THINKING OUTSIDE THE BOX CULVERT
UNDERSTANDING FLOOD MANAGEMENT AND NATURAL FLOODPLAIN MITIGATION

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ASSOCIATION OF STATE FLOODPLAIN MANGERS

mmsd

Preserving The Environment • Improving Water Quality

October 9th, 2012

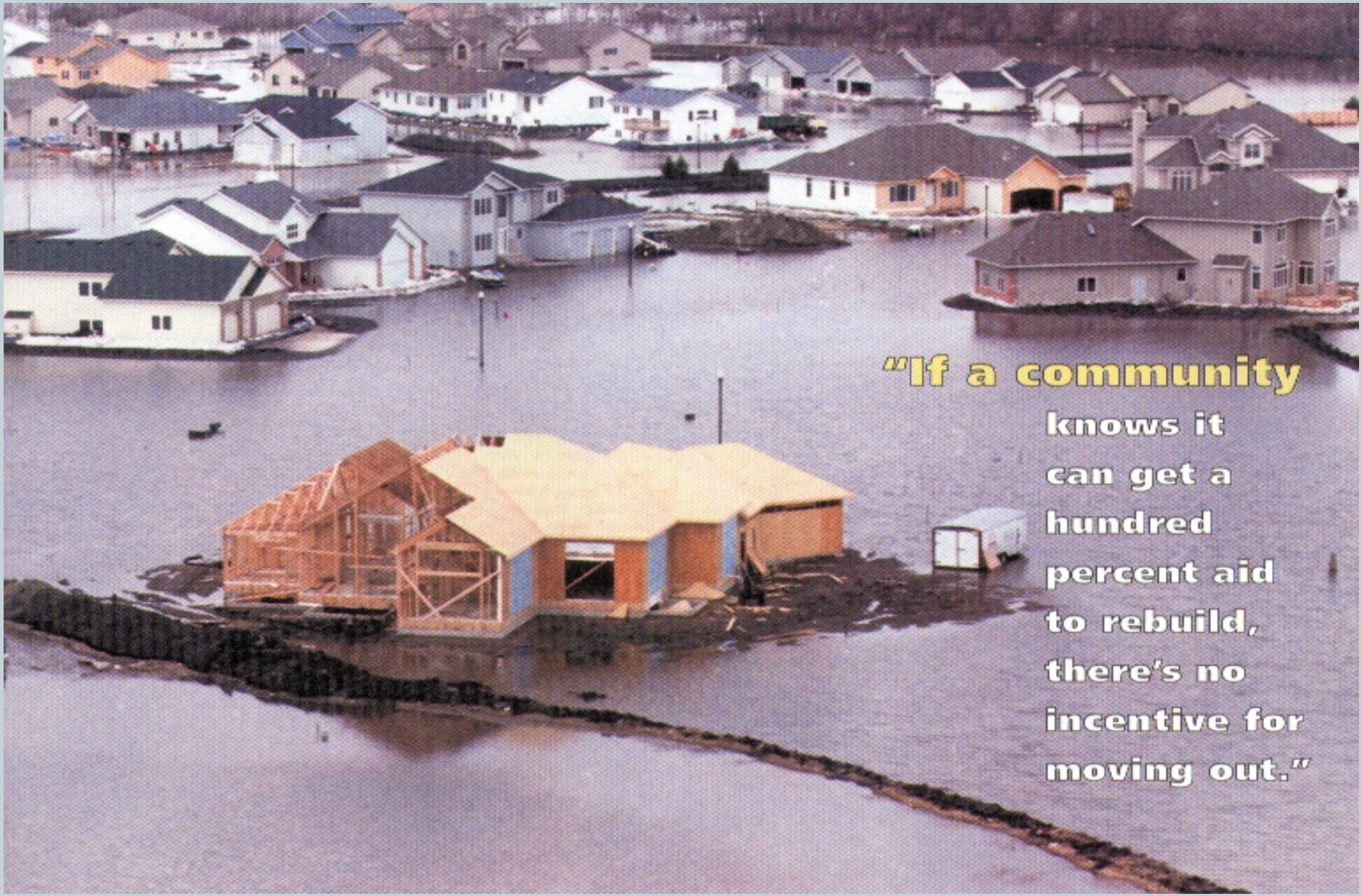
The following presentation represent the views of the speaker and may not represent views of the Milwaukee Metropolitan Sewerage District , the ASFPM Board or Membership

This Presentation is Focused on What I Think I know Best, Which is not Much.

Floodplain Managers Celebrating Job Security

If you lived here you would be flooded

A lake view was not in the Real Estate Brochure

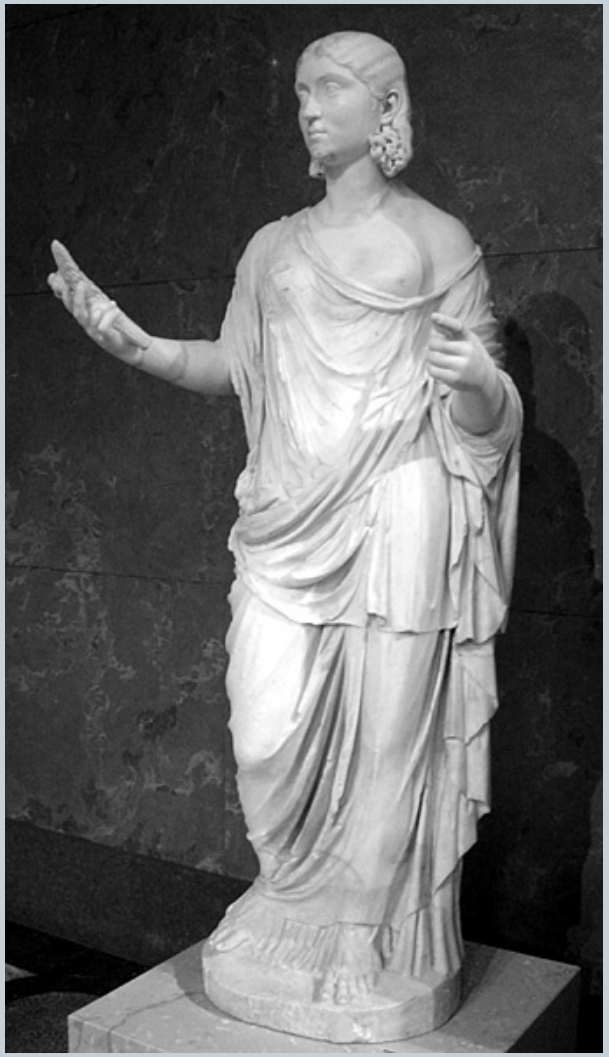


Background Basics for Flood Management

- Basics of Blame
- In any flood there is always a great search to find the culprit who caused the flood event "Take the Blame"
- Often Called SODDI-Some Other Dude Did It
- The SODDI for Flooding Damages and most natural disasters is:

Slide Courtesy of Ed Thomas

Mother Nature



Slide Courtesy of Ed Thomas

Does Nature Cause Disasters?

- Are Natural Disasters “Natural”?
- Chinese Proverb: “Floods are Gifts of Heaven, Flooding is the Work of the Devil”
- Dr. Gilbert Fowler White Stated The Facts:

  “Floods are Necessary Acts of Nature; But FloodLosses Are Largely Acts of Man”

Cause of increased Flood Loss Is Changes in the Density and Cost/Type of Buildings in Flood Hazard Areas

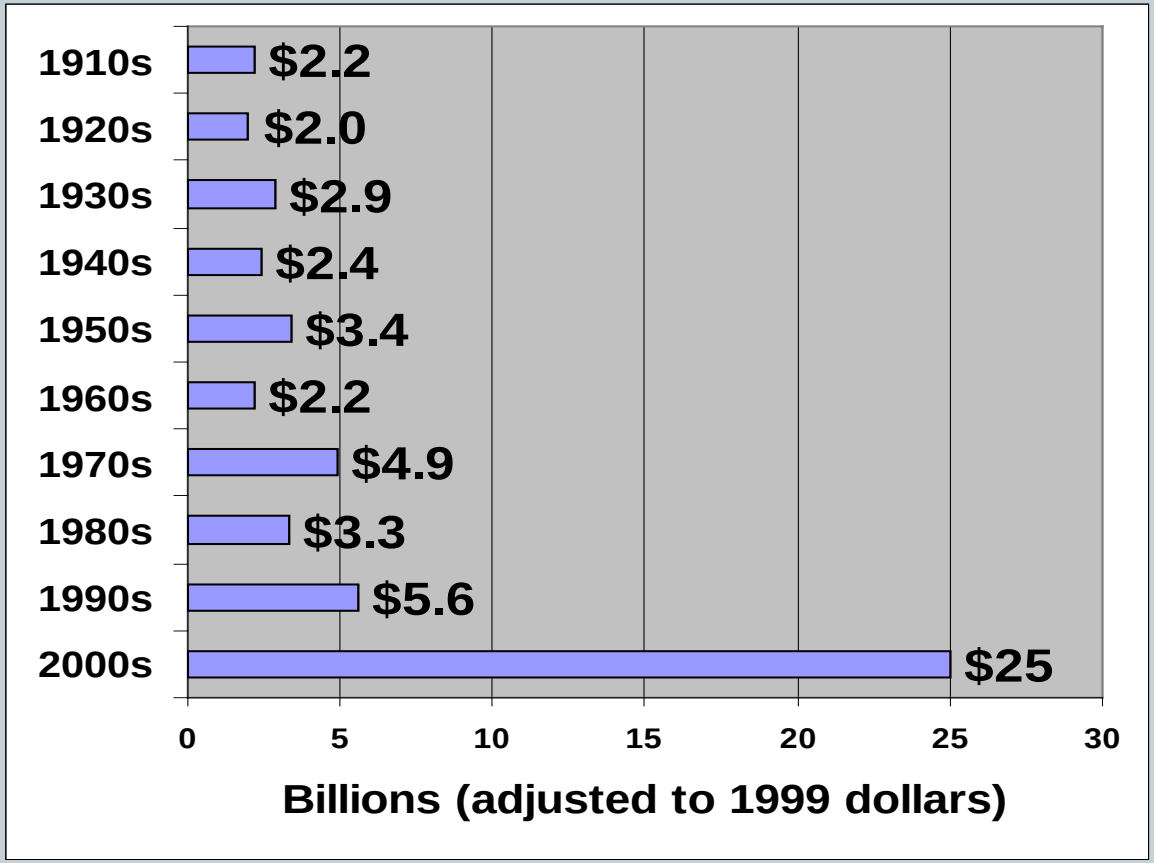
Slide Courtesy of Ed Thomas

Basic Flood Facts

- Flooding is #1 natural hazard in US and it is increasing
- More than 50% of properties in high-risk areas do not have flood insurance
- 25% flood insurance claims outside SFHA
- 26% chance of flood during 30-year mortgage (compared to 9% chance of fire)
- Studies show $4 savings on every $1 of mitigation

Trends in Flood Damages

- $16 billion annually
- Four-fold increase from early 1900s
- Per capita damages increased by more than a factor of 2.5 in the previous century in real dollar terms
- And then there was Katrina, Irene, and the Mississippi Floods…



Current Floodplain Management Approach Influences Damage Trends

- Promotes construction in risk areas
- Ignores changing conditions
- Ignores adverse impacts to existing properties
- Undervalues natural floodplain functions
- Transfer of who pays for Risk

What is Flood Management?

Flooding is a natural process that becomes problematic if property and life are put in the path of disaster!

THEREFORE:

Floodplain management is a decision making process for wise use of the Existing Floodplain based on all costs and benefits

Functions and Values

Wetlands

- **WILDLIFE AND WILDLIFE HABITAT**
- **FLOOD PROTECTION**
- **WATER QUALITY PROTECTION & IMPROVEMENT**
- **SURFACE WATER AND GROUNDWATER**
- **RECREATION AND AESTHETICS**
- **FOOD, JOBS, AND THE ECONOMY**

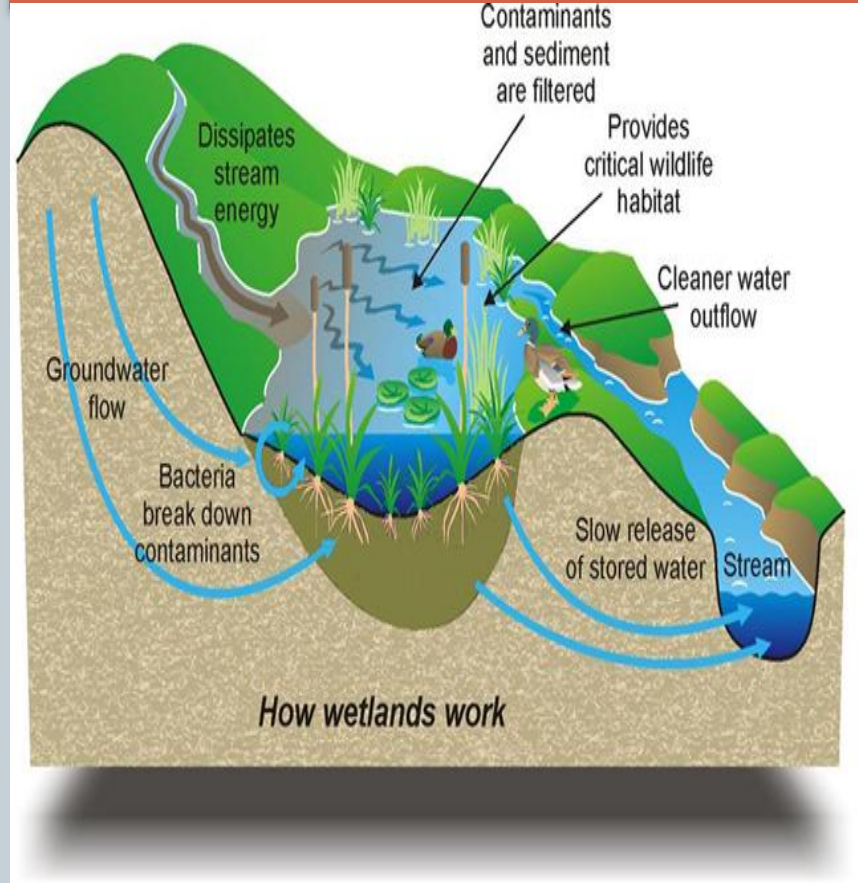
Floodplains

- **WATER RESOURCES VALUES**
  - **Natural Flood Storage and Conveyance.**
  - **Water Quality Maintenance**
  - **Groundwater Recharge**
- **LIVING RESOURCES AND HABITAT VALUES** (wildlife)
- **CULTURAL RESOURCES VALUES** (historical significance, aesthetics, recreation)

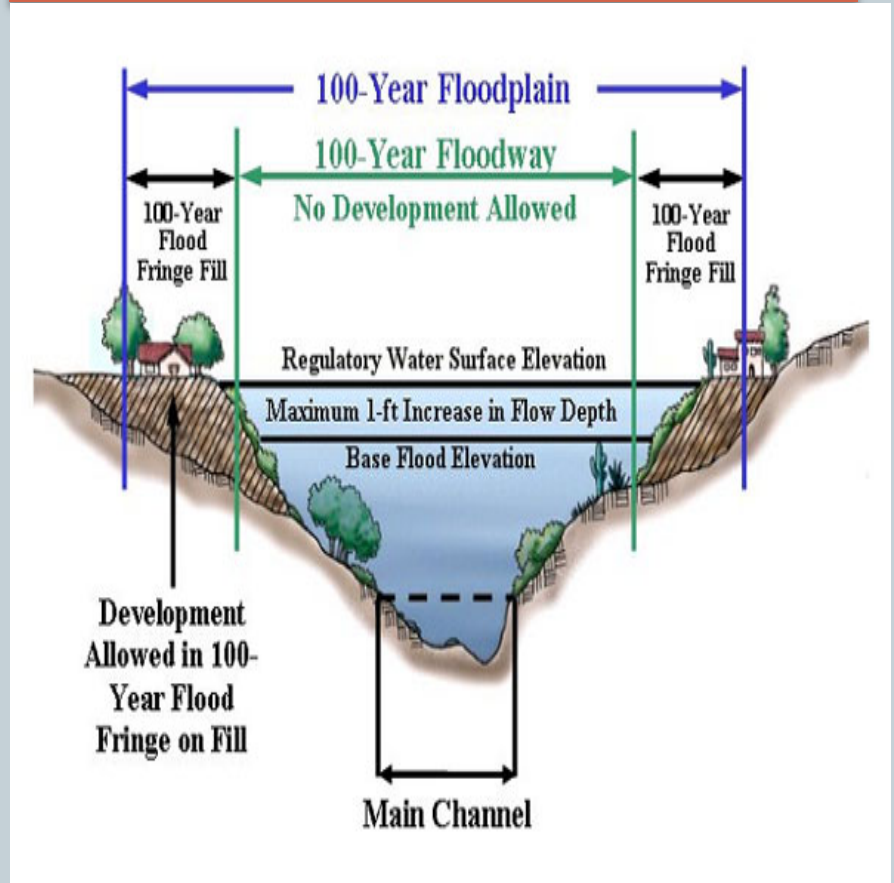
Slide Courtesy of Jeanne Christie

Functions and Values

Wetland



Floodplains



Slide Courtesy of Jeanne Christie

Funding and Programs Must Support Multi-Service Projects

- Flood Management+ Wildlife + Water Pollution
- Aesthetics + Flood Management + Wildlife
- Recreation + Groundwater Recharge + Sediment Management
- Wildlife + Erosion Control + Recreation
- Water Quality + Water Quantity

Slide Courtesy of Jeanne Christie

Constraints to Incorporating Ecosystem Functions and Services Into Local Land Use Decisions

- Local governments and Development:
  - Tend to have a short-term focus
  - Strive to increase the local tax base
  - Need to accommodate an increasing population
  - Must navigate local politics and property rights issues
  - Need to satisfy state/federal regulators
  - May not be aware of guidance/data on ecosystem service benefits

Natural Floodplain Functioning

Slide Courtesy of
John Mc Shane

ASFPM No Adverse Impact (NAI)

- Activities that could adversely impact flood damage to another property or community will be allowed only to the extent that the impacts are mitigated or have been accounted for within an adopted community-based plan.
- NAI is a concept/policy/strategy that broadens one's focus from the built environment to include how changes to the built environment potentially impact other properties.
- NAI broadens property rights by protecting the property rights of those that would be adversely impacted by the actions of others.

Economic Aspects of Integrated Flood Management

- “Floods produce several direct and indirect effects most of which remain unpriced by the market [and] prevents the market price from sending the correct signals about the true economic value of the wetland.”
- “…there is a need to consider other means to assess the true value of unpriced environmental resources taking into account implicit and explicit trade-offs between conservation and development.”
- Business as usual is not cost effective
- It is and will become increasingly difficult to get funds from federal government or state government
- Preserving (or Restoring) Natural Functions is cost effective (cheap)

Natural Floodplain Storage versus Detention Basins

- Located in the Menomonee River Watershed SE Wisconsin.
- Compared cost of building detention basin to provide flood water storage to preserving natural floodplain storage through the purchase of the land.

Constructed Detention	"Greenseams" (Natural Storage)
315M gallons	1.325 B gallons
$100M+	$22.5 M
$0.31 per gallon	$0.017 per gallon

- SE Wisconsin has lost 150,000 acres of wetlands and riparian flood storage, and more than 30 billion gallons of flood storage since the early 70s.

Natural Floodway Preservation
Otter Creek Vermont

- Town of Middlebury delineated natural floodplain and floodway
- Middlebury worked to prevent development in floodway
- Middlebury preserved natural floodplain and flood fringe through land purchases, zoning restrictions, and restoration of wetlands
- First big test was Tropical Storm (Hurricane) Irene
- Town of Rutland (30 miles upstream of Middlebury) saw a rapid rise in flow 15-16,000 CFS, severe damage, limited protection of natural floodplain
- Downstream in the Town of Middlebury no rapid rise, reduction in peak flow to 8,000 CFS, nearly 50% reduction with minimal damage.
- No calls from Middlebury Residents for dredging or channelization of Otter Creek. Cost benefit did not include structural flood control solutions not needed
- Up to 40 additional Vermont communities are looking at this model to lower their vulnerability to floods

Mike Kline, River Program Manager, Vermont Department of Environmental Conservation

Lessons From Louisiana and Katrina

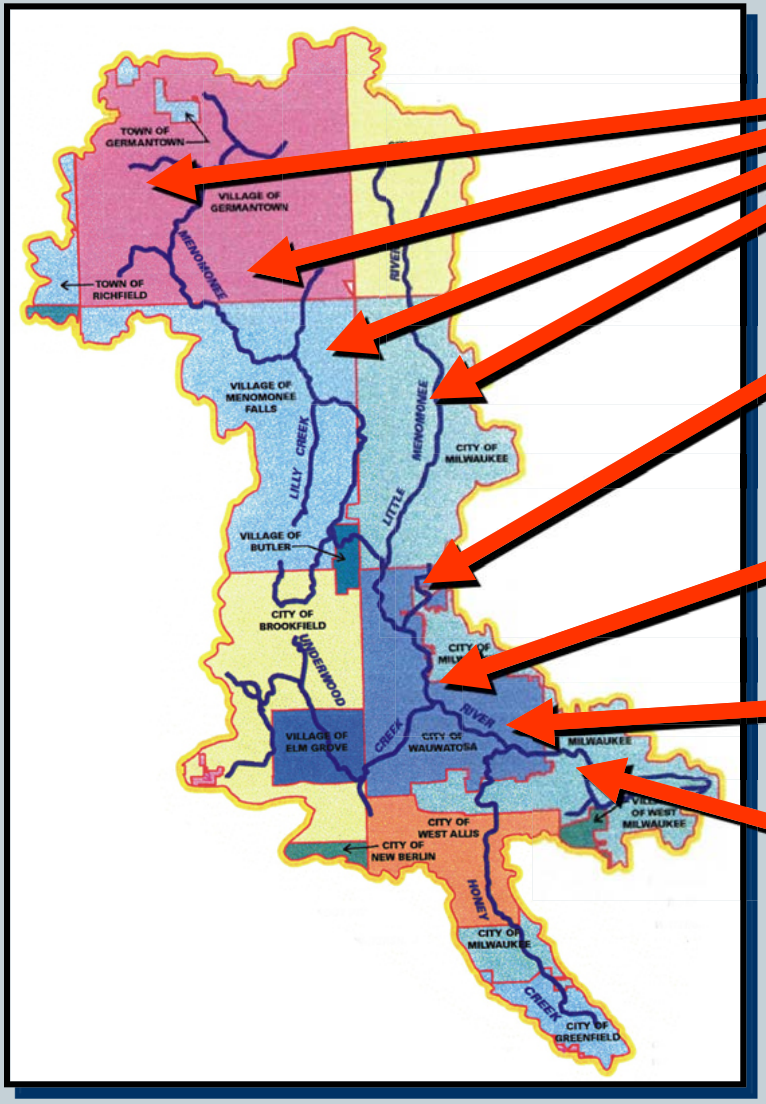
- Since the 1930s 1.2 million acres of Mississippi wetlands lost
- Levees and channels send billions of tons of sediment into the gulf
- Mississippi Delta Basin dams catch sand destined for barrier islands
- Wetlands can reduce the storm surge 1 foot for every 2,5 miles of wetlands
- There was reduced levee damage and flood damage where barrier islands, and wetlands were present in front of levee systems
- Levees damaged or breached where there was only open water
- The Mississippi River has the water, sediment and energy to rebuild the Delta
- Rebuilding the Delta will provide hurricane protection, increased fisheries, recreation, reduce “dead zone”, carbon sequestration, reduced flooding
- Costs to rebuild and restore the Delta are estimated at $15 Billion.
- Benefits are estimated at $12-$47 Billion/year.
- If treated as capital asset the value would be $330 billion to $1.3 trillion
- Rebuilt wetlands and barrier islands reconnected to the river system and delta will not degrade as constructed flood management facilities like levees

Bullet Points are from “What’s the Economy For Anyway?” John De Graaf and David Batker
Research from LSU Professors Paul Kemp, Hassan Mashriqui, and John Day

Menomonee River Watershed

Milwaukee, WI

Menomonee River Watercourse Management Plan



Greenseams Program

Timmerman Field Basin

County Grounds Basin & Hart Park

Western Milwaukee

Valley Park Levee Concrete Channel Removal

Every DROP COUNTS

- Rain Gardens

- Rain Barrels

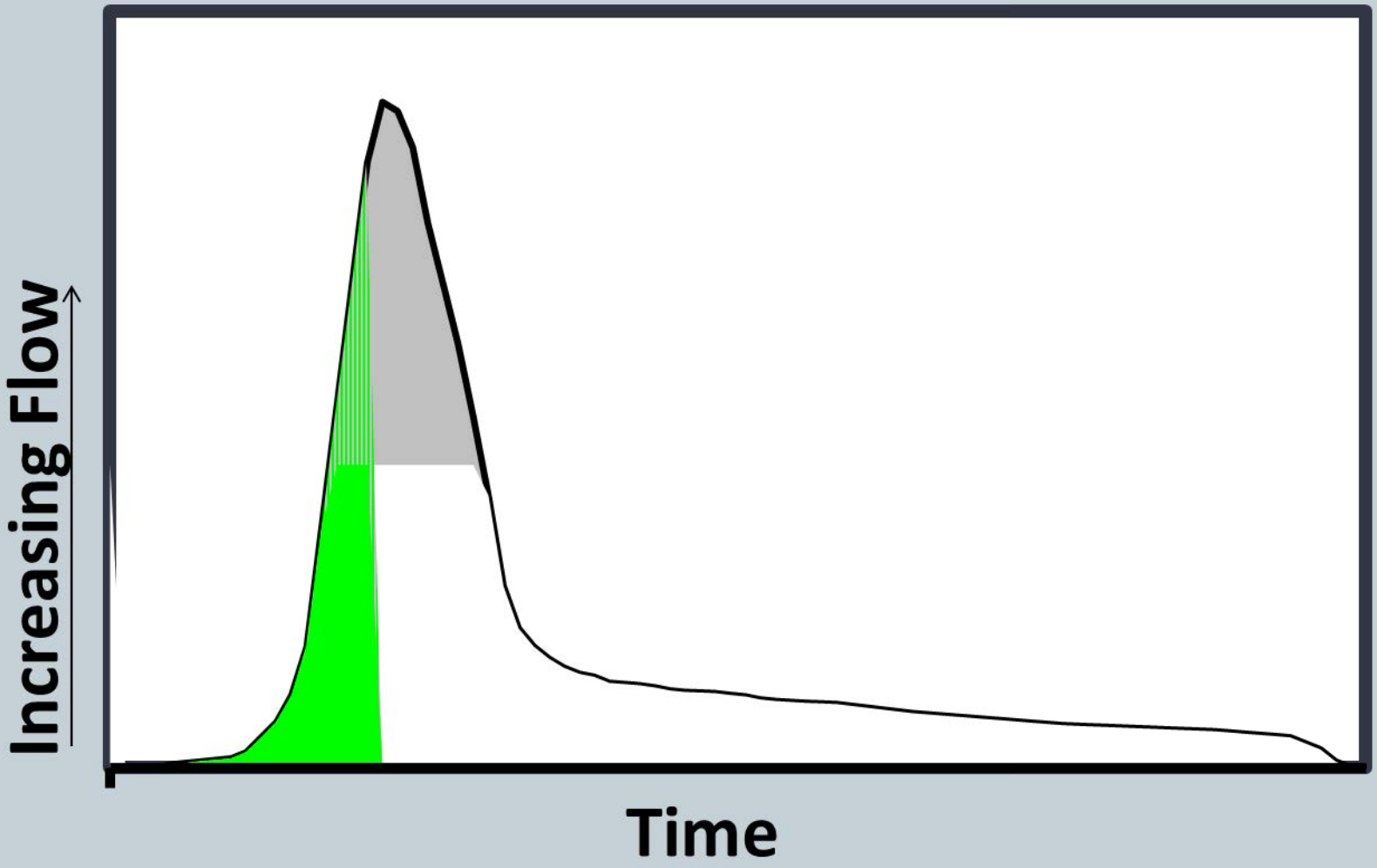
Promote BMP's…

- Stormwater Trees

- Downspout Disconnection

- Green Roofs

Green vs Grey Infrastructure



LAKE MICHIGAN

Rain Gardens

INITIATIVE

150, 700 Plants Sold Since 2006

Rain barrels

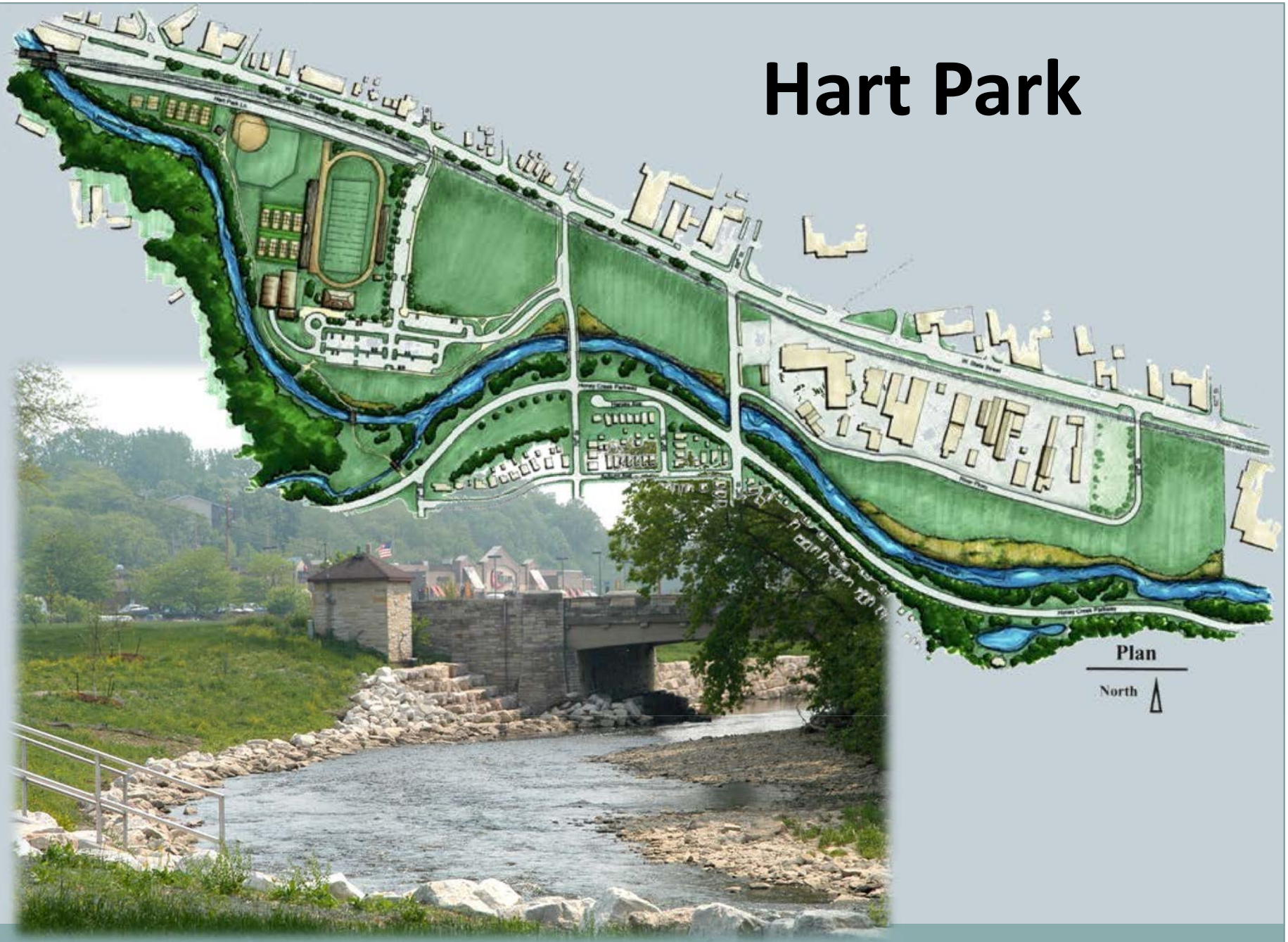
More than 20,000 Sold

Greenseams Land Purchases Superimposed on Downtown Milwaukee

Green Roofs

County Grounds

Hart Park



Hart Park Flood Management

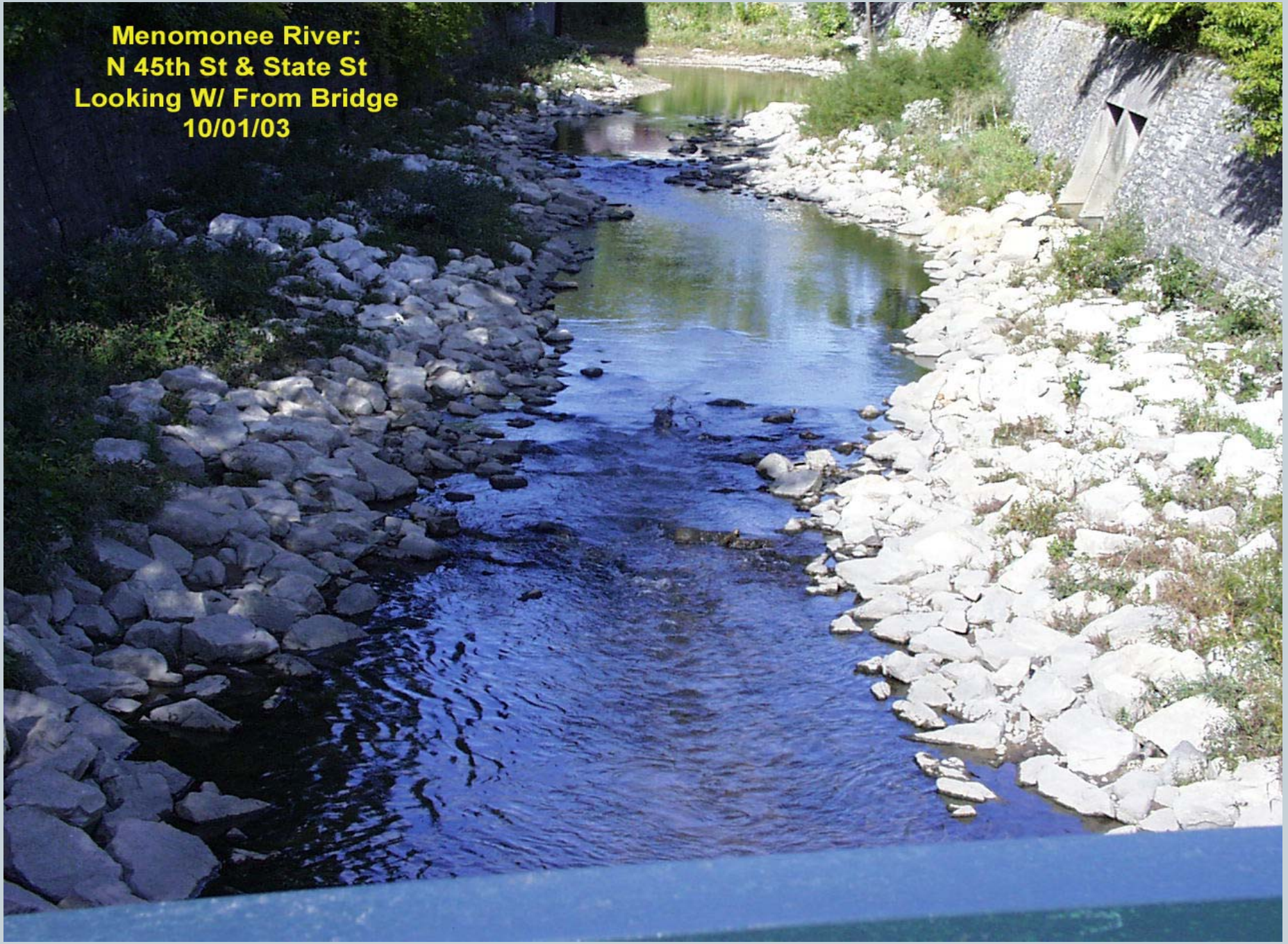
Rehabilitating Urban Streams

Old Ideas

New Ideas

Photos: Dr. Thomas M. Slawski


Men. River
Drop Structue
Dewatering Channel
12/20/99


Menomonee River:
N 45th St & State St
Looking W/ From Bridge
10/01/03

Revitalize Menomonee River Channel

Slide Courtesy of Tom Sear

Green Streets and Sustainable Storm Water Management

Before

After

Curb extensions instead of bigger pipes for storm water flows

Green infrastructure can be used

when its cost ≈ grey infrastructure.

Stormwater Trees

This needs lots of Explaining Lucy

Trees hold rain to reduce storm water runoff.

Small Project Can Have a Huge Impact… in urban areas

Channel Restoration Improved Fishing and Water Quality

Photos: Dr. Thomas M. Slawski and SEWRPC

MMSD Water Quality Index Menomonee River

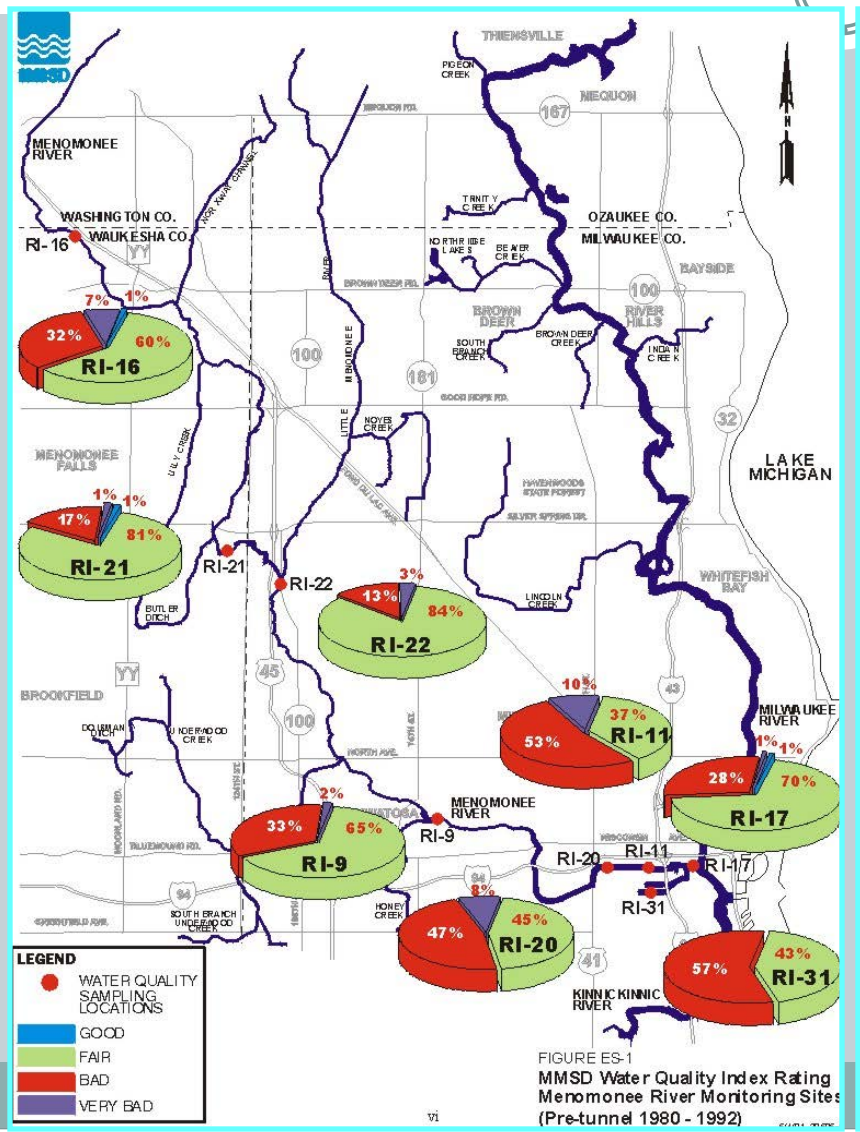


FIGURE ES-1
MMSD Water Quality Index Rating
Menomonee River Monitoring Sites
(Pre-tunnel 1980 - 1992)

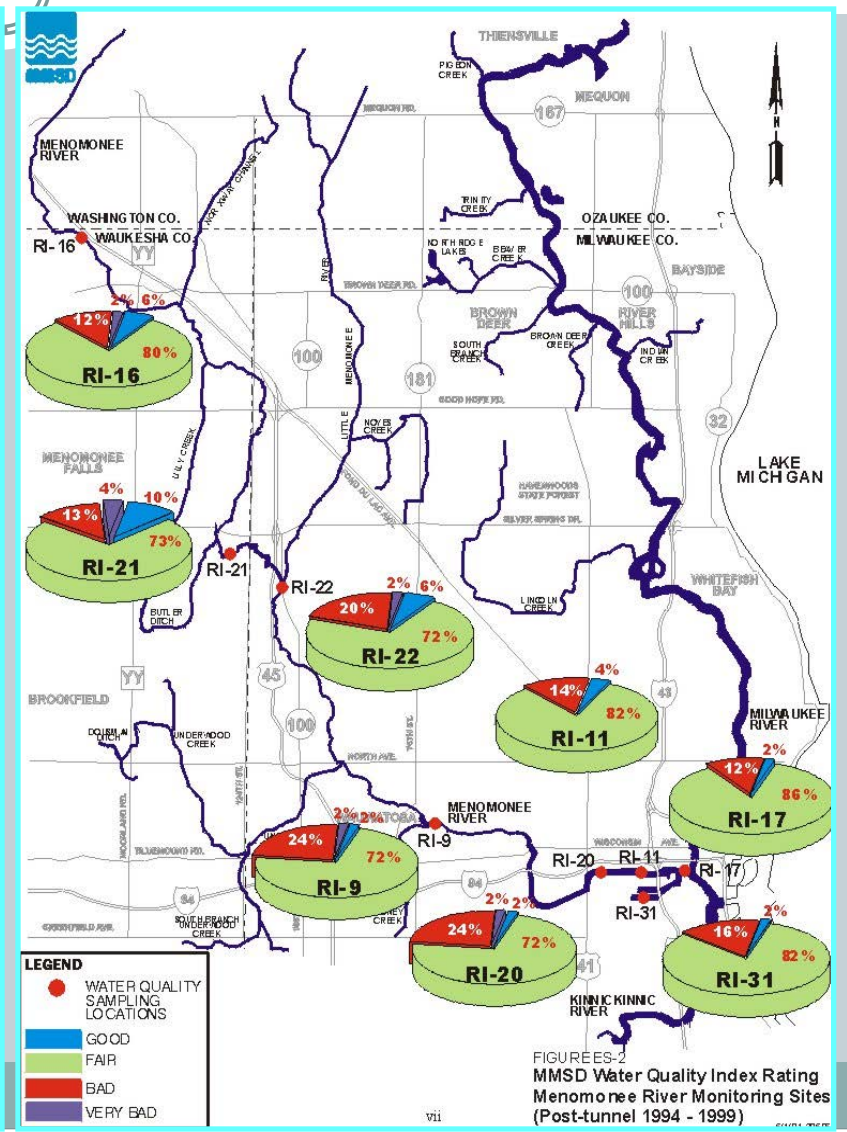


FIGURE ES-2
MMSD Water Quality Index Rating
Menomonee River Monitoring Sites
(Post-tunnel 1994 - 1999)

Underwood Creek – Before Construction 2008

Underwood Creek Phase I Construction - 2009

Underwood Creek Phase I – Post Construction 2009

Existing Conditions & 1st Flood Event

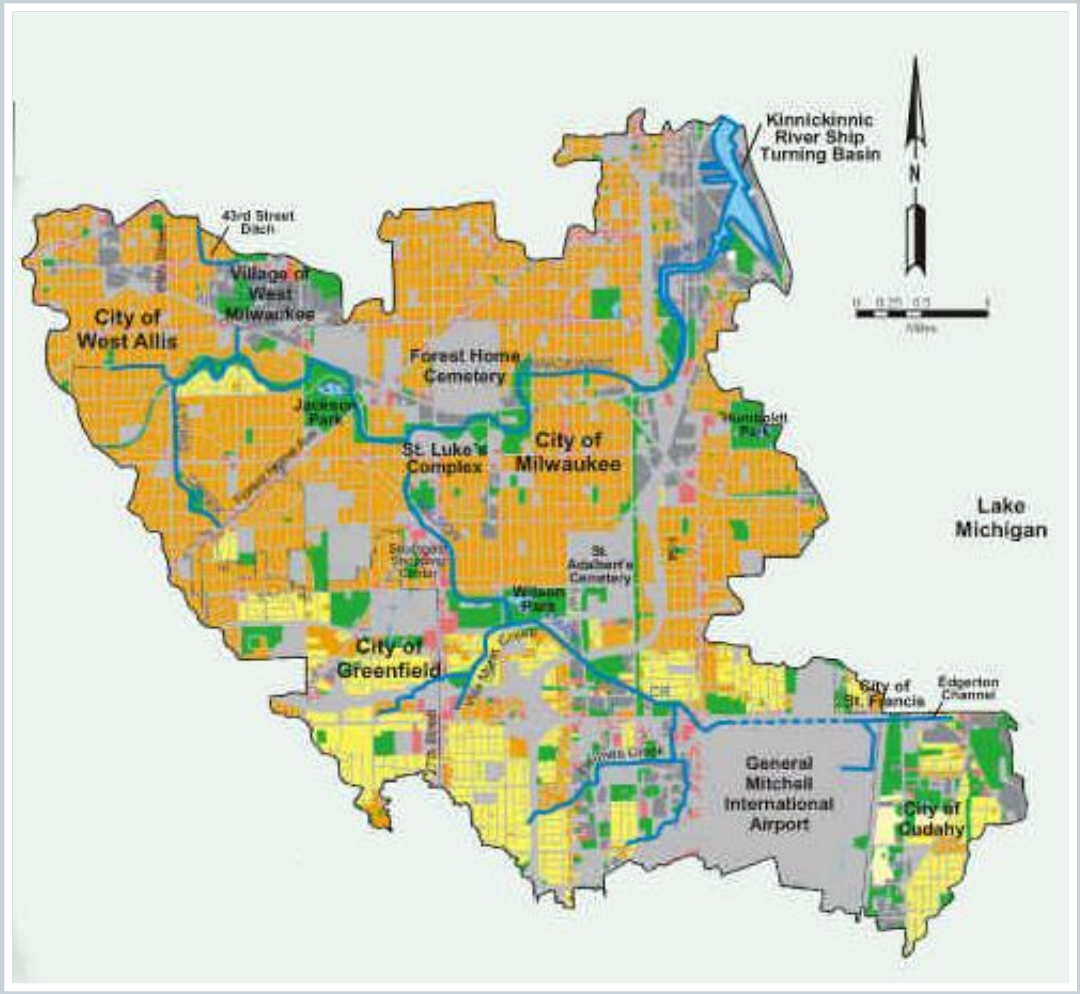
Kinnickinnic River Project

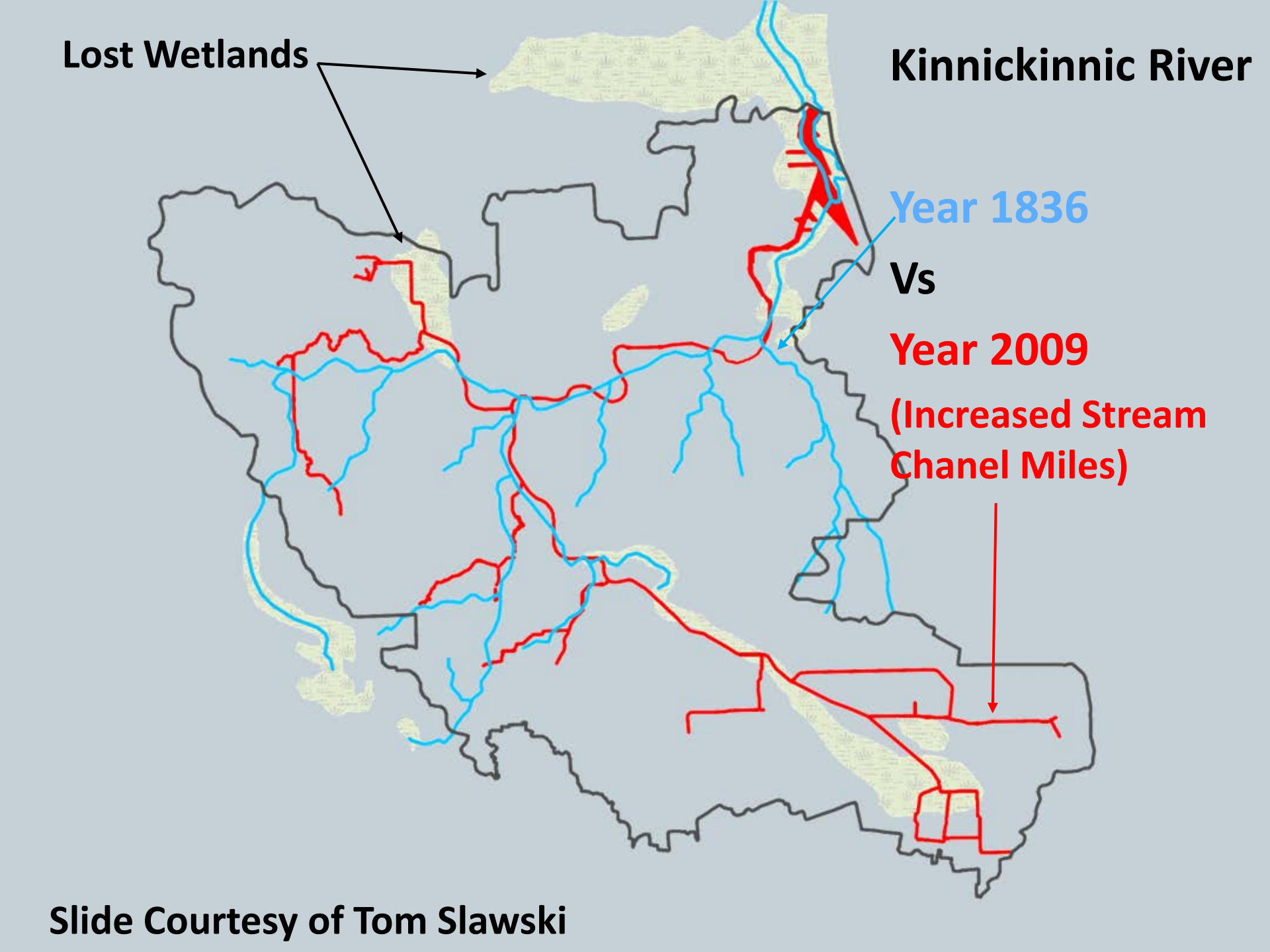
Objectives:

- Reduce Flood Risk
- Improve Public Safety
- Stream Channel Rehabilitation
- Neighborhood Development

Kinnickinnic River Watershed

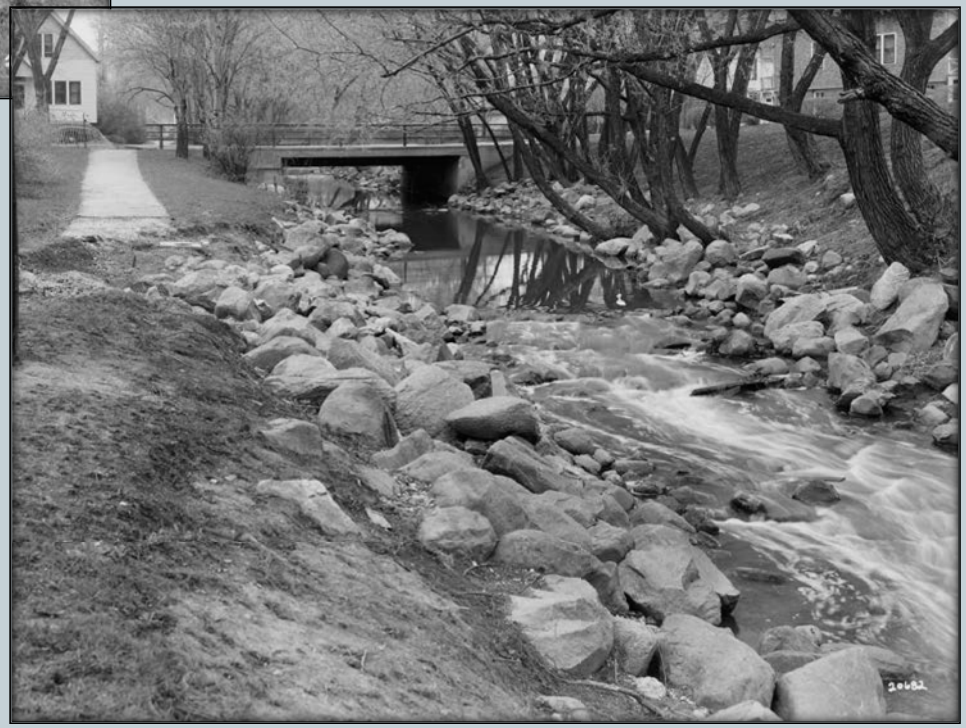
Was voted one of the top ten worst rivers in North America in 2007





Slide Courtesy of Tom Slawski

Kinnickinnic River 1930-1960



- Channel photos taken April 1960 in vicinity of S. 6th St Bridge
- Channel constructed by WPA in 1930's

March 1960 Flood Event

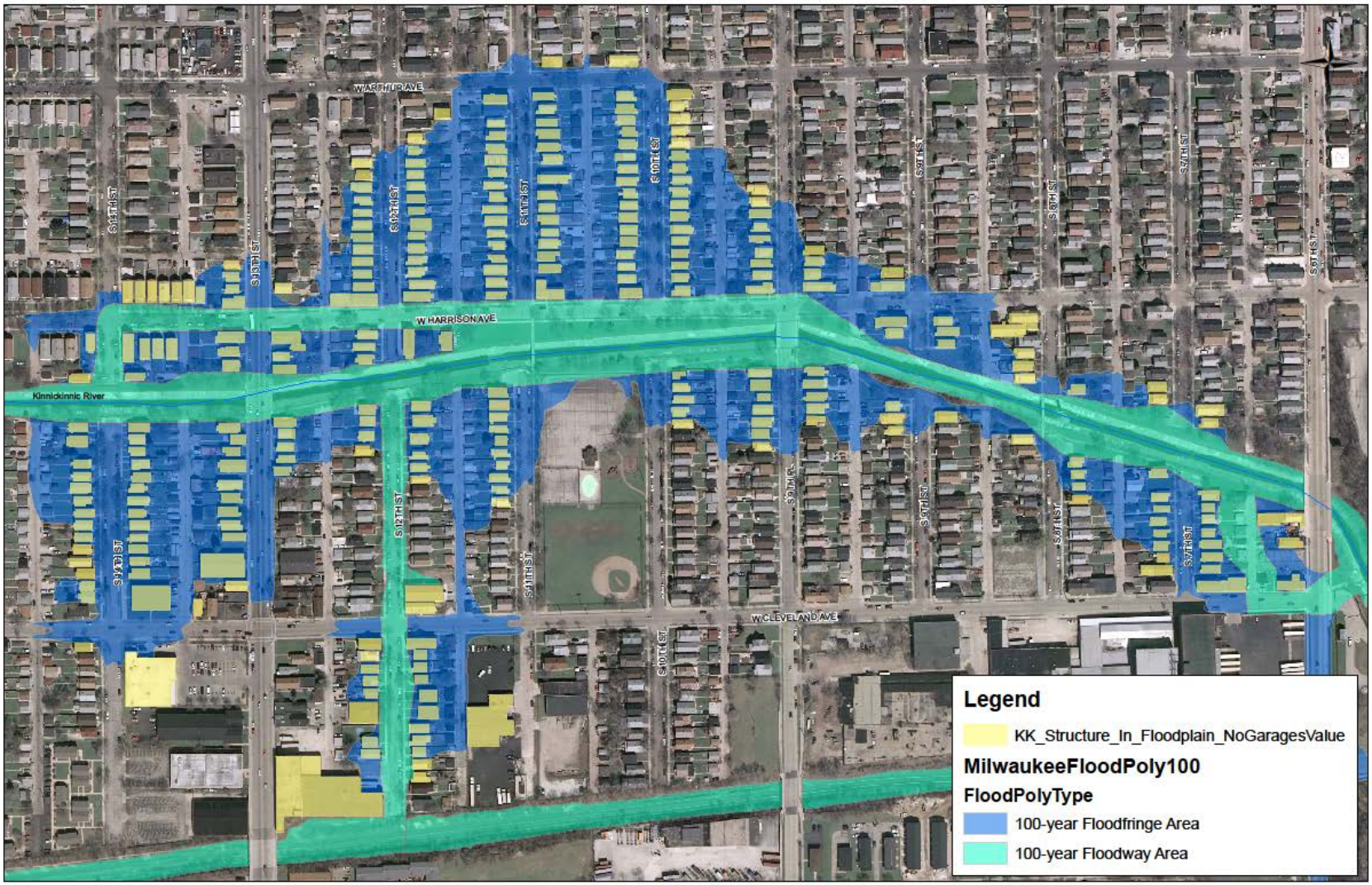
Flooding in S. 12th St South of the KK River

Flood Risk Management
Improved Channel?

Concrete Channel Encouraged Development in Floodplain

Kinnickinnic River 9th Place and Cleveland
June 7, 2008 (50 Year Flood)

KK River “100 year ”Floodplain and Floodway

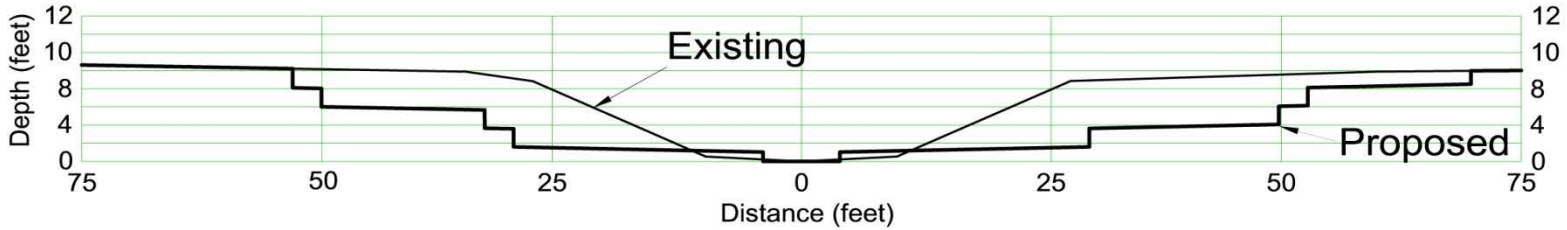


Current Project Background

- KK Watercourse Plan updated in October 2009
- Reduce flood risk for ~328 properties
- Improves public safety
- Includes acquiring 100 properties with 83 structures (Deconstruction Used)
- Neighborhood Plan (Catalytic Project)

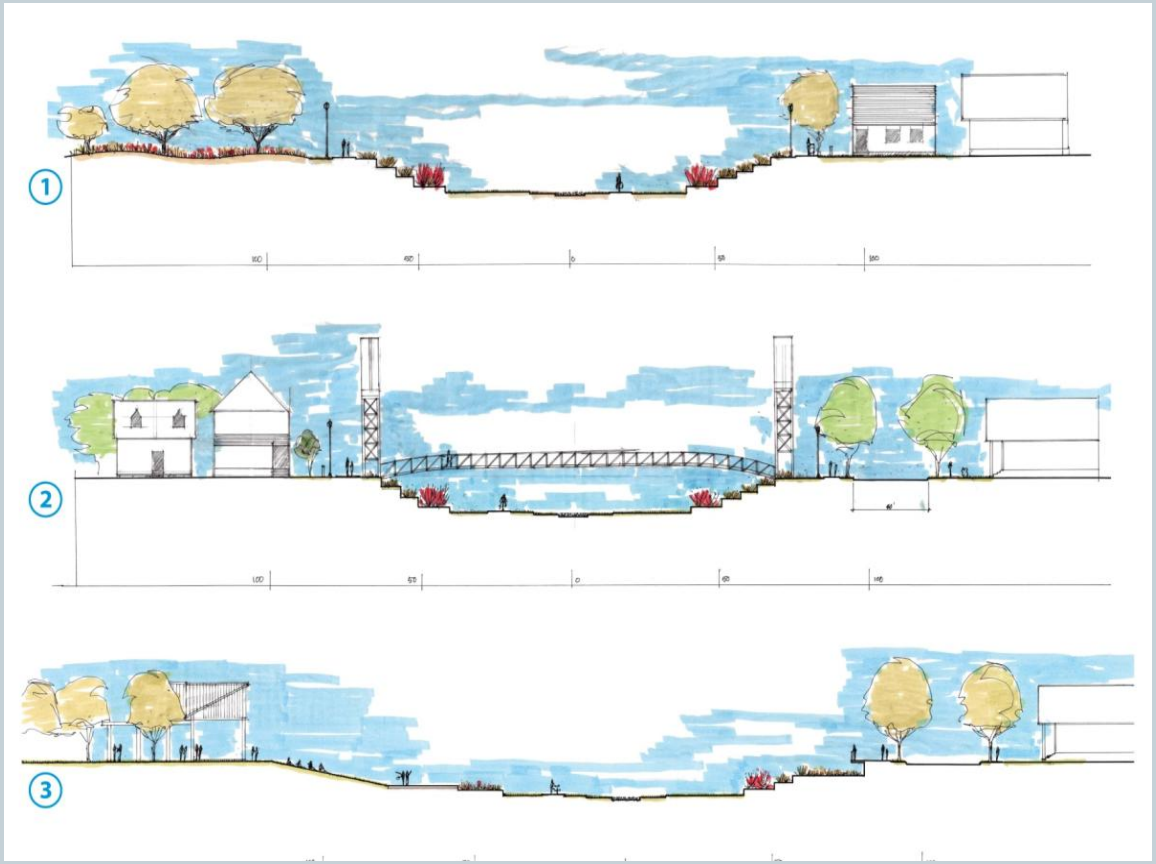
KK River Channel Alternatives 6th-16th Street

Stone Channel & Vegetated Overbanks Without Walls



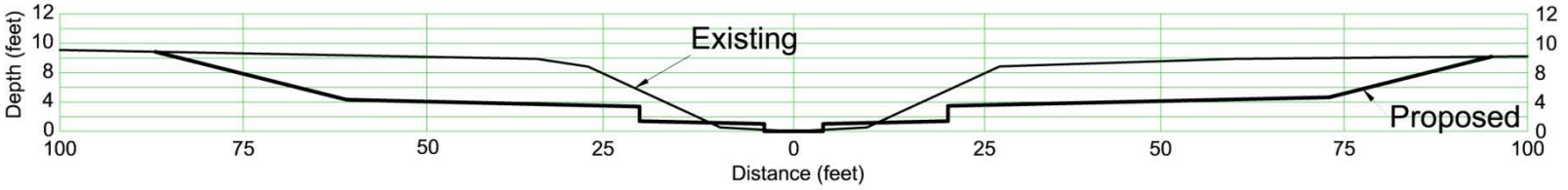
Low Flow Channel & Vegetated Overbanks With Walls

Potential Bioengineered Channel Conceptual Cross Sections

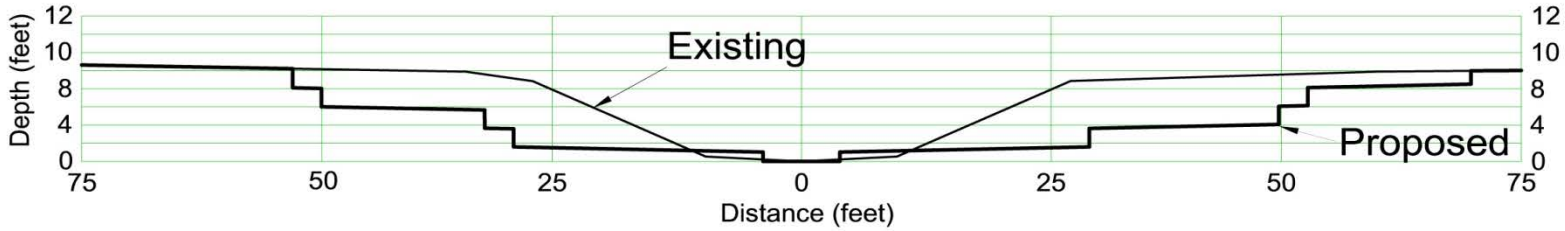


Kinnickinnic River Vision

KK River Channel Alternatives 6th-16th Street



Stone Channel & Vegetated Overbanks Without Walls



Low Flow Channel & Vegetated Overbanks With Walls

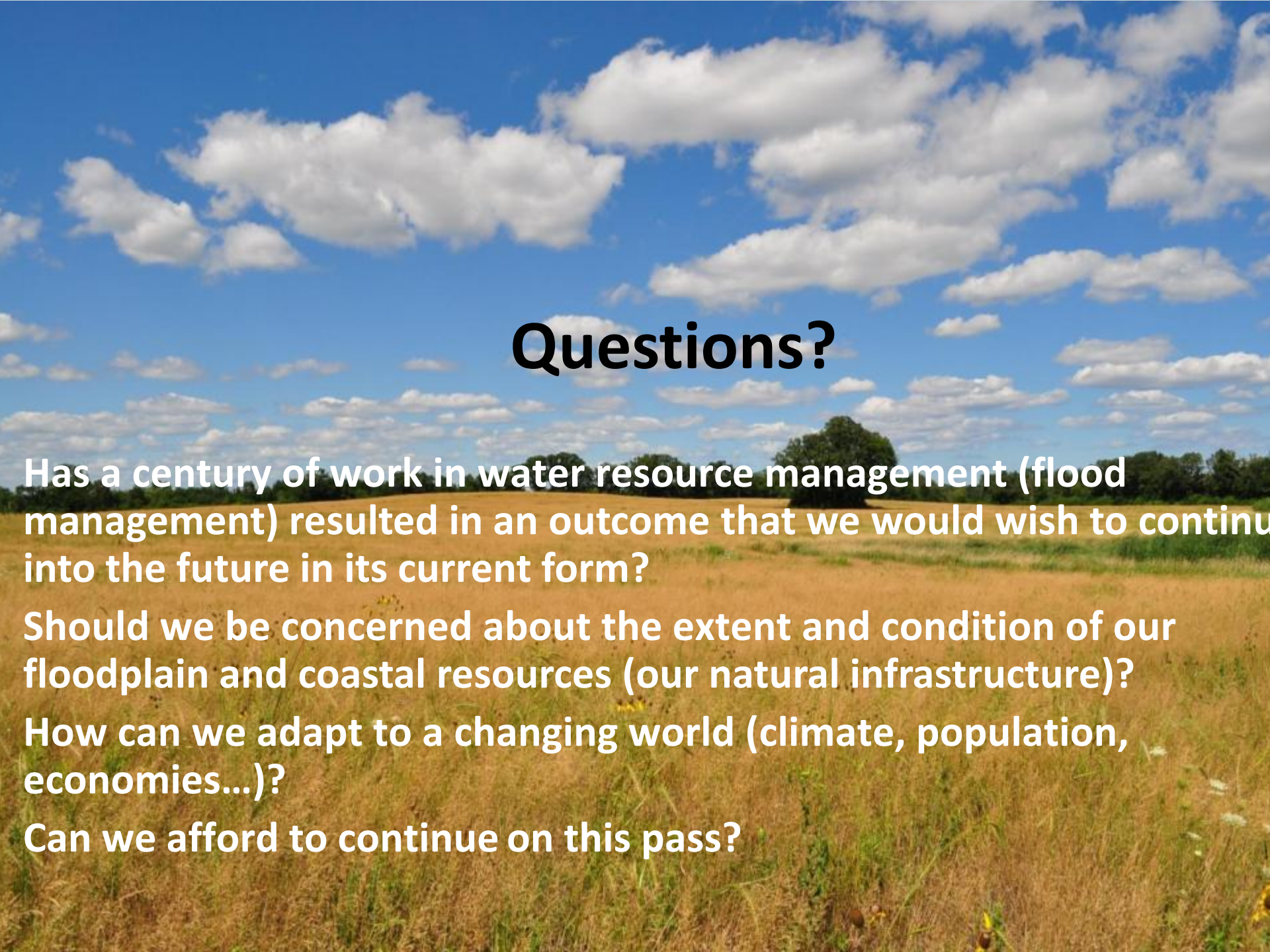
KK River 6th Street to I -94 Upstream 2010

- Existing concrete channel

Concrete Channel Removal

Channel Construction Completed


Oh, crap!
Was that
TODAY?
REGAN



Questions?

- Has a century of work in water resource management (flood management) resulted in an outcome that we would wish to continu into the future in its current form?
- Should we be concerned about the extent and condition of our floodplain and coastal resources (our natural infrastructure)?
- How can we adapt to a changing world (climate, population, economies…)?
- Can we afford to continue on this pass?