# Advancing Ecosystem Service Inclusion in BCA at the Local Level: FEMA Policy Impacts in Southern Wisconsin


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We value the earth.

EARTH ECONOMICS

- Founded in 1998 by David Batker (via Herman Daly, World Bank, Greenpeace)
- WA state based 501(c)3 non-profit
- Focus: Ecosystem Services Valuations to:
  - Champion sustainability
  - Invent novel win-win funding mechanisms for ecosystem preservation
  - Influence policy
  - Reform Accounting Rules

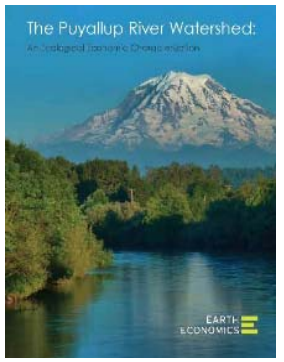
- Our tagline: *"We Value the Earth"*

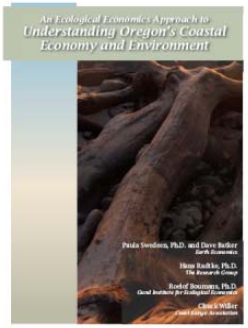

Earth Economics
is changing policy

# Sample Earth Economics Projects

1. Ecosystem Service Valuations (ESVs) at many scales & types:
    - Entire Colorado River Basin
    - Alaska “Mat-Su” Valley (Anchorage to Mt. McKinley)
    - Tulalip & Nisqually Tribe Valuations, WA State
    - Colombia (Legal Settlement for Anchicaya River Damages)
    - Long Island Sound Watershed
    - Costa Rica: Coastal Forests
    - Central and Northern California (9 counties)
    - Upper Mississippi watersheds
    - Mississippi Delta and storm-surge protection
2. Data Provider to FEMA’s Benefit Cost Analysis Tool
3. “21st Century Utilities” (reforming US GASB Accounting Rules)
4. Green Jobs
5. Core to all our work: Ecosystem Valuation Toolkit (EVT)

Current and past projects: eartheconomics.org/WhatWeDo.aspx





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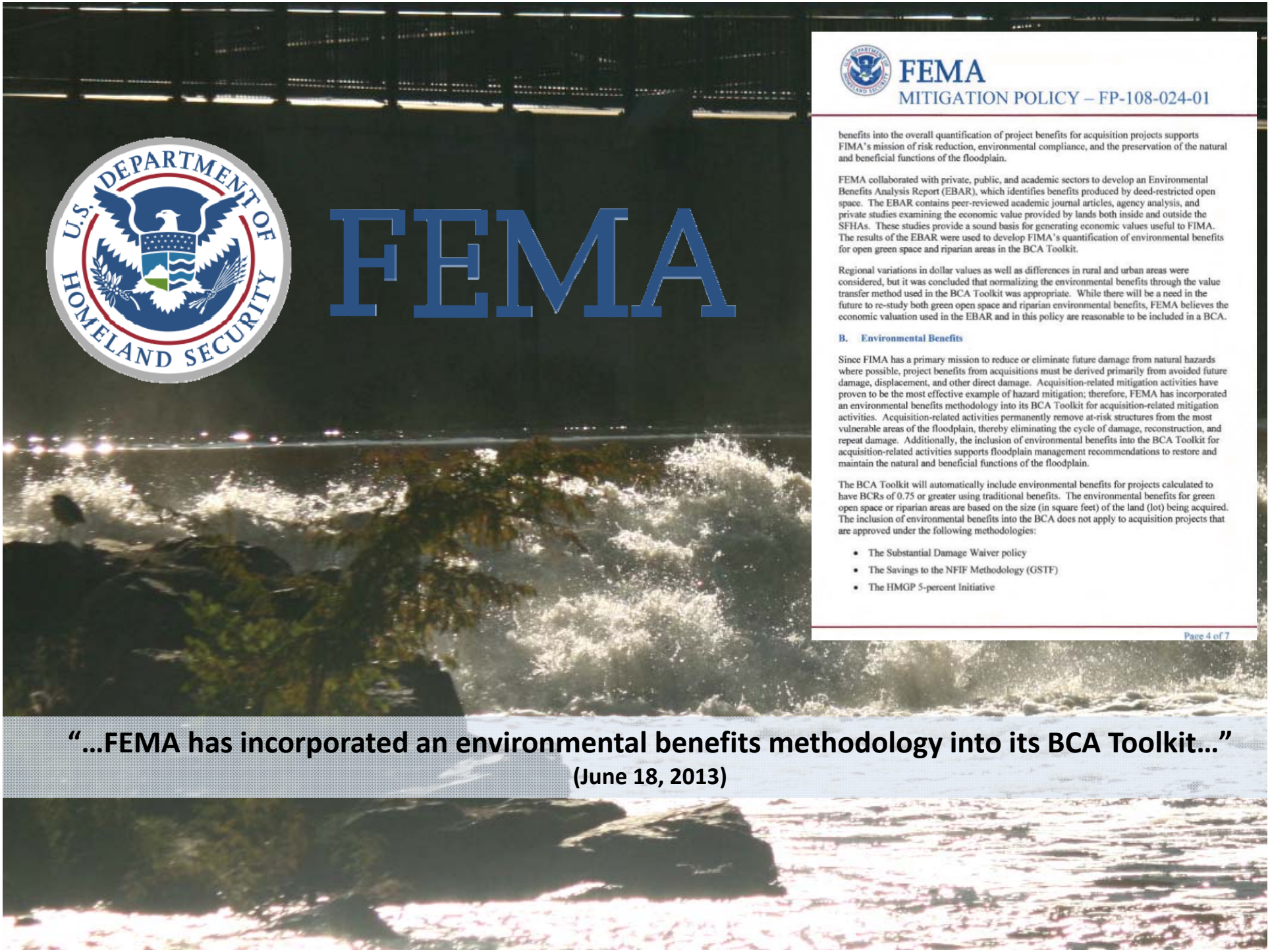
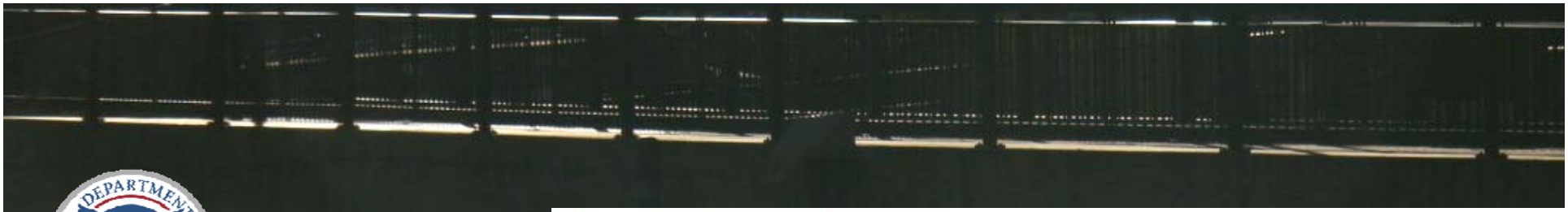



**"…FEMA has incorporated an environmental benefits methodology into its BCA Toolkit…"**

**(June 18, 2013)**



FEMA

## III. POLICY STATEMENT:

FEMA will allow the inclusion of environmental benefits in benefit-cost analyses (BCA) to determine cost effectiveness of acquisition projects.

## IV. PURPOSE:

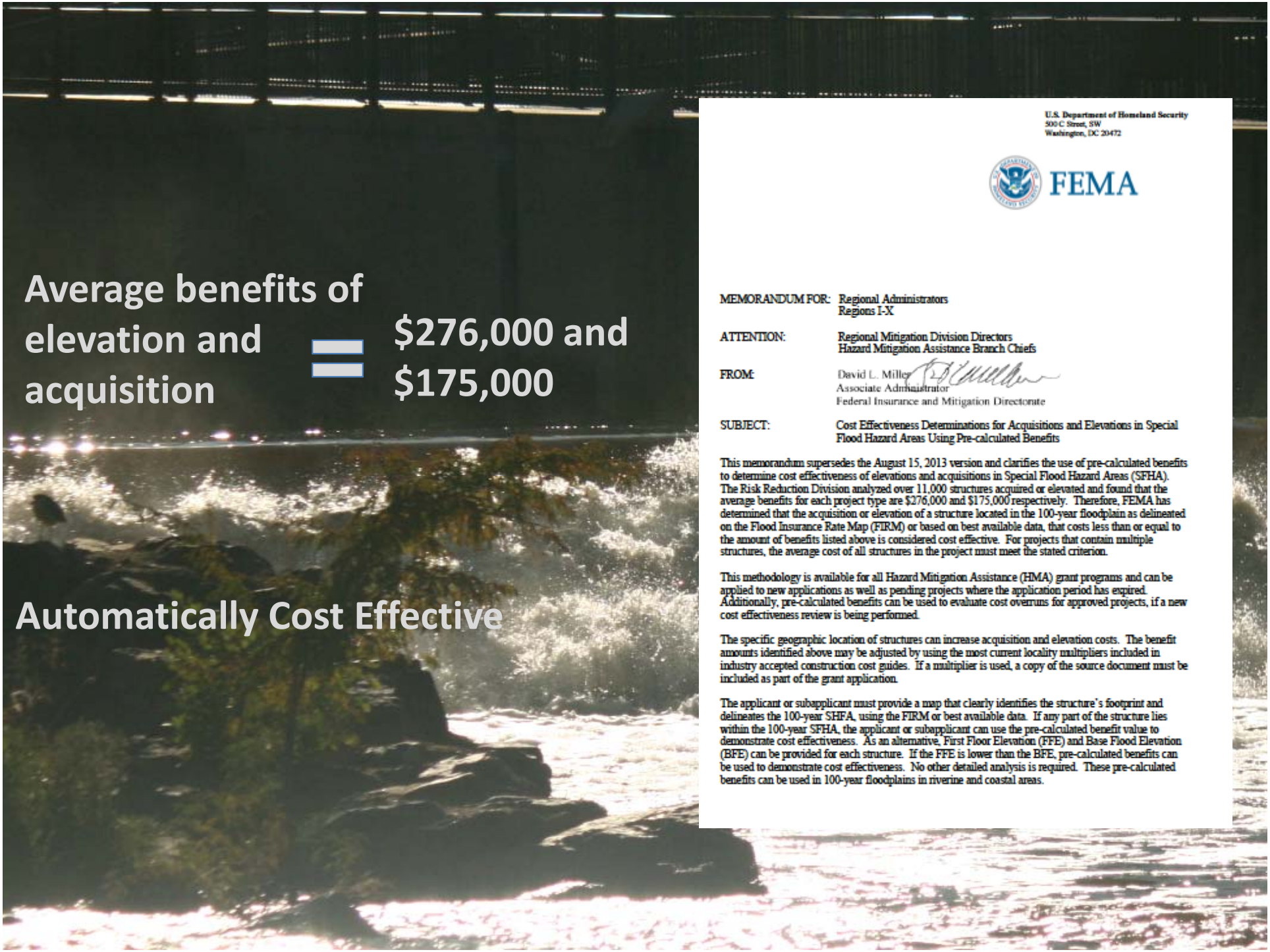
The purpose of this policy is to identify and quantify the types of environmental benefits that FEMA will consider in the BCA for acquisition projects.

Table I: Annual Estimated Monetary Benefits per Acre per Year

| Environmental Benefit | Green Open Space | Riparian |
|---|---|---|
| Aesthetic Value | $1,623 | $582 |
| Air Quality | $204 | $215 |
| Biological Control | -- | $164 |
| Climate Regulation | $13 | $204 |
| Erosion Control | $65 | $11,447 |
| Flood Hazard Reduction | -- | $4,007 |
| Food Provisioning | -- | $609 |
| Habitat | -- | $835 |
| Pollination | $290 | -- |
| Recreation/Tourism | $5,365 | $15,178 |
| Storm Water Retention | $293 | -- |
| Water Filtration | -- | $4,252 |
| **Total Estimated Benefits** | $7,853 | $37,493 |

Table II: Green Open Space and Riparian Benefits Allowed in the BCA Toolkit

| Land Use | Total Estimated Benefits | Total Estimated Benefits (projected for 100 years with 7 percent discount rate) |
|---|---|---|
| Green Open Space | $7,853 per acre per year | $2.57 per square foot |
| Riparian | $37,493 per acre per year | $12.29 per square foot |



**Average benefits of elevation and acquisition** = **$276,000 and $175,000**

**Automatically Cost Effective**

U.S. Department of Homeland Security
500 C Street, SW
Washington, DC 20472

FEMA

MEMORANDUM FOR: Regional Administrators
Regions I-X

ATTENTION: Regional Mitigation Division Directors
Hazard Mitigation Assistance Branch Chiefs

FROM: David L. Miller
Associate Administrator
Federal Insurance and Mitigation Directorate

SUBJECT: Cost Effectiveness Determinations for Acquisitions and Elevations in Special Flood Hazard Areas Using Pre-calculated Benefits

This memorandum supersedes the August 15, 2013 version and clarifies the use of pre-calculated benefits to determine cost effectiveness of elevations and acquisitions in Special Flood Hazard Areas (SFHA). The Risk Reduction Division analyzed over 11,000 structures acquired or elevated and found that the average benefits for each project type are $276,000 and $175,000 respectively. Therefore, FEMA has determined that the acquisition or elevation of a structure located in the 100-year floodplain as delineated on the Flood Insurance Rate Map (FIRM) or based on best available data, that costs less than or equal to the amount of benefits listed above is considered cost effective. For projects that contain multiple structures, the average cost of all structures in the project must meet the stated criterion.

This methodology is available for all Hazard Mitigation Assistance (HMA) grant programs and can be applied to new applications as well as pending projects where the application period has expired. Additionally, pre-calculated benefits can be used to evaluate cost overruns for approved projects, if a new cost effectiveness review is being performed.

The specific geographic location of structures can increase acquisition and elevation costs. The benefit amounts identified above may be adjusted by using the most current locality multipliers included in industry accepted construction cost guides. If a multiplier is used, a copy of the source document must be included as part of the grant application.

The applicant or subapplicant must provide a map that clearly identifies the structure's footprint and delineates the 100-year SHFA, using the FIRM or best available data. If any part of the structure lies within the 100-year SFHA, the applicant or subapplicant can use the pre-calculated benefit value to demonstrate cost effectiveness. As an alternative, First Floor Elevation (FFE) and Base Flood Elevation (BFE) can be provided for each structure. If the FFE is lower than the BFE, pre-calculated benefits can be used to demonstrate cost effectiveness. No other detailed analysis is required. These pre-calculated benefits can be used in 100-year floodplains in riverine and coastal areas.

# What is the impact on the ground?

- Our hypotheses:
  - The new BCA mitigation policy will help expand floodplain access for rivers and streams.
  - By establishing a threshold for automatic cost-effectiveness, acquisition and elevation applications will become much simpler for the towns, counties, and states involved.

# Case Study 1: Jefferson County

**Do the new policies change acquisition funding during a federal disaster?**



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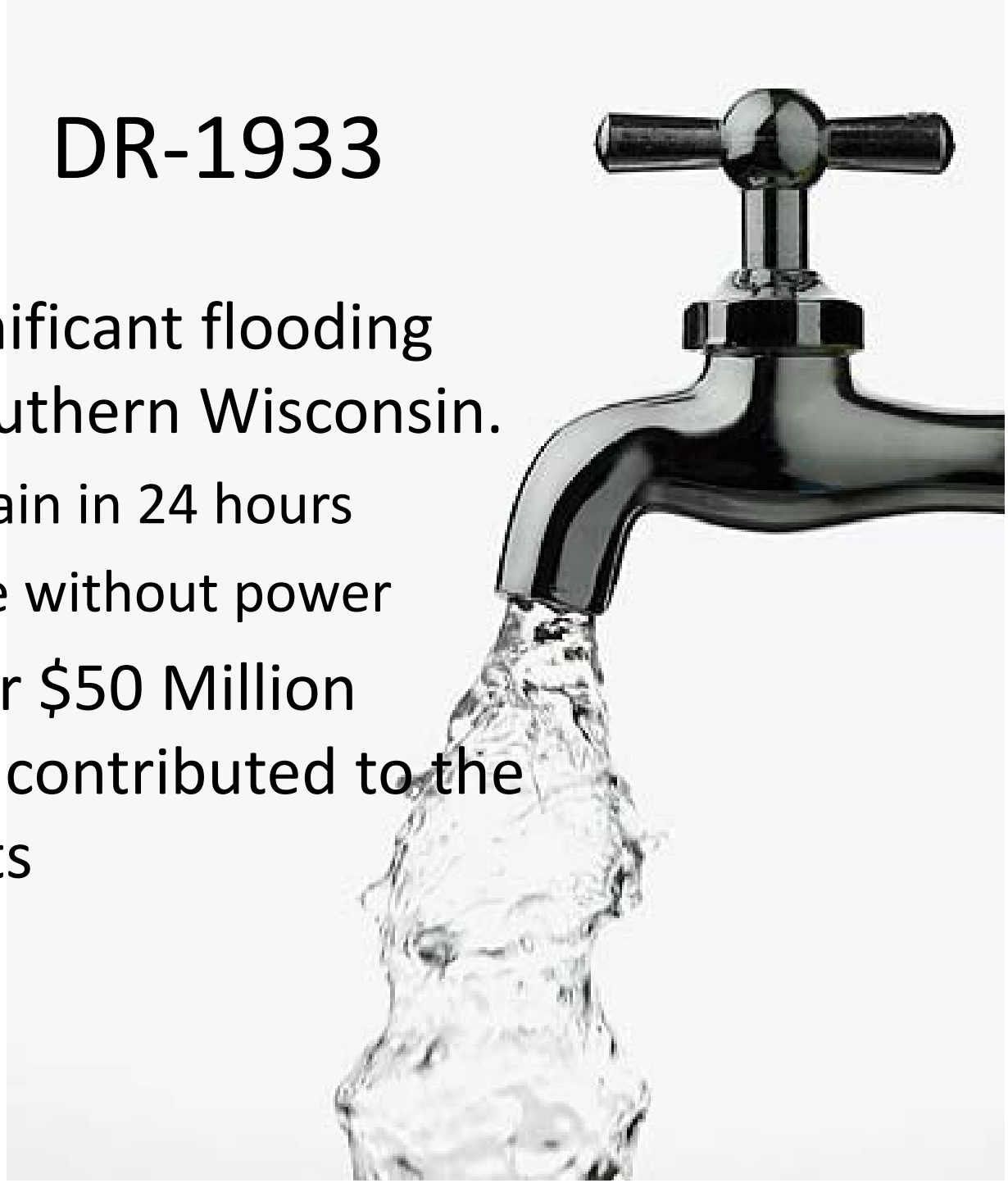
# DR-1933

- July, 2010, significant flooding throughout southern Wisconsin.
  - 12 inches of rain in 24 hours
  - 32,000 people without power
- Ultimately over $50 Million federal dollars contributed to the recovery efforts



# Jefferson County Applies for Mitigation Funding

- 37 high priority properties for acquisition
- Only 20 in the final proposal to FEMA with BCR=1.04
- $1.3 million provided from HMGP funds

# Our Approach

- Rerun the BCA Toolkit V5.0 with the new policies in mind.
- Ask ourselves and the toolkit if we can get every property to pass the 1.0 BCR threshold.

# Preliminary Results

- After inflation, only four of the properties were above the automatic cost effectiveness threshold.
- Of the four, only one qualified for including ES on its own.
- Because of the way that bundling can occur for project applications, ASFPM and WI EM were able to demonstrate that **all 37 properties could have reached a 1.0 BCR**.



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# Case Study 2: City of Portage

## Ecosystem Services and Stormwater Management



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# Original FEMA application

- Submitted February 2012
- Requested about $430,000
- Construct a parallel storm sewer to an existing sewer line that would alleviate flooding and damages to residential properties.
- The project proposed was meant to increase storm sewer drainage capacity for short duration storm events


Portage
Waunakee
Sun Prairie
Middleton
Madison
Fitchburg
Airport
Portage
N
Legend
EARTH ECONOMICS
5m Contour Isoline
0 0.1 0.2 0.4
Miles

# FEMA Response

- Cost: 440,249
- Benefits: 472,855

Benefit-Cost Ratio of 1.07

- FEMA throws out many of the benefits

Benefit-Cost Ratio of 0.11

Application Rejected



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# Alternative Approaches

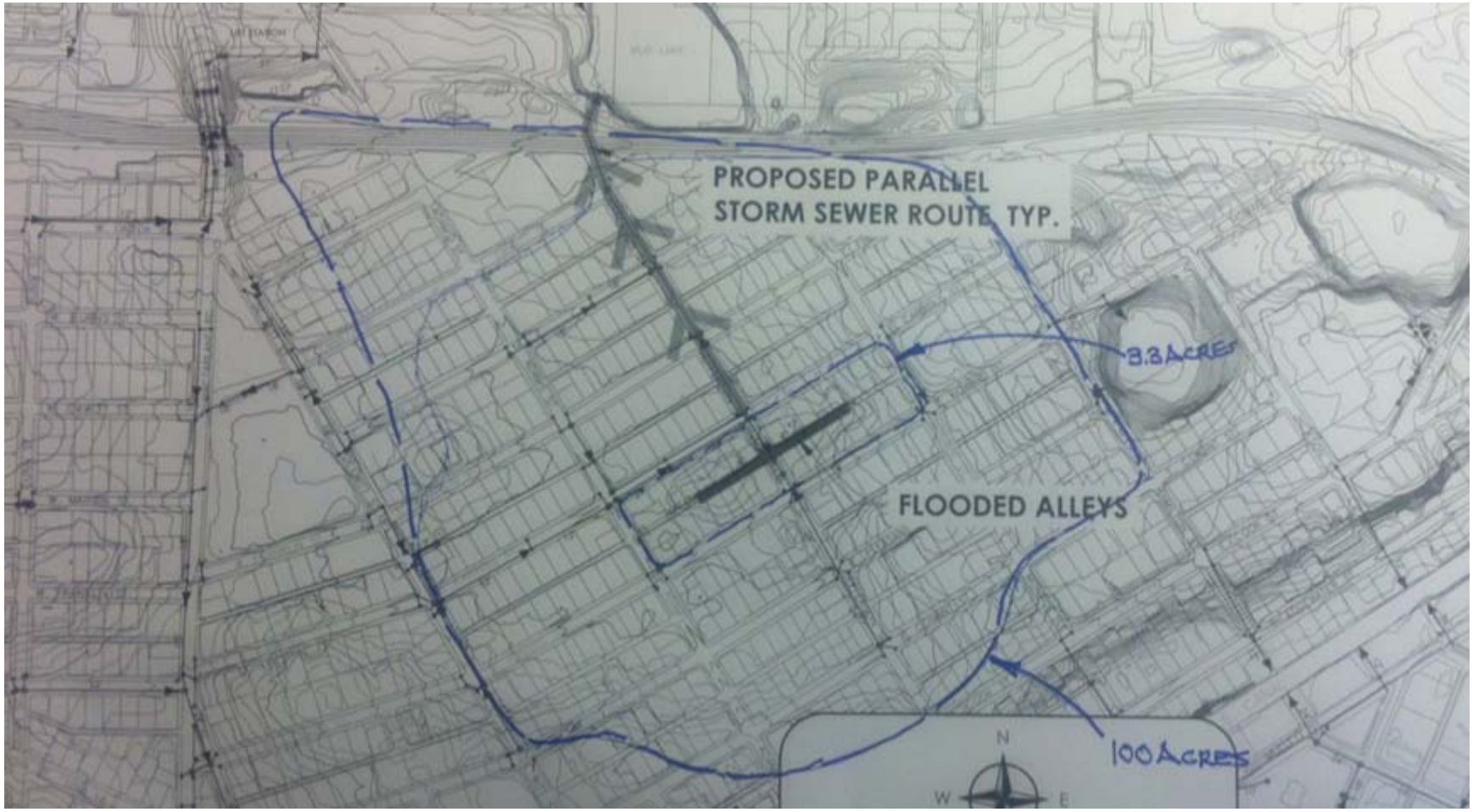
- We believe that the current proposal – to add another 36 inch pipe, connect little mud lake and big mud lake, and dredge the flow from big mud lake – is not the most effective or efficient means of solving the problem. The following alternatives were recommended instead:

- Placing rain gardens around the neighborhood
- Voluntary purchasing 1-2 properties in the lowest area to convert to detention basins
- Installing permeable pavement above the low spot to slow flow down.

Rain Gardens vs. Gray Infrastructure (dredging, storm sewer, upgrade lift stations, raise sidewalks and/or alleys)

| | Rain Gardens | | Gray Infrastructure (not specified) |
|---|---|---|---|
| Ecosystem | Increase urban greenspace areas<br>Increase Riparian Area (wetlands?)<br>Increase Open Canopy Area | | No Effect |
| | | | |
| Water Quality | Increase Sediment Retention<br>Increase Nutrient Retention<br>Increase Pollutant Retention<br>Decrease Water Temperature | | Increase Sediment Retention<br>Increase Nutrient Retention<br>Increase Pollutant Retention<br>Increase Water Temperature |
| | | | |
| Moderation of Extreme Events | Decrease Velocity<br>Decrease Flooding Severity<br>Increase Consistency of Flow<br>Increase Late Season Flow | | Decrease Stormwater Runoff Velocity<br>Decrease Flooding Severity |
| | | | |
| Habitat | Increase Wildlife Habitat<br>Increase Insect Habitat | | Decreases Wildlife Habitat<br>Decreases Insect Habitat |
| | | | |
| Air Quality | Increase removal of air pollutants | | No Effect |
| | | | |
| Water Supply | Increase Surface Water Storage<br>Increase Groundwater Storage<br>Increase Water Depth | | Increase Surface Water Storage |
| | | | |
| Biological Control | Increase insect visitation | | Decrease insect habitat |
| | | | |
| Climate stability | Increase carbon sequestration and storage | | No Effect |
| | | | |
| Pollination | Increase genetic variability | | No Effect |
| | | | |
| Aesthetic information | Increase value to nearby properties<br>Increase aesthetic beauty | | Decrease property value<br>Decrease aesthetic beauty |
| | | | |
| Science and education | Increase area to interact with nature<br>Increase areas to promote hands on learning | | No Effect |
| | | | |
| Economic Benefits | Value Appreciates Over Time | | Value Depreciates Over Time |

# Area for alternative approaches



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# Questions?

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Reports available at eartheconomics.org

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