

NYSDEC Climate Change Activities

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Susquehanna River Basin Commission
Water Quality Advisory Committee Meeting

July 1, 2008



outline

- Climate Change in NYS
 - What's happening?
 - What are we doing about it?
- Addressing climate change in NYSDEC Division of Water
 - Overview
 - Pilot study



Climate Change in New York State

What can we expect?

What's being done?

Office of Climate Change

<http://www.dec.ny.gov>



Scientific Consensus on Climate Change

- Greenhouse gas emissions from burning fossil fuels and other human activities are changing the climate
- There would be further warming, even if we stopped emissions now
 - GHGs have long atmospheric life
 - Ocean systems will take decades to respond
- Magnitude of warming depends on our greenhouse gas emissions



Joint National Academies of Science Statement

June 2005

“The scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action.”



Intergovernmental Panel on Climate Change (IPCC)

- Fourth Assessment Report published November, 2007
- Most comprehensive synthesis of climate change science to date
 - 130 countries
 - 1200 authors
 - 2500 experts reviewed



IPCC Fourth Assessment Report

- Warming since the mid-20th century is unequivocal and is caused primarily by human activities (>90 percent probability)
- Past emissions of heat trapping gases make some continued warming unavoidable



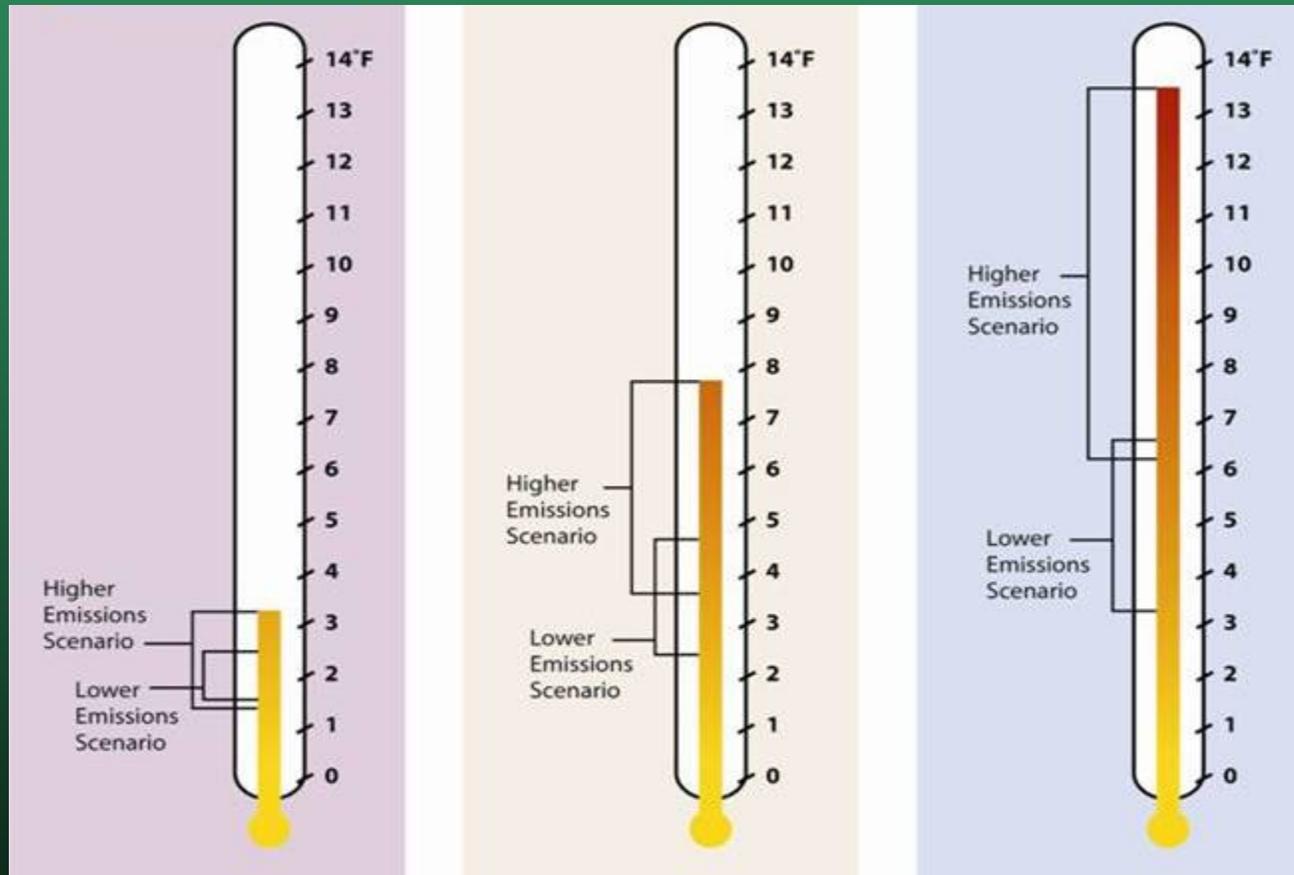
IPCC on Consequences

- Consequences of recent warming are already apparent around the world
- Severity of future impacts depends largely on the amount of heat-trapping gases emitted by current and future human activities



Rising Temperatures

Region-wide Summer Averages, High and Low Scenarios



30 yrs

60 yrs

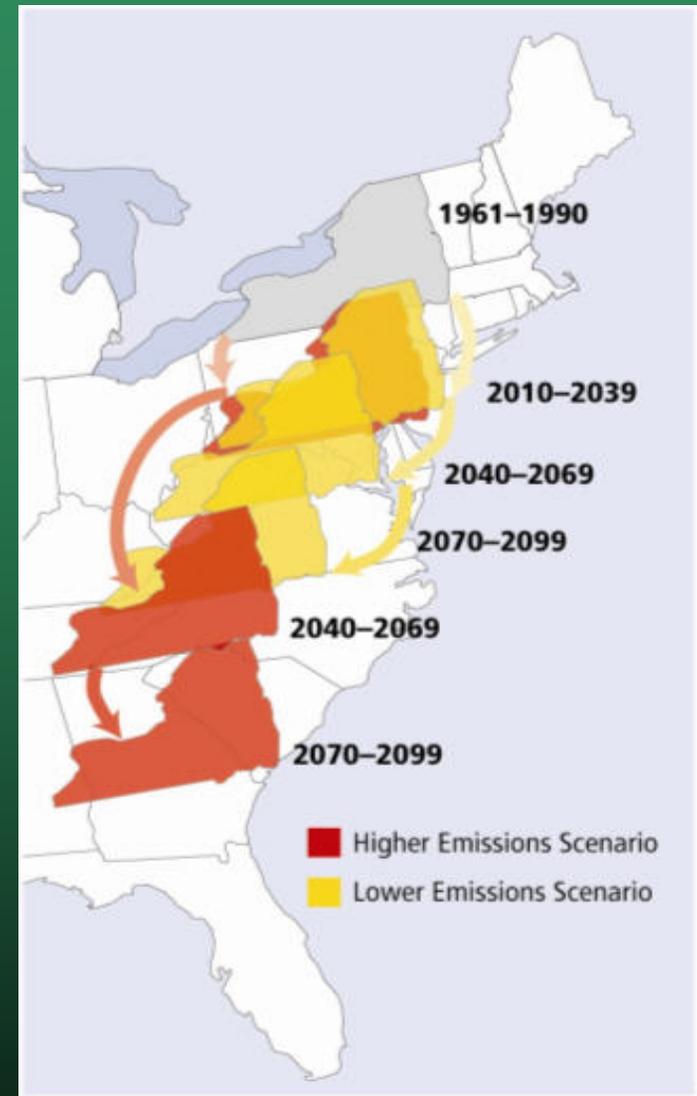
100 yrs

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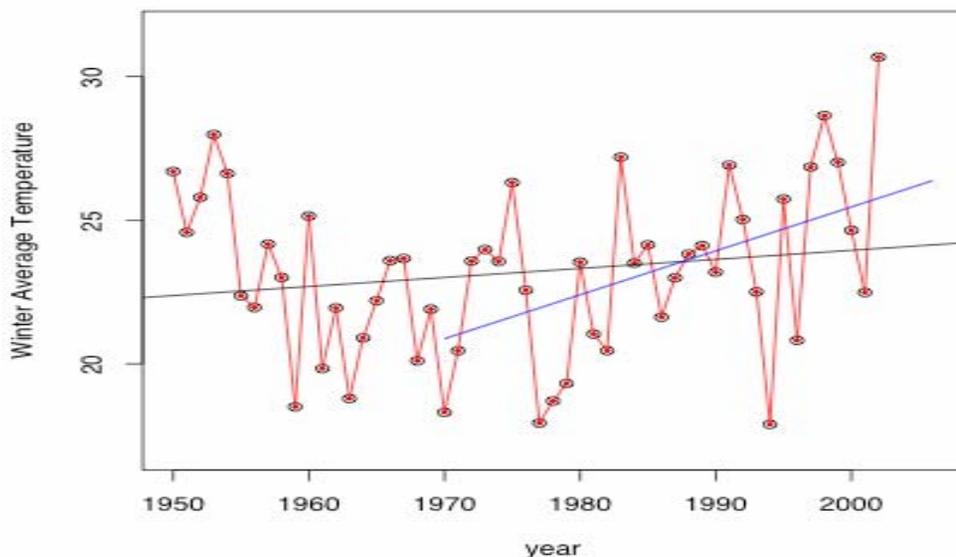
Summer Heat Index

How hot will summers “feel” in
Upstate New York?



Warming is Already Evident

Since 1970:



- Northeast annual average temperature up 1.4°F
- New York annual average temperature up almost 2°F
- New York winter temperatures almost 5°F warmer



Rainfall Projections

- More total precipitation in the Northeast
- More rain in winter
- More frequent extreme storms
- Heavier rain during storm events



Walkkill in New Paltz
March, 2005





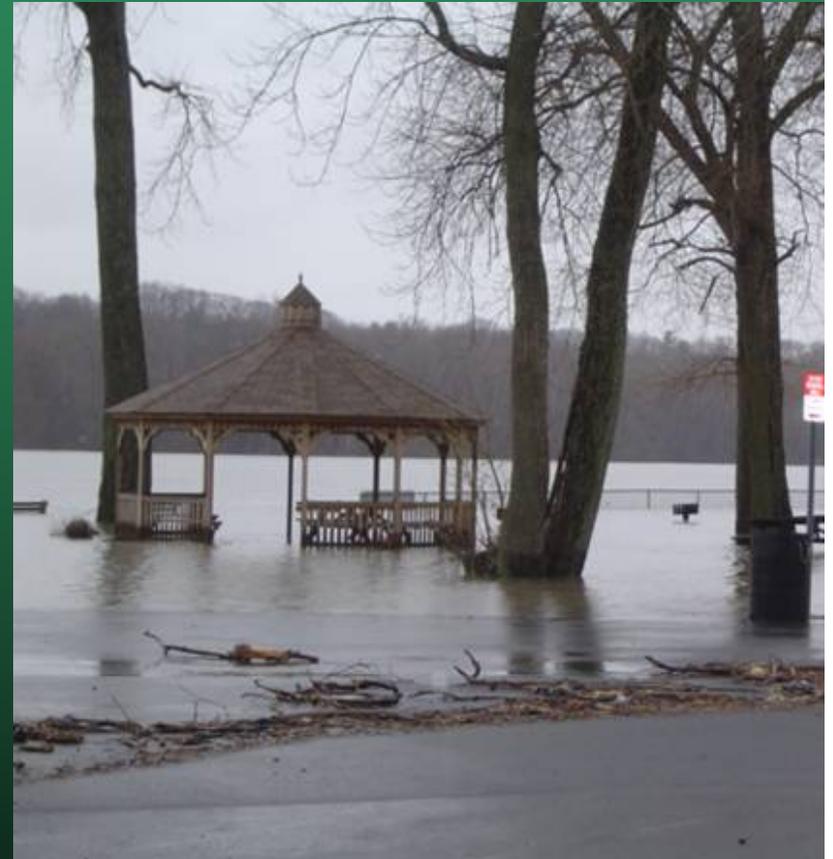
Kingston Waterfront Flooding
April 2005

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Ocean Changes

- Hudson affected by sea level to Troy Dam
- 15" rise in past 150 years at NYC
- Conservative projections:
 Low emission, 7-14" rise
 High emission, 10-24" rise
- Rising ocean temperatures may worsen storm flood events



Low-lying areas at risk
(Town of Bethlehem)



New York City: 100-Year Flood



Credit: Applied Science Associates, Inc.. Source: Google, Sanborn Map Company, Inc.. NECIA, 2007 (see: www.climatechoices.org/ne/).



Projected Great Lakes Impacts

- Average lake levels are expected to decline
- Turbidity and other water quality factors may increase
- Pressure will grow to take more water from the Great Lakes to serve dry areas
- Deep-water refuges will remain, but shallow areas may see dead zones and fish kills
- Lower lake levels will require more dredging and other adjustments for shippers/boaters
- Open water in winter will promote lake-effect snowfalls



Drought Projections

- Warmer summers
- Drier soils
- Periodic drought
- Longer periods of low streamflow



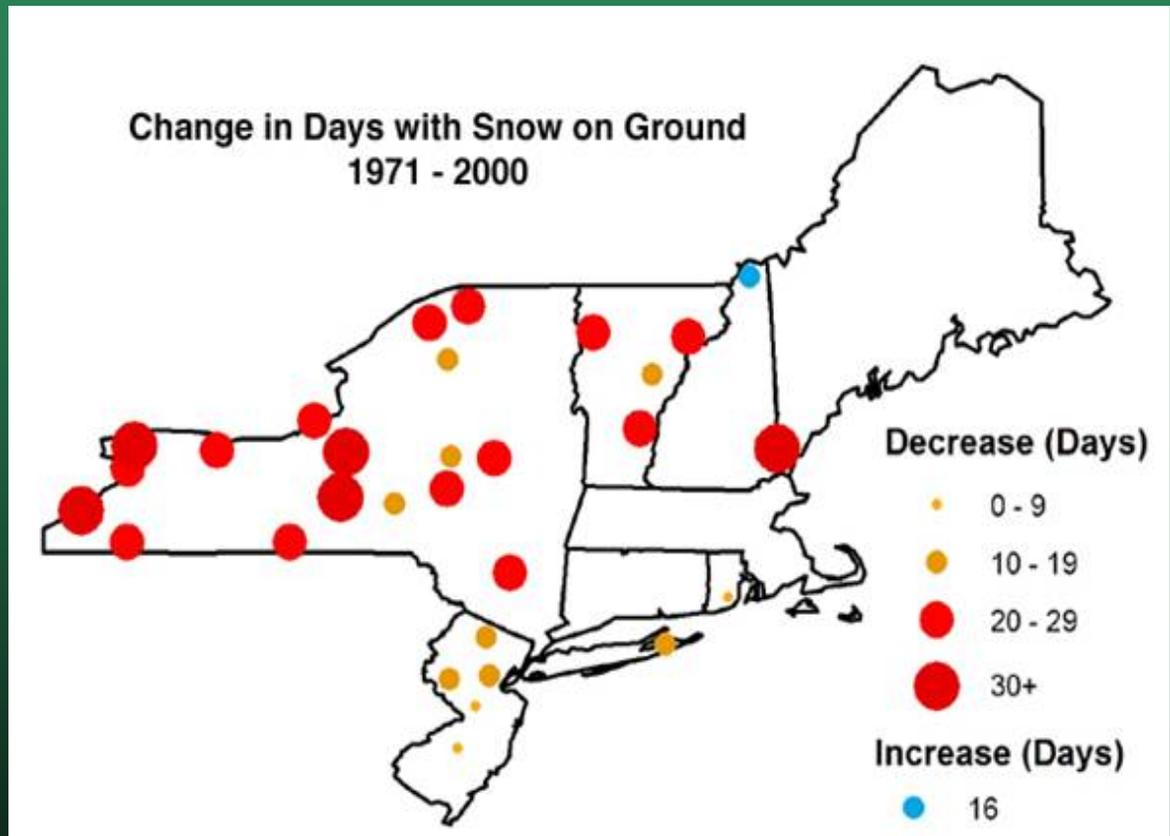
Plattekill, Summer 2005



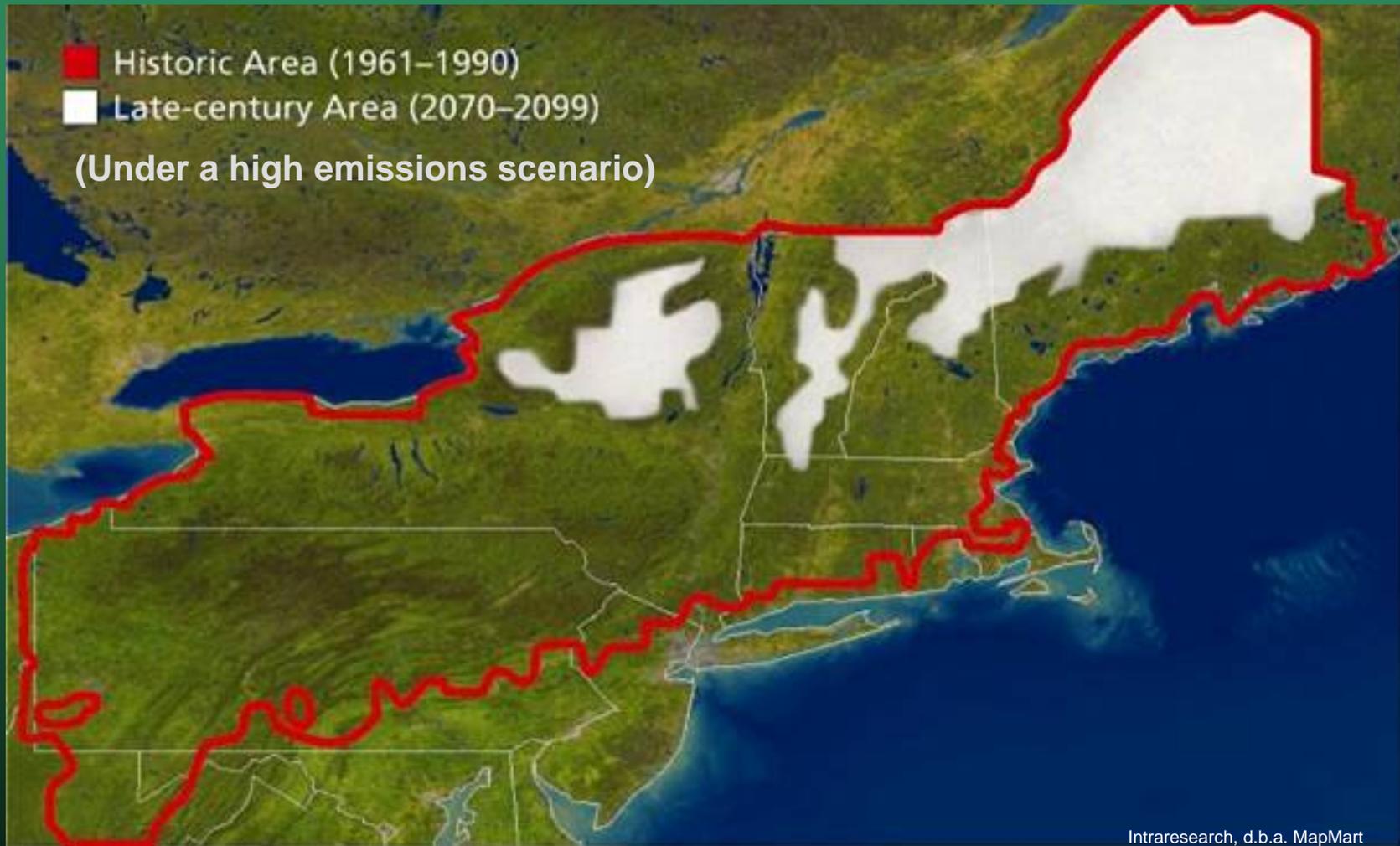
Snowfall

Expected:

- Decreasing snow cover
- Wetter and heavier snow
- Late ice in, early ice out
- Earlier spring snowmelt
- More intense high flows



The Changing Face of Winter



Who Cares?

Towns, cities and businesses care:

- Winter precipitation (mostly rain) could increase by 20-30%
- 100-year flood could occur every 10 years (NYC)
- Cities could see 20 days over 100 degrees (now only a few)
- Sea level rise could compromise water and wastewater infrastructure, as well as buffering and storage functions of wetlands



Who Cares?

Sports enthusiasts care:

- Northern NY snow season may be cut in half, southern NY cut to 1-2 weeks
- Sea level rise and wetlands loss may compromise fish spawning
- Cold water fish species may move north



Who Cares?

Consumers and businesses care:

- Existing policies and economic forces subsidize ways of doing business that put too much CO₂ into the air
- High fossil fuel prices put the Northeast at economic risk
- Sea level rise and increased storm activity discourage insurance coverage



Now - The Upside

- Climate change is making us “green” our economy and increase sustainability
- Renewable energy is becoming an integral part of the world energy mix
- In New York, RGGI is creating market incentives for low-carbon and non-carbon electricity technologies



What NYS is Doing

- Office of Climate Change
- International Carbon Action Partnership
- The Climate Registry
- Sea Level Rise Task Force
- Regional Greenhouse Gas Initiative
- GHG vehicle emission standards
- 15% reduction in electricity use by 2015
- Renewable Portfolio Standard: 25% by 2013
- Professional and public education



NYS Climate Change Office

Focusing state responses to climate change

- Created in 2007, staff of 12
 - Other DEC programs also integrating climate change
- Analyzes climate science
 - Provides reliable information to support policy, regulation
 - Promotes strategic technologies
- Builds climate partnerships
 - Works to empower governments, NGOs, individuals
 - Partners with local, state, federal agencies
 - Promotes planning, coordination and action



Science and Analysis

Climate Change Office

Scientific/technical support for programs to mitigate and adapt to climate change

- Economist
- Engineer
- Climatologist
- Research Scientist



Programs and Partnerships

Climate Change Office

Climate change lens for decisionmaking

- New York State Agencies
- DEC Programs
- Municipal Governments
- Universities/other Institutions
- Businesses
- Individuals



International Carbon Action Partnership

- Public entities with mandatory cap-trade systems work together on CO₂ trading
- Extends global carbon market
- Encourages consistent international regulatory framework
- Additional emissions reduction policies to complement carbon markets



The Climate Registry

- Common system to measure, track, verify, report GHG emissions
- Largest climate initiative in North America
 - States with more than 80% of U.S. population
 - Canadian provinces, Mexican states, Indian tribes



The Climate Registry

New York's Involvement

- Charter member (since May, 2007)
- Benefits
 - Participate in reporting protocol development
 - Share information with other states' climate change staff and decisionmakers
 - Gain access to verified data for comparison with sector estimates



New York State Sea Level Rise Task Force

- Established 2007, 16 members, DEC chair
- Report due late 2009
 - Impacts of sea level rise
 - Recommendations for protecting at-risk coastlines and habitats
 - Suggested adaptation measures
 - Recommended regulatory or statutory changes



Greenhouse Gas Vehicle Emission Standards

- **2004:** California adopts first regulation of CO₂ as tailpipe emission
- **2005:** CA requests EPA waiver to allow CO₂ standard; New York proposes to adopt CA standard
- **2007:** EPA denies waiver for CO₂ standard
- **2008:** New York and 14 other states sue EPA to allow CO₂ standard to proceed



Regional Greenhouse Gas Initiative (RGGI)

- Ten-state regional program to cap and reduce carbon emissions
- Focus on electric power sector
- Regionwide and state-specific caps
- Auction based allowance distribution



New York's "15 By 15" Program

By 2015, reduce power demand 15 percent from forecasted levels, through energy efficiency

- Decouple utility revenues to eliminate key conservation disincentive
- Strengthen efficiency standards for appliances, buildings
- Address New York's #1 energy consumer: state government



Renewable Portfolio Standard

- Specifies that utilities generate 25 percent of electricity from renewable sources by 2013
- Raising percentage will promote sustainability in electricity generation
- Relies on private market - investors and generators decide how to comply
- Expected to reduce emissions of nitrogen oxide, sulfur dioxide, carbon dioxide



Conclusions

- Climate is already changing across the Northeast
- Over the next few decades, high and low emission scenarios are expected to produce similar changes in climate
- By late-century, higher-emission scenario climate change is twice that of lower emissions
- Future climate depends on the decisions we make now and in the near future



For More Information

NYS Department of Environmental
Conservation

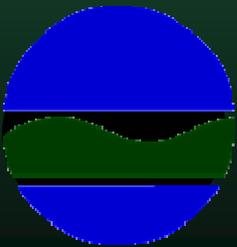
www.dec.ny.gov

United States Environmental Protection Agency

<http://www.epa.gov/climatechange/>

Union of Concerned Scientists

www.climatechoices.org



QUESTIONS?

Office of Climate Change

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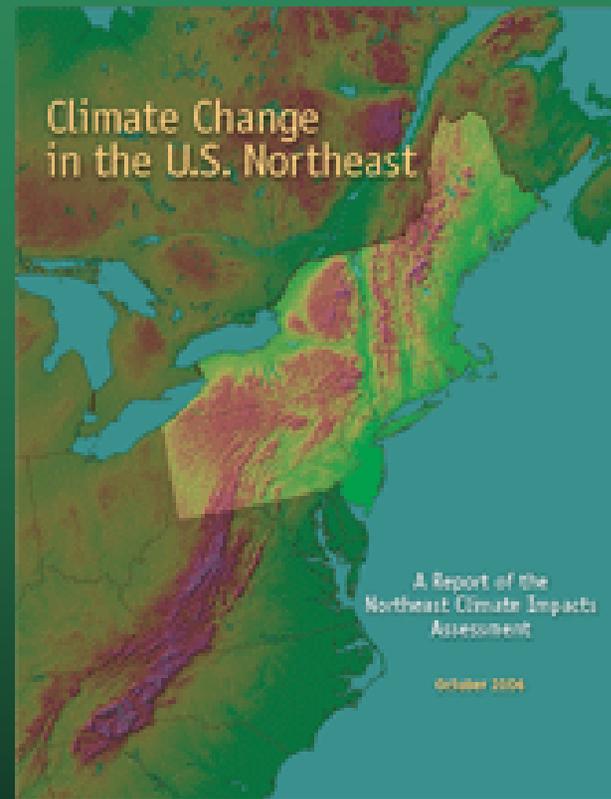
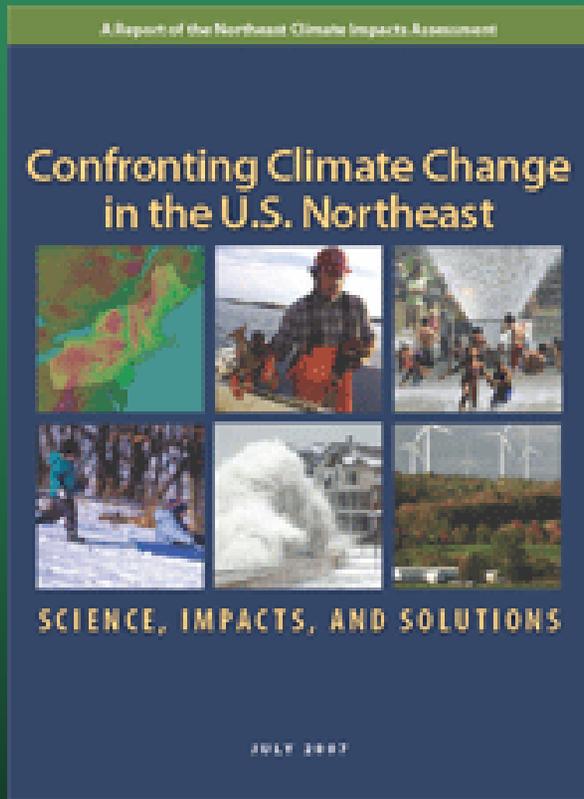


NYSDEC Division of Water Climate Change Activities

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www.climatechoices.org

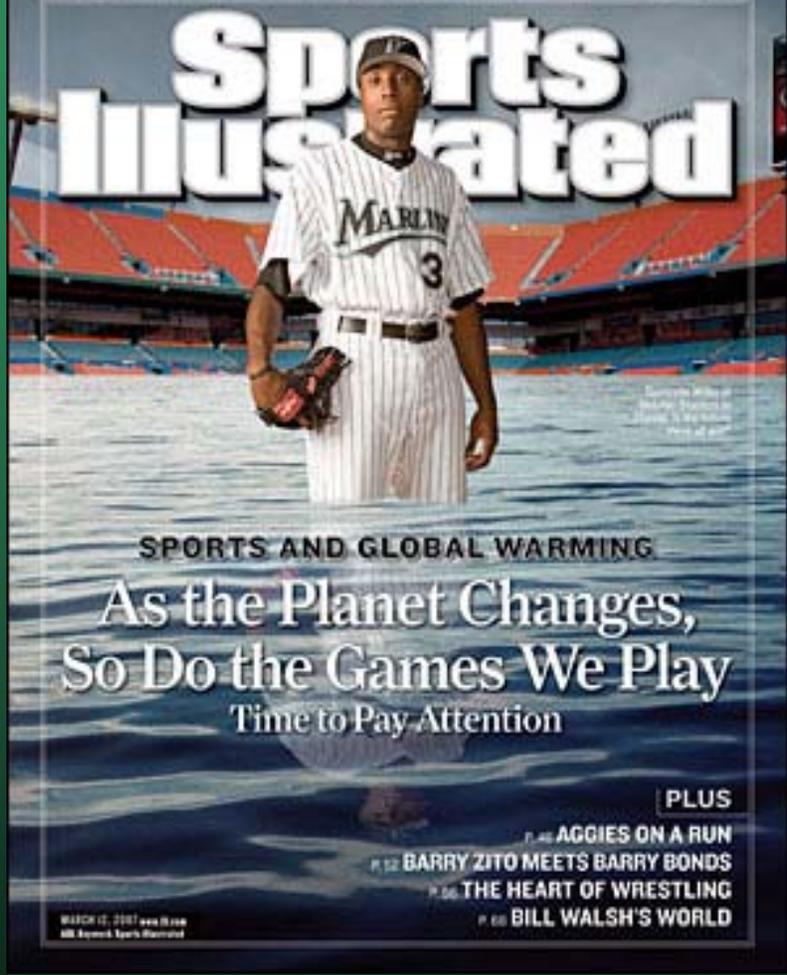
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EXCLUSIVE INSIDE THE STEROID PIPELINE STING

SI's Luis Fernando Llosa and L. Jon Wertheim, on the scene for the Florida raids, report on the ongoing investigation that will rock sports

Sports Illustrated



SPORTS AND GLOBAL WARMING

**As the Planet Changes,
So Do the Games We Play**
Time to Pay Attention

PLUS

P. 48 **AGGIES ON A RUN**

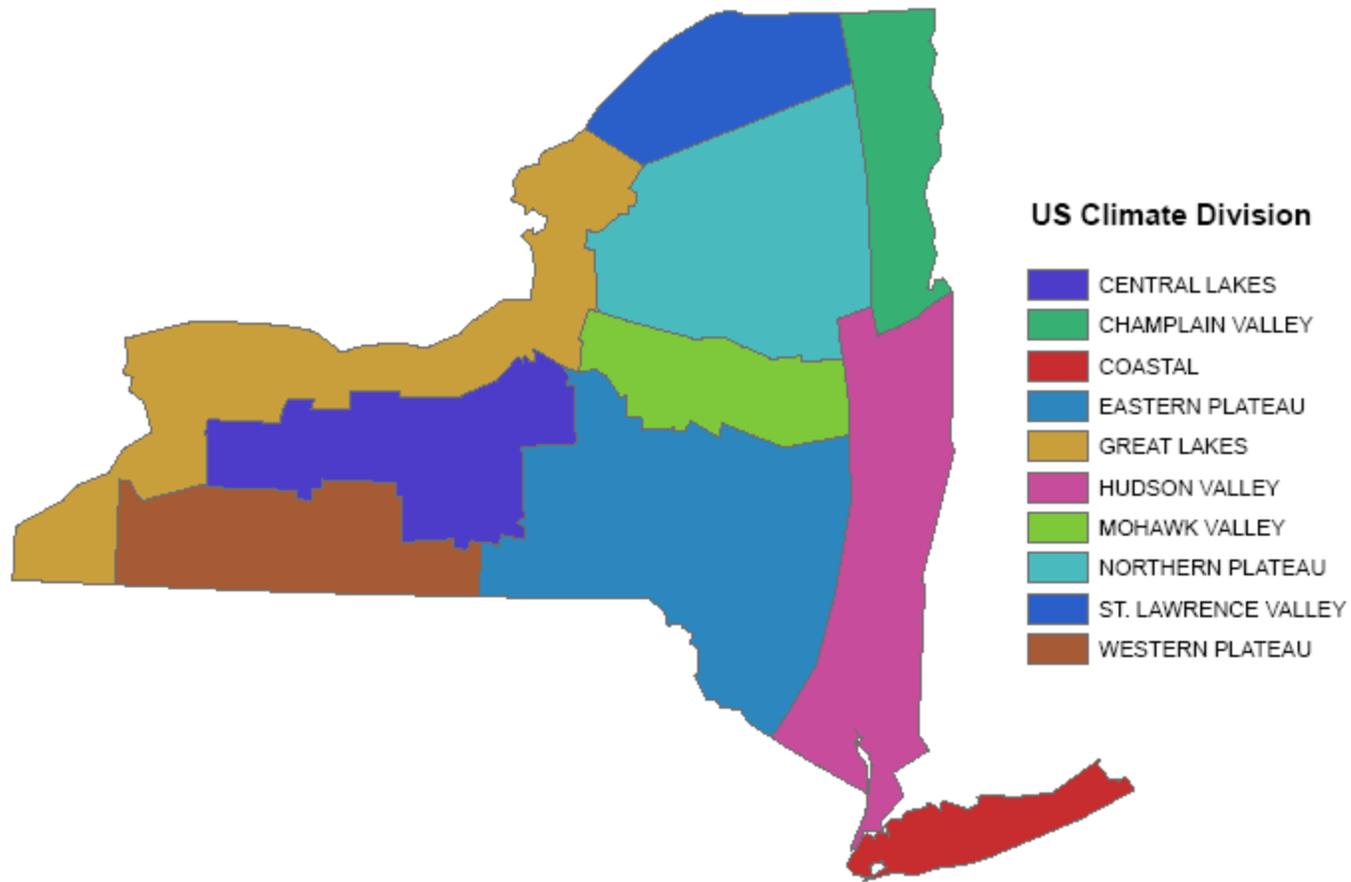
P. 52 **BARRY ZITO MEETS BARRY BONDS**

P. 56 **THE HEART OF WRESTLING**

P. 68 **BILL WALSH'S WORLD**

MARCH 12, 2007 \$4.99
\$8.99 (Canada, U.S. & Mexico)





New York State Water Quality

- New York State is the only state in the country that has some of all five designated waterbody types
 - Rivers and Streams
 - Lakes and Reservoirs
 - Estuary Waters
 - Great Lakes
 - Atlantic Ocean



Addressing climate change in NYS' water program

- Focus on adaptation
- Identify gaps in data
 - Examine existing datasets for suitability
 - Address data needs
 - Plan for supplementing existing data
- Paradigm shift
 - “stationarity is dead”



Some vulnerable programs

- Water quality/quantity
- Stormwater
- CSOs
- CAFO
- Floods/floodplain management
- Coastal areas/sea level rise
 - Hudson River is tidal past Albany
- Wastewater treatment
 - Mitigation opportunities: WW plants use 3% of the nations energy (EPA)

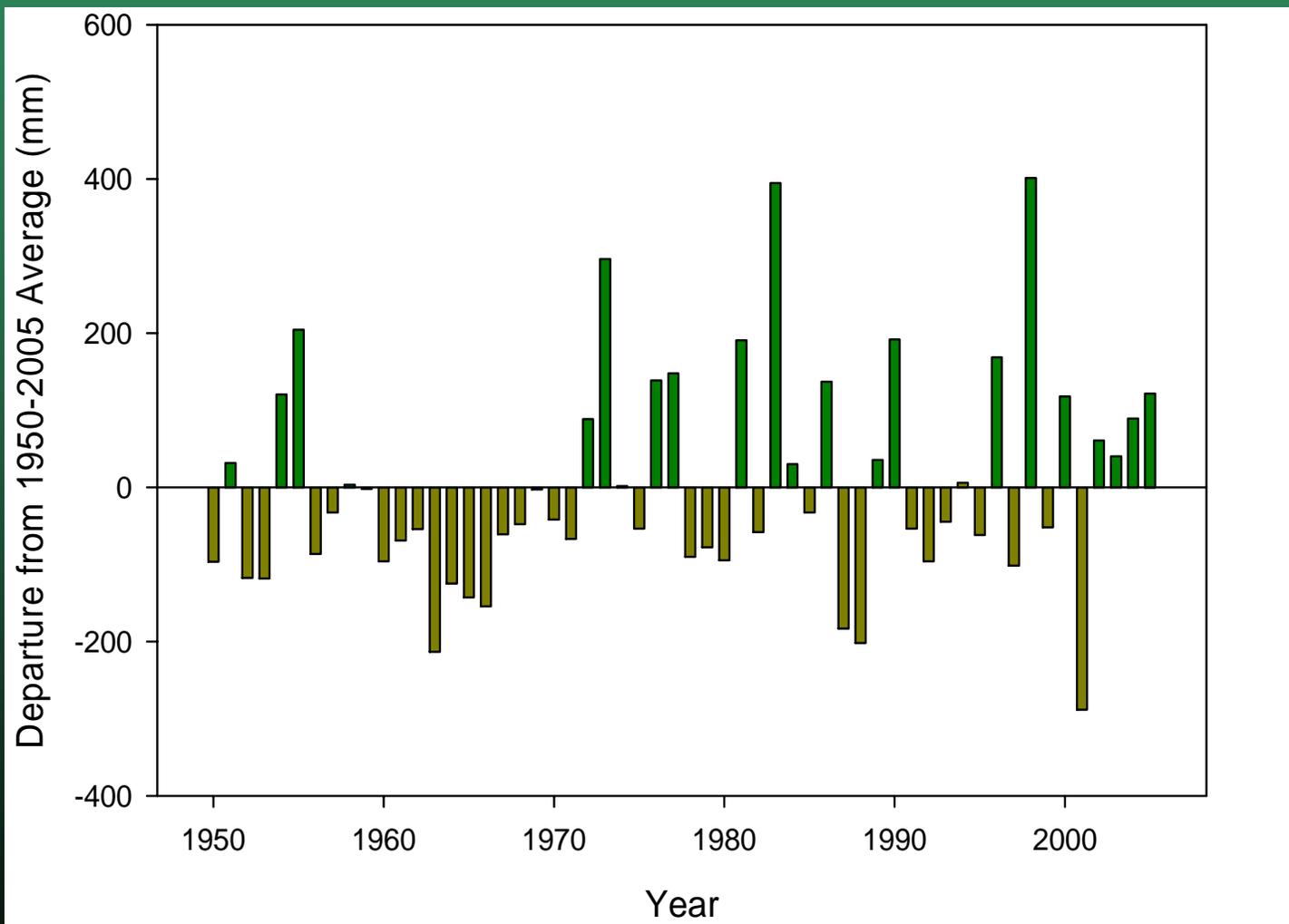


What we're doing...

- Identified climate change as a State, DEC, and DOW priority
- NEIWPC Climate Change Workgroup
 - Representatives from NE states & NY, as well as federal agencies and academic institutions
- Collaborations with the Office of Climate Change
- Develop “outline” of proposed DOW actions



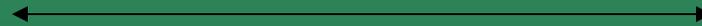
Northern NY/Western VT *precipitation anomalies, 1950-2005*



Precipitation trends by month



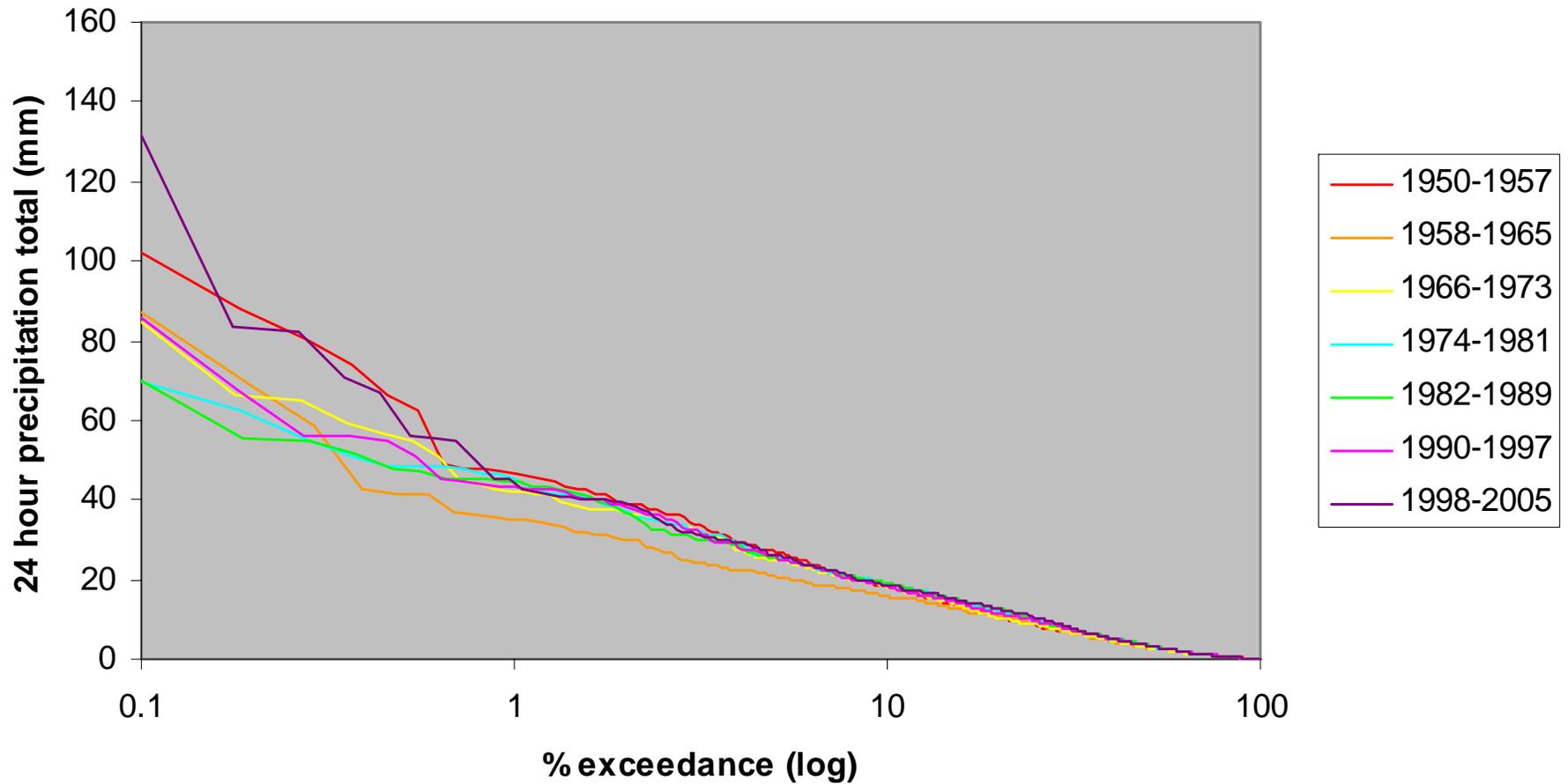
Field season



site	jan	feb	mar	apr	may	jun	july	aug	sept	oct	nov	dec
albany	up	down	up	down	up	up	up	up	down	up	up	down
troy dam	down	down	down	down	up	up	up	up	up	up	up	down
gloversville	up	down	up	up	up	up	up	up	up	up	up	no change
little falls	up	down	up	down	down	up	down	no change	down	up	down	down
watertown	up	down	up	up	up	up	up	up	up	up	up	down
stillwater	up	down	down	down	up	up	up	up	up	up	up	down
wanakena	up	down	down	down	up	up	up	down	up	up	up	down
indian lake	down	down	down	up	up	up	up	up	down	up	down	down
tupper lake	up	down	up	up	up	up	up	down	up	up	up	up
lake placid	down	down	down	down	up	up	up	down	up	up	down	down
ogdensburg	up	up	up	up	up							
dannemora	up	down	up	up	up	up	up	up	up	up	up	up
burlington	up	down	down	down	up	down	up	up	up	up	up	down



Albany



EPA National Water Program Strategy: Response to Climate Change (2008)

- Increases in water pollution problems
- More extreme water-related events *
- Changes to the availability of drinking water supplies
- Waterbody boundary movement and displacement
- Changing aquatic biology *
- Collective impacts on coastal areas

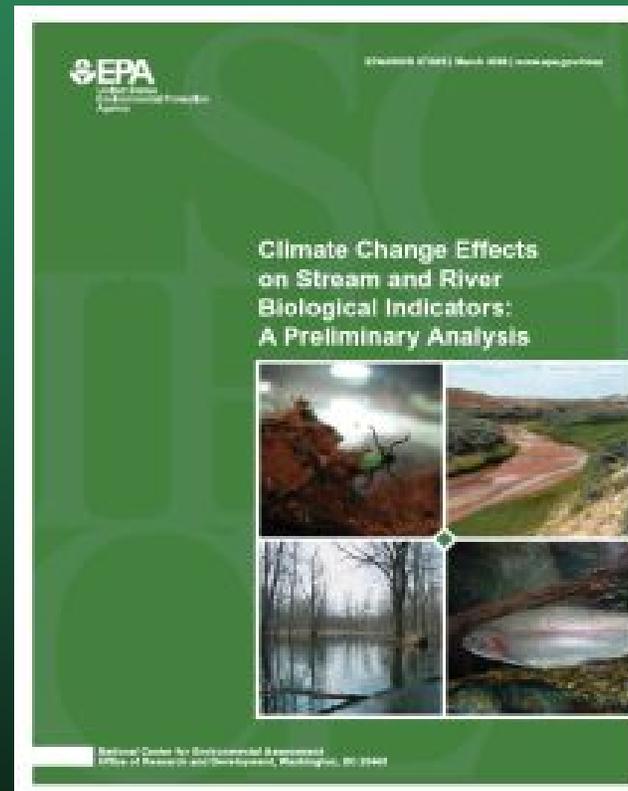


Susquehanna River Basin flood: June 2006

- Pre-June 2006: dry conditions in basin
 - PA in “drought watch”
- June 23: frontal passage
- June 26-28: heaviest widespread rainfall
- 8-15” of rain total
- USGS: discharges in NY greater than the 100-year flood
 - Susquehanna R. at Unadilla, NY – 450 years
 - Susquehanna R. at Conklin, NY – 450 years
 - Chenango R. at Sherburne, NY – 500 years
 - Chenango R. at Greene, NY - > 500 years



Climate Change Effects on Stream and River Biological Indicators: Preliminary Analysis (Final Report)



[http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=190304.](http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=190304)

NYS Department of Environmental Conservation



Questions

- Can we identify trends in benthic invertebrates due to climate change?
- Will climate change act as a stressor and mask assessments?
- Can we differentiate between land use changes and climate changes at our sites?



Climate Change effects on benthic invertebrates in NYS

- Pilot study (summer 2008)
- Collaboration between Water Quality Assessment and Stream Biomonitoring unit
- Goal is to create a network of sites to be sampled for climate change and land use effects



Pilot Study timeline

- Spring 2008:
 - select sites for pilot study
 - deploy in-stream temperature loggers
 - review long-term data to develop statewide reference network
- Summer – Fall 2008:
 - Record temperature data
 - weekly field parameters
 - Seasonal macroinvertebrate sampling
- Winter 2008-09:
 - Review data/findings
 - make recommendations for statewide study
 - collaborations



Reference site criteria

- Representative of the highest water quality or best attainable condition in a drainage basin
- Total natural cover typically > 75%
- Impervious cover usually < 2%
- Previous WQ determination should be non-impacted
 - Heavily disturbed watershed – use best attainable condition
- Specific conductance less than 150 $\mu\text{s}/\text{cm}$
 - 25th percentile of all ambient WQ data
 - Should not exceed 250 $\mu\text{s}/\text{cm}$



Urban site criteria

- Developed watershed
- Impacted conditions, likely due to land use
- Near USGS gage
- Small-medium drainage area



Pilot sites

- Reference
 - Upper Kinderhook Creek, Lower Kinderhook Creek
 - Rocky Brook (Kinderhook creek tributary)
- Urban/developed
 - Patroon Creek
 - Lisha Kill





Pilot study: the learning curve

- Sites that are assumed to be sufficient reference sites may no longer be considered so... recon!
- Extreme precip events make it hard to actually get into the stream to retrieve your data
- Kick off your study in the middle of a 4-day June heat wave, no questions asked!



Continuing thoughts

- How do we ensure our reference sites remain pristine?
- How do we account for changes in macroinvertebrates that have already occurred due to climate change
- Should we sample by degree days instead of calendar days?



Final thoughts

- Collaboration is key for success in addressing climate change in our water programs
- Continue to develop data, remain current on literature, act quickly



Questions?

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