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|-------------------------|----------------------------------|------------------------------|-------------------|
| County | Custer | Upstream River Mile | 195.9 |
| Classification | PCS: Partially confined straight | Downstream River Mile | 192.3 |
| General Location | Horton Siding | Length | 3.60 mi (5.79 km) |

Narrative Summary

Reach C15 is located in Custer County at Horton Siding, about seven miles upstream of Miles City. It is 3.6 miles long and classified as a Partially Confined Straight (PCS) reach type, as the river has low sinuosity and flows along the south valley wall.

As of 2011 there were about 7,600 feet of armor protecting 19 percent of the total bankline in Reach C15, the vast majority of which is rock riprap protecting the rail line as it flows along the south bluff of Fort Union Formation. There are also minor amounts of flow deflectors (80 feet) and car bodies (150 feet) in the reach.

About 17 percent of the historic 100-year floodplain has become isolated. Isolation of the 5-year floodplain has been even more substantial; 298 acres or 61 percent of the 5-year floodplain has become isolated at that frequency event. Floodplain isolation appears to be mostly due to flow alterations, although there are 35 acres if isolated 100-year floodplain behind the abandoned Milwaukee rail line embankment.

Reach C15 has lost approximately 3,000 feet of side channel length since 1950; although there is no indication that side channels were intentionally blocked.

There has been about 1,200 acres of pivot irrigation development in Reach C15 since 1950, and most of that expansion has occurred since 2001. Pivot irrigation is more extensive than flood irrigation in this area, which is somewhat unusual in the Yellowstone River valley. About 10 percent (115 acres) of the land under pivot irrigation is within the Channel Migration Zone (CMZ) of the river, making it especially prone to threats of river erosion.

Reach C15 has seen relatively extensive riparian clearing since 1950s. Typically, riparian clearing for agriculture occurred prior to 1950 along the Yellowstone River. In this reach, however, 48 acres of riparian area were cleared since 1950, which represents 20 percent of the total 1950s riparian corridor. With this clearing, the reach has seen a substantial loss of forest area considered at low risk of cowbird parasitism. In 1950, the reach had 51.3 acres of such forest per valley mile and by 2001 that forest extent had dropped to 37.2 acres per valley mile.

A total of 8 acres of Russian olive have been mapped in Reach C15.

A hydrologic evaluation of flow depletions indicates that flow alterations over the last century have been major in this reach. The 100-year flood has dropped by 18 percent and 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 4,850 cfs to 3,070 cfs with human development, a reduction of 37 percent. More typical summer low flows, described as the summer 95% flow duration, have dropped from 6,340 cfs under unregulated conditions to 3,390 cfs under regulated conditions, a reduction of 47 percent.

Fall and winter base flows have increased in Reach C15 by over 60 percent.

CEA-Related observations in Reach C15 include:

- Passive side channel abandonment due to flow alterations
- Extensive pivot irrigation development since 2001

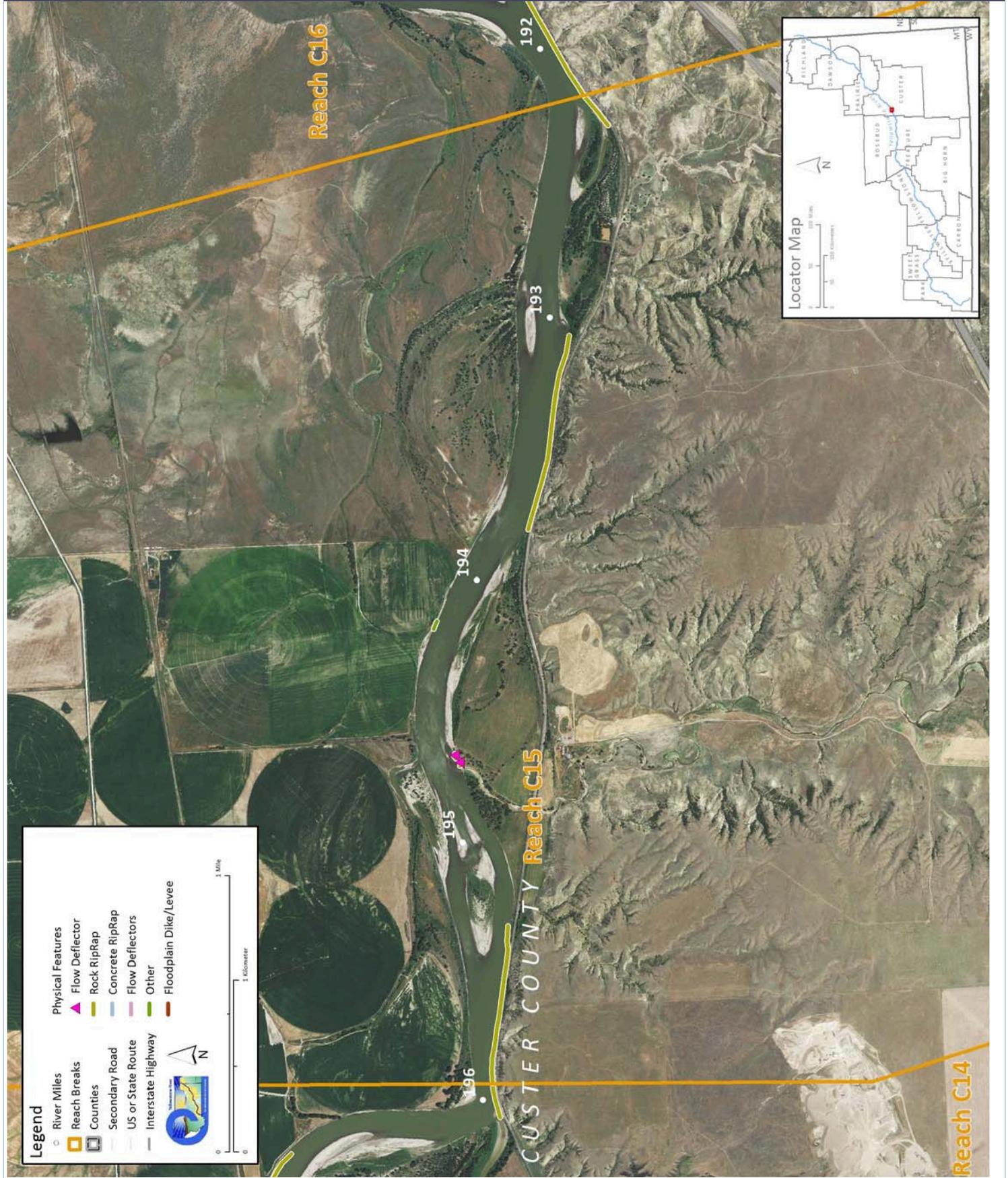
Recommended Practices (may include Yellowstone River Recommended Practices--YRRPs) for Reach C15 include:

- 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) | 62,000 | 47,300 | -23.7% | | | |
| 100 Year (cfs) | 120,000 | 98,600 | -17.8% | | | |
| 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. |
| | 368.5 | 371.3 | 359.6 | 365.6 | -2.8 | |
| 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 | 7,578 | 19.2% | -235 | | | |
| Concrete Riprap | 0 | 0.0% | 0 | | | |
| Flow Deflectors | 80 | 0.2% | 80 | | | |
| Total | 7,658 | 19.4% | -155 | | | |
| 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 | 43.6 | 23.1 | 12.67 acres | | | |
| Acres/Year | 1.7 | 0.9 | | | | |
| Acres/Year/Valley Mile | 0.5 | 0.3 | | | | |
| 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) | 0 | 42.5 | -7.5 | 35 | | |
| 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 | 298.3 | 61% | | | | |
| 100 Year | 168.3 | 17% | | | | |
| 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. | | | |
| | 15.5 | 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) | 3,770.6 | 3,729.5 | Flood (Ac) | 323.9 | 696.2 | |
| Ag. Infrastructure (Ac) | 6.4 | 53.7 | Sprinkler (Ac) | 0.0 | 0.0 | |
| Exurban (Ac) | 0.0 | 0.0 | Pivot (Ac) | 0.0 | 1,244.4 | |
| Urban (Ac) | 0.0 | 0.0 | | | | |
| Transportation (Ac) | 40.0 | 29.1 | | | | |
| 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. | |
| | 48.0 | 0.0 | 48.0 | 20.0% | | |
| 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 | 7.0 | 1.9 | 46.9 | | | |
| Emergent | 25.5 | 7.1 | | | | |
| Scrub/Shrub | 14.4 | 4.0 | | | | |
| 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. | | | |
| | 8.0 | 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. | |
| | 51.3 | 33.5 | 37.2 | -14.0 | | |

PHYSICAL FEATURES MAP (2011)



CHANNEL MIGRATION ZONE MAP

