Appendix I: Response to Public Comments

As described in Section 12.0, the formal public comment period for the Water Quality Restoration Plan and Total Maximum Daily Loads for the Ruby TMDL Planning Area, extended from January 25, 2006 to March 10, 2006. Eight individuals/organizations submitted formal written comments. Their comments have been summarized/paraphrased and organized by primary topic heading in this section. Responses prepared by MDEQ follow each of the individual comments. The original comment letters are located in the project files at MDEQ and may be reviewed upon request.

Where specific modifications to the document have been made in response to comments, they are noted in the responses. Notable modifications between the draft and final versions of this document include:

- The executive summary has been updated.
- The introduction (Section 1.0) has been modified to address a number of concerns.
- Shovel Creek and West Fork Ruby River sediment TMDLs were completed. Allocations for the main stem Ruby River already included allocations to these two watersheds comparable to the TMDLs presented.
- Section 11.0 of the draft document has been revised and is now entitled "Proposed Future Studies and Adaptive Management Strategy." This section has been reorganized to include three categories of monitoring; strengthening source assessment prior to restoration work, impairment status monitoring, and effectiveness monitoring for restoration activities.
- Section 10.0 has been slightly revised. This section presents a restoration plan with an objective of meeting state water quality standards and an implementation that presents useful information collected during the project for implementing restoration practices that will lead to improved water quality.
- Other smaller changes in the document are identified in response to comments.

In addition to the comments below, several general comments that mainly included grammar errors and missing information were addressed by modifying the final document. These comments were all addressed and since they were minor in extent, are not summarized below.

1. Executive Summary, Introduction and Watershed Characterization Sections

Comment 1.1: The review draft is difficult to read and the ¾ page text and the 2 and ½ pages of table on TMDL's in the executive summary leave a lot of questions unanswered.

Comment 1.2: The Executive Summary should outline the report's findings and recommendations clearly and concisely since it will be the main source of information for the landowner, farmer, rancher, or interested citizen. As currently written, it does not provide an adequate description of the process, authority and scope of the TMDL program. The Executive Summary should clearly state that the process is voluntary, cannot effect water rights or private property rights, and does not financially obligate identified stakeholders. These will no doubt be questions asked by the reader if they are unfamiliar with TMDL planning.

Response to 1.1-1.2: Text was added to the executive summary to address a number of the comments above. The executive summary is provided for a brief review of the critical components of the document, therefore some of the details asked for in Comment 1.2 are provided in Sections 1.0 and 3.0.

Comment 1.3:
a. Historical land use p.18 mentions vegetation reduction as a use. That has very little meaning for many of us. Tell us what vegetation reduction is. Are you referring to Indian management of the land with fire for at least 10,000 years? Are you referring to their removal of the bison on the Ruby by about 1857? See Granville Stuart menu for Christmas only that year, and Osborne Russell's mention that Indians had eliminated bison from the Henry's Fork of the Snake by 1840. Are you referring to Indian grazing of numerous horses after about 1770? Are you referring to the large scale spraying of sagebrush and forbs by the USFS in the 1950's and 1960's and the terracing and reseeding of steep slopes? Clearly grazing practices of the past were more abusive than at present. There are no historical pictures showing what the country looked like in 1921 and earlier even though many pictures are available for example the telegraph line and camp at the mouth of the Sweetwater about 1866. Comparisons with the present would be very good.
b. I do not believe that Bill Fairweather, Henry Edgar and three others discovered gold in Alder Gulch in 1835 because they were not present then. Check out Granville Stuart's two books and the date 1863. Page 19 there are probably 62,000 elk hunter days in the Gravelly-Snowcrest complex. See current draft USFS plan.

Response 1.3.a:
MDEQ edited the opening sentence in Section 2.3.3.1 for clarification about vegetation reduction. Vegetation reduction is not a land use category but a result of certain types of land use. The intent of Section 2.3.3 is to provide a basic background about the most significant human activities in the watershed. MDEQ agrees that grazing practices have improved over recent history in many areas of the Ruby Watershed. Continuing or installing grazing BMPs are needed to meet water quality standards in many areas of the Watershed.

A number of Montana's narrative water quality standards are tied to reasonable land, soil and water conservation practices. The restoration practices should reflect reasonable approaches to reduce pollutants under current land use. Many of the restoration practices that address current land use will reduce pollutant loads that are influenced from historic land uses.

The following paragraphs were inserted into Section 7.2.3.1.2 for clarification about how grazing impacts were assessed during the source assessment.

> Many of the impacts attributed to "grazing" in the inventory are related to the indirect effects of past grazing on streambanks by reducing riparian vegetation along stream banks. Long-term heavy grazing can reduce or fully suppress riparian shrub regeneration and growth. Riparian vegetation removal is associated with stream bank erosion because a lack of vegetative root mass allows streambank erosion to increase in large flood events.

Grazing influences are often recorded as a large contribution because they include both present and past influences, and are not meant to represent only current management practices. Restoration activities designed to reduce sediment loading from current grazing practices would also address past influences from livestock and wildlife. For example, management improvements designed to allow riparian area recovery will mitigate vegetation removal from past management by allowing adequate rest for shrub regeneration.

Response 1.3.b: The date gold was discovered in Alder Gulch has been changed to 1863. The final document reflects a change in the days of hunting effort.

Comment 1.4: In the final I hope there will be a couple of paragraphs detailing why this plan was needed, the action by EPA, the lawsuit and date, and the five year review after the TMDL's are written to determine if they have any effect.

Response: This information is provided in detail in Section 3.1 and briefly reviewed in the executive summary. The comment about a lawsuit is noted.

Comment 1.5: What is the breakdown of acres (or percent of total) by landowner in the Ruby watershed its tributary watersheds?

Response: Table 2-10 was added to Section 2.0. The table breaks down acres and percent of land area of the Ruby watershed by landowner type.

2. Targets and Impairment Status

Comment 2.1: It is noted that Robb Creek and Ledford Creek are recommended for 303d assessment. Nowhere did I see them on the final listing. Are you waiting to see what the flack might be from such a listing? They are both managed primarily by USFS, Montana Fish, Wildlife and Parks, DNRC school trust lands (federal and state public lands) and the Ted Turner Snowcrest Ranch. While your modeling may not be accurate (more on that soon) the creeks should have a high priority for accurate data collection on the ground. Samples taken recently by Ph.D. wildlife biologist showed much higher turbidity on the Robb-Ledford Game Range than on the USFS land above.

Response: The 303(d) listing process, TMDL process and a water quality restoration approach are described in Section 1.0 of the document. These streams have not been identified on a 303(d) list and therefore were not assessed as part of the present TMDL process other than being included in a general allocation process for the main stem Ruby River. Field reconnaissance occurred on portions of these streams during the TMDL process but initial project planning and budget did not allow for detailed monitoring on these two streams. During the TMDL assessment it was noted that these streams need to be assessed because of the conditions observed during the field reconnaissance, thus the recommendation for future monitoring to determine if the streams are supporting their beneficial uses.

Comment 2.2: We recommend dropping BEHI as a target. This metric has high observer variability and does not have a clear link to water quality standards or habitat variables. The remaining targets should be adequate to demonstrate watershed response.

> **Response:** Our use of the weight of evidence approach as described in Section 4.0 of the document is predicated upon the fact that there is no single parameter that can be applied alone to provide a direct measure of beneficial use impairments associated with sediment. Using the Bank Erosion Hazard Index (BEHI) along with the percent of eroding bank assesses the extent of eroding banks and their potential for future erosion. The BEHI method provides a cost effective and reliable method of assessing bank stability and to assess the potential for future erosion. As previously stated, the information provided by the BEHI assessment was used *in combination* with the information provided by all of the other targets and supplemental indicators to reach conclusions about water quality impairment, thus minimizing the potential impact of sampling bias. Additionally, the document specifically addresses and acknowledges variability and uncertainty associated with the analyses conducted as part of this WQRP in Section 4.0.

Comment 2.3: The addition of pool indices (frequency, residual depth) as targets (is) important to monitoring success relative to coldwater fisheries and aquatic life, beneficial uses identified for many of the streams in this Plan.

> **Response:** MDEQ agrees with this comment. Pool conditions are very relevant targets for sediment TMDLs because they relate directly to sediment conditions in the stream, sediment transport, and to the fishery use. MDEQ measured residual pool depths during this project but did not find a sufficient amount of internal reference data to set pool related targets. Also, the Beaverhead-Deerlodge and Greater Yellowstone reference data applicable to this TMDL project did not have sufficient amount of pool measurements to set pool function targets. The adaptive management strategy in the final document was modified to reflect this comment.

Comment 2.4: The Beaverhead-Deerlodge NF had just completed a Draft Forest Plan revision. Within the revised Forest Plan, there are standards similar to those found in Table 4-5 and were developed using the same dataset. We would like you to consider the following ranges as sediment targets.

Entrenchment	A	<1.4
	B	1.6 – 1.8
	C	>11.6
	E	>10.7
Width/Depth Ratio	A	<10.3
	B	<18.3
	C	<23.2
	E	<6.5
Sediment %<6.25mm	B3	>13
	B4	<27
	C3	<15
	C4	<25
	E3	<19
	E4	<35

Response: The Ruby TMDL sediment targets and the Beaverhead-Deerlodge NF standards are very similar and based on approximately the same reference dataset. MDEQ set targets based on the high or low quartiles depending upon the parameter measured. The USFS set standards on a mean of the data set. MDEQ will use the sediment targets provided in the draft Ruby Sediment TMDLs to provide target setting consistency within Montana's TMDL program. Both the TMDL targets and the Beaverhead-Deerlodge NF standards will likely be protective of impaired stream uses because they have similar thresholds.

Comment 2.5: It is stated in the report that the Ruby River below the reservoir is impaired for sediments and temperature, and that a TMDL will be written. According to State Law and the DEQ's assessment of current reservoir operations, the dam is being operated reasonably. Therefore conditions below the dam are considered natural, and that a condition of "purer than natural" is not required. Why then is a TMDL for sediments and temperature being proposed for the Lower Ruby?

Response: The Ruby Reservoir is being operated reasonably and is therefore not considered as source of sediment or thermal impacts as long as the facility continues to operate reasonably. Water entering the lower Ruby River from the dam facility is considered "natural" under state law if the facility is being operated reasonably. Sediment and temperature TMDLs are provided for the lower Ruby River because of the impacts of inefficient irrigation practices and riparian impacts that are affecting sediment and temperature conditions.

Alternatively, the Ruby Reservoir operations are an integral part of a restoration process for increasing irrigation efficiency below the reservoir and leasing the saved water for in-

stream use during the heat of the summer. If irrigation efficiency is addressed using environmental funding sources such as NRCS EQIP or Clean Water Act funds, the saved water should be used for environmental uses. MDNRC Ruby Dam operations can release the saved water during environmentally sensitive timeframes. MDEQ encourages MDNRC to coordinate Ruby Dam operations with local irrigators, MFWP, conservation districts and watershed groups if irrigation water savings initiatives occur in downstream irrigation networks where the Ruby Reservoir supplies water.

Comment 2.6: Delisting streams based on qualitative data and small sample sizes is alarming. We feel that all delisted streams in this document should be carefully reviewed. Additional data collection may be warranted. In cases where a delisted stream harbors WCT, additional data should be mandatory. Given the status of WCT in the Upper Missouri basin, only rigorous data must be applied toward any decisions regarding delisting.

Response: This response addresses the use of qualitative data and small sample sizes as questioned in Comments 2.6 – 2.6.6. Due to the nature of these comments, responses were combined for ease and readability. Each sub comment addressed a specific stream in the same framework as the main comment above. Responses for stream-specific sub-comments (2.6.2 – 2.6.6) are provided later in the text. All streams identified in this document as fully supporting beneficial uses on the 2004 303(d) list underwent multiple assessments as part of both the TMDL and the SCD/BUD process. For a more detailed account of the technical review process see the end of Section 3.2. For each streams impairment status review see the appropriate subsection within Section 5.0.

Hawkeye, North Fork Greenhorn, Mill Gulch, Current, and Harris Creeks, along with West Fork Ruby River are the streams questioned in Comment 2.6. For initial clarification, the impairment status review provided in this document is not the formal 303(d) impairment review process, but information in this document will be used to update 303(d) impairment reviews within the Ruby Watershed in the near future.

Comment 2.6 and all sub-comments listed below argue that data sets used for the decisions have low confidence for supporting the decisions made. MDEQ contends that by using a number of biological, chemical and physical (or riparian habitat) assessments in combination with detailed source assessments, provides for the best available approaches given the multitude of constraints associated with natural sciences and the TMDL program in Montana. Biological sampling captures a specific ecological population that represents local and upstream conditions over a temporal scale. Assessing current physical conditions and comparing them to expected conditions for the physical setting assesses likely stream channel geometry change over time. Stream channel and instream physical assessment identifies sediment deposition and transport conditions over time. Aerial photo/map assessments were used provide a complete overview of each watershed and to create efficiencies for watershed field reconnaissance.

Although the commenter alludes to single samples for specific streams, the Ruby TMDL project assessed 120 sections of stream that equaled approximately 20% of the listed stream mileage in the Ruby Watershed. An initial aerial photo/GIS map assessment

identified stream segments with consistent attributes and a subset of segments were identified for field assessment. In each stream section, one representative cross section was selected for measurement. Data from these sections of stream were used in developing the sediment impairment status sections along with other previously collected data. This data was also used to develop TMDLs for all listed stream segments in the Ruby TMDL Planning Area. The Monitoring and Adaptive Management Section (11.0) of this document provides an avenue to strengthen the validity of current knowledge.

Given a stringent schedule and large number of reassessments and TMDLs required for completion, MDEQ is often tasked with answering complex scientific questions with less than ideal data and resources. MDEQ will continue to utilize the best data and information attainable within the constraints of completion schedules and continue to propose monitoring that will help strengthen the validity of current knowledge. The weight of evidence approach applied to impairment status reports and the monitoring and adaptive management plan included in the TMDLs are designed to address the inevitable data limitations with which MDEQ must contend in meeting its obligations for TMDL completion.

Comment 2.6.1: Harris Creek - This creek contains >99% pure WCT and is currently listed from the FS boundary to headwaters, Data: TSS (n=1); visually clear stream; SRAF (n=?); ocular estimates of riparian cover and bank stability (n=?); spawning gravel and pool habitat abundant (narrative); MVFP index and Clinger Taxa (n=1); periphyton (n=?) It appears from Map 2 that the sample reach "HAR1A" is outside the listed segment, while a "water quality sampling site", "HARRC01" is within the reach. However, it is unclear which data were collected at which location making further critical comments difficult. The data relied on to delist this stream is largely based on visual observation without supporting quantifiable data. This highly subjective method is not sufficient to delist this stream segment.

Comment 2.6.2: Mill Gulch - This stream is listed from FS boundary to headwaters; contains 90-99% WCT. The full support decision seems to be based upon the following data: TSS (n=?); periphyton (n=?); MVFP index and clinger taxa (n=1?); cross section (n=?; no sample reach identified on map) SRAF; ocular riparian assessment; reduced cover and bank erosion due to grazing, but generally good condition (narrative); regenerating clearcuts (narrative); one road with stable surface and sufficient culvert at crossing (narrative), however the road was not assessed during the road sediment source inventory. The data supporting the de-listing of this stream is very qualitative in nature and the decision seems to be largely based on the observation contained in the narrative section of the report. This highly subjective method is not sufficient to de-list this segment.

Comment 2.6.3: North Fork Greenhorn Creek - This creek was contains >99% pure westslope cutthroat trout (WCT), 90-99% WCT, and suspected pure WCT in tributaries. The weight of evidence is not convincing for a conclusion of fully-supporting. It should not be removed from the 303d list. The full support decision seems to be based upon the following data: water chemistry samples (n=?); SRAF and riparian assessment (n=?) suggesting sustainable riparian conditions; narrative descriptions of a functioning system; a SRAF rating condition “good”; bank stability rated good (n=?, locations?); aquatic insect and periphyton suggesting full support

(n=2?); MVFP index and clinger taxa above targets (n=1?); and narrative information on Forest Service grazing management, roads and mines. From the lack of data reported, it appears that no cross section was conducted during the TMDL process. This is totally unacceptable for a stream with pure WCT. There is no strong evidence that the coldwater fishery in this stream isn't threatened.

Response to 2.6.1-2.6.3: MDEQ disagrees with the comments above. See response to Comment 2.6 for a general response to these comments. Sample size, location, monitoring techniques and target parameter selection are addressed in Responses 2.7-2.7.9. The following responses describe the overall approach that was used to determine the impairment status of Harris and North Fork Greenhorn creeks and also Mill Gulch.

These three streams were judged to be fully supporting beneficial uses during the 2004 303(d) process, which occurred prior to the TMDL process. The impairment status section of this document identifies data collected during the 303(d) assessments. Methodology for 303(d) assessment is provided in Appendix A of Montana's Water Quality Integrated Report for 2004.

Field reconnaissance of these watersheds was conducted during the TMDL project to strengthen the validity of the initial 303(d) assessment. No further data was collected during the TMDL process because the TMDL team concurred with the outcome of the 303(d) reassessments for these three streams based on the initial 303(d) data collection and their field observations of the watersheds. Because of this and other public comments, each of these streams 303(d) assessment results were reviewed for validity of "good cause delisting" for each previously listed pollutant according to guidelines under the Federal Clean Water Act (40 CFR).

MDEQ collected data to support the 303(d) assessment at site HARRC01 during 2002. The TMDL aerial photo/GIS assessment included a reach on the lower end of Harris Creek.

Comment 2.6.4: Hawkeye Creek - This stream contains 75-89% WCT and is still considered to be impaired (by commenter, not DEQ). The full support decision seems to be based upon the following data: Water quality sample (n=1); TSS (n=1); MVFP index and Clinger Taxa (n=1?); Sediment criteria – n=2? (% stable bank, % fines, entrenchment ratio, SRAF, width/depth ratio, BEHI). The TMDL concludes that the stream is impaired, but that the sources are essentially all natural (1% load from grazing) so all beneficial uses are considered supported. However, grazing still occurs and beaver are absent from the drainage. Although the drainage may have naturally high sediment levels, the loss of beaver and the corresponding loss of the streams ability to trap sediment should be viewed as anthropogenic impairment of the stream.

Comment 2.6.5: Shovel Creek - Though this creek contains a hybridized population of westslope cutthroat trout (78-89%), we feel that the weight of evidence is still too weak to warrant a conclusion of full-support. The conclusion appears to be based on the following data TSS (n=1); MVFP below target (n=1); clinger taxa above target (n=1); SRAF (n=1?) indicating lower range of full support; riparian assessment indicating sustainable conditions; narrative

descriptions of a highly erosive system, cross section data (n=2?) indicating fair condition; width/depth ratio(n=2?), % surface fines (n=2?), % gravel fines (n=1?), BEHI (n=2?) all within target; % stable bank below target (n=1?). We feel that Shovel Cr. is a case where confidence in the weight of evidence and conclusions is clearly overstated. There was one biological sample, from which one metric indicates aquatic life impairment; narratives discussing fine sediments (high natural erosion, large amounts of fine sediment, substrate often embedded with fines, slumped banks, undercutting, willow regeneration high but cover not continuous, banks vulnerable to shear stress) conflict with mostly qualitative samples using highly variable methods resulting in within-target results. This is not a case where the evidence overwhelmingly indicates full support, nor is it a case where there is no anthropogenic source of pollution (32% of sediment load has been attributed to grazing). This stream needs further assessment before delisting.

Comment 2.6.6: West Fork Ruby River - This creek contains 90-99% pure westslope cutthroat trout (WCT), and any decisions about impairment should rely on non-conflicting, quantitative data within the weight of evidence approach. The creek was determined to be fully-supporting based on the following data: TSS (n=1); MVFP index and clinger taxa within target (n=1); periphyton sampling (n=?) indicating some impacts potentially from sediment and organic enrichment; SRAF and riparian assessment indicating healthy and sustainable conditions; narrative descriptions of bank and sediment sensitivity to grazing, reduced spawning gravels due to fine sediment, clean gravel available in riffles, natural sources of sediment, high load of fines, high lateral movement, high width/depth ratio, regenerating willows, beaver activity in upper reaches; bank stability below reference (n=2?); cross section data (n=2) found entrenchment, % surface fines, and BEHI within target, width/depth ratio within target for one reach and above target on other; % gravel fines above target (n=1) in area of former beaver use, and % stable bank below target on both. We feel this creek is an example of conflicting data that is common with small sample sizes and uncertain targets. For example, a narrative describes somewhat reduced spawning gravels due to fine sediment and high load of fines, while the % surface fines (based on 2 pebble counts) were well within target, and the % fines in spawning gravel exceeded target by 800% at one sample location. The combination of WCT, conflicting data, and presence of an anthropogenic sediment source (12% from grazing) in a highly sensitive system warrants better data for impairment calls. We judge the conclusions based on these data unreliable and recommend additional data be collected for reassessment.

> **Response to Comments 2.6.4-2.6.6:** See response to Comment 2.6 for a more general response to these comments. The following responses describe the overall approach that was used to determine the impairment status of Hawkeye and Shovel creeks and also the West Fork of the Ruby River. The following response also considers specific comments for each stream that were provided.
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> These streams were judged to be fully supporting beneficial uses during the 2004 303(d) process, which occurred prior to the TMDL process. The impairment status section of this document identifies data collected during the 303(d) assessments. Methodology for 303(d) assessment is provided in Appendix A of Montana's Water Quality Integrated Report for 2004. However, additional steps were taken as part of the TMDL process to

validate the 2004 impairment calls. These steps are further described below and text was added to Section 3.2 in the final report to describe this process.

Field reconnaissance of these watersheds was conducted during the TMDL project to strengthen the validity of the initial 303(d) assessment. Field reconnaissance resulted in further physical condition and sediment source assessments on these streams because of the erosive nature of the upper Ruby Watershed, biological responses to sediment conditions, and potential for sediment production from grazing sources in these three watersheds. The impairment reviews for these streams identify data collected during both the 303(d) reassessment and the TMDL assessment (Section 5.0).

Because of this comment, these streams were assessed for "good causes for delisting" according to the federal clean water act guidelines. The outcomes are presented below and Sections 5.0 and 7.0 of the document have been revised.

The results of the sediment source assessment in Hawkeye Creek's watershed based on aerial photo review and field monitoring identified large natural sediment loads when compared to negligible sediment loads from grazing. The validity of the previous 2004 303(d) assessment for Hawkeye creek was upheld based on the original data collected during the 303(d) process and the new sediment source assessment information. There was good cause for delisting this stream because there was very little, if any, human controllable sediment loading in the watershed when compared to natural background sediment loads.

Although Shovel Creek is capable of effectively assimilating a large load of fine sediment, grazing related sediment sources are present. Fine sediments measured in the stream are lower than reference condition but the biological data indicate borderline impairment conditions. Although there is low confidence in determining sediment impairment because of borderline and conflicting biological and sediment indicators, a good cause for delisting can not be justified because human caused sediment sources may be impacting the fishery. A sediment TMDL will be completed in the final draft. An adaptive management plan is presented to solidify the link between sediment conditions and impaired uses.

In the West Fork of Ruby River, aquatic insect and periphyton monitoring indicated support of beneficial uses. Grazing related sediment sources are present in portions of the watershed. High fine sediment deposition was found only in conjunction with unmaintained upstream beaver dams that may naturally impact local siltation. Nevertheless, good cause for delisting can not be fully justified because human caused sediment conditions may be impacting fish spawning. A sediment TMDL will be completed in the final draft. The Sediment TMDL will address both deposited and suspended sediment sources. An adaptive management plan is presented to solidify the link between sediment conditions and impaired uses.

MDEQs approach for assessing impairment, writing TMDLs and TMDL allocations do not consider beaver activity as a human caused condition. Beaver activity can promote or

degrade the use of a stream for fishery or other aquatic life use depending on specific site conditions and beaver activities. Beaver are affected by natural predation, trapping, food availability and disease among other factors. The magnitude of these influences upon beaver populations in this stream, like most streams, is unknown. Where appropriate, MDEQ supports further efforts to manage beaver populations that may help trap sediments. Managing beaver populations will require a local and regulatory stakeholder management approach.

Comment 2.7: We are concerned by the lack of DEQ's attention to EPA's guidelines for quality of data. The EPA requires precision, reliability, accuracy, and representation for the data relied on in a TMDL. We cannot verify if these standards are met for the following reasons:

Response: See responses to Comments 2.7.1-2.7.11 along with the comment below.

MDEQ follows a Quality Assurance Plan and Standard Operating Prociedures (SOPs) for collecting biological, chemical, sediment, and temperature data. To view the quality assurance program and SOPs see the following link:
http://www.deq.mt.gov/wqinfo/QAProgram/index.asp

Comment 2.7.1: Absence of data in the report - We cannot be sure of the data quality due because it is not immediately available for review. Although the report obviously relied on a significant amount of data that data is not consolidated in one location where it can be reviewed by the public. This leads to several specific concerns: "n" or sample size is often not reported and has to be inferred, specifics of field sampling are often not given, and maps of sampling locations are clearly tied to data collected at that location.

Response: A MDEQ contact was identified in all public notices for the public comment period and could have provided a supporting database if requested. The data report generated as part of this plan was too large and costly to include in a draft report. No data inquiries were received during the public comment period. A data appendix is provided as Appendix D in the final document for electronic versions. Contact MDEQ for project data in hard copy format for future reference. MDEQ is willing to provide supporting data when requested.

Locations of sediment assessment reaches, water chemistry sites, and biomonitoring sites were referenced in the text and mapped in Figures 2 and 3 of Appendix A. A list of sediment, riparian and bank erosion sampling locations is provided in Appendix E. Map 2 of Appendix A identifies the location of each reach. Tables that compare the existing conditions to stream channel and sediment targets in Section 5.0 contain codes to indicate the number of locations sampled for each identified Rosgen stream type on each stream. Appendix E identifies methods used for the sediment source assessment. Water chemistry and stream flow locations are provided in Map 2 of Appendix A. Nutrient and metals data are summarized in Maps 10-15 in Appendix A.

Comment 2.7.2: Sample size - As we understand the data collection methods, one cross section, of unknown width or length, was conducted per reach, of unknown length. The cross section was

chosen at a location meant to represent the average conditions of that reach. This method doesn't seem adequate to represent the variability within a reach and relies on a subjective opinion of "average". A sample size of 1 doesn't allow for any statistical analysis of results or identification of anomalous readings. Three cross sections per reach, at a minimum, would result in a reliable dataset. Entrenchment also appears to suffer from a sample of n=1.

Response: Monitoring techniques are reviewed in Appendix E. See second half of the response to Comment 2.6 and 2.7.1 to consider along with the response below.

Selecting one representative cross-section is a standard method for characterizing a reach of at least 20x the bankfull width (Rosgen, 1996). Field crews were trained to select a riffle cross section site that would represent the assessment reach. Reach lengths vary according to the size of the water body, aerial assessment reach, (again to be at least 20x bankfull width) and variability of landform and stream and riparian types in neighboring areas. Due to the large number of miles (roughly 350 miles) of listed streams, a survey approach was necessary, as time and budget constraints precluded a detailed assessment of every stream mile. If averaged out over the watershed, one field assessment reach occurred for every three miles of listed stream.

Time and funding constraints provided limitation on the number of cross sections that were monitored for the Ruby TMDL project. The overall approach used represents a balance between a large number of sampling sites with fewer data at each site versus a low number of sample sites with more data at each site. Nevertheless, we agree that more cross sections at each site could be beneficial. Monitoring recommendations in Section 11.0 have been updated to provide guidance for at least three cross-sections per reach for future monitoring efforts. The adaptive management approach can use data collected in the future strengthen the validity of our current knowledge about the Ruby Watershed.

Comment 2.7.3: Riparian cover and bank erosion were both assessed via ocular estimates. Given the pervasiveness of the sediment problem in the Ruby, these subjective measures seem inappropriate and inadequate. Other, quantitative measures should have been used. No specific methods of the ocular estimates are given in the document, precluding critical review. The accuracy variability between observers was reported, but the method of determining this was not. Neither the size nor the location of the plots was reported.

Response: Montana DEQ disagrees with this comment. Woody vegetation cover on streambanks was estimated ocularly to the nearest 5%, with an expected error of 10% for this categorical method. Other studies using this same method of estimating vegetation cover also generally have accuracy to the nearest 10% (e.g. RWRP vegetation classification methods). Relying on only quantitative measures that include no estimation of cover can result in a less accurate, although more precise, classification of the vegetation when used to estimate cover over an entire reach. The method used has accuracy and precision that met the objectives of the project which were to identify the relative magnitude of sediment sources as per U.S. EPA guidance (EPA 841-B99-004).

Dimensions for estimating streambank erosion were measured for many discrete sediment sources, but were ocularly estimated for general sources spread throughout a reach. This method was followed because measuring all dimensions and deriving average dimensions from the data would have been more time-consuming than the budget allowed for the large number of reaches visited. As investigators assessed reaches they did note dimensions of different eroding areas where necessary to derive an average height or estimate the percent of the reach for estimating sediment loading from general sediment sources. The method used has accuracy and precision that met the objectives of the project which were to identify the relative magnitude of sediment sources as per U.S. EPA guidance (U.S. EPA 841-B99-004).

Methods are described in Appendix E. Text has been added to the methodology Appendix E, Section E.3.1.2, to specify data quality control measures in more detail. Plot size generally is the entire assessment reach.

Comment 2.7.4: Pebble counts, a method fraught with "considerable variability", were used to evaluate sedimentation, including fine sediments. Again, given the pervasiveness of this pollutant in the Ruby system, a reliable method of estimation should have been used, such as core sampling. Pebble counts are not a reliable measure of find sediments, nor is the metal grid method also employed in this assessment. If these methods are to continue being used, DEQ should require a higher sample size to account for observer bias.

Response: Montana DEQ agrees that a less bias measure of fine sediment sampling would provide a more reliable estimate of total percent fines. Unfortunately, analysis of McNeil cores is cost-prohibitive for the 120 locations in which channel morphology was measured. Core sampling provides a more robust assessment of a specific location but also has sampling biases associated with monitoring site selection. Additions to the future monitoring and adaptive management section indicate that future pebble count measures in the watershed should consider higher number of counts per assessment reach and that collecting McNeal core data could be considered in specific locations were sensitive species are known to spawn. Also, no reference data set was available for southwest Montana at the time of this project for McNeal core measurements but was available for pebble counts.

Comment 2.7.5: Other sediment criteria were assessed via the Stream Reach Assessment Form. This is really a qualitative measure, rather than "semi-qualitative". There is no justification given for using this method over other more quantitative methods. There is no discussion in the document of data reliability, and again, no spatial extent and location of sampling plots are reported. We feel that this method is useful for an initial, coarse assessment, but should not be given much "weight of evidence" when deciding to delist streams.

Response: Any data from the SRAF are considered as one piece of information to assess with a suite of indicators and is not used as solely for impairment status review. The SRAF scores are comparable to the "NRCS, USFS and BLM "Proper Functioning Condition" assessment methods. The SRAF score contains a qualitative assessment of many stream channel and riparian functional components and is a useful tool to

determine if a section of stream has been influenced by human activity. The SRAF assessment applies to a whole sampling section. See Comment 2.7.1 for description of sediment sampling locations.

Comment 2.7.6: Weight of Evidence Approach to Sediment Impairment Decisions. The "weight of evidence" approach for sediment is not objectionable in concept. However, as applied in this document, impairment decisions are made based on data of unknown quality, quantity, or reliability. This is not the intention of the weight of evidence approach. A collection of criteria, each with little confidence, cannot add up to a body of evidence.

Response: MDEQ disagrees with much of this comment. The impairment status review provided in this document is not the formal 303(d) impairment review process, but information in this document will be used to update 303(d) impairment reviews within the Ruby Watershed in the near future. See Appendix E, for data collection methods. Also see responses to Comments 2.6 and 2.7.1-2.7.5.

Comment 2.7.6 argues that data sets used for the decisions have low confidence for supporting the decisions made. MDEQ contends that by using a number of biological, chemical and physical (or riparian habitat) assessments in combination with detailed source assessments, provides for the best available approaches given the multitude of constraints associated with natural sciences and the TMDL program in Montana. Biological sampling captures a specific ecological population that represents local and upstream conditions over a temporal scale. Assessing current physical conditions and comparing them to expected conditions for the physical setting assesses likely stream channel geometry change over time. Stream channel and in-stream physical assessment identifies sediment deposition and transport conditions over time. Aerial photo/map assessments were used provide a complete overview of each watershed and to create efficiencies for watershed field reconnaissance.

Although the commenter alludes to single samples for specific streams, the Ruby TMDL project assessed 120 sections of stream that equaled approximately 20% of the listed stream mileage in the Ruby Watershed. An initial aerial photo/GIS map assessment identified stream segments with consistent attributes and a subset of segments were identified for field assessment. In each stream section, one representative cross section was selected for measurement. Data from these sections of stream were used in developing the sediment impairment status sections along with other previously collected data. This data was also used to develop TMDLs for all listed stream segments in the Ruby TMDL Planning Area. The Monitoring and Adaptive Management Section (11.0) of this document provides an avenue to strengthen the validity of current knowledge.

Given a stringent schedule and large number of reassessments and TMDLs required for completion, MDEQ is often tasked with answering complex scientific questions with less than ideal data and resources. MDEQ will continue to utilize the best data and information attainable within the constraints of the schedule and continue to propose monitoring that will help strengthen the validity of current knowledge. The weight of evidence approach applied to impairment status reports and the monitoring and adaptive

management plan included in the TMDLs are designed to address the inevitable data limitations with which MDEQ must contend in meeting its obligations for TMDL completion.

Comment 2.7.7: In this document, where quantitative sediment criteria were measured (entrenchment, % surface fines, width/depth ratio, % fines in spawning gravel, clinger richness, MVFP index, and TSS), there is quite commonly a lack of robust sample size (n=1 in many cases), a failure to report the depth of the data to allow for critical review (neither "n" nor location reported), or reliance on methods with high variability due to observer bias or seasonality. Of those quantitative measures listed above, only entrenchment, % surface fines, and width/depth ratio are considered robust enough criteria to carry full weight.

Response: See response to Comment 2.7.1 for data reporting concerns. Sample size concerns are addressed in response to Comments 2.7.2 and 2.7.6.

All of the sediment criteria are considered together to indicate if sediment conditions exceed state narrative sediment standards. Conditions that are considered in determining if Montana's narrative sediment standards are exceeded are:

- Are the beneficial uses impaired?
- Have anthropogenic sources increased sediment erosion and/or delivery?
- Is there a sediment supply problem (i.e., Is there too much or too little sediment in the stream)?
- Is there an indication of an in-channel sediment transport problem?

These factors are assessed via the selected target suite. Each parameter selected for sediment targets relates to one of the questions above and is used in context to answer the questions stated above. Uncertainty with each observation or measurement is considered within the impairment review.

Comment 2.7.8: The rest of the criteria (BEHI, % fines in spawning gravel, % streambank canopy, % stable bank, residual pool depth, clinger richness, MVFP index, TSS, and results from the Stream Reach Assessment Form) are supplemental – "used with less weight due to a lack of information about target values, low reproducibility of methods, or the nature of the parameter not being conducive to application in management as a target." Under this description, we would argue that % surface fines based on the highly variable Wollman pebble counts should also be considered supplemental.

Response: Since Montana's water quality standards for sediment are narrative; there is no single parameter that can be applied alone to provide a direct measure of beneficial use impairment associated with sediment. The weight of evidence approach described in Section 3.3 of the document is predicated upon this fact. The surface fines target (using pebble count data) was selected specifically to provide one type of measurement to assess potential sediment impairment associated with the aquatic life and cold-water fisheries beneficial use. Pool Tail out grid tosses were also used as an assessment tool.

Pebble counts were developed and have been regularly used by state and federal agencies to ascertain the amount of surface fines affecting streams (U.S. EPA, 1999). Furthermore, as stated in Section 3.4.1, "*Recent work completed in the Boise National Forest in Idaho show a strong correlation between the health of macroinvetebrate communities and percent surface fines.…*." The information provided by pebble counts were used in combination with the information provided by all of the other targets and supplemental indicators to reach conclusions about water quality impairment. Also, reference data sets for SW Montana were in the form of pebble count data. This influenced the use of pebble count methodology for comparison to reference conditions. The Proposed Future Studies and Adaptive Management Strategy section identifies approaches to collect more robust instream fine sediment data during future monitoring activities.

Comment 2.7.9: Additionally, certain supplemental criteria (% streambank canopy, % stable bank, residual pool depth and % fines in gravels) are fraught with low confidence in targets due to small sample size. Clinger richness and MVFP index not only suffer from small sample sizes, but have the added caveat of being "emerging science" that is not fully understood or accepted.

Response: The weight of evidence approach was used and multiple lines of evidence are assessed using a number of targets and supplemental criteria because of uncertainties involved in each of the sediment criteria. Text was added to the Proposed Future Studies and Adaptive Management Strategy that addresses the uncertainty associated with macroinvertebrate metric assessment.

Comment 2.7.10: Especially in the case of westslope cutthroat trout streams, only strong evidence that beneficial uses are fully supported would warrant removing a listed stream. We recommend all streams found fully-supporting under the weight of evidence approach for sediments be reassessed and credible data presented.

Response: All streams found fully-supporting their uses in this document have already been determined to fully support uses by previous 303(d) assessments. Data collected during the TMDL effort will be used in future 303(d) listing impairment determination updates. The 303(d) sufficient and credible data assessment and impairment determination assessment methods are provided in Appendix A of Montana's 2004 Water Quality Integrated Report.

Comment 2.7.11: Reference data – Beaverhead Deerlodge NF reference data were used to develop targets for some sediment criteria and Ruby River reference reaches were used for others. The authors acknowledge that the samples in these datasets are too few to have a high degree of confidence in targets. This uncertainty should be addressed not only through adaptive management, as suggested, but through quantitative sampling where possible, and a very high weight of evidence approach when qualitative measures are relied upon.

Response: The Beaverhead Deerlodge NF reference data contains quantitative sampling for 196 reference site locations and represents the best regional reference data set available. This data set is not only BDNF reference data but also reference data from the greater Yellowstone region. See the BDNF website for further information about this

reference dataset. The quantity of data provided in the BDNF data set is quite robust, although the application of this dataset to lower elevations and larger rivers provides some uncertainty. The BDNF reference data set contained limited types of stream channel criteria measurements. Other criteria that relate to riparian vegetation condition and bank erosion were based on internal least impacted sites found during the TMDL assessments. Sediment criteria based on the Ruby TMDL monitoring at least impacted sites are considered supplemental sediment criteria. A weight of evidence approach used all of the targets and supplemental indicators in combination to reach conclusions about water quality impairment to overcome uncertainty in some of the qualitative assessments used as supplemental indicators. Qualitative sampling was conducted where possible with available resources. The TMDL targets are not stagnant; targets can be updated with due cause via data collection and adaptive management.

3. Source Assessments and Allocations

Grazing and Vegetation

Comment 3.1: Throughout the report there is no differentiation of cattle, domestic bison, horses and domestic sheep grazing. They are not all the same and cattle are the only ones mentioned in most cases. Ditto this again for the various wildlife ungulates.

Comment 3.2: Page 135 Only on this page and one other did I find mention that wildlife grazing was affecting stream banks and sediment. You should note that the estimated 9,000 elk present have major impacts on vegetation as do moose and the few remaining mule deer, antelope and numerous white-tailed deer. Contact Howard Chrest former FG biologist Sheridan for information on mule deer populations in 1960's and 1970's and demise of browse species.

Comment 3.3: Livestock seem to get the blame for all the grazing ills on the range. Much work has been done on the impacts of the huge ungulent population in the Ruby. Elk and moose especially have been recognized as major contributors to riparian degradation.

> **Response to 3.1.-3.3:** The scope of this project was to estimate the grazing impacts from livestock and wildlife sources. Breaking the livestock impacts into categories would add significant costs to the analysis. MDEQ understands that wildlife are also managed by human actions, and these management activities, if done in a manner that follows existing wildlife management regulations, are considered part of the naturally occurring condition. Therefore, impacts that were clearly caused by wildlife graze and browse in riparian areas were classified under natural sources of sediment during this assessment, although they were not broken into a specific wildlife impacts category. Hoof prints, feces and browse height were used to determine the extent of livestock and wildlife impacts in riparian corridors, with the awareness that impacts from livestock can usually be mitigated via well defined best management practices consistent with water quality protection goals defined by State Law.

Comment 3.4: Your modeling statement that the sediment is coming from grazing on steep lands is probably only partially true. A task force was formed by FWP about one year ago to

correct problems on this game range but as far as I know no action has been taken and I am on the task force. Field trips I have made there recently show heavy cattle and bison grazing and abuse in a number of locations. Relatively few elk are on the Robb-Ledford and Blacktail Game Ranges again this winter (conversation with Bob Brannon FWP two days ago). During the relatively mild winter of 2004, most of the elk left both these game ranges and moved to private, BLM and USFS lands. Antelope and mule deer numbers have declined considerably since these game ranges were established. When the cattle grazing program was started on the Robb-ledford, the experienced FWP range specialist recommended no more than 500 cow/calf pairs in a rest rotation system. Politicians on the FWP Commission and in the Dept. increased that number to 1, 168 pairs. Only recently have transects been laid out to record condition and trend of the range. Wildlife, cattle and trespass bison grazing location data are not available and there is no accurate data on snowpack depths, distribution and longevity on these ranges. Wolves are a new impact which has not been assessed as is heavy hunter traffic effect on wildlife use of the range and winter use of the county road. Good data on wildlife are very much lacking in recent years compared with the past information which is available in reports.

> **Response:** For clarification, Rob and Ledford watersheds were not assessed by field measurements for the TMDL effort. These two watersheds were only assessed by field reconnaissance. The document identifies these areas for future 303(d) assessment.

Comment 3.5: You did not mention any part of the sediment which may be coming from heavy elk grazing. I know the only animal with the ability to cause more damage to habitat if unmanaged might be the horse. If the two were put into a small pasture and chewed everything as low and as high as they could reach it would be a toss up of which would be the final survivor. See YNP and Lamar Valley for some prime examples of elk abuse of habitat and increased erosion.

> **Response:** See the response to Comment 3.1-3.3. Areas of heavy elk grazing do occur in the Ruby Watershed and are noted in the document when they were found. Although Northern Yellowstone National Park is a good example of severe wildlife grazing, a comparison of wildlife impacts in Yellowstone National Park should not be equated to conditions in the Ruby Watershed because livestock, elk, and other wildlife are managed differently in both areas.

Comment 3.6: Where did the 51 per cent reduction from grazing sediment and 60 per cent for roads come from?

> **Response:** Two lines of reasoning were used to derive the road and grazing percent reduction allocations. For each, a general review of best management practice (BMP) effectiveness was completed and also a detailed assessment of the assessed sites in the Ruby Watershed was completed. For both roads and near stream grazing sources, reductions are based on applying effective BMP restoration controls on the top 20% of the sediment producing sites for each source. Section 7.3.2.1.2 identifies the approach used to derive the grazing allocation. Section 7.3.2.1.1 identifies the approach used to derive the road allocation.

The Washington Watershed Assessment methodology (Washington Forest Practices Board, 1997), which is regarded as an accepted approach in Northwestern United states watershed studies, cites a study by Burroughs and King (1989) that specified a 100% sediment delivery ratio for crossings and drain ditches within 200 feet of streams. The potential reduction from road-related sources is considered 75% instead of 100% to account for the likelihood that not all delivery sites will have a high delivery ratio and that restoration measures to prevent sediment delivery from roads can not be 100% effective. While all of the sites included in the road-related sediment source inventory for the Ruby watershed are within 200 feet of streams, not all involve actual crossings or drain ditches. For example, there are many delivery sites involving road fill erosion or water bars diverting road surface runoff over the fill near a stream. The allocation of 60% reduction in delivery from roads is based on the reduction expected from addressing the most severe sites, assuming a resulting 75% reduction in sediment loading from those sites after restoration. Rationale for the allocation of a 60% reduction is also discussed in Section 7.3.2.1.1 and Appendix E Section E.3.2.2 of this report.

The allocation for grazing is a 51% reduction in sediment delivery, based on the amount that can reasonably be achieved through addressing the worst of the grazing sites contributing to loading from near-stream sources, plus an expected reduction in loading from upland sources, as predicted in the upland sediment modeling. This allocation falls within the range of values for reductions expected in other studies, and is based on the assumption that a 75% reduction in loading from human-caused grazing sources can be achieved at these worst sites through upland and riparian rangeland improvement projects. The rationale for the recommended reduction is also discussed in Section 7.3.2.1.2.

Comment 3.7: The figure of 10 per cent increase in vegetation cover was apparently picked out of the air for a model. Justify this number.

Response: The justification for the 10% increase in vegetation cover in grass and shrub dominated areas of the watershed is based on an estimate of average conditions observed during field reconnaissance for the project. The 10% increase in vegetation cover in these areas is based on best professional judgment. Because of the uncertainties involved, a conservative approach was used in assessing an estimated increase in vegetative cover due to upland grazing BMPs. The assessors thought a higher level of cover could likely be achieved, on average, across the watershed. Results from local sediment studies conducted by Meeuwig (1970), Page (1978), and Van Mullem (2000) were also used to determine if the upland sediment modeling estimates were reasonable. Appendix H has been updated to reflect the comment.

Sediment

Comment 3.8: You apparently used road erosion from models (constructed in) the state of Washington. Would that be valid at all for SW Montana?

Response: The road sediment methodology follows the Washington Forest Practices Board method (WFPB, 1997). A summary of the methods are provided in Appendix E. The Washington Forest Practices Board method provides a reasonable sediment load estimate for the objectives of this document. Because all of the sediment source assessments have uncertainty associated with them, the numbers used for the source assessment should not be thought of as absolute and should be considered in light of the limitations and error associated with the source assessments. Because of this uncertainty in the source assessment the allocations are not set as absolute load reductions, but percent load reductions based on expected sediment reductions that restoration practices can likely achieve. Sediment source assessment results are useful for determining the largest sources within each watershed and are useful, along with consideration of restoration costs, to determine an allocation strategy based on economic costs and environmental benefits. See Section 7.3.4 for a general discussion about the uncertainty associated with all of the sediment load estimates.

Comment 3.9: "All streams have a natural sediment load that is associated with NATURAL SOURCES SUCH AS LAND SLIDES, WILDLIFE GRAZING, CHANNEL MITIGATION, FLOODING AND UPLAND EROSION. (My comment and emphasis) Humans have probably been having impacts on this watershed for at least 10, 000 years. See wintering sites at Barton Gulch over 9,000 years ago and Chert mine north of Black Butte over 8,000 years old.-- Now the old green environmental whammy follows!! Sediment production can be increased where humans have influence over activities that reduce vegetation or increase runoff such as grazing, roads, urban areas, crop production and other activities. The source assessment attempts to identify natural and human caused activities. "You have attempted to say grazing, roads, urban, crop production and other activities are unnatural. I believe the writing of this and future similar reports falls in the unnatural category also.

Response: The MDEQ disagrees with the nature and implications of this comment. We clearly do NOT define basic human activities such as road building or grazing livestock as unnatural. Under State water quality law these sources do **NOT** fall within the definition of naturally occurring when such activities are pursued without proper regard to protection of water quality.

The sediment TMDL process reviews water quality impairments, identifies sources that can be controlled by using reasonable land, soil and water conservation practices and identifies expected sediment reductions associated with installation of conservation practices. The sediment allocation approach in this document assumes an inherent level of sediment production from human caused sources after all reasonable land, soil and water conservation practices are implemented. This approach identifies that a controllable portion of the sediment coming from human activities is unnatural and a portion of the sediment production is inherent for humans to exist on the landscape and therefore falls within the State's definition of naturally occurring.

Comment 3.10: Best (1979) said bank erosion and avulsion of the Ruby River itself is the main source of sediment in the watershed. Five highest sediment producers in the Ruby Watershed are

Basin Creek, East Fork of Ruby River, Robb Creek, Ruby River 06 and Peterson Creek. I could not find Ruby River 06. Show better information on this in the final report.

Response: MDEQ reviews Best (1979) in the TMDL document and TMDL bank erosion assessments indicate likewise. The watershed areas identified in the second part of this comment relate to Figure 4 of Appendix H, which relate to upland erosion assessments. A citation to the figure was added to the text of the main document. The upland modeling identified in Appendix H does not consider channel avulsion process or bank erosion. Bank erosion assessment results techniques are discussed in Section 7.1.3.

Comment 3.11: All the modeling is a very weak point of this draft report and therefore it should never be used to force people in the drainage to do the bidding of government. I assume that because the chief field person was very young and inexperienced more modeling was needed than if very experienced people had been doing the field work. The Modeling by Golder Associates, Inc. Redmond, Washington used on page H-17 cover values of 50 for forest lands, 25 for grass and shrub lands and 2 for bare ground. Perhaps they have had no experience with dense stands of juniper or Douglas-fir and the erosion from these stands which have no under story resulting from many decades of poor forest management practices such as putting out fires, excluding tree harvest and doing no burning as the Indians did for many thousands of years in America. We have seen these erosion impacts very clearly in the Dry Creek area northwest of Whitehall, MT in the Jefferson River Drainage. I see the same things in the Gravelly, Greenhorn, Snowcrest, Ruby and Tobacco Root Mountains in the Ruby River Drainage.

Response: MDEQ understands that all models have associated error and has devoted Section 7.3.4, along with model specific sections in Appendices E and H, to describing the limitations of the sediment source assessment. In almost all cases, some type of sediment modeling is necessary to provide sufficient information for sediment TMDL formation. The need for modeling was not a result of the experience level of the field personnel.

The AGWA modeling by Golder Associates was not used for the sediment TMDL numeric source assessments or for the basis of percent reduction sediment allocations. The AGWA modeling was used to determine if specific restoration approaches would affect sediment yields. The USLE based upland modeling was used to estimate upland sediment yields and sediment yield reductions that could be realized from upland grazing restoration practices.

Forest duff can also play a significant role in erosion control in many forest types and is considered in the USLE based upland sediment modeling that was used for the numeric source assessment and percent reduction allocation. Conifer encroachment may impact erosion in specific areas of the watershed but conifer encroachment studies were outside the capacity of this project. The investigators recognize that conifer encroachment on floodplains is an important issue in the upper Ruby watershed.

Comment 3.12: We would like to see some discussion that recognizes the findings of Best et al. (1979), Page (1978), and USDA FS (1992) regarding the overall contribution of livestock

grazing and roads to the sediment yield in the basin. The TMDL implies that livestock grazing and roads are the major contributors to sediment in the upper watershed. In contrast, the referenced literature states that livestock and roads are very minor contributors to the sediment load in the basin as compared to the tremendous natural sediment loads in the basin. For example, Page (1978) states that 24% of the total sediment load of the Ruby is derived from in-channel sources.

Response: Please refer to Figure 7-1 and text in Section 7.2.1.1. Some text was added to this section to address this comment. Taking all listed streams in the upper watershed, human-caused sources account for 28.4% of the total sediment load generated in the upper Ruby, as estimated in the TMDL assessment. This result appears similar to that found by Page (1978) in your comment, although Page did not consider anthropogenic upland sources for that statistic, and in-channel sources may include both anthropogenic and natural sources. The text of page 185 also discusses the existing studies and makes the distinction between the nature of those studies and the recent assessment.

Comment 3.13: USDA FS (1992) states that the natural sediment loads in the Ruby are high enough to consider switching from managing the watershed to reduce sediment production to managing for stream function.

Response: The TMDL process must identify primary and controllable sediment sources at a watershed extent (U.S. EPA, 1999). Additionally, Montana's TMDL process also assesses instream sediment transport indirectly by assessing stream function (stream channel physical condition). MDEQ agrees that natural sediment production in many areas of the Upper Ruby River watershed is high and that managing for stream function is one very important objective given the linkage between proper stream function, sediment loading and water quality. Nevertheless, MDEQ does not support the idea of only managing for stream function if sediment sources other than near-stream grazing are identified. Roads are identified as sources of sediment in a number of listed watersheds in the Upper Ruby landscape. The roads sediment sources may not be restored in a restoration approach that only addresses stream function.

Comment 3.14: The TMDL has stream function targets (i.e., w/d ratio, entrenchment), but does not discuss stream function per se. We would like to see some discussion regarding ways to improve stream function.

Response: MDEQ interprets the meaning of "stream function" in this comment as the stream potential relating to three aspects; stream channel dimension (W/D, entrenchment, bank full), stream pattern (sinuosity, pool/riffle frequency), and stream profile (stream and valley gradient) (personal communication, Bryce Bon, USFS Hydrologist). Although not all of these stream function factors were used as TMDL targets in the Ruby TMDLs, the restoration approach, if followed, will address all of these factors. If passive restoration is used it may take considerable time for all of the stream function factors to respond in some circumstances. The strategy to improve stream function depends upon localized stream channel condition. A general approach to reach stream function is

identified for each impaired stream in Table 10-4. Site specific recommendations are provided in Table 10-5.

Comment 3.15: How is the naturally active erosion rate factored into the potential determination of the Upper Ruby?

Response: The sediment source assessment is used along with other targets to provide a feedback loop in the impairment process. Section 4.0 identifies that significant human caused sediment sources or changes in stream channel function that affect sediment transport need to be present for a TMDL to be written. Section 5.0 gives a brief review of the source assessment by water body. This was especially important in the upper Ruby landscape where large natural sources of sediment are found. Human influencing activities in areas with sensitive soils and geology may impact sediment production to a higher degree than in less sensitive areas. Section 7.3.4 provides limited rationale for determining significant human caused sources of sediment.

Comment 3.16. TMDL describes 80 miles of state roads, 400 miles of county roads, but does not state how many miles of Forest Service system roads. How many miles of Forest Service road are there in the Ruby watershed and the various tributary watersheds? We recognize that in some basins there may be more miles of NFS roads as compared to other ownerships, however that is not always the case. A breakdown of road miles by ownership by basin would be useful to display who is responsible for road management in the watershed.

Response: Allocating sediment loads to the overall road system is an acceptable approach for TMDL allocations. The Proposed Future Studies and Adaptive Management Strategy section now includes a recommendation to refine road sediment allocations for each watershed by road ownership. The project budget and timeframe do not allow for this type of assessment at this time.

Comment 3.17: Page (1978) states that the majority of sediment in the basin is derived from natural causes. Therefore, he concludes that overall improvement in the stability of the upper Ruby watershed will not occur until equilibrium is achieved. Does the TMDL agree with this statement? If so, how is the natural sediment load factored into the assignment of targets?

Response: The TMDL does not address reaching equilibrium over geologic time, but does recognize the natural erodibility of the upper watershed. The TMDL focuses on what can be done to minimize erosion in this fragile landscape through management, including improving vegetation cover where feasible through livestock management, restoring beaver populations to trap high loads of sediment, and addressing the few large sediment sources due to roads in the upper watershed. While improvement in the overall stability of the upper watershed is dependent on the geologic framework, stability of streambanks on many areas of the listed water bodies could be improved through grazing management. Improvements of this nature are most likely to improve aquatic habitat. The TMDL assessment does recognize that high eroding streambanks are a part of the natural setting in the upper watershed in many areas. Also see response to Comment 3.12.

Comment 3.18: Over time, "natural" or background levels of sediment can fluctuate due to a variety of naturally occurring processes (floods, fires, beaver, etc.); it is not a static target. Also worth noting is the relatively crude ability we have in quantifying sediment sources, transportation rates, etc. The Ruby TMDL plan has not addressed these quantities for all tributaries and so that adds another level of uncertainty to addressing downstream quantities/ quotas. When we develop standards or quotas designed to improve management, we should recognize the limitations of these standards when we monitor and apply them.

Response: Most models estimate average annual sediment yield when sediment production from a watershed is highly influenced by storm events. MDEQ added a paragraph to Section 7.3.4 about temporal variability of sediment production in a watershed and how the monitoring and modeling for the Ruby TMDLs estimated average sediment conditions. MDEQ understands that all models and sediment monitoring have associated error and has devoted Section 7.3.4, along with sections in Appendices E and H, to describing the limitations of the sediment source assessment. The adaptive management plan includes a strategy to apply stream bank erosion rates to all tributaries in the future. The upland sediment modeling accounts for the whole Ruby watershed. An adaptive management strategy is built into Montana's TMDL law.

If restoration practices are installed and targets and allocations are not met, the adaptive management component of the law can be used to reassess the TMDL targets if the sediment conditions are demonstrated to be natural or uncontrollable. During future TMDL review, targets for the specific watersheds in Comment 3.24 may be revised based on local sediment conditions if the current targets do not appear appropriate.

Comment 3.19: Does the TMDL recognize that much of the current problem with channel dynamics is a legacy of the disturbance that occurred 40-150 years ago by historic management activities (loss of beaver, grazing)? Unfortunately, it is difficult and/or expensive to quantify these historic effects, much less their contributions to current impacts. Current levels of livestock management have their impacts, but their magnitude pales in comparison to historic levels (based on numbers, and duration). We do know that many of these systems have yet to recover (over-widening and down-cutting of channels; loss of pool habitat) from the historic impacts, and projects that help to trap and reduce sediment, both what we consider human-derived and also naturally-derived, can be very useful.

Response: The sediment source assessment did consider the effects of past management as a large influence on current conditions. Areas with long-term heavy grazing as indicated by a lack of diversity in riparian shrub life stages or community structure are assumed to have been influenced primarily in the past, due to heavier grazing. Grazing influences are often recorded as a large contribution because they include both present and past influences that can be mitigated, and are not meant to represent only current management practices.

Although not directly considered in the impairment status or TMDL sediment allocation process, field assessments also considered lack of beaver management or grazing impacts

to riparian shrub generation that impact beaver viability. This was considered where there were obvious signs of past beaver activity but no signs of recent activity and inadequate habitat and regeneration of food species (willow or aspen) to support beaver recolonization. The investigators recognize that beaver management can be an important restoration tool in the upper Ruby watershed.

Comment 3.20: How did the automated GIS based Rosgen Level 1 results displayed in Table 2-4 correlate with data collected in the field?

Response: Field visits were used to verify aerial photo results and update the stream reach segmentation. In general, results from Rosgen level 1 typing via aerial photo assessment differed from the level 2 types determined in the field primarily for types dependent primarily on entrenchment. For example, reaches given a C type in the level 1 might have been an F type according to field measurements. Ea and Eb types were often categorized as A or B types in the level 1 assessment. There were other differences between the two analyses due to inaccurate sinuosity in the redigitized stream layer due to heavy forest cover in headwater areas or low quality photos, differences in reach length considered between the two analyses, or heavily altered systems. The level 1 analysis was used to delineate changes in stream type and stratify sampling to include broad categorical conditions. The stream type determined in the level 2 assessment should be taken as the correct type. Please note that Table 2-4 includes stream types corrected after the field assessment.

Comment 3.21: More emphasis needs to be placed on how conifer cover has changed on the headwater streams over the years. There is increasing evidence that ground water and stream flows are adversely affected by increased transpiration of greatly increased numbers of conifers. Also dense stands of conifers intercept snow and it sublimates from the branches and never makes it to the snow pack on the ground. Shrubs, grasses and sedges cannot compete with the deep rooted conifers and are thus lost in many riparian areas. Loss of forage in forested areas forces more wildlife and livestock grazing into the sensitive riparian areas. Environmental groups and lawsuits have nearly shut down responsible conifer management. While some of the dewatering is due to irrigation there is a considerable amount being accomplished with poor conifer management.

Response: Loss of aspen forests to conifers and replacement of grass/shrub-steppe lands with conifers are prime examples of vegetation changes that have occurred in the western United States over the past century. The shifts in vegetation have been influenced by historic fire suppression, grazing, flow and channel manipulation. While vegetation manipulations may have benefits, they may also have the potential to induce many physical, geochemical, and biological responses that, in turn, could affect regional ecosystems, perhaps negatively. For example, there is potential for increased erosion and sediment input to streams, increased rates of channel incision, mass-wasting of hill slopes, infestation of exotic plants, and shifts in abundance and type of forage for wildlife and livestock. Vegetation manipulation might also fail to significantly increase water yields if changes in plant communities do not significantly alter evapotranspiration rates or soil water runoff/retention. Assessing the impacts of conifer encroachment or the

possible impacts of conifer restoration was outside the capacity and scope of this project. This does not preclude looking at the conifer and vegetation situation and potential management objectives from the perspective of implementing water quality protection activities consistent with the TMDL and allocations for all pollutants. Such an effort could be pursued by watershed stakeholders.

Comment 3.22: When background sources of sediment overwhelm road and grazing contributions, a change in grazing patterns or road maintenance will improve site specific conditions, but will do little to reduce overall sediment production in the watershed. How is that factored into the expectations of this TMDL?

Comment 3.23: Relatively speaking, the soils of the Gravelly Mountains are above average in their propensity for mass wasting, or to erode along stream channels or road cuts.

Comment 3.24: Cottonwood, East Fork, and Coal Creeks are the watersheds that have been identified as having the largest natural sediment load in the Upper Ruby watershed (USDA FS 1992). These watersheds have had a glacial history that led to channel incisement and are prone to mass wasting. Other tributaries to the Upper Ruby are less prone to mass wasting. We would like to see the reference approach applied separately to streams with naturally high sediment loads versus those with less natural sediment loads.

Response to 3.22-3.24: Specific components (Sections 7.1, 7.2, 7.2.1) of the Ruby TMDL address the natural erosion rate in the upper Ruby watershed. Landslide prone areas were identified during the aerial photo assessment phase of the project. The near stream source assessment methods account for landslide areas that intercept the stream channels and identify them as natural sediment production. The TMDL allocations are prescribed as a percent sediment load reduction from each identified controllable sediment source. The percent load reductions are based on reasonable land, soil and water conservation practice installation. The TMDL sediment targets are based on regional reference conditions that may not fully factor in the natural tendency of higher erosion in the upper Ruby Watershed's erosion. An adaptive management strategy is built into Montana's TMDL law. During future TMDL review, targets for the specific watersheds in Comment 3.24 may be revised based on local sediment conditions if the current targets do not appear appropriate. If restoration practices are installed and targets are not met, the adaptive management component of the law can be used to reassess the TMDL targets if the sediment conditions within the stream are demonstrated to be less controllable then implied by the targets due to natural conditions in the watershed.

Comment 3.25: We would like to see the inventory categorize the sediment sources (numerically and on maps) as related to roads (just had a gentlemen in the office complaining about lack of waterbars on FS Road 952 along Lewis Creek), mass failures (e.g., upper Cottonwood Creek) and stream bank erosion (eg., Coal Creek; near-stream bare ground), to better help identify and monitor how these sore spots are distributed and/or healing or getting worse. Warm Springs is a good example where both processes are occurring, sometimes synergistically.

Response: Priority road sediment sources are listed in Table 10-3 of Section 10.2.1. Map 3 of Appendix A categorizes road sediment sources and stream reaches with near-stream sediment sources by severity. Landslide prone areas, which include mass failures, are included on this same map. Data for all sediment sources identified in Tables 10-2 and 10-3 are listed by the site names in Appendix D. Please note that Table 10-3 includes sites from the near-stream sediment source inventory and the road sediment source inventory. Data from the two inventories are in separate spreadsheets in Appendix D.

Comment 3.26: What is the target for riparian vegetation (e.g., density or species composition) to address channel function?

Response: Sediment criteria relating to riparian function in the document are the percent of bank covered by woody canopy (including shrubs), percent of an assessment reach with stable banks, and BEHI rating. Each of these measurements reflects riparian vegetation conditions either directly or indirectly. If stable banks were achieved by hard armoring instead of riparian vegetation, the text provided in the impairment status analysis or source assessments indicated that bank stability was achieved at the expense of hard armoring.

An addition to the Proposed Future Studies and Adaptive Management Strategy section provides an approach to better quantify riparian conditions for future assessments using green line transects. Riparian vegetation condition targets may be updated during future TMDL reviews if green line vegetation data is available.

Comment 3.27: We believe there should be some distinction between the processes and the influence of management in the tributaries and the main stem of the Ruby River. Our observations support the idea that the visible impacts in the main stem are more of a response to large scale hydrologic and geologic factors rather than changes in management. Whereas in the tributaries, the impacts of management are more direct and indirect in nature. Therefore, we expect that BMPs and changes in management to be more effective in the tributaries than in the main stem. The changes occurring in the main stem are long term responses to historic and prehistoric watershed processes and can only be dealt with through active restoration.

Response: MDEQ agrees with this comment for many portions of the upper Ruby River above the canyon because there are many sections of the Ruby River in this area with landslide prone areas in the stream corridor. The hydrography of the mainstem Ruby River in this area to carry large volumes of water during runoff when compared to base flow is also evident. Nevertheless, responsible management along the mainstem Ruby River above the Canyon should not be overlooked. The mainstem is a very important fishery resource. Management within the stream corridor could affect stream channel characteristics that may affect the fishery.

Comment 3.28: Why is the sediment estimate in the Ramshorn watershed so much higher than the other watersheds?

Response: Improperly managed roads, grazing and historic placer mining in the watershed add up to large sediment sources in Ramshorn Creek Watershed. The road management on Ramshorn Creek was the worst found in the Ruby Watershed. The road is managed by USFS, BLM and Madison County. The three entities should work together to manage sediment loading from this road. Grazing was also a very large source of sediment in portions of the watershed. Section 7.2.3.1.1 describes why load estimates may have been overestimated from the roads in Ramshorn Creek watershed. Nevertheless, Ramshorn Creek Road is the highest sediment producing road found in the Ruby watershed. Refinement of road sediment allocations is included in the Proposed Future Studies and Adaptive Management Strategy section.

Comment 3.29: Given the difficulties in modeling, there should be an error estimate with each of the values given in all tables with modeled estimates.

Comment 3.30: I do however have grave concerns with many of the assumptions which were made in the document. Most seem to be based on cursory speculation using often limited data and computer modeling scenarios.

Response to 3.29-3.30: MDEQ has devoted Section 7.3.4, along with model specific sections in Appendices C, E and H, to describing the limitations of the sediment and temperature source assessment. In almost all cases, some type of sediment modeling is necessary to provide sufficient information for sediment TMDL formation.

The modeling components of the TMDL assessment are tools to estimate sediment loads. Sediment load estimates from roads and all sources that cause bank erosion were derived from extrapolation efforts, a simplistic modeling approach. Extrapolation models and associated monitoring used for determining loads from bank erosion also do not provide an associated error estimate but overall sediment loads were also compared to Meeuwig (1970), Page (1978), and Van Mullem (2000). The upland sediment source assessment (USLE) model used does not provide an associated error assessment. The upland sediment source assessment results were compared to results from Meeuwig (1970), Page (1978), and Van Mullem (2000). The temperature (SNTEMP) modeling does provide model calibration error estimates and the error is reported in Appendix C. Environmental monitoring and modeling and errors do not preclude their use for identifying relative magnitude of sediment sources at a watershed scale.

Comment 3.31: Re-establishing beaver populations in headwater areas will not only trap sediments, reduce peak flows, and increase summer low flows, but may also improve fish habitat, particularly by providing over-winter pool habitat for yearling grayling, whose reintroduction to the upper Ruby River has been limited by yearling over winter mortality (Oswald, MFWP, personal communication).

Response: See response to Comment 2.6.2. MDEQ agrees with Comment 3.31.

Comment 3.32: The concern is that road and livestock management will be the sole tools used to correct sediment problems, when in fact, restoration projects, appropriately planned and of

proper scale (e.g., beaver reintroduction), can do much to correct sediment problems and reduce the impacts upon traditional user groups in meeting the overall sediment reduction objectives.

> **Response:** MDEQ recognizes this situation. Beaver management is discussed as a restoration approach in the document even though beaver activity or lack thereof, is not a consideration for the impairment status or TMDL process. MDEQ is open to other restoration practices, such as those described, that may be identified as effective water quality restoration tools and in some situation may be used to speed up natural stream recovery. Sediment sources identified in this document should not be overlooked in planning for future restoration activities in lieu of other approaches. This document is also a "watershed restoration plan" that can include non TMDL related restoration practices that address watershed health and aquatic habitat.

Comment 3.33: The 100 year flood event which occurred in 1984, caused a tremendous amount of channel disturbance, not only to the mainstem but also to many of the tributaries, especially as old beaver impoundments were washed out. The Document recognizes this event but I sense a need from the authors to assign blame for stream widening to man's influence.

> **Response:** Multiple factors affect stream channel conditions. Flooding is one of the factors that can affect bank stability and channel widening. Methods for setting sediment targets include a reference site approach to setting stream width and bank erosion criteria. Reference areas that were managed to promote healthy riparian vegetation both before and after the flood show that riparian BMPs do provide resilience to erosion during floods. TMDL targets that relate to bank erosion, streamside vegetation, and channel geometry were based on Ruby Watershed or SW Montana sites that were also influenced by the flood.

Comment 3.34: Much of Montana has been in a severe drought situation for the last eight to ten years. The document fails to recognize the impact of limited moisture, choosing to blame domestic livestock for the less than pristine range condition in the Ruby.

> **Response:** MDEQ acknowledges that drought conditions have persisted since 1999 in many areas of the state, including SW Montana. Response to Comment 3.7 partially addresses this comment. Text has been added to Section 5.0 to describe that range conditions have been affected by recent drought conditions. Reference area range conditions have also endured drought and show more resilience to erosion during drought conditions.

Comment 3.35: Much of the channel of the Ruby River is naturally incised due mostly to the deep soil profiles in the valley bottoms through which the river passes. The Ruby Valley Conservation District/NRCS Inventory of the river bears out the fact that much of man's efforts to stabilize this process has only shifted the impairment to a new site downstream.

> **Response:** Text was added to Sections 5.3.20.1.3 and 5.3.21.1.3 about soils along the Ruby mainstem. The restoration approach is not to fully "stabilize" the stream using rock or root wads. The stream channel should slowly erode banks and move over time. The

restoration approach indicates that by allowing appropriate riparian vegetation growth along the stream corridor, the channel will be more stable. The restoration approach does not promote full stabilization approaches such as installation of rip rap. Providing a bank that is too stable, such as rip rap, will deflect the stream energy to a new area and cause destabilization downstream. The restoration approach identified via sediment allocations promotes managing streamside vegetation to achieve a form of dynamic equilibrium, but does not fully require 100% bank stabilization. Bank erosion is a natural process. Notice that the bank stability targets were 83% of the stream channel. In reference areas, about 17% of the banks were eroding, usually on the outside of meanders.

Comment 3.36: Categorizing sediment inventoried as "human-derived" vs. "naturally-derived", and placing reduction quotas based on these values, creates the impression of static levels, and also creates disagreement over the appropriateness of their application. Focusing instead on striving for overall reduction in sediment levels via restoration projects may be a more appropriate means to addressing this problem.

Response: The TMDL process must identify primary and controllable sediment sources at a watershed extent (U.S. EPA, 1999). These include both natural and human caused components. TMDL allocations need to assess sediment load reductions from these sources. The sediment load allocations for the Ruby TMDLs are created by assessing restoration approaches and using the sediment reduction that can be realized from implementation of reasonable land soil and water conservation practices. The TMDL allocations focus on striving for overall reduction in sediment levels from each individual source category that would generally require some form of restoration projects that can include riparian grazing management projects or offsite watering projects. The next step is for land managers to use this document along with other tools to prioritize and implement projects that will effectively restore water quality and aquatic habitat.

Comment 3.37: Table 2-6 shows that sinuosity has increased significantly over much of the main stem of the Ruby River. This is a key piece of information that was not elaborated on in the TMDL. There exists a body of literature on the Ruby that discusses the source of sediment in the basin (Page 1978; Best et al. 1979; and USDA FS 1992). They conclude that the majority of the sediment in the main channel of the Ruby River is derived from instream sources. The authors state that the accelerated bank erosion generated by lateral migration (i.e. increased sinuosity) is the primary source of instream sediment. This fact was not addressed in the TMDL and we believe should be central to any discussion of sediment reduction in the basin.

Response: While the increase in sinuosity was not discussed specifically, the TMDL does address accelerated and natural bank erosion sources associated with channel avulsion. Table 7-4 of the document reflects that the great majority of sediment inputs from natural sources are from eroding stream banks. In addition, Table 7-5 outlines what percentage of the human-caused erosion is attributed to separate causes. In the upper watershed, channel manipulation (straightening) and rip-rapping (included in "other human causes") comprise less than 3% of the human-caused erosion in the upper watershed, but account for approximately 13 percent of the bank erosion in the lower watershed. While the NRCS survey (Alvin 1998) of the lower Ruby River did not

estimate actual loads or percentages due to riprap or straightening, the results of the TMDL assessment do appear to be consistent with the results of that study.

Temperature

Comment 3.38: Another beneficial part in the draft is the appendix section on infra-red technology and water temperature and the mapping of important cold water refuge areas for fish. I understand this is not a requirement for a TMDL but should be highly recommended for the future on this river and all others where water temperature is a problem.

Response: Comment noted.

Comment 3.39: According to the temperature allocations for the Lower Ruby (Table 6-4, page 174), the recommended action is to increase summer time instream flow by 37%. The report is not very clear as to what data the 37% increase recommendation was based on. Based on the historic use, our water rights, and the available water needed to fulfill our contract obligations with the Ruby River Water Users, this is not a practical or feasible alternative.

Response: Edits were made to the discussion of flow scenarios used in modeling in Attachment B of Appendix C. The scenario is based on technical analysis provided in Attachment B of Appendix C. The following edited excerpt from Attachment B of Appendix C is provided from the attachment:

> Instream flow scenario for the lower Ruby is based on information presented in the Lower Ruby Valley Groundwater Management Plan (Payne, 2004). This report concluded that an estimated 10,000 to 30,000 acre-feet per year (during the irrigation season) could be added to instream flows with increased irrigation efficiency, barring added irrigation development. The irrigation season spans approximately 6 months. The irrigation season water yield measured in 2002-2003 at Seyler Lane at the downstream end of the watershed was 55,000 ac-ft/yr. Comparing the estimated increase in water yield due to improved irrigation to the water yield at Seyler Lane results in an estimated 18-73% savings during this timeframe. This estimated increase in flow will be modeled by increasing flows throughout the basin by somewhere below the midpoint of this range, or by 37%. This is a conservative assumption because the water savings could be used only during the hot summer timeframe instead of an average of the six month irrigation period.

The investigators understand that a 37% increase in instream flow would only be feasible through securing instream water rights or water leasing for instream use, in addition to improvements in irrigation efficiency. Voluntary landowner, ditch company, MDNRC and MFWP participation is necessary to obtain this goal. There is no regulatory authority to implement this objective.

Comment 3.40: Improving irrigation efficiency seems to be a panacea for many ills in the Ruby. The document recognizes the importance of irrigation return flows in maintaining instream flows in late summer. For the most part, those return flows are the result of the less than optimumally

efficient flood irrigation practices. I fear that if more and more irrigation systems are converted to highly efficient pivot sprinkler irrigation, return flows will at best be diminished and ultimately late season instream flows will be reduced dramatically.

Response: There are three major temperature influencing factors that affect the Ruby River: stream shade, instream flow conditions, and ground and surface water influences. MDEQ agrees that in specific areas and timeframes, inefficient irrigation contributes to cooling of the Ruby River. Alternatively, irrigation efficiency and water leasing would increase stream flow and provide a thermal buffering capacity in the stream. The balance between these two mitigating factors should be considered during irrigation efficiency project installation. The document indicates that site specific ground water modeling should be considered before irrigation efficiency BMPs are installed. The State of Montana, along with U.S. EPA, funded a ground water modeling effort sponsored by the Ruby Valley Conservation District that should address this need.

Comment 3.41: Much discussion is centered around dry stream channels, especially in the drainage. Most of the dry channels discussed and pictured are the result of too many years without adequate precipitation and not necessarily the result of poor grazing practices as seems to be indicated. There is one section of Sweetwater creek which is chronically dewatered by irrigation. The authors of the document don't understand or know that this section of stream channel will naturally not carry a streamflow. Even if the natural flow of Sweetwater is allowed to remain in the channel, except during high water periods, the water disappears into the ground only to resurface several miles downstream.

Response: TMDL targets and allocations are in effect to protect water when it is present. They also protect downstream receiving waters such as the Ruby River and Ruby Reservoir.

The extent of irrigation, grazing and natural water loss in this section of Sweetwater Creek is poorly understood. The stream channel just below Sweetwater canyon is impacted by grazing activities and irrigation. The extent of dewatering in this reach due to irrigation, loss of stream channel function due to grazing, or natural channel loss is difficult to assess. It is likely that all three factors significantly affect the flow conditions in this reach.

Other streams maintaining dry or intermittent conditions are identified in the document. The document identifies both natural and irrigation related dewatering influences to stream flow conditions in Mill, Indian, California, and Ramshorn Creeks. Dry or intermittent conditions in Coal Creek were described as natural and likely due to recent drought conditions. Intermittent flow conditions in Alder Creek are attributed to past placer mining that altered stream channel conditions. Alder Creek runs through course fraction placer pilings that cause an intermittent condition in specific areas.

4. Restoration Approach

Comment 4.1: The TMDL addresses the potential for improving irrigation diversions and headgates on Wisconsin Creek to prevent fish from entering the canals (entrainment). Whereas improvements to headgates and weirs are also recommended for several other streams to improve irrigation efficiency and increase instream flows, entrainment prevention is not mentioned as a restoration priority for any of these streams. MCAFS recommends an assessment of the feasibility of altering diversions and headgates, or installing fish exclusion devices (e.g. fish screens) to prevent fish from entering irrigation canals at all sites listed for headgate and weir improvements. Irrigation canals that entrain westslope cutthroat trout or arctic grayling should receive top priority.

> **Response:** Including measures to prevent entrainment as part of irrigation diversion improvements was assumed but should have been stated for all streams. Text has been added to Table 10-4 for Ramshorn, Indian, California, and Mill Creeks and the lower and upper Ruby River in Section 10.3 to address this comment.

Comment 4.2: The Dillon Field Office conducted the Middle Ruby Watershed Assessment during the summer of 2003 and assessed portions of Cottonwood Creek. The assessment report was issued in December of 2003. In 2004 revised management plans were developed. DEQ was provided copies of the reports and management plans. Two projects to protect spring sources, provide offsite water and draw cattle off Cottonwood Creek were implemented in 2005.

> **Response:** This information has been added to Section 10.4.1.

Comment 4.3: In 2000 portions of Garden Creek and Cottonwood Creek as well as Hinch Creek and Peterson Creek were assessed in association with the Garden Creek Allotment evaluation. An allotment management plan was developed to address stream conditions where streams were not meeting riparian health standards. A Grazing Decision was issued in March of 2002 which implemented a revised allotment management plan. Additional baseline monitoring was established during the 2002 field season. This field season the monitoring will be reread and management will be adjusted as necessary to meet defined objectives.

> **Response:** This information has been added to Section 10.4.1.

Comment 4.4: The Dillon Field Office administers lands along several of the streams which were assessed in the restoration plan. These include:

Stream Name	Percent of Stream Administered by BLM[1]
Alder Gulch	6%
California Creek	24%
Cottonwood Creek	25%
Garden Creek	27%
Indian Creek	14%
Mill Gulch	49%
Mormon Creek	17%
North Fork Greenhorn Creek	9%

Stream Name	Percent of Stream Administered by BLM[1]
Ramshorn Creek	17%
Ruby River below reservoir	<1%
Sweetwater Creek	4%
Wisconsin Creek	2%

[1]Percent calculated using Dillon GIS Ownership coverage and NRIS TMDL coverage. NRIS coverage was not redigitized to follow USGS 7.5 minute quad stream threads. Percent administered therefore is subject to error.

Response: Comment noted.

Comment 4.5: Water leasing is the most viable concept for increasing flows in the Lower Ruby. This will require a cooperative effort on the part of the DEQ, DFWP, Water Users and the DNRC. We encourage the DEQ to further investigate this option.

Response: MDEQ agrees with your comment. The document discusses the necessity for this approach in Sections 5.3.14.2.1, 6.2.1.2.1, 6.3.4, and 10.3 of the document.

Comment 4.6: The DNRC is excluded as a stakeholder in the restoration priorities for the Lower Ruby as listed in section 10.0, page 267. This oversight should be corrected.

Response: Montana DNRC and MFWP were added to the list in Section 10.0.

Comment 4.7: We support the restoration recommendation of further research for sedimentation in the reservoir and unassessed tributaries. The Water Resources Division will not commit funding and staff to such an effort without a clear understanding of the desired outcome. Funding for this proposed research will require a multi-agency commitment and would need to be secured through the legislative process, or an applicable grant program. We look forward to working cooperatively with the DEQ, DFWP and other interested parties to further investigate this proposal.

Response: Comment noted.

Comment 4.8: Livestock Management of the approximately 223,721 acres of National Forest System Lands in the Ruby River watershed 49,332 acres (22%) are closed to livestock grazing. All or portions of 22 livestock grazing allotments lay within the watershed. Three of these allotments are closed and five have a very small portion within the watershed. All allotments are managed under an Allotment Management Plan. Updated Allotment Management Plans have been completed for 18 of the allotments. The Upper Ruby and Mill Ramshorn allotment in the Tobacco Root range were completed in 1993 and 1994. All others were completed in 1996 and 2000. All management plans include the Beaverhead riparian guidelines for managing livestock use in riparian areas. Long term monitoring has shown these guidelines to lessen livestock impacts to the streams and improve or maintain riparian condition. In addition to the riparian guidelines the District has installed a number of fences and water developments on these allotments to help with the distribution of livestock. With the updated allotment plans 74 troughs and 26 miles of pipeline has been installed helping reduce the need for cattle to water from the

streams. Eight hardened crossings have been installed to significantly reduce the impacts of livestock crossing streams. Temporary and permanent fences have been installed around specific riparian areas to exclude livestock. The District puts on a riparian guideline/monitoring training for permittees and their riders on an annual basis. District Rangeland Management Specialists work closely with the permittees and riders throughout the grazing season to insure AMP guidelines are followed.

Response: Portions of the comment were added to Section 10.4.1. The restoration strategy for grazing on the forest is to ensure that the Beaverhead riparian guidelines are followed.

Comment 4.9: The District has completed a number of road and bridge improvement projects over the last ten years. The Ruby Centennial road has had all bridges reconstructed or re-set to reduce stream impacts by these structures. In addition drainage and surfacing was completed along twenty miles of the Ruby road. This includes the County portion from the Warmsprings Bridge north. Road drainage improvement and surfacing has been completed on the upper portion of the Warmsprings road. The Cottonwood bridge was replaced and the approaches improved. This bridge replacement corrected a significant stream/bridge misalignment. These improvements will reduce sediment input in to the drainage. Annual road maintenance occurs on the District with an emphasis on reducing or eliminating sediment input to streams. Heavy maintenance on the Mill Creek road in the Tobacco Roots occurred in 2005. Drainage and spot surfacing was completed along five miles of road.

Response: Portions of the comment were added to Section 10.4.1.

Comment 4.10: It would useful to know the length of road with sediment problems.

Response: About 36.5 miles of road were assessed as impacting water quality in the Ruby Watershed.

Comment 4.11: The addition of a column (to table 10.4) stating the percentage of the watershed by ownership would be very useful to display who the primary landowners are with restoration responsibilities.

Response: An ownership map is provided in Appendix A. Comment noted for future TMDL planning activities. Ownership categories for future allocation revision would likely be on the order of U.S. Forest Service, Bureau of Land Management, state roads, county roads and all other private roads.

Comment 4.12: Paragraph 1 on page 269 is confusing and seems to be saying that many of the worst sites are located on National Forest system lands. Is that what is intended? It only seems fair to include greater discussion of Tier 1 priority opportunities for other landowner types, to balance the focus on NFS lands.

Response: The initial discussion in Section 10.4.1 does focus on sites on Forest Service land because there are a large number of sites in a similar landscape and under similar

management that can be addressed with the same recommendations. It is not the intention of the discussion to single out National Forest lands. This section has been modified to clarify the text and make it less focused solely on National Forest land.

Comment 4.13: Paragraph 2 on page 269 could be restated using "site specific BMP's" and reference the BMP Table 10-1.

Response: Comment noted.

Comment 4.14: What is the time element for restoration activities?

Response: Writing TMDLs is a requirement of the Clean Water Act. Restoration strategies identified in TMDLs are incorporated into subsequent NPDES permits. Restoration strategies identified for nonpoint sources that currently do not have enforceable regulation are not required. Landowner and stakeholder coordination in the Ruby Watershed will be relied upon to implement the identified nonpoint source restoration practices.

A time element for nonpoint source restoration activities is not explicit in the document because most restoration projects rely upon public funding programs, local and private funding match, local efforts to apply for funds, and landowner participation. A time frame for restoration projects on public land is also not specified because annual budget fluctuations for the agencies are unpredictable. An objective of the TMDL project is to provide tool to public land management agencies and private landowners to acquire funds for future restoration projects identified in the document.

A portion of the text above was added to Section 10.0.

Comment 4.15: Table 10-6: Add recent habitat restoration project on Willow Creek to provide grayling spawning habitat (private lands).

Response: The restoration project was added to Table 10-6.

Comment 4.16: Some discussion is warranted as to how restoration projects may (or may not, depending on type of treatment) reduce either "natural" and/or human caused in-channel sediment loads. Many are so focused on human-derived sediment, they lose sight that background levels of sediment can also be reduced via active restoration.

Response: The source assessment and restoration process identifies human caused and natural sources of pollutants because Montana's Water Quality Standards and TMDL Codes and Administrative Rules are constructed in a way that indicate TMDLs need to differentiate between human caused and natural sediment contributions. The document addresses this topic in the restoration section (Section 10.0). The restoration plan (Section 10.0) identifies that beaver management can reduce sediment transport and help increase summer low flow conditions. Care and agency discretion should be exercised when trying to reduce sediment loading from eroding banks that are completely natural since

this type of activity can have unintended negative consequences. For this reason, the MDEQ does not typically promote such projects. If a stream has a high natural sediment load and almost no sediment production that is derived from manageable human activities, a TMDL may not be needed, as is the case with Hawkeye Creek.

Comment 4.17: Throughout the report you have done a good job mentioning the beneficial impacts of beavers and showing the complexes in pictures. However you have not shown the bad impacts from current unmanaged trapping. (There used to be more effort on managing beaver populations). The effects of conifers and lack of fire on beaver foods should be noted. More stress is needed on the ability of beaver dams to store water in riparian areas for release two or three months later and the beneficial effects this has on water flow and temperature year around.

Response: Terminology about beaver management has been changed in the text. Text was added about water storage in beaver complexes. The interaction between fire and beaver is beyond the scope of this project (see Response to Comment 3.21).

5. Proposed Future Studies and Adaptive Management Strategy

A number of edits in this section occurred because of comments about uncertainty of the targets, impairment status and source assessment sections of the document. Comments that directly related to this section follow:

Comment 5.1: Who is responsible for the monitoring outlined in this section (11)?

Comment 5.2: It would useful to discuss partnerships and funding sources for monitoring to aid in the formulation of a monitoring plan.

Response: This response addresses Comments 5.1 and 5.2. Section 11.0 was reorganized and text was added to Section 11.0 regarding future monitoring roles and responsibility.

Comment 5.3: Will there be specific requirements of the monitoring data in order for it to be acceptable under the TMDL? How will this data be analyzed and interpreted?

Response: The commenter is encouraged to coordinate data collection with MDEQ if the objective of future data collection is TMDL related. Also see the following link for MDEQs TMDL and impairment determination data quality objectives. http://www.deq.mt.gov/wqinfo/QAProgram/index.asp.

6. TMDL Process and Document Editing Comments

Comment 6.1: TMDLS are by necessity very lengthy technical documents. A 30 day review and comment period is not sufficient. Although we realize it will slow down the process we strongly encourage the department to consider a 60 day comment period.

Response: MDEQ understands that TMDL documents can be long and technically complex. A commitment to 60 day public comment periods for all TMDL documents is

not feasible given the stringent TMDL development schedule, although this suggestion will be taken into consideration for the longer and more technically complex TMDL documents.

The Ruby Watershed Water Quality Restoration Plan and TMDLs document public comment period was originally set at 32 days. The Ruby Watershed Water Quality Restoration Plan and TMDLs document public comment period was extended to include 45 days. The public comment period timeframe and extension were communicated via public notices in local newspapers and through an email list service sent to interested parties.

Comment 6.2: In order for public comments, especially those regarding the techniques used in the TMDLS to be a meaningful part of the TMDL process, there needs to be an earlier opportunity for public involvement.

Response: During the TMDL development in the Ruby Watershed, stakeholder and technical advisory participation was solicited prior to and during the field work, target setting, impairment status review, and source assessment/allocation process. The avenue for participation may vary between TMDL planning areas because of stakeholder composition, interest level and structure. In the Ruby Watershed, stakeholder involvement was open to public participation and fostered via a 319 grant to the Ruby Valley Conservation District and Watershed Group. Please contact the MDEQ Watershed Planning Section at 444-6697 to be included in stakeholder participation for any particular TMDL planning area.

Comment 6.3: We strongly encourage the department to include a section that addresses unlisted, but likely impaired streams. It seems incomplete to create a drainage wide sediment reduction plan and exclude streams that are clearly producing anthropogenicaly increased sediment loads merely because they are were not listed on a previous 303d list. This document recommends monitoring of unlisted streams in various sections, but a standard reporting section would improve future 303d list assessments.

Response: The Future Studies and Adaptive Management Strategy Section (11.0), was restructured due to this comment and others. Section 11.2.2 identifies monitoring recommendations to strengthen impairment status, or to address new streams for 303(d) assessment.

The sediment allocation process for the Ruby Watershed identifies an overall percent reduction in sediment yield for each identified source in the watershed. This approach allocates loads at a watershed scale even though field assessments may be lacking for specific tributaries that were never listed. This method assumes that tributaries assessed via TMDL field work represent conditions in tributaries that were not previously listed. Based on field reconnaissance and best professional judgment, this appears to be a reasonable assumption for much of the Ruby Watershed.

Comment 6.4: There is a need to standardize how the data relied on for TMDLs is reported. Obviously an enormous amount of data was used in the preparation of this TMDL and including all of the data as part of the report would be un-necessarily cumbersome. However, for the public to provide a meaningful critique of a TMDL report, that data must be made available in some form.

> **Response:** A data appendix was added to the document containing data that was used for analysis in the document. Contact MDEQ to request access to the database. Also see response to Comment 2.8.1.

Comment 6.5: Because this document is presented as a comprehensive review of the Ruby River and its tributaries, it could be used by individuals or groups with an agenda of land use manipulation to bring pressure on private landowners or government land managers. I feel a statement from the authors concerning the intended use of this document is extremely important. I see this WQRP/TMDL document as a work in progress.

> **Response:** Sections 1.0, 3.0 and 10.0 are devoted to identifying the purpose of this document. Montana TMDL Codes identify that TMDL documents need periodic updates. Section 3.0 describes a 5-year TMDL review process identified in state law. Adaptive management is an essential part of a plan to improve water quality. Uncertainty in targets and source assessments are described in this document and a monitoring and adaptive management plan is provided in Section 11.0 to address the uncertainty.

Comment 6.6: This document can become a dynamic tool. Over time editing and amending by those working in natural resources, (private and public land managers, Conservation Districts, County Commissioners, and resource consultants, to name just a few). This WQRP/TMDL is a good start but it is definitely not accurate in its overall assessment.

> **Response:** The analysis in this document is the most comprehensive assessment of the Watershed's water quality condition. Although there are uncertainties involved in target setting and source assessments, the outcome of the survey is accurate enough to identify significant sources in the watershed and identify a restoration strategy that will meet the State's Water Quality Standards. Changing specific TMDL components such as water quality targets, impairment determination, allocations, identifying restoration approaches and an adaptive management policy for the documents that will meet water quality standards must be lead by MDEQ. MDEQ encourages stakeholders to use the document for identifying restoration opportunities and acquiring grants to implement restoration activities identified in Section 10.0. MDEQ encourages watershed stakeholders to use and build upon the Implementation Plan Section (10.4). Additions to Section 10.4 should continue to identify specific opportunities for implementing water quality restoration practices that will help achieve water quality standards.

Comment 6.7: The Ruby Valley Conservation District and The Ruby Watershed Council recognize that Montana DEQ has spent a considerable amount of time and effort preparing the WQRP/TMDL document for the Ruby Watershed Basin. While the scope and funding for this document did not allow for a comprehensive assessment of all the water bodies in the basin, but

focused on the impaired streams included on the 303(d) list, it does provide a sound basis for restoration strategies throughout the watershed. However, we do appreciate the overall efforts and the recommended restoration approaches to improve water quality in the Ruby Watershed.

> **Response:** MDEQ agrees with the overall intent of your comment. The Proposed Future Studies and Adaptive Management Strategy Section (11.0) identifies an approach to collect more information throughout the watershed if needed for restoration, impairment status or trends monitoring.

Comment 6.8: The PDF version of the (public comment draft) document we reviewed did not contain a section 12 or appendix D –was this intentional or were these sections missing from the PDF?

> **Response:** Section 12.0 is the public involvement section of the final document. Omitting Section 12.0 until the public process was complete was intentional. A place holder for this section will be provided in future public comment TMDL releases. The original Appendix D was combined with Appendix E for a public comment section. An additional appendix containing raw data was added to the final document and inserted as Appendix D in the final version of the document. See Comments 2.7.1 and 6.4 relating to the added Data Appendix (D).

7. Supportive and Other Miscellaneous Comments

Comment 7.1: It is apparent that a logical approach was employed during the development of the Ruby River watershed TMDL. A thorough compilation and synthesis of existing data was conducted and gaps in the data were identified with recommendations for monitoring strategies that would address these gaps.

Comment 7.2: The document addresses many site-specific sources of anthropogenic disturbance that are negatively impacting streams and fish populations with a number of recommendations for remediation. Impairments identified in the TMDL that may have negative impacts on fish populations and their habitats include sedimentation, dewatering of streams, and increased water temperatures. Successful implementation of grazing and road management BMPs at sites identified as sediment sources, and reducing sediment-laden ditch returns should improve the condition of streams currently impaired by increased sediment loads. Improving the efficiency of irrigation systems and leasing water rights for instream flows while reducing the return of warmer, nutrient-altered ditch water to the stream should have a positive effect on fish populations of the Ruby River watershed. The TMDL identifies potential negative impacts that improving stream continuity and fish passage may have on pure or nearly pure populations of native westslope cutthroat trout, such as genetic mixing with rainbow trout, which must be avoided. The costs and benefits to these populations must be identified prior to implementation of such alterations (as recommended in the TMDL). Improving riparian habitats, restoring historical stream discharge, and reducing ditch returns to streams will improve water temperature conditions on streams currently impaired by elevated temperatures.

Comment 7.3: The Dillon Field Office appreciates the immensity of the task and the enormous work involved in the preparation of the Ruby Watershed Restoration Plan and hopes you find our comments useful.

Comment 7.4: We support the DEQ's efforts to increase irrigation efficiency in the Lower Ruby.

Comment 7.5: We support the DEQ's efforts to encourage best land use management practices in the Upper Ruby to reduce sediments from entering the reservoir.

Comment 7.6: In Closing, the Water Resources Division is committed to protecting, enhancing and conserving our invaluable water resources in the Ruby watershed. We are also legally obligated to fulfill our water use and water marketing contracts to provide high quality water to our water users. We believe that protecting our water resources is best achieved through inter-agency, public / private voluntary cooperative ventures and efforts. We look forward to working with the DEQ and others to achieve this desired goal.

Comment 7.7: In my role as a Conservation District Supervisor and land owner-manager in the Ruby Valley, I see the compilation of information contained in the document as being of considerable value in future resource management decisions.

Comment 7.8: The RVCD and the RWC support the goals of the restoration plan and are excited to be nearing completion of the WQRP/TMDL document. We feel that it is an important tool for understanding the water resources in the Ruby and will be extremely useful for all of our future planning efforts. Thank you DEQ and Contractor (project managers) for all of your work on this large undertaking.

Comment 7.9: We congratulate the State DEQ for producing a document that is well written and conveys the water quality and habitat restoration plan (WQHRP) for the Ruby River in an understandable and coherent format.

Comment 7.10: We agree with the reference reach approach used in the Ruby River TMDL and commend the way that reference Beaverhead-Deerlodge National Forest stream reach data was used to define targets. The use of reference reaches is a realistic approach to describe the potential condition of the stream. The Beaverhead-Deerlodge National Forest has an extensive long term stream monitoring network similar to what was used in the Ruby TMDL.

Comment 7.11: I appreciate the work that has been put into this document.

Comment 7.12: We understand the limitations of time and money associated with the tremendous amount of data that was collected and quantified, but feel that there are some areas that may not accurately reflect all of the conditions currently, or historically. In particular, we have some concerns about the sediment sources and their allocations for tributaries in the upper Ruby and the associated management recommendations. We believe that this document, particularly the restoration component, should act as a living, workable document that provides priority targets for water quality projects that reflect the needs, desires and goals of the stakeholders within the watershed. While we may not entirely agree with all of the TMDL

sources and targets, we feel that it is a good place to begin collaboration with all of the stakeholders to develop both short-term and long range planning efforts. The Conservation District and the Watershed Council intend to rely on this document to implement water quality improvement projects and to provide leverage to secure funding for these prioritized project areas.

Response to 7.1-7.12: Thank you for your comments. Comments are noted.