



Water Availability: Examining Quantity, Quality, and Use

**Eric J. Evenson
Presentation at the
National Monitoring Conference
May 22, 2008**

New report from the Subcommittee on Water Availability and Quality:

Committee on Environment and Natural Resources

National Science and Technology Council



A STRATEGY FOR FEDERAL SCIENCE AND TECHNOLOGY TO SUPPORT WATER AVAILABILITY AND QUALITY IN THE UNITED STATES



September 2007

Does the United States Have Enough Water?



“We do not know.”



“The United States has a strong need for an ongoing census of water that describes the status of our Nation’s water resource at any point in time and identifies trends over time.”

National Science and Technology Council report,
“A Strategy for Federal Science and Technology to Support Water Availability and Quality in the United States.”



In the next decade, the Nation will have a new appraisal for water availability. In the FY 2009 Budget, the President has requested funds for an initiative to:

- Conduct a nationwide assessment of water availability
- Proceed with regional-scale studies
- Cooperate with State and local government in selected focused areas
- Cooperate with States to map the geologic framework of aquifers,
- Modernize the Nation's 7,000 streamgages

“Water for America”



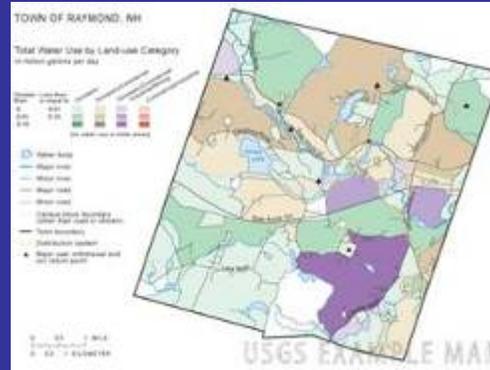
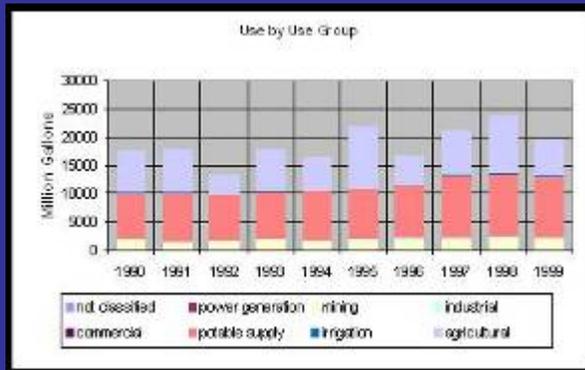
Enhancing the Nation's Water Use Information

**Integrative Water Use Science Goal:
A synthesis of water flow, water use, land use and water quality information.**

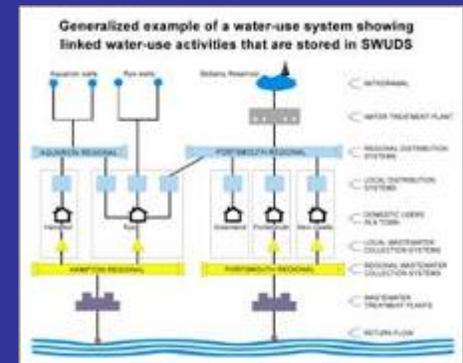
Use Recommendations of the
National Research Council Report

- Stratified Random Sampling
- Regression Models

Develop water use
characteristics by types
of land use



Ability to track water from
point of withdrawal thru to
return of flow.



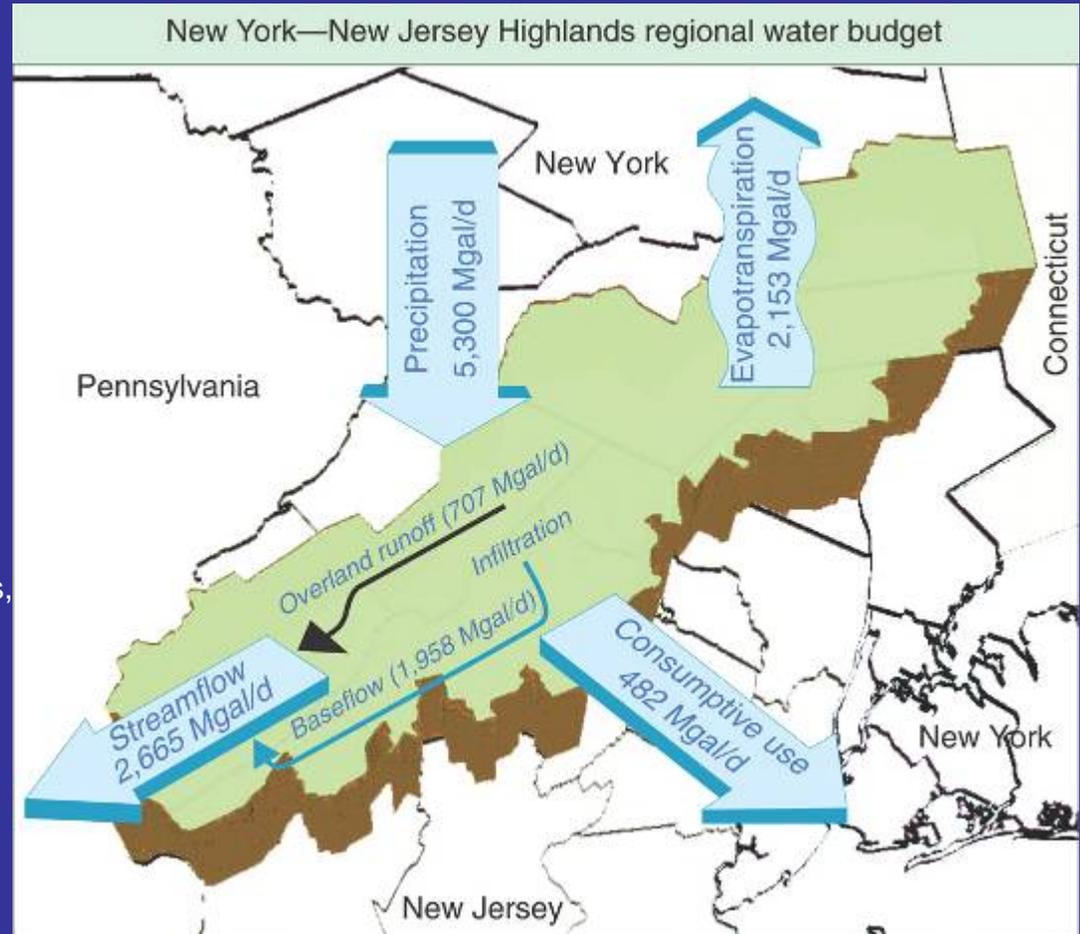
Nationwide Study Plans

Study activities will be organized around the 21 Water Resource Regions established in Circular 1223



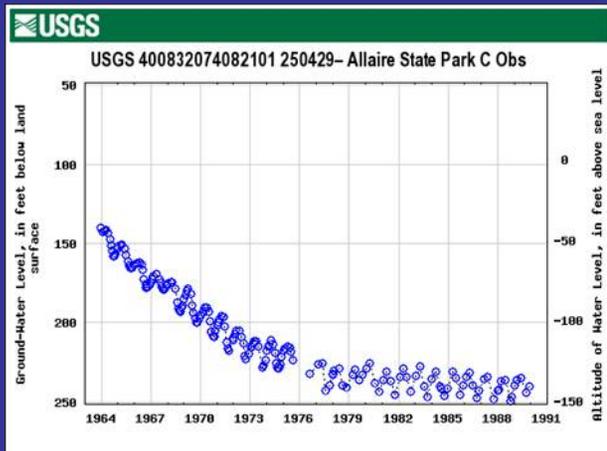
Regional Scale Studies will focus on Water Budgets

- Provides basis for evaluating change
- Accounts for system gains and losses
- Will strive to generate for each HUC 6
 - Precipitation
 - Infiltration – Recharge
 - Stream Flow (runoff & baseflow)
 - Evapotranspiration
 - Ground Water and Surface Water Withdrawals, Return Flows, Consumptive Use
 - Interbasin Transfers
- Examine trends in budget components



Focused Area Studies

Sustainable levels of water use



Three Studies will be started every three years.

- Nested inside Regional Studies
- Study design – afford latitude within Initiative’s mission
- Higher Funding
- Address local / national issues

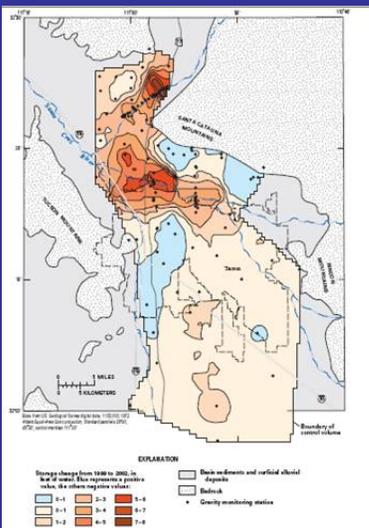
Water Quality



Ecosystem flow issues



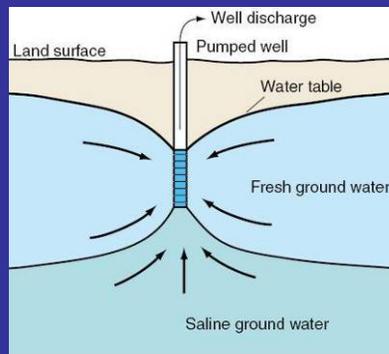
GW/SW



Changing land use



Saltwater intrusion



Four Science Areas –Selected Case Studies

- Water for Ecosystem Services
- Ground Water Storage Depletion
 - Saltwater Intrusion
 - Changing Ground-Water Divides
- Water Quality effects on Water Availability
- Climate Effects on Water Availability

Water for Ecosystem Services

- *When the systems were designed the question was:*

How much water can we reliably withdraw from the river?

- *Today's question is:*

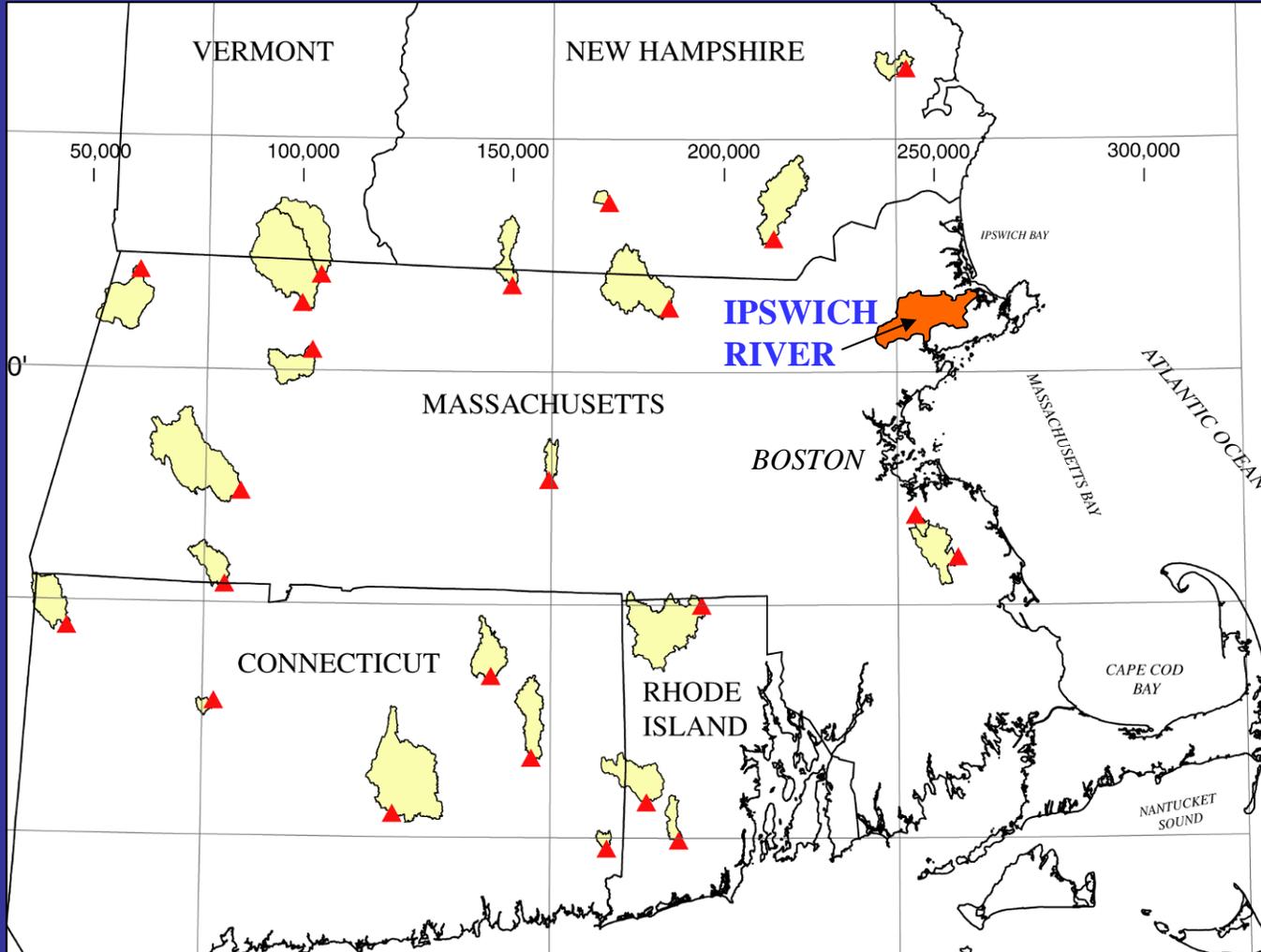
How much water do we need to leave in the river?

Ecosystem Flow needs are now a major consideration in many states in Water Allocation permitting

The biota now has a place at the negotiating “table”



Ecosystem Flow Requirements

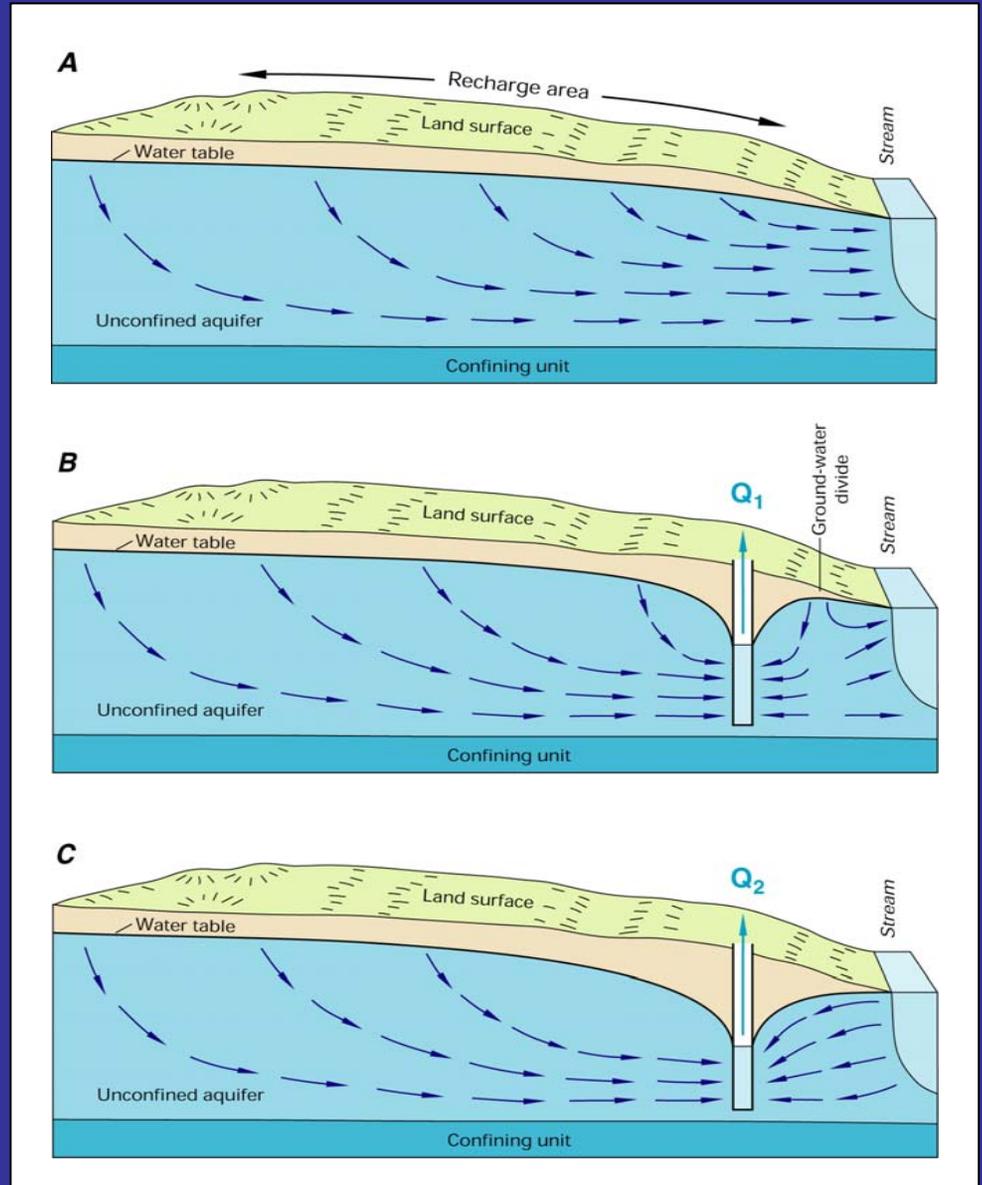


The Ipswich River basin supplies water to 330,000 people and 23 municipalities

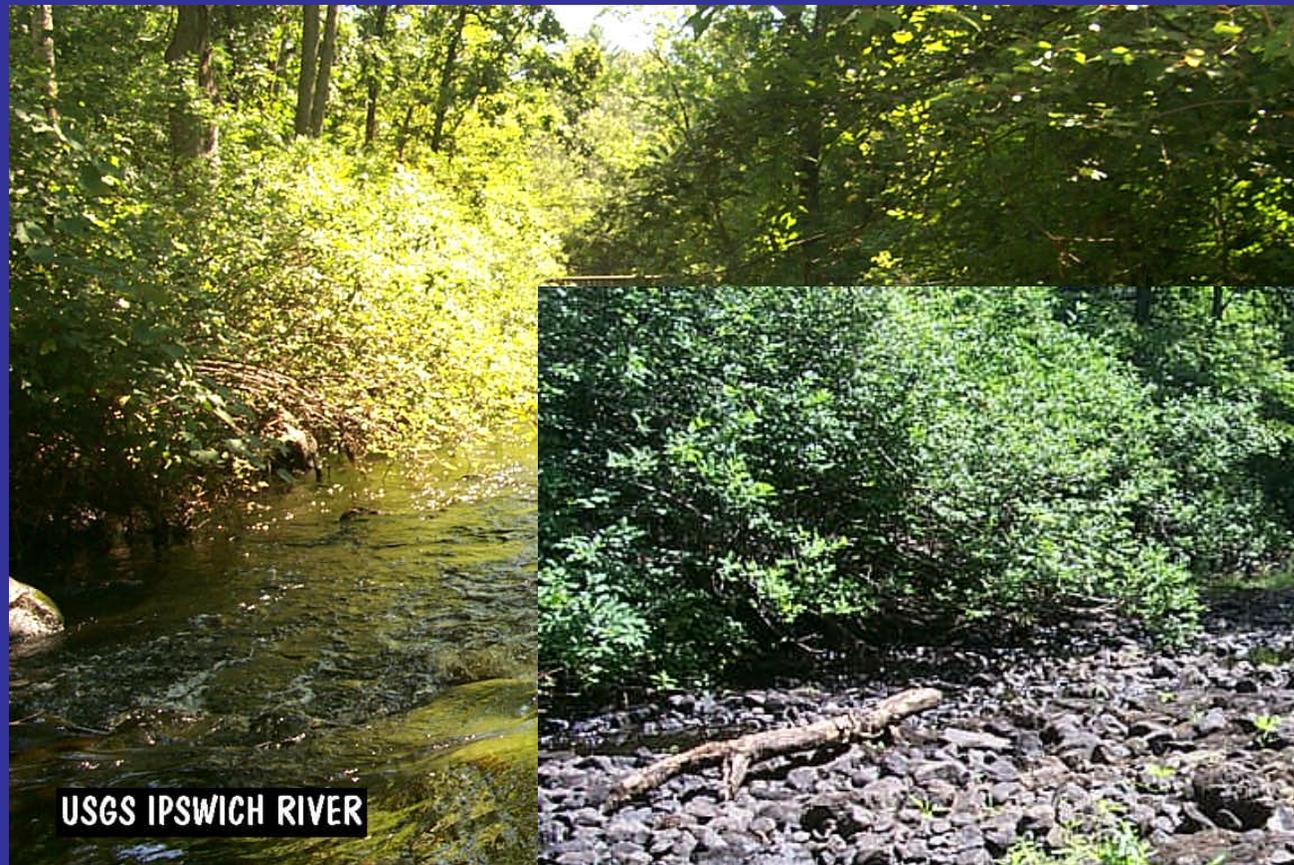
Ecosystem Flow Requirements



Influence of pumping on streamflow

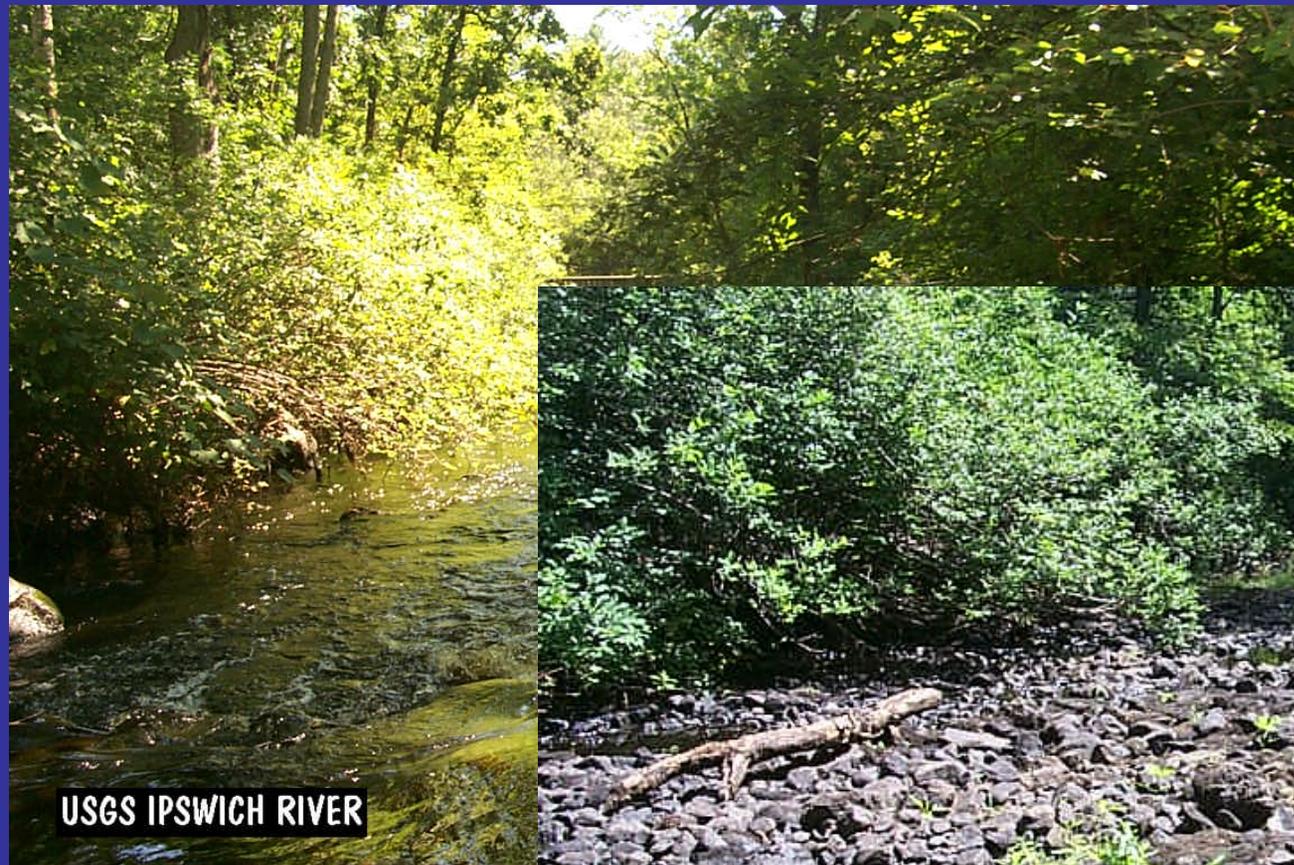


Ecosystem Flow Requirements



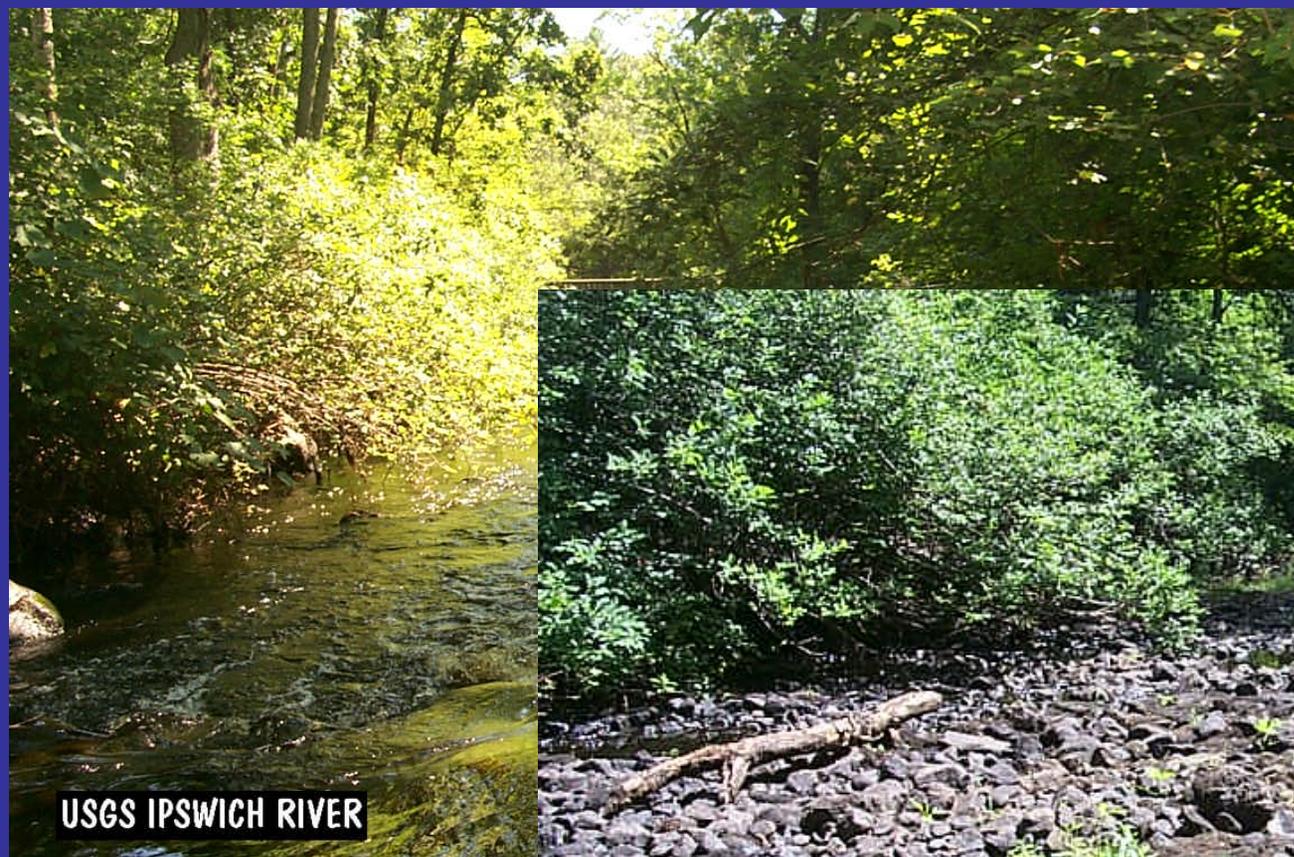
Ecosystem Flow Requirements

Watershed
Model



Ecosystem Flow Requirements

Watershed
Model



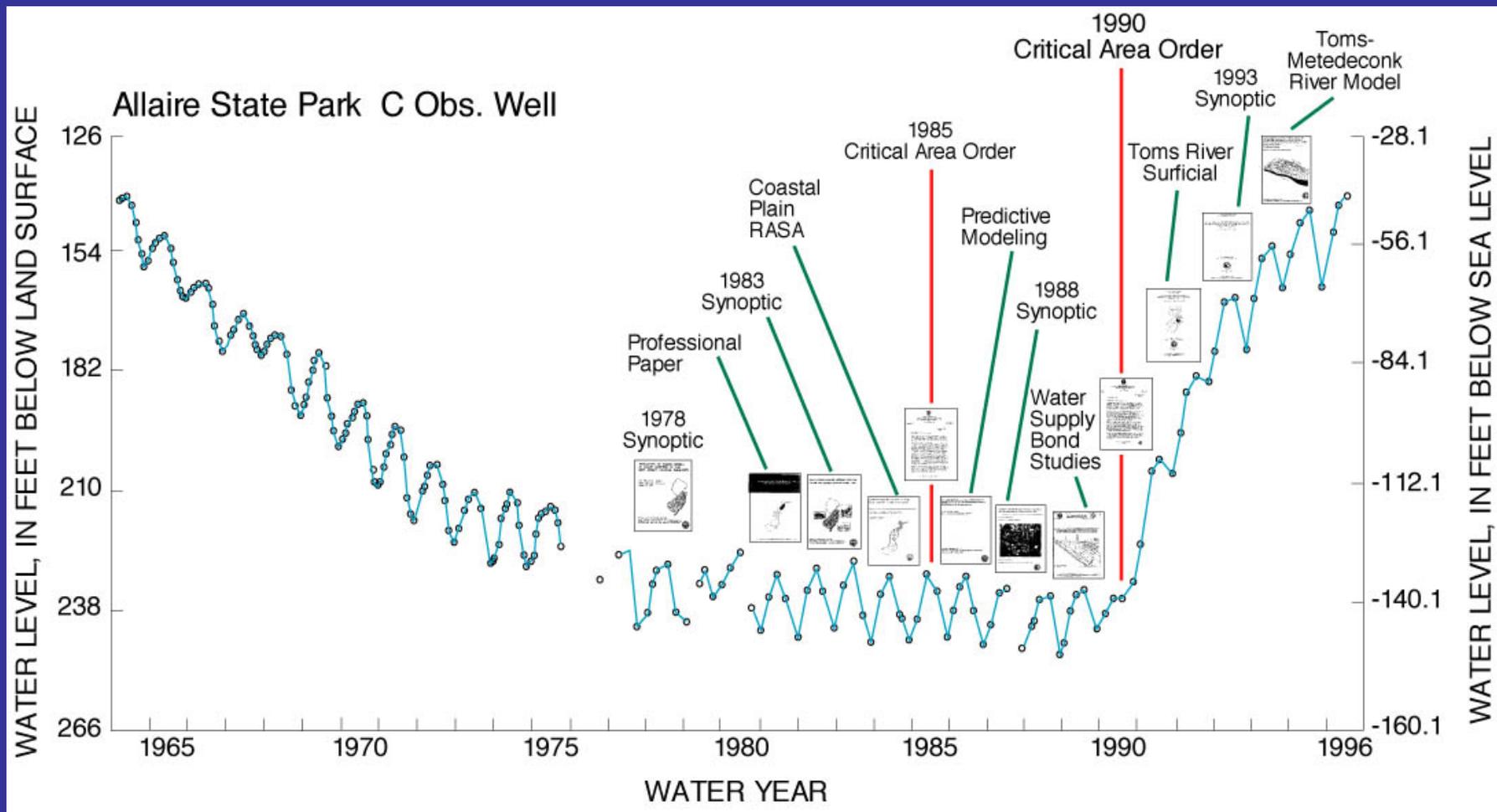
USGS IPSWICH RIVER

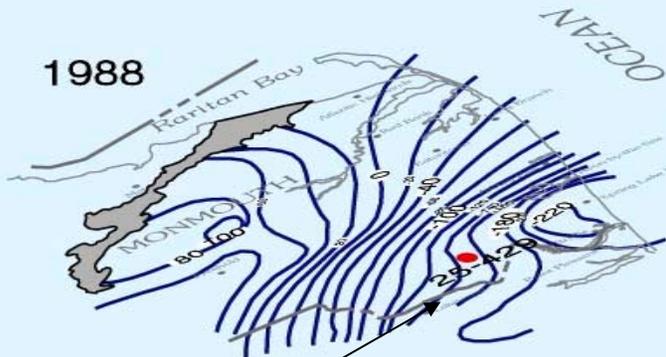
+ Habitat
Model



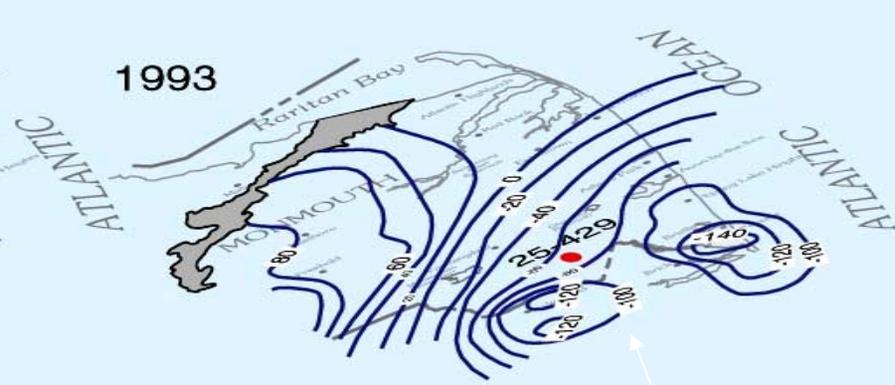
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Ground Water Storage Depletion Saltwater Intrusion





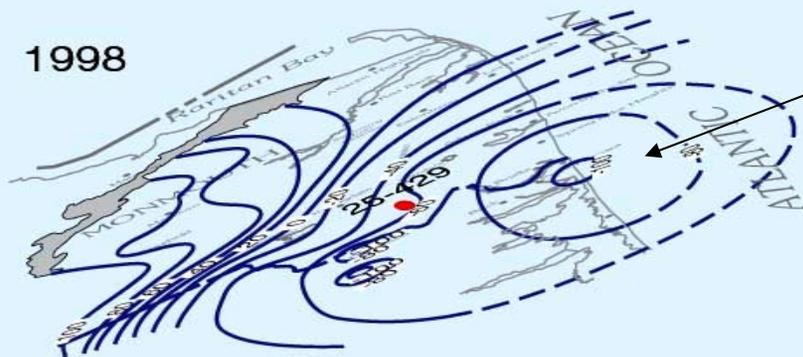
1988



1993

Water-level decline
resulting from
increased pumpage

Water-level recovery
resulting from
Critical Area #1
implementation



1998



Ground Water Storage Depletion Changing Ground-Water Divides



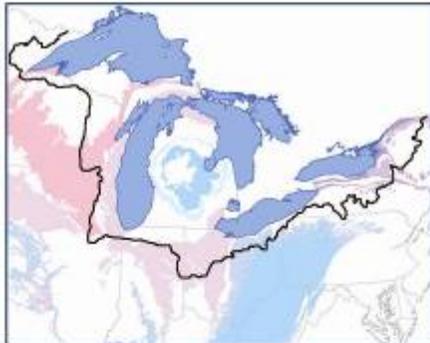
<http://water.usgs.gov/wateravailability/greatlakes>

GROUND-WATER STORAGE AND DIVIDES



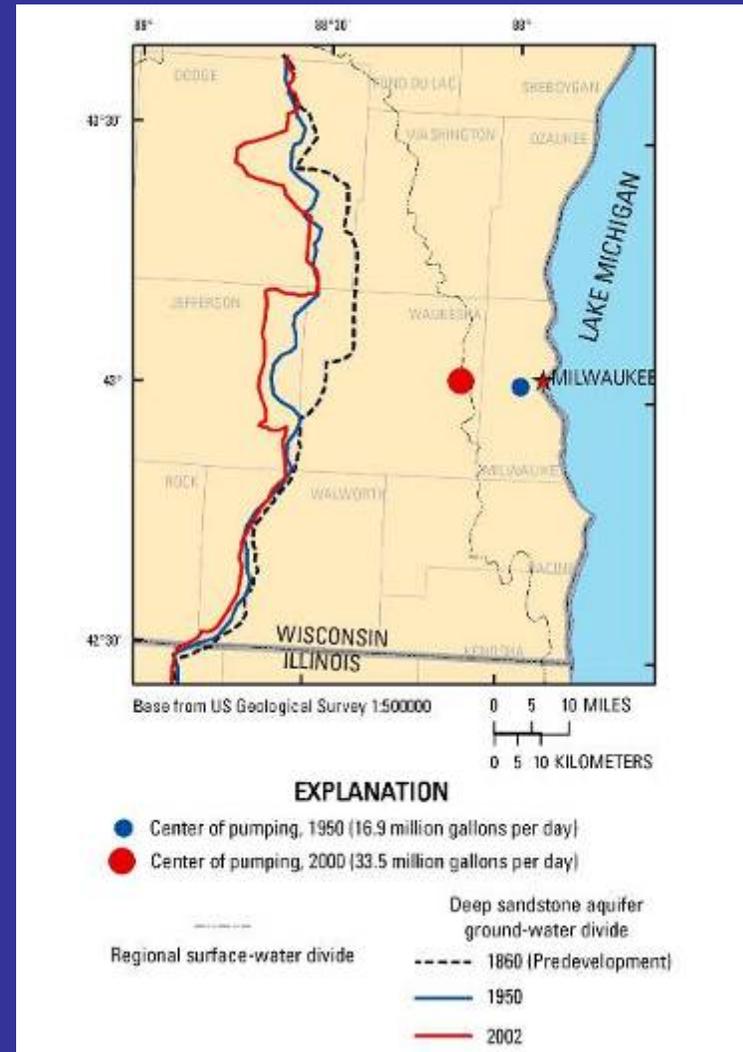
National Water Availability and Use Program

Compilation of Regional Ground-Water Divides for Principal Aquifers Corresponding to the Great Lakes Basin, United States



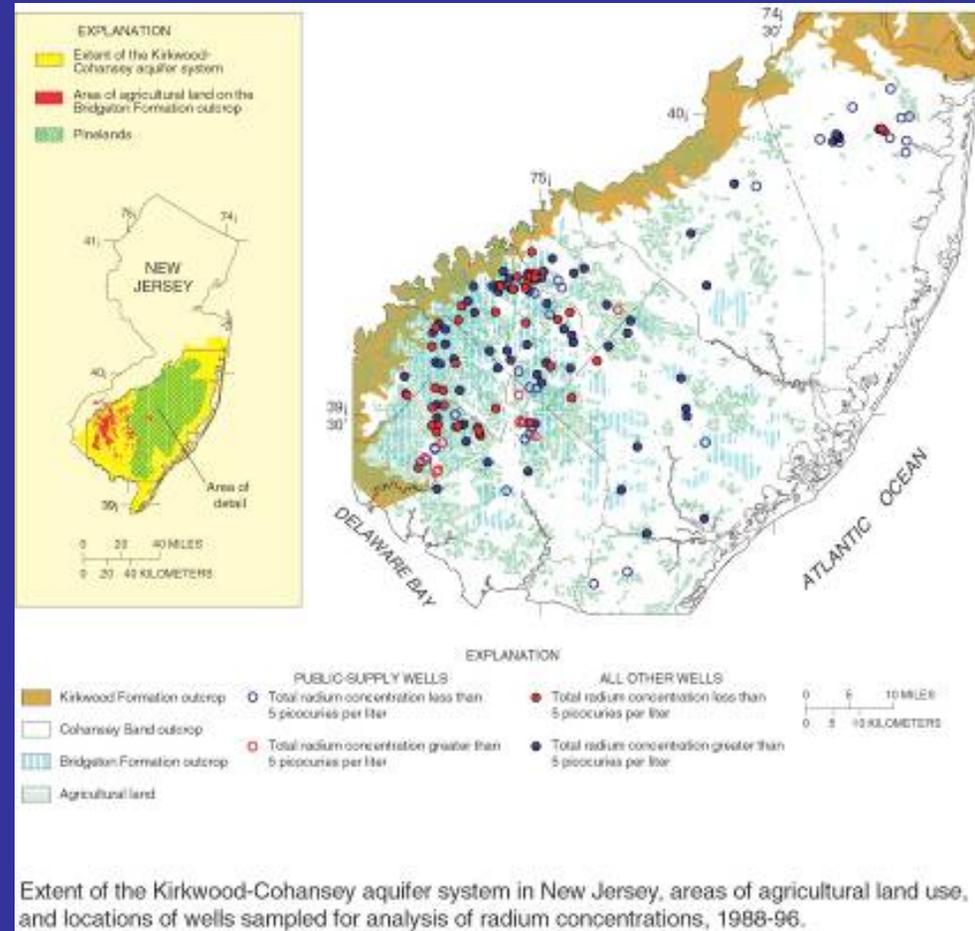
Scientific Investigations Report 2006-5102

U.S. Department of the Interior
U.S. Geological Survey



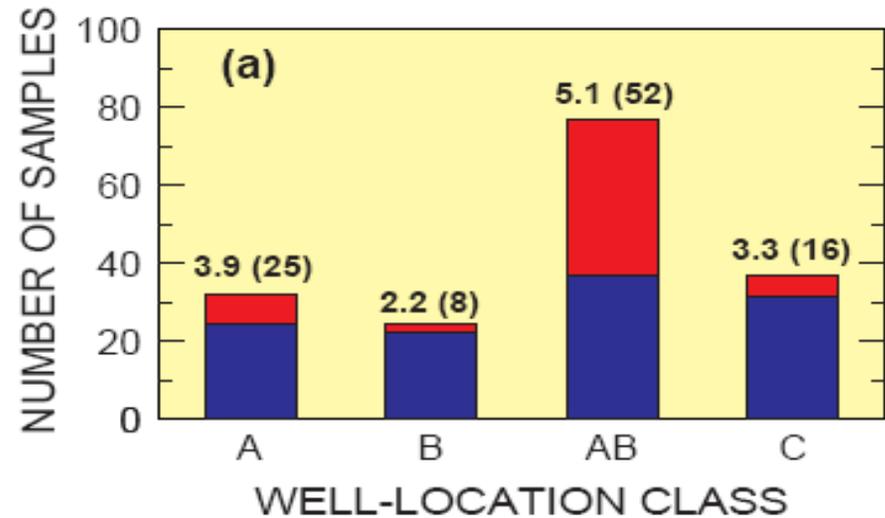
Water Quality effects Water Availability

- Naturally occurring radium in the coastal plain of New Jersey influenced the utilization of ground water for public and domestic supplies
- Nationally, other constituents like arsenic and nitrates similarly influence the utilization of ground water for drinking water.

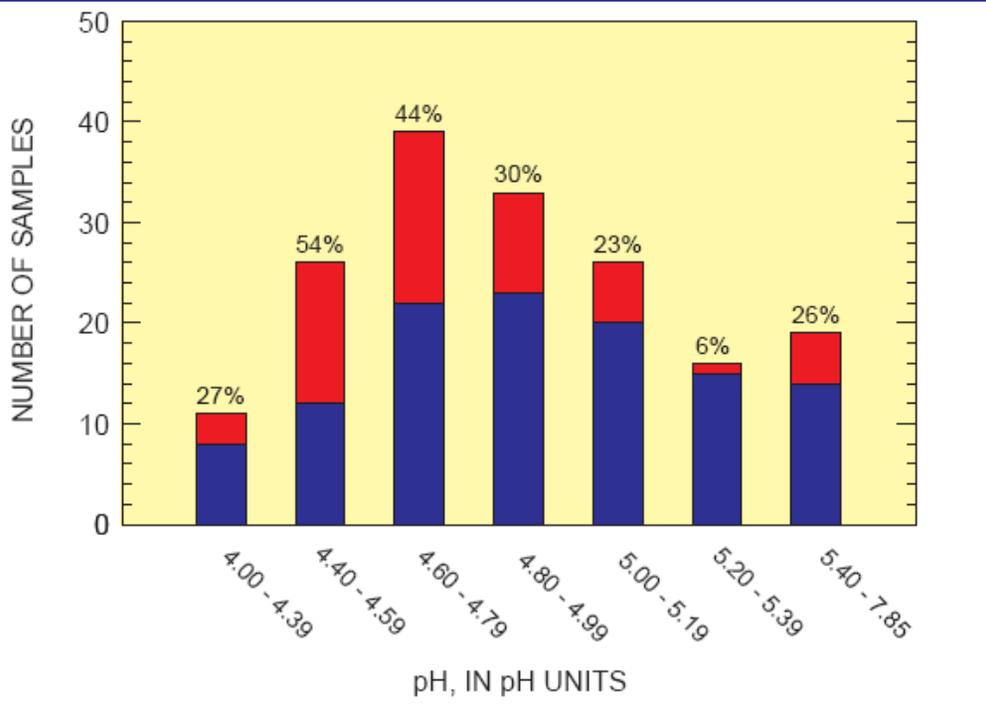


Reference: USGS Fact Sheet FS-062-98

Mobilization of the radium was enhanced by natural low acidity, changes in water chemistry, as well as land use effects.



A = Ag
 B = Bridgeton Formation
 AB = Ag + Bridgeton
 C = Neither Ag or Bridgeton

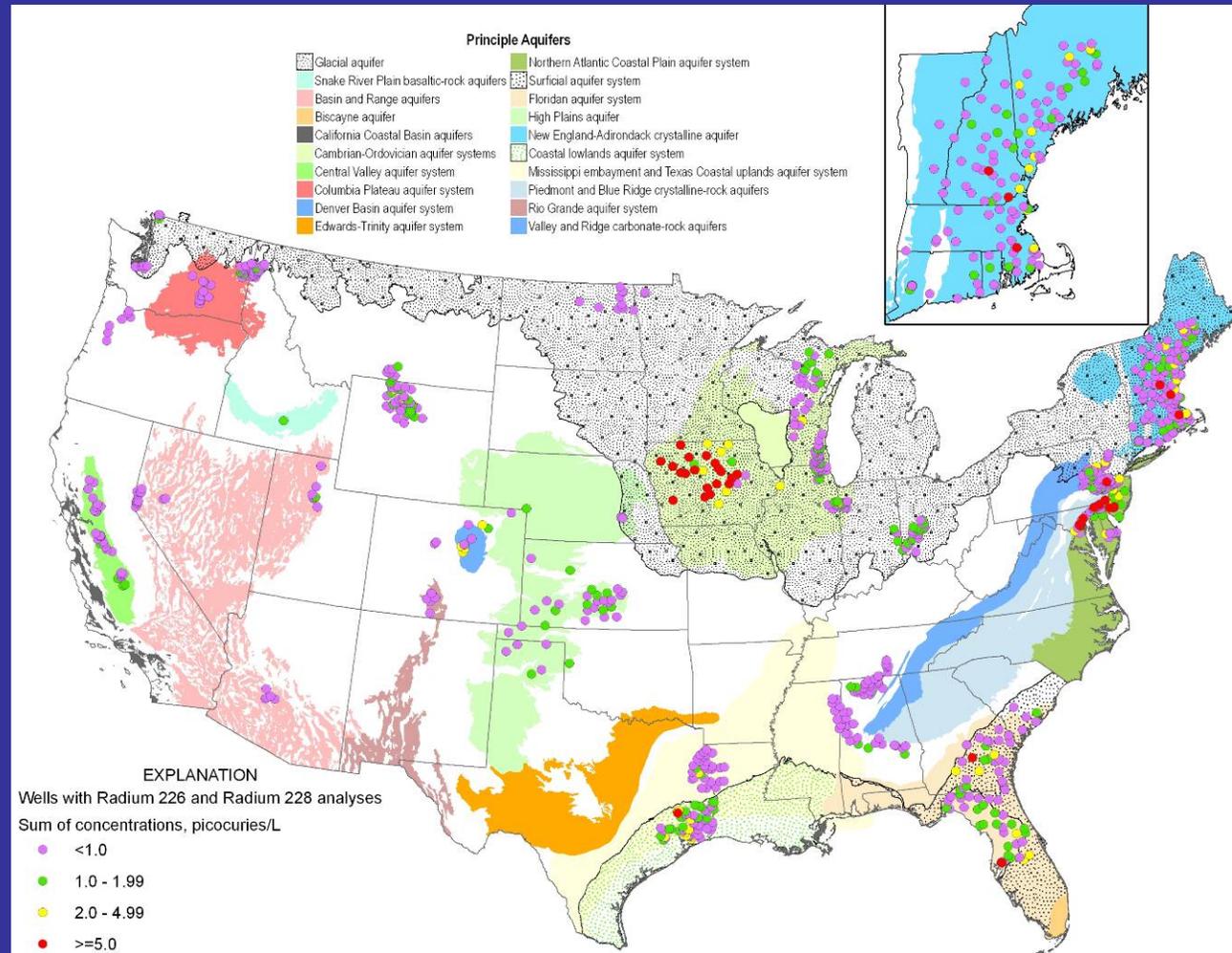


Water over the standard of 5 picocuries/liter had to be treated before it could be used for potable supply.

Findings Spur a National Reconnaissance

- Initial National Survey

- EPA Funding.
- AWWA (“volunteers”).

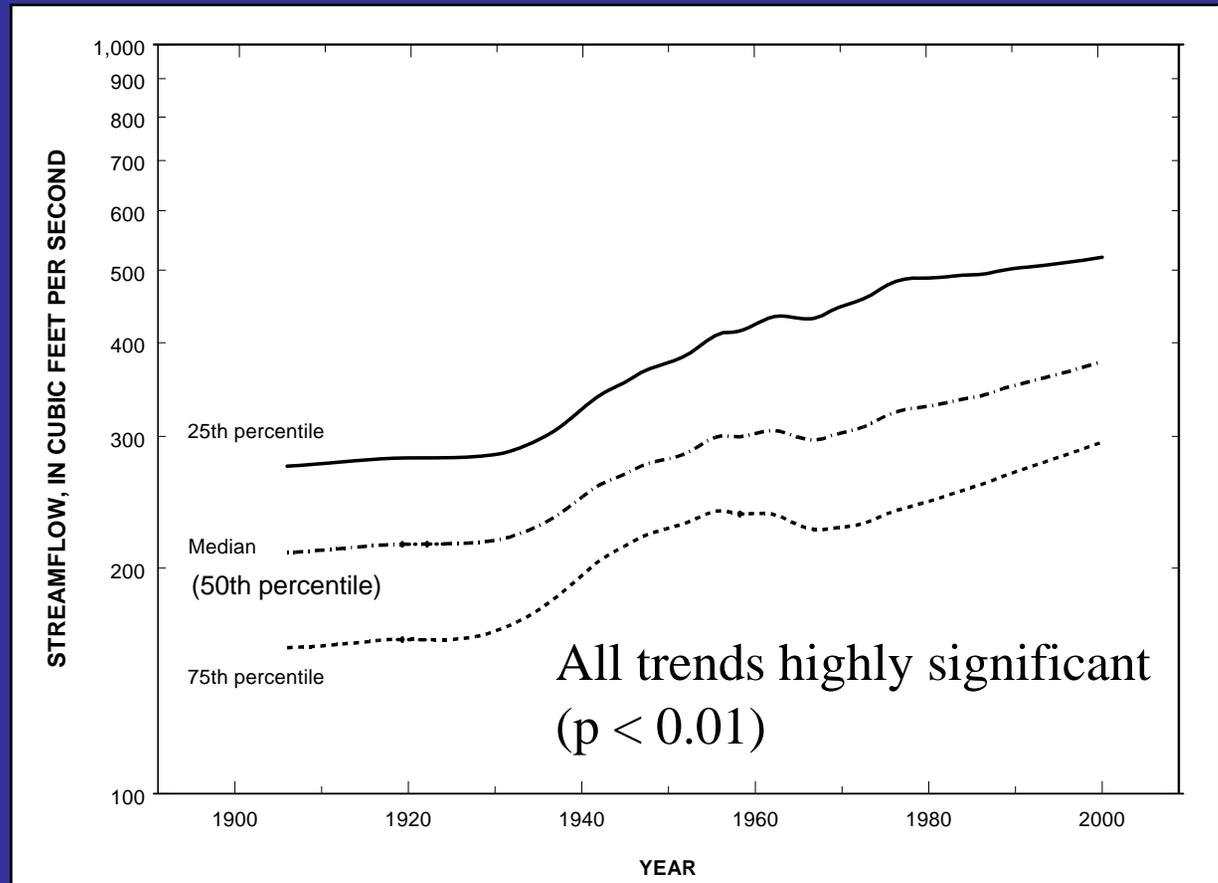


Climate change and water storage

- Changes in sea level
- Changes in temperature and evapotranspiration
- Changes in timing of precipitation
- Changes in recharge

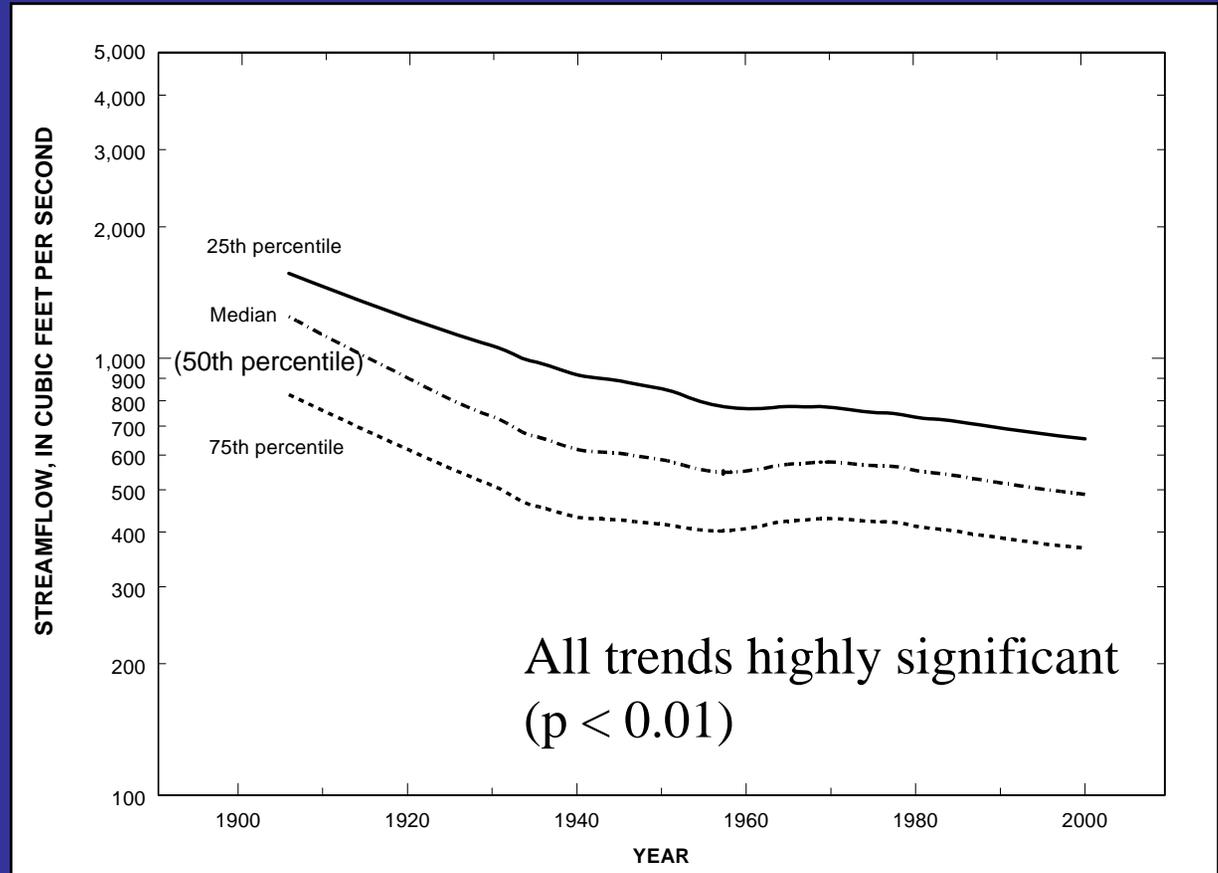
In parts of New England, February Daily Streamflow has Increased Over the Past 100 Years.

Narraguagus River, Maine

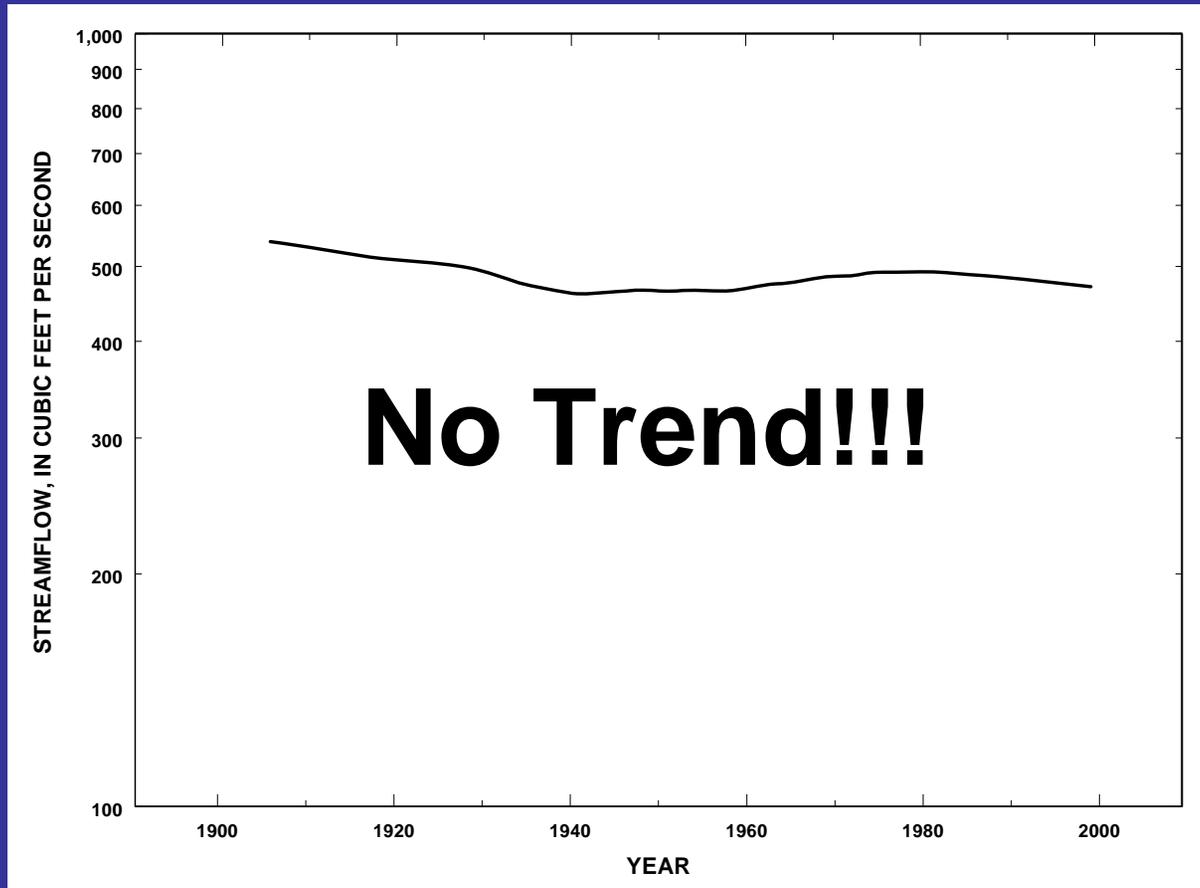


While May Daily Streamflow has Decreased

Narraguagus River, Maine



And Yet: Mean Annual Streamflow Shows



Our future studies of water availability need to comprehensively integrate information on quantity, quality, use and ecosystem requirements.

<http://water.usgs.gov/wsi>