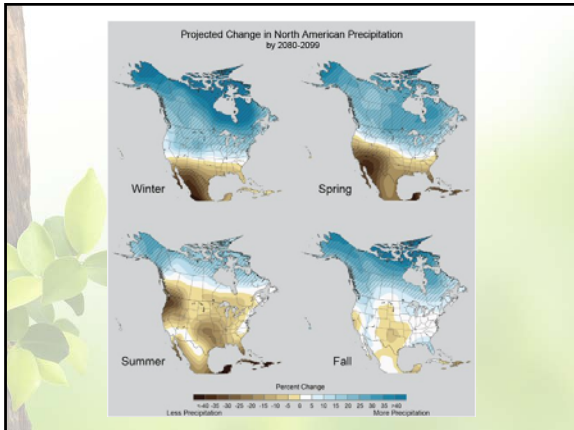
---

---

---

---

---




---

---

---

---

---

---

---

---

### Climate Change Projections (US EPA)

- Continued warming
- More heavy precip events
- More frequent heat waves and summer drought
- More days above 95°F
- Northward tree and pest migration

---

---

---

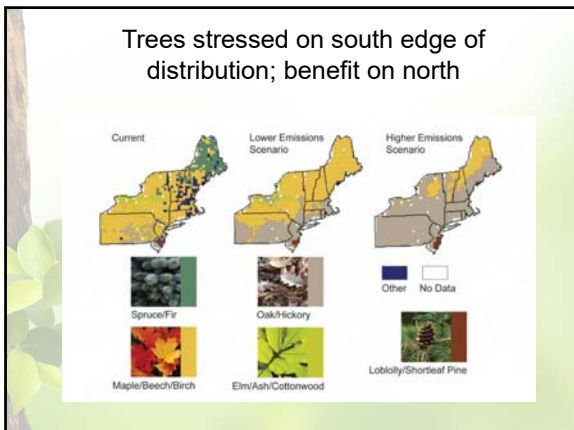
---

---

---

---

---




---

---

---

---



---

---

---

---

**Climate change, bronze birch borer, and the distribution of paper birch**

Conservation and Economic Research  
A Review of Bronze Birch Borer (Coleoptera: Buprestidae) Life History, Ecology, and Management  
VANESSA L. WOLLENBEEK<sup>1</sup> and DANIEL A. BRISQI<sup>2</sup>  
*Environ. Entomol.* (2012) 41:1372-1385

---

---

---

---


---

---

---

---

**Warmer, wetter weather has increased disease pressure from foliar pathogens on eastern white pine in the NE**



Forest Ecology and Management  
ELSEVIER journal homepage: www.elsevier.com/locate/foreco

Response of eastern white pine and associated foliar, blister rust, canker and root rot pathogens to climate change<sup>®</sup>  
Stephen A. Wyka<sup>1,\*</sup>, Isabel A. Munck<sup>2</sup>, Nicholas J. Brazner<sup>3</sup>, Kirk D. Broders<sup>4</sup>

---

---

---

---

---

---

---

---

**Range Expansion of Southern Pine Beetle  
New Jersey Pinelands**



Photo by Bob Williams, Land Dimensions

---

---

---

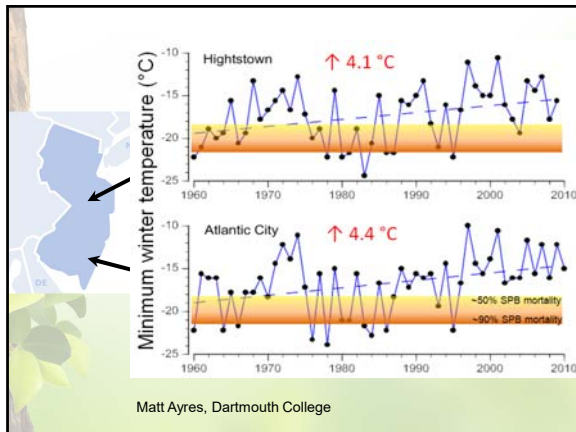
---

---

---

---

---




---

---

---

---

---

---

---

---

---

---

### Divergent temperature effects on survival of hemlock and hemlock woolly adelgid (HWA)

www.nativetreesociety.org

Drs. Angela Mech and Kamal Gandhi

Low altitude: healthy hemlock stands

High altitude: severe hemlock decline

---

---

---

---

---

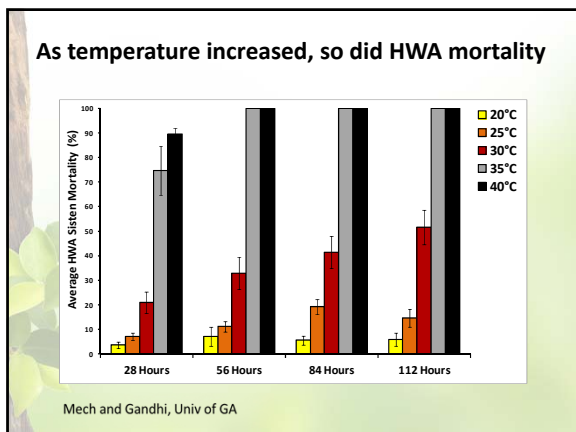
---

---

---

---

---




---

---

---

---

---

---

---

---


---

---

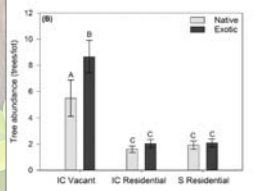


Urban Forestry & Urban Greening  
Journal homepage: www.elsevier.com/locate/ufug

Original article  
Exotic trees contribute to urban forest diversity and ecosystem services in inner-city Cleveland, OH  
Christopher B. Riley<sup>a,\*</sup>, Daniel A. Herms<sup>a</sup>, Mary M. Gardiner<sup>a</sup>



Chris Riley, OSU



**Carbon Storage (kg):**

Inner-City Vacant Lots	57,448
Suburban Residential Lots	17,997

C sequestered in US urban forests: 25.6 million tons / yr  
(Nowak et al. 2013. *Environ. Pollut.* 178:229-236)

---

---

---

---

---

---

---

---

---

---

**Horticultural implications next 30 years:**

- Increasing temperature nationwide
- Increasing storm intensity NE, SE, MW
- Decreasing precipitation SE, West
- Increasing insect pest pressure
- Increased stress for some trees; increased growth for others
- Increasing wildfire
- Increased worker stress, especially in southern US
- Trees can help mitigate effects of climate change

---

---

---

---

---

---

---

---

---

---