

County	Yellowstone	Upstream River Mile	302.7
Classification	UA: Unconfined anabranching	Downstream River Mile	298.1
General Location	To Bighorn River confluence	Length	4.60 mi (7.40 km)

Narrative Summary

Reach B12 is located in lowermost Yellowstone County and extends to the mouth of the Bighorn River. The Reach is 4.6 miles long and is an Unconfined Anabranching reach type, (UA), indicating the presence of forested islands with minimal valley wall influence on the river. These reach types tend to be the most dynamic of all reach types, with typically high rates of bank migration.

There are about 7,800 feet of rock riprap in the reach, which collectively armors about 16 percent of the total bankline. Most of the armor (7,700 feet) is protecting the rail line, with the remainder protecting non-irrigated agricultural land. At two locations (RM 301.5 and RM 299), the river is flowing along bank armor that is right on the railroad prism. One segment of bank armor right at the Bighorn River confluence is actively flanking and will likely be eroded out shortly. Most of the rock riprap was in place in 1950. About 3 miles of transportation encroachment due to the railroad was mapped in the reach.

No blocked side channels have been mapped in Reach B12.

Floodplain turnover rates have dropped in this reach, from 1.9 acres/year/valley mile between 1950 and 1976 to 1.3 acres/year/valley mile between 1976 and 2001. Between 1950 and 2001, there was a total of 214 acres of riparian recruitment in the reach, most of which was colonization of area that was channel in 1950.

Whereas 9 percent of the 100-year floodplain has become isolated due to human development, about 21 percent of the 5-year floodplain is no longer inundated at that frequency. All of the 100-year floodplain isolation is due to the railroad. These areas are very proximal to the river at RM 299 and 302, and could potentially be considered for floodplain and/or wetland restoration.

Land use is dominated by agriculture, with 137 acres of pivot irrigation development since 1950. Almost 50 of those acres of pivot are within the Channel Migration Zone (CMZ). Almost 9 percent of the Channel Migration Zone (CMZ) has been restricted, and the vast majority of that restriction is due to rock riprap protection of the railroad (8 percent).

Reach B12 supports 144 acres of wetland, which at over 35 acres per valley mile is a relatively high concentration of wetlands on the river. There are also 33 acres of mapped Russian olive.

Contrary to most other Reaches, Reach B11 has seen an increase in forested area that is at low risk of cowbird parasitism since 1950. At that time, there were 33 acres per valley mile of such forest, and that number increased to 36 acres per valley mile by 2001.

A hydrologic evaluation of flow depletions indicates that flow alterations over the last century have been major in this reach. The mean annual flood is estimated to have dropped from 30,200 cfs to 24,500 cfs, a drop of about 19 percent. The 2-year flood, which strongly influences overall channel form, has dropped by 11 percent. Low flows have also been impacted; severe low flows described as 7Q10 (the lowest average 7-day flow anticipated every ten years) for summer months has dropped from an estimated 3,090 cfs to 2,100 cfs with human development, a reduction of 32 percent. More typical summer low flows, described as the summer 95% flow duration, have dropped from 3,846 cfs under unregulated conditions to 2,227 cfs under regulated conditions at the Billings gage, a reduction of 42 percent.

CEA-Related observations in Reach B12 include:

- Active flanking of bank armor at mouth of Bighorn River
- Channel instability caused by avulsion at RM 305

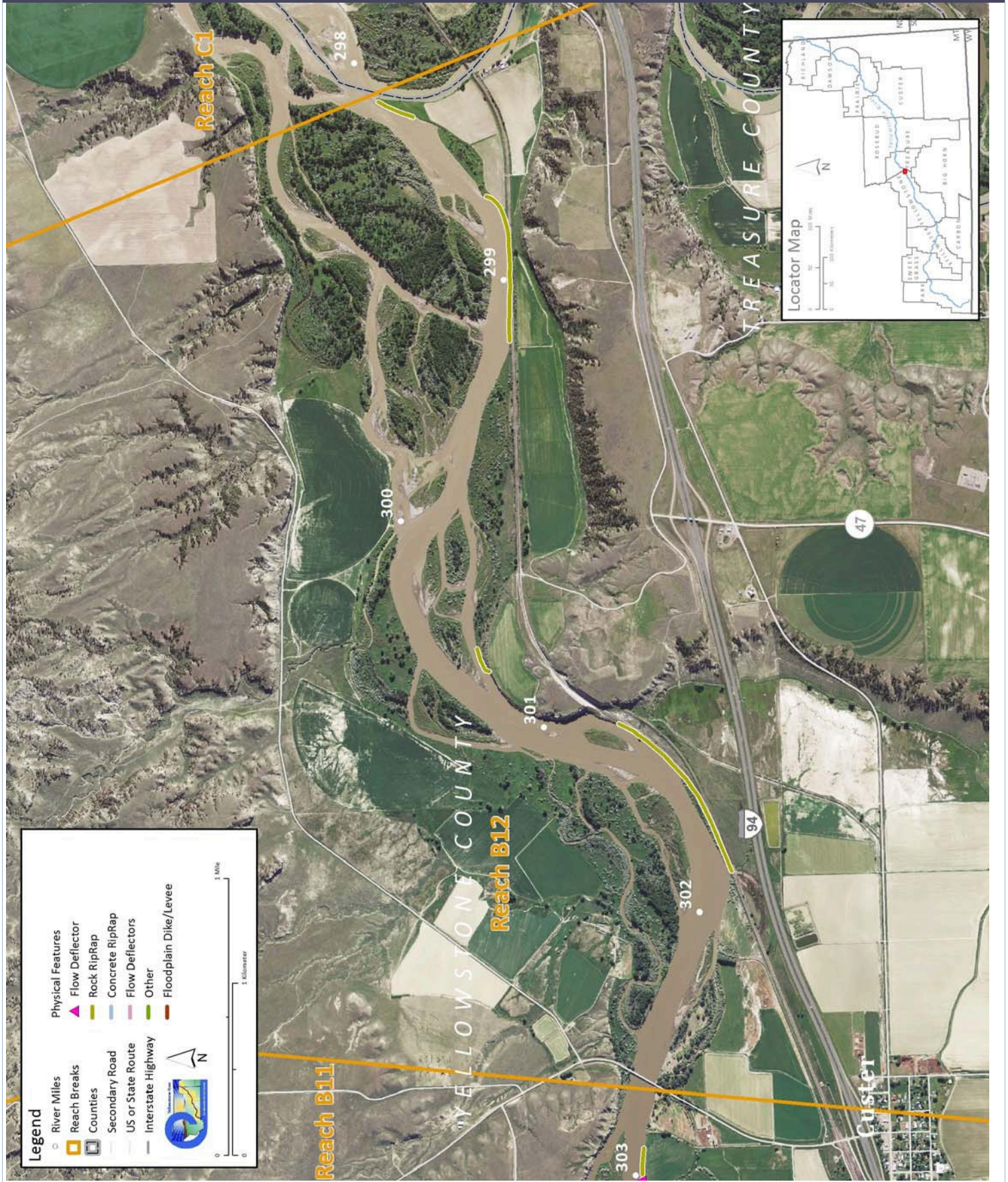
Recommended Practices (may include Yellowstone River Recommended Practices--YRRPs) for Reach B12 include:

- Bank armor maintenance where active flanking is occurring at mouth of Bighorn River at RM 298.3R
- Russian olive removal

The following table summarizes some key CEA results that have been used to describe overall condition and types of human influences affecting the river. The values are specific to this single reach. Blanks indicate that a particular value was not available for this area. This information is consolidated from a large dataset that is presented in more detail in the full reach narrative report.

Discharge	Undev.	Developed	% Change	"Undeveloped" flows represent conditions prior to significant human development, whereas "developed" flows reflect the current condition of both consumptive and non-consumptive water use.		
2 Year (cfs)	55,500	49,400	-11.0%			
100 Year (cfs)	97,200	93,600	-3.7%			
Bankfull Channel Area (Ac)	1950	1976	1995	2001	1950-2001	Bankfull channel area is the total footprint of the river inundated at approx. the 2-year flood.
	526.7	605.1	528.2	552.8	26.1	
Physical Features	2011 Length (ft)	% of Bankline	2001-2011 Change	There are additional types of bank armor such as car bodies and steel retaining walls, but they are relatively minor.		
Rock RipRap	7,778	16.2%	0			
Concrete Riprap	0	0.0%	0			
Flow Deflectors	0	0.0%	0			
Total	7,778	16.2%	0			
Length of Side Channels Blocked (ft)	Pre-1950s	Post-1950s	Numerous side channels have been blocked by small dikes.			
	0	0				
Floodplain Turnover	1950 - 1976	1976 - 2001	1950-2001 In-channel riparian encroachment (negative number indicates retreat)		The rate of floodplain turnover reflects how many acres of land are eroded by the river. Turnover is associated with the creation of riparian habitat.	
Total Acres	190.0	119.1	67.61 acres			
Acres/Year	7.3	4.8				
Acres/Year/Valley Mile	1.9	1.3				
Open Bar Area	Point Bars	Bank Attached	Mid-Channel	Total	The type and extent of open sand and gravel bars reflect in-stream habitat conditions that can be important to fish, amphibians, and ground-nesting birds such as least terns.	
Change in Area '50 - '01 (Ac)						
Floodplain Isolation	Acres	% of FP	Floodplain isolation refers to area that historically was flooded, but has become isolated do to flow alterations or physical features such as levees.			
5 Year	141.9	21%				
100 Year	89.6	9%				
Restricted Migration Area	Acres	% of CMZ	Channel Migration Zone restrictions refer to the area and percent of the CMZ that has been isolated by features such as bank armor, dikes, levees, and transportation embankments.			
	146.9	9%				
Land Use	1950	2011	1950	2011	Changes in land use reflect the development of the river corridor through time. The irrigated agricultural are is a sub-set of the mapped agricultural land.	
Agricultural Land (Ac)	2,985.1	2,805.0	Flood (Ac)	498.4	556.0	
Ag. Infrastructure (Ac)	10.9	42.9	Sprinkler (Ac)	0.0	0.0	
Exurban (Ac)	0.0	0.0	Pivot (Ac)	0.0	136.8	
Urban (Ac)	14.6	14.6				
Transportation (Ac)	60.1	130.2				
1950s Riparian Vegetation Converted to a Developed Land Use (ac)	To Irrigated	To Other Use	Total Rip. Converted	% of 1950s Rip.	Changes in the extents of riparian vegetation are influenced by land use changes within the corridor.	
		0.6	0.6	0.0%		
National Wetlands Inventory	Acres	Acres per Valley Mi	Total Wetland Acres	Wetlands units summarized from National Wetlands Inventory Mapping include Riverine (typically open water sloughs), Emergent (marshes and wet meadows) and Shrub-Scrub (open bar areas with colonizing woody vegetation).		
Riverine	5.6	1.5	144.3			
Emergent	104.4	27.8				
Scrub/Shrub	34.3	9.1				
Russian Olive (2001) (Appx. 100-yr Floodplain)	Acres	%	Russian olive is considered an invasive species and its presence in the corridor is fairly recent. Its spread can be used as a general indicator of invasive plants within the corridor.			
	32.5	1.6%				
Riparian Forest at low risk of Cowbird Parasitism (Ac/Valley Mile)	1950	1976	2001	Change 1950-2011	Cowbirds are associated with agricultural and residential development, displacing native bird species by parasitizing their nests.	
	33.0	42.0	36.1	3.1		

PHYSICAL FEATURES MAP (2011)



CHANNEL MIGRATION ZONE MAP

