

County	Rosebud	Upstream River Mile	243.1
Classification	PCM: Partially confined meandering	Downstream River Mile	236.3
General Location	Forsyth	Length	6.80 mi (10.94 km)

Narrative Summary

Reach C10 is 6.8 miles long and is located at Forsyth. It is a Partially Confined Meandering reach type, as the river flows within a primary meandering thread that is partially confined by the northern bluff line at the Forsyth Bridge.

There is approximately three miles of rock riprap in the reach, 500 feet of which was built since 2001. About a mile of armor is protecting the active rail line on the south side of the river, and another 3,700 feet are protecting the city of Forsyth. Just below Cartersville Dam, a ~330 foot-long stretch of bank armor was flanked sometime between 2001 and 2011. The river has since migrated to the south about 50 feet past the abandoned armor. As of 2011 there were 1,600 feet of flow deflectors mapped in the reach. About 22 percent of the total bankline is armored by either rock riprap or flow deflectors. There is also about a mile of floodplain dikes/levees in the reach, which are located on the south bank at Forsyth.

Cartersville Dam is located at RM 238.5 in the town of Forsyth. This diversion dam was constructed in the early 1930's and consists of a rock rubble riprap core that is capped by concrete. The structure is 800 feet long, spanning the width of the Yellowstone River. The river flows within a single thread at the structure, flowing along the northern bluff line of the Yellowstone River valley. Because of its impacts on the Yellowstone River fishery, efforts have begun to develop suitable alternatives and bypass designs to promote fish passage at Cartersville.

About 20 percent of the total 100-year floodplain has become isolated due to human development. The isolation is due to a combination of floodplain dikes that protect the city of Forsyth and the active railroad. The 5-year floodplain is even more affected; 50 percent of the historic 5-year floodplain is no longer inundated at that frequency. Most of the isolated 5-year floodplain area is occupied by flood irrigated fields north of the river, and by urban development in Forsyth. At RM 238 the river is migrating northward, and has reached the toe of the abandoned Milwaukee Rail Line embankment. Migration through this grade will increase floodplain access on the north side of the river downstream of Cartersville Dam. As this is an urban reach, strategic floodplain reconnection in this area could be beneficial.

One ice jam was reported in Reach C10 in February of 1996. No damages were reported.

Land use is dominated by agriculture (~4,700 acres), with 280 acres of pivot irrigation development since 1950. There are about 850 acres of urban/exurban development in the reach. About 4 percent of the CMZ is restricted by physical features, and most of that area is in town.

There are 250 acres of Russian olive in the reach, most of which is dispersed in riparian areas. Russian olive densities are especially high downstream of Cartersville Diversion dam on the south bank of the river near the water treatment plant.

A hydrologic evaluation of flow depletions indicates that flow alterations over the last century have been major in this reach. The 2-year flood, which strongly influences overall channel form, has dropped by 24 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 4,730 cfs to 3,020 cfs with human development, a reduction of 36 percent. More typical summer low flows, described as the summer 95% flow duration, have dropped from 6,150 cfs under unregulated conditions to 3,320 cfs under regulated conditions, a reduction of 46 percent.

CEA-Related observations in Reach C10 include:

- Floodplain isolation due to urban/exurban development.
- Extensive Russian olive colonization in urbanized reach

Recommended Practices (may include Yellowstone River Recommended Practices--YRRPs) for Reach C10 include:

- Floodplain reconnection at RM 238L behind abandoned Milwaukee rail line.
- Diversion structure management at Cartersville Dam
- Watercraft passage at Cartersville Dam
- Fish Passage at Cartersville Dam
- Flanked bank armor removal at RM 238.4R
- 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)	61,300	46,900	-23.5%			
100 Year (cfs)	121,000	101,000	-16.5%			
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.
	647.9	683.5	628.3	629.8	-18.2	
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	14,306	19.8%	493			
Concrete Riprap	0	0.0%	0			
Flow Deflectors	1,648	2.3%	-262			
Total	15,953	22.1%	231			
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	92.4	61.3				
Acres/Year	3.6	2.5				
Acres/Year/Valley Mile	0.6	0.4	32.02 acres			
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)	-11.2	-7	-11	-29.2		
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	1,118.9	50%				
100 Year	635.9	20%				
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.			
	72.6	4%				
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)	5,392.3	4,716.9	Flood (Ac)	904.3	874.1	
Ag. Infrastructure (Ac)	28.7	103.6	Sprinkler (Ac)	0.0	0.0	
Exurban (Ac)	0.0	141.6	Pivot (Ac)	0.0	278.3	
Urban (Ac)	483.8	728.0				
Transportation (Ac)	107.1	247.6				
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.	
	0.0	20.5	20.5	1.0%		
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	11.6	1.9	131.2			
Emergent	89.6	14.8				
Scrub/Shrub	30.1	5.0				
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.			
	250.5	5.7%				
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.	
	82.0	15.1	20.2	-61.8		

CHANNEL MIGRATION ZONE MAP

