Yellowstone River Reach Narratives

Reach D5

County	Dawson	**Upstream River Mile**	107.1
Classification	PCA: Partially confined anabranching	**Downstream River Mile**	94.6
General Location	To Glendive	**Length**	12.50 mi (20.12 km)

Narrative Summary

Reach D5 is located just south of Glendive. The reach is a 12.5 mile long Partially Confined Anabranching reach type, indicating the presence of forested islands with some valley wall influence on the river. The downstream end of the reach is at Black Bridge. Within Reach D5, the river flows across the Cedar Creek Anticline, which is a~115 mile long structure that extends from Glendive to Buffalo South Dakota. Oil was discovered on the anticline in 1951, and since then over a half a billion barrels of oil have been produced from 2,700 wells. As the river flows right through the anticline, the Pierre Shale becomes exposed in the right bluff line and the channel becomes more dynamic than upstream reaches. Active drill pads are located on both sides of the river; several of them are within the 100-year floodplain, and two are mapped within the CMZ.

Reach D5 has just over a mile of bank armor and most of that armor is rock riprap. There are also 1,050 feet of concrete armor and a few flow deflectors. About 640 feet of riprap was built between 2001 and 2011. The majority of the bank armor is protecting either streambank just upstream of Black Bridge. Black Bridge forms a major constriction in the river corridor and bank migration upstream of the bridge has been extensive. The bridge is oriented about 45 degrees off of the axis of the river corridor which further disrupts channel processes upstream. Just upstream of the bridge the river migrated over 1,700 feet eastward between 1950 and 2001, which is over 30 feet per year on average.

Since 1950, a side channel that is over 9,000 feet of side channel has been blocked by a dike at RM 105R. The dike crossing the head of this old channel is about 720 feet long. There are still several side channels in the reach that are perennial (flow year-round) and over a mile long.

Floodplain turnover rates have dropped in Reach D5 since 1976; prior to that time, floodplain turnover rates were about 18.5 acres per year, and since then rates have averaged 14.2 acres per year. The reduction in rates has been coupled by an increase in the extent of woody riparian vegetation of almost 300 acres.

Land use is dominated by agriculture, with 219 acres of pivot irrigation development since 1950. Some of the irrigation development took place in historic riparian areas; a total of 161 acres of riparian lands were converted for agricultural and other land uses since 1950. Development near Glendive has created about 310 acres of urban/exurban land uses in the reach. About 190 acres or 3 percent of the total CMZ has become restricted by physical features. Residential development near Glendive has encroached into the CMZ; in 2011, there were over 75 acres of urban/exurban land uses mapped within the CMZ.

Six dump sites were mapped in the reach in 2001. These sites are at RM 104L, RM 104.2L, RM 101L, RM 98L, RM 97.5L, and RM 97.1L.

One ice jam has been recorded in Reach D5. A breakup event was recorded on March 17, 2011, but no damages were recorded.

There is one pipeline crossing in the reach at RM 100. This crossing is the Poplar Pipeline owned by Bridger Pipeline, a 10 inch crude oil pipeline that ruptured in 2015. The pipeline crossing is located at the downstream end of a large forested island. Bank migration at the site has been relatively slow.

About 8 percent of the total 100-year floodplain has become isolated due to human development and most of that isolated floodplain area is behind floodplain dikes near Black Bridge. The 5-year floodplain is even more affected; 31 percent of the historic 5-year floodplain is no longer inundated at that frequency. There has been over 1,260 acres of woody riparian vegetation recruitment in the reach since 1950, indicating generation of new forest, some of which reflects encroachment due to lower flows and a shrinking river channel. The bankfull area of the channel has dropped by 255 acres since 1950. Some of that riparian expansion has been due to Russian olive colonization; there are just under 50 acres of mapped Russian olive in the Reach D5 floodplain.

Reach D5 was sampled as part of the fisheries study. A total of 33 fish species were sampled in the reach including four identified by the Montana Natural Heritage Program as a Species of Concern (SOC): the Blue Sucker, Pallid sturgeon, Sauger, and Sturgeon chub.

Reach D5 was sampled as part of the avian study. A total of 33 bird species were identified in the reach. One bird species identified by the Montana Natural Heritage Program as Potential Species of Concern (PSOC) was found, the Plumbeous Vireo. The Red-headed Woodpecker was also observed, which has been identified as a Species of Concern (SOC). Reach D5 has seen a decrease in the forested area that is at low risk of cowbird parasitism since 1950. At that time, there were 86 acres per valley mile of such forest, and that number decreased to 38 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 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 4,800 cfs to 2,720 cfs with human development, a reduction of 436 percent. More typical summer low flows, described as the summer 95% flow duration, have dropped from 6,980 cfs under unregulated conditions to 3,220 cfs, a reduction of 54 percent.

CEA-Related observations in Reach D5 include:
- Channel migration issues upstream of major constriction that is poorly aligned to corridor (Black Bridge)

Recommended Practices (may include Yellowstone River Recommended Practices--YRRPs) for Reach D5 include:

- Side channel reactivation at RM 104.5
- Russian olive removal
- Pipeline Crossing Practices at RM 100
- Dump site removal at RM 104L, RM 104.2L, RM 101L, RM 98L, RM 97.5L, and RM 97.1L

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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
2 Year (cfs)	69,200	54,000	-22.0%
100 Year (cfs)	145,000	124,000	-14.5%

"Undeveloped" flows represent conditions prior to significant human development, whereas "developed" flows reflect the current condition of both consumptive and non-consumptive water use.

Bankfull Channel Area (Ac)

1950	1976	1995	2001	1950-2001
2,086.3	1,995.7	1,964.9	1,830.9	-255.4

Bankful channel area is the total footprint of the river inundated at approx. the 2-year flood.

Physical Features

	2011 Length (ft)	% of Bankline	2001-2011 Change
Rock RipRap	4,408	3.3%	638
Concrete Riprap	1,049	0.8%	0
Flow Deflectors	58	0.0%	58
Total	**5,515**	**4.1%**	**696**

There are additional types of bank armor such as car bodies and steel retaining walls, but they are relatively minor.

Length of Side Channels Blocked (ft)

Pre-1950s	Post-1950s
	9,066

Numerous side channels have been blocked by small dikes.

Floodplain Turnover

	1950 - 1976	1976 - 2001
Total Acres	479.8	355.3
Acres/Year	18.5	14.2
Acres/Year/Valley Mile	1.7	1.3

1950-2001 In-channel riparian encroachment (negative number indicates retreat)

294.44 acres

The rate of floodplain turnover reflects how many acres of land are eroded by the river. Tunover is associated with the creation of riparian habitat.

Open Bar Area

	Point Bars	Bank Attached	Mid-Channel	Total
Change in Area '50 - '01 (Ac)	-7.9	28.3	21.8	42.2

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.

Floodplain Isolation

	Acres	% of FP
5 Year	536.1	31%
100 Year	248.3	8%

Floodplain isolation refers to area that historically was flooded, but has become isolated do to flow alterations or physical features such as levees.

Restricted Migration Area

Acres	% of CMZ
189.6	3%

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
Agricultural Land (Ac)	7,069.1	6,378.8
Ag. Infrastructure (Ac)	25.2	114.2
Exurban (Ac)	0.0	23.7
Urban (Ac)	0.0	391.2
Transportation (Ac)	105.6	102.2

	1950	2011
Flood (Ac)	864.7	1,691.1
Sprinkler (Ac)	0.0	0.0
Pivot (Ac)	0.0	218.5

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.

1950s Riparian Vegetation Converted to a Developed Land Use (ac)

To Irrigated	To Other Use	Total Rip. Converted	% of 1950s Rip.
114.0	46.8	160.8	6.0%

Changes in the extents of riparian vegetation are influenced by land use changes within the corridor.

National Wetlands Inventory

	Acres	Acres per Valley Mi
Riverine	23.7	2.2
Emergent	152.8	14.3
Scrub/Shrub	102.2	9.5

Total Wetland Acres

278.7

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).

Russian Olive (2001) (Appx. 100-yr Floodplain)

Acres	%
49.0	2.6%

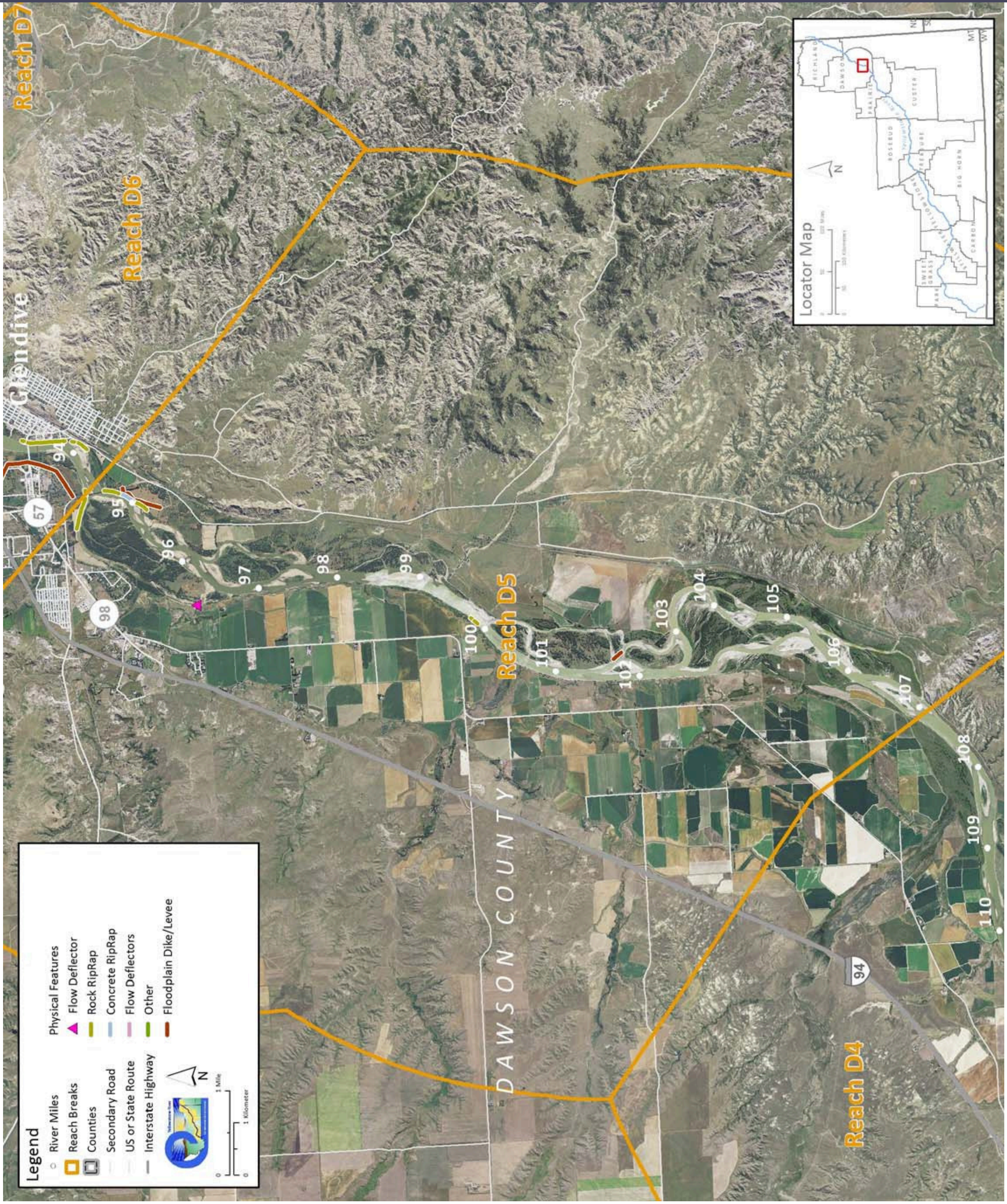
Russian olive is considered an invasive species and its presence in the corridor is fairly recent. Its spread can be used as a general indicator of invasive plants within the corridor.

Riparian Forest at low risk of Cowbird Parasitism (Ac/Valley Mile)

1950	1976	2001	Change 1950-2011
86.2	57.1	38.3	-47.9

Cowbirds are associated with agricultural and residential development, displacing native bird species by parasitizing their nests.

PHYSICAL FEATURES MAP (2011)



CHANNEL MIGRATION ZONE MAP