



IAFSM

*Illinois Association for
Floodplain and Stormwater Management*





Urban Flooding; The Hidden National Threat



Center for Disaster Resilience

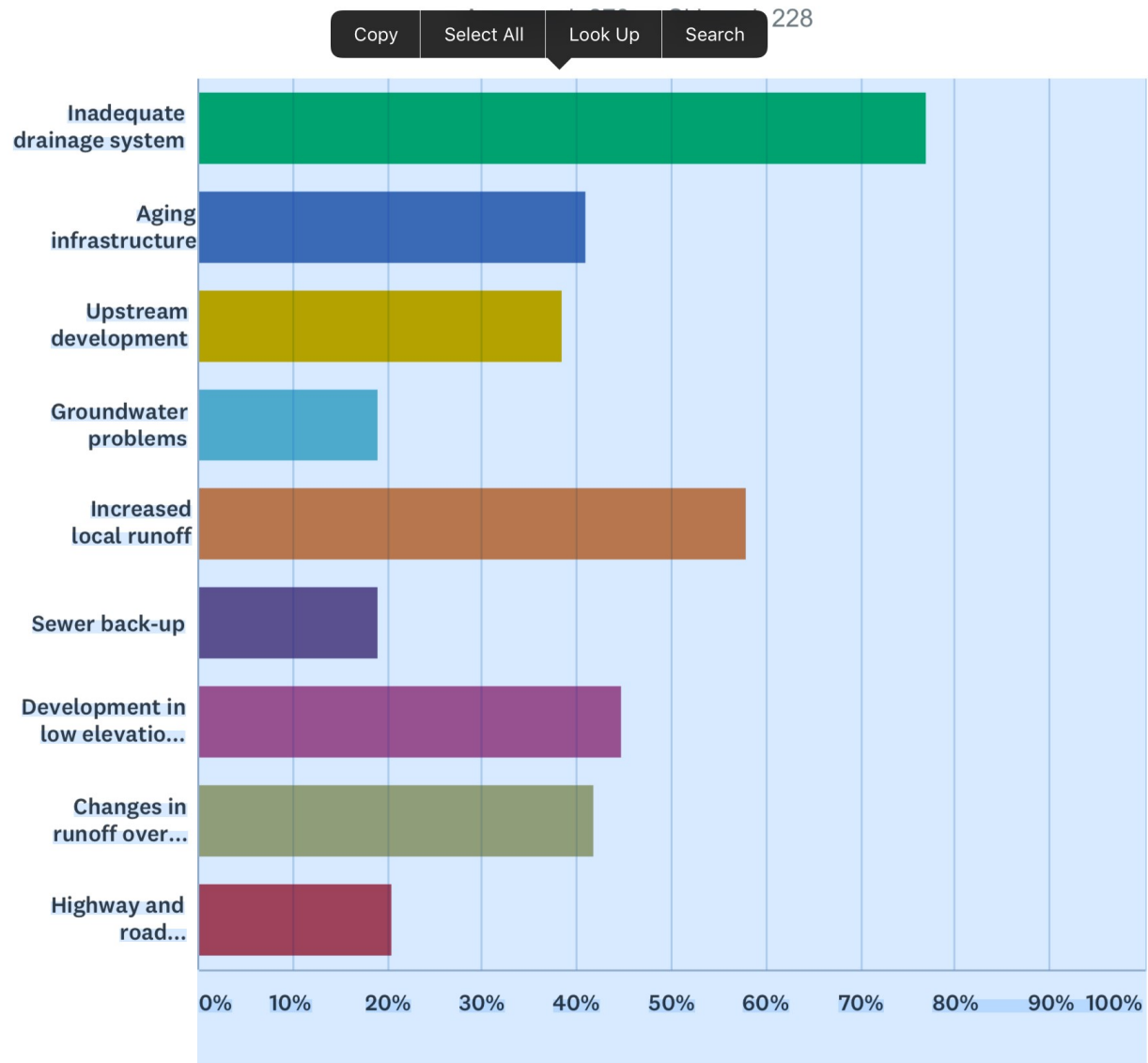
Gerald E. Galloway, Jr., PE, PhD

Glenn L. Martin Institute Professor of Engineering, University of Maryland
Eminent Scholar in Residence and Visiting Professor, Texas A&M – Galveston
gegallo@umd.edu



Hagler Institute for Advanced
Studies

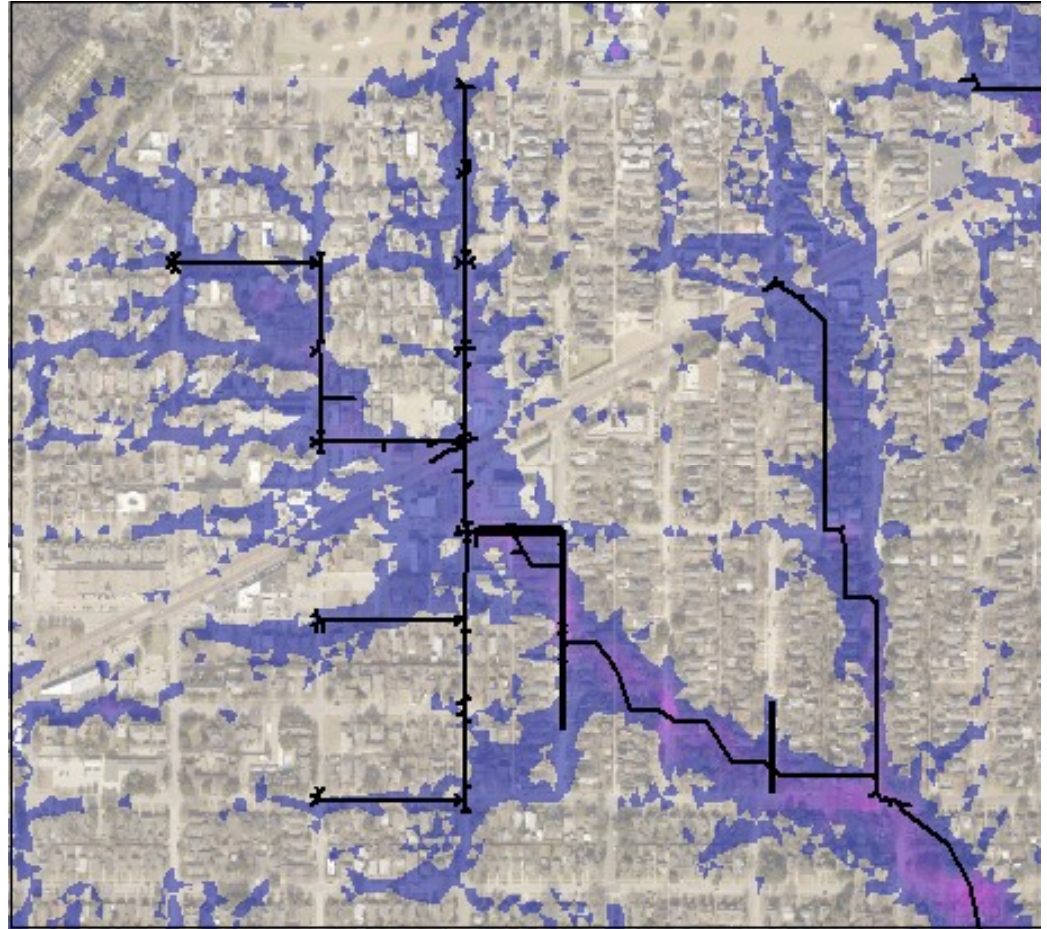
Q23 What are the principal causes of the urban flooding? (select all applicable)



ANSWER CHOICES

RESPONSES

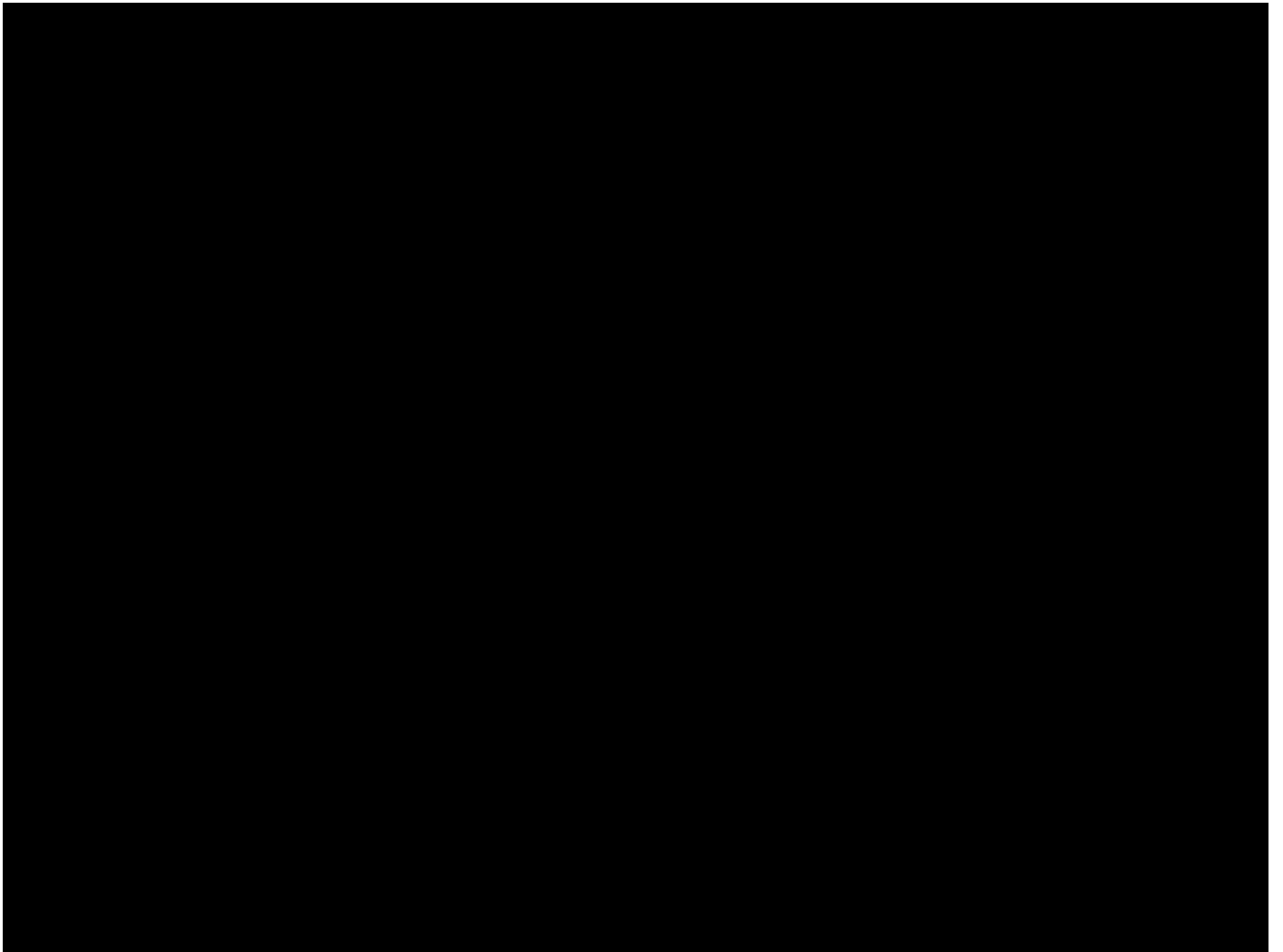
Ft Worth Experimental

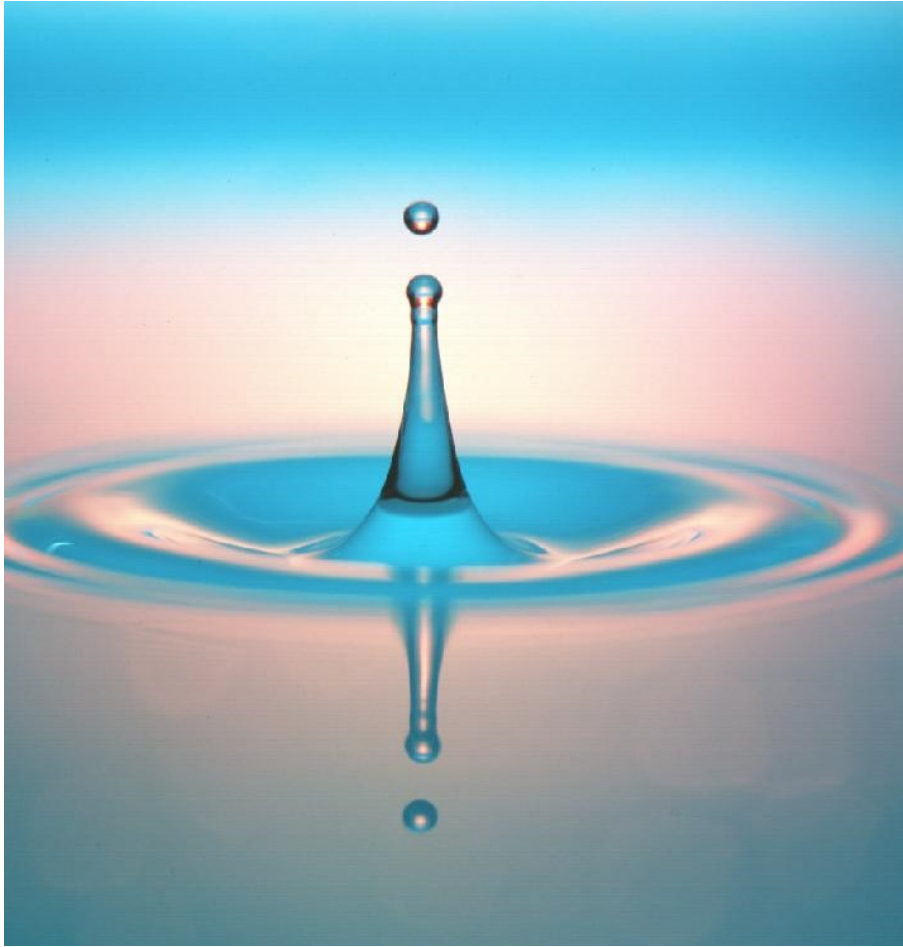


Tentative Bottom Line



- Urban Flooding Is a Growing National Problem and We Do Not Have a Handle on Its Extent, Consequences and Solutions
- Urban Flooding Has a Disproportionately Large Effect on Those Who Are Least Able to Deal with It





Water is the best
of all things.

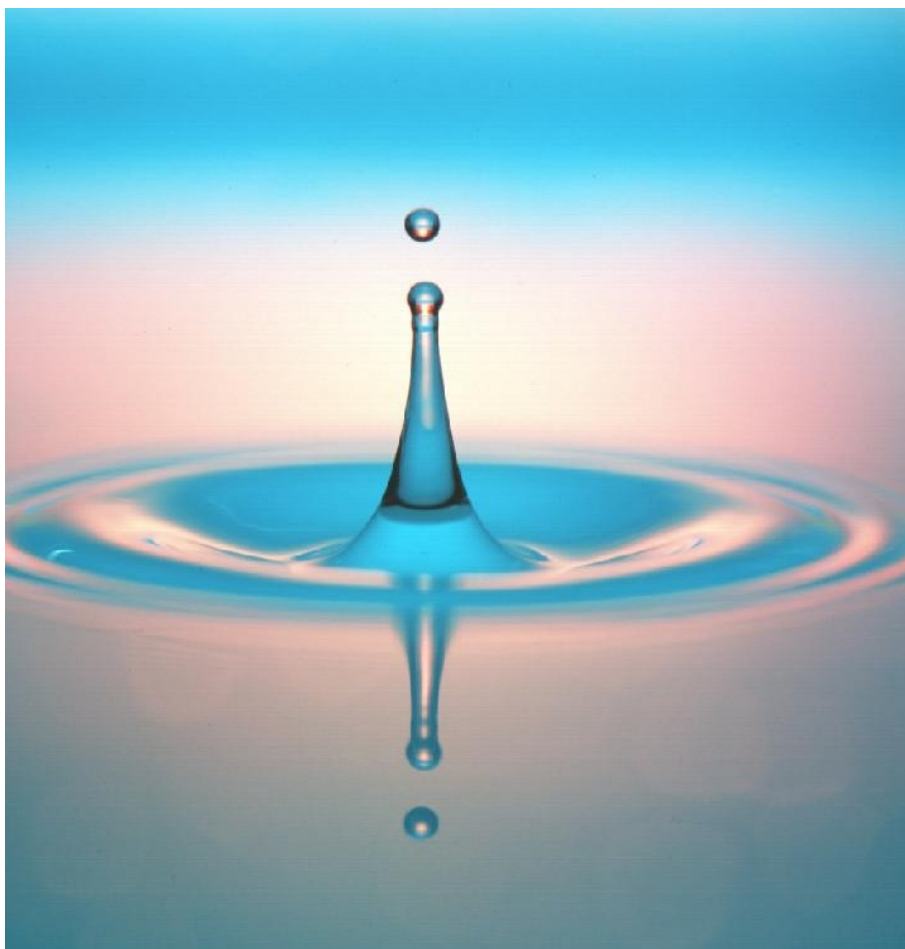
Pindar, 500 BC

When the well's
dry, we know the
worth of water.

Benjamin Franklin, Poor
Richard's Almanac, 1746

Whiskey is for drinking; water is for
fighting over

Mark Twain ca 1881



Floods are an act of
God; flood damages
result from acts of men

House Doc 465, 89th Congress, 2d Session

***A Unified National Program for Managing
Flood Losses, August 1966
Gilbert F White, Chair***



Jack and Jill went up the hill to fetch a pail of water." But Jack fell down when tests came back showing a high count of two water-borne parasites known as cryptosporidia and giardia lamblia in his restaurant's water.

It's the water, stupid. Sorry about that, but it is. If we don't pay attention to the water, it's going to bite us big time."

21st Century Blogs



**Sustainable water
management and use
requires integrating
science and policy and is
as much an art as it a
science**

Abel Wolman

What About Tomorrow?

2017 Annual Conference



IAFSM

Illinois Association for
Floodplain and Stormwater Management

Looking to the Future: Too Much, Too Little, or Too Dirty Water: Not a Water Crisis, but a Water Management Crisis

December 5, 2017

Washington, DC



Center for Disaster Resilience

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Caution



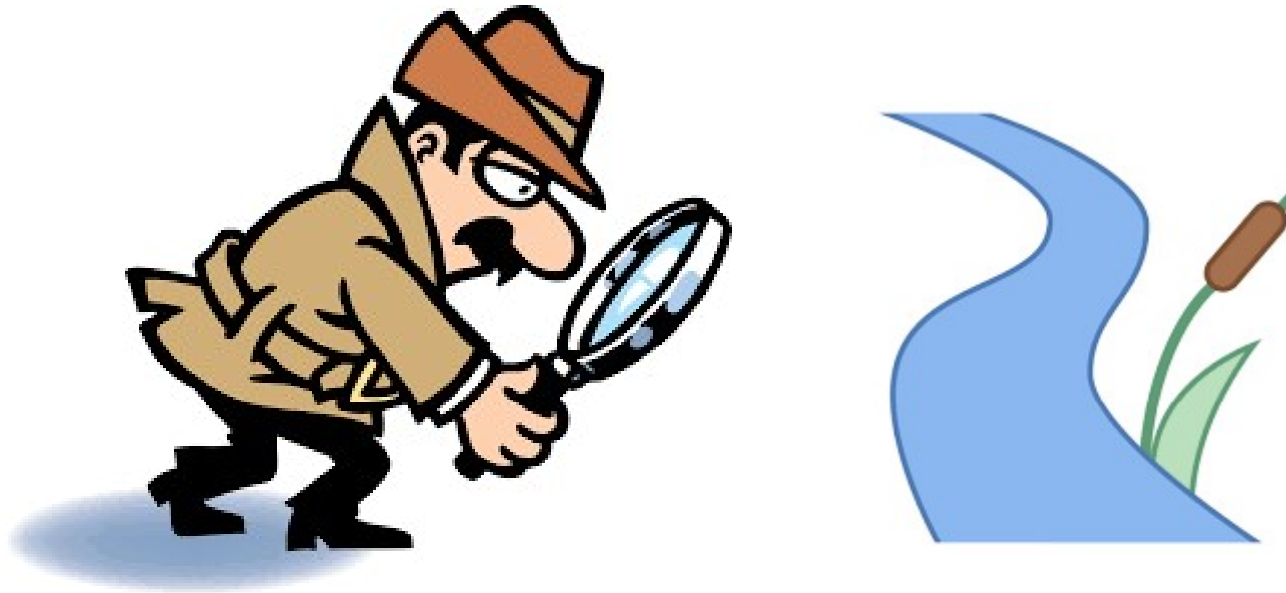
**FEAR THE
TURTLE**



“It is now widely acknowledged that there is enough water on Earth for all, even in areas where temporary shortages may exist. Clearly, the current water "crisis" is not a crisis of scarcity but a crisis of mismanagement, with strong public governance features.

OECD (2011). Water Governance in OECD Countries

The Search



Literature

65 Interviews

Personal Experience

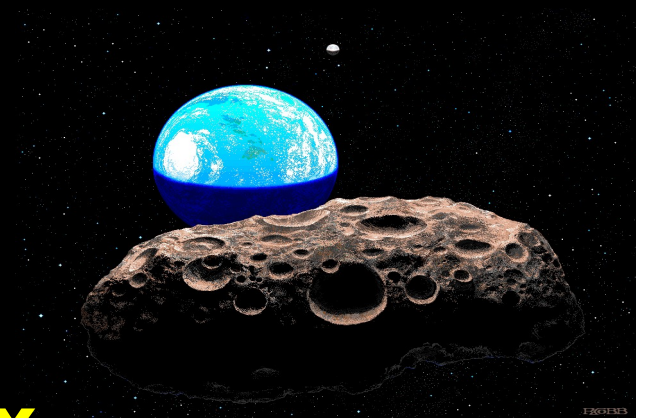
21st Century \neq 20th Century



"Toto, I've a feeling we're not in Kansas anymore"

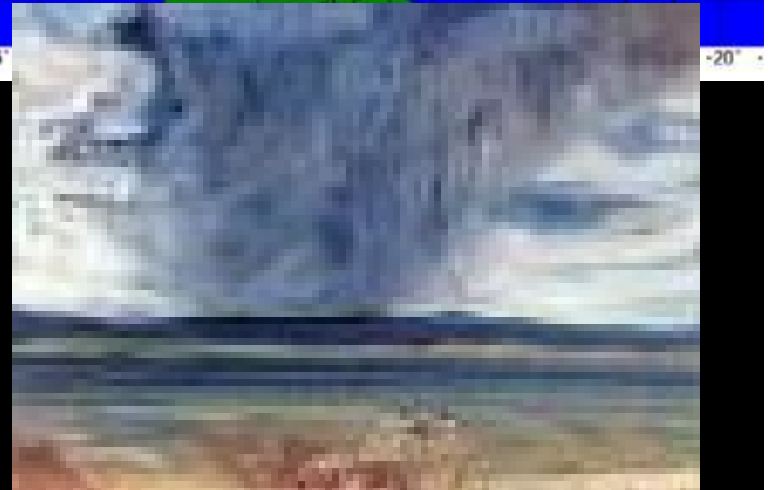
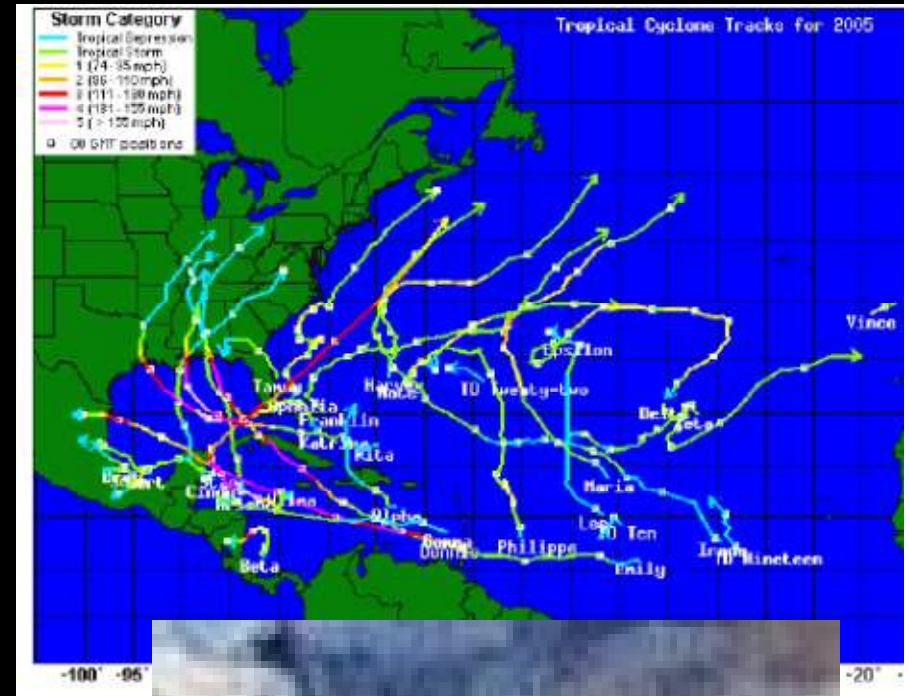
The 21st Century

- Population Explosion
- Pressures for Development
- Crumbling Infrastructure
- Volatile, Uncertain, Complex, Ambiguous National and World Situations
- Climate Change

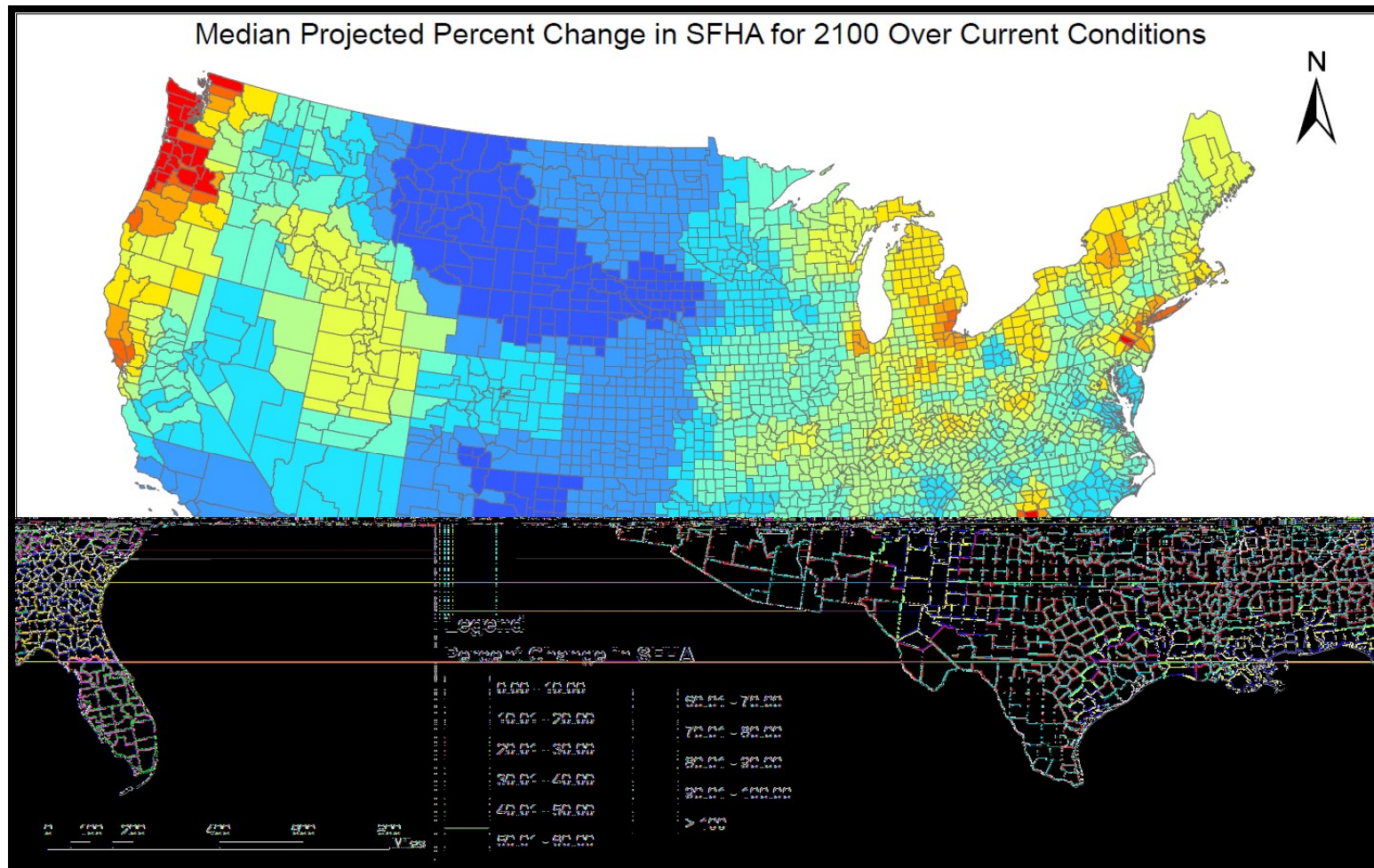


The Climate Change Bears

- Sea Level Rise
- Increased Hurricane Intensity -SST
- Increased Flood Potential - Rain
- Increased Drought
- Increased Temperatures
- Surge
- Erosion
- Uncertainty



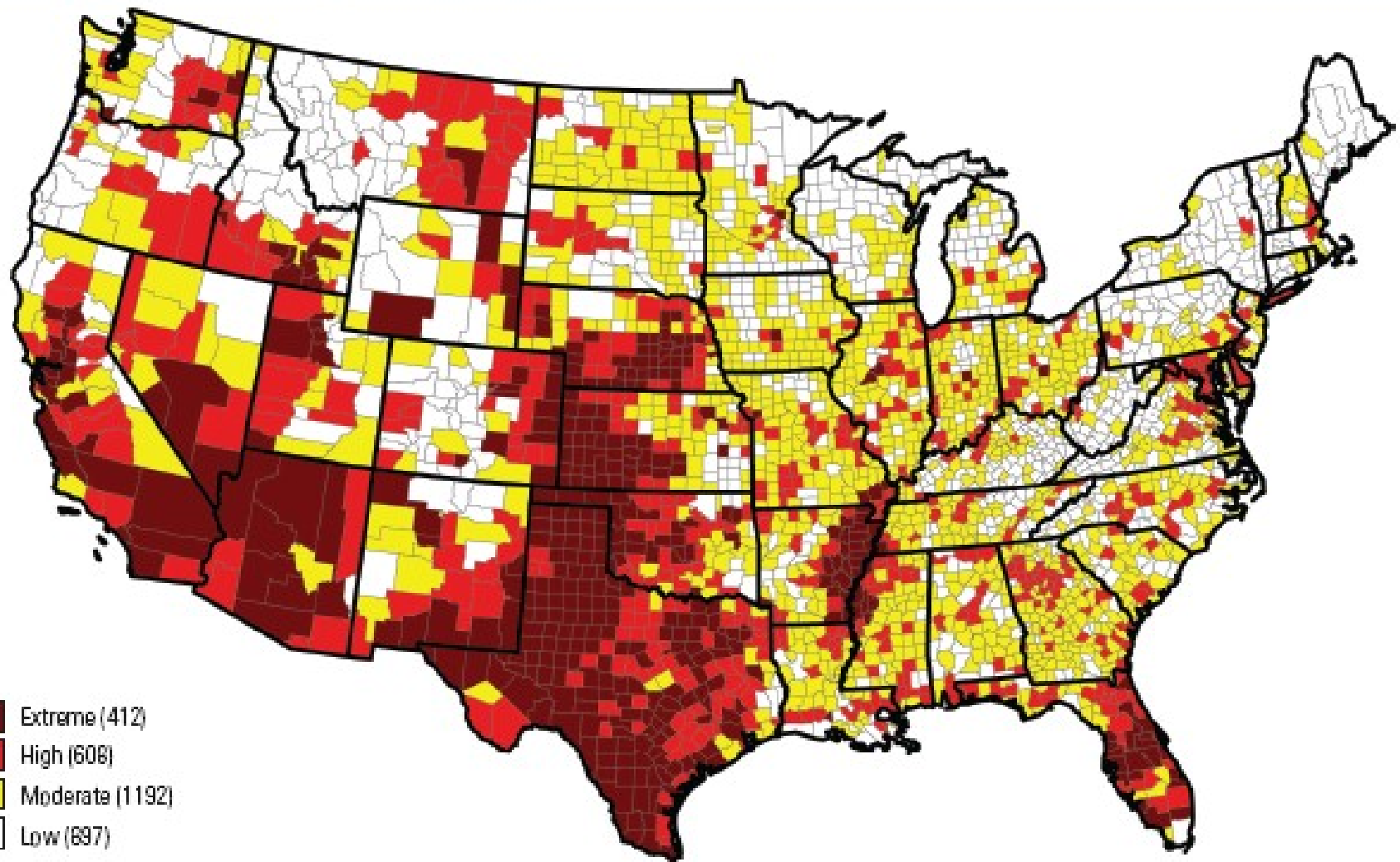
Changes to Flood Areas



Climate Change and the NFIP

AECOM

Water Supply Sustainability Index (2050)



Source NRDC

Planning for a Murky Future

- Traditional Planning

- » Assumed little change – climate and human
- » Operated within a narrow future
- » Stayed inside disciplinary stovepipes



Dealing with a Murky Future

- Traditional Approach

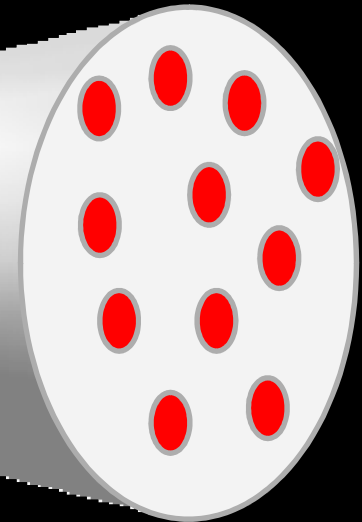
- » Assumed little change – climate and human
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Present

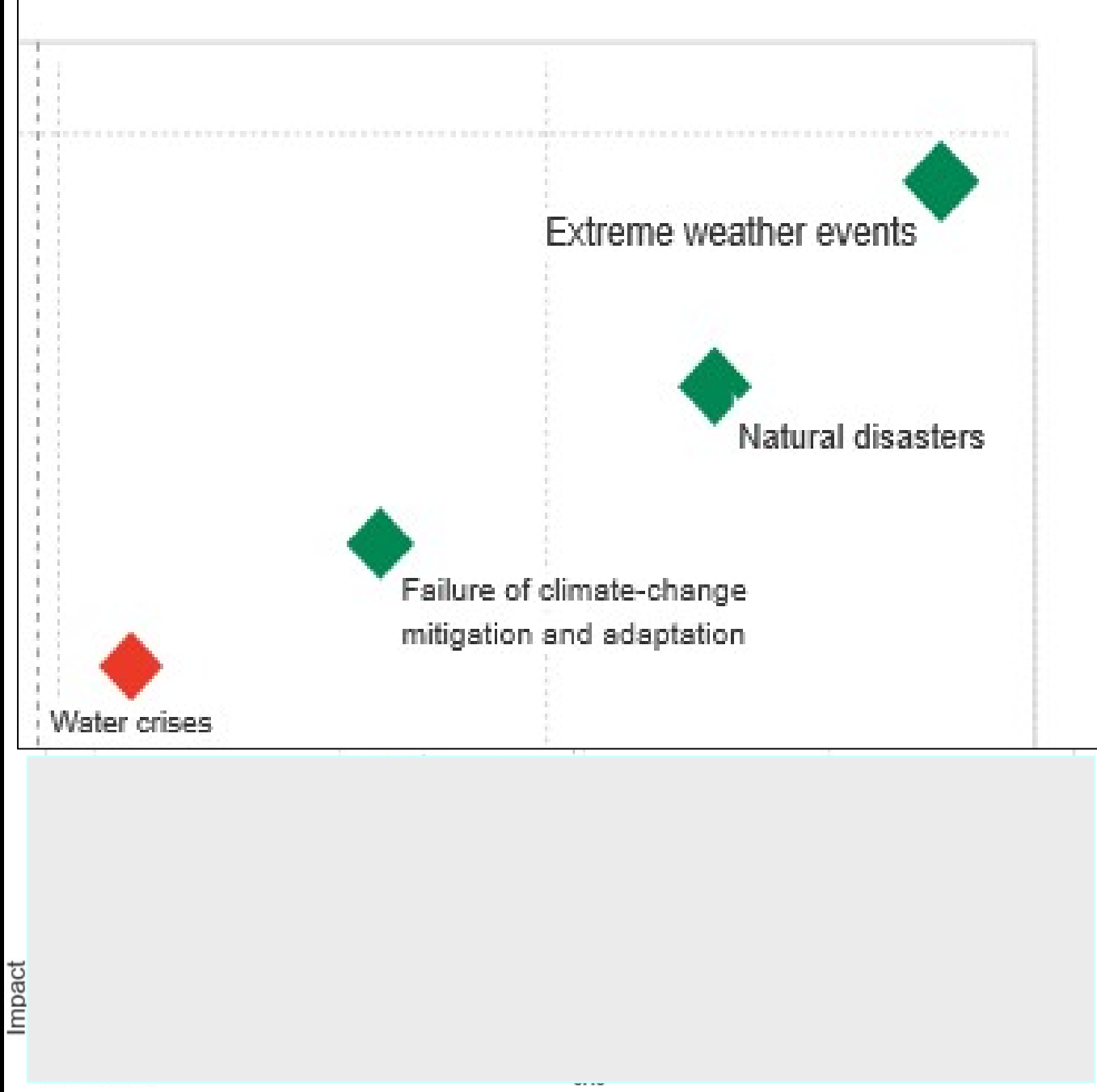
- New Approach

- Hundreds of possible climate and anthropogenic-driven scenarios
- Shared responsibilities
- Changing linkages - codes
- Adaptive, complimentary efforts



Future

Adapted from Marc Waage , Denver Water



The Global Risks Landscape 2018. What is the impact and likelihood of global risks?

World Economic Forum

Today, The US Faces Major Water Challenges



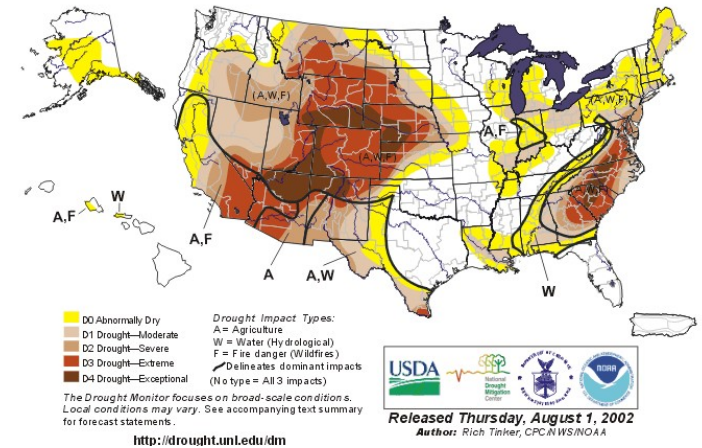
And We Are Not Effectively Addressing Them

US Water Challenges

We Use Water (a lot)

- July 2002 - 49 percent of the contiguous United States in moderate to extreme drought
- February 2003 - \$3B Drought Relief Act
- Communities across nation seeking water for developmen
- No action on National Drought Commission

U.S. Drought Monitor July 30, 2002 Valid 8 a.m. EDT



US Water Challenges

Our Water Quality Is at Risk

- Flint
- 46% of river and stream miles are in poor biological condition;
- 18% of the nation's coastal and Great Lakes waters are in poor biological condition and 14% are rated poor
- Non-point source pollution not yet controlled
- Alien Species on the Rise



PRINCIPAL OXIDIZED NITROGEN AIRSHEDS FOR:
NARRAGANSETT BAY, CHESAPEAKE BAY,
PAMLICO SOUND, TAMPA BAY, MOBILE BAY,
LAKE PONTCHARTRAIN



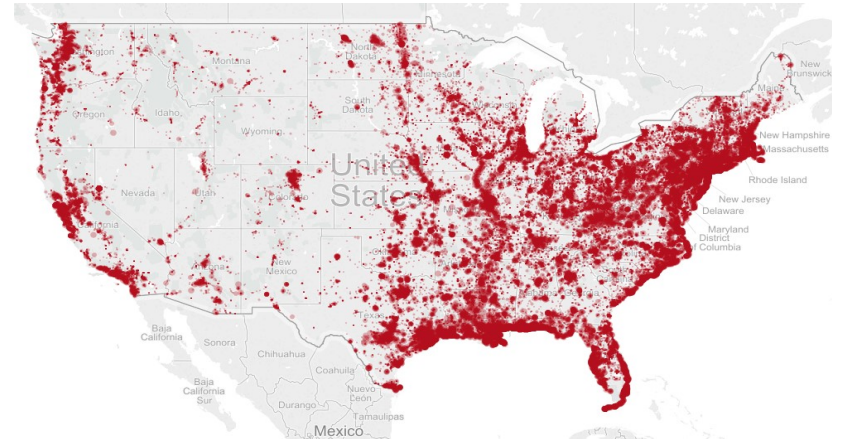
DEVELOPED BY R. DENNIS, ATMOSPHERIC SCIENCES MODELING DIVISION,
ARL, NOAA, and NERL USEPA



US Water Challenges

We Haven't Solved the Flood Problem

- 82 Years of Flood Control
- 50 Years of Flood Insurance
- Increasing Flood Damages
- Inadequate Protection
- Inadequate Maintenance
- Project Focus



US Water Challenges

We Still Need to Protect the Environment

- 32% of the nation's wetland area is in poor biological condition,
- Continuing annual wetland loss
- >1200 threatened or endangered plants and animals
- Minimum instream flows and flood pulses



US Water Challenges

Ports , Harbors and Waterways Are in Transition

- **Non-Competitive Port Depths**
 - US Ports – 45 foot depths
 - International Ports > 60 foot depths
 - Expanded Panama Canal
- **Inland Waterway System**
 - Limited Size Locks
 - Traffic Congestion
 - Age
 - Economic Necessity



US Water Challenges

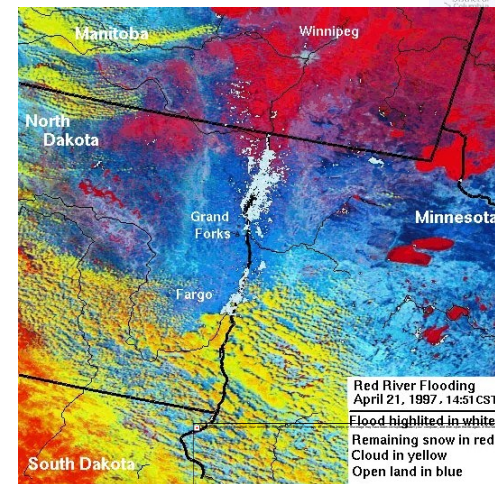
Too Many Conflicts



US Water Challenges

Comprehensive Planning is Limited

- Multitude of Problems
- Little Structure
 - No full-service basin commissions
 - No funding
 - No leaders



US Water Challenges

Much Needs Be Restored



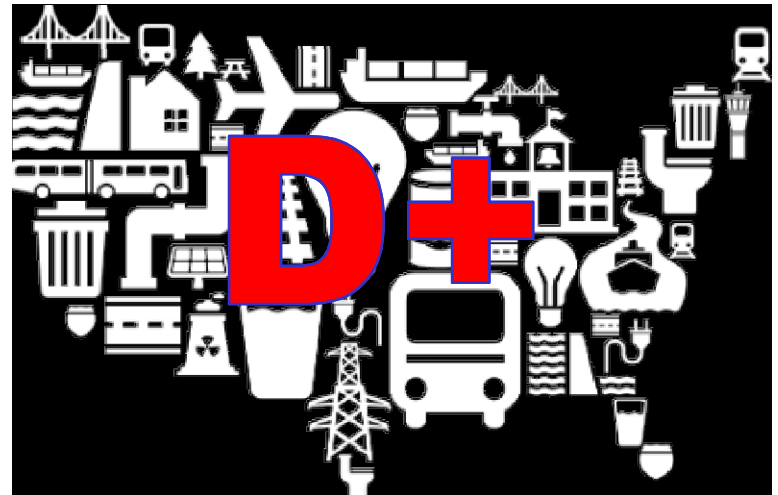
CHESAPEAKE BAY FOUNDATION
Save the Bay



US Water Challenges

Maintaining and Upgrading Our Infrastructure

- Infrastructure Shortfalls
 - Need – Wastewater - \$270 Billion/25 yrs
 - Need – Water treatment \$1 Trillion/25 yrs
 - 2170 Unsafe Dams
 - 90,000 Dams-Ave age 56



Water Challenges

Social Equality

On Whom Is the Greatest Impact?



Tercha, M. (2008) Chicago Tribune



From Brad Winters, IL DNR

Climate Change!!!

Where Are the Problems?

Comments from the Field

Water Challenges Are Not on the Radar Screen of Decision Makers

- **Nobody is listening about water problems**
- **People are taking water for granted**
- **Water never gets attention at very senior-level**
- **Decision-makers not aware of issues**

We Have No Vision or Roadmap to Guide Our Direction

- Big complaint -we have no national water vision; who is looking beyond 3 to 5 years in water
- Where is the visionary?
- We have no water policy; no support for one and an east-west divergence
- There needs to be strong leadership to develop annual and long range plans for the management of the whole system
- Ag-water-energy nexus needs to be part of the picture

We Have No Leadership

- Lack leadership in water
- Not much Congressional leadership; too much political gamesmanship
- There is no federal guru for water
- Need some White House leadership about water but can't leave it up to them alone
- We have no water advocates in Congress
- Need to work Hill
- There is no person of stature who can speak across agencies about water
- Need to get Hill into the game
- We have no water advocates in Congress

Water Law Is Archaic

- Got to shake up water rights system
- Use it or lose it worked 150 years ago not today; need to examine laws see Brazil and Australia
- We have a governance challenge, lack of comprehensive approach, complicated by state level issues on nature of water rights
- Need new paradigm; more active management- now very compartmentalized and archaic especially surface; groundwater is in the infancy.
- Conundrum in governance; archaic water rights system; allocation system out of whack; at end of day delivery system priorities are using 18th century water rights system

We Are Not Coordinated and Integrated within Feds and Fed-State

- Need to think about more robust measures for coordination and collaboration
- Big issue: we are still dealing with water in silos
- Need more deliberate organizational support like durable coordination
- Don't look at water in separate parts-integrate



The Silo Effect

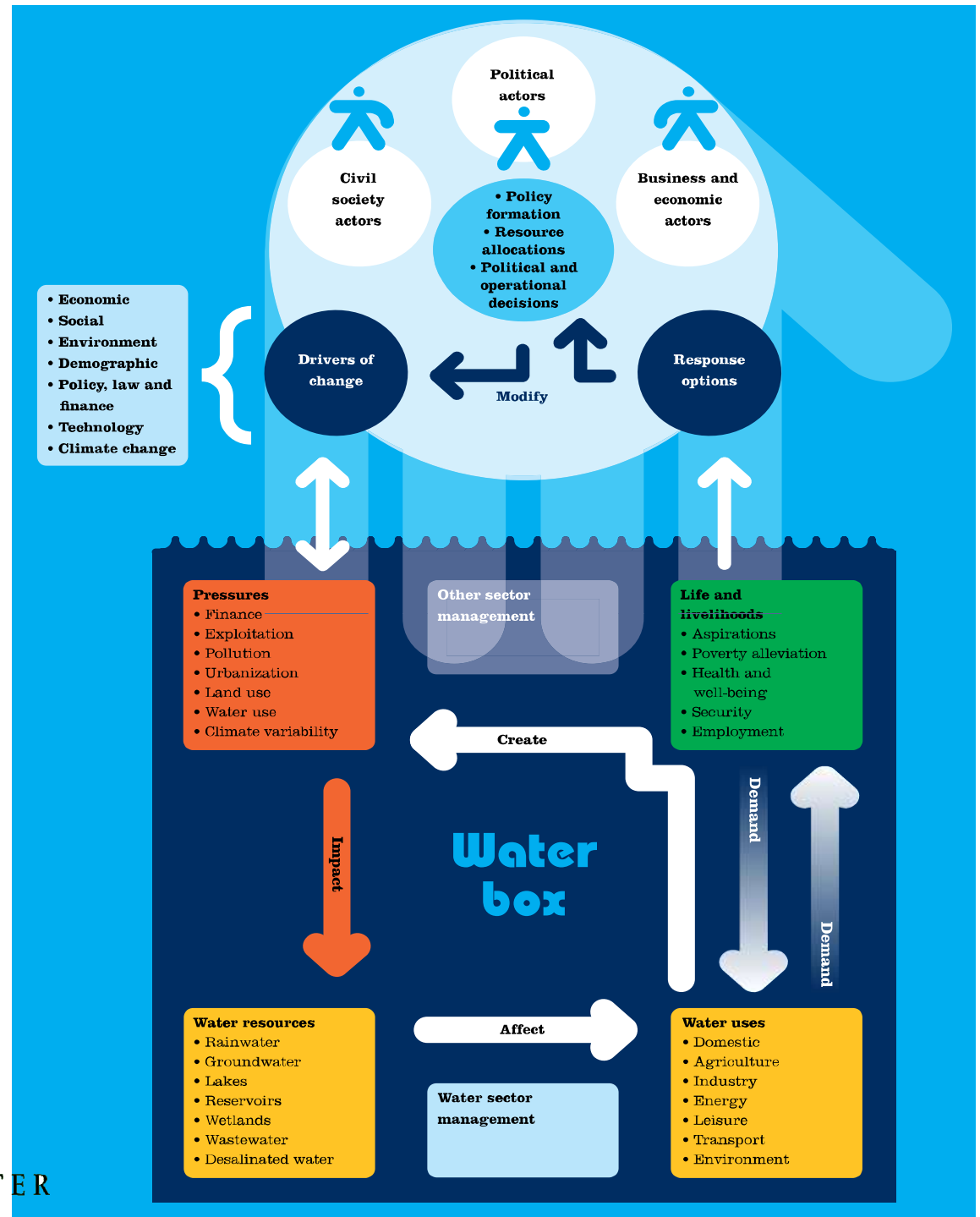
Today, the diverse water resources challenges throughout the United States are often studied, planned and managed in individual silos, independently of other water areas and projects. Generally, this has resulted in local and narrowly focused project objectives with little consideration of the broader watersheds that surround the project. .. Policy is ad hoc, implementation is decentralized, coordination is fragmented, and communication is non-existent or fails to connect. We need a national water policy and unifying vision and guiding principles

**Congressman James Oberstar
Aug 27, 2009**

We Are Trapped in the Water Box

Decision-making affecting water

UN Third World Water Development Report



Pressures

- Finance
- Exploitation
- Pollution
- Urbanization
- Land use
- Water use
- Climate variability

Impact

Water resources

- Rainwater
- Groundwater
- Lakes
- Reservoirs
- Wetlands
- Wastewater
- Desalinated water

Other sector
management

Create

Water
box

Affect

Water sector
management

Life and livelihoods

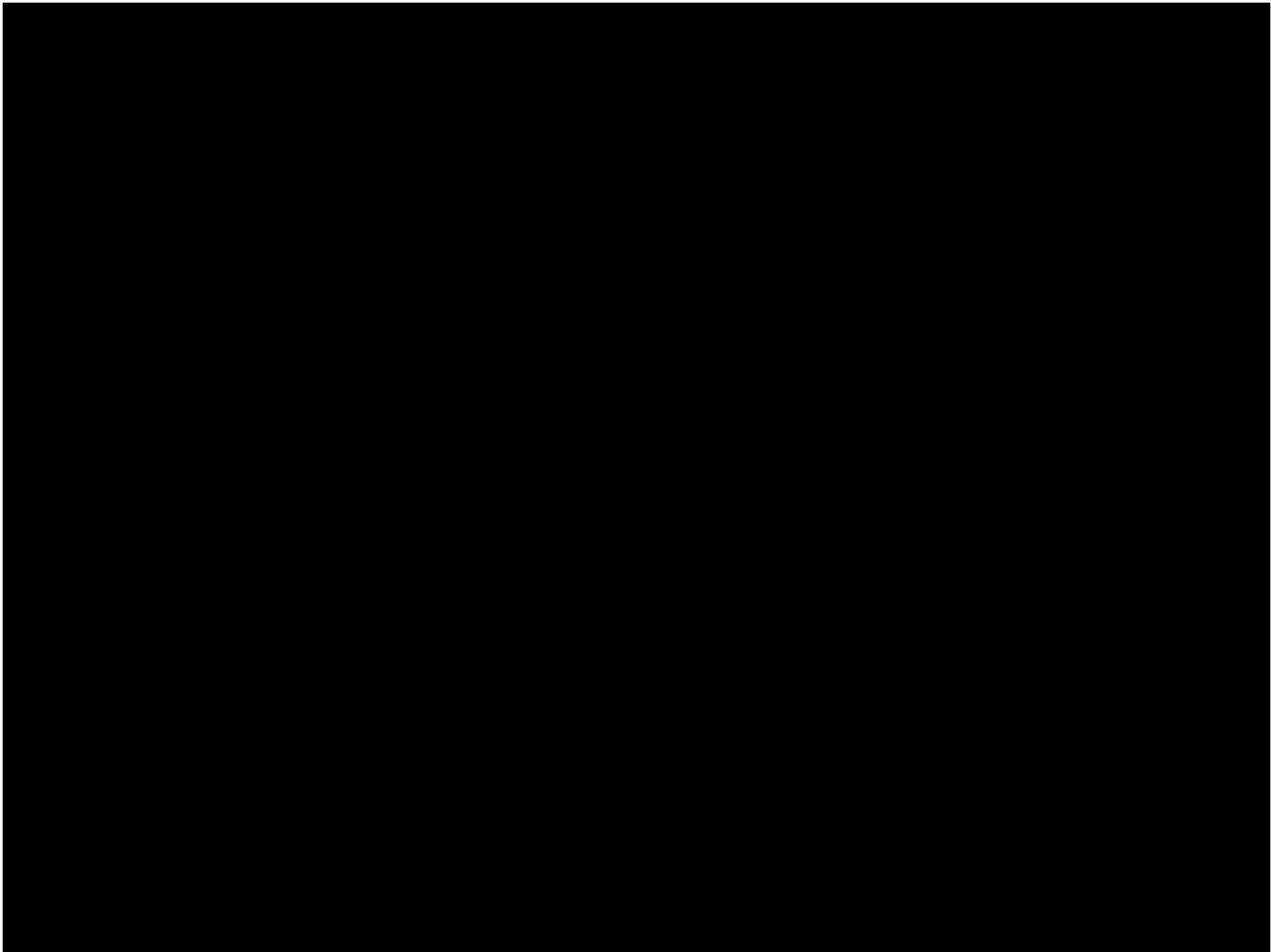
- Aspirations
- Poverty alleviation
- Health & well-being
- Security
- Employment

Demand

Demand

Water uses

- Domestic
- Agriculture
- Industry
- Energy
- Leisure
- Transport
- Environment

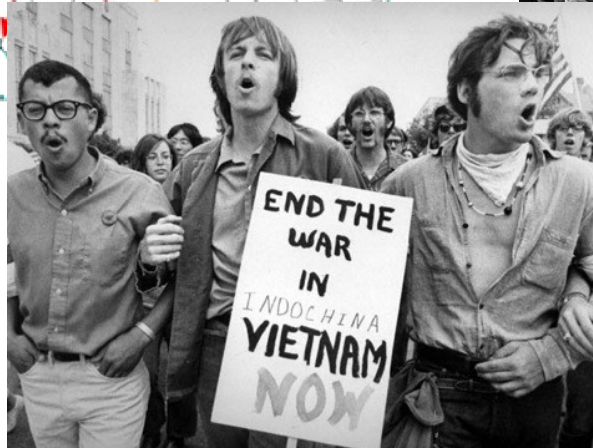
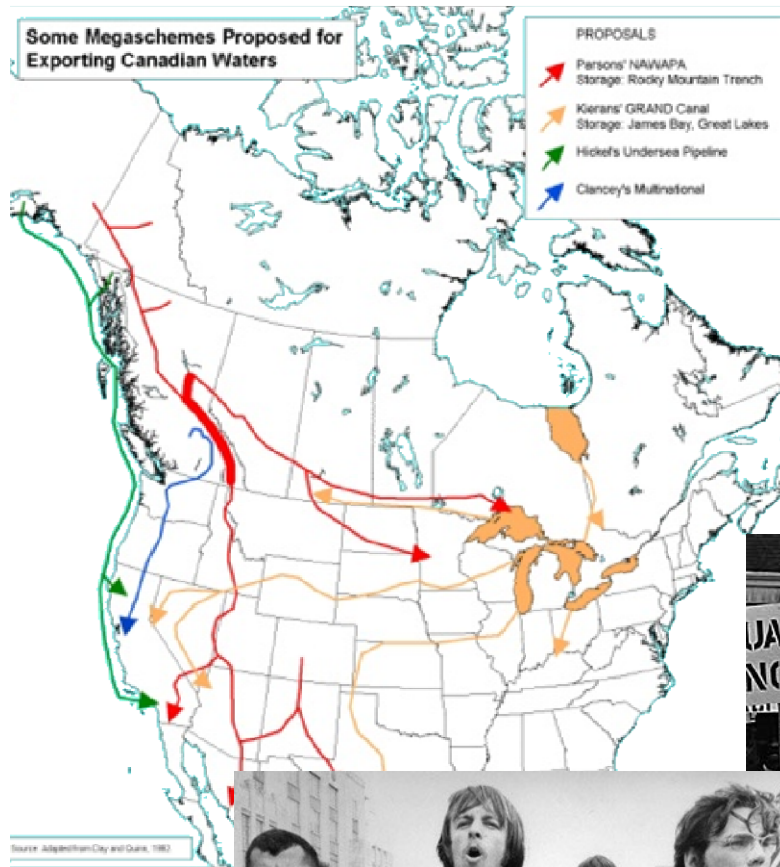


We Are Not Listening

Hoover Commission 1955

- **Federal development of water resources is carried on today under a complex of conflicting policies** which have been evolving to meet changing conditions, needs and pressures for well over a century of direct Federal activity, and which cause competition, duplication, and waste.
- It must be evident that there is imperative **need for a clear definition of the role and policies of the Federal Government** in the framework of a consistent national water policy and the coordination of Federal and State agencies which will progressively promote conservation and development of this vital natural resource for the Nation as a whole, as well as for States and local communities.
- [It is recommended] that **Water Resources Board be created** [including] the President's present Cabinet and Interagency Committees on Water Resources and five public members

The Sixties

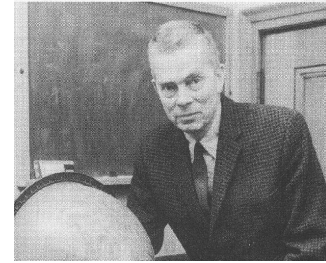


The Great Days for Water!



- Water Resources Planning Act of 1965
 - Established Water Resources Council
 - Established Basin Commissions
 - Required Principles and Standards (published 1973)
 - Established Policy
 - ...to encourage the conservation, development, and utilization of water and related land resources of the United States on a comprehensive and coordinated basis by the Federal Government, States, localities, and private enterprise with the cooperation of all affected Federal agencies, States, local governments, individuals, corporations, business enterprises, and others concerned
 - Established Objectives (1970)
 - ...the objectives of enhancing regional economic development, the quality of the total environment, including its protection and improvement, the well-being of the people of the United States, and the national economic development are the objectives to be included in federally financed water resource projects

The Great Days!



- **Other Legislation**

- 1966 National Historic Preservation Act
- 1968 Estuary Protection Act
- 1968 Wild and Scenic Rivers Act
- 1968 National Trails System Act.
- 1970 National Environmental Policy Act
- 1971 Uniform Relocations Assistance and Real Property Acquisition Policies Act
- 1972 The Federal Water Pollution Control Act Amendments
- 1972 Marine Protection, Research and Sanctuaries Act
- 1972 Coastal Zone Management Act
- 1973 Conservation, Protection, and Propagation of Endangered Species
- 1974 Preservation of Historical and Archeological Data.

- **National Water Commission**

- In 1973 the National Water Commission concluded its five-year study of national water policy by issuing a massive report containing over 200 recommendations for improvements in the way the Nation deals with its water resources.

- **National Water Assessment**

- National water assessment ...provides a unifying *general* description of the Nation's water resource situation and ...serves as a symbolic statement that a rational thought process guides national water policy

And Then.....

1981

- Elimination of River Basin Commissions
- Zero Funding of the Water Resource Council

1983

- Rescission of Principles and Standards
- Publication of Principles and Guidelines
 - The Federal objective of water and related land resources project planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements.



A Strange Sort of Secretary

National Water Commission 1973

- **...Management, and protection of water resources should be controlled by that level of government nearest the problem** and most capable of effectively representing the vital interests involved.
- Water resource planning must be tied more closely to land use planning.
- **Sound economic principles should be applied to decisions** on whether to build water projects...If the Nation is to achieve wise and efficient use of its water resources, the identifiable beneficiaries of water services should be obliged to pay the cost of providing the benefits they receive.
- **Laws and legal institutions should be reexamined in the light of contemporary water problems. Many water laws, both statutory and judge-made, have their origin in the 19th century and were fashioned to meet social needs of that era..... In particular, there is need to modernize laws dealing with ground water development...**
- The level of future demands for water is not inevitable but derives in large part from policy decisions within the control of society...policies which will lead to the conservation of water...policies which will motivate better use of water and reduce water losses by improved efficiency.

Western Water Policy Review Commission 1998

To help address the **problems created by multiple and often conflicting jurisdictions, authorities, and program objectives**, we should organize or integrate water planning, programs, agencies, funding, and decision-making around natural systems—the watersheds and river basins.

Planning and management of land and water, surface and groundwater, water quantity and quality, and point and nonpoint pollution must be coordinated at the appropriate level of government.

Miscellaneous Reports

- The many water and related land problems are complex, and **any attempt to solve these problems is hampered by competing forces with legitimate interests**. No easy answer to the many varied problems exists, and the findings of the second assessment are not free of conflict.

Second National Water Assessment 1978

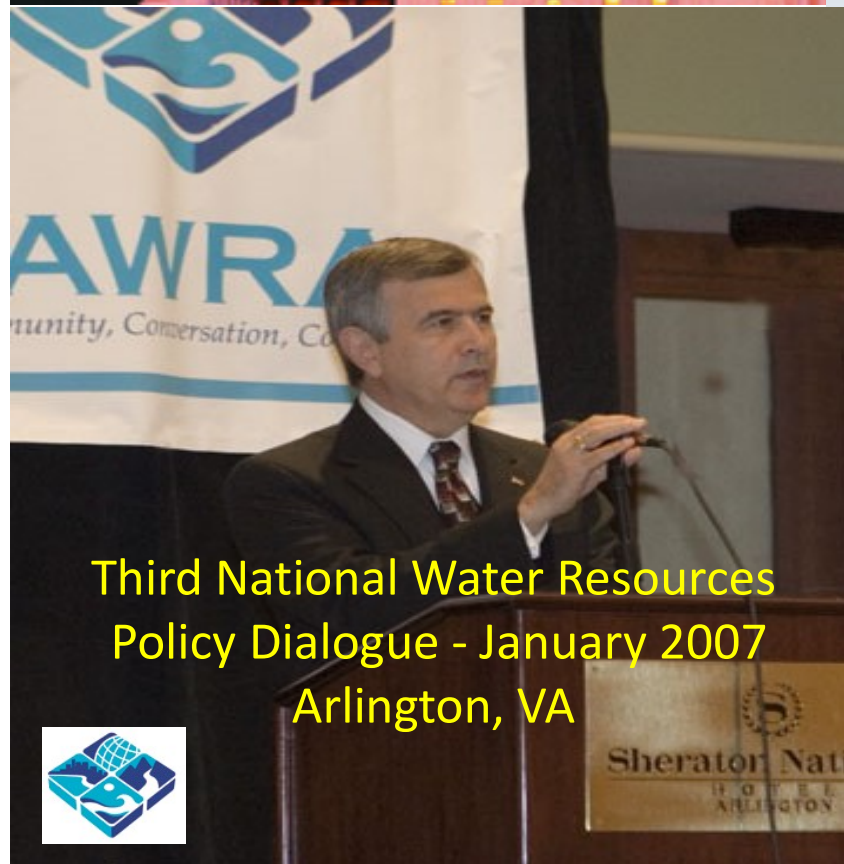
- There is little in the existing structure or procedures which clearly defines the nature and extent of the federal interest in the nation's waters.

Federal Policies in Water Resources Planning, ASCE, 1985

- The primary recommendation of this paper is that the **President appoint a White House level group**, chaired by a high-level White House official, with membership drawn from departments and independent agencies with jurisdiction over water programs, to serve as an interagency forum **to improve coordination of federal water programs with each other and with state water policy**.

Western Governors' Association, 1989

**American Water Resources Association's
National Water Resources Policy Dialogue
Washington, D.C.
September 17-18, 2002**



**AMERICAN WATER RESOURCES
ASSOCIATION
Second National Water Resources Policy Dialogue**

Tucson, Arizona

February 14-15, 2005





Stewardship of the Nation's water resources is being neglected and the manner in which we deal with water issues is dysfunctional.

AWRA
February 2007

Third National Water Policy Dialogue

March 13, 2007
Washington, D.C.

...the American Water Works Association (AWWA) and the American Water Resources Association (AWRA) have been instrumental in the development of the National Water Policy Dialogue. The Dialogue is a unique opportunity for water professionals from across the country to come together and discuss the most pressing water issues facing the nation. The Dialogue is a forum for the exchange of ideas and information, and for the development of consensus on the most important water issues. The Dialogue is a key component of the National Water Policy Dialogue, which is a multi-year effort to develop a national water policy. The Dialogue is a key component of the National Water Policy Dialogue, which is a multi-year effort to develop a national water policy. The Dialogue is a key component of the National Water Policy Dialogue, which is a multi-year effort to develop a national water policy.

AMERICAN WATER RESOURCES ASSOCIATION
4100A Fairview Road • A.O. Box 1000 • Bethesda, MD 20814-1000
Phone: (301) 657-5500 • Fax: (301) 657-5501 • www.awra.org

Dialogue Recommendations

- **Establish Broad Principles for Water Management – a National – Not a Federal - Vision**
- **Translate Vision Into Water Policies**
- **Encourage Policies that Promote Watershed Planning and Change Policies that Do Not.**
- **Use Nation's Vast Scientific Knowledge About Water - Fully Consider In Making Decisions**

Too Difficult?



The Water Framework Directive establishes a legal framework to protect and restore clean water across Europe and ensure its long-term and sustainable use.

The directive establishes an innovative approach for water management based on river basins, the natural geographical and hydrological units, and sets specific deadlines for Member States to achieve ambitious environmental objectives for aquatic ecosystems. The directive addresses inland surface waters, transitional waters, coastal waters and groundwater.

Directive 2000/60/EC of the European Parliament
and of the Council of 23 October 2000 , *Establishing a
Framework for Community Action in the Field of Water
Policy*



- **Directive on the quality of water intended for human consumption**
- **Framework for community action in the field of marine environmental policy**
- **Framework for community action in the field of marine environmental policy**
- **Directive on the assessment and management of flood risks**

The Bottom Lines

The nation faces many difficult water resources challenges in the decades ahead, and it is operating without a plan to effectively manage and sustain these resources.

Federal, state, tribal and local governments, working collaboratively with the public, need to establish our national water resources development objectives (vision) and define the roles and responsibilities they believe each should play in dealing with our water challenges and then act.

What To Do?

Become Involved!

- Learn – Stay Informed
- Educationally – Explaining to Others
- Ethically – Speaking When King Has No Clothes
- *Politically/Institutionally - Becoming Involved in the Decision Process - DOING*



We Don't Know Everything!! It Is All About You!!

Not Possible??

"Alice laughed: "There's no use trying," she said; "one can't believe impossible things."

"I daresay you haven't had much practice," said the Queen. "When I was younger, I always did it for half an hour a day. *Why, sometimes I've believed as many as six impossible things before breakfast*

Alice in Wonderland.









**Remember:
Nature Bats Last**

Thank You!