Upper Clark Fork River Floodplain
--Geomorphic Context

Upper Clark Fork Working Group
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What was the pre-impact floodplain like?

Johnny Grant (Grant Kohrs Ranch) was a French Fur Trapper

Described Deer Lodge Valley as “trapped out” in 1850s
Was it multi-thread?
Probably early flow consolidation/incision

- **DB Stage 0**: wooded branching stream with beavers (native condition) - 97%
- **DB Stage 0**: wooded branching stream no beavers - 79%
- **DA Stage 1a**: grassy branching stream (or irrigated) - 67%
- **E Stage 1b**: grassy sinuous stream - 64%
- **C Stage 1c**: enlarged/over-wide straight stream - 36%
- **B, G, F Stage 2**: channelized stream - 18%
- **G-F Stage 3-5**: incised stream - 18%

Mark Beardsley, Ecometrics
1868—Primarily Single Thread

Left Bank of Deer Lodge River, Timber cottonwoods with willows and alders

Avoid crossing south 693 ft east 1617 ft to Deer Lodge River

Right bank Deer Lodge River, to avoid crossing the same four times I ran east

Race track creek no timber willow thickets

Right bank Racetrack Creek no timber

Left bank of Deer Lodge River—Timber a few cottonwoods with willows and alders

“Fence -- House of Kohrs”
The post-1908 CFR largely follows its pre-flood channel.
Floodplain Inundation Frequency: ~10-year event

Floodplain Vegetation Trajectory: DOWNWARD
Will the River Heal Itself?

What is its natural recovery trajectory?
Pre-1850’s– maybe multi-thread, good floodplain connection

Flow consolidation (trapping, irrigation), some downcutting– 1880s

Heavy aggradation by tailings causes entrenchment (1908)

Some inset floodplain creation (2000), tailings recruitment

Are we going to get here? Lots of tailings recruitment. Channel migration. Inset Floodplain bench construction.
Pre-1850’s– maybe multi-thread, good floodplain connection

Flow consolidation (trapping, irrigation), some downcutting– 1880s

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Some inset floodplain creation (2000), tailings recruitment

This requires sediment input and channel migration
Pre-1850’s– maybe multi-thread, good floodplain connection

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Heavy aggradation by tailings causes entrenchment (1908)

We are STUCK HERE (for the foreseeable future)
Low rates of sediment delivery
Supply limited
Clark Fork below Garrison
Warm Springs Ponds contains an estimated 19 million cubic yards of contaminated sediment (~160,000 cy/yr)
Primary Source
Boulder Batholith
So What to Do?

We are STUCK HERE (for the foreseeable future)

MAKE THIS HAPPEN
Excavate a new floodplain: Clark Fork River
Clark Fork River
Major Floodplain Design Elements

- Elevation of Floodplain Surface
- Shape of Floodplain Surface
- Types of Floodplain Treatments

Balancing Function and Risk
Before

~10-year capacity
After

~1.5-2-year capacity
How has the floodplain performed?

Context is important!
How has the floodplain performed?
Context is important!

Total Number of Days Design Flow Exceeded at Galen (USGS 12323800) vs. Year of Project Life

Phase 1 hovered at design flow for about a week
2018 High Water Drone Flight
Inundation of Major Floodplain Features

- **Bank/Floodplain**
- **Floodplain swale**
- **Side channel**
- **Wetland**
- **Wetland (Oxbow)**
- **Wetland (Side channel)**

### 2018 High Water Drone Flight

**Percent of Floodplain Inundated**

- **Phase 1**: 57%
  - 376 cfs

- **Phase 2**: 26%
  - 315 cfs

- **Phase 5**: 38%
  - 260 cfs

- **Phase 6**: 23%
  - 219 cfs
Restoration Trajectory—**NATURE AND NURTURE**

**Nature:**
- Removal locations/extents
- Materials available for construction
- Landowner preferences
- Design/implementation

**Nurture:**
- Age of project
- Post-implementation events