County	Park	**Upstream River Mile**	501.7
Classification	PCS: Partially confined straight	**Downstream River Mile**	499.9
General Location	To Mayors Landing	**Length**	1.80 mi (2.90 km)

Narrative Summary

Reach PC15 is a 1.83 mile long river segment that extends from Sacajawea Park to the KPRK Bridge (Hwy 89) in Livingston. Within the reach, the river largely flows along the east valley wall, with extensive development on the west side of the river. There are almost 463 acres of urban development in the land use mapping corridor within this reach. There is also over a mile of bank armor, almost all of which is on the left (west) bank of the river. This includes about 5,000 feet of rock riprap and 600 feet of flow deflectors, which drape about 29 percent of the bankline. There are also 9,000 feet of floodplain dikes mapped in this reach, and again, they are on the west side of the river. The physical features have restricted about one half of the river's natural Channel Migration Zone in Reach PC15.

The Vallis Ditch Diversion diverts water from a side channel on the east side of the river at RM 500.4. Across the river from the diversion, Mayor's Landing is a popular ~3 acre fishing access site with a boat ramp.

About 50 acres of wetlands have been mapped in Reach PC15, and most of these remain connected to the main channel. About 20 of those wetland acres are on Siebeck Island.

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 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 1,570 cfs to 1,510 cfs with human development, a reduction of 3.8 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 PC15 include:
- Physical features blocking over 13,000 feet of side channels.
- Extensive CMZ Restriction with floodplain development.

Recommended Practices (may include Yellowstone River Recommended Practices--YRRPs) for Reach PC15 include:
- CMZ Management due to current restriction of 53 percent of the Channel Migration Zone
- Channel Bank Stabilization Recommended Practices due to 29 percent of banks being armored in reach
- Irrigation diversion management at Vallis Ditch Diversion

Yellowstone River Reach Narratives — Reach PC15

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)	20,300	20,200	-0.5%
100 Year (cfs)	38,200	38,100	-0.3%

"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
86.6			99.9	13.3

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	4,880	25.8%	243
Concrete Riprap	0	0.0%	0
Flow Deflectors	613	3.2%	-139
Total	**5,493**	**29.1%**	**104**

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		
Acres/Year		
Acres/Year/Valley Mile		

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

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		
100 Year		

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
232.1	53%

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)	517.5	368.5
Ag. Infrastructure (Ac)	6.7	25.6
Exurban (Ac)	7.7	50.7
Urban (Ac)	393.6	463.3
Transportation (Ac)	31.5	33.6

	1950	2011
Flood (Ac)	13.5	0.0
Sprinkler (Ac)	0.0	18.1
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.

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	2.8	1.6
Emergent	36.7	20.9
Scrub/Shrub	10.9	6.2

Total Wetland Acres: **50.5**

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	%
0.7	0.2%

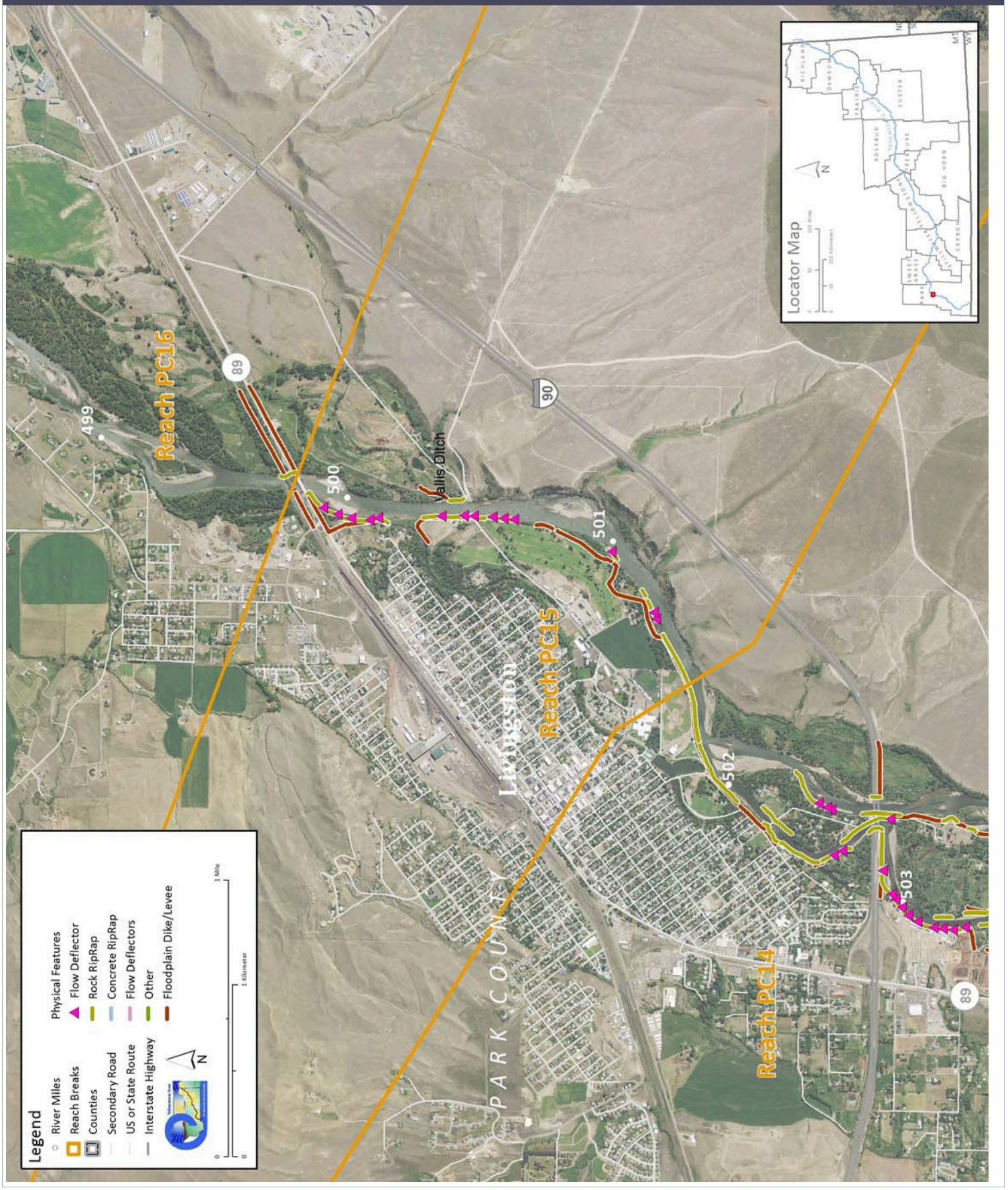
Russian olive is considered an invasive species and its presence in the corridor is fairly recent. Its spread can be used as a general indicator of invasive plants within the corridor.

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

1950	1976	2001	Change 1950-2011

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

PHYSICAL FEATURES MAP (2011)



CHANNEL MIGRATION ZONE MAP