

County	Park	Upstream River Mile	529
Classification	CM: Confined meandering	Downstream River Mile	516.3
General Location	Grey Owl to just below Mallard's Rest	Length	12.70 mi (20.44 km)

Narrative Summary

Reach PC8 extends from the Grey Owl fishing access site to just below Mallard's Rest. It is almost 13 miles long and is classified as confined meandering, indicating that it has somewhat of a sinuous planform but is largely confined by older terraces or bedrock. This is a remarkably stable reach that shows little evidence of channel migration. Even though migration rates are low, approximately 8 percent of the bankline has been armored by 7,500 feet of rock riprap and 2,760 feet of flow deflectors. About 3,200 feet of that armor was constructed since 2001.

Similar to other reaches in Park County, the extent of flood irrigation has dropped in the reach since 1950, and the amount of sprinkler and pivot irrigation has increased proportionately. There has also been a major expansion of exurban land uses in the reach from 14 acres in 1950 to 1,433 acres in 2011. By comparison, 220 acres are in flood, 170 acres in sprinkler, and 1,014 acres in pivot irrigation. The relative expansion of pivot irrigation in this reach is large compared to the rest of the Paradise Valley. About 30 acres of irrigated land are located within the Channel Migration Zone, and 14 of those are under pivot. In one case (RM 519.5) a pivot occupies the entire core of a meander bend.

The popularity of recreational fishing in this reach is exemplified by the seven boat ramps identified in this 13 mile stretch of river. Fishing Access Sites in this reach include Grey Owl, Paradise, Lock Leven, and Mallard's Rest.

This area of the upper Yellowstone River has seen three severe floods in the last 20 years. The 1996 and 1997 floods were very damaging, early-June events that peaked at 37,100 and 38,000 cfs, respectively. At the time, these were considered to be sequential 100-year floods. Then in late June of 2011, the river peaked at 40,600 cfs, which is currently the flood of record at Livingston. This flood exceeded a 100-year event, with both the 1996/1997 events now considered to have exceeded a 75-year flood.

A hydrologic evaluation of flow depletions indicates that flow alterations over the last century have been relatively small in this reach. The biggest influence has been on low flows: severe low flows described as 7Q10 (the lowest average 7-day flow anticipated every ten years) for summer months has dropped from an estimated 1,470 cfs to 1,430 cfs with human development, a reduction of 2.7 percent.

CEA-Related observations in Reach PC8 include:

- Major expansion from flood irrigation to pivot
- Conversion of agricultural land to exurban development
- Extensive armoring in naturally stable reach

Recommended Practices (may include Yellowstone River Recommended Practices--YRRPs) for Reach PC8 include:

- Channel Migration Zone (CMZ) management

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)	19,500	19,400	-0.5%			
100 Year (cfs)	36,800	36,800	0.0%			
Bankfull Channel Area (Ac)	1950	1976	1995	2001	1950-2001	Bankful channel area is the total footprint of the river inundated at approx. the 2-year flood.
	499.3			497.1	-2.3	
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	7,494	5.6%	3,036			
Concrete Riprap	0	0.0%	0			
Flow Deflectors	2,757	2.1%	163			
Total	10,251	7.7%	3,199			
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 Acres/Year Acres/Year/Valley Mile			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)						
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 100 Year						
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.			
	14.5	2%				
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)	4,334.7	2,838.2	Flood (Ac)	1,368.9	221.1	
Ag. Infrastructure (Ac)	72.8	100.0	Sprinkler (Ac)	0.0	171.1	
Exurban (Ac)	13.6	1,433.0	Pivot (Ac)	0.0	1,014.3	
Urban (Ac)	0.0	3.5				
Transportation (Ac)	17.1	63.7				
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.	
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	3.3	0.3	48.1			
Emergent	43.2	4.5				
Scrub/Shrub	1.6	0.2				
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.			
	0.7	0.3%				
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.	

CHANNEL MIGRATION ZONE MAP

