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SLIDES: Reclamation: Managing Water in the West: Elwha River Restoration Project

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Elwha River Restoration Project

Tim Randle, Manager, Sedimentation and River Hydraulic Group
Elwha River, Washington
Elwha Dam

Glines Canyon Dam

Lower Elwha Tribal Reservation

Lake Sutherland

Lake Aldwell

Lake Mills

Strait of Juan de Fuca

325 mi²

100 mi of tributaries

RECLAMATION
Lake Aldwell behind Elwha Dam

- 300 to 2,000 ft wide
- 2 mi long
- 8,100 acre-ft
Elwha Dam and Powerplant

- 5 miles upstream from river mouth
- Constructed in 1913 for hydropower
- 105-foot high concrete gravity dam
- 14.8 MW Powerplant
Lake Mills behind Glines Canyon Dam

- 1,000 to 2,000 ft wide
- 2 miles long
- 40,500 acre-ft
Glines Canyon Dam

- 13.5 miles upstream from river mouth
- Constructed in 1927 for hydropower
- Concrete arch dam
  - 210 ft high
  - 50 to 150 ft wide
- 13.3 MW Powerplant
At river mile 3, water is diverted from the river for the local paper mill and fish rearing channel.
Reservoir Sedimentation

Lake Aldwell

Lake Mills
1994 Reservoir Sedimentation:

17.7 million yd$^3$

Lake Mills Sediment Volume:
- 13.8 million yd$^3$
- ½ clay and silt
- ½ sand and gravel

Lake Aldwell Sediment Volume:
- 3.9 million yd$^3$
- 2/3 clay and silt
- 1/3 sand and gravel

22 million yd$^3$ by 2012
Reservoir Sediment Grain Size Distribution:

**Lake Aldwell**
- Sand: 27.8%
- Silt & Clay: 66.8%
- Gravel: 4.1%
- Cobble: 1.3%

**Lake Mills**
- Sand: 47.8%
- Silt & Clay: 13.4%
- Gravel: 1.5%
- Cobble: 26.3%
Planning Process

• The National Park Service is the lead agency for the U.S. Department of the Interior.

• Bureau of Reclamation was charged with engineering the dam removal and sediment management.
Planning Process (continued)

• The National Park Service completed a programmatic EIS to determine the best way to achieve river restoration.

• The Record of Decision was to remove both dams.
Planning Process (continued)

- The next EIS was completed to determine the best way to remove the dams and manage the reservoir sediment.
- The Record of Decision was to concurrently remove both dams in controlled increments and allow the Elwha River to erode a portion of the sediments from both reservoirs.
Planning Process (continued)

- The following infrastructure will be built to mitigate project impacts:
  - Engineered riffle to back up river water and divert it for industrial and municipal use. This will replace the existing rock diversion dam, which creates fish passage problems.
  - Water treatment plant to pre-treat water for existing water users.
Planning Process (continued)

• Infrastructure (continued):
  – Municipal water treatment plant.
  – Industrial water treatment plant.
  – Flood protection structures (increased height of existing levees and new levees and dikes)
Glines Canyon Dam Removal

50 feet

25 feet
Lake Mills

Delta

Glines Canyon Dam

2005
1994 Drawdown Experiment
04/10/94  8:02 am  587.0 El  1,090 cfs
Lower Delta

04/14/94  8:02 am  575.0 El  933 cfs  1990 mg/l  Qs
04/15/94 12:46 pm 572.8 El 890 cfs 2200 mg/l Qs
Horizontal scale = 1 : 310

2.05 miles = 35 ft

Chris Bromley
University of Nottingham / Oregon State University
Horizontal scale = 1 : 310

3,500 ft = 11 ft

Chris Bromley
University of Nottingham / Oregon State University
Lake Mills Physical Model Experiment

Chris Bromley
University of Nottingham / Oregon State University
Predicted Reservoir Sediment Erosion

• Erode ¼ to 1/3 of coarse reservoir sediment
  – 600,000 to 800,000 yd$^3$ of gravel
  – 1,600,000 to 2,000,000 yd$^3$ of sand

• Erode ½ to 2/3 of fine sediment
  – 4,600,000 to 6,100,000 yd$^3$ of silt and clay

• Peak suspended-sediment concentrations could reach 40,000 ppm.
Downstream Channel Predictions

- Temporary sediment deposition in river pools
- Straightening of sinuous river alignment
- Aggradation of some riffles
- Lateral channel migration
- Temporary braided river channel
- 100-year flood stage could increase by up to 2.5 ft.
Conclusions

• The Elwha River Restoration Project has the opportunity to nearly restore a complete watershed.

• Physical habitat restoration is expected to allow recovery of native fish populations.

• River restoration is expected to result in improved conditions for the Lower Elwha Klallam Tribe and substantial net economic (non market) benefits to the United States.
The End