White River Integrated Water Initiative

Reach Report
Upper White River

Spring 2022

White River & Douglas Creek Conservation Districts P.O. Box 837 – 351 7th Street – Meeker, CO 81641 – Phone (970) 878-9838

White River Integrated Water Initiative

Mission Statement and Overall Goals

Mission Statement

Community based initiative to identify actions promoting a healthy river that ensures a vibrant economic community capable of securing the future vitality of agriculture, fisheries, recreation, municipalities, and industry while protecting water rights, quantity, and quality with respect for the local customs, cultures, and property rights.

Overall River Goals for Current and Future Generations

1) Protect and preserve existing water rights and other beneficial water uses
2) Protect and enhance water quantity and quality through promoting best management practices for:
   a. Agriculture Enhancements
   b. Favorable Conditions of Streamflow
   c. Forest Health
   d. Rangeland Health
   e. Riparian Health
3) Identify opportunities for creation or improvement of infrastructure to support efficient consumptive and non-consumptive uses
4) Support the development and maintenance of efficient and necessary long term storage solutions that will improve, enhance and ensure irrigation, river health, water quantity, water quality, and native and recreational fisheries

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Executive Summary

There are three main components in Phase II of the White River Integrated Water Initiative: Public Outreach/Community Engagement, Diversion Assessments, and Riparian Assessments.

At its core, the Water Initiative is a community-based water planning process. Numerous public meetings were held in all areas of the White River Basin. The purpose of the meetings was to gather input, communicate assessment findings, and plan for future activities.

The Diversion Assessments team completed twenty-five assessments on the White River and Piceance Creek. Each diversion was assessed for its functionality and environmental health. In general, the infrastructure of all assessed diversions is functional. There are two assessed diversions that are being negatively impacted by erosion along the White River. The erosion is causing the in-stream diversion to lose functionality. The environmental health assessment of the assessed diversions revealed a need for improved fish passage and increased management of noxious weeds.

The Riparian Assessment Team completed twenty-one assessments on the White River and Piceance Creek. Proper Functioning Condition of Lotic areas was used as the assessment methodology. In general, Piceance Creek is having negative impacts from the ongoing drought. Paradoxically, Piceance Creek is also negatively impacted by flash floods. The White River has isolated areas of bank erosion that are impacting the river. All areas assessed were found to be either Functional-At-Risk or in Proper Functioning Condition.

Complete assessment summaries can be found on the White River and Douglas Creek Conservation District website (https://wrcd-dccd.colorado.gov/) Go to the Water Initiative tab and then click on the Reach Reports.

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Upper Reach of the White River

For the purposes of the White River Integrated Water Initiative, we have defined the Upper Reach as the headwaters of the White River to its confluence with Miller Creek.

Physical Characteristics: by Mario Sullivan, PhD

Sinuosity and Elevation Gradients:

The North Fork and South Fork of the White River are markedly steeper than the rest of the upper reach with 2.4 and 1.8% grades, respectively. The remaining upper reach is closer to a 1.0% average grade. Sinuosity (***S***) is generally low to moderate (average = 1.2) but the South Fork has a small reach that would be considered a meandering reach (***S*** = 1.6) which appears to also contain an oxbow lake.

Hydrology:

USGS Station No. 09304115 had the most recent data within the main-stem of the upper reach but the period of record is only 2003 through 2009. During this period, the average annual CFS appears to be increasing (slope = 20.2) although a longer period would be desirable for this analysis because similar increases in flow are observed in other reaches during the same period of record. Peak discharge occurs in June with an average of about 1,487 CFS and drops to a winter base flow of about 270 CFS. In terms of average monthly flows, the upper reach is the least variable and the greatest variability in flow occurs in June (coefficient of variation = 44%).

Geologic Transitions:

While it is true that the water quality of the North and South forks, at least in terms of clarity, is protected by more resistant geological strata in the upper segments (which includes both relatively old Cambrian to

Pennsylvanian rocks and relatively young basalt lava flows). However, both tributaries quickly begin to drain Mesozoic sedimentary strata (i.e. Chinle formation) that contain shales and mudstones with mobile sediments. Therefore, the forested areas and riparian zones around the upper reach are of particular importance with respect to sediment stability and maintaining water clarity. The riverbed and tributary of the upper reaches of the North and South Forks have some glacial influence but in general, the valley fill is of Quaternary aged gravels deposited by flowing water.

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Rosgen (1994) Classification:

Because of the relatively steep gradients along the upper reaches of the North and South Forks along with the relatively low sinuosity (with the exception of specific reaches), the top of the upper reach might be classified as A+ to A depending on the entrenchment of the segment of river being assessed. Given the gradient and geology, the substrates will likely be coarse sands to boulders (A1-A3) or B1a-B3a depending on local steepness. The lower segments of the upper reach are likely to be primarily classified as "B" streams due to the potential for a greater width to depth ratio.

References:

Rosgen, D.L. 1994. A classification of natural rivers. Catena (22) 169 – 199.

Tobin, R. L., H.E. Stranathan, and K.J. Covay. 1985. Water-quality characteristics of streams in the Piceance Creek and Yellow creek drainage basins, northwestern Colorado, water years 1977-81. USGS Report 84-4261

Tobin, R.L. 1993. Sediment transport and water-quality characteristics and loads, White River, Northwestern Colorado, water years 1975-88. USGS Report 92-4031

Unique Features of the Upper White River

(All Water Rights data from CDSS: https://dwr.state.co.us/Tools/WaterRights/NetAmounts)

- Big Fish Fire (2002) - The Big Fish fire burned 17, 056 acres of the forest at the headwaters of the White River. It could be impacting the watershed and the ability of snow pack to turn into stream flow.
- Lake Avery (Big Beaver Reservoir) – Total absolute water decree is 7917.76 acre-feet and has a storage volume of 7,658 acre-feet. Water is decreed to be used for recreation, fisheries, and wildlife. The Colorado Parks and Wildlife has entered into a water loan agreement with the Colorado Water Conservation Board to lease the water a maximum of five years out of every 10 years to satisfy instream flow rights on the White River and Big Beaver Creek. The released water also helps to reduce the overall water temperature on the White River
- Fish species – Brook trout, native cutthroat trout, rainbow trout, brown trout, mottled sculpin, and mountain whitefish prefer the colder waters of the Upper Reach. They are more prevalent in this reach than other reaches of the White River.

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Diversion Assessments

The White River Integrated Water Initiative Diversion Assessment team conducted six assessments on the Upper White River. The largest diversion structures were prioritized and then volunteered diversions were assessed.

In general, the ditches assessed in this reach are very functional, in good condition, and are environmentally healthy. One ditch was found to need a better in-stream diversion and control structure. A complete scoring summary follows.

Score Summary

Score Description: Each category has a maximum score of 4. The lower the score, the greater the opportunity your diversion system presents for a multi-benefit improvement project.

Infrastructure Information

Category	Ditch 1	Ditch 2	Ditch 3	Ditch 4	Ditch 5	Ditch 6	Total	Average
In-Stream Diversion	4	4	4	3	4	1	**20**	**3.3**
Control Structure	3	4	3	3	4	0	**17**	**2.8**
Wastegate	4	N/A	4	3	4	N/A	**15**	**3.7**
Measuring Device	3	3	2	2	3	4	**17**	**2.8**
Total	**14/16**	**11/12**	**13/16**	**11/16**	**15/16**	**5/12**	**-----**	**3.1**

Environmental Health Information

Category	Ditch 1	Ditch 2	Ditch 3	Ditch 4	Ditch 5	Ditch 6	Total	Average
Vegetation	4	4	4	4	3	4	**23**	**3.8**
Fish Entrainment	3	4	3	4	3	1	**18**	**3**
Fish Passage	4	4	3	4	4	1	**20**	**3.3**
Erosion	4	4	4	4	4	4	**24**	**4**
Geomorphology	4	4	4	4	4	4	**24**	**4**
Total	**19/20**	**20/20**	**18/20**	**20/20**	**18/20**	**14/20**	**18.2/20**	**3.6**

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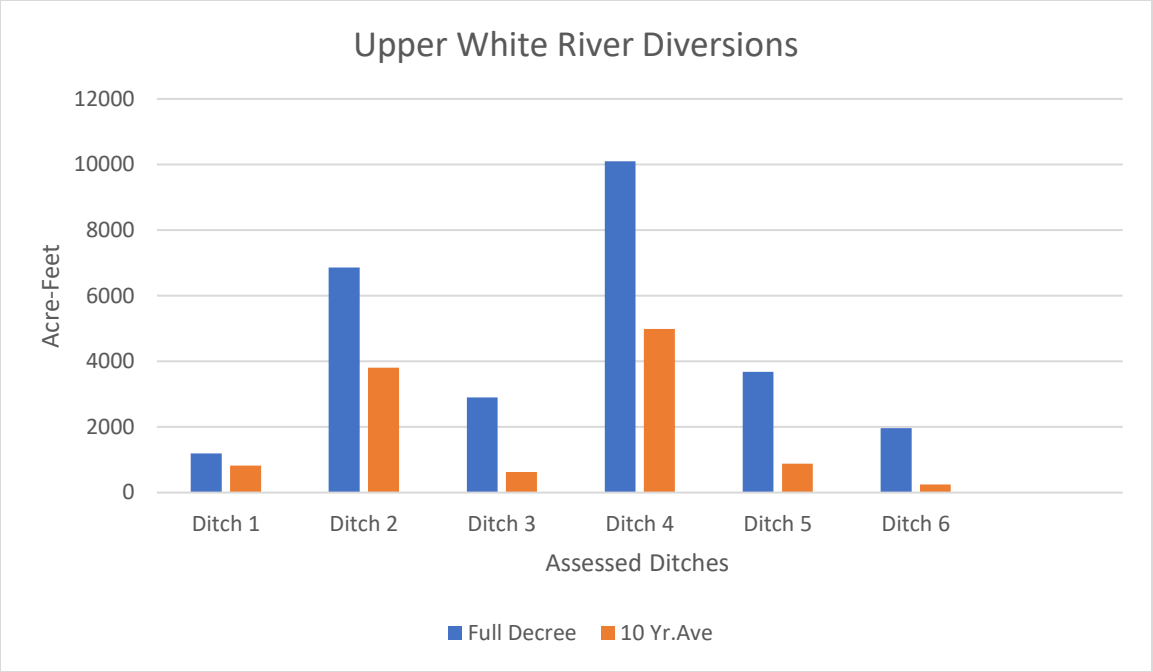

Source: CDSS Structure Report

The difference between the full decree and actual amount of water diverted in several ditches is often due to the lack of water available to divert throughout the entire irrigation season and/or voluntary measures to maintain stream flow.

Blue line – Total absolute water right in AF for a 213 day irrigation season (April 1st to October 31st)
Orange Line – Amount of water reported as diverted to State CDSS Site from 2012 – 2021 shown as yearly average. (Sum of diversion from 2012-2021 divided by reported number of diversion years)

Summary and Recommendations

Ditch 1

Identified Issue	Recommendations
Measuring device back eddy	Consider placing wings in the vault structure to ensure water flows towards the rectangular weir
Reading measuring device	Consider placing a mirror or similar device at level of staff gauge to allow for more accurate readings
Vegetation in construction area	Consider planting more native plants to encourage revegetation at these sites

Fish entrainment	Consider placing screens at headgate to prevent entrainment

Ditch 2

Identified Issue	**Recommendations**
Excess vegetation between the control structure and the measuring device	Recommend trimming or removing excess vegetation
Fluctuations in reading on measuring device	Suggest modifying structure to realize a more consistent measurement.
Invasive/noxious weeds present	Consider developing and implementing a weed control program

Ditch 3

Identified Issue	**Recommendations**
Log jam on side channel preventing diversion of full decree	Find a way to remove log jam. Suggestions are a crane from the road or chain saw and pack out the pieces.
Slide gate at control structure does not allow for adjusting water intake.	Replace slide gate with a radial gate, or attach a side lever so the gate can be adjusted.
Slide gate does not allow for water administration to lock the headgate.	Insert holes into the slide gate or replace with a gate that allows for locking.
Measuring device is not level.	Level measuring device
Measuring device is clogged with debris.	Remove debris and trim vegetation upstream of the measuring device.

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Ditch 4

Identified Issue	Recommendations
Stagnant pool at headgate with debris buildup	Consider changing the angle of the riffle to the headgate to encourage better water flow
Control structure loose	Secure headgate to concrete structure
Screw gate does not appear to fully close	Repair and maintain as needed to allow for radial screw to fully close
Wastegate does not empty directly to river	Consider separating the wastegate and measuring device so the wastegate is between the control device and the measuring device. This would bring it closer to the river and allow for water to enter the river.
Measuring tape submerged/turbulent flow	Move the wastegate upstream of the measuring device to reduce water presented to measuring device
Invasive weed species	Develop and implement a noxious weed control program

Ditch 5

Identified Issue	Recommendations
Headgate is oversized for the water decree	In the event of an administrative call, a secondary gate may be necessary to precisely control water flow.
Minor erosion at exit of wastegate	Consider rip-rap or other measure to control erosion
Sediment and debris obstructing water entering and leaving the Parshall flume	Clean the sediment, debris, and vegetation so the water can flow freely
Sparse vegetation at headgate	Consider planting appropriate native species at this site
Thistle and houndstongue	Consider developing and implementing a noxious weed control program

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Ditch 6

Identified Issue	Recommendations
In-stream diversion	Stabilize existing structure after consulting with Trout Unlimited about an updated design to aid fish passage
Channel spanning structure	Consider building a fish ladder or creating a bypass channel for better fish passage
Control structure	Consider installing a slide gate or radial screw control structure
Control structure	Consider installing screens to prevent entrainment if you decide to install a control structure
Erosion at Parshall flume	Place small rocks or cobble in the ditch at the intake and discharge of the Parshall flume

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Riparian Assessments

Criteria for Determining Riparian Condition

The PAC selected the Proper Functioning Condition Assessment for Lotic Areas (PFC) as the riparian assessment methodology. PFC is a qualitative method of assessing physical riparian processes based on three categories of indicators-hydrology, vegetation, and geomorphology. It provides a broad "snapshot" of the current state of riparian functionality and a riparian area's probability of withstanding and/or recovering from a moderately high flow event. PFC is also used to identify additional monitoring actions as it does not assess individual resource values such as aquatic or terrestrial habitat components. For example, the vegetation indicators do not distinguish between native and non-native/invasive vegetation.

Proper Functioning Condition (PFC): A lotic riparian area is in PFC, or "functioning properly," when adequate vegetation, landform, or woody material is present to dissipate stream-energy associated with high waterflow, thereby reducing erosion and improving water quality.

- Capture sediment and aid floodplain development.
- Improve floodwater retention and ground-water recharge.
- Develop root masses that stabilize streambanks against erosion.
- Maintain channel characteristics.

A riparian area in PFC will, in turn, provide associated values, such as wildlife habitat or recreation

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opportunities. (Ref.2)

Functional—At Risk (FAR): Riparian areas that are in functional condition, but an existing landform, water, or vegetation attribute makes them susceptible to impairment. (Ref.2)

Nonfunctional (NF): Riparian areas that clearly are not providing adequate vegetation, landform, or large woody material to dissipate stream-energy associated with high flows, and thus are not reducing erosion, improving water quality, etc. (Ref.2)

Note: References provided directly from the Bureau of Land Management/Forest Service/NRCS book titled "RIPARIAN AREA MANAGEMENT, Proper Function Condition Assessment for Lotic Areas". Technical Reference 1737-15, Second Edition, 2015.

Ref.1: Section I. Introduction, pg. 1.

Ref.2: Section I. Introduction, pg. 2.

Upper White River Riparian Summary

The Riparian Assessment Team performed six assessments on the Upper White River. In general, the riparian areas were in proper functioning condition. Two sites were rated as Functional at Risk, but both sites are trending upward and do not appear to be at risk of becoming non-functional.

Score Summary: Upper White River Riparian Areas

	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
PFC	-----	YES	YES	YES	YES	-----
FAR	YES	-----	-----	-----	-----	YES
NF	-----	-----	-----	-----	-----	-----

Summary and Recommendations

Area 1

Key Question Results:

The key question is the bolded question from each major category. If any of the questions are answered "No", the riparian area is not in proper functioning condition.

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Question	**Rating Yes-No-N/A**
Hydrological 3. Sinuosity, gradient, and width/depth ratio are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region.	No
Vegetation 11. An adequate amount of stabilizing riparian vegetation is present to protect banks and dissipate energy during moderately high flows.	Yes
Erosion/Deposition 16. Stream system is vertically stable (not incising).	Yes

Trend (Only Applicable to Functional-At Risk Rating)

Trend	**Rating**
Upward	X

Risk for Outside Factors

Are factors contributing to unacceptable conditions outside the land manager's control or management?	Yes
If yes, what are those factors?	
Channelization	X
Road encroachment	X

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Recommendations

Identified Issue	Recommendations
Primary issue identified is the lack of sinuosity which in turn is causing a lack of point bar development and an imbalance in energy transformation (deposition vs. scouring).	Rehabilitating the channel morphology given the confinement of the roads would be very difficult. Perhaps minor modifications/improvements (for example, point bar enhancement or construction) can be made by focusing on the middle of the reach.
Some issues with beaver and muskrats around diversion infrastructure.	Manage as needed.

Assessment Summary:

This site was found to be on the upper end of functional at risk due to a noticeable imbalance in sediment deposition due to channelization. While the riparian area and banks appear to be stable, this is not an ideal situation since the energy of flowing water is not being dissipated. That there is access to a floodplain and the presence of stable beaver dams and a subsequent wetland upstream of the channelized stretch suggest the riparian area is functional, but the substantial channelization can put downstream features at risk. The trend is apparently upward due to the stability of the beaver dams and expansion of the riparian-wetland complex at the confluence and just downstream.

Plant Species List:

Willows, wild rose, chokecherry, alder, and some cedars dominate woody species. Some young cottonwoods noted. Herbs and forbs include crested wheat grass, thistle, and mullein.

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Area 2

Key Question Results:

The key question is the bolded question from each major category. If any of the questions are answered "No", the riparian area is not in proper functioning condition.

Question	Rating Yes-No-N/A
Hydrological 3. Sinuosity, gradient, and width/depth ratio are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region.	Yes
Vegetation 11. An adequate amount of stabilizing riparian vegetation is present to protect banks and dissipate energy during moderately high flows.	Yes
Erosion/Deposition 16. Stream system is vertically stable (not incising).	Yes

Recommendations

Identified Issue	Recommendations
None identified.	None reported

Assessment Summary

This site was determined to be on the upper end of proper functioning condition due to the vigorous and dense riparian area. That there are multiple aged cottonwoods and armored banks suggest this riparian area will be is very stable during high flow events.

Plant Species List:

Diverse age classes in cottonwoods; aspens and pines also present. Alders, oaks, birch, and cedars (and cottonwoods) are dominant woody species.

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Area 3

Key Question Results:

The key question is the bolded question from each major category. If any of the questions are answered "no", the riparian area is not in proper functioning condition.

Question	Rating Yes-No-N/A
Hydrological 3. Sinuosity, gradient, and width/depth ratio are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region.	Yes
Vegetation 11. An adequate amount of stabilizing riparian vegetation is present to protect banks and dissipate energy during moderately high flows.	Yes
Erosion/Deposition 16. Stream system is vertically stable (not incising).	Yes

Recommendations

Identified Issue	Recommendations
No issues identified	Continue to monitor for changes and maintain as needed

Assessment Summary

This site has been assessed as being on the upper end of PFC. The riparian area has highly diverse and vigorous vegetation both along the channel and upland. Overall, this site is stable. Along the channels edge there is a mixture of diverse riparian vegetation and typical forest vegetation and terrain. Furthermore, the streambed and banks are well armored by gravels, cobbles, and boulders which all lead to a resilient and stable riparian area.

Plant Species List:

Alder and willows dominate (noted on one field sheet that this is the closest to a climax riparian community yet observed). Other woody species include pines, aspens, and birch. Herbaceous and grassy species include wheat grass, reed grass, mint, and rushes.

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Area 4

Key Question Results:

The key question is the bolded question from each major category. If any of the questions are answered "No", the riparian area is not in proper functioning condition.

Question	Rating Yes-No-N/A
Hydrological 3. Sinuosity, gradient, and width/depth ratio are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region.	Yes
Vegetation 11. An adequate amount of stabilizing riparian vegetation is present to protect banks and dissipate energy during moderately high flows.	Yes
Erosion/Deposition 16. Stream system is vertically stable (not incising).	Yes

Recommendations

Identified Issue	Recommendations
Only issue identified is some erosion due to foot traffic.	None given; that the erosion is not excessive suggests no major management steps should be taken other than perhaps some monitoring.

Assessment Summary:

This site was found to be on the upper end of proper functioning condition due to the dense, woody riparian area. Additionally, this site contains bank armor via the boulders, cobbles, and gravels that make up the river's substrate. Some erosion from foot traffic is evidenced but not negatively affecting the riparian area to any significant extent. Some monitoring is advised.

Plant Species List:

Dominated by woody species: willows, wild rose, douglas firs, chokecherries, oaks, lodgepole pine, birch, and hawthorn. Broom grasses, horsetail, and sedges dominate the herbaceous species.

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Area 5

Key Question Results:

The key question is the bolded question from each major category. If any of the questions are answered "No", the riparian area is not in proper functioning condition.

Question	Rating Yes-No-N/A
Hydrological 3. Sinuosity, gradient, and width/depth ratio are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region.	Yes
Vegetation 11. An adequate amount of stabilizing riparian vegetation is present to protect banks and dissipate energy during moderately high flows.	Yes
Erosion/Deposition 16. Stream system is vertically stable (not incising).	Yes

Recommendations

Identified Issue	Recommendations
No major issues identified.	Only suggestions are that managers continue what they are doing as it is resulting in a vigorous riparian area and then to potentially improve, planting of young cottonwoods to diversify age structure would be beneficial

Assessment Summary:

This site was found to be in proper functioning condition due to the vigorous and dense riparian zone that is primarily composed of favorable, woody species. Along with the cobble armoring along the banks, this riparian area is stable. The only improvement identified would be attempt cottonwood planting to ensure that that member of the riparian community persists.

Plant Species List:

Large cottonwoods, alders, choke cherry, and all ages of willows. Some oak brush, equisetum, and sedges. Point bars are primarily grasses. Mint is also prevalent.

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Area 6

Key Question Results:

The key question is the bolded question from each major category. If any of the questions are answered "No", the riparian area is not in proper functioning condition.

Question	**Rating Yes-No**
Hydrological 3. Sinuosity, gradient, and width/depth ratio are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region.	No
Vegetation 11. An adequate amount of stabilizing riparian vegetation is present to protect banks and dissipate energy during moderately high flows.	Yes
Erosion/Deposition 16. Stream system is vertically stable (not incising).	Yes

Trend (Only Applicable to Functional-At Risk Rating)

Trend	**Rating**
Upward	X

Risk for Outside Factors

Are factors contributing to unacceptable conditions outside the land manager's control or management?	Yes
If yes, what are those factors?	
Upstream channel conditions	X
Channelization	X

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Recommendations

Identified Issue	Recommendations
Some excessive erosion on banks and outside bends.	If possible, leave buffer. Willow planting in particularly problematic areas might be beneficial.
Increasing width to depth ratio and straightened channel.	To the extend possible, rebuild point bars, and narrow channel to recreate some sinuosity.

Assessment Summary:

This site was assessed to be at the very high end of functional at risk. This is primarily due to the lack of meanders and the points of excessive erosion. At the same time, there is a generally healthy riparian area with some specific points that are concerning. Any attempt at planting willows or encouraging willow recruitment at these specific points will help. The high width to dept ratio is certainly difficult, time consuming, and potentially expensive to address. Focusing on rebuilding old point bars that are easily accessible might be the most effective and efficient way to start.

Plant Species List:

Willows dominate the woody portion of the riparian community. Some newly planted cotton-less cottonwoods have also been planted. Some rose hips and rabbit brush downstream. Orchard, brome, timothy, wheat, and fescue grasses along with some horsetail and hound's tongue dominate the herbaceous component.

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