

County	Dawson	Upstream River Mile	71.1
Classification	PCM/I: Partially confined meandering/islands	Downstream River Mile	67.8
General Location	Downstream of Intake	Length	3.30 mi (5.31 km)

Narrative Summary

Reach D9 is located in Dawson County and starts 1 mile below the Intake Diversion Dam. The reach is a 3.3 mile long Partly Confined Meandering with Islands (PCM/I) reach type, indicating a single-threaded channel with vegetated islands and some valley wall influence on the active channel. This reach is currently the most upstream reach that fully supports pallid sturgeon and paddlefish in the watershed.

This reach has almost no bank armor. There are almost three miles of floodplain dikes associated with irrigation, and two miles of transportation encroachment associated with the railroad grade.

By 1950 almost three miles of side channel had been blocked in Reach D9, with another mile blocked since then. At RM 68.8L, discreet dikes block a side channel that remains within the riparian area, suggesting some potential for restoration.

There is one small rapid in the reach at RM 69.8 where it appears that a bedrock shelf is exposed in the riverbed.

Isolation of the 100 year floodplain has resulted from both physical features on the floodplain as well as reduced flows with human development. In Reach D9, 170 acres of the floodplain, which is 15 percent of the historic floodplain area, is no longer inundated at that frequency. Most of this area isolated is out in flood irrigated fields on the west floodplain. The 5-year floodplain, which has become smaller primarily due to flow alterations, has lost 161 acres or 50 percent of its original footprint.

Land use is predominantly agricultural, with about 183 acres of pivot irrigation development since 1950. There are a total of 19 acres of pivot-irrigated ground within the Channel Migration Zone (CMZ), making these fields especially prone to river erosion.

Reach D9 has seen an increase in the amount of forest area considered at low risk of cowbird parasitism. In 1950, there were 42.3 acres per valley mile of such forest, and by 2001, that number had increased to 79.7 acres per valley mile.

A hydrologic evaluation of flow depletions indicates that flow alterations over the last century have been major in this reach. The magnitude of the 100-year flood is now 128,000 cfs, which is 12 percent lower than it was pre-development (145,000 cfs). The 2-year flood, which strongly influences overall channel form, has dropped by 22 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 4,630 cfs to 2,460 cfs with human development, a reduction of 47 percent. More typical summer low flows, described as the summer 95% flow duration, have dropped from 6,760 cfs under unregulated conditions to 2,980 cfs under regulated conditions, a reduction of 56 percent.

In the fall and winter, low flows are typically around 3,500 cfs, which is 60-75 percent higher than historic flow conditions.

CEA-Related observations in Reach D9 include:

- Floodplain isolation due to flow alterations and agricultural dikes
- Side channel blockages

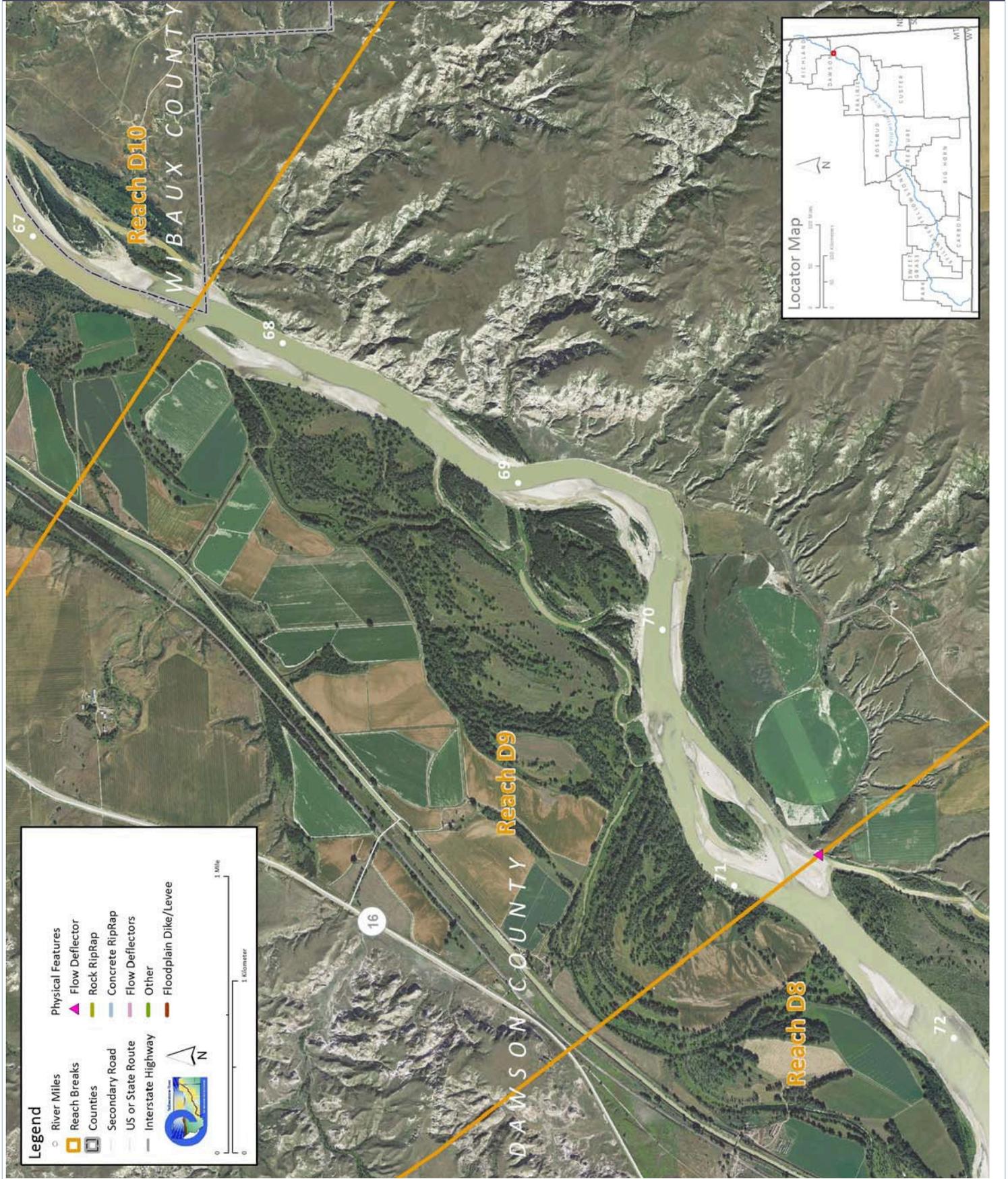
Recommended Practices (may include Yellowstone River Recommended Practices--YRRPs) for Reach D9 include:

- Side channel reactivation at RM 68.8L
- 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)	69,600	54,200	-22.1%			
100 Year (cfs)	145,000	128,000	-11.7%			
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.
	434.7	456.9	410.8	418.7	-16.0	
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	0	0.0%	0			
Concrete Riprap	0	0.0%	0			
Flow Deflectors	45	0.1%	45			
Total	45	0.1%	45			
Length of Side Channels Blocked (ft)	Pre-1950s	Post-1950s	Numerous side channels have been blocked by small dikes.			
	14,796	6,635				
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	95.2	61.2	35.3 acres			
Acres/Year	3.7	2.4				
Acres/Year/Valley Mile	1.2	0.8				
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)	47.2	15	-22.5	39.7		
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	161.4	50%				
100 Year	170.4	15%				
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.			
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)	3,008.1	3,102.1	Flood (Ac)	760.3	708.0	
Ag. Infrastructure (Ac)	81.3	78.3	Sprinkler (Ac)	0.0	0.0	
Exurban (Ac)	0.0	0.0	Pivot (Ac)	0.0	183.0	
Urban (Ac)	0.0	0.0				
Transportation (Ac)	35.2	35.2				
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.	
	73.2	0.0	73.2	8.0%		
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	1.9	0.6	41.9			
Emergent	21.8	7.2				
Scrub/Shrub	18.1	6.0				
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.			
	1.0	0.0%				
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.	
	42.3	53.1	79.7	37.4		

PHYSICAL FEATURES MAP (2011)



CHANNEL MIGRATION ZONE MAP

