

County	Yellowstone	Upstream River Mile	392.4
Classification	UA: Unconfined anabranching	Downstream River Mile	386
General Location	To Laurel	Length	6.40 mi (10.30 km)

Narrative Summary

Reach A17 is 7.6 miles long and is located just above Laurel. The reach is classified as Unconfined Anabranching (UA), which is characteristically one of the most dynamic reach types on the river. The river is flowing in the alluvial valley with minimal influences of the valley wall and through numerous forested islands. There are sites in Reach A17 where the river has migrated almost 1,000 feet since 1950.

Approximately 13 percent of the bankline in Reach A17 is armored by rock riprap, concrete riprap and flow deflectors. Between 2001 and 2011 the total length of rock riprap increased by about a half of a mile. At RM 387, a ~750 foot long stretch of flow deflectors on the left bank have been flanked, and by fall 2011 the river had migrated about 120 feet behind the flanked armor. The deflectors are still visible in the channel. In some places such as at RM 389.8, bank armor on both sides of the river narrows the corridor to about one channel width, or 1,000 feet.

Over a mile of side channels in Reach A17 were blocked prior to 1950. Two major channels were blocked on the north side of the river, one at the Buffalo Mirage Fishing Access Site at RM 391.5, and the other at Rm 389.5. These channels, as well as other secondary channels that were passively lost, host fairly dense concentrations of Russian olive. Similar to most reaches in Region A, the loss of side channels has been accompanied by an increase in the total river footprint, indicating that flow concentration into the main river channel has caused it to enlarge. Between 1950 and 2001, the size of the channel increased from 560 acres to 645 acres.

Land use in Reach A17 is primarily agricultural, although there are almost 600 acres of urban/exurban development in the reach as the river approaches the City of Laurel. Since 1950, there has been a reduction in flood irrigated acres of about 550 acres, and an increase in pivot irrigation from 0 acres in 1950 to 284 acres in 2011. A total of 383 acres of developed ground are in the mapped Channel Migration Zone; and about 11 percent of the CMZ has been isolated by physical features protecting those land uses.

At RM 388.5, a headgate diverts water into an old side channel that has been converted to a canal on the north side of the river. About ½ mile downstream, the canal is riprapped where it was recently threatened by rapid northward river migration. At this location, the river has migrated over 800 feet northward since 1950. The main channel of the river now flows along the riprapped canal embankment for about 750 feet.

There are corrals that are part of an animal handling facility within 600 feet of the north riverbank at RM 392.

Side channel loss and channel migration in Reach A17 has resulted in relatively high rates of riparian recruitment. Since 1950, there has been 330 acres of land that experience recruitment of new riparian vegetation. Most of that recruitment was in abandoned channels (200 acres) and about 27 acres of recruitment was direct result of channel migration.

Two ice jams have been recorded in Reach A17, in 1996 and 1997. Both occurred during the month of February, and were reported to have occurred at the Laurel Bridge.

There are over 200 acres of mapped wetland in the reach, with most of that emergent marshes and wet meadows. Many of these wetland areas occupy river swales on the floodplain north of the river, or abandoned channels in the active corridor.

Almost 22 acres of Russian olive has been mapped in the floodplain.

Reach A17 was sampled as part of the avian study. The average species richness in Reach A17 was 7.7, which indicates the average number of species observed during site visits to the reach in cottonwood habitats. The average species richness for all sites evaluated is 8. An average of 0.9 Cowbirds (a bird that parasitizes other bird's nests) were observed in cottonwood habitats during the field sampling visits. Reach A17 has lost about two thirds of its riparian forest considered at low risk of cowbird parasitism since 1950. At that time, there were about 28 acres of forest per valley mile considered to be isolated enough from agricultural infrastructure and urban/exurban development to be considered at low risk. By 2011, about 10 acres per valley mile considered low risk remained.

A total of three Potential Species of Concern (PSOCs) were observed in Reach A17 during the avian study, including the Black and White Warbler, Chimney Swift, and Ovenbird. One Species of Concern (SOC), the Bobolink, was also observed in Reach A17.

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 16,900 cfs to 15,500 cfs, a drop of about 8 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 2,320 cfs to 1,780 cfs with human development, a reduction of 23 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 A17 include:

- Flanking of flow deflectors and accelerated erosion behind flanked structures
- Physical blockage of over a mile of side channel
- Russian olive colonization in abandoned side channels

- Emergent wetland development in abandoned side channels
- Ice jamming potentially associated with the Laurel Bridge

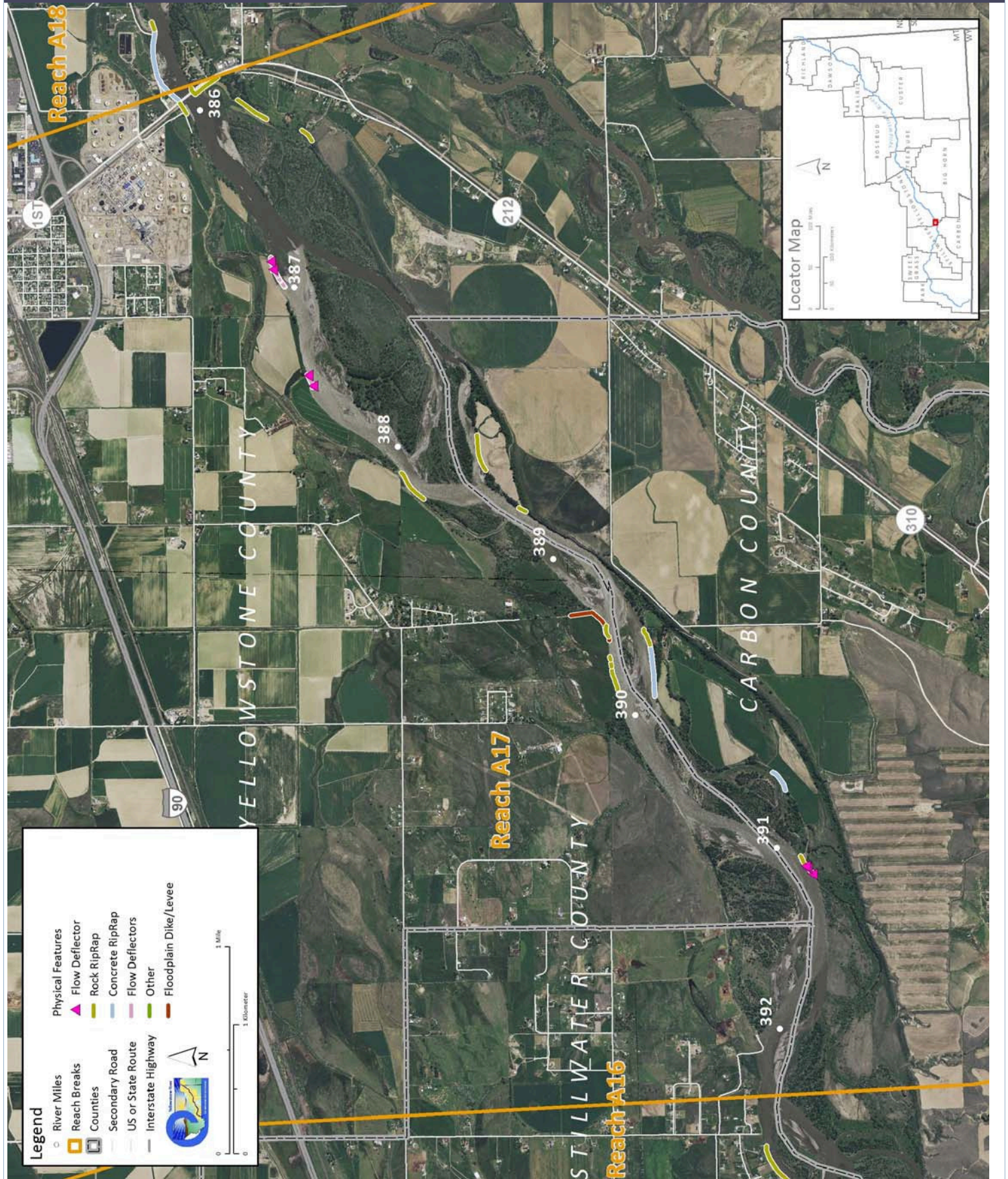
Recommended Practices (may include Yellowstone River Recommended Practices--YRRPs) for Reach A17 include:

- Bank armor removal (flanked flow deflectors), RM 387
- Side channel restoration at RM 391.5 and RM 389.5
- Nutrient management associated with corrals that are part of an animal handling facility at RM 392.
- Russian olive removal (22 acres)
- Wetland management/restoration due to extent of mapped wetland (200 acres)
- Irrigation diversion structure management at headgate on side channel at RM 388.5

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)	32,200	30,600	-5.0%			
100 Year (cfs)	58,600	57,600	-1.7%			
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.
	560.0	608.9	557.5	644.6	84.6	
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	6,184	9.1%	2,584			
Concrete Riprap	2,205	3.2%	0			
Flow Deflectors	671	1.0%	-176			
Total	9,060	13.3%	2,407			
Length of Side Channels Blocked (ft)	Pre-1950s	Post-1950s	Numerous side channels have been blocked by small dikes.			
	7,639	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	195.3	180.6	-19.75 acres			
Acres/Year	7.5	7.2				
Acres/Year/Valley Mile	1.3	1.3				
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)						
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	46.4	9%				
100 Year	89.9	7%				
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.			
	245.6	11%				
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)	4,530.2	4,110.3	Flood (Ac)	1,927.0	1,384.1	
Ag. Infrastructure (Ac)	68.6	118.5	Sprinkler (Ac)	0.0	0.0	
Exurban (Ac)	59.1	292.3	Pivot (Ac)	0.0	283.8	
Urban (Ac)	95.4	203.9				
Transportation (Ac)	50.2	50.2				
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.	
	6.0	0.8	6.8	1.0%		
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	9.4	1.6	226.2			
Emergent	203.4	35.6				
Scrub/Shrub	13.4	2.3				
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.			
	21.8	6.7%				
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.	
	27.7	64.2	9.7	-18.0		

PHYSICAL FEATURES MAP (2011)



CHANNEL MIGRATION ZONE MAP

