

County	Yellowstone	Upstream River Mile	362.2
Classification	UB: Unconfined braided	Downstream River Mile	357.9
General Location	East Billings	Length	4.30 mi (6.92 km)

Narrative Summary

Reach B3 is 4.3 miles long and located in east Billings. The reach is characterized by the loss of several miles of side channel, extensive Russian olive infestation, and substantial flow alterations due to human influences.

In total there are about 13,500 feet of bank armor in Reach B3, which covers almost 30 percent of the bankline. Most of the armor is rock riprap, although there are over 3,000 feet of flow deflectors mapped in the reach, as well as over a mile of floodplain dikes.

Prior to 1950, 11,000 feet of side channels had been blocked in the reach, and since that time another 14,000 feet have been similarly blocked by small dikes. These ~4 miles of blocked channel are about equivalent in length to that of the main river. That said, as of 2001 there were still about 35,000 feet of active side channel in Reach B3.

Solid waste dumps were mapped on old side channels on the east floodplain areas at RM 361.5 and RM 360.6. There is one major headgate on the left bank of the river that feeds a heavily armored canal at RM 359.9.

Flow alterations and channel blockages have promoted the encroachment of riparian vegetation into old channel areas. Since 1950, almost 200 acres of riparian vegetation colonized previously un-vegetated side channels. Floodplain turnover rates have gone down since 1976 by about 2 acres per year, indicating slower rates of erosion.

Since 1950, predominantly agricultural land uses in Reach B3 have been converted to a mix of agriculture and urban/exurban development. About 1,000 acres of urban/exurban development has taken place since 1950. About 470 acres of ground continues to be flood irrigated in this area of east Billings. Approximately 16 percent of the Channel Migration Zone has become restricted due to physical features, all of which are bank armor installations designed to protect urban/industrial and agricultural land uses.

About 50 acres of Russian olive have been mapped in Reach B3. There are also fairly extensive mapped wetlands, with about 230 acres of total wetland area mapped, 95 acres of which are emergent wet meadows and marsh areas.

Reach B3 was sampled as part of the fisheries study. A total of 29 fish species were sampled in the reach, and none of those species have been identified by the Montana Natural Heritage Program as a Species of Concern (SOC).

Reach B3 was sampled as part of the avian study. The average species richness in this reach was 7.5, which indicates the average number of species observed during site visits to the reach in cottonwood habitats. The average species richness for sites evaluated is 8. One bird species identified by the Montana Natural Heritage Program as Potential Species of Concern (PSOC) was also found, the Plumbeous Vireo.

A hydrologic evaluation of flow depletions indicates that flow alterations over the last century have been substantial in this reach. The mean annual flood is estimated to have dropped from 23,900 cfs to 19,800 cfs, a drop of about 17 percent. The 2-year flood, which strongly influences overall channel form, has dropped from 44,500 cfs to 40,100 cfs, which is a reduction of 10 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 2,920 cfs to 2,010 cfs with human development, a reduction of 31 percent. More typical summer low flows, described as the summer 95% flow duration, have dropped from 3,836 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 B3 include:

- Riparian encroachment with flow alterations
- Extensive armoring with CMZ encroachment

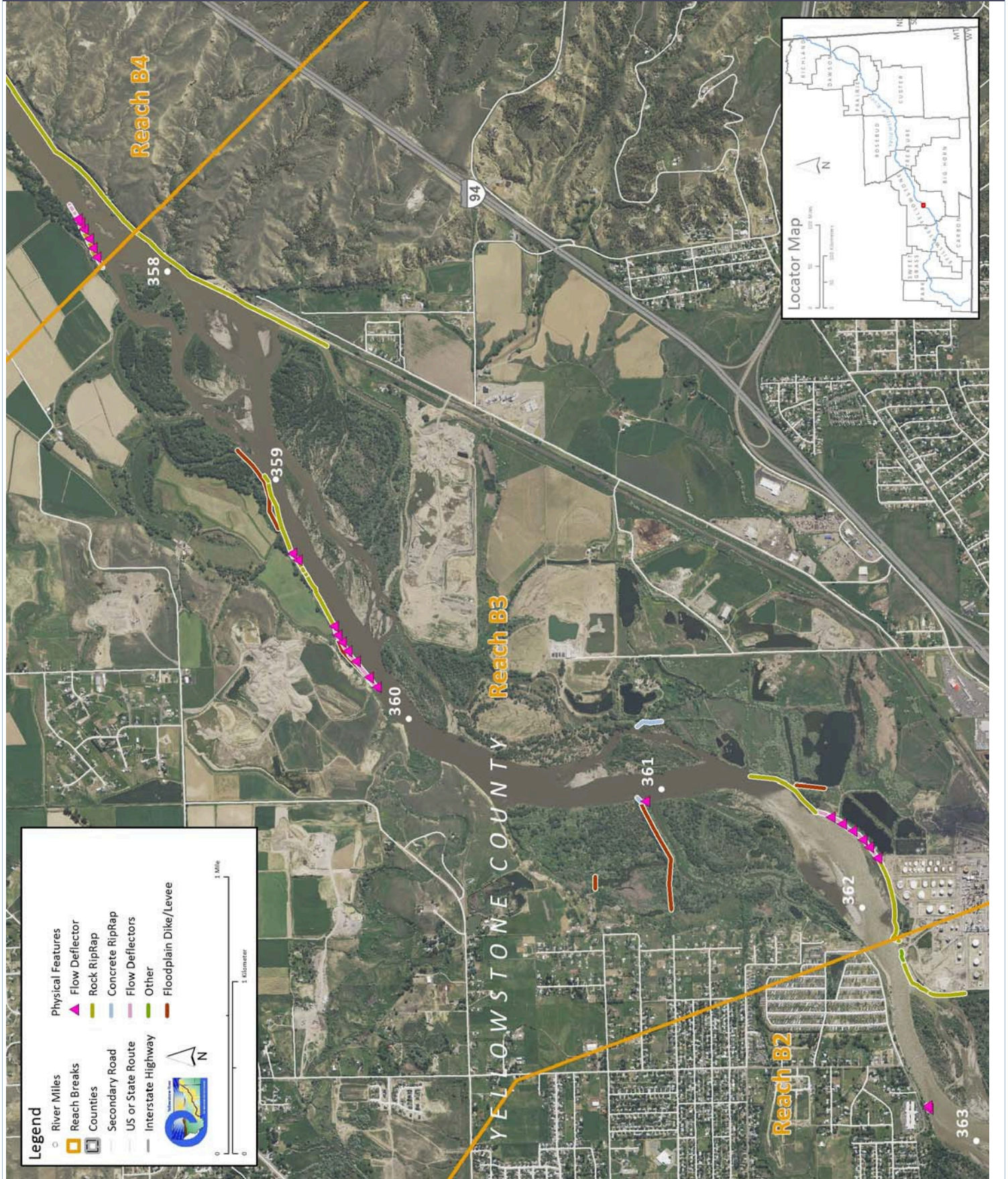
Recommended Practices (may include Yellowstone River Recommended Practices--YRRPs) for Reach B3 include:

- Side channel reactivation at RM 362.0, 360.5, 359.8 and RM 359.0
- Russian olive removal
- Solid waste dump removal RM 361.5 and RM 360.6
- Irrigation diversion structure management at RM 359.9.

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)	44,500	40,100	-9.9%			
100 Year (cfs)	79,200	76,600	-3.3%			
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.
	576.6	595.2	489.5	548.1	-28.5	
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	10,047	21.7%	-252			
Concrete Riprap	592	1.3%	0			
Flow Deflectors	3,111	6.7%	42			
Total	13,750	29.7%	-209			
Length of Side Channels Blocked (ft)	Pre-1950s	Post-1950s	Numerous side channels have been blocked by small dikes.			
	11,002	13,693				
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	184.6	127.0	57.31 acres			
Acres/Year	7.1	5.1				
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	154.8	14%				
100 Year	0.0	0%				
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.			
	265.8	16%				
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)	2,717.1	1,770.0	Flood (Ac)	420.2	472.5	
Ag. Infrastructure (Ac)	50.5	51.4	Sprinkler (Ac)	0.0	0.0	
Exurban (Ac)	21.4	616.2	Pivot (Ac)	0.0	0.0	
Urban (Ac)	116.0	485.1				
Transportation (Ac)	21.2	20.4				
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.	
	29.6	166.2	195.8	21.0%		
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	95.8	25.3	231.2			
Emergent	94.9	25.0				
Scrub/Shrub	40.5	10.7				
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.			
	49.8	4.1%				
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.	
	19.8	0.0	0.8	-19.1		

PHYSICAL FEATURES MAP (2011)



CHANNEL MIGRATION ZONE MAP

