Minneapolis Climate Vulnerability Assessment

5/23/13

Agenda

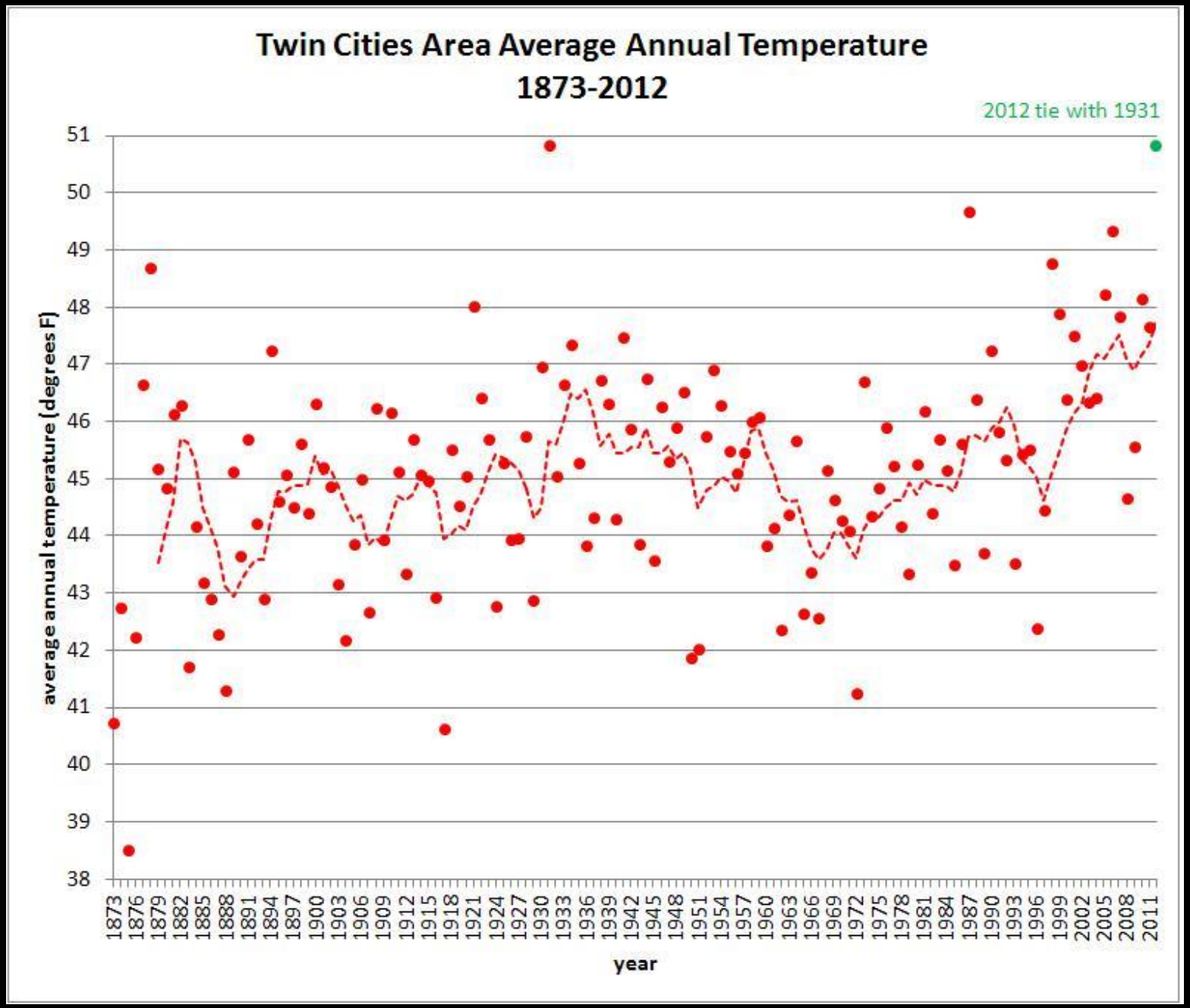
8:15	Climate Change impacts and adaptation examples *Brendon Slotterback*
8:45	Recap from Wednesday *Dan Brown*
9:15	Understanding vulnerability *Missy Stults*
9:30	Likely climate impacts *Group discussion*
11:00	Identifying key vulnerabilities *Group discussion*
12:00	Identifying strategies to reduce vulnerabilities
12:30	Lunch

2012: HOTTEST YEAR ON RECORD

Average Annual Temperature in Contiguous U.S.

* Source: Climate Central, compiled from NOAA's National Climatic Data Center and Applied Climate Information System. Based on observed temperatures through December 10, 2012 and an estimate of the Normal distribution of temperatures for the last 21 days of December based on data from the previous 117 years. (See methodology)

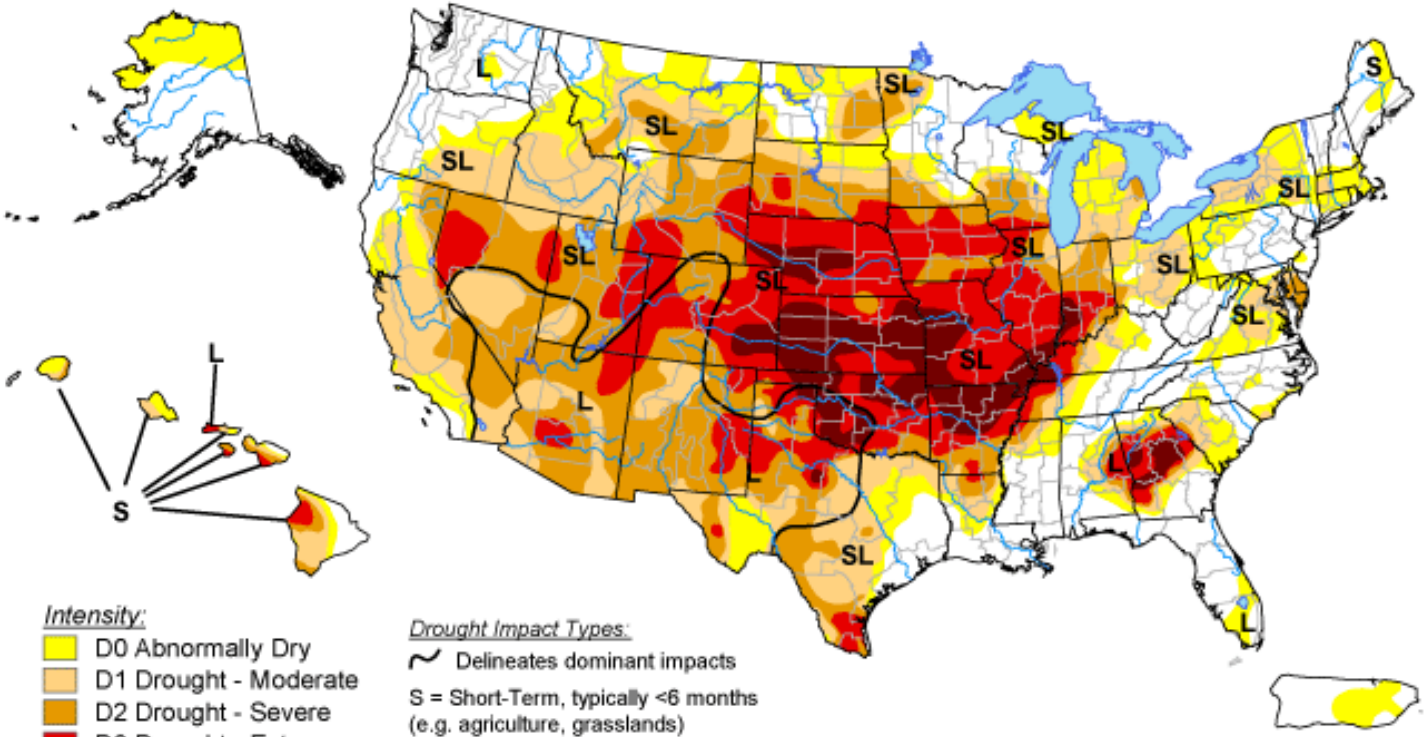
CLIMATE CENTRAL



Source: MN Climate Change Working Group

U.S. Drought Monitor

August 21, 2012
Valid 7 a.m. EDT



Intensity:
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

~ Delineates dominant impacts

S = Short-Term, typically <6 months (e.g. agriculture, grasslands)

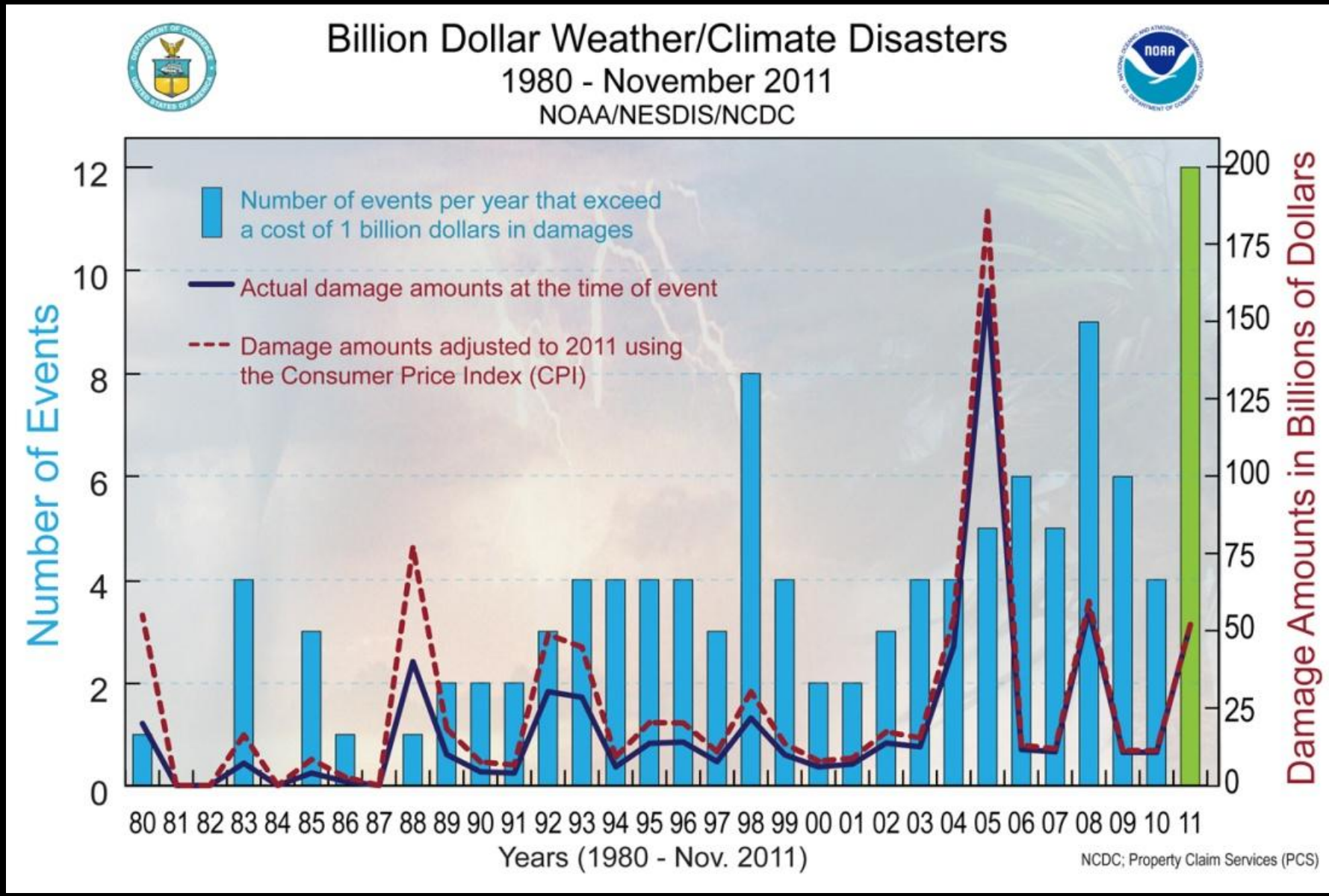
L = Long-Term, typically >6 months (e.g. hydrology, ecology)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

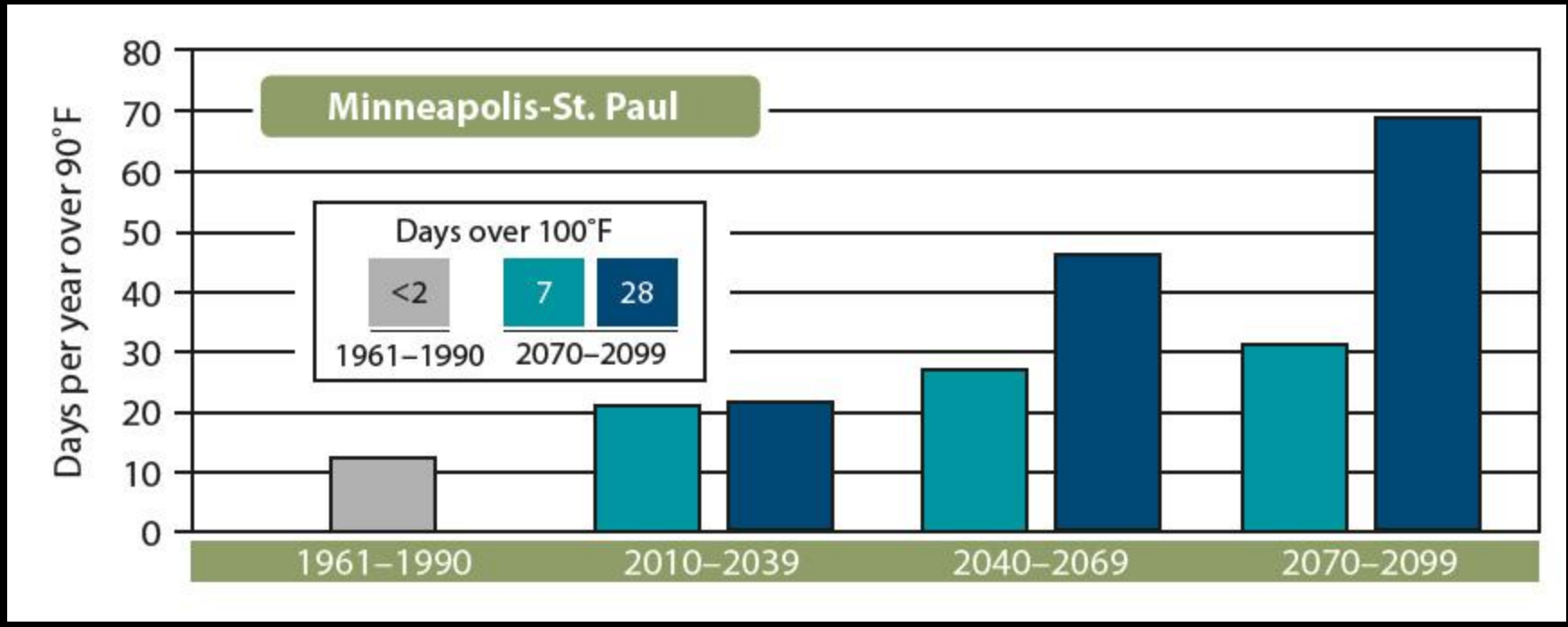
http://droughtmonitor.unl.edu/

Released Thursday, August 23, 2012

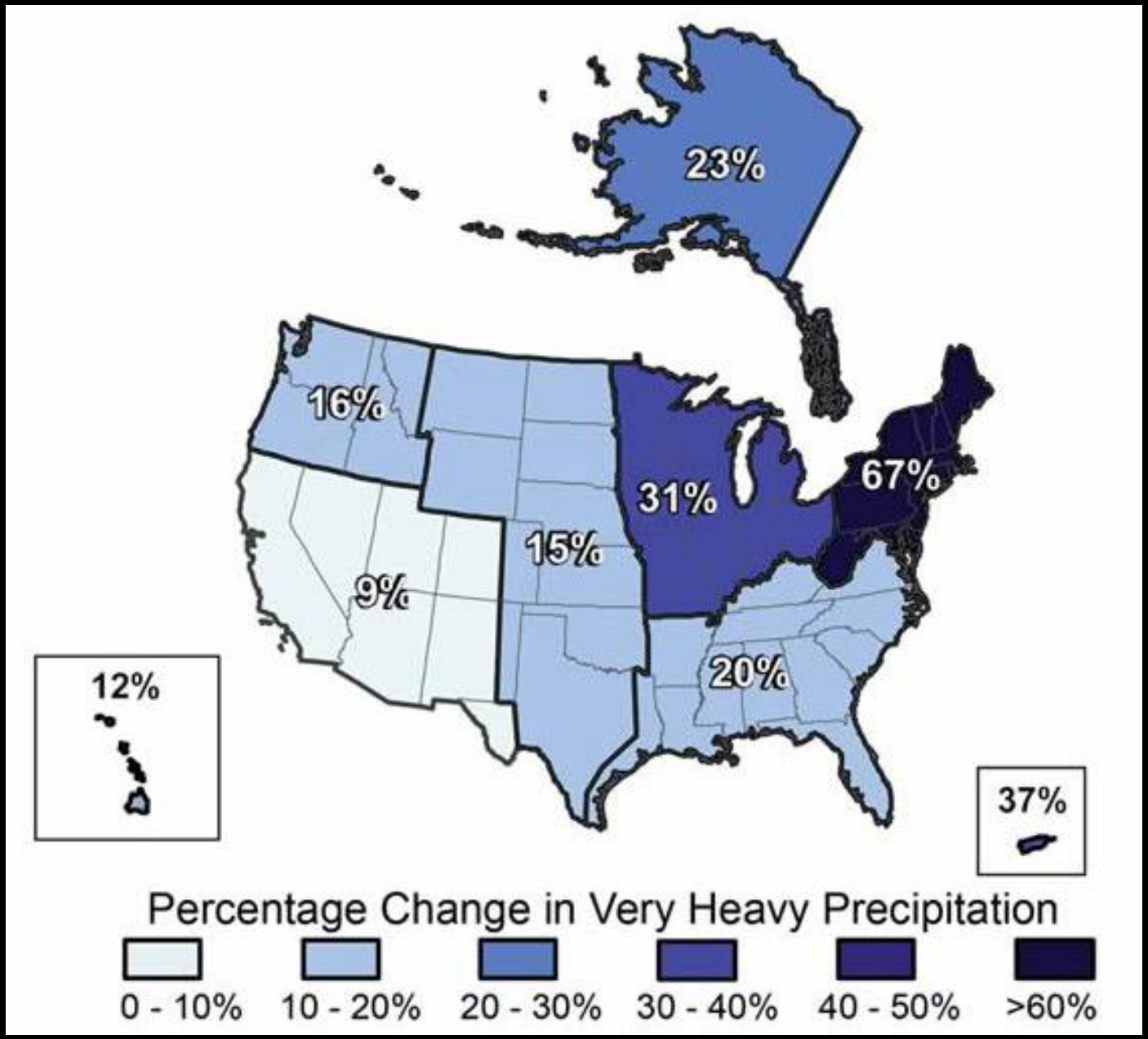
Author: Michael Brewer/Liz Love-Brotak, NOAA/NESDIS/NCDC


Billion Dollar Weather/Climate Disasters
1980 - November 2011
NOAA/NESDIS/NCDC
Number of events per year that exceed a cost of 1 billion dollars in damages
Actual damage amounts at the time of event
Damage amounts adjusted to 2011 using the Consumer Price Index (CPI)
Number of Events
Damage Amounts in Billions of Dollars
0
2
4
6
8
10
12
0
25
50
75
100
125
150
175
200
80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11
Years (1980 - Nov. 2011)
NCDC; Property Claim Services (PCS)


151-UXP



Source: UCS Heat in the Heartland


23%
16%
31%
67%
15%
9%
20%
12%
37%
Percentage Change in Very Heavy Precipitation
0 - 10%
10 - 20%
20 - 30%
30 - 40%
40 - 50%
>60%

2030 MODEL-PROJECTED DRAWDOWN IN THE PRAIRIE DU CHIEN-JORDAN AQUIFER

CHANGE IN FUTURE GROUNDWATER DRAWDOWN

- Less than 5 feet
- 5.1 to 10 feet
- 10.1 to 20 feet
- 20.1 to 30 feet
- 30.1 to 40 feet
- 40.1 to 45 feet

AREAS MOST AFFECTED

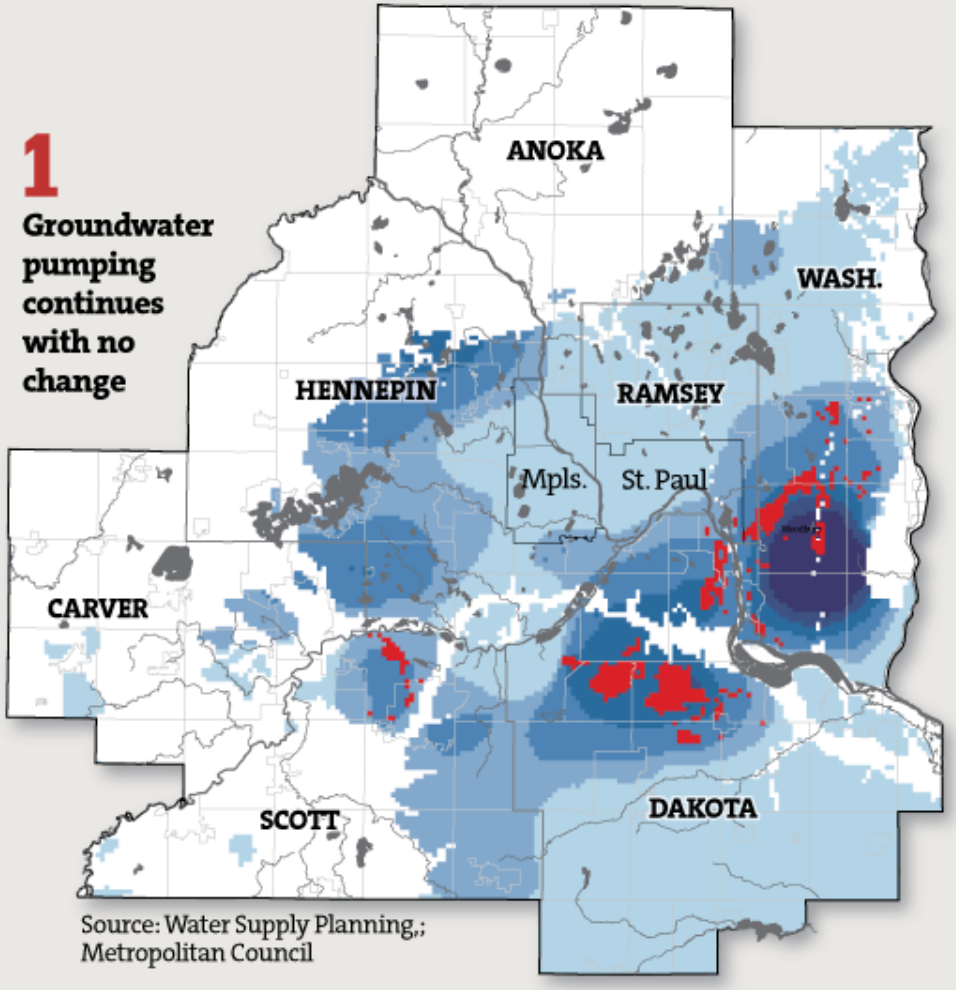
Drawdown exceeds 50% of available head*

*Available head in a well is the height water rises above the physical top of the aquifer, the 50 percent mark is when it becomes the greatest concern.

Note: Model 1 results assume long-term average conditions and continued development of traditional water supplies. Models 2 and 3 assume that some communities adopt different water supplies than they currently use.

1

Groundwater pumping continues with no change



Source: Water Supply Planning,; Metropolitan Council

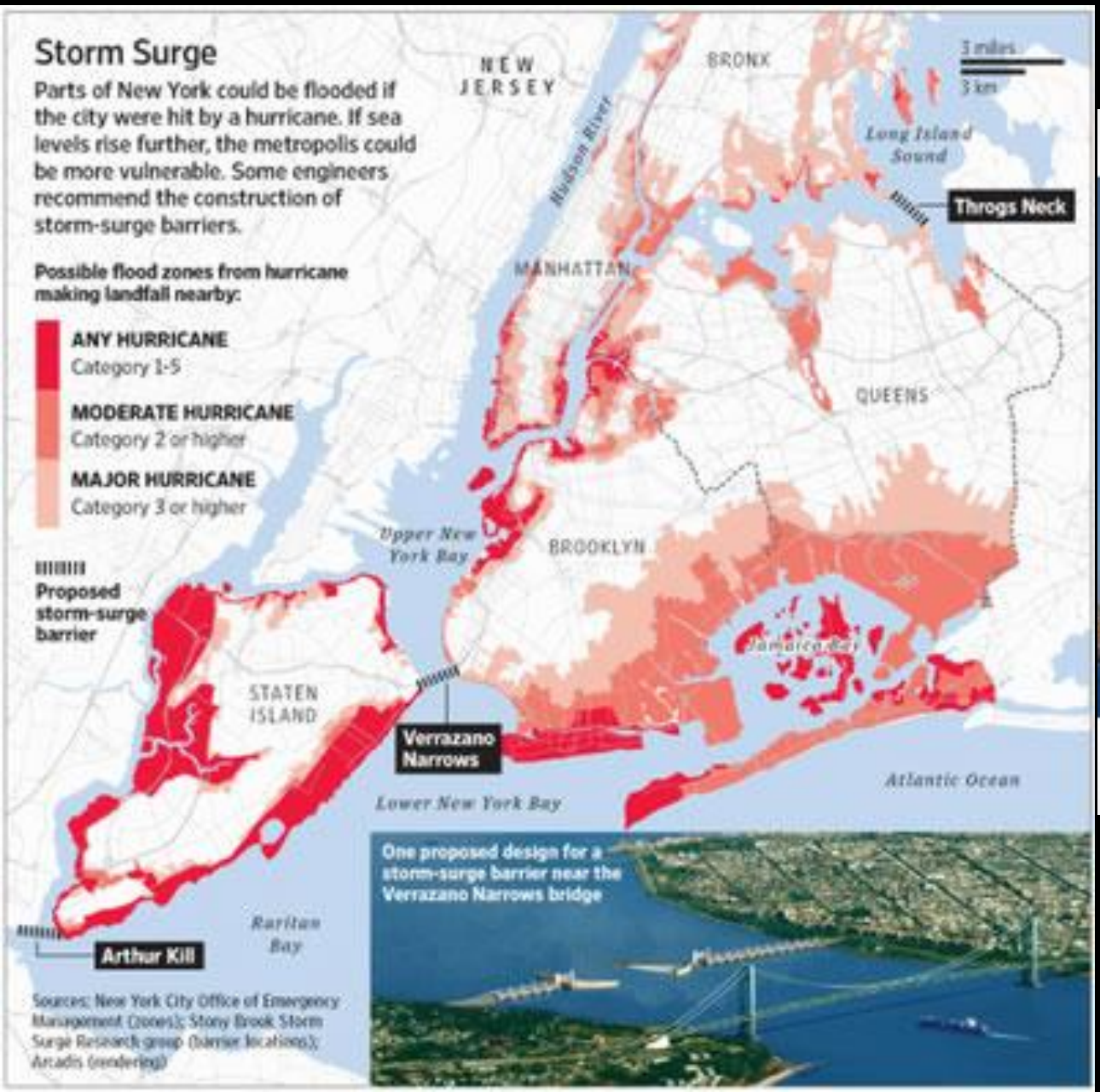
Why are cities doing climate adaptation?

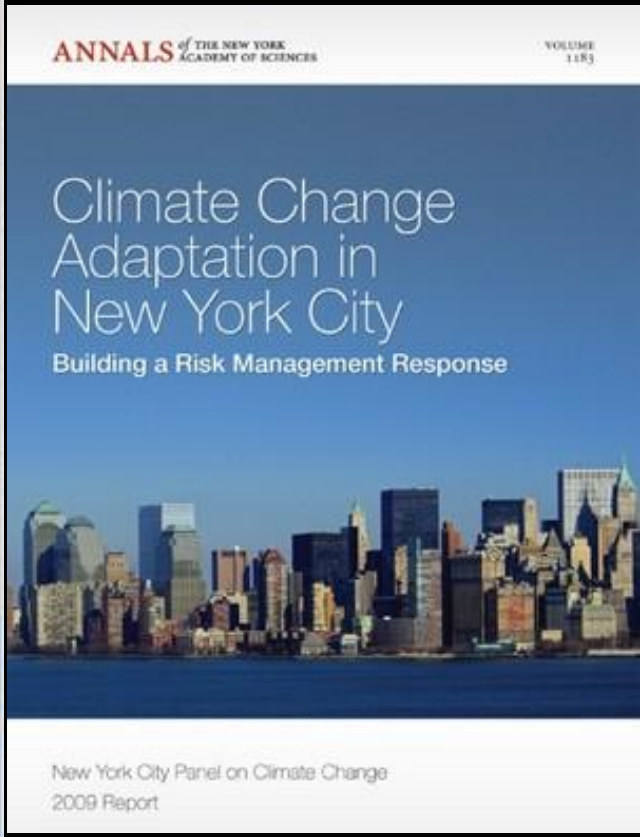
Chicago Climate Action Plan

City of Chicago Urban Heat Island Policies

Chicago Climate Action Plan

New York City Risk Management Response





NYC Panel on Climate Change-
2009 Climate Risk Information Report

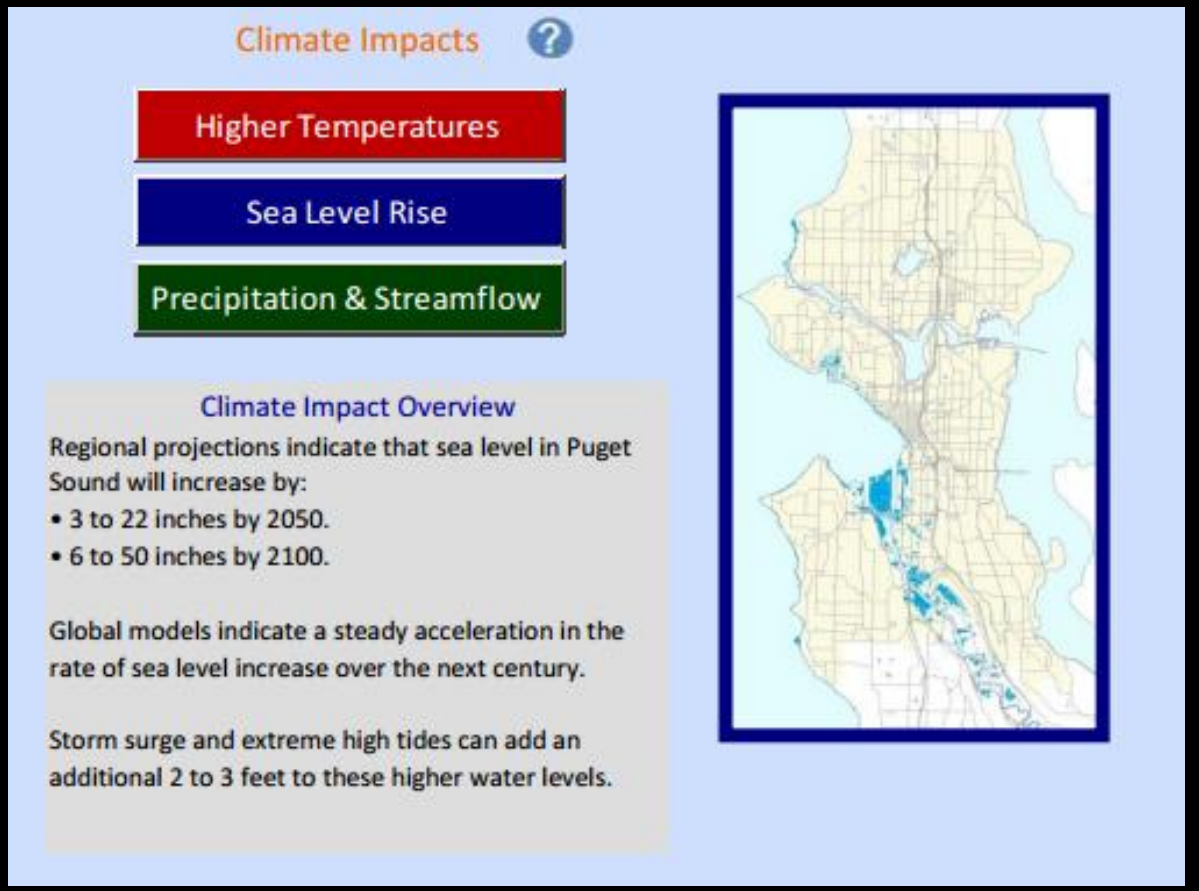
Seattle Climate Protection Initiative

PROJECT SPOTLIGHT

PARKS ADAPTIVE IRRIGATION TECHNOLOGY

The irrigation systems at Seattle parks are smarter than they've ever been. Timing and responsiveness are the emphasis; whereas in a traditional irrigation system, clocks are set so that the grass is watered at the same time each afternoon, 65 of Seattle's park sites have schedules that change each day according to environmental conditions. And 30 sites are even *more* responsive, as they're equipped with rain sensors. If it starts to rain, the sensor responds, and irrigation halts. The system is a very literal example of adapting to the environment in real time. We save precious water by not using it when it's raining anyway, and we ensure that we can provide that water during dry spells, when it's needed most.

Parks irrigation rain sensor



Seattle Climate Impacts Planning Tool

Milwaukee Climate Change Working Group

Stormwater Management Strategies

Vulnerabilities assessment

Milwaukee Green Streets Stormwater Management Plan

City of Portland Climate Action Plan: Climate Change Preparation

Public Outreach

Invasive Species Plan

City of Portland and Multnomah County- Climate Action Plan 2009

HIGHLIGHTS

CLIMATE CHANGE PREPARATION

The Climate Action Plan contains one 2030 objective in the focus area of climate change preparation:

1. Adapt successfully to a changing climate.

Preparation and Adaptation Planning: The City and County have jointly established three working groups comprised of multiple bureaus and departments to develop a Climate Adaptation Plan that addresses Infrastructure (water, sewer, roads and bridges, developed parks and stormwater), Natural Systems, Public Health and Human Services. The three efforts have assembled the local and regional science on climate impacts, and are evaluating the potential risks, assessing the vulnerability of City and County resources and identifying resiliency strategies that have multiple benefits across all three areas. The City and County will use the findings from the various vulnerability assessments to develop both near-term and long-term adaptation and preparation recommendations by the end of 2012.

Regional Collaboration: The City and County continue to engage in a related effort focused on climate resilience in the Willamette Valley that is being coordinated by The Resource Innovation Group's Climate Leadership Initiative. The City and County are also working with Metro to coordinate climate change preparation assessment efforts where possible.

Protection and Restoration of Natural Areas: The City continues to acquire land to protect sensitive habitat and hydrologic function as well as buffer natural systems to increase their resilience to change. The City has also coordinated numerous stream restoration projects that incorporated floodplain reconnection and riparian plantings to respond more effectively to potential climatic events.

Water Consumption Research: The Portland Water Bureau is a partner with Portland State University working on a NOAA Sectoral Applications Research Program grant to evaluate the impacts of land use, cover and climate change on residential water consumption. The results of this grant are expected to be available in 2012 (*http://sites.google.com/site/portlandstatenoaasarp/*).

Challenges: Decision-making in the face of uncertainties in climate change projections, especially in regional downscaling of global climate change models, remains a challenge. Climate projections work well for some variables and poorly for others. For example, currently available model projections for the Pacific Northwest have a higher degree of certainty related to expected changes in precipitation patterns and temperature increases, but are inconclusive about what should be expected for total annual precipitation or extreme weather events.

EXPECTED CLIMATE IMPACTS IN THE PACIFIC NORTHWEST

Scientists have a good understanding of how climate change impacts will manifest on a global scale, but it is less clear what to expect on a smaller, regional scale. Oregon and Washington scientists and modelers are working hard to improve our understanding of climate projections at a regional and local scale. Based on currently available information and modeling results, we have a range of confidence in the climate projections for a variety of impacts.

We are fairly certain that the Portland region will experience:

- Increased temperatures overall, including average, maximum and minimum temperatures in the summer and the winter months.
- Changes in precipitation patterns, with more precipitation falling in mid-winter.

Climate Impact:

TEMPERATURE

One of the most obvious changes to come could be hotter summers and more frequent and intense heat waves. Less deep freeze periods with greater shifts at the freeze-thaw cycle could be likely.

Lake Michigan
Decreased lake ice in winter & lower lake levels. Greater stress on water resources in times of need.

Hospitals & Emergency Response
More heat-related emergencies & mortalities. Changed conditions for communicable diseases.

Homes
Increased cooling costs & energy demand.

Chicago River
Reduced water quality. Changed conditions for invasive species.

Roads
More potholes. Increased urban heat island in built areas.

Green Space
Shift in plant zones. Increased threat of invasive species. Decreased biodiversity.

The "L", Metra, & Freight
Increased pavement damage & rail buckling.

Air Quality
Increased ozone days & decreased air quality. Increased respiratory ailments.

Buildings
Façade & structural damage. Higher peak electricity demand.

Schools
More heat-related dismissals. Greater need for medical response.

Energy Utilities
Increased brown & blackouts.

Urban Forest
Decreased diversity & increased disease/pest introduction.

Most impacts were drawn from: Hayhoe, K. Research Associate Professor of Atmospheric Science, Texas Tech University; Expert Reviewer for the Intergovernmental Panel on Climate Change. May 2010.

Climate Impact:

PRECIPITATION
Heavy rains and snow could become more frequent in winter and spring. During summer, rains may fall more heavily but less frequently, translating to more dry spells, as well.

Lake Michigan
Slightly decreased lake levels. Increased likelihood of storm & seiche occurrences.

Hospitals & Emergency Response
More storm & flood-related emergencies & post-flood health risks. Changed conditions for communicable diseases.

Homes
Increased basement flooding. Decreased property values & increased insurance premiums.

Chicago River
More combined sewer overflows. Reduced water quality.

Roads
Flooded & impassable.

Green Space
Increased storm & flooding damage. Changes in biodiversity.

The "L", Metra, & Freight
Rain & flooding delays. Pavement & track damage.

Urban Forest
Increased storm damage & fallen trees. Inundated soils.

Energy Utilities
Downed lines & greater distribution issues.

Schools
More snow-related dismissals.

Buildings
Greater stormwater volumes to manage.

Air Quality
Increased humidity, impacting public heath.

Most impacts were drawn from: Hayhoe, K. Research Associate Professor of Atmospheric Science, Texas Tech University; Expert Reviewer for the Intergovernmental Panel on Climate Change. May 2010.

Climate Adaptation:

RESILIENCY Adaptation will help reduce the impact of the changes that can be expected even if we greatly reduce emissions.

Lake Michigan
Implement shoreline, wildlife, & water quality protection plans. Confirm infrastructure is prepared for changes in lake levels.

Hospitals & Emergency Response
Update the extreme weather operation plan, focusing on vulnerable populations. Add climate-sensitive disease surveillance.

Homes
Encourage residents to make green landscape & energy efficiency improvements. Prepare residents for before, during, & after extreme weather events.

Chicago River
Promote & incentivize green infrastructure to manage stormwater. Monitor threat of aquatic invasive species.

Roads
Pilot & implement new road materials to manage stormwater, decrease urban heat island effect, & maintain resiliency.

Green Space
Implement adaptive management plans. Give land managers tools to plan for resilient landscapes.

The "L", Metra, & Freight
Ensure rail infrastructure improvements consider future climate scenarios. Intensify efforts to reduce ozone-precursors by reducing car traffic. Increase communication during storms.

Air Quality
Retrofit equipment & vehicles. Promote alternative fuels & public transportation. Expand urban forest.

Buildings
Work with businesses & all sectors to analyze their vulnerability to climate change & take action.

Schools
Educate & inform the next generation of environmental leaders.

Energy Utilities
Harden infrastructure & decentralize energy production.

Urban Forest
Research the urban heat island effect & pursue ways to cool hot spots & manage stormwater. Plant diverse, resilient tree species.

Most impacts were drawn from: Hayhoe, K. Research Associate Professor of Atmospheric Science, Texas Tech University; Expert Reviewer for the Intergovernmental Panel on Climate Change. May 2010.

Minnehaha Creek Watershed