


The effects of climate change on native plants

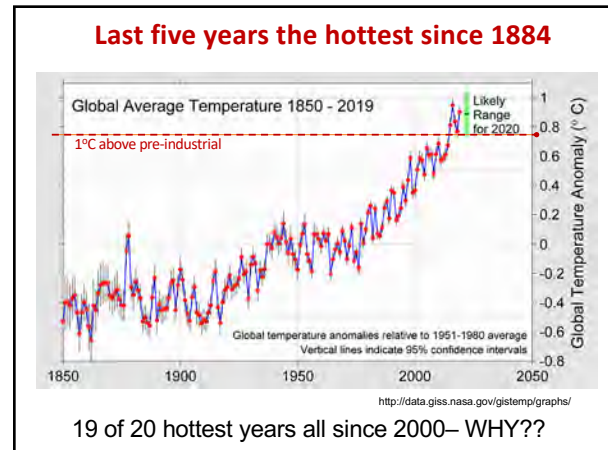


David Inouye

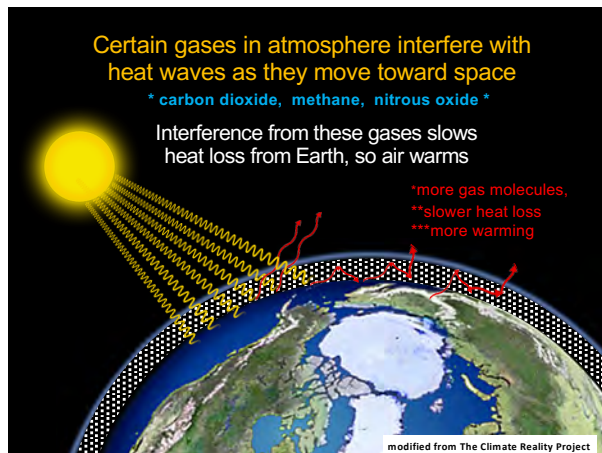
Dr. Sara Via
Professor &
Climate Extension Specialist
UMD, College Park
svia@umd.edu

Master Gardeners
University of Maryland System

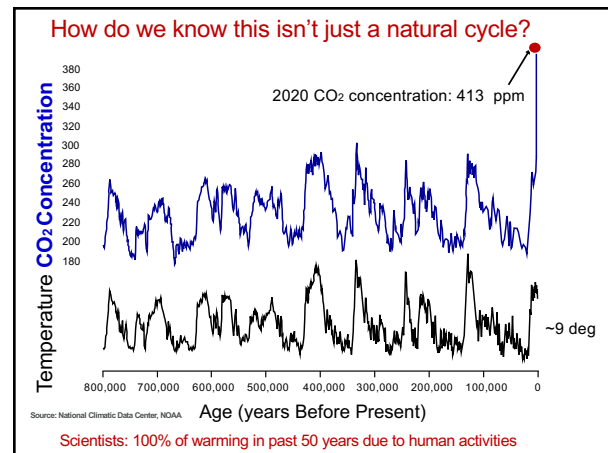
1



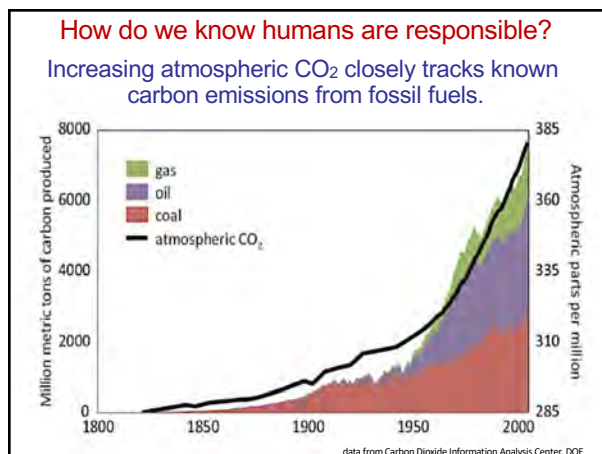
2



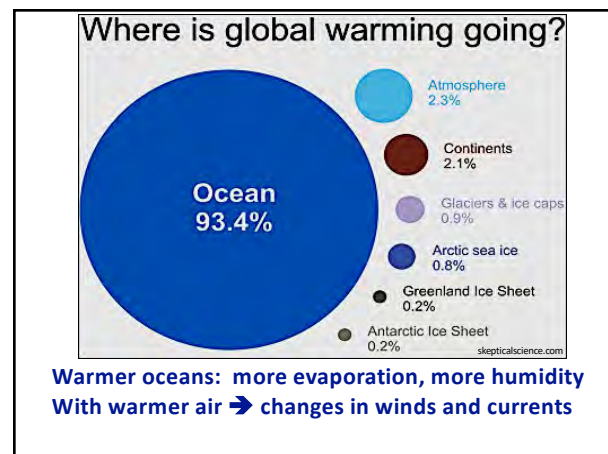
3



4



5



6

The "NEW NORMAL"

1. Rising temperatures

- warmer winters, earlier springs
- longer growing season
- more extremely hot days, fewer cool nights

2. Heavier downpours, more flooding

3. More summer drought, wildfires

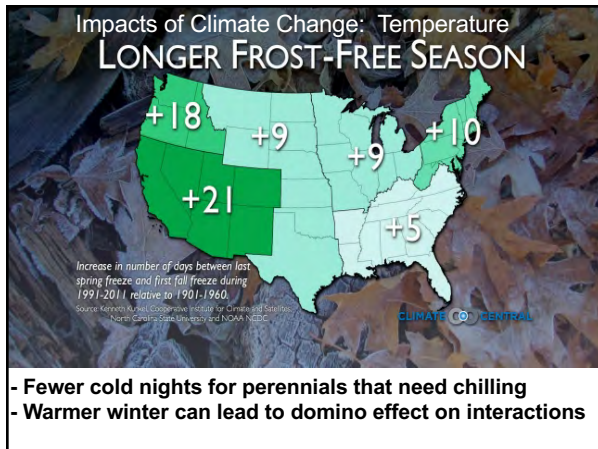
7

Impacts of the New Normal on native plants

Heat, flooding, droughts, extreme weather:

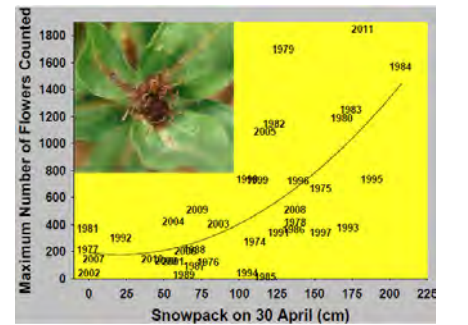
- Increase plant stress
- Increase susceptibility to disease, herbivory
- Change species interactions (competition, herbivory, pollination, microbial effects)
- Can change habitat availability & species range
- Change community composition
- Will cause local extinction of some species

8



9

Warmer winters in Rockies → less snow & fewer flowers survive late freeze



so less food for pollinators,
fewer seeds to maintain plant population

10

Mismatched timing in species interactions

Plants and pollinators can respond differently to warming

- Asynchrony can cause failure to set seed, lack of food for pollinators
- Bad for plants AND pollinators



Speyeria mormonia and *Erigeron speciosus*



Source: David Inouye

11

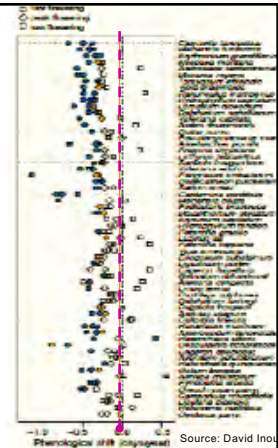
Warmer winters, earlier flowering

Native Plants:

Shifts in flowering time in just 39 years

- 69 native species Rocky Mountains
 - most species flower earlier, extent variable
 - plants may flower at smaller size
- Franks & Weis (2008) *J. Evol. Biol.*

Long-term studies crucial



12

Warmer winters & earlier flowering



Delphinium barbeyi
- pollinated by broadtailed hummingbird
& hawkmoths

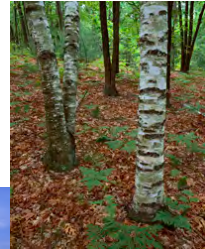


But, unexpected cold snap
→ freezing, flower loss
- no food for pollinators
- no seeds

Source: David Inouye

13

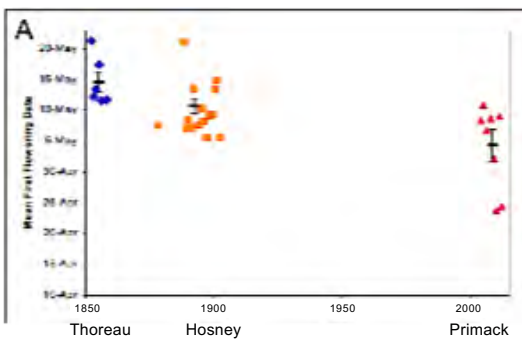
Climate change in Thoreau's wood



14

Climate change in Thoreau's woods

Native plants flower 11 days earlier now (on average)
and invasives flower earlier than natives



15

Thoreau's wood and beyond Warmer winters favor invasives

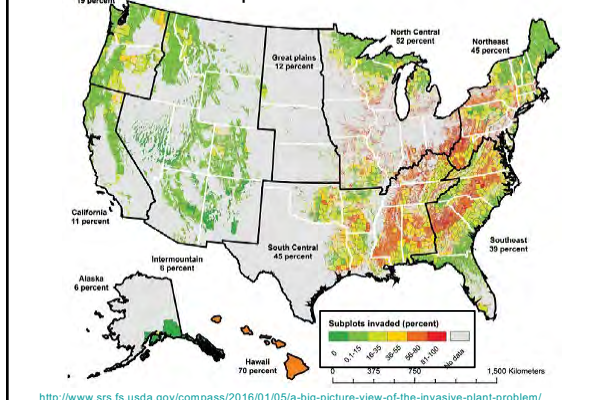


- better overwinter survival
- earlier flowering time
- competitive advantage over natives by taking space, water & nutrients

Willis CG, et al. (2010) Favorable Climate Change Response Explains Non-Native Species' Success in Thoreau's Woods. PLoS ONE 5(1): e8878. doi:10.1371/journal.pone.0008878

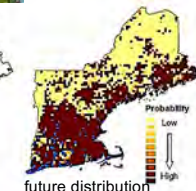
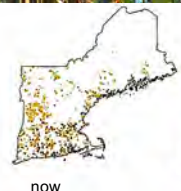
16

Invasive plants in US forests



17

Range expansion of invasive: Oriental bittersweet



now

future distribution
(Business as usual, BAU)

18

Effects of warmer winters: animals

Deer

- more food during winter
- healthier populations
- higher overwinter survival
- increase in # offspring & offspring survival



19

Deer grazing changes plant communities!

-Native plants favored by deer decline, ie *Trillium*



-Plants deer avoid increase:

garlic mustard



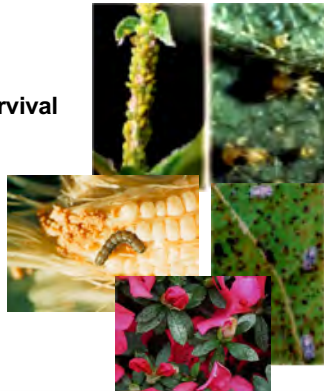
multiflora rose

20

Effects of warmer winters on animals

Insects

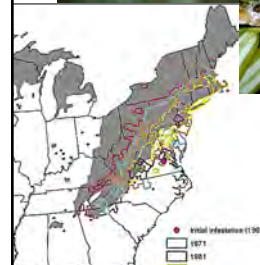
- better overwinter survival
- earlier appearance
- more generations/yr
- range expansion



21

Warmer winters: Insect range expansions

Hemlock woolly adelgid

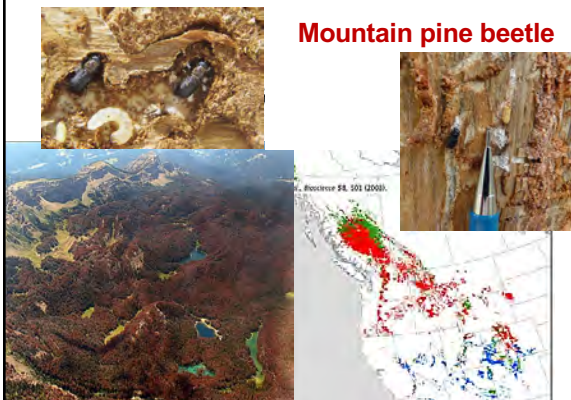


Dukes et al (2009) Can. J. For. Res 39:231

22

Warmer winters: Insect range expansions

Mountain pine beetle



23

MPB now ready to spread to eastern Canada

-Crossed the Rockies

- Shifted onto Jack Pine



Lodgepole Pine

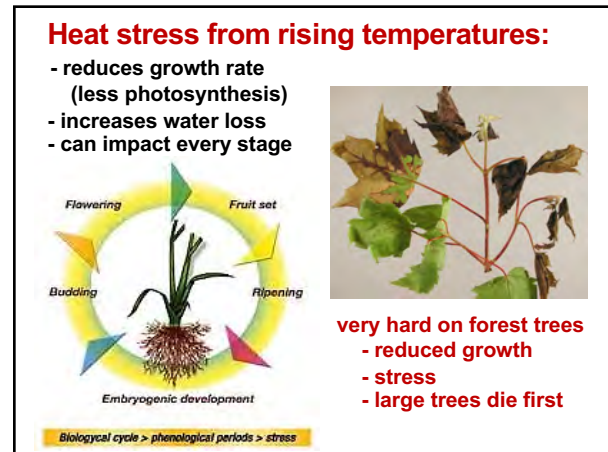


Jack Pine

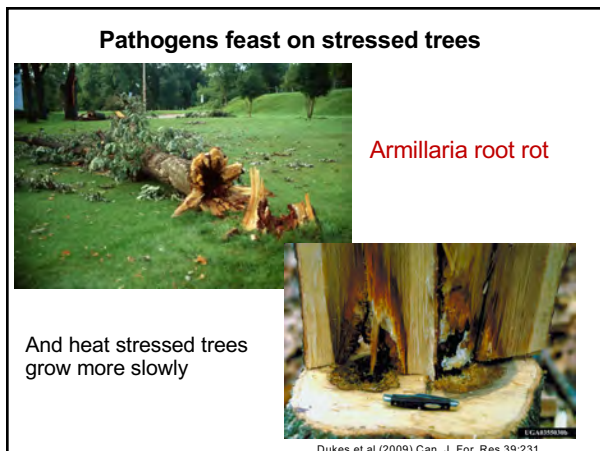
24



25



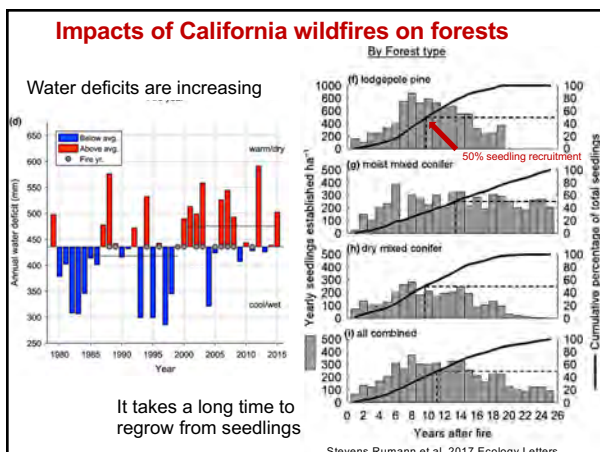
26



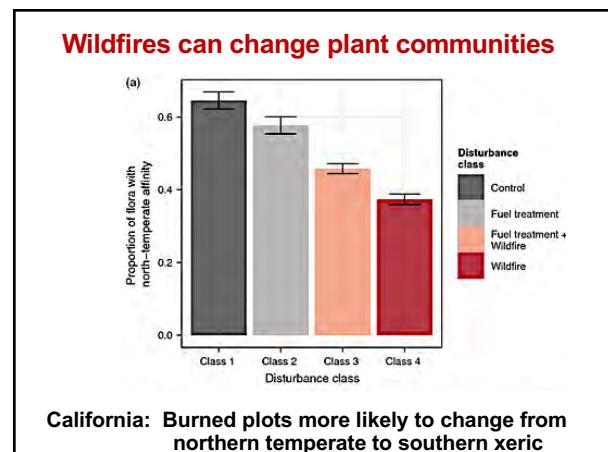
27



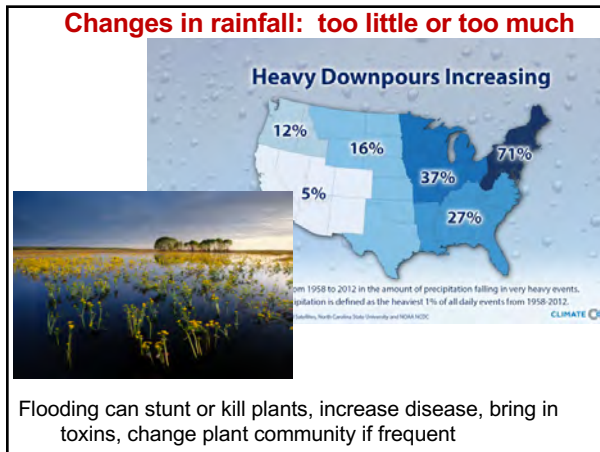
28



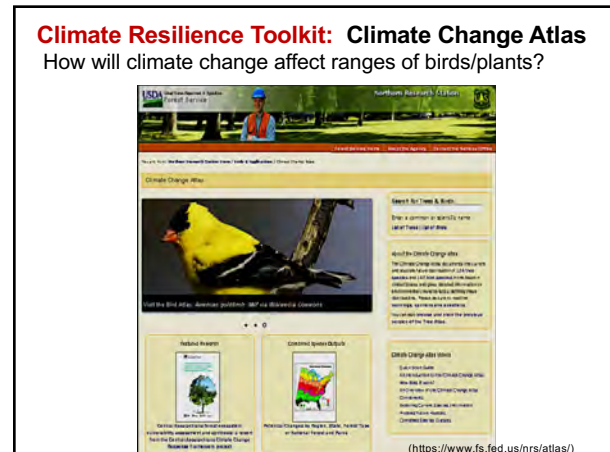
29



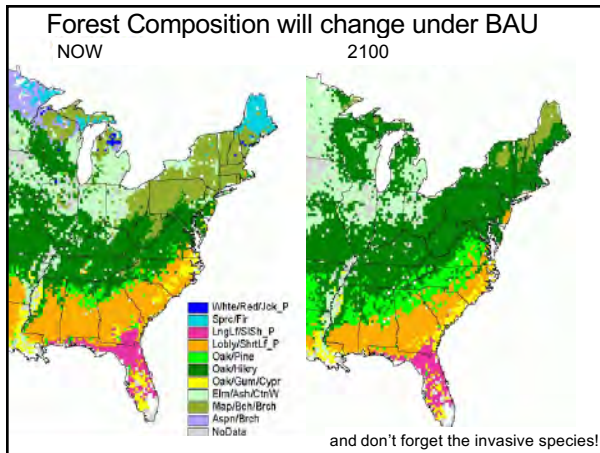
30



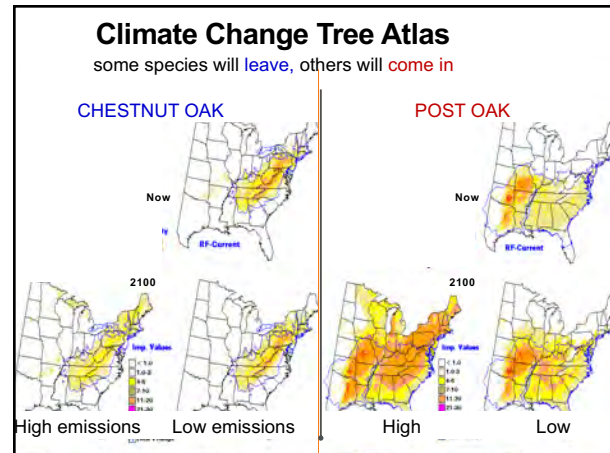
31



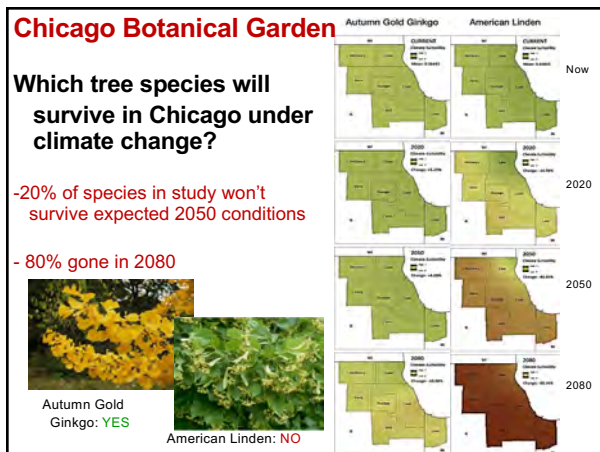
32



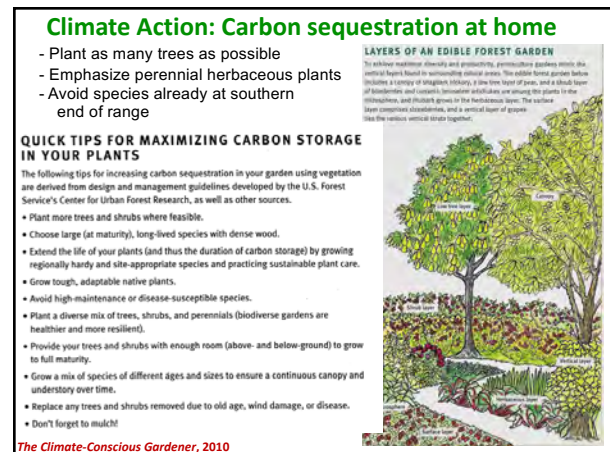
33





34




35



36



Thank you!



Email me anytime with questions:

Dr. Sara Via
Professor &
Climate Extension Specialist
svia@umd.edu