

CLIMATE ADAPTATION IN ILLINOIS

IDOT FALL PLANNING CONFERENCE | OCTOBER 9, 2014 | BLOOMINGTON, IL

SPEAKERS



**Illinois Department
of Transportation**

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EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

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Chicago Metropolitan
Agency for Planning

LOUISE **YEUNG**

PLANNER

REGIONAL OVERVIEW

ST. LOUIS REGION

East-West Gateway Council of Governments & the St. Louis Metropolitan Statistical Area



EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

April 2013

AREA OF COUNTIES IN THE ST. LOUIS MSA (Sq. Mi.)

Bond County, IL	380
Calhoun County, IL	254
Clinton County, IL	474
Franklin County, MO	923
Jefferson County, MO	657
Jersey County, IL	369
Lincoln County, MO	630
Macoupin County, IL	864
Madison County, IL	725
Monroe County, IL	388
St. Charles County, MO	560
St. Clair County, IL	664
St. Louis City, MO	62
St. Louis County, MO	508
Warren County, MO	431

East-West Gateway Region 4,487 sq. mi.

St. Louis MSA 7,889 sq. mi.

 East-West Gateway Region
(also part of MSA Region)

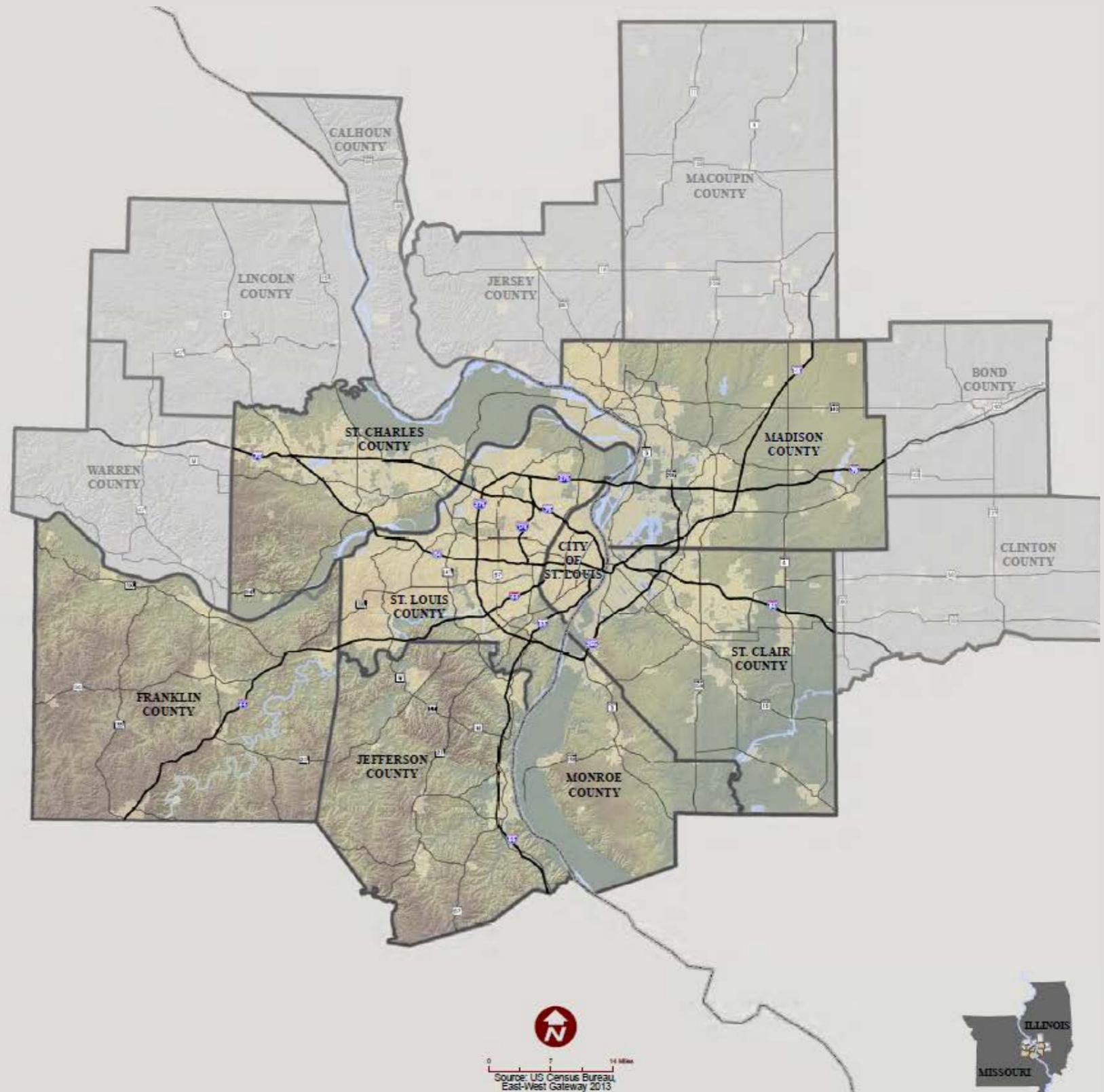
 MSA Region

 Incorporated Areas

 State Boundary

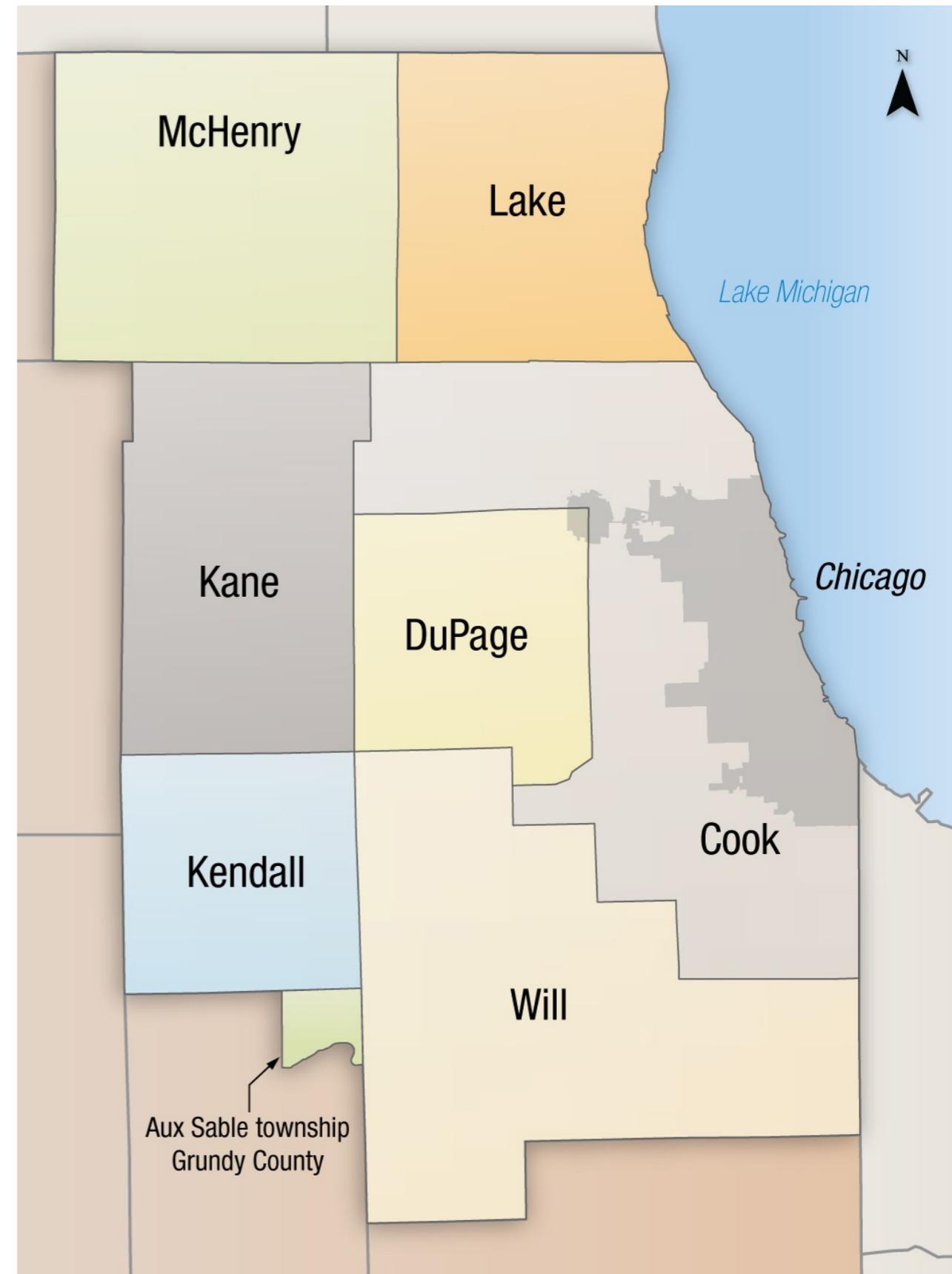
 Interstate Highways

 Other Major Roads



CMAP CHICAGO REGION

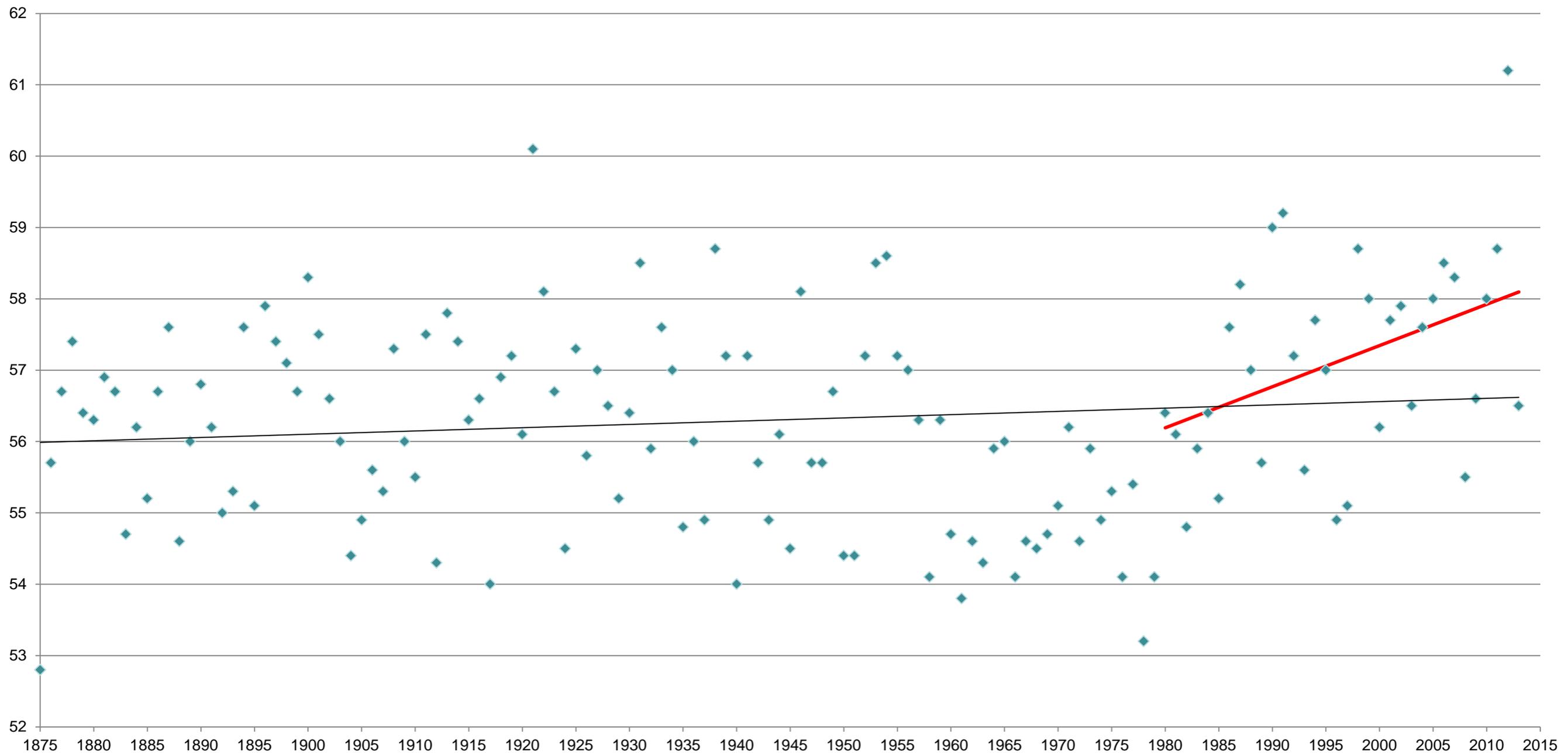
- 7 counties
- 284 municipalities, including the City of Chicago
- Land use and transportation planning



CLIMATE TRENDS + PROJECTIONS

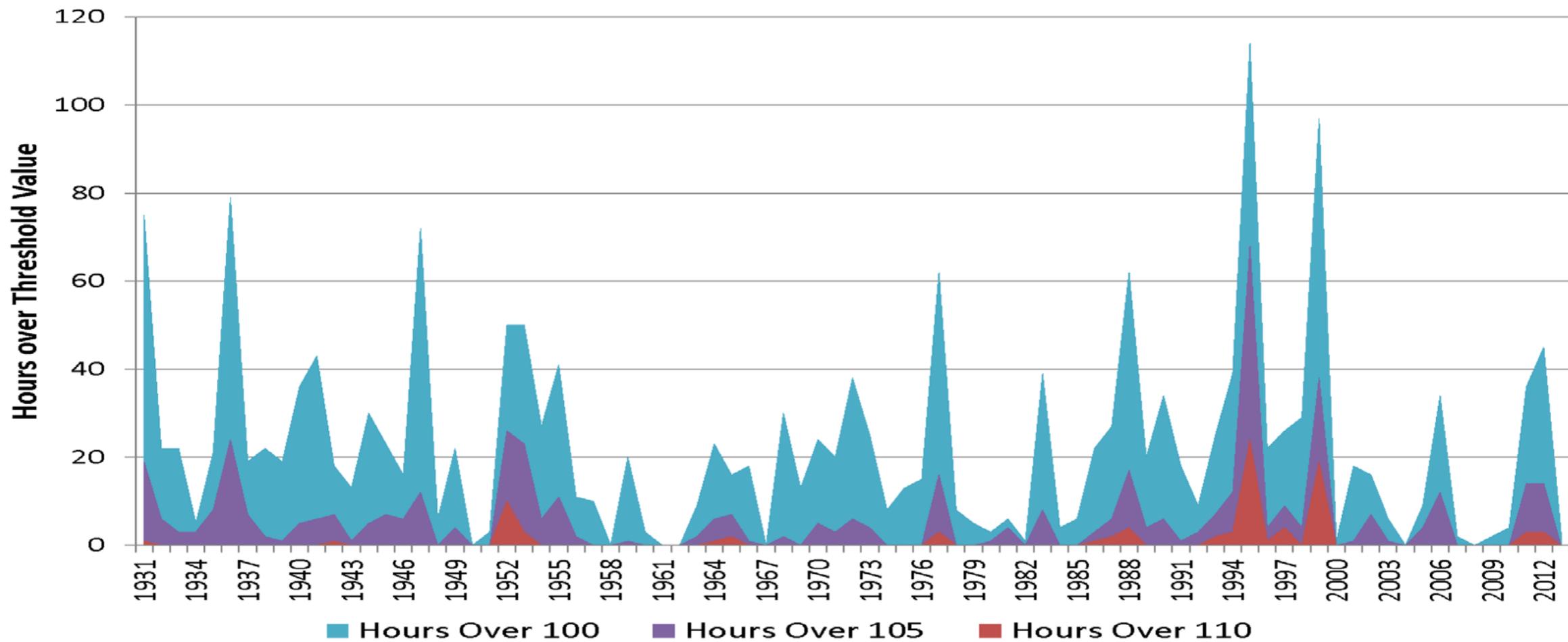
TEMPERATURE

Mean Annual Temperature, St. Louis



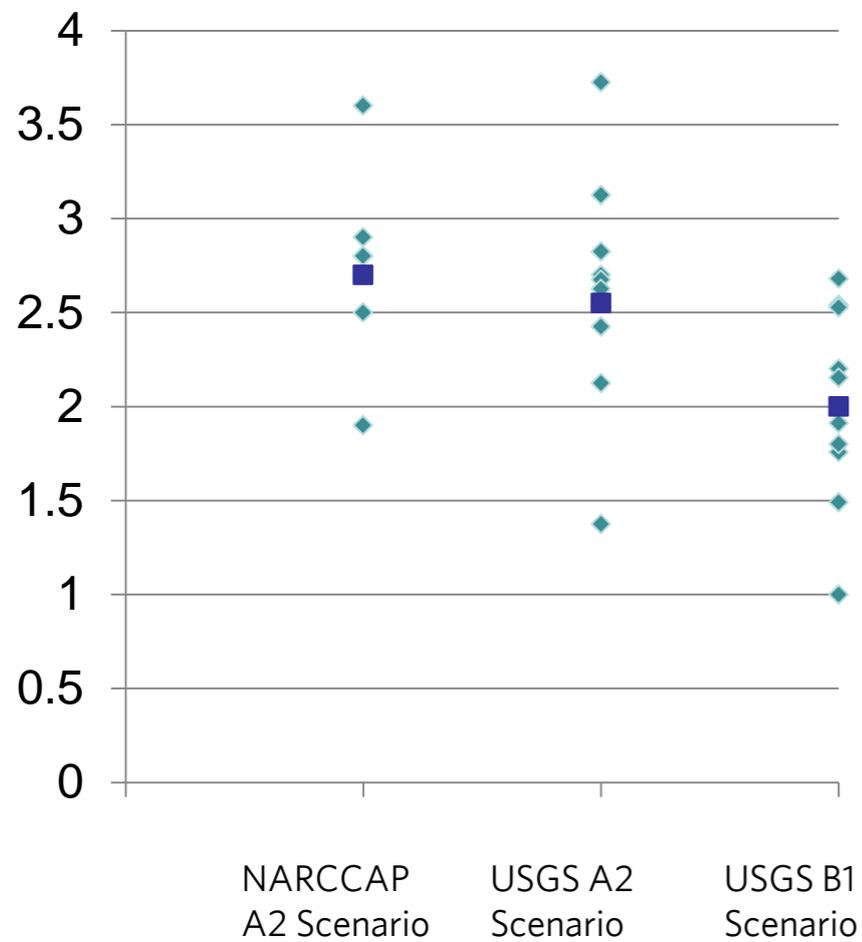
TEMPERATURE

Hours of Heat Index of Threshold Values (June-Sept), Chicago

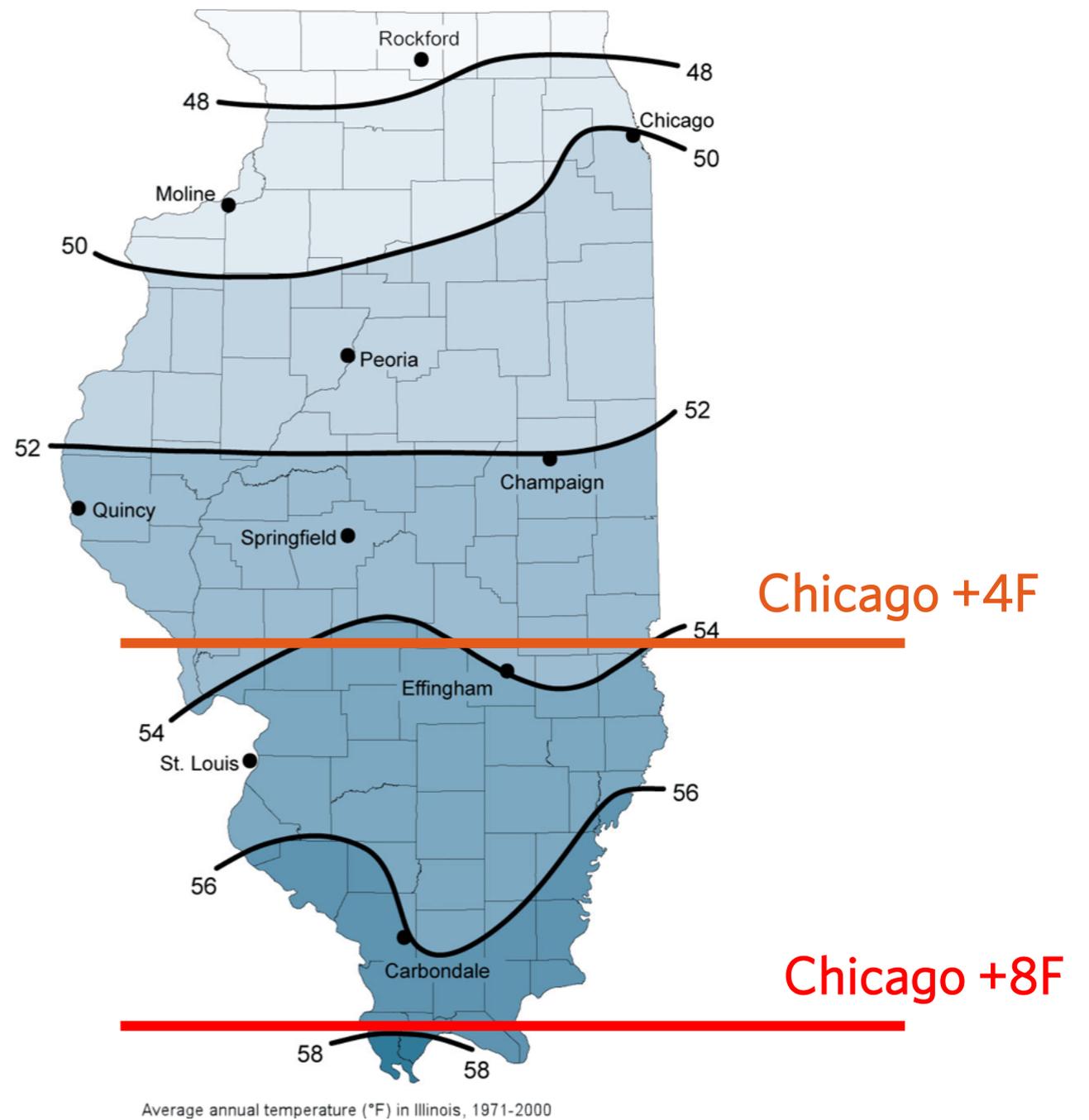


PROJECTED TEMPERATURE CHANGE

1970-2000 to 2040-2070, St. Louis



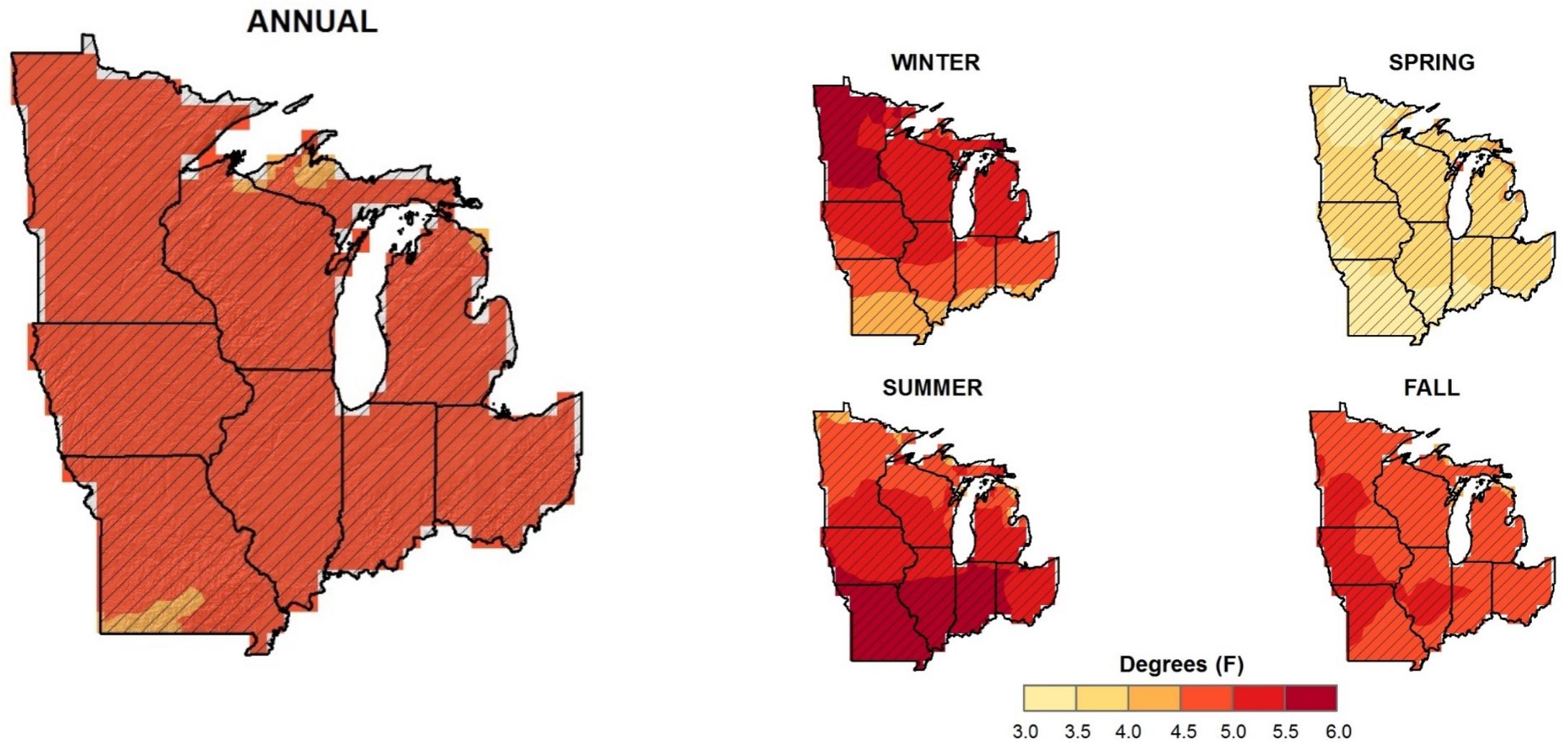
Chicago temperature change under high- and low-emissions scenarios



PROJECTED TEMPERATURE CHANGE

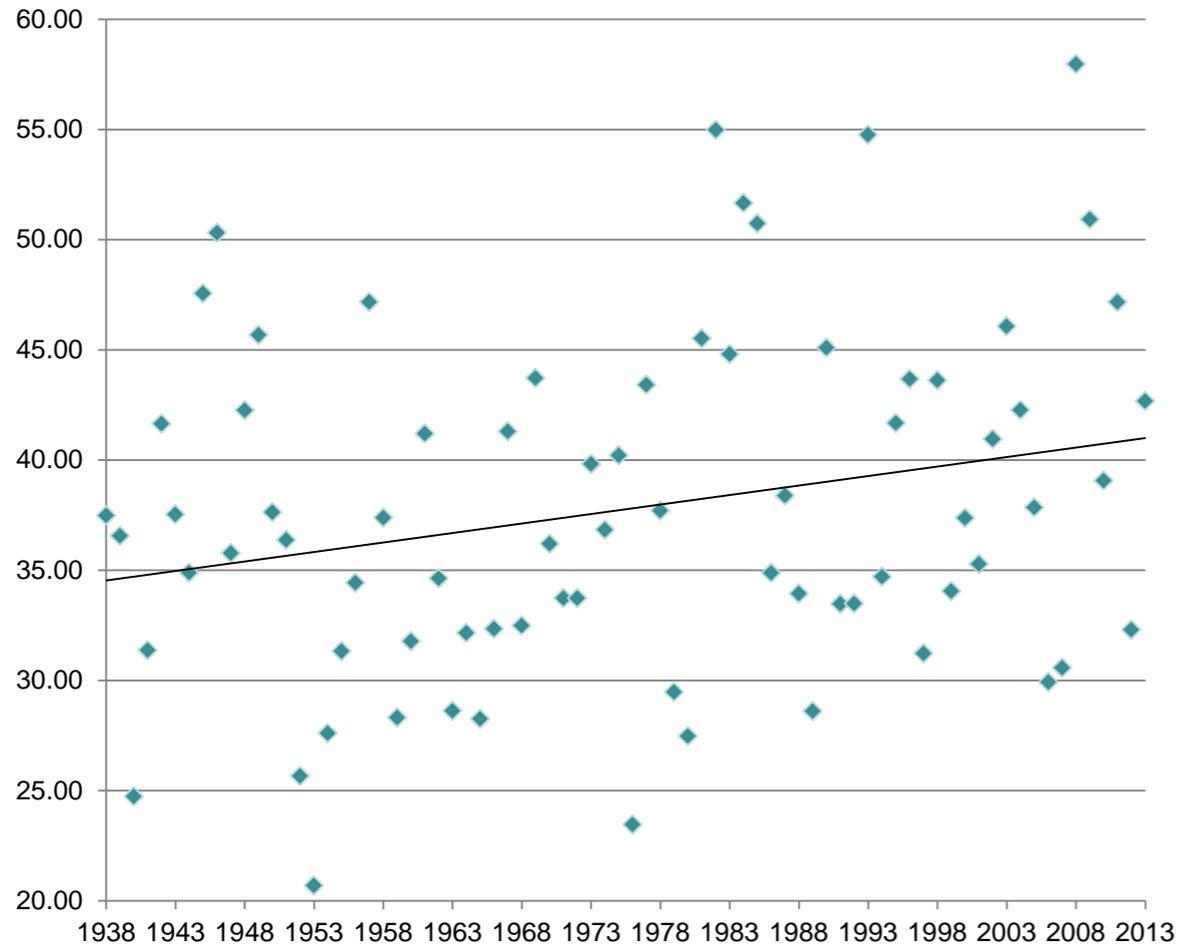
NARCCAP, SRES A2, TEMPERATURE CHANGE

Multi-Model Mean Simulated Difference - (2041-2070 minus 1971-2000)

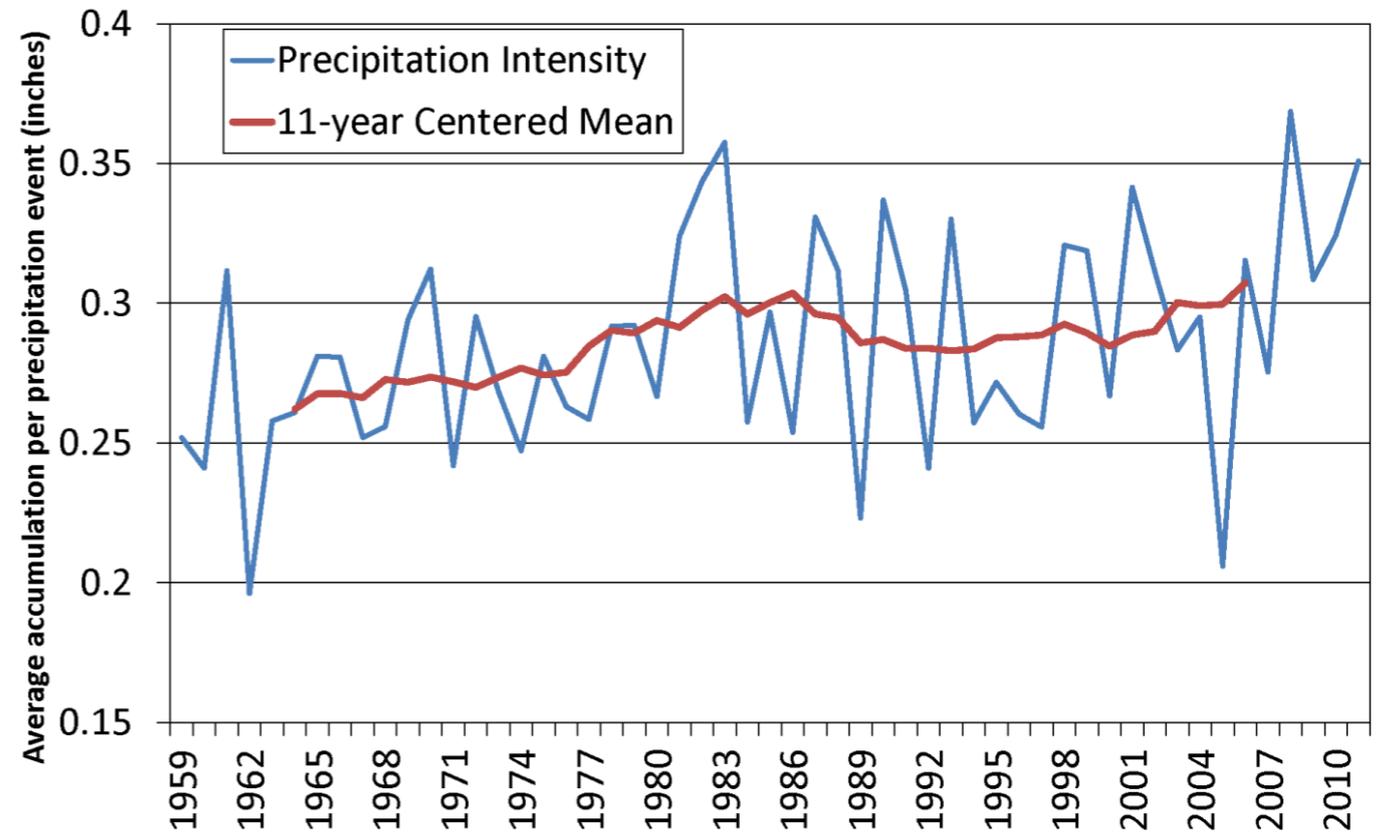


PRECIPITATION

Annual Precipitation, St. Louis

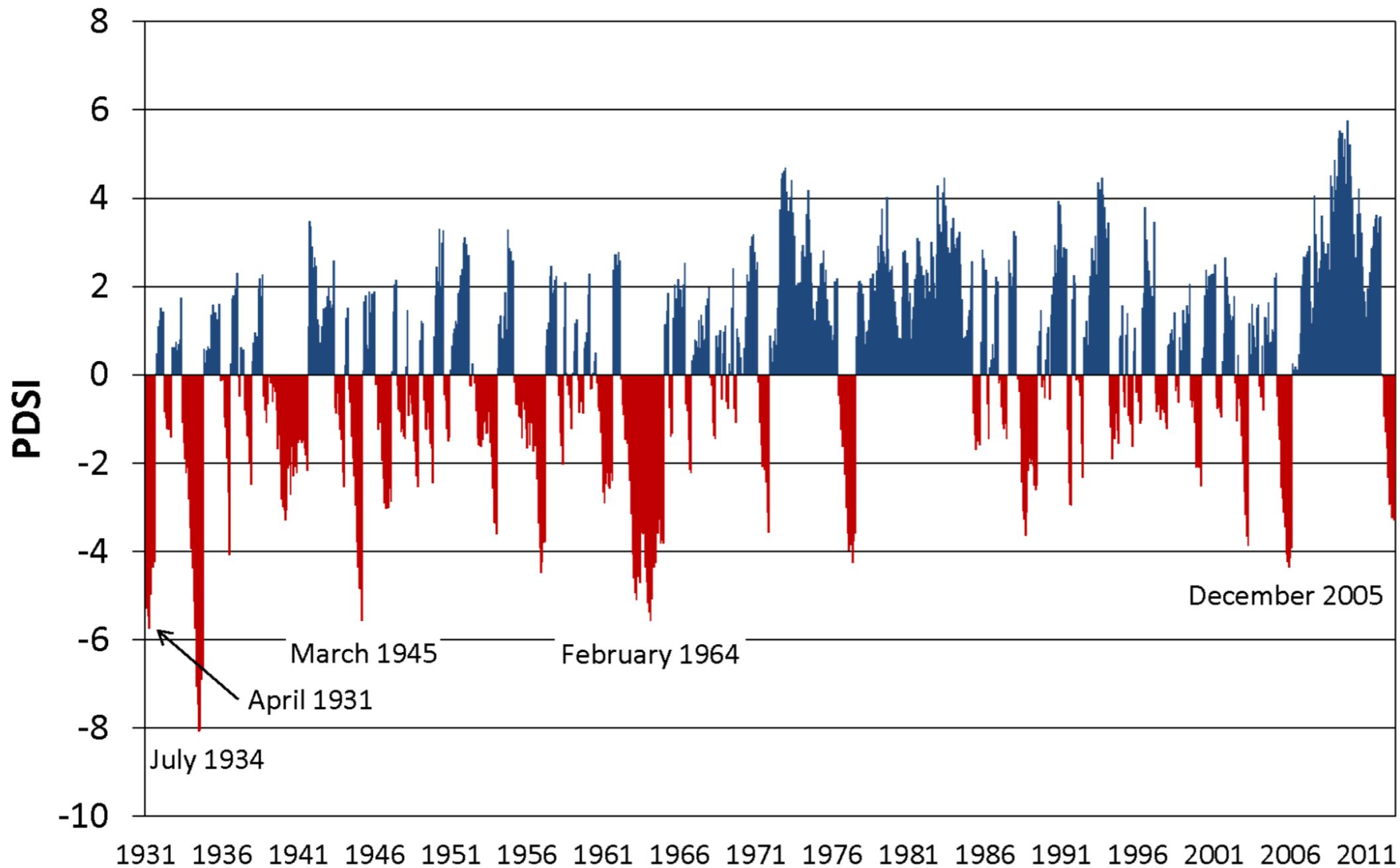


Precipitation Intensity, Chicago



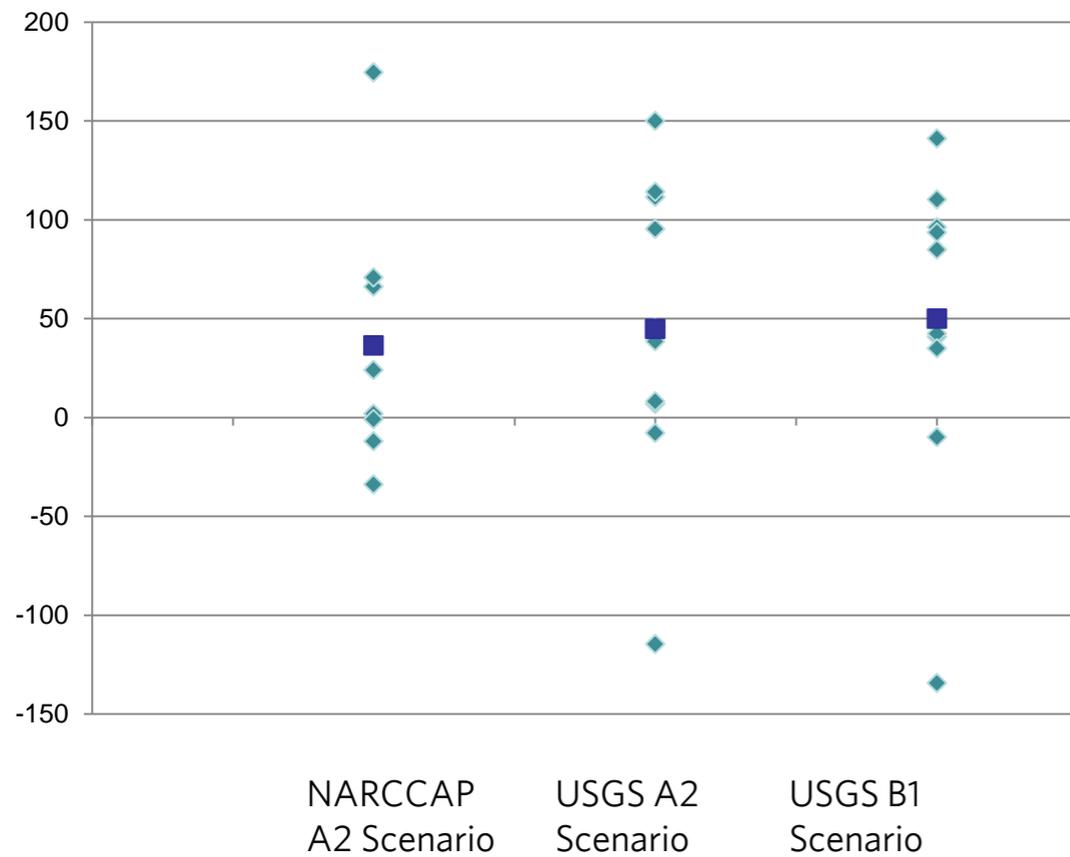
PRECIPITATION

Periods of Drought, Northeast Illinois



PROJECTED PRECIPITATION CHANGE

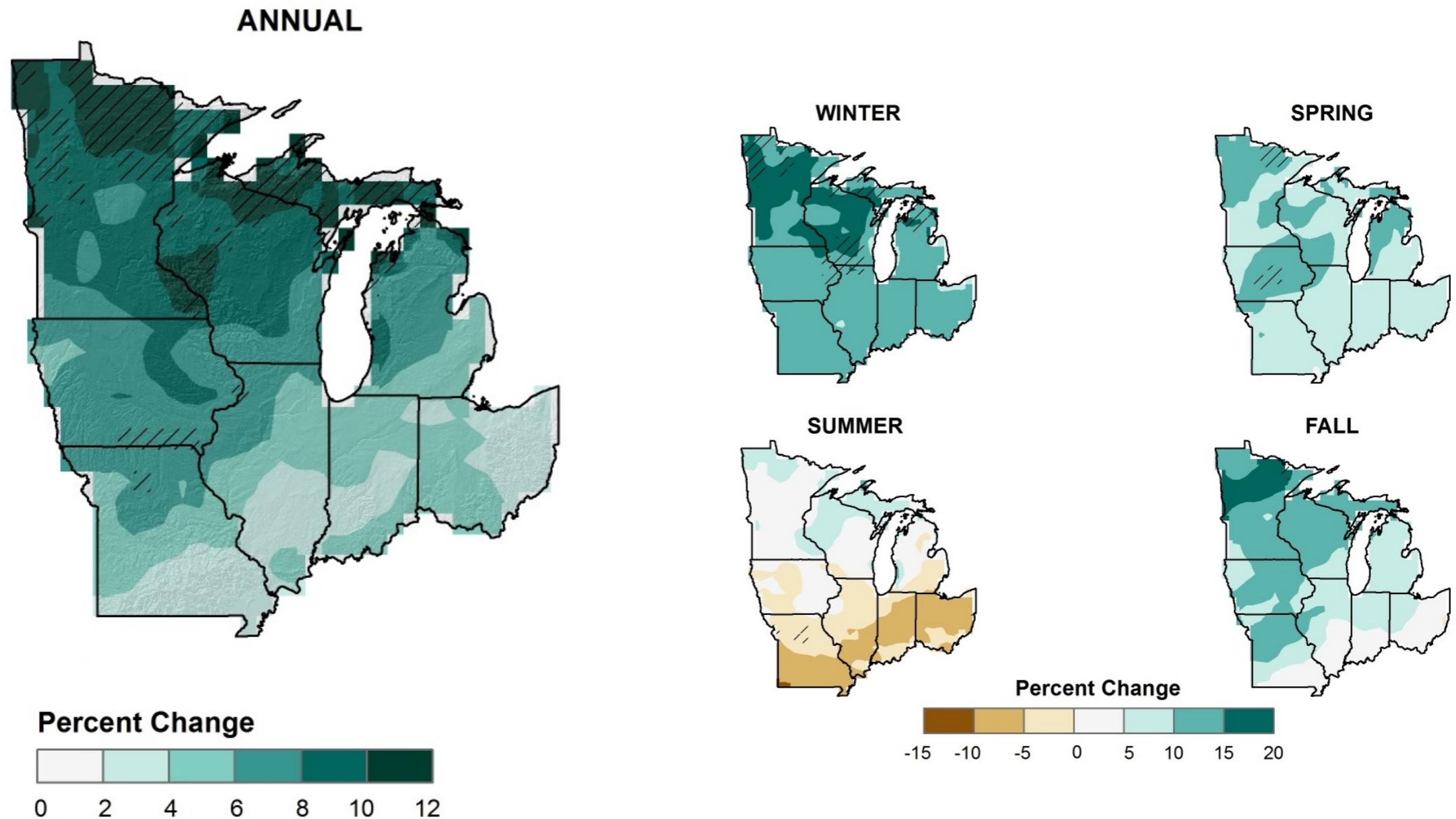
Projected Change in Precipitation 1970-2000 to 2040-2070, St. Louis



PROJECTED TEMPERATURE CHANGE

NARCCAP, SRES A2, PRECIPITATION CHANGE

Multi-Model Mean Simulated Difference - (2041-2070 minus 1971-2000)



TRANSPORTATION **IMPACTS** +
ADAPTATION **STRATEGIES**

TRANSPORTATION IMPACTS

ANTICIPATED CLIMATIC CHANGE	EXPECTED IMPACTS
Increase in average temperature	Pavement buckling and rutting
	Bridge expansion joints
	Lengthened construction season
Increase in frequency and intensity of heavy rainstorms	Increased damage to bridges due to stream scour
	Inadequate hydraulic opening in some culverts
	Disruptions to barge traffic
	Road closures
Increase in seasonal climate variability	Increased difficulty of planning (e.g., budgeting for snow removal costs)
	Difficulty maintaining system performance

RISING TEMPERATURES

IMPACTS

Bridge expansion joints



Source: Washington State Department of Transportation

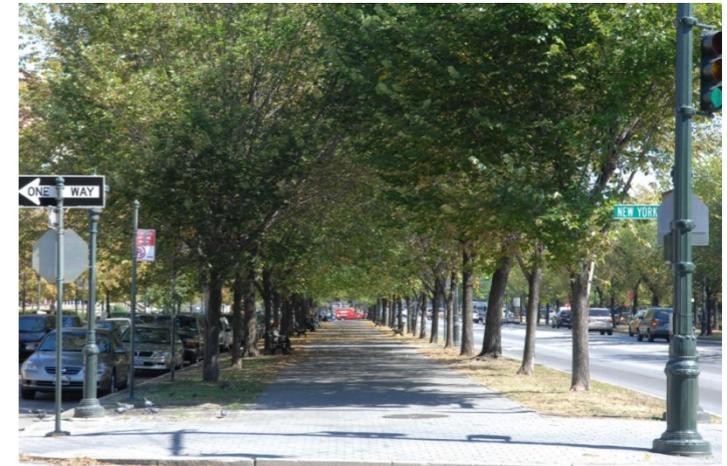
Buckled rails



Source: Federal Transit Administration

STRATEGIES

Street trees



Source: MilliontreesNYC

Transportation asset management



Source: Federal Highways Administration

PRECIPITATION

IMPACTS

Barge traffic



Road closures



Source: National Weather Service

Bridge scour



Source: USGS

System performance



Source: NCDOT

STRATEGIES

Green infrastructure



Source: Ritter, Ohio Public Library



Source: City of Raleigh, NC

Intelligent transportation systems



Source: Florida DOT



Source: Wisconsin DOT

PRECIPITATION

Levee repair



Source: State of California

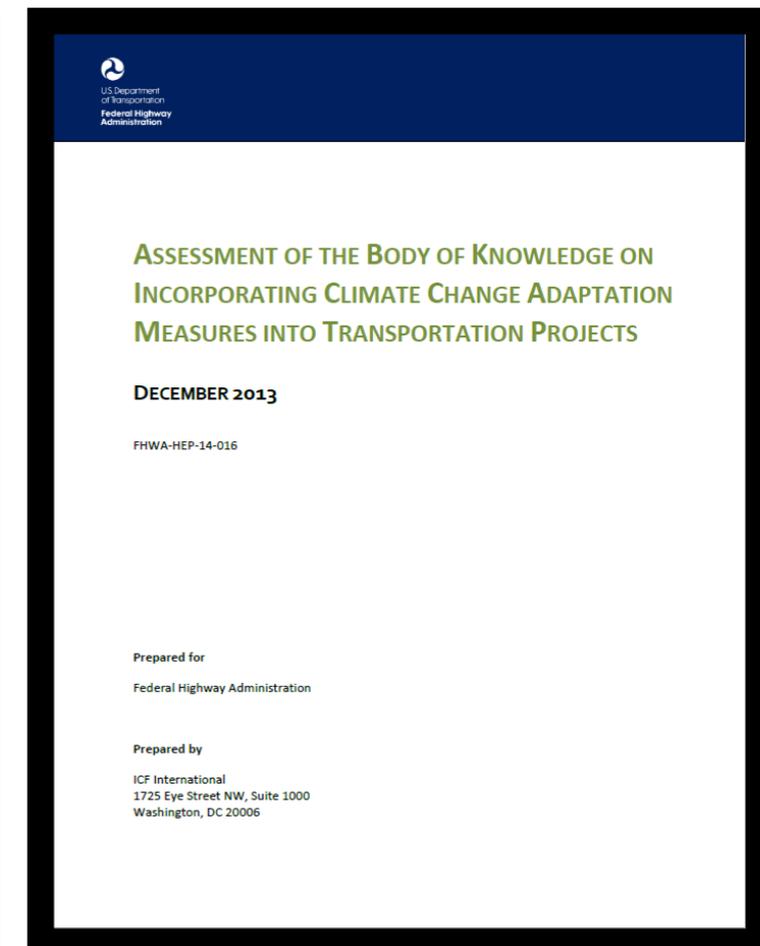
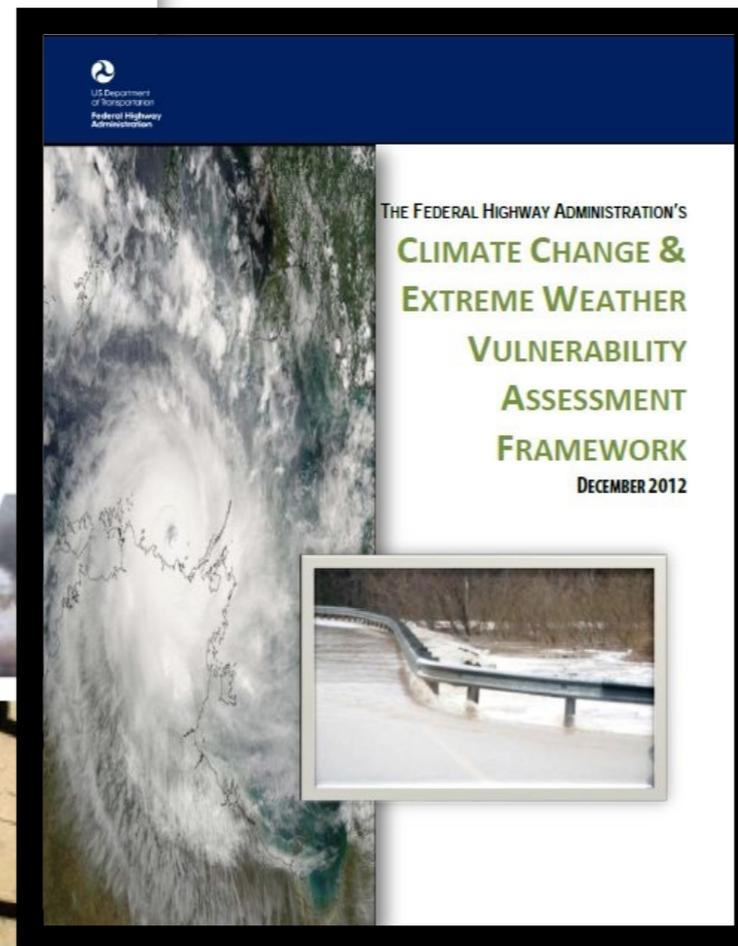
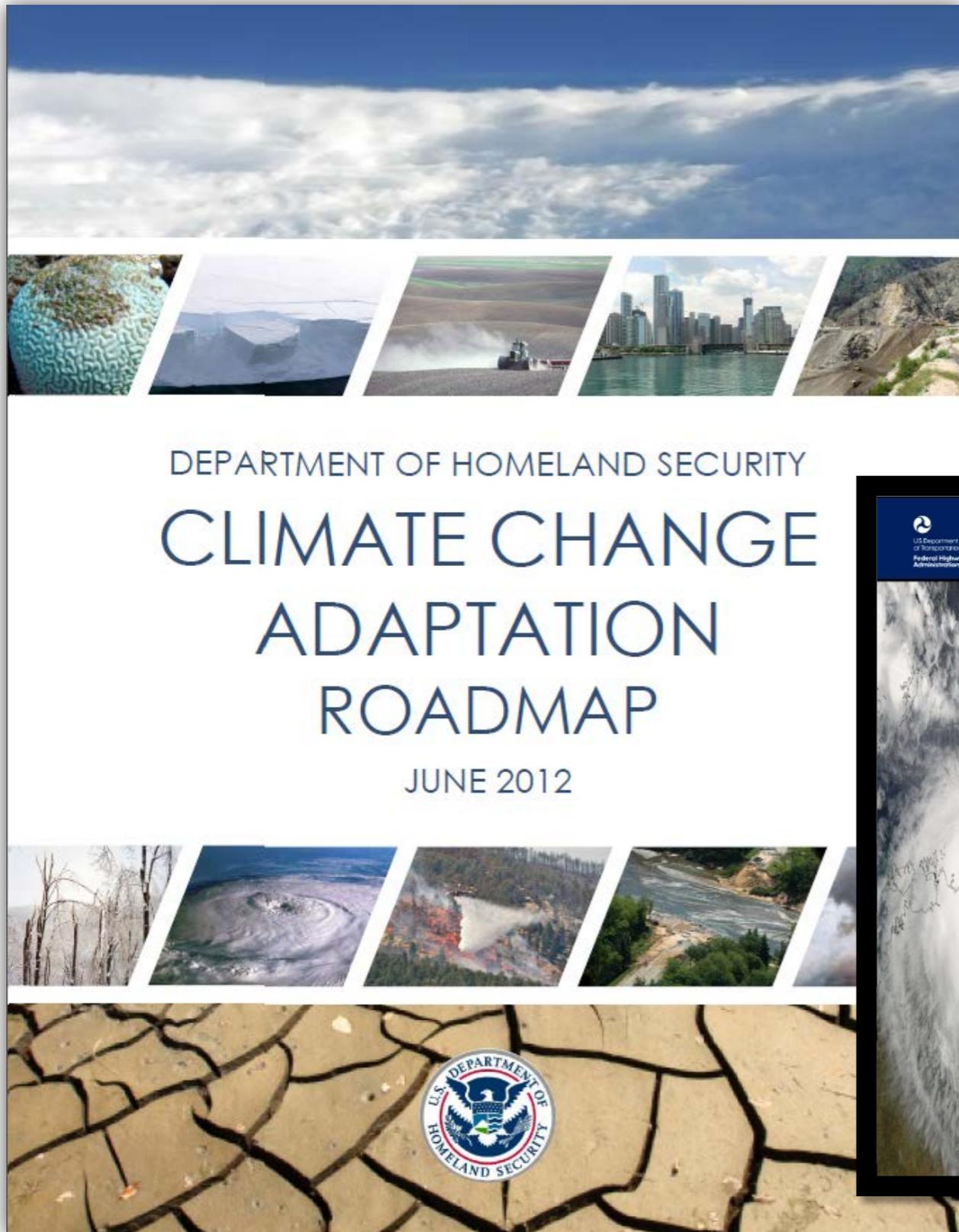
Community rating system

Community Rating System Premium Discounts

Class	Premium Discount	
	SFHA*	Non-SFHA
1	45%	10%
2	40%	10%
3	35%	10%
4	30%	10%
5	25%	10%
6	20%	10%
7	15%	5%
8	10%	5%
9	5%	5%
10	0	0

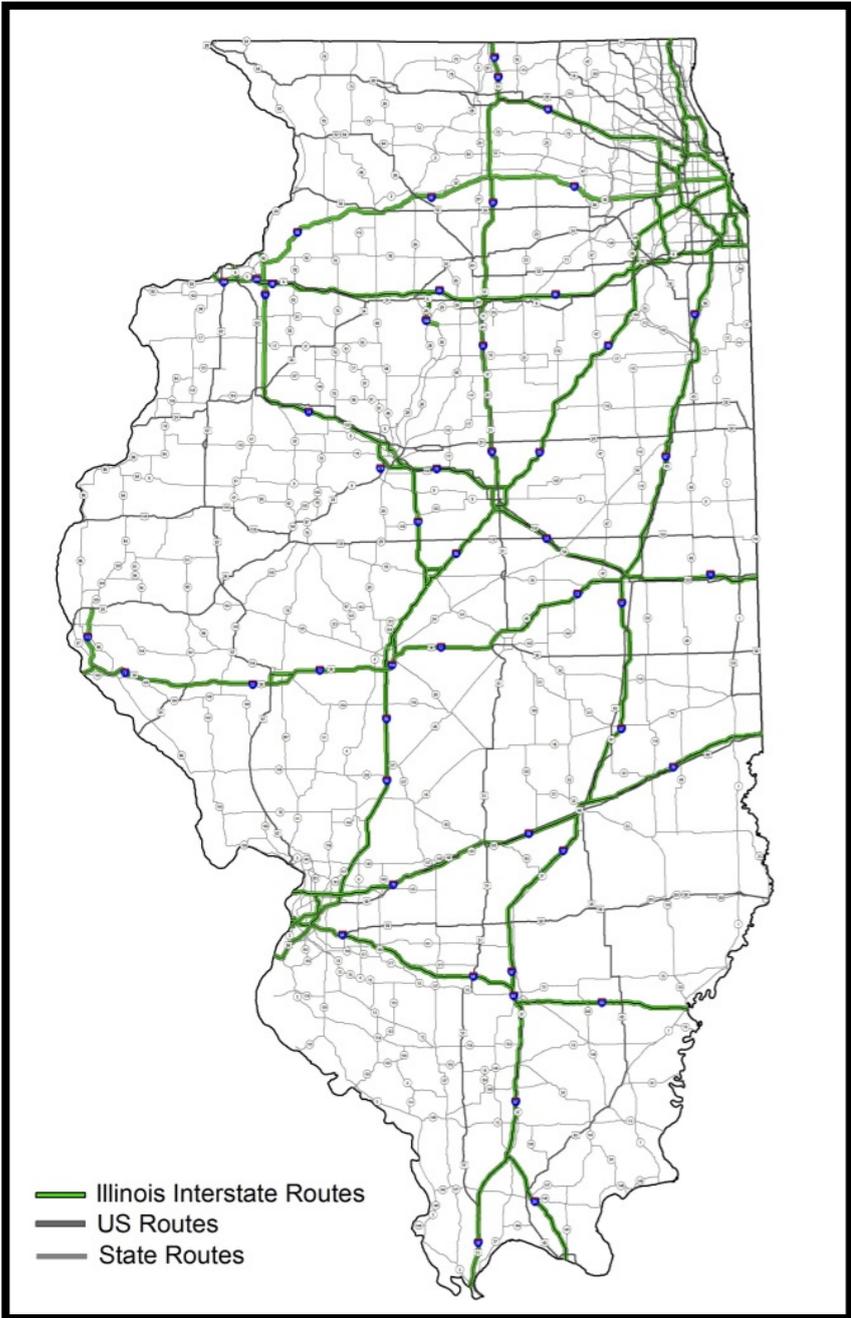
* Special Flood Hazard Area. Non-SFHA premium reductions apply to B, C, D, X, A99, and AR Zones.

IDOT ASSET MANAGEMENT

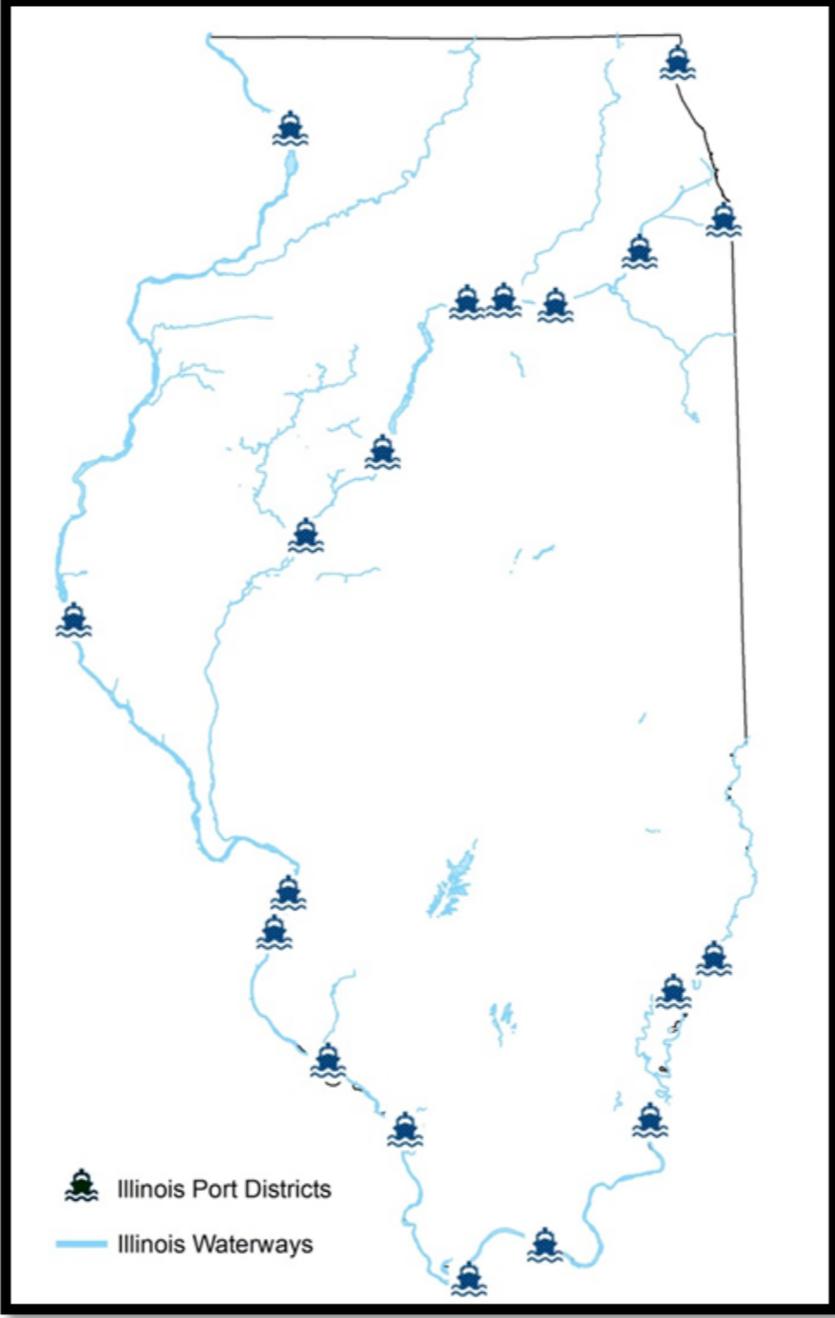


IDOT ASSET MANAGEMENT

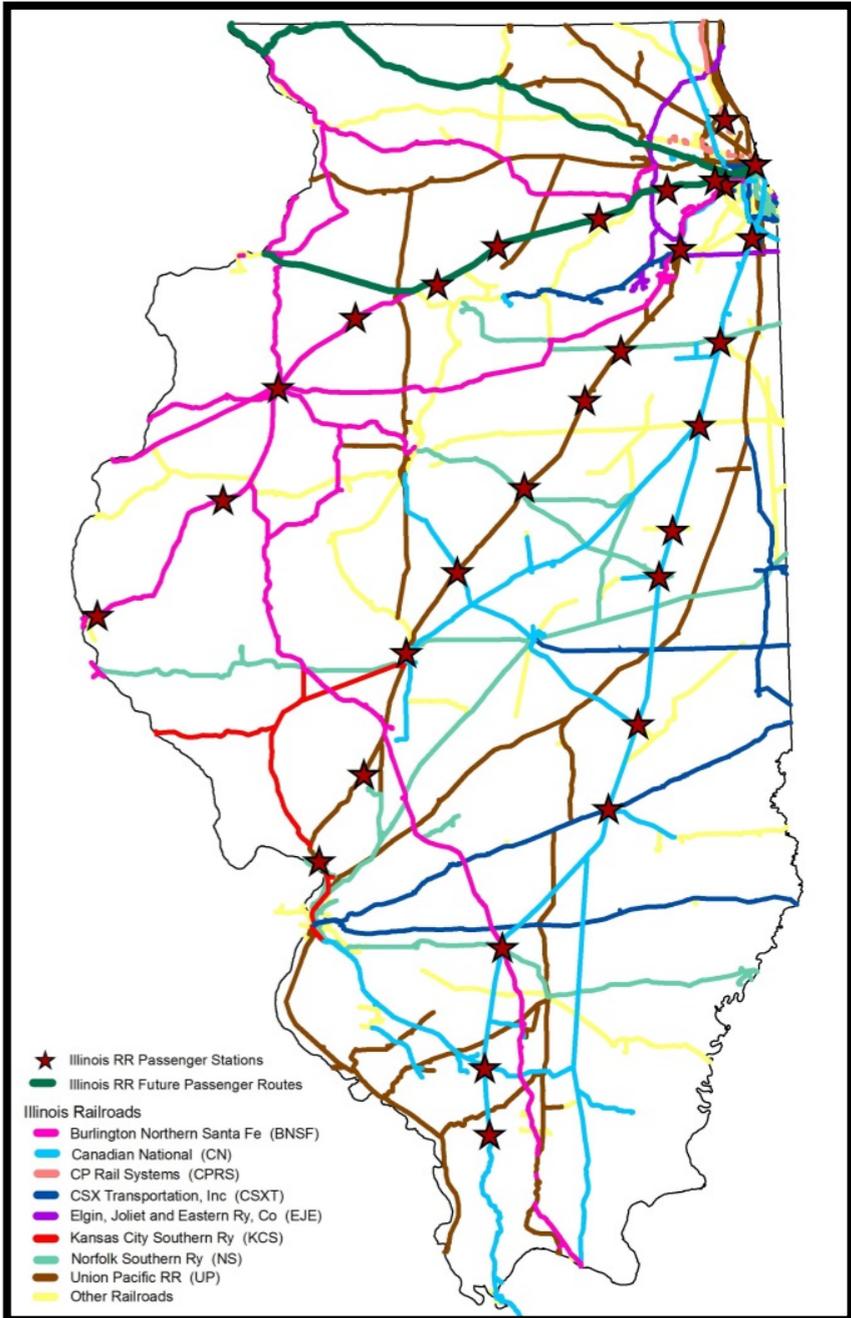
Illinois Road Network



Illinois Waterways



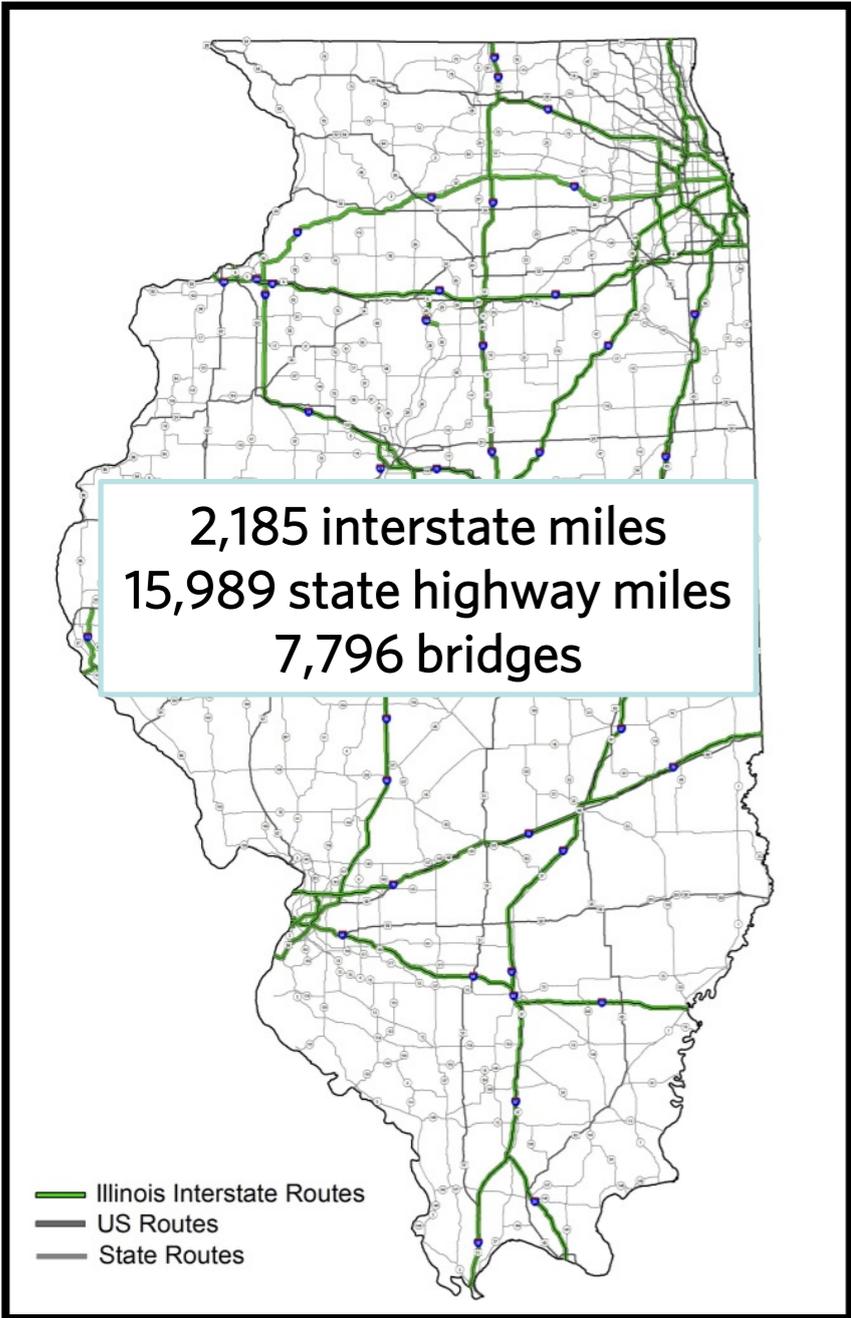
Illinois Rail Network



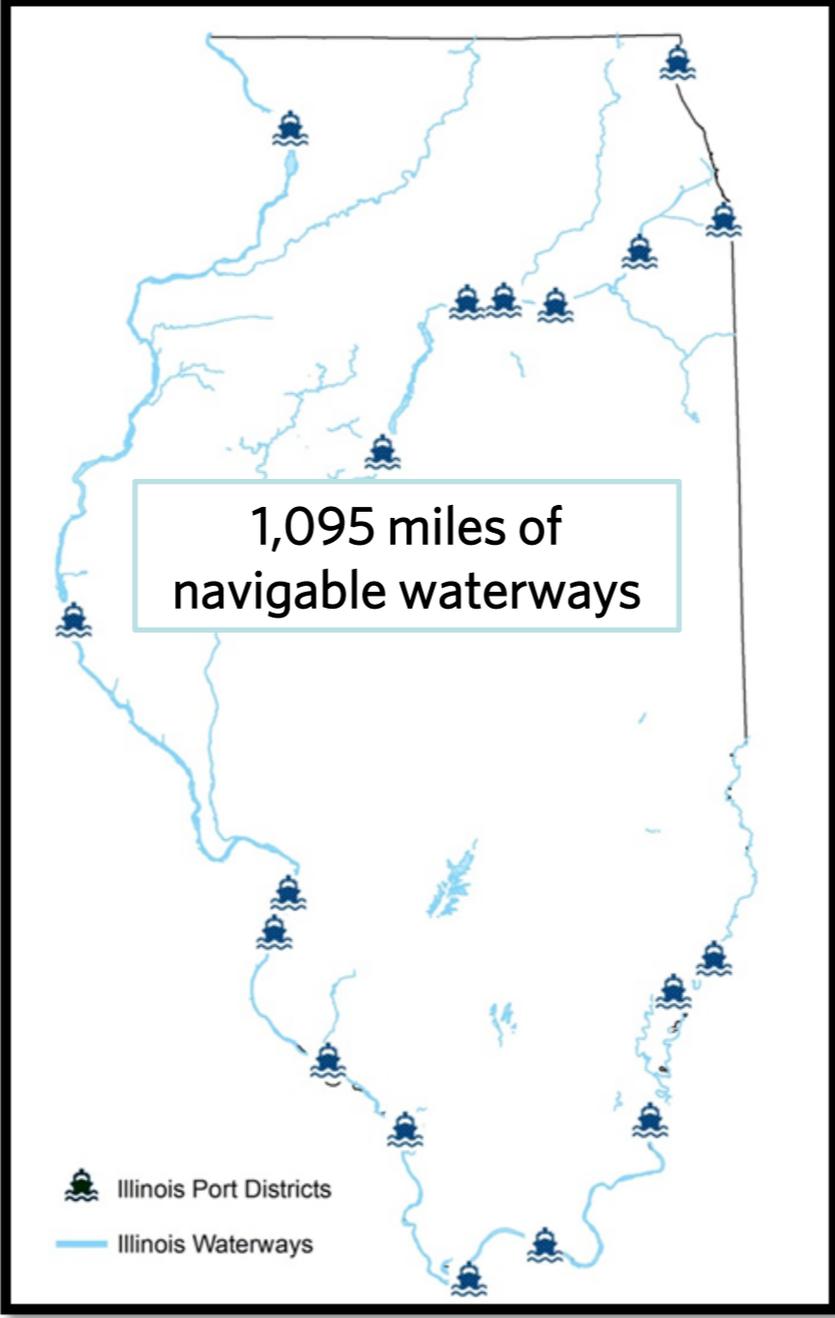
Source: idot.illinois.gov

IDOT ASSET MANAGEMENT

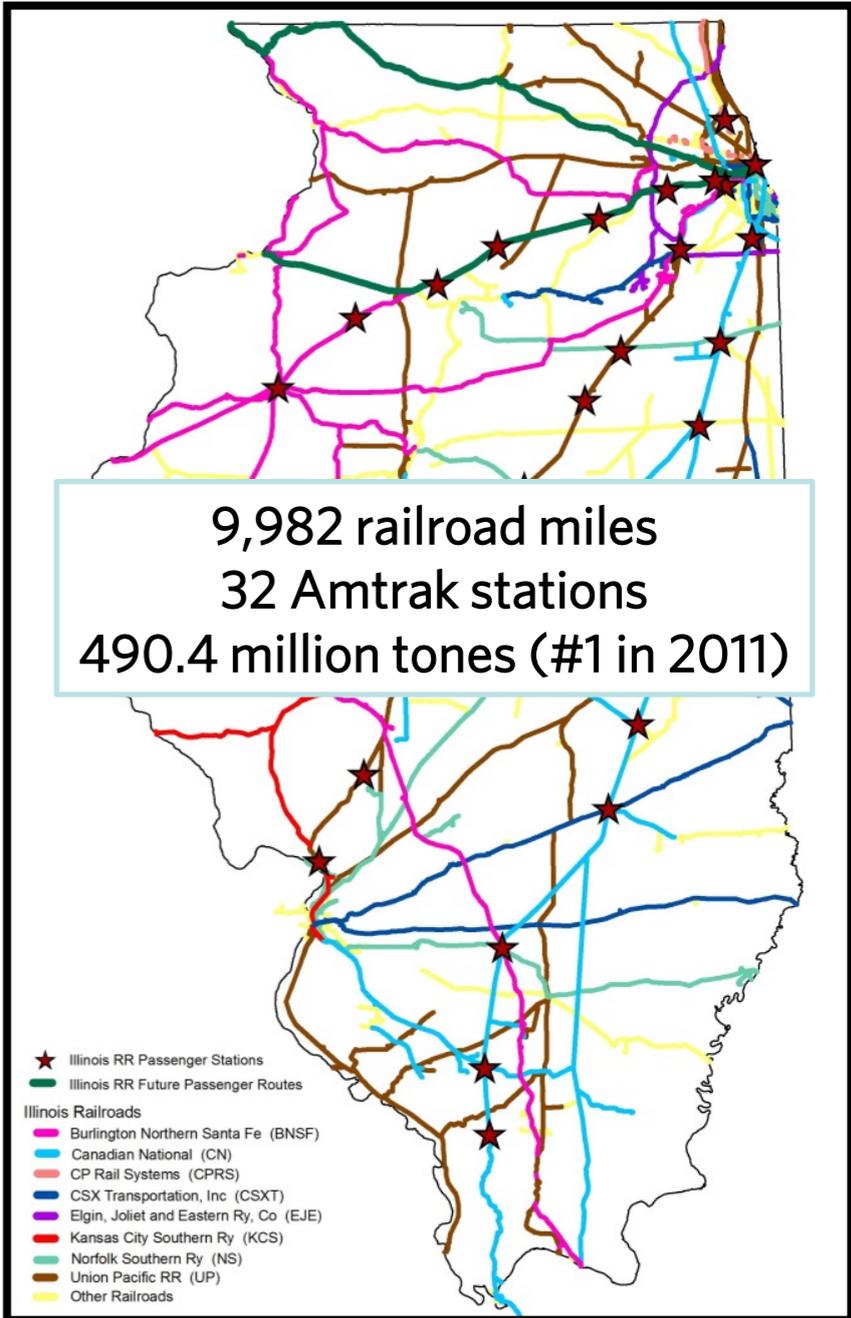
Illinois Road Network



Illinois Waterways



Illinois Rail Network



Source: idot.illinois.gov

IDOT ASSET MANAGEMENT

Task List for IDOT All-Hazards Assessment

Task 1 - Develop Asset Inventory

Task 2 - Compile All-Hazards List (Climate and Manmade)

Task 3 - Develop Vulnerability Index

Task 4 - Draft Potential Alternatives List

Task 5 - Establish an Action Plan

Task 6 - Prepare Draft and Final Project Report

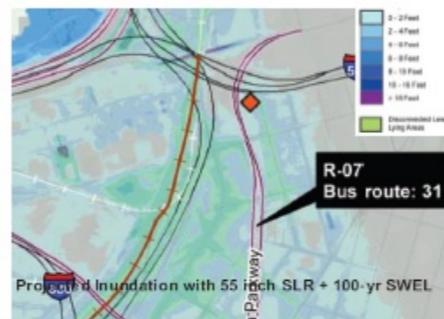
IDOT ASSET MANAGEMENT

Asset Risk Profile

Mandela Parkway (R-07)

Asset Location / Jurisdiction Oakland / City of Oakland	
Summary Mandela Parkway is a collector street that runs between 3rd Street in Oakland to the Emeryville border. This profile considers the segment north of West Grand Avenue. Sensitivity is low (due to the relatively low level of use and annual O&M cost), while exposure is medium due to inundation under the 55" + 100-yr SWEL SLR scenario. When combined with the fact that Peralta Street provides an alternate route, this results in a medium vulnerability rating. Consequence rates low for all but Mandela Parkway's role as a commuter route and socioeconomic impact, which are moderate, given the connection to freeways, Community of Concern, and Transit-Dependent populations. The overall consequence rating is 1.67, making this a low-risk asset.	
Characteristics:	
<ul style="list-style-type: none"> • Transit routes (31) • Bike route 	

Sensitivity: Low	
Remaining Service Life	40 years
Level of Use	
ADT	8,030
Seismic Retrofit	Not applicable
O&M	\$972,000 (30 years)
Liquefaction Susceptibility	Very high
Exposure: Medium	
Maximum Inundation Depths	
16" + MHHW	0 ft
16" + 100-yr SWEL	0 ft
16" + 100-yr SWEL + wind waves	YES
55" + MHHW	2 ft
55" + 100-yr SWEL	4 ft
55" + 100-yr SWEL + wind waves	YES
Inadequate Adaptive Capacity (16" SLR): Medium Peralta Street provides an alternate route	
Vulnerability Rating (mid century): Medium	



Consequence Rating (out of 5): 1.67	
Capital improvement cost	\$15.9 million (between West Grand Avenue and 32nd Street) (1)
Time to rebuild	2 years (between West Grand Avenue and 32nd Street) (1)
Public safety	Not applicable (1)
Economic impact - goods movement	Local street (1)
Economic impact - commuter route	1,700 daily transit riders (3)
Socio-economic impact	Community of Concern + Transit Dependent area and local transit access (3)
Risk Rating: Low	

Shoreline Asset "Overtopping" Analysis	
Proximity to Overtopping (distance)	16" + 100-yr SWEL 1,670 ft
	55" + 100-yr SWEL 1,650 ft
Length Overtopped (% of System)	16" + 100-yr SWEL 10,510 ft (45%)
	55" + 100-yr SWEL 16,900 ft (72%)
	Average Depth of Overtopping
	16" + 100-yr SWEL 1.7 ft
	55" + 100-yr SWEL 3.9 ft
System Responsible (See overview map)	2 Asset is landward of System 3, but shoreline overtopping does not contribute to inundation of asset.

Future Projects	None
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OTHER INFRASTRUCTURE **IMPACTS** +
ADAPTATION **STRATEGIES**

DRAINAGE + FLOOD PROTECTION

ANTICIPATED CLIMATIC CHANGE	EXPECTED IMPACTS
Increase in frequency of heavy rainfall	Increased flood damage because area of significant flood risk and elevation of floodwaters are underestimated on flood maps
	Increased downstream flood damage due to inadequate detention

ADAPTATION STRATEGIES

- Increase flood protection elevation
- Apply floodplain management requirements to area larger than historic Special Flood Hazard Area (based on 100-year flood)
- Develop stormwater master plan to identify needed drainage improvements
- Integrate green and gray infrastructure strategy for more adaptive stormwater management strategy



2013 flooding in McHenry County, IL. Source: Chuck Berman/Chicago Tribune

ELECTRIC INFRASTRUCTURE

ANTICIPATED CLIMATIC CHANGE	EXPECTED IMPACTS
Increase in average summer temperature and frequency of summer heat waves	Greater peak demand for electricity due to cooling needs
Increase in frequency and intensity of heavy rainstorms	Increased damage to trees, power poles, electrical lines, electrical supply

ADAPTATION STRATEGIES

- Convert electric lines to run underground
- Permit and encourage distributed renewable energy generation
- Minimize conflicts with trees on public and private property
- Support energy efficiency efforts



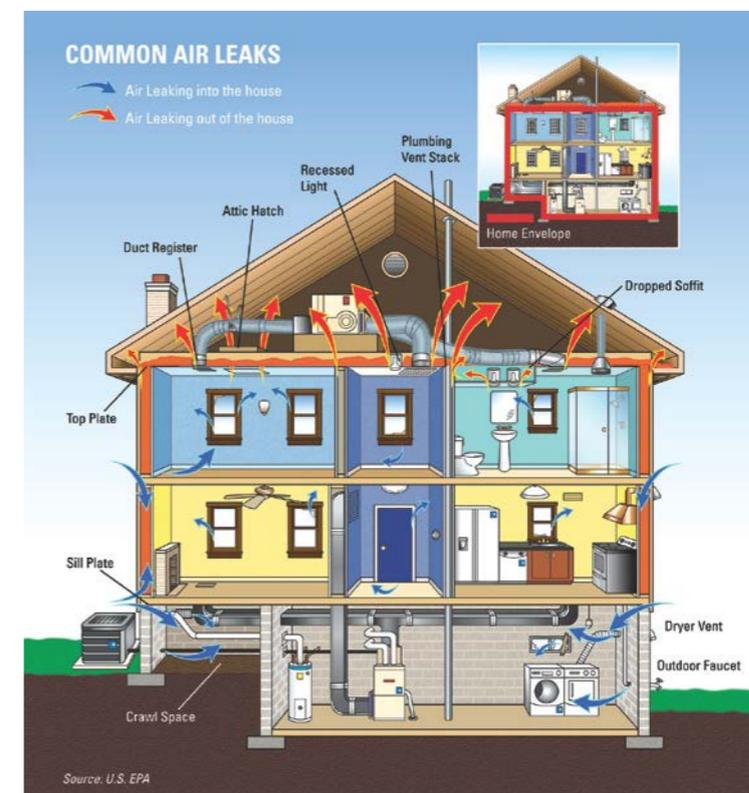
Source: CMAP

BUILDING AND SITE PLANNING

ANTICIPATED CLIMATIC CHANGE	EXPECTED IMPACTS
Increase in average summer temperature	Increased damage to roofs, windows, and other building components
Increase in frequency and intensity of heavy rainstorms	Increased cooling demand
Increase in spring and fall humidity	Increased moisture intrusion and negative effects on building durability

ADAPTATION STRATEGIES

- Encourage participation in voluntary “above-code” programs for wind/hail resistance
- Require moisture intrusion and pest and decay resistance measures to improve material durability
- Require cool roofs
- Permit and encourage passive solar design



Source: USEPA

OPEN SPACE + ECOSYSTEMS

ANTICIPATED CLIMATIC CHANGE	EXPECTED IMPACTS
Increase in average summer temperature	Increased stress on street trees, landscaping, and other natural areas
Increase in frequency and intensity of flooding and drought	
Higher winter temperatures	Increased risk of introducing new invasive species

ADAPTATION STRATEGIES

- Update tree-planting requirements in ordinances
- Review approved list of tree species for street trees based on resilience to invasives and tolerance to heat and drought and replace trees as appropriate
- Implement water-efficient irrigation practices



Source: CMAP

PUBLIC HEALTH

ANTICIPATED CLIMATIC CHANGE	EXPECTED IMPACTS
Increase in frequency, duration, and severity of extreme heat periods	Increased mortality rates from heat-related causes, particularly to vulnerable populations
Increase in summer temperatures	Increased incidence of respiratory symptoms due to ground-level ozone
Increase in average temperature and seasonal humidity	Increased prevalence of vector-borne diseases

ADAPTATION STRATEGIES

- Identify concentrations of vulnerable populations: elderly, low-income communities, people with limited mobility
- Develop extreme heat or emergency preparedness plan
- Increase tree canopy to reduce urban heat island effect
- Adopt anti-idling ordinance
- Control disease vectors

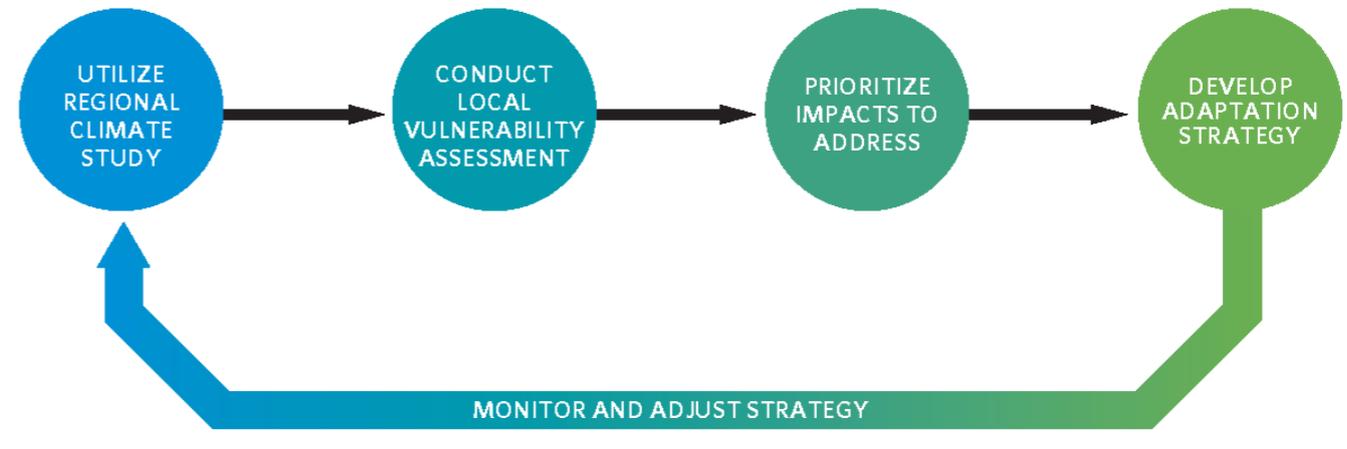


Source: Chicago Tribune archive, 1995

ADAPTATION PLANNING

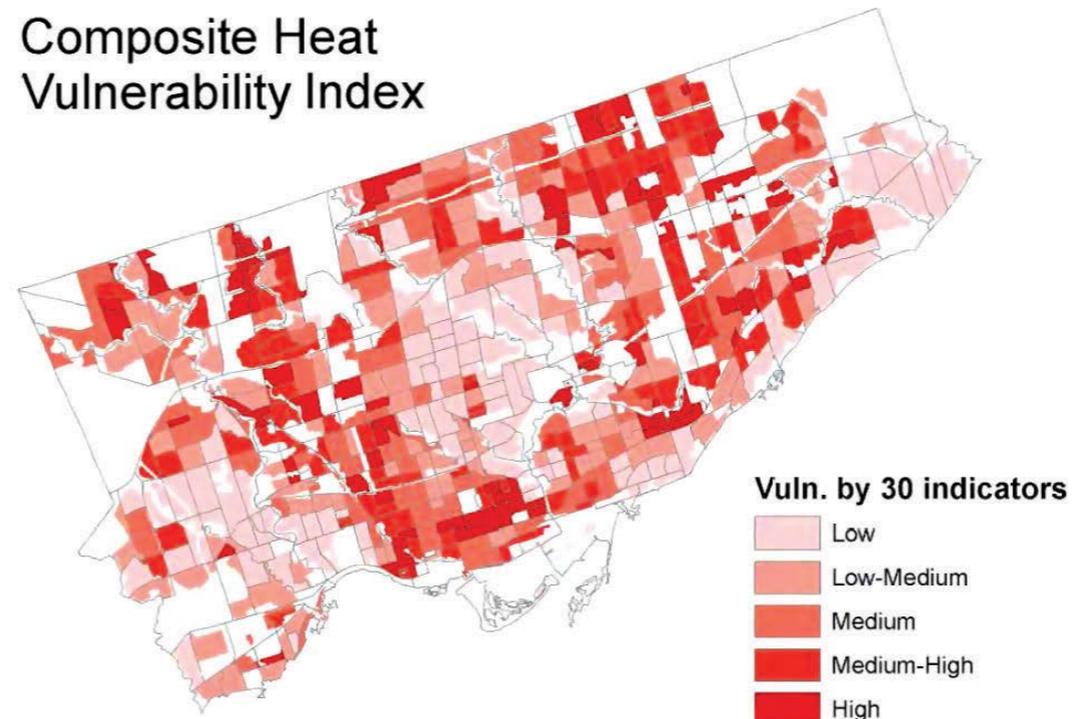


Steps for developing a municipal climate adaptation strategy



Source: Chicago Metropolitan Agency for Planning.

Composite Heat Vulnerability Index



Source: City of Toronto

CLIMATE READINESS CHECKLIST

Facilities	Scenario	Scenario	Scenario
	Located in the Floodplain ¹ ?	Flooding expected due to 100-year, 24-hour storm ² ?	Flooding expected due to storm event 50% greater than column 2? ³
Police station(s)			
Fire station(s)			
City Hall			
Emergency operation centers			
Evacuation Shelter(s)			
Hospital(s)			
Communications center(s)			
Public Works Facilities			
Total Check Marks (facilities)			

Business Plans and Equipment	Yes (50% or more)	No (Less than 50%)
Generators		
Backup options for basic needs (water, waste, communications)		
Plans to bring in staff to help re-open the business		
Plans for re-stocking		
Total Number of Yes and No answers		

Operations and Maintenance	Yes	No	Comment
Snowplowing and snow removal has an increasing trend.			
Storm sewer system repair, including conveyances, inlet/outlet structures or best management practice (BMP) maintenance is on the rise.			
Road buckle and pot holes maintenance is on the rise.			
Sanitary sewer overflow (sanitary waste overflowing into storm sewer system) is occurring more frequently.			
Beach closures from water quality, erosion, or high water, is more frequent.			
Urban tree maintenance and replacement is on the rise.			
Total Number of Yes and No answers			

Categories 3-8	Total Yes answers (shaded box of given table above)	Translate Total Answers from Column 1 of this table to a Readiness Index	Readiness Index	Comments
Category 3: Built Environment & Infrastructure		0 to 2 (HIGH) 3 to 5 (MEDIUM) 6 to 8 (LOW)		
Category 4: Operations and Maintenance		0 to 1 (HIGH) 2 to 4 (MEDIUM) 5 to 6 (LOW)		
Category 5: Water Resources		0 to 2 (HIGH) 3 to 5 (MEDIUM) 6 to 7 (LOW)		
Category 6: Ecosystems & Habitats		0 to 2 (HIGH) 3 to 6 (MEDIUM) 7 to 9 (LOW)		
Category 7: Tourism and Recreation		0 to 1 (HIGH) 2 (MEDIUM) 3 to 4 (LOW)		
Category 8: Business Plans & Equipment		4 (HIGH) 2 to 3 (MEDIUM) 0 to 1 (LOW)		
Category 9: Community Plans		6 to 8 (HIGH) 3 to 5 (MEDIUM) 1 to 2 (LOW)		

Source: Self-Assessment to Address Climate Change Readiness in Your Community

OTHER CONSIDERATIONS

POLITICAL

- Understanding the issues that resonate with the community and discussing impacts in practical, concrete terms
- Public education and awareness to connect global climate change to local actions

FINANCIAL + OPERATIONAL

- Capturing strategies with multiple co-benefits
- Implications for municipal budgeting cycles
- Ensuring that departments understand and address climate impacts on their operations and assets
- Identifying leadership to keep track of adaptation activities

CONTACT US

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