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Photo by Natural Lands

Climate Change Trends & Projections FOR NATURAL LANDS PRESERVES



Introduction



★ Climate Projections



What future changes do scientists expect to occur?

Information drawn from multiple sources:

- PA 2021 Climate Impacts Assessment
- Climate Explorer (web-based tool)
- Other scientific literature (reports and peer-reviewed journal articles)



Overview of Climate Trends and Projections for Natural Lands Preserves

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Bear Creek Preserve
Photo by Nicholas A. Tonelli



Eastern Hemlock and Red Spruce
Photo by Nicholas A. Tonelli (Public Domain)



ChesLen Preserve
Photo by Simone Collins

Recommended Citation

EcoAdapt. 2022. Overview of Climate Trends and Projections for the Natural Lands Adaptation Project. Version 1.0. EcoAdapt, Bainbridge Island, WA.

Further information on the Natural Lands Adaptation Project is available on the project website at <http://ecoadapt.org/programs/awareness-to-action/natural-lands>.

Climate Explorer



 The Climate Explorer

 About the data ▾



THE CLIMATE EXPLORER

Explore how climate is projected to change in any county in the United States.

To get started, enter a city or county



or click one of these cities:

New York City, NY

Los Angeles, CA

Anchorage, AK

Phoenix, AZ

Houston, TX

Honolulu, HI

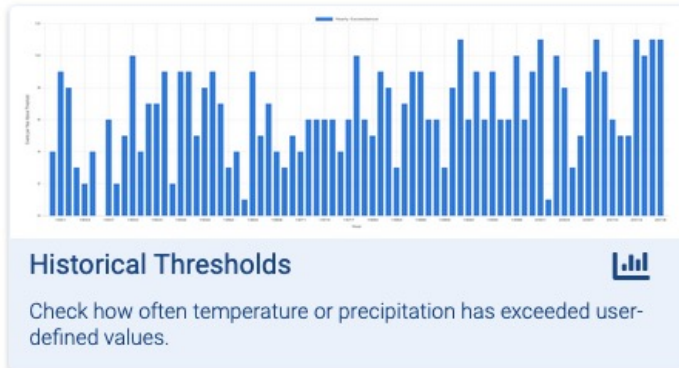
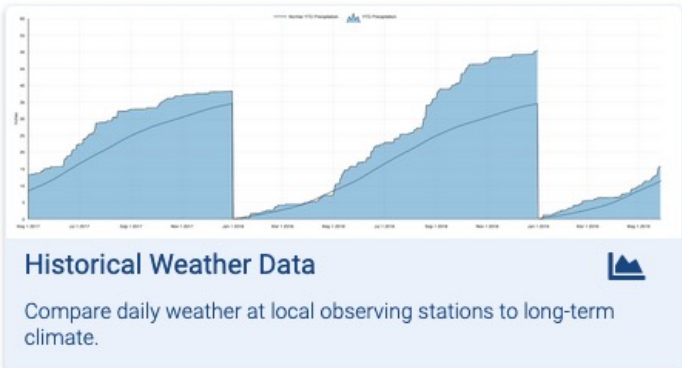
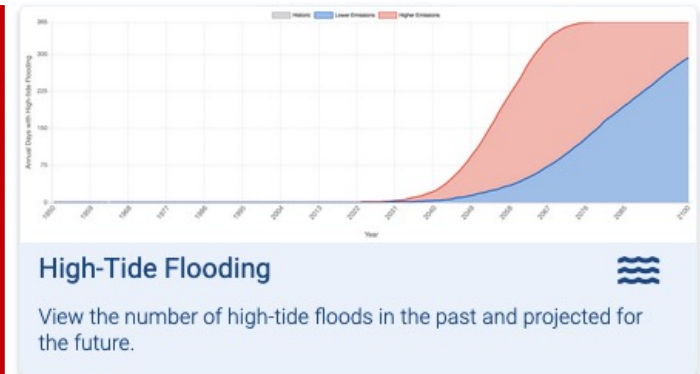
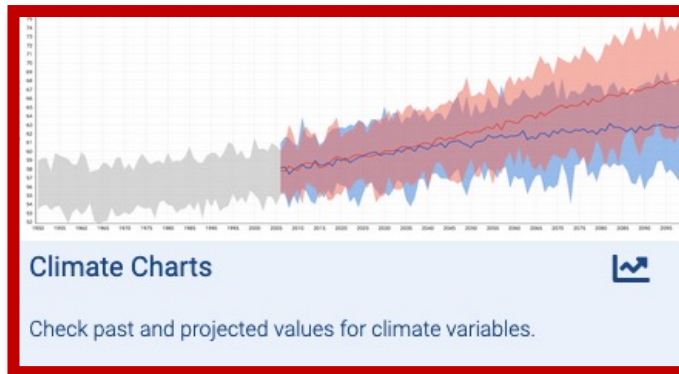
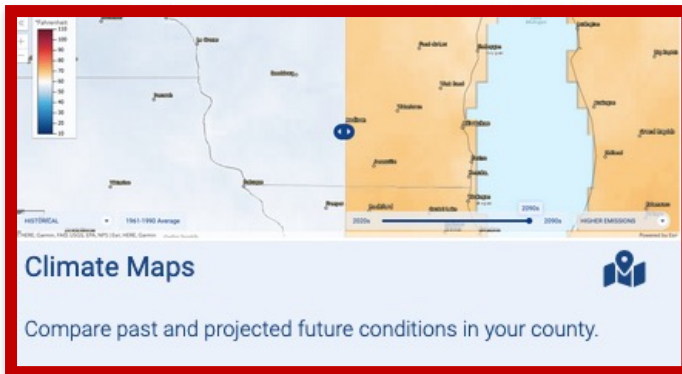
New! Climate projection charts are now available for [Hawai'i](#) and [U.S. territories](#).

Climate Explorer



Chester County, PA

Select one of the following for Chester County, PA



Ready to plan for resilience?

Resources from our partners can help you identify what matters to your community and evaluate how climate change could affect it:

- Check your exposure to extreme events such as wildfires and flooding
- Identify social vulnerabilities across urban areas
- Get step-by-step guidance for completing a vulnerability assessment or crafting an action plan.

[Explore planning tools →](#)

Climate Explorer



The Climate Explorer

About the data



Chester County, PA

Stations

- Average Daily Maximum Temp (°F)

Average Daily Maximum Temperature (°F)

Graph

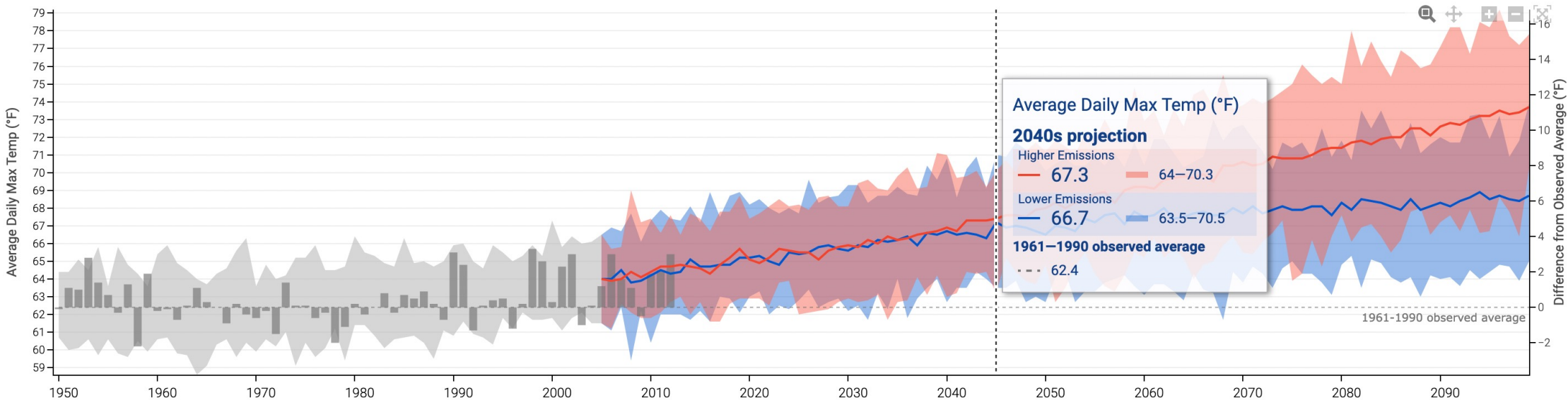
Map

Annual

Monthly

Downloads

About



Observations

Modeled History

Lower Emissions

Higher Emissions

Cards Home

Climate Maps

Climate Graphs

Historical Weather Data

Historical Thresholds

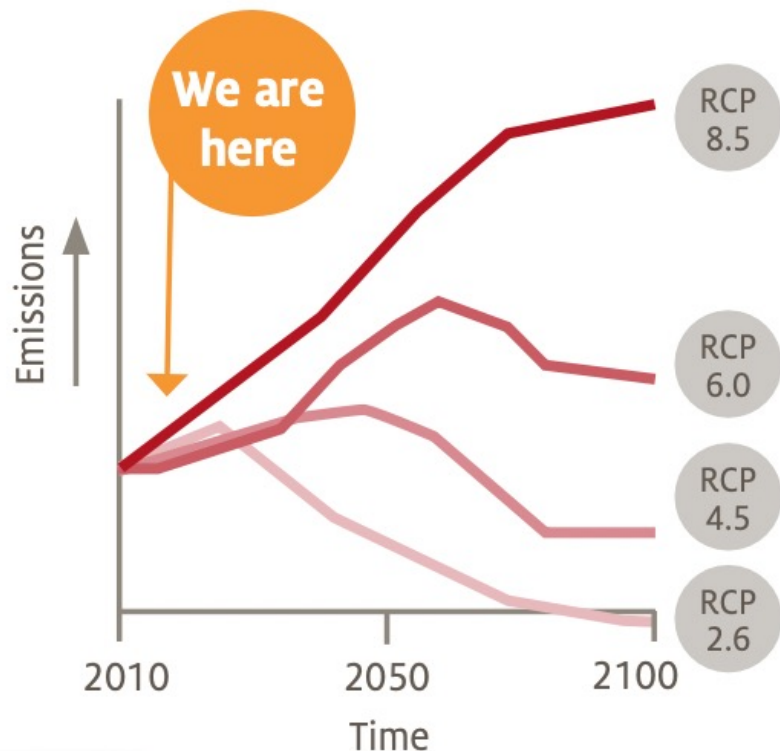
High-Tide Flooding

Take Action



Climate Models and Emissions Scenarios

Emissions scenarios are standardized descriptions of potential futures and the pathway leading to them



If we follow the RCP 8.5 pathway,
more adaptation
will be needed.

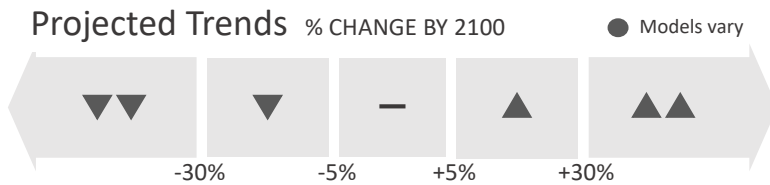
If we follow the RCP 2.6 pathway,
less adaptation
is needed.

- **RCP 8.5:** High-emissions scenario (“business-as-usual”)
 - ~~RCP 6.0~~
 - **RCP 4.5**
 - ~~RCP 2.6~~
- } *Not usually available*

Important Considerations

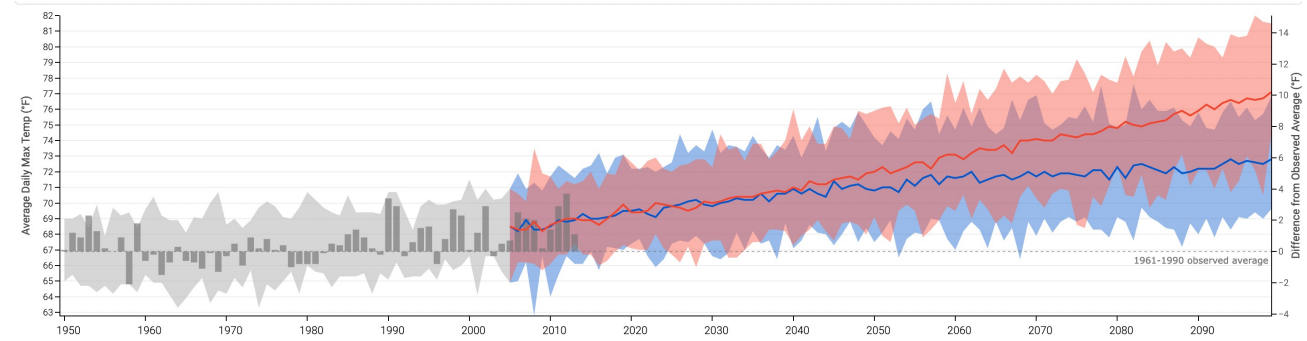


- Trend direction
- Magnitude of change

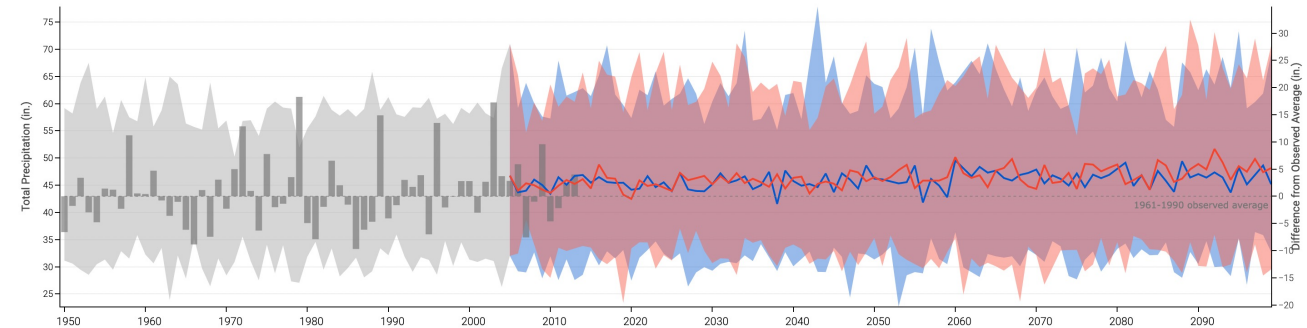


- Shifts in timing and/or variability
- Scientific uncertainty

Maximum temperature



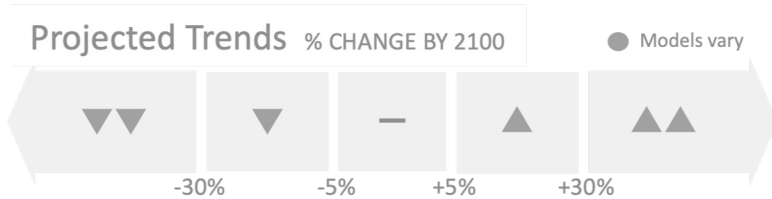
Total precipitation



Important Considerations



- Trend direction
- Magnitude of change



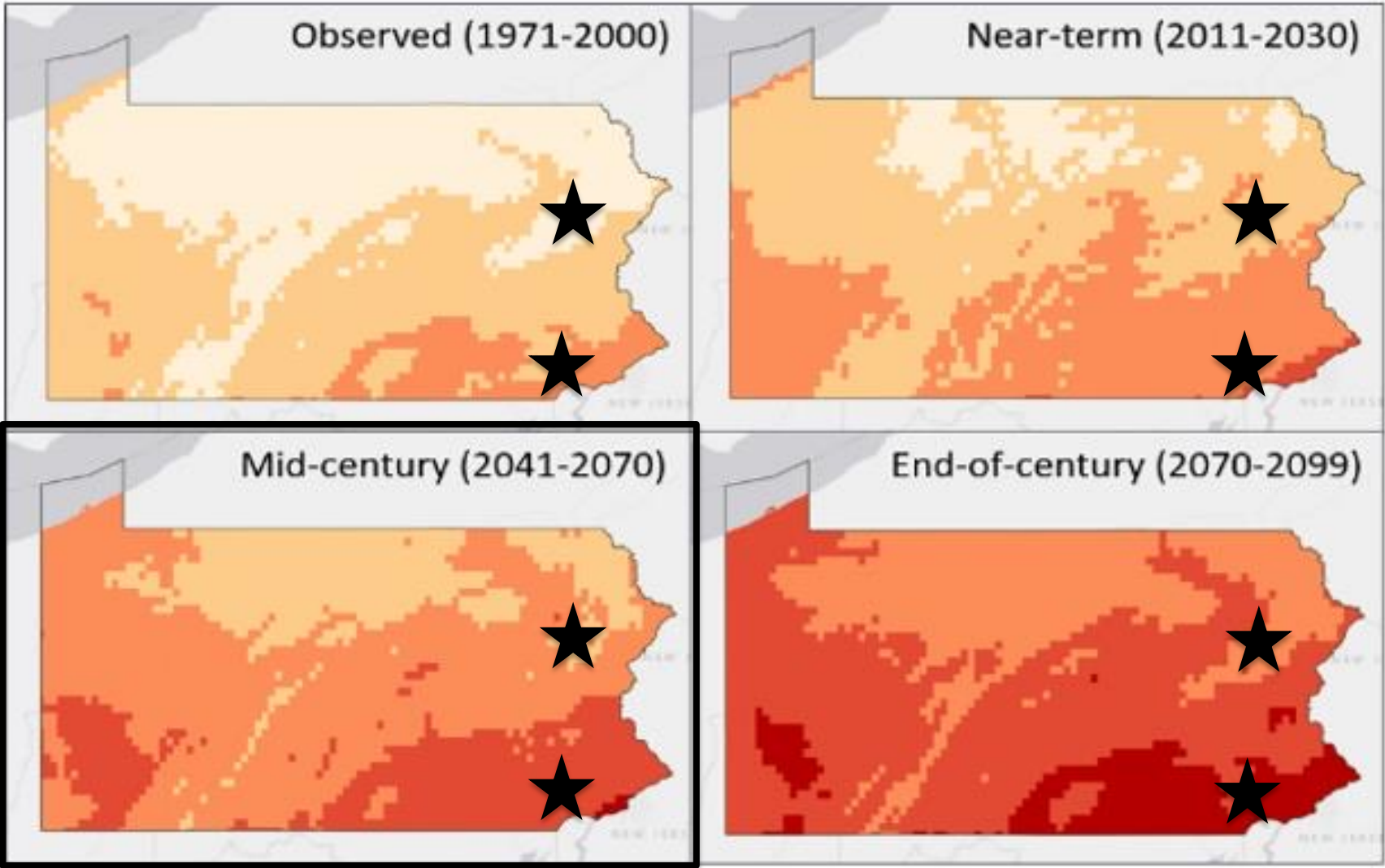
- Shifts in timing and/or variability
- Scientific uncertainty

Observed historical
1971–2000

Mid-Century
2041–2070

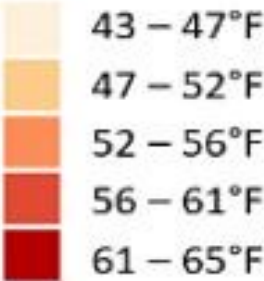
Late-Century
2081–2100

Air Temperature

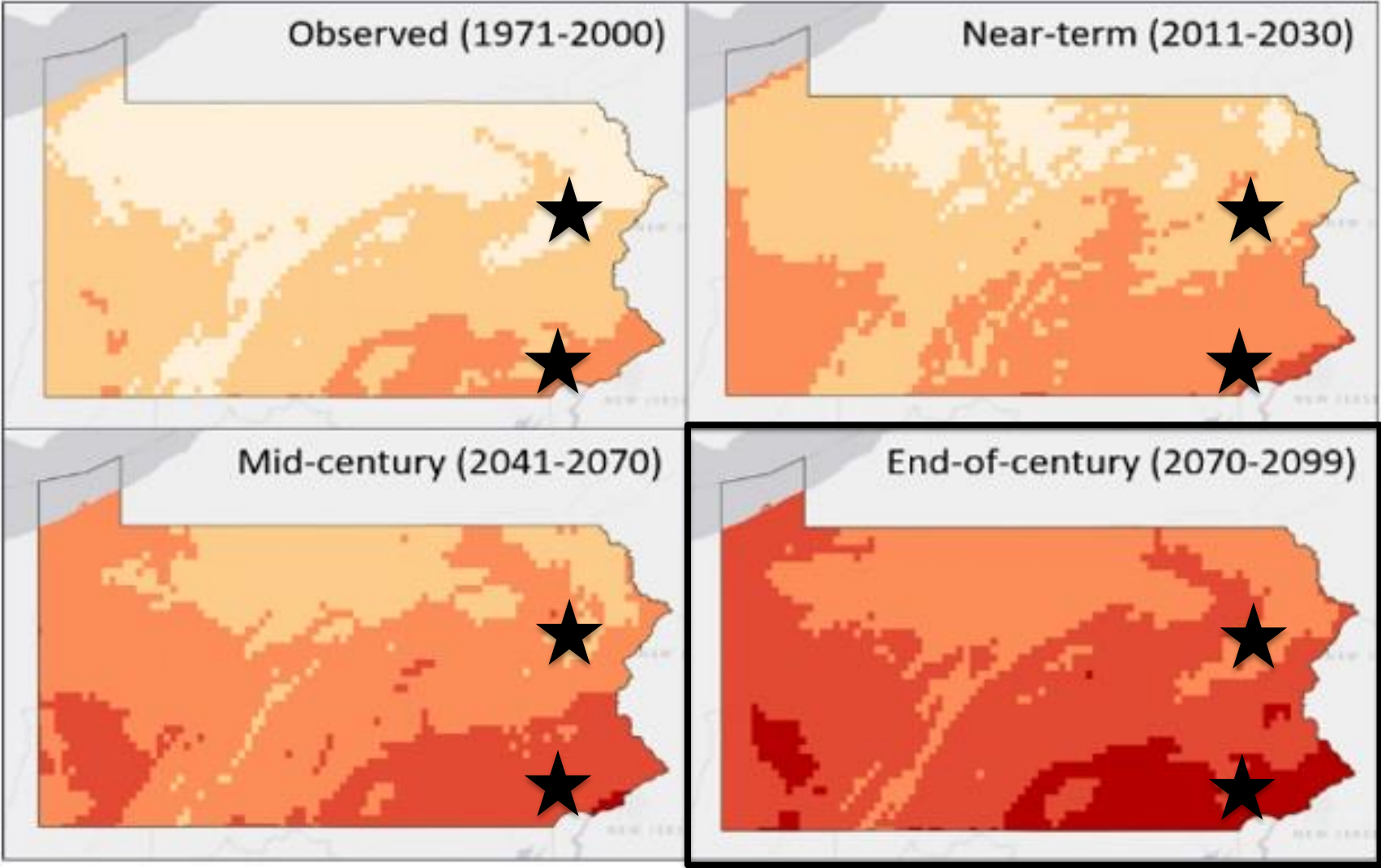


Compared to 1971-2000

By Mid-Century:
+5.9°F increase in annual temps in PA
+5.7°F in Chester Co.
+6.1°F in Luzerne Co.

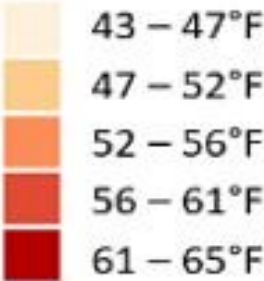


Air Temperature

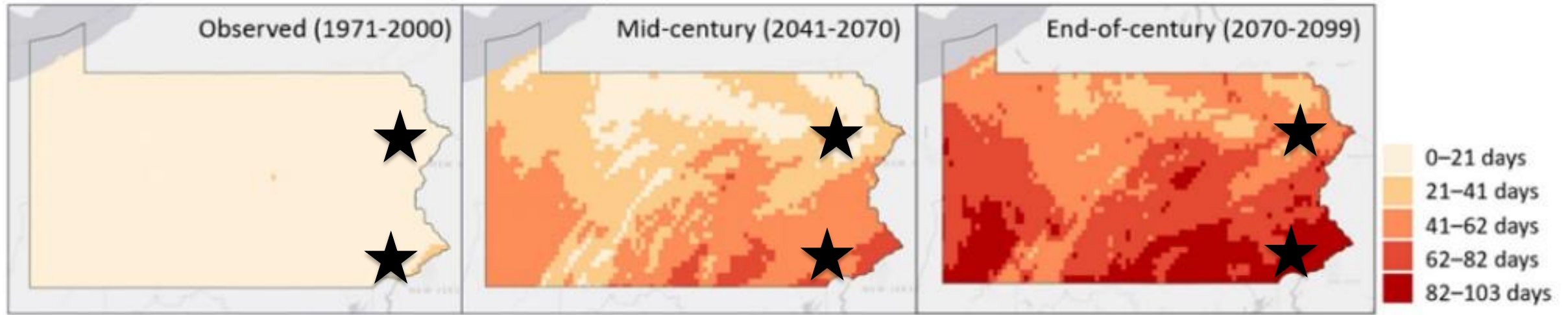


Compared to 1971-2000

By Late-Century:
+9.3°F increase in annual temps in PA
+9.1°F in Chester Co.
+9.6°F in Luzerne Co.



Extreme Heat



5.1 days over 90°F

13.3 days in Chester Co.

2.3 days in Luzerne Co.

By Mid-Century:

**+32 days per year
(+625%) in PA**

+32.1 days in Chester Co.

+19.1 days in Luzerne Co.

By Late-Century:

**+60.4 days per year
(+1,184%) in PA**

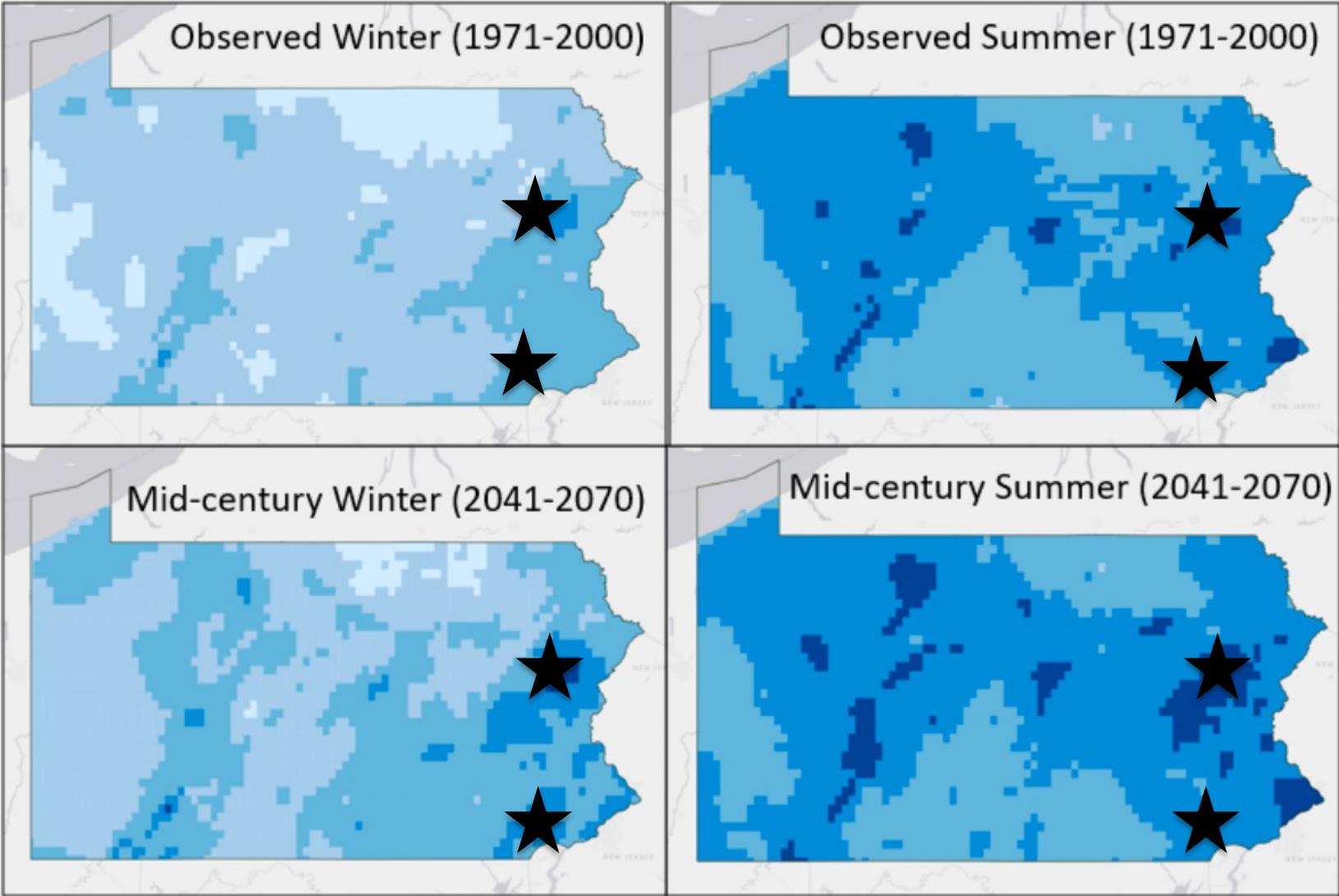
+78.3 days in Chester Co.

+60.7 days in Luzerne Co.

Precipitation

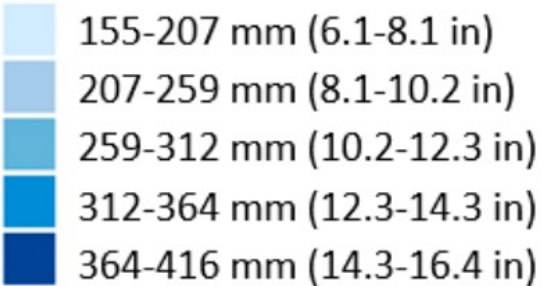


Seasonal Average Cumulative Precipitation



Compared to 1971-2000

By Mid-Century:
+8.4% increase in
annual precip in PA
+4.8% in Chester Co.
+4.7% in Luzerne Co.

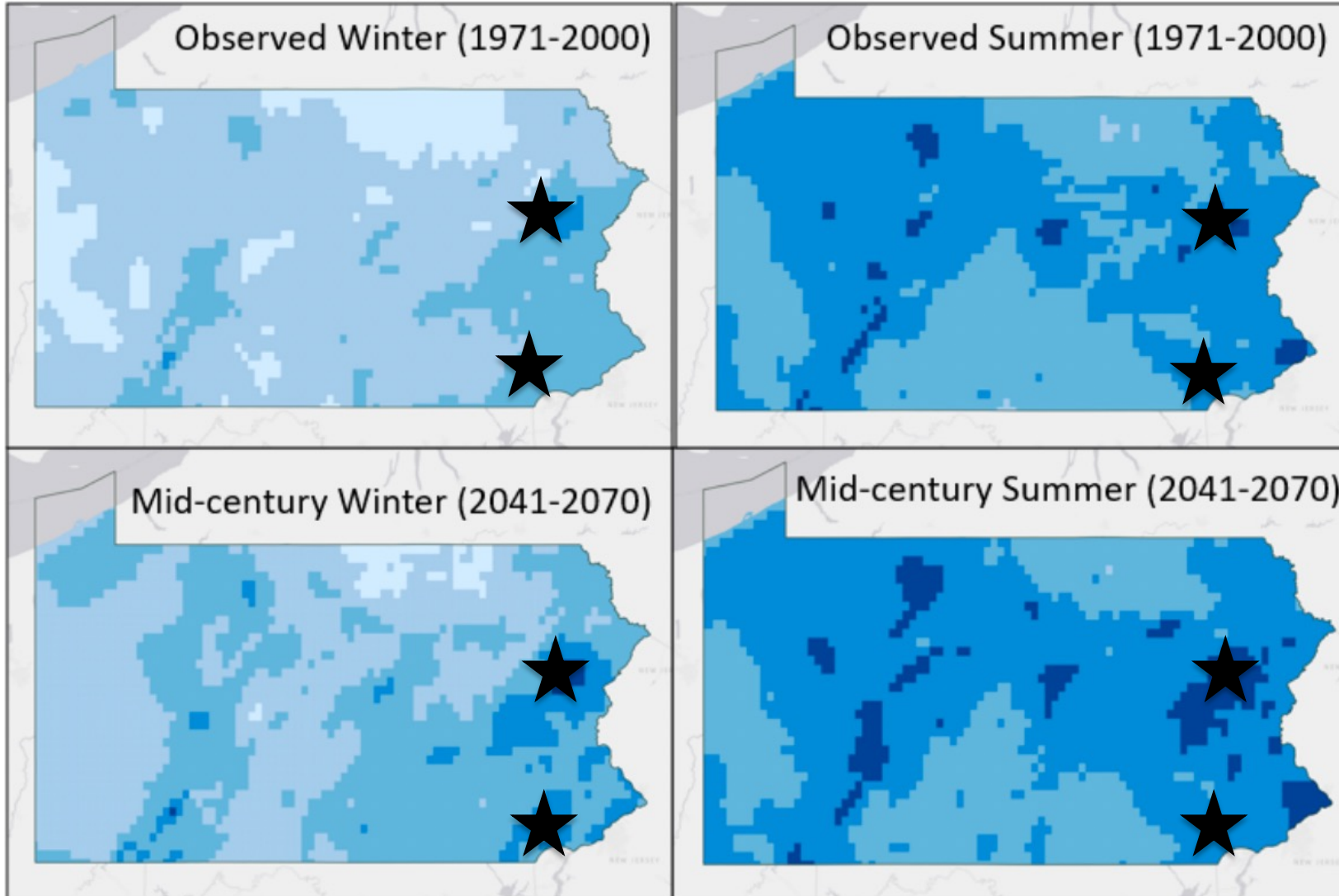


Source: ICF 2021, Climate Explorer

Precipitation



Seasonal Average Cumulative Precipitation



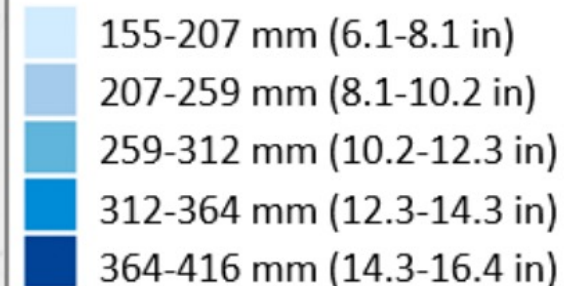
Compared to 1971-2000

By Late-Century:

**+11.5% increase in
annual precip in PA**

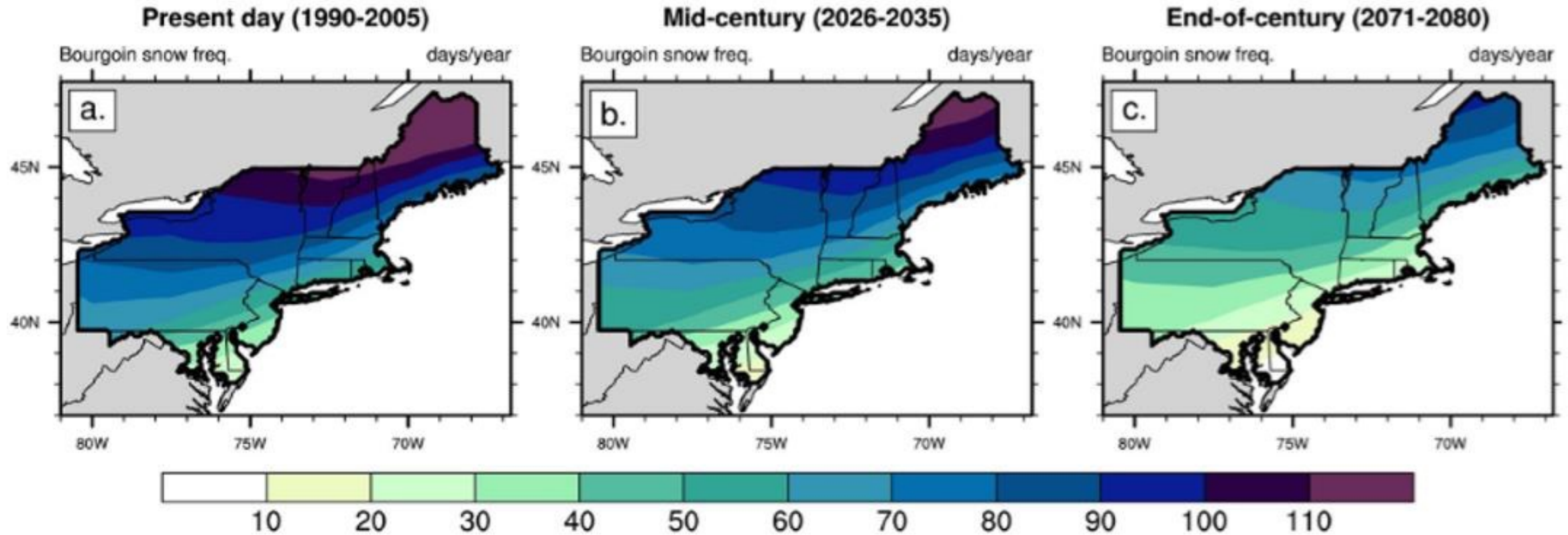
+12% in Chester Co.

+12% in Luzerne Co.



Source: ICF 2021, Climate Explorer

Snow



Across the Northeast, fewer days per year when snowfall occurs

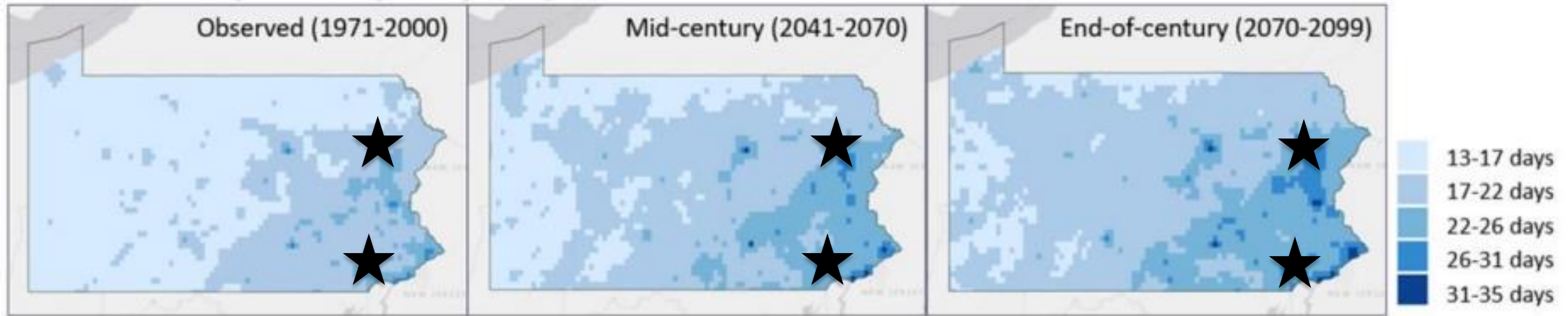
Snow



- 60-70% decline in snowfall by mid-century; 100% decline by late-century
- Decreased extent and duration of snow cover
- Increased proportion of winter precipitation falling as rain, contributing to earlier snowmelt



Extreme Precipitation



2.5 days per year with extremely heavy rain (event that occurs less than 1% of the time)

1.2" average amount for these events

By Mid-Century:

+3.5 days/year (+42%) in PA

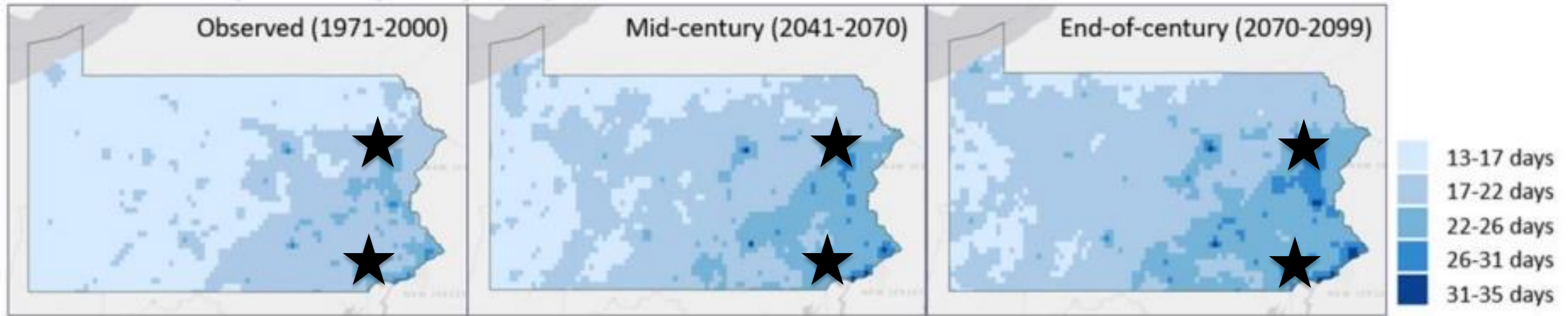
13% increase in average amount to 1.3"

By Late-Century:

+4.2 days/year (+69%) in PA

20% increase in average amount to 1.4"

Extreme Precipitation



Days over 2" of rain:

0.8 days in Chester Co.

0.5 days in Luzerne Co.

By Mid-Century:

+0 days (+0%) in Chester Co.

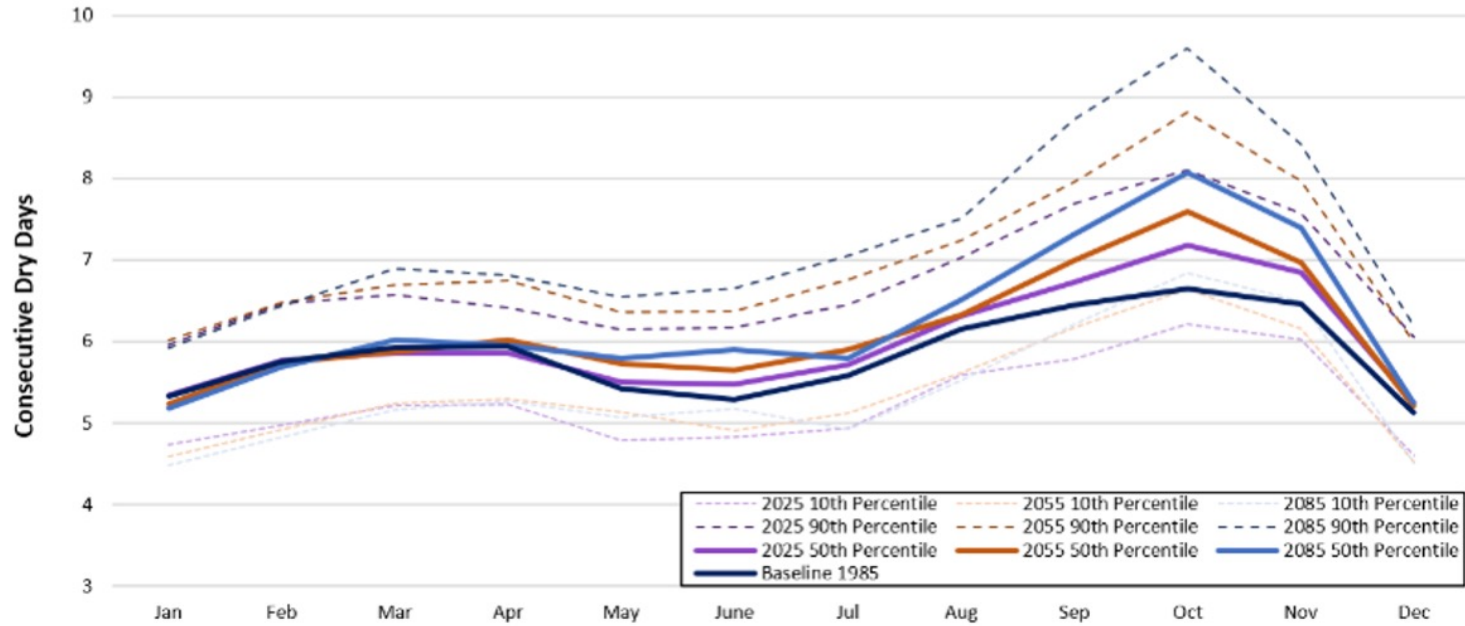
+0.1 days (+20%) in Luzerne Co.

By Late-Century:

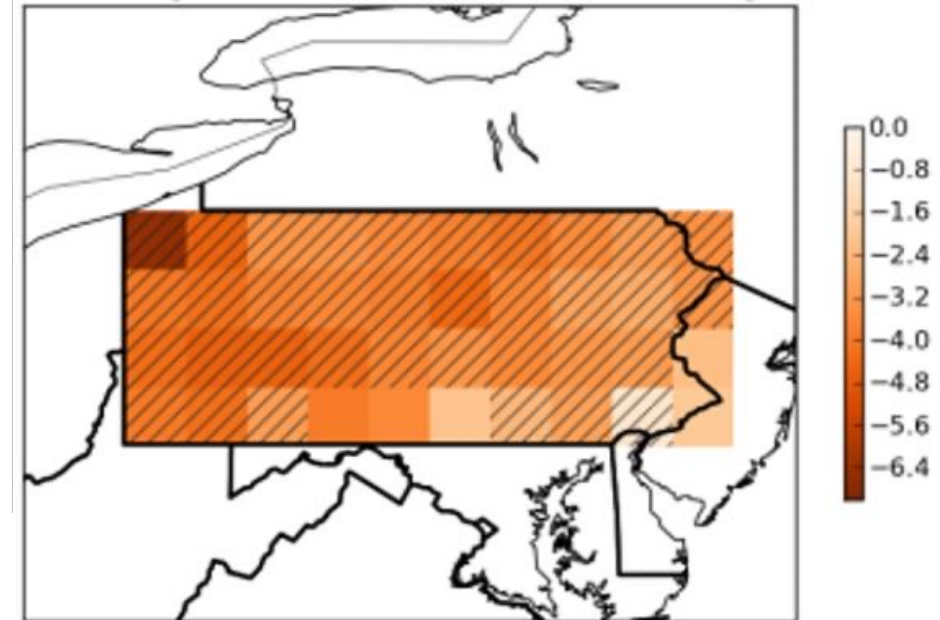
+0.4 days (+50%, to 1.2 days) in Chester Co.

+0.4 days (+80%, to 0.9 days) in Luzerne Co.

Drought



11% increase in consecutive dry days statewide by the end of the century

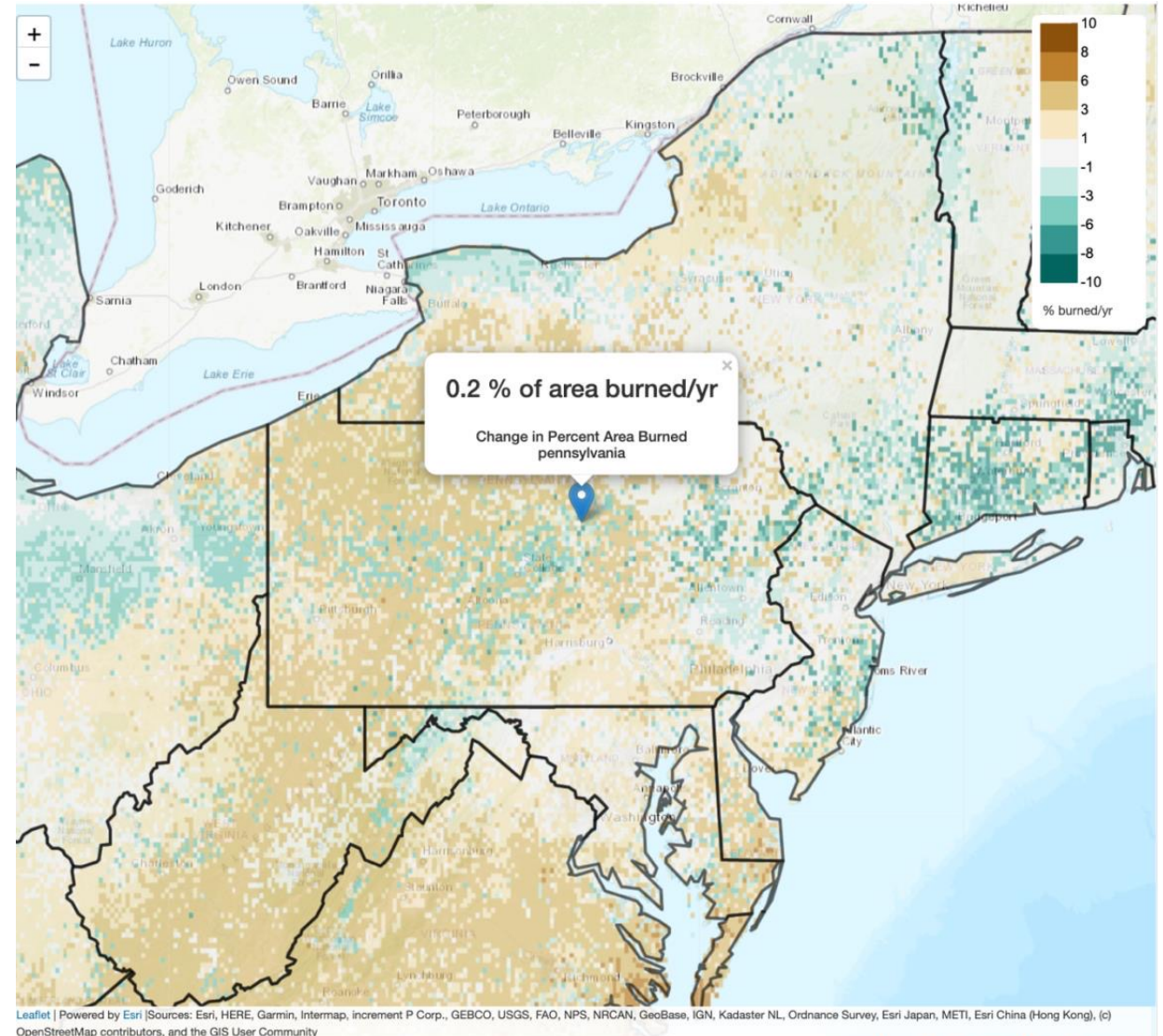


Decreased soil moisture

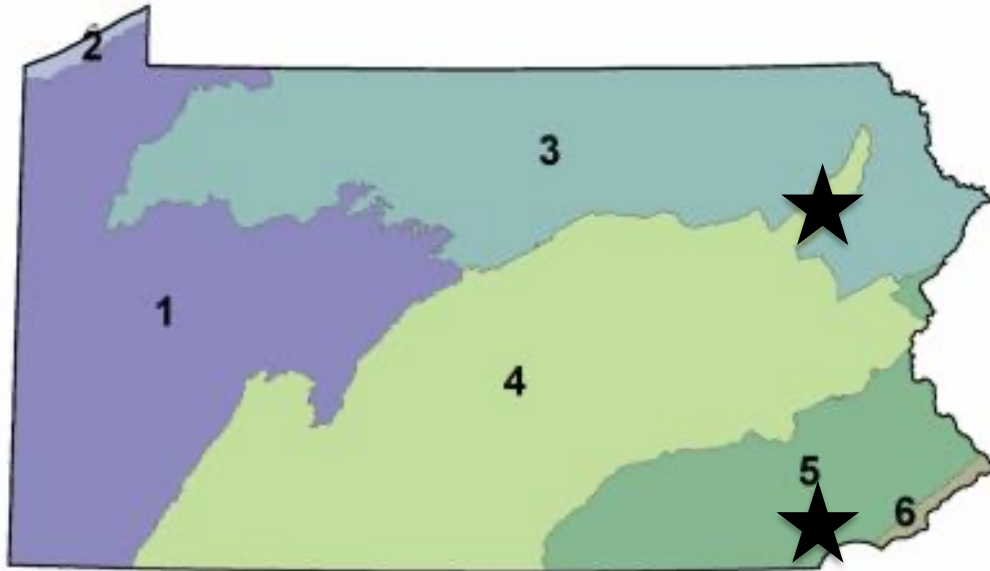
Wildfire



- 0.2% increase in the area of the state that burns each year (from historical average of 0.6% area)
- Greater risk in Chester County compared to many other areas of the state



Climate Change Projections for Tree Species



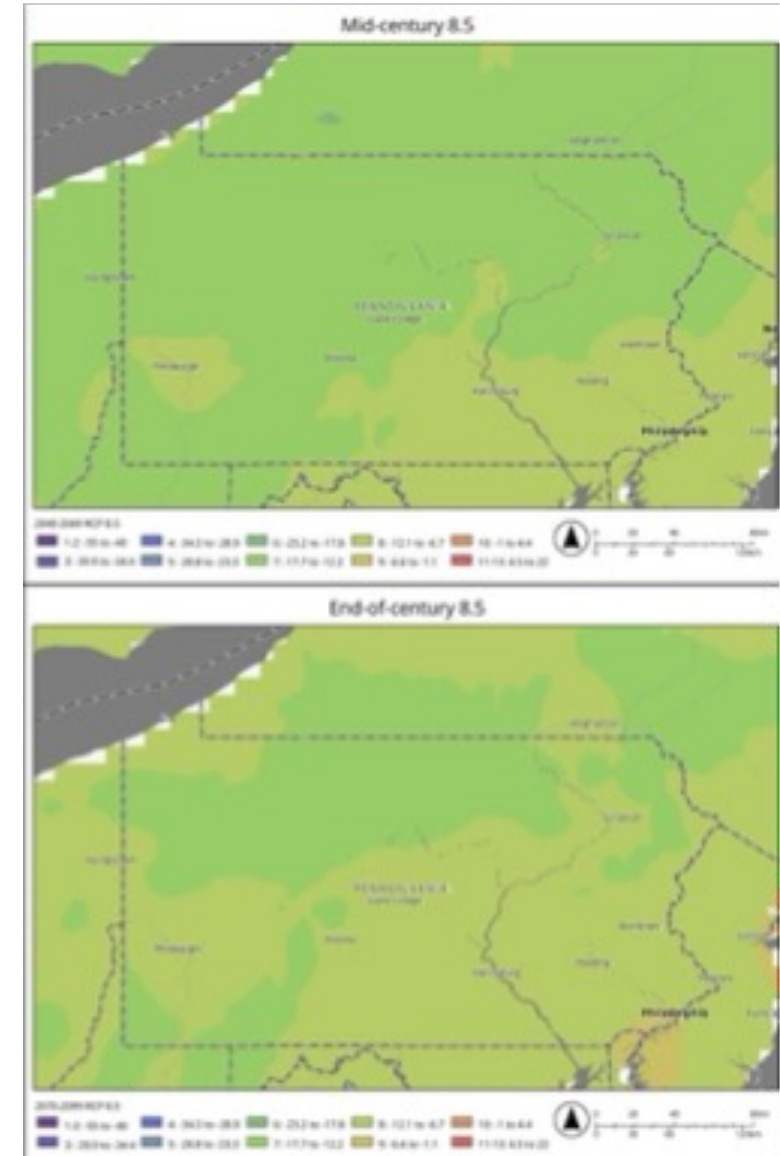
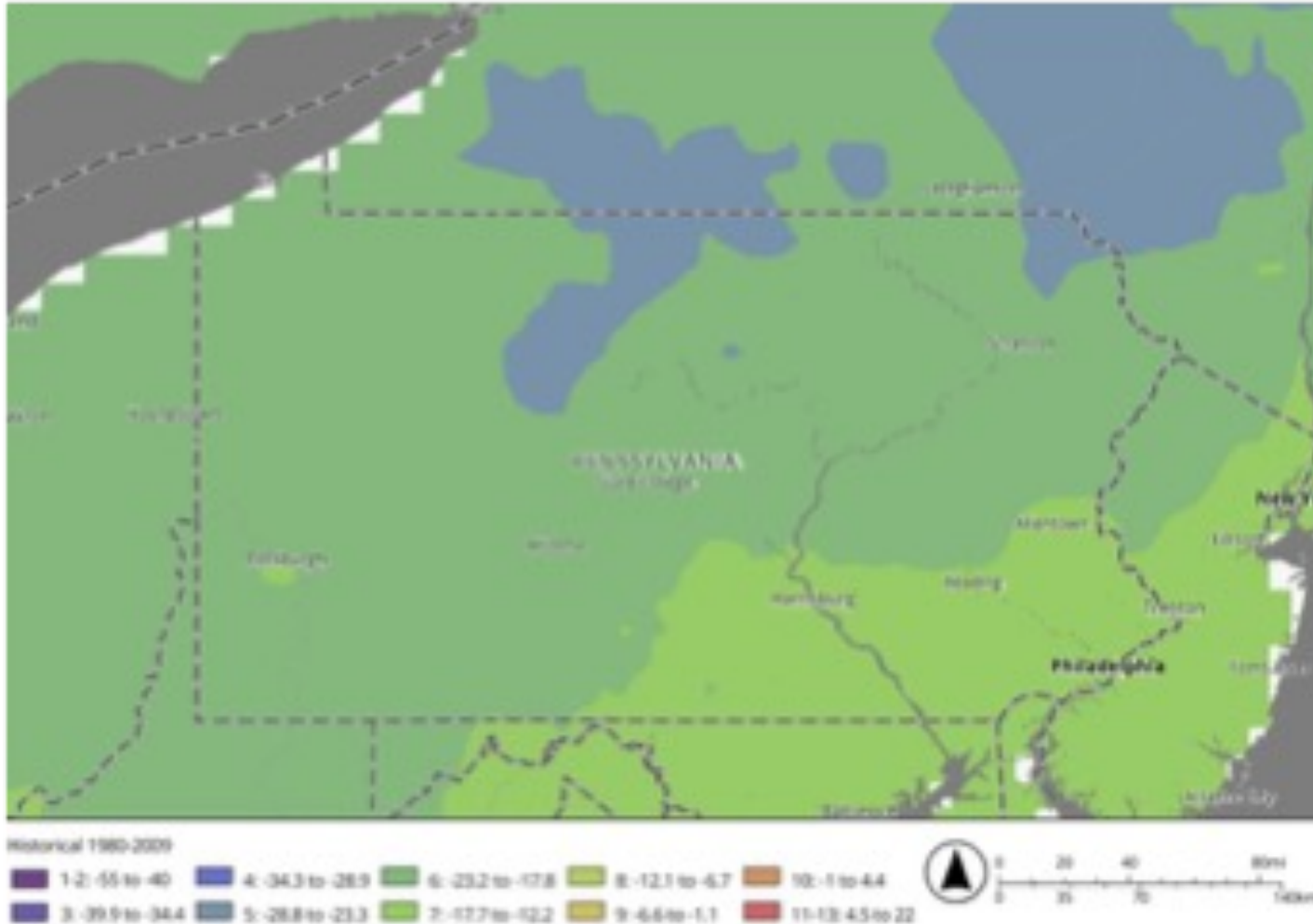
Physiographic Regions of Pennsylvania

- 1 - Western Allegheny Plateau
- 2 - Erie and Ontario Lake Plain
- 3 - Northern Allegheny Plateau
- 4 - Ridge and Valley
- 5 - Piedmont
- 6 - Coastal Plain

Subregion 5: Piedmont

SPECIES	ADAPT	ABUN	LOW CLIMATE CHANGE (RCP 4.5)		HIGH CLIMATE CHANGE (RCP 8.5)		SPECIES	ADAPT	ABUN	LOW CLIMATE CHANGE (RCP 4.5)		HIGH CLIMATE CHANGE (RCP 8.5)	
			HABITAT	CHANGE CAPABILITY	HABITAT	CHANGE CAPABILITY				HABITAT	CHANGE CAPABILITY	HABITAT	CHANGE CAPABILITY
American basswood	+	-	▲	▲	▲	▲	Pignut hickory	+	+	▲	▲	▲	▲
American beech	+	-	▲	▲	▲	▲	Pin oak*	-	-	▲	▼	▲	▼
American elm	+	-	▲	○	▲	▲	Pitch pine	+	-	▼	▼	▼	▼
American hornbeam*	+	-	○	▼	▲	○	Post oak	+	-	★	★	★	★
Bald cypress	+	-	★	★	★	★	Quaking aspen	+	-	▼	▼	▼	▼
Bigtooth aspen	+	-	▼	▼	▼	▼	Red maple	+	+	○	▲	▼	▲
Bitternut hickory*	+	-	▲	▲	▲	▲	Red mulberry*	+	-	▼	▼	▼	▼
Black cherry	-	+	○	▼	▼	▼	Redbay*	+	-	★	★	★	★
Black locust*	+	+	○	○	▲	▲	Sassafras*	+	+	▲	▲	▲	▲
Black oak	+	+	▲	▲	▲	▲	Scarlet oak	+	+	▲	▲	▲	▲
Black walnut*	+	+	▼	▼	▼	▼	Shagbark hickory	+	+	▲	▲	○	○
Black willow*	-	-	▼	▼	○	▼	Shortleaf pine	+	-	★	★	★	★
Blackgum	+	+	▲	▲	▲	▲	Silver maple*	+	-	○	○	▲	▲
Blackjack oak	+	-	★	★	★	★	Sugar maple	+	+	▲	▲	▲	▲
Boxelder*	+	+	○	▲	▲	▲	Swamp tupelo	-	-	★	★	★	★
Cherrybark oak	+	-	★	★	★	★	Swamp white oak*	+	-	▼	▼	▼	▼
Chestnut oak	+	+	○	▲	▼	○	Sweet birch	-	+	▼	▼	▼	▼
Common persimmon*	+	-	○	○	▲	▲	Sweetbay	+	-	★	★	★	★
Eastern hemlock	-	-	▼	▼	▼	▼	Sweetgum	+	+	▲	▲	▲	▲
Eastern redcedar	+	+	▲	▲	▲	▲	Virginia pine	+	-	▲	▲	▲	▲
Eastern white pine	-	+	▼	▼	▼	▼	Water oak	+	-	★	★	★	★
Flowering dogwood	+	-	▲	▲	▲	▲	Water tupelo	-	-	★	★	★	★
Green ash*	+	+	○	○	▲	▲	White ash	-	+	▼	▼	▼	▼
Hackberry	+	-	▼	▼	○	○	White oak	+	+	▲	▲	▲	▲
Jack pine	+	-	▼	▼	▼	▼	White spruce	+	-	▼	▼	▼	▼
Loblolly pine	+	-	▲	▲	▲	▲	Winged elm	+	-	★	★	★	★
Mockernut hickory	+	+	▲	▲	▲	▲	Yellow birch	+	-	○	▼	○	▼
Northern red oak	+	+	▲	▲	○	▲	Yellow-poplar	+	+	○	▲	▼	○
Osage-orange	+	-	▼	▼	▼	▼							

Plant Hardiness Zones



Questions?

