Yellowstone River - Cumulative Effects Analysis
Project Objectives

1. Evaluate the cumulative hydraulic, biological, and socioeconomic impacts of human activity on the Yellowstone River.

2. Develop recommended management practices and position statements.
Project Extent

- Gardiner MT to the Missouri River confluence (565 River Miles)
Montana’s Involvement

- Yellowstone River Conservation District Council (YRCDC)
  - Technical Advisory Committee (TAC)
  - Resource Advisory Committee (RAC)

- 2004 Cost-Share Agreement with Corps of Engineers
- YRCDC – Local Leadership and Participation
Primary Project Components

- Hydrology
- Hydraulics - Floodplain
- Channel Geomorphology
- Riparian
- Wetlands
- Water Quality
- Avian
- Fisheries
- Land Use Trends
- Socioeconomics
- Lidar Topographic Mapping
- Cumulative Effects Analysis
Main Results:

- Natural streamflows have been affected by human development.

- Primary influences are flow alterations on the Bighorn River and irrigation withdrawals.

- The Yellowstone River has responded to these flow alterations.
Bighorn River Watershed
22,885 square miles (33%) of total Yellowstone River watershed
Bighorn River Flow Alterations

Yellowtail Dam: Built mid-1960s

- 1,331,725 acre-feet of storage in Bighorn Reservoir

- Flood control targets including preventing flows at the confluence of the Yellowstone River from exceeding 25,000 cfs
Hydrology
Changes in Flow from Undeveloped to Developed Conditions

1. High Flows: Decreased for all flood events, beginning at the Clark Fork River and increasing downstream.

2. Summer Flows: Decreased

3. Winter Flows: Increased below mouth of Bighorn River

Comparison of “Unregulated” (Undeveloped) and “Regulated” (Developed) Flows --- USGS and USACE
Changes in Flood Flows

Biggest reductions are downstream of the mouth of the Bighorn River (15-25 percent)
Typical Summer Low Flows

Decreased ~ 48% at Miles City

- Undeveloped Summer Low Flow was ~ 6,200 cfs
- Developed Summer Low Flow is ~ 3,200 cfs.
Irrigation Water Use (2000)

• All uses: 3.5 million acre feet per year withdrawn

• Irrigation
  
  • 94% of total (3.3 million acre feet per year) withdrawn for irrigation
  
  • 660,340 acre feet per year consumed by irrigation
How do influences of irrigation compare to changes on Bighorn River?

Summer: Overall Decrease in flows: ~ 50% Bighorn, ~ 50% Irrigation
Relative Changes in Natural River Flows

- Minor: Irrigation
- Moderate: Irrigation
- Major: Irrigation and Bighorn River Flow Alterations
Geomorphic Response to Flow Alterations
Smaller Channel below Bighorn Confluence
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4,460 fewer acres of river channel below Bighorn River since 1950
Cottonwood Forest Regeneration
Fewer Channel Gravel Bars
Geomorphologic Response to Flow Alterations
Less Side Channel Length During Spring Runoff
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Developed Condition
Floodplain Isolation Due To Flow Alterations and Floodplain Dikes

Between Springdale and the mouth (477 miles), over 21,000 acres of floodplain are no longer inundated at a 100-year flood

- The largest cause is the reduction in flows - 8,604 acres isolated at a 100-year event
- Agricultural dikes and levees and the railroad each isolate about 3,500 acres.
- The abandoned railroad isolates about 2,300 acres
Sediment Reduction
Leaking Irrigation Ditches
Yellowstone River Recommended Practices & Position Statements: