



Big Spring Creek Watershed TMDL Implementation Evaluation



December 2019

Steve Bullock, Governor
Shaun McGrath, Director DEQ



Prepared by:

Water Protection Bureau
Watershed Protection Section
Robert Ray, Water Quality Specialist

Contributors:

Fergus County Conservation District
Montana Department of Fish, Wildlife and Parks
Natural Resources and Conservation Service

Photograph on the title page is of the 319 “Cutler Project”, DEQ contract number 208028, sponsored by the Fergus Conservation District

Montana Department of Environmental Quality
Water Protection Bureau
1520 E. Sixth Avenue
P.O. Box 200901
Helena, MT 59620-0901

Suggested citation: Prepared by Robert Ray. 2019. Big Spring Creek Watershed TMDL Implementation Evaluation. Helena, MT: Montana Dept. of Environmental Quality.

Table of Contents

.....	1
REVISION HISTORY	i
Acronyms	ii
Document Summary	3
1.0 – Background	1
1.1 Impaired Waterbodies and Pollutant Sources	1
1.2 Application of TMDL Targets.....	2
1.3 PCBs.....	2
1.4 Nutrients	2
1.5 Sediment	3
1.6 Local Planning Activities.....	3
2.0 – TMDL Document-Recommended Activities	4
3.0 – Indicators of Progress	5
3.1 – Restoration.....	5
3.2 – Monitoring	6
3.3 – Planning.....	8
4.0 – Recommendations for Additional Work	9
5.0 – Conclusions	10
6.0 – References.....	12
Appendix A – Conclusions Spreadsheet.....	1
Appendix B – Consulted Sources	1

ACRONYMS

AU – Assessment Unit
BLM – United States Bureau of Land Management
BMP – Best Management Practice
CD – Conservation District
DEQ – Montana Department of Environmental Quality
DNRC – Montana Department of Natural Resources and Conservation
DO Dissolved Oxygen
EPA – United States Environmental Protection Agency
EQUIS – DEQ Environmental Quality Information Storage database
FAS – Fishing Access Site
FWP – Montana Department of Fish, Wildlife and Parks
gpm – gallons per minute
ICIS – Integrated Compliance Information System
lbs/day – pounds per day
MCA – Montana Code Annotated
mg/kg – milligram per kilogram (equivalent to parts per million, or ppm)
mg/L – milligram per liter (equivalent to parts per million, or ppm)
mg/m² – milligram per square meter
NPS – Nonpoint Source (pollution)
NO₂ – nitrite
NO₃ - nitrate
NRCS – Natural Resources Conservation Service
PCB - Polychlorinated biphenyls
ppm – parts per million
STORET – EPA’s STORage and RETrieval database
TDS – Total Dissolved Solids
TIE – TMDL Implementation Evaluation
TKN – Total Kjeldahl Nitrogen
TMDL – Total Maximum Daily Load
TMDL Document – A document produced by DEQ to describe the total maximum daily load of a pollutant that a waterbody can receive and still maintain all of its beneficial uses. The document typically also contains pollutant source assessment information and a restoration strategy.
TN – total nitrogen
TP – total phosphorus
TSS – total suspended solids
UCL – Upper Confidence Level
WRP – Watershed Restoration Plan
WWTP – Wastewater Treatment Plant

DOCUMENT SUMMARY

Big Spring Creek watershed is in the geographic center on Montana, encompasses an area of about 400 square miles, and is comprised of two fifth level Hydrologic Unit Codes (HUCs). In 2005, total maximum daily loads (TMDLs) were developed for: upper Big Spring Creek (PCBs or polychlorinated biphenyls); lower Big Spring Creek (PCBs, phosphorus and sediment/siltation). Casino Creek and lower Cottonwood Creek were identified as impaired for nutrients, but no TMDLs were developed for these stream segments.

As part of the TMDL investigation the source of the PCBs were determined to be the Montana Fish, Wildlife and Parks Big Spring Creek Fish Hatchery. Montana Fish, Wildlife and Parks (FWP) has been responsible for directing remediation activities associated with the PCB impairment, with oversight by the US Environmental Protection Agency (EPA) and input from a local PCB advisory council. In March of 2017, the Region 8 determined that the PCB cleanup level in Big Spring Creek met the October 14, 2009 “Approval for Big Springs Creek Streambed Dredging”. TMDL targets for PCB reductions in sediment have been met, and fish tissue targets for Big Spring Creek below Casino Creek have been met **[assess for standards attainment]**, however fish tissue PCB levels above East Fork of Big Spring Creek continue to remain above the TMDL target of 0.025 mg/kg as of 2017 **[needs more time]**.

Fergus Conservation District was awarded two Clean Water Act Section 319 contracts in 2008 and 2011 to investigate and reduce nutrient and sediment sources in Big Spring Creek. Several sediment and nutrient reduction projects have been completed and NRCS Farm Bill funding has been used by producers in the area. However, according to the conservation district, flooding in the Big Spring Creek watershed in 2011 and 2013 caused significant bank erosion and resulted in issuance of numerous 310-permits to address infrastructure and property loss. DEQ recommends additional native riparian vegetation and riparian buffers, reducing stream channelization and eroding banks, using contextually appropriate materials and techniques to address the sediment/siltation listing on lower Big Spring Creek **[needs additional reasonable land, soil and water conservation practices]**.

The Lewistown wastewater treatment plant (WWTP) was upgraded to provide enhanced nutrient removal in 2006, and the Big Spring Fish Hatchery enhanced their ability to remove waste product with the reconstruction of the hatchery raceways in 2011. These actions have very likely reduced phosphorus concentrations in lower Big Spring Creek **[needs more time]**.

Information regarding Casino and Cottonwood is limited, however, water quality monitoring in Casino Creek on four occasions in 2010 suggests Casino Creek might be meeting the northwestern great plains ecoregion nutrient criteria.

1.0 – BACKGROUND

The “Big Spring Creek Watershed Water Quality Restoration Plan and Total Maximum Daily Loads” (Big Spring TMDL) document (DEQ 2005) was submitted to the US Environmental Protection Agency (EPA) in March 2005 and approved by EPA in September 2005.

1.1 IMPAIRED WATERBODIES AND POLLUTANT SOURCES

The following impaired waterbodies are included in whole or in part, within the boundaries of the Big Spring Creek Watershed:

- Big Spring Creek – headwaters to the confluence of Casino Creek: MT 41S004_010
- Big Spring Creek – from Casino Creek to mouth (Judith River): MT 41S004_020
- Casino Creek – from headwaters to mouth (Big Spring Creek): MT 41S004_040
- Cottonwood Creek – from county road at T14N R18E S18 to mouth (Big Spring Creek): MT 41S004_052

Pollutants of concern include the following:

- Polychlorinated biphenyls (PCBs) [upper and lower Big Spring Creek]
- Nutrients [lower Big Spring Creek (TP), Casino Creek and lower Cottonwood Creek (TN, TP)]
- Sediment/siltation [lower Big Spring Creek]
- Alteration in streamside or littoral vegetative cover [non-pollutant- no TMDL required – lower Big Spring Creek, Casino Creek, Lower Cottonwood Creek]

Within the Big Spring Creek Watershed, the main pollutant sources include:

- Aquaculture (FWP hatchery – PCBs): contaminated sediments
- Lewistown Wastewater Treatment Plant (WWTP, permitted): nutrients (total phosphorus)
- Urban stormwater: nutrients, sediment
- Livestock feedlots and animal feeding operations: nutrients, sediment
- Grazing in riparian areas: nutrients, sediment
- Channelization: sediment
- Loss of riparian habitat: nutrients, sediment

TMDLs were written for the following waterbody/pollutant combinations

- Big Spring Creek: Headwaters to Casino Creek: PCBs
- Big Spring Creek: Casino Creek to mouth: PCBs, nutrients (total phosphorus), sediment

TMDLs were NOT written for:

- Casino Creek: nutrients
- Lower Cottonwood Creek: nutrients/dissolved oxygen, sediment/siltation

As part of the Big Spring Creek Watershed TIE, DEQ resolved inconsistencies in the identification of the assessment units (AU) for Big Spring Creek. Specifically, the start of the upper AU (MT 41S004_010) was variously identified as the East Fork of Big Spring Creek, and the headwaters. DEQ has determined that the upper AU beginning is correctly identified as the headwaters of Big Spring Creek, above the Big Spring Creek fish hatchery. Additionally, the lower end of the upper Big Spring Creek AU was variously identified as the confluence with the East Fork of Big Spring Creek and Casino Creek. DEQ has determined that the lower end of upper Big Spring Creek AU is at the confluence of Casino Creek. The

2020 Integrated Report will reflect this correction and an erratum for the Big Spring Creek TMDL document correcting this error will be made.

1.2 APPLICATION OF TMDL TARGETS

Consistent with state law and the Clean Water Act, DEQ reviews and revises water quality standards on a regular basis (75-5-301(3) Montana Code Annotated (MCA)). Additionally, assessment methodologies for interpreting and applying numeric and narrative standards are often developed or updated between completion of the TMDL targets and the subsequent TMDL Implementation Evaluation (TIE). In some cases (e.g. Big Spring Creek total phosphorus TMDL), TMDL targets or target values may be superseded by an updated standard and/or assessment method since the goal of a TMDL is to achieve the applicable water quality standard(s). TMDL Implementation Evaluations often focus on a combination of existing and modified ‘targets’ in recognition of assessment method improvements and/or water quality standards updates.

1.3 PCBs

During the development of the Big Spring TMDL document DEQ determined that the source of the polychlorinated biphenyls, PCBs (Arochlor 1254), was paint used on the raceways of the Big Springs Trout Hatchery, operated by FWP. Decades of maintenance operations included flushing of PCB-containing paint chips into Big Spring Creek. TMDL targets included fish tissue PCB concentrations less than 0.025 mg/kg, and stream sediment PCB concentrations less than 0.189 mg/L. FWP has been responsible in directing restoration activities associated with the PCB impairment, with oversight by EPA and input from a local PCB Advisory Council, established by FWP. Currently DEQ recognizes the EPA’s PCB fish tissue screening value for recreational fishers of 0.020 mg/kg as a water quality attainment standard target (EPA, 2000).

1.4 NUTRIENTS

The TMDL confirmed nutrient (specifically total phosphorus in lower Big Spring Creek) impairments in lower Big Spring Creek, Casino Creek and the lower portion of Cottonwood Creek. While developing the Big Spring TMDL, DEQ’s Standards program was concurrently developing nutrient criteria and the nutrient TMDL used interim values windows. After the Big Spring TMDL document was finished, DEQ promulgated nutrient criteria (DEQ, 2008; DEQ, 2013). This work refined the interim nutrient criteria for the Northwestern Great Plains ecoregion, in which the Lewistown wastewater treatment plant (WWTP) is located. Total nitrogen (TN) criteria changed from an interim value of 0.50 mg/L (used as a TMDL target) to 1.30 mg/L. Total phosphorus (TP) changed from a TMDL target of 0.035 mg/L to the current criteria of 0.150 mg/L. The growing season, during which the criteria apply, was modified from June 1 – November 1 to July 1 through September 30. The TMDL also set a benthic chlorophyll target for the growing season average of less than 100 mg/m² and maximum of 150 mg/m² which is specifically excluded in the current nutrient criteria for the Northwestern Great Plains ecoregion. DEQ’s current nutrient assessment methods, however, include an examination of daily changes between maximum and minimum dissolved oxygen (DO) concentrations, with a change in DO of greater than 5.3 as an indication of problems.

Along with the nutrient concerns in lower Cottonwood Creek, low dissolved oxygen and filamentous algae was identified as a problem. Figure 1 depicts the Level III and IV ecoregions within the Big Spring Creek watershed. The dominant and relevant ecoregions include the Middle Rockies (17); non-

calcareous foothill grassland (43s); and Northwestern Great Plains (43). Figure 1 depicts the watershed ecoregions and applicable nutrient standards.

Permitted point source nutrient discharges in the watershed include the Big Springs trout hatchery located along the border of ecoregions 17 and 43s in the upper Big Spring Creek assessment unit (AU) and the Lewistown wastewater treatment plant located in the Northwestern Great Plains ecoregion 43. TMDL wasteload allocations were provided for the Lewistown WWTP for total phosphorus, and based on flows in Big Spring Creek. Nutrient impairment (total phosphorus only) was found in the lower Big Spring Creek AU. With stream flows between 80 and 250 cfs, the Lewistown WWTP has a TP wasteload allocation between 8.3 and 11.9 pounds per day (lbs/day). This information was used to develop TP discharge limits for the Lewistown WWTP (permit MT0020044). This limit will take effect January 1, 2021. Nonpoint source load allocations for phosphorus sources (Table 8-8, Big Spring TMDL document) were allocated to upstream loading (2.6 – 27.3 lbs/day; 0.006- 0.018 mg/L), urban (0.7 lbs/day; 0.035 mg/L), land use (1 lb/day;), tributaries (1 – 1.5 lbs/day; 0.070 mg/L), plus a margin of safety (1.5 – 4.7 lbs/day).

1.5 SEDIMENT

The Big Spring Creek Watershed TMDL document confirmed the sediment impairment determination for the lower reach of Big Spring Creek based on macroinvertebrate percent clinger taxa, periphyton siltation index data and stream reach assessments (1989 aerial photographic analysis). TMDL sediment targets include macroinvertebrate clinger taxa >50%, a periphyton siltation index of < 25, percent surface fines less than 2 mm in size, of less than 20%. Identified sediment sources include flow modification, bank erosion (mostly human-caused), and localized urban nonpoint source pollution. Load allocations were provided for bank erosion (20% less unstable and eroding banks) and urban stormwater and nonpoint source runoff (60% reduction in TSS loads from stormwater and urban NPS). Flow and tributary contributions were not provided (“phased allocation”). Although the allocations are for the mainstem, reductions in tributary loading can help address mainstem sediment impairment.

Although sediment was determined to meet the standard in lower Cottonwood Creek during the TMDL process, DEQ maintained the sediment impairment listing and has not collected additional sediment data since 2003. During future TMDL activities in the Big Spring watershed, the sediment listing in lower Cottonwood Creek should be re-assessed.

1.6 LOCAL PLANNING ACTIVITIES

Major entities involved in addressing Big Spring Creek water resource concerns include FWP; Natural Resources Conservation Service (NRCS); Fergus Conservation District, the city of Lewistown, the Snowy Mountain chapter of Trout Unlimited; Big Spring Creek Watershed Council and Bureau of Land Management (BLM) Lewistown Field Office. The Conservation District and Watershed Council completed a “Big Spring Creek Watershed Restoration Plan – Phase I” strategy in 2012 as part of a 2008 319 nonpoint source project. The strategy outlined a phased approach to addressing pollutant reductions in the watershed and identified several “Restoration Strategies- Management Measures to Be Implemented”.

2.0 – TMDL DOCUMENT-RECOMMENDED ACTIVITIES

The TMDL document recommends specific restoration activities for addressing pollutants within the Big Spring Creek watershed. These recommendations are summarized by waterbody and pollutant, below:

- Big Spring Creek – (MT 41S004_010 and 020) PCB TMDLs written
 - Hatchery raceway remediation (100% reduction in PCB load)
 - In-stream restoration (79% reduction target in average PCB concentrations in stream sediments)
- Lower Big Spring Creek (MT41S004_020) - nutrients -total phosphorus TMDL written
 - Reduce phosphorus from Lewistown WWTP through MPDES permit
 - Investigate potential nutrient sources from stormwater through Lewistown, residential sources, livestock feedlots and animal feeding operations, and fish hatchery discharges
- Lower Big Spring Creek (MT41S004_020) – sediment/siltation TMDL written
 - Determine appropriate flushing flows
 - Implement BMPs for grazing and agriculture that reduce bank erosion
 - Source assessment work in tributary streams
 - Reduce TSS from stormwater and urban NPS sources
- Casino Creek (MT 41S004040) – nutrients – No TMDL written
 - Apply agricultural and residential BMPs to 85% of the length of Casino Creek
- Lower Cottonwood Creek (MT 41S004_052) – nutrients, dissolved oxygen – No TMDL written
 - Source assessment work through watershed field evaluation, synoptic nutrient survey during low and high flows, and dissolved oxygen, chlorophyll and filamentous algae monitoring

The TMDL document recommends the following types of monitoring activities:

- For Big Spring Creek PCBs
 - Assess the success of remediation activities at the Big Spring fish hatchery
 - Track interim bench marks and final target conditions for PCB concentrations
 - In-stream sediment concentration: <0.189 ppm
 - Fish tissue: <0.025 ppm (superseded by the EPA fish tissue advisory value of 0.020 mg/kg)
 - Identify all possible sources of PCB contamination
- For Big Spring Creek nutrients
 - Evaluate targets and assess target attainment
 - Establish adequate flow information
 - Investigate and delineate potential nutrient sources
- For Big Spring Creek sediment/siltation
 - Monitor and measure hydraulic parameters for determining effective flushing flows
 - Assess road and road crossing sediment contributions
 - Aerial bank erosion and riparian health inventory
 - Monitor stormwater discharges to determine event-mean concentration of TSS
 - Inventory major urban nonpoint sources, present private and public stormwater BMPs
 - Evaluate agricultural and stormwater BMP compliance and effectiveness
- For Casino Creek nutrients
 - Implement, monitor and evaluate BMP effectiveness in meeting water quality targets
 - Evaluate the nutrient targets themselves

- For Cottonwood Creek nutrients; sediment/siltation
 - Continue monitoring of macroinvertebrates and periphyton at established sites

3.0 – INDICATORS OF PROGRESS

Indicators of progress towards achieving Big Spring Creek watershed targets generally fall into one of three major categories: 1) Restoration, 2) Monitoring, and 3) Planning. Below is a summary of actions taken in the Big Spring Creek watershed under these broad categories.

3.1 – RESTORATION

Big Spring Creek Headwaters to confluence with Casino Creek; confluence with Casino Creek to mouth: PCBs

- The FWP contracted with CDM to complete a risk assessment of the PCB contamination in Big Spring Creek (CDM, 2005). Later FWP contracted with Olympus Technical Services to develop a Remedial Investigation (Olympus, 2009a) to characterize the vertical and longitudinal distribution of PCBs, characterize stream processes in Big Spring Creek and support the development of a Feasibility Study. The Feasibility Study was completed by Olympus in 2009 (Olympus, 2009b) and provided a preferred remediation alternative. The preferred alternative was approved by EPA in 2009, and a detailed summary of the dredging operations was completed in a 2014 sediment monitoring report (Olympus, 2014).
- PCB cleanup of state FWP Big Spring fish hatchery in 2011
- Upper hatchery cleanup included buildings, old dump and soil
- Lower Raceways demolished in 2011 due to PCB contamination (2016 Hatchery Permit BMP Plan), with new raceways built with improvements for fish waste collection
- In-stream hydraulic dredging of Big Spring Creek to remove PCBs in reaches 2, 3, and 4 (from the upper hatchery effluent discharge to the confluence with the East Fork, about 2.8 miles) took place from 2011 – August 2013
- Total cost of PCB clean-up approximately \$8.3 million
- PCB sediment concentrations were reduced by 95 – 97%

Big Spring Creek Confluence with Casino Creek to mouth: nutrients (Total Phosphorus)

- Lewistown Wastewater Treatment Plant upgrades were completed in 2006 with enhanced nutrient removal (biological nutrient reduction). 2017 average TP discharge concentration was 0.44 mg/l. [WWTP design goal for TP: <1.0mg/l]. No TMDL was needed for nitrogen, but a TN target was set at 0.5 mg/l for June 1 – November 1, prior to nutrient criteria being set by the Board of Environmental Review. A TP wasteload allocation based on the “draft Circular DEQ 12” was established in 2012. The 2012 discharge permit was issued with a TP limit of 9 pounds TP per day, July 1 – September 30, with an effective date of January 1, 2021 to provide time for facility optimization.
- In the upper Big Spring Creek Big Springs Fish Hatchery improved waste solids control practices in 2011 (renewal of Concentrated Aquatic Animal Production general permit).

Big Spring Creek Confluence with Casino Creek to mouth: Sediment-siltation

- Cutler project (319 – funded contract 208028)- bank stabilization at north (downstream) end of Brewery Flats

- East Fork Dam – repair of operating gate will allow for potential use of storage water to augment low-flow conditions in Big Spring Creek during drought years
- Machler Project (319 contract # 211069) - bank stabilization, sinuosity and floodplain access improvements below Lewistown. This reach, just downstream of Lewistown, was channelized in the 1960's, resulting in a straight and entrenched channel with degraded habitat. The project returned meanders to the channel and created a functional floodplain for 3,200 feet of stream, resulting in the addition of about 1,200 feet of new channel (FWP, 2018). This project was estimated to reduce sediment/siltation by 250 – 300 tons per year (Clint Smith, FWP, personal communication). 319 funds \$185,000 obligated, but spent \$8,519.80. Project was completed in 2017 with DNRC and NRCS funding
- Carroll Trail FAS bank stabilization, sinuosity and floodplain access improvements
- The Fergus Conservation District (Fergus CD) noted that significant flooding occurred in the Big Spring Creek watershed in 2011 and 2013 and that major changes were seen in all creeks in the watershed. Numerous emergency actions and 310 permits were issued to address property loss and infrastructure protection. Fergus CD provided a list of 310 permits issued between 2011 and 2018 (e-mail dated November 5, 2018 from Administrator Shonny Nordlund). In this timeframe 35 permits were issued for Big Spring Creek and 11 for the East Fork, largely for bank stabilization, bridge, culvert and irrigation diversion repairs from flooding.
- Fergus CD also indicated that there has been “lots of riparian fencing” installed by local land owners “on their own”, without governmental financial assistance that would be difficult to document (personal communication with Fergus CD, July 11, 2018 CD meeting).
- DEQ is not aware of additional Big Spring Creek channel restoration activities

Casino Creek Headwaters to mouth: Nutrients

- No known restoration activities

Cottonwood Creek County Rd at T14N, R18E S18 to mouth: Nutrients/DO; sediment/siltation

- No known restoration activities

3.2 – MONITORING

Big Spring Creek PCB-related planning and monitoring

- The Montana Department of Fish, Wildlife and Parks (FW&P) contracted additional in-stream PCB sediment monitoring in 2013 (Olympus, 2015), 2014, 2015 and 2016 (Olympus, 2016)
- FW&P oversaw and/or completed PCB sediment and fish tissue monitoring and benthic macroinvertebrate population censusing in Big Spring Creek. A letter written by FW&P Fisheries Division Administrator Eileen Ryce in November 2016 (FW&P, 2016) to EPA provided a summary of FW&P's sediment, fish tissue and macroinvertebrate monitoring. Rainbow and brown trout were collected annually from 2006 – 2016 for assessing PCB concentrations in fish tissue. Additional fish tissue monitoring by FW&P is planned for 2019. Macroinvertebrates were collected for three years prior to dredging and four years after dredging to determine population recovery
- The TMDL sediment clean up target level was set at 0.189 mg/kg. FW&P sediment monitoring established that the 95% upper confidence level (UCL) of PCBs in sediment in reaches 2, 3 and 4 were 0.127, 0.071 and 0.031 mg/kg, respectively (reported in a letter to EPA (FWP, 2016)). Reach 1 is above all PCB contamination. Reaches 2,3 and 4 are located on upper Big Spring Creek

between the fish hatcheries and the confluence of the East Fork, a distance of approximately 2.8 miles.

- The TMDL target for fish tissue PCB levels was set at 0.025 mg/kg. FWP fish tissue monitoring results from 2015 and 2016 (FWP, 2016) for rainbow trout at all sites had PCB average concentrations less than 0.06 mg/kg, and brown trout at all sites were less than 0.08 mg/kg. Within the remediation area (between the hatchery and East Fork), adult rainbow and brown trout in 2015 and 2016 continue to exceed the DEQ currently recognized PCB fish tissue screening value for recreational fishers of 0.020 mg/kg (EPA, 2000).
- Below East Fork, PCB concentrations in fish tissue in 2016 were below the 0.025 mg/kg target for both rainbow and brown trout adults except for brown trout at the upper most site.
- Benthic macroinvertebrates collected in reach 2, 9 months after dredging showed higher taxa richness and densities than prior to dredging, demonstrating full macroinvertebrate recovery after the dredging disturbance (FWP, 2016).

Big Spring Creek nutrient-related monitoring

- General Concentrated Aquatic Animal Production Permit discusses nutrient standards. [July – September TP: 0.033 mg/l; TN: 0.440 mg/l – ecoregion 43s]. Hatchery is monitoring each outfall for TP, TKN, NO₂, NO₃ in July, August, and September, and TSS twice per year. As pointed out in Section 1.5, reductions in upstream or tributary loads provides benefit to downstream impaired waterbodies. DEQ 319 contract 208028 (2008) provided funding to the Fergus CD to monitor water quality above, in, and below Lewistown in Big Spring Creek, as well as in Wolverine, Burnett, Breed and Casino Creeks. The ecoregion transition on Big Creek occurs around Casino Creek confluence.
- The TN numeric criteria for the Northwestern Great Plains ecoregion is 1.3 mg/L. Big Spring Creek values for TN ranged from 0.2 to 1.0 mg/L (n= 31) during the summer growing season (July – September 30). All TN samples in Big Spring Creek met the TN criteria.
- The TP numeric criteria for the Northwestern Great Plains ecoregion is 0.150 mg/L. TP values ranged from <0.005 to 0.592 mg/L (n=31). Two exceedances of the TP numeric criteria occurred (0.592 and 0.440), both below the WWTF on the same day (August 19, 2009). All other Big Spring Creek samples met the TP numeric criteria (data available through EQuIS and STORET).
- As previously stated in section 3.2 – effluent nutrient and TSS monitoring is a permit requirement for the Lewistown WWTP and Big Springs fish hatchery. Summer monthly summaries can be obtained from discharge monitoring reports (DMRs) or through the EPA Integrated Compliance Information System (ICIS) database
 - Big Spring Fish Hatchery – upper unit: 400 – 500 gpm average daily flow
 - Effluent TN: mean 0.18; min ND; max: 0.60 mg/L, 0 – 3 lbs/day
 - Effluent TP: mean 0.040; min 0.012; max: 0.095 mg/L, 0 – 0.5 lbs/day
 - Big Spring Fish Hatchery – lower unit: 15,000 – 20,000 gpm average daily flow
 - Effluent TN: mean 0.35; min 0.20; max: 0.50 mg/L, 4 – 105 lbs/day
 - Effluent TP: mean: 0.020; min 0.010; max: 0.026 mg/L, 2 – 5.5 lbs/day
 - Lewistown WWTP – Reporting pounds per day – monthly mean total phosphorus
 - 2013: July: 7.0 lb/day; August: 3.0 lbs/day; September: 7.0 lbs/day
 - 2014: July: 10.0 lbs/day; August: 5.0 lbs/day; September: 1.0 lbs/day
 - 2015: July: 11.0 lbs/day; August: 9.0 lbs/day; September: 7.0 lbs/day
 - 2016: July: 30.8 lbs/day; August: 10.0 lbs/day; September: 7.9 lbs/day
- Tributary monitoring in the lower Big Spring Creek watershed was done in Casino, Breed, Burnette and Wolverine Creeks (listed from upstream to downstream confluences with Big

Spring Creek, all in ecoregion 43) on 4 dates in 2010 (Fergus CD Final Report for contract 208028, 2012). The mean and range of each of the sites from upstream to downstream creeks (Figure 1 shows the ecoregions and associated nutrient criteria), in mg/L was:

- **Casino:** TN: 0.8, 0.7 – 1.3; TP: 0.07, 0.02 – 0.11;
- **Breed:** TN: 0.7, 0.6 – 0.8; TP: 0.06, 0.02 – 0.14;
- **Burnette:** TN: 1.4, 1.1- 1.9; TP 0.03, 0.01 – 0.06;
- **Wolverine:** TN: 6.8, 6.7 – 7.5; TP: 0.02, 0.02 – 0.03.

Generally, TN values were higher (worse) in the lower tributaries, and TP values were higher (worse) in the higher tributaries. Both lower tributaries (Burnette and Wolverine) were consistently above the TN numeric criteria of 1.3 mg/L (data available through STORET or EQUIS) which is an indication of a problem. None of the 16 tributary TP samples exceeded the 0.150 mg/L numeric criteria for the Northwestern Great Plains ecosystem.

- The 2008 NPS contract also supported development of a Sampling and Analysis Plan and water quality monitoring above and below Lewistown for TDS, nitrogen and phosphorus (data available through STORET or EQUIS).
- The Casino Creek sub-watershed is largely within the Northwestern Great Plains ecoregion. One of four samples was above the total nitrogen numeric criteria of 1.3 mg/L. All four total phosphorus samples were below the total phosphorus numeric criteria of 0.15 mg/L (mean of 0.07mg/L).

Big Spring Creek sediment-related monitoring

- DEQ 319 contract 208028 supported the Fergus CD stream/riparian assessments reported on in August 2010 (Ted Hawn, 2010b). Thirty-five reaches (the same reaches identified in the Big Spring Creek TMDL assessment) were assessed for stream channel and riparian condition. Reach 1 was from the mouth of the Judith River and reach 35 was at the Big Spring Fish Hatchery. 15 reaches (43%) were determined to be sustainable, 17 reaches (49%) were determined to be “at risk”, and 3 reaches (including the reach through Lewistown) were determined to be “not sustainable” (Big Spring Creek Riparian Assessment, Ted Hawn August 2010).

3.3 – PLANNING

- A significant amount of planning went into the development of the FWP PCB clean up, both for the fish hatchery on-site and Big Spring Creek in-stream. The FWP contracted with CDM to complete a risk assessment of the PCB contamination in Big Spring Creek (CDM, 2005). Later FWP contracted with Olympus Technical Services to develop a Remedial Investigation (Olympus, 2009a) to characterize the distribution of PCBs, characterize stream processes in Big Spring Creek and support the development of a Feasibility Study. The Feasibility Study, completed by Olympus in 2009 (Olympus, 2009b), provided Big Spring Creek PCB background information, applicable or relevant and appropriate requirements, identification of remediation alternatives, and a recommendation of a preferred alternative.
- Fergus CD was awarded \$70,000 in 319 funding in 2008 for 319 a nonpoint source project (contract 208028) that included the development of a Big Spring Creek Watershed Restoration Plan – Phase I. The draft document, however, could not be accepted by DEQ as a Watershed Restoration Plan as it did not adequately address EPA’s nine minimum elements. The same contract included the development of a “Big Spring Creek Riparian Assessment” and a Voluntary Drought Response Plan.

4.0 – RECOMMENDATIONS FOR ADDITIONAL WORK

Recommendations for additional restoration work, monitoring and planning are outlined below.

- Big Spring Creek PCB (both segments)
 - FWP will conduct additional fish tissue monitoring in 2019, as planned. Based on results, FWP should develop additional monitoring plans for fish tissue and sediment data needs.
 - DEQ should consider assessment of PCB impairment determination using existing data, especially for the lower segment (below Casino Creek).
 - DEQ should create fish tissue based assessment criteria in coordination with FWP and EPA.
- Big Spring Creek (lower section) Nutrients – Listing for total phosphorus
 - Continue Lewistown WWTP improvements to optimize TP reduction needed for high-efficiency removal of nutrients (with an emphasis on phosphorus reduction) to meet “highest attainable conditions” for meeting state water quality standards
 - More monitoring of total phosphorus along lower Big Spring Creek may help address uncertainty regarding total phosphorus levels in this AU
 - Photographs, aquatic plant coverage, TN and TSS data would also be useful information to collect
 - Further investigation of sources of high nitrogen levels in Wolverine Creek should be considered
- Big Spring Creek (lower section) sediment
 - Engage/encourage landowners in watershed to consider BMPs linked to grazing management strategies, wider riparian buffers along agricultural fields that result in improved riparian buffers with enhanced native vegetation to promote stream health. Outreach on this topic could be focused in areas identified in the “Big Spring Creek Riparian Assessment” Table 3 – Impacted Riparian Vegetation (reaches Big 26, 33, 25, 18, and 23). Additionally, projects to reduce sediment/siltation from channelization and accelerated streambank erosion identified in “Table 4 – Stream Reaches with Most Significant Impacts” in reaches 25, 26, 35, 18, 11, 23, and 29 using “contextually appropriate” materials and techniques should be considered.
- Casino and Cottonwood Creek (lower section) nutrients, sediment
 - Monitoring of TN and TP water quality samples in July, August and September would be useful for further characterizing nutrient status in Casino Creek. Diurnal (24-hour) dissolved oxygen changes would also be valuable information.
 - DEQ TMDL program should consider assessment and possible TMDL development for Casino and lower Cottonwood Creek nutrients and lower Cottonwood Creek sediment impairment listing.
- To be eligible for additional Clean Water Act Section 319 funding, Fergus County Conservation District should work with DEQ Watershed Protection Section staff to revise the draft Big Spring Creek Watershed Restoration Plan to obtain DEQ acceptance of the plan.

5.0 – CONCLUSIONS

Please see Appendix A – Conclusions Spreadsheet for a detailed explanation of conclusions reached through the development of the Big Spring Creek Watershed Water Quality Restoration Plan and Total Maximum Daily Loads Implementation Evaluation. A summary is provided below:

Big Spring Creek (MT 41S004_010) PCB-related – upper AU TMDL

- PCB impairment listing on upper Big Spring Creek. TMDL PCB-sediment cleanup targets have been met. The upper Big Spring Creek assessment unit (above Casino Creek) still exceeds the TMDL fish tissue cleanup standard, but has decreased significantly and continues to decline since the in-stream dredging. FWP should continue to monitor for PCBs in fish tissue and work with the DEQ on the appropriate next steps for before DEQ conducts an updated PCB assessment. **Conclusion:** Needs more time for PCBs in fish tissue to meet the TMDL target.

Big Spring Creek (MT 41S004_020) PCB-related – lower AU TMDL

- Information collected by Montana Fish, Wildlife and Parks for the lower Big Spring Creek assessment unit should be evaluated to determine if the PCB impairment should be removed. In 2015 and 2016 all fish sampled below the East Fork of Big Springs Creek (end of the 2.8-mile remediation reach, and above Casino Creek) had PCB levels below the “safe to eat” level of 0.025mg/kg, except for brown trout in 2016 at the Burleigh site. **Conclusion:** Assess lower Big Spring Creek (below Casino Creek) for PCB impairment using sediment and fish tissue data.

Big Spring Creek (MT 41S004_020) sediment-related lower AU TMDL

- Sediment/siltation impairment listing in lower Big Spring Creek assessment unit. Monitoring (Big Spring Creek Riparian Assessment, 2010), sediment reduction projects and 310 permitting activities strongly suggest that sediment/siltation continues to impair aquatic life uses. More native riparian tree and shrub vegetation, and improved livestock management is needed to reduce sediment/siltation in Big Spring Creek from Casino Creek down and below Lewistown. Some NRCS BMP implementation information is available. **Conclusion:** Needs an improved phase of voluntary reasonable land, soil and water conservation practices.

Big Spring Creek (MT 41S004_020) total phosphorus-related lower AU TMDL

- Phosphorus impairment listing in Big Spring Creek from Casino Creek to the Judith. Very limited total phosphorus sampling suggests lower Big Spring Creek AU can occasionally meet the total phosphorus criteria for this ecoregion (0.150 mg/L).
- Optimization of TP removal at the Lewistown wastewater treatment plant should be pursued to consistently meet future total phosphorus discharge permit limit. **Conclusion:** Needs more time (currently unknown timeframe) for the WWTP to meet “highest attainable conditions” with respect to TP discharges.
- Follow-up sampling in Wolverine Creek should be considered to determine potential sources of the very high total nitrogen samples collected through the Fergus CD’s 2009-2010 nutrient monitoring effort.

Casino Creek (MT 41S004_040) Nutrients (no TMDL written)

- Nutrient impairment listing on Casino Creek. A very limited amount of data indicates that the total nitrogen criteria is not met and that the total phosphorus criteria could be met in Casino Creek. **Conclusion:** Needs an improved phase of voluntary reasonable land, soil and water conservation practices.

Cottonwood Creek (MT 41S004_052) County Rd at T14N, R18E S18 to mouth: Nutrients/DO; sediment/siltation (no TMDL written)

- Nutrient impairment listing on lower Cottonwood Creek. Some NRCS BMP implementation information is available for this segment. **Conclusion:** Needs an improved phase of voluntary reasonable land, soil and water conservation practices.
- Although sediment was determined to meet the standard in lower Cottonwood Creek during the TMDL process, DEQ maintained the sediment impairment listing and has not collected additional sediment data since 2003. During future TMDL activities in the Big Spring watershed, the sediment listing in lower Cottonwood Creek should be re-assessed.

6.0 – REFERENCES

A wide variety of information sources were consulted during the preparation of the Big Spring Creek Watershed Water Quality Restoration Plan and Total Maximum Daily Loads Implementation Evaluation. They included reports, databases, and websites, and personal communications. A complete list can be found in Appendix B – Consulted Sources. Detailed questions concerning the construction and content of the Big Spring Creek Watershed Water Quality Restoration Plan and Total Maximum Daily Loads Implementation Evaluation should be directed to Dean Yashan, Section Supervisor, Montana Department of Environmental Quality Watershed Improvement Section, (406) 444-5317, or dyashan@mt.gov.

CDM, 2005. Big Spring Creek, Lewistown, Montana – Risk Assessment (Final Screening Level Ecological Assessment, Final Baseline Ecological Risk Assessment and Final Human Health Risk Assessment), prepared for Montana Fish, wildlife and Parks, October 2005.

Fergus Conservation District. 2010. Big Spring Creek Riparian Assessment.

Fergus Conservation District. 2012 Big Spring Creek 319 Grant Final Report (Contract 208028)

Fergus Conservation District. 2015. Final Report for 319 Grant 211069 Machler Restoration Project

Fergus Conservation District. 2015 Big Spring Creek Watershed Restoration Plan – Phase I - Draft

Montana Department of Environmental Quality, 2005. Big Spring Creek Watershed Water Quality Restoration Plan and Total Maximum Daily Loads.

Montana Department of Environmental Quality, 2012. City of Lewistown Wastewater Treatment Facility Permit MT 0020044. Revised Fact Sheet

Montana Department of Environmental Quality, 2016. Big Springs Fish Hatchery General Discharge Permits MT G 130003, MT G 130004.

Montana Department of Fish, Wildlife and Parks. 2016. Letter from Eileen Rice, Fisheries Division Administrator to EPA Civil/Environmental Engineer Francis Tran RE: Removal of PCB Paint from Big Spring Creek Sediment, Lewistown, MT.

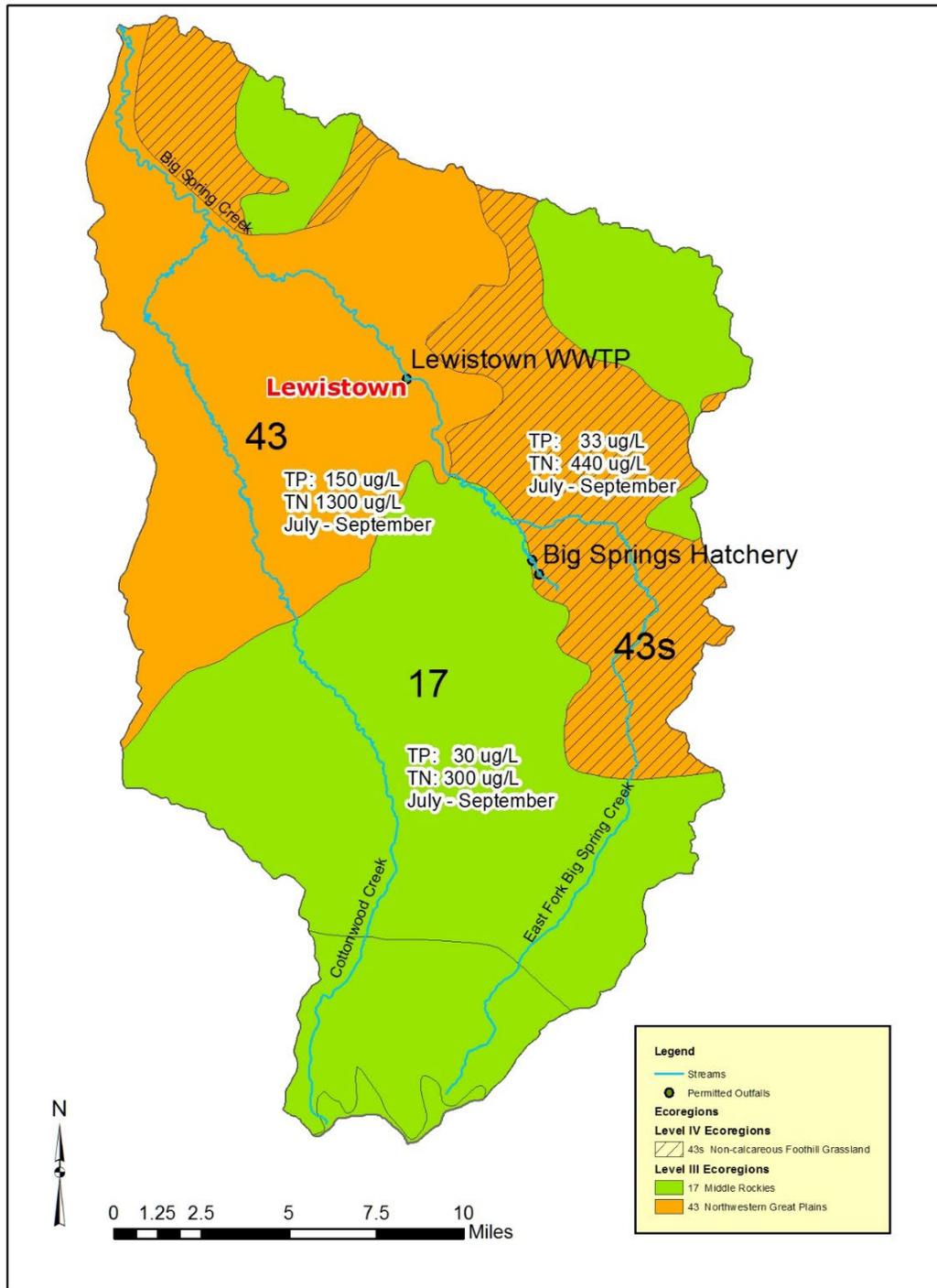
Olympus, 2009a. Big Spring Creek Remedial Investigation – Fergus County, Montana prepared for Montana Department of Fish, Wildlife and Parks, February 2009.

Olympus, 2009b. Big Spring Creek Feasibility Study – Fergus County, Montana prepared for Montana Department of Fish, Wildlife and Parks, August 2009.

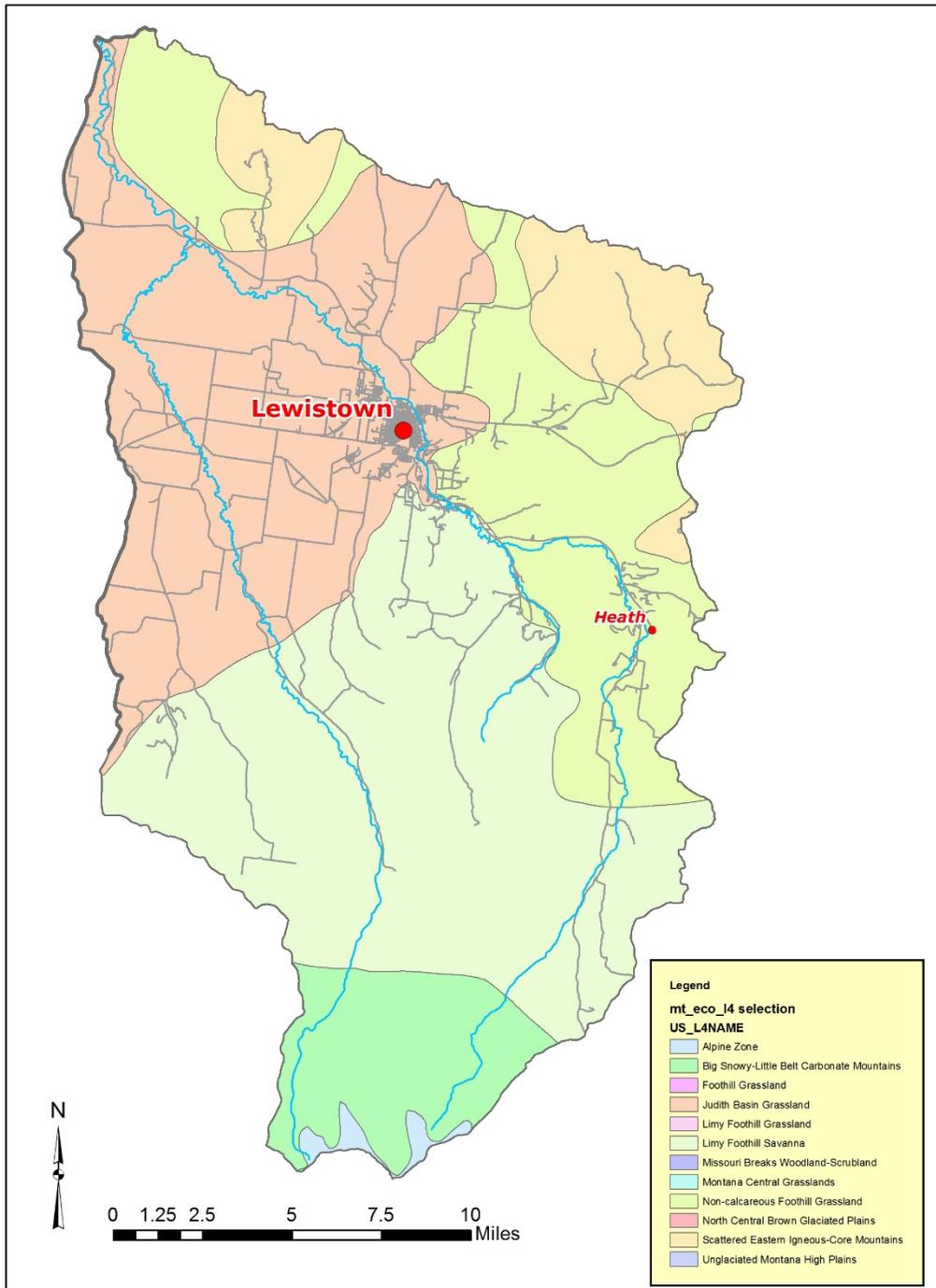
Olympus Technical Services, Inc. for Montana Fish, Wildlife and Parks. 2016. Big Spring Creek Streambed PCB Remediation Project 2015 Reach 2, 3, and 4 Post-Dredging Sediment Monitoring Report.

US Environmental Protection Agency. 2000. Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 1 Fish Sampling and Analysis Third Edition.

FIGURE 1. BIG SPRING CREEK WATERSHED LEVEL III AND IV ECOREGIONS AND NUTRIENT CRITERIA



Level IV Ecoregions - Big Spring Creek Watershed



APPENDIX A – CONCLUSIONS SPREADSHEET

Table A1 – Conclusions

Waterbody Pollutant	Conclusion*	Justification/Recommendations
Big Spring Creek Headwaters to confluence w/ Casino Creek MT41S004_010	Move beginning of reach segment from “East Fork” to “Headwaters”	<ul style="list-style-type: none"> • Consistent with normal DEQ reach designation for upstream point for headwater waterbody • Significant change in land use below Casino Creek • Consistent with ecoregion boundary change at same downstream location
Big Spring Creek Headwaters to confluence w/ Casino Creek MT41S004_010 PCBs	2 or Assess	<p>TMDL target: Fish tissue target set at <0.025 ppm (composite of 5 rainbow trout fillets). DEQ currently recognizes EPA’s fish tissue consumption value of 0.020 mg/kg as a target.</p> <ul style="list-style-type: none"> • Adult rainbow trout composite samples (13-15 inches) at all sites have PCB concentrations less than 0.06 mg/kg wet weight • Adult brown trout composite samples (14-16 inches) at all sites have less than 0.08 mg/kg wet weight • All fish sampled downstream of the remediation area (below reach 4, East Fork confluence) were non-detect for PCBs and below any fish advisory level (0.025 mg/kg) in 2016 <p>TMDL target: In-stream sediment PCB concentration of <0.189mg/kg</p> <ul style="list-style-type: none"> • 95% Upper Confidence Level (UCL) of the mean post-dredging PCB concentration in reaches 2, 3, and 4 in 2016 was 0.057mg/kg • The 95% UCL of the mean PCB contractions in reach 2 was 0.127mg/kg, reach 3 was 0.071mg/kg, and reach 4 was 0.031 mg/kg • PCB concentrations in stream sediment have been reduced by 99% in comparison of pre-dredging versus post-dredging sediment data from 2015
Big Spring Creek Confluence w/ Casino Creek to mouth MT41S004_020 PCBs	2 or Assess	<p>TMDL target: Fish tissue target set at <0.025 ppm (composite of 5 rainbow trout fillets).). DEQ currently recognizes EPA’s fish tissue consumption value of 0.020 mg/kg as a target.</p> <ul style="list-style-type: none"> • All fish sampled downstream of the remediation area (East Fork confluence) were non-detect for PCBs and below any fish advisory level (0.025 mg/kg) in 2016 <p>TMDL target: In-stream sediment PCB concentration of <0.189</p> <ul style="list-style-type: none"> • 95% Upper Confidence Level (UCL) of the mean post-dredging PCB concentration in reaches 2, 3, and 4 in 2016 was 0.057mg/kg
Big Spring Creek confluence w/ Casino Creek to mouth MT41S004_020	1	<p>TMDL targets: Macroinvertebrate clinger taxa > 50%; periphyton siltation index <25, Wolman pebble counts: <20% surface fines <2mm.</p> <ul style="list-style-type: none"> • Current monitoring indicates continued sediment/siltation impairment • Recommend use of current sediment/siltation targets

<p>Sediment/ siltation</p>		<ul style="list-style-type: none"> Significant amount of riparian native woody vegetation establishment is necessary. The “Big Spring Creek Riparian Assessment” document prepared for Fergus Conservation District in 2010 should be used as a guide for prioritizing projects
<p>Big Spring Creek confluence w/ Casino Ck to mouth MT41S004_020 Nutrients</p>	<p>2 – Needs more time</p>	<p>TMDL impairment listing causes include: Other habitat alterations; riparian degradation; fish habitat degradation. TMDL Nutrient targets: June 1 – November 1: 0.5 mg/L TN; 0.035 mg/L TP. Benthic Chl a: x 100 mg/m²; 150 mg/m² max. Current 303(d) listing: TP; alteration in streamside vegetative cover.</p> <ul style="list-style-type: none"> Recommend using existing numeric nutrient criteria: Northwestern Great Plains ecoregion (43): July 1 – September 30: 0.150 mg/L TP; 1.3; mg/L TN TP has exceeded standard downstream of WWTP. TN appears to meet water quality standards Optimize TP removal at the Lewistown wastewater treatment to consistently meet future total phosphorus discharge permit limits Needs more time (currently unknow timeframe) for the WWTP to meet “highest attainable condition” for TP discharge limits Significant amount of riparian native woody vegetation establishment is necessary. The “Big Spring Creek Riparian Assessment” document should be used as a guide for prioritizing projects Additional tributary source characterization monitoring would likely be helpful
<p>Casino Creek Headwaters to mouth MT41S004_040 Nutrients</p>	<p>1</p>	<p>TMDL Nutrient targets: June 1 – November 1: 0.5mg/L TN; 0.035mg/L TP. Benthic Chl a: x 100 mg/m²; 150 mg/m² max. Filamentous algae: <30% cover TMDL impairment listing causes include: Other habitat alterations and riparian degradation Current 303(d) listing: TN, TP, Chl a; alteration in streamside vegetative cover</p> <ul style="list-style-type: none"> Recommend using existing numeric nutrient criteria: Northwestern Great Plain ecoregions: July 1 – September 30: 0.150 mg/L TP; 1.3 mg/L TN Drop filamentous algae, benthic algae monitoring and replace with delta dissolved oxygen assessment methodology. Significant amount of riparian native woody vegetation establishment is necessary
<p>Cottonwood Creek County Rd at T14N,R18E S18 to mouth MT41S004_052 Nutrients/DO</p>	<p>1</p>	<p>Dissolved oxygen: 7-day average: 9.5 mg/L; 1-day minimum: 8.0 mg/L. TMDL target: > 4 mg/L Filamentous algae: <30% cover; x benthic Chl a < 100 mg/m²; max 150 mg/m² TMDL impairment listing causes include: organic enrichment; flow alteration; dewatering; other habitat alteration; riparian degradation; fish habitat degradation. Current 303(d) listing: nitrate/nitrite; TN; TP; DO; sediment/siltation; TKN; excess algal growth; alteration in streamside vegetative cover; other flow regime alterations.</p> <ul style="list-style-type: none"> Recommend using existing numeric nutrient criteria: Northwestern Great Plains ecoregion: July 1 – September 30: 0.150 mg/L TP; 1.3 mg/L TN

		<ul style="list-style-type: none"> • Drop filamentous algae, benthic algae monitoring and replace with delta dissolved oxygen assessment methodology • Significant amount of riparian native woody vegetation establishment is necessary to stabilize banks, protect property and infrastructure
<p>Cottonwood Creek County Rd at T14N,R18E S18 to mouth MT41S004_052</p> <p>Sediment/siltation</p>	<p>NA **</p>	<ul style="list-style-type: none"> • Although sediment was determined to meet the standard in lower Cottonwood Creek during the TMDL process, DEQ maintained the sediment impairment listing and has not collected additional sediment data since 2003. During future TMDL activities in the Big Spring watershed, the sediment listing in lower Cottonwood Creek should be re-assessed.

*Conclusions are limited to one of the three specific conclusions identified in 75-5-703(9) MCA. In this column, the three possible conclusions will be denoted by individual numbers as described below:

- 1 – The implementation of a new or improved phase of voluntary reasonable land, soil, and water conservation practice is necessary.
- 2 – Water quality is improving but a specified time is needed for compliance with water quality standards.
- 3 – Revisions to the TMDL are necessary to achieve applicable water quality standards.

**In these instances, the typical three conclusions are superseded by complicating factors in statute, or a lack of sufficient information in order to draw defensible conclusions.

APPENDIX B – CONSULTED SOURCES

Table B1 – Publications and Databases

Title	Author(s)	Brief Content Description	Source Location
NRCS: September 13, 2018	NRCS National Database	HUC -10 NRCS Practices installed, costs, by year.	NRCS REAP Data Team (REAPDataTeam@wdc.usda.gov)
June 12, 2018	Personal Communication (meeting) with Don Skaar and Trevor Selch to go over draft document, discuss PCB monitoring results	Discussed concerns about PCB “nugget” effect that skews data for PCB sediment concentrations. One paint chip can significantly alter “mean” of data. Median probably better measure of actual contaminant concern. Next fish tissue monitoring planned for 2019 to have new “cohort” of rainbow trout. Brown trout can live 18-38 years (http://www.worldlifeexpectancy.com/fish-life-expectancy-brown-trout).	
Future Fisheries Improvement Program Biennial Report November 1, 2016 – October 31, 2018 (December 2018)	Fisheries Management Bureau, Montana Fish, Wildlife and Parks	Summary of Future Fisheries program activities November 1, 2016 – October 31, 2018	http://fwp.mt.gov/fishAndWildlife/habitat/fish/futureFisheries/legislative/

Contacted? (Y/N)	Entity Name	Contact Last Name	Contact First Name	Contact Title	Phone 1	E-mail	Mailing Address	City	State
Y	Montana FW&P	Skaar	Don	Fisheries Bureau Chief	406 444-7409	DSkaar@mt.gov		Helena	MT
Y	Montana FW&P	Selch	Trevor	Fisheries	406 444-5686	TSelch@mt.gov		Helena	MT
Y	Natural Resources Conservati on Service	Philp	Lorna	District Conservatio nist	406 708-3011	Lorna.philp@mt.usd a.gov		Lewistown	MT
Y	Fergus County Conservati on District	Nordlund	Shonny	District Administrat or	406 538-7401 x3001	fcd@midrivers.com	211 McKinley, Suite 3, Lewistown MT 59457	Lewistown	MT
N	Natural Resources Conservati on Service	Schalitz	Nick	Civil Engineer	406 708-3016	Nicholas.schalitz@ mt.usda.gov		Lewistown	MT
Y	Montana FW&P	Smith	Clint	Fisheries Biologist	406 538-2445, x227	clsmith@mt.gov		Great Falls	MT
N	Big Spring Watershed Group	Dunlop	Clay	citizen	406 535-6694			Lewistown	MT