DEQ Montana Department of Environmental Quality

Lone Tree Creek TMDL Implementation Evaluation

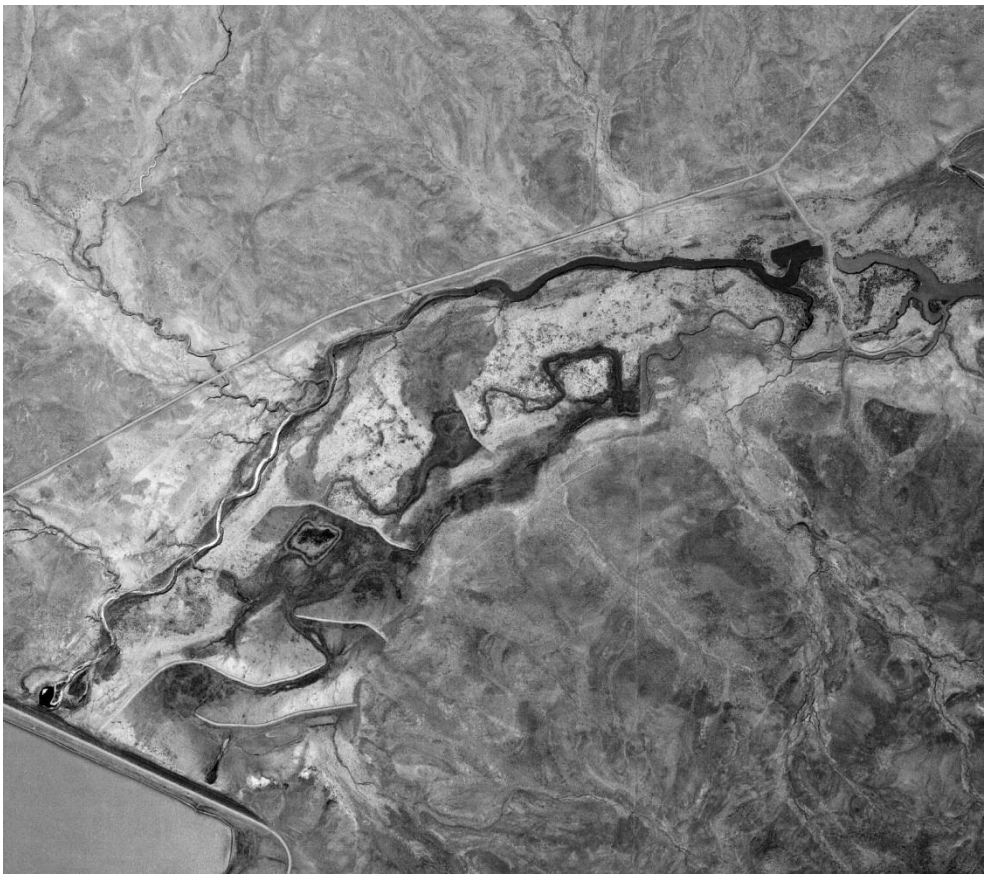

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TABLE OF CONTENTS

ACRONYMS

BLM – United States Bureau of Land Management
DEQ – Montana Department of Environmental Quality
DNRC – Montana Department of Natural Resources and Conservation
EPA – United States Environmental Protection Agency
ESA – United State Endangered Species Act
MAS – Montana DEQ Monitoring and Assessment Section
MLT – Missouri-Lone Tree (watershed)
NPS – Nonpoint Source (pollution)
NRCS – Natural Resources Conservation Service
PFC – Proper Functioning Condition (field evaluation method used by USDI, BLM)
TIE – TMDL Implementation Evaluation
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.
USDI – United States Department of the Interior
WPB – Montana DEQ Water Protection Bureau
WQPB – Montana DEQ Water Quality Planning Bureau
WPS – Montana DEQ Watershed Protection Section

DOCUMENT SUMMARY

In 2001, the Montana Department of Environmental Quality (DEQ) completed a Total Maximum Daily Load (TMDL) for Lone Tree Creek, located in south Valley County, Montana. The TMDL document outlined actions that could be taken to address impairment from excess nitrogen and alterations in riparian habitat. Human-related sources of impairment in the watershed are generally limited to livestock grazing and hydrologic modification (dams, dikes, pit ponds). The goal of this TMDL Implementation Evaluation (TIE) is to evaluate progress toward meeting the desired outcomes of the 2001 Lone Tree Creek TMDL document.

Prior to and following completion of the TMDL, the BLM and individual grazing permittees worked together to address nitrogen pollution and riparian habitat degradation from livestock. Annual grazing land monitoring and periodic PFC evaluations, followed by ongoing adaptive management of grazing practices have had a positive impact on riparian health and rangeland forage production, which likely has increased nitrogen uptake and reduced nitrogen pollution. BLM also devoted a considerable amount of resources to repairing the Triple Crossing Reservoir dam and restoring flow to the old North Channel below the reservoir. BLM continues to repair and maintain the limited transportation network within the watershed, and prevent excess runoff from impervious surfaces.

In 2015 and 2016, DEQ staff conducted field visits, met with local ranchers, attended grazing association and district meetings, and met and corresponded with staff from the BLM Glasgow Field Office. DEQ staff also spoke with individuals at the DNRC Field Office and the Valley County Pioneer Museum. Based on the information gathered in 2015 and 2016, DEQ has concluded the following:

- BLM and the grazing permittees appear to have implemented adequate land management practices to prevent excess nitrogen enrichment of Lone Tree Creek from livestock sources. As time and resources allow, DEQ intends to conduct a formal assessment to determine whether Lone Tree Creek should still be considered impaired due to excess nutrients (nitrogen and phosphorus). If an updated impairment assessment indicates that excess nitrogen and/or phosphorus is impairing beneficial uses in Lone Tree Creek, further evaluation will be necessary to identify the sources of the pollutants, and determine what can be done to address them.
- Dam, dike, and reservoir maintenance and operation continue to have a significant impact on riparian habitat and streamside vegetation.

1.0 INTRODUCTION

This document provides an evaluation of implementation activities for the Lone Tree Creek TMDL document, which was approved by EPA on September 26, 2001. The TMDL document outlines measures that could be taken by BLM, grazing permittees, and DEQ to address nutrient enrichment, riparian habitat alterations, and flow alterations in order to restore full support of aquatic life. Many of the recommendations in the TMDL document were derived from recommendations in the BLM's July 1997, Missouri-Lone Tree Watershed Plan. Since the TMDL approval date, changes in DEQ and/or EPA impairment documentation procedures converted the original probable causes of impairment to total nitrogen and alterations in stream-side or littoral vegetative covers (a form of habitat alteration).

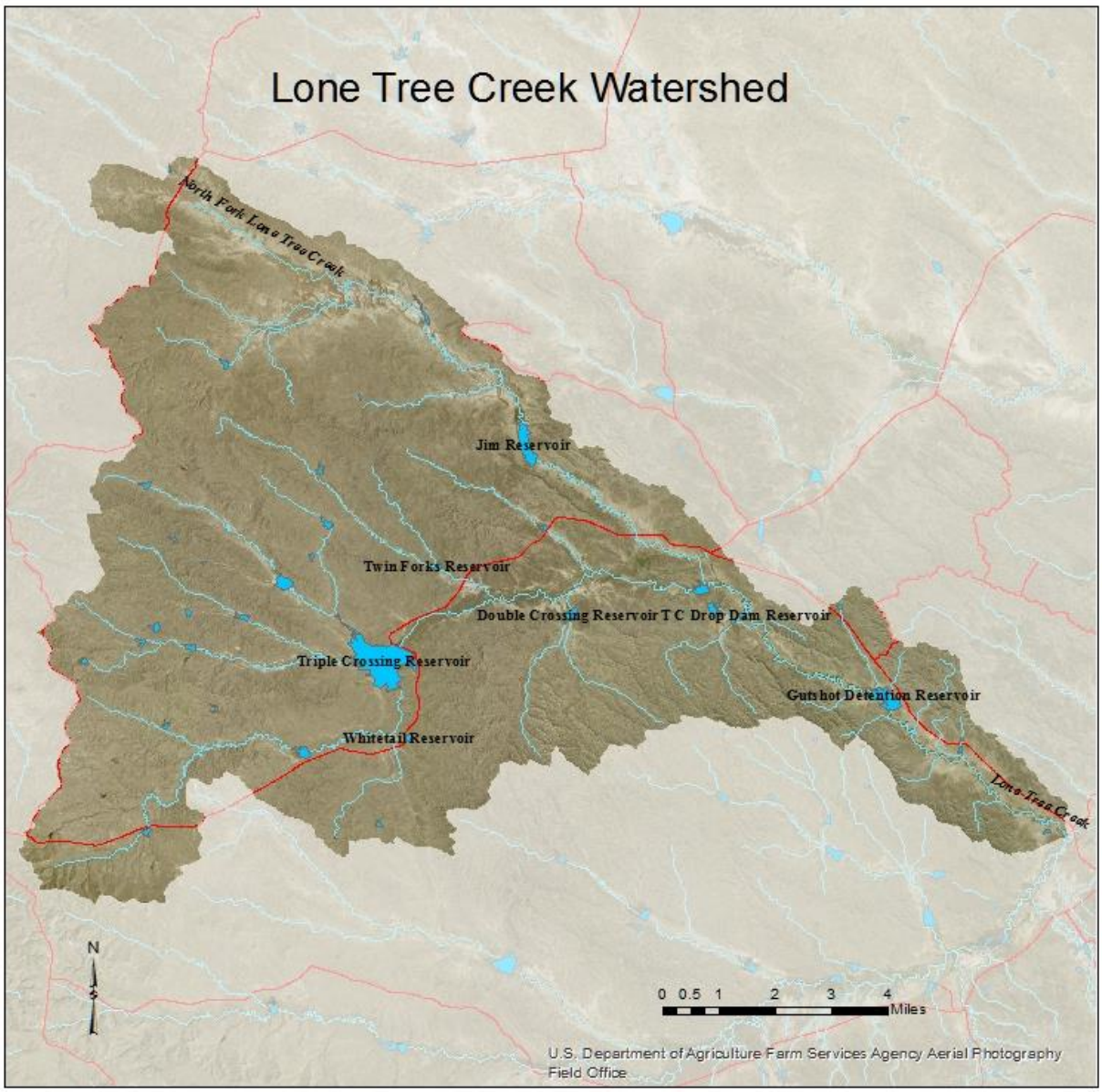

Figure 1 Lone Tree Creek Watershed

For the purpose of the TMDL Implementation Evaluation (TIE), DEQ considered contributing factors from the broader Lone Tree Creek watershed (Figure 1), then focused primarily on the specific section of Lone Tree Creek from the Triple Crossing dam outfall to the mouth at Willow Creek. Throughout this section, Lone Tree Creek is an intermittent stream. The longest reaches of standing/flowing water are located between the TC Drop Dam Reservoir and Gutshot Detention Reservoir, and are dominated by beaver pond sequences.

2.0 HUMAN ALTERATIONS

Human alterations affect water quality and quantity throughout much of the Lone Tree Creek watershed.

Ponds and Impoundments

More than 150 man-made ponds and reservoirs dot the Lone Tree Creek watershed (Figure 2). Many of these structures are small ponds (less than ¼ acre) excavated into areas of shallow groundwater. The rest are reservoirs of varying shapes and sizes. Triple Crossing Reservoir and Gutshot Detention Reservoir are the largest reservoirs on the mainstem of Lone Tree Creek, and Jim Reservoir is the largest reservoir on a tributary (Figure 1).

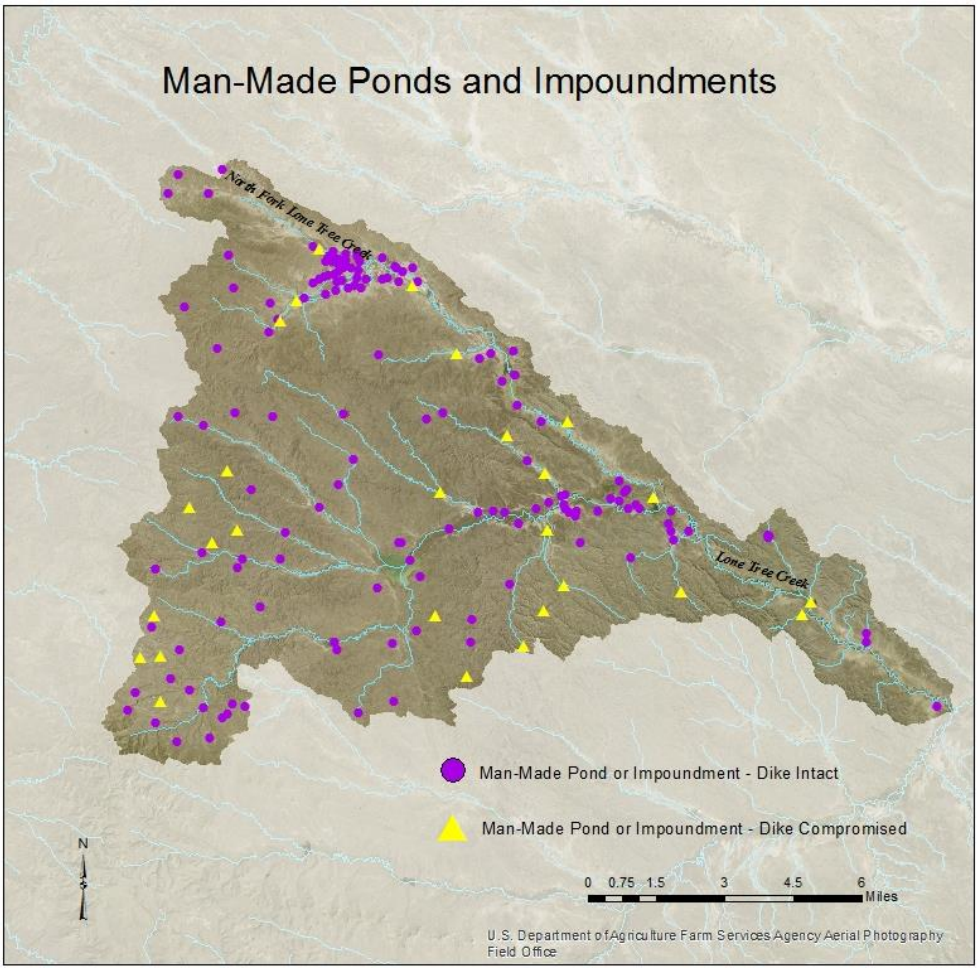

Figure 2 Man-Made Ponds and Reservoirs in the Lone Tree Creek Watershed

Impoundment Failure

Since their construction, an estimated 20% of the impoundment dikes in the watershed have failed (Figure 2). In 2014, BLM repaired a large breach in the Triple Crossing Reservoir dam and returned flow to what was likely the original North Channel below the reservoir (Figure 3). The North Channel (A1/A2) is likely the original, pre-dam channel downstream of Triple Crossing Reservoir. The South Channel (C/B2) formed from headcutting, following construction of the dam, the irrigation pipe outflow, and the down-gradient spreader dikes. The North/South Channel Cutoff (B1) formed from headcutting.

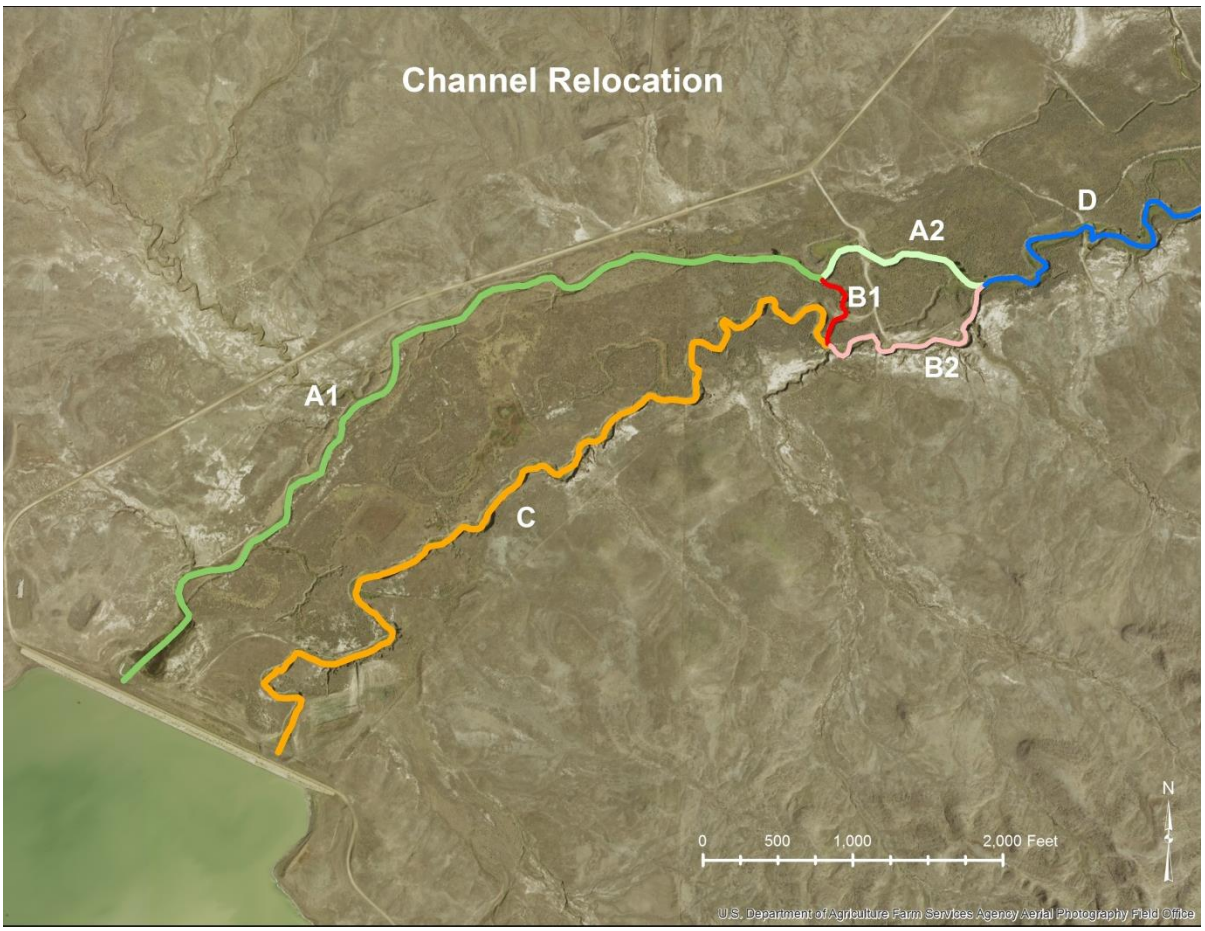

Figure 3 North and South Channels.

Figure 4 Headcut Through Gutshot Detention Reservoir Bottom

The Gutshot Detention Reservoir dam failed in 2009, causing a swift-moving headcut to migrate up through the soft reservoir bottom sediments, creating a canyon roughly 40 feet wide, 8 feet deep, and 2,000 feet long (Figure 4). Construction costs and lack of suitable, on-site dam building material have prevented repair. Over time, the Creek is likely to reestablish an inset floodplain within the downcut reach, resulting in the return of a more natural habitat condition.

Spreader Dikes

Extensive spreader dike systems dominate water movement in several of the largest valley bottoms. Spreader dikes are typically positioned perpendicular or at a slight angle to the flow of water or the downward gradient of a valley. In the Lone Tree Creek watershed, these structures are typically 1 to 5 feet tall, and are found in series down wide valley bottoms. Dozens of them were constructed back in the 1950's and 1960's to capture surface runoff, with a dual purpose of providing flood control and irrigation. The majority of them have failed or been breached (Figure 5).

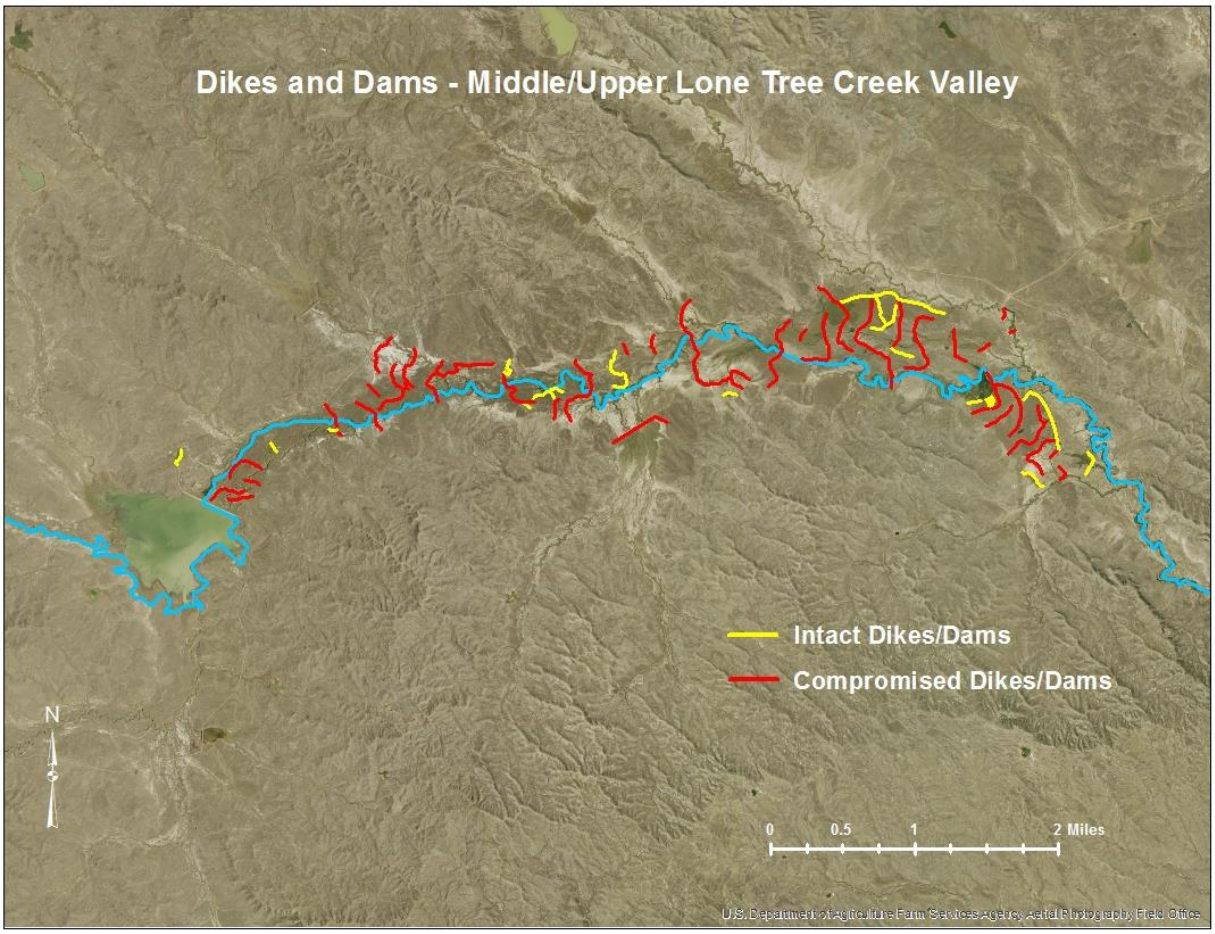

Figure 5 Dikes and Dams

3.0 TMDL TARGETS AND IMPLEMENTATION ACTIVITIES

The Lone Tree Creek TMDL contains targets and implementation recommendations that relate to both nitrogen impairment and alterations in streamside vegetation. Since the TMDL document was written, DEQ's processes for monitoring streams and setting TMDL targets have evolved significantly. DEQ has also developed numeric nutrient standards to replace the narrative standards on which the Lone Tree Creek TMDL was based. Future advances in science may lead to further improvements in DEQ's nutrient assessment methods.

Some of the parameters DEQ would measure and the targets DEQ would set today might be significantly different from those developed 15 years ago. However, most of the on-the-ground activities DEQ would recommend today in order to achieve targets would be similar to the recommendations DEQ made 15 years ago. Therefore, efforts to address potential sources of water quality impairment provide insight into potential improvements in water quality. The following are a few specific examples of the work done by local individuals and entities.

<u>Rangeland Monitoring and Adaptive Grazing Management</u>
BLM and the grazing permittees worked with Dr. John Lacy and the Badlands Cooperative State Grazing District to establish a rangeland and riparian monitoring program. The program included yearly photo-

point monitoring and rangeland condition descriptions. Individual permittees are still collecting data in many parts of the Lone Tree Creek watershed. Copies of the photos and the rangeland condition descriptions are maintained at the Grazing Office in downtown Glasgow, at the BLM Glasgow Field Office, and/or at the headquarters of individual ranches. Self-monitoring by the grazing permittees has helped facilitate timely, evidence-based management of both upland and riparian range resources. The 2003 MLT Watershed Monitoring and Standards and Guidelines Report and the 2010 Missouri-Lonetree Watershed Ten Year Monitoring and Standards and Guidelines Report, attribute much of the improvement in riparian condition to the efforts of grazing permittees to self-monitor under the program originally established with Dr. John Lacy.

PFC Monitoring

In 2009 and 2012, BLM collected stream morphology data in accordance with the PFC protocol. This data included visual descriptions of channel cross-section geometry, erosional features, and longitudinal profile stability. The 2010 Missouri-Lonetree Watershed Ten Year Monitoring and Standards and Guidelines Report provides a summary of the 2009 PFC data. Additional PFC data was collected by the BLM in 2012. Both the 2009 and 2012 PFC data sets contain detailed information on riparian condition.

Restoring Flow to a Historic Stream Channel

BLM's 1997 Missouri-Lone Tree Watershed Plan recommended that flow be restored to the original channel below Triple Crossing Reservoir in order to halt the erosion that was creating the South Channel. A little more than ten years later, the dam breached, deepening and widening the South Channel. In 2014, BLM repaired the breach in the Triple Crossing Reservoir dam, effectively stopping flow down the South Channel (Figure 3). At the same time, BLM repaired and improved the reservoir outfall into the North Channel, and reconfigured the dikes near the end of the North Channel, restoring flow to the original (North) channel (Figure 3).

4.0 CONCLUSIONS

Based on a thorough review of available information, DEQ has reached several conclusions with respect to nitrogen and habitat related impairments within the mainstem of Lone Tree Creek.

4.1 NITROGEN IMPAIRMENT

Conclusion 1

Livestock grazing best management practices have been implemented, and livestock are likely not a significant source of nitrogen pollution or riparian degradation.

Supporting Information

- During site visits in February and June of 2016, DEQ staff saw no evidence of overgrazing or excessive manure deposition in the Lone Tree Creek watershed.
- For over 15 years, BLM and local grazing permittees have been regularly monitoring the effects of grazing on riparian and upland areas. Monitoring methods have included PFC analysis, photo-point monitoring, and collection of written field observations. Monitoring data is used by BLM and the grazing permittees to adapt grazing practices (stocking rates, season of use, rest-rotation, etc.) to halt, reverse, and prevent negative impacts on water quality and riparian health.

- Monitoring efforts and subsequent changes in grazing management are described in great detail in the 2003 MLT Watershed Monitoring and Standards and Guidelines Report, the 2010 Missouri-Lonetree Watershed Ten Year Monitoring and Standards and Guidelines Report, and in individual allotment reports.

Conclusion 2
Ongoing dam and dike failure, followed by headcutting and channel widening, are releasing sediment into Lone Tree Creek. It is unclear whether this sediment release has the potential to cause or contribute to an increase in nitrogen levels in Lone Tree Creek above the applicable nitrogen standard.

Supporting Information
- Figure 4 demonstrates the quantity of reservoir bottom deposits that can be eroded into the creek as a result of dam failure.
- Reservoirs can become nitrogen sinks, capable of collecting and concentrating nitrogen in plant debris, domestic and wild animal waste, and decaying aquatic organisms. Over time, nitrogen-containing organic matter can accumulate in reservoir bottom sediments. There currently is no data on nitrogen enrichment of the reservoir sediments in the Lone Tree Creek watershed.

Conclusion 3
With the possible exception of nitrogen contributions from dam failure, there appear to be no remaining, significant, anthropogenic sources of nitrogen within the watershed that have not been addressed through the implementation of land, soil, and water conservation practices.

Supporting Information
- There are no dwellings, industrial operations, feedlots, croplands, point source BLM and the grazing permittees appear to have implemented adequate land management practices to prevent excess nitrogen enrichment of Lone Tree Creek from livestock sources.

4.2 HABITAT IMPAIRMENT

Large dams and dikes and their periodic failure are having a significant impact on riparian and instream habitat in the Lone Tree Creek watershed. Available information suggests that habitat alterations continue to be a cause of impairment to aquatic life.

Supporting Information
- Since their construction in the 1950's and 1960's, many of the dams and dikes in the Lone Tree Creek watershed have failed (Figure 5). Causes of failure have included headcuts, piping, formation of new channels that side-skirt the impoundment structures, and ice-dozing and wind/wave erosion along the upstream face of dams and dikes. Dam/dike failures have, in turn, caused headcutting, channel incision, and loss of stream/floodplain connectivity.

5.0 CONTINUING EFFORT AND FURTHER ACTION

The local grazing district and grazing associations, individual ranchers, and state and federal agencies all have a continuing role in maintaining and improving water quality in the Lone Tree Creek watershed.

5.1 RECOMMENDATIONS FOR LANDOWNERS AND LAND MANAGERS

The recommendations below are intended to support voluntary actions that may help maintain existing improvements in water quality or further reduce nitrogen pollution and riparian habitat degradation.

Recommendation 1
Continue the volunteer range monitoring program. Based on the records kept at the Grazing Office, and observations made by DEQ staff on the ground, this voluntary monitoring program has had a significant impact on riparian area health within the Lone Tree Creek watershed.

Recommendation 2
Beaver population expansion would likely represent an effective means toward creating and maintaining aquatic and riparian habitat. Beaver dams could also play an important role in retaining water on the landscape for the benefit of livestock and game. State and federal wildlife biologists, as well as some private consultants, may be able to recommend voluntary approaches to manage beaver populations in a manner that can achieve improved water quality and quantity conditions in the Lone Tree Creek watershed.

Recommendation 3
Monitor the advancement of headcuts in the North Channel below Triple Crossing Reservoir on an annual or biannual basis. Unless the headcuts in the North Channel become an obvious threat to the Triple Crossing dam, don't place rock, dikes, log vanes, or other structures in their path. Allow the streambed to find its own state of equilibrium.

Active headcuts are moving swiftly up the North Channel from its confluence with the South Channel. In 2015, Tom Probert, former hydrologist for the BLM Glasgow field office, estimated that one of the headcuts was advancing at a rate of about 23 feet per year. In 2016, based on a review of sequential aerial photos and field observations DEQ staff estimated the rate of advancement to be somewhere between 50 and 100 feet per year. DEQ recommends that BLM annually monitor the advancement of the headcuts, and ensure ample time to arrest their progress before they threaten the dam. Attempting to prevent advancement of the headcuts by placing rock, log vanes, or other hardened structure within the lower section of the North Channel would probably only briefly prolong the inevitable advancement of the headcuts. The stream would quickly find a way to either cut through or side-step around the structures, as it has done historically with spreader dikes and baffle dikes.

Recommendation 4
Discussions regarding potential repair of the Gutshot Reservoir dam should consider the benefits to the Creek of not repairing it. Based on BLM's analysis, existing, on-site construction materials are not adequate for reconstruction, and bringing suitable materials into the area would likely make reconstruction cost-prohibitive. The dam used to serve as an access point for ranchers and recreationalists to get across the creek. Moving the access point to a narrower, more stabile section of the valley would likely be more cost-effective than attempting to restore the dam or construct a bridge at the existing, highly unstable dam site. When the Gutshot Detention Reservoir dam failed, a headcut carved a deep, narrow channel up through the old reservoir bottom (Figure 4). Over time, processes of channel migration and streambank erosion should widen out the channel and return it to a more natural state.

Recommendation 5
Continue efforts to achieve and maintain PFC in riparian areas. Continue to review and adapt grazing management practices in accordance with BLM standards for rangeland health.

Recommendation 6
Continue ongoing efforts to prioritize and address road maintenance. Careful monitoring and timely corrective action appear to be successfully minimizing the effects of transportation networks on sediment transport.

5.2 Next Steps for DEQ

Assessment to Evaluate Current Status of Nutrient Impairment
As time and resources allow, DEQ intends to conduct a formal assessment to determine whether Lone Tree Creek should still be considered impaired due to excess nutrients (nitrogen and phosphorus). If an updated impairment assessment indicates that excess nitrogen and/or phosphorus is impairing beneficial uses in Lone Tree Creek, further evaluation will be necessary to identify the sources of the pollutants, and determine what can be done to address them.

Assessment to Evaluate Current Status of Riparian Habitat Impairment
On-the-ground observations strongly suggest that reservoir operation and dam/dike failure continue to have a significant impact on riparian health. At this time, additional assessment beyond the evaluation conducted for this TIE would likely not change the habitat impairment status for Lone Tree Creek. In the event that circumstances in the watershed change significantly, either through the application of additional dam/dike management practices or through natural stabilization over time, DEQ will re-evaluate whether to conduct additional habitat impairment assessments.

Reclassification of Lone Tree Creek
Reclassification of Lone Tree Creek is a low priority for DEQ because the numeric nutrient standards for nitrogen and phosphorus are primarily determined by ecoregion, versus waterbody classification. For example, a reclassification from B-3 to C-3, which is a common classification for prairie streams, would likely not affect the applicable nitrogen standard.

6.0 REFERENCES

Tables 1 and 2 identify the sources of information used to complete the Lone Tree Creek TIE.

Table 1 - Publications

Title	Author(s)	Brief Content Description
Climate Data – Glasgow MT - NWS	NOAA	Climatological data (climate normal temperature and precipitation data) for Glasgow, MT.
PFC Data – Reach 340 – 2012	USDI, BLM Glasgow Field Office	Lotic PFC data field sheets and maps from September 2012 assessment on four stream reaches on Lone Tree Creek.
DEQ Water Quality Standards Attainment Record and Assessment Data for Lone Tree Creek	DEQ	Hard copy file folder containing copies of the water quality data and other information used to make beneficial use impairment decisions for Lone Tree Creek. Part of a large collection of similar file folders maintained for other assessed waterbodies in Montana.
Lone Tree Creek TMDL Document	Montana Department of Environmental Quality	Total maximum daily load (TMDL) document for the Lone Tree Creek planning area. Completed on February 16, 2001. Approval letter from EPA received September 21, 2001. The document includes a TMDL for nitrogen. Attachments include the EPA approval letter, Section 7 ESA concurrence, and a record of public comment and stakeholder engagement activities.
Missouri-Lone Tree Watershed Plan, July 1997	USDI, BLM Lewistown District Office, Valley Resource Area	A management plan for 286,000 acres of public lands within the Missouri-Lone Tree watershed area in south Valley County. The plan was designed to implement the Judith-Valley-Phillips Resource Management Plan. Many of the implementation recommendations found in the Lone Tree Creek TMDL document were taken directly from this plan.
Missouri-Lonetree Watershed Ten Year Monitoring and Standards and Guidelines Report, Glasgow Field Office, 2010	USDI, BLM Glasgow Field Office	An assessment of the Standards for Rangeland Health in the Missouri - Lone Tree Watershed in south Valley County, Montana. The document also addresses other resource issues such as Cultural, Transportation, Recreation, Visual Resource Management (VRM) and Weeds.
MLT Watershed Monitoring and Standards and Guidelines Report, Glasgow Field Station, 2003	USDI, BLM Glasgow Field Station	A report of changes in riparian condition as a result of increased grazing monitoring by both the grazing permittees and the BLM.
Precipitation Data – Glasgow MT - NOAA	NOAA	Monthly precipitation data for the Glasgow, Montana area, for the period of January 2000 through April 2016.
Riparian Habitat Data – Reach R-343 – 1996 to 2009	BLM	A compilation of data collected on reach R-343 of Lone Tree Creek. Includes field forms and photo-point photos from various years from 1996 to 2009.

Title	Author(s)	Brief Content Description
Range Monitoring in the Badlands Grazing District, 2004 Final Report	USDA, Sustainable Agriculture Research and Education (SARE) program	Final Report for a SARE grant used to support development and implementation of riparian range monitoring on public grazing lands.
BLM Grazing Allotment Reports	USDI, BLM	Grazing allotment plan and authorized use data for individual grazing allotments. Data was current as of 05/12/2016.
Web Soil Survey http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm#	USDA, NRCS	Soils data for Lone Tree Creek watershed.
Volunteer Grazing Monitoring Records	Individual Grazing Permit Holders	Photo-point and narrative data submitted annually to either the Glasgow Grazing Office or the Glasgow BLM Field Office by individual grazing permit holders. Data collection based on a volunteer monitoring program established with the help of Dr. John Lacy.

Table 2 – Contacts

Entity Name	Contact Last Name	Contact First Name	Contact Title	City	State
Badlands Grazing District and Wittmayer Grazing Association	Dirkson	Diane	Secretary	Glasgow	MT
BLM – Glasgow Field Office	Gunderson	Pat	Glasgow Field Office Manager	Glasgow	MT
DNRC – Trust Lands – Glasgow Unit	Dirkson	Randy	Range Management Specialist	Glasgow	MT
McIntyre Ranch, Inc	McIntyre	Jim	Operator	Glasgow	MT
Page-Whitham Land and Cattle LLP	Page	Steve	Owner	Glasgow	MT
Private Citizen	Klessens	Steve	Range Ecologist (retired)	Fort Peck	MT
Valley County Pioneer Museum		Barbara	Employee	Glasgow	MT