

# ***DRAFT 2019 Benthic Macroinvertebrate and Habitat Assessment Results***

*Purpose of Draft San Juan Watershed Program Benthic Macroinvertebrate and Habitat Assessment Summary*

- *Meet the objectives of the WIIN Act*
- *Conduct collaborative benthic macroinvertebrate and habitat monitoring*

*The information in this factsheet does not address:*

- *The Superfund process for the Bonita Peak Mining District NPL Site, including but not limited to any potential response actions, additional investigations, scoping of contamination, or delineations of the Site*
- *Clean Water Act Sections 303(d) and 305(b) water quality assessment decisions*
- *Recommendations to states and tribes regarding water quality standards*

## Draft 2019 Benthic Macroinvertebrate and Habitat Assessment Results

### *Benthic Macroinvertebrates:*

Benthic macroinvertebrates were collected in Fall 2019 at thirteen locations within the watershed: seven sites located on the Animas River; five sites on the San Juan River; and one site on the Piedra River which serves as a reference comparison to the upper-mid Animas River (Figure 1.) Sites on the Animas River in Colorado and the site on the Piedra River were sampled using respective benthic macroinvertebrate collection protocols employed by the EPA National Rivers and Streams Assessment (NRSA) and by the CDPHE. In most cases, taxonomic resolution was to Genus.

Multimetric Indices (MMIs) were applied to the benthic macroinvertebrate samples to determine an overall site score and associated condition estimate (e.g., *good-fair-poor*) or use attainment. Both NRSA and CDPHE MMIs employ individual metrics assessing components of taxonomic richness, community composition, stressor/pollution tolerance, locomotory habitat and functional feeding types (Tables 1-2). In addition to using MMI scoring, two specific metrics were evaluated independently: 1) Percent of the sample comprised of members of the Orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) – or %EPT; and 2) Total number of taxa represented in the sample. Generally, both %EPT and number of total taxa are expected to inversely reflect the magnitude of the sum of water quality and habitat stressors. EPT taxa are typically intolerant of pollution and prefer higher gradient waters with larger substrate – typical of the Animas River. Likewise, total number of taxa tend to increase when more favorable water and habitat quality are present.

To provide a comparison of 2019 results to historical results, and display longitudinal trends moving downstream, graphs of MMI scores, % EPT, and total taxa for all sites are provided in Figures 2-11. Direct comparisons of Animas River results with those of the San Juan River are discouraged due to the distinctly different substrate characteristics and differences in water quality. Additionally, results for each site have been plotted over time and accompanied by a site location map, habitat results, and photos of high and low flows. These individual site results are represented in Figures 13-52; Photographs 3-22; and Tables 3-12. Note that individual site results are not provided for sites WIIN-14, 28, or 40 as these sites did not have historical data for comparison. However, these sites are represented in Figures 2-11. A map of labeled sites and a crosswalk to site descriptions is found in Figure 53 and Table 13, respectively.

### *Habitat Assessments:*

Habitat data were collected concurrent with benthic macroinvertebrate collections. Habitat quality for all sites was assessed using protocols employed by the EPA NRSA. Condition estimates (e.g., *good-fair-poor*) were calculated for four categories: Relative Bed Stability; Riparian Vegetation; Habitat Complexity; and Human Disturbance Pressure. Results of 2019 and historical results, as well as definitions of each of the above categories, can be found in Table 14. One category, Human Disturbance Pressure, a measure of the intensity and extent of human activities along the sample reach, is graphed by site and represented in Figures 12 and Photographs 1-2.

### *General Take-aways:*

2019 macroinvertebrate results appear consistent with past observations and trends. Observations are not unlike those identified in EPA's 2018 biological report ([https://www.epa.gov/sites/default/files/2018-11/documents/gkm\\_bio\\_report\\_181129-508-final.pdf](https://www.epa.gov/sites/default/files/2018-11/documents/gkm_bio_report_181129-508-final.pdf))

#### Specifically:

- Total taxa increase as you move downstream on the Animas River and away from the mining district, as does EPT % and diversity.
- In the Animas River, MMI scores reflect improving water quality conditions as you move downstream from Silverton, CO.
- San Juan River MMI results indicate a more stable condition though habitat is more limiting to EPT taxa (due to natural substrate characteristics).
- Habitat assessments reflect impact of development and roads along the rivers (human disturbance) and is generally higher along the Animas; In-stream habitat complexity and intact riparian vegetation is generally better along the San Juan; and, as expected, relative bed stability is greater in the Animas due to the presence of larger, courser, substrate.

Figures 1-4. Sampling site locations and results of MMI scoring.

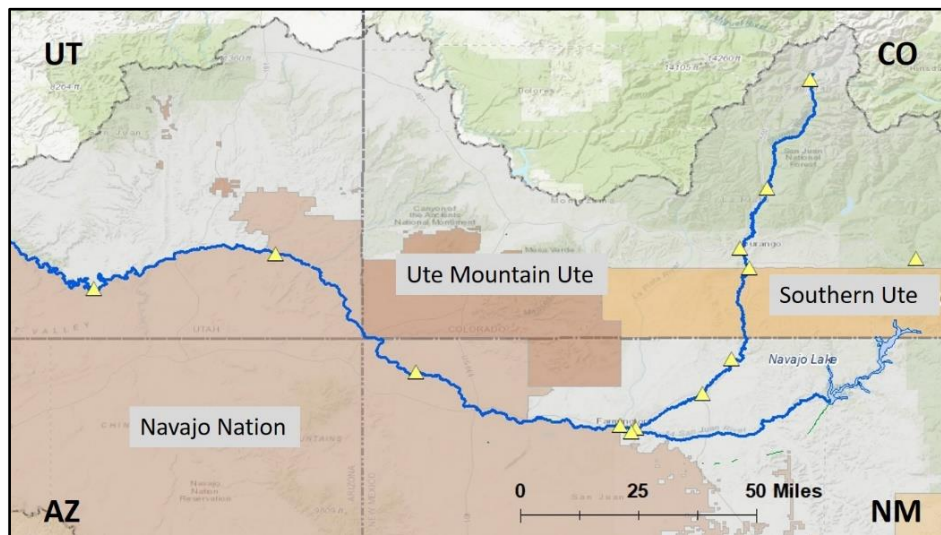


Figure 1. Sampling Locations

Macroinvertebrate Multimetric Index Score (COEDAS)  
Animas River Sites (2019)

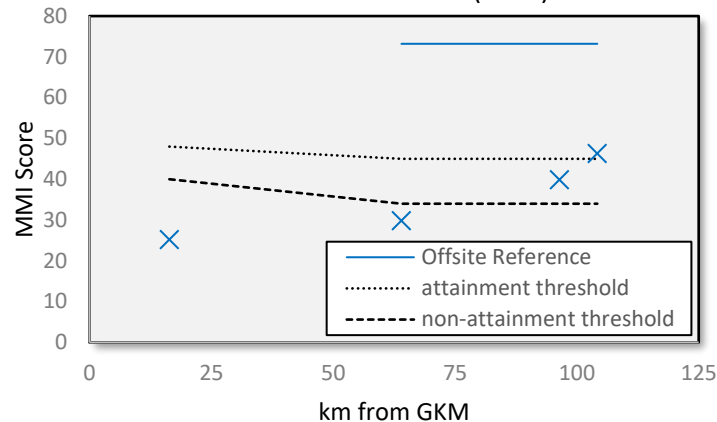


Figure 3. MMI Scores using CO EDAS MMI, Animas River, 2019 results.

Macroinvertebrate Multimetric Index Scores (NRSA)

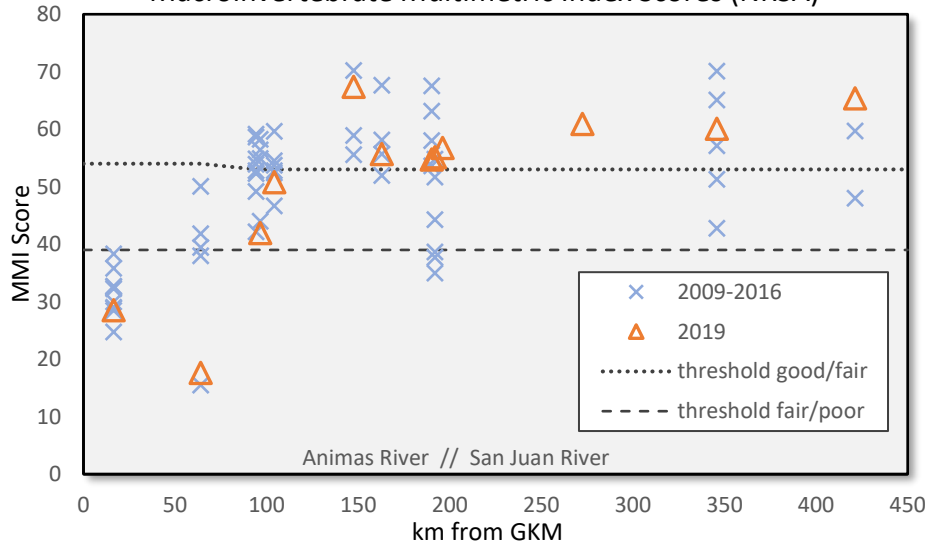


Figure 2. NRSA MMI for all sites, historical and 2019 data.

Macroinvertebrate Multimetric Index Score (NRSA)  
Animas River Sites (2019)

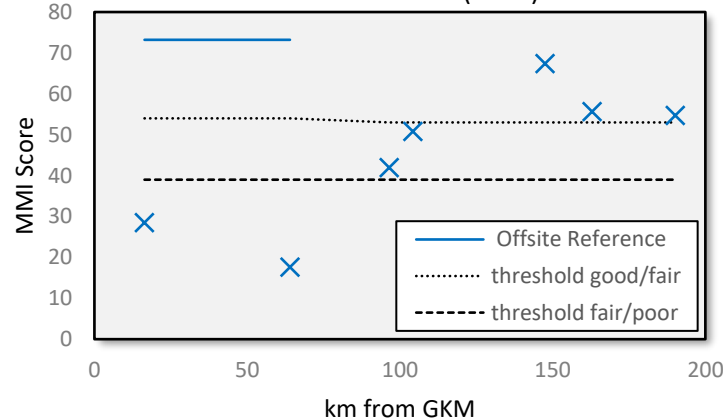


Figure 4. MMI Scores using NRSA MMI, Animas River, 2019 results.

Figure 5; Tables 1-2. MMI results for San Juan River and MMI scoring metrics.

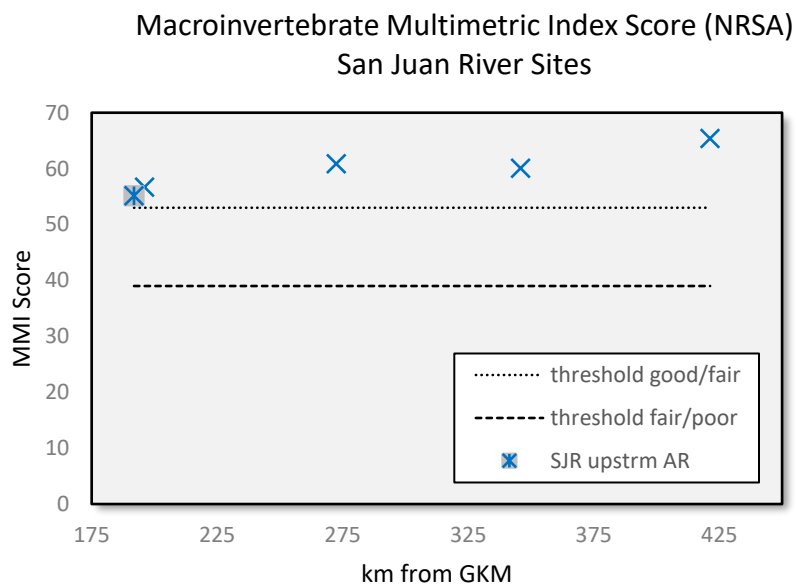


Figure 5. MMI Scores using NRSA MMI, San Juan River, 2019 results.

	Biotypes		
	Mountain	Transition	Plains and Xeric
<b>Metrics</b>	<ul style="list-style-type: none"> <li>TotalTax</li> <li>EPTTax^</li> <li>pEPTnoB</li> <li>ClngrTax</li> <li>IntolTax</li> <li>pi_DecrMtnTrn</li> <li>PredTaxFAC</li> <li>ScrapPctFAC</li> </ul>	<ul style="list-style-type: none"> <li>EPTTax*</li> <li>NonInPct</li> <li>pEPTnoB</li> <li>ColeoPct</li> <li>pt_Intol*</li> <li>pi_IncrMidElev</li> <li>ClngrTax*</li> <li>PredShrTaxFAC</li> </ul>	<ul style="list-style-type: none"> <li>TotalTax</li> <li>pt_noninsect</li> <li>pEPTnoB</li> <li>SprwlTax^</li> <li>IntolTax</li> <li>pi_IncrPlains</li> <li>PredTaxFAC</li> <li>ScrapPctFAC</li> </ul>
<b>Attainment threshold</b>	<b>48</b>	<b>45</b>	<b>42</b>
<b>Impairment threshold</b>	<b>40</b>	<b>34</b>	<b>29</b>

^ Metric has been adjusted based on Julian Day of sample collection.

\* Metric has been adjusted based on average summer temperature

Table 1. CO EDAS MMI Scoring metrics. Used for sites located in CO and SUIT.

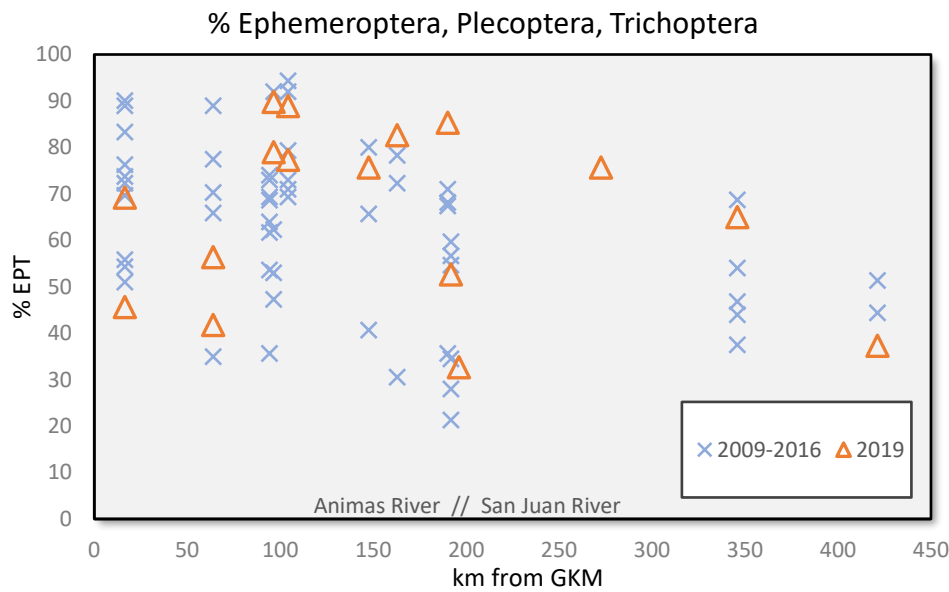
From: [https://www.colorado.gov/pacific/sites/default/files/Policy%2010-1\\_Appendices.pdf](https://www.colorado.gov/pacific/sites/default/files/Policy%2010-1_Appendices.pdf)

	Ecoregion	
	Western Mountain (WMT)	Xeric (XER)
<b>Metrics</b>	<ul style="list-style-type: none"> <li>EPT % taxa richness</li> <li>% individuals in top 5 taxa</li> <li>Scraper taxa richness</li> <li>Clinger % taxa richness</li> <li>EPT taxa richness</li> <li>Tolerant % taxa richness</li> </ul>	<ul style="list-style-type: none"> <li>Non-insect % individuals</li> <li>% individuals in top 5 taxa</li> <li>Scraper taxa richness</li> <li>Clinger % taxa richness</li> <li>EPT taxa richness</li> <li>Tolerant % taxa richness</li> </ul>
<b>Good threshold</b>	<b>≥54</b>	<b>≥53</b>
<b>Poor threshold</b>	<b>&lt;40</b>	<b>&lt;40</b>

Table 2. NRSA MMI scoring metrics.

From: [https://www.epa.gov/sites/default/files/2016-03/documents/nrsa\\_08\\_09\\_technical\\_appendix\\_03082016.pdf](https://www.epa.gov/sites/default/files/2016-03/documents/nrsa_08_09_technical_appendix_03082016.pdf)

Figures 6-8. Historical and 2019 results for percent sample composition of Orders Ephemeroptera, Plecoptera, Trichoptera.



Figures 9-11. Historical and 2019 results for total taxa in sample.

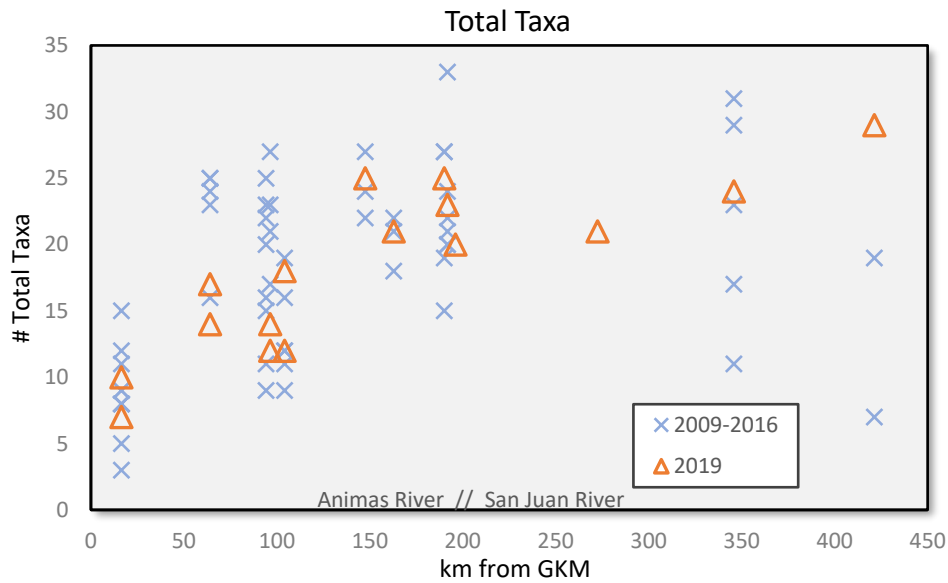


Figure 9. Total taxa collected at each site, historical and 2019 results.

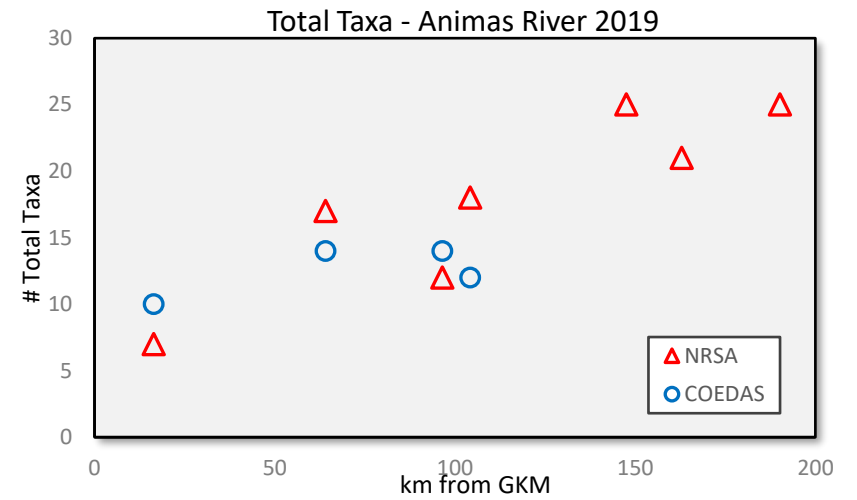


Table 10. Total taxa collected at Animas River sites, 2019.

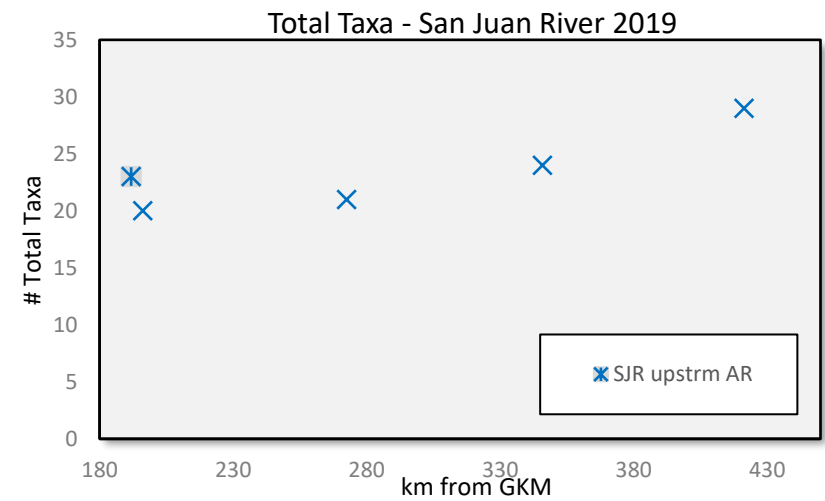


Figure 11. Total taxa collected from San Juan River sites, 2019.

Figure 12; Photographs 1-2: Human disturbance/pressure scores and examples.

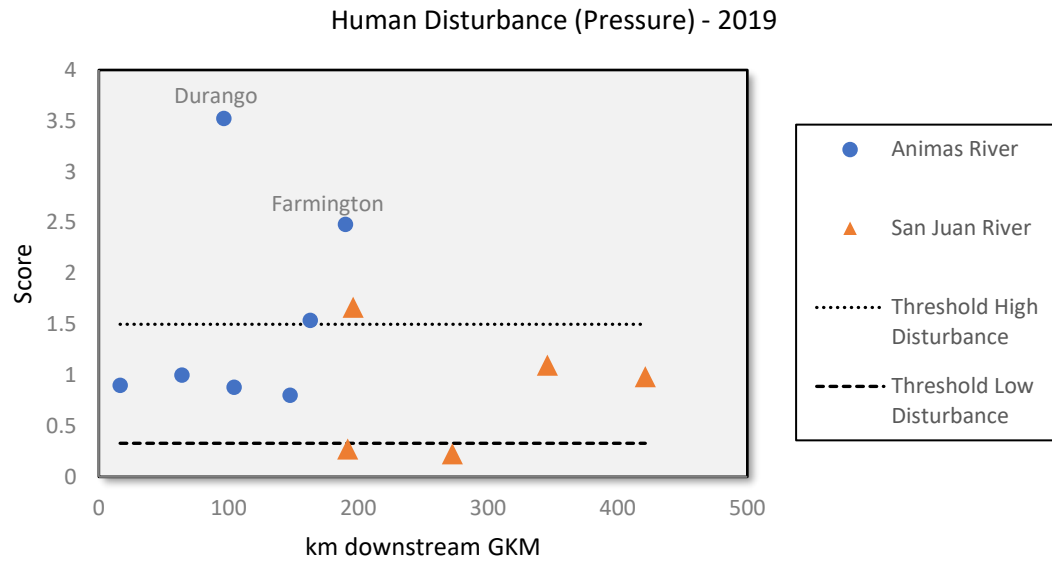


Figure 12. Human disturbance/pressure as measured during habitat assessments, 2019.



Photograph 1. Example of high human disturbance. Animas River in Durango, CO.



Photograph 2. Example of low human disturbance. San Juan River downstream of Shiprock, NM.



Figures 13-16. Site specific results, Animas River below Silverton, CO.

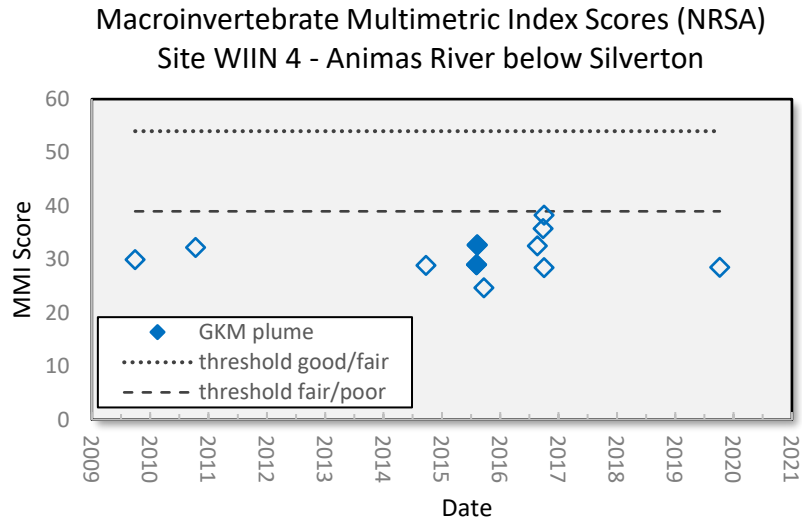


Figure 13. NRSA MMI Score.

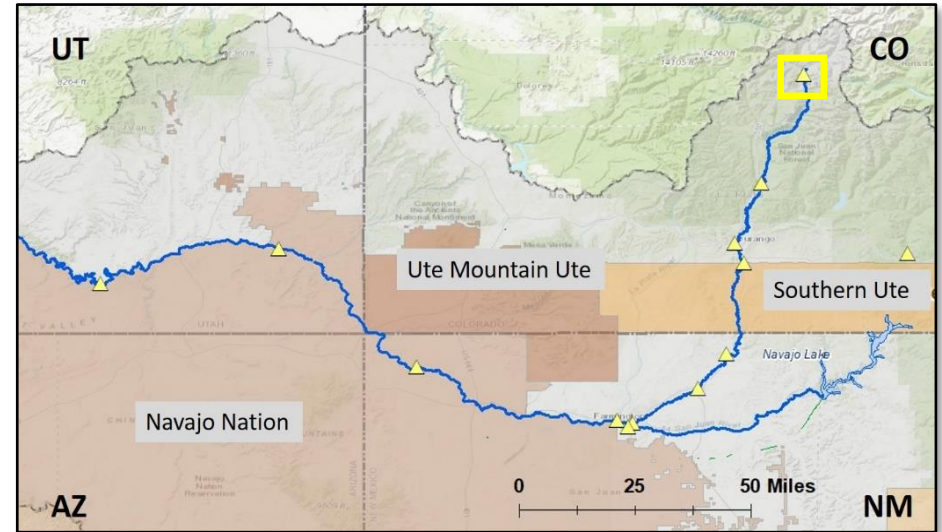


Figure 15. Location of site.

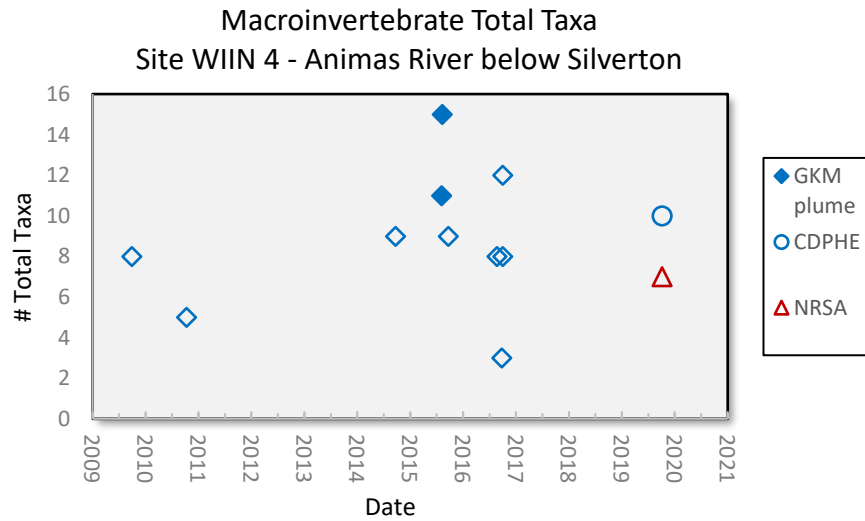


Figure 14. Total taxa.

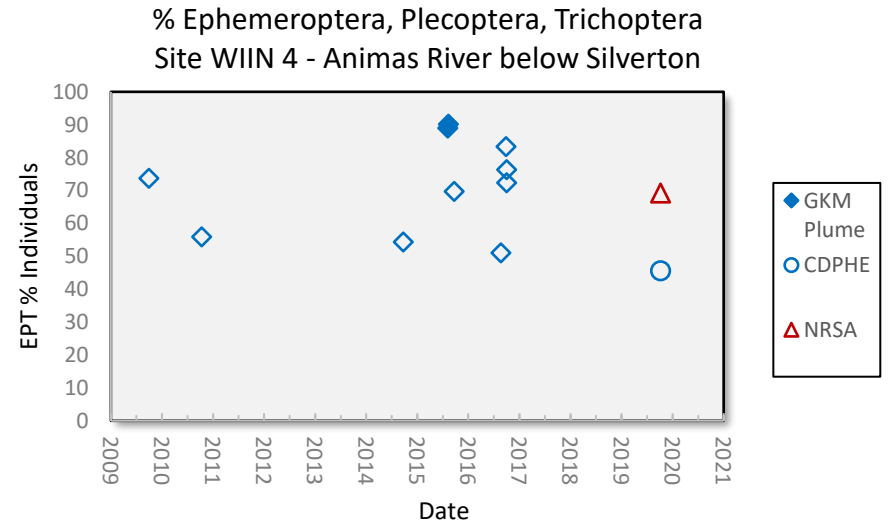


Figure 16. Percent composition EPT taxa.



Table 3; Photographs 3-4. Habitat metric condition estimates and photographs of typical conditions. Animas River below Silverton, CO

WIIN SITE ID	SITE_ID	Year	Relative Bed Stability	Riparian Vegetation	Habitat Complexity	Human Disturbance
			<i>LRBS_Cond_use</i>	<i>LXCMGW_Cond_use</i>	<i>LXFC_NAT_Cond_use</i>	<i>RDIST_COND_use</i>
Animas River						
WIIN-4	A72	2019	Fair	Good	Poor	Medium
		2016	Good	Fair	Poor	Medium

Table 3. Habitat metric condition estimates.



Photograph 3. Base flow conditions, Fall 2021



Photograph 4. Runoff flow conditions, Spring 2021

Figures 17-20. Site specific results, Animas River at Bakers Bridge, CO.

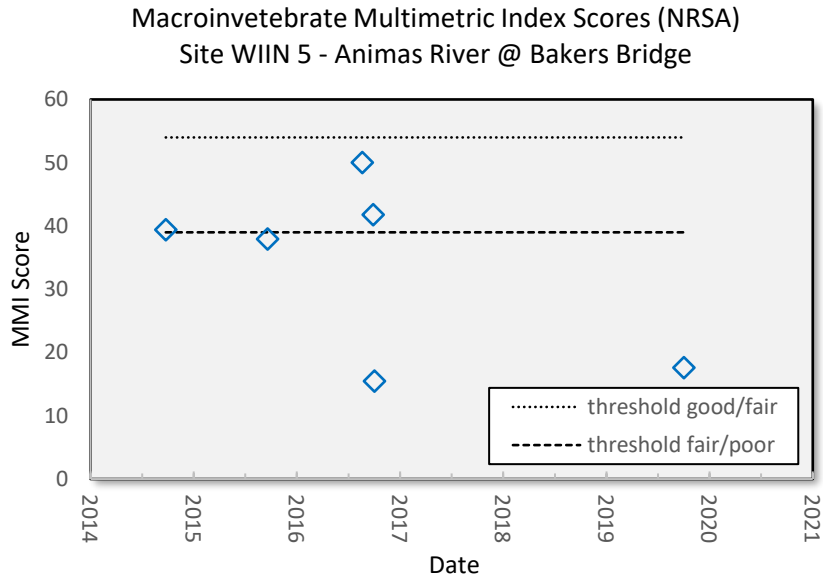


Figure 17. NRSA MMI Score.

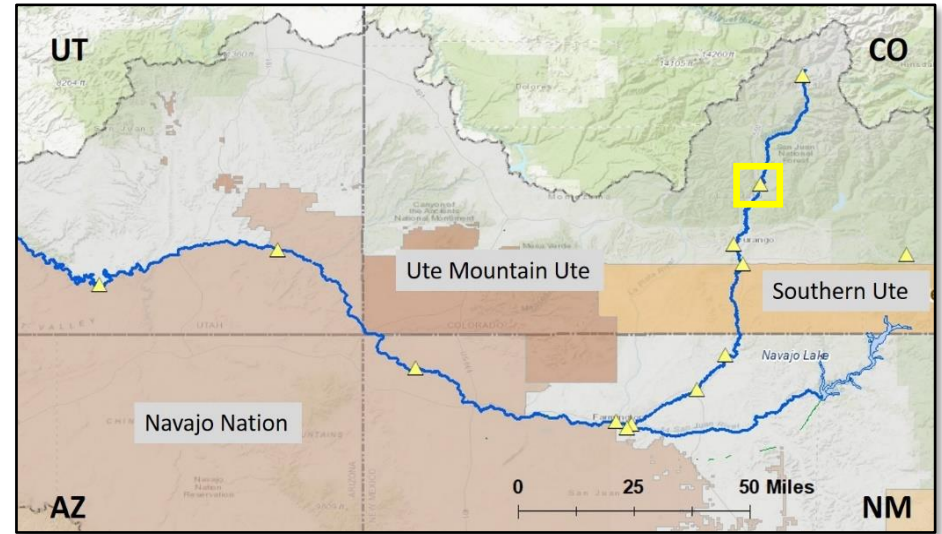


Figure 19. Location of site.

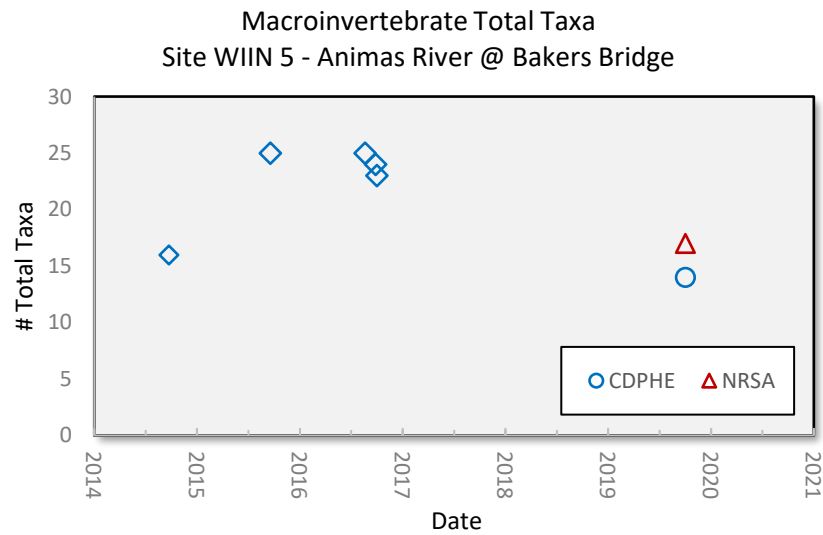


Figure 18. Total taxa.

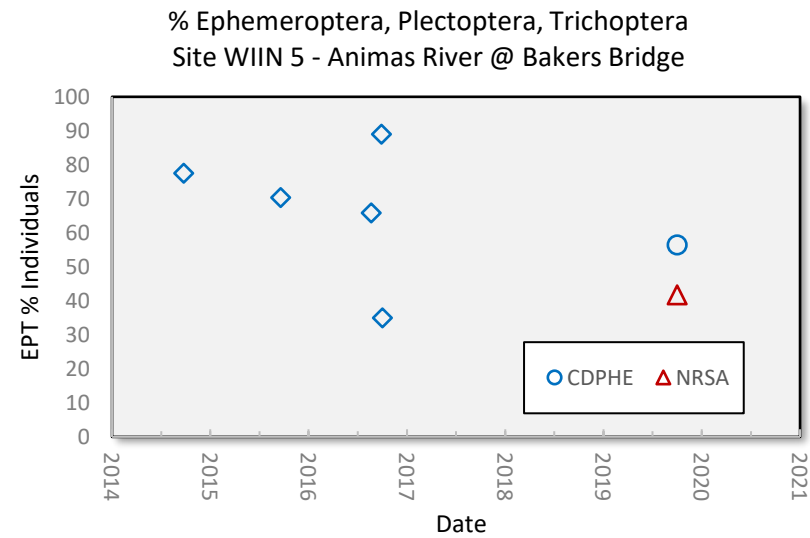


Figure 20. Percent composition EPT taxa.



Table 4; Photographs 5-6. Habitat metric condition estimates and photographs of typical conditions. Animas River at Bakers Bridge, CO.

WIIN SITE ID	SITE_ID	Year	Relative Bed Stability	Riparian Vegetation	Habitat Complexity	Human Disturbance
			LRBS_Cond_use	LXCMGW_Cond_use	LXFC_NAT_Cond_use	RDIST_COND_use
Animas River						
WIIN-5	BAKERS_BRIDGE2	2019	Fair	Good	Poor	Medium
		2016	Good	Good	Poor	High

Table 4. Habitat metric condition estimates.



Photograph 5. Base flow conditions, Winter 2020



Photograph 6. Runoff flow conditions, Spring 2019

Figures 21-24. Site specific results, Animas River at Durango, CO.

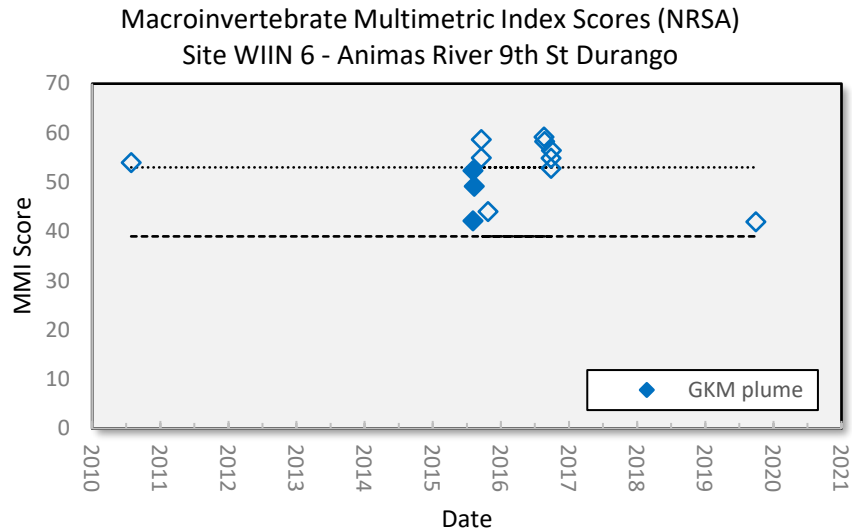


Figure 21. NRSA MMI Score.

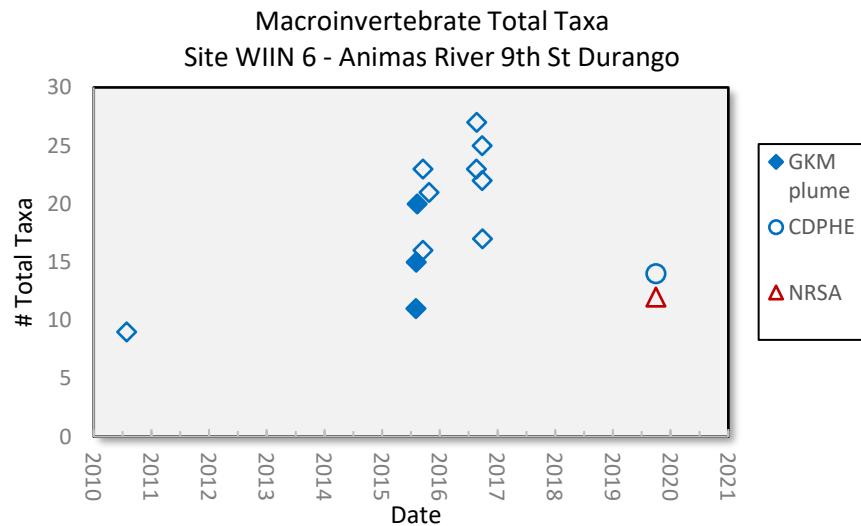


Figure 22. Total taxa.

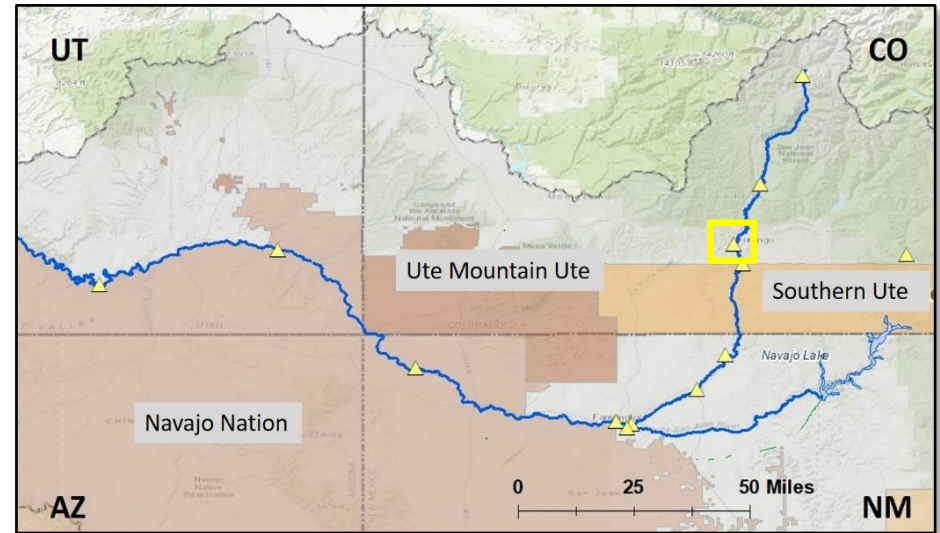


Figure 23. Location of site.

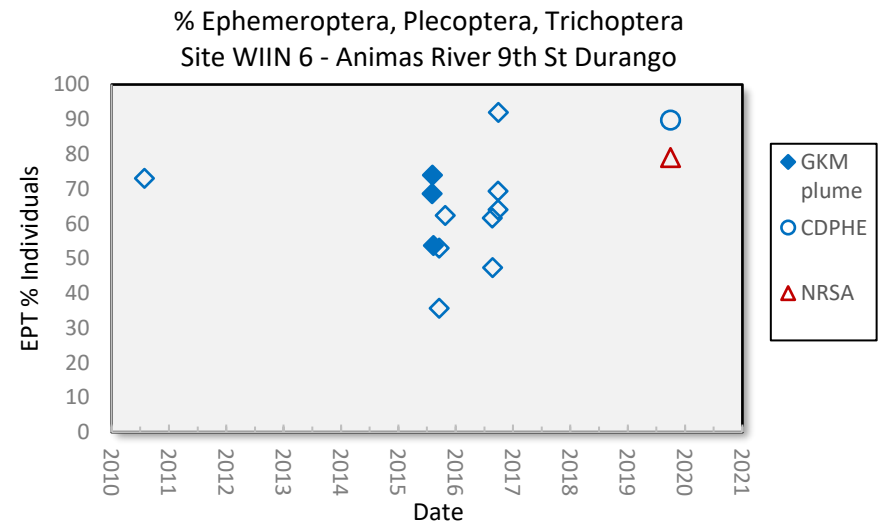


Figure 24. Percent composition EPT taxa.



Table 5; Photographs 7-8. Habitat metric condition estimates and photographs of typical conditions. Animas River at Durango, CO.

WIIN SITE ID	SITE_ID	Year	Relative Bed Stability	Riparian Vegetation	Habitat Complexity	Human Disturbance
			LRBS_Cond_use	LXCMGW_Cond_use	LXFC_NAT_Cond_use	RDIST_COND_use
Animas River						
WIIN-6	GKM05	2019	Good	Good	Good	High
		2016	Fair	Fair	Fair	High

Table 5. Habitat metric condition estimates.



Photograph 7. Base flow conditions, Winter 2020



Photograph 8. Runoff flow conditions, Spring 2019

Figures 25-28. Site specific results, Animas River at SUIT.

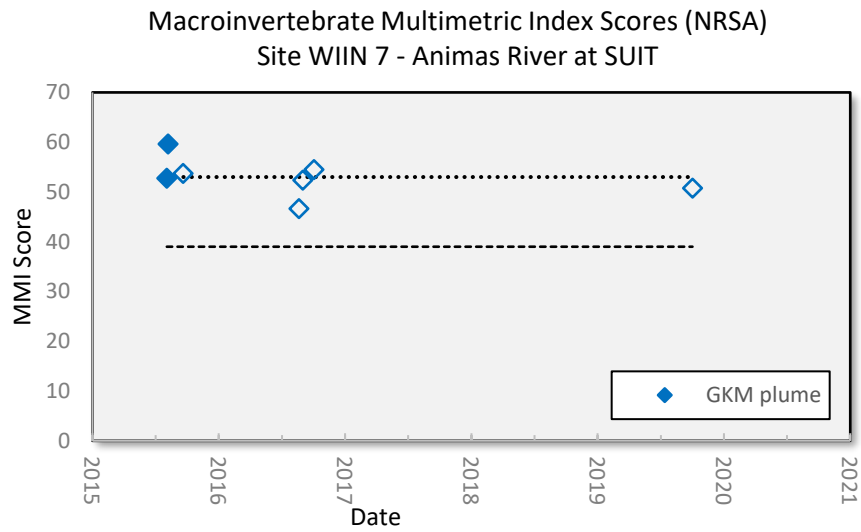


Figure 25. NRSA MMI Score.

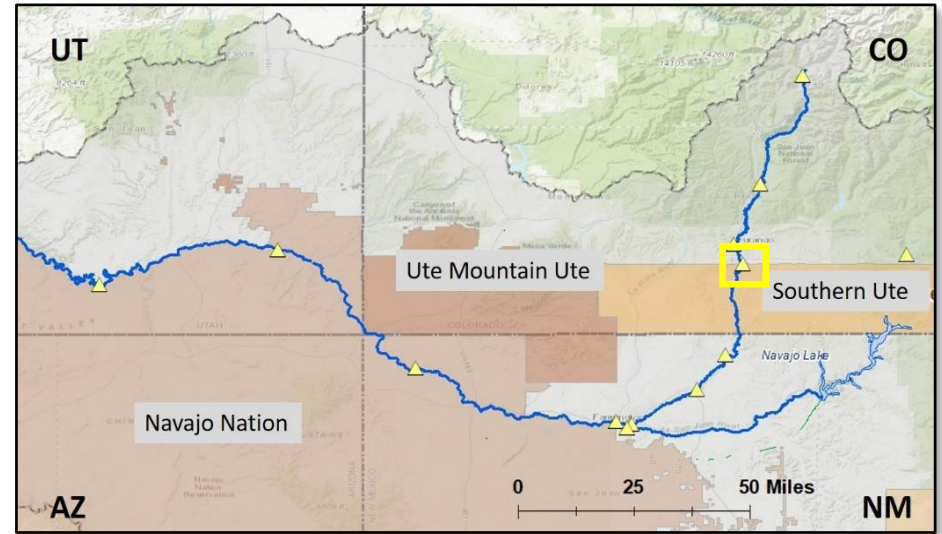


Figure 27. Location of site.

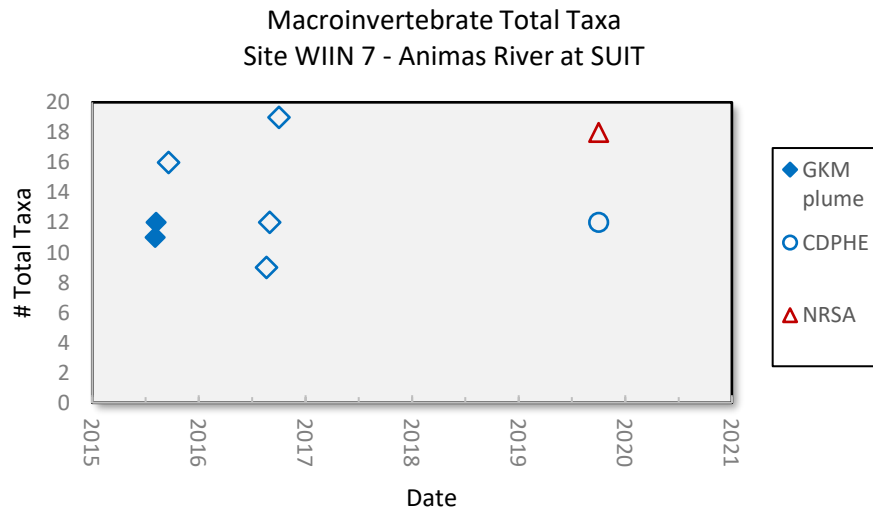


Figure 26. Total taxa.

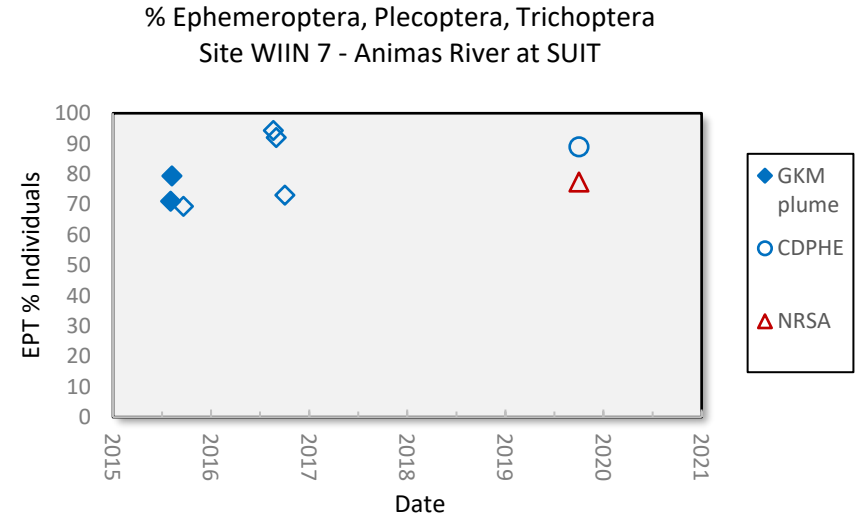


Figure 28. Percent composition EPT taxa.



Table 6; Photographs 9-10. Habitat metric condition estimates and photographs of typical conditions. Animas River at SUIT.

WIIN SITE ID	SITE_ID	Year	Relative Bed Stability	Riparian Vegetation	Habitat Complexity	Human Disturbance
			LRBS_Cond_use	LXCMGW_Cond_use	LXFC_NAT_Cond_use	RDIST_COND_use
Animas River						
WIIN-7	AR19-3	2019	Good	Good	Good	Medium
		2016	Poor	Fair	Fair	High

Table 6. Habitat metric condition estimates.



Photograph 9. Base flow conditions, Winter 2020



Photograph 10. Runoff flow conditions, Spring 2019



Figures 29-32. Site specific results, Animas River near Cedar Hill, NM.

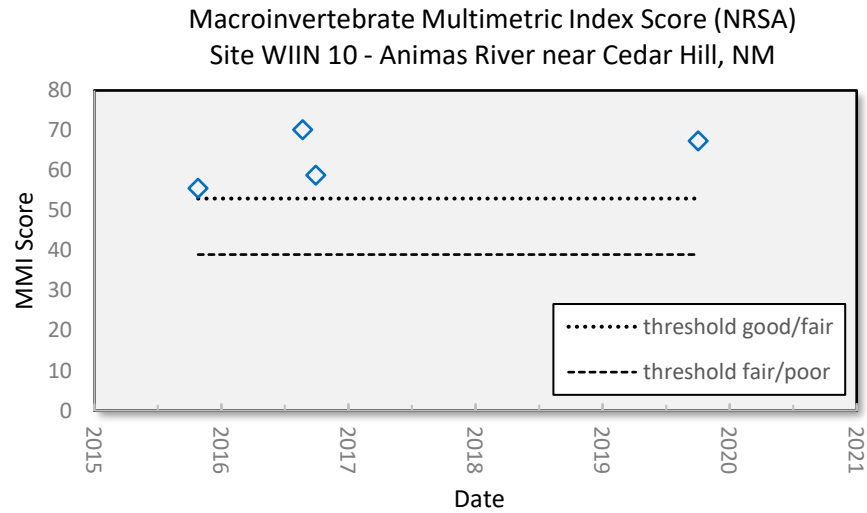


Figure 29. NRSA MMI Score.

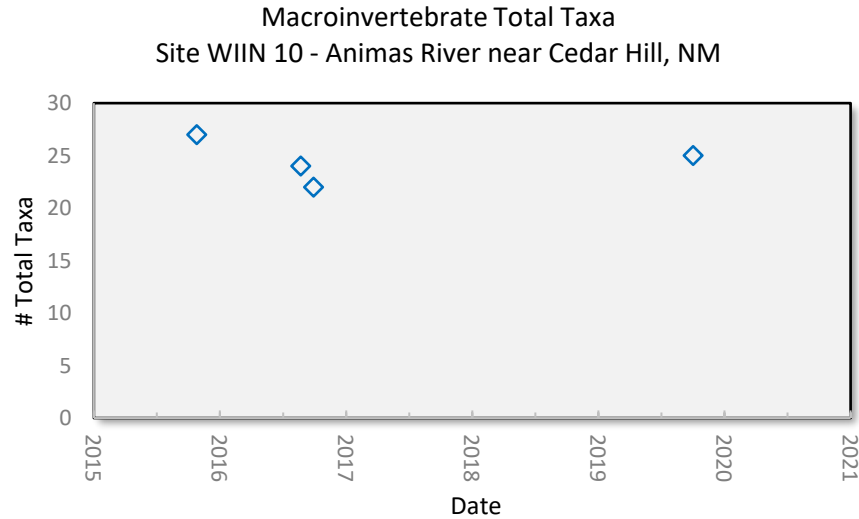


Figure 30. Total taxa.

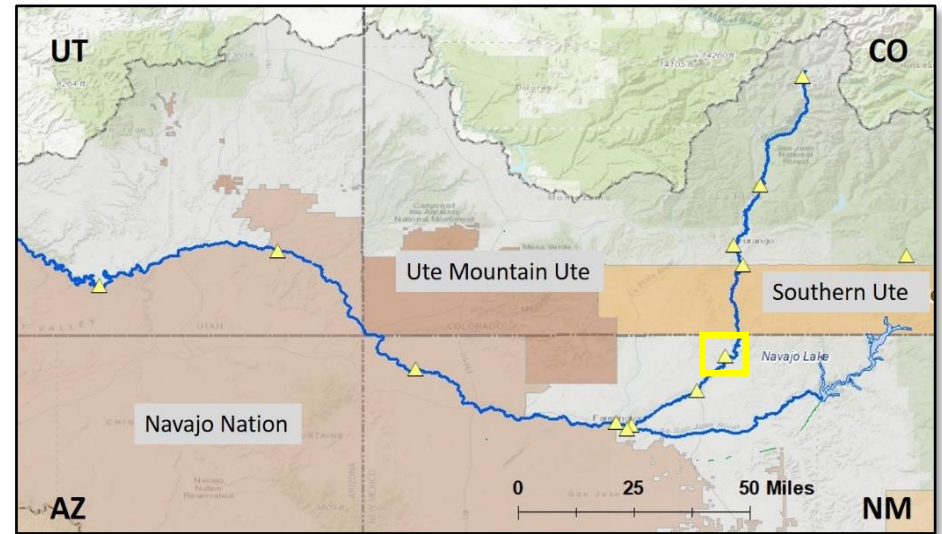


Figure 31. Location of site.

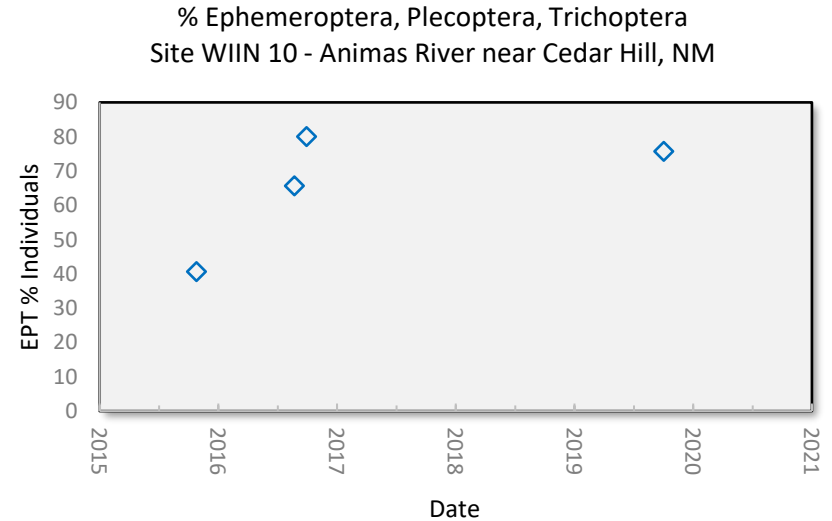


Figure 32. Percent composition EPT taxa.

Table 7; Photographs 11-12. Habitat metric condition estimates and photographs of typical conditions. Animas River near Cedar Hill, NM.

WIIN SITE ID	SITE_ID	Year	Relative Bed Stability	Riparian Vegetation	Habitat Complexity	Human Disturbance
			LRBS_Cond_use	LXCMGW_Cond_use	LXFC_NAT_Cond_use	RDIST_COND_use
Animas River						
WIIN-10	ADW-022	2019	Good	Good	Good	Medium
		2016	Good	Fair	Good	High

Table 7. Habitat metric condition estimates.



Photograph 11. Base flow conditions, Winter 2020



Photograph 12. Runoff flow conditions, Spring 2019



Figures 33-36. Site specific results, Animas River near Aztec, NM.

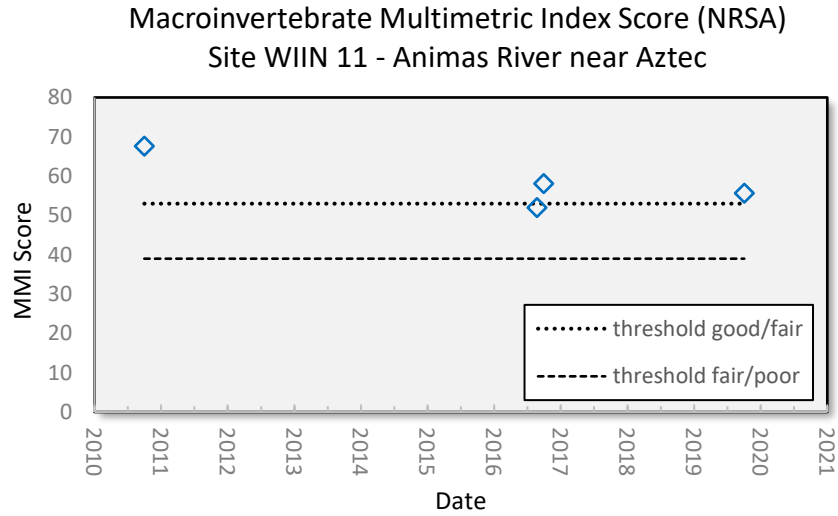


Figure 33. NRSA MMI Score.

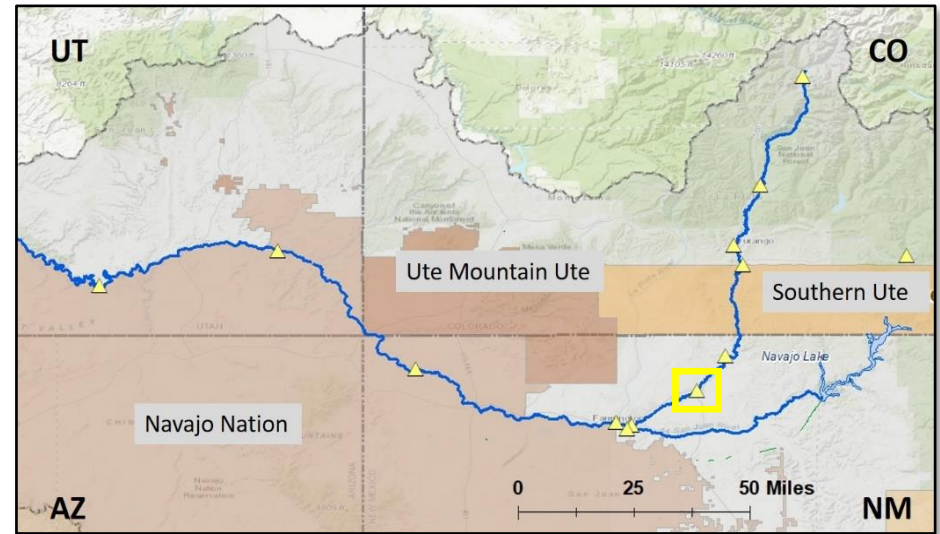


Figure 35. Location of site.

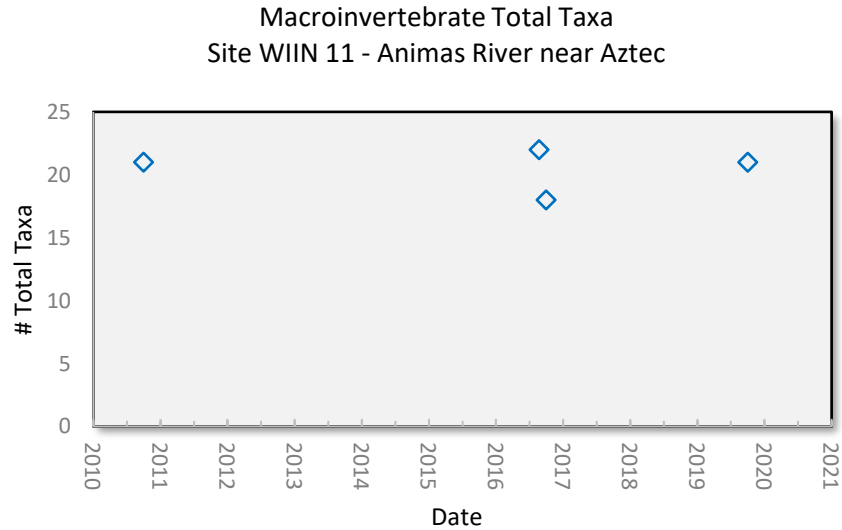


Figure 34. Total taxa.

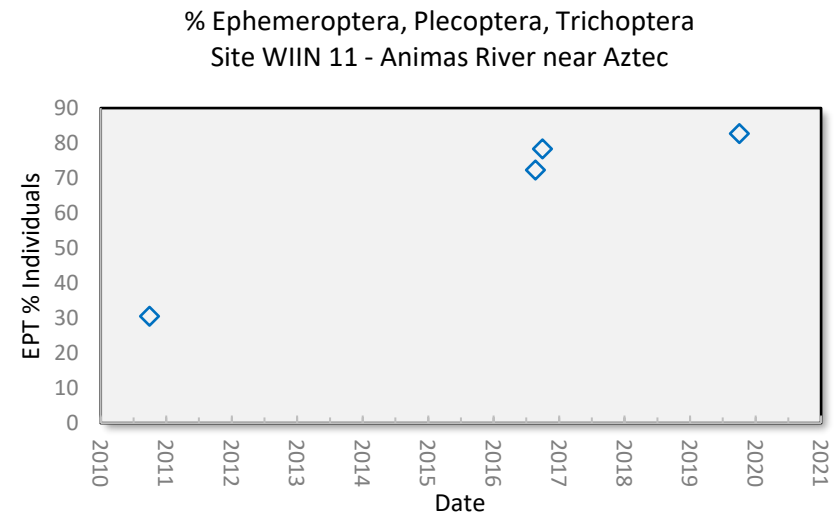


Figure 36. Percent composition EPT taxa.

Table 8; Photographs 13-14. Habitat metric condition estimates and photographs of typical conditions. Animas River near Aztec, NM.

WIIN SITE ID	SITE_ID	Year	Relative Bed Stability	Riparian Vegetation	Habitat Complexity	Human Disturbance
			LRBS_Cond_use	LXCMGW_Cond_use	LXFC_NAT_Cond_use	RDIST_COND_use
Animas River						
WIIN-11	ADW-10	2019	Good	Good	Good	High
		2016	Fair	Good	Fair	High

Table 8. Habitat metric condition estimates.



Photograph 13. Base flow conditions, Winter 2020



Photograph 14. Runoff flow conditions, Spring 2019

Figures 37-40. Site specific results, Animas River at Farmington, NM.

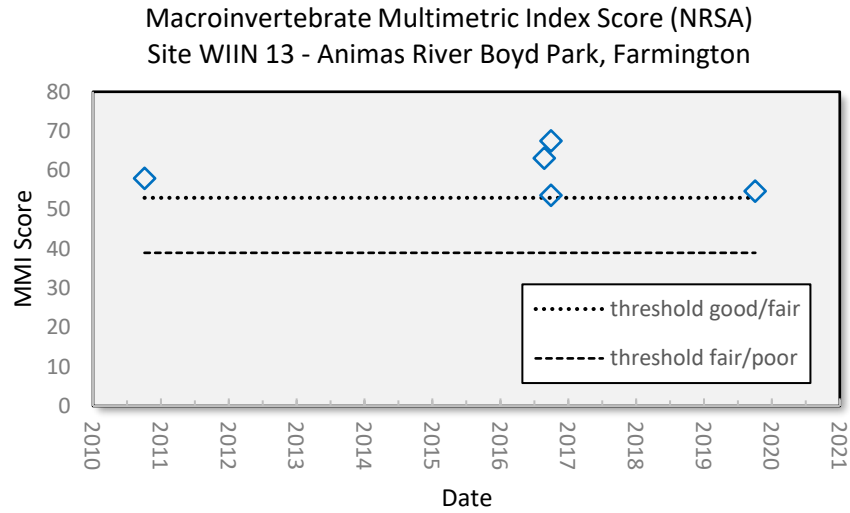


Figure 37. NRSA MMI Score.

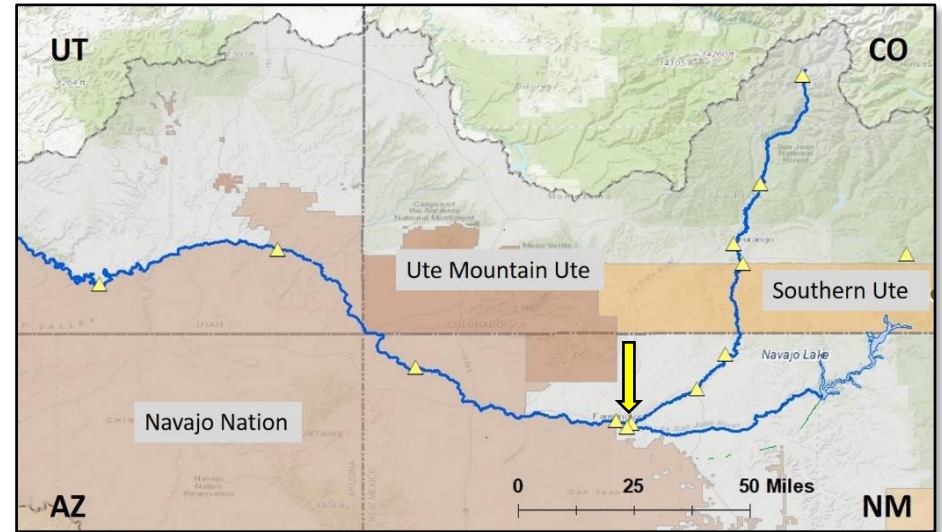


Figure 39. Location of site.

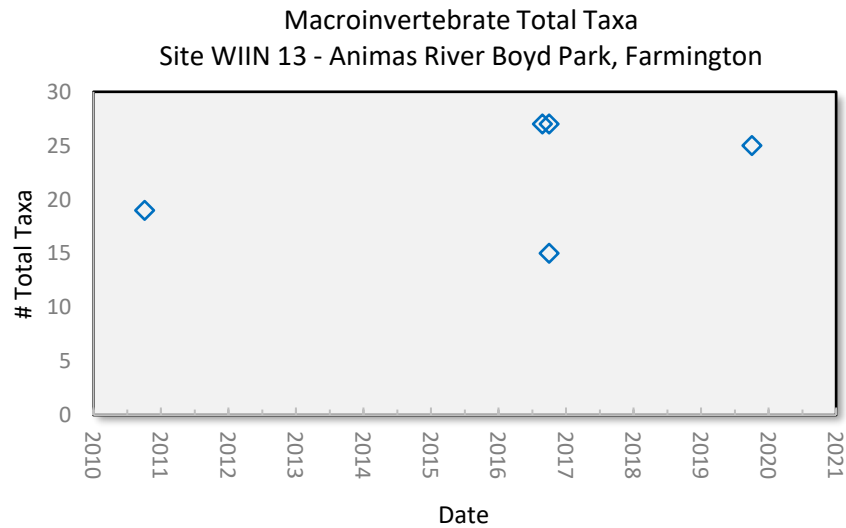


Figure 38. Total taxa.

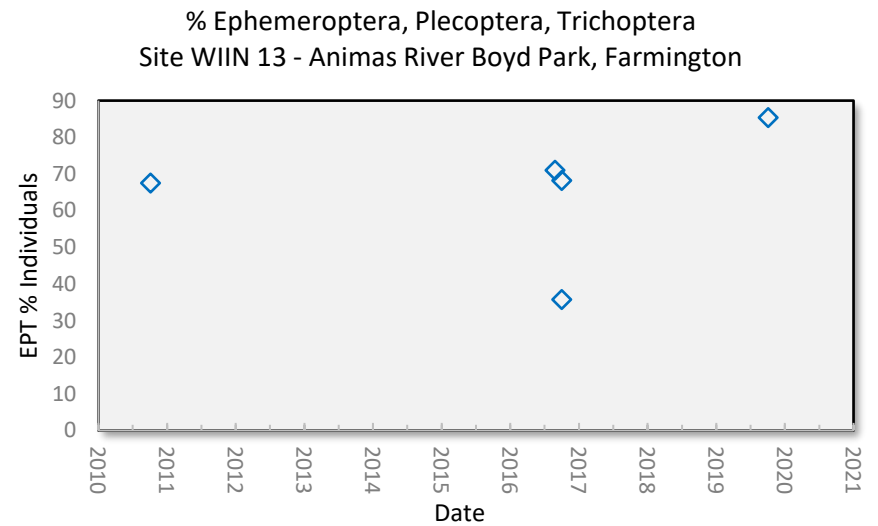


Figure 40. Percent composition EPT taxa.



Table 9; Photographs 15-16. Habitat metric condition estimates and photographs of typical conditions. Animas River at Farmington, NM.

WIIN SITE ID	SITE_ID	Year	Relative Bed Stability	Riparian Vegetation	Habitat Complexity	Human Disturbance
			<i>LRBS_Cond_use</i>	<i>LXCMGW_Cond_use</i>	<i>LXFC_NAT_Cond_use</i>	<i>RDIST_COND_use</i>
Animas River						
WIIN-13	FW-040	2019	Good	Good	Good	High
		2016	Good	Good	Good	High

Table 9. Habitat metric condition estimates.



Photograph 15. Base flow conditions, Winter 2020



Photograph 16. Runoff flow conditions, Spring 2019

Figures 41-44. Site specific results, San Juan River above Animas River.

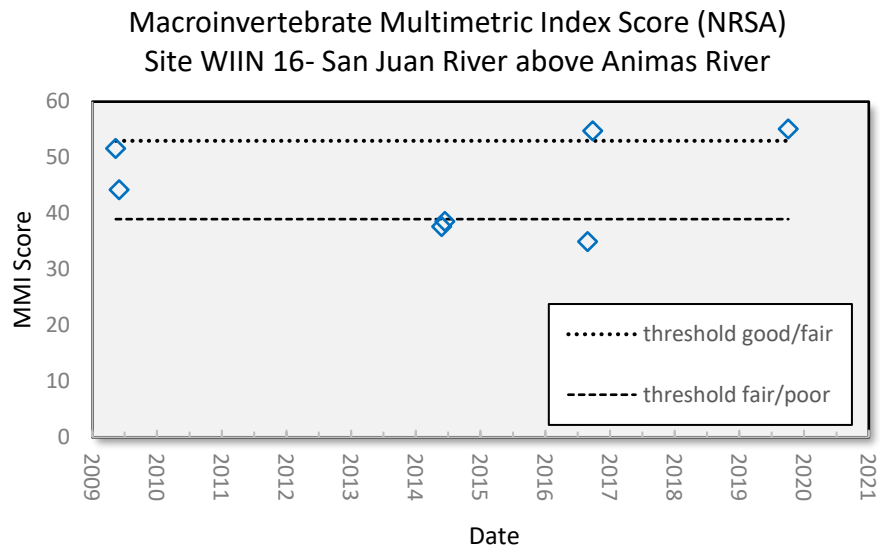


Figure 41. NRSA MMI Score.

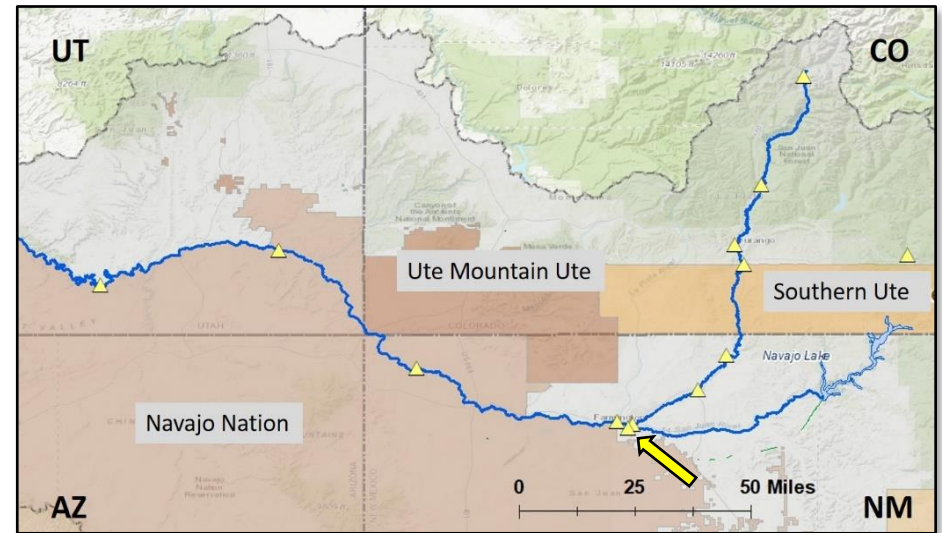


Figure 43. Location of site.

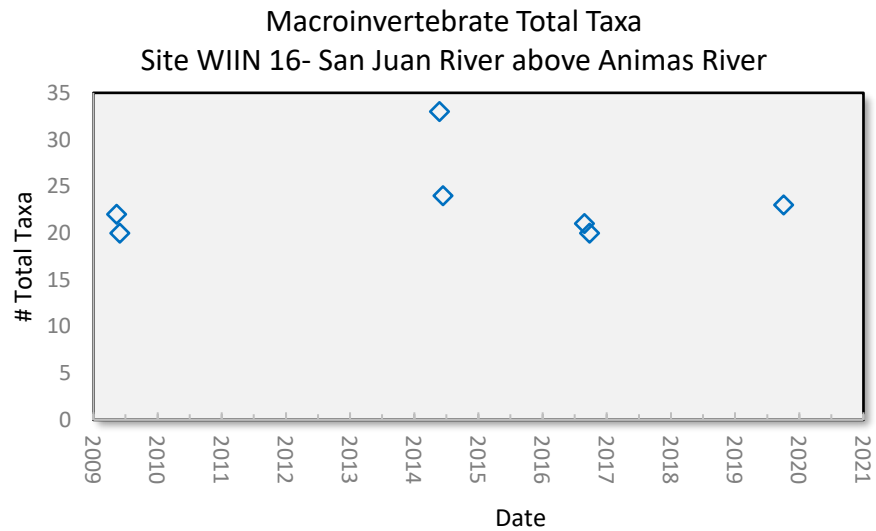


Figure 42. Total taxa.

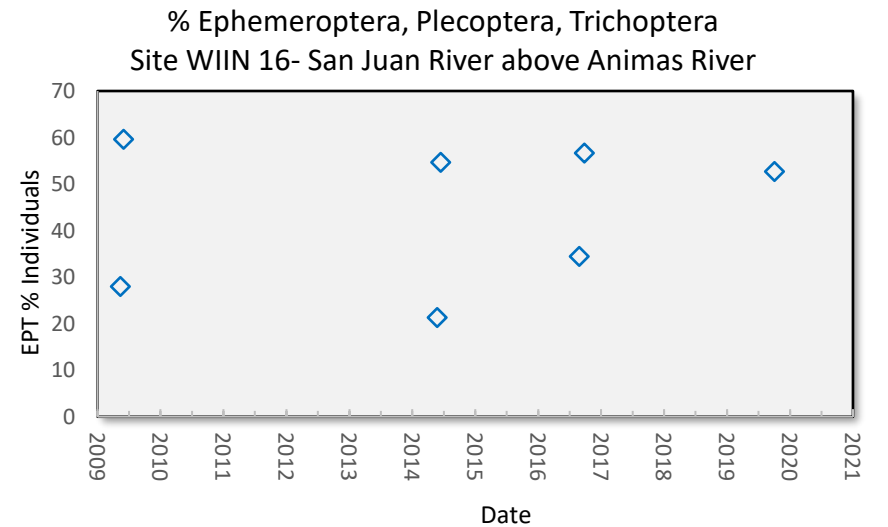


Figure 44. Percent composition EPT taxa.



Table 10; Photographs 17-18. Habitat metric condition estimates and photographs of typical conditions. San Juan River above Animas River.

WIIN SITE ID	SITE_ID	Year	Relative Bed Stability	Riparian Vegetation	Habitat Complexity	Human Disturbance
			LRBS_Cond_use	LXCMGW_Cond_use	LXFC_NAT_Cond_use	RDIST_COND_use
San Juan River						
WIIN-16	SJAR	2019	Fair	Good	Good	Low
		2016	Poor	Good	Fair	High
		2014	Fair	Good	Good	Medium
		2009 (May)	Poor	Good	Good	Medium
		2009 (June)	Fair	Good	Good	Low

Table 10. Habitat metric condition estimates.



Photograph 17. Base flow conditions, Fall 2019



Photograph 18. Spring 2019. Flow determined by release from Navajo Lake.

Figures 45-48. Site specific results, San Juan River at Montezuma, UT.

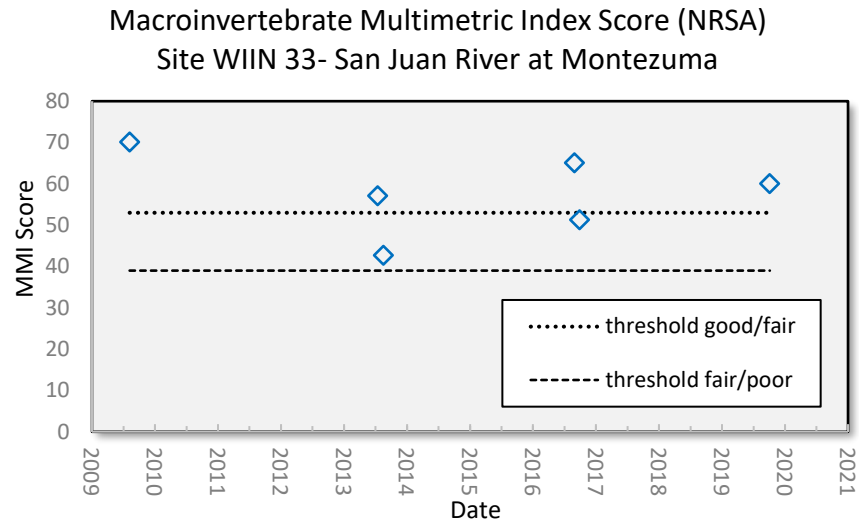


Figure 45. NRSA MMI Score.

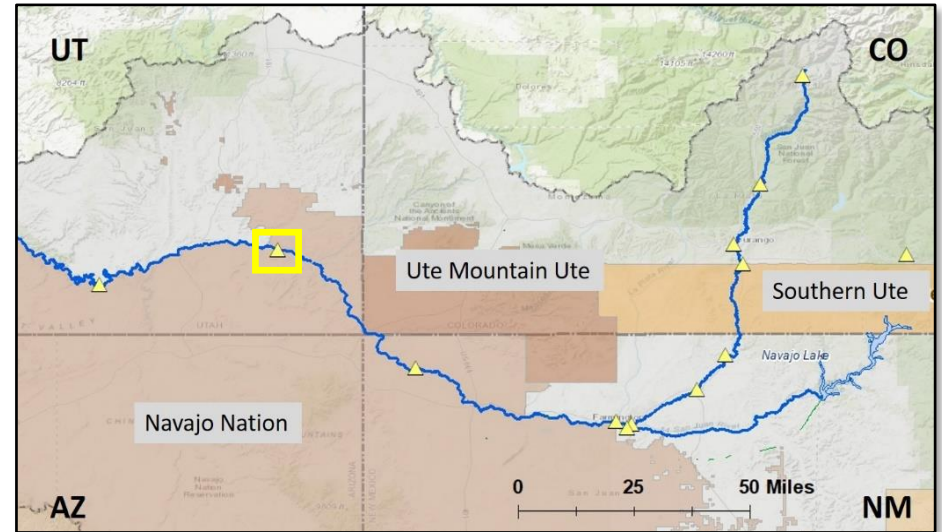


Figure 47. Location of site.

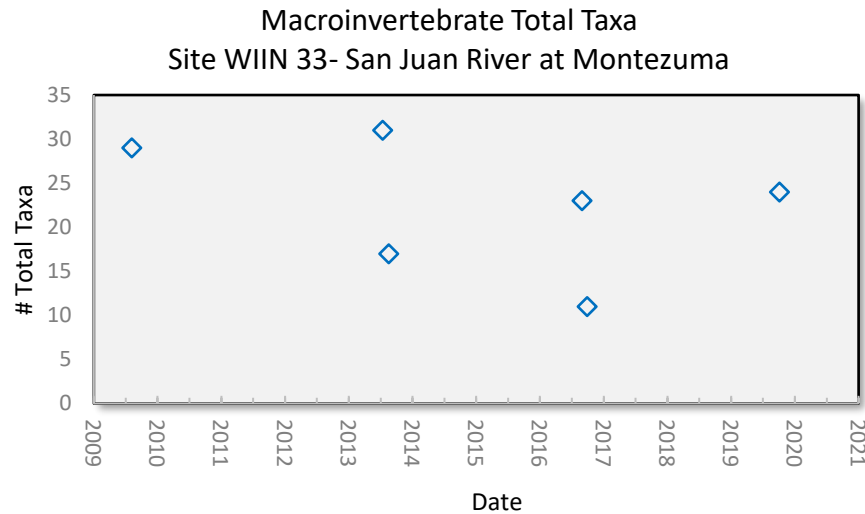


Figure 46. Total taxa.

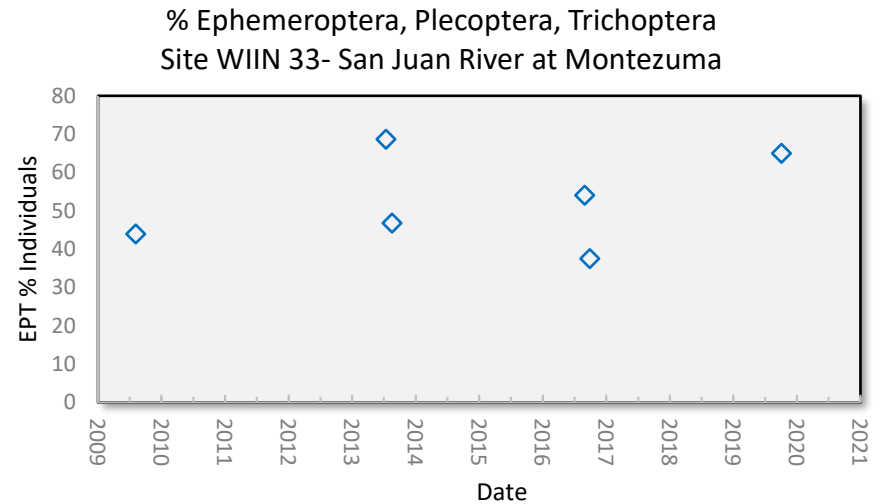


Figure 48. Percent composition EPT taxa.



Table 11; Photographs 19-20. Habitat metric condition estimates and photographs of typical conditions. San Juan River at Montezuma, UT.

WIIN SITE ID	SITE_ID	Year	Relative Bed Stability	Riparian Vegetation	Habitat Complexity	Human Disturbance
			<i>LRBS_Cond_use</i>	<i>LXCMGW_Cond_use</i>	<i>LXFC_NAT_Cond_use</i>	<i>RDIST_COND_use</i>
San Juan River						
WIIN-33	SJMC	2019	Good	Good	Good	Medium
		2016	Fair	Good	Good	Medium
		2013	Fair	Good	Good	High
		2009	Fair	Good	Good	Medium

Table 11. Habitat metric condition estimates.



Photograph 19. Base flow conditions, Fall 2019



Photograph 20. Flow conditions, Fall 2021.

Figures 49-52. Site specific results, San Juan River at Mexican Hat.

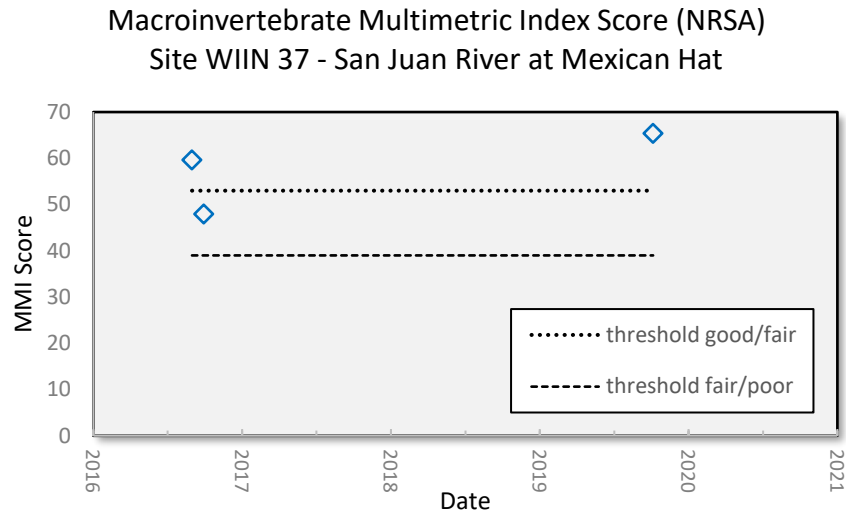


Figure 49. NRSA MMI Score.

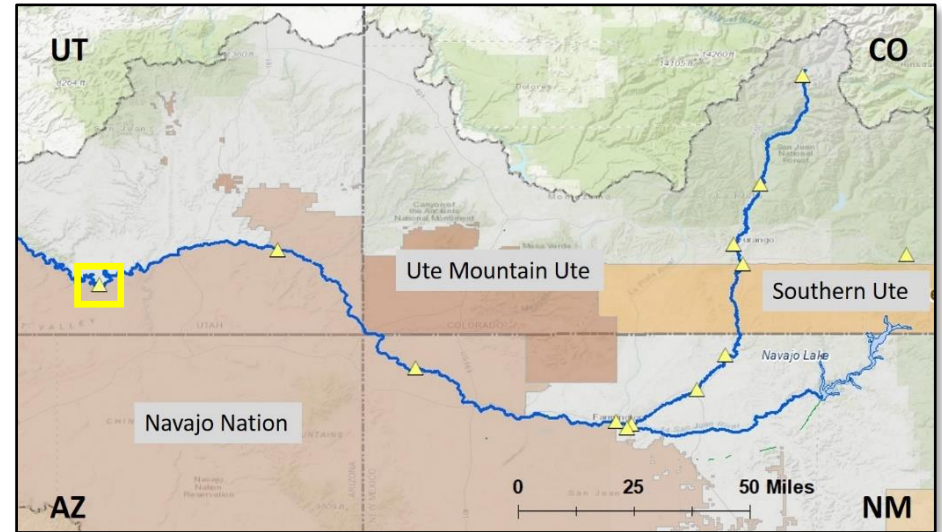


Figure 51. Location of site.

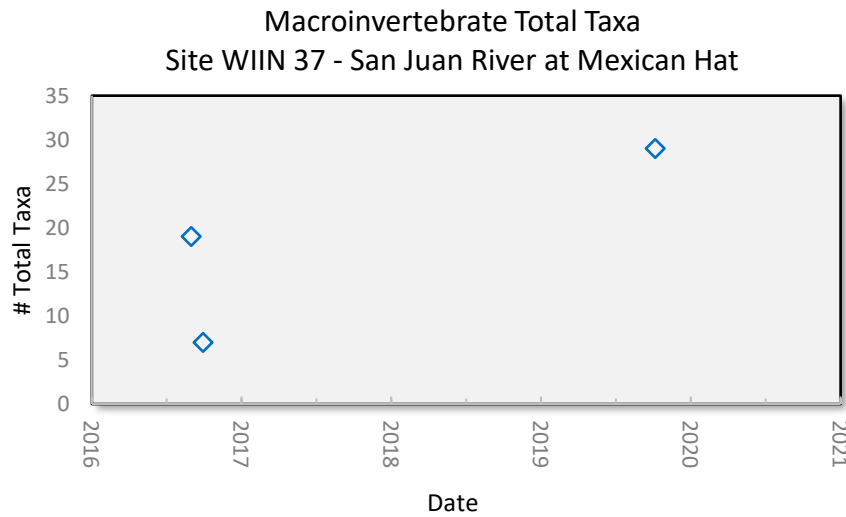


Figure 50. Total taxa.

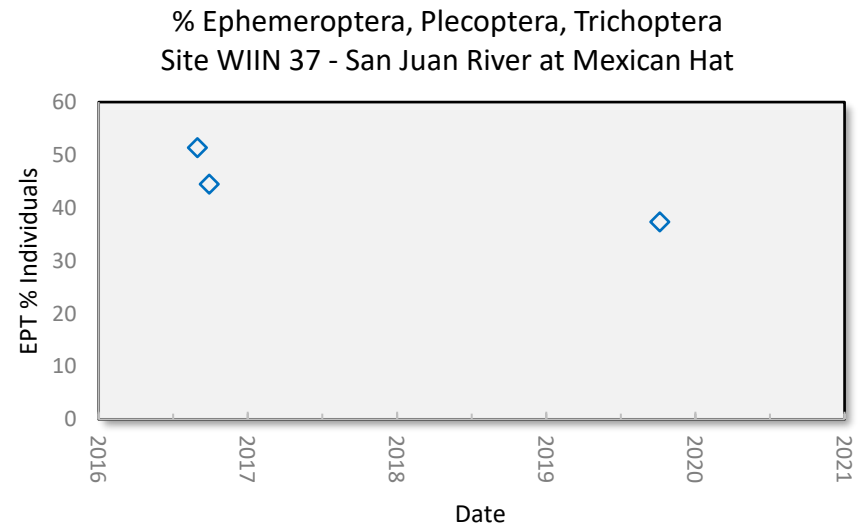


Figure 52. Percent composition EPT taxa.



Table 12; Photographs 21-22. Habitat metric condition estimates and photographs of typical conditions. San Juan River at Montezuma, UT.

WIIN SITE ID	SITE_ID	Year	Relative Bed Stability	Riparian Vegetation	Habitat Complexity	Human Disturbance
			LRBS_Cond_use	LXCMGW_Cond_use	LXFC_NAT_Cond_use	RDIST_COND_use
San Juan River						
WIIN-37	SJMh	2019	Fair	Good	Good	Medium
		2016	Good	Fair	Good	High

Table 12. Habitat metric condition estimates.



Photograph 21. Base flow conditions, Winter 2020



Photograph 22. Flow conditions, Spring 2021.

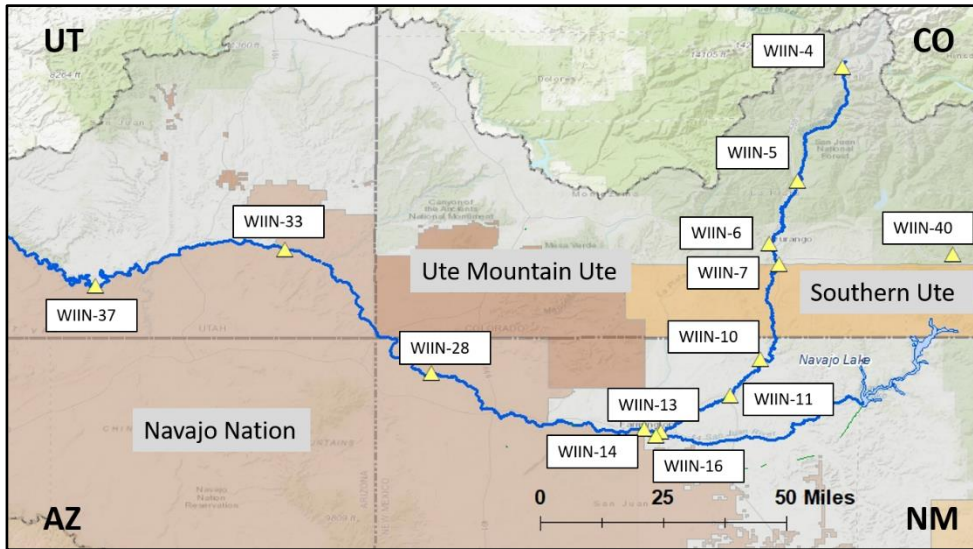


Figure 53. Site locations with corresponding identification numbers.

Site ID Macroinvr Habitat assessmnt	Site ID in Sed/Chem QAPP	Nearby Sampling Locations (river miles)	Description/Location
WIIN-3 macroinve only	CEM49	EPA CC48 (12.54) USGS 09358550 (12.41)	Cement Creek at Silverton CO
WIIN-4	82	EPA A72 (16.35) USGS 09359020 (16.34) RCWWN 3579 (15.88)	Animas Below Silverton
WIIN-5	81	EPA Bakers Bridge (64.02) EPA GKM02 (63.83) RCWWN 3611 (16.4)	Animas River at Bakers Bridge
WIIN-6	9423A	EPA Rotary Park (94.24) EPA GKM05 (96.66) USGS GAGE RCWWN 3576 (93.83)	Animas River at 9th Street
WIIN-7	AR 19-3 (NAR1)	EPA GKM01 (103.16) CDPHE 9420C (103.16)	Animas River at Southern Ute Tribe AR19-3
WIIN-10	ADW-022		Animas River near Cedar Hill, NM
WIIN-11	66Animas028.1 (ANIMASAB)	EPA ADW010 (162.87)	Animas River above Estes Arroyo, near Aztec
WIIN-13	WIIN-13	USGS 0936500 (192.96) EPA FW040 (190.16) 66Animas001.7	Animas River at Boyd Park in Farmington
WIIN-14	66SanJuan100.2	EPA LVW-020	Lower valley water users association, Intake Sampling Location
WIIN-16	64SanJua101.6	Site SJAR (further upstream)	San Juan River above Animas River
WIIN-28	10SANJUANR26	EPA SJDS (272.48)	San Juan River 15 miles downstream from Shiprock
WIIN-33	UDEQ 4953990 NNEPA 02SANJUANR07	EPA SJMC (345.80)	San Juan River at U262 Xing Phillips Camp Road Xing (San Juan River at Town of Montezuma)
WIIN-37	NNEPA 29SANJUANR05	EPA SJMH (421.33) USGS 09379500 (420.92) UDEQ 4953000	San Juan River at Mexican Hat US163 Xing
WIIN-40	WIIN-40	n/a	Piedra River N of Hwy 160 off of USFS Rd 622

Table 13. Site location crosswalk.

WIIN SITE ID	SITE_ID	Year	Relative Bed Stability	Riparian Vegetation	Habitat Complexity	Human Disturbance
			<i>LRBS_Cond_use</i>	<i>LXCMGW_Cond_use</i>	<i>LXFC_NAT_Cond_use</i>	<i>RDIST_COND_use</i>
Animas River						
WIIN-4	A72	2019	Fair	Good	Poor	Medium
		2016	Good	Fair	Poor	Medium
WIIN-5	BAKERS_BRIDGE2	2019	Fair	Good	Poor	Medium
		2016	Good	Good	Poor	High
WIIN-6	GKM05	2019	Good	Good	Good	High
		2016	Fair	Fair	Fair	High
WIIN-7	AR19-3	2019	Good	Good	Good	Medium
		2016	Poor	Fair	Fair	High
WIIN-10	ADW-022	2019	Good	Good	Good	Medium
		2016	Good	Fair	Good	High
WIIN-11	ADW-10	2019	Good	Good	Good	High
		2016	Fair	Good	Fair	High
WIIN-13	FW-040	2019	Good	Good	Good	High
		2016	Good	Good	Good	High
Piedra River - offsite reference for Animas River						
WIIN-40	N/A	2019	Good	Good	Poor	Medium
San Juan River						
WIIN-16	SJAR	2019	Fair	Good	Good	Low
		2016	Poor	Good	Fair	High
		2014	Fair	Good	Good	Medium
		2009 (May)	Poor	Good	Good	Medium
		2009 (June)	Fair	Good	Good	Low
WIIN-14	LVW-020	2019	Fair	Good	Good	High
		2016	Good	Good	Good	High
WIIN-28	N/A	2019	Fair	Good	Good	Low
WIIN-33	SJMC	2019	Good	Good	Good	Medium
		2016	Fair	Good	Good	Medium
		2013	Fair	Good	Good	High
		2009	Fair	Good	Good	Medium
WIIN-37	SJMh	2019	Fair	Good	Good	Medium
		2016	Good	Fair	Good	High
<b>Definitions:</b>						
<ul style="list-style-type: none"> <li>• <b><i>LRBS_Cond_use</i></b>: Bed Sediment Condition -- Relative Bed Stability and Excess Fines. Does not consider potential scouring nor does this measure characterize sediment quality (potential contaminants).</li> <li>• <b><i>LXCMGW_COND_use</i></b>: Riparian vegetation condition. Does not factor in invasive species such as Russian Olive.</li> <li>• <b><i>LXFC_NAT_COND_use</i></b>: Instream habitat cover and complexity condition. Does not factor in invasive species.</li> <li>• <b><i>RDIST_COND_use</i></b>: Human Disturbance Pressure. Proximity-weighted tally of the intensity and extent of human activities along the sample reach which is demonstrated to be related to "impact" alteration of habitat, chemistry, biota, etc. Typically referred to as the level of human disturbance.</li> </ul>						

**Table 14. Habitat assessment condition estimates, all years.**