White River Integrated Water Initiative

Reach Report Piceance Creek

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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Piceance Creek Reach

For the purposes of the White River Integrated Water Initiative, we have classified the entire length of Piceance Creek as its own separate reach.

Physical Characteristics: by Mario Sullivan, PhD

Sinuosity and Elevation Gradients:

The average sinuosity of Piceance Creek is about 1.3 and ranges from 1.1 to 1.4. The upper stretch tends to be less sinuous. While upper Piceance creek (above where it crosses highway 13) is rather steep with a nearly 3% grade. Overall, the average grade is 1.2%.

Hydrology:

Piceance Creek appears to have unique seasonal patterns of discharge. While peak flows occur in May at 167 and 190 CFS (Station No's. 093062000 and 093062222, respectively), both the middle and lower stretches of Piceance Creek demonstrate much more variability during the winter months than other reaches in the White River. Therefore, winter time base flow might require more analysis but flows in Piceance Creek do drop in September to about 9 and 14 CFS in the middle and lower stretches respectively and then begin to rise. This pattern might be explained, at least in part, by the fact that Piceance Creek is a smaller drainage area and tends to be more sensitive (flashy) and the lower stretches might receive more precipitation in the form of rain later into the winter than some of the other reaches on the White River (particularly compared to the upper and middle reaches of the main-stem White River). Another noteworthy finding is the substantial variation in average monthly flows within Piceance Creek (CV max = 190% in lower Piceance Creek in May). This means that this stretch of Piceance Creek could be nearly dry or be flowing at double the average discharge in any give May. While flow variability decreases into the winter time, the average CV is still greater (30%-40%) than that in the White River (13%-20%).

Geologic Transitions:

The hillslopes of Piceance Creek tend to drain relatively young Tertiary sedimentary deposits; younger Uinta formation toward the tops of the ridges and older Green River formation in the lower elevations. In addition, the lower most stretches of Piceance Creek might drain some Mancos shale. In reviewing Tobin et al. (1985), sediment loads in Piceance Creek are highly variable and sensitive to flow magnitude. For example, a tributary near the upper stretches of Piceance Creek had sediment loads that ranged from 0.0 mg/L (no flow) up to 76,000 mg/L during run-off events. Furthermore, sediment loads can be highly localized; some sites from Tobin (1985) reported maximum sediment loads in the range of 100's of mg/L.

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Rosgen 1994 Classifications:

Due to the variation in sinuosity and slope, Piceance Creek might be classified as a type E or G stream, depending on local slope and sinuosity. A designation of E versus G will depend on local entrenchment. Because Piceance Creek's sediment load is highly variable and the geology it drains is somewhat similar to that of the middle and lower White River, there will probably some gravels (perhaps cobbles and boulders in the steeper, upper reach) but primarily gravels, sands, and silts perhaps putting this stream in G4-G6 or G4c-G6c.

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

- Piceance Creek has a unique hydrology compared to the White River.
    - Based on USGS Flow Gauges at Ryan Gulch and White River, Piceance Creek does not have a consistent peak flow period.
    - The creek is prone to flash flooding and associated sediment loads.
    - Administrative calls on the water occur on an annual basis. Junior water rights are frequently subjected to the calls and the water rights owners have their water curtailed.
- The Piceance Creek basin holds the largest known oil shale deposit in the world. (U.S. Geological Survey Professional Paper 1310)
    - If these deposits are developed, it will likely divert water rights to an industrial use instead of agricultural use.
- The gas industry is highly developed in the Piceance Creek basin. It is a large holder of land and water rights.
- Agriculture is the predominant land use along the creek valley.

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USGS Flow Gauge Data

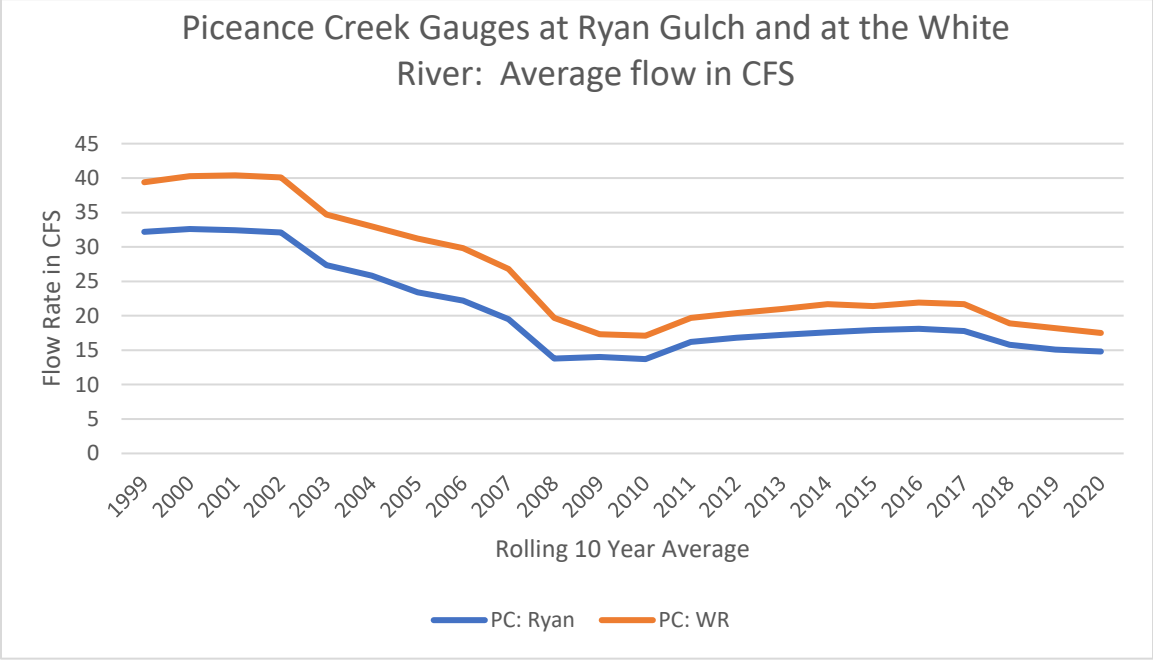
Daily Mean Flow Data

Yearly Data averaged in 10 year rolling increments

Gauges:

Piceance Creek below Ryan Gulch : USGS 09306200

Piceance Creek at White River, Colorado: USGS 09306222



USGS National Water Information System: https://waterdata.usgs.nwis/annual

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Diversion Assessments

The White River Integrated Water Initiative Diversion Assessment team conducted six assessments on Piceance Creek. Piceance Creek is subject to administrative calls on water on a yearly basis. Because of these calls, it was felt assessing the ditches with the most senior water rights would have the biggest impact in this reach. Volunteered diversions were assessed secondarily.

In general, the ditches assessed in this reach are very functional, in good condition, and are environmentally healthy. The in-stream diversion structures are large and tended to span the width of the creek. This would be a large concern for fish passage and entrainment if fish were reliably present in the creek.

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Score Summary: Piceance Creek Diversions

Score Description: Each category has a maximum score of 4. The lower the score, the greater the opportunity the 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	2	4	4	4	3	3	**20**	**3.3**
Control Structure	2	4	4	4	4	4	**22**	**3.7**
Wastegate	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	**N/A**
Measuring Device	2	3	4	4	3	4	**18**	**3**
Total	**6/12**	**11/12**	**12/12**	**12/12**	**10/12**	**11/12**	**10.3/12**	**3.3**

Environmental Health Information

Category	Ditch 1	Ditch 2	Ditch 3	Ditch 4	Ditch 5	Ditch 6	Total	Average
Vegetation	3	4	4	3	3	4	**21**	**3.5**
Fish Entrainment	3	3	3	3	3	3	**18**	**3**
Fish Passage	2	2	1	2	2	2	**11**	**1.8**
Erosion	2	4	4	4	4	4	**22**	**3.7**
Geomorphology	4	4	4	4	4	4	**24**	**4**
Total	**14/20**	**17/20**	**16/20**	**16/20**	**16/20**	**17/20**	**16/20**	**3.2**

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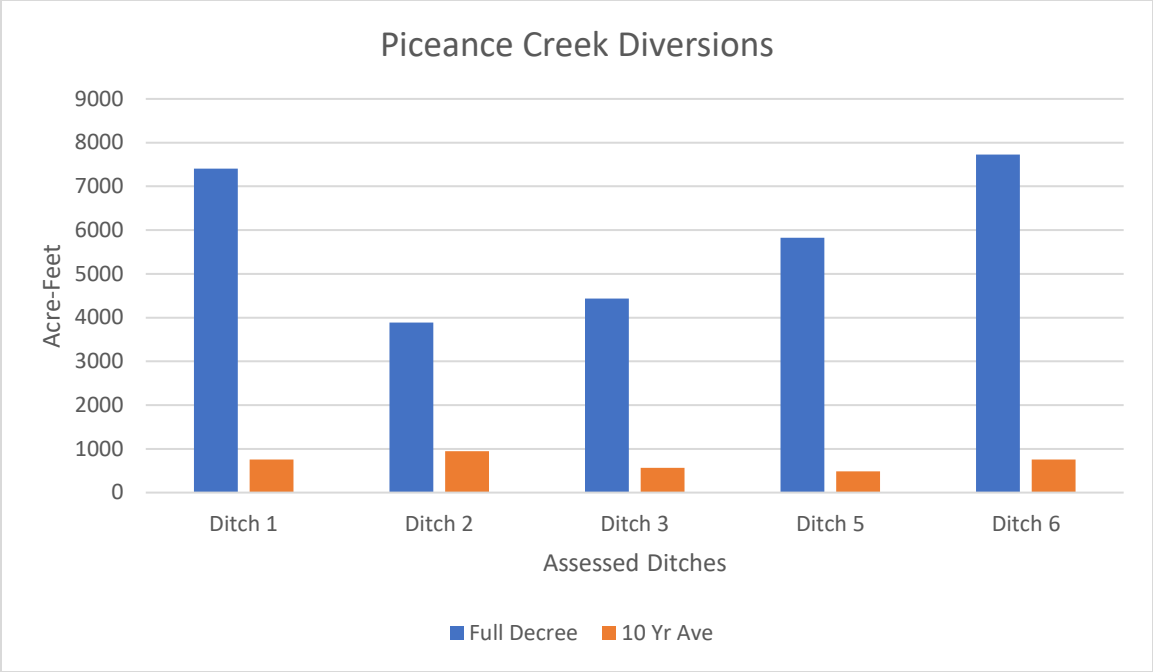

Source: CDSS Structure Report

The difference between the full decree and actual amount of water diverted is due to the lack of water available to divert.

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
Fish passage and entrainment is impacted at this diversion point.	Screens could be added to decrease fish entrainment. A stair step structure could be extended on the downstream end of the diversion structure to aid in fish passage.
The functionality of the input channel to the headgate is being affected by the physical properties of the channel.	Consider widening, straightening, and cleaning the ditch for a cleaner and smoother water flow prior to the headgate.

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Some erosion noted around structures.	Consider adding erosion mitigation measures and increasing site stability.
Mulch is currently used to seal cracks in the in-stream diversion structure to increase its functionality.	Consider improving or replacing diversion structure with a system that is more permanent and won't require debris to be added to the system.
Diversion is rebuilt every year and undergoes annual maintenance, as well as ongoing maintenance throughout the year.	Consider replacing diversion system with a more permanent structure that requires less maintenance and annual upkeep, while improving functionality.
The Parshall flume is not in a level setting. The flume is level side to side but is ~1 inch lower at the exit than the entrance.	Set the flume in a level environment to increase accuracy.
There is sediment and debris build-up at the Parshall flume	Clean the flume's entry and the area immediately before it to ensure accuracy in the water reading.
Ditch upstream from flume could be affecting the water flow through the flume	Clean, straighten, and reroute the ditch upstream from the flume to provide a laminar flow to the flume.
Parshall flume size	Install a larger Parshall flume to accommodate the full water decree.

Ditch 2

Identified Issue	**Recommendations**
Fish passage and entrainment is impacted at this diversion point.	Screens could be added to decrease fish entrainment. A stair step structure could be added on the downstream end of the diversion structure to aid in fish passage.
The current maintenance and upkeep schedule is creating a highly functioning diversion system.	Continue with the current schedule of operations to maintain a highly functioning irrigation diversion system.

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There is significant erosion near both Parshall flumes	Consider filling in eroded areas and adding mitigation practices to control future erosion. Consider welding wings on the exit of the flumes to control erosion.
There is erosion in the ditch at and near the second Parshall flume southeast of the diversion.	Consider straightening out the channel to prevent the back eddy and erosion and to allow the water's energy a straight path through the flume. Consider backfilling around the flumes to stabilize and prevent erosion.
There are several thistle plants near the Parshall flume southeast of the diversion.	Spray the thistle or otherwise remove the noxious species.

Ditch 3

Identified Issue	**Recommendations**
Fish passage and entrainment is impacted at this diversion point.	Screens could be added to decrease fish entrainment. A stair step structure could be added on the downstream end of the diversion structure to aid in fish passage.
The banks of Piceance Creek below the diversion are prone to erosion and washout episodes.	Continue placing rock and gravel on erosion-prone areas to assist with site stability and reduce erosion.
Mulch is currently used to seal cracks in the in-stream diversion structure to increase its functionality.	Consider improving or replacing diversion structure with a system that is more functional and won't require mulch to be added to the system.

Ditch 4

Identified Issue	**Recommendations**
The in-stream diversion structure could inhibit fish passage.	Add screens to the diversion system to prevent fish entrainment. And adda stair step structure to the downstream end of the diversion structure to aid in fish passage.
There is heavy vegetation growing around the Parshall flume.	Consider clearing the vegetation from around the flume, for better readings and easier access.

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The screw handle of the headgate is overgrown with willows and other vegetation.	Consider clearing the vegetation to ensure continual operation of the control structure.
The landowner would like to increase the height of the diversion to get a better drop in the system.	A better drop in the system would provide a more accurate measurement reading and smoother flowing of the entire ditch.

Ditch 5

Identified Issue	**Recommendations**
The entire diversion system is functioning well as a whole under the current maintenance schedule.	Continue with annual maintenance as currently doing, and repairs as needed.
The measuring flume is slightly off-level. The south side of the structure is ½ to 1 inch lower.	Set flume in a level environment. Clear vegetation around the flume.
The in-stream diversion structure poses a fish passage problem. It spans the entire channel and is an obstruction.	Install fish ladders or a stair step structure on the downstream end of the diversion structure to increase possible fish passage and other multi-purpose improvements like erosion.
The area around the in-stream diversion point is not as stable as the rest of the system. The area is composed of mainly shale. Mitigations have been made to improve stability and decrease erosion.	Continue installing mitigation practices as currently doing, including rock work and wire panels. Consider installing a more concrete or permanent diversion structure to stabilize more area around the diversion, improve fish passage, and enhance the ability to divert water more easily.
There are grasses and other vegetation growing at the entrance and exit of the measuring flume.	Consider clearing the vegetation from around the flume, for better readings and easier access.
The screw handle of the headgate is overgrown with willows and other vegetation.	Consider clearing the vegetation to ensure continual operation of the control structure.

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Ditch 6

Identified Issue	Recommendations
Sediment in control structure and Parshall flume	Remove sediment before allowing water into the diversion
Vegetation near Parshall flume	Trim vegetation as needed to allow for laminar water flow into and through the flume
Rod in the headgate appears bent	Run the headgate wheel and slide in its full range of motion to test the functionality and repair as needed.
Fish Passage	Consider installing a fish ladder to allow for passage during irrigation season. This a lower priority since no fish have been seen the last 2 years.

Riparian Assessments

Definitions of Riparian Conditions

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 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)

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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.

Piceance Creek Riparian Summary

The Riparian Assessment Team performed five assessments on Piceance Creek. In general, the riparian areas were in proper functioning condition. One site has been impacted by drought and the need to graze cattle in the riparian area. One other area has been impacted by the flash flooding that is common on Piceance Creek.

Score Summary: Piceance Creek Riparian Areas

	Area 1	Area 2	Area 3	Area 4	Area 5
PFC	-----	YES	YES	YES	YES
FAR	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.

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 upper, No lower
Vegetation	Yes upper, No lower

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11. An adequate amount of stabilizing riparian vegetation is present to protect banks and dissipate energy during moderately high flows.	
Erosion/Deposition 16. Stream system is vertically stable (not incising).	Yes

Trend (Only Applicable to Functional-At Risk Rating)

Trend	**Rating**
Not Apparent	X

Recommendations

Identified Issue	**Recommendations**
Lack of riparian vegetation in lower stretch	When there is a severe drought and lack of pasture, there isn't much to recommend. The land manager(s) were able to see the differences between what they would like to be doing (upper) versus what they had to do (lower) in terms of riparian grazing management. Given the time and cooperation from nature, allowing that lower stretch to recover to the extent possible is our only practical recommendation. If conditions improve and time and money are ample, planting willows and creating enclosures in the lower stretch would be beneficial for protection against future adverse conditions.

Assessment Summary

This site was found to be in FAR condition because there are two distinct reaches and currently, the upper reach has a more functional riparian area than the lower reach. However, in either case, the dominant vegetation that makes up the riparian area (common reed grass) is not ideal. The trend for FAR is not apparent as the disparities in the upper and lower reach appear to be due to recent conditions. On one hand, if current hot and dry conditions persist, the trend would be downward with

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no management or mitigation. On the other hand, if climate conditions improve, it would be likely that the plants from the upper reach would naturally colonize the lower reach and bring it into a more functional condition. Given the uncertainty of the future, managers at this site should consider some protective or rehabilitation options for the lower portion of this site so that it continues to function.

Plant Species List:

Dominated by common reed, some rushes and sedges, willows present are heavily browsed, some cattails. Soil appears to be very alkaline.

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
No major issues identified; there is an area of focused use but is beneficial for a large part of the reach.	None; fencing enclosure and grazing regimes appear to be well balanced and have resulted in a healthy, functional riparian area.

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Assessment Summary

This site was assessed as on the upper end of PFC due to a generally vigorous riparian area. Although common reed grass dominates the riparian vegetation, it is in sufficient quantities as to be stabilizing. Furthermore, there are willow thickets with multiple age classes interspersed. Fencing enclosures and a balanced grazing regimen are largely attributed to the robust riparian area at this site.

Plant Species List:

Largely dominated by common reed grass, rushes, horsetail grass, and aster spp. Some dense thickets of willow with multiple age classes.

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
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

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No issues identified	None; the stream channel might be a bit confined but that is largely due to the natural geologic setting of a confining valley.

Assessment Summary

This site was found to be above middle PFC. Any limitations to outward expansion of the riparian are either natural or due to the presence of a roadbed. There is an abundance of mat forming, stabilizing grasses that are reinforced by interspersed willows and sedges. Managers have made a practice of leaving riparian buffers around ditches and Piceance Creek itself.

Plant Species List:

Upstream stretches contain cattails. Otherwise, riparian community largely consists of willows, sedges, and hanging mats of grasses. Sunflowers, equisetum, and wild rose also present.

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, generally
Erosion/Deposition 16. Stream system is vertically stable (not incising).	Yes

Risk for Outside Factors

Are factors contributing to unacceptable conditions outside the land manager's control or management?	Yes

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If yes, what are those factors?	
Other (specify)	Tributary channel debris flow has impacted riparian area

Recommendations

Identified Issue	Recommendations
Tributary channels blow out and debris build up can impact riparian area.	Lessee handles the tributary blow outs and rebuilds banks as needed. However, keeping a watch on tributary blow outs will be key to maintenance.
Sparse Tamarisk and Russian Olive present	Monitor and mitigate as needed.

Assessment Summary

This site is assessed as being on the lower end of PFC. This is due to the fact there exists a functional riparian area, albeit sparse in some places, there is no reason to anticipate this site going into a non-functional condition. Especially since there is exists a very dense and vigorous wetland in the middle of the reach due to irrigation return flows. However, it is known that a tributary debris flow will endanger the riparian area during high flows and work has already been done to sure up the banks and protect as much as possible. In addition, a greater abundance of willows and other preferred riparian species would benefit this site in terms of stability. Lastly, some tamarisk and a russian olive tree were spotted sparsely throughout the reach and these are very invasive. Monitoring and mitigating the species will be crucial for overall stability of the riparian area.

Plant Species List:

Common reed grass, some rushes, sedges, and seashore aster. Middle stretch has vigorous wetland from irrigation return flows. A few tamarisks and russian olive present.

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.

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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.	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
Primary issue identified is a ditch being threatened by an outside bend; the growing inside point bar continues to push the bulk of the water's force against that bank.	Dig out point bar from the point bar side of stream. This would widen the choke point and alleviate some erosive force on outside bend.
Some erosion around water gap in the "New Lot"	Create a secondary channel through the water gap itself while maintaining a broad, natural radius that will empty back into main channel downstream of erosional area.
Rodent tunnels are increasing erosion.	No practical recommendations; manage as needed.

Assessment Summary

This site has been assessed on the upper end of PFC due to the presence of thick, multi-aged stands of willows interspersed with preferred riparian plant species such as sedges and rushes. Where there are not willows, there tend to be dense stands of Common reed grass, which is a functional riparian species. Management practices such as building and maintaining water gaps are attributed to the high functionality of the riparian area.

Plant Species List:

Dominated by common reed grass, sedges, rushes, wild licorice, abundant willows, aster spp.

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