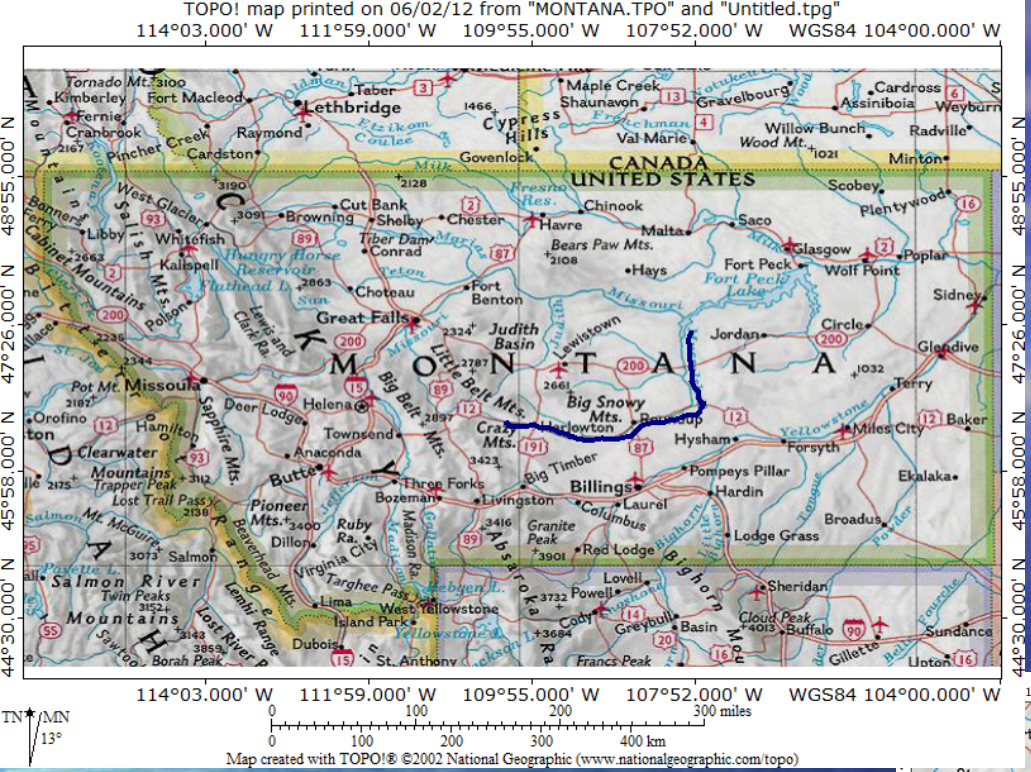
MT DNRC Response to Musselshell Flood 2011

Musselshell River

- Named by Lewis & Clark on 5/20/1805 for Freshwater Mussels Lining Banks of River
- Tributary to Missouri River (Fort Peck Reservoir) Largely Fed by Snowmelt in Spring & Early Summer



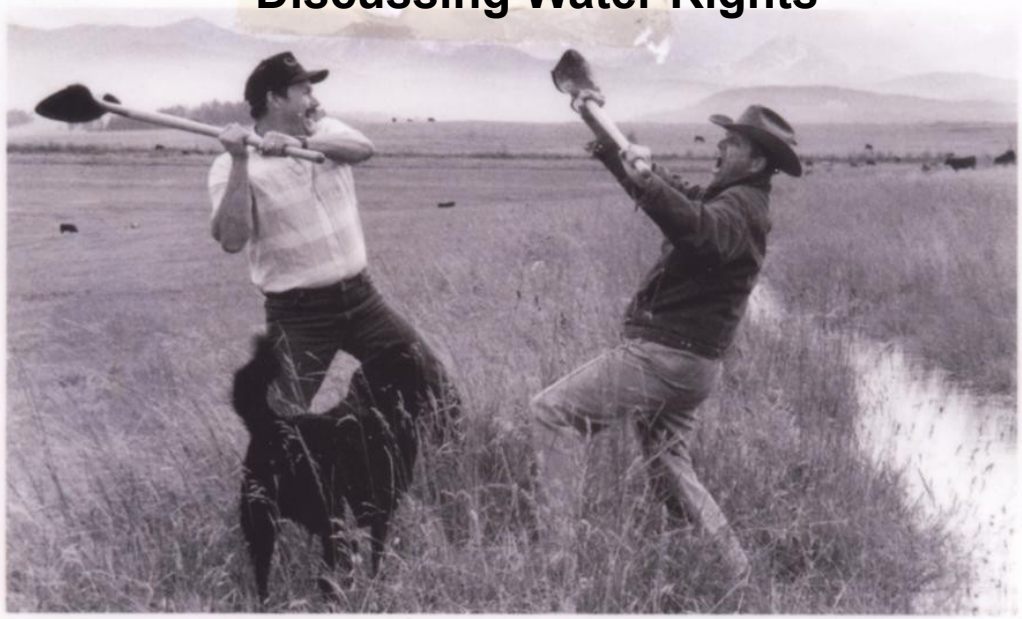
- Mainstem is 342 Miles Long
- North & South Forks make River ~ 500 Miles Long
- Drains 108,268 Acres

Typical Musselshell River Water Availability and Distribution Issues

"Fight for the Water Hole"

Musselshell River was Administratively Closed in 1992 and has been a Montana Water Court Distribution Project since 2003

Discussing Water Rights



"Whiskey is for Drinking, Water is for Fighting!"
Mark Twain

Reason for Closure and Distribution Project – Generally there is not enough Water Physically Available in the Musselshell River compared to Existing Legal Demands (314 of the total 342 miles of the Mainstem are Classified as Chronically Dewatered, River Managed for Agriculture Purposes)

Average Annual Flow of Musselshell River @ Mosby Gage from years 2000-2010 was 94.8 CFS

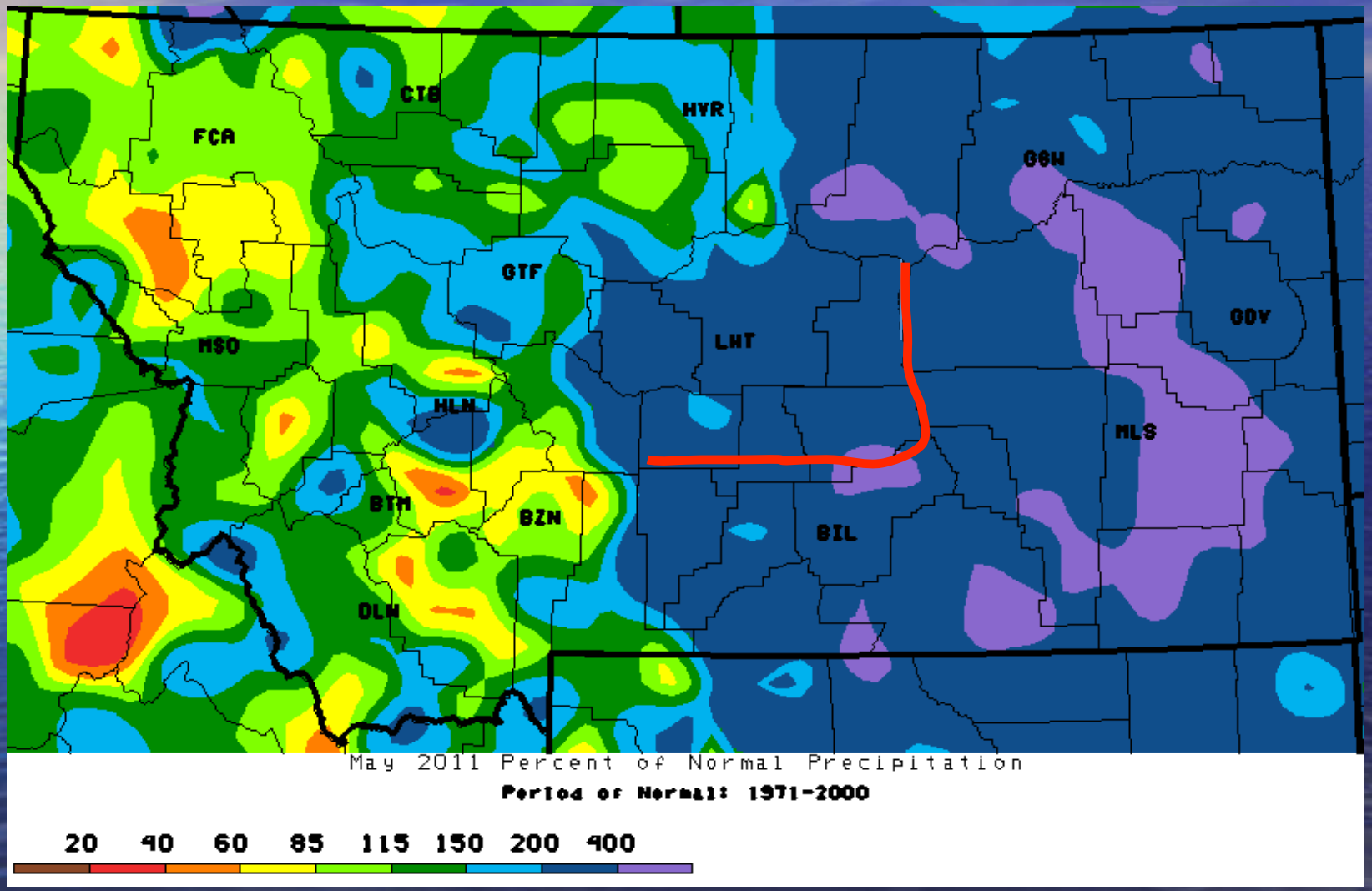
May 26, 2011

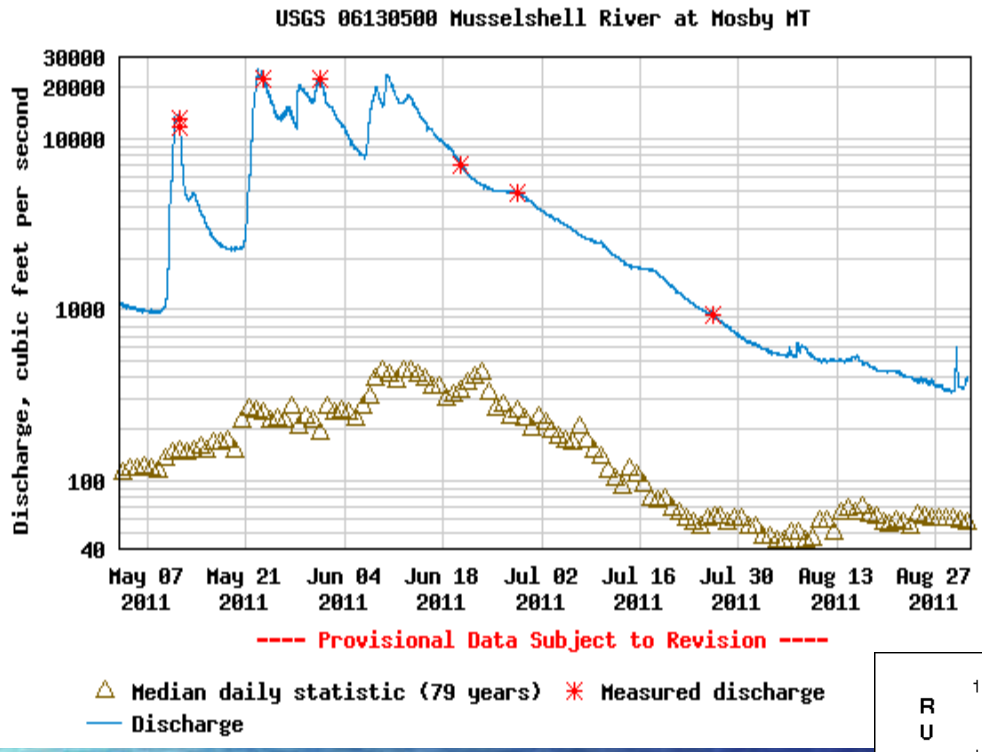
Musselshell River @ Roundup Crested at 4.78 Feet above Flood Stage. River Flowed at or above Flood Stage for 21 Days

May 23, 2011

Musselshell River @ Mosby Crested at 5.98 feet above Flood Stage. River Flowed at or above Flood Stage for 42 Days

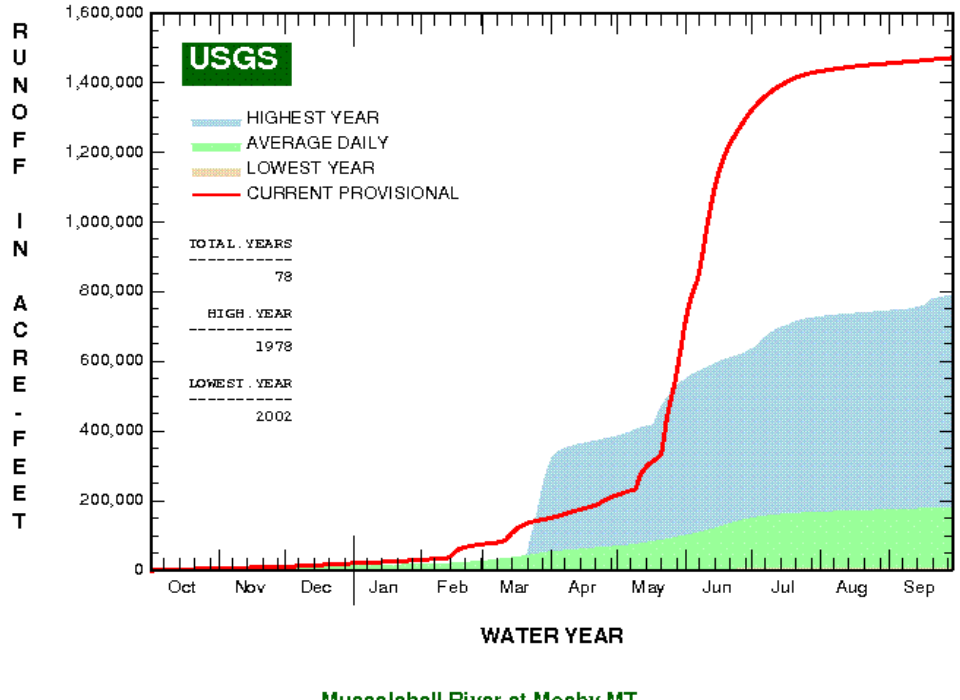
Percent of Normal Precipitation
May 2011





Peak Flow @ Mosby Gage - 25,100 CFS on 5/23/2011 (Previous Peak – 18,000 CFS on 6/18/1944)

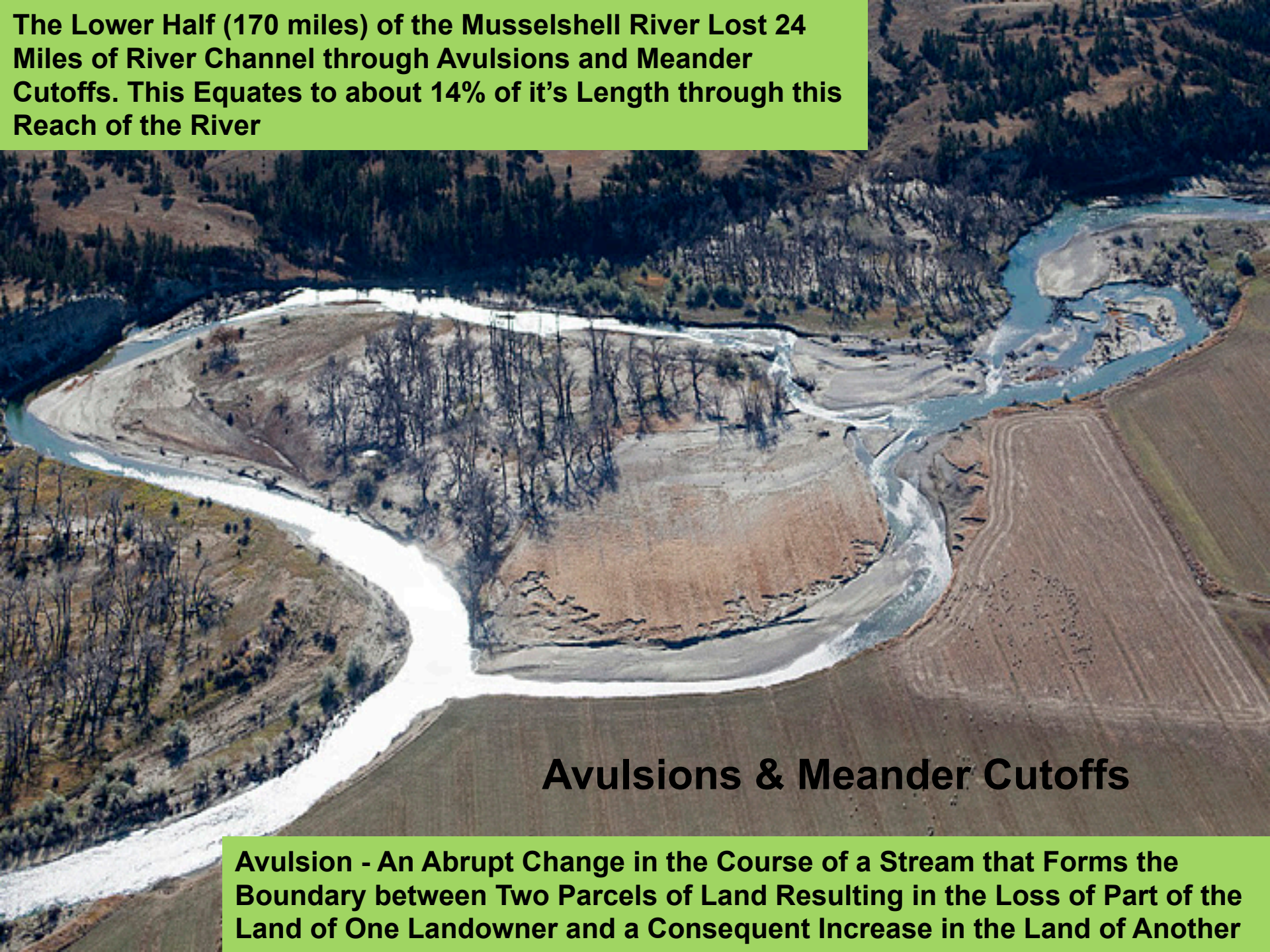
51 Days in 2011 each Contributed more Volume to Fort Peck Reservoir than the Entire Year of 2002



Flood Damage Impacts to Water Rights

- Avulsions & Meander Cutoffs
- Breached Dams, Dikes & Canals
- Diversion Structure Damage
- Pump Site Damage
- Fields Damaged or Destroyed
- Irrigation Infrastructure Lost

The Lower Half (170 miles) of the Musselshell River Lost 24 Miles of River Channel through Avulsions and Meander Cutoffs. This Equates to about 14% of it's Length through this Reach of the River



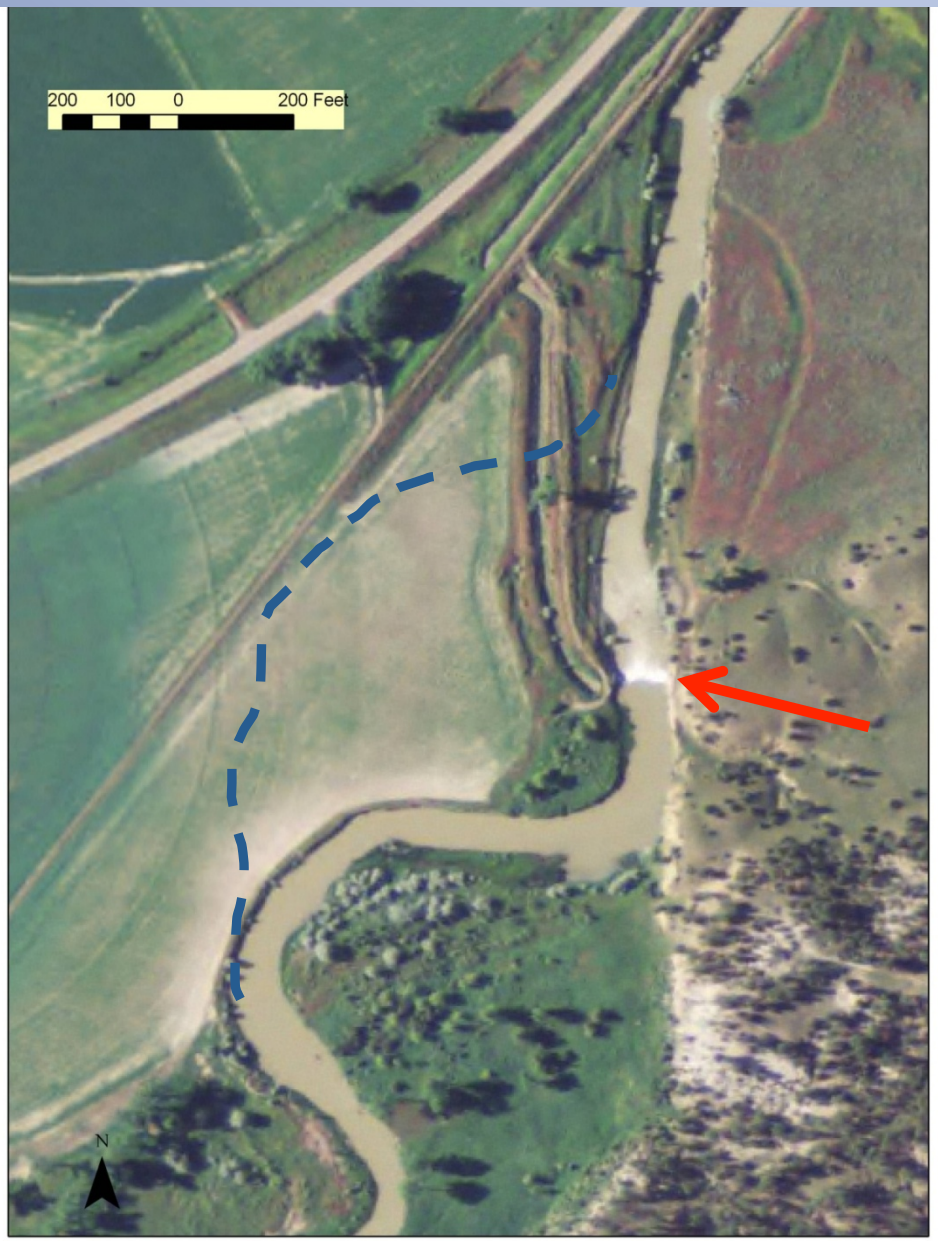
Avulsions & Meander Cutoffs

Avulsion - An Abrupt Change in the Course of a Stream that Forms the Boundary between Two Parcels of Land Resulting in the Loss of Part of the Land of One Landowner and a Consequent Increase in the Land of Another


N
500 250 0 500 Feet


N
500 250 0 500 Feet


Breached Dams, Dikes & Canals
©WWW.KESTRELAERIAL.COM


200 100 0 200 Feet
N


200 100 0 200 Feet
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Diversion Structure Damage

Pump Site Damage

Crop Land Lost to Production from Scour of Failed Avulsions & Cutoffs


Several Feet of Sediment is Deposited on the Floodplain

Irrigation Infrastructure Lost – Miles of Gated Pipe Washed Downstream


Water Well

Montana Water Law:
Basic Principles

- **Doctrine of Prior Appropriation**
  - ✓ **First in time is first in right**
  - ✓ **No priority of use in Montana**
  - ✓ **Limited to beneficial use (no waste)**
  - ✓ **Limited to historic use (no expansion)**
  - ✓ **Use it or lose it (10 years)**

Emergency Declaration to Suspend Point of Diversion Changes for Flood Damaged Water Rights on the Musselshell River

1. Executive Order by Governor (June 21, 2011 – December 31, 2012)
   - Emergency Declaration resulting from 2011 flood (extended for Musselshell Drainage through 2012)
   - Temporary suspension of requirements for changes in points of diversion that were rendered inoperable by flood
   - Cannot increase water use
   - Notice to the DNRC after temporary change has been made
   - Point of diversion reverts back to former diversion site after December 31, 2012

Musselshell Watershed Coalition

The Musselshell Water Coalition is a voluntary partnership of four water-user groups, conservation districts and state and federal agencies.

Montana Department of Natural Resources and Conservation (DNRC) staff:

• Provide Information for Grant Assistance. The Coalition's Irrigation Management Program is proposed to establish a toolkit to inventory, describe, analyze and prioritize water management activities on the Musselshell River. Montana DNRC awarded $18,000 in grant funds to begin this project and another $60,000 is pending approval by the Montana Legislature.

• Attend and Facilitate Meetings with Multiple Agencies to Assist Producers

• Help Staff a Team Comprised of Experts in Various Disciplines to Evaluate Impacts and make Recommendations to Producers for Re-establishing Operations. (River Assessment Triage Team (RATT))

River Assessment Triage Team (RATT) Site Report

Site: Randy Frost

Impacts: Floodplain Scour, Avulsion, Lost Pump Site
Date of Field Visit: October 6, 2011
Latitude: 47.08104° Longitude: - 107.94163°

The following summary describes field observations of the 2011 Musselshell River flooding impacts and restoration considerations developed by the RATT team. The recommendations are conceptual in nature, and may require more detailed designs, background information to obtain necessary permits, and potential changes in points of diversion. This effort has not included detailed feasibility, design, or cost development. The recommendations are intended to help landowners plan restoration projects at specific sites evaluated by the RATT team by request.

1 Flood Impacts

Flood impacts to this area of the Lower Musselshell River include avulsions (carving of new channels), lost pump sites, severe bank erosion, channel widening, massive sediment deposition on the floodplain, and hillslope failure (Figure 1 and Figure 2). An old cabin was destroyed by an avulsion, and a water line was washed out. Three sites are described in this report, including one pump site abandoned by an avulsion, one pump site eroded out, and a buried field (Figure 2).

Figure 1. Pre-flood (2009) air photo of sites.

Figure 2. Post-flood (August 2011) air photo of sites

2 Site 1: Abandoned Pump Site

Site 1 consists of a pump site that was abandoned due to an avulsion cut off a large bendway (figure 3). Nearly 1.5 miles of river channel were lost. Discussions at the site focused on the identification of a new pump site to irrigate fields east of the river. A good site was identified along the left valley wall bluff line near a power line crossing. The site should be relatively stable against the valley wall, but it will be important to locate the inlet of a portable pump in relatively deep water through the bend. A ford river crossing to access this field will also need to be constructed downstream of the proposed pump site.

Figure 3. 2011 air photo showing abandoned pump and recommended new pump site, Site 1.

Figure 4. View downstream of proposed pump site and fields to right.

3 Site 2: Eroded Pump Site

Site 2 consists of a long section of left bank erosion that eroded out a pump site and exposed sections of buried mainline pipe. It is located on a large bendway that eroded over 800 feet toward the west during the flood, destroying approximately 37.5 acres of field (Figure 5). The bank is approximately 15 feet high, and is on the edge of an irrigated field. The bank is unstable, and will continue to collapse and slope back with time. There is portable floating pump available at the site. The best option at this site appears to be excavation of an access ramp down through the high bank to gain river access for the floating pump. The ramp should be low gradient and fairly wide to accommodate future slumping of the riverbank and walls of the ramp.

The irrigated field that was eroded now extends to the river's edge (Figure 5). The bank will continue to adjust in response to the flood, so more bankline will likely be lost due to either mass failure (slumping) or bank erosion. It is important that a buffer be established between the actively irrigated ground and the bank edge, to prevent oversaturation and to minimize additional slumping of the bank.

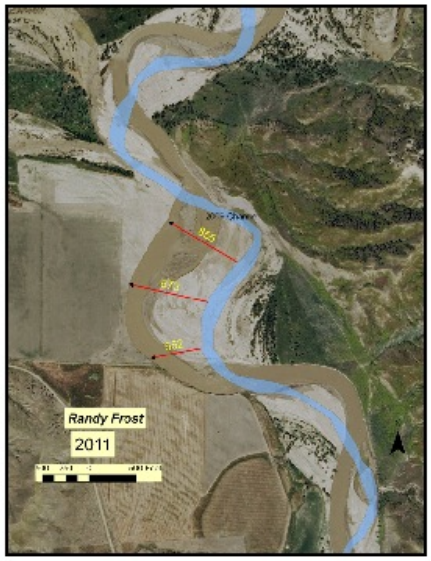

Figure 5. 2009 channel (blue) showing migration distances in feet.

Figure 6. View upstream of eroded pump site showing ongoing failure of high bank.

4 Site 3: Buried Field

The third site is an area of massive sediment deposition on a previously sprinkler irrigated field (Figure 2). A sediment probe indicated at least 4 feet of deposition in some areas. Because of the depth of the new sediment, it is not feasible to till it into the old field soil, and probably too expensive to remove with normal means. There are broad carpets of cottonwood and riparian seedlings in the new sediment. The best opportunity in this area may be to place this area into a USDA program designed to protect the seedlings and encourage their growth over at least the next several years while providing incentive payments to off-set some lost production.

Figure 7. Four foot long sediment probe sinking into buried field.

Figure 8. Cottonwood seedlings at Site 3.

In some areas, fields with over 2 inches of flood sediment will be reclaimed for irrigation. In these cases we recommend that the fields be cultivated deeply to insure mixing of old and new soil followed by several seasons of planting to a cover crop mix and/or small grain (hay barley). This approach will provide time for freeze and thaw sequences to help break down the clay clods as well as to improve the organic matter and biologic activity in sandy deposits. After several crops, the soil tilth or workability should be suitable for hay production.

5 Conservation Opportunity

The 2011 flood deposited sediment on fields, in old cottonwood stands, as new gravel bars, and in abandoned channels, in some cases making them difficult to irrigate or use productively. In many of these areas, thousands of young cottonwood and willow seedlings have taken root. This flood event has created a tremendous opportunity to develop a young class of riparian vegetation in the river corridor that will help to stabilize the system in the long-term. In order to encourage the protection of these areas to increase the odds of survival of the young trees, the USDA has developed several program options for riparian area protection (Flood Recovery Initiative Programs). Additional programs are available to help restore fields damaged by the flooding. If producers are interested in these programs, they should contact the local USDA office (FSA and NRCS) for program eligibility criteria, participation requirements, and financial benefits.

6 RATT Recommendations

This area experienced extensive flood damages. There were multiple avulsions, bank erosion was severe, the channel widened dramatically, and fields were buried with sediment. A recent air photo of the site shows how dramatic the flood damage was, with extensive new open bar areas and abandoned cutoff channels (Figure 9 and Figure 10). The river will continue to adjust to its new configuration for many years. To that end, we recommend that flexible solutions be considered as much as possible, so project implementation and maintenance costs can be minimized in the long run.

At Sites 1 and 2, we recommend that the pump sites be relocated as described above. Moving the pumps to a new location is a change in Point of Diversion (POD). This has implications for water rights; the DNRC Water Rights Bureau in Lewistown should be contracted prior to any work to determine how water rights issues should be addressed. It may be optimal for the new portable pumps to be filed as a "transitory" POD to allow them to be moved as necessary within a designated reach of river.

Site 1 will also require a river ford crossing to access the fields east of the river. Shape the banks to allow equipment access and transport in pit run gravel to harden the river bottom crossing as necessary.

At Site 3, the depth of sediment is such that restoration of the field for irrigation may not be cost effective. If that is the case, we recommend placing the ground into one of the USDA programs that will

protect the area and encourage the continued growth of woody riparian vegetation. This will help the long-term stability of the river through the property and provide some opportunity for the recovery of foregone income.

Figure 9. November 2011 photo showing Site 1 in foreground (Kestrel Aviation).

Figure 10. November 2011 photo of Site 2 (Kestrel Aviation).

Replacement Point of Diversion Form 644

(Abbreviated Water Right Change Process)

- **Point of diversion change only (no other changes to water right)**
- **Flood rendered diversion inoperable or deteriorated infrastructure**
- **Capacity of diversion cannot increase**
- **No other water users between old and new diversions. If so, need waiver**
- **If users share water rights and diversion facilities, then process allows one replacement POD**
- **No change in water sources and old diversion is as close as "reasonably practicable"**
- **Old diversion can no longer be used**
- **Prove that water has been used from old diversion in last 10 years**
- **Change will not increase access to water availability**
- **Cannot change irrigation method (no flood to sprinkler conversions)**
- **Cannot increase amount of water diverted, used or consumed**
- **Department notice within 60 days after completion - $400**

MT DNRC Water Right Change Process Form 606

(General Summary)

1. File application - $700
2. Prove Statutory Criteria (adverse effect, beneficial use, etc.)
   a. Evidence of historic use
3. Department preliminary determination
   a. Historic use analysis
   b. No expansions
4. Public notice
5. Objection stage
6. Objection Received -> Administrative Hearing
7. Final determination

Positive Impacts from the Flood

The new inset floodplain should improve long-term function

- Recharge Groundwater Systems
- Fill Wetlands
- Connect Aquatic Habitats
- Move both Sediment and Nutrients
- Triggers Certain Species for Breeding Events, Migration and Dispersal
- Help Economy through Increased Fish Production and Maintenance of Recreational Environments

Woody Debris Creates Habitat


Cottonwoods

More Cottonwoods!

Spring Spawns - Thank You!