

Don't Push the River

Ecological Benefits of Natural Floodplain and Channel Migration Processes

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Northern Rockies

Northern Great Plains

- Disturbance-based environment: shaped, maintained and renewed by disturbance
- Regular, frequent disturbances are part of the landscape – predictably occur somewhere most years



Cultural attitudes toward disturbance

Three approaches a society can take:

- **Control** - suppress or eliminate the threat
- **Manage or adapt to the disturbance**
- **Avoid** - by timing or location

Attempts to Control Fire:

- **Pre-1910: stop deliberate ignitions by “renegades”**
(i.e., Indians, miners, etc.)
- **1910 to present: primarily suppression, with relatively minor amounts of prescribed fire**
(natural and human ignitions)



Efficacy of Control: Short term

- 98.5% of fire ignitions are controlled at Initial Attack
- 1.5% of fires that escape Initial Attack are becoming increasingly large and increasingly destructive
- Fires are showing greater “resistance to control”



“Fire On the Land”

http://www.cskt.org/fire_history.swf

Confederated Salish & Kootenai Tribes:



A Loss of Diversity

Frequent lightning and Indian-lit fires created many different kinds of habitats, as the top photo of the mountains east of Arlee shows. It was taken around 1920. Each patch of vegetation represents a different kind of forest habitat for wildlife. The bottom picture was taken in the late 1990s after over 100 years of excluding fires. It shows a tremendous loss of diversity.



Water-related Disturbance:

Flood:



Bitterroot River – “8-year” flood

Erosion:



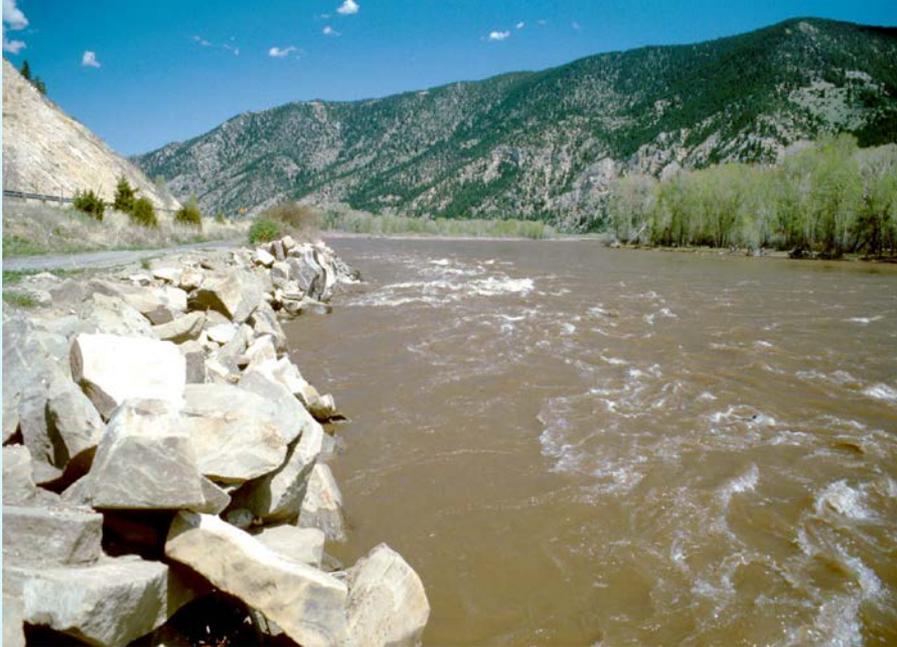
Yellowstone River - 1997

Attempts to Control:

Dams



Riprap, dikes, levees, barbs, etc.



Efficacy of Control: a mixed bag

Examples from the Bitterroot River



Effects of “Control” Measures on Habitat

- Loss of diversity
- Loss of water storage
- Lowered water table
- More extreme high and low flows
- Erosion out of balance
- Higher risk of catastrophic event



The “Control” Approach

Benefits:

- **Protects life and property – for now**
- **Provides economic benefit**

Limitations:

- **Will fail from time to time –increasing trend (larger fires, storms, flashier runoff)**
- **Often degrades habitat and creates a greater problem elsewhere or later – short-term or limited benefit**
- **Remember: Water always wins, given time.**

Control measures fail periodically. Do our rivers have enough resilience?



Missoula, MT



Grand Forks, ND



New Orleans

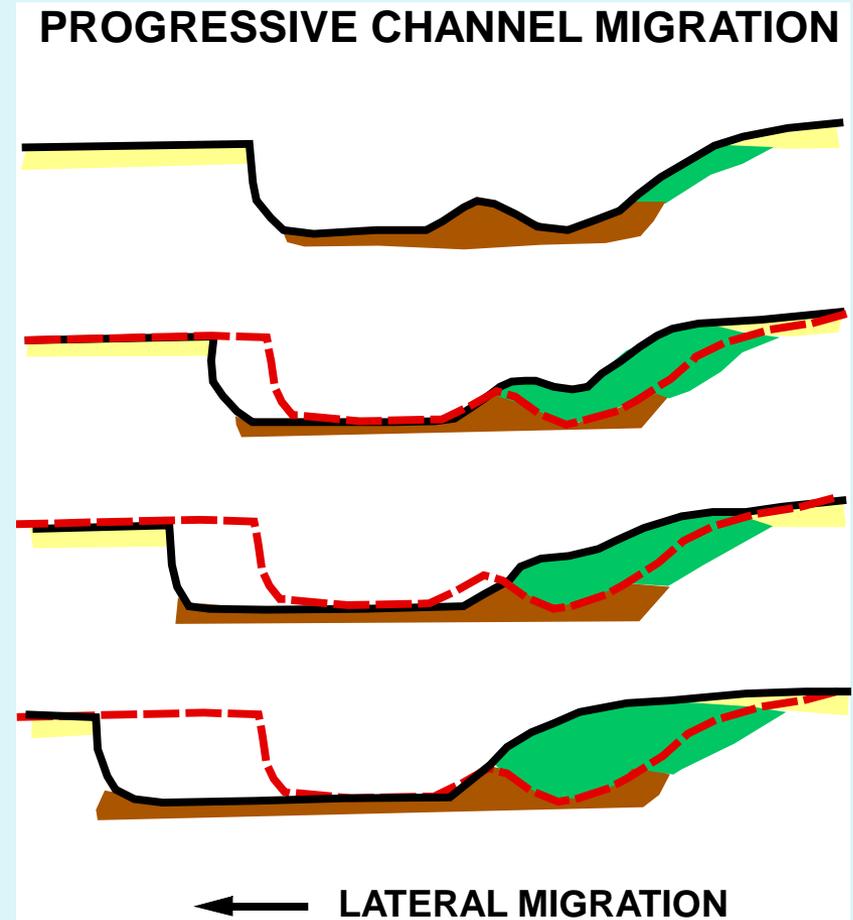
Better long-term strategy: **Manage** floodplains within Natural Constraints, and **Avoid** conflict with natural processes

- Understand and map the full extent of the river and floodplain: Channel Migration Zone (CMZ)
- Avoid building in floodplains and CMZ: Includes limiting utilities and other infrastructure
- Consider the watershed upstream and downstream: Protect/Restore natural water storage, wetlands, and overflow capacity

CMZ: Avoid conflict and gain long-term stability

The Channel Migration Zone

- Allow for natural development and shifting of the stream channel
- ***Channel migration is not channel instability!***
(no net change in sediment volume in a given reach)





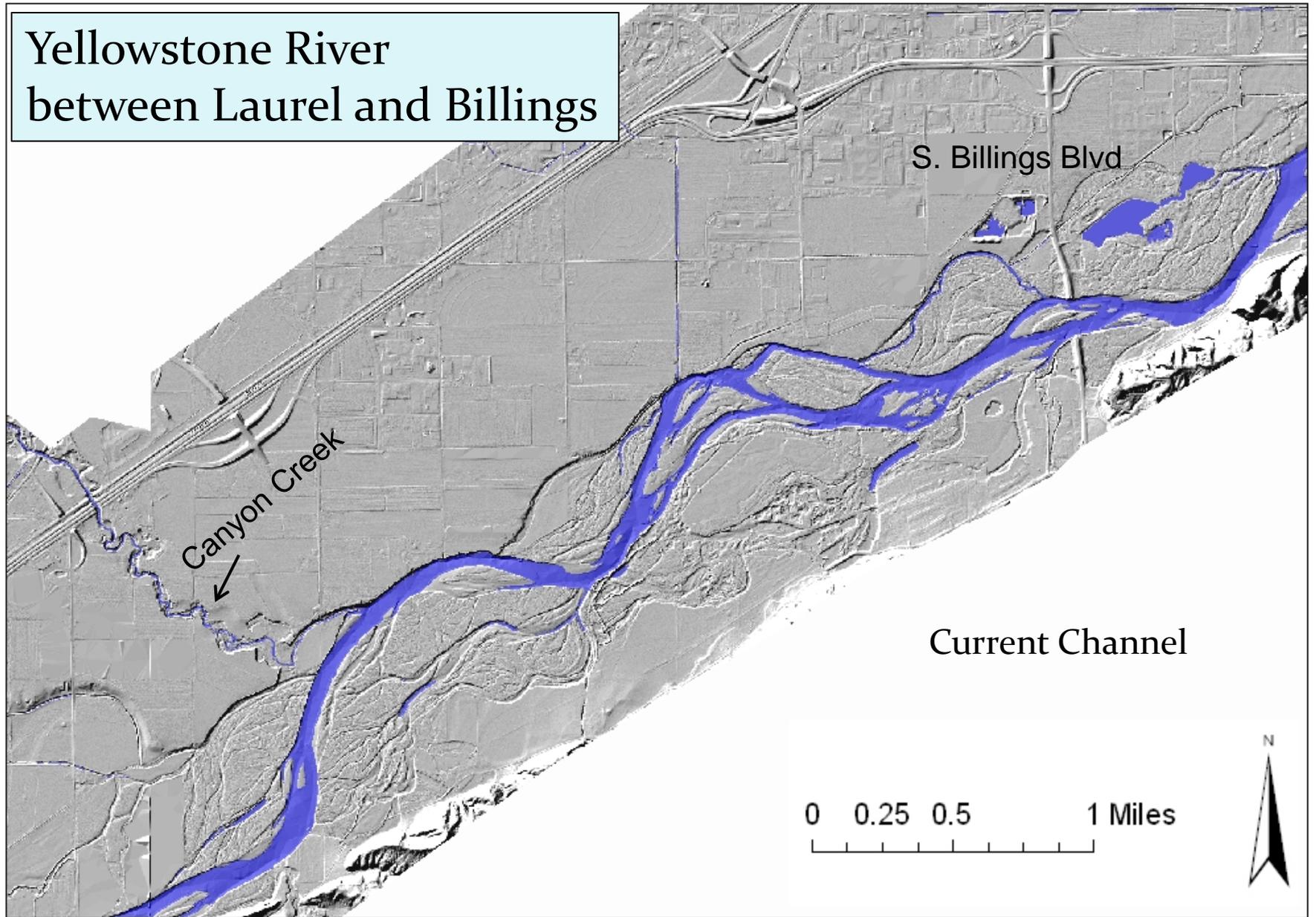
Example:

Yellowstone River
Channel Migration Zone Delineation

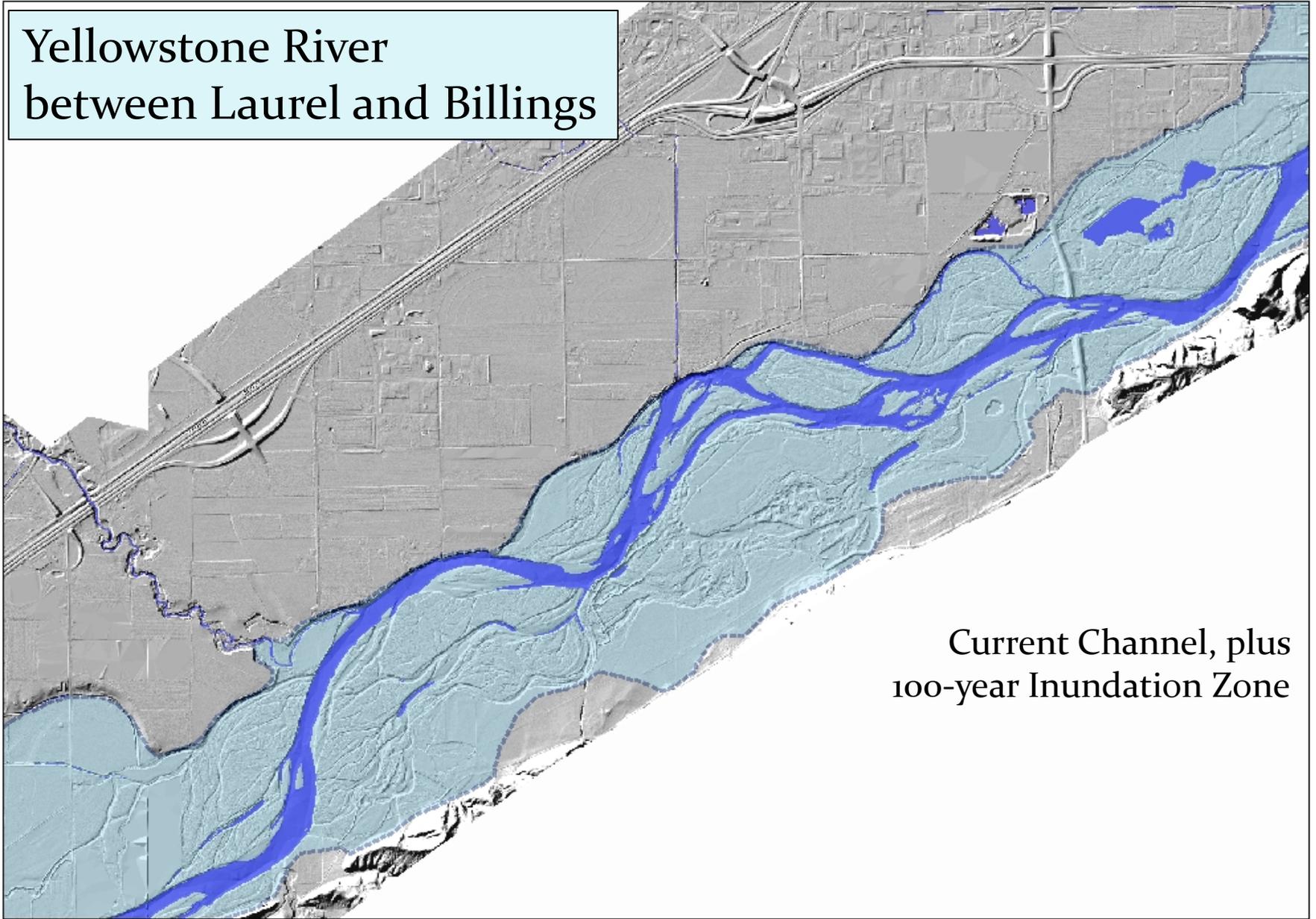
Acknowledgments to:

Karin Boyd, Tony Thatcher, Jim Robinson and
Yellowstone River Conservation District Council

Yellowstone River between Laurel and Billings

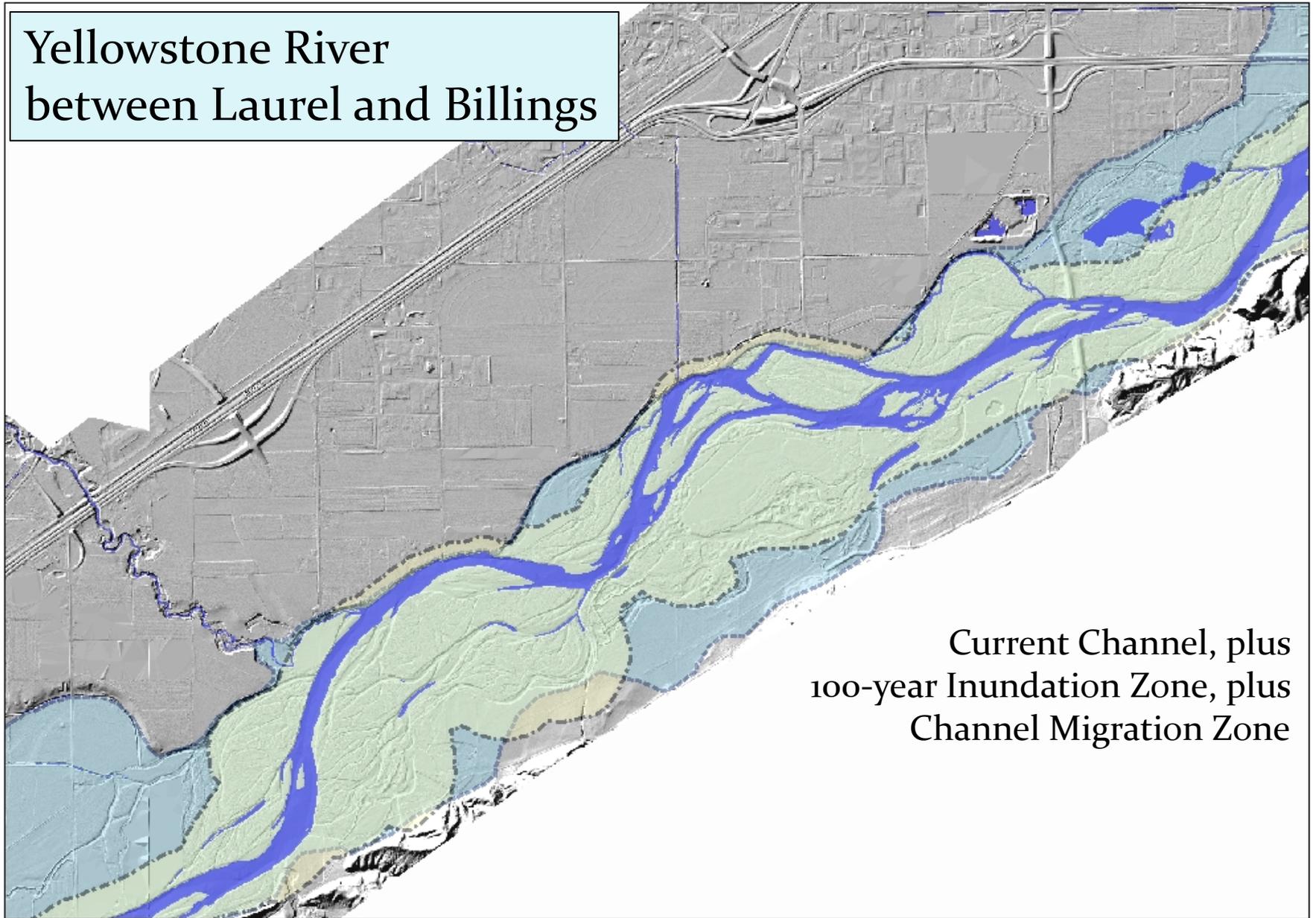


Yellowstone River between Laurel and Billings



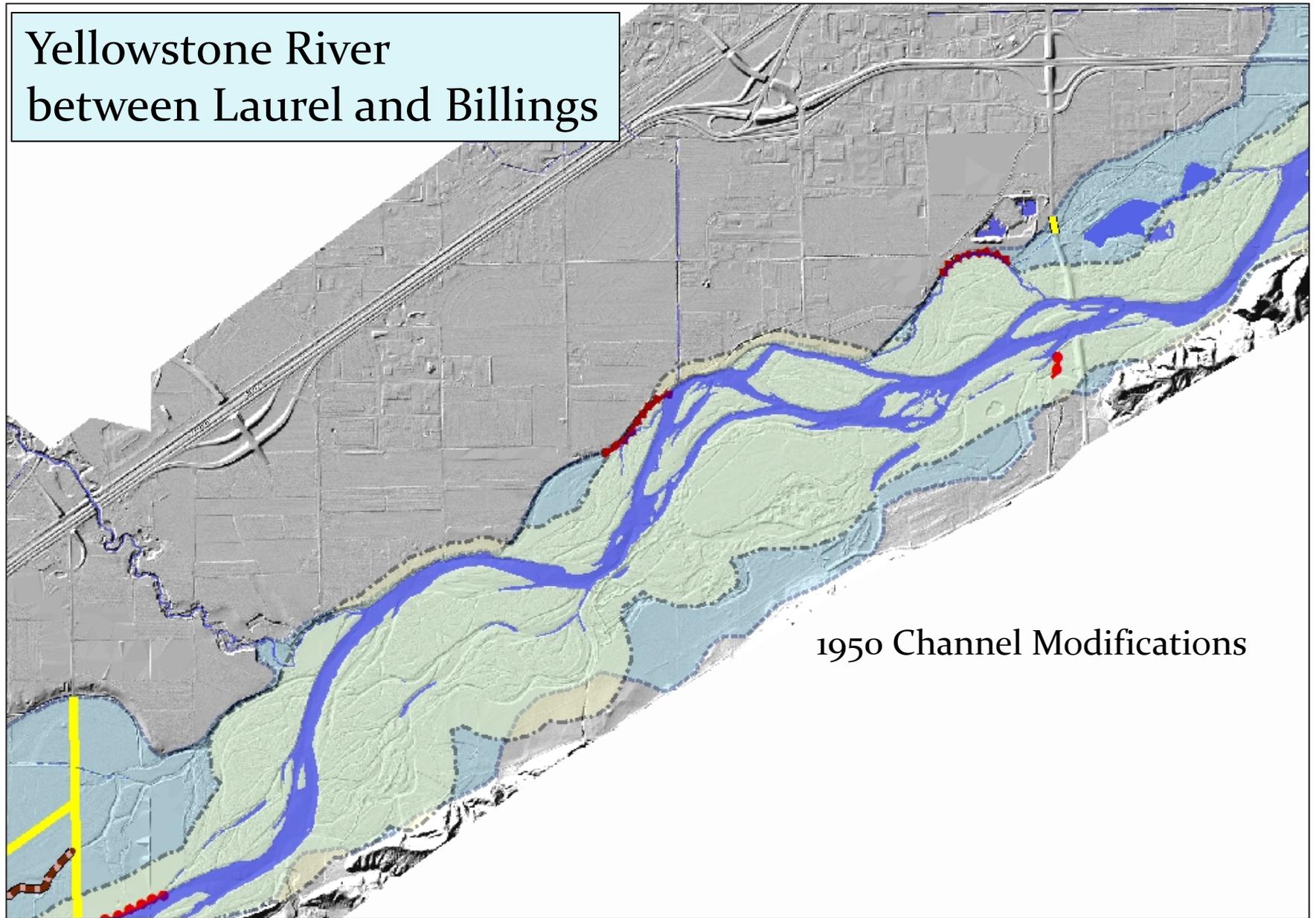
Current Channel, plus
100-year Inundation Zone

Yellowstone River between Laurel and Billings



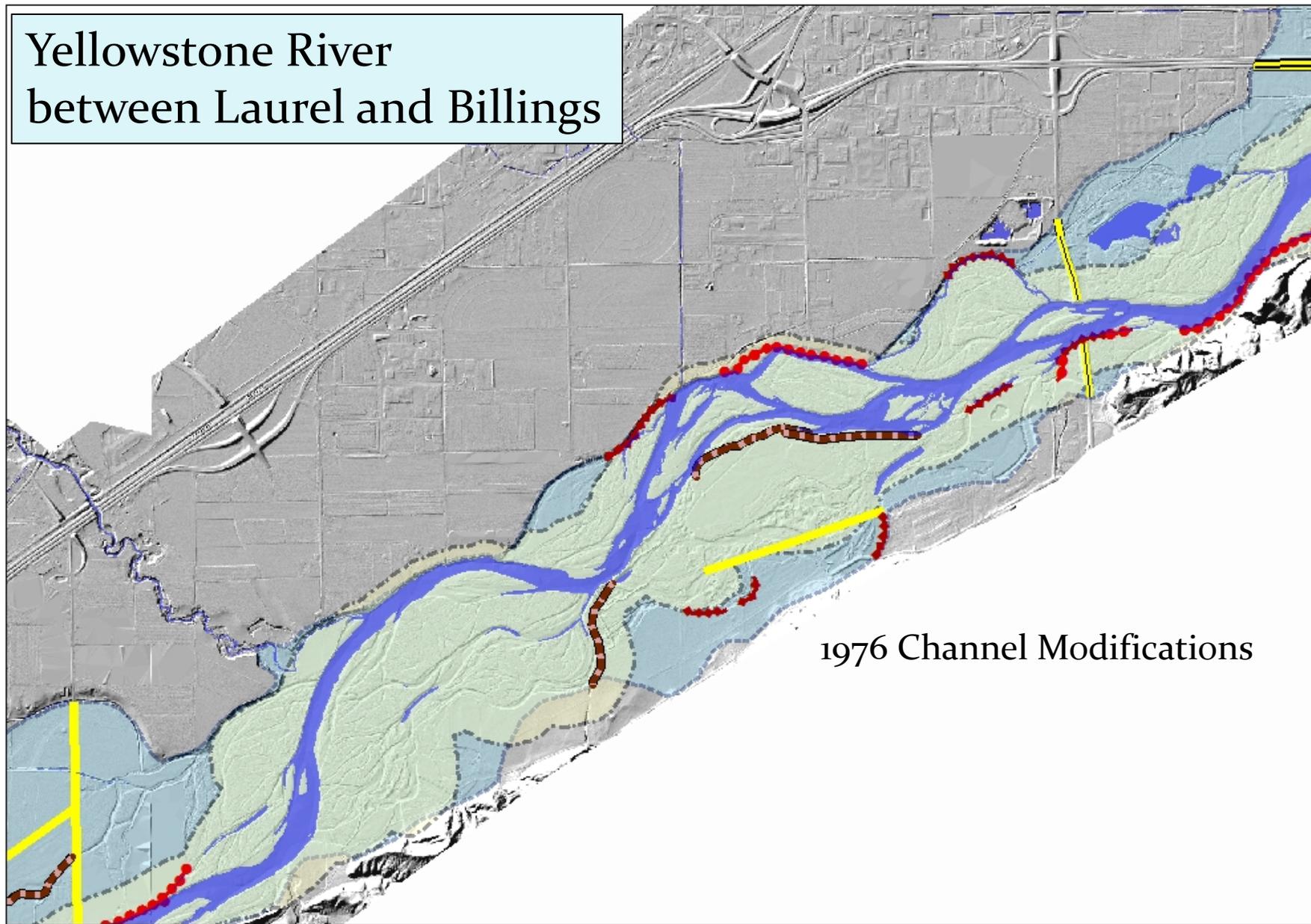
Current Channel, plus
100-year Inundation Zone, plus
Channel Migration Zone

Yellowstone River between Laurel and Billings



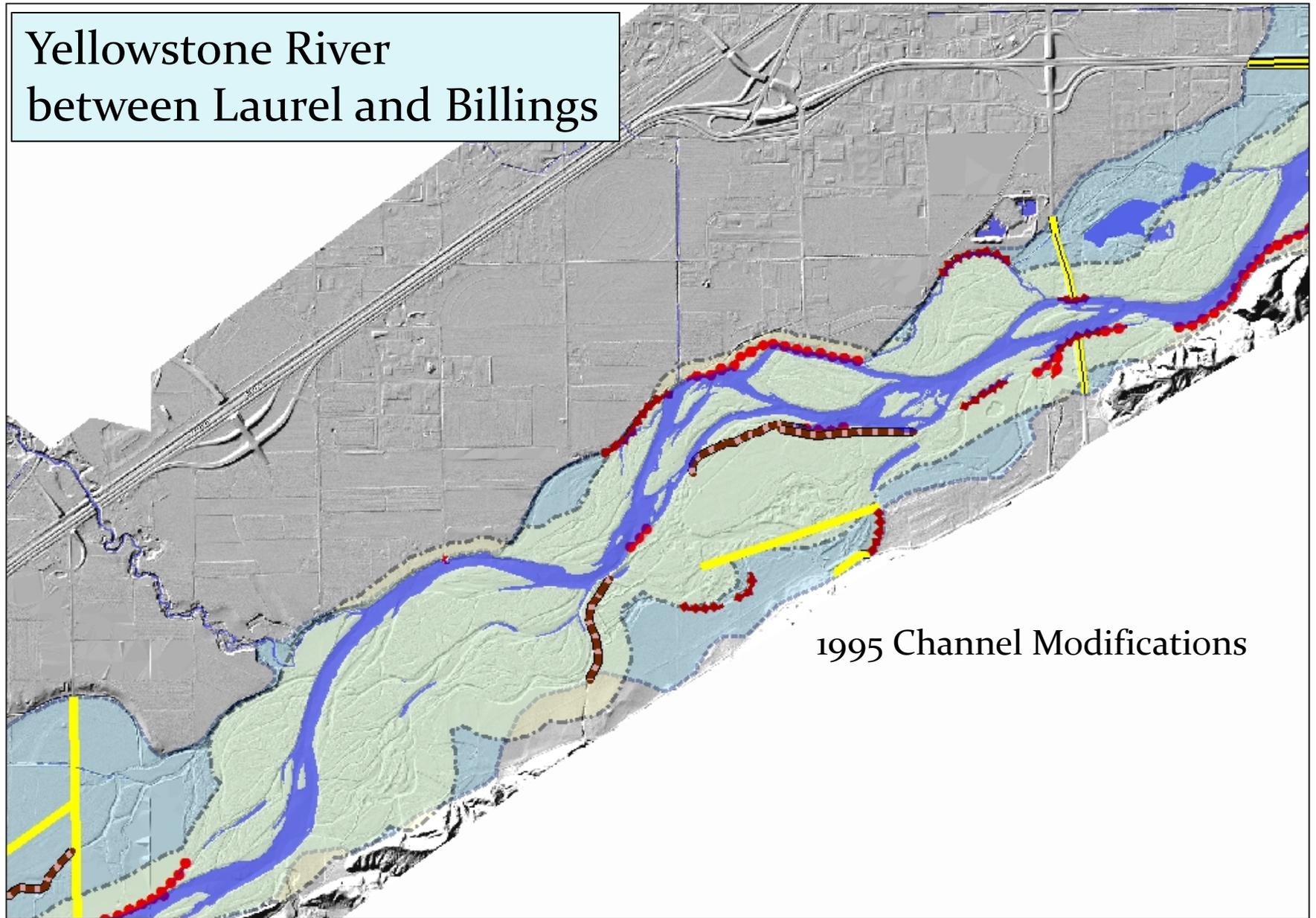
1950 Channel Modifications

Yellowstone River between Laurel and Billings



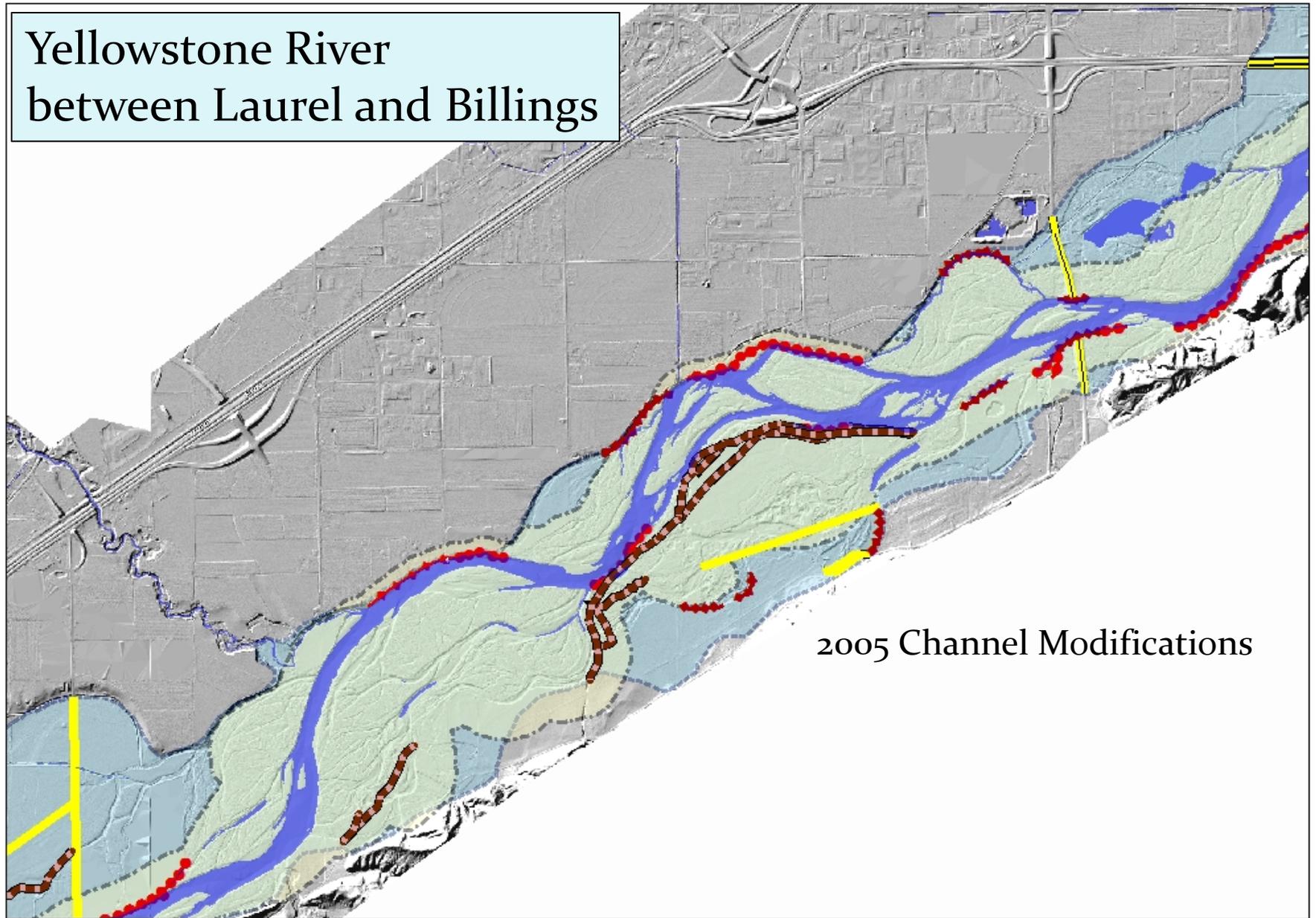
1976 Channel Modifications

Yellowstone River between Laurel and Billings



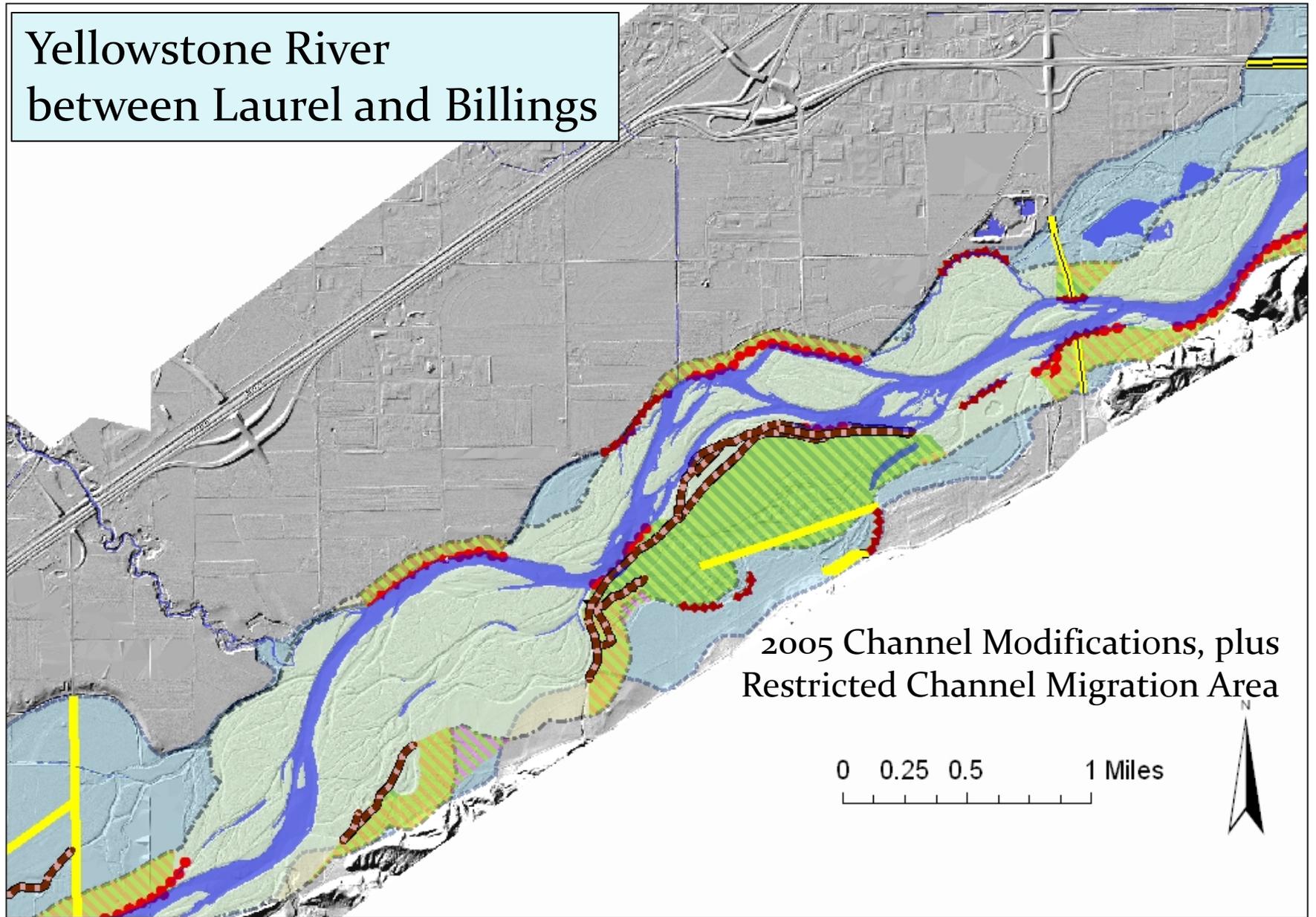
1995 Channel Modifications

Yellowstone River between Laurel and Billings



2005 Channel Modifications

Yellowstone River between Laurel and Billings



2005 Channel Modifications, plus
Restricted Channel Migration Area

0 0.25 0.5 1 Miles



Limiting Floodplain Development (“Avoid” Strategy)

- Limit development in floodplain and CMZ to avoid on-going costs to taxpayers
- Weigh eventual public cost of extending utilities and other infrastructure to floodplain
 - Opens door to more floodplain development
 - Increased maintenance
 - Expectations for neighboring properties
 - Risk of infrastructure damage and remediation costs

Building along the river:

Who Loses?



The property owner or the river?

Using fill to meet floodplain separation requirements for septic systems?

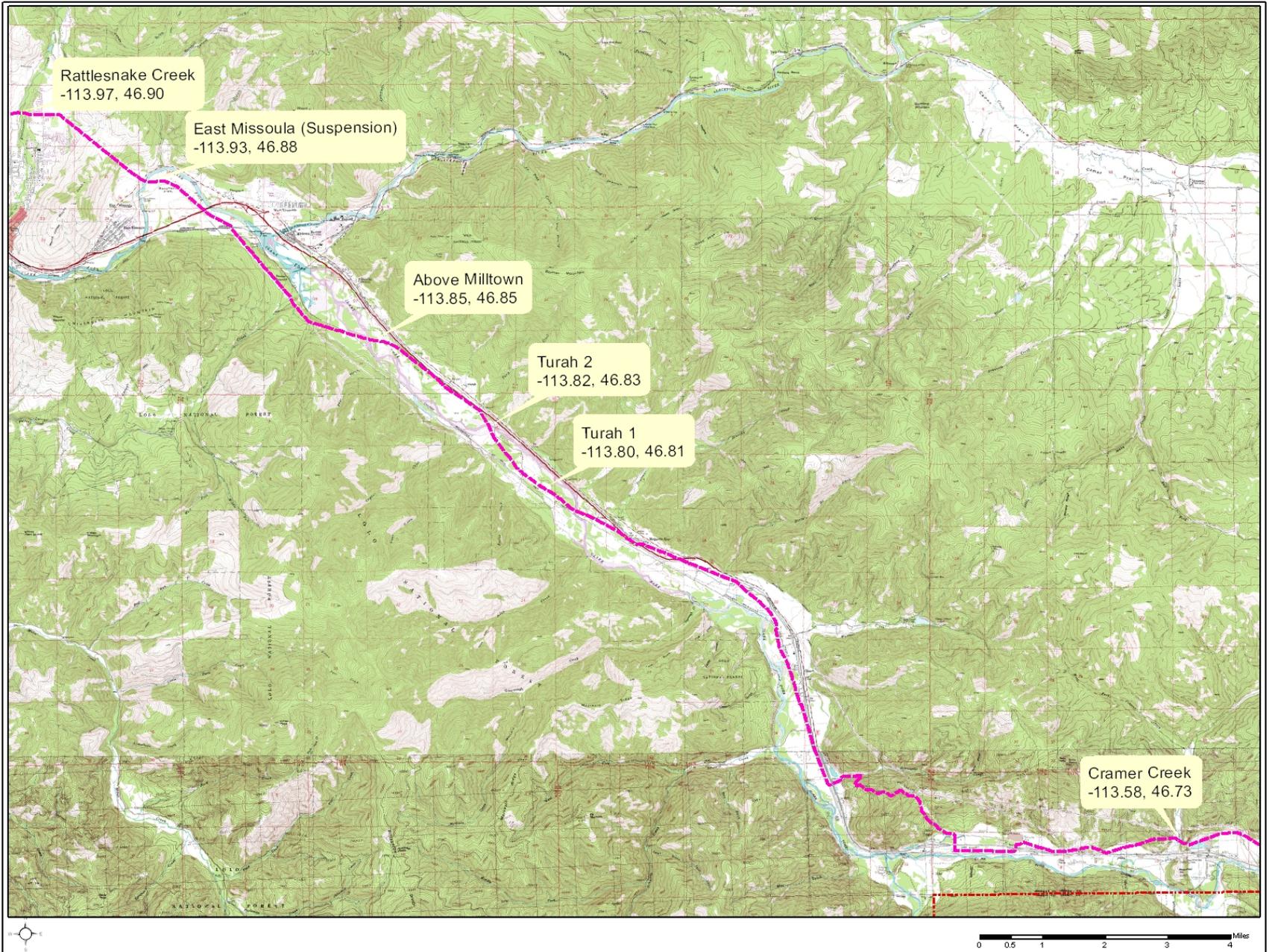


Utilities and Other Infrastructure

- Are we considering natural process and variability?
- Consequences when nature acts beyond our control?
- Recognizing that the river consists of the entire active floodplain?



Yellowstone Pipeline Stream Crossings in Missoula County



1995



2009



Manage/Adapt: Don't forget the source

- Watershed view of floodplain management
- Where can we reduce energy of flood flows?
 - Restore channel length (incl. side channels)
 - Increase roughness of streams- wetlands, ponds, logs
- Where are our opportunities to store flood flows for more consistent late-season flows?
- Where can we add resiliency to flow surges after storms and fires?
- How can we add resiliency under changing patterns?

Protecting/Restoring Stream Length and Channel Complexity to absorb energy



Manage/Adapt: Create Resiliency

From this:



To this:



Water doesn't have to run off all at once

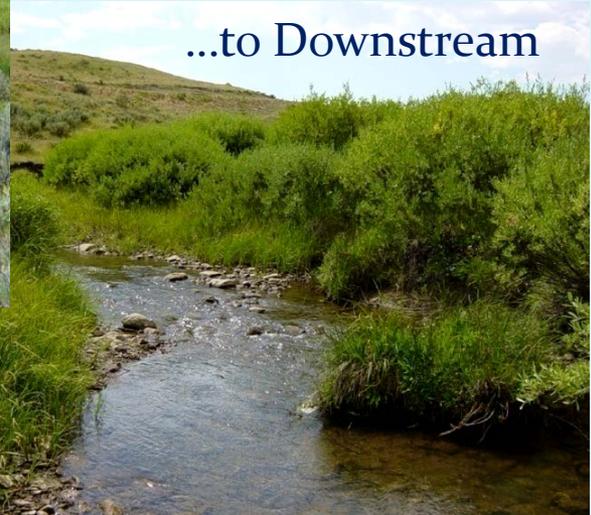


Photo credit: WCS

Habitat value at **multiple spatial and temporal scales**: Habitat connectivity, sediment and water storage, and flow moderation.



Beaver ponds and other wetlands filter water and reduce storm surges



On large rivers, this can happen on side channels and floodplains.

Benefits of Working with Natural Processes

- Resilience under changing conditions
 - Changing climate and runoff patterns
 - More severe storms and fires
 - More development pressure
- Economic benefits
 - Lower long-term costs
 - Less loss of life and property
 - Fish and wildlife response, tourism economy
 - More water when we need it; cleaner water

To Conclude:

- Floodplain management that does not consider the natural disturbance regimes is more costly in the long run
- Effective floodplain management includes watershed management to store water and dissipate flow energy
- We can't completely control disturbance, so it is our responsibility to make room for the river and manage the floodplain to maintain and create resilience.

...oh, and don't be these guys.

From Bloomberg.com

Year of Misfortune: Top 12 Billion-Dollar U.S. Disasters

“In Davenport, Iowa (pictured), the flood surrounded a minor league baseball stadium but couldn't deter the Quad Cities River Bandits from playing the Peoria Chiefs. People entered the stadium by a 300-yard walkway.”



Photograph: Paul Colletti/AP Photo/The Dispatch

Your Turn.

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