County	Stillwater	**Upstream River Mile**	434.7
Classification	PCS: Partially confined straight	**Downstream River Mile**	430.3
General Location	Reed Point	**Length**	4.40 mi (7.08 km)

Narrative Summary

Reach A10 is 4.4 miles long and begins at Reed Point. The reach is a Partially Confined Straight (PCS) reach type, indicating valley wall influences and minimal meandering. The river flows closely along the north valley wall sandstones of the Hell Creek Formation. Migration activity to the south off of the valley wall has been limited and relatively slow, resulting in a fairly narrow Channel Migration Zone and relatively little bank armor. There is only 500 feet of bank armor in the reach, which protects less than 2 percent of the bankline.
No side channels have been physically blocked in Reach A10, however there still has been a net loss of almost 2 miles of side channel length since 1950. This is in part due to the loss of a several thousand foot side channel on the south side of the corridor at RM 431. The entrance to the side channel is just downstream of a series of flow deflectors that appear to have contributed to aggradation at the entrance to the side channel.

Riparian mapping in Reach A10 shows a reduction in total acreage of closed timber from 222 acres in 1950 to 155 acres in 2001.

One of the most evident impacts in Reach A10 is floodplain isolation. Due to the transportation encroachment into the reach by the rail line, approximately 30 percent of the 100 year floodplain has become isolated from the river.

Land use in Reach A10 is predominantly agricultural, although there several hundred acres of non-agricultural uses due to the proximity of the transportation corridor as well as the town of Reed Point. All of the irrigated land is in flood. A total of 163 acres of developed land are in the Channel Migration Zone. Almost all of that ground is in flood irrigation. Less than 1 percent of the CMZ is restricted by physical features.

A hydrologic evaluation of flow depletions indicates that flow alterations over the last century have been moderate in this reach. The mean annual flood is estimated to have dropped from 14,000 cfs to 13,300 cfs, a drop of about 5 percent. 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 2,060 cfs to 1,690 cfs with human development, a reduction of 18 percent. More typical summer low flows, described as the summer 95% flow duration, have dropped from 1,760 cfs under unregulated conditions to 1,680 cfs under regulated conditions at the Livingston gage, a reduction of 4.6 percent.

CEA-Related observations in Reach A10 include:
- Passive loss of anabranching channels, some potentially correlated to flow deflectors
- Floodplain isolation by active rail line.

Recommended Practices (may include Yellowstone River Recommended Practices--YRRPs) for Reach A10 include:
- Floodplain restoration/reconnection behind rail line at RM 430.1
- Side channel restoration at RM 431

Yellowstone River Reach Narratives — Reach A10

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)	27,100	26,300	-3.0%
100 Year (cfs)	49,900	49,400	-1.0%

"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
255.8	268.7	286.2	290.6	34.8

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	270	0.6%	82
Concrete Riprap	0	0.0%	0
Flow Deflectors	255	0.6%	255
Total	**525**	**1.2%**	**338**

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
0	0

Numerous side channels have been blocked by small dikes.

Floodplain Turnover

	1950 - 1976	1976 - 2001
Total Acres	44.4	45.1
Acres/Year	1.7	1.8
Acres/Year/Valley Mile	0.4	0.4

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

-2.51 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)				

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	8.4	22%
100 Year	191.5	30%

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
6.1	1%

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)	2,550.7	2,370.7
Ag. Infrastructure (Ac)	23.4	27.9
Exurban (Ac)	0.0	30.0
Urban (Ac)	46.2	56.4
Transportation (Ac)	55.1	158.2

	1950	2011
Flood (Ac)	636.2	597.4
Sprinkler (Ac)	0.0	0.0
Pivot (Ac)	0.0	0.0

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.
4.3	1.1	5.4	2.0%

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	0.3	0.1
Emergent	15.9	3.9
Scrub/Shrub	6.4	1.6

Total Wetland Acres: **22.6**

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	%
0.0	0.0%

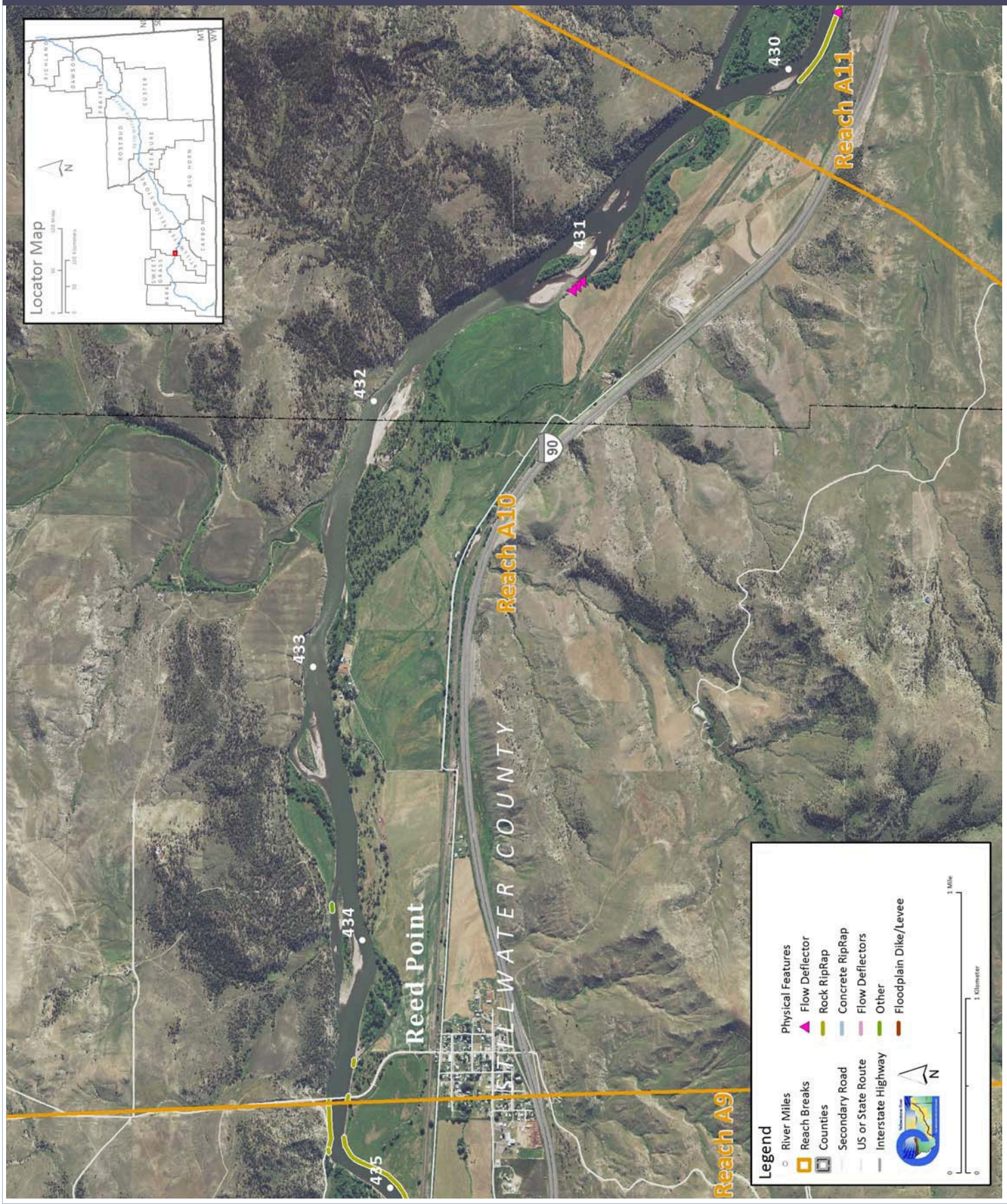
Russian olive is considered an invasive species and its presence in the corridor is fairly recent. Its spread can be used as a general indicator of invasive plants within the corridor.

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

1950	1976	2001	Change 1950-2011
3.9	2.6	2.7	-1.3

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

PHYSICAL FEATURES MAP (2011)



CHANNEL MIGRATION ZONE MAP