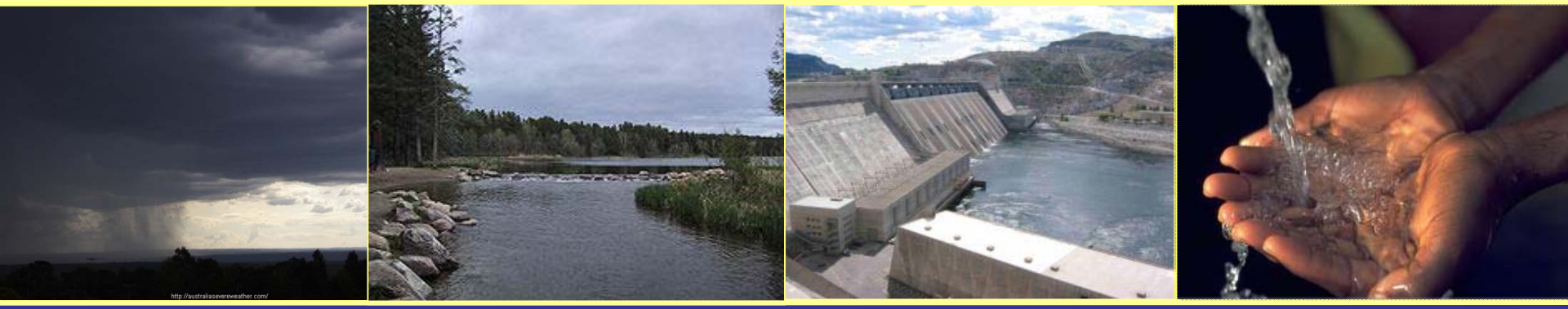
The role of benefit-cost analysis in water resources planning for the U.S. Army Corps of Engineers (Part 1)



Julie Vano and Tyler Davis

In collaboration with Jonathan Armah, Hande Ayan, Bethanne Barnes, Christina Bernard, Aaron Blumenthal, Lea Fortmann, Lori Reimann Garretson, Ross Gilliland, Chris Godwin, W. Dean Runolfson, and Peter Teigen

Supervised by: Dr. Richard O. Zerbe, Jr. and Dr. Joseph Cook

February 17, 2010
Water Center Annual Review, Seattle, WA

Who are we?

- University of Washington, Evans School of Public Affairs
- Congressional Research Service collaboration, working with Betsy Cody and Nicole Carter
- Graduate course on benefit-cost analysis, transitioned into class focused on this CRS project

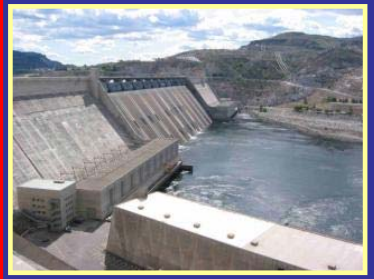
Why Now?

- Timely investigation, requests for revisions WRDA 2007
- Agencies that follow the Principles and Guidelines: U.S. Army Corps of Engineers, Bureau of Reclamation, Tennessee Valley Authority, Natural Resource Conservation Services
- Water managed for multiple purposes with limited federal funds

Municipal & Industrial Use

Irrigated Agriculture

Flood Control



Hydropower & Navigation

Ecosystems / Instream Flows

Scope of Analysis

- Planning in the U.S. Army Corps of Engineers
- Criticisms and Revisions to the Principles and Guidelines
- Upper Mississippi Case Study

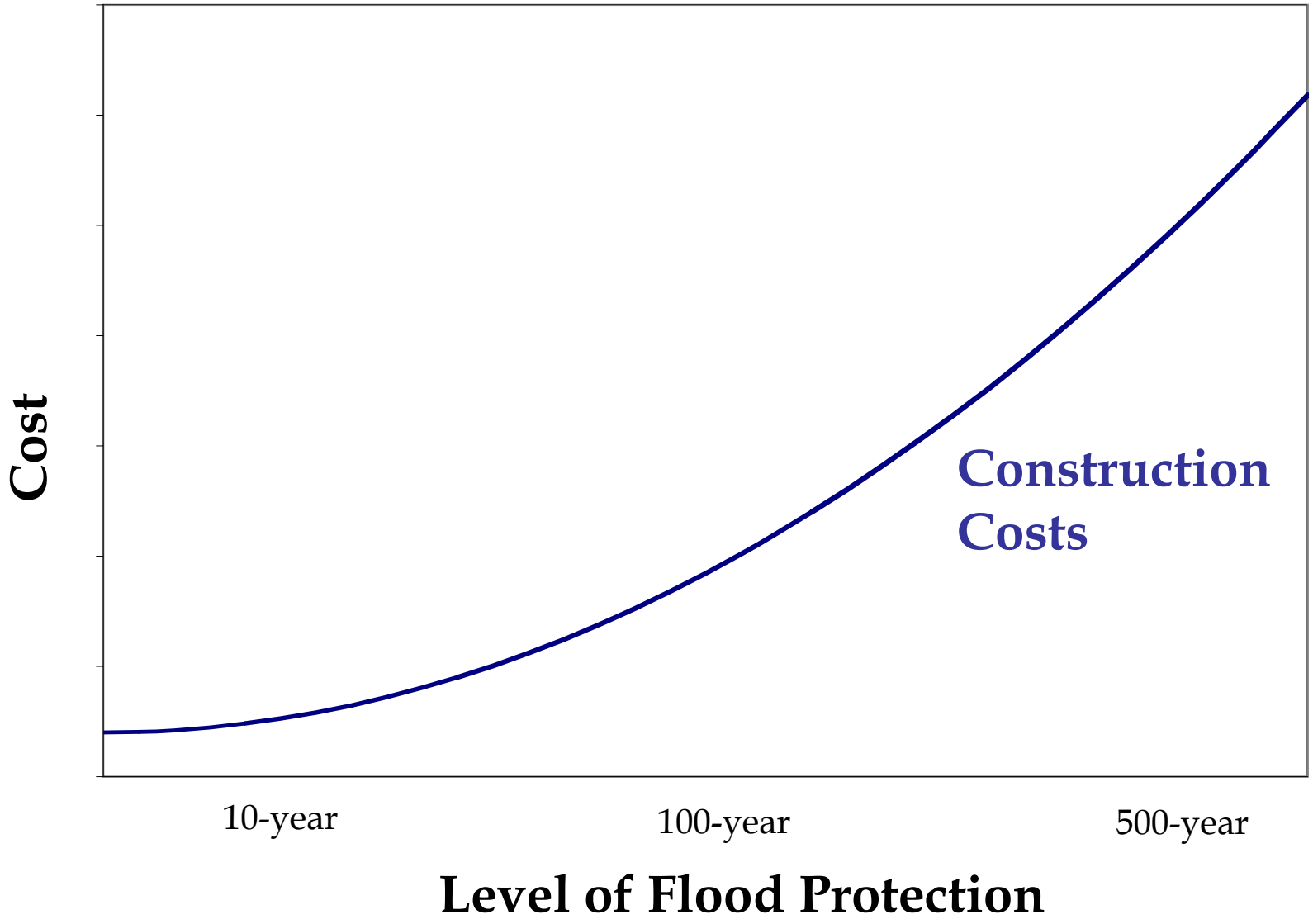
Photo courtesy of UMRCP final report.

Overview

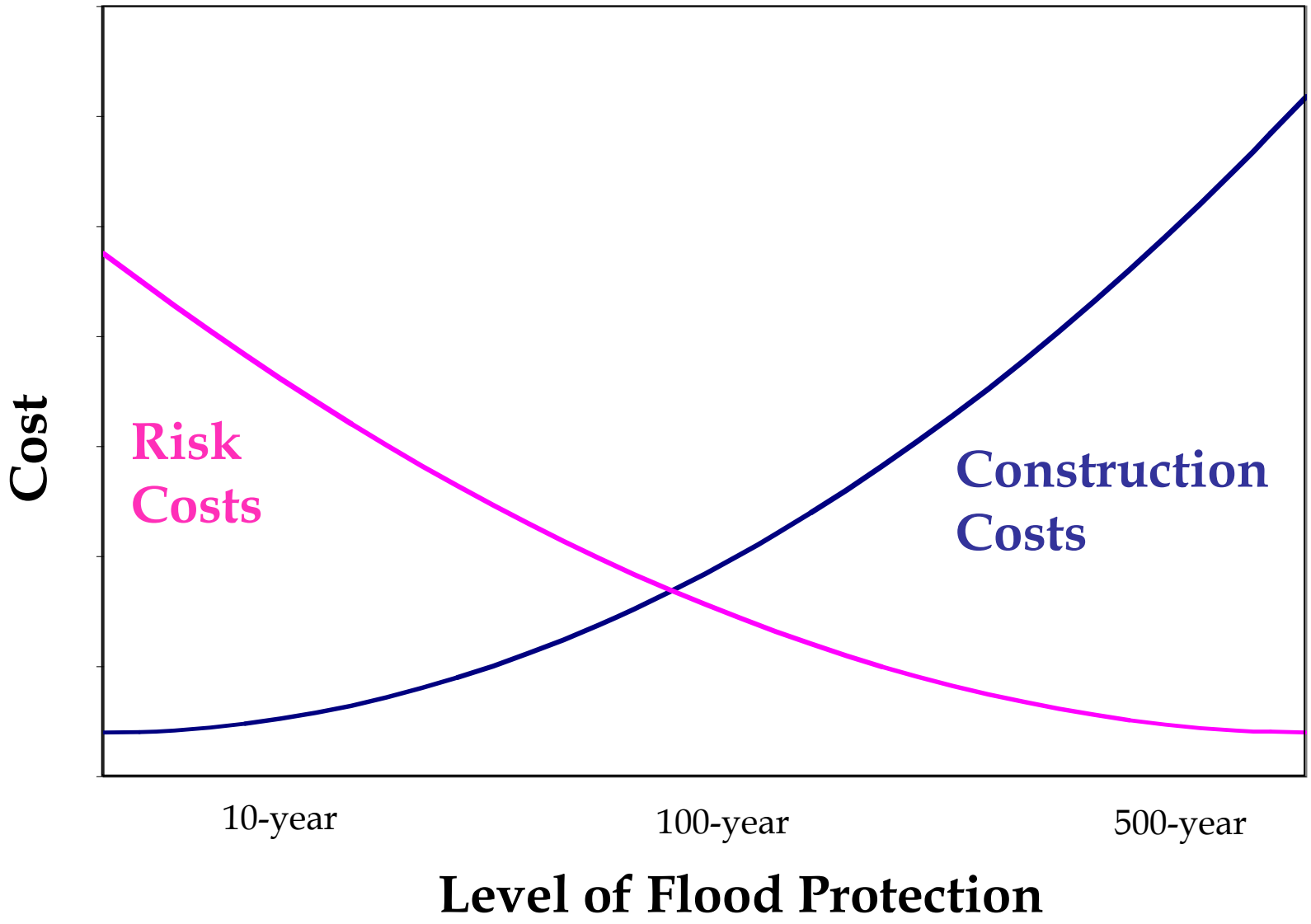
1. *What* is benefit-cost analysis in water resource planning?
2. *Why* is benefit-cost analysis of federal water projects important?
3. *How* does benefit-cost analysis relate to Corps practices?
4. In what ways might benefit-cost analysis be improved in Principles and Guidelines in the future? (Part 2)

1. What is benefit-cost analysis in water resource planning?

Benefit-Costs Analysis in Water Resource Planning



Benefit-Costs Analysis in Water Resource Planning



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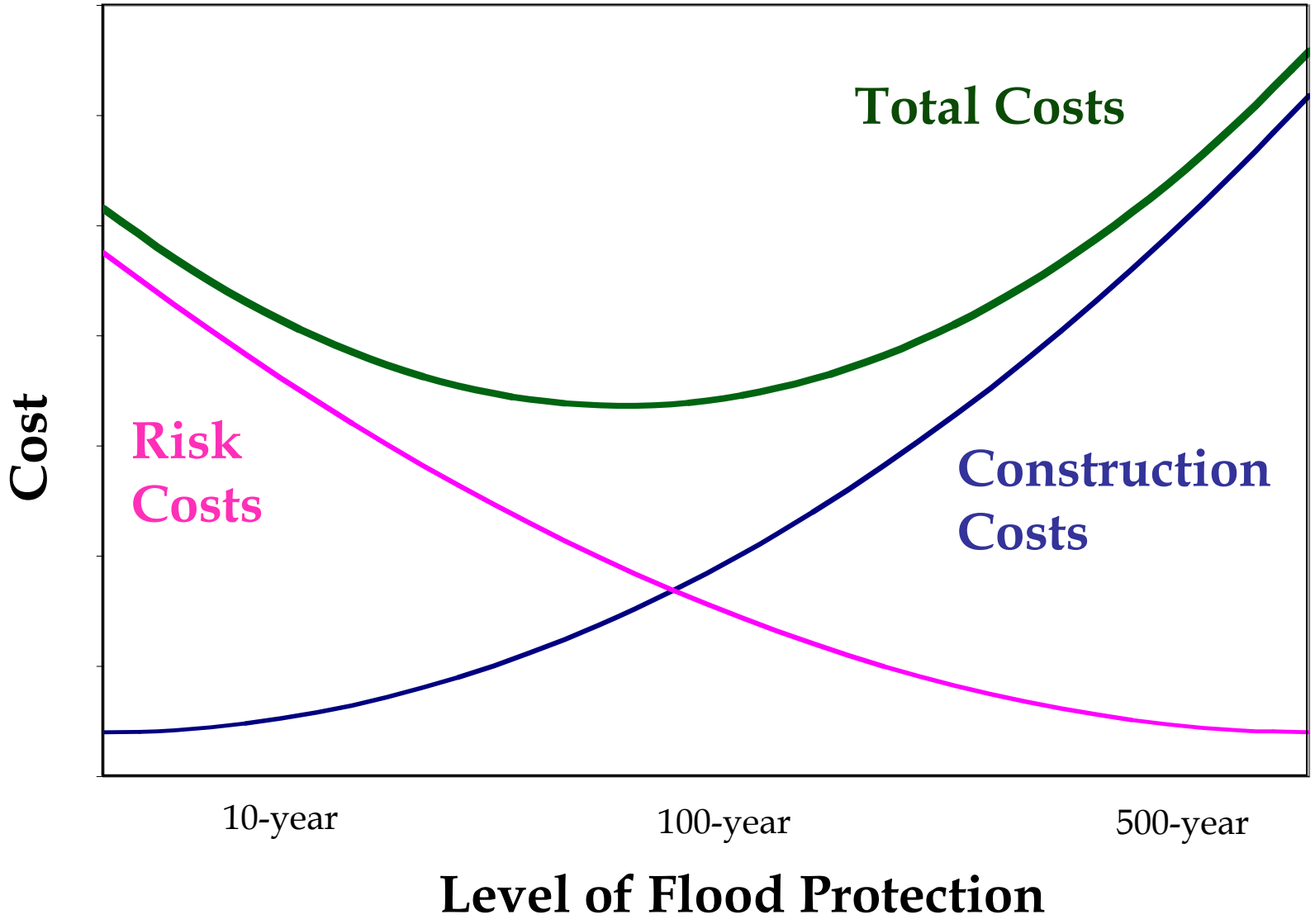

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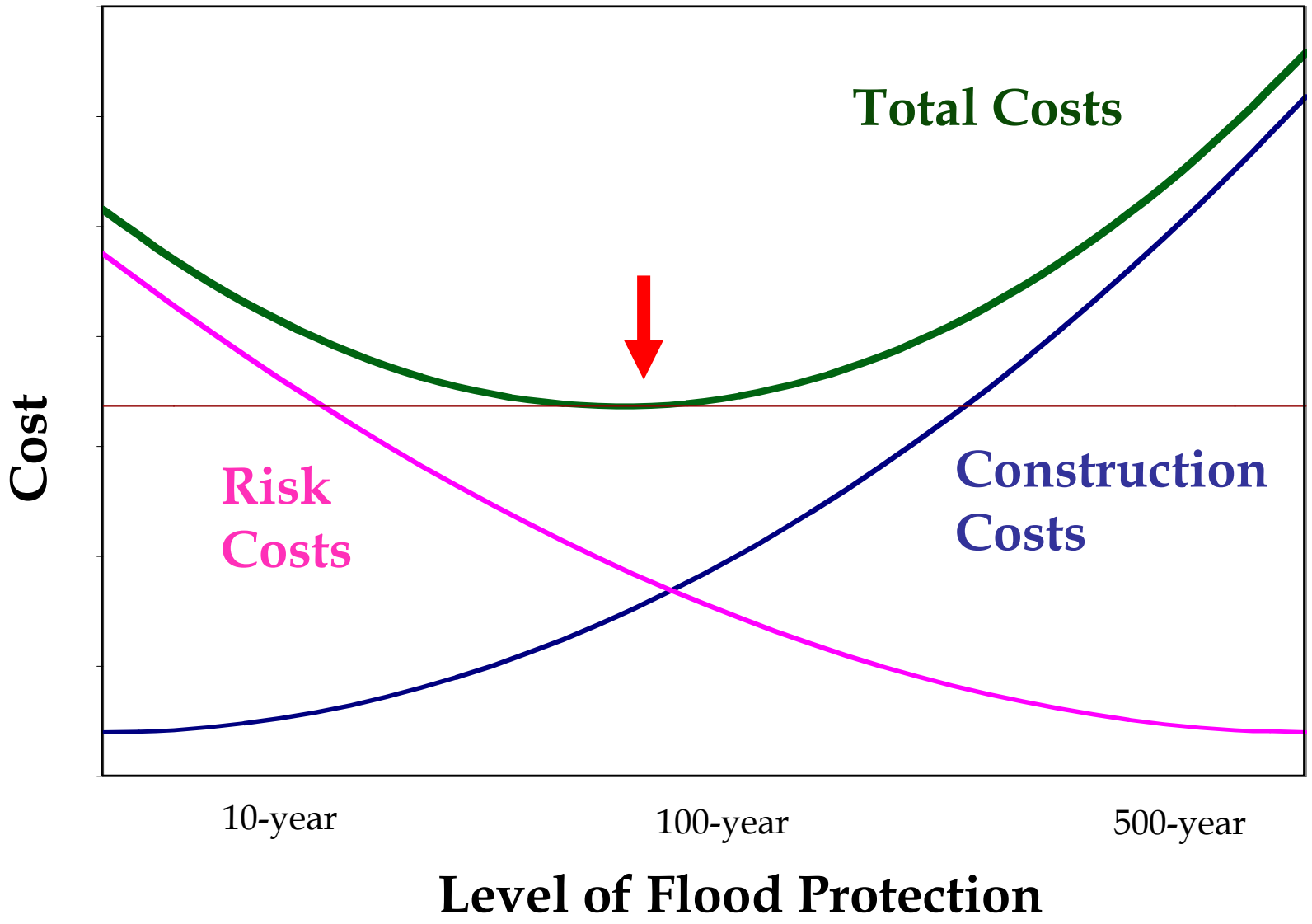

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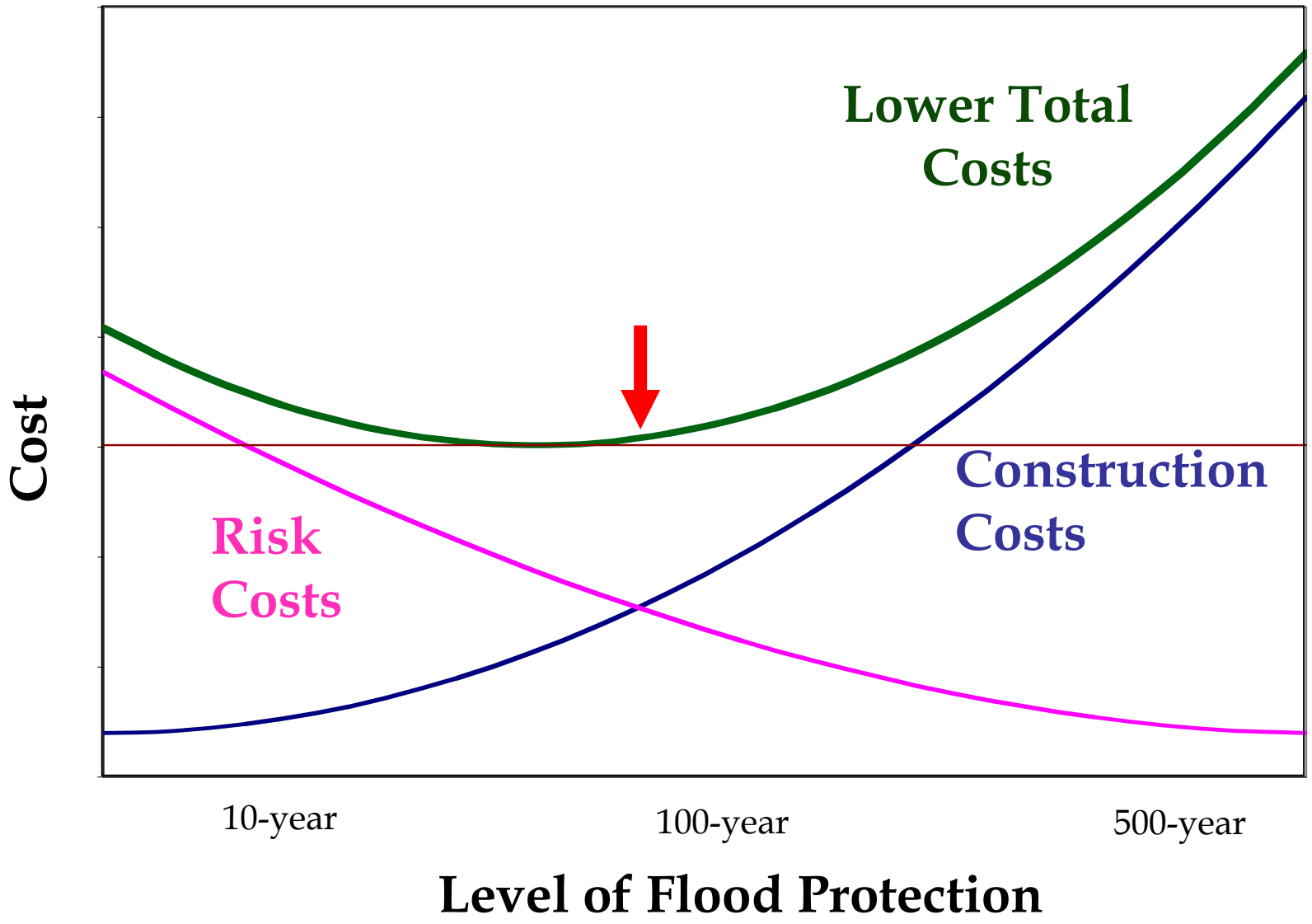

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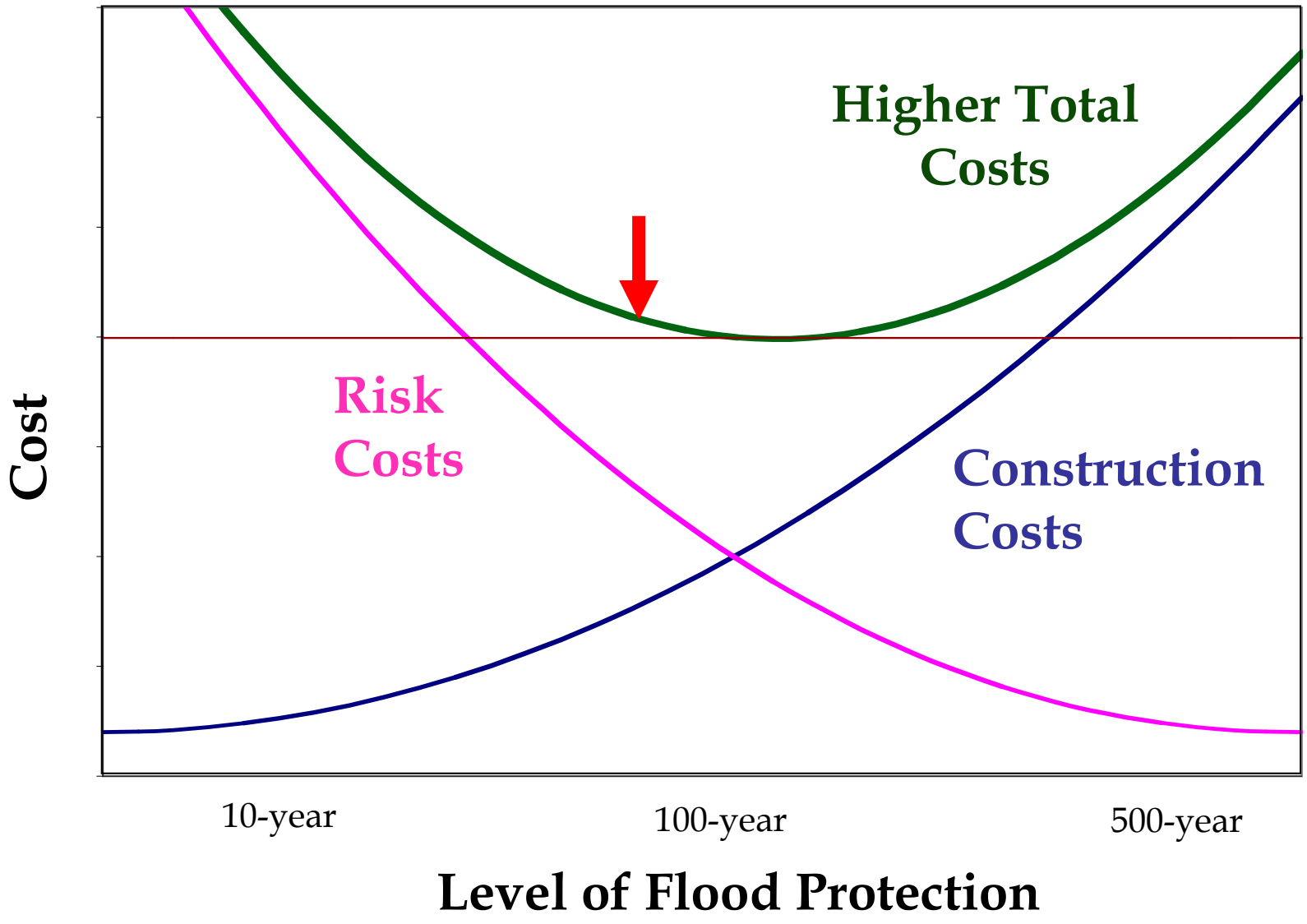

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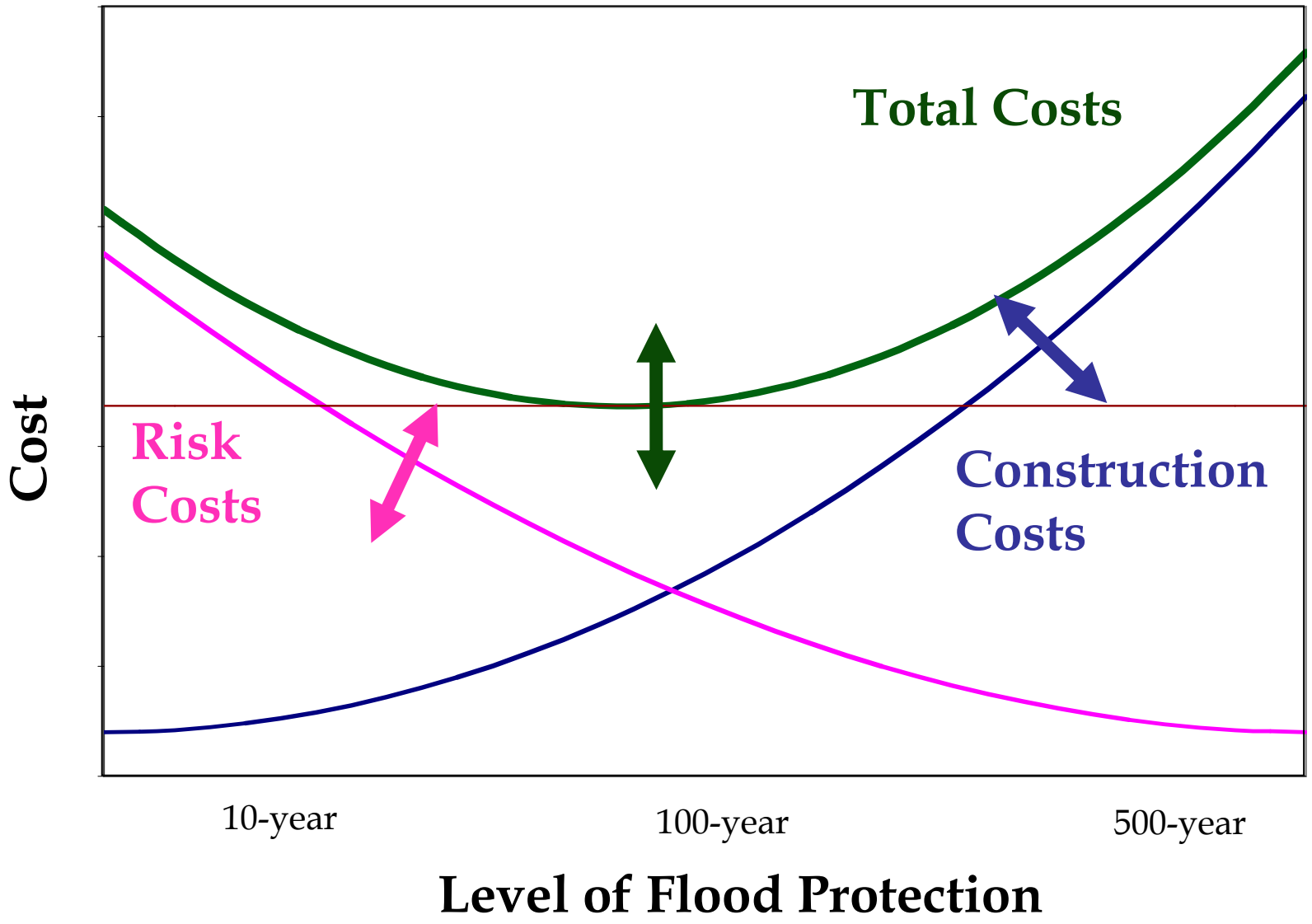


Benefit-Cost Ratio

$$\frac{\text{\$ project benefits}}{\text{\$ project costs}} = \text{benefit-cost ratio}$$

If greater than 1, project has net benefit and project moves forward.

2. Why is benefit-cost analysis of federal water projects important?

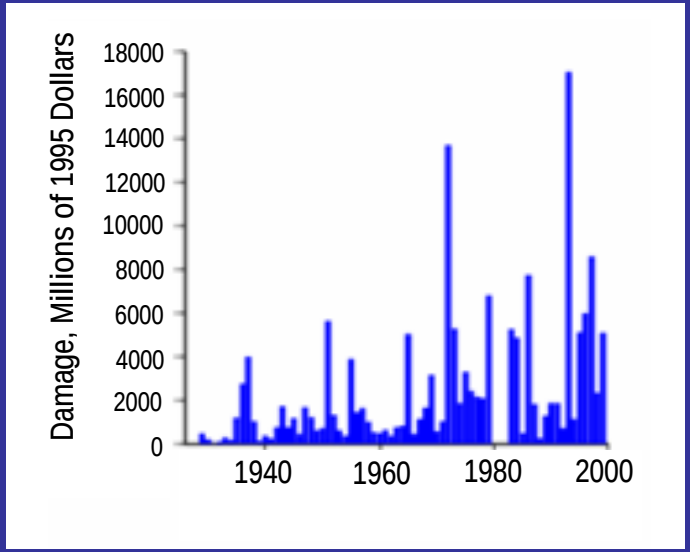
Cowlitz River near Packwood, WA, The Seattle Times, November 6, 2006.

Flood Damages

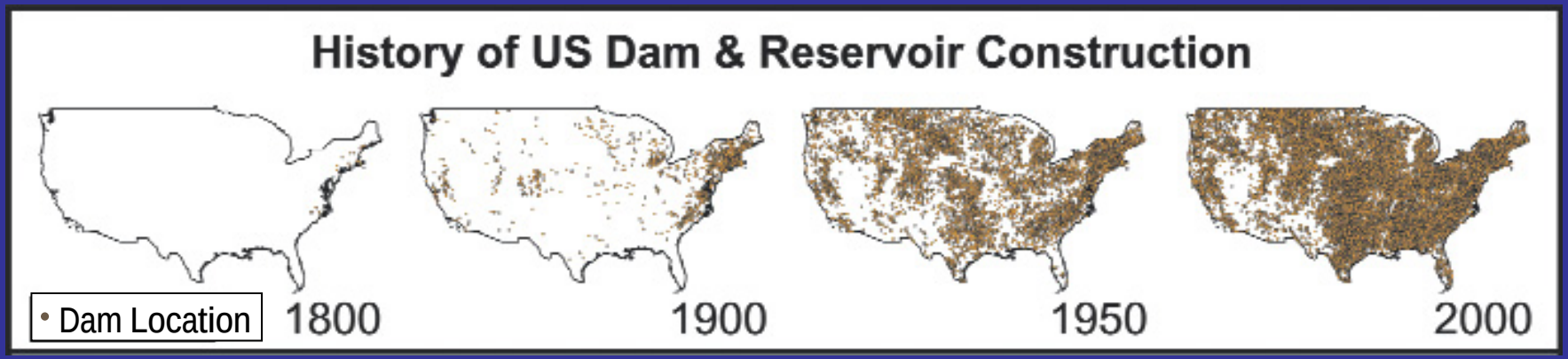
- 2008 floods caused more than $6 billion in damages and 13 deaths in the Mississippi River Valley
- 2005 floods from Hurricane Katrina caused ~$125 billion in damages
- 1993 Mississippi River floods caused $20 billion in damages

Trends in Infrastructure and Floods

Flood Damage Costs



Increased Infrastructure



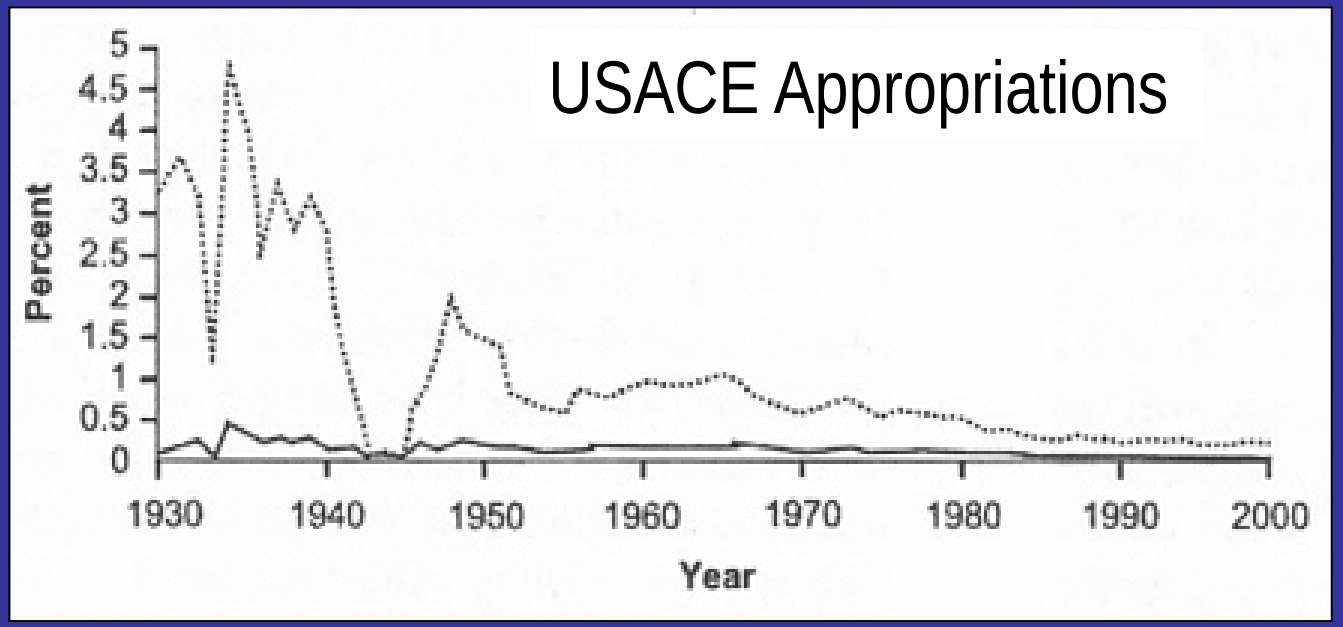
Figures from Vorosmarty et al., 2004 and Pielke et al., 2002.

3. How does benefit-cost analysis relate to Corps practices?

U.S. Army Corps of Engineers

Public engineering to control the flow of the nation's rivers and maintain navigable depths for its ports and harbors

Created 1775 to improve navigation, since mission has evolved to include hydropower, flood control, and aquatic ecosystem restoration



Appropriations as percentages of federal budget (dotted line) and of U.S. GDP (solid line), SOURCE: USACE, 2001

Corps Planning Guidance

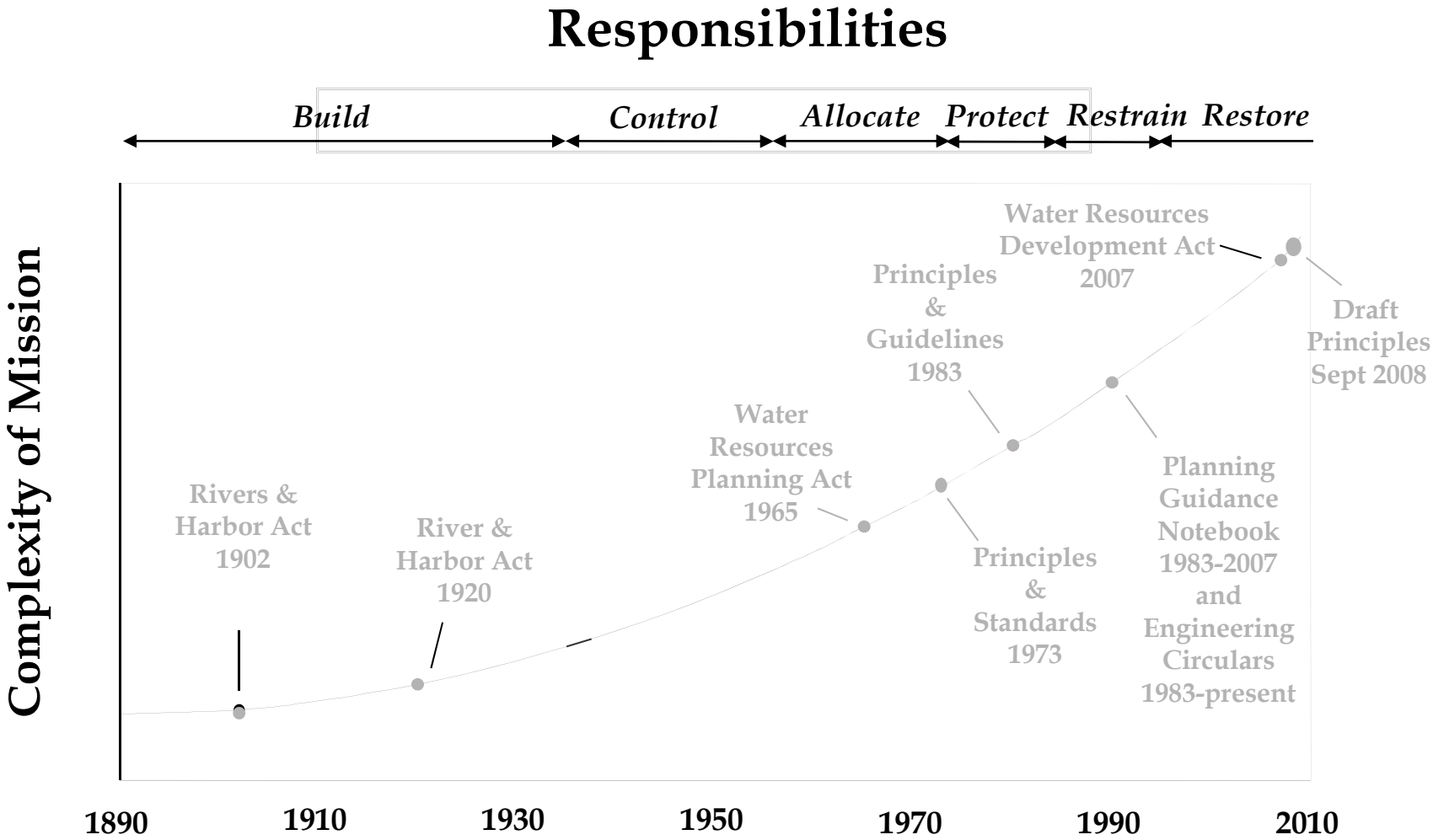


Figure revised from Water Resource Trends report by NRC 1999.

Corps Planning Guidance

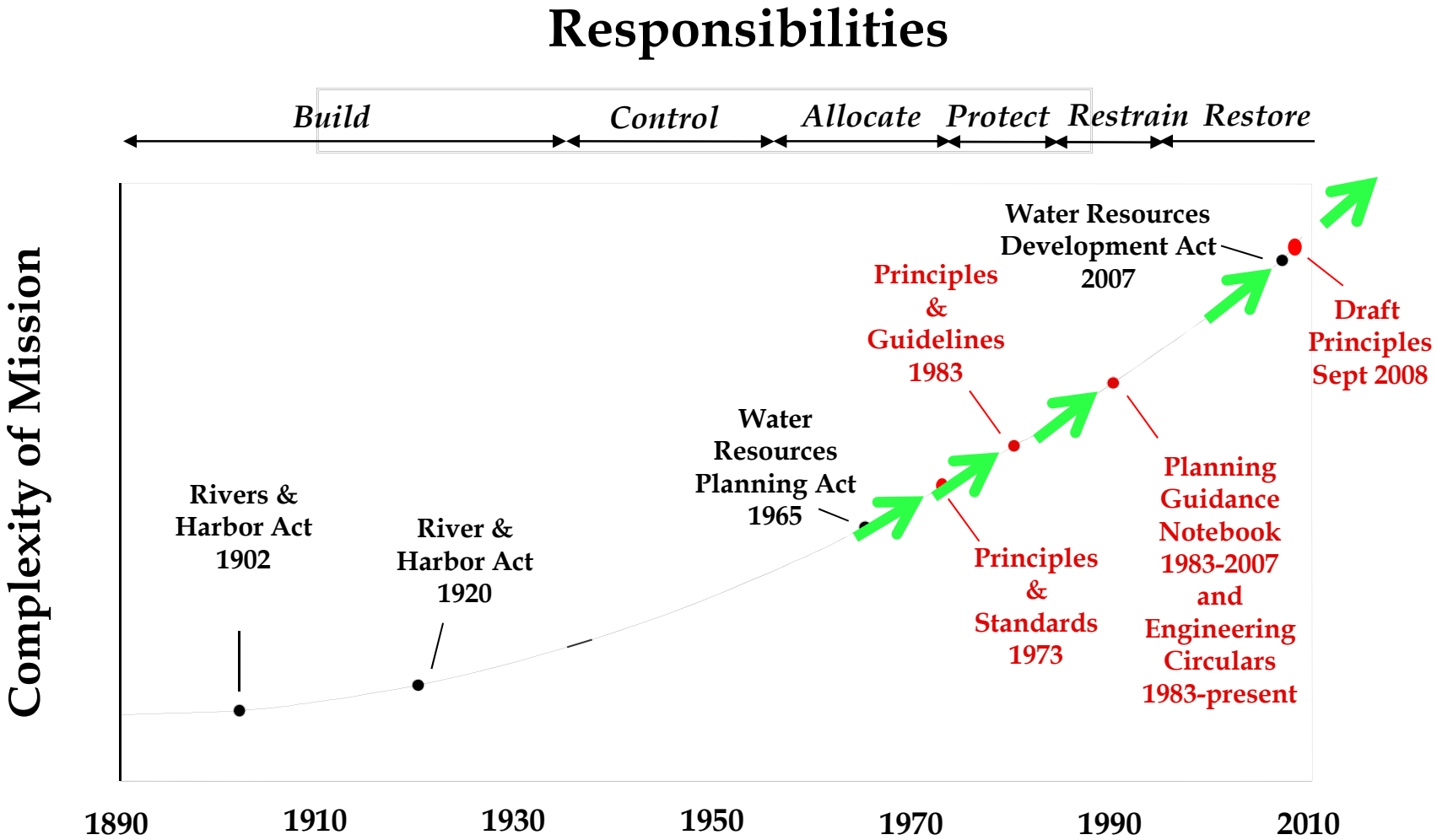


Figure revised from Water Resource Trends report by NRC 1999.

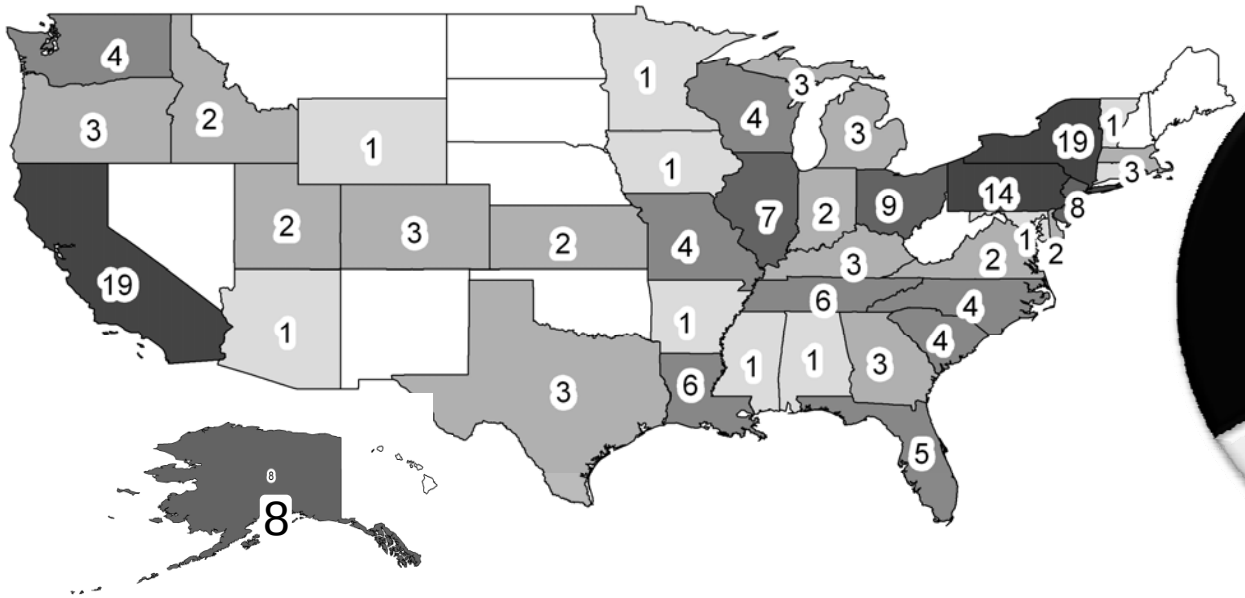
2009 Updates

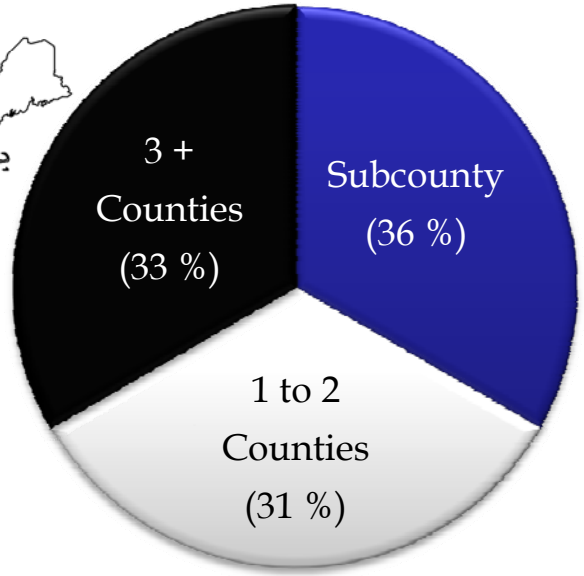
Dec 3, 2009 - draft proposal from Council on Environmental Quality, now being reviewed by National Research Council.

- **Achieving Co-Equal Goals**
- **Considering Monetary and Non-Monetary Benefits**
- **Avoiding the Unwise Use of Floodplains**
- **Increasing Transparency and "Good Government" Results**

http://www.whitehouse.gov/administration/eop/ceq/initiatives/PandG

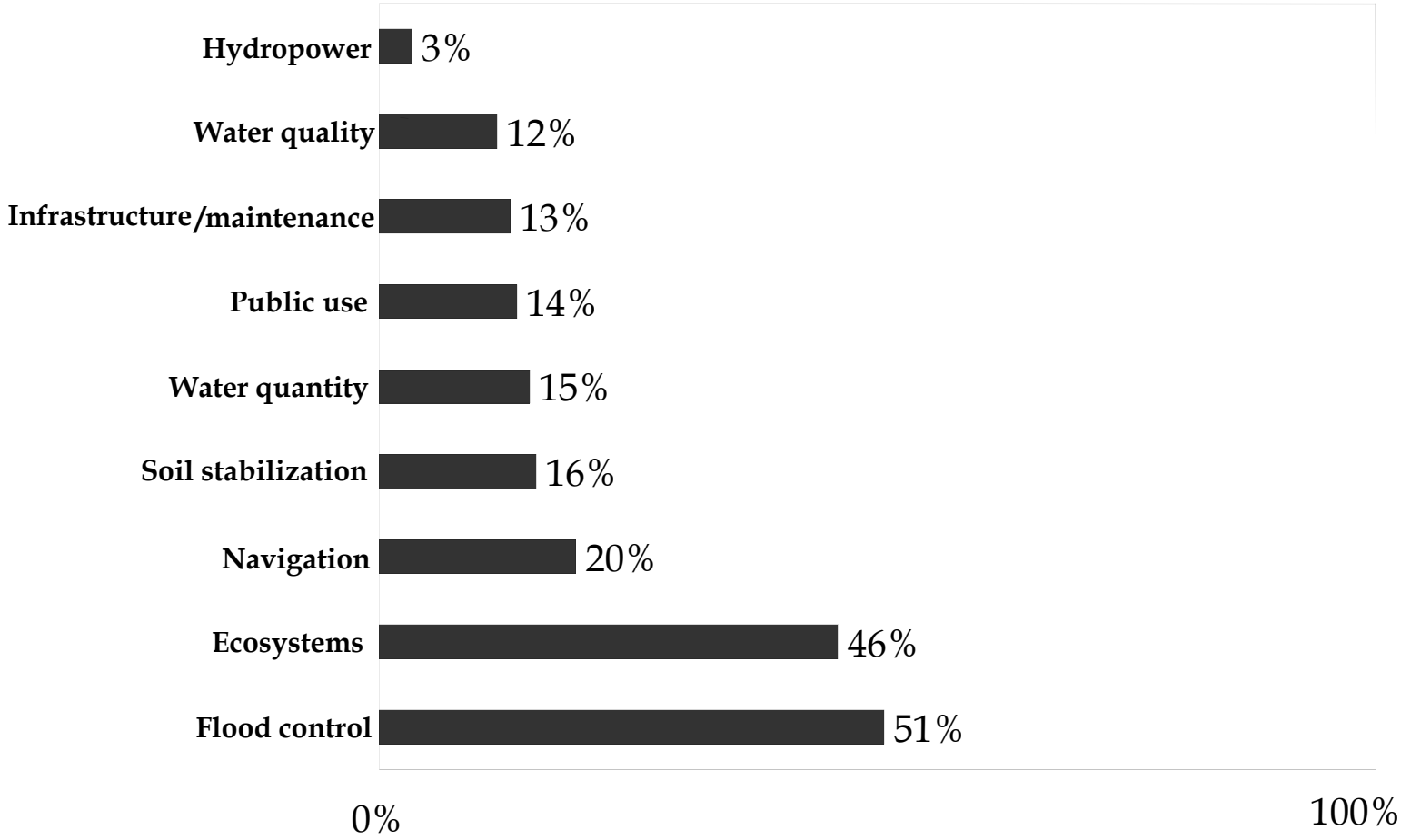
Proposed Projects





- **154 projects:** Committee Resolutions in House (51) & Senate (3), WRDA 2007 (100)
- 88% one state, 6% two states, 3% three states
- **Five regional projects:** John Glen Great Lakes Basin, Southwest, Lake Erie Region, Northeast, New England States
- **State of Washington:** Elliott Bay Seawall, Flood control in Kelso, Bonneville Project - Rock Creek flooding, Walla Walla River restoration

Proposed Project Goals



- Half projects, single goal in legislation
- Half projects, average three goals, maximum of six goals

Principles and Guidelines Categories

Account	P&G (1983)	Metric
National Economic Development	**Required** Economic value of the national output of goods and services	Monetary
Environmental Quality	Ecological, cultural, and aesthetic effects on natural and cultural resources	Non-monetary units
Regional Economic Development	Regional economic activity, income transfers, and employment effects	Monetary
Other Social Effects/ Social Well-being	Urban and community impacts, effects on life, health and safety, and relevant effects not reflected in other accounts	Monetary and/or Non-monetary units

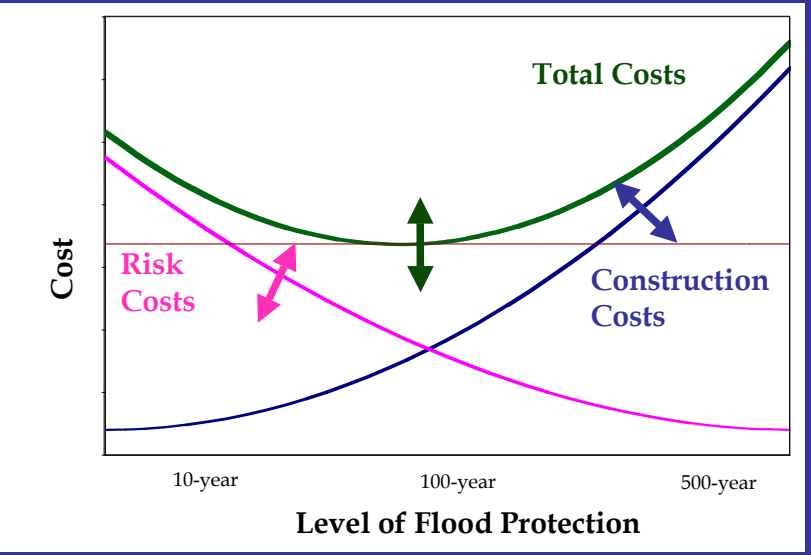
Required for Decision Criteria

Concluding Remarks

Why? Federal water management confronted with increasing mission and costs, decreasing funds

What? Benefit-cost analysis, approach to decision-making, simple in concept, but details are complicated

How? 1983 Principles and Guidelines determine what is included and excluded in evaluating future water projects (four accounts)



4. In what ways might benefit-cost analysis be improved in the Principles and Guidelines in the future? (Part 2)

Questions on Part 1?

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Additional items (possible references for questions & answer)

P&S and P&G Accounts

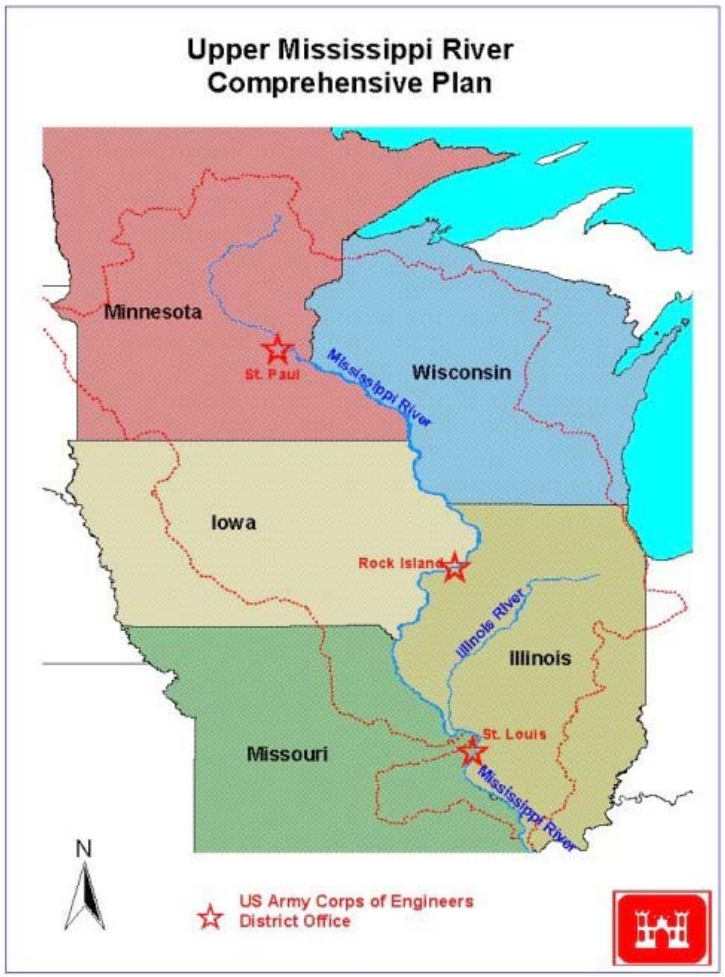
Account	P&S (1974)	Metric	P&G (1983)	Metric
National Economic Development	**Required** Economic value of the national output of goods and services	Monetary	**Required** Economic value of the national output of goods and services	Monetary
Environmental Quality	**Required** Natural and historical resources, ecological systems, and irreversible commitments to future uses	Monetary and/or Non-monetary units	Ecological, cultural, and aesthetic effects on natural and cultural resources	Non-monetary units
Regional Economic Development	Regional employment, population distribution, economic stability, and environment	Monetary	Regional economic activity, income transfers, and employment effects	Monetary
Other Social Effects/ Social Well-being	Real income distribution, life, health, safety, education, culture, recreation, and emergency preparedness	Monetary and/or Non-monetary units	Urban and community impacts, effects on life, health and safety, and relevant effects not reflected in other accounts	Monetary and/or Non-monetary units

National vs. Regional Accounts

NED and RED can be of different signs and different magnitudes for the same project. Four possible combinations of circumstances of Regional Economic Efficiency and National Economic Efficiency:

Possible Combination of Regional and National Economic Capacity				
Regional Economy	Below Capacity	Below Capacity	Near Capacity	Near Capacity
National Economy	Below Capacity	Near Capacity	Below Capacity	Near Capacity
Treatment of RED vs. NED	Conducting a Corps project in the region may preclude conducting a project in some other region of the nation that results in higher returns. Therefore a Corps project may have positive RED and negative NED effects. It is possible that the RED would be positive and the NED would be positive but smaller.	Unlikely by definition	Conducting a Corps project will draw economic resources from other regions to meet the increased demand in the region with the Corps project. Therefore, in an extreme case the RED may be 0 and the NED positive.	Conducting a Corps project will draw resources from within the region and possibly from surrounding regions. RED may be either positive, while NED is either negative or smaller than RED.

UMRCP



Time Line

Aug 2002 – Collaboration Team formed to work with Corps Product Development Team (PDT)

Sep 2002 & Jun 2006 – four public meetings hosted by Rock Island and St. Louis Districts

2004 – Evaluation of RED benefits completed

Early 2005 – UMRCP draft report issued to public

Aug-Sep 2005 – Hurricanes Katrina and Rita

Fall 2006-Spring 2008 – public input led the PDT to develop Plan M

Figure from UMRCP website: http://www2.mvr.usace.army.mil/UMRCP/

Project Evaluation

The Corps is not required to evaluate the impacts of projects. The information from these projects would improve future planning processes.