

Draft National Guidelines for Assessing Sediment-Related Effects of Dam Removal: Illinois' Role

**13th Biennial Governor's Conference on the
Management of the Illinois River System**

October 6, 2011

Timothy D. Straub, P.E., Ph.D.

Outline

- Illinois Dams
- Dam Removal Nationwide
- Guidelines
 - Background
 - Objectives
 - Steps
- Illinois' Role

Illinois Dams

- 1,395 dams (upon last inventory performed in 2007)
- 445 dams of all existing dams in the Illinois are more than 50 years old.

Sources:

American Society of Civil Engineers, *Report Card for America's Infrastructure*, 2009, <http://www.infrastructurereportcard.org/report-cards>
Association of State Dam Safety Officials, *Illinois Dam Inventory 2007* www.damsafety.org/map/state.aspx?=-13

Dam Removal Nationwide

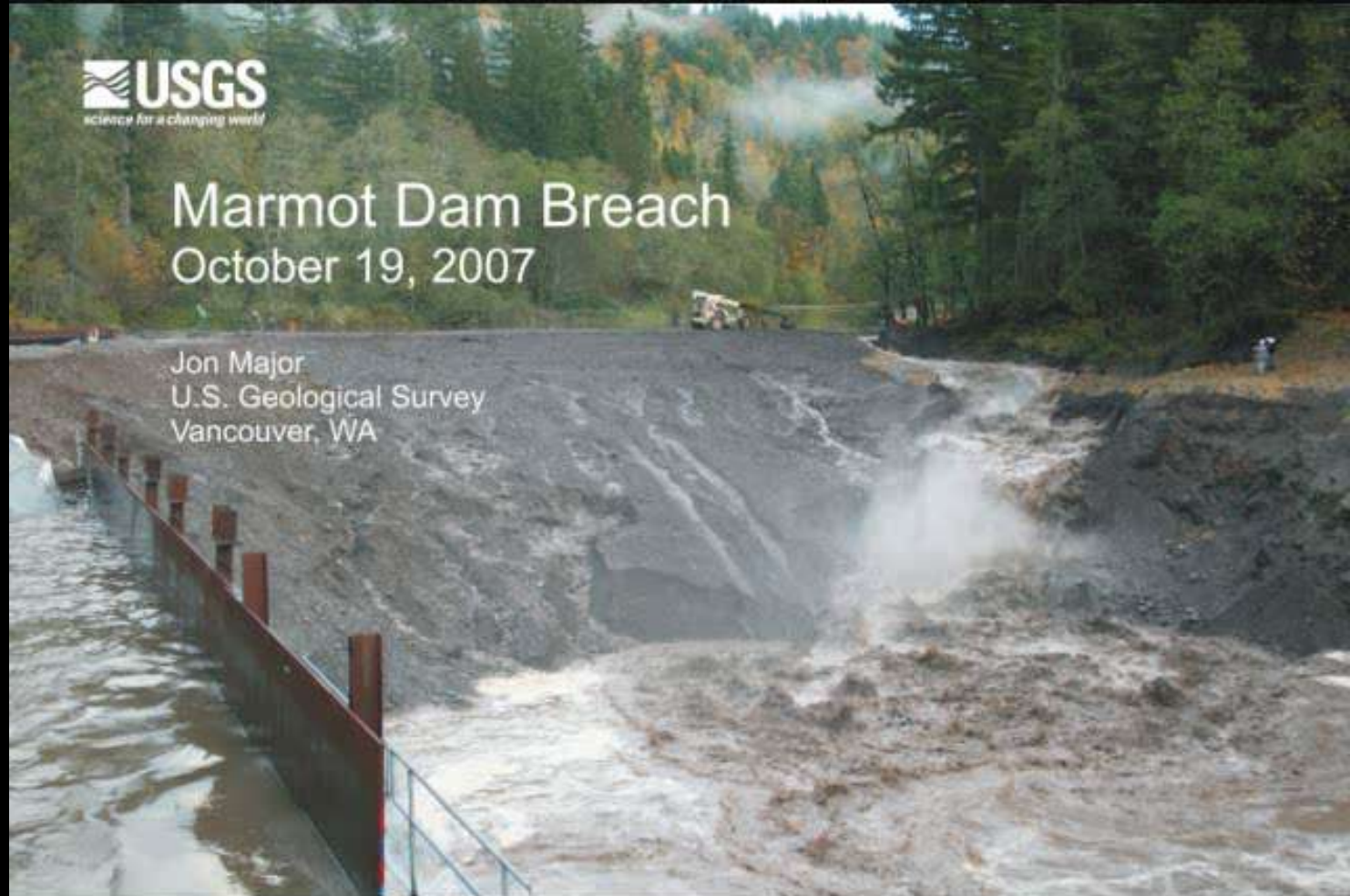
- More than 600 dams have been removed in the United States over the last 50 years.
- States with the most dams removed include Pennsylvania and Wisconsin.
- Approximately 10 dams removed in Illinois.

Marmot Dam Removal in Oregon

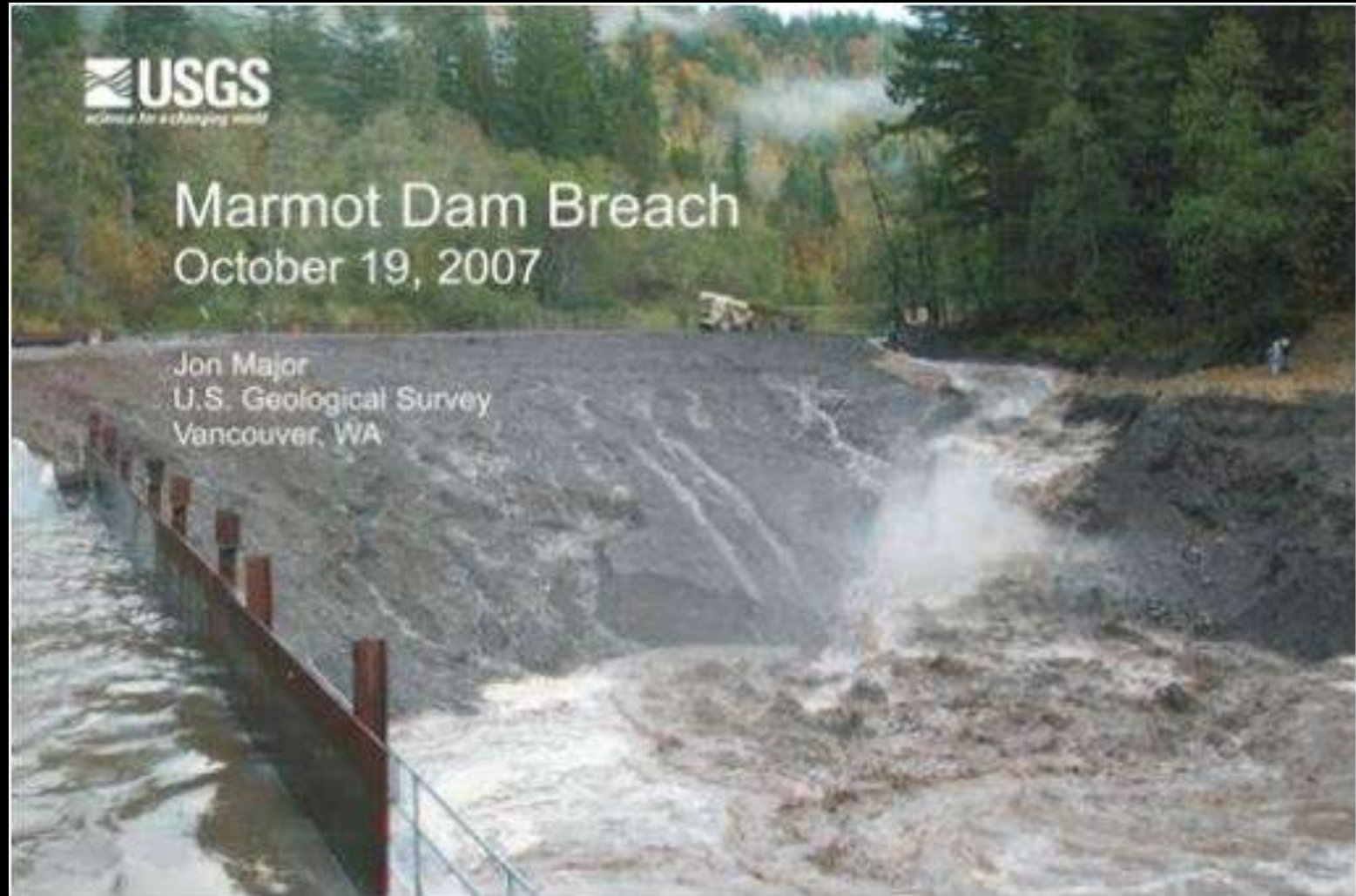


Marmot Dam Breach October 19, 2007

Jon Major
U.S. Geological Survey
Vancouver, WA



Marmot Dam Removal in Oregon



Small Dam Removal in Pennsylvania



WPC staff members and partners brave mud and swift currents to remove a 25-foot-wide dam by hand.

Stepwise Notching of Brewster Creek Dam in Illinois



Guidelines Background

- U.S. Department of Interior led effort
 - Subcommittee on Sedimentation (SOS)
- Contributions from over 26 entities
- Effort started in 2008
- Bureau of Reclamation is the lead agency

Guidelines Objectives

- Provide guidance on
 - data collection, analyses, modeling, and monitoring
 - how to scale reservoir sediment
 - on how to adjust management alternatives
 - acceptable to local stakeholders and decision makers.

Draft National Guidelines Steps

- 1: Reconnaissance of dam history, watershed context, and sediment concerns
- 2: Characterize the reservoir sediment deposit
- 3: Contaminant Concerns
- 4: Determine the scale of reservoir sediment volumes**
- 5: Select initial dam removal and sediment management plan
- 6: Evaluate reservoir and downstream sediment impacts**
- 7: Assess confidence, impact probability, and risk
- 8: Determine if sediment impacts are tolerable
- 9: Develop monitoring and adaptive management plan
- 10: Proceed with dam removal planning

Step 4: Determine the scale of reservoir sediment volumes.

$$\text{Scale} = \frac{\text{Mass of Reservoir Sediment}}{\text{Ave. Annual Sediment Load}}$$

OR

$$\text{Scale} = \frac{\text{Mass of Reservoir Sediment}}{\text{Sediment Load of 2-yr Flood}}$$

Step 4: Determine the scale of reservoir sediment volumes.

Reservoir Sediment Classification	Reservoir Sediment Scale
Small	$0.01 < Scale \leq 0.1$
Medium	$0.1 < Scale \leq 10$
Large	$10 < Scale$

Step 4: Determine the scale of reservoir sediment volumes.

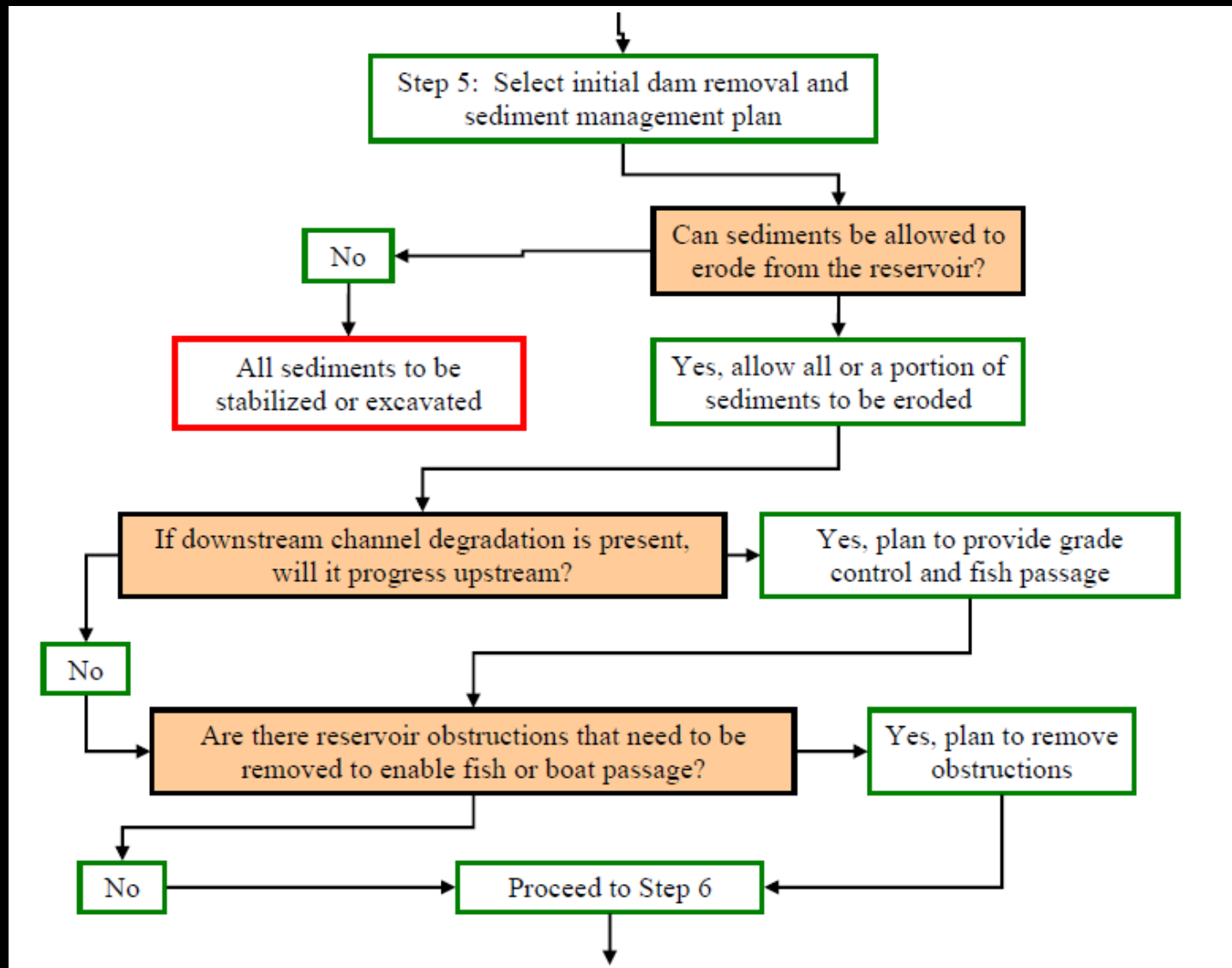
Brewster Creek Example:

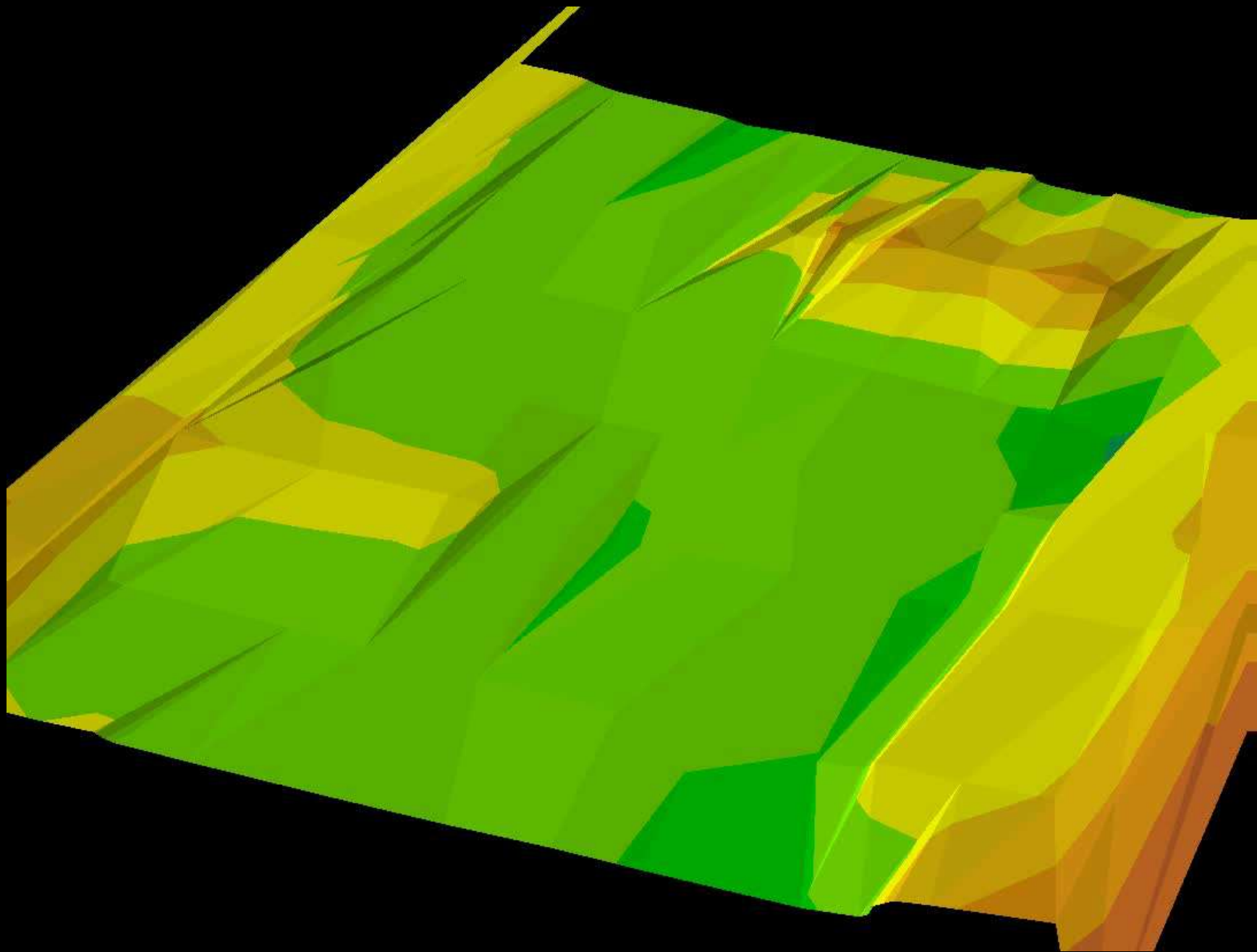
$$\begin{aligned} \text{Scale} &= \frac{\text{Mass of Reservoir Sediment Eroded}}{\text{Ave. Annual Sediment Load}} \\ &= \frac{\sim 2,000 \text{ tons Eroded}}{\sim 2,000 \text{ tons Annual}} \\ &= 1 \end{aligned}$$

Step 4: Determine the scale of reservoir sediment volumes.

Reservoir Sediment Classification	Reservoir Sediment Scale
Small	$0.01 < Scale \leq 0.1$
Medium	$0.1 < Scale \leq 10$
Large	$10 < Scale$

Step 5: Select initial dam removal and sediment management plan.

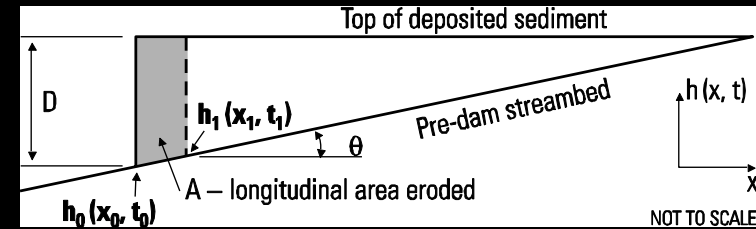




Erosion Modeling Upstream of Brewster Creek Dam



April 2004



(Straub, 2007)

**Cohesive Knickpoint
Parallel Retreat Model (CKPR)**

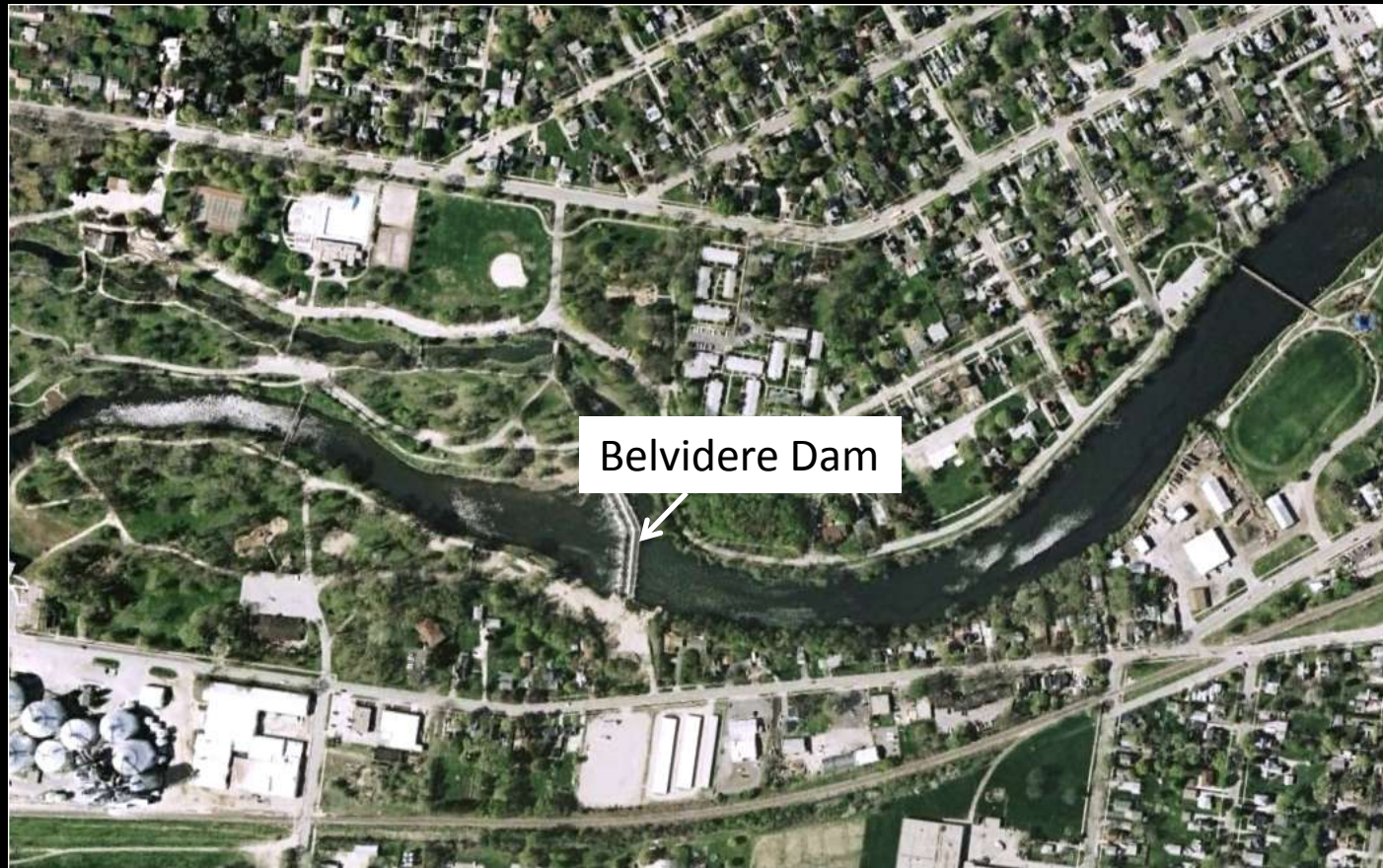


July 2006

Step 6: Evaluate reservoir and downstream sediment impacts according to sediment scale.

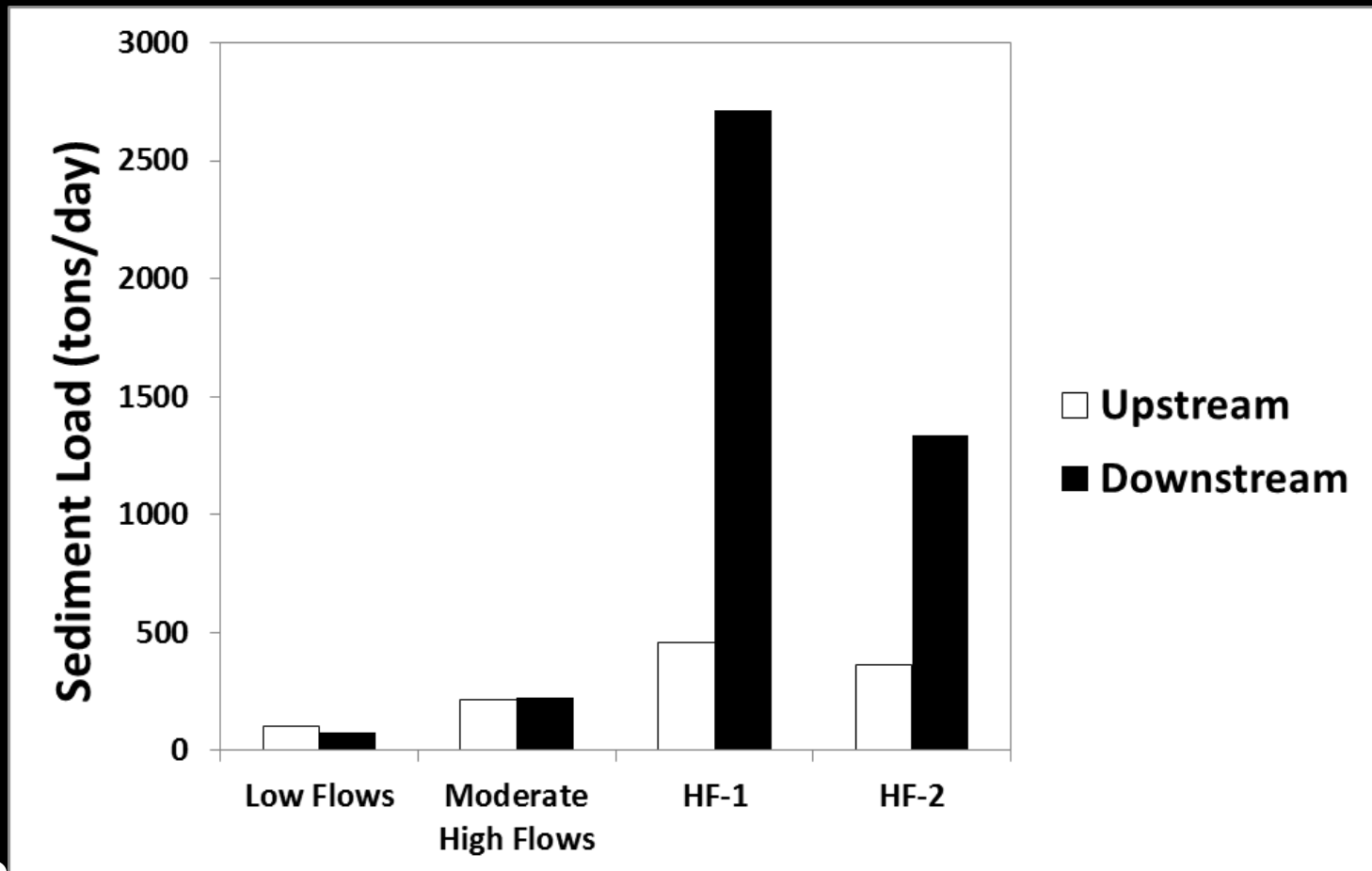


Step 6: Evaluate reservoir and downstream sediment impacts according to sediment scale.

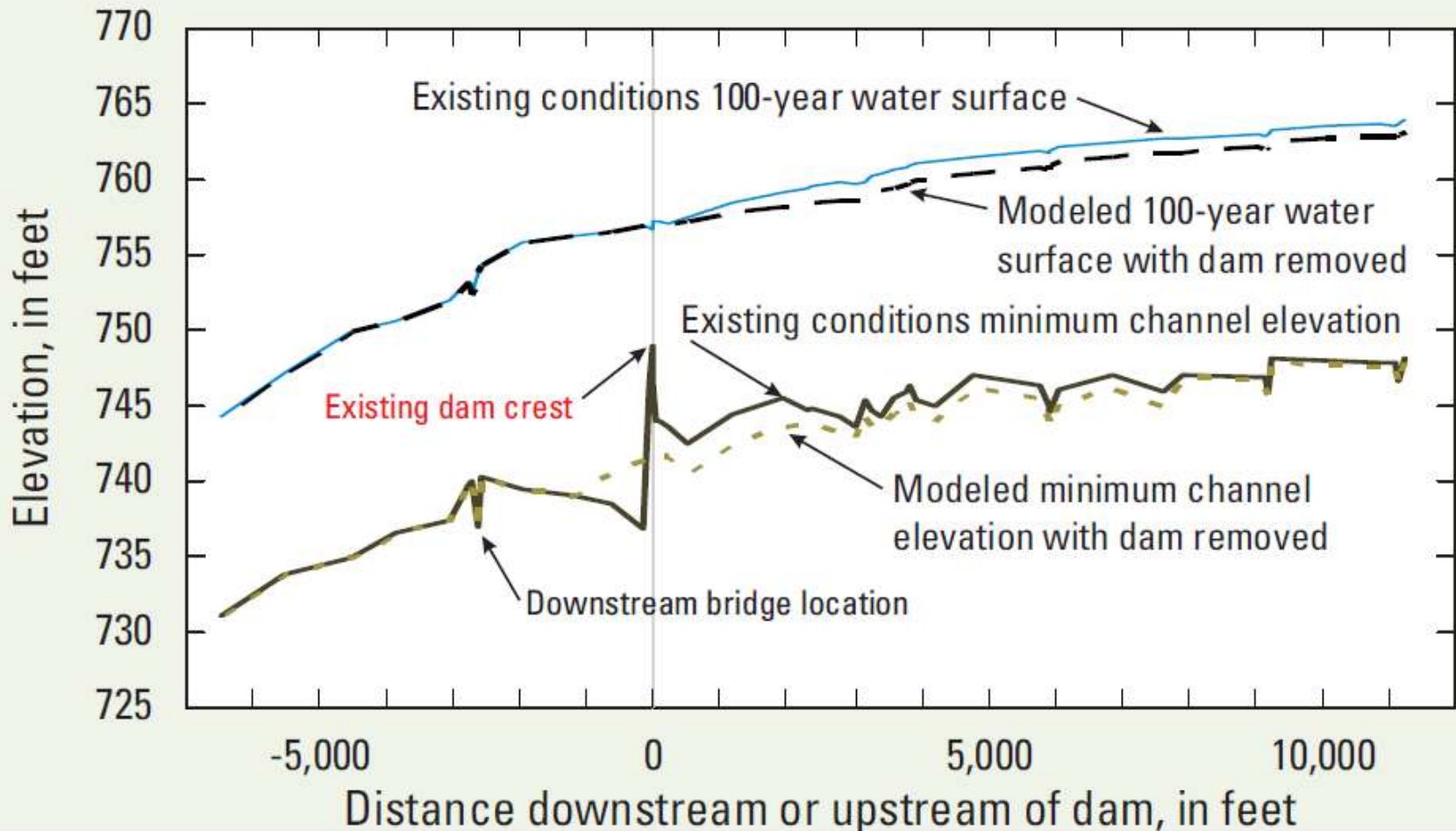


Step 6: Evaluate reservoir and downstream sediment impacts according to sediment scale.

Sediment data with dam in place (WY 2007)



Step 6: Evaluate reservoir and downstream sediment impacts according to sediment scale.

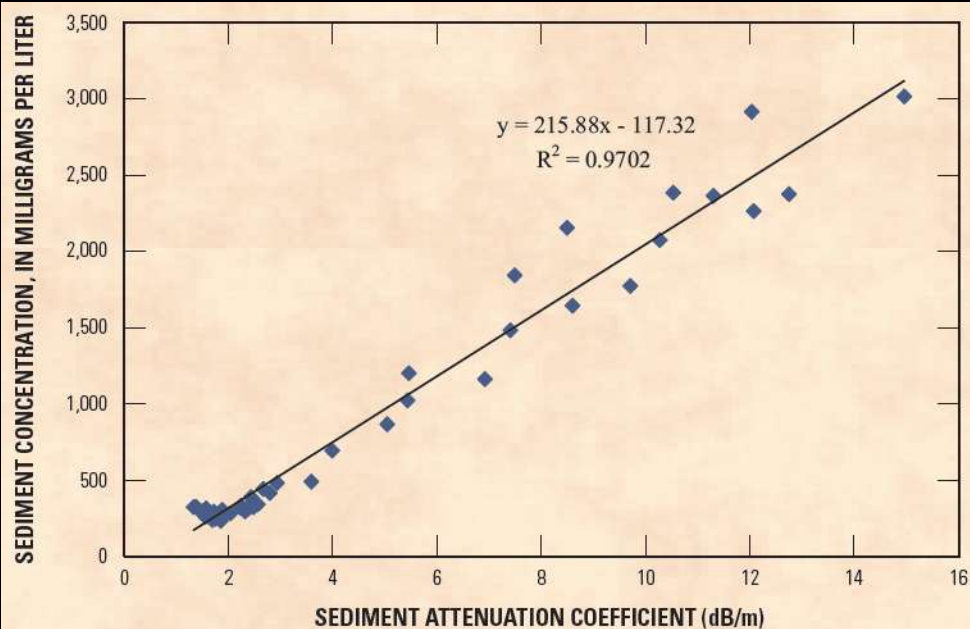


Draft National Guidelines Steps

- 7: Assess confidence, impact probability, and risk
- 8: Determine if sediment impacts are tolerable
- 9: Develop **monitoring** and adaptive management plan
- 10: Proceed with dam removal planning

Innovative Sediment Monitoring

ACoU-SED



use of acoustics to estimate
suspended-sediment concentration

LISST-SL (Laser In-Situ Scattering and Transmissometry-StreamLined)



Illinois' Role

In Illinois we have a unique opportunity to further test these guidelines given the forward thinking approach to sediment management in completed and planned dam removal projects.

