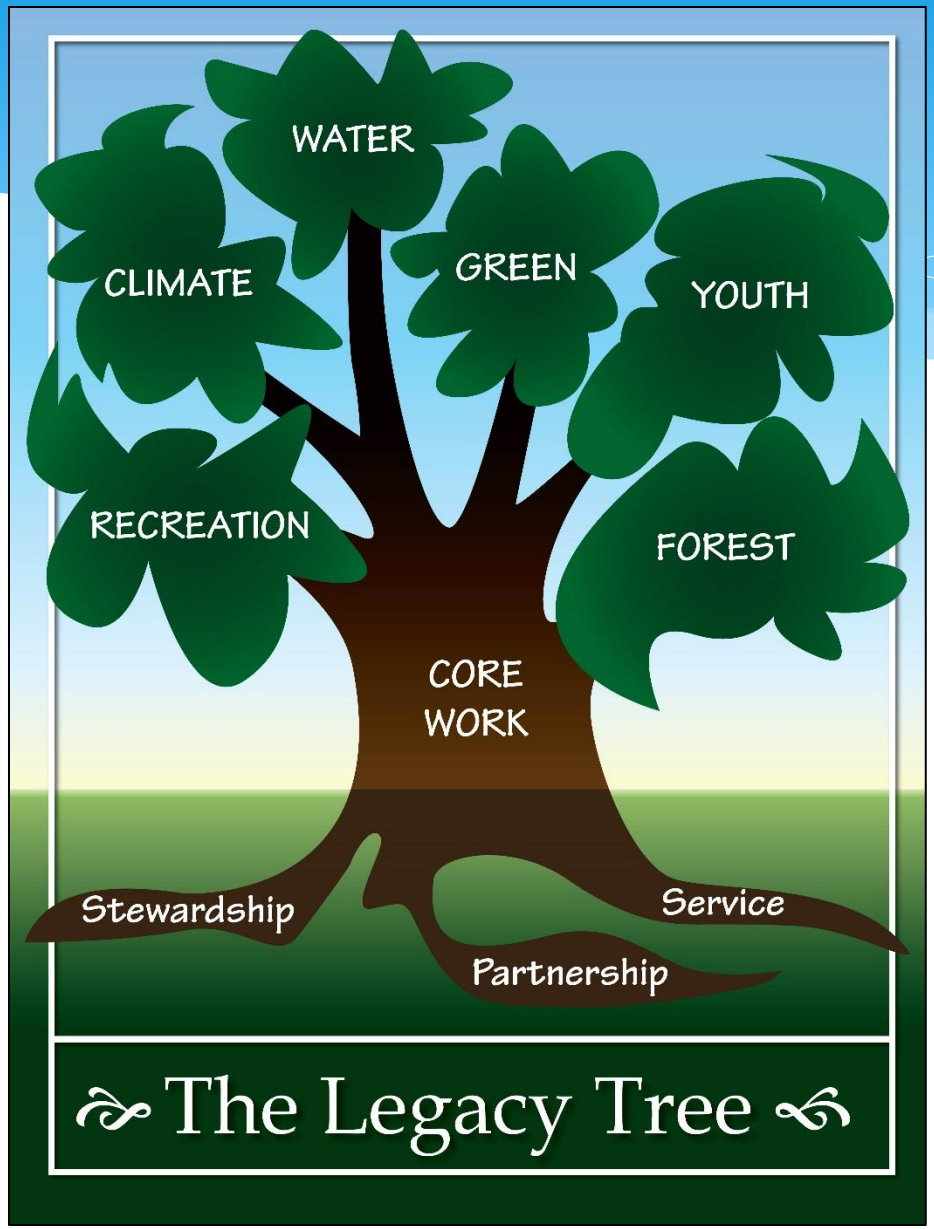
DCNR's Approach to Climate Change

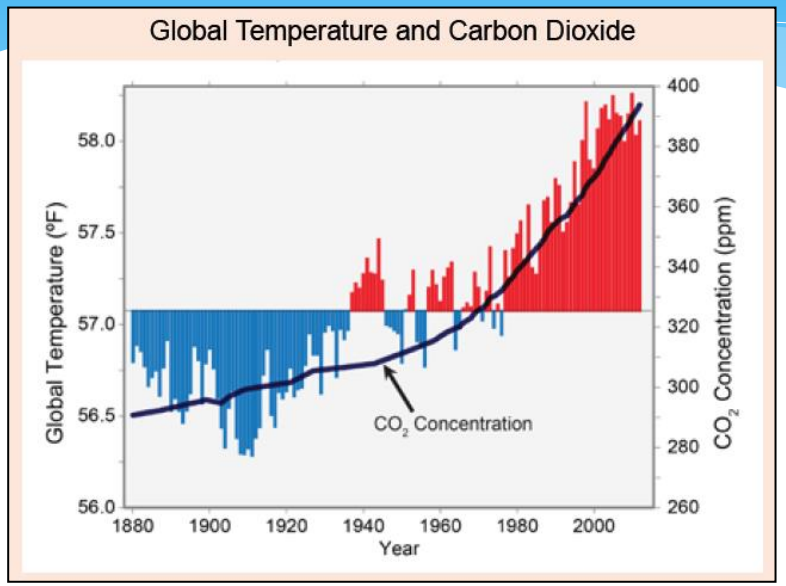
From carbon sequestration to climate adaptation

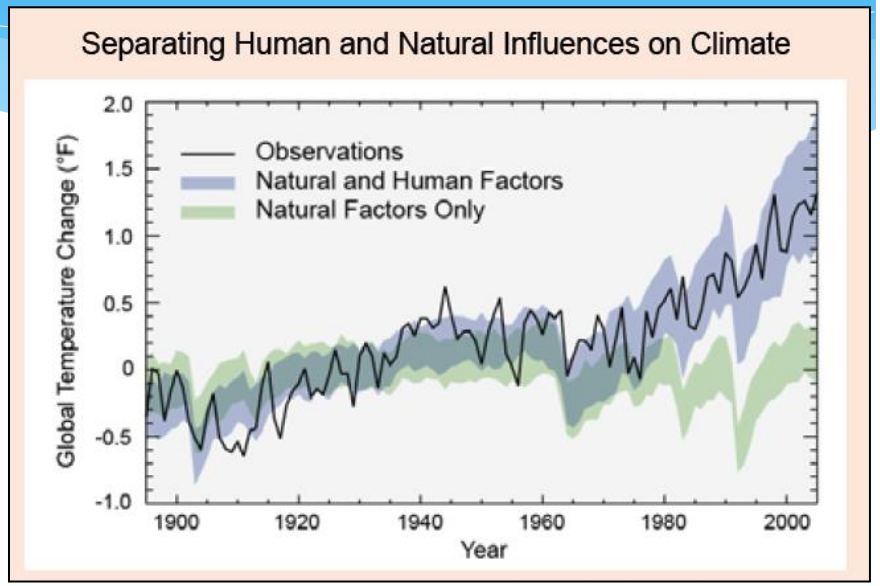
Greg Czarnecki

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES


WATER
CLIMATE
GREEN
YOUTH
RECREATION
FOREST
CORE
WORK
Stewardship
Service
Partnership
The Legacy Tree

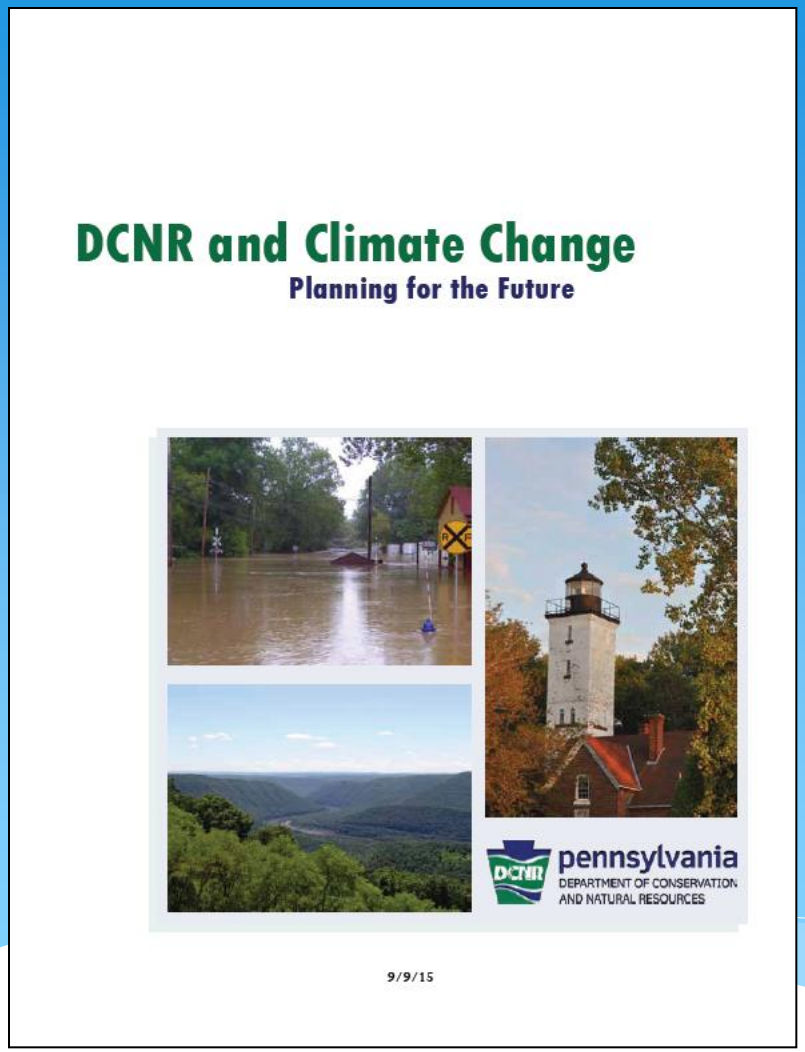
Why is this one of our initiatives?





Source: U.S. National Climate Assessment

As the state's leading conservation and recreation agency and largest public lands steward, DCNR should be a leader in the Commonwealth's response to climate change.



Audience:

DCNR staff and constituents

Purpose:

Provides a roadmap for reducing the department's carbon footprint, adapting to climate change, and establishing DCNR as a role model for effectively dealing with climate change.

Sources of Info

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

National Wildlife Federation

EPA United States Environmental Protection Agency

The Nature Conservancy

GlobalChange.gov
U.S. Global Change Research Program

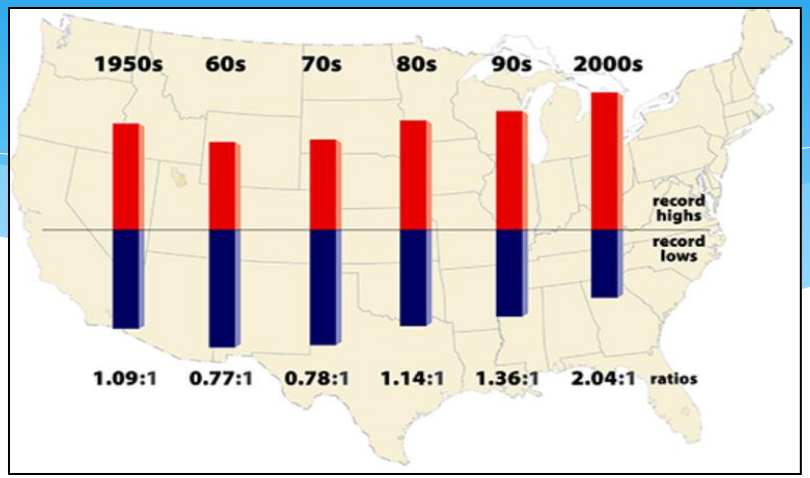
PennState

USDA United States Department of Agriculture
Forest Service

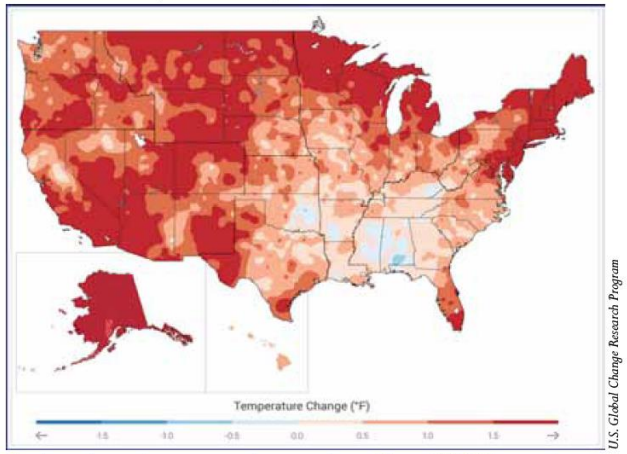
Climate Change
Tree Atlas

Northern
Research Station

National Climate Trends

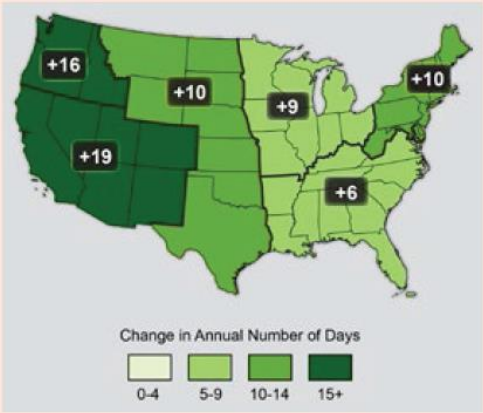


Observed U.S. Temperature Change

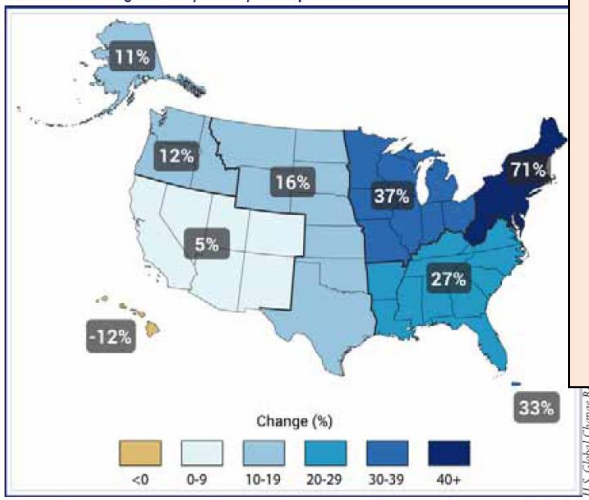


The colors on the map show temperature changes over the past 22 years (1991-2012) compared to the 1901-1960 average. The period from 2001 to 2012 was warmer than any previous decade in every region. (Figure source: NOAA NCDC / CICS-NC).

Observed Increase in Frost-Free Season Length

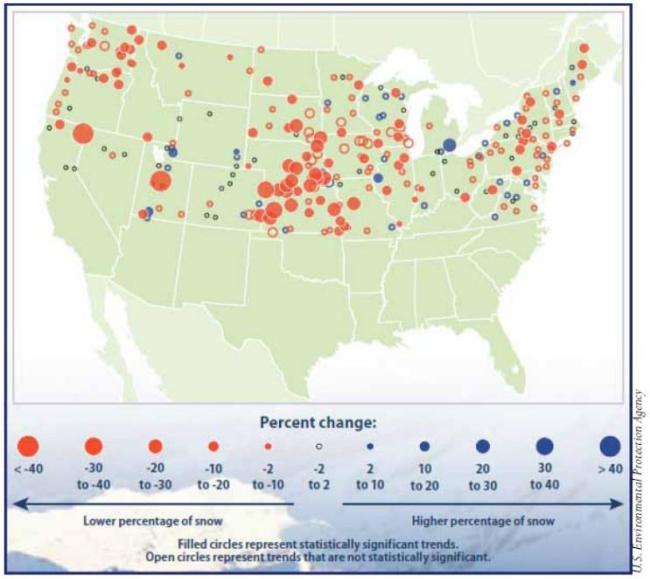


Observed Change in Very Heavy Precipitation

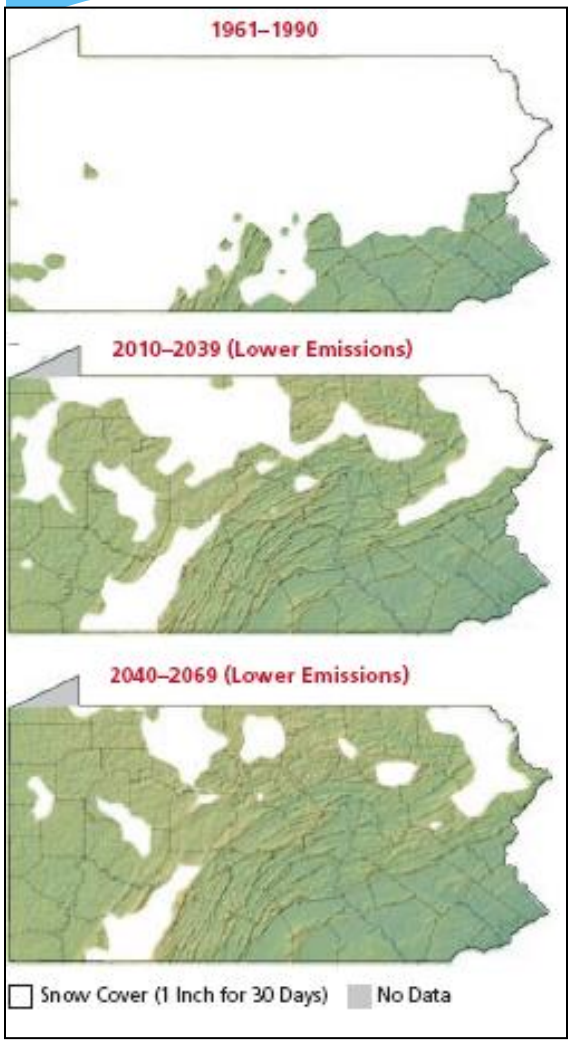


The map shows percent increases in the amount of precipitation falling in very heavy events (defined as the heaviest 1% of all daily events) from 1958 to 2012 for each region of the continental United States. (Figure source: updated from Karl et al. 2009).

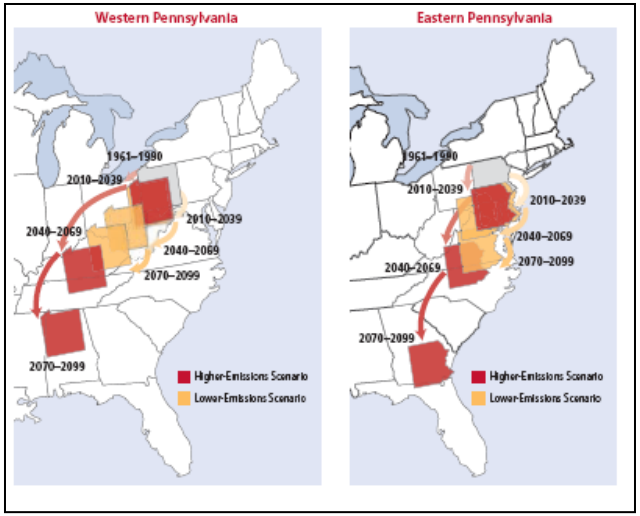
Change in Snow-to-Precipitation Ratio in the Contiguous 48 States, 1949–2014

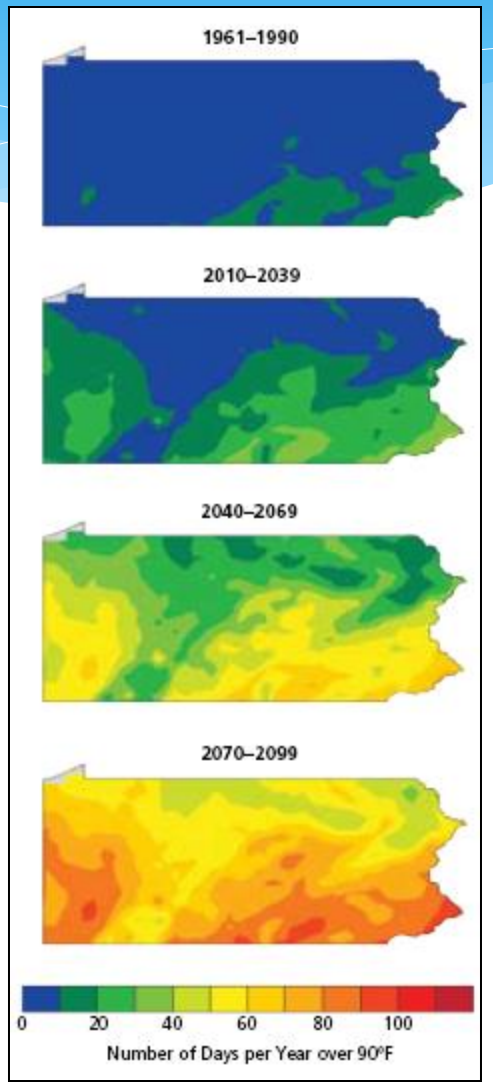


Climate Trends - Pennsylvania



- 5.4 F warmer by mid-century
- 14% more winter precipitation

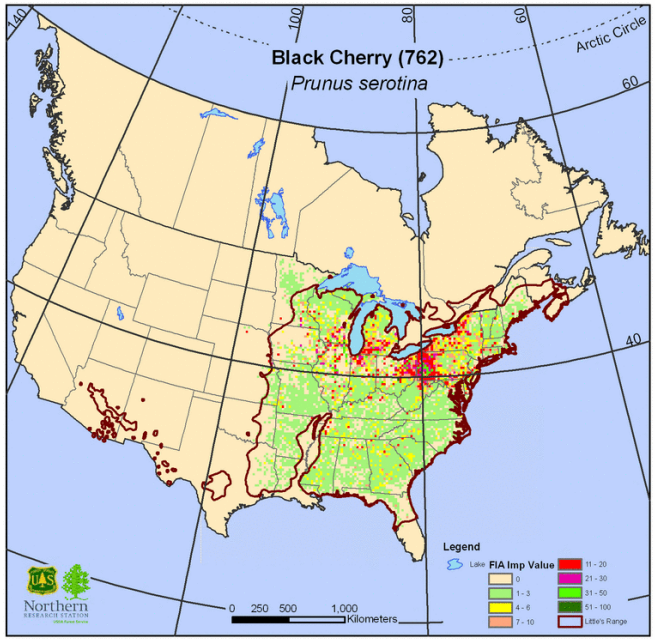




Existing Risks & Vulnerabilities

Emerging Risks & Vulnerabilities

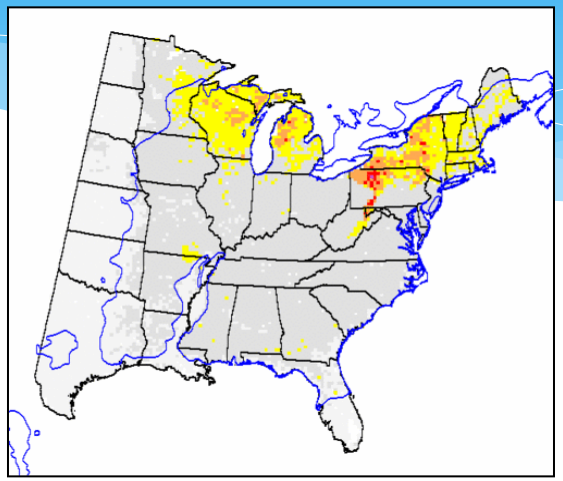
Range Shifts for Important Tree Species



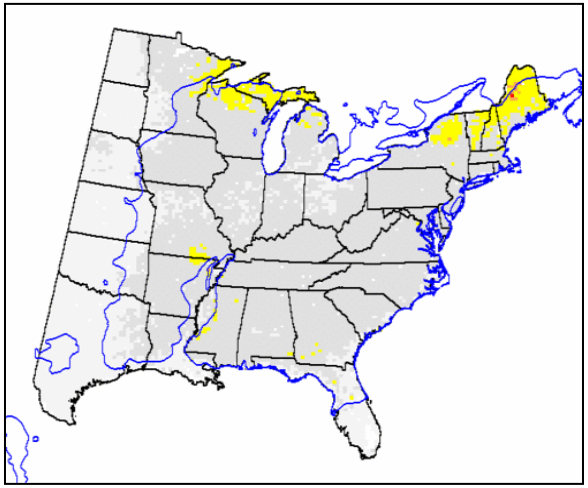
Current distribution

(Source: USFS)

Doubling of CO_2



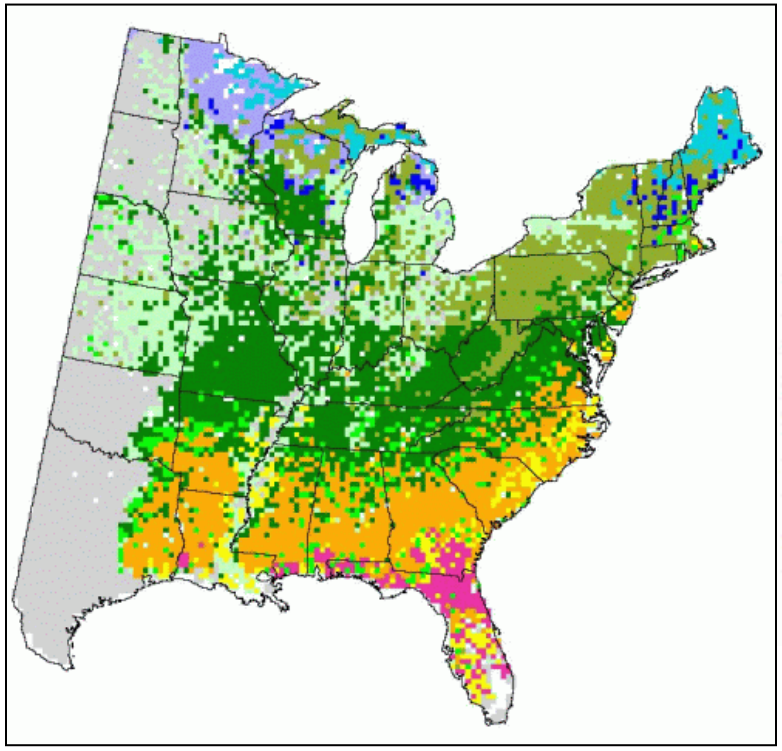
Tripling of CO_2



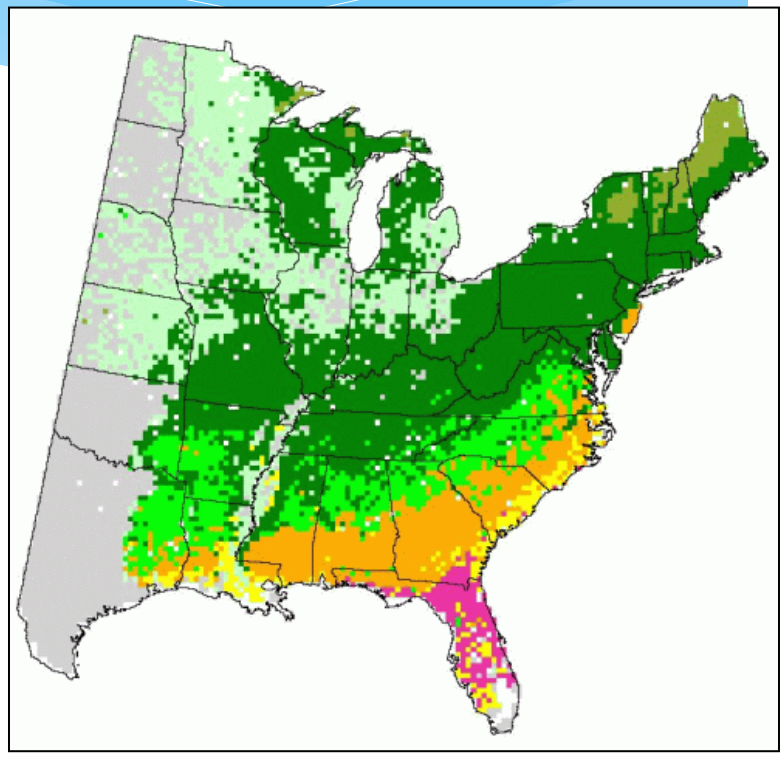
Trees that germinated at the southern end of their range, such as sugar maple, may not be in suitable habitat when they mature.

Forest Type Distribution

Current

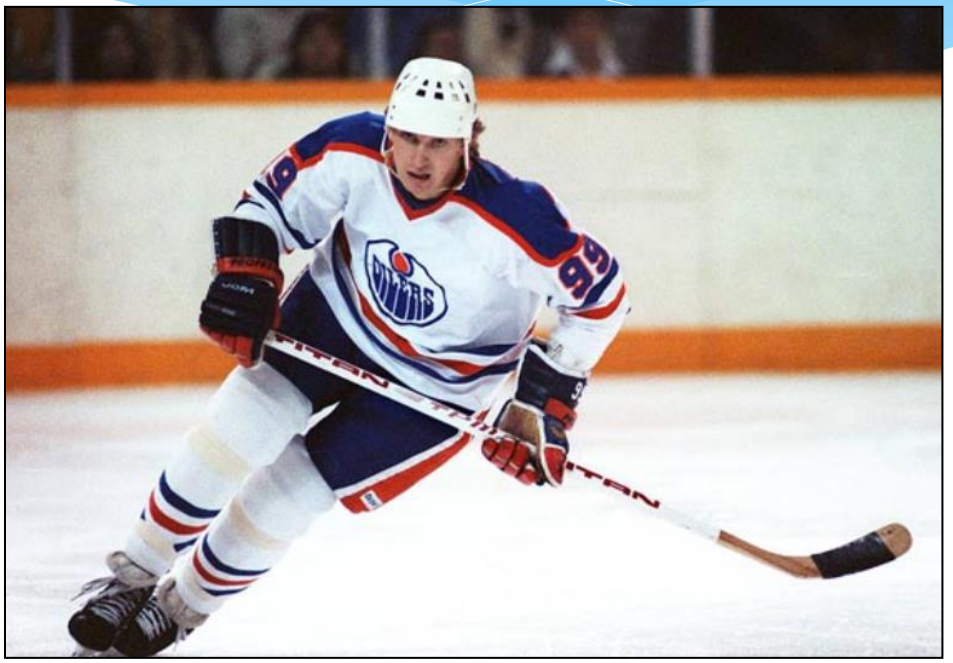


Tripling of CO_2



The forest products industry may need to adjust to a changing forest resource.

Our Approach to Conservation Must Change



"I skate to where the puck is going to be, not where it's been."

Wayne Gretzky

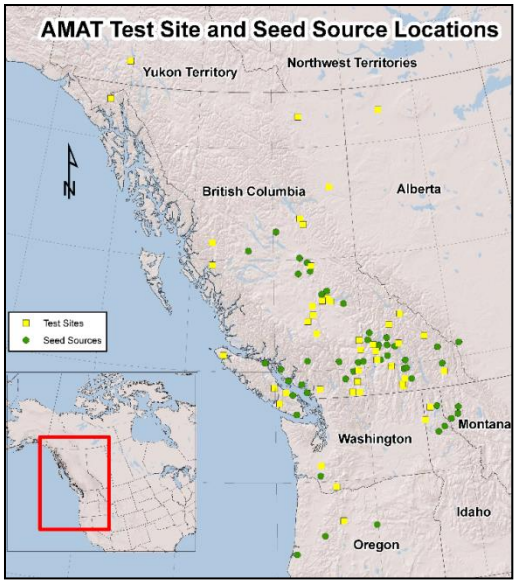
The New Conservation Paradigm

- Manage for change and not some ideal end point
- Focus on maintaining ecological integrity, not species
- Create arenas of evolution, not museums of the past

Consider New Approaches

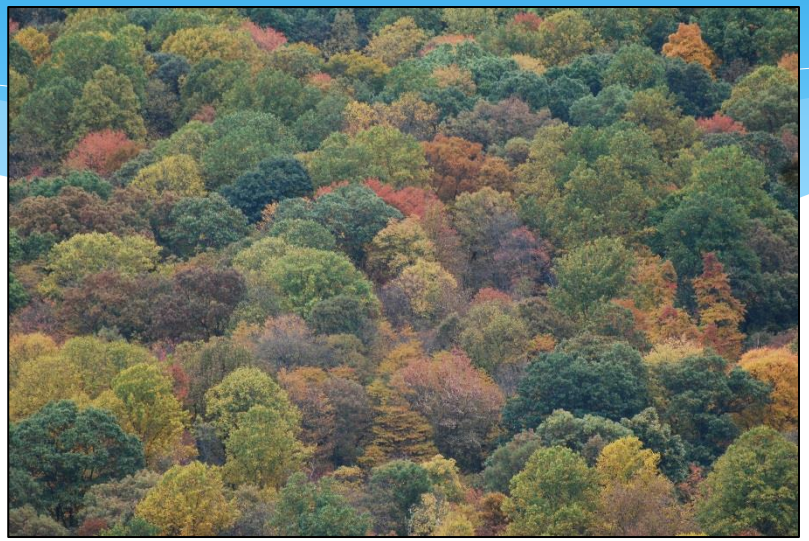
Can fragmenting features be corridors?

Assisted migration



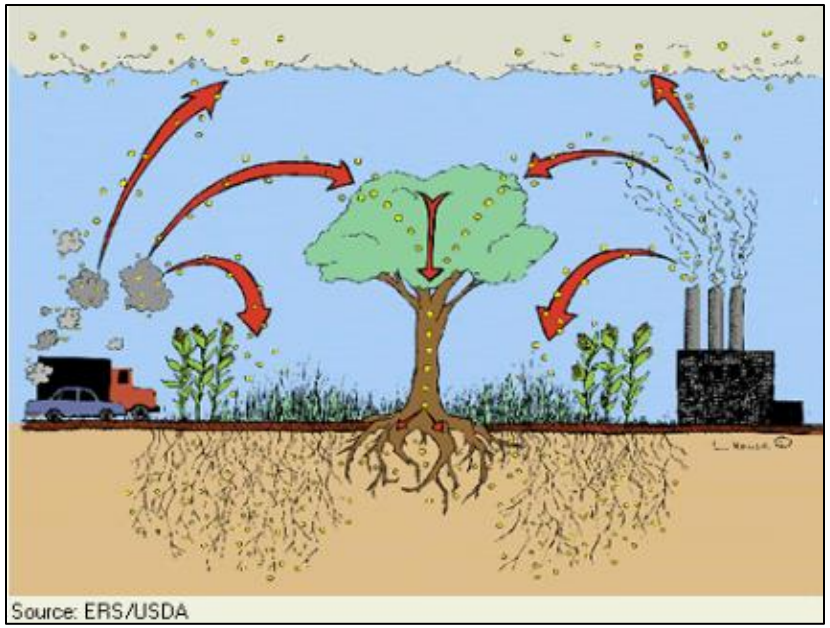
Consider non-native species in restoration projects

DCNR's Climate Change Goals



* Maintain healthy diverse forests that sequester an increasing amount of carbon
* Understand the current and developing impacts of climate change on DCNR's mission and lands
* Reduce DCNR's carbon footprint
* Be prepared to deal with the impacts of climate change
* Educate DCNR staff and constituents about the science of climate change and the need to take action

Carbon Sequestration



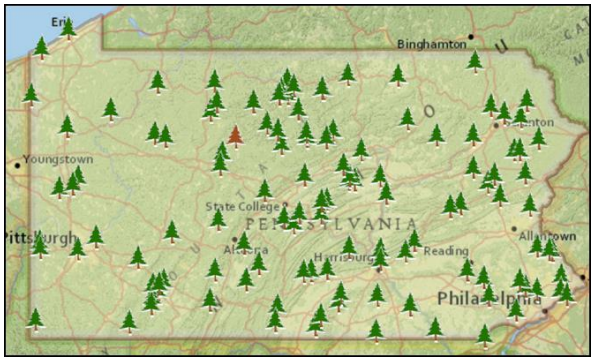
- 50% of a tree's weight is Carbon
- US forests sequester 41% of US power plant emissions
- PA State Forests sequester 4.7 million tons of CO_2

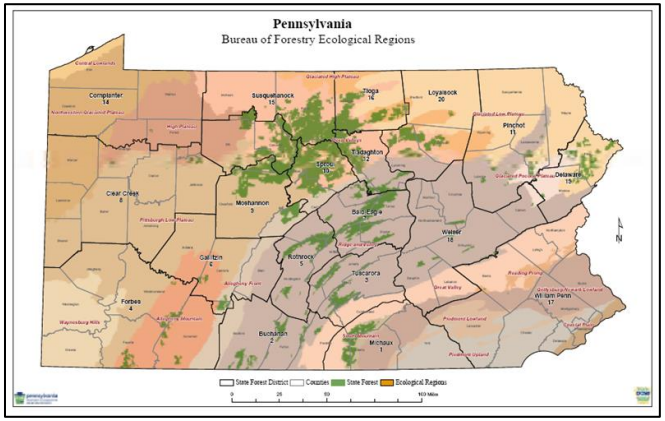
Adaptation Plan

- Will include every bureau and function, from grants and recreation to environmental education and land management

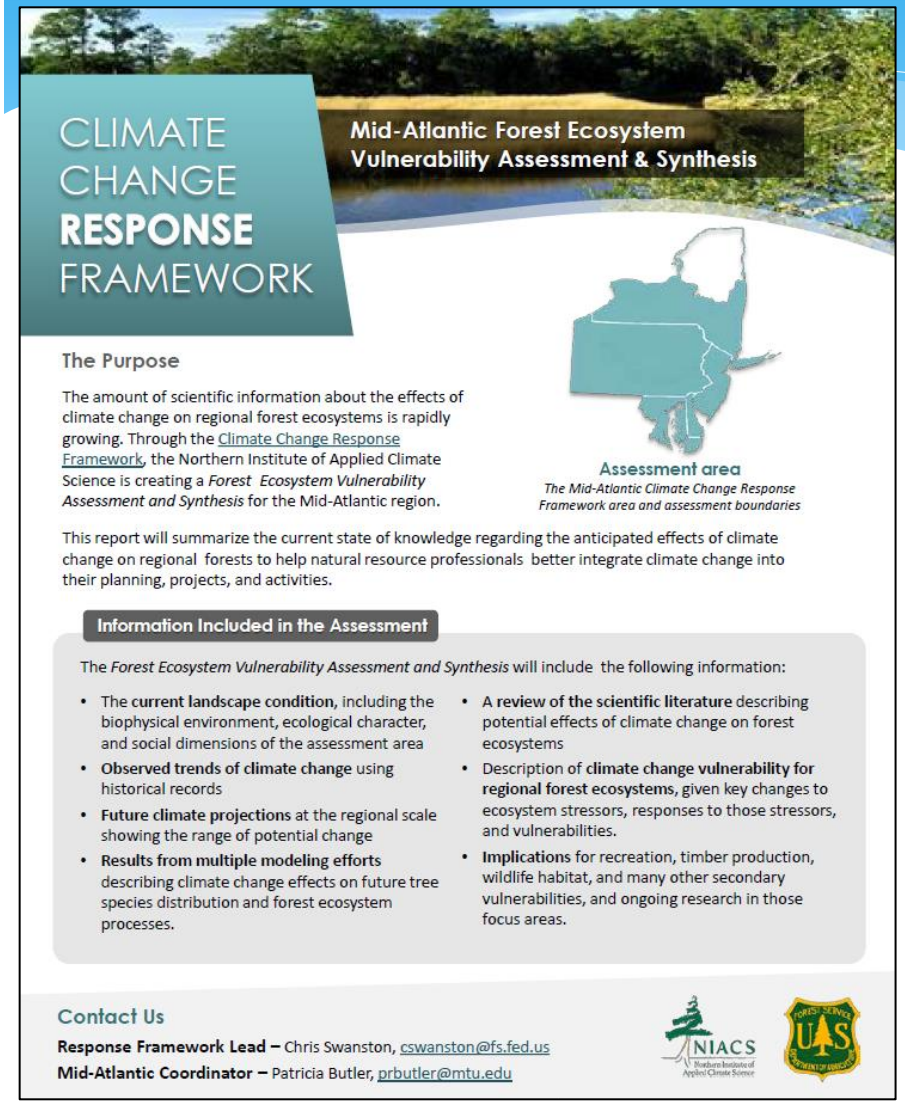
- Likely strategies:
  - Sustain ecological functions
  - Reduce the impact of existing stressors
  - Maintain and create refugia
  - Promote landscape connectivity
  - Maintain and enhance species and structural diversity
  - Enhance genetic diversity

NIACS
Northern Institute of Applied Climate Science





Vulnerability analyses



CLIMATE CHANGE **RESPONSE** FRAMEWORK

Mid-Atlantic Forest Ecosystem Vulnerability Assessment & Synthesis

The Purpose

The amount of scientific information about the effects of climate change on regional forest ecosystems is rapidly growing. Through the Climate Change Response Framework, the Northern Institute of Applied Climate Science is creating a *Forest Ecosystem Vulnerability Assessment and Synthesis* for the Mid-Atlantic region.

Assessment area

The Mid-Atlantic Climate Change Response Framework area and assessment boundaries

This report will summarize the current state of knowledge regarding the anticipated effects of climate change on regional forests to help natural resource professionals better integrate climate change into their planning, projects, and activities.

Information Included in the Assessment

The *Forest Ecosystem Vulnerability Assessment and Synthesis* will include the following information:

- The **current landscape condition**, including the biophysical environment, ecological character, and social dimensions of the assessment area
- **Observed trends of climate change** using historical records
- **Future climate projections** at the regional scale showing the range of potential change
- **Results from multiple modeling efforts** describing climate change effects on future tree species distribution and forest ecosystem processes.
- **A review of the scientific literature** describing potential effects of climate change on forest ecosystems
- Description of **climate change vulnerability for regional forest ecosystems**, given key changes to ecosystem stressors, responses to those stressors, and vulnerabilities.
- **Implications** for recreation, timber production, wildlife habitat, and many other secondary vulnerabilities, and ongoing research in those focus areas.

Contact Us

Response Framework Lead – Chris Swanston, cswanston@fs.fed.us

Mid-Atlantic Coordinator – Patricia Butler, prbutler@mtu.edu

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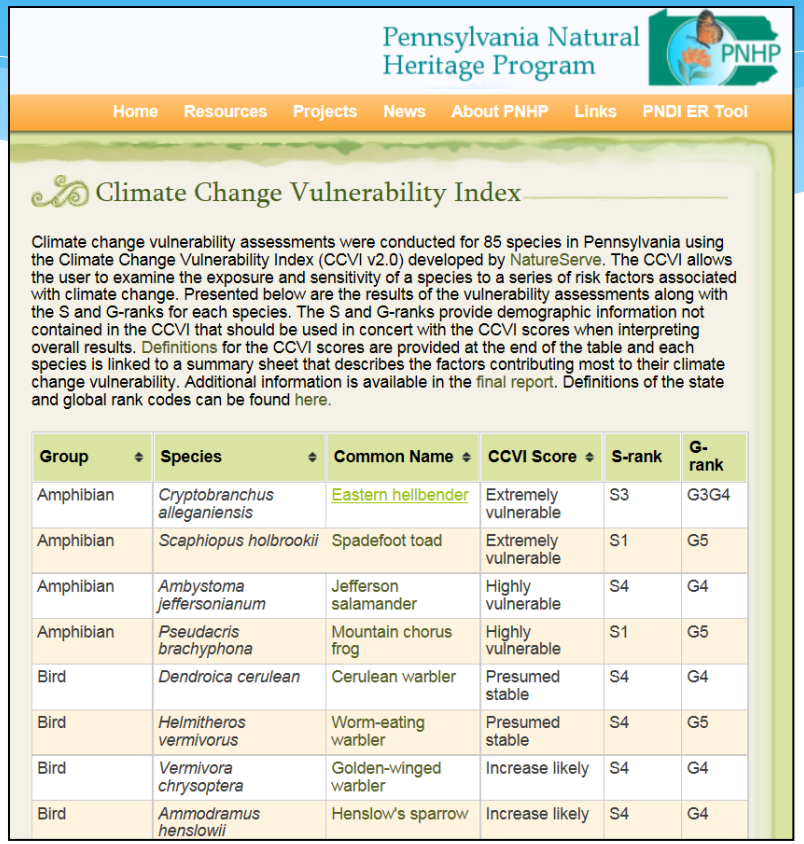

Pennsylvania Natural Heritage Program

PNHP

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Climate Change Vulnerability Index

Climate change vulnerability assessments were conducted for 85 species in Pennsylvania using the Climate Change Vulnerability Index (CCVI v2.0) developed by NatureServe. The CCVI allows the user to examine the exposure and sensitivity of a species to a series of risk factors associated with climate change. Presented below are the results of the vulnerability assessments along with the S and G-ranks for each species. The S and G-ranks provide demographic information not contained in the CCVI that should be used in concert with the CCVI scores when interpreting overall results. Definitions for the CCVI scores are provided at the end of the table and each species is linked to a summary sheet that describes the factors contributing most to their climate change vulnerability. Additional information is available in the final report. Definitions of the state and global rank codes can be found here.

Group	Species	Common Name	CCVI Score	S-rank	G-rank
Amphibian	*Cryptobranchus alleganiensis*	Eastern hellbender	Extremely vulnerable	S3	G3G4
Amphibian	*Scaphiopus holbrookii*	Spadefoot toad	Extremely vulnerable	S1	G5
Amphibian	*Ambystoma jeffersonianum*	Jefferson salamander	Highly vulnerable	S4	G4
Amphibian	*Pseudacris brachyphona*	Mountain chorus frog	Highly vulnerable	S1	G5
Bird	*Dendroica cerulean*	Cerulean warbler	Presumed stable	S4	G4
Bird	*Helmitheros vermivorus*	Worm-eating warbler	Presumed stable	S4	G5
Bird	*Vermivora chrysoptera*	Golden-winged warbler	Increase likely	S4	G4
Bird	*Ammodramus henslowii*	Henslow's sparrow	Increase likely	S4	G4

Questions?