Montana DEQ - Water Quality Standards Attainment Record

Reporting Cycle: 2020 **Assessment Record:** MT41H001_021.pdf **Status:** Completed

ASSESSMENT UNIT INFORMATION

Reporting Cycle:	2020
Assessment Unit:	MT41H001_021
Waterbody Name:	Gallatin River
Location Description:	GALLATIN RIVER, Yellowstone National Park Boundary to Spanish Creek

Water Type:	Size (Miles/Acres)	Use Class:
RIVER	39.28 MILES	B-1

Hydrologic Unit Code:	10020008
HUC Name:	Gallatin
Watershed:	Missouri Headwaters
Basin:	Upper Missouri
TMDL Planning Area:	Upper Gallatin
Ecoregion:	Middle Rockies
County:	Gallatin County
Lat/Long AU Start (U/S):	45.053804 / -111.155988
Lat/Long AU End (D/S):	45.493542 / -111.271486

MONITORING INFORMATION

Date Assessment Started:	06/14/2022
Assessed By:	Bell, Chace

Reporting Cycle: 2020 **Assessment Record:** MT41H001_021.pdf **Status:** Completed

CITATIONS

Citation	Location	Biological Data	Habitat Data	Chemistry Data
Montana State Board of Health (1960), Water Pollution in the Missouri River Drainage in Montana, Progress Report No. 60-1	WQPB Ebrary	fecal coliforms; fish; macroinvertebrates; other bacteriological data	riparian &/or instream surveys & physical features	common ions, pH, conductivity, miscellaneous; major nutrients; quantitative physical data
Keppner, Alfred P. ; Nielson, Gerald A. ; Wright, John C. (1971), Assessing Potential Impacts of Sewage From Recreational Development in a Semi-Primitive Watershed	WQPB Ebrary			major nutrients
Committee on Water Quality Criteria, Environmental Studies Board (1972), Water Quality Criteria, 1972: A Report of the Committee on Water Quality Criteria	WQPB Ebrary			common ions, pH, conductivity, miscellaneous; major nutrients; metals
Adamsen, Floyd James (1974), Phosphorus, Sediment, and Water Interactions in the Gallatin River of Southwestern Montana (Masters Thesis)	WQPB Ebrary		riparian &/or instream surveys & physical features	General; benthic sediment data; common ions, pH, conductivity, miscellaneous; major nutrients; metals; quantitative physical data
Stuart, David Gordon ; Wright, John C. ; Schillinger, John Edward ; Bissonnette, Gary K. ; Jezeski, James J. (1974), Gallatin Basin Waste Allocation Study	WQPB Ebrary	algae; fecal coliforms; macroinvertebrates		major nutrients; quantitative physical data
Coutant, Charles C. (1977), Compilation of Temperature Preference Data	WQPB Ebrary	fish		common ions, pH, conductivity, miscellaneous; quantitative physical data
Water and Environment Consultants, Inc (1977), Gallatin River Stability Evaluation	WQPB Ebrary			quantitative physical data

Citation	Location	Biological Data	Habitat Data	Chemistry Data
Blue Ribbons of the Big Sky Country Areawide Planning Organization (1978), Forestry	WQPB Ebrary	fecal coliforms	Land use; photo points; riparian &/or instream surveys & physical features	common ions, pH, conductivity, miscellaneous; major nutrients; metals; quantitative physical data
Snyder, Gordon ; Black, John ; Swetik, Paul ; Haupt, Harold F. (1978), Modeling Forest Water Quality of the Upper Gallatin-Madison Watersheds Using the Benchmark System	WQPB Ebrary		photo points; riparian &/or instream surveys & physical features	quantitative physical data
Blue Ribbons of the Big Sky Country Areawide Planning Organization (1979), Final Report and Water Quality Management Plan	WQPB Ebrary	fecal coliforms; fish	Land use; riparian &/or instream surveys & physical features	common ions, pH, conductivity, miscellaneous; major nutrients; metals; quantitative physical data
Montana Department of Fish and Game (1979), Instream Flow Evaluation for Selected Streams in the Upper Missouri River Basin	WQPB Ebrary	fish; macroinvertebrates; wildlife	riparian &/or instream surveys & physical features	quantitative physical data
Vincent, E. Richard ; Nelson, Fred ; Rehwinkel, Bruce J. (1982), Southwestern Fisheries Inventory: Inventory and Survey of the Waters of the Project Area (Gallatin and Madison Drainages) July 1, 1975 through June 30, 1982, F-9-R-24 through F-9-R-30 Job # I-a	WQPB Ebrary	fish		quantitative physical data
Nordin, Richard N. (1985), Province of British Columbia Chlorophyll Criteria Limits for Attached Algal Biomass to Protect Recreation / Aestethics and Aquatic Life	Assessment Record	algae; chlorophyll		
Bell, Milo C. (1986), Fisheries Handbook of Engineering Requirements and Biological Criteria	WQPB Ebrary	fish	riparian &/or instream surveys & physical features	quantitative physical data
Chapman, Donald W. (1988), Critical Review of Variables Used to Define Effects of Fines in Redds of Large Salmonids	WQPB Ebrary	fish	riparian &/or instream surveys & physical features	common ions, pH, conductivity, miscellaneous

Citation	Location	Biological Data	Habitat Data	Chemistry Data
Montana Department of Fish, Wildlife, and Parks (1989), Application for Reservations of Water in the Missouri River Basin above Fort Peck Dam. Volume 2: Reservation Requests for Waters Above Canyon Ferry Dam	WQPB Ebrary	fish; macroinvertebrates; wildlife	Land use; riparian &/or instream surveys & physical features	benthic sediment data; quantitative physical data
Hicks, Brendan J. ; Hall, James D. ; Bisson, Peter A. ; Sedell, James R. (1991), Responses of Salmonids to Habitat Changes	WQPB Ebrary		riparian &/or instream surveys & physical features	quantitative physical data
Montana Department of Fish, Wildlife, and Parks (1991), Dewatered Streams List, 1991	WQPB Ebrary		riparian &/or instream surveys & physical features	common ions, pH, conductivity, miscellaneous; quantitative physical data
Kaya, Calvin M. (1992), Restoration of Fluvial Arctic Grayling to Montana Streams: Assessment of Reintroduction Potential of Streams in the Native Range, the Upper Missouri River Drainage above Great Falls (Masters Thesis)	WQPB Ebrary	fish	riparian &/or instream surveys & physical features	quantitative physical data
Ontario Ministry of the Environment (1993), Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario	WQPB Ebrary			benthic sediment data; toxicity tests
Gendusa, Tony ; LaVelle, James M. (1994), Draft Baseline Risk Assessment: Streamside Tailing Operable Unit Silver Bow Creek NPL Site, MDHES Contract # 430009-TO6	WQPB Ebrary		riparian &/or instream surveys & physical features	benthic sediment data; metals
Runyan, Craig ; Bader, Jeff (1995), Water Quality for Livestock and Poultry, Guide M-112	WQPB Ebrary	other bacteriological data		common ions, pH, conductivity, miscellaneous; metals; organics

Citation	Location	Biological Data	Habitat Data	Chemistry Data
(1997), DEQ Field Assessment Form	Assessment Record	algae; chlorophyll; macroinvertebrates	Land use; photo points; riparian &/or instream surveys & physical features	Rosgen type; benthic sediment data; common ions, pH, conductivity, miscellaneous; major nutrients; metals; quantitative physical data
Anderson, Chauncey W. ; Carpenter, Kurt D. (1998), Water-Quality and Algal Conditions in the North Umpqua River Basin, Oregon, 1992-95, and Implications for Resource Management, Water-Resources Investigations Report 98?4125	WQPB Ebrary	algae; chlorophyll		major nutrients
(1998), DEQ Field Assessment Form	Assessment Record	algae; chlorophyll	photo points; riparian &/or instream surveys & physical features	Rosgen type; benthic sediment data; common ions, pH, conductivity, miscellaneous; major nutrients; metals; quantitative physical data; toxicity tests
Bollman, Wease (1999), Macroinvertebrates and Bioassessment of the Gallatin River and Tributaries of the West Fork Gallatin River	WQPB Ebrary	fecal coliforms; macroinvertebrates		common ions, pH, conductivity, miscellaneous
(2000), DEQ Field Assessment Form	Assessment Record	algae; chlorophyll; fish; macroinvertebrates	Land use; photo points; riparian &/or instream surveys & physical features	Rosgen type; benthic sediment data; common ions, pH, conductivity, miscellaneous; major nutrients; metals; quantitative physical data
Bahls, Loren L. (2001), Biological Integrity of the Gallatin River and Selected Tributaries Near Big Sky Based on the Composition and Structure of the Benthic Algae Community, DEQ Contract # 200012-2	WQPB Ebrary	algae		

Citation	Location	Biological Data	Habitat Data	Chemistry Data
Bollman, Wease (2002), An Analysis of the Aquatic Invertebrates and Habitat of the Gallatin River, August 2000	WQPB Ebrary	General; macroinvertebrates	General	
Kappesser, Gary B. (2002), A Riffle Stability Index to Evaluate Sediment Loading to Streams	WQPB Ebrary		riparian &/or instream surveys & physical features	General; quantitative physical data
Anderson, Bob ; Yashan, Dean ; Walker, Mark ; Bernd-Cohen, Tina (2003), Water Quality Restoration Plan for Metals in the Blackfoot Headwaters TMDL Planning Area	WEB			benthic sediment data; metals
Rowe, Mike ; Essig, Don A. ; Jessup, Benjamin K. (2003), Guide to Selection of Sediment Targets for Use in Idaho TMDLs	WQPB Ebrary		riparian &/or instream surveys & physical features	benthic sediment data; common ions, pH, conductivity, miscellaneous; quantitative physical data
Montana Department of Fish, Wildlife, and Parks, Fisheries Division (2004), FWP Dewatering Concern Areas: Revised May 2003 [Dewatered Streams List 2003]	WQPB Ebrary		Land use; riparian &/or instream surveys & physical features	common ions, pH, conductivity, miscellaneous; quantitative physical data
Montana State University, Blue Water Task Force (2004), Upper Gallatin Monitoring Data for 2000 Through 2003	Assessment Record	fecal coliforms		major nutrients; quantitative physical data
Suplee, Michael W. (2005), Best Use of the June 2005 Nutrient Data Statistical Summaries	WQPB Ebrary	algae		major nutrients
Montana Department of Fish, Wildlife, and Parks (2006), Montana Rivers Information System (MRIS): Montana Fisheries Information System (MFISH) - http://maps2.nris.mt.gov/scripts/esrimap.dll?name=MFISH&Cmd=INST	Assessment Record	fish; wildlife	Land use; riparian &/or instream surveys & physical features	benthic sediment data; common ions, pH, conductivity, miscellaneous; quantitative physical data

Citation	Location	Biological Data	Habitat Data	Chemistry Data
Montana State Library Natural Resouce Information System ; Montana State University (2006), Montana View at http://montanaview.org/	DEQ PPA Data Archive	chlorophyll; fecal coliforms; macroinvertebrates; other bacteriological data	photo points; riparian &/or instream surveys & physical features	benthic sediment data; bioaccumulation; common ions, pH, conductivity, miscellaneous; imagery data; major nutrients; metals; organics; quantitative physical data
Varghese, Arun ; Cleland, Joshua (2006), Bootstrap Confidence Intervals and Updated Statistical Analyses of Water Quality Data for Montana Rivers and Streams	WQPB Ebrary	algae		major nutrients
(2007), Montana State University, Bozeman Department of Land Resources and Environmental Sciences, Water Quality and Irrigation Management Website	Assessment Record	fecal coliforms		common ions, pH, conductivity, miscellaneous; major nutrients; quantitative physical data
Montana Department of Environmental Quality (2008), Montana Numeric Water Quality Standards, Circular WQB-7	WQPB Ebrary	fecal coliforms	riparian &/or instream surveys & physical features	General; benthic sediment data; common ions, pH, conductivity, miscellaneous; major nutrients; metals; organics; quantitative physical data
Suplee, Michael W. ; Watson, Vicki ; Varghese, Arun ; Cleland, Joshua (2008), Scientific and Technical Basis of the Numeric Nutrient Criteria for Montana's Wadeable Streams and Rivers	WQPB Ebrary	chlorophyll		major nutrients
Drygas, Jonathan (2012), The Montana Department of Environmental Quality Metals Assessment Method-Final, WQPBMASTR-03	WQPB Ebrary			benthic sediment data; metals

Citation	Location	Biological Data	Habitat Data	Chemistry Data
Montana Department of Environmental Quality (2012), Montana Numeric Water Quality Standards: Circular DEQ-7, Circular DEQ-7	WQPB Ebrary			common ions, pH, conductivity, miscellaneous; major nutrients; metals; organics
Bollman, Wease (2013), Biological Assessment of Sites in the Gallatin River Drainage, Gallatin County, Montana: Macroinvertebrate Assemblages	WQPB Ebrary	macroinvertebrates		
Montana Department of Environmental Quality (2014), Department Circular DEQ-12A: Montana Base Numeric Nutrient Standards, Circular DEQ-12A	WQPB Ebrary			major nutrients
Montana Department of Environmental Quality (2016), Assessment Methodology for Determining Wadeable Stream Impairment Due to Excess Nitrogen and Phosphorus Levels, WQPBMASTR-01	WQPB Ebrary	General; algae; chlorophyll; macroinvertebrates		General; common ions, pH, conductivity, miscellaneous; major nutrients
Kerans, Billie L. ; Bollman, Wease (2017), Biological Assessment of Sites on the Gallatin River, Gallatin County, Montana: Macroinvertebrate Assemblages	WQPB Ebrary	macroinvertebrates		
Kerans, Billie L. ; Bollman, Wease (2018), Biological Assessment of Sites on the Gallatin River, Gallatin County, Montana: Macroinvertebrate Assemblages	WQPB Ebrary	macroinvertebrates		
Kerans, Billie L. ; Bollman, Wease (2019), Biological Assessment of Sites on the Gallatin River, Gallatin County, Montana: Macroinvertebrate Assemblages	WQPB Ebrary	macroinvertebrates		
Makarowski, Kathryn (2019), Escherichia coli (E. coli) Assessment Method for State Surface Waters	WQPB Ebrary	e-coli		
Kerans, Billie L. ; Bollman, Wease (2020), Biological Assessment of Sites on the Gallatin River, Gallatin County, Montana: Macroinvertebrate Assemblages	WQPB Ebrary	macroinvertebrates		
Alsentzer, Guy ; Gardner, Kristin ; Brooks, David ; Bosse, Scott ; Drimal, Charles Wolf (2022), Petition to Assess the Middle Segment of the Gallatin River and Determine Recurrent Nuisance Algal Blooms	WQPB Ebrary	General		

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Citation	Location	Biological Data	Habitat Data	Chemistry Data
Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Water Quality Planning Bureau (nnnn), Montana Water Quality EQuIS	WEB	General; algae; chlorophyll; e-coli; macroinvertebrates	riparian &/or instream surveys & physical features	General; General; benthic sediment data; common ions, pH, conductivity, miscellaneous; major nutrients; metals; organics; quantitative physical data
(nnnn), USFS Field Data	Assessment Record	chlorophyll; fish; macroinvertebrates	Land use; photo points; riparian &/or instream surveys & physical features	Rosgen type; benthic sediment data; common ions, pH, conductivity, miscellaneous; major nutrients; metals; quantitative physical data

Comments: The waterbody number for this stream segment was created in August, 2002 when waterbody MT41H001_010 was split into two segments. The split separated the stream segment which is located within the boundary of Yellowstone National Park from the segment located between the National Park boundary and Spanish Creek. The segment in YNP is classified as A-1. This segment is located immediately downstream, and is classified as B-1. Previously updated by Carol Endicott on 11/15/1999

DATA MATRIX
Biological Data

Comments: **2006 cycle**: Fish: Surveys of rainbow and brown trout were conducted in numerous years from 1981 through 2004 in the Jack Smith Bridge section and from 1984-2004 in the Porcupine Creek section. The surveys yielded fish counts, size range of the captured trout, and population estimates. Numbers of rainbow trout in the Porcupine Cr. section show a general increase from 1984 to 2004, with about 1800 fish per mile. Brown trout declined from 1995 to 2004, from about 350 to 160 fish per mile. The brown trout data might indicate a recovery trend from the lows in 1995. The Jack Smith Bridge section shows rainbow trout numbers in 2004 of almost 5000 fish per mile. There was a decline from 2000 to 2002, but the 2004 data indicate a recovery to levels near the 2000 numbers. Brown trout numbers are often about 80 fish per mile in this section. Macroinvertebrate Data: 1998 macroinvertebrate data indicates Partial support for three of the six samples. Both replicate samples taken above Jack Smith bridge indicate Partial Support of aquatic life uses. 2000 sampling scores indicate unimpaired biotic communities at all study sites. Biotic scores indicate water quality diminishes somewhat in a downstream direction. Chlorophyll a: All reported chlorophyll-a values are in the range of reference condition, indicating that Aquatic Life, Cold Water Fishery and Primary Contact/Recreation uses are not impaired by algal growth. Siltation caused minor impairment (Full Support) of aquatic life uses above and below the West Fork at G-3 and G-4., and minor impairment at G-2. The siltation index value above the West Fork was slightly larger than the value below the the West Fork, indicating that the West Fork probably did not contribute a significant amount of sediment to the mainstem Gallatin. 1998 data: Siltation index suggests that siltation causes moderate impairment and partial support of aquatic life uses above and below the West Fork at sites G-3 and G-4. Overall, macroinvertebrate and periphyton data suggests improved biointegrity from 1998 to 2000. **2020 cycle**: BIOLOGY: 48 samples chlorophyll-a and ash-free dry weight collected range from 5.4 to 33.7 mg/m2 chl-a and 11.8 to 52.1 g/m2 AFDW. Macroinvertebrate data collected between 2012 and 2021 indicate eutrophication, HBI threshold exceeded. E.COLI: 12 samples collected on 8/14/2013 range from 1 to 517 MPN/100mL. Insufficient information to calculate 30-day mean. PHOTO/VIDEOS: Photos from 2018 to 2021 indicate widespread filamentous algae growth

Near Jack Smith Bridge

Data Type	Comments	Ref Num	Citation
algae	An increase in the abundance of organic pollution-tolerant Oscillatoria may indicate an increase in organic loading and nutrient concentrations below West Fork Gallatin R.	551	Bahls, Loren L. (2001), Biological Integrity of the Gallatin River and Selected Tributaries Near Big Sky Based on the Composition and Structure of the Benthic Algae Community, DEQ Contract # 200012-2
chlorophyll	Chlorophyll a result: 31.42 mg/sq m	4647	(2000), DEQ Field Assessment Form
macroinvertebrates	Bioassessment : Score: 89, Non-Impaired, Full-Support. Biotic Index: 2.77. "Scores indicate unimpaired biotic communities at all study sites. Biotic scores indicate water quality diminishes in a downstream direction. The proportion of midges increases between site G-3 and G-4 (Jack Smith Bridge), but drops off	141	Bollman, Wease (2002), An Analysis of the Aquatic Invertebrates and Habitat of the Gallatin River, August 2000

	again at site G-6. Results could be interpreted as evidence that nutrient availability in the river may increase longitudinally within the stream segment. Midges comprise 30% of the sample, suggesting mildly diminished water quality. Only 3 stonefly taxa were present in the sample, suggesting reach-		

entire segment

Data Type	Comments	Ref Num	Citation
algae	BIOLOGY: 48 samples chlorophyll-a and ash-free dry weight collected range from 5.4 to 33.7 mg/m2 chla and 11.8 to 52.1 g/m2 AFDW. Macroinvertebrate data collected between 2012 and 2021 indicate eutrophication, HBI threshold exceeded. E.COLI: 12 samples collected on 8/14/2013 range from 1 to 517 MPN/100mL. Insufficient information calculate 30-day mean. PHOTO/VIDEOS: Photos from 2018 to 2021 indicate widespread filamentous algae growth	4647	(2000), DEQ Field Assessment Form
e-coli	12 samples collected on 8/14/2013 range from 1 to 517 MPN/100mL. Insufficient information to calculate 30-day mean.	15759	Makarowski, Kathryn (2019), Escherichia coli (E. coli) Assessment Method for State Surface Waters
General	PHOTO/VIDEOS: Photos from 2018 to 2021 indicate widespread filamentous algae growth	15769	Alsentzer, Guy ; Gardner, Kristin ; Brooks, David ; Bosse, Scott ; Drimal, Charles Wolf (2022), Petition to Assess the Middle Segment of the Gallatin River and Determine Recurrent Nuisance Algal Blooms
macroinvertebrates	Macroinvertebrate data collected between 2012 and 2021 indicate eutrophication, HBI threshold exceeded.	15764	Bollman, Wease (2013), Biological Assessment of Sites in the Gallatin River Drainage, Gallatin County, Montana: Macroinvertebrate Assemblages
macroinvertebrates	Macroinvertebrate data collected between 2012 and 2021 indicate eutrophication, HBI threshold exceeded.	15765	Kerans, Billie L. ; Bollman, Wease (2017), Biological Assessment of Sites on the Gallatin River, Gallatin County, Montana: Macroinvertebrate Assemblages
macroinvertebrates	Macroinvertebrate data collected between 2012 and 2021 indicate eutrophication, HBI threshold exceeded.	15766	Kerans, Billie L. ; Bollman, Wease (2018), Biological Assessment of Sites on the Gallatin River, Gallatin County, Montana: Macroinvertebrate Assemblages
macroinvertebrates	Macroinvertebrate data collected between 2012 and 2021 indicate eutrophication, HBI threshold exceeded.	15767	Kerans, Billie L. ; Bollman, Wease (2019), Biological Assessment of Sites on the Gallatin

			River, Gallatin County, Montana: Macroinvertebrate Assemblages
macroinvertebrates	Macroinvertebrate data collected between 2012 and 2021 indicate eutrophication, HBI threshold exceeded.	15768	Kerans, Billie L. ; Bollman, Wease (2020), Biological Assessment of Sites on the Gallatin River, Gallatin County, Montana: Macroinvertebrate Assemblages

About 1 mi. upstream of Spanish Cr.

Data Type	Comments	Ref Num	Citation
chlorophyll	Chlorophyll a result: 40.22 mg/sq m	4647	(2000), DEQ Field Assessment Form
macroinvertebrates	Bioassessment : Score: 94, Non-Impaired, Full-Support. Biotic Index: 2.50. " Good habitat conditions and good water quality persist at the most downstream site. Functional composition was appropriate for an unimpaired mountain stream; abundant "Clinger" taxa (17) suggested that instream habitats were unimpacted by sediment deposition.	141	Bollman, Wease (2002), An Analysis of the Aquatic Invertebrates and Habitat of the Gallatin River, August 2000

About 3/4 mi downstream of Taylor Fork

Data Type	Comments	Ref Num	Citation
algae	Adjacent sites on the Gallatin R. shared between 60% and 80 % of their diatom floras, indicating that little to no environmental change or human-caused perturbation occurred between them. The most change occurred between sites G-2 and G-3	551	Bahls, Loren L. (2001), Biological Integrity of the Gallatin River and Selected Tributaries Near Big Sky Based on the Composition and Structure of the Benthic Algae Community, DEQ Contract # 200012-2
chlorophyll	Chlorophyll a result: 19.1 mg/sq m	4645	(1998), DEQ Field Assessment Form
chlorophyll	Chlorophyll a result: 12.28 mg/sq m	4647	(2000), DEQ Field Assessment Form
macroinvertebrates	October 1998 Scores for the Red Cliff site were 71% (Partial Support) and 76 (Full Support). Porcupine 76% & 88% both indicating Full Support. Above Jack Smith bridge: 29% and 62 both indicating Partial Support. Sites on the Gallatin in 1998 showed a decline in water quality from the uppermost site at Red Cliff to the lowermost site above Jack Smith Bridge. Organic and/or nutrient pollution was the source of impairment, through thermal influence or sedimentation cannot be ruled out with the evidence at hand. The biotic index increased from 1.62 at the upstream site to 2.97 at the lowermost site.	1702	Bollman, Wease (1999), Macroinvertebrates and Bioassessment of the Gallatin River and Tributaries of the West Fork Gallatin River

macroinvertebrates	Bioassessment : Score: 89, Non-Impaired, Full-Support. Biotic Index: 1.12.	141	Bollman, Wease (2002), An Analysis of the Aquatic Invertebrates and Habitat of the Gallatin River, August 2000

100 yds below Porcupine Cr.

Data Type	Comments	Ref Num	Citation
algae	2000: At site G-3, dominance shifted to diatoms and Nostoc ranked second in biovolume. Below West Fork, the filamentous green alga Cladophora dominated the algal biomass. Siltation caused minor impairment (Full Support) of aquatic life uses above and below the West Fork at G-3 and G-4., and minor impairment at G-2. The siltation index value above the West Fork was slightly larger than the value below the the West Fork, indicating that the West Fork probably did not contribute a significant amount of sediment to the mainstem Gallatin. 1998 data: Siltation index suggests that siltation causes moderate impairment and partial support of aquatic life uses above and below the West Fork at sites G-3 and G-4.	551	Bahls, Loren L. (2001), Biological Integrity of the Gallatin River and Selected Tributaries Near Big Sky Based on the Composition and Structure of the Benthic Algae Community, DEQ Contract # 200012-2
chlorophyll	Chlorophyll a result: 17.4 mg/sq m	4645	(1998), DEQ Field Assessment Form
chlorophyll	Chlorophyll a result: 68.66 mg/sq m	4647	(2000), DEQ Field Assessment Form
macroinvertebrates	Bioassessment : Score: 89, Non-Impaired, Full-Support. Biotic Index: 2.0. "The assemblage is characteristic of an unimpaired montane stream; all functional components of a health community are represented."	141	Bollman, Wease (2002), An Analysis of the Aquatic Invertebrates and Habitat of the Gallatin River, August 2000

At Greek Cr. Campground

Data Type	Comments	Ref Num	Citation
algae	Siltation Index: G-1:30.82, G-2: 28.66, G-3: 38.84, G-4: 34.22, G-5: 33.01, G-6: 36.67 all indicate Full Support & Minor Impairment.	551	Bahls, Loren L. (2001), Biological Integrity of the Gallatin River and Selected Tributaries Near Big Sky Based on the Composition and Structure of the Benthic Algae Community, DEQ Contract # 200012-2
chlorophyll	Chlorophyll a result: 40.14 mg/sq m	4647	(2000), DEQ Field Assessment Form
macroinvertebrates	Bioassessment : Score: 94, Non-Impaired, Full-Support. Biotic Index: 2.70. " The assemblage included representative taxa	141	Bollman, Wease (2002), An Analysis of the Aquatic Invertebrates and Habitat of the Gallatin

	from all appropriate functional groups. High richness scores for mayflies, stoneflies and caddis flies implied good water quality and unimpaired large and small habitat components. The slight increase in proportion of filter-feeders over expectations suggests that increased nutrient concentrations were accompanied by increased abundance of fine organic particles in suspension. Filter feeders at the site were entirely comprised of Simulium(blackflies) and Hydropsyche caddisflies; both of these are characteristic opportunists when		River, August 2000

Just downstream of the lower Yellowstone Park Boundary

Data Type	Comments	Ref Num	Citation
algae	MT DEQ 2000 Field Sampling Results for the Reassessment of the Upper Gallatin River: G-3: Very small patches (approximately 1X1foot) evident and some filamentous algea near the leftbank side of channel. G-5: Few large mats, but aquatic vegetation is visible throughout entire reach. G-6: Small colonies are present on most of the substrate, no large patches.	4647	(2000), DEQ Field Assessment Form
algae	The upper two sites were dominated by Nostoc, indicating nitrogen deficiency at these sites. Except for the unusually large percentage of abnormal diatom cells at G-1, diatom metrics indicate good to excellent biological integrity and little or no impairment of aquatic life uses at all the Gallatin R. sites. The abnormal cells at site G-1 may be natural in origin. There was no distinct longitudinal trend in siltation index values.	551	Bahls, Loren L. (2001), Biological Integrity of the Gallatin River and Selected Tributaries Near Big Sky Based on the Composition and Structure of the Benthic Algae Community, DEQ Contract # 200012-2
chlorophyll	Chlorophyll a result: 46.2 mg/sq m	4645	(1998), DEQ Field Assessment Form
chlorophyll	Chlorophyll a result:16.22 mg/sq m	4647	(2000), DEQ Field Assessment Form
fecal coliforms	Total Coliform (Bacteria/100ml) data was collected from 2000 through 2003 at four sites on the Gallatin River and on three tributaries. Some of the high values (1600/ 100ml) were sampled near the Yellowstone Park boundary; that number was equalled at other sites.	11357	(2007), Montana State University, Bozeman Department of Land Resources and Environmental Sciences, Water Quality and Irrigation Management Website
fish	In the canyon section the rainbow trout is the dominant trout species, while brown trout is dominant in the valley. Electrofishing results were: approx. 2115 adult rainbows and browns, weighing 1082 lbs. The reach supports a substantial	1450	Montana Department of Fish and Game (1979), Instream Flow Evaluation for Selected Streams in the Upper Missouri River Basin

	population of mountain whitefish. Wild rainbow trout estimates from the Karst section of the Upper Gallatin show an unusually high annual mortality for older trout (4&5 yrs. old). This would suggest that angling pressure is over-harvesting this portion. A 2.2 mile section held an estimated 7356 rainbows weighing		
fish	Karst Ranch: from 1970 through 1973-11,000 catchable were annually stocked in the Gallatin. Trout around the age of five years old or older had the highest mortality rate of 65% for the summer of 1978 and 70% for the winter of 1978.	1498	Vincent, E. Richard ; Nelson, Fred ; Rehwinkel, Bruce J. (1982), Southwestern Fisheries Inventory: Inventory and Survey of the Waters of the Project Area (Gallatin and Madison Drainages) July 1, 1975 through June 30, 1982, F-9-R-24 through F-9-R-30 Job # I-a
fish	The upper portion of the Gallatin River may have once supported Artic Grayling. It is unknown whether the fish were native or planted in the area. Rainbow trout are predominant and small numbers of cutthroat, brook and brown trout are present. The disadvantages to the grayling are due to non-native trout being present including brown trout. The Upper Gallatin River does not appear to provide good grayling habitat because of the few pools present in this region. Most of stream is wide and shallow and flows over clean, coarse substrate without beds of macrophytes. The recent July 1992 experimental plant of Age 1 Big Hole River grayling was instructive and appeared to confirm that even fluvial grayling will tend not to remain in a stream with such characteristics.	3444	Kaya, Calvin M. (1992), Restoration of Fluvial Arctic Grayling to Montana Streams: Assessment of Reintroduction Potential of Streams in the Native Range, the Upper Missouri River Drainage above Great Falls (Masters Thesis)
fish	Surveys of rainbow and brown trout were conducted in numerous years from 1981 through 2004 in the Jack Smith Bridge reach and from 1984-2004 in the Porcupine Creek reach. The surveys yielded fish counts, size range of the captured trout, and population estimates. Numbers of rainbow trout in the Porcupine section show a general increase from 1984 to 2004, with about 1800 fish per mile. Brown trout declined from 1995 to 2004, from about 350 to 160 fish per mile. The brown trout data might indicate a recovery trend from the lows in 1995. The Jack Smith Bridge section shows rainbow trout numbers in 2004 of almost 5000 fish per mile. There was a decline from 2000 to 2002, but the 2004 data indicates a recovery to levels near the 2000 numbers. Brown trout numbers are often about 80 fish per mile in this section.	11355	Montana Department of Fish, Wildlife, and Parks (2006), Montana Rivers Information System (MRIS): Montana Fisheries Information System (MFISH) - http://maps2.nris.mt.gov/scripts/esrimap.dll?name=MFISH&Cmd=INST
macroinvertebrates	All mainstem Gallatin River communities were dominated by	1702	Bollman, Wease (1999), Macroinvertebrates and

	the sensitive caddisfly Glossosoma species, but the relative contribution of this organism to assemblages declined in a downstream direction. It made up 42%, 36% and 30% of samples from the Red Cliff site, the Porcupine bridge site, and the Jack Smith bridge site. In addition the abundance of midges increased steadily from the Red Cliff site to the lowermost site: Chironomids made up 9% of the community at the uppermost site, 14% at the Porcupine site, and 44% at the Jack Smith site. There was a corresponding increase in biotic index, from a mean of 1.62 at the uppermost site, to 2.97 at the lowermost site, the mayfly Drunella dodsi, and the stonefly Diura knowltoni. The coefficient of variability (V) was used as the measure of variability, and it ranged from 3.2% to 34.0%		Bioassessment of the Gallatin River and Tributaries of the West Fork Gallatin River
macroinvertebrates	Replicate samples were collected at the three sites. All mainstem Gallatin River communities were dominated by the sensitive caddisfly Glossosoma species, but the relative contribution of this organism to assemblages declined in a downstream direction. It made up 42%, 36% and 30% of samples from the Red Cliff site, the Porcupine bridge site, and the Jack Smith bridge site. In addition the abundance of midges increased steadily from the Red Cliff site to the lowermost site: Chironomids made up 9% of the community at the uppermost site, 14% at the Porcupine site, and 44% at the Jack Smith site. There was a corresponding increase in biotic index, from a mean of 1.62 at the uppermost site, to 2.97 at the lowermost site. These changes are consistent with a mild increase in organic and/or nutrient pollution over the downstream course of the Gallatin River. Only two sensitive taxa were found at the lowermost site, the mayfly Drunella doddsi, and the stonefly Diura knowltoni. October 1998 Scores for the Red Cliff site were 71% (Partial Support) and 76 (Full Support). Porcupine 76% & 88% both indicating Full Support. Above Jack Smith bridge: 29% and 62 both indicating Partial Support. Sites on the Gallatin in 1998 showed a decline in water quality from the uppermost site at Red Cliff to the lowermost site above Jack Smith Bridge. Organic and/or nutrient pollution was the source of impairment, through thermal influence or sedimentation cannot be ruled out with the evidence at hand. The biotic index increased from 1.62 at the upstream site to 2.97 at the lowermost site.	1702	Bollman, Wease (1999), Macroinvertebrates and Bioassessment of the Gallatin River and Tributaries of the West Fork Gallatin River
macroinvertebrates	Bioassessment : Score: 83, Non-Impaired, Full-Support. Biotic	141	Bollman, Wease (2002), An Analysis of the

	Index: 1.57. Sediment deposition did not appear to impair community integrity at G-1 & G-2. Good habitat at all sites support essentially unimpaired biotic communities.	Aquatic Invertebrates and Habitat of the Gallatin River, August 2000

Reporting Cycle: 2020 **Assessment Record:** MT41H001_021.pdf **Status:** Completed

DATA MATRIX

Habitat Data

Comments: **2006 cycle**: MT DEQ 2000 Field Sampling Results: Percent fines < 6mm were highest below Porcupine Cr., where the grid method yielded an average of 38.5%. Additional modified Wolman pebble count data would be helpful in characterizing the sediment storage/transport relations of the Gallatin River. The particle size distributions obtained from Wolman pebble counts would provide a better comparison to the Beaverhead-Deerlodge NF reference data set, since the methodology used by the USFS (zig-zag pebble count) yields results nearly identical to the Wolman method. That method would also provide results for percent fines less than 2 mm, a habitat threshold value shown to affect some sediment-sensitive macroinvertebrate taxa, and spawning substrate for trout. Stream Reach Assessment: Site G-5 : The substrate was described as, "mostly cobbles and boulders; large amount of silt." Bank erosion is evident in the area of the Greek Creek Campground. Below the West Fork, near Jack Smith Bridge, silt and sand accumulations occur near channel margins and between large rocks located in the central portion of the channel. The scores suggest only moderate severity of sediment deposition.

Near Jack Smith Bridge

Data Type	Comments	Ref Num	Citation
riparian &/or instream surveys & physical features	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998: Stream Reach Assessment Score: 82%, Non-Impaired, Full-Support	4645	(1998), DEQ Field Assessment Form
riparian &/or instream surveys & physical features	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998: Percent fines: Avg: 24.7%	4645	(1998), DEQ Field Assessment Form

About 1 mi. upstream of Spanish Cr.

Data Type	Comments	Ref Num	Citation
riparian &/or instream surveys & physical features	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998: Stream Reach Assessment Score: 70%, Moderate Impairment, Partial-Support	4645	(1998), DEQ Field Assessment Form
riparian &/or instream surveys & physical features	Percent fines: Avg: 33.6%	4645	(1998), DEQ Field Assessment Form

About 3/4 mi downstream of Taylor Fork

Data Type	Comments	Ref Num	Citation
riparian &/or instream surveys & physical features	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998: Percent fines: Avg: 8.3% (Rosgen B-3 channel here)	4645	(1998), DEQ Field Assessment Form
riparian &/or instream surveys & physical features	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998: Stream Reach Assessment Score: 82%, Non-Impaired, Full-Support	4645	(1998), DEQ Field Assessment Form
100 yds below Porcupine Cr.			
Data Type	**Comments**	**Ref Num**	**Citation**
riparian &/or instream surveys & physical features	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998: Stream Reach Assessment Score: 83%, Non-Impaired, Full-Support. No silt evident except in very small areas near the channel margains.	4645	(1998), DEQ Field Assessment Form
riparian &/or instream surveys & physical features	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998 : Percent fines: Avg: 38.5%	4645	(1998), DEQ Field Assessment Form
riparian &/or instream surveys & physical features	2000 Stream Corridor Inventory: GNF: The watershed is located above about 2/3 of Gallatin River and 1/3 above Taylor F. The upper Gallatin watershed geology and soil is described on the previous form. The area is primarily tertiary volcanic. Taylor F. is predominately tertiary volcanic with minimal Mesozoic limestone. The upper 1/4 of the the Taylor F. watershed is cretaceous shale, which is fine (clay) textured and very erosive . During periods of snowfall and runoff or stormflow the cretaceous shales make the TF an energy limited system, which input considerable sediment and turbidity to the Gallatin River system. About 90% if the sediment in this reach come from the T.F. and about 10% come from the upper Gallatin River. The riparian zone is very narrow, about 10 ft. The areas vegetation consists of Douglas firs, grasses, Forbes and willows. G-6: Large limestone (Mesozoic) out crop here on the right bank and alluvial fan on the left bank at the mouth of Gallatin where valley begins to widen. The limestone ridge on the right bank is actively eroding; sheet erosion, debris flow deposits in channels.	4647	(2000), DEQ Field Assessment Form

At Greek Cr. Campground

Data Type	Comments	Ref Num	Citation
riparian &/or instream surveys & physical features	Percent fines: Avg: 29.3%	4645	(1998), DEQ Field Assessment Form
riparian &/or instream surveys & physical features	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998: Stream Reach Assessment Score: 71.5%, Minor Impairment, Partial-Support	4645	(1998), DEQ Field Assessment Form

Just downstream of the lower Yellowstone Park Boundary

Data Type	Comments	Ref Num	Citation
Land use	2000 Stream Corridor Inventory: G-1: The watershed above this area is predominately in Yellowstone National Park. The main variable is heavy Elk & moderately heavy Bison grazing which reduce riparian shrubs (primarily willow) density and vigor to some degree. Overall wildlife grazing is not a likely impact on bank erosion or water quality. The only horses that were seen were at the Black Butte Ranch upstream. Resource conditions are good with the only significant variable being wildlife grazing. Most of the watershed area is located outside Yellowstone National Park in the Lee Metcalf Wilderness, which has no livestock grazing. The overall trends appear to be stable. The Gallatin Hwy 191 GNF/YNP corridor runs along much of this watershed. The main water quality variable would be wildlife feces and eroding stream-banks, which appear to be at about natural levels. There are no evident sources of pollution occurring from the highway GNF: The upper Gallatin Watershed is located in YNP	4647	(2000), DEQ Field Assessment Form
riparian &/or instream surveys & physical features	Evidence of a direct relationship between sediment production and percent of the drainage in the sedimentary category. Thus, it is clear that the potential suspended sediment production problems lie in drainages with highest percentages of sedimentary-glacial-alluvial geologic formations. Based on these findings extreme caution should be exercised when considering management plans for any similar watersheds.	1294	Blue Ribbons of the Big Sky Country Areawide Planning Organization (1978), Forestry

riparian &/or instream surveys & physical features	MT DEQ 2000 Field Sampling Results for the Reassessment of the Upper Gallatin River: The stream transports sediments well; good trout habitat, predominately in runs and riffles. Large boulders provide refuge habitat. Spawning gravels present throughout the stream segment.	4654	(1997), DEQ Field Assessment Form
riparian &/or instream surveys & physical features	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998.: Stream Reach Assessment Score: 78%, Minor Impairment, Partial-Support.	4645	(1998), DEQ Field Assessment Form
riparian &/or instream surveys & physical features	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998: Percent fines: Avg: 20.7	4645	(1998), DEQ Field Assessment Form
riparian &/or instream surveys & physical features	2000 Stream Corridor Inventory: G-6: Lower end of moderate fish cover is being provided; there is partial shading of the channel (about 35%) by willows and firs. There are also numerous boulders and deep pools, and not any woody debris in the water. Embeddedness is <15%; D50=large cobble; minimal macrophyte growth observed; with no undercut banks. G-5: The fish cover in this area is fairly sparse; there are some logs, but few fully submerged in the channel, some undercut banks, some boulders, a few deep pools and partial shading, (about 30%) provided by tall firs lining the channel banks. Embeddedness is about 15% to 20%; D50=cobble, very little macrophyte growth; some silt and sand deposits in eddies at channel edges. G-4: This reach has fairly sparse fish cover available. There are a few logs, not wads and undercut banks that may provide some shelter for the fish habitat. There is not much macrophyte growth and the area has low Embeddedness (<15%); D50=medium cobble, Partial shading (about 30%) of the channel by tall (about 100ft) streamside firs. G-3: The aquatic habitat here is pretty sparse, high width, extremely limited.	4647	(2000), DEQ Field Assessment Form

riparian &/or instream surveys & physical features	2000 Stream Corridor Inventory: G-6: Lower end of moderate fish cover is being provided; there is partial shading of the channel (about 35%) by willows and firs. There are also numerous boulders and deep pools, and not any woody debris in the water. Embeddedness is <15%; D50=large cobble; minimal macrophyte growth observed; with no undercut banks. G-5: The fish cover in this area is fairly sparse; theere are some logs, but few full submerged in the channel, some undercut banks, some boulders, a few deep pools and partial shading, (about 30%) provided by tall firs lining the channel banks. Embeddedness is about 15% to 20%; D50=cobble, very little macrophyte growth; some silt and sand deposits in eddies at channel edges. G-4: This reach has fairly sparse fish cover available. There are a few logs, not wads and undercut banks that may provide some shelter for the fish habitat. There is not much macrophyte growth and the area has low Embeddedness (<15%); D50=medium cobble, Partial shading (about 30%) of the channel by tall (about 100ft) streamside firs. G-3: The aquatic habitat here is pretty sparse, high width, extremely limited.	4647	(2000), DEQ Field Assessment Form
riparian &/or instream surveys & physical features	This segment of the Gallatin River is not on the MFWP List of Dewatering Concern Areas	10801	Montana Department of Fish, Wildlife, and Parks, Fisheries Division (2004), FWP Dewatering Concern Areas: Revised May 2003 [Dewatered Streams List 2003]
riparian &/or instream surveys & physical features	For comparison to reference condition, Beaverhead-Deerlodge National Forest C4 reference reaches have a mean Percent Fines <6 mm of 16%; 90 % confidence intervals are 13-18%. Reference B4 streams have a mean Percent Fines <6 mm of 17%, and 90 % confidence intervals are 12-22%.	10467	(nnnn), USFS Field Data

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DATA MATRIX

Chemistry Data

Comments: **2006 cycle**: Metals: No exceedances of Human Health or Aquatic Life Standards were reported for the sampling results for the six sites. Sediment metals concentrations were below the values shown to affect aquatic life. Other: Specific Conductivity and TDS values were low, indicating low salinity. SAR values indicate low sodium ion levels in ratio to magnesium and calcium ions. The use of Gallatin River water for crop irrigation would not pose a risk to the soils or to sodium-sensitive crops, or for livestock and poultry water. Turbidity is low at base flow conditions. Water Temperatures are below the maximum weekly average temperature for growth rainbow trout (66 F =18.9 C), and temperatures avoided by juvenile and adult rainbow trout: 71 F, and in the range of Optimal Temperature for rainbow trout: 54-66 F. **2020 cycle**: NUTRIENTS: In the years 2013 to 2021, 86 samples were collected for TN and NO2+3, and 80 TP samples collected. TN samples range from non-detect to 0.8mg/L, NO2+3 samples range from non-detect to 0.34mg/L, and TP samples range from non-detect to 0.068mg/L. METALS: One sample had been collected for metals from 2011 to 2021. PHOTO/VIDEOS: Photos from 2018 to 2021 indicate widespread filamentous algae growth

Near Jack Smith Bridge

Data Type	Comments	Ref Num	Citation
benthic sediment data	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998: Sediment metals concentrations were below the values shown to affect aquatic life.	4645	(1998), DEQ Field Assessment Form
common ions, pH, conductivity, miscellaneous	8/22/2000: Water temperature: 12.5 C, pH: 8.43, Specific Conductivity: 347 umhos/cm, Dissolved Oxygen: 12.47 mg/L, TDS: 233 mg/L, TSS: <10 mg/L	4647	(2000), DEQ Field Assessment Form
major nutrients	Total Kjeldahl N: <.5 mg/l, Nitrate + Nitrite: .02 mg/l, Total Phosphorus: .027 mg/l	4647	(2000), DEQ Field Assessment Form
metals	No exceedences of Human Health or Aquatic Life Standards	4647	(2000), DEQ Field Assessment Form
quantitative physical data	pH: 8.43, Dissolved Oxygen: 12.47 mg/L, Specific conductivity: .347 mS/cm, Water temperature: 12.5 C. TDS: 233 mg/L	4647	(2000), DEQ Field Assessment Form

entire segment

Reporting Cycle: 2020 **Assessment Record:** MT41H001_021.pdf **Status:** Completed

Data Type	Comments	Ref Num	Citation
General	86 TN, NO2+3, 80 TP samples collected from 2013 to 2021 48 chlorophyll-a and 48 ash free dry weight samples collected from 2016 to 2020 12 E.coli samples collected in august of 2014 1 As, Al, Cd, Cr, Cu, Pb, Hg, Se, Zn, Fe, Se have been collected in from 2011 to 2021.	15288	Montana Department of Environmental Quality, Planning, Prevention and Assistance Division, Water Quality Planning Bureau (nnnn), Montana Water Quality EQuIS
major nutrients	NO2+3 samples range from non-detect to 0.34mg/L, and TP samples range from non-detect to 0.068mg/L.	11934	Suplee, Michael W. ; Watson, Vicki ; Varghese, Arun ; Cleland, Joshua (2008), Scientific and Technical Basis of the Numeric Nutrient Criteria for Montana's Wadeable Streams and Rivers
major nutrients	This document contains the numeric total nitrogen (TN) and total phosphorus (TP) standards for wadeable streams in the Middle Rockies level III ecoregion. These standards were used to analyze TN and TP data for beneficial use determination for wadeable streams	15265	Montana Department of Environmental Quality (2014), Department Circular DEQ-12A: Montana Base Numeric Nutrient Standards, Circular DEQ-12A
major nutrients	In the years 2013 to 2021, 86 samples were collected for TN and NO2+3, and 80 TP samples collected. TN samples range from non-detect to 0.8mg/L, NO2+3 samples range from non-detect to 0.34mg/L, and TP samples range from non-detect to 0.068mg/L.	15655	Montana Department of Environmental Quality (2016), Assessment Methodology for Determining Wadeable Stream Impairment Due to Excess Nitrogen and Phosphorus Levels, WQPBMASTR-01
metals	METALS: 1 samples had been collected for metals from 2011 to 2021.	14350	Drygas, Jonathan (2012), The Montana Department of Environmental Quality Metals Assessment Method-Final, WQPBMASTR-03
metals	This document contains the numeric water quality standards used to evaluate metals concentrations for beneficial use support in waters in the Gallatin River.	13619	Montana Department of Environmental Quality (2012), Montana Numeric Water Quality Standards: Circular DEQ-7, Circular DEQ-7
About 1 mi. upstream of Spanish Cr.			

Reporting Cycle: 2020 **Assessment Record:** MT41H001_021.pdf **Status:** Completed

Data Type	Comments	Ref Num	Citation
common ions, pH, conductivity, miscellaneous	8/22/2000: Water temperature: 13.8 C, pH: 8.50, Specific Conductivity: 293 umhos/cm, Dissolved Oxygen: 11.86 mg/L, TDS: 198 mg/L, TSS: <10 mg/L	4647	(2000), DEQ Field Assessment Form
major nutrients	Total Kjeldahl N: <.5 mg/l, Nitrate + Nitrite: <.01 mg/l, Total Phosphorus: .020 mg/l	4647	(2000), DEQ Field Assessment Form
metals	No exceedences of Human Health or Aquatic Life Standards	4647	(2000), DEQ Field Assessment Form
quantitative physical data	pH: 8.5, Dissolved Oxygen: 11.86 mg/L, Specific conductivity: .293 mS/cm, Water temperature: 13.8 C. TDS: 198mg/L	4647	(2000), DEQ Field Assessment Form
About 3/4 mi downstream of Taylor Fork			

Data Type	Comments	Ref Num	Citation
benthic sediment data	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998: Sediment metals concentrations were below the values shown to affect aquatic life. (CDM, 1994. Draft Baseline Risk Assessment Streamside Tailings Operating Unit Silver Bow Creek NPL Site, and MDEQ, 2003. WATER QUALITY RESTORATION PLAN FOR METALS IN THE BLACKFOOT HEADWATERS TMDL PLANNING AREA)	4645	(1998), DEQ Field Assessment Form
common ions, pH, conductivity, miscellaneous	8/21/2000: Water temperature: 14.6 C, pH: 8.31, Specific Conductivity: 272 umhos/cm, Dissolved Oxygen: 10.79 mg/L, TDS: 186 mg/L, TSS: <10 mg/L	4647	(2000), DEQ Field Assessment Form
major nutrients	Van Voast found a saturated thickness of unconsolidated materials as great as 58 feet with yields as large as 200gpm. The groundwater is in good to excellent condition with hardness being the only undesirable concentration. All concentrations other than iron and manganese were within the set of standards. The average concentrations of phosphate were found to be ~0.038 mg PO4-P/1. Nitrate is ~0.003 mg/l NO3-N . Coliform count averaged from 13,000-100,000 and enterococcus counts averaged from 2,400-3,400.	1319	Stuart, David Gordon ; Wright, John C. ; Schillinger, John Edward ; Bissonnette, Gary K. ; Jezeski, James J. (1974), Gallatin Basin Waste Allocation Study
major nutrients	Total Kjeldahl N: <.5 mg/l, Nitrate + Nitrite: <0.01 mg/l, Total Phosphorus: .038 mg/l	4647	(2000), DEQ Field Assessment Form
metals	No exceedences of Human Health or Aquatic Life Standards	4647	(2000), DEQ Field Assessment Form
quantitative physical data	pH: 8.31, Dissolved Oxygen: 10.79 mg/L, Specific conductivity: .272 mS/cm, Water temperature: 14.6 C. TDS: 186mg/L	4647	(2000), DEQ Field Assessment Form
100 yds below Porcupine Cr.			

Data Type	Comments	Ref Num	Citation
benthic sediment data	NUTRIENTS: In the years 2013 to 2021, 86 samples were collected for TN and NO2+3, and 80 TP samples collected. TN samples range from non-detect to 0.8mg/L, NO2+3 samples range from non-detect to 0.34mg/L, and TP samples range from non-detect to 0.068mg/L.METALS: Zero samples had been collected for metals from 2011 to 2021.PHOTO/VIDEOS: Photos from 2018 to 2021 indicate widespread filamentous algae growth	10546	Ontario Ministry of the Environment (1993), Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario
benthic sediment data	MDEQ 1998. Data and field notes from assessment of West Fork and upper Gallatin drainage, October 1998: Sediment metals concentrations were below the values shown to affect aquatic life.	4645	(1998), DEQ Field Assessment Form
common ions, pH, conductivity, miscellaneous	8/22/2000: Water temperature: 9.1 C, pH: 8.09, Specific Conductivity: 284 umhos/cm, Dissolved Oxygen: 12.22 mg/L, TDS: 186 mg/L, TSS: <10 mg/L	4647	(2000), DEQ Field Assessment Form
major nutrients	Total Kjeldahl N: <.5 mg/l, Nitrate + Nitrite: < .01 mg/l, Total Phosphorus: .037 mg/l	4647	(2000), DEQ Field Assessment Form
metals	No exceedences of Human Health or Aquatic Life Standards	4647	(2000), DEQ Field Assessment Form
quantitative physical data	pH: 8.09, Dissolved Oxygen: 12.22 mg/L, Specific conductivity: .284 mS/cm, Water temperature: 9.1 C. TDS=186 mg/L	4647	(2000), DEQ Field Assessment Form

At Greek Cr. Campground

Data Type	Comments	Ref Num	Citation
common ions, pH, conductivity, miscellaneous	8/22/2000: Water temperature: 13.0 C, pH: 8.4, Specific Conductivity: 321 umhos/cm, Dissolved Oxygen: 12.6 mg/L, TDS: 216 mg/L, TSS: <10 mg/L	4647	(2000), DEQ Field Assessment Form
major nutrients	Total Kjeldahl N: <.5 mg/l, Nitrate + Nitrite: <.01 mg/l, Total Phosphorus: .029 mg/l	4647	(2000), DEQ Field Assessment Form
metals	No exceedences of Human Health or Aquatic Life Standards	4647	(2000), DEQ Field Assessment Form
quantitative physical data	pH: 8.4, Dissolved Oxygen: 12.60 mg/L, Specific conductivity: .321 mS/cm, Water temperature: 13.0 C. TDS: 216 mg/L	4647	(2000), DEQ Field Assessment Form

Just downstream of the lower Yellowstone Park Boundary

Data Type	Comments	Ref Num	Citation
Rosgen type	2000 Stream Corridor Inventory: G-1: C3 G-3: B3 G-4: C3 G-5: C3 G-6: C3-B2 almost C2	4647	(2000), DEQ Field Assessment Form
benthic sediment data	Table 1 of this document provides sediment metals concentrations values that have been shown to be at the "No Effect Level", "Lowest Effect Level", and "Severe Effect Level".	10546	Ontario Ministry of the Environment (1993), Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario
benthic sediment data	Table 5-20 of this document provides summary of ecological risks from chemical and metal stressors.	984	Gendusa, Tony ; LaVelle, James M. (1994), Draft Baseline Risk Assessment: Streamside Tailing Operable Unit Silver Bow Creek NPL Site, MDHES Contract # 430009-TO6
benthic sediment data	Sediment metals concentrations (ug/g), guideline thresholds of impairment to aquatic life.	4428	Anderson, Bob ; Yashan, Dean ; Walker, Mark ; Bernd-Cohen, Tina (2003), Water Quality Restoration Plan for Metals in the Blackfoot Headwaters TMDL Planning Area
common ions, pH, conductivity, miscellaneous	8/21/2000: Water temperature: 12 C, pH: 8.02, Specific Conductivity: 249 umhos/cm, Dissolved Oxygen: 11.8 mg/L, TDS: 169 mg/L, TSS: 4.5 mg/L	4647	(2000), DEQ Field Assessment Form
major nutrients	Inorganic phosphorus enrichment is generally less extensive than nitrate enrichment. In this area microorganisms are not expected to move more than 3 meters under saturated conditions. Groundwater in this area contained ~0.035 mg of phosphorus and ~0.14 mg of nitrate nitrogen per liter. This was nearly identical to the levels found in the river but exceeds the average nitrate levels by 26 fold. Studies indicated that objectionable growths of cladophora occur when inorganic phosphorus concentrations approximate 0.10 mg/l. Average concentrations of phosphorus amounted to 0.038 mg/l ranging from a high of 0.045 mg/l to a low of 0.023 mg/l. Considering the low total dissolved solids of 216 mg/l and the low nutrient concentrations, the Gallatin River was classified as an oligotrophic stream.	380	Keppner, Alfred P. ; Nielson, Gerald A. ; Wright, John C. (1971), Assessing Potential Impacts of Sewage From Recreational Development in a Semi-Primitive Watershed

major nutrients	Total Kjeldahl N: <.5 mg/l, Nitrate + Nitrite: .02 mg/l, Total Phosphorus: .037 mg/l. 2000 DEQ nutrient data: Reported Total Phosphorus concentrations generally decrease in a downstream direction. A slight increase in phosphorus occurs downstream of Taylor Fork. Total Kjeldahl Nitrogen concentrations were below the (rather high..) laboratory method detection level of 0.5 mg/L at all sites. Only two sites had a Nitrate + Nitrite value greater than the lab method detection level, and those were just .02 mg/L. Additional nutrient monitoring is suggested, with the results reported to a lower method detection level. As is , the 2000 MDEQ nutrient data does not suggest impairment of beneficial uses.	4647	(2000), DEQ Field Assessment Form

major nutrients	Observations of the Nitrate data from this study: Data from this three-year study shows that the West Fork Gallatin River is sometimes the source of significant loads of nitrate to the Gallatin River. Monitoring sites were located on the Gallatin River upstream and downstream of the the mouth of the West Fork Gallatin, and on the West Fork. A cursory analysis of this paired data resulted in the following observations: 1) Nitrate concentrations in the WF Gallatin were often 2-3 times higher than the Gallatin River above the mouth of the West Fork. 2) Nitrate concentrations in the Gallatin R below the West Fork rise significantly during the Fall, Winter, and Spring, but apparently not during the Summer sampling periods. Four selected dates yielded Nitrate increases of 33%, 60%, 70%, and 140% between the two Gallatin River assessment sites. The corresponding increases in nitrate concentrations on those dates were: from 0.09 mg/L to 0.12 mg/L, from 0.075 mg/L to 0.12 mg/L, from 0.05 mg/L to 0.085 mg/L, and from 0.05 mg/L to 0.12 mg/L. Those selected dates were during November, December, January, and April. During the summer months of the three-year monitoring effort, the Nitrate concentrations of the West Fork Gallatin were similar to those of the Gallatin River, and did not result in an increase in Nitrate concentrations in the Gallatin River. The increases seemed to occur during the late Fall, winter, and early spring, and the resulting concentrations were moderately higher than the upper (90th) confidence limit of the p90 reference site Nitrate concentration value for the Winter period (0.100 mg/L). This analysis concludes that there is a seasonal influence in Nitrate concentrations due to contributed loads from the West Fork Gallatin drainage. This seems to occur during the most benign periods of the year, when there is little to no chance of excess growth algal developing in response to the nitrate load.	10813	Montana State University, Blue Water Task Force (2004), Upper Gallatin Monitoring Data for 2000 Through 2003
major nutrients	Analysis of Nitrate sampling results for Aquatic Life and Cold Water Fisheries Uses: A comparison is made to the upper 90th confidence level for the 90th percentile for the Level 3 Ecoregion Middle Rockies, stratified by season. That UCL value for the Winter Season for Nitrate plus Nitrite is 0.100 mg/L.	10813	Montana State University, Blue Water Task Force (2004), Upper Gallatin Monitoring Data for 2000 Through 2003

major nutrients	Aquatic Life uses: If a nutrient concentration is less than or equal to the 90th percentile of reference, it meets the intent of the statement, "nutrient concentrations are similar to reference condition". Nutrient concentrations above the 90th percentile of reference can be interpreted as " moderately higher" or "substantially higher" than reference, and therefore impairing aquatic life/fishery uses. Contact Recreation uses: Nuisance algae generally occur when nutrient concentrations are at or above the 80th percentile of reference. "Nutrient concentrations at the 80th percentile of reference can be used to help assess impacts to Contact Recreation, but only in conjunction with benthic chl-a."	10811	Suplee, Michael W. (2005), Best Use of the June 2005 Nutrient Data Statistical Summaries
major nutrients	This document concludes that there is no significant difference in Nitrate concentrations among streams grouped in 2nd, 3rd , and 4th Strahler order from that of 5th order streams. Reference concentration percentiles from 2nd-4th order streams may therefore be applied to 5th order streams. The lower and upper confidence intervals provide a 90 percent confidence range in which the true percentile value may be expected to lie. Middle Rockies level 3 Ecoregion reference sites data for Nitrate plus Nitrite, Growing Season has an upper confidence level for the 90th percentile of 0.094 mg/L. (The LCL and UCL values are: LCL: 0.040 mg/L, UCL: 0.094 mg/L .) For the Winter Season the UCL for the p90 is 0.100 mg/L .	10275	Varghese, Arun ; Cleland, Joshua (2006), Bootstrap Confidence Intervals and Updated Statistical Analyses of Water Quality Data for Montana Rivers and Streams
metals	Arsenic concentrations of 20-40 ug/l in the Missouri upstream from Canyon Ferry Reservoir. The Madison River Drainage was measured to be 200-300 ug/l and needs the water from the Missouri drainage to help dilute the Arsenic levels in the water since drinking water standards are currently 50 ug/l. The Jefferson and Gallatin Rivers have a low concentrations of Arsenic; normally helps dilute the high concentrations in the Madison.	4560	Adamsen, Floyd James (1974), Phosphorus, Sediment, and Water Interactions in the Gallatin River of Southwestern Montana (Masters Thesis)
metals	No exceedences of Human Health or Aquatic Life Standards at any of the six sites sampled.	4647	(2000), DEQ Field Assessment Form
quantitative physical data	Maximum weekly average for growth , for EBT and RBT: 66 F (=18.9 C) Temperatures avoided by juvenile and adult RBT: 71 F. Optimal Temperature for RBT : 54-66 F.	10588	Coutant, Charles C. (1977), Compilation of Temperature Preference Data

quantitative physical data	Gallatin headwaters: Approximate drainage area=95 square miles. Annual Average Prescipiation=44 in. Average annual yield 1000s Ac. Ft.=96.5.	1320	Water and Environment Consultants, Inc (1977), Gallatin River Stability Evaluation
quantitative physical data	Upper Lethal Limit for RBT: 85F, EBT: 77F	11010	Bell, Milo C. (1986), Fisheries Handbook of Engineering Requirements and Biological Criteria
quantitative physical data	pH: 8.02, Dissolved Oxygen: 11.8 mg/L, Specific conductivity: .249 mS/cm, Water temperature: 12 C. TDS: 169 mg/L	4647	(2000), DEQ Field Assessment Form
quantitative physical data	Suggested range of SAR for Irrigation Water: For soils with clay content greater than 30% , water for flood irrigation should have an SAR of 6 or less. Water for sprinkler irrigation can be higher, with an SAR of 9.	11357	(2007), Montana State University, Bozeman Department of Land Resources and Environmental Sciences, Water Quality and Irrigation Management Website

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DQA SUMMARY

Aquatic Life & Fishes

Nutrients	PASS
Metals	FAIL
Sediment	NOT ASSESSED
Temperature	NOT ASSESSED
Other	NOT ASSESSED

Drinking Water

Metals	FAIL
Other	NOT ASSESSED

Recreation

Nutrients	PASS
E.coli	FAIL
Other	NOT ASSESSED

Agriculture

Common	NOT ASSESSED
Other	NOT ASSESSED

ASSESSMENT HISTORY

Cycle 2006

1996 303 (d) Listing: This segment of the Gallatin River was included on the 1996 303(d) List of impaired waterbodies, as part of another stream segment. Aquatic Life, Cold Water Fishery, and Primary Contact/Recreation uses were judged to be Partially Supported. The 1996 303(d) List indicated the Probable Causes of Impairment as Flow Alteration and Siltation. The Probable Source of Impairment was listed as Agriculture/Irrigated Crop Production. These Causes and Source of Impairment were likely intended only for the segment of the Gallatin River from Spanish Creek to the mouth. 1998 303(d) List: Same as 1996. Waterbodies appearing on the 1996 and 1998 303(d) Lists were re-evaluated for the 2000 List and subsequent 303(d) Lists using a more rigorous Sufficient Credible Data/Beneficial Use Support Determination (SCD/BUD) methodology. 2000, 2002, and 2004 303(d) Lists: There was not sufficient credible data to make beneficial use support determinations for any of the uses for the Gallatin River. 2006 303(d) List: The 2006 update to the waterbody file includes data from the 2000 MDEQ stream reassessment effort and all readily available data. The data assemblage used for this update provided the first use of sufficient credible data for determining beneficial use support/impairment for the uses prescribed for the Gallatin River as a State waterbody with a B-1 water-use classification. The 2006 303(d) Listing for this waterbody concludes Full Support of all beneficial uses.
De-listing of previously-indicated Causes of Impairment: Flow Alteration and Siltation. Both of these Causes of Impairment were probably intended for the stream segment from Spanish Creek to the mouth. The 1996 303(d) List used waterbody ID # MT41H001-1 for both stream segments. This segment of the Gallatin river is not dewatered by flow diversions. Several tributaries in this stream segment contribute substantial flow volume to the Gallatin River. Siltation/sediment deposition appears to cause minor stress to macroinvertebrate and benthic algae communities, but trout populations are robust. The most recent periphyton data suggest that siltation causes minor impairment, but the siltation index value is in the range of full support. The siltation index value above the West Fork was slightly larger than the value below the the West Fork, indicating that the West Fork probably did not contribute a significant amount of sediment to the mainstem Gallatin.

Cycle 2008

Not assessed this cycle

Cycle 2010

Not assessed this cycle

Cycle 2012

Not assessed this cycle

Cycle 2014

Not assessed this cycle

Cycle 2016

Not assessed this cycle

Cycle 2018

Not assessed this cycle

Cycle 2020

This assessment unit (AU) was assessed for nutrients.

Total Nitrogen and Total Phosphorus are not listed. Excessive Algae is identified as the pollutant not fully supporting Primary Contact Recreation and Aquatic Life Beneficial uses.

There was insufficient information to assess for metals.

There was insufficient information to assess for E. coli.

Overall Condition of Segment

OVERALL CONDITION OF ASSESSMENT UNIT
The middle segment of the Gallatin River originates at the Yellowstone National Park boundary and flows 39.28 miles to its confluence with Spanish Creek. The river is in the Middle Rockies ecoregion and flows through sedimentary shale, sandstone, limestone, metamorphic gneiss, schist and granite geology. The landscape in the middle and upper reaches is a mix of evergreen forest and open grassland areas with relatively low-intensity grazing; the middle reach borders some development around the Big Sky meadow; the lower reach is evergreen forest and interspersed harvested areas. Sources identified in this watershed have not been verified except for those identified in the West Fork Gallatin River TMDL.

Assessment indicates Gallatin River from the Yellowstone National Park Boundary to Spanish Creek is impaired for Excessive Algae Growth. Nutrient data were analyzed to update the 2020 303(d) list for this assessment unit for aquatic life and primary contact recreation beneficial uses. Water chemistry, benthic algae samples and aquatic insects were collected following approved sampling protocols during the index period when nutrient standards apply for the Middle Rockies level III ecoregion (July 1 – September 30). Water Chemistry data were evaluated against numeric standards for TN and TP and to recommended NO2+3 nutrient criteria for the middle Rockies ecoregion (TN=0.30mg/L; TP=0.03mg/L; NO2+3=0.01mg/L). Of all samples collected (n=86 for TN and NO2+3; n=80 for TP), one sample exceeded TN standard, one sample NO2+3 exceeded NO2+3 threshold and three samples exceed TP standard and both nutrients passed statistical tests outlined in the assessment method. Benthic algae samples were evaluated against the recommended thresholds for benthic algal chlorophyll-a (120 mg/m2) and ash-free dry weight (35g/m2). Of all the benthic algae samples analyzed (n=48), no samples exceeded chlorophyll-a threshold and 12 (25%) samples exceed ash free dry weight threshold. Additionally, aquatic insect sample results indicate that algae conditions are likely influencing the community and that nutrient tolerant taxa are higher than expected. With excessive algae growth occurring over multiple years and the biological community in the river responding to these conditions, DEQ is listing this segment of the Gallatin River for Algae as a pollutant.

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USE SUPPORT DECISION

Use Class	B-1	Biology Score		Habitat Score		Chemistry Score		Total Score	

Trophic Status: **Trophic Trend:**

Uses	DQA	Method, Data, and Information Used	Assessment Type and Confidence	Use Support	Use Support Certainty	Threatened
Aquatic Life	Fail			Not Fully Supporting	Low	No
Agricultural				Fully Supporting	High	No
Drinking Water	Fail			Fully Supporting	High	No
Primary Contact Recreation	Fail			Not Fully Supporting	Medium	No

Method Number and Description

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IMPAIRMENT INFORMATION

Uses	Cause (Confidence): Source(Confirmed)	Observed Effects
Aquatic Life	227 (): 41 (N), 43 (N), 44 (N), 45 (N), 50 (N), 72 (N), 73 (N), 84 (N), 92 (N), 95 (N), 98 (N), 108 (N), 155 (N), 164 (N), 166 (N), 169 (N)	
Agricultural		
Drinking Water		
Primary Contact Recreation	227 (): 50 (N)	

Cause Number and Description	Source Number and Description	Observed Effect Number and Description
227-Excess Algal Growth	41-Erosion from Derelict Land (Barren Land) 43-Forest Roads (Road Construction and Use) 44-Freshets or Major Flooding 45-Golf Courses 50-Highways, Roads, Bridges, Infrastructure (New Construction) 72-Loss of Riparian Habitat 73-Managed Pasture Grazing 84-Municipal (Urbanized High Density Area) 92-On-site Treatment Systems (Septic Systems and Similar Decentralized Systems) 95-Other Recreational Pollution Sources 98-Other Turf Management 108-Rangeland Grazing 155-Natural Sources 164-Impervious Surface/Parking Lot Runoff 166-Silviculture Activities 169-Unspecified Urban Stormwater	

DELISTING / STATUS CHANGES

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Cause	Reason for Change	Date of Change

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CATEGORY INFORMATION

Previous Cycle	
Cycle	2018
Category	1 - Waters for which all applicable beneficial uses have been assessed and all uses have been determined to be fully supported.
User Defined Category	

Current Cycle	
Cycle	2020
Category	5 - Waters where one or more applicable beneficial uses have been assessed as being impaired or threatened, and a TMDL is required to address the factors causing the impairment or threat.
User Defined Category	