Methow River Reach Assessment

Appendix B | Reach-Based Ecosystem Indicators (REI)

Methow River (RM 40.6 – 62.3)

May 2026

Contents

Methow River – Reach 13, July 2025

1 Introduction

1.1 BACKGROUND

The Reach-based Ecosystem Indicators (REI) provide a consistent means of evaluating biological and physical conditions of a watershed in relation to regional standards and known habitat requirements for aquatic biota. These indicators, along with other scientific evaluations, describe the current quality of stream biophysical conditions and can help inform restoration targets and actions. The REI indicators used in this assessment are adaptations from previous efforts including The National Marine Fisheries Service (NMFS) matrix of pathways and indicators (MNFS, 1996) and the U.S. Fish and Wildlife Service (USFWS) watershed assessment (USFWS, 1998).

The REI evaluation for the Methow River was conducted using field data, observations, previous studies, and available data for the study area. In particular, the rankings were developed based on 1) quantitative inventory information from the Habitat Assessment performed as part of the Reach Assessment using U.S. Forest Service (2020) protocols, 2) assessment of geomorphic patterns and processes and how they have deviated, if at all, from historical conditions, and 3) analysis of existing watershed assessments and data (e.g. available ArcMap layers and shapefiles). Functional ratings include Adequate, At Risk, or

Unacceptable. The REI analysis helps to summarize habitat impairments and to distill the impairments down to a consistent value that can be compared among reaches. The REI results help to inform the identification of recommended restoration measures in the Restoration Strategy (Appendix C). They are also used in the project prioritization framework, where existing conditions are rated and compared to target conditions (typically equivalent to an REI Adequate rating) to determine project priorities.

1.2 SUMMARY OF RESULTS

At the watershed scale, REI ratings for the Methow River (RM 40.6-62.3) ranged from Unacceptable to Adequate. Watershed-scale impairments are primarily related to historical or ongoing anthropogenic disturbance to the watershed. At the reach scale, the most impaired indicators occurred in the Riparian Vegetation and Habitat Quality categories. High-quality riparian vegetation conditions that support aquatic ecosystem processes, such as mature, old-growth trees in the riparian zone that offer channel shading and contribute large wood to the channel are limited within the assessment area, largely due to the presence of roads, agriculture and grazing land uses, and residential infrastructure in the towns of Winthrop and Twisp, Washington. Riparian Vegetation condition indicators were predominantly rated Unacceptable, with Disturbance (Human) rating Adequate in the upstream reaches where anthropogenic impacts to the riparian buffer zone are minimal. The Foghorn Diversion is a potential fish passage barrier at certain flows; Reach 10 is rated At Risk for Habitat Access and all other reaches rate Adequate. Habitat Quality indicators ranged from Adequate to Unacceptable with the most Unacceptable ratings occurring in Pool Frequency/Quality indicator. However, the upper to mid-reaches (Reach 12 – Reach 15) offer high-quality, deep pool habitat. Off-channel habitat is intermittently available within the assessment area, with Unacceptable and At Risk ratings in reaches where anthropogenic impacts to the channel and floodplain are relatively high, such as near Winthrop and Twisp. The Off-Channel Habitat indicator did receive Adequate ratings in the Big Valley area, from Reach 12 to Reach 15, however. Suitable-sized substrates where natural channel form and stream power support the development of spawning areas occurred in most upstream reaches. Spawning gravels were observationally limited between Reach 1 and Reach 10. Geomorphic channel conditions were largely rated At Risk to Unacceptable within the assessment area, except the upper reaches (Reach 12 to 15) where anthropogenic impacts to the channel are minimal, and floodplain connectivity is adequate (Table 1).

Table 1. Summary ratings for the Methow River reach assessment (Reach 1 – Reach 16). Ratings are color-coded, with green shading for Adequate condition, yellow for At Risk condition, and red for Unacceptable condition.

Pathway	General Indicators	Specific Indicators	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8	Reach 9	Reach 10	Reach 11	Reach 12	Reach 13	Reach 14	Reach 15	Reach 16
Habitat Access	Physical Barriers	Main Channel Barriers	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	At Risk	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate
Habitat Quality	Substrate	Dominant Substrate/ Fine Sediment	Unacceptable	At Risk	At Risk	At Risk	At Risk	At Risk	At Risk	At Risk	Unacceptable	At Risk	At Risk	Adequate	At Risk	At Risk	Adequate	Adequate
	LWM	Pieces per Mile at Bankfull	Unacceptable	Adequate*	At Risk	Adequate*	At Risk	At Risk	At Risk	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Adequate*	Adequate*	Adequate*	Adequate*	Unacceptable
	Pools	Pool Frequency and Quality, Presence of Large Pools	Unacceptable	At Risk	Unacceptable	At Risk	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	At Risk	At Risk	Unacceptable	At Risk	Unacceptable
	Off-Channel Habitat	Connectivity with Main Channel	Unacceptable	Unacceptable	At Risk	At Risk	Unacceptable	At Risk	Unacceptable	Adequate	Unacceptable	At Risk	At Risk	Adequate	Adequate	Adequate	Adequate	At Risk
Riparian Vegetation	Condition	Structure	Unacceptable	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	At Risk
		Disturbance (Human)	Unacceptable	Adequate	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Adequate	Adequate	Adequate	Adequate	Unacceptable
		Canopy Cover	Unacceptable	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	At Risk
Channel	Dynamics	Floodplain Connectivity	At Risk	At Risk	At Risk	At Risk	At Risk	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable	At Risk	Adequate	Adequate	Adequate	At Risk	At Risk
		Bank Stability/ Channel Migration	Unacceptable	Unacceptable	Unacceptable	Unacceptable	At Risk	At Risk	Unacceptable	At Risk	Unacceptable	Unacceptable	At Risk	Adequate	Adequate	Adequate	At Risk	Unacceptable
		Vertical Channel Stability	At Risk	Adequate	At Risk	At Risk	Adequate	At Risk	At Risk	At Risk	At Risk	At Risk	At Risk	Adequate	Adequate	Adequate	Adequate	At Risk

**Although the LWM maybe be adequate from a habitat/cover perspective, this indicator does not consider the geomorphic function of LWM. An asterisk is indicated in the LWM reach rating where the rating would potentially be lowered if geomorphic function of LWM was considered.*

1.3 COMPARISON TO PREVIOUS REI ANALYSES

Three reach assessments with corresponding REIs have been previously conducted in the Methow River assessment area (RM 40.6 – 61.2), including:

- 2008 Big Valley Reach Assessment (USBR, 2008), RM 54.2 – RM 61
- 2010 Middle Methow Reach Assessment (USBR, 2010), RM 40.3 – RM 52.4
- 2011 Winthrop Area (W2) Assessment of Geomorphic and Ecologic Indicators (USBR, 2011), RM 50 – RM 55

Past REIs included ratings for watershed-scale metrics and reach-scale metrics. Watershed-scale metrics generally evaluated watershed hydrology, watershed conditions (specifically, road densities and land disturbances), and water quality within the entire Methow watershed. Reach-scale metrics evaluated instream aquatic habitat quality, fish passage, physical channel dynamics and riparian vegetation conditions of the Methow River. In some cases, metric rating criteria differed among the previous REI analysis and may contribute to the variation in ratings between previous assessment and this 2024 assessment. To the extent possible, the comparison described below acknowledges where key differences in rating criteria occurred.

At a watershed-scale, Watershed Conditions, Disturbance and Road Density have remained in an At Risk condition. Flow/Hydrology, as determined by the Changes in Peak/Base Flows, has remained in an At Risk condition. Water Quality metrics were rated either Adequate or At Risk in previous assessments. Due to the ongoing and future anticipated impacts of climate change on water temperatures and flows, this assessment rated the Water Quality – Water Temperature metric as Unacceptable. A summary of past assessment ratings at the watershed scale are provided in Table 2 - Table 4.

At the reach-scale, habitat access metrics have largely improved since the removal of the Barkley Diversion Dam and enhancement of the Foghorn Diversion. Habitat quality, including channel substrate, pool frequency, and off channel habitat appear to have degraded in the downstream to mid reaches (Reach 1 - Reach 8) based on REI ratings. LWM remained relatively stable in the upstream reaches (Reach 11 – Reach 15) where habitat restoration projects have improved channel habitat conditions and implemented large wood structures. However, it is important to note the difference in LWM and Pool rating criteria among the previous assessments compared to this 2024 assessment. In the 2024 assessment, higher LWM pieces per mile was required for adequate conditions. For pool frequency in the previous assessment, conditions required less frequent pools per mile to be considered Adequate. Channel dynamics including floodplain connectivity and bank stability and channel migration were relatively stable in the upper reaches (Reach 11-Reach 15) but degraded in the mid to lower reaches (Reach 1 – Reach 8) based on REI ratings. Vertical channel stability remained stable throughout the entire assessment area. The Riparian Vegetation rating comparison appears to suggest conditions may have worsened over time throughout all reaches, except for the Disturbance (Human) indicator improving in the upper reaches of this assessment. However, the riparian vegetation buffer zone criteria varied among the past assessments and this assessment which may indicate the difference is related to assessment methodologies. Despite continued project-level efforts to establish quality riparian vegetation buffer zone within the watershed, continued anthropogenic uses including residential, agricultural and

transportational infrastructure may affect the rate and extent at which adequate riparian vegetation can recover. The 2008 Big Valley Assessment used a 100-foot buffer for Disturbance (Human) and the full floodplain area for Road Disturbance and Structure criteria. The 2010 Middle Methow Assessment used the full floodplain area to calculate all Riparian indicators. The 2011 Winthrop Area (W2) used a 100-foot riparian buffer for both Disturbance and Canopy Cover metrics. Therefore, upon close comparison, any perceived degradation of Riparian Vegetation in this assessment may reflect either true degradation of the riparian condition around the Methow River or it may reflect the varied analyses used to evaluate the Riparian Condition indicators.

A summary of the past assessment ratings compared to the current assessment at the study area scale are shown in Figure 1. A summary of past assessment ratings compared to the current assessment at the reach scale are shown in Table 5 - Table 7 below. Refer to the past assessments listed above for details on methods used to determine REI ratings.

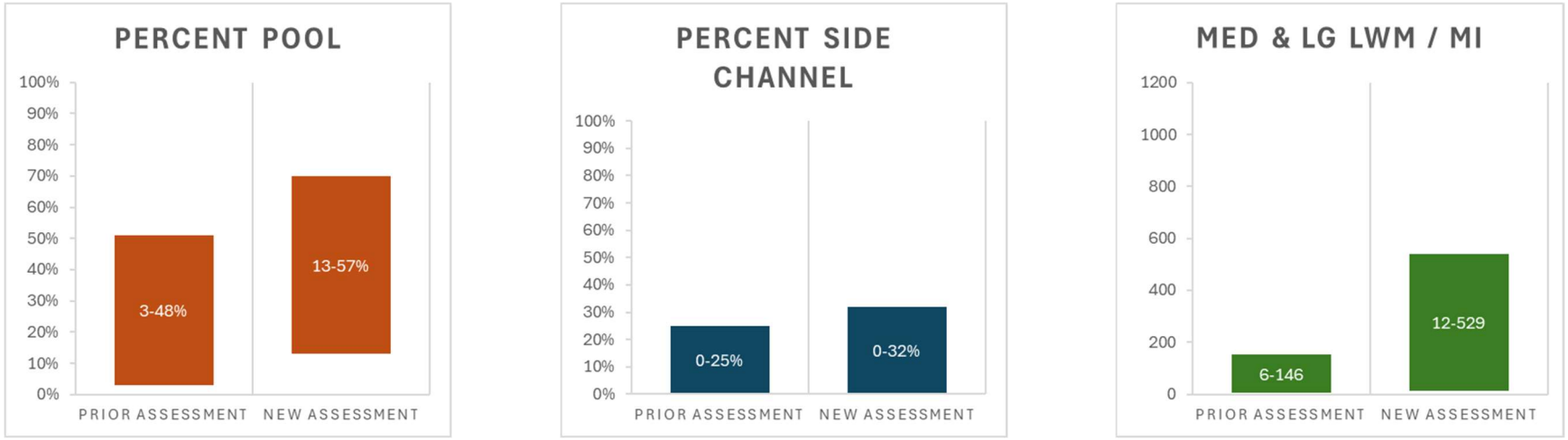

Figure 1. Percent change in REI metrics between past assessments (2008 Big Valley Reach Assessment, 2010 Middle Methow Reach Assessment and 2011 Winthrop (W2) Assessment of Geomorphic and Ecologic Indicators compiled) to this 2024 assessment. Percentages above are based on metrics observed and are not intended to be an effective monitoring tool.

Table 2. Watershed scale ratings from the 2008 Big Valley Reach Assessment (RM 54.2 -61) compared to the equivalent watershed scale ratings from this 2024 assessment.

2008 Big Valley Reach Assessment Watershed Scale Rating				2024 Methow Reach Assessment Watershed Scale Rating		
General Indicator	**Specific Indicator**	**Rating**		**General Indicator**	**Specific Indicator**	**Rating**
Watershed Condition	Effective Drainage Network and Watershed Road Density	At Risk	vs.	Watershed Condition	Effective Drainage Network and Watershed Road Density	At Risk
	Disturbance Regime	At Risk			Disturbance Regime	At Risk
Flow/Hydrology	Stream Flow	At Risk		Flow/Hydrology	Stream Flow	At Risk
Water Quality	Temperature	At Risk		Water Quality	Temperature	Unacceptable

Table 3. Watershed scale ratings from the 2010 Middle Methow Reach Assessment (RM 40.3 - 52.4) compared to the equivalent watershed scale ratings from this 2024 assessment. In the previous assessment, Water Quality metric evaluated additional criteria such as turbidity and chemical contaminants in addition to water temperature. This 2024 assessment evaluated water temperature as criteria for Water Quality.

2010 Middle Methow Reach Assessment Watershed-Scale Rating				2024 Methow River Reach Assessment Watershed-Scale Rating		
General Indicator	**Specific Indicator**	**Rating**		**General Indicator**	**Specific Indicator**	**Rating**
Watershed Condition	Effective Drainage Network and Watershed Road Density	At Risk	vs.	Watershed Condition	Effective Drainage Network and Watershed Road Density	At Risk
	Disturbance Regime (Natural/Human)	At Risk			Disturbance Regime	At Risk
	Stream Flow	At Risk			Stream Flow	At Risk
Water Quality	Turbidity, Temperature, Chemical Contaminants	At Risk		Water Quality	Temperature	Unacceptable

Table 4. Watershed scale ratings from the 2011 Winthrop (W2) Assessment of Geomorphic and Ecologic Indicators (RM 50-55) compared to the equivalent watershed scale ratings from this 2024 assessment. In the previous assessment, Water Quality metric evaluated additional criteria such as turbidity and chemical contaminants/nutrients in addition to water temperature. This 2024 assessment evaluated water temperature as criteria for Water Quality

2011 Winthrop (W2) Assessment Watershed-Scale Rating				2024 Methow River Reach Assessment Watershed-Scale Rating		
General Indicator	**Specific Indicator**	**Rating**		**General Indicator**	**Specific Indicator**	**Rating**
Watershed Condition	Effective Drainage Network and Watershed Road Density	At Risk	vs.	Watershed Condition	Effective Drainage Network and Watershed Road Density	At Risk
	Disturbance Regime	At Risk			Disturbance Regime	At Risk
	Flow/Hydrology	At Risk		Flow/Hydrology	Stream Flow	At Risk
Water Quality	Turbidity,Temperature, Chemical Contamination/Nutrients	At Risk		Water Quality	Temperature	Unacceptable

Table 5. REI ratings from the 2008 Big Valley Reach Assessment (RM 54.2 -61). The Big Valley assessment area covered is equivalent to Reach 11 to Reach 15 in this 2024 assessment.

Pathway	2008 Big Valley Reach Assessment Reach-Scale Rating			2024 Methow Reach Assessment Reach-Scale Rating				
	Specific Indicator	Rating		Reach 11	Reach 12	Reach 13	Reach 14	Reach 15
Habitat Access	Physical barriers	Adequate		Adequate	Adequate	Adequate	Adequate	Adequate
Habitat Quality	Substrate	Adequate		At Risk	Adequate	At Risk	At Risk	Adequate
	LWM (Frequency)	At Risk		Unacceptable	Adequate	Adequate	Adequate	Adequate
	Pools (Frequency and Quality)	Adequate		Unacceptable	At Risk	At Risk	Unacceptable	At Risk
	Off Channel Habitat	At Risk	vs.	At Risk	Adequate	Adequate	Adequate	Adequate
Channel	Floodplain Connectivity	At Risk		At Risk	Adequate	Adequate	Adequate	At Risk
	Bank Stability/ Channel Migration	At Risk		At Risk	Adequate	Adequate	Adequate	At Risk
	Vertical Channel stability	Adequate		At Risk	Adequate	Adequate	Adequate	Adequate
Riparian Vegetation	Structure	Unacceptable		Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable
	Disturbance (human)	At Risk		Unacceptable	Adequate	Adequate	Adequate	Adequate
	Canopy Cover	At Risk		Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable

Table 6. REI Ratings from the 2010 Middle Methow Reach Assessment (RM 40.3 - 52.4). The Middle Methow assessment area covered is equivalent to Reach 1 to Reach 8 in this 2024 assessment.

Pathway	2010 Middle Methow Reach Assessment Reach-Scale Rating			2024 Methow Reach Assessment Reach-Scale Rating							
	Specific Indicator	Rating		Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8
Habitat Access	Main Channel Physical Barriers (Natural/Human)	At Risk		Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate
Habitat Quality	Channel Substrate	Adequate		Unacceptable	At Risk	At Risk	At Risk	At Risk	At Risk	At Risk	At Risk
	LWM (Frequency)	At Risk		Unacceptable	Adequate*	At Risk	Adequate*	At Risk	At Risk	At Risk	Unacceptable
	Pools (Frequency and Quality)	At Risk		Unacceptable	At Risk	Unacceptable	At Risk	Unacceptable	At Risk	Unacceptable	Unacceptable
	Off Channel Habitat	At Risk	vs.	Unacceptable	Unacceptable	At Risk	At Risk	Unacceptable	At Risk	Unacceptable	Adequate
Riparian Vegetation	Structure	At Risk		Unacceptable	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable
	Disturbance (human)	Unacceptable		Unacceptable	Adequate	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable	Unacceptable
	Canopy Cover	At Risk		Unacceptable	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable
Channel	Floodplain Connectivity	At Risk		At Risk	At Risk	At Risk	At Risk	At Risk	Unacceptable	At Risk	Unacceptable
	Bank Stability/ Channel Migration	At Risk		Unacceptable	Unacceptable	Unacceptable	Unacceptable	At Risk	At Risk	Unacceptable	At Risk
	Vertical Channel stability	At Risk		At Risk	Adequate	At Risk	At Risk	Adequate	At Risk	At Risk	At Risk

Table 7. REI Ratings from the 2011 Winthrop (W2) Assessment of Geomorphic and Ecologic Indicators (RM 50-55). The Winthrop (W2) assessment area covered is equivalent to Reach 8 to Reach 10 in this 2024 assessment.

Pathway	2011 Winthrop (W2) Assessment Reach-Scale Rating			2024 Methow Reach Assessment Reach-Scale Rating		
	Specific Indicator	Rating		Reach 8	Reach 9	Reach 10
Habitat Access	Main Channel Physical Barriers (Natural/Human)	At Risk		Adequate	Adequate	At Risk
Habitat Quality	Channel Substrate	Adequate		At Risk	Unacceptable	At Risk
	LWM (Frequency)	Adequate		Unacceptable	Unacceptable	Unacceptable
	Pools (Frequency and Quality)	Adequate		Unacceptable	Unacceptable	Unacceptable
	Off Channel Habitat	At Risk	vs.	Adequate	Unacceptable	At Risk
Riparian Vegetation	Structure	At Risk		Unacceptable	Unacceptable	Unacceptable
	Disturbance (human)	At Risk		Unacceptable	Unacceptable	Unacceptable
	Canopy Cover	Adequate		Unacceptable	Unacceptable	Unacceptable
Channel	Floodplain Connectivity	At Risk		Unacceptable	Unacceptable	Unacceptable
	Bank Stability/ Channel Migration	At Risk		At Risk	Unacceptable	Unacceptable
	Vertical Channel stability	Adequate		At Risk	At Risk	At Risk

2 Metrics & Indicators

2.1 WATERSHED-SCALE METRICS

Pathway	General Indicators	Specific Indicators	Adequate Condition	At Risk Condition	Unacceptable Risk Condition
Watershed Scale					
Watershed Condition	Drainage Network and Hydrologically Impaired Surfaces	Increase in Drainage Network/ Hydrologically Impaired Surfaces	Zero or minimal increases in the drainage network that is correlated with human caused disturbances. Hydrologically impaired surfaces in watershed total <8%. Road density <1 mile/miles^2.	Low to moderate increase in the drainage network correlated with human caused disturbances. Hydrologically impaired surfaces in watershed total between 8 and 14.9%. Road density 1-2.4 miles/miles^2.	Substantial increase in the drainage network correlated with human caused disturbances. Hydrologically impaired surfaces in watershed total >15%. Road density ≥2.5 miles/miles^2.
	Disturbance Regime	Natural/Human Caused	Environmental disturbance is short-lived; predictable hydrograph, high-quality habitat and watershed complexity providing refuge and rearing space for all life stages or multiple life-history forms. Natural processes are stable.	Localized events of hillslope contributions, avulsion, lateral migrations, minor bed incision, or wildfires. Resiliency of habitat to recover from environmental disturbances is moderate.	Frequent flood or drought producing highly variable and unpredictable flows, hillslope contributions, avulsion, lateral migrations, minor to major bed incision (head cuts), or wildfires throughout a majority of the watershed. The channel is simplified, providing little hydraulic complexity in the form of pools or side channels. Natural processes are unstable.
Flow/Hydrology	Streamflow	Alterations to Peak/Base Flows	Magnitude, timing, duration, and frequency of peak flows within a watershed are not altered relative to natural conditions of an undisturbed watershed of similar size, geology, and geography.	Some evidence of altered magnitude, timing, duration and/or frequency of peak flows relative to natural conditions of an undisturbed watershed of similar size, geology, and geography.	Pronounced changes in magnitude, timing, duration and/or frequency of peak flows relative to natural conditions of an undisturbed watershed of similar size, geology, and geography.
Water Quality	Temperature	7-day Rolling Mean of Daily Maximum Temperatures (7-DADMax)	**Bull Trout:** incubation 2 - 5°C rearing 4 - 12°C spawning 4 - 9°C **Other salmonids:** spawning <13°C rearing <15°C holding & migration <15°C And, temperatures do not exceed 15°C in areas used by adults during migration (no thermal barriers)	**Bull Trout:** incubation <2 or 6°C rearing <4 or 13 - 15°C spawning <4 or 10°C **Other salmonids:** spawning 14-15.5°C rearing <14 – 17.5°C holding & migration <14 – 17.5°C And, temperatures in areas used by adults during migration sometimes exceed 15°C	**Bull Trout:** incubation <1 or >6°C rearing >15°C spawning <4 or >10°C **Other salmonids:** spawning >15.5°C rearing >17.5°C holding & migration >17.5°C And, temperatures in areas used by adults during migration regularly exceed 15°C (thermal barriers present)

2.2 REACH-SCALE METRICS

<table>
<tr><th>Pathway</th><th>General Indicators</th><th>Specific Indicators</th><th>Adequate Condition</th><th>At Risk Condition</th><th>Unacceptable Risk Condition</th></tr>
<tr><td colspan="6">Reach Scale</td></tr>
<tr><td>Habitat Access</td><td>Physical Barriers</td><td>Main Channel Barriers</td><td>No man-made barriers present in the mainstem that limit upstream or downstream migration at any flow.</td><td>Man-made barriers are present in the mainstem that have the potential to prevent or inhibit upstream or downstream migration at a subset of flows.</td><td>Man-made barriers present in the mainstem that prevent upstream or downstream migration at multiple or all flows.</td></tr>
<tr><td rowspan="3">Habitat Quality</td><td>Substrate</td><td>Dominant Substrate/Fine Sediment</td><td>Gravels or small cobbles make up >50% of the bed materials where natural channel form and stream power support development of spawning areas, with spawning gravel present (<5.6mm).</td><td>Gravels or small cobbles make up 30-50% of the bed materials where natural channel form and stream power support the development of spawning areas, with spawning gravel present (<5.6mm)</td><td>Gravels or small cobbles make up <30% of the bed materials where natural channel form and stream power support the development of spawning areas.</td></tr>
<tr><td>Large Woody Material (LWM)</td><td>Pieces per Mile at Bankfull</td><td>Fox and Bolton (2007) metrics for Eastern Washington, at least 67.45 pieces/mile of “Medium” and “Large” size large woody material (LWM) are present in the reach, based on USFS (2020) size classifications. USFS Stream Inventory protocol (2020) large woody material criteria, under the Eastside Forests criteria:
Medium = diameter > 12 in, length > 35 ft
Large = diameter > 20 in, length > 35 ft
In addition to a minimum of 67.5 pieces of medium or large wood/mile, an adequate rating also indicates the LWM are well-distributed throughout the reach and there are sources of woody debris available for long-term recruitment within the reach.</td><td>Current levels are able to maintain the minimum requirements for an "adequate" rating, but potential sources for long-term woody debris recruitment, as determined by the Riparian Structure reach metrics, are lacking in order to maintain these current levels or wood is not well distributed throughout the reach.</td><td>Current levels are not meeting the minimum requirements for an “adequate” rating, and potential source of woody debris for long-term recruitment are lacking or wood is not well-distributed throughout the reach.</td></tr>
<tr><td>Pools</td><td>Pool Frequency and Quality; presence of large pools.</td><td>Pool frequency: Number of pools/mile for a given bankfull width (BFW) equal or exceed NMFS (1996) criteria (below). For channels with bankfull >100 ft, minimum number of pools/mile were extrapolated based on relationship between BFW and pools/mile in NMFS (1996) criteria.
Bankfull width:<table><tr><td>121-140</td><td>14</td><td>pools/mile</td></tr><tr><td>141-150</td><td>13</td><td>pools/mile</td></tr><tr><td>151-170</td><td>12</td><td>pools/mile</td></tr><tr><td>171-180</td><td>11</td><td>pools/mile</td></tr><tr><td>181-210</td><td>10</td><td>pools/mile</td></tr><tr><td>211-240</td><td>9</td><td>pools/mile</td></tr></table>In addition, at least 50% of the total pools must be large pools with >1 m (3 ft) of residual depth and good fish cover.</td><td>Pool frequency meets or almost meets the values for the "adequate" rating, but pools have inadequate cover/temperature and/or there has been a moderate reduction of pool volume by fine sediment. Reaches have between 20-50% large pools present with good fish cover.</td><td>Pool frequency does not meet the pools/mile metric given in the “adequate” rating. Reaches have <20% large pools (>1 m deep). Pools also have inadequate cover/temperature and/or there has been a major reduction of pool volume by fine sediment.</td></tr>
</table>

Pathway	General Indicators	Specific Indicators	Adequate Condition	At Risk Condition	Unacceptable Risk Condition
	Off-Channel Habitat and Refugia	Connectivity with Main Channel	Reach has side channels and/or groundwater fed tributaries. Aquatic refugia such as backwaters, alcoves, large boulder eddies exist within the reach. Well-vegetated floodplains with healthy riparian community are inundated on a 1-2-year recurrence frequency. No man-made barriers that prevent access to off-channel areas.	Reach provides some aquatic off-channel and refugia features but access varies or is at risk of disconnection due to human impacts or man-made barriers. Floodplains along the off-channel habitat are well-vegetated with inundation recurrence of 2-5-years.	Reach provides no or only minimal off-channel refugia. Floodplains are disconnected and riparian vegetation has been altered.
Riparian Vegetation	Condition	Structure	>80% large trees (>21" DBH; USFS, 2020) in the riparian zone (defined as a 100ft buffer along each bank) based on habitat assessment data, as well as no visual evidence of human impacts on vegetations (e.g. logging or residential/agricultural clearing) in the floodplain.	50-80% large trees (>21" DBH; USFS, 2020) in the riparian zone (defined as a 100ft buffer along each bank) based on habitat assessment data, as well as moderate amount of visual evidence of human impact on vegetation (e.g., logging or residential/agricultural clearing) in the floodplain.	<50% large trees (>21" DBH; USFS, 2020) in the riparian zone (defined as a 100ft buffer along each bank) based on habitat assessment data, as well as moderate-high visual evidence of human impact on vegetation (e.g., logging or residential/agricultural clearing) in the floodplain.
		Disturbance (Human)	<20% disturbance (e.g. agriculture and grazing, residential, roads, etc.) and <2 mile/miles^2 road density in the 200-foot channel buffer.	20-50% disturbance (e.g. agriculture and grazing, residential, roads, etc.) and/or 2-3 miles/miles^2 road density in the 200-foot channel buffer zone.	>50% disturbance (e.g. agriculture and grazing, residential, roads, etc.) and/or >3 miles/miles^2 road density in the in the 200-foot channel buffer zone.
		Canopy Cover	Canopy cover provides high level of channel shading relative to likely natural condition, based on the number of shaded daylight hours on the summer solstice according to publicly available map tool Shademap (https://shademap.app/). In addition, a high proportion of large trees (height > 100 feet) and little or no anthropogenic clearing or disturbance are present within 100-feet of the channel bank.	Canopy cover provides moderate level of channel shading, based on the number of shaded daylight hours on the summer solstice. In addition, a moderate proportion of large trees (height > 100 feet) and some anthropogenic clearing or disturbance is present within 100-feet of the channel bank.	Canopy cover provides low level of channel shading, based on the number of shaded daylight hours on the summer solstice. In addition, a small proportion of large trees (height > 100 feet) and substantial anthropogenic clearing or disturbance are present within 100-feet of the channel bank.
Channel	Dynamics	Floodplain Connectivity	Floodplain areas are hydrologically linked to main channel within the context of the local process domain; overbank flows occur and maintain riverine and floodplain wetland functions, and riparian vegetation. Reaches that are naturally confined by bedrock, glacial terraces, or glacial fans are considered adequate.	Reduced linkage of wetland, floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function and riparian vegetation/succession.	Severe reduction in hydrologic connectivity between off-channel, floodplain, and riparian areas relative to historical connectivity; riparian vegetation/ succession is altered significantly.
		Bank Stability/Channel Migration	Channel is migrating at or near natural rates within the geomorphic construct of the reach. Geomorphic construct considers naturally occurring confining features such as channel adjacent glacial terraces, glacial outwash fans, or bedrock.	Channel migration is occurring at a faster or slower rate, relative to expected natural rates, but significant change in channel width or planform is not detectable; large woody debris is still being recruited – unless naturally confined by bedrock.	Little or no channel migration is occurring because of human actions preventing reworking of the floodplain and large woody debris recruitment; or channel migration is occurring at an accelerated rate such that channel width has at least doubled, possibly resulting in a channel planform change, and sediment supply has noticeably increased from bank erosion.
		Vertical Channel Stability	No measurable trend of aggradation or incision beyond the natural geomorphic processes of the reach.	Measurable trend of aggradation or incision that has the potential to, but has not yet caused, full disconnection of the floodplain or a visible change in channel planform (e.g. single thread to braided).	Enough incision or human infrastructure has occurred that the floodplain and off-channel habitat areas have been disconnected from the main channel; or enough aggradation has occurred to create a visible change in channel planform (e.g. single thread to braided.)

3 REI Ratings

This section discusses the results for each indicator, rated at either the reach-scale or watershed-scale for all reaches.

3.1 WATERSHED-SCALE RATINGS

General Characteristics	General Indicators	Specific Indicators	Rating	Discussion
Watershed Scale				
Watershed Condition	Drainage Network and Hydrologically Impaired Surfaces	Increase in Drainage Network/ Hydrologically Impaired Surfaces	At Risk	Hydrologically impaired surfaces (roads, parking lots, and buildings) in the watershed were calculated using the Washington State Department of Ecology State Land Use GIS Database (WADOE, 2010). Parcels were classified as "hydrologically impaired" or "Not hydrologically impaired" for the watershed based on land use codes in the dataset. Land use codes are numerical values assigned to a property based on the property's "use" and was established by the Washington State Department of Revenue to classify "Real Property". For parcels with land use code 91 to 99 were "Not hydrologically impaired", as the property was "undeveloped" and hydrologically impaired. "Hydrologically impaired" parcels included, but not limited to residential (code 11 to 19), manufacturing (code 21 to 36), transportation, communication, utilities (code 41 to 49) and services (code 61 to 69). Hydrologically impaired parcel polygon areas were summed and compared to the total watershed area, as determined using the StreamStats online mapper application (USGS, 2024). The average percentage of hydrologically impaired surfaces for the entire contributing watershed was 1.95%. Road density was calculated using the Washington state Department of Natural Resources roads GIS dataset (WADNR, 2017), as well as visual interpretation of LiDAR and aerial imagery. The total length of roads in the Methow River watershed was calculated and compared to the total watershed area. Watershed road density is 2.1 miles of road per square mile of watershed. The Methow River watershed is relatively developed, with most of the impaired surfaces in the lower watershed near the towns of Mazama, Winthrop, Twisp, Methow, Carlton and Pateros. Roads and structures are frequently adjacent to the river channel. However, road density and percentage of impaired surfaces is low throughout much of the watershed, therefore this indicator receives an At Risk condition.
	Disturbance Regime	Natural/Human Caused	At Risk	This disturbance history rating reflects historical accounts of riparian and hillslope timber harvest and clearing, mining, grazing, mining, agriculture, road infrastructure and residential development. These human-caused disturbances have historical and on-going impacts on the watershed and have altered the natural disturbance cycles. Since the late 1800's, when Euro-American settlement began in the Methow watershed, the land use along the river has been altered from mining, timber, orchards, grazing, and development (NPCC, 2004; Wilson, 1990). Timber harvest and riparian clearing for anthropogenic uses have reduced the width and structure of the riparian vegetation, as well as reduced the amount of LWM available for recruitment. Past splashing damming and the simplification of in-channel conditions to assist in timber transport have reduced the amount and quality of in-stream habitat. The Methow watershed ecosystem is adapted to frequent, low intensity fires, but fire suppression efforts have led to an increase in the size and intensity of fires. Roughly 59% of the Methow watershed has been burned in the past five decades (WADNR, 2023). Though these legacy effects and on-going disturbance within the watershed are negatively impacting geomorphic and habitat-forming processes in the Methow River, the development within the watershed is relatively low. Additionally, the Methow River watershed is used recreationally, with activities including tubing, kayaking, rafting, hiking, fishing, and camping. In consideration of these factors, the watershed receives an At Risk rating for disturbance.
Flow/Hydrology	Streamflow	Alterations to Peak/Base Flows	At Risk	The hydrology of the Methow River watershed is driven by a combination of precipitation and snowmelt. Annual snowmelt flooding in the spring and early summer, with infrequent rain-on-snow floods, dominates the season streamflow pattern in the basin. Snowmelt runoff is primarily driven by changes in ambient air temperatures, snowpack mass, and the elevation distribution of the season's snowpack. Peak run off usually occurs April through July, with the highest rates typically in late June. The Methow typically returns to baseflow by late August. Though low instream flows during the late summer and early fall are a natural hydrologic pattern in the Methow, several sections of the river frequently flow subsurface and leave the main channel dry or with disconnected pools. These sections have been designated as water quality limited and placed on the 303(d) list by the state (WQA, 2025). Climate change models indicate that rainfall is expected to increase 1-2% by 2040, and 4% by 2080 (Mote and Salanthe 2009) and likely result in an increase in winter stream discharges, earlier and lower peak runoff flows, and lower summer baseflows. Given the current streamflow conditions and probable current and future changes in snowpack from climate shifts, this rating receives an At Risk rating.
Water Quality	Temperature	7-day Rolling Mean of Daily Maximum Temperatures (7-DADMax)	Unacceptable	Based on water temperature data collected between 2015-2017, the 7-Day Rolling Mean of Daily Maximum Temperatures (7-DADMax) were compared to salmonid water temperature preferences. The average 7-DADMax for summer months was 17.6°C and ranged from 15 °C to 20.7°C. The salmonid rearing temperature preference threshold of 15°C was exceeded every year. The mainstem of the Methow River has been rated a Category 5 on the 303(d) list for temperature (WQA, 2025). Several tributaries to the Methow River within the assessment area, including the Chewuch River, Wolf Creek, and the Twisp River, have stream segments listed as Category 5 for water temperatures as well. Warm water temperatures occur in the Methow River and its tributaries during summer and late fall months and may be exacerbated by decreasing instream baseflows as a result of climate shifts, loss of floodplain connectivity, and removal of riparian vegetation along the river. For these reasons, this indicator receives an Unacceptable rating.

3.2 REACH-SCALE RATINGS – REACH 1 - REACH 10

Pathway	General Indicators	Specific Indicators	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8	Reach 9	Reach 10
Habitat Access	Physical Barriers	Main Channel Barriers	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	At Risk
			There were no anthropogenic barriers in the main channel.	There were no anthropogenic barriers in the main channel.	There were no anthropogenic barriers in the main channel.	There were no anthropogenic barriers in the main channel.	There were no anthropogenic barriers in the main channel.	There were no anthropogenic barriers in the main channel.	There were no anthropogenic barriers in the main channel.	There were no anthropogenic barriers in the main channel.	There were no anthropogenic barriers in the main channel.	The Foghorn Diversion is a potential fish passage barrier at certain flows.
Habitat Quality	Substrate	Dominant Substrate/ Fine Sediment	Unacceptable	At Risk	At Risk	At Risk	At Risk	At Risk	At Risk	At Risk	Unacceptable	At Risk
			Dominant substrate: Cobble (64.1-256mm) Cobble was the dominant substrate. Small boulders then Gravel were the sub-dominant substrate. Sand was occasionally noted. Substrate was generally not embedded.	Dominant substrate: Cobble (64.1-256mm) and Gravel (4-64mm) Cobble and gravel were the dominant substrate. Small boulder and sand were occasionally present. Substrate was generally not embedded.	Dominant substrate: Cobble (64.1-256mm) Cobble was the dominant substrate. Gravel was the sub-dominant substrate. Small boulders and sand were occasionally present. Substrate was generally not embedded.	Dominant substrate: Gravel (4-64mm) Gravel was the dominant substrate. Cobbles and sand were present. Substrate was generally not embedded.	Dominant substrate: Cobble (64.1-256mm) Cobble was the dominant substrate. Gravel was the sub-dominant substrate. Sand was occasionally present. Substrate was generally not embedded.	Dominant substrate: Cobble (64.1-256mm) Cobble was the dominant substrate. Gravel was the sub-dominant substrate. Small boulders and sand were occasionally present. Substrate was generally not embedded.	Dominant substrate: Cobble (64.1-256mm) Cobble was the dominant substrate. Sand was sparce but occasionally present. No boulders were present. Substrate was partially embedded.	Dominant substrate: Cobble (64.1-256mm) Cobble was the dominant substrate. Small boulder, gravels and sand were occasionally present. Substrate was partially embedded.	Dominant substrate: Boulder (>256.1mm) Small boulder was the dominant substrate. Cobbles and gravel were present. Sand was occasionally present. Substrate was partially embedded.	Dominant substrate: Cobble (64.1-256mm) Cobble was the dominant substrate. Small boulders and gravel were present. Substrate was embedded.

Pathway	General Indicators	Specific Indicators	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8	Reach 9	Reach 10
Habitat Quality	Large Wood Material (LWM)	Pieces per Mile at Bankfull	Unacceptable	Adequate*	At Risk	Adequate*	At Risk	At Risk	At Risk	Unacceptable	Unacceptable	Unacceptable
			M+L pieces/mi = 22 Percent in Jams = 8% Does not meet the minimum criteria of 67.5 pieces of M+L wood per mile. Less than 50% of M+L wood is within a naturally occurring jam. The potential sources for short and long-term woody debris recruitment are extremely limited as determined by riparian condition ratings and anthropogenic land-use modifications.	M+L pieces/mi = 345 Percent in Jams = 78% Meets the minimum criteria of 67.5 pieces of M+L wood per mile. A large proportion of M+L wood is within jams (both constructed and natural). Without constructed jams, there would be 118.4 M+L pieces per mile, which meets the minimum criteria. The potential sources for short and long-term woody debris recruitment are extremely limited due to anthropogenic land-use modifications.	M+L pieces/mi = 113 Percent in Jams = 79% Meets the minimum criteria of 67.5 pieces of M+L wood per mile. A large proportion of M+L wood is within jams (both constructed and natural). Without constructed jams there would be 40 M+L pieces per mile, which would not meet the minimum criteria. There are limited potential sources of short and long-term recruitment of woody debris within the reach. However, field observations suggest that riparian conditions are improving.	M+L pieces/mi = 337 Percent in Jams = 84% Meets the minimum criteria of 67.5 pieces of M+L wood per mile. A large proportion of M+L wood is within jams (both constructed and natural). Without constructed jams there would be 73 M+L pieces per mile, which meets the minimum criteria. However, the potential sources for short and long-term recruitment of woody debris are extremely limited within the reach.	M+L pieces/mi = 142 Percent in Jams = 81% Meets the minimum criteria of 67.5 pieces of M+L wood per mile. A large proportion of M+L wood is within jams (both constructed and natural). Without constructed jams there would be 63.9 M+L pieces per mile, just short of the minimum criteria. The potential sources for short and long-term recruitment of woody debris are extremely limited within the reach. However, field observations indicate that riparian conditions are improving and with the high number of constructed jams	M+L pieces/mi = 261 Percent in Jams = 84% Meets the minimum criteria of 67.5 pieces of M+L wood per mile. A large proportion of M+L wood is within jams (both constructed and natural). Without constructed jams there would be 55.5 M+L pieces per mile, which would not meet the minimum criteria. The potential sources for short and long-term recruitment of woody debris are extremely limited within the reach.	M+L pieces/mi = 77 Percent in Jams = 81% Meets the minimum criteria of 67.5 pieces of M+L wood per mile. A large proportion of M+L wood is within jams (both constructed and natural). Without constructed jams there would be 56.7 M+L pieces per mile, which would not meet the minimum criteria. The potential sources for short and long-term recruitment of woody debris are limited within the reach.	M+L pieces/mi = 29 Percent in Jams = 19% Does not meet the minimum criteria of 67.5 pieces of M+L wood per mile. Less than 50% of M+L wood is within jams (both constructed and natural). Without constructed jams there would be only 20 M+L pieces per mile. The potential sources for short and long-term recruitment of woody debris are extremely limited within the reach.	M+L pieces/mi = 65 Percent in Jams = 49% Does not meet the minimum criteria of 67.5 pieces of M+L wood per mile. About half of M+L wood is within jams (both constructed and natural). Without constructed jams there would be 58 M+L pieces per mile. The potential sources for short and long-term recruitment of woody debris are extremely limited within the reach.	M+L pieces/mi = 18 Percent in Jams = 8% Does not meet the minimum criteria of 67.5 pieces of M+L wood per mile. Less than 50% of M+L wood is within jams (only constructed; no natural jams occur in this reach). The potential sources for short and long-term recruitment of woody debris are extremely limited within the reach.

Pathway	General Indicators	Specific Indicators	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8	Reach 9	Reach 10
Habitat Quality	Pools	Pool Frequency and Quality; Presence of large pools.	Unacceptable	At Risk	Unacceptable	At Risk	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable	Unacceptable
			Total Pools = 4 Pools/mi = 4 Total Pools ≥ 3 ft = 0 (100%) Avg residual pool depth: 2.1 ft Cover: Low Though pool frequency criteria are not met for bankfull width (average BFW = 226, requires 9 pools/mile), the reach is dominated by pool habitat. Pool residual depths are relatively low. Overhanging cover and LWM is relatively minimal.	Total Pools = 10 Pools/mi = 5 Total Pools ≥ 3 ft = 5 (50%) Avg residual pool depth: 4.0 ft Cover: Low Does meet the pool frequency criteria for bankfull width (average BFW = 238, requires 9 pools/mile). Reach is dominated by pool habitat. Pools are large and deep. One pool was recorded greater than or equal to six feet. Overhanging cover is low, though LWM is present.	Total Pools = 4 Pools/mi = 2 Total Pools ≥ 3 ft = 2 (50%) Avg residual pool depth: 5.2 ft Cover: Moderate Though pool frequency criteria are not met for bankfull width (average BFW = 204, requires 10 pools/mile), reach is dominated by pool habitat. Pool residual depths are variable. One pool was recorded greater than or equal to six feet. Overhanging cover and LWM are moderately available.	Total Pools = 7 Pools/mi = 7 Total Pools ≥ 3 ft = 4 (57%) Avg residual pool depth: 3.8 ft Cover: Moderate Though pool frequency criteria are not met for bankfull width (average BFW = 206, requires 10 pools/mile), reach is dominated by pool habitat. Pools are large and deep. One pool was recorded greater than or equal to six feet. Overhanging cover is moderately available, with LWM present.	Total Pools = 4 Pools/mi = 4 Total Pools ≥ 3 ft = 2 (50%) Avg residual pool depth: 3.2 ft Cover: Moderate Though pool frequency criteria are not met for bankfull width (average BFW = 206, requires 10 pools/mile), reach is dominated by pool habitat. Pool residual depths are variable, with some large deep pools. Overhanging cover is minimal, LWM is moderately available.	Total Pools = 8 Pools/mi = 4 Total Pools ≥ 3 ft = 5 (63%) Avg residual pool depth: 4.0 ft Cover: Low Though pool frequency criteria are not met for bankfull width (average BFW = 197, requires 10 pools/mile). Pools are large and deep. Two pools were recorded greater than or equal to six feet. Overhanging cover is minimal, though there is LWM present.	Total Pools = 3 Pools/mi = 3 Total Pools ≥ 3 ft = 2 (67%) Avg residual pool depth: 4.2 ft Cover: Low Does not meet the pool frequency criteria for bankfull width (average BFW = 189, requires 10 pools/mile), despite reach dominated by pool habitat. Pool residual depths are variable, with some large deep pools. Overhanging cover and LWM is relatively minimal.	Total Pools = 5 Pools/mi = 4 Total Pools ≥ 3 ft = 1 (20%) Avg residual pool depth: 2.8 ft Cover: Low Does not meet the pool frequency criteria for bankfull width (average BFW = 187, requires 10 pools/mile). Pool residual depths are relatively low. Overhanging cover and LWM is relatively minimal.	Total Pools = 8 Pools/mi = 5 Total Pools ≥ 3 ft = 3 (38%) Avg residual pool depth: 3.8 ft Cover: Low Though pool frequency criteria are not met for bankfull width (average BFW = 176, requires 11 pools/mile), reach is dominated by pool habitat. Pool residual depths are variable. One pool was recorded greater than or equal to six feet. Overhanging cover and LWM is relatively minimal.	Total Pools = 2 Pools/mi = 2 Total Pools ≥ 3 ft = 1 (50%) Avg residual pool depth: 3.5 ft Cover: Low Does not meet the pool frequency criteria for bankfull width (average BFW = 141, requires 13 pools/mile). Pool residual depths are relatively low. Overhanging cover and LWM is relatively minimal.

Pathway	General Indicators	Specific Indicators	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8	Reach 9	Reach 10
Habitat Quality	Off-Channel Habitat and Refugia	Connectivity with Main Channel	Unacceptable Total SC = 0 Very little off-channel habitat exists that is connected at a variety of flows. Floodplains have been disconnected by incision and anthropogenic features, as determined by field observations and hydraulic modeling.	Unacceptable Total SC = 2 Fast water = 1 Slow water = 1 Some off-channel habitat exists that is connected at a variety of flows. Floodplains have been disconnected by incision and anthropogenic features, as determined by field observations and hydraulic modeling.	At Risk Total SC = 2 Fast water = 0 Slow water = 2 Some off-channel habitat exists that is connected at a variety of flows. Available floodplains are marginally hydraulically connected to the channel.	At Risk Total SC = 3 Fast water = 1 Slow water = 2 Some off-channel habitat exists that is connected at a variety of flows. Available floodplains are marginally hydraulically connected to the channel.	Unacceptable Total SC = 1 Fast water = 0 Slow water = 1 Very little off-channel habitat exists that is connected at a variety of flows. Floodplains have been disconnected by incision and anthropogenic features, as determined by field observations and hydraulic modeling.	At Risk Total SC = 3 Fast water = 1 Slow water = 2 Some off-channel habitat exists that is connected at a range of flows. Floodplains have been disconnected by incision and anthropogenic features, as determined by field observations and hydraulic modeling.	Unacceptable Total SC = 1 Fast water = 0 Slow water = 1 Very little off-channel habitat exists that is connected at a variety of flows. A large portion of the floodplain is anthropogenically disconnected or has other impacts (levees, roads, bridges, etc.).	Adequate Total SC = 1 Fast water = 1 Slow water = 0 Minimal off channel habitat exists; however, natural conditions (bedrock confinement) limit the natural potential for off channel habitat to be present. Where geomorphically available, floodplains are hydraulically connected to the channel.	Unacceptable Total SC = 1 Fast water = 1 Slow water = 0 Very little off-channel habitat exists that is connected at a variety of flows. A large portion of the floodplain is anthropogenically disconnected or has other impacts (levees, roads, bridges, etc.).	At Risk Total SC = 0 Minimal off channel habitat exists; however, natural conditions (bedrock confinement) limit the natural potential for off channel habitat to be present. Where geomorphically available, floodplains are hydraulically connected to the channel.

Pathway	General Indicators	Specific Indicators	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8	Reach 9	Reach 10
Riparian Vegetation	Condition	Structure	Unacceptable	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable
			The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 100% Small Tree. Reach has a high amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 83% Small Tree and 17% Sapling Pole. Though the riparian areas remain relatively vegetated, adjacent historic land use and disturbance are likely impacting riparian stand age and structural complexity as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 64% Large Tree, 18% Small Tree, 9% Sapling Pole and 9% No Vegetation. Reach has a moderate amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 67% Small Tree, 22% Sapling Pole and 11% Large Tree. Reach has a moderate amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach, as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 50% Small Tree, 33% Large Tree and 17% Sapling Pole. Reach has a moderate amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach, as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 65% Small Tree, 18% Sapling Pole and 17% Large Tree. Reach has Reach has a moderate of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach, as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 72% Small Tree, 14% Large Tree, and 14% No Vegetation. Reach has moderate of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 80% Small Tree, 10% Large Tree, and 10% Sapling Pole. Reach has a high amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach, as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 87% Small Tree, 7% Sapling Pole, 6% No Vegetation. Reach has a moderate amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach, as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 72% Small Tree, 14% Large Tree, and 14% No Vegetation. Reach has a moderate amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach, as determined by field estimates, tree height data, or aerial photographs.

Pathway	General Indicators	Specific Indicators	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8	Reach 9	Reach 10
Riparian Vegetation	Condition	Disturbance (Human)	Unacceptable	Adequate	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable
			18.3% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 9.0 miles/miles^2 road density in the 200-foot riparian buffer zone.	3.0% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 0.8 miles/miles^2 road density in the 200-foot riparian buffer zone. Outside the 200-ft buffer zone, Disturbance is significantly high due to current and historical land use. Other metrics riparian indicators such as Structure and Canopy cover, better reflect vegetation conditions in this reach.	10.2% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 5.6 miles/miles^2 road density in the 200-foot riparian buffer zone.	6.0% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 2.5 miles/miles^2 road density in the 200-foot riparian buffer zone.	10.6% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 6.9 miles/miles^2 road density in the 200-foot riparian buffer zone.	7.0% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 3.8 miles/miles^2 road density in the 200-foot riparian buffer zone.	9.7% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 4.2 miles/miles^2 road density in the 200-foot riparian buffer zone.	19.0% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 9.6 miles/miles^2 road density in the 200-foot riparian buffer zone.	15.1% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 3.6 miles/miles^2 road density in the 200-foot riparian buffer zone.	9.7% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 7.2 miles/miles^2 road density in the 200-foot riparian buffer zone.

Pathway	General Indicators	Specific Indicators	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8	Reach 9	Reach 10
Riparian Vegetation	Condition	Canopy Cover	Unacceptable	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable
			Reach average of 4.4 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. No large trees within the 100-foot riparian buffer are present, and disturbance or clearing within the 100-foot buffer were observed likely reducing shading potential in reach.	Reach average of 4.0 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. No large trees within the 100-foot riparian buffer are present, and some disturbance or clearing within the 100-foot buffer were observed likely reducing shading potential in reach.	Reach average of 4.0 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. Large trees within the 100-foot riparian buffer are present, but disturbance or clearing within the 100-foot buffer were observed likely reducing shading potential in reach.	Reach average of 4.0 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. Few large trees within the 100-foot riparian buffer are present, but disturbance or clearing within the 100-foot buffer were observed likely reducing shading potential in reach.	Reach average of 4.0 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. Few large trees within the 100-foot riparian buffer are present, but disturbance or clearing within the 100-foot buffer were observed likely reducing shading potential in reach.	Reach average of 4.0 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. Few large trees are present within the 100-foot riparian buffer. Some disturbance or clearing within the 100-foot buffer has likely further reduced shading potential in reach.	Reach average of 4.0 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. Few large trees are present within the 100-foot riparian buffer. Some disturbance or clearing within the 100-foot buffer has likely further reduced shading potential in reach.	Reach average of 4.0 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. Few large trees within the 100-foot riparian buffer are present and disturbance or clearing is evident within the riparian buffer.	Reach average of 4.0 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. No large trees within the 100-foot riparian buffer are present and disturbance or clearing is evident within the riparian buffer.	Reach average of 4.0 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. Few large trees within the 100-foot riparian buffer are present and disturbance or clearing is evident within the riparian buffer.

Pathway	General Indicators	Specific Indicators	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8	Reach 9	Reach 10
Channel	Dynamics	Floodplain Connectivity	At Risk	At Risk	At Risk	At Risk	At Risk	Unacceptable	At Risk	Unacceptable	Unacceptable	Unacceptable
			Infrastructure and development, including bridge crossing and constructed levees within the reach, impose continued confinement and reduced potential floodplain connectivity.	Infrastructure and constructed levees mid-reach impose confinement and reduced potential floodplain connectivity.	Infrastructure and development, including constructed levees impose confinement and reduce potential floodplain connectivity. Within the majority of the reach, floodplain connectivity is maintained.	Infrastructure and development, including residential properties. constructed levees and terraces, impose confinement and reduce floodplain connectivity.	Armored banks result in reduced lateral process. In some areas the modern active channel corridor width allows narrow functional floodplains and islands exist.	Infrastructure and development, including residential properties, roads, and constructed levees impose confinement and reduce floodplain connectivity.	Constructed levees and infrastructure, impose confinement and reduce potential floodplain connectivity.	Infrastructure and development, including bridge crossing, residential properties and constructed levees within the reach impose continued confinement and reduce potential floodplain connectivity.	Infrastructure and development, including residential areas and constructed levees impose continued confinement and reduce floodplain connectivity.	Infrastructure and development, including residential properties, roads constructed levees impose confinement and reduce floodplain connectivity.
		Bank Stability/ Channel Migration	Unacceptable	Unacceptable	Unacceptable	Unacceptable	At Risk	At Risk	Unacceptable	At Risk	Unacceptable	Unacceptable
			Natural lateral processes are reduced by anthropogenic confinement and infrastructure. Channel was potentially trenched historically	Channel has reduced rate of lateral migration in majority of the reach due to anthropogenic confinement and development.	Channel has reduced rate of lateral migration due to anthropogenic confinement and infrastructure.	Channel has Anthropogenic bank hardening and infrastructure that notably decreases lateral processes.	Channel has reduced rate of lateral migration due to anthropogenic confinement and infrastructure.	Natural lateral processes are reduced by anthropogenic confinement and infrastructure.	Natural lateral processes are reduced by anthropogenic confinement and infrastructure – channel was potentially trenched historically.	Natural lateral processes are reduced by anthropogenic confinement and infrastructure – a naturally partially confined reach that was likely trenched historically.	Natural lateral processes are reduced by anthropogenic confinement and infrastructure – channel was potentially trenched historically.	Natural lateral processes are reduced by anthropogenic confinement and infrastructure – channel was potentially trenched historically.
		Vertical Channel Stability	At Risk	Adequate	At Risk	At Risk	Adequate	At Risk	At Risk	At Risk	At Risk	At Risk
			Existing anthro confinements continue to force entrenchment (incised below available floodplain). Channel over widening in the downstream portion of reach.	Minimal aggradation or modern incision beyond the natural geomorphic processes of the reach.	Minor trend of incision beyond natural geomorphic processes.	Trends of continued incision associated with anthropogenic confinement and development.	Only minor trends of incision beyond natural geomorphic processes.	Existing anthro confinements continue to force channel entrenchment (incised below available floodplain).	Existing anthro confinements continue to force channel entrenchment (incised below available floodplain).	Existing anthro confinements continue to force channel entrenchment (incised below available floodplain).	Existing anthro confinements continue to force channel entrenchment (incised below available floodplain).	Existing anthro confinements continue to force channel entrenchment (incised below available floodplain).

*Although the LWM maybe be adequate from a habitat/cover perspective, this does not consider the geomorphic function of the LWM, which may be lacking

3.3 REACH-SCALE RATINGS – REACH 11 – REACH 16

Pathway	General Indicators	Specific Indicators	Reach 11	Reach 12	Reach 13	Reach 14	Reach 15	Reach 16
Habitat Access	Physical Barriers	Main Channel Barriers	Adequate There were no anthropogenic barriers in the main channel.	Adequate There were no anthropogenic barriers in the main channel.	Adequate There were no anthropogenic barriers in the main channel.	Adequate There were no anthropogenic barriers in the main channel.	Adequate There were no anthropogenic barriers in the main channel.	Adequate There were no anthropogenic barriers in the main channel.
Habitat Quality	Substrate	Dominant Substrate/ Fine Sediment	At Risk Dominant substrate: Cobble (64.1-256mm) Cobble was the dominant substrate. Gravel was the sub-dominant substrate. Small Boulder and sand were occasionally present. Substrate was generally partially embedded.	Adequate Dominant substrate: Cobble (64.1-256mm) and Gravel (4-64mm) Cobble and Gravel were the dominant substrate. Small boulders and sand were occasionally present. Substrate was not embedded.	At Risk Dominant substrate: Cobble (64.1-256mm) Cobble was the dominant substrate. Gravel was the sub-dominant substrate. Small boulders were occasionally present. Substrate was partially embedded.	At Risk Dominant substrate: Cobble (64.1-256mm) Cobble was the dominant substrate. Gravel was the sub-dominant substrate. Fines were present. Substrate was embedded.	Adequate Dominant substrate: Gravel (4-64mm) Gravel was the dominant substrate. Cobbles and sand were present. Substrate was not embedded.	Adequate Dominant substrate: Cobble (64.1-256mm) Cobble was the dominant substrate. Gravel was the sub-dominant substrate. Small boulders and sand were occasionally present. Substrate was generally not embedded.
Habitat Quality	LWM	Pieces per Mile at Bankfull	Unacceptable M+L pieces/mi = 12 Percent in Jams = 0% Does not meet the minimum criteria of 67.5 pieces of M+L wood per mile. No jams were observed in this reach. There are extremely limited potential sources of woody debris for long-term recruitment within the reach.	Adequate* M+L pieces/mi = 491 Percent in Jams = 85% Meets the minimum criteria of 67.5 pieces of M+L wood per mile. A large proportion of M+L wood is within jams (both constructed and natural). Without constructed jams there would be 456.5 M+L pieces per mile, still greatly exceeding the minimum criteria. Potential sources for short and long- term recruitment of woody debris are present. There is minimal disturbance in the riparian buffer but most of the trees are small.	Adequate* M+L pieces/mi = 282 Percent in Jams = 78% Meets the minimum criteria of 67.5 pieces of M+L wood per mile. A large proportion of M+L wood is within jams (both constructed and natural). Without constructed jams there would be 172.7 M+L pieces per mile, which meets the minimum criteria. Potential sources for short and long-term recruitment of woody debris are present. There is minimal disturbance in the riparian buffer but most of the trees are small.	Adequate * M+L pieces/mi = 222 Percent in Jams = 81% Meets the minimum criteria of 67.5 pieces of M+L wood per mile. A large proportion of M+L wood is within jams (both constructed and natural). Without constructed jams there would be 213.8 M+L pieces per mile, which meets the minimum criteria. Potential sources for short and long-term recruitment of woody debris are present. There is minimal disturbance in the riparian buffer but most of the trees are small.	Adequate* M+L pieces/mi = 529 Percent in Jams = 85% Meets the minimum criteria of 67.5 pieces of M+L wood per mile. A large proportion of M+L wood is within jams (both constructed and natural). Without constructed jams there would be 189.1 M+L pieces per mile, which meets the minimum criteria. Potential sources for short and long-term recruitment of woody debris are limited. There is minimal disturbance in the riparian buffer but most of the trees are small.	Unacceptable M+L pieces/mi = 43 Percent in Jams = 33% Does not meet the minimum criteria of 67.5 pieces of M+L wood per mile. Less than 50% of M+L wood is within jams (only natural jams occurred in this reach). Potential sources for short and long-term recruitment of woody debris are limited within the reach.

Pathway	General Indicators	Specific Indicators	Reach 11	Reach 12	Reach 13	Reach 14	Reach 15	Reach 16
Habitat Quality	Pools	Pool Frequency and Quality; Presence of large pools.	Unacceptable Total Pools = 2 Pools/mi = 2 Total Pools ≥ 3 ft = 0 (0%) Avg residual pool depth: 1.3 ft Cover: Low Does not meet the pool frequency criteria for bankfull width (average BFW = 122, requires 14 pools/mile). Pool residual depths are relatively low. Overhanging cover and LWM is relatively minimal.	At Risk Total Pools = 10 Pools/mi = 6 Total Pools ≥ 3 ft = 4 (40%) Avg residual pool depth: 3.0 ft Cover: High Though pool frequency criteria are not met for bankfull width (average BFW = 174, requires 11 pools/mile), reach is dominated by pool habitat and overhanging cover LWM is available. Pools residual depths are variable.	At Risk Total Pools = 17 Pools/mi = 8 Total Pools ≥ 3 ft = 5 (29%) Avg residual pool depth: 2.7 ft Cover: Moderate Does meet the pool frequency criteria for bankfull width (average BFW = 140, requires 13 pools/mile). Overhanging cover is moderately available, with LWM present.	Unacceptable Total Pools = 6 Pools/mi = 5 Total Pools ≥ 3 ft = 4 (67%) Avg residual pool depth: 3.4 ft Cover: Moderate Does not meet the pool frequency criteria for bankfull width (average BFW = 131, requires 14 pools/mile). Pool residual depths are variable. Overhanging cover and LWM are moderately available.	At Risk Total Pools = 8 Pools/mi = 7 Total Pools ≥ 3 ft = 5 (63%) Avg residual pool depth: 3.3 ft Cover: Moderate Though pool frequency criteria are not met for bankfull width (average BFW = 156, requires 12 pools/mile), reach is dominated by pool habitat. Pools are large and deep Overhanging cover and LWM are moderately available.	Unacceptable Total Pools = 3 Pools/mi = 5 Total Pools ≥ 3 ft = 1 (33%) Avg residual pool depth: 2.9 ft Cover: Low Does not meet the pool frequency criteria for bankfull width (average BFW = 156, requires 12 pools/mile). Pool residual depths are relatively low. Overhanging cover is moderately available, LWM is minimal.
Habitat Quality	Off-Channel Habitat and Refugia	Connectivity with Main Channel	At Risk Total SC = 0 No off-channel habitat is available. Though natural channel conditions (partial confinement) limit the natural potential for off-channel habitat to be present, significant entrenchment from anthropogenic features is present in the reach and has disconnected any potential available off-channel features.	Adequate Total SC = 14 Fast water = 4 Slow water = 10 Off-channel habitat that is connected at a variety of flows is present and available in this reach. Minimal constriction from anthropogenic features is present in the reach.	Adequate Total SC = 11 Fast water = 1 Slow water = 10 Off-channel habitat that is connected at a variety of flows is present and available in this reach. Minimal constriction from anthropogenic features is present in the reach.	Adequate Total SC = 10 Fast water = 0 Slow water = 10 Off-channel habitat that is connected at a variety of flows is present and available in this reach. Minimal constriction from anthropogenic features is present in the reach.	Adequate Total SC = 11 Fast water = 0 Slow water = 11 Off-channel habitat that is connected at a variety of flows is present and available in this reach. Available floodplains are somewhat connected to the channel. Entrenched sections have the potential to reduce connectivity of other sections.	At Risk Total SC = 3 Fast water = 1 Slow water = 3 A minimal amount of off-channel habitat exists that is connected at a variety of flows. Constriction from anthropogenic features is present in the reach. Downstream entrenchment has potential to continue to impact floodplain connectivity.

Pathway	General Indicators	Specific Indicators	Reach 11	Reach 12	Reach 13	Reach 14	Reach 15	Reach 16
Riparian Vegetation	Condition	Structure	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	At Risk
			The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 83% Small Tree and 17% No Vegetation. Reach has a moderate amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 50% Small Tree, 19% No Vegetation, 18% Sapling Pole and 12% Large Tree. Reach has a low amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 52% Small Tree, 35% Large Tree, and 13% Sapling Pole. Reach has a low amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 67% Small Tree and 33% Large Tree. Reach has a low amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach, as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 59% Small Tree, 18% Large Tree, 8% Sapling Pole, 8% Shrub Seedling and 8% No Vegetation. Reach has a low amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach, as determined by field estimates, tree height data, or aerial photographs.	The riparian canopy overstory composition within the 100-foot riparian buffer was recorded as 62% Large Tree, 13% Sapling Pole, 13% No Vegetation and 12% Small Tree. Reach has moderate amount of human disturbance that has reduced the width of the riparian buffer and impacted stand age and structural complexity in many areas of this reach, as determined by field estimates, tree height data, or aerial photographs.
		Disturbance (Human)	Unacceptable	Adequate	Adequate	Adequate	At Risk	Unacceptable
			13.1% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 11.5 miles/miles^2 road density in the 200-foot riparian buffer zone.	2.2% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 2.0 miles/miles^2 road density in the 200-foot riparian buffer zone.	0.7% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 0.9 miles/miles^2 road density in the 200-foot riparian buffer zone.	0.5% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 0.0 miles/miles^2 road density in the 200-foot riparian buffer zone.	2.3% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 2.5 miles/miles^2 road density in the 200-foot riparian buffer zone.	10.1% disturbance in the 200-foot buffer zone (e.g. residential, roads, etc.) and 12.3 miles/miles^2 road density in the 200-foot riparian buffer zone.

Pathway	General Indicators	Specific Indicators	Reach 11	Reach 12	Reach 13	Reach 14	Reach 15	Reach 16
Riparian Vegetation	Condition	Canopy Cover	Unacceptable Reach average of 4.2 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. No large trees within the 100-foot riparian buffer are present and disturbance or clearing is evident within the riparian buffer.	Unacceptable Reach average of 4.0 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. Few large trees within the 100-foot riparian buffer are present, but disturbance or clearing within the 100-foot buffer were observed likely reducing shading potential in reach.	Unacceptable Reach average of 4.0 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. Few large trees within the 100-foot riparian buffer are present, but disturbance or clearing within the 100-foot buffer were observed likely reducing shading potential in reach.	Unacceptable Reach average of 4.0 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. Few large trees within the 100-foot riparian buffer are present, but disturbance or clearing within the 100-foot buffer were observed likely reducing shading potential in reach.	Unacceptable Reach average of 4.3 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. Few large trees within the 100-foot riparian buffer are present, but disturbance or clearing within the 100-foot buffer were observed likely reducing shading potential in reach.	At Risk Reach average of 5.2 hours shaded during daylight hours on the summer solstice, determined from the weighted average of raster data from the shademap tool for each reach. Large trees are present within the 100-foot riparian buffer in some location and disturbance, or clearing is evident within the riparian buffer.
Channel	Dynamics	Floodplain Connectivity	At Risk Infrastructure and development, including roads constructed levees and terraces, impose additional confinement in a naturally confined reach - reducing floodplain connectivity.	Adequate Naturally partially confined to unconfined reach. Where valley width allows, floodplains and islands exist, and connectivity is maintained.	Adequate Naturally partially confined reach. Where valley width allows, functional floodplains and islands exist, and connectivity is maintained.	Adequate Naturally unconfined to partially confined reach. Where valley width allows, narrow functional floodplains and islands exist, and connectivity is maintained.	At Risk At the upper extent and mid extent, infrastructure and development, including roads and constructed levees, impose confinement - reducing potential floodplain connectivity.	At Risk Infrastructure and development, including bridges, roads, constructed levees and terraces, impose confinement and reduce floodplain connectivity.
		Bank Stability/ Channel Migration	At Risk Natural lateral processes are reduced with bank hardening – potentially trenched historically	Adequate Channel is laterally migrating at or near natural rates within the geomorphic construct of the reach.	Adequate Channel is laterally migrating at or near natural rates within the geomorphic construct of the reach.	Adequate Channel is laterally migrating at or near natural rates within the geomorphic construct of the reach.	At Risk Channel is confined by bridge, levee remnants, and bank armoring in portions, but migration in other portions is near natural rates.	Unacceptable Anthropogenic features (bridge, road, etc.) have notably decreased lateral processes.
		Vertical Channel Stability	At Risk Channel is both naturally entrenched along fan toe, and Anthro confined by road and armoring – forcing continued entrenchment (incised below available floodplain).	Adequate No measurable trend in incision or aggradation beyond natural geomorphic processes was observed in the reach.	Adequate No measurable trend in incision or aggradation beyond natural geomorphic processes was observed in the reach.	Adequate No measurable trend in incision or aggradation beyond natural geomorphic processes was observed in the reach.	Adequate Relatively equal trends of incision and aggradation overall in the reach	At Risk Aggradation at and immediately upstream of the bridge.

Although the LWM maybe be adequate from a habitat/cover perspective, this does not consider the geomorphic function of the LWM, which may be lacking.

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