

Channel Migration Zone & Smurfit Berms

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Clark Fork and Bitterroot Rivers Channel Migration Mapping Missoula County



Prepared for:

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Smurfit Stone

- Paper mills are built next to large bodies of water
- Direct discharge killed fish, invertebrates etc.
- Needed to “hold” water for higher flows or use infiltration into ground water
- 4 miles of berms
- PRPs/EPA asserts the berms are not contaminated

Channel Migration Zone vs. Floodplain Mapping

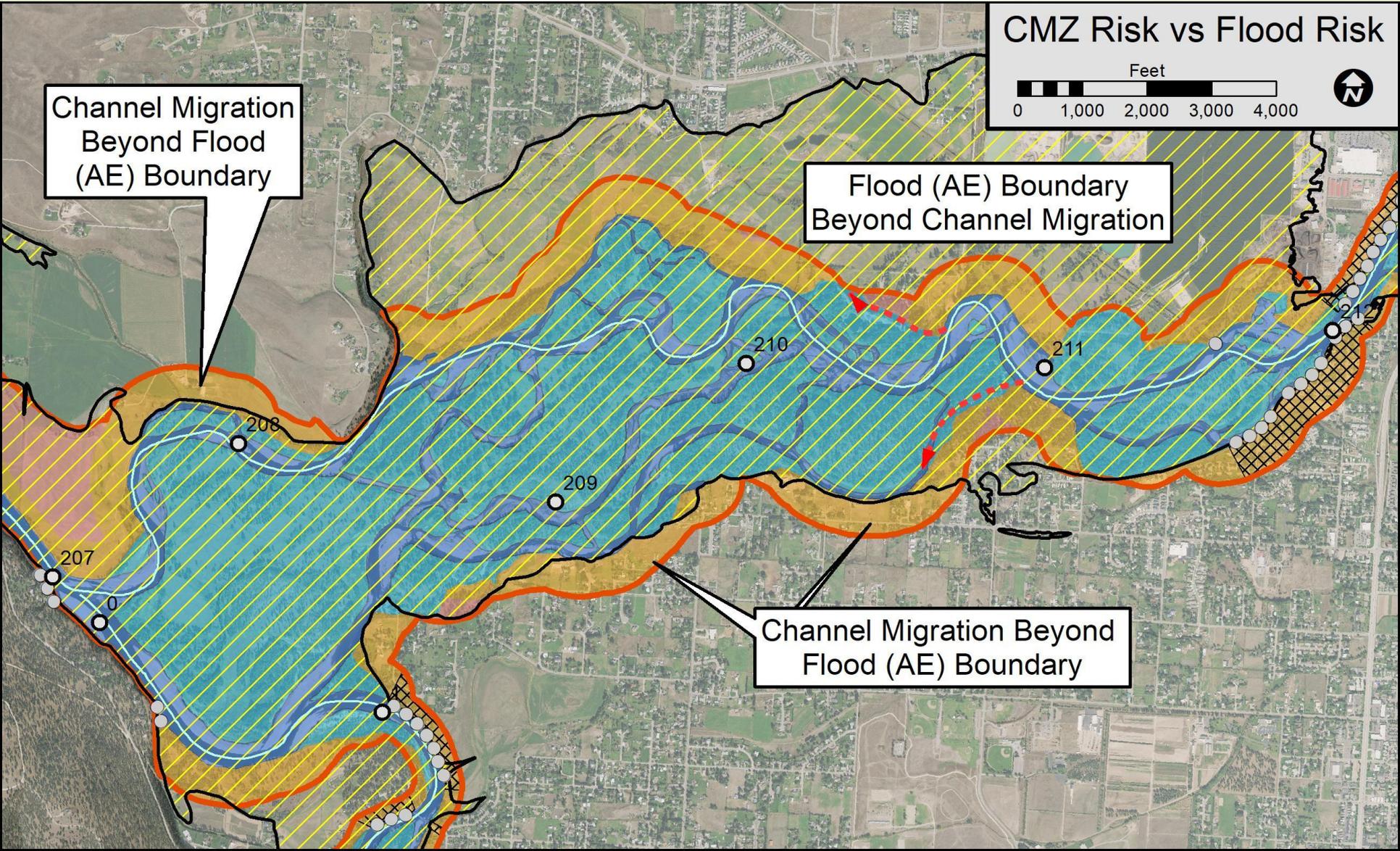
CMZ –
Will the river take out your
field/house/bridge?



Floodplain –
Will your field/house/bridge
get flooded out during high
water?



CMZ Risk vs Flood Risk



River Migration

The lateral movement of a stream or river due to processes of erosion and deposition

Avulsion

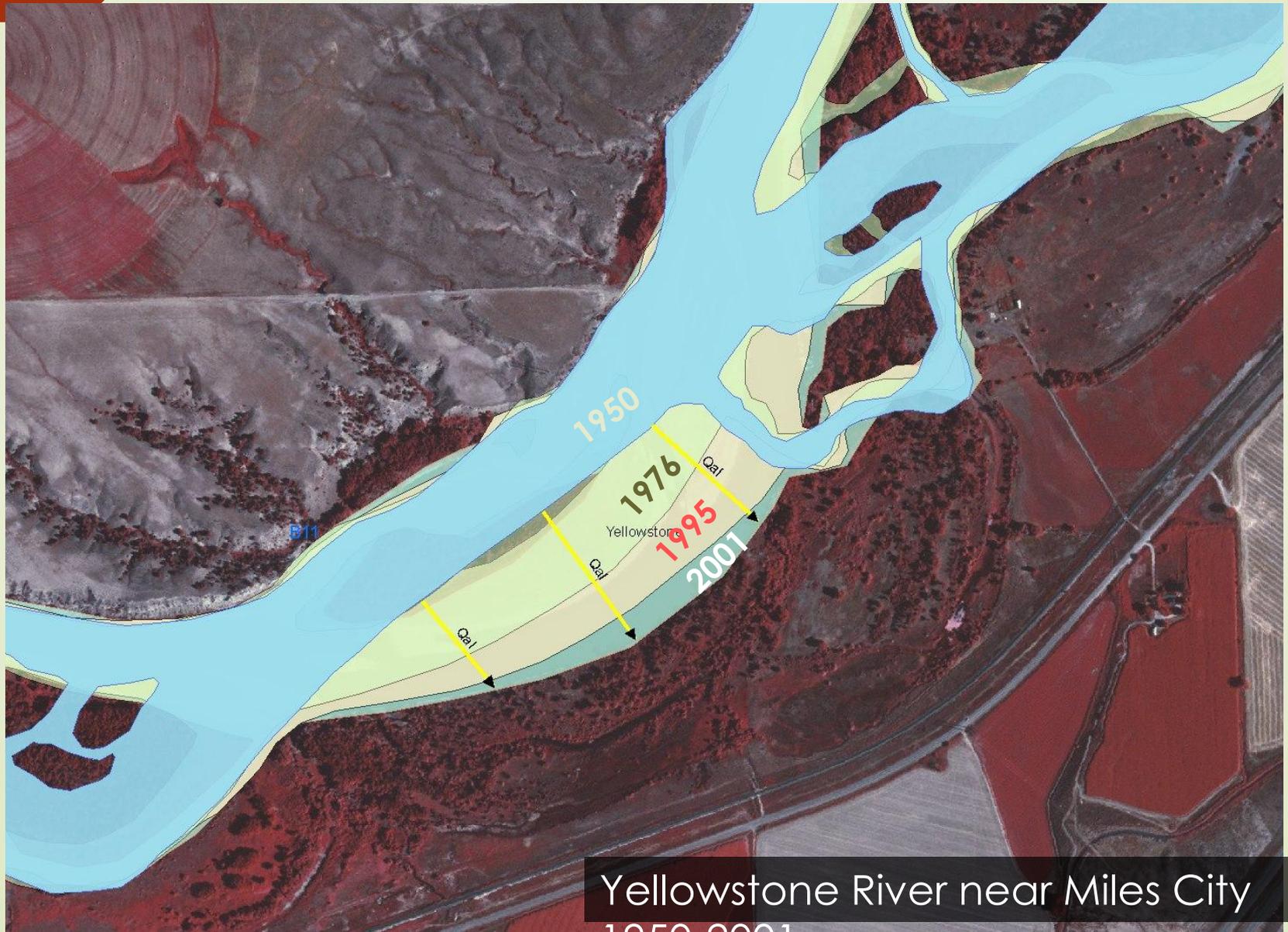


Bendway Migration



Migration:

“Marching” of a River across its Floodplain



Yellowstone River near Miles City

1950-2001

Avulsion:

The Carving of a New Channel on the Floodplain



East Gallatin River, May 25, 2008 (DNRC)

The Rate of River Movement Varies with Materials



Left Valley Wall below
Missoula
Bedrock

Kelly Island Terrace Erosion

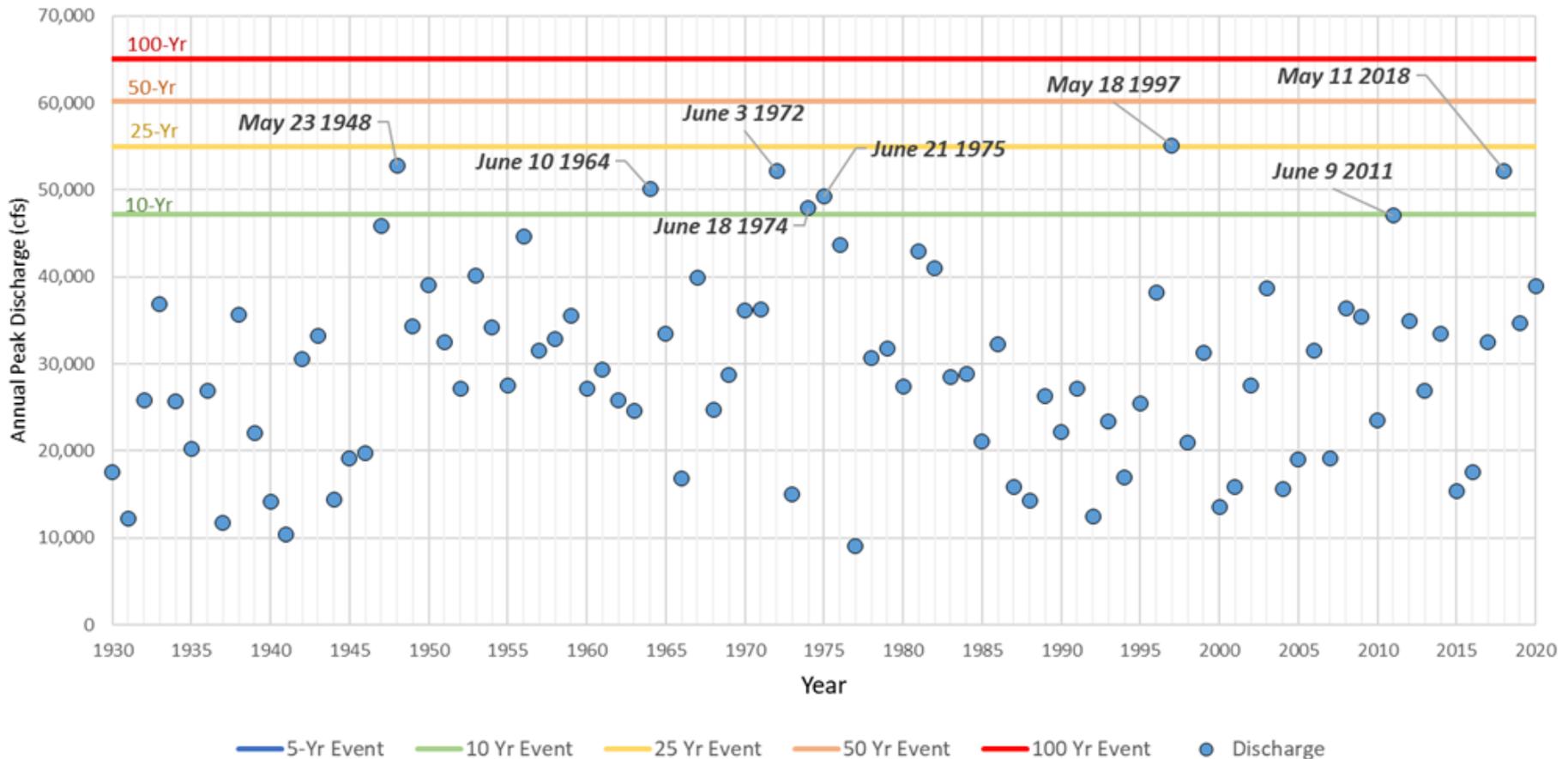


Flood History Below Missoula

2018: 52,200 cfs (10-25 year flood)

1997: 55,100 cfs (25-50 year flood)

Annual Peak Discharge
Clark Fork River below Missoula 12353000





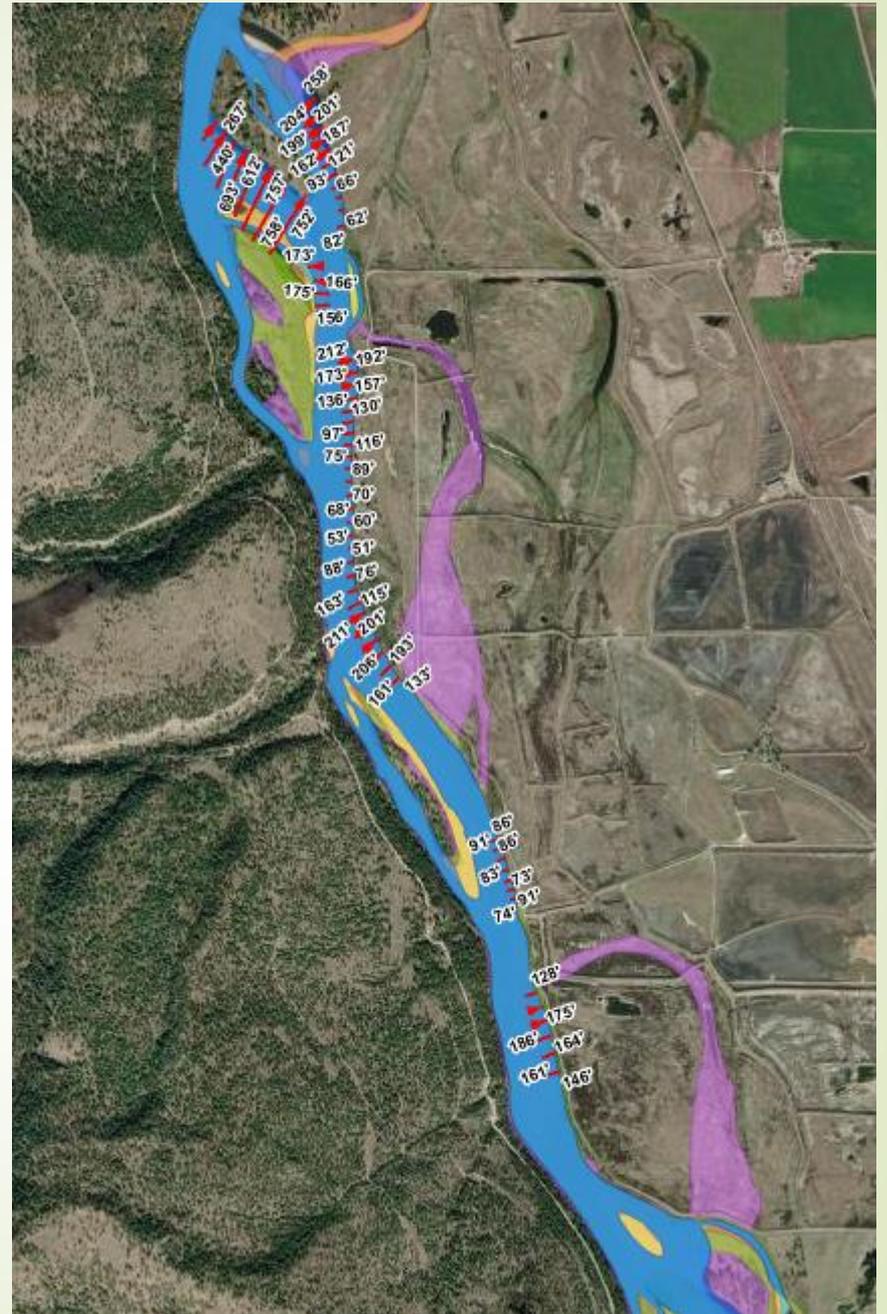
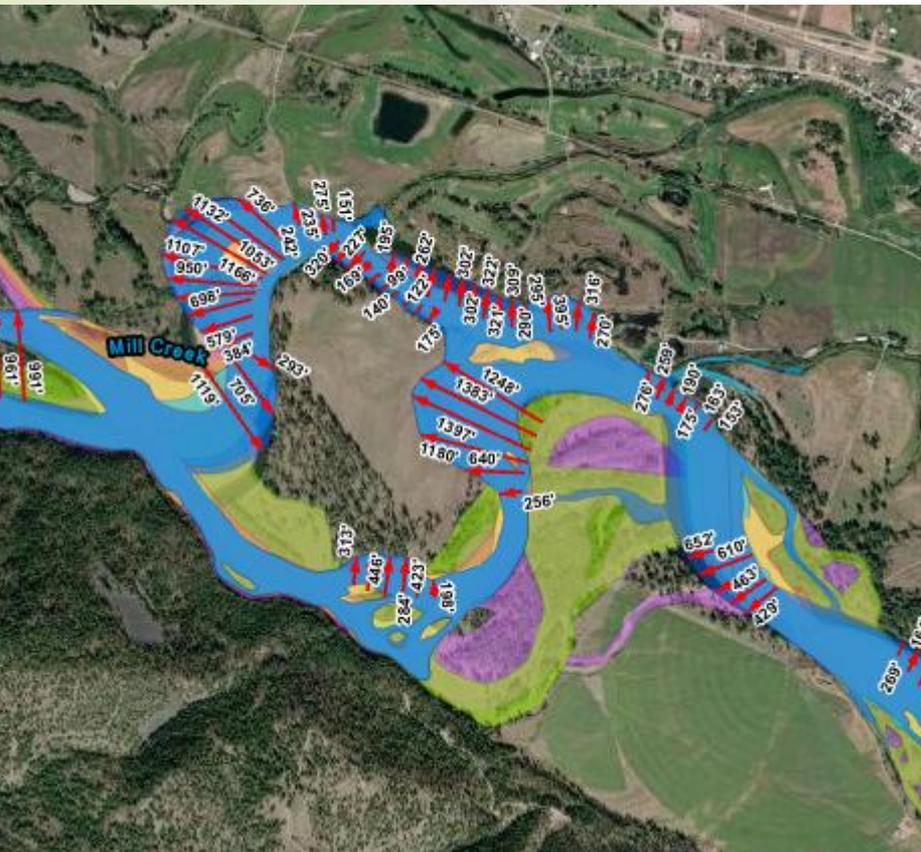
CMZ Mapping Process

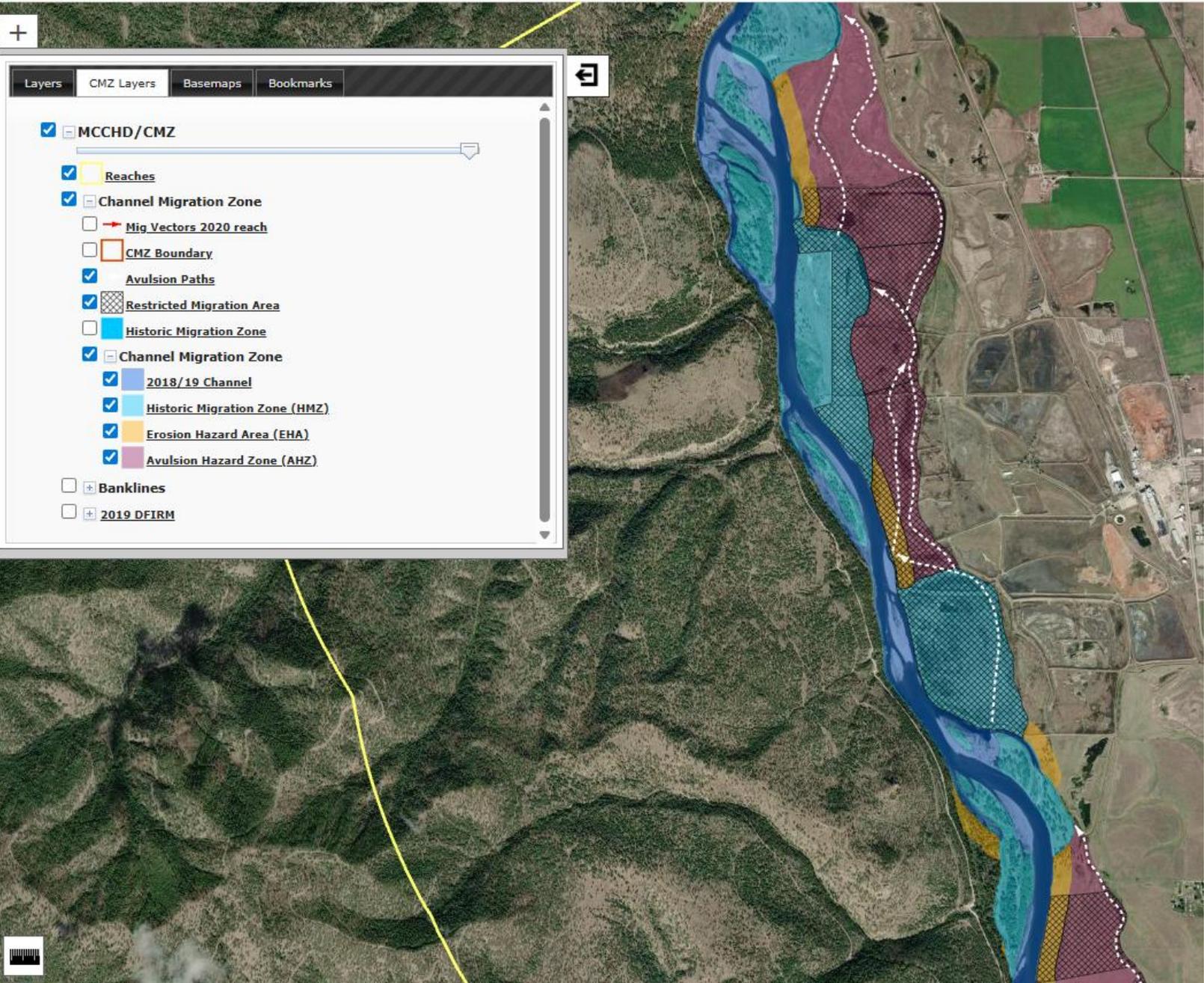
1. Identify where the river has been
⇒ **Historic Migration Zone (HMZ)**
2. Anticipate future erosion
⇒ **Erosion Hazard Area (100-yr)**
3. Map Avulsion Potential
⇒ **Avulsion Hazard Zone**

Smurfit



Downstream access
to floodplain





Layers CMZ Layers Basemaps Bookmarks

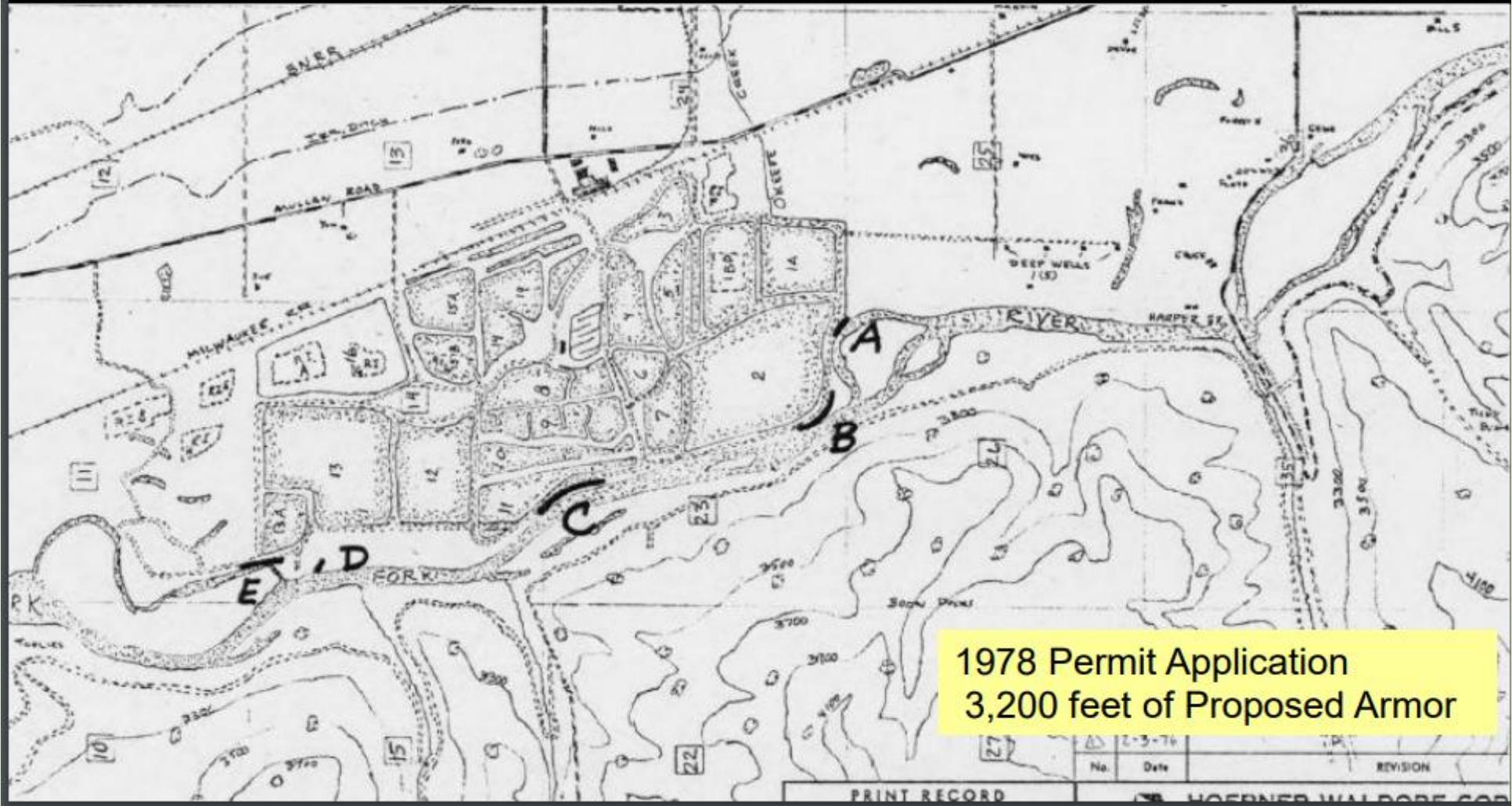
MCCHD/CMZ

- Reaches
- Channel Migration Zone
 - Mig Vectors 2020 reach
 - CMZ Boundary
 - Avulsion Paths
 - Restricted Migration Area
 - Historic Migration Zone
- Channel Migration Zone
 - 2018/19 Channel
 - Historic Migration Zone (HMZ)
 - Erosion Hazard Area (EHA)
 - Avulsion Hazard Zone (AHZ)
- Banklines
- 2019 DFIRM

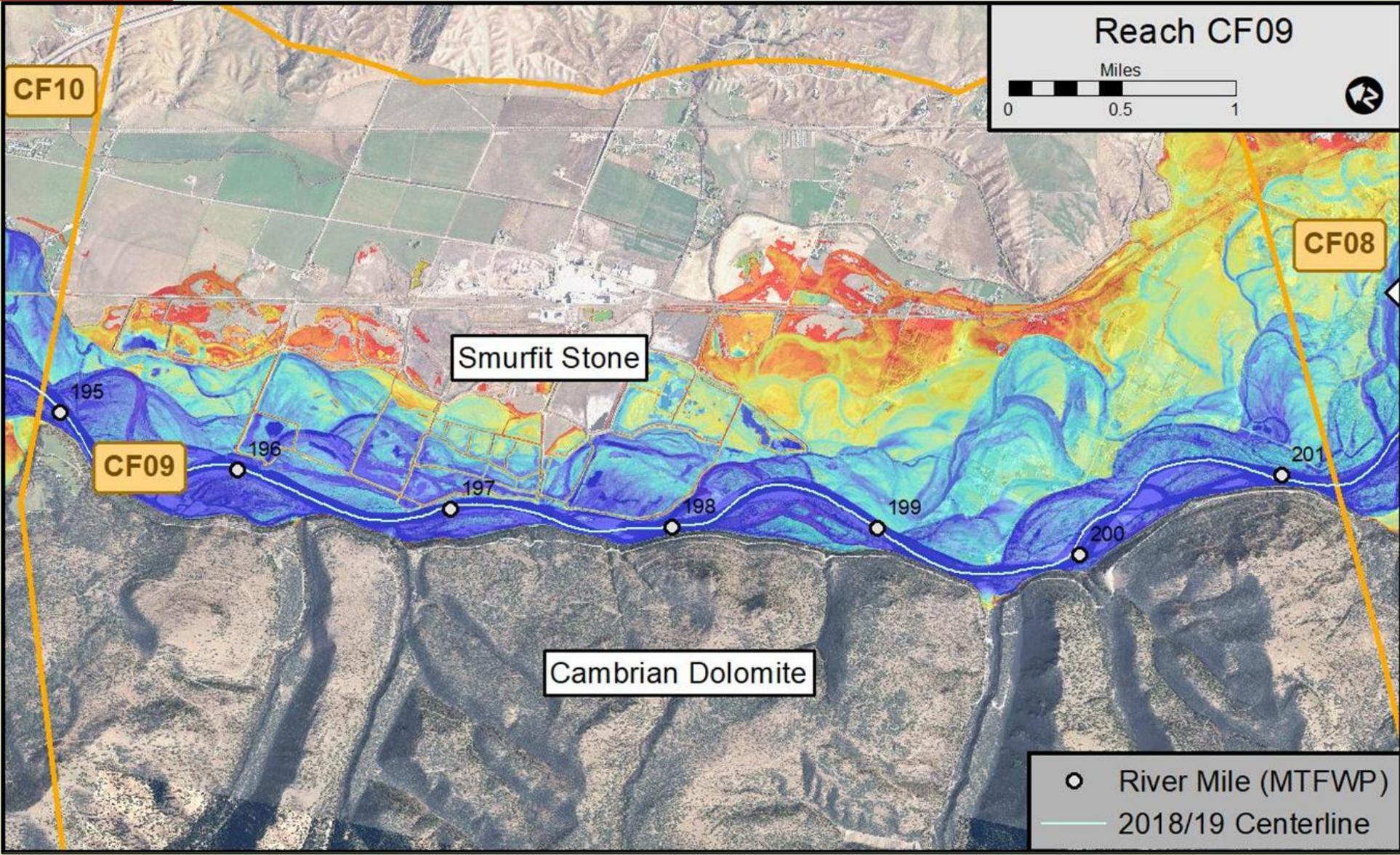
Protecting the Ponds

10 maintenance permits to protect ponds from 1974-2007

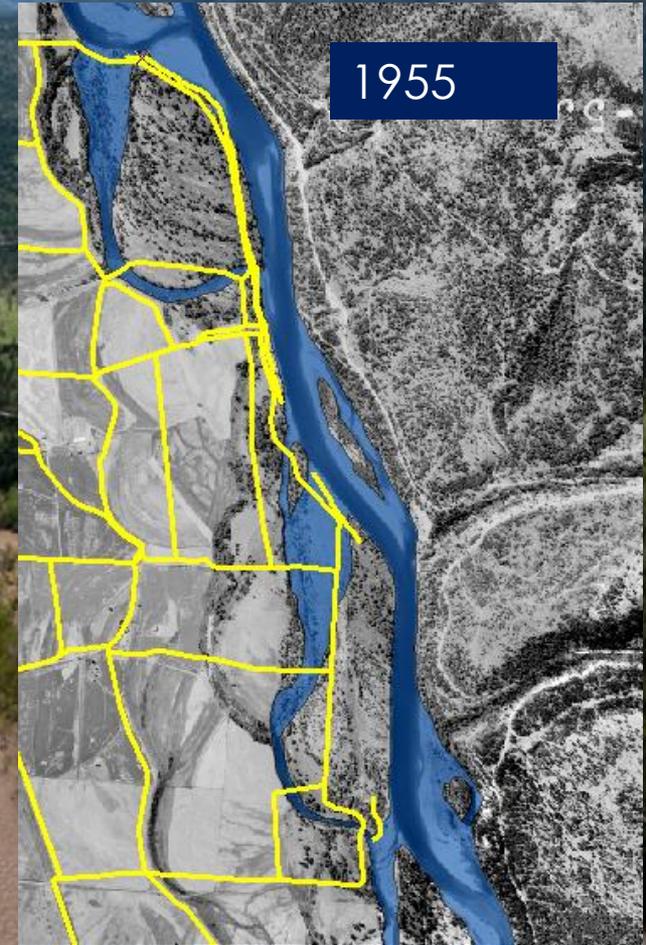
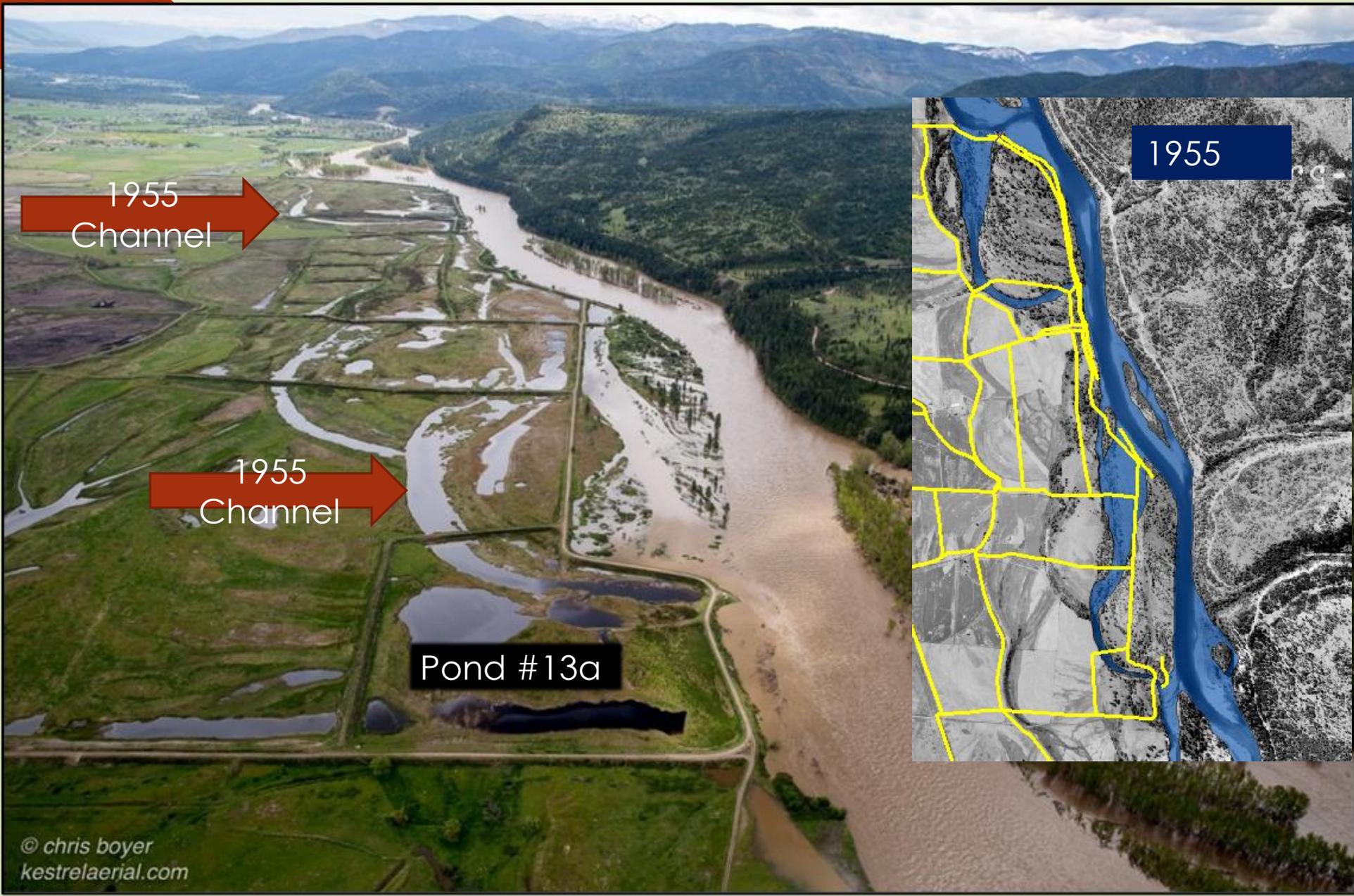
Bank Armor Construction and/or Repair, Breach Repair, Seepage Treatments



CF09 - Smurfit Stone



1950s Channels Behind Berms



Boil or “volcano” in Pond 13A May 17, 2018

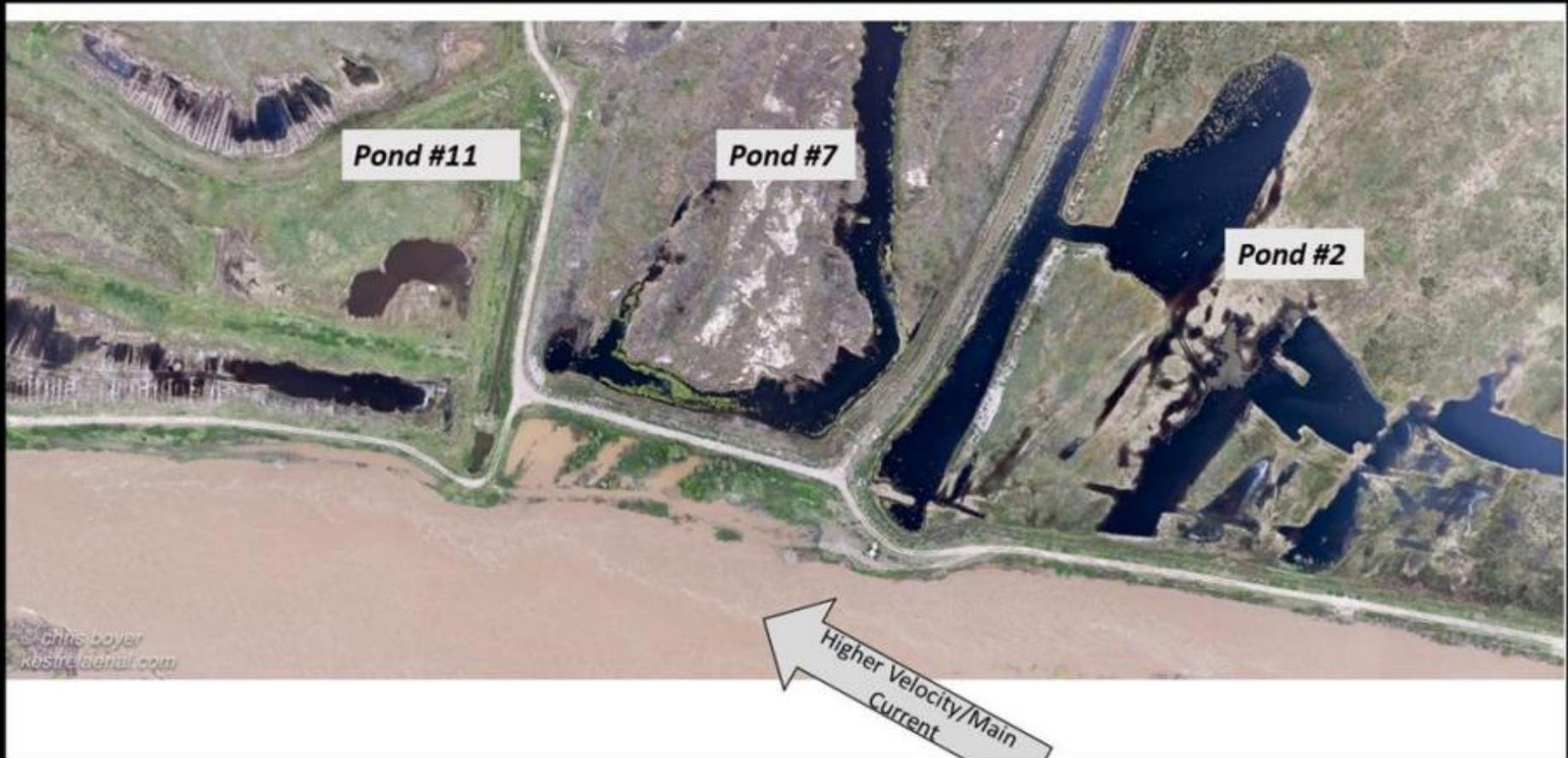
Table 6-3 Summary of Results for Seepage Analyses

STA	Pond	Steady-State Exit Gradient at Landside Toe
30+00	HP2	0.9
50+00	HP2	0.1
66+00	HP2	0.4
74+00	HP7	0.1
94+0	HP11	0.2
122+00	HP12	0.3
147+00	HP13a	4.0
177+00	HP13	2.0

Red bold values indicate results do not meet minimum acceptance criterion for factor of safety.



High flow velocities against ponds Repeated maintenance is necessary

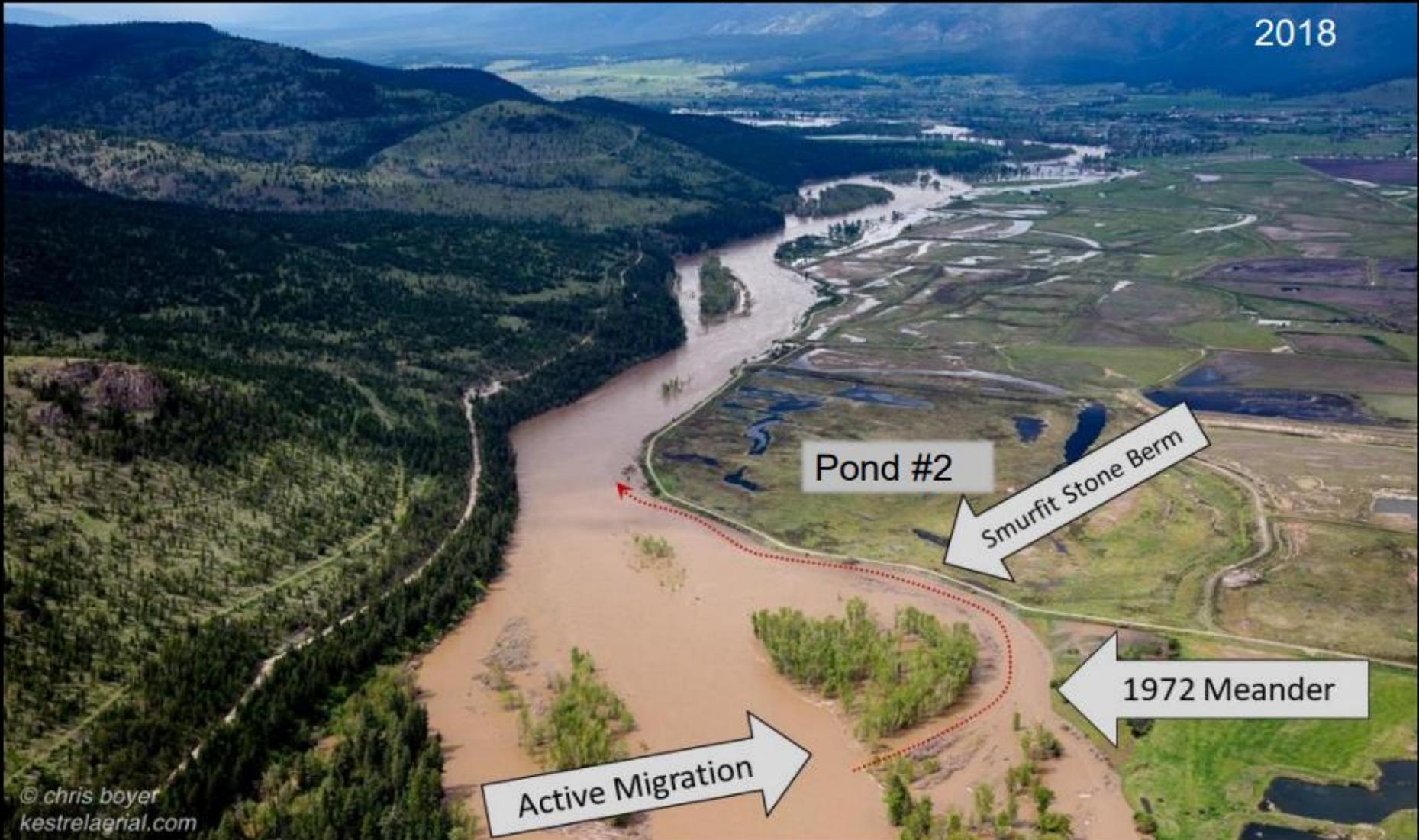


Flow Against Pond #2

~70 ft of migration into island 2017-2019

Increasing pressure

2018



Pond 2 Berm Repairs

- 1976: 300 feet of riprap west side of Pond 2 berm
- 1978: 1,400 feet of repair south and west Pond 2 berms
- 1985: 500 feet of riprap west side of Pond 2
- 1990: Two barbs on river side of Pond 2 (riprap had failed)
- 2001: Emergency repair of Pond 2 berm (leak)



Pond 11

- 300 feet of riprap in 1976
- 1,600 feet of riprap in 1978
- Little channel movement so river is constantly working on the armor





Missoula Conservation District

November 7, 2022 Letter

- The berms may be maintained while different remedies are debated and the site continues through the Superfund process – the final remedy and the Record of Decision, however, cannot include the maintenance and upkeep of the berm in perpetuity.



Questions?

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<https://gis.missoulacounty.us/mcchd/cmz/>