Big Horn Lake Sediment Management Study
Study Proposal

• Bureau of Reclamation and Omaha District Interagency Agreement
• Omaha provide technical report
• Compares sediment management alternatives and provide future recommendations
• PM/Technical Lead
  – Reclamation – Stephanie Hellekson
  – COE – Dan Pridal
Scope

- Initial appraisal level of detail
- Focus on screening and alternative comparison
- Highlight constraints/issues/impacts of the sediment management challenge
- Technical focus – number crunching, define what is feasible
Alternatives

- A) Higher pool level during recreation season
- B) Trap sediments upstream of Horseshoe Bend
- C) Flush sediment through Horseshoe Bend
- D) Manage sediment within Horseshoe Bend
- E) Manage sediments within the watershed (not part of this study)
- F) Dredging/Removal (evaluate previous)
Delta Formation Overview
Alternative A

A) Higher pool levels during recreation season

Change Yellowtail operation to alter pool level – examine past records with respect to pool level vs. sediment inflow

Modifies deposition location, probably increase in southern end of reservoir, eventually worsen conditions at Horseshoe Bend

Does not solve problem but may buy some time for Horseshoe Bend
Alternative B

B) Trap sediments upstream of Horseshoe Bend

Alter causeway east of Lovell to serve as impoundment
Area is wide and shallow, more effective for coarse material than fine
Trapped sediment could be removed if funds available
Identify construction issues, policy issues, O&M
Alternative C

C) Flush sediment through Horseshoe Bend

Maintain lower pool level during high sediment runoff period to flush sediment past Horseshoe Bend

 Likely some deposition still occurs within Horseshoe Bend

Does not solve sediment problem but spreads to entire project to buy time, long term impact may be detrimental and worse than without change

Risk that pool may be impacted during lower runoff years, other similar impacts
Alternative D

D) Manage sediment within Horseshoe Bend

Implement local features to control and alter sediment deposition and transport through Horseshoe Bend

May require berm construction to separate flowing river from recreation area

Sediments move past Horseshoe Bend with minimal impact to recreation area

Alternative is most independent of other actives, least impacted by hydrology

Other alternatives may also require some implementation of local sediment management activities
Figure 3. - Drainage area for Bighorn River above Yellowtail Dam.
Evaluation Method

- Collect available data
- Construct hydraulic model
- Verify model with existing conditions
- Modify model for alternative
- Evaluate and compare
- Basis for recommendations
Modeling Options

- Simple sediment transport for a cross section
- HEC-RAS / HEC-6 / GSTARS Hydraulic Models
- More complex models (2d and 3d)
- Model complexity and analysis limited
- Will select model consistent with alternatives and available data
Model Input

- Hydraulic Model Data Requirements
  - River/Reservoir Geometry Data
  - Roughness and Loss Coefficients
  - Bed Gradation Data for River and Reservoir Reaches
  - Upstream Inflow
  - Sediment Inflow and Gradation
  - Pool Level
Data Sources

• Reservoir rangeline surveys (numerous years)
• Sediment sampling
• USGS gage stations
• Other Agencies
  – Sediment data?
  – Historical topo data?
  – Aerial photos?
  – Previous Studies
**D/S Horseshoe Bend**

2000 Bighorn Lake Sed. Survey –
Reclamation Sed. Group

**Range Line 14**

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**Graph Details:**
- **X-Axis:** Distance - Feet
- **Y-Axis:** Elevation - Ft

**Lines:**
- **Original Survey**
- **1982 Survey**
- **2000 Survey**

**Annotations:**
- **Summer – Top of Joint Use**
- **Safe Launch Elev at Horseshoe Bend**

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[Graph Image]

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**Legend:**
- D/S Horseshoe Bend
- Original Survey
- 1982 Survey
- 2000 Survey
Lower Horseshoe Bend

2000 Bighorn Lake Sed. Survey –
Reclamation Sed. Group

Range Line 15

- Original Survey
- 1982 Survey
- 2000 Survey

Distance - Feet

Elevation - Fe

Summer – Top of Joint Use

Safe Launch Elev at Horseshoe Bend
Upper Horseshoe Bend

2000 Bighorn Lake Sed. Survey –
Reclamation Sed. Group

Range Line 16

- Orginal Survey
- 1982 Survey
- 2000 Survey

Summer – Top of Joint Use
Safe Launch Elev at Horseshoe Bend
Example
Delta Progression at Gavins Point Dam

- Springfield, SD
- Santee, NE
- Missouri River Niobrara River Confluence
- Chief Standing Bear Bridge
Schedule

• Kickoff Meeting – Jan 2008
• Site Visit and Data Collection – Spring 2008
• Initial model assembly – June 2008
• 60% Alternatives Analysis – August 2008
• 90% Draft Report – October 2008
• Study Complete – November 2008
Summary

• Compare Sediment Management Alternatives
• Initial assessment level of detail to screen and compare alternatives
• Provide technical report and recommendations
Questions ?