

Attachment B. CLARK FORK BASIN NUTRIENT REDUCTION ACTIVITIES

Point Source Nutrient Reduction Activities

Projects and descriptions provided by Montana DEQ

Nutrient Source	Nutrient Reduction Activity
Missoula wastewater facility	~2013: launched a large-scale tree plantation irrigation project. Irrigates 160 acres of hybrid poplar trees May 1 to September 30. During that period about 10% of total effluent is diverted for irrigation. On average this is about 0.77 million gallons per day (MGD) of 7.45 MGD total. The amount diverted for irrigation is optimized to match evapotranspiration rates. 2009: Launched a pilot project to irrigate 1.6 acres of poplar trees with treated effluent. 2004-2005: Upgraded and expanded the facility's biological nutrient removal (BNR) system, and fermenter. The City first started using biological treatment with activated sludge in 1974. IN 1982 a new solids handling facility, and a new headworks building were constructed to improve treatment processes.
Deer Lodge wastewater facility	2022: Wastewater System Improvement projects were initiated. These included the lining and replacement of sewer lines. They also included the installation of a storm water tank and replacement of sump pump. The improvements reduced inflow and infiltration into the collection system by 50,000 gpd. 2018: Alum was added to the process in July and August to enhance phosphorus removal. Effluent sampling results showed 4.5 mg/L or less for total nitrogen and 0.4 mg/L or less for total phosphorus. Based on the effluent data from the new facility, it appears that TN loads to the Clark Fork River were reduced by approximately 45%, whereas phosphorus loads, while slightly lower, were essentially unchanged. A major challenge for optimizing nutrient removal at the Deer Lodge facility is the significant infiltration of groundwater into the collection system that results in very dilute influent concentrations. 2017: The lagoon system was upgraded to a basic BNR mechanical treatment plant. The process design is called an MLE (Modified Ludzack-Ettinger). The design target effluent concentrations are 0.8 mg/l TP and 8 mg/l TN. The facility is designed for biological nitrogen removal but not biological phosphorus removal. Alum dosing during July, August, and September will be utilized for phosphorus removal

	when the numeric nutrient standards are in effect. This plant was put on line in the fall of 2017. 2009: Replaced old leaking sewer lines by slip lining them. 2008: Developed a land application system for effluent to reduce direct July–September discharge to the river to zero (Note: Reductions occurred only up to 2008, as facility returned temporarily to direct discharge in 2008).
Town of Plains	2023: Newly built WWTP went into service for the Town of Plains with upgraded monitoring and treatment technology.
Thompson Falls Wastewater Treatment Plant	2021: Sewer plant and treatment system upgrades were initiated in 2021 and completed in 2023. These upgrades included incorporating homes in the town of Thompson Falls into a central sewer and removal of the existing septic systems within the city limits. They also included the installation of a Lemni Covered Lagoon, an ammonia removal polishing reactor, a UV building to treat E. coli, and a headworks stairstep- garbage removal system.
Smurfit-Stone Container Corporation	2010: Mill was closed. The paper mill operated along the banks of the Clark Fork River downstream of Missoula for over 50 years and processed up to 25 million gallons of water per day during peak production. Pre-2010: Reduced nutrient additions to treatment systems; no direct discharge to river July-August (used storage ponds).
Hamilton wastewater treatment plant	2010: Upgraded facility (headworks, flow meters, transfer switch for generator, computer system), added a dissolved air floatation unit, upgraded the return activated sludge pumps, and added a screw press.
Stevensville wastewater facility	2011: Replaced unlined polishing lagoons with a UV disinfection as a final clarifier.
Missoula County	1998-2012: Connected thousands of existing home septic systems to the central sewer.
Butte wastewater facility	2016: Plant was upgraded from a conventional activated sludge (secondary mechanical treatment) plant to a membrane BNR plant. The design target effluent limits are 0.3 mg/l TP and 3 mg/l TN.

	2011: Constructed stormwater detention basins to reduce stormwater overflow to the sanitary sewers; reduced industrial loads; grew sod with effluent in summer; updated facilities headworks, and installed influent and effluent Parshall flumes, and two vertical turbine effluent pumps for sod farm.
Lolo Wastewater Facility	2014: Plant staff, DEQ and Water Planet technicians visited to plant to engage in optimization discussions. Based on operational changes to the aeration basins, TN in the effluent was reduced from 28 mg/L to 21 mg/L resulting in a 25% reduction. TP remained essentially unchanged with the operational changes, but was reduced from an average concentration of 4.6 mg/L to 4.4 mg/L.
Polson Wastewater Facility	2018: Replacement of an existing lagoon system with a sequencing batch reactor (SBR) mechanical plant. Plant operates under an NPDES discharge permit administered by the EPA. Design target effluent concentrations are 8 mg/L TN and 1.5 mg/L TP.

Non-Point Source Nutrient Reduction Activities

Projects and descriptions provided by Montana DEQ

Date	Waterbody/Project Name	Project Sponsor or Organization
2022-Present	Nevada Creek Restoration Project Phase 5	Big Blackfoot Chapter Of Trout Unlimited
This project will reduce nonpoint source pollution on a minimum of 3,900 feet of Nevada Creek. This will include developing and implementing a grazing management plan for 375 acres of grazing land. Restoration will include stabilization of high, eroding streambanks by lowering them, reconnecting the floodplain, and establishing native riparian vegetation.		
2022-Present	Revegetate the Valley	Bitter Root Water Forum
Revegetate the Valley will assist at least three private landowners with streamside restoration and grazing best management practices to reduce pollutant loading to streams identified in the Bitterroot Watershed Restoration Plan.		
2022-Present	Fishing Access Site Revegetation	Bitter Root Water Forum
Revegetation, protective fencing for plantings, and educational signage shall be installed at Chief Looking Glass, Tucker Crossing, C Ben White, Weigh Station, Clearwater Crossing, and Westslope Fishing Access Sites to improve habitat and reduce temperature and sediment loading.		

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2022-Present	Willow Creek Stabilization	Bitter Root Water Forum
Three high, eroding banks will be stabilized along Willow Creek. A small road adjacent to the eroding banks will be modified, and a horse pasture will be improved by installing 1,000 feet of livestock fencing and two water gaps.		
2022-Present	O'Brien Creek Sediment Reduction	Clark Fork Coalition
Sediment pollution will be addressed along 2,500 feet of O'Brien Creek by stabilizing eroding streambanks, realigning the stream channel, reconnecting the floodplain, and restoring aquatic habitat using revegetation and large wood installation.		
2022-Present	Upper O'Brien Creek Restoration Planning	Clark Fork Coalition
Design plans for upper O'Brien Creek will address eroding stream banks and parallel road segments within 200 feet of the stream channel/		
2022-Present	Miller Creek (Leik) Restoration Planning and Implementation	Clark Fork Coalition
Reduction of sediment pollution and habitat improvement will be accomplished along 1,500 feet of Miller Creek by implementing grazing best practices, stabilizing eroding streambanks, reconnecting the floodplain, and installing native vegetation and large woody debris.		
2022-Present	Ranching for Rivers	Montana Association Of Conservation Districts
The purpose of this project was to establish improved grazing management in riparian areas adjacent to or upstream of DEQ-identified impaired waterbodies. Landowners with grazing activities in riparian areas were solicited for participation in the program. By providing cost share for strategic riparian fencing, sediment loading to impaired waterbodies will be reduced.		
2022-Present	Flint Creek Riparian Restoration - Phase 2	Trout Unlimited, Inc.
New riparian fencing for livestock, stabilized banks using large woody debris and revegetation, increased stream meander, riffle and point bar enhancements, and wetland creation in the abandoned channel will address sediment and habitat impairments on Flint Creek.		
2021-Present	Upper Ninemile Creek Placer Mine Reclamation and Stream Restoration – Phases 5 and 6	Trout Unlimited, Inc.
The purpose of this Contract is to rehabilitate habitat modifications and reduce sediment loading to placer mining impacted reaches of Ninemile Creek. Objectives of this project are to remove approximately 245,000 cubic yards of placer processed material and to establish approximately 6,500 feet of naturally functioning stream channel and 45 acres of floodplain, riparian buffer, and off channel wetlands. This contract is for Phases 5 and 6 (from the confluence with Twin Creek through		

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the confluence with Soldier Creek and ending at the confluence with Camp Creek) of a broad scale (approximately five miles) rehabilitation of Ninemile Creek and its tributaries.		
2021-Present	Returning Lolo Creek to a Natural State	Lolo Watershed Group
To restore approximately 3,000 feet of Lolo Creek as designated by DEQ to reduce sediment pollution, restore natural stream processes, and improve riparian and instream habitat. The designs must address both construction and land management actions. Contractor shall conduct education and outreach activities to educate the public and landowners about nonpoint source pollution and gain interest for similar water quality improvement projects. (Continuation of 220106)		
2021-Present	Basin-wide Restoration of the Upper Lolo Watershed	Clark Fork Coalition
Design and implement a water quality improvement project that will reduce sources of sediment pollution and improve native fish habitat throughout the Upper Lolo watershed. The project will include decommissioning at least 4.4 miles of roads, upgrading at least 19 culverts, and installing large woody debris (LWD) jams along 19.1 miles of streams. This current phase of work builds on previous similar projects implemented within the Upper Lolo watershed, beginning in 2006.		
2021-Present	Project on Threemile tributaries	Bitter Root Water Forum
This contract will reduce sediment and nutrient pollution on Threemile Creek and its tributaries. Contractor will develop plans to improve water quality and land management of a ranch property spanning three tributaries. On the 2nd project, riparian fencing will be installed on 2,200 feet of Threemile Creek.		
2021-Present	Project on Threemile creek	Bitter Root Water Forum
This contract will reduce sediment and nutrient pollution on Threemile Creek and its tributaries. Contractor will develop plans to improve water quality and land management of a ranch property spanning three tributaries. On the 2nd project, riparian fencing will be installed on 2,200 feet of Threemile Creek.		
2021-Present	Poorman Creek Restoration Project	Big Blackfoot Chapter Of Trout Unlimited
Reduce nonpoint source pollution (riparian habitat loss and sediment erosion) on a minimum of 9,500 feet of Poorman Creek. Contractor shall implement restoration techniques and land management practices that restore and maintain natural stream conditions and processes.		
2020-Present	West Fork Lolo and Lee Creek project	Clark Fork Coalition
To address sediment from forest roads and improve native fish habitat in the West Fork Lolo and Lee Creek drainages, 11 miles of forest roads and 25 associated culverts will be decommissioned.		
2020-Present	O'Brien Creek Project Design	Clark Fork Coalition

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Design a stream restoration project that will improve water quality on O'Brien Creek by reducing sediment pollution, improving riparian and instream habitat, and ensure floodplain connectivity.		
2020-Present	Miller Creek-Wustner and MPG Projects	Clark Fork Coalition
Miller Creek restoration projects on the Wustner and MPG properties will reduce sediment pollution, restore natural stream processes including channel migration, and improve riparian habitat		
2020-Present	Returning Lolo Creek to a Natural State	Lolo Watershed Group
Design a stream restoration project that will reduce sediment pollution on Lolo Creek by improving riparian and instream function and habitat on at least 3,000 feet of existing stream channel.		
2020-Present	Flint Creek Riparian Restoration	Trout Unlimited, Inc.
This project will reduce nonpoint sources of metals, nutrients, and sediment pollution through stream bank restoration, revegetation, grazing management BMPs, and community education.		
2019-Present	Threemile Project	Bitter Root Water Forum
Three projects near Stevensville, MT, will help address sediment, temperature, and nutrients—the most prevalent nonpoint source pollution impairments identified in the Bitterroot Watershed Restoration Plan. Installation of rolling dips, drainage features, and culverts on 1.7 miles of roads in the Threemile/Wheelbarrow Creek drainage will reduce erosion into nearby streams.		
2019-Present	Bitterroot Project	Bitter Root Water Forum
Three projects near Stevensville, MT, will help address sediment, temperature, and nutrients—the most prevalent nonpoint source pollution impairments identified in the Bitterroot Watershed Restoration Plan. Fencing 400+ feet of streambank, revegetating 0.17 acres of riparian area, and installing interpretive signage at a Fishing Access Site on the Bitterroot River will help increase shade, reduce streambank erosion, and educate the public about riparian vegetation and water quality.		
2019-Present	North Burnt Fork Project	Bitter Root Water Forum
Three projects near Stevensville, MT, will help address sediment, temperature, and nutrients—the most prevalent nonpoint source pollution impairments identified in the Bitterroot Watershed Restoration Plan. The implementation of at least one fencing and revegetation project along North Burnt Fork Creek will increase riparian vegetation, stabilize streambanks, and reduce pollution loading associated with grazing.		
2019-Present	Sims Meander Stream and Floodplain Restoration	Sims Meander Stream and Floodplain Restoration
Reduce sediment inputs and improve altered stream-side vegetation along the Vermillion River by reestablishing a functional floodplain, stream channel, and riparian vegetation. Project activities shall address disturbance from historic mining and forestry operations and include recontouring the floodplain, installing floodplain and in-stream structures, and revegetating the floodplain along a		

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1,500-2,000 foot reach. Located downstream from the Chapel Slide and Miners Gulch restoration phases, this project continues an upstream to downstream effort to improve water quality and habitat.		
2018—Present	Tramway Creek Mine Reclamation	Trout Unlimited
Activity Description: Water quality in Tramway Creek, a tributary to the Little Blackfoot River, will be improved by removing ~30,000 cubic yards of mine waste from multiple sites, hauling the material to an existing repository, and regrading and revegetating streambanks.		
2018—Present	Cow Creek Restoration Project	Flathead Conservation District
Activity Description: Restoration along Cow Creek, a tributary to the Whitefish River, will reduce pollutants to downstream impaired waterbodies. Riparian fencing, hardened water crossings, and water gaps will protect streambanks from trampling, and stream channel function will improve by reestablishing native riparian and woody vegetation and floodplain connection.		
2018—Present	Granite Creek Sediment Reduction	Clark Fork Coalition
Activity Description: Sediment input to Upper Lolo Creek will be reduced by completing 100% recontouring of 8.5 miles of forest roads and removing at least 9 culverts. Work is anticipated to reduce sediment in Granite Creek by up to 175 tons/year.		
2018—Present	Fencing and Riparian Improvements on Miller Creek	Bitter Root Water Forum
Activity Description: The Water Forum is working with the Oxbow Cattle Co. to rebuild a healthy riparian area with exclosure fencing, appropriately sized water gaps, beaver mimicry, and riparian plantings.		
2017—Present	Middle and Upper Blackfoot Stream Restoration	Blackfoot Challenge
Activity Description: Sediment and nutrient inputs will be reduced along a 3,700-foot reach of Nevada Creek, a tributary to the Blackfoot River, by stabilizing banks, reconnecting the floodplain, and improving riparian and instream habitat. Grazing management plans will also be established at sites along Nevada and Chimney Creeks.		
2017—Present	Temperature and Sediment Reduction on the East Fork of the Bitterroot	Bitter Root Water Forum
Activity Description: This project's goal is to reduce pollutant inputs to the East Fork of the Bitterroot River by stabilizing stream banks. 2,000 feet of fencing was installed to protect streambanks and the reestablishment of nursery plants and live shrub transplants.		
2017—Present	Ontario and Monarch Creek Floodplain Project	Helena National Forest

Date	Waterbody/Project Name	Project Sponsor or Organization
Activity Description: This project will reduce sediment loading to the Little Blackfoot River and its tributaries by removing 7,800 feet of road segments and associated crossing structures. This will require rerouting Ontario Creek away from a road and into a historic channel.		
2017—Present	Lower Swan Valley Road Sediment Reduction Project	Swan Valley Connections
Activity Description: Road decommissioning and stream restoration projects in Squeezer Creek, Whitetail Creek, and Woodward Creek watersheds will reduce sediment delivery. Project activities include removing culverts and abandoned bridge abutments, obliterating roads, creating alternate roads with best management practices in place, stabilizing road slopes with terracing and vegetation, and restoring channel geometry and floodplain connection.		
2017—Present	Mud Creek Stream and Wetland Restoration Project	Lincoln Conservation District
Activity Description: This site was a timber milling operation from 1954 - 1973, during which time a cooling pond was installed and Mud Creek was straightened and channelized. Restoration of Mud Creek includes improving riparian and floodplain conditions by reconnecting the floodplain, creating a matrix of wetlands, and creating complex aquatic habitat.		
2013—Present	Ninemile Creek Reclamation	Trout Unlimited
Activity Description: By the end of 2018, Trout Unlimited and partners will have restored over 1.5 miles of stream channel and associated floodplain of Ninemile Creek and tributaries. This watershed was heavily impacted by historical placer and hardrock mining. Restoration included the removal of over 150,000 cubic yards of sediment from remnant placer piles in the historical floodplain.		
2014—Present	Bull River Sediment Reduction and Revegetation	Lower Clark Fork Watershed Council
Activity Description: This will replace invasive reed canary grass, which covers most of the banks along the Bull River, with deeply-rooted riparian shrubs and trees. 11,000 feet of fencing was used to build exclosures that were revegetated with native plants.		
2012—Present	Watershed Restoration Plans	Local watershed groups
Activity Description: Since 2012, 13 watershed groups within the Clark Fork River basin completed a Watershed Restoration Plan and more are in development. Watersheds with approved Watershed Restoration Plans include the Bitterroot River, Blackfoot River, Flathead Lake, Flathead-Stillwater, Flint Creek, Kootenai Basin, Little Blackfoot, Lolo Creek, Lower Clark Fork, Ninemile Creek, Swan Lake, Rock Creek, Miller Creek, Thompson River, and Upper Clark Fork River Tributaries. These documents guide planning and implementation of restoration activities and make watershed groups eligible for grant funding through the Clean Water Act Section 319 program.		
2015-2017	Telegraph Creek Restoration	Trout Unlimited

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Activity Description: Three waste rock piles were removed from the Lily/Orphan Boy abandoned mine site, including one that spanned Telegraph Creek. Additional contaminated sediment was removed from the floodplain, 400 feet of stream channel was restored to natural conditions, and floodplain wetland acreage increased. The project resulted in decreases of long-term sediment and metals loading.		
2015-2017	Upper Lolo Creek Sediment Reduction Project	Clark Fork Coalition
Activity Description: 12 miles of forest roads were 100% recontoured. At 19 sites where culverts were removed, recontouring matches natural stream geomorphology, and large woody debris and boulders were placed to control the grade. The project reduced pollutants in Upper Lolo Creek and opened 7-10 miles of stream to fish for spawning and cold water refugia.		
2016	Flathead Ripples of Change Project	Flathead Lakers
Activity Description: 2,650 feet of the riparian area along Ashley Creek was fenced off from livestock and a water gap was built to limit stream access by livestock. Additionally, a lakefront lawn was converted to a vegetated riparian buffer.		
2012-2016	Watershed Improvement through Sediment Reduction in Upper Sleeping Child Creek and Rye Creek	Bitter Root Water Forum
Activity Description: Pollutant inputs to Rye and Sleeping Child Creeks were reduced by installing 250 feet of bioengineered, fabric-wrapped soil lifts to help stabilize eroding banks. One woody debris pile was built, and one was rebuilt, to stop erosion and avulsion.		
2015-2017	Sediment Reduction in Lolo Creek Watershed	Lolo Watershed Group
Activity Description: Primarily in burned riparian areas, 840 feet of streambank along Highway 12 were improved by planting ~900 trees to serve as a riparian buffer between the road and the creek.		
2012-2015	Browns Gulch Restoration Project	Watershed Restoration Coalition for the Upper Clark Fork River
Activity Description: This project was designed to restore water quality and wetland and aquatic habitat in the largest tributary to Silver Bow Creek. It reduced sedimentation from streambanks and roads by stabilizing banks and improving drainage on 9 miles of county road. Funding also supported reconstruction of livestock corrals, installation of an all-season livestock water tank, and fencing off the creek to protect the banks from cattle.		
2012-2014	Swan Watershed TMDL Implementation	Swan Ecosystem Center
Activity Description: By 2010, landownership of 93% of the Jim Creek watershed had been transferred from private timberlands to public lands. This grant contract funded an assessment of forest roads and a design for restoration based on the assessment's results. Best management practices were		

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installed along 7.3 miles of road along lower Jim Creek to reduce pollutant inputs to streams and lakes. In 2018, sediment was removed as an impairment cause on Jim Creek.		
2013-2017	Lost Horse Creek Streamflow Enhancement	Clark Fork Coalition
Activity Description: Irrigation from Lost Horse Creek was formerly provided by excavating an earthen dam. This project funded construction of a siphon to provide irrigation water instead. Flows in Lost Horse Creek increased by more than 10 cfs and reconnected the creek to the Bitterroot River. Additionally, because yearly excavations are no longer necessary, this project decreased sediment inputs. Increased flows lowered stream temperature and restored connectivity for migratory fish, especially rare westslope cutthroat trout.		
2013-2014	Realign Clear Creek Road	Lolo National Forest
Activity Description: The goal of the project was to improve water quality by reducing or eliminating the frequency of road washout and streambank failure at several locations. Objectives focused on realigning the road further from Clear Creek and creating floodplain.		
2013-2014	East Fork Bitterroot River Watershed Improvement	Trout Unlimited
Activity Description: This project fully decommissioned 10 miles of forest roads along tributaries to the East Fork Bitterroot River. Activities included decompaction, recontouring, seeding, fertilizing, mulching, removing culverts, and re-grading the stream channel to match historic contours.		
2012	Revegetation on East Fork Bitterroot	Bitter Root Water Forum
Activity Description: Volunteers revegetated 380 feet of streambank to increase the size and quality of the riparian buffer between Highway 93 and the East Fork Bitterroot River. This small-scale effort accomplished 1 of 5 designs aimed at revegetating 5,000 feet of bank within a 2 mile stretch of road.		
2012-2014	Blackfoot Watershed Water Quality and Native Fish Restoration	Blackfoot Challenge
Activity Description: Restoration projects along ~9,000 feet of Cottonwood, South Fork Poorman, and Ashby creeks improved water quality by stabilizing and revegetating eroding streambanks. The restoration included obliterating roads, reconstructing stream channels, replacing culverts with bridges, and removing four fords.		
2010-2014	Conservation Advisor for Livestock Operations	Soil and Water Conservation Districts of Montana
Activity Description: This project reduced nonpoint source pollution associated with animal feeding operations by providing an on-site assessment tool to determine risk of impacting water quality. Based on these assessments, consulting and funding for best management practices implementation was provided. 28 assessments were conducted, and 3 resulted in on-the-ground projects (2 in the Stillwater basin). 3,000 copies of the on-site assessment tool were published and distributed to		

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conservation districts and posted electronically on the Montana Association of Conservation District's website (www.macdnet.org).		
2011-2013	Haskill Creek Floodplain Renovation	Flathead Conservation District
Activity Description: This project created a riparian buffer for agricultural land. Floodplain renovation along 1,222 feet of Haskill Creek included lowering high banks to floodplain elevation, installing woody debris jams and conifer/willow fascines, and implementing a rigorous floodplain revegetation plan. The project successfully provided bank stability and reduced erosion in the project reach by 74%.		
2010-2011	Bigfork Stormwater Project	Flathead County
Activity Description: The Bigfork Stormwater Project improved water quality in Bigfork Bay and Flathead Lake by developing successful stormwater management strategies. Flathead County installed a stormwater conveyance and filtration systems and pet waste bins to reduce nutrient, sediment, and <i>E. coli</i> pollution.		
2007-2012	Upper Clark Fork Activities	Deer Lodge Valley Conservation District
Activity Description: Multiple projects completed under this grant contract reduced metals, nutrients, sediment, and temperature pollution from private ranches in the upper Clark Fork basin. Installation of projects concluded in 2011 and included new pivot irrigation, stockwater pipelines, corrals, and riparian fencing along Gold Creek. On Peterson Creek, over 6 miles of 3-strand high tensile electric fence was installed to protect 3 miles (the majority) of Peterson Creek from livestock impact. Additionally, an 18,000-foot stock water pipeline was installed to supply 5 tanks with seasonal stock water.		