Water Quality Assessment and TMDLs for the Dearborn River Planning Area

FINAL

Prepared for: Montana Department of Environmental Quality

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CONTENTS

	e Summary	
1.0 In	troduction	1
1.1	Approach	3
1.1.1	Watershed Characterization	3
1.1.2	Air Photo Analysis	3
1.1.3	Compilation of all Available Water Quality Data and Data Gaps Analysis	
1.1.4	Sampling and Analysis Plan Development and Implementation	
1.1.5	Comparison of Available Data to Applicable Water Quality Standards	
1.1.6	Pollutant Source Assessment	
1.1.7	- TMDLs	
1.1.8	Adaptive Management Concepts	
1.1.9	Response to Public Comment	
1.2	Document Contents	
	atershed Characterization	
2.0 0	Physical Characteristics	
2.1	Location	
2.1.1	Climate	
2.1.2	Hydrology	
2.1.4	Topography	
2.1.5	Ecoregions	
2.1.6	Land Use and Land Cover	
2.1.7	Vegetative Cover	
2.1.8	Soils	
2.1.9	Riparian Vegetation Characteristics	
2.2	Cultural Characteristics	
2.2.1	I	
2.2.2	I	
2.3	Fisheries	
	ater Quality Impairment Status	
3.1	303(d) List Status	
3.2	Applicable Water Quality Standards	
3.2.1		
3.2.2	Standards	38
3.3	Water Quality Goals and Indicators	
3.4	Sediment Targets	
3.4.1	Surface Fines	
3.4.2	Macroinvertebrates – Number of Clinger Taxa	45
3.4.3	Periphyton Siltation Index	46
3.4.4	Cold-Water Fish Populations	46
3.5	Sediment Supplemental Indicators	47
3.5.1	Macroinvertebrates	47
3.5.2	Bank Stability and Riparian Condition	49
3.5.3	Montana Adjusted NRCS Stream Habitat Surveys	
3.5.4	Total Suspended Solids	
3.5.5	Turbidity	
3.6	Temperature Targets	
3.7	Temperature Supplemental Indicators	
3.8	Current Water Quality Impairment Status	
3.8.1	The Dearborn River.	
2.0.1		

3.8	.2 The South Fork of the Dearborn River	72
3.8		
3.8	.4 Flat Creek	
3.9	Water Quality Impairment Status Summary	
4.0	Source Identification	
4.1	Point Sources	
4.2	Nonpoint Sources	
4.3	Source Assessment Uncertainty	
5.0 \$	South Fork Dearborn River, Middle Fork Dearborn River, and Flat Cree	
	S	
5.1	South Fork Dearborn River Sediment TMDL	
	.1 TMDL and Allocations	
5.2	Middle Fork Dearborn River Sediment TMDL	
5.2		
5.3	Flat Creek Sediment TMDL	
5.3		
5.4	TMDL Targets	
5.5	Monitoring and Assessment Strategy	
5.5		
5.5		
5.6	Conceptual Restoration Strategy	
5.7	Dealing with Uncertainty and Margin of Safety	
6.0	Proposed Future Studies and Adaptive Management Strategy	
6.1	Proposed Supplemental Temperature and Flow Study for the Dearborn River	
6.1		
6.1	.2 Schedule and Commitments	
6.2	Suspended Sediment Monitoring	
6.3	Adaptive Management	
7.0	Public Involvement	
8.0]	References	
Append Append	ix A: Multi-Resolution Land Characteristics (MRLC) Consortium Data Description ix B: supplemental Data (Available Upon Request From Montana DEQ) ix C: Dearborn River Macroinvertebrate and Periphyton Analysis ix D: Channel and Riparian Aerial Assessment	

Appendix E: Response to Public Comments

TABLES

Table 1-1.	303(d) Listing Information for the Dearborn TMDL Planning Area	1
Table 2-1.	Selected USGS Stream Gages on the Dearborn River	
Table 2-2.	Summary of Stream Type in the Dearborn River Basin	13
Table 2-3.	Flow Conditions at Various Locations in the Dearborn River Watershed on July 24, 2003.	.16
Table 2-4.	Ecoregions in the Dearborn River Watershed	. 19
Table 2-5.	Land Use and Land Cover in the Dearborn TPA (acres)	.20
Table 2-6.	Vegetative Cover According to GAP Analysis for the Dearborn River Watershed	.23
Table 2-7.	Hydrologic Soil Groups	25
Table 2-8.	Riparian Vegetation in the Dearborn River TPA	. 28
Table 2-9.	Dearborn River TPA Population Summarized by County	29
	Land Ownership in the Dearborn River TPA	
Table 2-11.	Fisheries Data for the Dearborn TPA, Reported by the Montana Department of Fish,	
	Wildlife, and Parks.	.31
Table 3-1.	303(d) Listing Information for the Dearborn River TPA	. 35
Table 3-2.	Montana Surface Water Classifications and Designated Beneficial Uses	.37
Table 3-3.	Applicable Rules for Sediment Related Pollutants	
Table 3-4.	Summary of the Proposed Targets and Supplemental Indicators for the Dearborn	
	River TPA	
Table 3-5.	Average Monthly Water Temperatures for the Dearborn River and Other Western	
	Montana Rivers (1995–2002)	
Table 3-6.	Dearborn River Stream Bottom Deposits Data Summary Table	
Table 3-7.	Summary of Periphyton Data and Siltation Index for Sites in the Dearborn River.	
	Bank Stability along the Dearborn River	
	Dearborn River Riparian Habitat Data Summary	
	Dearborn River SSC and TSS Data	
Table 3-12.	Dearborn River Turbidity Data Summary Table	. 64
Table 3-13.	Measured Flow and Temperature Conditions at Various Locations in the Dearborn	
	River Watershed on July 24, 2003	
	Measured and Predicted Temperatures for the Dearborn River, July 24, 2003	
Table 3-15.	Comparison of Available Data with the Proposed Targets and Supplemental Indicators	
	for the Dearborn River	
	South Fork of the Dearborn River Pebble Counts Data Summary	
	Summary of Periphyton Siltation Indexes for the South Fork Dearborn River.	
	Summary of Macroinvertebrate Metrics for the South Fork Dearborn River.	
	Bank Stability along the South Fork Dearborn River	
	Riparian Vegetation in the South Fork Dearborn River	
	South Fork of the Dearborn River Suspended Sediment Data Summary Table	
	Summary of turbidity data available for the South Fork Dearborn River	
Table 3-23.	Comparison of Available Data with the Proposed Targets and Supplemental Indicators	
	for the South Fork Dearborn River	
	Middle Fork of the Dearborn River Stream Bottom Deposits Data Summary Table	
	Summary of Periphyton Siltation Indexes for the Middle Fork Dearborn River.	
	Summary of Macroinvertebrate Metrics for the Middle Fork Dearborn River.	
	Bank Stability in the Middle Fork Dearborn River	
	Middle Fork of the Dearborn River Riparian Habitat Data Summary Table	
	Middle Fork of the Dearborn River Suspended Sediment Data Summary Table	
Table 3-30.	Summary of Turbidity Data Available for the Middle Fork Dearborn River	. 87

Table 3-31.	Comparison of Available Data with the Proposed Targets and Supplemental Indicators fo	r the
	Middle Fork Dearborn River	88
Table 3-32.	Flat Creek Surface Fines Summary	91
Table 3-33.	Summary of Periphyton Siltation Indexes for Flat Creek.	92
Table 3-34.	Summary of Macroinvertebrate Metrics for Flat Creek.	93
Table 3-35.	Bank stability in Flat Creek	94
Table 3-36.	Flat Creek Riparian Habitat Data Summary Table	94
	Flat Creek Suspended Sediment Data Summary Table	
	Flat Creek Turbidity Data Summary Table	
Table 3-39.	Comparison of Available Data with the Proposed Targets and Supplemental Indicators fo	r
	Flat Creek	
Table 3-40.	Current Water Quality Impairment Status of Waters in the Dearborn TPA	99
Table 4-1.	USLE Sediment Calculations	
Table 4-2.	Sediment Delivery to the Streams	
Table 4-3.	Stream Bank Erosion Estimates for the Dearborn River TPA	
Table 4-4.	Land and Stream Bank Erosion Loads in the Dearborn River TPA	. 106
Table 5-1.	Summary of other potential anthropogenic-related sources in the South Fork Dearborn	
	River	
Table 5-2.	TMDL and Load Allocations for Sediment in the South Fork Dearborn River.	
Table 5-3.	Summary of other potential anthropogenic-related sources in the Middle Fork	
	Dearborn River.	
Table 5-4.	TMDL and Load Allocations for Sediment in the Middle Fork Dearborn River	.121
Table 5-5.	Summary of other potential anthropogenic-related sources in the Flat Creek watershed	.122
Table 5-6.	TMDL and Load Allocations for Sediment in Flat Creek.	.127
Table 5-7.	South Fork Dearborn River, Middle Fork Dearborn River, and Flat Creek Water	
	Quality Goals	. 128

FIGURES

Figure 1-1.	Location of 303(d) listed streams in the Dearborn TPA.	2
Figure 2-1.	Climagraph for Rogers Pass 9NNE MT, Station 247159-4. Data cover the period	
C	1971 to 12000.	9
Figure 2-2.	Location of USGS gages in the Dearborn TPA.	11
Figure 2-3.	Average daily flows at two USGS gages on the Dearborn River main stem. Data	
-	show the entire period of record for both gages	12
Figure 2-4.	Stream types in the Dearborn River watershed.	14
Figure 2-5.	Flat Creek diversion gate structure (view from Dearborn River)	15
Figure 2-6.	Flat Creek diversion canal	
Figure 2-7.	Elevation in the Dearborn River watershed.	
Figure 2-8.	Topographic relief in the Dearborn River watershed	
Figure 2-9.	Ecoregions in the Dearborn TPA.	
Figure 2-10.	MRLC land use/land cover in the Dearborn River watershed.	21
Figure 2-11.	GAP vegetative cover in the Dearborn River Watershed	24
Figure 2-12.	General soil units in the Dearborn River TPA.	26
Figure 2-13.	Distribution of USLE K-factor	26
Figure 2-14.	Distribution of hydrologic soil groups.	27
Figure 2-15.	Land ownership in the Dearborn TPA.	30
Figure 3-1.	Location of 303(d) listed streams in the Dearborn River TPA.	34
Figure 3-2.	Weight-of-evidence approach for determining beneficial use impairments.	42
Figure 3-3.	Methodology for determining compliance with water quality standards	43
Figure 3-4.	Comparison of Dearborn River temperature data to the Sun River and Little	
-	Prickly Pear Creek.	52
Figure 3-5.	Dearborn River at Highway 200.	54
Figure 3-6.	Dearborn River downstream of Highway 287.	54
Figure 3-7.	Sampling locations in the mainstem Dearborn River	55
Figure 3-8.	Cumulative stream bottom particle distribution for the Dearborn River.	56
Figure 3-10.	Evaluation of continuous temperature data for the Dearborn River at Highway 287	
	(USGS gage 06073500)	66
Figure 3-11.	Continuous temperature evaluation for the Dearborn River downstream of Flat Creek	67
Figure 3-12.	Continuous temperature evaluation for the Dearborn River at the Highway 200 Bridge.	67
Figure 3-13.	South Fork of Dearborn River upstream of Blacktail.	72
Figure 3-14.	South Fork Dearborn River near Hwy 434.	72
Figure 3-15.	Sampling locations in the South Fork Dearborn River watershed.	73
Figure 3-16.	Cumulative stream bottom particle distribution for the South Fork of the	
	Dearborn River	74
Figure 3-17.	Middle Fork Dearborn River near Rogers Pass.	80
Figure 3-18.	Middle Fork Dearborn River downstream of Highway 434.	80
Figure 3-19.	Sampling locations in the Middle Fork Dearborn River watershed	81
Figure 3-20.	Cumulative stream bottom particle distribution for the Middle Fork of the	
-	Dearborn River.	82
Figure 3-23.	Sampling locations in the Flat Creek watershed.	90
Figure 3-24.	Cumulative stream bottom particle distribution for Flat Creek	91
Figure 4-1.	USLE soil loss in the Dearborn River watershed	
Figure 5-1.	Human-caused sources of bank erosion along the South Fork Dearborn River	10
Figure 5-2.	Riparian condition along the South Fork Dearborn River	
Figure 5-3.	Extensive riparian clearing in the upstream section of the South Fork1	
Figure 5-4.	Extensive riparian clearing in the downstream section of the South Fork1	12

Figure 5-5.	Livestock access to South Fork Dearborn River upstream of Highway 434	.112
Figure 5-6.	Point features along the South Fork Dearborn River.	.113
Figure 5-7.	Human-caused sources of bank erosion along the Middle Fork Dearborn River	.116
Figure 5-8.	Riparian condition along the Middle Fork Dearborn River.	.117
Figure 5-9.	Point features along the Middle Fork Dearborn River	. 119
Figure 5-10.	Extensive riparian clearing in the downstream section of Middle Fork Dearborn	
	River.	. 120
Figure 5-11.	Cattle grazing along Middle Fork Dearborn River near Highway 200 Bridge	. 120
Figure 5-12.	Moderate riparian clearing in the downstream section of Middle Fork Dearborn River	.120
Figure 5-13.	Lack of riparian vegetation along Middle Fork Dearborn River near confluence with	
	Skunk Creek	. 120
Figure 5-14.	Human-caused sources of bank erosion along Flat Creek.	. 123
Figure 5-15.	Riparian condition along Flat Creek.	.124
Figure 5-16.	Flat Creek near Birdtail Road.	. 125
Figure 5-17.	Bank erosion in lower Flat Creek.	. 125
Figure 5-18.	Cattle grazing in lower Flat Creek.	. 125
Figure 5-19.	Bank erosion upstream of Highway 200.	. 125
Figure 5-20.	Point features along Flat Creek.	. 126

Executive Summary

The Montana 1996, 2002, and 2004 303(d) lists reported that several stream segments in the Dearborn River Total Maximum Daily Load Planning Area (TPA) in west-central Montana have impaired beneficial uses. The segments of concern are the Dearborn River, Middle Fork Dearborn River, South Fork Dearborn River, and Flat Creek. Causes of impairment in these stream segments include flow alteration, thermal modifications, other habitat alterations, and siltation (see Table 1-1 in Section 1.1). Habitat alteration, flow alteration, and dewatering are considered "pollution"; siltation and thermal modifications are considered "pollutants." The U.S. Environmental Protection Agency takes the position that Total Maximum Daily Loads (TMDLs) are required only for "pollutants" that are causing or contributing to impairment of a water body (Dodson, 2001). For this reason, the water quality analysis presented in this report focuses on thermal modifications and siltation. However, flow alterations, habitat alterations, and dewatering are also discussed as potential sources or causes of thermal modification or siltation.

DEQ and EPA selected the Dearborn TPA as a pilot project to evaluate the feasibility of completion of all necessary TMDLs relying primarily on currently available data, use of remote sensing techniques, and application of modeling techniques. The Dearborn TPA was selected for this approach because, with the exception of the headwaters region, the Dearborn TPA is largely under private ownership with limited access. Also, when this approach was originally conceived in July of 2002, all necessary TMDLs for the Dearborn TPA were scheduled for completion by December 31, 2003.

Before proceeding with the TMDL process, the impairment status of the 303(d) listed waterbodies must be verified. There are no numeric criteria for sediment-related pollutants in Montana, only narrative criteria. Narrative criteria were therefore interpreted to derive water quality targets and supplemental indicators, with which siltation impairments could be verified. Using available data, published studies, and best professional judgment, a suite of targets and indicators were derived for streams in the Dearborn TPA (See Table 3-4 in Section 3.3). The primary sediment targets for the Dearborn River, Middle Fork Dearborn River, South Fork Dearborn River, and Flat Creek are percent surface fines, clinger taxa, and the periphyton siltation index. Supplemental indicators include bank stability and riparian condition, macroinvertebrate multimetric index, EPT richness, percent clinger taxa, Montana adjusted NRCS stream habitat surveys, TSS, and turbidity. These targets and supplemental indicators were combined in a weight of evidence approach to determine beneficial use impairments caused by siltation.

The Montana water quality standard for temperature is used as a target to address the thermal modifications 303(d) listing for the Dearborn River. In addition, 3-day maximum and 60-day average supplemental temperature indicators were identified to complement the target. Modeling was also conducted in an attempt to determine "natural" temperature conditions in the Dearborn River. The targets, supplemental indicators, and modeling results were combined in a weight of evidence approach to determine beneficial use impairments caused by thermal modifications in the Dearborn River.

The weight-of-evidence approach was applied to each of these waters to determine whether or not they are currently meeting water quality standards. The results and a summary of the proposed actions are presented in Table 1. In no case did comparison of the available data with the target and supplemental indictor values provide for "black and white" conclusions regarding current water quality impairment status. To be conservative, TMDLs are proposed for siltation in the Middle Fork and South Fork Dearborn Rivers and Flat Creek (See Sections 5.1 to 5.3). Although it appears that Montana's temperature standards may be exceeded in the Dearborn River, the predicted magnitude of the exceedance is minor, uncertainty in the prediction is high, and the cost of implementation of the solution (i.e., elimination of the diversion of irrigation water into Flat Creek) that would likely be proposed in a TMDL is very high. As a result, further study is proposed to develop a better understanding of the potential

temperature impairment in the Dearborn River before proceeding with a TMDL. Finally, the results of the evaluations summarized herein suggest potential nutrient impairments in the Middle and South Forks of the Dearborn River and Flat Creek. Further study is proposed to develop a better understanding of these potential nutrient related impairments.

Water body Name and	Listed Probable	303(d) List Status		Current	Proposed Action	
Number	Causes	1996	2002	Status	Proposed Action	
Dearborn River	Siltation	Impaired	Impaired	Not Impaired	To be indirectly considered in further study as proposed in Section 6.	
	Thermal Modification	Impaired	Impaired	Unknown	Further study as proposed in Section 6.	
Middle Fork Dearborn River	Siltation	Impaired	Not Listed	Impaired	Address through preparation of a TMDL (Section 5.2).	
	Nutrients	Not Listed	Not Listed	Potentially Impaired	Further study as proposed in Section 5.5.	
South Fork Dearborn River	Siltation	Not Listed	Impaired	Impaired	Address through preparation of a TMDL (Section 5.1).	
	Nutrients	Not Listed	Not Listed	Potential Impaired	Further study as proposed in Section 5.5.	
Flat Creek	Siltation	Impaired	Impaired	Impaired	Address through preparation of a TMDL (Section 5.3)	
	Nutrients	Not Listed	Not Listed	Potentially Impaired	Further study as proposed in Section 5.5.	

Table 1. Current Water Quality Impairment Status of Waters in the Dearborn TPA.

1.0 INTRODUCTION

The Dearborn River Total Maximum Daily Load (TMDL) Planning Area (TPA) drains approximately 550 square miles in western Montana (Figure 1-1). Three streams in the Dearborn River TPA appeared on Montana's 1996 303(d) list (MDEQ, 1996) and the listing information is shown in Table 1-1. The causes of impairment include flow alteration, thermal modifications, other habitat alterations, and siltation. The South Fork of the Dearborn River was added to the 2002 303(d) list for de-watering, flow alterations, and siltation.

The purpose of this document is to provide an updated assessment of all waters in the Dearborn River TPA that appear on the 1996, 2002, or 2004 303(d) lists and to present all of the required TMDL elements for those waters that are not currently in compliance with the applicable water quality standards.

Segment Name	Size (miles)	Use	Listing Year	Probable Impaired Uses	Probable Causes
		48.6 B-1	1996	Aquatic Life Support Cold-Water Fishery	Flow Alteration Thermal Modifications Siltation Habitat Alterations
Dearborn River, from Falls Creek to the Missouri River	48.6		2002	Aquatic Life Support Cold-Water Fishery Primary Contact Recreation	Flow Alteration Thermal Modifications Siltation
			2004	Aquatic Life Support Cold-Water Fishery Primary Contact Recreation	Flow Alteration Siltation Thermal Modifications
Flat Creek, from	15.5	5 B-1	1996	Aquatic Life Support Cold-Water Fishery	Flow Alteration Habitat Alterations Siltation
Henry Creek to Dearborn River			D-1	2002	Aquatic Life Support Cold-Water Fishery
			2004	Insufficient Data	
Middle Fork of the			1996	Aquatic Life Support	Siltation
Dearborn River, Headwaters to the	13.5	.5 B-1	2002	Not Listed	Not Listed
Dearborn River			2004	Not Listed	Not Listed
			1996	Not Listed	Not Listed
South Fork of the Dearborn River, Headwaters to the	er, 15.8 the	15.8 B-1	2002	Aquatic Life Support Cold-Water Fishery	Dewatering Flow Alteration Siltation
Dearborn River			2004	Aquatic Life Support Cold-Water Fishery	Dewatering Flow Alteration Siltation

 Table 1-1.
 303(d) Listing Information for the Dearborn TMDL Planning Area

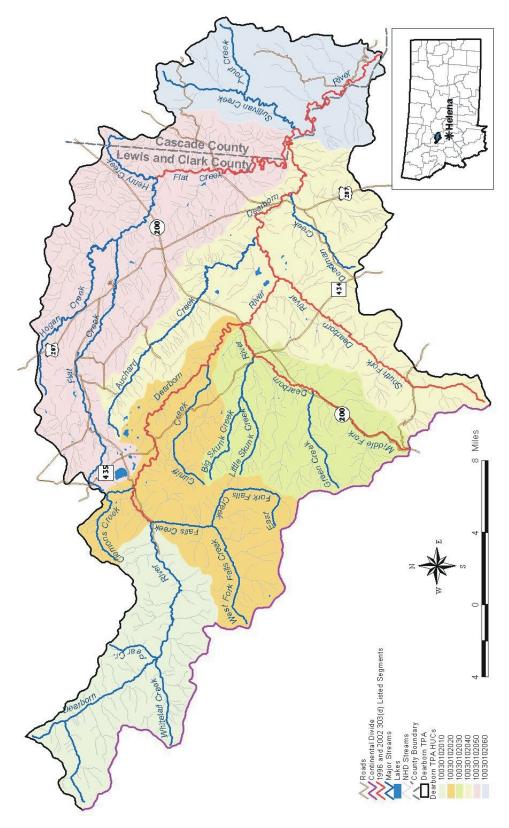


Figure 1-1. Location of 303(d) listed streams in the Dearborn TPA.

1.1 Approach

DEQ and EPA selected the Dearborn TPA as a pilot project to evaluate the feasibility of completion of all necessary TMDLs relying primarily on currently available data, use of remote sensing techniques, and application of modeling techniques. The Dearborn TPA was selected for this approach because, with the exception of the headwaters region, the Dearborn TPA is largely under private ownership with limited access. Also, when this approach was originally conceived in July of 2002, all necessary TMDLs for the Dearborn TPA were scheduled for completion by December 31, 2003.

As described above and in more detail in Section 3.1, the pollutants of concern in the Dearborn TPA included thermal modifications and siltation¹. This approach focused on these two pollutants (i.e., specifically the water body/pollutant combinations appearing in Table 3-1). The various components of this approach are summarized below in the chronological order in which they were completed.

1.1.1 Watershed Characterization

The first step, the Watershed Characterization presented in Section 2.0, involved compiling available information to develop an understanding of the environmental and socioeconomic characteristics of the watershed that may have an influence on water quality and quantity. The watershed characterization step is a coarse-level, watershed-scale analysis relying primarily on information contained in published reports and through geographic information system (GIS) sources. This step is intended to put the subject water bodies into context with the watersheds in which they occur; provide the necessary information to fine-tune subsequent steps; and provide preliminary, coarse-level information regarding the identity of potential pollutant sources.

1.1.2 Air Photo Analysis

A review of historical aerial photos and a low-level reconnaissance flight were conducted to: 1) assess historical trends in physical stream corridor conditions (with an emphasis on impacts associated with the 1964 flood); 2) preliminarily identify irrigation points of diversion and returns; 3) assess the condition of the riparian corridors; and 4) to conduct a coarse-level assessment of potential sources of sediment and/or thermal modification (see Appendix D).

1.1.3 Compilation of all Available Water Quality Data and Data Gaps Analysis

While the previously described analyses were ongoing, EPA and DEQ began to compile all of the readily available water quality data that had relevance to the listed impairments (i.e., siltation and thermal modification). This first involved obtaining and reviewing all of the information compiled previously by DEQ in support of the 303(d) listings and reviewing DEQ's internal files and databases. All available data were then downloaded from STORET and contacts were made with the various resource agencies in the state in an attempt to obtain all available data (e.g., USGS, Montana Fish, Wildlife and Parks, Montana Department of Natural Resources and Conservation, and United States Natural Resource Conservation Service). The available and relevant data are presented in the water body – by – water body discussions in Section 3.0. The results of this step indicated that the available data were inconclusive regarding

¹ EPA has made a determination that some categories of water quality impairment are best resolved through measures other than TMDLs. Impairment causes including habitat alterations, fish habitat degradation, channel incisement, bank erosion, riparian degradation, stream dewatering, and flow alterations have all been placed in a general category of "pollution" for which TMDLs are not required. On the other hand, TMDLs are required to address impairments caused by discrete "pollutants", such as heavy metals, nutrients, and sediment (Dodson, 2001).

potential fine sediment related impairments, and insufficient data were available to determine if the current temperature regime was largely natural or significantly influenced by anthropogenic sources.

1.1.4 Sampling and Analysis Plan Development and Implementation

A Sampling and Analysis Plan (SAP) was prepared to address fine sediment related data gaps within the constraints of available resources and one field season (see Appendix B). The SAP also included the installation of two continuous temperature data loggers in the main stem Dearborn River to supplement the available data and calculation of the Bank Erosion Hazard Index (BEHI) at two sites to assist in verification of air photo interpretations. Additionally, a quality assurance project plan (QAPP) was prepared to guide data collection activities in the Dearborn River and several other Montana watersheds during the 2003 field season. The SAP was implemented in the summer of 2003. All field data forms and data reports are presented in Appendix B.

1.1.5 Comparison of Available Data to Applicable Water Quality Standards

The applicable water quality standards for both siltation and thermal modification are narrative (see Section 3.2). In general, the narrative criteria do not allow for harmful or other undesirable conditions to occur above naturally occurring levels from discharges to state surface waters. Without a specific number, it is necessary to translate the narrative criteria into measurable water quality goals. As a result, the first step in the comparison of the available data to the applicable water quality standards involved the selection of a suite of targets and supplemental indicators that provided measurable thresholds for evaluation of water quality standards compliance (see Section 3.3). The available data were compared to the selected threshold values for the targets and supplemental indicators to assess compliance with water quality standards. The results are presented in Section 3.4.

In the absence of temperature data from a suitable reference stream or reach, it was not possible to use the available data to determine compliance with the applicable temperature standards (see Section 3.2.2 for Montana's temperature standard). As a result, a model-based approach was used to simulate current stream temperatures and to simulate stream temperatures in the absence of human-caused sources. The results were used to determine compliance with the applicable water quality standards (Section 3.8.1).

1.1.6 Pollutant Source Assessment

This step involved identifying and quantifying the relative importance of the significant sources of pollutants. Since this document focused primarily on two pollutants, siltation and thermal modification, the source assessment focused on sources of fine sediment, and factors that may contribute to thermal modification.

For fine sediment, the primary sources considered included landscape scale erosion associated with overland flow, sheet/rill erosion, stream bank erosion, and riparian condition. Source identification was accomplished largely through evaluation of current and historic air photos, a low-level aerial flight, and compiling readily available information from various GIS sources. Coarse-level ground truthing occurred via visual site reconnaissance at all public stream crossings, along all public roads, during all sampling events described above, and the lower 19 miles of the main stem Dearborn was floated in June 2003. Source load quantification was largely accomplished using model-based techniques and/or calculations using literature-based relationships (see Section 4.0).

For thermal modification, the analysis focused primarily on the main stem Dearborn River and the sources considered included riparian vegetation (i.e., as a surrogate for shade), geomorphology (i.e., an air

photo comparison between historic and current conditions – See Appendix D), and human-caused flow alteration. A simplistic model-based approach was used to determine the significance of human-caused flow alteration (See Section 3.8.1).

In general, the source assessment conducted in the Dearborn TPA is considered preliminary. Although it is felt that this level of source assessment is adequate to identify, and determine the relative importance of sources in context with others within the TPA, additional source assessment will likely be necessary during the future implementation phases.

1.1.7 TMDLs

Total Maximum Daily Loads, allocations, and margins of safety were presented for all waters determined to be impaired (i.e., South Fork Dearborn River, Middle Fork Dearborn River, and Flat Creek for siltation – See Section 5.0). It was determined that siltation is <u>not</u> currently impairing beneficial uses in the main stem Dearborn River, therefore no TMDL is necessary (See Section 3.8.1). However, a Voluntary Water Quality Restoration Strategy is proposed to address identified minor sources of siltation along the Dearborn River main stem and to coordinate with the proposed TMDL activities in the tributaries (See Section 5.0). Insufficient information is currently available to definitively determine whether or not thermal modification is a human-caused impairment in the Dearborn River. As a result, no TMDL is proposed at this time to address temperature issues in the main stem Dearborn River, rather, further study is proposed (See Section 6.0).

1.1.8 Adaptive Management Concepts

Adaptive management is an important component of the approach in the Dearborn TPA. The adaptive management strategy presented in Section 6.3 provides a conceptual plan for addressing uncertainties and reacting to new information that may become available in the future.

1.1.9 Response to Public Comment

Finally, this document reflects the public comment submitted to DEQ and EPA during the formal public comment period regarding the November 18, 2004 draft document. A summary of the public comment received and corresponding agency responses are provided in Section 7.0.

1.2 Document Contents

The relevant physical, chemical, biological, and socioeconomic characteristics of the environment in which the subject water bodies exist are described in Section 2 (Watershed Characterization). A summary and evaluation of all available water quality information are presented in Section 3 (Water Quality Concerns and Status). Potential sources of pollutants are discussed in Section 4 (Source Identification). The required TMDL elements for the Middle Fork and South Fork Dearborn Rivers and Flat Creek are presented in Section 5. A monitoring and adaptive management strategy for the Dearborn River is presented in Section 6. And finally, a public involvement summary is presented in Section 7.

2.0 WATERSHED CHARACTERIZATION

The intent of this section of the document is to put the Dearborn River and its tributaries into context with the watershed in which they occur. This section provides the reader with a general understanding of the environmental characteristics of the watershed that may have relevance to the 303(d) listed water quality impairments. This section also provides some detail regarding those characteristics of the watershed that may play a significant role in pollutant loading (e.g., geographical distribution of soil types, vegetative cover, land use).

2.1 Physical Characteristics

The following sections of the document describe the physical characteristics of the watershed, such as its location, climate, hydrologic features, and land use/land cover.

2.1.1 Location

The Dearborn TPA is located entirely within Montana and encompasses approximately 550 square miles of Cascade County and Lewis and Clark County. Bounded by the Sun River watershed on the north, the headwaters originate in the Rocky Mountains and the basin drains generally to the southeast toward the Dearborn River's confluence with the Missouri River. The Continental Divide serves as the western boundary of the Dearborn River TPA. Major tributaries to the Dearborn River include the South Fork Dearborn River, Middle Fork Dearborn River, Falls Creek, Hogan Creek, Flat Creek, and Sullivan Creek. The watershed is in the western portion of the Upper Missouri–Dearborn subbasin and contains six USGS (U.S. Geological Survey) 11-digit hydrologic cataloging units, as shown in Figure 1-1. Typical views of streams in the watershed are shown in the photographs below.



Dearborn River at Upstream Sampling Site



Middle Fork Dearborn River at Rogers Pass



South Fork Dearborn River near Highway 434



Flat Creek above Highway 200

2.1.2 Climate

The National Oceanic and Atmospheric Administration (NOAA) collects data from one climate station in the watershed. The Rogers Pass 9NNE station (NOAA Cooperative station number 247159-4) is in the Middle Fork subwatershed at an elevation of approximately 4,200 feet² and data are available for the period from June 15, 1989, to December 31, 2002. A graphical summary of the average climatic characteristics at a station is called a climagraph. The climagraph in Figure 2-1 illustrates annual average precipitation and temperature for the Rogers Pass 9NNE station. This station typifies climate in the middle and lower reaches of the Dearborn TPA, and shows that much of the snowfall occurs from September through May, while most of the rainfall occurs from April through September (WRCC, 2002b). Total annual average precipitation and total annual average snowfall at this station are 18.3 inches and 87.8 inches, respectively. Average monthly temperatures range from a maximum of 64.4 degrees Fahrenheit (°F) in July to a minimum of 21.2 °F in January.

Historical averages for precipitation, snowfall, and temperature are not available for other parts of the watershed. As a result climate conditions in the Dearborn TPA headwaters cannot be assessed with precision. However, annual precipitation and temperature are largely governed by elevation in watersheds with considerable change in topography. Since elevation in the Dearborn TPA varies considerably, it is assumed that conditions in the headwaters are significantly different from conditions at the Rogers Pass 9 NNE station. The headwaters region is likely to have higher average annual precipitation and snowfall and cooler average annual temperatures than the lower elevation regions. In addition, this region is likely to receive snowfall earlier than September and later than May. Significant precipitation may also occur for a longer period of time in the spring and summer.

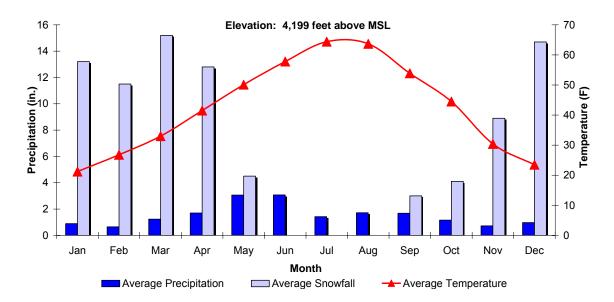


Figure 2-1. Climagraph for Rogers Pass 9NNE MT, Station 247159-4. Data cover the period 1971 to 2000.

 $^{^{2}}$ There is an inactive climate station also named "Rogers Pass." This station (247156-4) is located at an elevation of 5,540 feet, whereas the active Rogers Pass station (9NNE) is located at an elevation of 4,200 feet. Both stations are shown in Figure 2-2.

2.1.3 Hydrology

Dearborn River Flow Data - Main Stem

There are four USGS flow gages with current and historical flow data in the Dearborn TPA (Figure 2-2 and Table 2-1). Two stations on the Dearborn River main stem were analyzed to obtain a general understanding of flow from the river's headwaters to its mouth at the Missouri River. These stations are the Dearborn River near Clemons (upstream) and the Dearborn River near Craig (downstream). The flow patterns at the two main stem stations are very similar. Figure 2-3 shows that flow increases between March and April as a result of snowmelt. On average, flows continue to increase until a maximum is achieved at the end of May. By the end of July, evaporation, reduced precipitation, reduced snowmelt, and withdrawals cause the river to flow at base flow. Flow slightly increases from upstream to downstream, and the most pronounced changes in flow occur during the rainfall and snowmelt season.

Extreme flood events can significantly alter the morphological characteristics of stream channels and can also affect the condition of the stream's floodplains and riparian corridors. In some cases, the resulting changes are evident many years after the events. One such event occurred in the Dearborn River watershed in June of 1964, when 3 to 16 inches of rain fell over a 40 hour period on a deeper than normal snowpack. The resulting flows significantly increased channel widths, in some cases more than doubling the size of the pre-flood channel. A major decrease in channel stability occurred along with the channel width increases. Gravel bars, eroding banks, and loss of riparian vegetation were apparent throughout much of the Dearborn in post-flood aerial photos (see Appendix D). It is reasonable to assume that rebuilding of floodplain soils on exposed gravel deposits and re-establishment of climax floodplain vegetation communities is still continuing in the present day. Full recovery from the 1964 flood event has been gradual in many alluvial channels along the Rocky Mountain front. Exposed gravel floodplain surfaces are also widespread in portions of the Teton River, Birch Creek, and elsewhere in the area.

Station ID	Gage Name	Drainage Area (mi ²)	Start Date	End Date
06072000	Dearborn River AB Falls Creek, near Clemons, MT	69.6	5/1/1908	12/31/1911
06072500	Falls Creek near Clemons, MT	37.6	5/1/1908	12/31/1911
06073000	Dearborn River near Clemons, MT	123.0	4/1/1921	9/30/1953
06073500	Dearborn River near Craig, MT	325.0	10/1/1945	9/30/2003

 Table 2-1.
 Selected USGS Stream Gages on the Dearborn River

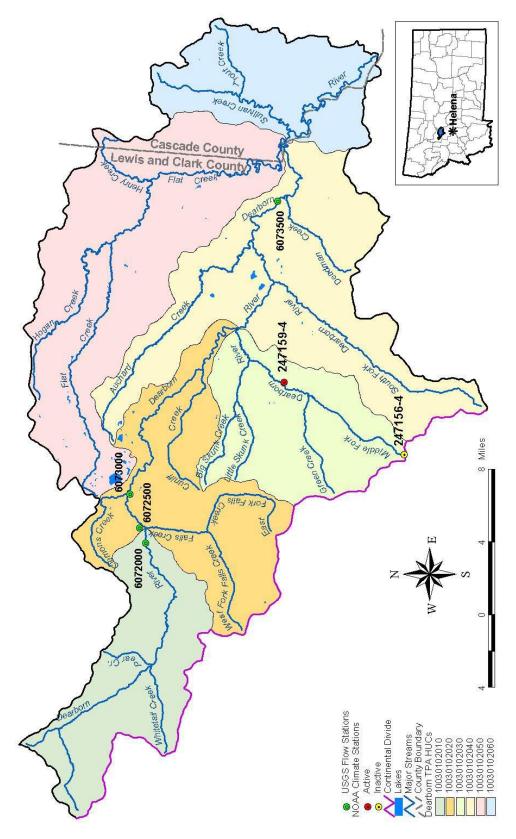


Figure 2-2. Location of USGS gages in the Dearborn TPA.

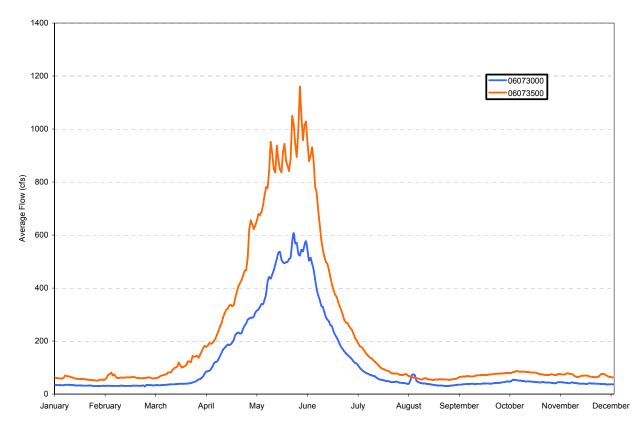


Figure 2-3. Average daily flows at two USGS gages on the Dearborn River main stem. Data show the entire period of record for both gages.

Stream Types

The National Hydrography Data (NHD) provided by EPA and USGS identified the major stream types in the Dearborn River Basin. Most of the streams in the Dearborn TPA were classified as intermittent streams (Table 2-2). Intermittent streams flow for short periods during the course of a year, and flow events are usually initiated by rainfall or snow melt. Perennial stream flow was classified in major streams and tributaries of the basin, including the Dearborn River, South Fork Dearborn River, Middle Fork Dearborn River, and Flat Creek (Figure 2-4). Mountain streams and major tributaries of varying sizes have perennial flow due to snowmelt and precipitation; streams at lower elevations are generally intermittent and flow after local rainstorms. Most of the canals, ditches, connectors, and artificial paths are located along Flat Creek.

Stream Type	Stream Length (feet)	Percentage
Intermittent	4,949,496	72.76
Perennial	1,574,946	23.15
Canal/ditch	248,313	3.65
Artificial Path	28,517	0.42
Connector	1,644	0.02
Total	6,802,916	100.00

 Table 2-2.
 Summary of Stream Type in the Dearborn River Basin

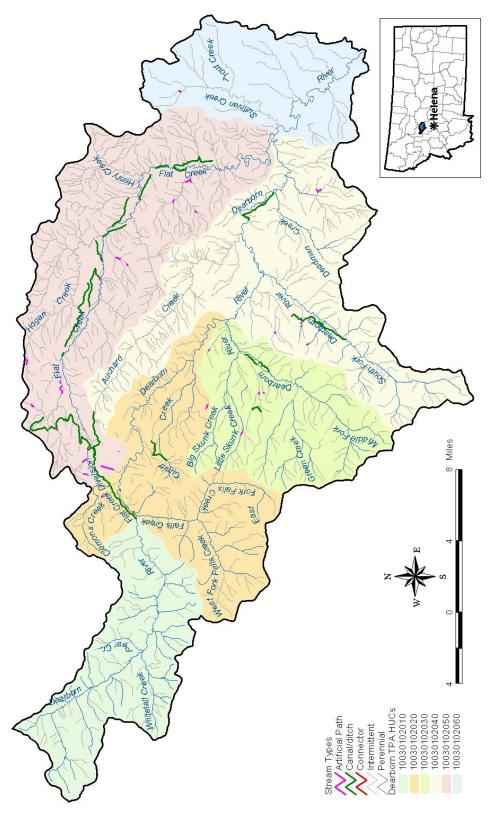


Figure 2-4. Stream types in the Dearborn River watershed.

Irrigation Practices

Irrigation activities have a significant impact on the hydrology of the Dearborn River watershed. The largest diversion in the watershed is located on the upper portion of the Dearborn River main stem and diverts a significant portion of the river's flow into Flat Creek (Figure 2-5 and Figure 2-6). The head gate is used on an "as needed" basis (Barrett, private landowner, December 29, 2004) and no data are available on the daily flows diverted to Flat Creek.

Flow measurements at various points in the Dearborn River watershed were taken on July 24, 2003, to assess the significance of the Flat Creek diversion. The results of these measurements are presented in Table 2-3 and several observations can be made. First, approximately 55 percent of the flow in the Dearborn River was diverted to Flat Creek at the time of the field visit. The Middle and South Forks returned an additional 7.2 cubic feet per (cfs) second (combined) flow to the Dearborn River downstream of the Flat Creek diversion, but flows at the Highway 287 bridge were still only 38 cfs. An additional 15.2 cfs were therefore lost from the Dearborn River as a result of other irrigation diversions, groundwater percolation, and evaporation. These water losses, combined with the loss due to the Flat Creek diversion, affect water quality in the Dearborn River by concentrating pollutants and elevating temperatures. Another observation that can be made is that the volume of water added to Flat Creek is several times greater than would naturally occur in the stream channel. The impact of this is discussed in Sections 3 and 4.



Figure 2-5. Flat Creek diversion gate structure (view from Dearborn River)



Figure 2-6. Flat Creek diversion canal.

Table 2-3.Flow Conditions at Various Locations in the Dearborn River Watershed on July 24,
2003

Location	Measured Flow (cfs)
Dearborn River immediately upstream of Flat Creek diversion	105
Irrigation channel immediately downstream of diversion	58
Dearborn River downstream of Flat Creek diversion (calculated)	47
Middle Fork Dearborn River at confluence with Dearborn River	5
South Fork Dearborn River at confluence with Dearborn River	1.2
Flat Creek at confluence with Dearborn River	4
Dearborn River at Highway 287 Bridge	38

2.1.4 Topography

Figure 2-7 displays the general topography within the Dearborn River TPA, and a shaded relief map of the watershed is presented in Figure 2-8. Elevations range from around 3,422 feet above mean sea level at the confluence with the Missouri River to 9,078 feet at the highest point in the watershed.

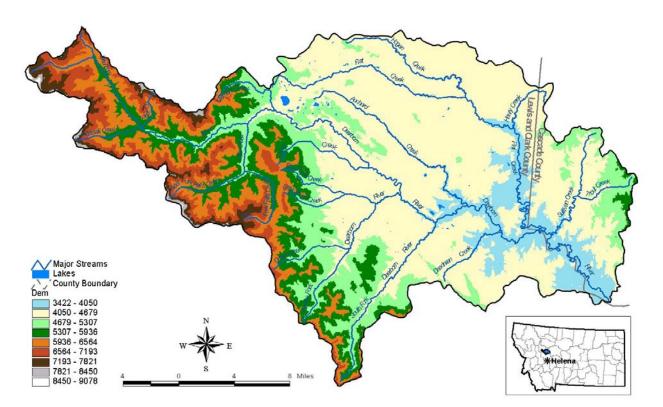


Figure 2-7. Elevation in the Dearborn River watershed.

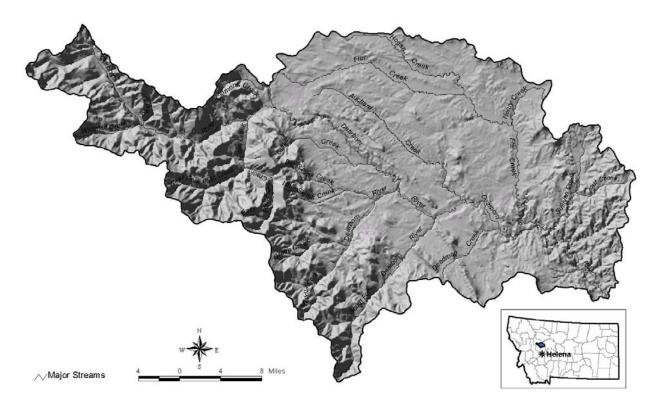


Figure 2-8. Topographic relief in the Dearborn River watershed.

2.1.5 Ecoregions

Omernik (1995) has defined ecoregions as areas with common ecological settings that have relatively homogeneous features including potential natural vegetation, geology, mineral availability from soils, physiography, and land use and land cover. MDEQ uses ecoregions to establish a variety of water quality targets, such as for macroinvertebrate populations and nutrient concentrations. The Dearborn River watershed contains parts of three ecoregions (see Figure 2-9 and Table 2-4).

Ecoregion	Area (acres)	Area (square miles)	Percentage
Northern Rockies	84,219	131.6	23.87
Canadian Rockies	83,203	130.0	23.58
Montana Valley and Foothill Prairies	185,392	289.7	52.55
Total	352,814	551.3	100.00

Table 2-4.Ecoregions in the Dearborn River Watershed

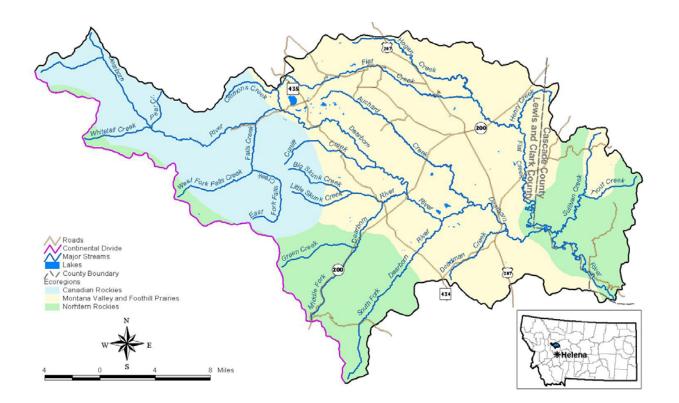


Figure 2-9. Ecoregions in the Dearborn TPA.

2.1.6 Land Use and Land Cover

General land use and land cover data for the Dearborn River basin were extracted from the Multi-Resolution Land Characterization (MRLC) database (MRLC, 1992) and are shown in Table 2-5 and Figure 2-10. This database was derived from satellite imagery taken during the early 1990s and is the most current detailed land use data known to be available for the watershed. Each 98-foot by 98-foot pixel in the satellite image is classified according to its reflective characteristics. A complete list of the MRLC land cover categories and their definitions is given in Appendix A. Table 2-5 summarizes land cover in the Dearborn River TPA and shows that grasslands/herbaceous is the dominant land cover, comprising approximately 55.71 percent of the total land cover. Evergreen forest and shrublands comprise 32.02 percent and 6.56 percent, respectively. Other important cover types are pasture/hay (3.54 percent) and bare rock/sand/clay (1.02 percent). All other land cover types combined account for less than 2 percent of the total watershed area.

Land Use/Cover	Dearborn River	Middle Fork Dearborn	South Fork Dearborn	Flat Creek
Grasslands/herbaceous	196,564	20,121	9,104	74,071
Evergreen forest	112,962	18,216	12,466	2,443
Shrubland	23,162	4,463	3,241	1,660
Pasture/hay	12,479	173	160	10,031
Bare rock/sand/clay	3,600	12	4	13
Open water	1,056	5	7	403
Woody wetlands	970	377	90	107
Small grains	872	130	116	0
Deciduous forest	472	34	52	29
Mixed forest	381	1	1	3
Emergent herbaceous wetlands	185	30	14	39
Commercial/industrial/transportation	42	4	8	6
Fallow	42	0	0	0
Perennial ice/snow	22	0	1	0
Row crops	22	10	0	8
Low Intensity Residential	< 1	<1	0	0
Total	352,831	43,575	25,263	88,812

 Table 2-5.
 Land Use and Land Cover in the Dearborn TPA (acres)

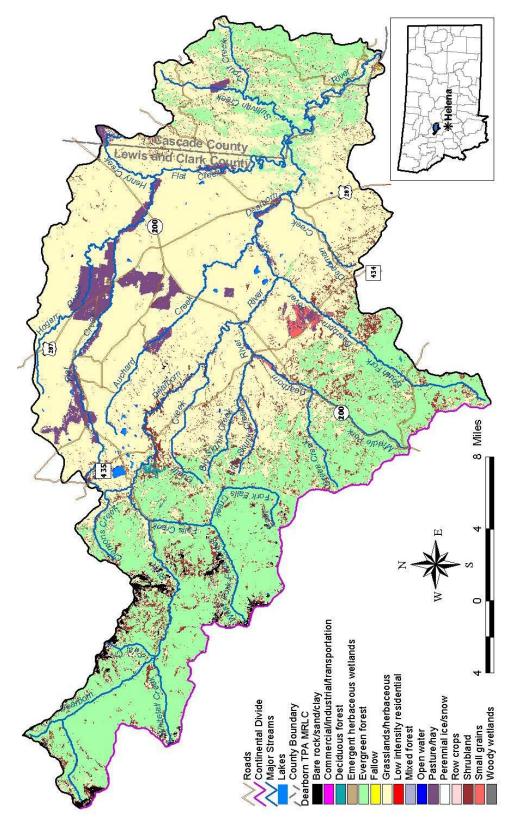


Figure 2-10. MRLC land use/land cover in the Dearborn River watershed.

2.1.7 Vegetative Cover

Vegetative data were gathered from GAP Analysis Projects completed for Montana. The GAP Analyses are a nationwide program conducted under the guidance of the USGS for the purpose of assessing the extent of conservation of native plant and animal species. Since an important part of the analyses is the identification of habitat, detailed vegetative spatial data are usually available for states that have completed their analyses. Like the MRLC data, the spatial data for Montana were derived from satellite imagery taken during the early 1990s. However, the vegetative classification is much more detailed than that of the MRLC; the GAP data include vegetative species such as ponderosa pine, rather than general land cover classes like evergreen forest. Vegetative cover provided by GAP data for the Dearborn River watershed is summarized in Table 2-6 and shown in Figure 2-11.

Table 2-6 and Figure 2-11 show that low to moderate cover grasslands, altered herbaceous lands, and mixed mesic shrubs are the dominant vegetative cover in the middle portion of the basin and occupy 28.92 percent, 15.16 percent, and 8.65 percent of the watershed, respectively. Douglas fir and ponderosa pine collectively occupy approximately 13 percent of the watershed, primarily throughout the South Fork and Middle Fork Dearborn River and the lower reaches of the Dearborn River. In addition, 25,312 acres (7.17 percent) throughout the Falls Creek watershed, Clemons Creek watershed, and the Dearborn River headwaters are classified as standing burnt forest, a result of the 1988 Canyon Creek Fire. Irrigated and dry agricultural lands account for 3.48 percent and 0.61 percent of the watershed, respectively. The remaining land cover classes occupy approximately 23 percent of the Dearborn River TPA.

	Ar	Percentage of		
Vegetative Cover	Acres	Square Miles	Watershed	
Low/Moderate Cover Grasslands	102,051	159.5	28.92	
Altered Herbaceous	53,486	83.6	15.16	
Mixed Mesic Shrubs	30,520	47.7	8.65	
Douglas Fir	25,552	39.9	7.24	
Standing Burnt Forest	25,312	39.6	7.17	
Ponderosa Pine	20,520	32.1	5.82	
Mixed Xeric Forest	13,108	20.5	3.72	
Agricultural Lands - Irrigated	12,270	19.2	3.48	
Mixed Subalpine Forest	9,548	14.9	2.71	
Rock	8,315	13.0	2.36	
Douglas Fir/Lodgepole Pine	7,908	12.4	2.24	
Lodgepole Pine	6,809	10.6	1.93	
Montane Parklands and Subalpine Meadows	5,162	8.1	1.46	
Moderate/High Cover Grasslands	3,973	6.2	1.13	
Shrub Riparian	3,847	6.0	1.09	
Graminoid and Forb Riparian	2,570	4.0	0.73	
Mixed Barren Sites	2,362	3.7	0.67	
Mixed Whitebark Pine Forest	2,182	3.4	0.62	
Agricultural Lands - Dry	2,164	3.4	0.61	
Rocky Mountain Juniper	1,912	3.0	0.54	
Cloud Shadows	1,891	3.0	0.54	
Conifer Riparian	1,811	2.8	0.51	
Limber Pine	1,621	2.5	0.46	
Mixed Xeric Shrubs	1,227	1.9	0.35	
Clouds	1,203	1.9	0.34	
Mixed Mesic Forest	1,133	1.8	0.32	
Mixed Broadleaf Forest	1,107	1.7	0.31	
Alpine Meadows	849	1.3	0.24	
Broadleaf Riparian	504	0.8	0.14	
Sagebrush	494	0.8	0.14	
Mixed Riparian	478	0.7	0.14	
Water	412	0.6	0.12	
Mixed Broadleaf and Conifer Forest	280	0.4	0.08	
Mines, Quarries, Gravel Pits	244	0.4	0.07	
Mixed Broadleaf and Conifer Riparian	12	< 0.1	< 0.01	
Total	352,839	551.3	100.00	

Table 2-6.	Vegetative Cover	According to GAP	Analysis for the	Dearborn River Watershed
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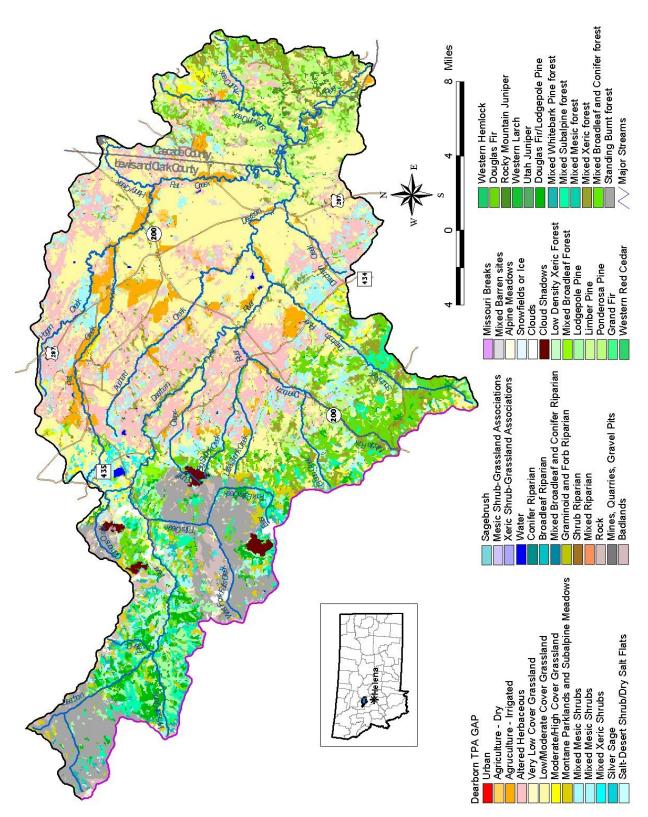


Figure 2-11. GAP vegetative cover in the Dearborn River Watershed.

2.1.8 Soils

Soils data from the Natural Resources Conservation Service (NRCS) were used to characterize soils in the Dearborn River TPA. General soils data and map unit delineations for the United States are provided as part of the State Soil Geographic (STATSGO) database. Geographic information system (GIS) coverages provide accurate locations for the soil map units at a scale of 1:250,000 (USDA, 1995). A map unit is composed of several soil series having similar properties. Identification fields in the GIS coverages can be linked to a database that provides information on chemical and physical soil characteristics. Figure 2-12 shows the general map unit boundaries in the Dearborn River TPA, and the following sections summarize relevant chemical and physical soil data.

Universal Soil Loss Equation (USLE) K-factor

A commonly used soil attribute is the K-factor, a component of the Universal Soil Loss Equation (Wischmeier and Smith, 1978). The K-factor is a dimensionless measure of a soil's natural susceptibility to erosion, and values may range from 0 for water surfaces to 1.00 (although in practice, maximum values do not generally exceed 0.67). Large K-factor values reflect greater inherent soil erodibility. The distribution of K-factor values in the Dearborn River Basin is shown in Figure 2-13, which shows that nearly all the soils in the watershed have K-factors ranging from 0.18 to 0.37, suggesting moderate soil erosion potential. The figure also shows that soils with the highest susceptibility to erosion are located in the headwaters of Flat Creek and Auchard Creek.

Hydrologic Soil Group

The hydrologic soil group classification is a means for grouping soils by similar infiltration and runoff characteristics during periods of prolonged wetting. Typically, clay soils that are poorly drained have the slowest infiltration rates, while sandy soils that are well drained have the fastest infiltration rates. NRCS has defined four hydrologic groups for soils. Data for the Dearborn River TPA were obtained from STATSGO and summarized based on the major hydrologic group in the surface layers of the map unit (Table 2-7) (NRCS, 2001). The resulting hydrologic soil information is displayed in Figure 2-14.

Hydrologic Soil Groups	Description
A	Soils with high infiltrations rates. Usually deep, well-drained sands or gravels. Little runoff.
В	Soils with moderate infiltration rates. Usually moderately deep, moderately well-drained soils.
С	Soils with slow infiltration rates. Soils with finer textures and slow water movement.
D	Soils with very slow infiltration rates. Soils with high clay content and poor drainage. High amounts of runoff.

The majority of soils in the middle portion of the Dearborn River Basin are moderately deep, finetextured C soils, characterized by moderately slow infiltration rates. A large portion of soils in the upper Dearborn TPA have moderate infiltration rates typical of moderately well drained alluvial B soils. The remainder of the basin contains poorly drained D soils. These areas have very slow infiltration rates and high amounts of runoff resulting from high soil clay content.

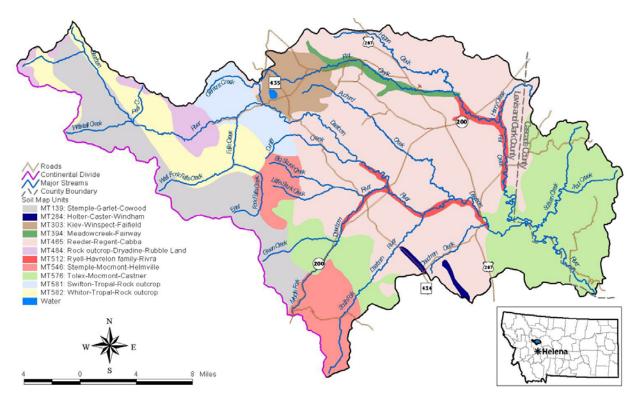


Figure 2-12. General soil units in the Dearborn River TPA.

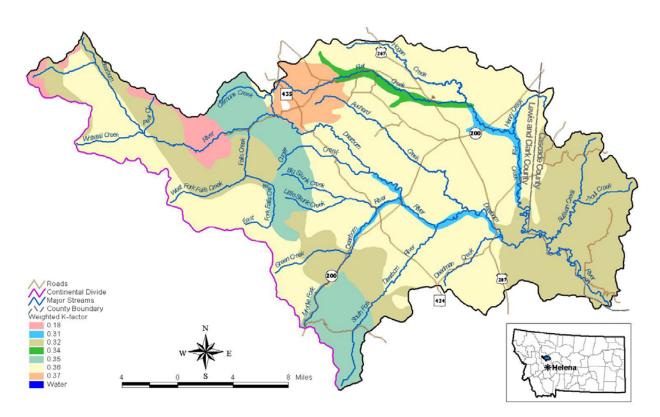


Figure 2-13. Distribution of USLE K-factor.

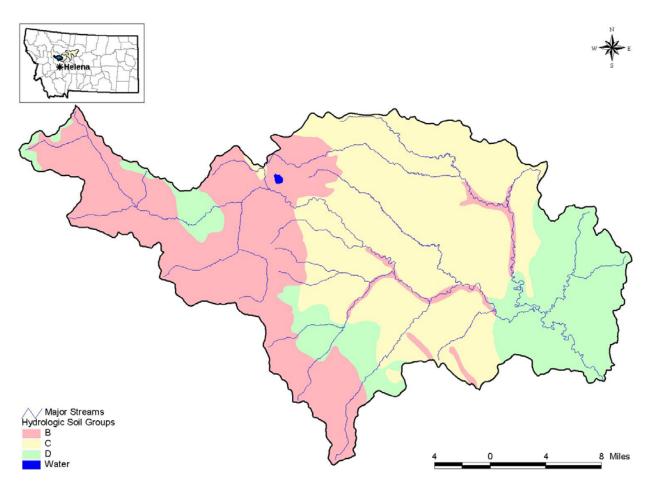


Figure 2-14. Distribution of hydrologic soil groups.

2.1.9 Riparian Vegetation Characteristics

Riparian vegetation was evaluated for several stream segments in the Dearborn River TPA using historical and current aerial and video photography (Land and Water Consulting, 2004). Riparian vegetation along the Dearborn River consisted primarily of open stands of deciduous cottonwoods with extensive areas of herbaceous understory and woody shrub components (Table 2-8). Riparian buffer widths in the evaluated segments of the Dearborn River ranged between 42 and 136 feet wide, with a median width of 46 feet. Although trees were not the dominant vegetation appeared to be in a seral state with multiple age classes of cottonwood in active alluvial reaches. Upper reaches in the Dearborn River had increasing amounts of coniferous overstory relative to deciduous cottonwood.

Riparian vegetation in the Middle and South Forks of the Dearborn River was characterized by isolated stands of deciduous cottonwood with extensive areas of herbaceous understory and woody shrub components. The headwater regions tended to have a higher percentage of trees. Tree and woody shrub density generally increased toward the headwaters where the reaches transitioned into a coniferous forest.

Vegetation metrics for Flat Creek indicated that riparian tree and woody shrub coverage was extremely low for most reaches. Trees were less than 1 percent in all reaches except the most downstream reach. Overall, woody shrubs covered about 21 percent of the riparian corridor, and herbaceous species averaged 77 percent. Vegetation in the upstream reaches was largely herbaceous, with lesser amounts of remnant and decadent woody shrub species. Riparian buffer width in all of the Flat Creek segments was low relative to potential.

		Vegetation Type (% of reach)					
Reach	Riparian Buffer Width (feet)	Coniferous/ Deciduous (%)	Woody Shrub (%)	Grass/ Sedge (%)	Bare Ground/ Disturbed (%)		
Dearborn R	iver						
DR1	45	16	19	56	10		
DR2	42	19	27	49	5		
DR3	43	6	25	64	5		
DR4	46	12	27	60	1		
DR5	72	33	22	41	5		
DR6	136	11	39	30	20		
South Fork	Dearborn River						
SF1	28	3	49	46	2		
SF2	61	18	31	51	<1		
Middle Fork	Dearborn River						
MF1	78	4	37	59	1		
MF2	36	11	6	76	8		
Flat Creek							
FC1	47	9	12	79	<1		
FC2	51	<1	35	64	<1		
FC3	64	<1	21	77	1.5		
FC4	31	<1	4	93	2		

Table 2-8.Riparian Vegetation in the Dearborn River TPA

2.2 Cultural Characteristics

The following sections of the report provide information on watershed population and describe land ownership characteristics.

2.2.1 Population

The total population for the watershed is not directly available but may be inferred from the 2000 U.S. Census data, which were downloaded for all towns, cities, and counties whose boundaries lie wholly or partially within the watershed. The proportion of county area within the basin was determined from spatial overlay of county boundaries and the watershed boundary in a GIS. It is assumed that the nonurban population for each county is uniformly distributed within the county. The nonurban county population was multiplied by the county's proportional watershed area and the product was assumed to reflect the county's nonurban population.

The analysis found that approximately 4,000 people reside within the Dearborn River watershed. Table 2-9 presents the watershed's urban and nonurban population totals by county. Figure 1-1 displays the locations of counties, cities, and towns. From the table, it can be seen that the vast majority of the population live in nonurban areas, while 50 people (1.26 percent) reside in the Millford Colony.

County	Estimated Watershed Population	Percentage of Total Population	Nonurban Population	Percent Nonurban	Urban Population	Percent Urban
Cascade	36	0.91	36	0.91	0	0
Lewis and Clark	3,917	99.09	3,867	97.82	50	1.26
Total	3,953	100	3,903	98.74	50	1.26

 Table 2-9.
 Dearborn River TPA Population Summarized by County

Source: U.S. 2000 Census and GIS analysis.

2.2.2 Land Ownership

Various private, tribal, state, and federal agencies hold title to portions of the Dearborn River watershed, as shown in 0 and Figure 2-15. For the watershed as a whole, the majority of land is privately owned, encompassing 250,539 acres, or 71.01 percent of watershed area. The U.S. Forest Service maintains 74,094 acres, 21 percent of total land holdings, while the Montana Department of Natural Resources and Conservation governs more than 22,000 acres (6.32 percent) of the planning area. Furthermore, the Bureau of Land Management holds title to 5,120 acres (1.45 percent). The remaining ownership in the basin accounts for less than one-half of a percentage point of total ownership (approximately 751 acres).

Land Ownership Description	Area			
	Acres	Square Miles	Percentage	
Private land	250,539	391.5	71.01	
U.S. Forest Service	74,094	115.8	21.00	
Department of Natural Resources and Conservation	22,309	34.9	6.32	
Bureau of Land Management	5,120	8.0	1.45	
Water	734	1.1	0.21	
Montana Fish, Wildlife, and Parks	17	< 0.1	< 0.01	
Total	352,813	551.3	100.00	

 Table 2-10.
 Land Ownership in the Dearborn River TPA

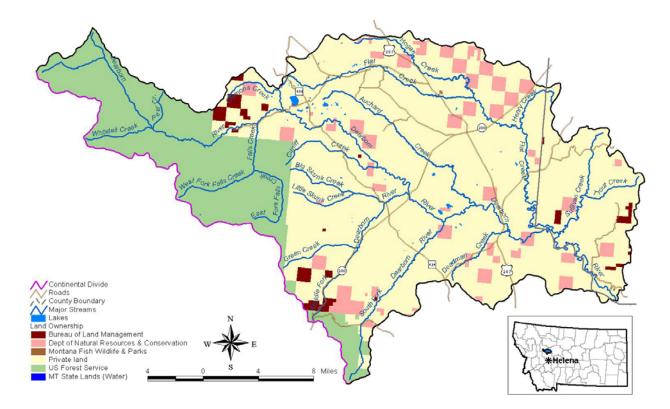


Figure 2-15. Land ownership in the Dearborn TPA.

2.3 Fisheries

The stream segments in the Dearborn River TPA are classified as "B-1" (see Section 3.2.1), which calls for the water to sustain the "growth and propagation of salmonid fishes and associated aquatic life" (ARM, 1996). Fisheries data reported by the Montana Fisheries Information System Database (MFISH, 2004) are presented in Table 2-11 and provide information on the fish species present in the watershed. Qualitative descriptions of the fishery were also discussed with Montana Department of Fish, Wildlife, and Parks (MFWP) personnel.

Category	Species	Dearborn River	Middle Fork Dearborn River	South Fork Dearborn River	Flat Creek
Native Species of Special Concern	Westslope Cutthroat Trout	х			
Native	White Sucker	Х			
Native	Longnose Dace	Х			Х
Native	Longnose Sucker	х			
Native	Mottled Sculpin	Х	Х	Х	Х
Native	Mountain Whitefish	х			Х
Native	Lake Chub				Х
Native	White Sucker				Х
Introduced	Rainbow Trout	Х			Х
Introduced	Brook Trout	Х	Х	Х	Х
Introduced	Brown Trout	Х	Х	Х	Х

Table 2-11.	Fisheries Data for the Dearborn TPA, Reported by the Montana Department of
	Fish, Wildlife, and Parks.

Rainbow trout and westlope cutthroat trout are two of the more important fish species in the Dearborn TPA and the Dearborn River is the main spawning and rearing tributary to the trout fishery in the Missouri River. Rainbow trout ascend the Dearborn River annually from March through May, spawn, and then return to the Missouri River. After hatching, most rainbow trout rear for one winter in the Dearborn River basin before migrating to the Missouri River during spring runoff. Therefore, habitat and environmental conditions in the Dearborn River Basin set year class strengths for the rainbow trout population in the Missouri River (Leathe, 2004). Figure 2-16 provides information on the number of rainbow trout per mile in the Missouri River at Pelican Point over the past twenty-three years. The data are considered representative of populations in the Dearborn River watershed (Horton, FWP, personal communication, January 12, 2005) and indicate that there is no clear increasing or trend over the period-of-record.

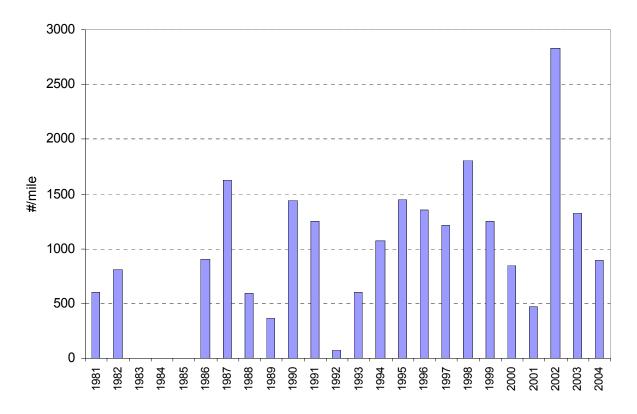


Figure 2-16. Fall estimates of age-1 rainbow trout in the Missouri River at Pelican Point.

Populations of rainbow trout in the Dearborn River watershed have recently been affected by whirling disease, which was first observed in the watershed in 2003. Infection rates in the South Fork and the Middle Fork of the Dearborn are among the highest infection rates observed in Montana (Leathe, 2004). Whirling disease is caused by a tiny metazoan parasite (*Myxobolus cerebralis*) that is native to the Eurasian continent and was introduced into U.S. waters in the late 1950s, possibly with the importation of brown trout. Myxobolus cerebralis penetrates the head and spinal cartilage of fingerling trout where it multiplies rapidly, putting pressure on the organ of equilibrium. This causes the fish to swim erratically (hence the name "whirling disease") and have difficulty feeding and avoiding predators. In severe infections, the disease can cause high rates of mortality in young-of-the-year fish. When each infected fish dies, thousands to millions of the parasite spores are released to the water. Spores can withstand freezing and desiccation, and can survive in a stream for 20 to 30 years. Spores must be ingested by its alternate host, a tiny, common aquatic worm (Tubifex tubifex) where the spore takes on the form that once again will infect trout. The highly infective form released by Tubifex worms is called Triactinomyon. This form hooks onto passing fish and burrows into its nervous system, completing the life cycle. Whirling disease attacks juvenile trout and salmon, but doesn't infect warm water species. Rainbow trout and cutthroat trout appear to be more susceptible than other trout species.

3.0 WATER QUALITY IMPAIRMENT STATUS

This section first presents the status of all 303(d)-listed water bodies in the TPA (i.e., which water bodies are listed as impaired or threatened and for which pollutant). This information is followed by a summary of the applicable water quality standards and a translation of those standards into proposed water quality goals or targets. The remainder of the section is devoted to a water body-by-water body review of available water quality data and an updated water quality impairment status determination for each listed water body.

3.1 303(d) List Status

A summary of the 303(d) list status and history of listings is provided in Figure 3-1. The listed stream segments are shown in Figure 3-1. As mentioned in Section 1.1, all necessary TMDLs must be completed for all pollutant–water body combinations appearing on the 1996 303(d) list. The Montana 1996 303(d) list reported that the Dearborn River, Flat Creek, and the Middle Fork Dearborn River were impaired. The causes of impairment listed for these waterbodies were habitat alterations, flow alteration, siltation, and thermal modification.

In 2002, the South Fork Dearborn River was added to the list of impaired streams in the Dearborn River TPA, and the Middle Fork Dearborn River was de-listed due to a lack of sufficient credible data. The causes of impairment listed for the South Fork Dearborn River were dewatering, flow alteration, and siltation. The draft 2004 303(d) list indicates that the Dearborn River is impaired because of flow alterations, siltation, and thermal modifications; insufficient data are available to assess Flat Creek; the Middle Fork is not listed; and the South Fork is impaired because of dewatering, flow alteration, and siltation.

Habitat alteration and flow alteration are considered "pollution," while siltation and thermal modifications are considered "pollutants." It is EPA's position that TMDLs are required only for "pollutants" that are causing or contributing to water body impairments (Dodson, 2001). Therefore, because TMDLs are required only for pollutants and flow alteration and habitat alteration are not pollutants, the focus of this document is on siltation and thermal modifications. Flow alteration and habitat alteration might certainly constitute potential sources or causes of sediment related impairments, and while no TMDLs are established to specifically address these issues, they will be addressed as sources, as appropriate.

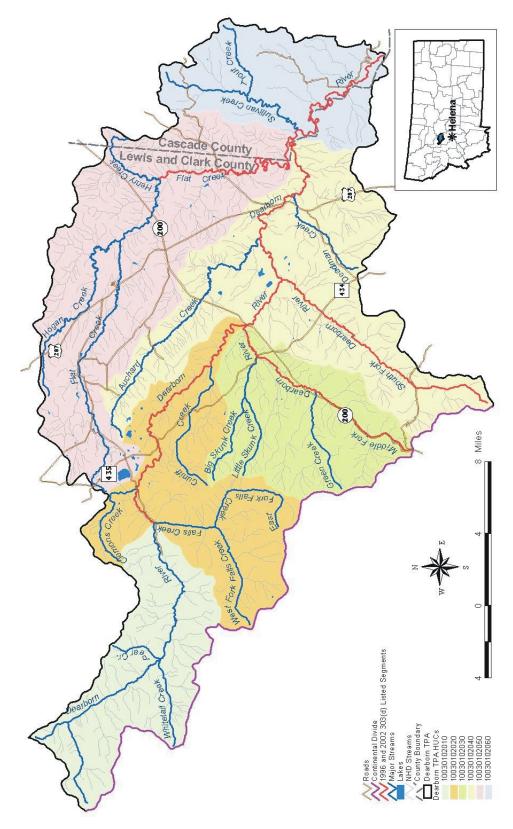


Figure 3-1. Location of 303(d) listed streams in the Dearborn River TPA.

	Size	Use	Listing	5	
Segment Name	(mi)	Class	Year	Probable Impaired Uses	Probable Causes
			1996	Aquatic Life Support Coldwater Fishery	Flow Alteration Thermal Modifications Siltation Habitat Alterations
Dearborn River, from Falls Creek to the Missouri River	48.6	B-1	2002	Aquatic Life SupportFlow AlterationColdwater FisheryThermal ModificationsPrimary Contact RecreationSiltation	Thermal Modifications
			2004	Aquatic Life Support Coldwater Fishery Primary Contact Recreation	Flow Alteration Siltation Thermal Modifications
Flat Creek, from			1996 Aquatic Life Support Coldwater Fishery		Flow Alteration Habitat Alterations Siltation
Henry Creek to Dearborn River	15.5	B-1	2002	002Aquatic Life Support Coldwater FisheryFlow Alterations Siltation	
			2004	Insufficient Data	
Middle Fork of the			1996	Aquatic Life Support	Siltation
Dearborn River, Headwaters to the	13.5	B-1	2002	Not Listed	Not Listed
Dearborn River			2004	Not Listed	Not Listed
			1996	Not Listed	Not Listed
South Fork of the Dearborn River, Headwaters to the	15.8	B-1	2002	02 Aquatic Life Support Coldwater Fishery Siltation	Flow Alteration
Dearborn River			2004	Aquatic Life Support Coldwater Fishery	Dewatering Flow Alteration Siltation

Table 3-1.303(d) Listing Information for the Dearborn River TPA

3.2 Applicable Water Quality Standards

Water quality standards include the uses designated for a water body, the legally enforceable standards that ensure that the uses are supported, and a non-degradation policy that protects the high quality of a water body. The ultimate goal of this water quality restoration plan, once implemented, is to ensure that all designated beneficial uses are fully supported and all standards are met. Water quality standards form the basis for the targets described in Section 3.3. The pollutants addressed in this water quality assessment are sediment and thermal modifications. This section provides a summary of the applicable water quality standards for each of these pollutants.

3.2.1 Classification and Beneficial Uses

Classification is the assignment (designation) of a single use or group of uses to a water body based on the potential of the water body to support those uses. Designated uses or beneficial uses are simple narrative descriptions of water quality expectations or water quality goals. There are a variety of "uses" of state waters, including growth and propagation of fish and associated aquatic life; drinking water; agriculture; industrial supply; and recreation and wildlife. The Montana Water Quality Act (WQA) directs the Board of Environmental Review (BER) to establish a classification system for all waters of the state that includes their most beneficial uses, both at the time the Act was originally written and in the future (Administrative Rules of Montana [ARM] 17.30.607–616), and to adopt standards to protect those uses (ARM 17.30.620–670).

Montana, unlike many other states, uses a watershed-based classification system with some specific exceptions. As a result, *all* waters of the state are classified and have designated uses and supporting standards. All classifications have multiple uses and in only one case (A-Closed) is a specific use (drinking water) given preference over the other designated uses. Some waters may not actually be used for a specific designated use (e.g., as a public drinking water supply); however, the quality of that water body must be maintained suitable for that designated use. When natural conditions limit or preclude a designated use, permitted point source discharges or nonpoint source discharges may not make the natural conditions worse.

Modification of classifications or standards that would lower a water's classification or a standard (e.g., from B-1 to B-3) or removal of a designated use because of natural conditions can occur only if the water was originally misclassified. All such modifications must be approved by the BER and are undertaken on the basis of a Use Attainability Analysis (UAA) that must meet EPA requirements (40 Code of Federal Regulations [CFR] 131.10(g), (h) and (j)). The UAA and findings presented to the BER during rulemaking must prove that the modification is correct and all existing uses are supported. An existing use cannot be removed or made less stringent.

Descriptions of Montana's surface water classifications and designated beneficial uses are presented in Table 3-2. All water bodies within the Dearborn River TPA are classified as B-1.

Classification	Designated Uses
A-CLOSED CLASSIFICATION:	Waters classified A-Closed are to be maintained suitable for drinking, culinary, and food-processing purposes after simple disinfection.
A-1	Waters classified A-1 are to be maintained suitable for drinking, culinary, and food- processing purposes after conventional treatment for removal of naturally present impurities.
B-1	Waters classified B-1 are to be maintained suitable for drinking, culinary, and food-processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.
B-2	Waters classified B-2 are to be maintained suitable for drinking, culinary, and food- processing purposes after conventional treatment; bathing, swimming, and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.
B-3	Waters classified B-3 are to be maintained suitable for drinking, culinary, and food- processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.
C-1	Waters classified C-1 are to be maintained suitable for bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.
C-2	Waters classified C-2 are to be maintained suitable for bathing, swimming, and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.
C-3	Waters classified C-3 are to be maintained suitable for bathing, swimming, and recreation; and for growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl, and furbearers. The quality of these waters is naturally marginal for drinking, culinary, and food-processing purposes, agriculture and industrial water supply.
Ι	The goal of the State of Montana is to have these waters fully support the following uses: drinking, culinary, and food-processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.

 Table 3-2.
 Montana Surface Water Classifications and Designated Beneficial Uses

3.2.2 Standards

Montana's water quality standards include numeric and narrative criteria, as well as a nondegradation policy that currently applies to the numeric criteria.

Numeric surface water quality standards have been developed for many parameters to protect human health and aquatic life. These standards are in Department Circular WQB-7 (MDEQ, 2004). The numeric human health standards have been developed for parameters determined to be toxic, carcinogenic, or harmful and have been established at levels to be protective of long-term (i.e., lifelong) exposures as well as exposure through direct contact such as swimming.

The numeric aquatic life standards include chronic and acute values that are based on extensive laboratory studies including a wide variety of potentially affected species, a variety of life stages, and various durations of exposure. *Chronic* aquatic life standards are protective of long-term exposure to a parameter. The protection afforded by the chronic standards includes reproduction, early life stage survival, and growth rates. In most cases the chronic standard is more stringent than the corresponding acute standard. *Acute* aquatic life standards are protective of short-term exposures to a parameter and are not to be exceeded.

High-quality waters are afforded an additional level of protection by the nondegradation rules (ARM 17.30.701 et. seq.,) and in statute 75-5-303 MCA. Changes in water quality must be "non-significant" or an authorization to degrade must be granted by MDEQ. Under no circumstance, however, may standards be exceeded. It is important to note that waters that meet or are of better quality than a standard are high-quality for that parameter, and nondegradation policies apply to new or increased discharges to the water body.

Narrative standards have been developed for substances or conditions for which sufficient information does not exist to develop specific numeric standards. The term *narrative standards* commonly refers to the General Prohibitions in ARM 17.30.637 and other descriptive portions of the surface water quality standards. The General Prohibitions are also called the "free from" standards; that is, the surface waters of the state must be free from substances attributable to discharges that impair the beneficial uses of a water body. Uses can be impaired by toxic or harmful conditions (from one parameter or a combination of parameters) or conditions that produce undesirable aquatic life. Undesirable aquatic life includes bacteria, fungi, and algae.

The standards applicable to the pollutants addressed in the Dearborn River TPA are summarized below.

Sediment

Sediment (i.e., coarse and fine bed sediment) and suspended sediment are addressed by the narrative criteria identified in Table 3-3. The relevant narrative criteria do not allow for harmful or other undesirable conditions related to increases above naturally occurring levels or from discharges to state surface waters. This is interpreted to mean that water quality goals should strive toward a reference condition that reflects a water body's greatest potential for water quality given current and historic land use activities where all reasonable land, soil, and water conservation practices have been applied (see definitions in Table 3-3).

Rule	Standard
17.30.623(2)	No person may violate the following specific water quality standards for waters classified B-1.
17.30.623(2)(f)	No increases are allowed above naturally occurring concentrations of sediment or suspended sediment (except as permitted in 75-5-318, MCA), settleable solids, oils, or floating solids, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife.
17.30.637(1)	State surface waters must be free from substances attributable to municipal, industrial, agricultural practices or other discharges that will:
17.30.637(1)(a)	Settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines.
17.30.637(1)(d)	Create concentrations or combinations of materials that are toxic or harmful to human, animal, plant, or aquatic life.
	The maximum allowable increase above naturally occurring turbidity is 0 NTU for A-closed; 5 NTUs for A-1, B-1, and C-1; 10 NTUs for B-2, C-2, and C-3
17.30.602(17)	"Naturally occurring" means conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil, and water conservation practices have been applied.
17.30.602(21)	"Reasonable land, soil, and water conservation practices" means methods, measures, or practices that protect present and reasonably anticipated beneficial uses. These practices include but are not limited to structural and nonstructural controls and operation and maintenance procedures. Appropriate practices may be applied before, during, or after pollution-producing activities.

Table 3-3.	Applicable Rules for Sediment Related Pollutants
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Temperature

Montana's temperature standards were originally developed to address situations associated with point source discharges, making them somewhat awkward to apply when dealing with primarily nonpoint source issues. In practical terms, the temperature standards address a maximum allowable increase above "naturally occurring" temperatures to protect the existing temperature regime for fish and aquatic life. In addition, Montana's temperature standards address the maximum allowable rate at which temperature changes (i.e., above or below naturally occurring) can occur to avoid producing temperature shock in aquatic life.

For waters classified as B-1, the maximum allowable increase over naturally occurring temperature (if the naturally occurring temperature is less than 67 °F) is 1 °F, and the rate of change cannot exceed 2 °F per hour. If the natural occurring temperature is greater than 67 °F, the maximum allowable increase is 0.5 °F (ARM 17.30.623(e)).

3.3 Water Quality Goals and Indicators

To develop a TMDL, it is necessary to establish quantitative water quality goals referred to in this document as targets. TMDL targets must represent the applicable numeric or narrative water quality standards and full support of all associated beneficial uses. For many pollutants with established numeric water quality standards, the water quality standard is used directly as the TMDL target. However, one of the pollutants of concern in the Dearborn TPA (siltation) does not have established numeric water quality standards that can be directly applied as TMDL targets. In addition, the numeric standards for thermal modifications are based on a comparison to natural occurring temperatures, which are difficult to determine for the Dearborn TPA. Where targets are established for pollutants with only narrative standards, the target must be a water body-specific, measurable interpretation of the narrative standard.

In the case of the Dearborn TPA, there is no single parameter that can be applied alone to provide a direct measure of beneficial use impairment associated with sediment or thermal modifications. As a result, a suite of targets and supplemental indicators has been selected to help determine when impairments are present (Table 3-4). In consideration of the available data for the Dearborn TPA, the targets are the most reliable and robust measures of impairment and beneficial use support available. As described in the one-by-one discussions of individual targets presented in the following paragraphs, there is a documented relationship between the selected target values and beneficial use support, or sufficient reference data are available to establish a threshold value representing "natural" conditions. In addition to having a documented relationship with the suspected impaired beneficial use, the targets have direct relevance to the pollutant of concern. The targets, therefore, are relied on as threshold values that if exceeded (based on sufficient data), indicate water quality impairment. The targets are also applied as water quality goals by which the ultimate success of implementation of this plan will be measured in the future.

The supplemental indicators provide supporting and/or collaborative information when used in combination with the targets. In addition, some of the supplemental indicators are necessary to determine whether exceedances of targets are a result of natural versus anthropogenic causes. However, the proposed supplemental indicators are not sufficiently reliable to be used alone as a measure of impairment because (1) the cause-effect relationship between the supplemental indicator(s) and beneficial use impairments is weak or uncertain; (2) the supplemental indicator(s) cannot be used to isolate impairment associated with individual pollutants (e.g., to differentiate between an impairment caused by excessive levels of sediment and an impairment caused by high concentrations of metals); or (3) there is too much uncertainty associated with the supplemental indicator(s) to have a high level of confidence in the result.

Sediment Target	Threshold Value
Percent Surface Fines < 2mm	< 20 percent
Number of Clinger Taxa	> 14
Periphyton Siltation Index	< 20.0 for mountain streams < 50.0 for plains streams
Sediment – Supplemental Indicator	Recommended Value
Bank Stability and Riparian Condition	No significant disturbances
MFVP Macroinvertebrate Multimetric Index	> 75 percent
EPT Richness	> 18.5
Percentage of Clinger Taxa	Best Professional Judgment
Montana Adjusted NRCS Stream Habitat Surveys	> 75 percent
TSS (Mean)	< 10 mg/L
Turbidity	High Flow – 50-NTU instantaneous maximum Summer base flow – 10 NTUs
Thermal Modifications – Target	Threshold Value
Temperature (Change in Temperature Due to Anthropogenic Sources, or Variation from a Reference Condition)	< 1° (F)
Thermal Modifications – Supplemental Indicators	Recommended Value
Riparian Condition	No significant disturbances
Daily Maximum Temperature Over a 3-Day Period	< 73º F
Average Temperature Over a 60-Day Period	< 53.6° F

Table 3-4.Summary of the Proposed Targets and Supplemental Indicators for the Dearborn
River TPA

Targets and Supplemental Indicators Applied to Beneficial Use Impairment Determinations

The beneficial use impairment determinations presented in Section 3.4 are based on a weight-of-evidence approach in combination with the application of best professional judgment. The weight-of-evidence approach outlined in Figure 3-2, is applied as follows. If none of the target values are exceeded, the water is considered to be fully supporting its beneficial uses and a TMDL is not required. This is true even if one or more of the supplemental indicator values are exceeded. On the other hand, if one or more of the target values are exceeded, the circumstances around the exceedance are investigated and the supplemental indicators are used to provide additional information to support a determination of impairment/non-impairment. In this case, the circumstances around the exceedance of a target value are investigated and it is not automatically assumed that the exceedance represents anthropogenic impairment (e.g., Are the data reliable and representative of the entire reach? Might the exceedance be a result of natural causes such as floods, drought, fire, or the physical character of the watershed?). This is also the case where the supplemental indicators assist by providing collaborative and supplemental information, and the weight-of-evidence of the complete suite of targets and supplemental indicators is used to make the impairment determination. A conservative approach is used if the supplemental indicators are inconclusive. When the supplemental indicators support neither impairment nor non-impairment, it is assumed that the water is impaired.

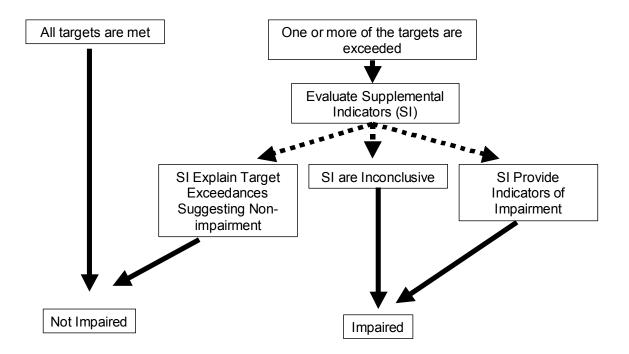


Figure 3-2. Weight-of-evidence approach for determining beneficial use impairments.

Targets and Supplemental Indicators as Water Quality Goals

In accordance with the Montana Water Quality Act (MCA 75-5-703(7) and (9)), the MDEQ is required to assess the waters for which TMDLs have been completed to determine whether compliance with water quality standards has been attained. This assessment will use the suite of targets specified in Table 3-4 to measure compliance with water quality standards and achievement of full support of all applicable beneficial uses (Figure 3-3). The supplemental indicators will not be used directly as water quality goals to measure the success of this water quality restoration plan. If all of the target threshold values are met, it will be assumed that beneficial uses are fully supported and water quality standards have been achieved. Alternatively, if one or more of the target threshold values are exceeded, it will be assumed that beneficial uses are quality standards have <u>not</u> been achieved. However, it will not be automatically assumed that implementation of a TMDL was unsuccessful just because one or more of the target threshold values have been exceeded. As noted above, the circumstances around the exceedance will be investigated. For example, might the exceedance be a result of natural causes such as floods, drought, fire, or the physical character of the watershed? In addition, in accordance with MCA 75-5-703(9), an evaluation will be conducted to determine whether:

- the implementation of a new or improved suite of control measures is necessary
- more time is needed to achieve water quality standards, or
- revisions to components of the TMDL are necessary.

Detailed discussions regarding each of the targets and supplemental indicators are presented below.

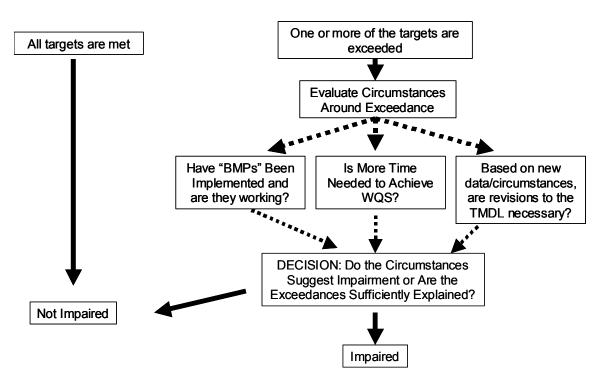


Figure 3-3. Methodology for determining compliance with water quality standards.

3.4 Sediment Targets

The proposed sediment targets for the Dearborn River are the percent surface fines, the number of clinger taxa, and the periphyton siltation index.

3.4.1 Surface Fines

Pebble counts provide an indication of the type and distribution of bed material in a stream. Streams naturally have a wide variety of bed material; however, streams with too much fine material can have lowered spawning rates for many fish species, especially salmonids. Too much fine material also degrades the habitat of aquatic invertebrates, and can cause a shift in the invertebrate population if conditions deteriorate from natural conditions. The state in which there is too much fine sediment in a streambed is often referred to as "embeddedness" or "siltation." It is desirable (and usually natural) that streams have a low percentage of bed material that is less than 2 millimeters in diameter.

The Wolman pebble count method is one method for determining the amount of fine sediment in a water body. Wolman pebble counts involve walking a transect in a riffle section from bankfull to bankfull width. The field person places one foot in front of the other and, without looking down, selects a rock and measures the intermediate diameter of the rock. This information is recorded and the procedure followed until a minimum of 100 rocks per transect are counted (Wolman, 1954). Pebble count data can be interpreted to compare median particle sizes between streams, evaluate the percentage of fines of less than a specific size, and compare particle distributions between streams. The field sheets used to record Wolman pebble counts at several sites within the Dearborn River TPA in 2003 are included in Appendix B.

Threshold pebble count values have not been fully developed in Montana and suitable reference data are not available for comparison to the data collected in the Dearborn River TPA. Recent work completed in the Boise National Forest in Idaho show a strong correlation between the health of macroinvertebrate communities and percent surface fines, where fine sediments are defined as all particles less than 2 millimeters. The most sensitive species were affected at 20 percent surface fines and a definite threshold was observed at 30 percent surface fines (Relyea, personal communications, April 28, 2004). The New Mexico Environmental Department has also established a percent surface fines target of less than 20 percent for TMDL development (NMED, 2002).

The percent surface fines is a good measure of the siltation of a river system and, when combined with biological indicators and other measures, is a direct measure of stream bottom aquatic habitat. Although it is difficult to directly correlate percent surface fines with loadings in mass per time, the Clean Water Act allows "other applicable measures" for the development of TMDLs, and percent surface fines have been used successfully in other TMDLs where stream bottom deposits, siltation, and aquatic life uses are the major issues of concern (USEPA, 1999). Based on these considerations, less than 20 percent surface fines (2 millimeters) is proposed as one of the TMDL targets for the Dearborn River TPA.

3.4.2 Macroinvertebrates – Number of Clinger Taxa

Macroinvertebrate data help to provide a better understanding of the cumulative and intermittent impacts that may have occurred over time in a stream, and they are a direct measure of the aquatic life beneficial use. Several macroinvertebrate metrics and indexes have been developed to help assess aquatic life beneficial use impairments. Some are useful for assessing the overall health of the aquatic life community, while others help to assess the effects of a specific pollutant. Seven metrics and indexes were selected to summarize the macroinvertebrate data collected in the Dearborn River TPA. These metrics were chosen to help determine if sediment is a cause of impairment to the aquatic life community. Using the methodology described in Section 3.3, the macroinvertebrate metrics and indexes were assigned to one of three categories – macroinvertebrate *targets*, *supplemental indicators*, and *supporting information*. The three categories are further described below.

- **Targets (i.e., number of clinger taxa)** There is a documented relationship between the macroinvertebrate metric, aquatic life health, and sediment stressors.
- Supplemental Indicators (i.e., MFVP macroinvertebrate index; EPT richness; percentage of clinger taxa) There is a documented relationship between the macroinvertebrate metric and the overall health of the aquatic life community; however, the metric does not specifically identify sediment as a cause of impairment. Or, there is a documented relationship between the macroinvertebrate metric, aquatic life health, and sediment stressors. However, there is currently no information to suggest an appropriate threshold value.
- Supporting Information (i.e., percentage of tolerant taxa, Hilsenhoff Biotic Index, and stressor tolerance of dominant taxa) The macroinvertebrate metric provides information about the composition of the aquatic life community and may reflect impacts from other stressors (i.e. nutrients) that are beyond the scope of the TMDL.

Based on the available data, only one specific macroinvertebrate metric – number of clinger taxa – appears to have a direct relationship with sediment in a stream. The number of clinger taxa is proposed as a target because clingers have morphological and behavioral adaptations that allow individuals to maintain position on an object in the substrate even in the face of potentially shearing flows. These taxa are also sensitive to fine sediments that fill interstitial spaces, one of the main niches. This metric is calculated as the number of clinger taxa in a sample, and decreases in the presence of sediment stressors. A minimum of 14 clinger taxa are expected in unimpaired Montana streams, and this is proposed as a target for streams in the Dearborn TPA (Bollman, 1998).

The number of clinger taxa are proposed here as a target because of the documented relationship with sediment stressors. The remaining six macroinvertebrate metrics and indexes are considered as supplemental indicators and supporting evidence, and are further described in Section 3.5.1.

3.4.3 Periphyton Siltation Index

MDEQ has collected periphyton samples at sites throughout Montana for more than 15 years. Periphyton are recommended as an additional biological assemblage (USEPA, 2003; USEPA, 1997) and diatoms, in particular, are considered useful water quality indicators because so much is known about the relative pollution tolerances of different taxa and the water quality preferences of common species (Bahls, 2003a; Barbour et al., 1999. MDEQ uses several different diatom indices to assess stream condition.

Analysis of the periphyton data focused on the siltation index, which provides an indication of periphyton health with respect to sediment impact. The siltation index is the sum of the percent abundances of all species in the silt-tolerant diatom genera *Navicula*, *Nitzschia*, and *Surirella*. The following thresholds apply for this index (Bahls, 2003a) and were used as additional targets:

- > 20.0 indicates potential sediment impacts for mountain streams
- > 50.0 indicates potential sediment impacts for plains streams

3.4.4 Cold-Water Fish Populations

Existing fish data include information on the annual numbers of rainbow and brown trout emigrating from the Dearborn River and estimates of age-1 rainbow trout in the Missouri River at Pelican Point (which are representative of populations in the Dearborn River). However, the available data do not provide readily useful information in relation to the listed segments and impairments. For example, limited data are available regarding fish populations in the Middle Fork, South Fork, and Flat Creek and trends in the population data could be due to a number of factors in addition to fine sediments or temperature. Because of these reasons, fish populations were not used to assess impairment status and are not discussed in the water-body-by-water-body discussion below. Instead, future monitoring should attempt to identify trends and this target should be applied as a water quality goal as described in Section 5.4.

3.5 Sediment Supplemental Indicators

The proposed supplemental indicators for the sediment impairment are the MFVP macroinvertebrate index; EPT richness; percentage of clinger taxa; bank stability and riparian condition; Montana adjusted NRCS stream habitat surveys; total suspended solids, and turbidity.

3.5.1 Macroinvertebrates

As described above in Section 3.4.2, only one specific macroinvertebrate metric – number of clinger taxa – appears to have a direct relationship with sediment in a stream. Therefore, it is the only metric to be included as a *target*. Other metrics having a documented relationship with the health of the aquatic life community are discussed below as *supplemental indicators*. These include the Montana Foothill, Valley, and Plains Index of Biological Integrity (MFVP IBI), percentage of clinger taxa, and number of EPT taxa. Finally, the Hilsenhoff Biotic Index (HBI), percentage of tolerant taxa, and stressor tolerance of the dominant taxa metrics are discussed as *supporting information*. These metrics provide insight into the aquatic life community, but are not necessarily correlated with the overall aquatic life health or sediment stressors. Therefore, the supporting information metrics are not used when making beneficial use determinations.

Montana Foothill, Valley, and Plains Index of Biological Integrity

Macroinvertebrate data are typically organized according to a multimetric index of biological integrity (IBI), or a "multimetric index." Individual metrics (e.g., clinger taxa, percentage of EPT) are designed to indicate biological response to human-induced stressors. Scores are assigned to individual metrics, summed across several of them, and the total used to compare samples or sampling sites. Three possible multimetric indices have been developed for Montana: (1) Mountain; (2) Foothill Valley and Plains (MFVP); and (3) Plains. The MFVP IBI was chosen for streams in the Dearborn TPA based on site characteristics, primarily elevation. Most of the sites in the Dearborn TPA are within the Montana Valley and Foothill Prairies ecoregion (Woods et al., 1999) and range in elevation from 3,700 feet to 4,900 feet. The MFVP index is most appropriate for these conditions. MDEQ uses a scoring procedure with a maximum possible score of 100 percent. Total scores *greater than 75 percent* are considered within the range of expected natural variability and represent full support of their beneficial use (aquatic life). Streams scoring between 25 and 75 are considered partially supporting their aquatic life uses, and scores lower than 25 percent represent unsupported uses.

It should be noted that the MDEQ scoring index was developed for 2nd to 4th order streams whereas the Dearborn River is a 5th to 6th order stream. Scoring criteria have not yet been developed for larger rivers, and this is another reason the MFVP index is applied as a supplemental indicator rather than as a target.

Percentage of Clingers

As previously discussed, clinger taxa have morphological and behavioral adaptations that allow individuals to maintain position on an object in the substrate even in the face of potentially shearing flows. These taxa are sensitive to fine sediments that fill interstitial spaces, one of the main niches. This metric is calculated as the number of individuals categorized as belonging to clinger taxa as a proportion of the total sample. The number decreases in the presence of stressors. Scientific literature documenting values or other information on the expected percentage of clingers is not available. A higher percentage of clingers suggests little impact from sediment. This metric provides supplemental information on the overall impacts of sediment.

Number of EPT Taxa

This metric is the richness of the sample in taxa that are mayflies (Ephemeroptera), stoneflies (Plecoptera), or caddisflies (Trichoptera). Invertebrates that are members of these groups are generally understood to be sensitive to stressors in streams, whether the stressors are physical, chemical, or biological. Consequently, these taxa are less common in degraded streams. Metric values decrease in the presence of stressors. Bahls et al. (1992) determined that average EPT taxa richness for foothill streams was 16 taxa. This value was combined with the maximum EPT score to select the indicator value of 18.5.

Percentage of Tolerant Taxa

The tolerance value designation is an estimate of the relative capacity of a taxon to survive and reproduce in the presence of stressors (for more discussion of tolerance values, see below). This metric is calculated as the number of tolerant taxa as a proportion of the total taxa richness in a sample, and it increases in the presence of stressors. A higher proportion of tolerant taxa suggests impacts on the biological condition. Since a threshold value for the percentage of tolerant taxa has not been determined, this metric provides supplemental information regarding the possible impacts of other stressors and is not used as a target or supplemental indicator.

Hilsenhoff Biotic Index (HBI)

The HBI is an abundance weighted index developed to assess impacts from organic pollution (Hilsenhoff, 1987). Since the original HBI was developed in Wisconsin, the HBI metric is used to "screen" for possible indications of nutrient impacts. Bahls et al. (1992) determined that the average HBI value for foothill streams was 3.8. This value provides an indicator for comparison and is used in this analysis as supporting information (but not as a target or supplemental indicator).

Stressor Tolerance of Dominant Taxa

Tolerance values of the dominant taxa in a sample can give some indication of the presence of stressors at the site. Tolerance values for Montana benthic macroinvertebrate taxa were provided by Marshall and Kerans (2003 [draft]). Although the objectivity used in developing tolerance values is often unknown, the tolerance values of the dominant taxa were used as additional information to help interpret reach status. For each sampling site, the dominant taxa in each sample and their associated stressor tolerance values were examined. Shifts in taxa dominance were investigated both in an upstream-downstream comparison within a channel, as well as within a single site from one sample event to another (either between 2000 and 2003 or between 2002 and 2003). The tolerance of dominant taxa was used in this analysis as supporting information (but not as a target or supplemental indicator).

3.5.2 Bank Stability and Riparian Condition

Vegetated riparian buffers are a vital functional component of stream ecosystems and are instrumental in providing suitable habitat to aquatic communities. In addition, excessive sediment loading can occur when anthropogenic activities disrupt the natural vegetative cover or destabilize stream banks. Riparian vegetation health and stream bank stability are therefore two additional supplemental indicators selected for the Dearborn River TPA. An aerial assessment of channel and riparian vegetation in the Dearborn River watershed was conducted in 2003. The overall objectives of the aerial assessment were:

- Provide information about surface physical stream corridor conditions as required to support determinations of impairment and beneficial use status.
- Identify potential causes and sources of natural resource concerns when feasible.
- Establish a baseline of current resource conditions and indicators along the stream corridor for future trend monitoring
- Support recommendations for natural resource restoration and protection strategies along the stream corridor and important uplands within the watershed.
- Serve as a source of background information and interpretations to support future requests for technical and financial assistance to carry out watershed planning efforts.

Land and Water Consulting, Inc. conducted the assessment in 2003 (Appendix D). The results of this assessment were used qualitatively in making impairment determinations.

3.5.3 Montana Adjusted NRCS Stream Habitat Surveys

The NRCS stream habitat survey is a visual assessment of stream habitat condition. The rating is based on scores assigned to 11 categories. Six of the categories relate to the condition and type of riparian vegetation; 4 of the categories describe streambank condition; and one category captures the instream characteristics. Montana adjusted NRCS stream habitat surveys, completed for the Dearborn River in 2003, were used to make comparisons to a potential maximum score. This percentage of a maximum score was then used to represent the overall health of the riparian habitat. A score of 0 to 50 percent is considered "not sustainable," 50 to 75 percent is "at risk," and a score of 75 to 100 percent is classified as "sustainable." These scores were used in conjunction with other supporting indicators to determine whether a habitat degradation impact had occurred.

3.5.4 Total Suspended Solids

Siltation is a difficult impairment to quantify and address in a defensible manner because rivers naturally transport sediment loads. Total suspended solids (TSS), or the similar measurement suspended sediment concentration (SSC), are often used as a surrogate for siltation. However, TSS and SSC have limitations for addressing sediment impairments because they measure the amount of suspended solids within the water column during a given flow, and the units are a mass per volume. As the flow increases and decreases, the suspended solids also change in a direct relation to stream energy. To further complicate the issue, seasonality, antecedent rainfall events, and the length, duration, and intensity of precipitation events all contribute to TSS, so it is difficult to determine an appropriate duration by which to evaluate TSS values (e.g., instantaneous maximum, daily average, or monthly average).

Even with these limitations, TSS values can provide some insight into the sediment characteristics of a stream, and a few TSS and SSC data are available in the Dearborn River TPA. These data have been evaluated where available and were considered as collaborative evidence in support of conclusions on water quality impairment status.

Recommended values for TSS and SSC are best based on least-disturbed, reference watersheds that have similar characteristics as the subject watershed. No such reference watersheds have been identified for the Dearborn River. An average of 10.0 milligrams per liter (mg/L) TSS/SSC for the Dearborn River and its tributaries has therefore been chosen based on best professional judgment and taking into consideration that 10 mg/L is the detection limit for TSS. It should be noted that TSS and SSC are treated equally in this analysis, although SSC values have been shown to slightly exceed TSS values in paired studies, depending on the percentage of sand-sized particles in the sample (Gray et al., 2000).

3.5.5 Turbidity

Turbidity is a measure of water clarity that refers to the scattering of light by suspended matter, dissolved organic compounds, and plankton in the water. If water becomes too turbid, it loses the ability to support a wide variety of plants and other aquatic organisms. Suspended particles can also clog fish gills, lowering their resistance to disease and their growth rates, and affecting egg and larval development. The measurement of turbidity is used as an indirect indicator of the concentration of suspended matter, and can also be important in evaluating the available light for photosynthetic use by aquatic plants and algae.

Historical turbidity measures from the 1970s in the Dearborn TPA were reported in Jackson Candle Units (JCUs). These past turbidity measures are actually very different from current measures, and are not directly related on a one-to-one basis. JCUs involved a method in which a candle was placed opposite a water sample, and the resulting clarity was compared against a chart to adequately describe the clarity, or opacity, of the water sample. Current methods of measuring turbidity express results in Nephlometric Turbidity Units (NTUs). These methods rely on a machine to pass light particles into a water sample, and measure the amount of photons received at a 90 degree offset. This reflection of light particles is a direct result of the suspended materials within the water sample that the light encounters as it passes through the sample. Because of these different analytical methods, JCU data cannot be combined and compared to current turbidity data measured and reported as NTUs.

Another challenge associated with evaluating turbidity as a TMDL target is that both organic and inorganic particles affect water clarity. Organic particles are usually a result of a healthy biological community, however, and thus can distort the interpretation of high turbidity readings. Furthermore, organic particulates also have a seasonal variation, with higher concentrations occurring during the summer months. This introduces variability into turbidity measurements and their relationship to other variables because turbidity readings will be affected more by the organic particulates present in the water at certain times of the year, such as in the summer.

Montana's water quality standard for turbidity varies according to stream classification. The subject waters within the Dearborn River TPA are all classified as B-1. For B-1 waters, the standard is no more than a 5-NTU (instantaneous) increase above naturally occurring turbidity. In the absence of sufficient data to characterize "naturally occurring turbidity," it is not possible to directly apply this standard as a TMDL target.

As a result, where turbidity data are available they are used only as supplemental indicators. The State of Idaho's standard to protect cold-water aquatic life will be used as the proposed supplemental indicator value. In accordance with Idaho's Water Quality Standards and Wastewater Treatment Requirements (58.01.02.250.02.e), turbidity below any applicable mixing zone should not be greater than 50 NTUs (instantaneous). This value will be applied to high flow events or during the time of annual runoff. Some evidence suggests that detrimental effects on biota can occur with turbidity as low as 10 NTUs. The State of Idaho therefore has recommended that chronic turbidity not exceed 10 NTUs during summer base flow, and this value is also used as a supplemental indicator.

3.6 Temperature Targets

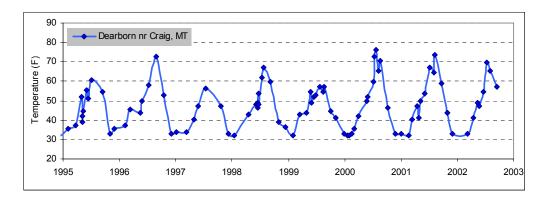
An EPA study and several independent studies have shown a strong relationship between cold-water fish (salmonids) and water temperature (USEPA, 1976; Coutant, 1977; Cherry et al., 1977; Bell, 1986; Lee and Rinne, 1980). Increased water temperature can affect fish reproduction and feeding habits. Also, warmer water temperatures can lead to a shift in fish species from cold-water to warm-water fish. Increases in water temperature are not normally lethal to fish because they can avoid areas of warmer water by migrating to other parts of the river. However, prolonged periods of extremely warm water temperatures can be fatal.

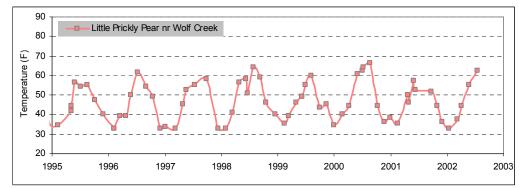
The Montana Administrative Rules state that "the maximum allowable increase over naturally occurring temperature (if the naturally occurring temperature is less than 67° Fahrenheit) is 1° (F) and the rate of change cannot exceed 2° F per hour" (ARM 17.30.623). These numeric criteria are used as the temperature targets for the Dearborn River.

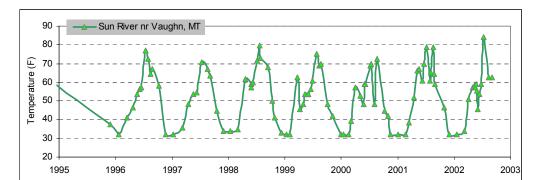
An attempt was made to identify a suitable reference stream with which to assess "naturally occurring temperatures" in the Dearborn River so that the temperature criteria could be more directly applied. Ambient data from the Dearborn were compared with those from other streams of similar size near the Dearborn River, including the Sun River and Little Prickly Pear Creek (Figure 3-4). Table 3-5 shows the average monthly temperatures for four different USGS stations for the years 1995 through 2002. Water temperatures in the Dearborn River were similar to water temperatures in the Sun River and Little Prickly Pear Creek. The Sun River had a greater variability in temperature and, on average, higher summer temperatures than the Dearborn River. Little Prickly Pear Creek had the lowest average summer temperatures. However, both the Sun River and Little Prickly Pear Creek have been listed on a 303(d) list (the 1996 or 2002 303(d) list or both) for thermal modifications, and are therefore not considered appropriate as reference streams for the Dearborn River. No other appropriate reference streams were identified.

Month	Dearborn at Craig, MT (06073500)	Little Prickly Pear at Wolf Creek (06071300)	Sun River at Simms, MT (06085800)	Sun River at Vaughn, MT (06089000)
Watershed Area (square miles)	325	381	1,320	1,854
January	32.8	34.6	32.0	32.1
February	33.7	35.3	32.0	33.4
March	37.9	36.8	38.8	37.8
April	42.7	47.1	49.4	52.2
Мау	46.7	50.0	55.1	54.2
June	51.1	53.3	52.5	61.2
July	64.5	61.4	68.6	68.6
August	67.1	61.2	64.6	66.3
September	59.0	53.8	61.3	57.7
October	45.2	46.5	48.2	47.5
November	38.2	42.1	39.0	39.6
December	33.8	35.9	32.9	32.7

Table 3-5.	Average Monthly Water Temperatures for the Dearborn River and Other Western
	Montana Rivers (1995–2002)







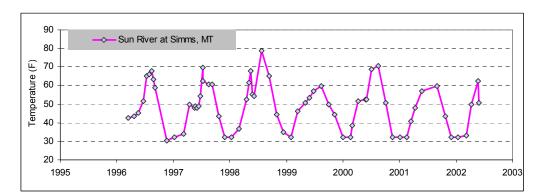


Figure 3-4. Comparison of Dearborn River temperature data to the Sun River and Little Prickly Pear Creek.

3.7 Temperature Supplemental Indicators

Three supplemental indicators were used for temperature impairments in the Dearborn TPA: riparian condition, 3-day maximum temperature, and 60-day average temperature. The riparian condition indicator was discussed above in Section 3.5.2. The two other supplemental indicators are discussed below.

Two sources were consulted in selecting supplemental temperature indicators for the Dearborn River: MFWP's Drought Fishing Closure Policy and ongoing laboratory research at Montana State University.

Among the objectives of MFWP's Drought Fishing Closure Policy is to "protect long-term health of aquatic systems from impacts of severe drought, especially waters supporting species of special concern" and to "provide consistency in decisions across the state" (MFWP, 2004). The policy specifies that exceedance of threshold levels for salmonids and for bull trout will initiate a discussion for appropriate action to protect the fisheries. The thresholds for salmonids (excluding bull trout) are the following:

- Flows are at the 95 percent monthly exceedence level (1-in-20-year low flows); or
- Daily maximum water temperature reaches or exceeds 73 °F (23 degrees Celsius [°C]) for at least some period of time during 3 consecutive days.

Thermal requirements specific to westslope cutthroat trout were also investigated because they are reported to inhabit the Dearborn River headwaters. As reported by McMahon et al. (2004), the thermal requirements of westslope cutthroat trout are largely unknown. In addition, increased water temperature is thought to favor non-natives in many cases, yet the effect of temperature on competition between westslope cutthroat and non-natives is unknown. Furthermore, hybridization between westslope cutthroat trout has resulted in a decline in populations of genetically pure westslopes. McMahon et al. (2004) conducted laboratory tests to assess the thermal requirements of hybrids, as well as how the competitive interaction between hybrids, genetically pure westslope cutthroat trout, and non-natives is influenced by water temperature. The tests were conducted over 60 days and used the acclimated chronic exposure method to assess upper thermal limits and growth optima during 60-day trials. Preliminary results suggest the upper limit for survival of westslope cutthroat trout is near 69.8 °F, whereas peak growth occurred around 53.6 °F. Both the upper lethal and optimal growth temperatures for westslope cutthroat trout were surprisingly similar to previously studied bull trout (Selong et al., 2001).

Both MFWPs' Drought Fishing Closure Policy and the research by McMahon et al. were used to develop temperature supplemental indicators for the Dearborn River. These supplemental indicators are as follows:

- Daily maximum water temperature should not exceed 73.0 °F for at least some period of time during 3 consecutive days.
- Average temperatures over any 60-day period should not exceed 53.6 °F.

3.8 Current Water Quality Impairment Status

This section presents summaries and evaluations of all available water quality data for waters appearing on Montana's 1996, 2002, and draft 2004 303(d) lists. The weight-of-evidence approach described above in Section 3.3, using a suite of targets and supplemental indicators, has been applied to verify each of the water quality impairments listed in 1996 and 2002. This section provides supporting documentation for each water body within each of the three major drainages.

3.8.1 The Dearborn River

The main stem of the Dearborn River is primarily an alluvial, gravel bed river with a small to moderately extensive floodplain. Significant reaches of the channel are confined by deeply dissected terrain and canyon walls. Areas of lateral and vertical bedrock control are present, and this confinement has resulted in limited lateral floodplain development in some reaches. A short section of unstable braided channel is present in the transition from the headwaters near Falls Creek/Bean Lake. Typical views of the Dearborn River are shown in Figure 3-5 and Figure 3-6. The locations of all of the mainstem sampling sites are shown in Figure 3-7 and field sheets and photos from the 2003 sampling are included in Appendix B.

Montana's 1996 303(d) list reported that the Dearborn River (from Falls Creek to the Missouri River) was impaired because of siltation, thermal modifications, flow alterations, and habitat alterations. The basis for the 1996 listings is unknown. The same causes of impairment, except habitat alterations, appeared on the 2002 and draft 2004 303(d) lists. MDEQ's Assessment Record Sheet (Phillips, 2000) indicates that the 2002 listings were based on the results of benthic macroinvertebrate surveys, periphyton surveys, and visual observation.

A review of the available data, some of which were not previously considered by MDEQ, is provided below. Available data include Wolman pebble counts, information on macroinvertebrate and periphyton populations, the results of a channel and riparian aerial assessment, stream habitat surveys, total suspended solids, turbidity, and temperature data and modeling.



Figure 3-5. Dearborn River at Highway 200.



Figure 3-6. Dearborn River downstream of Highway 287.

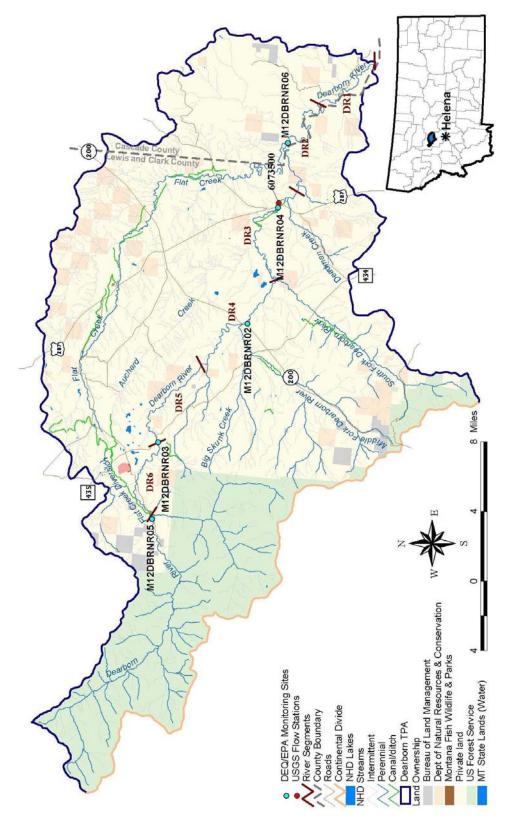


Figure 3-7. Sampling locations in the mainstem Dearborn River.

Surface Fines

Pebble count data have been collected and analyzed for the Dearborn River at four different sites covering the period from September 2002 to July 2003 (Table 3-6). These data were used to create the particle distribution curves shown in Figure 3-8. These data show that the average percent surface fines (less than 2 millimeters) in the Dearborn River at all sites is significantly less than the 20 percent target. The particle size distribution curves are similar at all four sites. The data suggest no sediment impairment.

Site ID	Site Name	Percentage < 2mm				
		9/10/2002	6/17/2003	7/24/2003		
M12DBRNR05	Dearborn River below Falls Creek above the Falls Creek diversion	_	_	4.9		
M12DBRNR03	Dearborn River near Bean Lake	5.6				
M12DBRNR02	Dearborn River downstream of Highway 200	6.5	_	-		
M12DBRNR04	Dearborn River at Highway 287	_	10.9			

 Table 3-6.
 Dearborn River Stream Bottom Deposits Data Summary Table

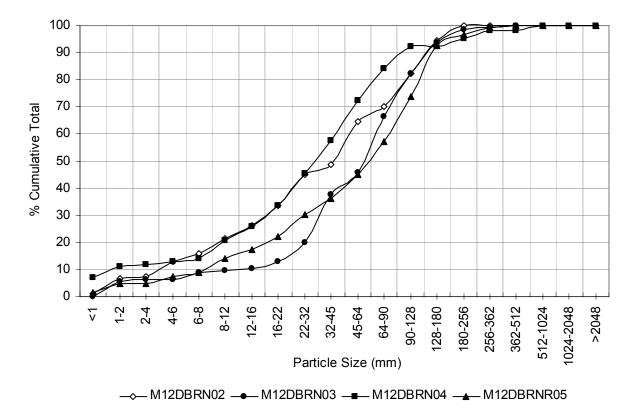


Figure 3-8. Cumulative stream bottom particle distribution for the Dearborn River.

Periphyton Siltation Index

Periphyton samples were collected at five sites along the main stem of the Dearborn River from 2001 to 2003. An EPA field crew sampled two reaches in 2002 and three reaches in 2003. MDEQ has an established statewide monitoring site located at Highway 287 that has been sampled yearly since 2001. Results from the MDEQ 2001 and 2002 statewide sampling events are included in this report; at the time of this report, the 2003 statewide monitoring site data were not available. Results from individual sites are presented in Table 3-1 and in Appendix C.

Based on the periphyton assessments, the main stem Dearborn River suggested no impacts from sediment. Results from two of the five sites indicated excellent biological integrity, and the other three reaches indicated some slight impacts from other stressors (e.g., nutrients) but still maintained good biological integrity.

		Siltation Index			
Site ID	Site Name	2002	2003	Narrative Summary	
M12DBRNR02	Dearborn River at Highway 200		1.75	The summary findings for periphyton at this site indicate excellent biological integrity (Bahls, personal communication, 2003b) and full support of aquatic life	
M12DBRNR03	Dearborn River near Bean Lake	2.52		The summary findings for periphyton at this site indicate excellent biological integrity	
M12DBRNR04	Dearborn River at Highway 287	5.36		The summary findings for periphyton at this site suggested some slight impacts, possibly attributable to increased nutrient concentrations. Overall, periphyton results showed no indication of sediment impacts and indicate full support of aquatic life.	
M12DBRNR05	Dearborn River below Falls Creek	9.11	6.9	The summary findings for periphyton at this site suggest some slight impacts at this site, but the overall biological integrity was considered "good" in 2002 and excellent in 2003 (Bahls, 2003b). Overall, periphyton results show no indication of sediment impacts and indicate full support of aquatic life.	
M12DBRNR06	Dearborn River below Flat (DB5)		8.56	The summary findings for periphyton suggest some slight impacts at this site, possibly attributable to increased nutrient concentrations. Overall, periphyton results show no indication of sediment impacts and indicate full support of aquatic life.	

Table 3-7.Summary of Periphyton Data and Siltation Index for Sites in the Dearborn River.

Macroinvertebrates

Macroinvertebrate samples were collected at five sites along the mainstem Dearborn River from 2001 to 2003. An EPA field crew sampled two reaches in 2002 and three in 2003. In addition, MDEQ has an established statewide monitoring site located at Highway 287 that has been sampled yearly since 2001. Results from the 2001 and 2002 statewide sampling events are included in this report. At the time of this report, the 2003 statewide monitoring site data were not available. Results from individual sites are summarized in Table 3-8 and in Appendix C.

Macroinvertebrate data suggest that the main stem of the Dearborn River is in relatively good condition, exhibiting only slight impact in the downstream areas in 2 years of sampling (2002 and 2003). MFVP scores were considered a screening mechanism to evaluate the presence of possible stressors, but the individual metric values were given more weight in evaluating the biological condition because the MFVP index was not developed for 5th and 6th order streams like the Dearborn River. From 2002 to 2003, the numbers of EPT taxa ranged from 11 to 20. The percentage of tolerant taxa was very low for all reaches (< 30), and four out of five reaches had a high percentage of clingers, ranging from 64 to 75 percent. The ranges of these metric values indicate good conditions in the main stem, although there may be localized impacts from habitat disturbance or other stressors. Based on evaluations of EPT taxa richness, and the characteristics of the dominant taxa, the macroinvertebrate data do not suggest any sediment impacts on the main stem Dearborn River. Increases in the percentage of tolerant taxa and a slightly elevated HBI value at the site below Highway 200 may indicate the presence of other possible stressors, such as nutrients, habitat alterations, or flow alterations, and may warrant further studies (see Section 6.0).

		Targets	argets Supplemental Indicators			Supporting Information			
Site Description	Year	# Clinger Taxa	% Clinger Taxa	MFVP IBI	# EPT Taxa	HBI	% Tolerant Taxa	Stressor Tolerance	
Threshold or Indicator Value		>14	BPJ	>75	>18.5	<3.8	BPJ	BPJ	
Dearborn River below Falls Creek (M12DBRNR05)	2003	17	64	83	19	2.92	0.3	Low	
Dearborn River near Bean Lake (M12DBRNR03)	2002	10	69	50	11	2.25	8	Low	
Dearborn River at	2001	8	26	50	7	3.89	25	NA	
Highway 287	2002			50					
(M12DBRNR04)	2003	17	75	50	14	3.75	15	Moderate	
Dearborn River below Flat Creek (M12DBRNR06)	2003	20	75	50	15	3.8	20	Low	
Dearborn River at Highway 200 (M12DBRNR02)	2002	12	53	56	14	4.14	29	Moderate	
Average		14	60	56	13	3.46	16	Low	

 Table 3-8.
 Summary of Macroinvertebrate Metrics for the Dearborn River.

To further assess potential impacts to aquatic life (i.e., macroinvertebrates) from sediment, an additional analysis using the recently developed "Fine Sediment Index" (FSI) was also conducted. The Fine Sediment Index was developed using data from more than 600 sites across the western United States and has been shown to be a good indicator of possible sediment impacts. A FSI score was calculated for 5 sites on the Dearborn River using the available macroinvertebrate data. FSI scores have not been developed for the Montana Foothill, Valley, and Plains ecoregion so these scores were compared to 262 streams in the Columbia, Snake, and Northern Basin and Range ecoregion. Previous work on the FSI found that the basin and plains streams in the western U.S. were very similar in the quantity of fine sediment among ecoregions and in the types of macroinvertebrate communities found in these streams.

In general, FSI scores greater than or equal to the 75th percentile are considered non-impaired by fine sediment. All 5 Dearborn River sites scored above the 75th percentile; with three sites indicating no fine sediment related impairments and two with possible slight fine sediment related impairments. One of these two (i.e., Dearborn River near Bean Lake) was not sampled at the ideal time of the year for application of the FSI, and therefore the results should be used with caution. At the other site (i.e., Dearborn River below Highway 200), other stressors such as organic enrichment, temperature, or flow may be affecting the results.

Dearborn River below Falls Creek

This most upstream site of the Dearborn River had the highest FSI score of all five sites sampled. The FSI score of 170 would place this segment above the 90th percentile when compared to streams in the Columbia/Snake/NBR ecoregions. The macroinvertebrate community was somewhat different than the communities found in the lower Dearborn sites. Approximately 20 of the 41 macroinvertebrate taxa were only found in this site when compared to the other sampled Dearborn sites. These taxa were more similar to mountainous stream taxa. This indicates that this segment of the Dearborn is transitional between mountain and plain ecoregions. The most invertebrates (n=292) were also collected at this site but this number seems slightly low when compared to other streams sampled at the same time of year (September). *Drunella doddsi*, *Epeorus longimanus, Arctopsyche grandis*, and *Hesperoperla pacifica* all had substantial populations at this site and are all sediment sensitive with their 75th percentile of occurrence at 30% fine sediment (<2mm). The Dearborn River below Falls Creek does not appear to be impacted by fine sediment (<2mm).

Dearborn River near Bean Lake

This segment only had 87 invertebrates collected for a richness of 21 taxa. With such a low number of individuals collected and no replicate sample to verify whether this low number reflects conditions at this site or is merely an artifact of sampling, results from this site should be used with caution. This site along with the Hwy. 200 site had the lowest FSI scores of 105. These scores were just slightly above the Columbia/Snake/NBR cutoff score at the 75th percentile. This along with the presence of *Rhithrogena* and *Drunella doddsi*, who are sediment sensitive with their 75th percentile of occurrence at 30% fine sediment (<2mm), indicates that this segment is slightly to non-impaired for fine sediment. Other sediment sensitive species were present but because only one individual was counted health of the population cannot be determined. It is also worth mentioning that FSI was developed for streams sampled in the fall period at baseflow conditions. This segment was sampled in July which should also be considered when comparing this score to streams sampled in September when typically more invertebrates are present.

Dearborn River at Hwy 200

This segment has one of the highest taxa richness values (n=41) but the lowest FSI-EPT score (n=6). This means that only 6 of the 41 taxa are sediment sensitive. The FSI score was the lowest (105) of the 5 sites, but when compared to the Columbia/Snake/NBR ecoregion is slightly

above the 75th percentile. This site does have *Claassenia sabulosa* which has its 75th percentile of occurrence at 20 percent fines. The taxa at this site are different from the other sites in that there are more non-insect taxa. This site may have different flow characteristics or temperature regime from the remaining sites. A high Hilsenhoff Biotic Index indicates possible organic nutrient enrichment.

Dearborn River at Hwy 287

This site had an FSI score of 125 which puts it well above the 75^{th} percentile. The high FSI score coupled with numerous *Claassenia sabulosa* (n=27) (who is very sediment intolerant) indicates no sediment impairment.

Dearborn River below Flat Creek

This segment had a high FSI score of 120 above the 75^{th} percentile and numerous *Claassenia* sabulosa (n=19) indicating fine sediment is not an impairment at this site.

Bank Stability and Riparian Condition

As discussed in section 3.5.2, Land and Water Consulting, Inc., conducted a channel and riparian aerial assessment study in 2003. The results indicated that the majority of stream banks in the surveyed reaches were rated as *good* or *fair* (Table 3-9). The one *poor* rating in the Dearborn River was attributed to natural causes (reach DR3 is in an unconfined channel with an active floodplain). Mass failure was an uncommon source for sediment along the Dearborn River and its tributaries. At a single location, a failing hillside was noted. However, the active failure was attributed to natural sources.

Reach	Reach Length (miles)	Channel Type	Slope	Sinuosity	Channel Width (feet)	Bank Instability (% of reach)			Overall Channel Condition
						High	Mod	Low	Condition
DR1	8.88	C4	0.005	1.15	115	11.1	44.3	44.5	Good
DR2	9.52	C4	0.006	1.25	117	15.8	42.1	42.1	Good
DR3	8.00	C4	0.007	1.13	120	29.4	35.3	35.3	Fair-Good
DR4	8.15	C4	0.007	1.22	100	11.8	41.2	47.1	Good
DR5	7.436	C4	0.008	1.04	100	31.2	18.8	50.0	Fair
DR6	6.53	D4	0.008	1.1	107	57.1	21.2	21.6	Poor

Table 3-9.	Bank Stability along the Dearborn River
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Riparian vegetation along the Dearborn River consists primarily of open stands of deciduous cottonwood with extensive areas of herbaceous understory. There is very little bare or disturbed ground in the Dearborn River riparian area, most segments having 5 percent or less bare ground. The complete results of the aerial survey are discussed in Appendix C. The average riparian buffer width appeared to be in good condition, ranging from 42 to 49 feet in the lower segments of the Dearborn River and 72 to 136 feet in the upper segments. There are few roads and culverts in the riparian area that could contribute sediment during precipitation or snowmelt events.

Shade provided by riparian vegetation to the stream channel was very limited in all reaches. This is explained in part by low to moderate tree densities and canopy coverage, but also by the fact that tree heights and offset from the channel resulted in minimal shade projected to the water surface. Channel widths exceeding 100 feet limited effective shading potential from even mature cottonwood stands adjacent to the river. The majority of shade on the Dearborn is provided by topography.

The majority of the agricultural uses are not along the stream corridor, and do not appear to be altering the riparian corridor or the geomorphology of the channel. Also, the presence of wide, intact riparian areas acts as a buffer between the agricultural land and the streams.

Upland sources did not appear to contribute appreciable quantities of sediment to the Dearborn main stem or tributaries. Perennial and intermittent tributaries appeared stable, and rangeland did not show evidence of surface erosion, rilling, or other signs of accelerated soil loss due to anthropogenic influences. Forested headwaters were largely pristine. Sediment contribution from cut/fill slopes and road sand appeared to be minimal given the long delivery distance to the channel.

The channel and riparian aerial assessment study included an examination of historical photos. The analysis did not show any strong, localized riparian modification and bank instability, or grazing-related sediment issues. The possibility exists that historical anthropogenic land use factors may play a role in

existing conditions. However, past human influence on channel and stream bank sediment sources in the Dearborn appeared minimal based on aerial photo interpretation.

A major decrease in channel stability occurred along with channel width increases after the major flood of 1964. Aerial photos taken in 1995 showed recovery of channel widths to dimensions near (or less than) 1955 values, indicating a strong trend for channel recovery following the 1964 flood. It is reasonable to assume the rebuilding of floodplain soils on exposed gravel deposits and reestablishment of climax floodplain vegetation communities is still continuing in the present day. Full recovery from the 1964 flood has been gradual in many alluvial channels along the Rocky Mountain front. Exposed gravel floodplain surfaces are widespread in portions of the Teton River, Birch Creek, and other nearby watersheds.

Montana Adjusted NRCS Stream Habitat Surveys

The Montana adjusted NRCS visual riparian assessments were completed in 2002 and 2003. The average Dearborn River reach score was 83.7 percent, which is above the recommended value of 75 percent and is indicative of excellent riparian conditions. All three sites were rated as being sustainable (Table 3-10) and suggest that these sites do not contribute significant amounts of sediment to the Dearborn River.

S	ample Site Information	Stream Habitat Ratings					
Site ID	Site ID Site Name		NRCS Rating	MT Adjusted NRCS Score (% Max)	MT Adjusted NRCS Rating		
M12DBRNR04	Dearborn River at Highway 287	85.0	Non Impaired, Fully Supporting	91.0	Sustainable		
M12DBRNR02	Dearborn River downstream of Highway 200	87.0	Sustainable	82.0	Sustainable		
M12DBRNR03	Dearborn River Near Bean Lake	84.0	Sustainable	78.0	Sustainable		
	AVERAGE FOR DEARBORN RIVER:	85.3	Non Impaired, Fully Supporting	83.7	Sustainable		

 Table 3-10.
 Dearborn River Riparian Habitat Data Summary

Total Suspended Solids

Limited SSC and TSS data are available for the Dearborn River and all of the data are presented in Table 3-11. As indicated by the last column in Table 3-11, most samples were taken during periods of below average flow. The average SSC at station 6073500 (20 mg/L) is above the proposed indicator (10 mg/L) but is based on a relatively small sample set. The median value at site 6073500 is 13 mg/L.

Site ID	Date	Parameter	Result (mg/L)	Flow Condition ¹
M12DBRNR02	8/10/02	TSS	<1	36%
M12DBRN03	8/10/02	TSS	< 1	36%
M12DRBNR04	6/17/03	TSS	<10	97%
M12DRBNR04	7/22/03	TSS	<10	21%
M12DRBNR05	7/24/03	TSS	<10	19%
M12DRBNR06	7/24/03	TSS	<10	19%
6073500	6/2/99	SSC	22	312%
6073500	6/22/99	SSC	6	208%
6073500	8/23/99	SSC	13	26%
6073500	11/9/99	SSC	18	29%
6073500	4/4/00	SSC	2	27%
6073500	6/2/00	SSC	3	76%
6073500	8/10/00	SSC	14	6%
6073500	3/19/01	SSC	1	20%
6073500	5/14/01	SSC	62	344%
6073500	7/11/01	SSC	5	46%
6073500	8/9/01	SSC	8	27%
6073500	11/1/01	SSC	19	18%
6073500	4/19/02	SSC	5	75%
6073500	5/28/02	SSC	65	376%
6073500	7/19/02	SSC	19	61%
6073500	4/8/03	SSC	2	65%
6073500	5/27/03	SSC	98	343%
6073500	6/16/03	SSC	5	103%
6073500	7/15/03	SSC	13	28%

Table 3-11.Dearborn River SSC and TSS Data

¹Flow condition is calculated by dividing the recorded flow at Craig, MT, on the date of the sampling by the long-term average flow at Craig, MT (203 cfs). In the absence of site-specific flow data, this value is meant to provide perspective on overall watershed flows during the time of the sampling.

Turbidity

Only the turbidity samples taken during the TMDL sampling that was completed in June and July of 2003 are available for the Dearborn River (see Table 3-12). All values are well below the 10-NTU target level. In addition, turbidity data from 1973 to 1974 were analyzed, and the 11 samples showed a mean turbidity value of 0.45 JCUs, with a maximum value of 1.0 JCU. Jackson Candle Units are not directly comparable to NTUs; however, these values indicate that the historical turbidity samples were also low.

Site ID	Date	Result (NTU)	Flow Condition ¹
M12DRBNR04	7/22/2003	1.39	21%
M12DRBNR04	7/22/2003	1.39	21%
M12DRBNR06	7/24/2003	1.11	19%
M12DRBNR05	7/24/2003	0.76	19%

Table 3-12.	Dearborn River Turbidity Data Summary Table
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¹Flow condition is calculated by dividing the recorded flow at Craig, MT, on the date of the sampling by the long-term average flow at Craig, MT (203 cfs). In the absence of site-specific flow data, this value is meant to provide perspective on overall watershed flows during the time of the sampling.

Temperature

Temperature data are available from three locations in the Dearborn River. The USGS gage at the Highway 287 Bridge near Craig, Montana (USGS station 06073500) provides continuous (every 15 minutes) temperature data at the Dearborn River–Highway 287 station for the period from October 1995 through September 2004 (Figure 3-9). Montana Fish, Wildlife, and Parks also records continuous temperature data upstream of Highway 287 and data are available for July 1997 to October 2003. An evaluation of the USGS data indicates that the 3-day daily maximum supplemental indicator (73 degrees F) was exceeded 221 times (7 percent of all days sampled) during the period of record. The 60-day average supplemental indicator (53.6 degrees F) was exceeded 948 times (30 percent).

Two continuous temperature samplers were installed on the Dearborn River from July 25, 2003 to October 23, 2003, as part of the TMDL sampling effort. These were installed on the Dearborn River just downstream of Flat Creek and at the Dearborn River at Highway 200. Figure 3-10 shows that the 3-day daily maximum supplemental indicator was exceeded 36 times (39 percent of all days sampled) downstream of Flat Creek. The 60-day average supplemental indicator was also exceeded 36 times (100 percent). Figure 3-11 shows that at Highway 200 the 3-day daily maximum supplemental indicator was exceeded 34 times (39 percent of all days sampled). The 60-day average supplemental indicator was exceeded 36 times (100 percent).

Montana Fish, Wildlife, and Parks also reported observing a fish kill on August 2, 2000 that was attributed to high temperatures. Dead sculpin and longnose dace were observed scattered throughout shallow water areas upstream of the Highway 287 bridge and the fish kill report noted that: "Hundreds of trout, primarily rainbows from 3" to 20" were packed into a spring area with substantially cooler water than surface water in the Dearborn... Upon spooking the fish, they would move off the bank but once they got into the hot surface water they would return to the cooler spring-influenced area" (FWP, 2000).

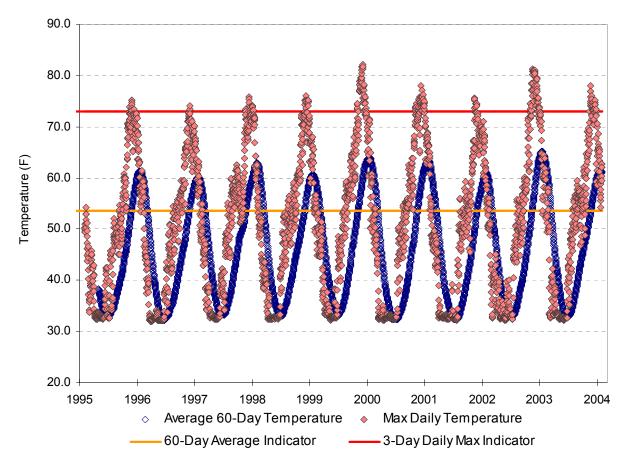


Figure 3-9. Evaluation of continuous temperature data for the Dearborn River at Highway 287 (USGS gage 06073500).

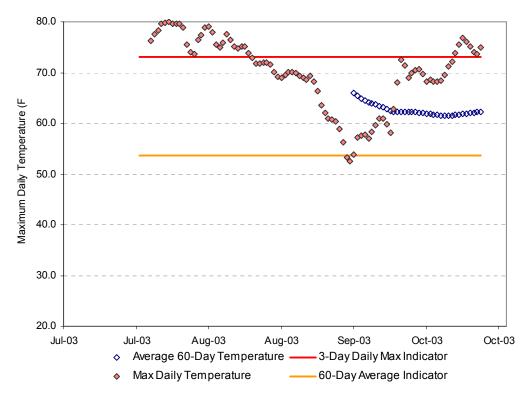


Figure 3-10. Continuous temperature evaluation for the Dearborn River downstream of Flat Creek.

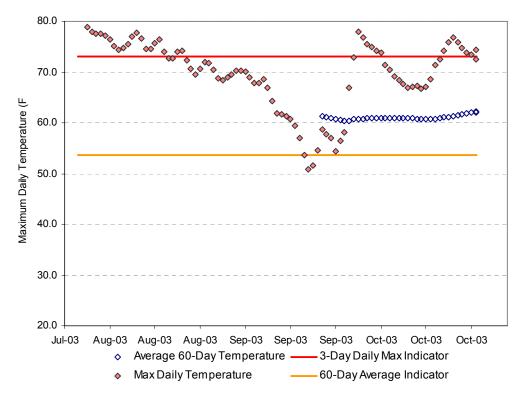


Figure 3-11. Continuous temperature evaluation for the Dearborn River at the Highway 200 Bridge.

The Montana numeric water quality standards for temperature state that the maximum allowable increase over naturally occurring temperature (if the naturally occurring temperature is less than 67 °F) is 1 °F and the rate of change cannot exceed 2 °F per hour. If the naturally occurring temperature is greater than 67° F, the maximum allowable increase is 0.5 °F (ARM 17.30.623(e)). It is suspected that the upstream irrigation diversion from the Dearborn River to Flat Creek is causing an increase in water temperature in the downstream segments of the Dearborn River. The resulting decreased water depth and volume in the Dearborn River may lead to increased temperatures over natural conditions because shallow, low-volume water bodies are more easily heated. To better understand the effects of the diversion, temperature in the Dearborn River was modeled with the USGS Stream Segment Temperature Model Version 2.0 (SSTEMP) (Bartholow, 2002).

SSTEMP is a simplified, steady-state model capable of predicting the change in temperature along a stream reach. The model simulates the various natural heat flux processes found in a stream such as convection, conduction, and long and short wave radiation. Some of the various user inputs to the model are shown below.

- Hydrology: segment inflow, segment outflow, inflow temperature
- Channel Geometry: segment length, upstream and downstream elevation, wetted width and depth, Manning's "n"
- Meteorology: segment latitude, average daily air temperature, relative humidity, wind speed, ground temperature, thermal gradient, possible sun (percentage), percentage of shade, time of the year

The model predicts mean, minimum, and maximum temperatures at a specified reach outflow under steady-state conditions. It also assumes that conditions along the reach – such as air temperature, shade, and channel shape – do not change. As stated above, the SSTEMP model must be run for a reach with both a known inflow and outflow. Both flows and instream temperatures were collected on July 24, 2003 at two sites in the Dearborn River – upstream of the Flat Creek diversion and downstream of the confluence with Flat Creek. At the time of this report, only these two sites had both flow and temperatures collected on the same day, and also spanned the reach of concern (Dearborn River near the Flat Creek diversion). Therefore, the model was calibrated and run for the 36-mile segment between the two sampling sites. The Dearborn River upstream of the Flat Creek diversion was the known *inflow* site, and temperatures were calibrated and predicted at the Dearborn River downstream of the confluence with Flat Creek (*outflow* site). Because of the constraints of the model inputs (specifically, having a *known outflow*), stream temperatures could not be predicted anywhere else in the river. In the future, additional flow information could be input to the model to predict temperatures throughout the river.

SSTEMP was used to simulate current conditions in the Dearborn River with the Flat Creek diversion and a condition where no water is diverted. As stated above, the model was calibrated with synoptic flow and temperature data obtained on July 24, 2003. The sampling occurred during hot, low flow conditions in which it is expected there would be the most pronounced changes in temperature due to changes in volume (i.e., critical conditions). Flow and temperature data were obtained in the Dearborn River upstream of the diversion, in the diversion, and in the Dearborn River downstream of the confluence with Flat Creek (Table 3-13). The model was calibrated using these values, along with weather information and information about the stream channel conditions. For the purpose of this modeling exercise, it is assumed that the measured temperatures and flows are daily mean values.

Table 3-13.	Measured Flow and Temperature Conditions at Various Locations in the Dearborn
	River Watershed on July 24, 2003

Location	Measured Flow (cfs)	Measured Stream Temperature (°F)
Dearborn River immediately upstream of Flat Creek diversion	105	56.2
Irrigation channel immediately downstream of diversion	58	56.2
Dearborn River downstream of Flat Creek diversion (calculated)	47	56.2
Dearborn River downstream of Flat Creek confluence	43	67.1

The results of the model calibration indicate that the predicted mean output temperature is similar to the measured outflow temperature at the Dearborn River downstream of Flat Creek. The model was then run for various flow conditions to predict water temperature. Table 3-14 shows the results of this analysis. The model suggests that the loss of water from the irrigation diversion is resulting in increased temperatures in the Dearborn River. The actual temperature of the Dearborn River downstream of Flat Creek was 67.1 °F. The model predicted that the temperature with no diversion would be 65.9 °F, assuming no other inputs or withdrawals of flow between the diversion and the downstream monitoring site. This difference of 1.2 °F is above the standard that allows for only a 1-degree increase in water temperature. However, the range of uncertainty associated with the modeling is +- 2.1 °F. The impact of the diversion is slightly more dramatic assuming that cool water from the Middle Fork Dearborn River, South Fork Dearborn River, and miscellaneous other tributaries add flow to the Dearborn River (and assuming no other major withdrawals). The difference in temperature in this scenario is 1.9 °F.

Table 3-14.	Measured and Predicted Temperatures for the Dearborn River, July 24, 2003
1 abic 5 14.	Measured and Fredetice Femperatures for the Dearborn River, sury 24, 2005

Location	Flow (cfs)	Stream Temperature (°F)	
Measured			
Dearborn River immediately upstream of Flat Creek diversion	105	56.2	
Dearborn River downstream of Flat Creek confluence	43	67.1	
Predicted – Dearborn River Downstream of Flat Creek Conflue	ence		
Current Conditions with diversion	43	67	
No diversion – Conservative (no flow added or withdrawn)	105	65.9	
No diversion – Increased flow	120	65.2	

Dearborn River – Impairment Summary

The most significant influences on water quality in the Dearborn River appear to be associated with the 1964 flood and the diversion of a significant portion of the River's flow into Flat Creek. The 1964 flood scoured the stream channel and floodplain resulting in new channel alignments, significant channel widening, and bank erosion. Much of the vegetation existing in the riparian corridor at that time was destroyed. Although the stream channel and riparian vegetation community has returned to near pre-flood conditions, evidence of the flood is still obvious and natural channel/riparian corridor adjustments may be ongoing for years to come. The 1964 flood, however, was a natural event and should not be considered a human-caused source of water quality impairment.

On the other hand, based on the limited flow data collected as part of this analysis, the diversion of approximately 50 percent of the Dearborn River's flow into Flat Creek (during the summer) is a humancaused phenomenon that may be having a negative influence on recreation, habitat for fish and aquatic life, and water temperature. In accordance with the Clean Water Act, however, flow alteration is not considered a pollutant and, therefore, a TMDL is not required to specifically address flow issues unless they can be directly linked to a pollutant (e.g., temperature, sediment, etc.).

Montana's 1996 303(d) list reported that the Dearborn River was impaired by the pollutants siltation and thermal modification. Based on this analysis, it has been concluded that siltation is not causing impairment in the Dearborn River. A modeling analysis is described in Section 3.8.1, in which water temperatures in the Dearborn River were estimated to be between one and two degrees Fahrenheit higher than natural as a result of the flow diversion. This estimated increase is a violation of Montana's water quality standards and a TMDL is, therefore, required to address human-caused thermal modifications. However, the estimated temperature increases are based on limited data and the model is only able to predict temperature changes within ± 2.1 degrees (with a 95 percent confidence interval). Therefore, the uncertainty regarding the model predictions is relatively high. Additionally, the most obvious solution (i.e., eliminate the Flat Creek diversion) would likely be very costly yet result in only minor improvements. For example, the resulting one to two-degree temperature decrease associated with elimination of the diversion would do little to improve the fish and aquatic life communities and the expense to irrigators could be very high.

Given the minor gains that would be achieved at this time by preparing and implementing a TMDL, and given the uncertainties associated with the temperature analysis, it is not recommended that a TMDL be prepared at this time. Rather, additional investigations are proposed to develop a better understanding of the magnitude of the potential impacts associated with the Flat Creek diversion and to evaluate the feasibility of more efficient use of irrigation waters in the Flat Creek Watershed (see Section 6).

Sediment Target	Threshold Value	Minimum Average Maxim		
Percent surface fines < 2mm	< 20 percent	4.9	7.0	10.9
Number of Clinger Taxa	> 14	10	14	20
Periphyton Siltation Index	<20.0 for mountain streams <50.0 for plains streams	1.8	5.0	8.6
Sediment – Supplemental Indicators	Recommended Value	Minimum	Average	Maximum
Riparian Condition	No significant disturbances	No sigr	nificant distu	rbances
MFVP Macroinvertebrate Multimetric Index	> 75 percent	50	56	83
EPT Richness	>18.5	7	13	19
Percentage of Clinger Taxa	BPJ	26	60	75
Montana Adjusted NRCS Stream Habitat Surveys	> 75 percent	78	84	91
TSS (Mean)	< 10 mg/L	2	9	22
Turbidity	High Flow – 50-NTU instantaneous maximum Summer base flow – 10 NTUs	0.8	1.0	1.4
Thermal Modifications – Target	Threshold Value		Value	
Maximum Allowable Increase Over Naturally Occurring Temperature	+ 1 °F			+ 1.9 °F
Thermal Modifications – Supplemental Indicators	Recommended Value	Value		
Riparian Condition	No significant disturbances	No significant disturbances		
Daily Maximum Temperature Over 3- Day Period	< 73 °F	13 consecutive days in July/August 2003 with Max Temp > 73 °F		
Average Temperature Over 60-Day Period	< 53.6 °F	Average temperature of 64.4 °F from 7/25/03 to 9/2303		

Table 3-15.Comparison of Available Data with the Proposed Targets and Supplemental
Indicators for the Dearborn River

3.8.2 The South Fork of the Dearborn River

The headwaters of the South Fork of the Dearborn River are in relatively undisturbed, steep, forested terrain. The river becomes an alluvial, gravel substrate channel in the lower reaches with some impacts associated with small-scale logging and agricultural activities. Typical views of the South Fork are shown in Figure 3-12 and Figure 3-13. The locations of all South Fork sampling sites are shown in Figure 3-14 and field sheets from the 2003 sampling are included in Appendix B.

The South Fork of the Dearborn River (from its headwaters to the Dearborn River) did not appear on Montana's 1996 303(d) list. The state's 2002 and 2004 303(d) lists reported that the South Fork of the Dearborn River (from its headwaters to the Dearborn River) was impaired by siltation. MDEQ's Assessment Record Sheet (Nixon, 2001) indicates that the 2002 listing was based on the results of benthic macroinvertebrate surveys, periphyton surveys, surveys of fish and game biologists, and visual observation.

A review of the available data, some of which was not previously considered by MDEQ, is provided below. Available data include Wolman pebble counts, information on macroinvertebrate and periphyton populations, the results of a channel and riparian aerial assessment, stream habitat surveys, and TSS and turbidity data.



Figure 3-12. South Fork of Dearborn River upstream of Blacktail.



Figure 3-13. South Fork Dearborn River near Highway 434.

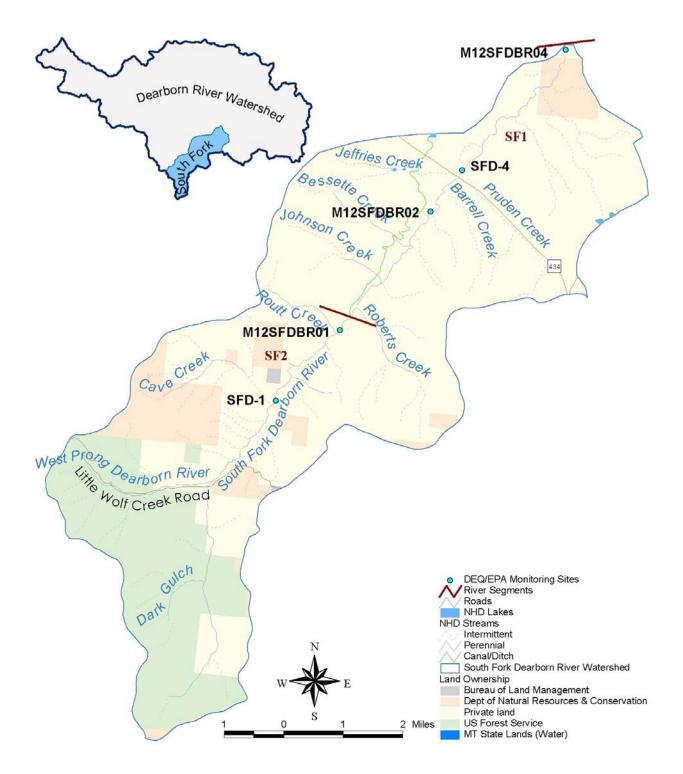


Figure 3-14. Sampling locations in the South Fork Dearborn River watershed.

Surface Fines

Pebble count data were collected and analyzed for the South Fork Dearborn River at three sites in June and July 2003 (Table 3-16). These data were used to create the particle distribution curves shown in Figure 3-15. The percent surface fines is below the threshold value at the upstream and downstream sites but exceeded the indicator value near Highway 434. The aerial survey noted agricultural disturbances along this reach.

Site ID	Site Name	Percenta	age < 2mm
		6/17/03	7/22/03
M12SFDBR01	Upstream site above Roberts Creek	9.0	
M12SFDBR02	Above Highway 434	_	25.6
M12SFDBR04	Confluence with Dearborn River	10.4	—

 Table 3-16.
 South Fork of the Dearborn River Pebble Counts Data Summary

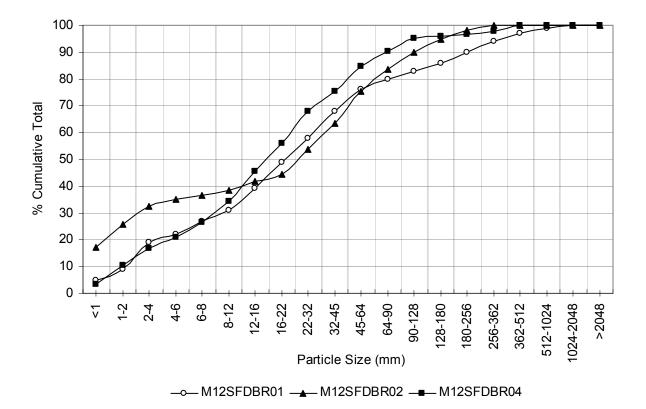


Figure 3-15. Cumulative stream bottom particle distribution for the South Fork of the Dearborn River.

Periphyton Siltation Index

Periphyton samples were collected at five sites along the South Fork of the Dearborn River from 2000 to 2003. MDEQ sampled two reaches in 2000 and EPA sampled three reaches in 2002 and 2003. Results from individual sites are summarized in Table 3-17 and in Appendix C.

Based on an evaluation of the periphyton results, the siltation index increased slightly in a downstream direction and the South Fork of the Dearborn shows slight impairment from sediment and possibly other stressors such as nutrients.

		Si	Siltation Index		
Site ID	Site Name	2000	2002	2003	Narrative Summary
SFD-1	South Fork 100 Yards upstream of First Bridge and below Blacktail	8.70			Summary findings for periphyton indicate excellent biological integrity (Bahls, 2001).
M12SFDBR01	South Fork Dearborn River upstream of Blacktail		11.09	15.25	In 2002, diatoms tolerant of organic pollution were abundant at this site (Bahls 2003b). In 2003, the periphyton community had excellent biological integrity (Bahls, 2003b).
M12SFDBR02	South Fork Dearborn River upstream of Highway 434		31.84	52.88	In 2002, the diatom metrics at this site were generally better than those at the upstream site. In 2003, periphyton results suggested slight impacts from nutrient enrichment and sediment.
SFD-4	South Fork Dearborn River Downstream of Highway 434	40.71			
M12SFDBR04	South Fork Dearborn River at Confluence			37.49	

 Table 3-17.
 Summary of Periphyton Siltation Indexes for the South Fork Dearborn River.

Macroinvertebrates

Macroinvertebrate samples were collected at five sites along the South Fork of the Dearborn River from 2000 to 2003. MDEQ sampled two reaches in 2000 and EPA sampled three reaches in 2002 and 2003. Results from individual sites are summarized in Table 3-18 and in Appendix C.

In light of the macroinvertebrate results, sediment deposition does not appear to affect the aquatic life use for the South Fork of the Dearborn. The HBI and percentage of tolerant taxa both increase as reaches are assessed further downstream. The slightly depressed MFVP index scores at several sites may suggest other stressors (e.g., nutrients) and warrant further study (see Section 5.5).

		Targets	Supplemental Indicators			Su	oporting Infor	mation
Site Description	Year	# Clinger Taxa	% Clinger Taxa	MFVP IBI	# EPT Taxa	HBI	% Tolerant Taxa	Stressor Tolerance
Threshold or Indicator Value		>14	BPJ	>75	>18.5	<3.8	NA	NA
SFD-1 – South Fork 100 Yards upstream of First Bridge and below Blacktail	2000	12	42	78	14	3.08	7.7	Low
M12SFDBR01 – South	2002	20	52.6	72	18	4.06	20.7	Moderate
Fork Dearborn River upstream of Blacktail	2003	23	84.5	56	21	3.55	6.8	Low
M12SFDBR02 – South	2002	18	21.2	67	17	6.01	14.4	Low
Fork Dearborn River upstream of Highway 434	2003	18	57.9	72	16	3.04	36.9	Moderate
SFD-4 – South Fork Dearborn River downstream of Highway 434	2000	13	66	50	11	3.47	59	Low
M12SFDBR04 – South Fork Dearborn River at Confluence	2003	15	82	72	16	4.44	65.1	Moderate
Average		17	58.0	67	16	3.95	30.1	Low/ Moderate

 Table 3-18.
 Summary of Macroinvertebrate Metrics for the South Fork Dearborn River.

Bank Stability and Riparian Condition

There are few significant anthropogenic sources of sediment within the upstream portion of the South Fork Dearborn River watershed (Land and Water, 2003). Stream banks were rated fair to excellent during the aerial assessment (Table 3-19). Riparian vegetation is primarily open stands of deciduous cottonwood with extensive areas of herbaceous understory. A single 5,910-foot segment showed loss of riparian vegetation due to logging/riparian clearing that occurred after 1995. Less than 3 percent of the riparian areas had bare or disturbed ground.

Reach	Reach Length	Channel Type	Slope	Sinuosity		Bank Instability (% of reach)			Overall Channel Condition
	(miles)	турс			(feet)	High	Mod	Low	Condition
SF1	5.83	C4	0.012	1.22	34	8.3	50.0	41.7	Fair to Good
SF2	5.56	B4/A3	0.017	1.09	17	1.0	14.3	84.7	Good to Excellent

 Table 3-19.
 Bank Stability along the South Fork Dearborn River

The aerial survey noted that the lower portion of the South Fork suffered from riparian habitat degradation for approximately 20,500 feet. These areas did show more signs of unstable banks, but the overall channel function did not appear to be impaired. No areas of mass failure were noted in the watershed and little sediment is contributed by tributaries (Land and Water, 2003).

Upland sources did not appear to contribute appreciable quantities of sediment to the South Fork Dearborn River or tributaries. Perennial and intermittent tributaries appeared stable, and rangeland did not show evidence of surface erosion or rilling, or other signs of accelerated soil loss due to anthropogenic influences. Forested headwaters were largely pristine in nature. Sediment contribution from cut/fill slopes and road sand appeared to be minimal given the long delivery distance to the channel.

Montana Adjusted NRCS Stream Habitat Surveys

Montana adjusted NRCS visual riparian assessments were completed at three sites on the South Fork Dearborn River in 2002 and 2003. The average stream reach score was 92.9 percent, well above the recommended value of 75 percent and indicative of excellent riparian condition (Table 3-20). No sites scored below the 75 recommended value.

Sa	mple Site Information	Stream Habitat Ratings				
Site ID	Site Name	NRCS Score (% Max)	NRCS Rating	MT Adjusted Score (% Max)	MT Adjusted Rating	
M12SFDBR01	South Fork Dearborn Upstream Site above Roberts Creek	94.5	Non Impaired, Fully Supporting	97.5	Sustainable	
M12SFDBR02	South Fork Dearborn above U.S Highway 434	85.0	Sustainable	84.0	Sustainable	
M12SFDBR04 South Fork Dearborn at Mouth at Dearborn River		98.4	Non Impaired, Fully Supporting	97.1	Sustainable	
AVERAGE FOR SOUTH FORK, DEARBORN RIVER:		92.6	Non Impaired, Fully Supporting	92.9	Sustainable	

 Table 3-20.
 Riparian Vegetation in the South Fork Dearborn River

Total Suspended Solids

Very limited TSS samples are available for the South Fork, Dearborn River (Table 3-21) and all data have been collected at low to average flow conditions. All samples were below the detection limit of 10 mg/L and do not suggest a sediment impairment.

Site ID	Date	Parameter	Result	Flow Condition ¹
M12SFDBR01	6/17/2003	TSS	<10	97%
M12SFDBR01	7/22/2003	TSS	<10	21%
M12SFDBR02	7/22/2003	TSS	<10	21%
M12SFDBR04	6/17/2003	TSS	<10	97%
M12SFDBR04	7/22/2003	TSS	<10	21%
SFD-1	7/16/2000	TSS	<10	11%
SFD-4	7/11/2000	TSS	<10	15%

 Table 3-21.
 South Fork of the Dearborn River Suspended Sediment Data Summary Table

¹Flow condition is calculated by dividing the recorded flow at Craig, MT, on the date of the sampling by the long-term average flow at Craig, MT (203 cfs). In the absence of site-specific flow data, this value is meant to provide perspective on overall watershed flows during the time of the sampling.

Turbidity

Very little turbidity data exist for the South Fork Dearborn River. Turbidity samples were taken only during the TMDL sampling that was completed in July 2003 and these turbidity values are presented in Table 3-22. The observed turbidity values are well below the proposed indicator value, although flow conditions during the sampling were low.

Site ID	Date	Result	Flow Condition ¹
M12SFDBR01	7/22/2003	1.28	21%
M12SFDBR02	7/22/2003	0.80	21%
M12SFDBR04	7/23/2003	1.40	21%

 Table 3-22.
 Summary of turbidity data available for the South Fork Dearborn River

¹Flow condition is calculated by dividing the recorded flow at Craig, MT on the date of the sampling by the long-term average flow at Craig, MT (203 cfs).

South Fork Dearborn River – Impairment Summary

The South Fork of the Dearborn River (from its headwaters to the Dearborn River) did not appear on Monatana's 1996 303(d) list. The State's 2002 303(d) list reported that the South Fork of the Dearborn River (from its headwaters to the Dearborn River) was impaired by siltation. MDEQ's Assessment Record Sheet (Nixon, 2001) indicates that the 2002 listing was based on the results of benthic macroinvertebrate surveys, periphyton surveys, surveys of fish and game biologists, and visual observation.

A summary of the results of the updated impairment analysis is presented in Table 3-23. When averaged, the targets are all met and do not indicate water quality impairment associated with sediment. However, examination of the results from some of the individual samples suggests potential localized areas of minor

sediment related impairments (e.g., elevated percent fines near Highway 434; low clinger taxa at two locations in 2000; and high periphyton siltation index values upstream of Highway 434 in 2003). Some of the supplemental indicators also suggest potential impairment, not only associated with sediment, but also potentially associated with nutrients. For example, approximately 20,593 feet of the riparian corridor was rated as "poor" due to land use conversions to cropland and pasture and approximately 5900 feet of the riparian corridor the riparian corridor appears to have been cleared/logged.

Given that some of the targets are exceeded in some areas of the South Fork, and human-caused sources have been identified, a TMDL is proposed for sediment, in which all of the identified human-caused alterations to the riparian corridor will be addressed (see Section 5.1).

As indicated above, some of the supplemental indicators suggest a potential impairment associated with nutrients. Since this pollutant has never appeared as a cause of impairment on any of Montana's 303(d) lists, a TMDL for nutrients is not required at this time. However, additional study is proposed to develop a better understanding of this potential impairment issue (see Section 5.5).

Table 3-23.Comparison of Available Data with the Proposed Targets and Supplemental
Indicators for the South Fork Dearborn River

Sediment Target	Threshold Value	Minimum	Average	Maximum
Percent surface fines < 2mm	< 20 percent	9.0	15	25.6
Number of Clinger Taxa	> 14	12	17	23
Periphyton Siltation Index	<20.0 for mountain streams <50.0 for plains streams	8.7	30.7	53.0
Sediment – Supplemental Indicators	Recommended Value	Minimum	Average	Maximum
Riparian Condition	No significant disturbances	20,593 rated "poor"		oor"
MFVP Macroinvertebrate Multimetric Index	> 75 percent	50	67	78
EPT Richness	> 18.5	11	16	21
Percentage of Clinger Taxa	BPJ	21	58	85
Montana Adjusted NRCS Stream Habitat Surveys	> 75 percent	84.0	92.9	97.5
TSS (Mean) ¹	< 10 mg/L	5	5	5
Turbidity	High Flow – 50-NTU instantaneous maximum Summer base flow – 10 NTUs	0.80	1.16	1.28

¹All suspended sediment samples were below the detection limit.

3.8.3 The Middle Fork of the Dearborn River

The Middle Fork of the Dearborn River has characteristics similar to those of the South Fork, and much of the headwater zone is relatively undisturbed, steep, forested terrain. Land use impacts are apparent in the central and lower reaches. Typical views are shown in Figure 3-16 and Figure 3-17. The locations of all of the mainstem sampling sites are shown in Figure 3-18 and field sheets and photos from the 2003 sampling are included in Appendix B.

Montana's 1996 303(d) list reported that aquatic life uses in the Middle Fork Dearborn River were impaired because of siltation. The basis for the 1996 listing is unknown. Beneficial uses were not evaluated in 2002 because of a lack of sufficient credible data.

A review of the available data, some of which was not previously considered by MDEQ, is provided below. Available data include Wolman pebble counts, information on macroinvertebrate and periphyton populations, the results of a channel and riparian aerial assessment, stream habitat surveys, total suspended solids, turbidity, and temperature data and modeling.



Figure 3-16. Middle Fork Dearborn River near Rogers Pass.



Figure 3-17. Middle Fork Dearborn River downstream of Highway 434.

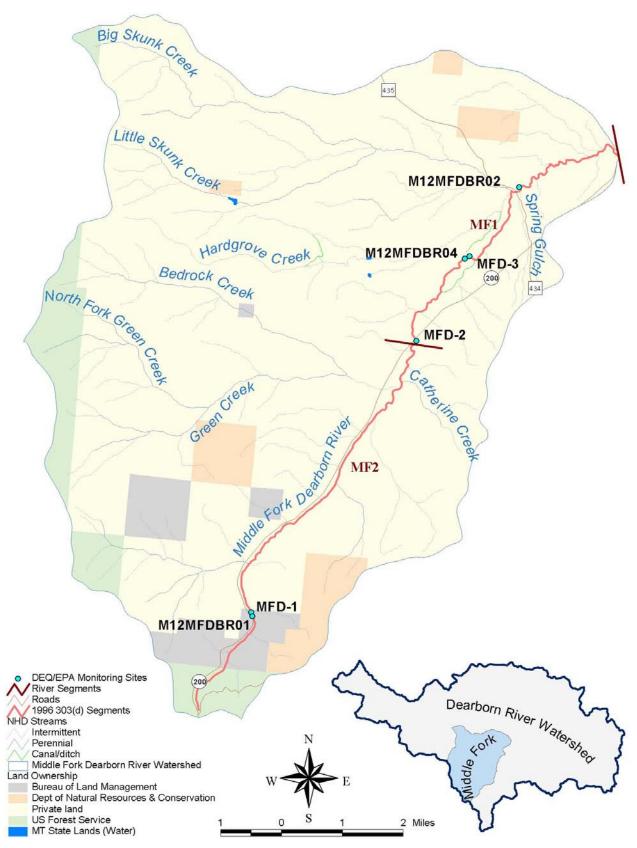


Figure 3-18. Sampling locations in the Middle Fork Dearborn River watershed.

Surface Fines

Pebble count data were collected and analyzed for the Middle Fork of the Dearborn River at three sites. Data were collected at two of the sites in 2002 and all three sites in June 2003. The data are summarized in Table 3-24. These data were used to create the particle distribution curves shown in Figure 3-19. Four of the five data points show that the percent surface fines in the Middle Fork Dearborn River is less than the 20 percent target. The only site with more than 20 percent surface fines was the site near Rogers Pass in 2002. The 2003 sampling at this site indicates a percent surface fines score of 15.2 percent. This site is the uppermost sampling site, and it is a smaller, steeper gradient and highly vegetated section of stream. There are no major observed impacts in the area, and the 2002 data do not seem to correspond with what is observed in the area.

Site ID	Site Name	Percentage < 2mm				
			8/29/02	6/19/03		
M12MFDBR01	Middle Fork Dearborn near Rogers Pass	22.55		15.24		
M12MFDBR04	Middle Fork Dearborn below Ingersoll's Road	_	_	17.59		
M12MFDBR02	Middle Fork Dearborn downstream of Highway 434	_	10.53	17.36		

Table 3-24.	Middle Fork of the Dearborn River Stream Bottom Deposits Data Summary Table
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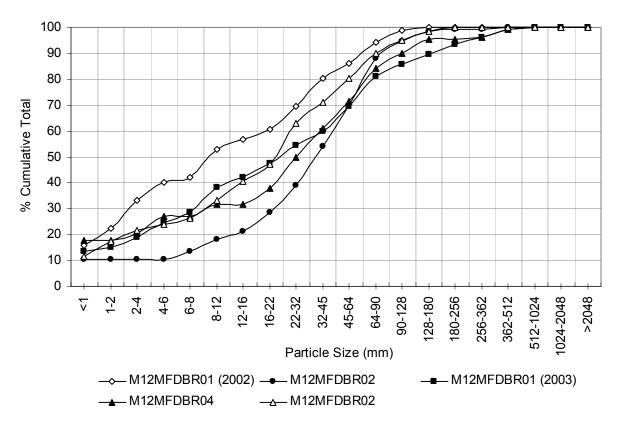


Figure 3-19. Cumulative stream bottom particle distribution for the Middle Fork of the Dearborn River.

Periphyton Siltation Index

Periphyton samples were collected at four sites along the Middle Fork of the Dearborn River from 2000 through 2003. MDEQ sampled two reaches in 2000 and EPA sampled two reaches in 2002 and 2003. Results from individual sites are summarized in Table 3-25 and in Appendix C.

		Si	Itation In	dex	
Site ID	Site Name	2000	2002	2003	Narrative Summary
M12MFDBR01	Middle Fork Dearborn River at Rogers Pass		1.68	4.43	In both years, the diatom community was dominated by organisms found in streams with cold water temperatures and low nutrient concentrations (Bahls, 2003a).
MFD-2	Middle Fork Dearborn River upstream of Highway 200	16.37			Community composition indicated excellent biological integrity (Bahls, 2001).
M12MFDBR04	Middle Fork Dearborn River at Ingersoll	11.89		27.12	In both years, this site seemed to demonstrate a slight increase in organic loading and sediment.
M12MFDBR02	Middle Fork Dearborn River downstream of Highway 434		11.38	36.62	The 2002 results indicate possible impacts from organic loading, but the 2003 results suggest impacts from inorganic nutrients. Periphyton results suggest slight impacts at this site and the presence of other stressors (e.g., nutrients).

 Table 3-25.
 Summary of Periphyton Siltation Indexes for the Middle Fork Dearborn River.

Macroinvertebrates

Macroinvertebrate samples were collected at four sites along the Middle Fork of the Dearborn River from 2000 through 2003. MDEQ sampled two reaches in 2000 and EPA sampled two reaches in 2002. In 2003, these sites were resampled and an additional site was added. Results from individual sites are discussed in more detail in Table 3-26 and in Appendix C.

In general, clingers are well represented in all reaches of the Middle Fork Dearborn River (both percent and number of taxa), suggesting that aquatic life is not impacted by sedimentation. In the lower part of the Middle Fork of the Dearborn, the percentage of tolerant taxa metric and the HBI are high and the MFVP index scores are low. These results may reflect localized sources of stressors or nutrient enrichment. The 2002 macroinvertebrate data (e.g. clinger taxa richness, percent clingers) indicates slight impacts to aquatic life from sedimentation compared to the 2003 data which suggests that aquatic life is not affected by sediment. Additional monitoring would help determine whether the difference in the biological community between 2002 and 2003 is a trend, anomaly, or natural variability. In the lower part of the Middle Fork of the Dearborn, the percentage of tolerant taxa and the HBI are high and the MFVP index scores are low. These results may reflect localized sources of stress, habitat alteration, or nutrient enrichment.

		Targets	Supplemental Indicators			Supporting Information		
Site Description	Year	# Clinger Taxa	% Clinger Taxa	MFVP IBI	# EPT Taxa	НВІ	% Tolerant Taxa	Stressor Tolerance
Threshold or Indicator Value		>14	BPJ	>75	>18.5	<3.8	NA	NA
M12MFDBR01 - Middle	2002	16	37.5	78	18	3.58	36.1	High
Fork Dearborn River at Rogers Pass	2003	14	85.6	89	15	0.77	0.3	Low
MFD-2 - Middle Fork Dearborn River upstream of Highway 200	2000	19	62.2	56	17	3.60	22.1	High
M12MFDBR04 - Middle	2000	12	52.9	56	11	4.6	29.6	High
Fork Dearborn River at Ingersoll	2003	19	70.3	61	17	3.8	36.7	Moderate
M12MFDBR02 - Middle Fork Dearborn River downstream of Highway 434	2002	11	57.7	44	11	5.34	34.6	High
	2003	18	77.4	61	18	4.08	46.1	High
Average		16	63.4	64	15	3.7	29.4	

 Table 3-26.
 Summary of Macroinvertebrate Metrics for the Middle Fork Dearborn River.

Bank Stability and Riparian Conditions

The Middle Fork of the Dearborn showed little influence of anthropogenic, in-channel sediment sources in the headwaters during the aerial assessment. This section of the channel is situated in deeply dissected, forested terrain and no significant channel or riparian modifications were present. Highway 200 has the potential to deliver sediment from cut/fill slopes and applied road sand. However, the aerial assessment did not show any apparent delivery of sediment from the road to the Middle Fork. This is likely due to the long delivery distance from the road to the channel. A possible pathway for road runoff was investigated on the ground, but did not appear to be a probable source for significant sediment delivery to the channel.

The lower reach of the Middle Fork showed evidence of some channel instability related to land use/riparian modification for agriculture. Localized bank instability attributable to anthropogenic sources was present in approximately 6,200 feet (20 percent) of the channel (Land and Water, 2003). However, no significant areas of mass slope failure were noted in the Middle Fork Dearborn River watershed (Table 3-27).

The low-level aerial survey found that riparian vegetation in the upper portion of the watershed was excellent; however, in the lower portion of the watershed, 65 percent of the stream was ranked as having "poor" riparian vegetation. The major influence on this loss in riparian habitat health appeared to be anthropogenic in nature, and linked to agricultural activities. This degradation of riparian habitat was also observed to be causing more bank instabilities and poor stream channel conditions.

Reach	Reach Length		Slope	Sinuosity		Bank Instability (% of reach)		Overall Channel Condition	
	(miles)	турс			(feet)	High	Mod	Low	Condition
MF1	6.17	C4	0.015	1.25	39	16.7	42.1	41.2	Fair to Good
MF2	1.32	B4/A3	0.025	1.09	30	0.0	48.1	51.9	Good

 Table 3-27.
 Bank Stability in the Middle Fork Dearborn River

Montana Adjusted NRCS Riparian Assessment

The Montana adjusted NRCS visual riparian assessments were completed in 2002 and 2003. The average stream reach score was 85.1 percent, which is above the recommended value of 75 percent and is indicative of excellent riparian condition (Table 3-28). However one site in the lower portion of the watershed, M12MFDBR02, showed a habitat score of 66.6 percent, or "at risk." The upper sites showed excellent riparian habitat conditions during the NRCS surveys.

Sa	mple Site Information	Stream Habitat Ratings				
Site ID	ID Site Name		NRCS Rating	MT Adjusted Score (% Max)	MT Adjusted Rating	
M12MFDBR04	Middle Fork Dearborn below Ingersoll's Road	100.0	Non Impaired, Fully Supporting	99.3	Sustainable	
M12MFDBR02	Middle Fork Dearborn downstream of Highway 434 (2002)	74.0	At Risk	66.6	At Risk	
M12MFDBR02	Middle Fork Dearborn downstream of Highway 434 (2003)	85.0	Non Impaired, Fully Supporting	86.8	Sustainable	
M12MFDBR01 Middle Fork Dearborn near Rogers Pass		93.0	Sustainable	87.5	Sustainable	
AVERAGE FOR MIDDLE FORK, DEARBORN RIVER:		88.0	Non Impaired, Fully Supporting	85.1	Sustainable	

 Table 3-28.
 Middle Fork of the Dearborn River Riparian Habitat Data Summary Table

Total Suspended Solids

Very limited TSS samples are available for the Middle Fork Dearborn River (Table 3-29). All data have been collected at low to average flow conditions and all samples were below the detection limit of 10 mg/L.

Site ID	Date	Parameter	Result	Flow Condition ¹
MFD-5	7/11/2000	TSS	< 10	15%
MFD-3	7/11/2000	TSS	< 10	15%
MFD-1	7/11/2000	TSS	< 10	15%
M12MFDBR02	6/19/2003	TSS	< 10	93%
M12MFDBR04	6/19/2003	TSS	< 10	93%
M12MFDBR01	6/19/2003	TSS	< 10	93%
M12MFDBR02	7/23/2003	TSS	< 10	21%
M12MFDBR04	7/23/2003	TSS	< 10	21%
M12MFDBR01	7/23/2003	TSS	< 10	21%

 Table 3-29.
 Middle Fork of the Dearborn River Suspended Sediment Data Summary Table

¹Flow condition is calculated by dividing the recorded flow at Craig, MT, on the date of the sampling by the long-term average flow at Craig, MT (203 cfs). In the absence of site-specific flow data, this value is meant to provide perspective on overall watershed flows during the time of the sampling.

Turbidity

Very few turbidity data exist on the Middle Fork Dearborn River. Turbidity samples were taken only during the TMDL sampling that was completed in June and July 2003, and these turbidity values are presented in Table 3-30. The observed turbidity values are well below the proposed indicator value, although flow conditions during the sampling were below average.

Site ID	Date	Result	Flow Condition ¹
M12MFDBR04	6/19/2003	2.9	93%
M12MFDBR02	6/19/2003	2.8	93%
M12MFDBR01	6/19/2003	1.9	93%
M12MFDBR02	7/23/2003	1.2	21%
M12MFDBR04	7/23/2003	1.0	21%
M12MFDBR01	7/23/2003	0.5	21%

 Table 3-30.
 Summary of Turbidity Data Available for the Middle Fork Dearborn River

¹Flow condition is calculated by dividing the recorded flow at Craig, MT, on the date of the sampling by the long-term average flow at Craig, MT (203 cfs).

Middle Fork Dearborn River – Impairment Summary

Montana's 1996 303(d) list reported that aquatic life uses in the Middle Fork Dearborn River were impaired due to siltation. The basis for the1996 listing is unknown. Beneficial uses were not evaluated in 2002 because of a lack of sufficient credible data.

Evaluation of the targets and supplemental indicators for the Middle Fork Dearborn River do not provide a "black and white" answer to the question: *Are aquatic life and fisheries beneficial uses impaired due to excessive sediment loading from human-caused sources*? When averaged, the targets are all met and do not indicate water quality impairment associated with sediment. However, examination of the results from some of the individual samples suggests potential localized areas of minor sediment related impairments. Some of the supplemental indicators also suggest potential impairment, although not necessarily associated with sediment. Consideration of the available chemical, physical, and biological data in combination with the identified human-caused sources of impairment suggest that the fish and aquatic life beneficial uses may be slightly below their potential in the lower reaches of the Middle Fork Dearborn River (i.e., several macroinvertebrate indices below recommended values). It is not clear if this is directly attributable to the 303(d) listed cause of impairment (i.e., sediment), degraded habitat, or other factors. To be conservative, a TMDL is proposed for sediment, in which all of the identified human-caused alterations to the stream banks/channel and riparian corridor will be addressed. Additional post-TMDL implementation monitoring is then proposed to determine if the fish and aquatic life communities have improved (see Section 5.5).

Table 3-31.Comparison of Available Data with the Proposed Targets and Supplemental Indicators for the Middle Fork Dearborn River								

Sediment Target	Threshold Value	Minimum	Average	Maximum
Percent surface fines < 2mm	< 20 percent	10.5	16.7	22.6
Number of Clinger Taxa	> 14	11	16	19
Periphyton Siltation Index	< 20.0 for mountain streams < 50.0 for plains streams	1.7	15.6	36.6
Sediment – Supplemental Indicators	Recommended Value	Minimum	Average	Maximum
Riparian Condition	No significant disturbances	Localized bank instability attributable to anthropogen sources was present in approximately 6,200 feet of lo reach; 65 percent of the low reach was also ranked as hav "poor" riparian vegetation		ppogenic sent in eet of lower the lower d as having
MFVP Macroinvertebrate Multimetric Index	> 75 percent	t 44 64		89
EPT Richness	> 18.5	11	15	18
Percentage of Clinger Taxa	BPJ	38	63	86
Montana Adjusted NRCS Stream Habitat Surveys	> 75 percent	67	85	99
TSS (Mean) ¹	< 10 mg/L	5	5	5
Turbidity	High Flow – 50-NTU instantaneous maximum Summer base flow – 10 NTUs	0.5	1.7	2.9

¹All TSS data were below the detection limit of 10 mg/L. One-half the detection limit was used for statistical purposes.

3.8.4 Flat Creek

Flat Creek is a low gradient, meandering channel with fine to very fine gravel bed materials. Flat Creek serves as a conveyance for irrigation water diverted from the main stem of the Dearborn River and channel morphology reflects this altered flow regime. The channel cross section is enlarged because of diverted irrigation flows and some channel erosion/instability in localized areas. Grazing and agricultural uses (pasture and cropland) are widespread along Flat Creek. Typical views are shown in Figure 3-20 and Figure 3-21. Figure 3-22 shows a map of the watershed along with the sampling sites and river segments used in the aerial assessment.

Montana's 1996 and 2002 303(d) lists reported that Flat Creek was impaired by siltation, flow alterations, and habitat alterations. The basis of the 1996 listings is unknown. MDEQ's Assessment Record Sheet indicates that the 2002 listing was based on physical/chemical sampling, benthic macroinvertebrate surveys, habitat surveys, information from local residents, land use information, surveys of fish and game biologists, and visual observation.

A review of the available data, some of which were not previously considered by MDEQ, is provided below. Available data include Wolman pebble counts, information on macroinvertebrate and periphyton populations, the results of a channel and riparian aerial assessment, stream habitat surveys, total suspended solids, turbidity, and temperature data and modeling.



Figure 3-20. Flat Creek at Milford.



Figure 3-21. Flat Creek near Birdtail Road.

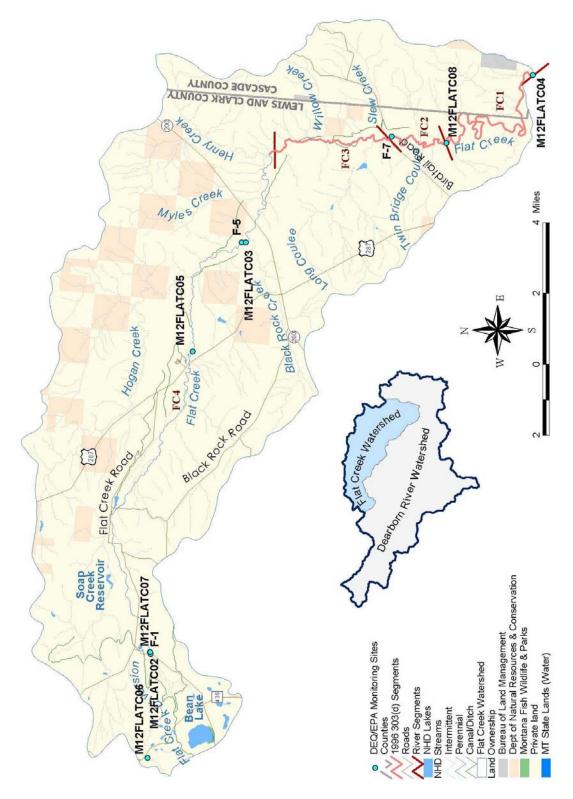


Figure 3-22. Sampling locations in the Flat Creek watershed.

Surface Fines

Pebble count data were collected and analyzed for Flat Creek at four sites in June and July 2003 (Table 3-32). These data were used to create the particle distribution curves shown in Figure 3-23. The data show that the average percent surface fines at three of the sites is below the threshold value of the target. However, the site upstream of Highway 200 was well above the threshold value. It should be noted that the lowermost site at the mouth of Flat Creek is dissimilar to the rest of Flat Creek because it is primarily made up of a bedrock-dominated stream bottom. The percent surface fines in a bedrock-dominated channel would be expected to be low.

Site ID	Site Name	Percentage < 2mm		
		6/18/03	7/22/03	
M12FLATC05	Flat Creek downstream of Milford Colony	13.2	—	
M12FLATC03	Flat Creek upstream of Highway 200	_	32.0	
M12FLATC08	Flat Creek below Birdtail Road	15.8	—	
M12FLATC04	2FLATC04 Flat Creek at Mouth		—	

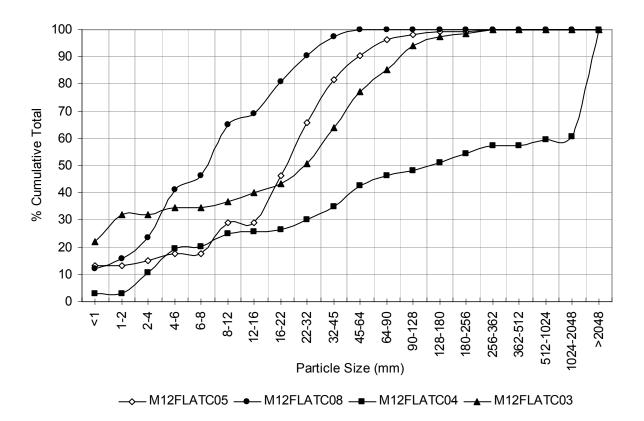


Figure 3-23. Cumulative stream bottom particle distribution for Flat Creek.

Periphyton Siltation Index

Periphyton samples were collected at six sites along Flat Creek. Results from individual sites are discussed in more detail in Table 3-33 and in Appendix C.

The siltation index values for Flat Creek fell within the range considered acceptable for transitional streams (between mountain and plains) and did not suggest sediment impacts. Other stressors such as nutrients appeared to be present at a few sites but do not seem to significantly affect aquatic life use.

		Siltatio	on Index	
Site ID	Site Name	2000 2003		Narrative Summary
M12FLATC02	Flat Creek at Flat Creek Road	24.01		Other periphyton metrics indicated full support of aquatic life (Bahls, 2001).
M12FLATC05	Flat Creek at Milford		25.96	Other periphyton metrics indicated full support of aquatic life.
M12FLATC03	Flat Creek upstream of Highway 200	13.36	23.79	In 2000, this site was dominated by Cladophora, indicating slight impairment of aquatic life (Bahls, 2001).
F-7	Flat Creek upstream of Birdtail Road	26.20		Other periphyton metrics indicated full support of aquatic life.
M12FLATC08	Flat Creek below Birdtail		24.53	The periphyton results do indicate possible impacts from other stressors such as nutrients (Bahls 2003b).
M12FLATC04	Flat Creek at mouth		14.29	The periphyton results do indicate possible impacts from other stressors such as nutrients (Bahls 2003b).

 Table 3-33.
 Summary of Periphyton Siltation Indexes for Flat Creek.

Macroinvertebrates

Macroinvertebrate samples were collected at six sites along Flat Creek in 2000 and 2003. MDEQ sampled three reaches in 2000 and EPA sampled four reaches in 2003. Results from individual sites are summarized in Table 3-34 and in Appendix C.

Of all areas sampled in the Dearborn River drainage, Flat Creek exhibited the poorest macroinvertebrate health. Metrics from the six locations tend toward the extremes of observed values, particularly obvious for number of EPT taxa (low) and the HBI (high). Half of the reaches had clinger values (percentage and number of taxa) indicative of possible sediment impacts. Other sites had clinger values representative of relatively good conditions; however, HBI values at these sites were high and the samples were dominated by taxa that are moderately tolerant of stress.

		Targets	rgets Supplemental Indicators		Sup	oporting Infor	mation	
Site Description	Year	# Clinger Taxa	% Clinger Taxa	MFVP IBI	# EPT Taxa	HBI	% Tolerant Taxa	Stressor Tolerance
Threshold or Indicator Value		>14	BPJ	>75	>18.5	<3.8	NA	NA
M12FLATC02 - Flat Creek at Flat Creek Road	2000	13	25.7	50	8	5.11	14.1	High
M12FLATC05 - Flat Creek at Milford	2003	15	70.3	44	12	3.94	27.7	Low
M12FLATC03 - Flat Creek	2000	10	59.0	39	10	4.6	41.0	High
upstream of Highway 200	2003	15	70.1	28	10	4.9	38.8	Moderate
F-7- Flat Creek upstream of Birdtail Road	2000	9	43.0	22	7	5.85	58.7	High
M12FLATC08 - Flat Creek below Birdtail	2003	15	52.7	33	9	5.45	34.6	High
M12FLATC04 - Flat Creek at Mouth	2003	13	78.3	28	7	4.65	18.7	Moderate
Average		13	57.0	35	9	4.9	33.4	High

 Table 3-34.
 Summary of Macroinvertebrate Metrics for Flat Creek.

Bank Stability and Riparian Conditions

Flat Creek is a low gradient, meandering channel with fine to very fine gravel bed materials. Flat Creek serves as a conveyance for irrigation water diverted from the main stem of the Dearborn and channel morphology reflects this altered flow regime. The channel cross section is enlarged because of diverted irrigation flows and some channel erosion/instability is present in localized areas. Observed channel instability is likely the result of increased flows due to irrigation diversion and conversion of riparian vegetation to agricultural uses. Grazing and agricultural uses (pasture and cropland) were widespread in Flat Creek and grazing appeared to be of higher density in the lower reaches (Land and Water Consulting, 2003). Channel conditions were rated as poor to fair during the aerial assessment (Table 3-35).

Hogan Creek, a tributary to Flat Creek, showed pronounced turbidity during the 2003 aerial survey (Land and Water, 2003). Sediment sources appeared to originate from channel incisement, exposed soils, and relatively poor vegetation coverage. However, no obvious anthropogenic sources were noted in the watershed. The aerial survey also identified several incised channels in portions of Flat Creek. These were attributed to the increased flows.

Reach	Reach Length	Channel Type	Slope	Sinuosity			k Instabili 6 of reach)		Overall Channel Condition
	(miles)	туре			(feet)	High	Mod	Low	Condition
FC1	7.49	C4	0.007	1.6	49	11.2	17.7	71.1	Fair
FC2	4.43	C5/E5	0.006	1.55	36	13.1	36.9	50.0	Poor-Fair
FC3	4.35	C5/E5	0.006	1.28	38	14.0	30.8	55.2	Fair
FC4	11.64	C5/E5	0.006	1.3	19	8.4	33.3	58.3	Fair

Montana Adjusted NRCS Riparian Assessment

The Montana adjusted NRCS visual riparian assessments were conducted at three sites along Flat Creek (Table 3-36). The most downstream site was rated "sustainable" but the two upstream sites were rated as being "at risk".

Table 3-36.	Flat Creek Riparian Habitat Data Summary Table
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Sa	mple Site Information	Stream Habitat Ratings					
Site ID	Site ID Site Name		NRCS Rating	MT Adjusted Score (% Max)	MT Adjusted Rating		
M12FLATC08	Flat Creek Below Birdtail Road	51.1	At Risk	61.6	At Risk		
M12FLATC04	Flat Creek at Mouth	94.8	Sustainable	94.1	Sustainable		
M12FLATC05	Flat Creek at Milford	59.6	At Risk	65.6	At Risk		

Total Suspended Solids

The suspended sediment data for Flat Creek are presented in Table 3-37. Similar to other streams in the Dearborn TPA, many values are below the detection limit. However, several samples at various locations along Flat Creek had concentrations between 10 and 14 mg/L, even during low flow conditions.

Site ID	Date	Parameter	Result (mg/L)	Flow Condition ¹
F-5	7/12/2000	TSS	13	14%
F-1	7/13/2000	TSS	10	14%
F-7	7/13/2000	TSS	12	14%
M12FLATC02	6/18/2003	TSS	<10	93%
M12FLATC05	6/18/2003	TSS	<10	93%
M12FLATC08	6/18/2003	TSS	<10	93%
M12FLATC04	6/18/2003	TSS	<10	93%
M12FLATC06	6/18/2003	TSS	<10	93%
M12FLATC03	7/24/2003	TSS	<10	19%
M12FLATC06	7/24/2003	TSS	<10	19%
M12FLATC02	7/24/2003	TSS	<10	19%
M12FLATC05	7/24/2003	TSS	14	19%
M12FLATC08	7/24/2003	TSS	<10	19%
M12FLATC04	7/24/2003	TSS	<10	19%

 Table 3-37.
 Flat Creek Suspended Sediment Data Summary Table

¹Flow condition is calculated by dividing the recorded flow at Craig, MT, on the date of the sampling by the long-term average flow at Craig, MT (203 cfs). In the absence of site-specific flow data, this value is meant to provide perspective on overall watershed flows during the time of the sampling.

Turbidity

Very few turbidity data exist for Flat Creek—only the samples taken during TMDL field sampling in June and July 2003. The turbidity values are presented in Table 3-38. The average value observed in the field during these visits was 6.1 NTUs, which is below the 10-NTU recommended level but higher than values observed at other sites within the Dearborn TPA.

Site ID	Date	Result	Flow Condition ¹
M12FLATC05	6/18/2003	10.8	93%
M12FLATC08	6/18/2003	7.4	93%
M12FLATC07	6/18/2003	7.3	93%
M12FLATC06	6/18/2003	1.0	93%
M12FLATC03	7/22/2003	10.1	21%
M12FLATC08	7/23/2003	5.7	21%
M12FLATC05	7/24/2003	10.5	19%
M12FLATC07	7/24/2003	3.5	19%
M12FLATC04	7/24/2003	3.3	19%
M12FLATC06	7/24/2003	0.5	19%

Table 3-38.	Flat Creek Turbidity Data Summary Table
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¹Flow condition is calculated by dividing the recorded flow at Craig, MT, on the date of the sampling by the long-term average flow at Craig, MT (203 cfs). In the absence of site-specific flow data, this value is meant to provide perspective on overall watershed flows during the time of the sampling.

Flat Creek – Impairment Summary

Montana's 1996 and 2002 303(d) lists reported that Flat Creek was impaired by siltation, flow alterations, and habitat alterations. The basis of the 1996 listings is unknown. MDEQ's Assessment Record Sheet (Wilson, 2002) indicates that the 2002 listing was based on physical/chemical sampling, benthic macroinvertibrate surveys, habitat surveys, information from local residents, land use information, surveys of fish and game biologists, and visual observation.

A summary of the results of the updated impairment analysis is presented in Table 3-39. The most significant influences on water quality in Flat Creek appear to be associated with the diversion of a significant portion of the Dearborn River's flow into Flat Creek Flat Creek serves as a conveyance for irrigation water and it's channel morphology reflects this altered flow regime. It is likely that Flat Creek is still in a process of reaching "equilibrium" with this altered flow regime.

As with the Middle Fork and South Fork of the Dearborn River, the Flat Creek target values are not exceeded when averaged across all sample stations and sample dates. However, examination of the results from some of the individual samples suggests potential localized areas of minor sediment related impairments (e.g., high percentage of surface fines near Highway 200, low number of clinger taxa). Some of the supplemental indicators also suggest potential impairment, not only associated with sediment, but also potentially associated with nutrients. For example, significant human caused riparian corridor disturbances were observed associated with grazing and agricultural encroachment, and the macroinvertebrate results generally suggest impairment.

Given that some of the targets are exceeded in some areas of Flat Creek, and human-caused sources have been identified, a TMDL is proposed for sediment (See Section 5.3). As indicated above, some of the supplemental indicators suggest a potential impairment associated with nutrients. Since this pollutant has never appeared as a cause of impairment on any of Montana's 303(d) lists, a TMDL for nutrients is not required at this time. However, additional study is proposed to develop a better understanding of this potential impairment issue (see Section 5.5).

Sediment Target	Threshold Value	Minimum	Average	Maximum
Percent Surface Fines < 2mm	< 20 percent	2.8	16.0	32.0
Number of Clinger Taxa	> 14	9	13	15
Periphyton Siltation Index	<20.0 for mountain streams <50.0 for plains streams	13.4	21.7	26.2
Sediment – Supplemental Indicators	Recommended Value	Minimum	Average	Maximum
Riparian Condition	No significant disturbances	Significant disturbances		
MFVP Macroinvertebrate Multimetric Index	> 75 percent	22	35	50
EPT Richness	> 18.5	7	9	12
Percentage of Clinger Taxa	BPJ	26	57	78
Montana Adjusted NRCS Stream Habitat Surveys ¹	> 75 percent	94	94	94
TSS (Mean)	< 10 mg/L	5	8	14
Turbidity	High Flow – 50-NTU instantaneous maximum Summer base flow – 10 NTUs	0.5	6.0	10.8

Table 3-39.Comparison of Available Data with the Proposed Targets and Supplemental
Indicators for Flat Creek

¹The stream habitat survey was conducted at only one site along Flat Creek.

3.9 Water Quality Impairment Status Summary

The focus of this analysis was on potential water quality impairments reported in the 1996 and 2002 303(d) lists in the Dearborn, South Fork Dearborn, and Middle Fork Dearborn Rivers and Flat Creek. Each of these waters was listed for sediment related impairments. The Dearborn River was also listed for water quality issues associated with thermal modification. This evaluation considered:

- available data and reports compiled from a variety of sources including MTDEQ, MTFWP, NRCS, USGS and USFS
- chemical, physical, and biological monitoring data collected during a 2003 field survey conducted by EPA
- the results of an aerial survey focusing on riparian and geomorphic integrity and the identification of anthropogenic sources of water quality impairment
- visual observations during numerous site reconnaissance visits in 2003 and 2004 by EPA personnel.

The weight-of-evidence approach described in Section 3.3 was applied to each of these waters to determine whether or not they are currently meeting water quality standards. The results and a summary of the proposed actions are presented in Table 3-40. In no case did comparison of the available data with the target and supplemental indictor values provide for "black and white" conclusions regarding current water quality impairment status. To be conservative, TMDLs are proposed for siltation in the Middle Fork and South Fork Dearborn Rivers and Flat Creek (See Sections 5.1 to 5.3). Although it appears that Montana's temperature standards may be exceeded in the Dearborn River, the predicted magnitude of the exceedance is minor, uncertainty in the prediction is high, and the cost of implementation of the solution (i.e., elimination of the diversion of irrigation water into Flat Creek) that would likely be proposed in a TMDL is very high. As a result, further study is proposed to develop a better understanding of the potential temperature impairment in the Dearborn River before proceeding with a TMDL (Section 1.0). Finally, the results of the evaluations summarized herein suggest potential nutrient impairments in the Middle and South Forks of the Dearborn River and Flat Creek. Further study is proposed to develop a better understanding of the solutions is the provide the evaluation summarized herein suggest potential nutrient impairments in the Middle and South Forks of the Dearborn River and Flat Creek. Further study is proposed to develop a better understanding of the solutions are solutions of the solutions summarized herein suggest potential nutrient impairments in the Middle and South Forks of the Dearborn River and Flat Creek. Further study is proposed to develop a better understanding of these potential nutrient related impairments (Section 5.5).

Water body Name and	Listed Probable	303(d) Li	ist Status	Current	Proposed Action
Number	Causes	1996	2002	Status	Froposed Action
Dearborn River	Siltation	Impaired	Impaired	Not Impaired	To be indirectly considered in further study as proposed in Section 6.
	Thermal Modification	Impaired	Impaired	Unknown	Further study as proposed in Section 6.
Middle Fork Dearborn River	Siltation	Impaired	Not Listed	Impaired	Address through preparation of a TMDL (Section 5.2).
	Nutrients	Not Listed	Not Listed	Potentially Impaired	Further study as proposed in Section 5.5.
South Fork Dearborn River	Siltation	Not Listed	Impaired	Impaired	Address through preparation of a TMDL (Section 5.1).
	Nutrients	Not Listed	Not Listed	Potential Impaired	Further study as proposed in Section 5.5.
Flat Creek	Siltation	Impaired	Impaired	Impaired	Address through preparation of a TMDL (Section 5.3)
	Nutrients	Not Listed	Not Listed	Potentially Impaired	Further study as proposed in Section 5.5.

Table 3-40, Current Water Quanty Impariment Status of Waters in the Dearborn 1174	Table 3-40.	Current Water Qual	ity Impairment Status	of Waters in the Dearborn TPA.
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4.0 SOURCE IDENTIFICATION

As discussed in Section 3, TMDLs are proposed for sediment/siltation in the Middle Fork and South Fork Dearborn Rivers and Flat Creek. This section of the report presents the results of an analysis to estimate sediment loading throughout the watershed to support TMDL development. TMDLs and load allocations are presented in Section 5.0.

4.1 Point Sources

There are no point sources of sediment in the Dearborn River TPA.

4.2 Nonpoint Sources

Nonpoint sources of sediment in the Dearborn River TPA were estimated using a screening level approach solely to gain an understanding of the relative magnitude of the various sources. The primary potential sediment sources identified and considered herein include landscape scale erosion associated with overland flow, sheet/rill erosion, and stream bank erosion. The results of this analysis are summarized below.

Land Soil Erosion

Land soil erosion in the Dearborn River watershed was estimated using the Universal Soil Loss Equation (USLE). The USLE (Wischmeier and Smith, 1978) is the most common and best-known method for estimating gross annual soil loss from upland erosion. The USLE is an index method involving factors that represent how climate, soil, topography, and land use affect soil erosion caused by raindrop impact and surface runoff. Rather than explicitly representing the fundamental processes of detachment, deposition, and transport by rainfall and runoff, the USLE represents the effects of these processes on soil loss. These influences are described by the USLE as follows:

$$A = (R) (K) (LS) (C) (P)$$

Where A is estimated soil loss in tons/acre for a given storm or period; R is a rainfall energy factor; K is a soil erodibility factor; LS is a slope-length, slope steepness factor; C is a vegetative cover factor; and P is a conservation practice factor.

The individual USLE factors for the Dearborn River watershed were estimated based on available GIS data and values in the scientific literature. GIS data layers for elevation, soils, and land cover helped to facilitate the USLE analysis for a large, watershed-scale area such as the entire Dearborn River watershed. Data available for such an analysis included the State Soil Geographic Database and GIS coverage for Montana (STATSGO), the GAP Analysis Program's land cover data for Montana, and the USGS's 30-meter Digital Elevation Models (DEMs) for the topography of the Dearborn River watershed (see Section 2 for maps of these data). The soils and land cover GIS coverages were merged to create a new polygon coverage, where each polygon had a unique combination of land cover and soils information. The polygon data were then entered into a database to calculate a sediment load per polygon. Average slopes were calculated from the DEM data for each unique polygon, and were also entered into the database. Slope lengths were estimated from the DEM data. Each of the USLE parameters and the origin of the data are described below.

- Rainfall and Runoff (*R*) Estimated for the entire region based on literature values (Haan et al., 1994)
- Soil Erodibility (*K*) Calculated from the STATSGO data. Average weighted K-factors were calculated using the K-factor for the surface layer of each soil, and the soil's percent composition in the larger map unit.
- Slope and Slope Length (S)(L) Average slopes and slope lengths were calculated for each land use using the 30-meter DEM data. Slope and slope lengths were input into defined formulas to calculate a slope factor (S) and slope length factor (L).

Equation	Conditions
S = 10.8sin θ + 0.03	Sin θ < 0.09
S = 16.8sin θ - 0.50	Sin θ ≥ 0.09

Note: θ is the slope angle

$$L = \left[\frac{\lambda}{72.6}\right]^m$$

Where \mathcal{S} = slope length, and m = the slope length exponent derived from literature values and based on the percent slope and the estimated rill to interrill erosion.

- Cover and Management (*C*) Literature values based on the GAP land cover classes (Haan, Barfield, and Hayes, 1994)
- Erosion Control Practice (*P*) Estimated from literature values (Brady, 1990; Haan, Barfield, and Hayes, 1994)

The six USLE soil factors were multiplied together for each unique polygon in the Dearborn River watershed. Annual loads and annual loads per acre were then calculated for each polygon. The results of the USLE analyses for the entire watershed are shown in Figure 4-1 and Table 4-1. The areas with the highest surface erosion were in the middle sections of the Dearborn River watershed near the Dearborn River, Auchard Creek, and Big Skunk Creek. The least amount of surface erosion was estimated to occur in the headwaters region and near the mouth of the Dearborn River near Sullivan Creek.

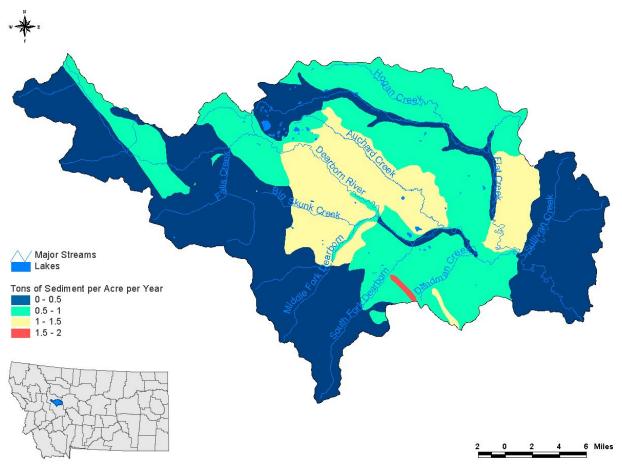


Figure 4-1. USLE soil loss in the Dearborn River watershed.

Watershed	Watershed Acres	Tons Sediment/Year	Tons Sediment/ Acre/Year
Flat Creek	88,060	65,117	0.74
Middle Fork Dearborn River	43,577	26,205	0.60
South Fork Dearborn River	26,994	11,930	0.44
Falls Creek (Dearborn River Headwaters Region)	25,126	9,465	0.38
Dearborn River (All)	352,812	218,268	0.62

Table 4-1. USLE Sediment Calculations

The USLE equation does not consider sediment delivery to a stream, only sediment loss on a plot of land. Vanoni (1975) developed a formula for estimating the sediment delivery ratio (SDR) to streams using watershed area. The formula is shown below.

$$SDR = 0.418 (Watershed _ Area)^{-0.135} - 0.127$$

Where watershed area is in square kilometers.

Using this formula, the sediment load to each stream outlet from sheet and rill erosion was estimated (Table 4-1). Loads are smaller than the calculated USLE loads because not all eroded material makes it to the stream. The results indicate that Flat Creek contributes significantly more sediment than either the Middle Fork or the South Fork, due both to its larger drainage area and higher erosion rate.

It should be noted that this method of estimating sheet and rill erosion and sediment delivery has a large margin of error. The results are presented here primarily to provide an understanding of relative land erosion among the Dearborn TPA subwatersheds. The Dearborn River and Falls Creek, although *not* impaired because of sediment, are included in the analysis for comparative purposes.

Watershed	Watershed Size (square km)	Sediment Delivery Ratio	Load to the Stream (tons/year)
Flat Creek	356.4	0.062	4,030
Middle Fork Dearborn River	176.3	0.081	2,115
South Fork Dearborn River	109.2	0.095	1,128
Falls Creek	101.7	0.097	916
Dearborn River (All)	1,427.8	0.030	6,462

 Table 4-2.
 Sediment Delivery to the Streams

Stream Bank Soil Erosion

Because stream bank erosion is spatially variable on a large scale within a watershed, it is very difficult to apply one approach to provide representative data on status and trends in channel health. Furthermore, existing watershed models have limited ability to predict stream bank erosion. Sediment loads from stream bank erosion were therefore estimated according to the results of the field and aerial assessments; corresponding literature values for bank erosion rates (Rosgen, 1996); and soils data from the NRCS (NRCS, 1994).

The results of the aerial assessment for the Dearborn River watershed indicated moderate to high levels of stream bank instability in Flat Creek and some segments of the Dearborn River (see Table 4-3). Bank heights were estimated from cross sections obtained in the various stream segments during the field assessment, and near bank stress was estimated from aerial photos and cross-sectional data. The Rosgen (1996) stream bank erosion curves for Colorado were then used to estimate a stream bank erosion rate for each segment. An average soil bulk density of 1.1 grams per cubic centimeter (g/cm³) was used to determine the mass of eroded sediment for each segment, based on NRCS soils data. The bank height, bulk density, bank erosion rate, and reach length were multiplied together and summed for each water body to estimate total bank erosion. It should be noted that this method of estimating bank erosion has a large margin of error. The results are presented here primarily to provide an understanding of relative bank erosion among the segments of concern in the Dearborn TPA.

The results of the stream bank erosion analysis are shown in Table 4-4. Flat Creek had very high bank erosion compared with the other streams, and one segment of the Dearborn River also had very high stream bank erosion (the most upstream segment, which has a natural braided channel morphology). Total bank erosion from Flat Creek was approximately 3,000 tons per year more than the total bank erosion from the Dearborn River, even though the evaluated segments of the Dearborn River are 21 miles longer than Flat Creek. The analysis suggests that, relative to each other, the South Fork and Middle Fork of the Dearborn have the least amount of stream bank erosion, the Dearborn River has moderate stream bank erosion, and Flat Creek has significant stream bank erosion.

	Reach Length	Near Bank		nk Instabil % of reach	-		k Erosion F (Feet/year)	Rate	Total Bank Erosion	Sediment (Tons//Mile/
Reach	(miles)	Stress	High	Medium	Low	High	Medium	Low	(Tons/year)	Year)
Dearborn	River									
DR1	8.88	Low	11.1	44.3	44.5	0.18	0.08	0.03	664	75
DR2	9.52	Low	15.8	42.1	42.1	0.18	0.08	0.03	773	81
DR3	8.00	Moderate	29.4	35.3	35.3	0.3	0.2	0.06	1,565	196
DR4	8.15	Low	11.8	41.2	47.1	0.18	0.08	0.03	605	74
DR5	7.44	Moderate	31.2	18.8	50.0	0.3	0.2	0.06	1,303	175
DR6	6.53	High	57.1	21.2	21.6	0.5	0.4	0.15	2,858	438
South For	rk Dearbori	n River								
SF1	5.83	Low	8.3	50.0	41.7	0.18	0.08	0.03	142	24
SF2	5.56	Low	1.0	14.3	84.7	0.18	0.08	0.03	78	14
Middle Fo	ork Dearboi	rn River								
MF1	6.17	Low	16.7	42.1	41.2	0.18	0.08	0.03	170	28
MF2	1.32	Low	0.0	48.1	51.9	0.18	0.08	0.03	26	20
Flat Creel	k									
FC1	7.49	High	7	60	33	0.5	0.4	0.15	2,641	353
FC2	4.43	High	23	50	27	0.5	0.4	0.15	1,711	386
FC3	4.35	High	14	61	25	0.5	0.4	0.15	1,662	382
FC4	11.64	High	27	55	18	0.5	0.4	0.15	4,832	415

Table 4-3. Stream Bank Erosion Estimates for the Dearborn River TPA

Sheet and rill erosion loads were compared with the bank erosion loads for the entire length of each stream (see Table 4-4). Bank erosion loads were only calculated for the main stem of each subwatershed, and therefore the two loads cannot be directly compared. It is of some note that estimated bank erosion in the main stem of Flat Creek exceeds sheet and rill erosion for the entire Flat Creek watershed by 6,800 tons. Bank erosion along the main stem of the Middle and South Forks of the Dearborn River was only a small percentage of the total estimated overland erosion. As already noted, these load estimates have large margins of error and must be used cautiously when making planning decisions. However, the evidence suggests that there is a large imbalance of bank erosion in Flat Creek compared with other streams in the Dearborn River watershed.

Stream	Sheet and Rill Erosion (tons/acres/year)	Bank Erosion (tons/mile/year)	Sheet and Rill Erosion (tons/year)	Bank Erosion (tons/year)
Flat Creek	0.74	389	4,030	10,856
Middle Fork Dearborn River	0.60	26	2,115	196
South Fork Dearborn River	0.44	19	1,128	220
Dearborn River	0.62	160	6,462	7,768

4.3 Source Assessment Uncertainty

The estimates of upland and bank erosion described above are based on the best currently available information but are prone to high margins of error. Although it is felt that the estimates have resulted in sufficient information to reach the conclusions presented in this report, there are still some uncertainties regarding whether or not all of the significant sources have been identified, and regarding the quantification of sediment loads. The primary uncertainties are as follows:

- Insufficient sediment and flow data have been collected to quantify existing sediment loads in the watershed.
- Bank erosion has not been measured to allow for a comparison between actual loads and the estimated loads presented in Section 4.2.
- A comprehensive source assessment inventory has not been conducted to locate and categorize all significant sediment sources.

These uncertainties will be addressed by the proposed activities described in Section 5.

5.0 SOUTH FORK DEARBORN RIVER, MIDDLE FORK DEARBORN RIVER, AND FLAT CREEK SEDIMENT TMDLS

As discussed in Section 3.9, TMDLs focusing on addressing all known anthropogenic sediment sources are proposed for the South Fork Dearborn River, Middle Fork Dearborn River, and Flat Creek. The required TMDL elements (i.e., identification of all significant sources, water quality goals or targets, a TMDL, allocation, and margin of safety) are presented in this section.

5.1 South Fork Dearborn River Sediment TMDL

A screening-level analysis of sediment loading in the South Fork Dearborn River watershed was presented in Section 1.0. The results indicate that upland sources of sediment contribute approximately 84 percent of the total sediment load and bank erosion sources contribute approximately 16 percent (Table 4-4). Based on the aerial assessment, however, upland sources were determined to be almost entirely natural with the only anthropogenic sources being isolated areas of bank erosion. Additional information on these anthropogenic sources is presented here.

The location of human-caused sources of bank erosion along the South Fork Dearborn River are shown in Figure 5-1 and an assessment of the riparian condition is shown in Figure 5-2. The headwaters of the South Fork Dearborn River are steep, forested terrain and do not show evidence of anthropogenic sediment sources or accelerated bank erosion. However, a 5,900 foot segment was identified during the aerial assessment that showed a riparian area that was cleared/logged with an expected increase in bank erosion (Figure 5-3). In addition, the lower reach of the South Fork has several miles where the riparian corridor has been converted to agricultural purposes (pasture and grazing) (Figure 5-4). Some impacts to bank stability and channel shading are apparent in this section but are generally of a diffuse nature. Livestock also have direct access to the South Fork at several locations and could be contributing to isolated cases of sedimentation (Figure 5-5).

Most other potential anthropogenic sources of sediment in the South Fork Dearborn River were not considered to be significant (Table 5-1 and Figure 5-6). Several bridges pose a potential risk of sediment loading and should be investigated during TMDL implementation (see Section 5.6). Appendix D includes detailed maps showing the locations of these bridges along with photos from the 2003 low-level aerial assessment. The maps are intended to facilitate additional investigations and the placement of best management practices by identifying precisely the locations of high priority sites.

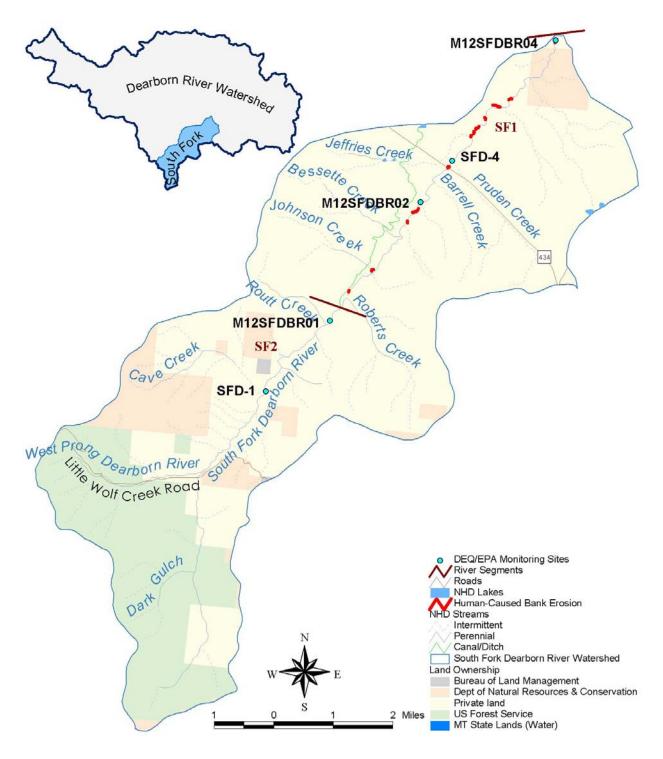


Figure 5-1. Human-caused sources of bank erosion along the South Fork Dearborn River.

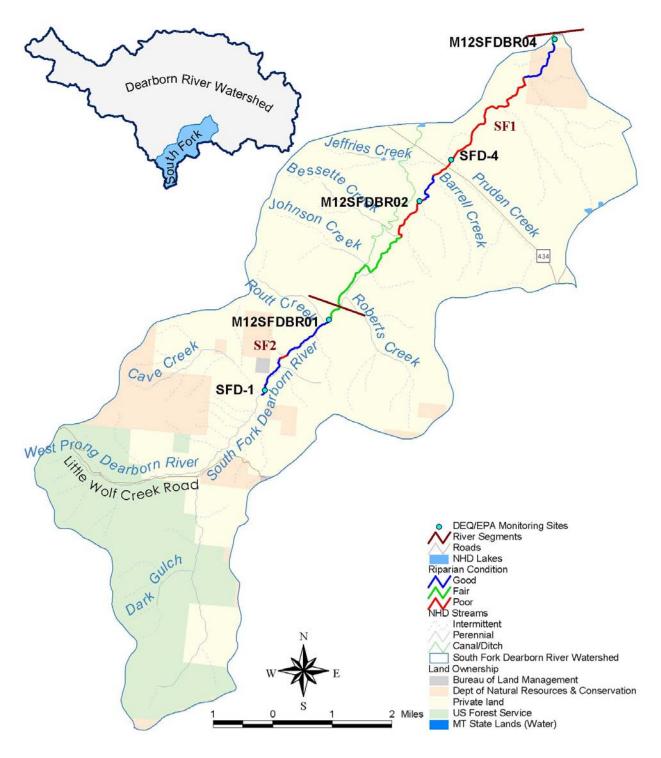


Figure 5-2. Riparian condition along the South Fork Dearborn River.



Figure 5-3. Extensive riparian clearing in the upstream section of the South Fork.



Figure 5-5. Livestock access to South Fork Dearborn River upstream of Highway 434.



Figure 5-4. Extensive riparian clearing in the downstream section of the South Fork.

Reach	Rip-rap	Channelization	Impoundments	Instream Structures/ Diversions	Stream Crossings	Other (gravel pits, construction)
SF1	None	None	None	None	Ford near mouth Four bridges	None
SF2	None	None	None	Gibson- Renning ditch diversion	Seven bridges or fords	None

Table 5-1. Summary of other potential anthropogenic-related sources in the South Fork Dearborn River.

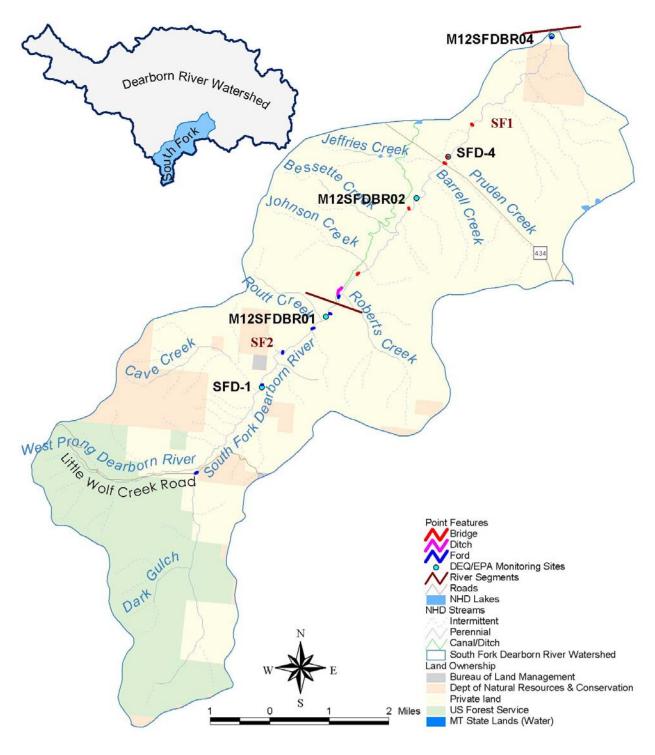


Figure 5-6. Point features along the South Fork Dearborn River.

5.1.1 TMDL and Allocations

A TMDL is composed of the sum of individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving water body. This definition is denoted by the following equation:

$\mathbf{TMDL} = \mathbf{WLAs} + \mathbf{LAs} + \mathbf{MOS}$

There are no point sources of sediment in the South Fork Dearborn River; therefore, the waste load allocation for point sources can be removed from the equation. Furthermore, since people have no control over natural sediment loading, there is no practical purpose for considering natural loading in the TMDL equation. Therefore, the South Fork Dearborn River TMDL is expressed merely as the sum of the allocations to known nonpoint sources. The hypothesis is that there is no more that can be accomplished to solve the problem if all the current anthropogenic sediment sources are addressed. However, given that the estimated loads from anthropogenic sources are very small in comparison with the estimated loads from natural sources, it is not known whether reducing anthropogenic sources will result in significant improvements to the health of the aquatic community. An additional performance-based allocation is that 100 percent of the riparian corridor should be improved to "good" or "excellent" conditions.

To estimate the load reduction associated with addressing all anthropogenic sources of bank erosion, new load estimates were calculated by assuming that all "high instability" reaches identified during the aerial assessment were associated with human activities and could be improved to "medium instability" (see Table 4-3). For the South Fork Dearborn River this is estimated to result in a 9 percent reduction in bank erosion loads and an overall 1 percent reduction in sediment loads. The TMDL and allocations are summarized in Table 5-2 and the proposed restoration and adaptive management strategy is presented in Section 5.6.

Sources	Current Loa	d (tons/year)	Reduction	Allocation (tons/year) or Approach
Point Sources (WLA)	0		NA	0
	Upland Erosion	1,128	0%	1,128
Nonnoint Courses	Bank Erosion	220	9%	201
Nonpoint Sources (LA)	Riparian Vegetation Condition	NA	Performance-based	100% of the riparian corridor should be improved to "good – excellent" condition
	TMDL	1,348	1%	1,329

Table 5-2. TMDL and Load Allocations for Sediment in the South Fork Dearborn River.

5.2 Middle Fork Dearborn River Sediment TMDL

A screening-level analysis of sediment loading in the Middle Fork Dearborn River watershed was presented in Section 1.0. The results indicate that upland sources of sediment contribute approximately 92 percent of the total sediment load and bank erosion sources contribute approximately 8 percent (Table 4-4). As with the South Fork Dearborn River, upland sources were determined to be almost entirely natural with the only anthropogenic sources being isolated areas of bank erosion. Additional information on these anthropogenic sources is presented here.

The locations of human-caused sources of bank erosion along the Middle Fork Dearborn River are shown in Figure 5-7 and an assessment of the riparian condition is shown in Figure 5-8. The Middle Fork of the Dearborn River has characteristics similar to those of the South Fork, and much of the headwater zone is relatively undisturbed, steep, forested terrain. Highway 200 has the potential to deliver sediment from cut/fill slopes and applied road sand. However, the aerial assessment did not show any apparent delivery of sediment from the road to the Middle Fork, likely due to the long delivery distance from the road to the channel. A possible pathway for road runoff was investigated on the ground, but did not appear to be a probable source for significant sediment delivery to the channel.

The lower reach of the Middle Fork showed more evidence of channel instability related to land use/riparian modification for agriculture (Figure 5-10 to Figure 5-13). Localized bank instability attributable to anthropogenic sources was present in approximately 6,200 feet of the channel (Land and Water, 2003). However, no significant areas of mass slope failure were noted in the Middle Fork Dearborn River watershed.

Most other potential anthropogenic sources of sediment in the Middle Fork Dearborn River were not considered to be significant (Table 5-3 and Figure 5-9). Several bridges pose a potential risk of sediment loading and should be investigated during TMDL implementation (see Section 5.6). Appendix D includes detailed maps showing the locations of the bridges along with photos from the 2003 low-level aerial assessment. The maps are intended to facilitate additional investigations and the placement of best management practices by identifying precisely the locations of high priority sites.



Figure 5-7. Human-caused sources of bank erosion along the Middle Fork Dearborn River.

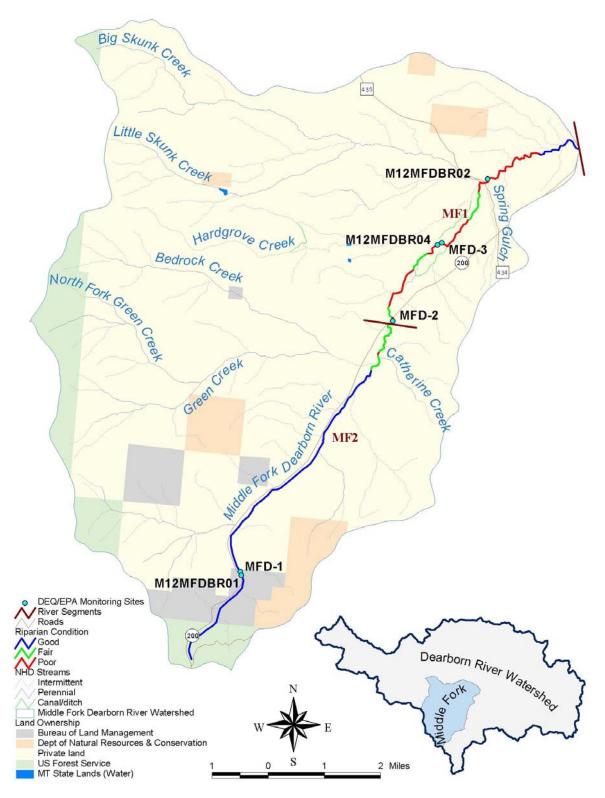


Figure 5-8. Riparian condition along the Middle Fork Dearborn River.

Reach	Rip-rap	Channelization	Impoundments	Instream Structures/ Diversions	Stream Crossings	Other (gravel pits, construction)
MF1	NA	NA	NA	2 Gillette ditch Borho Ditch diversion	Two bridges	None
MF2	Riprap by Hwy 200 (500 feet)	NA	NA	Nitch ditch Dueringer ditch	Hwy 200 bridge Two additional bridges	None

 Table 5-3. Summary of other potential anthropogenic-related sources in the Middle Fork

 Dearborn River.

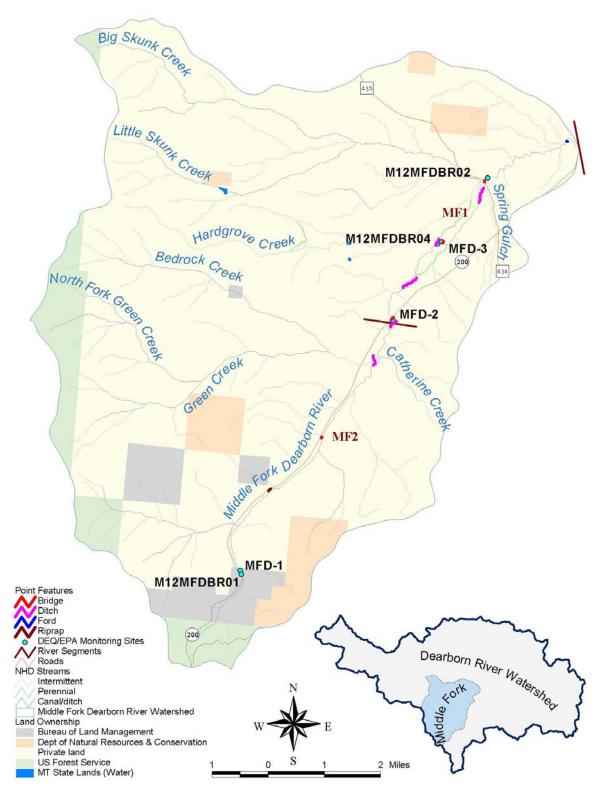


Figure 5-9. Point features along the Middle Fork Dearborn River.



Figure 5-10. Extensive riparian clearing in the downstream section of Middle Fork Dearborn River .



Figure 5-12. Moderate riparian clearing in the downstream section of Middle Fork Dearborn River.



Figure 5-11. Cattle grazing along Middle Fork Dearborn River near Highway 200 Bridge.



Figure 5-13. Lack of riparian vegetation along Middle Fork Dearborn River near confluence with Skunk Creek.

5.2.1 TMDL and Allocations

Similar to the South Fork Dearborn River, no point sources are located in the Middle Fork and most anthropogenic-related sources of sediment are associated with bank erosion. To estimate the load reduction associated with addressing all anthropogenic sources, new load estimates were calculated using the results from the aerial assessment. Results indicated that 45 percent of the "high" and 40 percent of the "medium" bank erosion instability is related to human influences. The TMDL was calculated by assuming that human caused "high instability" reaches could be improved to "medium instability", and human caused "medium instability" reaches could be improved to "low instability" (see Table 4-3). For the Middle Fork Dearborn River this is estimated to result in a 22 percent reduction in bank erosion loads and an overall 2 percent reduction in sediment loads. The TMDL and allocations are summarized in Table 5-4 and the proposed restoration and adaptive management strategy is presented in Section 5.6.

Similar to the South Fork Dearborn River, an additional performance-based allocation is that 100 percent of the riparian corridor should be improved to "good" or "excellent" conditions.

Sources	Current Loa	d (tons/year)	Reduction	Allocation (tons/year) or Approach
Point Sources (WLA)	0		NA	0
	Upland Erosion 2,115		0	2,115
Normalia (Osumos	Bank Erosion 196		22%	152
Nonpoint Sources (LA)	Riparian Vegetation Condition	NA	Performance-based	100% of the riparian corridor should be improved to "good – excellent" condition
	TMDL	2,311	2%	2,267

Table 5-4. TMDL and Load Allocations for Sediment in the Middle Fork Dearborn River.

5.3 Flat Creek Sediment TMDL

A screening-level analysis of sediment loading in the Flat Creek watershed was presented in Section 1.0. Unlike the Middle Fork and South Fork Dearborn Rivers, the results indicate that bank erosion is a more significant source of sediment (73 percent) than are upland sources (27 percent). This is due to the fact that Flat Creek serves as a conveyance for irrigation water diverted from the main stem of the Dearborn River and channel morphology reflects this altered flow regime. Observed channel instability is likely the result of increased flows due to irrigation diversion and conversion of riparian vegetation to agricultural uses. Grazing and agricultural uses (pasture and cropland) were widespread in Flat Creek and grazing appeared to be of higher density in the lower reaches.

The locations of human-caused sources of bank erosion along Flat Creek are shown in Figure 5-14and an assessment of the riparian condition is shown in Figure 5-15. Numerous areas of high bank erosion potential were identified during the aerial survey and are highlighted in Appendix D. Several of these areas are also shown in the photos below (Figure 5-16 to Figure 5-19).

Most other potential anthropogenic sources of sediment in Flat Creek were not considered to be significant (Table 5-5 and Figure 5-20). Several bridges pose a potential risk of sediment loading and should be investigated during TMDL implementation (see Section 5.6). Appendix D includes detailed maps showing the locations of the bridges along with photos from the 2003 low-level aerial assessment. Areas of high erosion potential are also highlighted in the Appendix D maps.

Reach	Rip-rap	Channelization	Impoundments	Instream Structures/ Diversions	Stream Crossings	Other (gravel pits, construction)
FC1	None	None	None	None	None	None
FC2	None	None	None	None	One ford One bridge	None
FC3	Minor	None	None	Garino ditch Diversion Diversion a Hamilton ditch diversion	Several bridges and fords	None
FC4	Minor	None	Hogan Cr.	None	None	None

Table 5-5. Summary of other potential anthropogenic-related sources in the Flat Creek watershed.

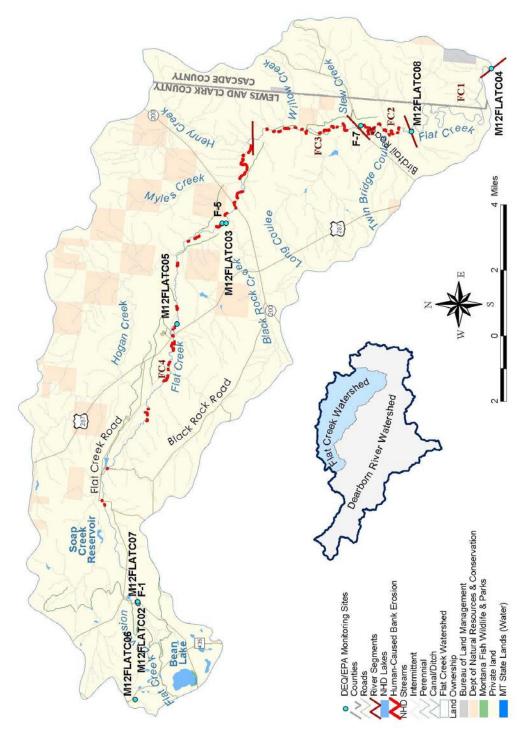


Figure 5-14. Human-caused sources of bank erosion along Flat Creek.

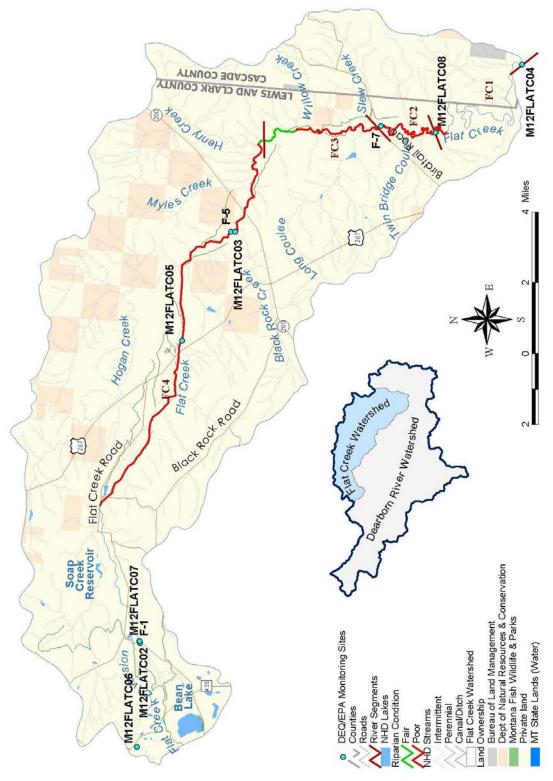


Figure 5-15. Riparian condition along Flat Creek.



Figure 5-16. Flat Creek near Birdtail Road.



Figure 5-18. Cattle grazing in lower Flat Creek.



Figure 5-17. Bank erosion in lower Flat Creek.



Figure 5-19. Bank erosion upstream of Highway 200.

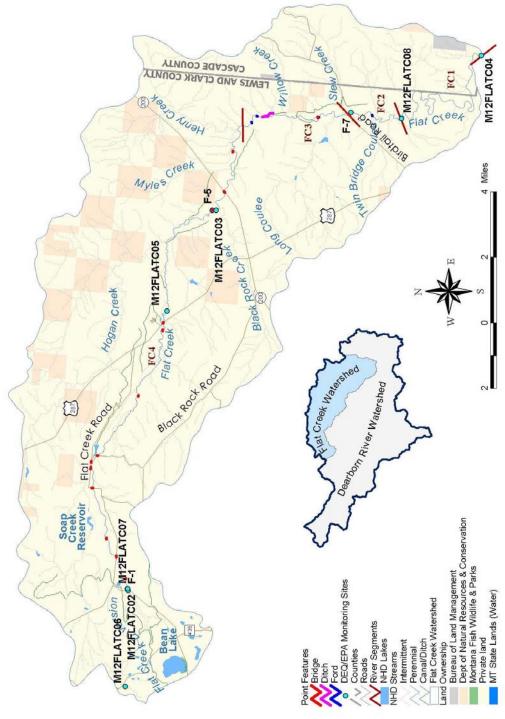


Figure 5-20.

Point features along Flat Creek.

5.3.1 TMDL and Allocations

No point sources are located in the Flat Creek watershed. To estimate the load reduction associated with addressing all anthropogenic sources, new load estimates were calculated using the results from the aerial assessment. Results indicated that 90 percent of the "high" and "medium" bank erosion instability is related to human influences (Segment F2, F3, and F4). In segment F1, 80 percent of the "high" and 60 percent of the "medium" bank erosion instability is related to human influences. The TMDL was calculated by assuming that human caused "high instability" reaches could be improved to "medium instability" (see Table 4-3). For Flat Creek this is estimated to result in a 40 percent reduction in bank erosion loads and an overall 27 percent reduction in sediment loads. The TMDL and allocations are summarized in Table 5-4 and the proposed restoration and adaptive management strategy is presented in Section 5.6. An additional performance-based allocation is that 100 percent of the riparian corridor should be improved to "good" or "excellent" conditions.

Sources	Current Load (tons/year)		Reduction	Allocation (tons/year) or Approach
Point Sources (WLA)	0		NA	0
	Upland Erosion	4,030	0	4,030
Normalist October	Bank Erosion	10,856	40%	6,846
Nonpoint Sources (LA)	Riparian Vegetation Condition	NA	Performance-based	100% of the riparian corridor should be improved to "good – excellent" condition
	TMDL	14,886	27%	10,876

Table 5-6. TMDL and Load Allocations for Sediment in Flat Creek.

5.4 TMDL Targets

As noted in Section 3.3, MDEQ is required to assess the waters for which TMDLs have been completed to determine whether compliance with water quality standards has been attained. The process by which this will be accomplished is discussed in Section 3.3 (Targets and Supplemental Indicators Applied as Water Quality Goals) and is shown in Figure 3-3. The sediment targets listed in Table 3-6, and restated below in Table 5-7, are proposed as the thresholds against which compliance with water quality standards will be measured in the South Fork Dearborn River, Middle Fork Dearborn River, and Flat Creek. If all the target threshold values are met, it will be assumed that beneficial uses are fully supported and water quality standards have been achieved. Alternatively, if one or more of the target threshold values are exceeded, it will be assumed that beneficial uses are <u>not</u> fully supported and water quality standards have not been achieved. However, it will not be automatically assumed that implementation of this TMDL was unsuccessful just because one or more of the target threshold values have been exceeded. The circumstances around the exceedance will be investigated. For example, the exceedance might be a result of natural causes such as floods, drought, fire or the physical character of the watershed. In addition, in accordance with MCA 75-5-703(9), an evaluation will be conducted to determine whether:

- the implementation of a new or improved suite of control measures is necessary;
- more time is needed to achieve water quality standards;
- revisions to components of the TMDL are necessary, or;
- changes in land management practices occur

Sediment Target	Threshold Value		
Percent Surface Fines < 2mm	< 20 percent		
Number of Clinger Taxa	> 14		
Periphyton Siltation Index	< 20.0 for mountain streams < 50.0 for plains streams		
Cold-Water Fish Populations ¹	Documented increasing or stable trend		

Table 5-7. South Fork Dearborn River, Middle Fork Dearborn River, and Flat Creek Water Quality Goals.

¹ The available fisheries data do not provide readily useful information in relation to the listed segments and impairments. For example, limited data are available regarding fish populations in the Middle Fork, South Fork, and Flat Creek and trends in the population data could be due to a number of factors in addition to, or other than, fine sediments or temperature. Because of these reasons, fish population data cannot be used directly to evaluate success of the implementation of this plan. However, future monitoring should attempt to identify trends in the fishery and, to the extent possible, determine the relationship between these trends and stressors placed on the resource.

5.5 Monitoring and Assessment Strategy

The purpose of the monitoring strategy is to provide answers to the following questions:

- 1. Has implementation of this plan resulted in attainment of water quality standards and full support of the cold-water fishery beneficial use? (i.e., trend and compliance monitoring)
- 2. Have all the significant anthropogenic sediment sources been identified? (supplemental monitoring)
- 3. Are other factors such as nutrients, physical habitat limitations, or stream channel morphology having a significant negative impact on aquatic life? (supplemental monitoring)

It is envisioned that the first step in the implementation of this monitoring and assessment strategy will be the development of a detailed work plan and sampling and analysis plan.

5.5.1 Trend Monitoring

Monitoring of percent surface fines, macroinvertebrates, and periphyton on roughly a 5-year basis is recommended at a minimum at the following sites:

- South Fork Dearborn River at confluence with Dearborn River (M12SFDBR04)
- Middle Fork Dearborn River downstream of Highway 434 (M12MFDBR02)
- Flat Creek below Birdtail Road (M12FLATC08)

MFWP should also continue tracking fish populations in the Dearborn TPA to evaluate whether populations of key species are improving, declining, or remaining steady.

5.5.2 Supplemental Monitoring

Additional monitoring is also suggested to better assess channel, bank, and habitat conditions and to collect supplemental information regarding potential sources of sediment within the watershed. The following activities are recommended:

- Conduct a complete source assessment survey to ground-truth potential sediment sources described above in Sections 5.1 to 5.3 and in Appendix D. The goal of the source assessment survey should be to identify and prioritize all anthropogenic-related sediment sources within the Middle Fork Dearborn River, South Fork Dearborn River, and Flat Creek subwatersheds.
- Identify and complete Rosgen Level II surveys for reference sites in the Middle Fork Dearborn River, South Fork Dearborn River, and Flat Creek to obtain reference cross section information.
- Because nutrients were identified as a potential cause of impairment at several sites in the watershed, additional nutrient data should be collected to better assess current conditions. Dissolved and total phosphorus and nitrogen and algal biomass should be sampled in the Middle Fork Dearborn River, South Fork Dearborn River and Flat Creek.
- Evaluate the condition of cross sections and longitudinal profiles established in 2003.

5.6 Conceptual Restoration Strategy

A phased restoration strategy is proposed. Phase I will involve implementation of the monitoring and assessment strategy described above in Section 5.5 to identify all anthropogenic-related sediment sources. Phase II should involve developing and implementing a detailed Project Implementation Plan to obtain the sediment load reductions from the known anthropogenic sediment sources. The Project Implementation Plan should outline responsibilities, specific types of restoration activities, and a schedule. Potential restoration activities for each of the water bodies are identified below but should not be considered all-inclusive.

The lower end of the upper reach of the South Fork Dearborn River (SF2 in the aerial assessment report) appears to have experienced some impacts from logging and land clearing operations in the riparian area. Natural recovery from logging impacts would be expected to result in improved conditions in this reach. The lower reach of the South Fork (SF1 in the aerial assessment report) experienced some impacts from grazing and removal of riparian vegetation. Suggested restoration activities in the South Fork include improving land use practices and possibly installing riparian fencing to promote riparian vegetation recovery.

Suggested restoration activities in the Middle Fork include improving woody riparian coverage and restoration of over-widened cross sections to reference conditions along impacted segments. Bank restoration can be accomplished with soft bioengineering methods (e.g., geotextile coir fabric wraps) and woody shrub/tree revegetation. Fencing in riparian areas would be beneficial to promote increased coverage of woody species. Off-stream water sources might need to be developed.

Without significant changes to current water management practices, restoration to pristine conditions along Flat Creek is not a realistic objective at this time. There are, however, steps that can be taken to reduce water quality impacts and improve habitat conditions while continuing to accommodate the current flow regime and land use activities. Suggested restoration activities include promoting recovery or enhancing riparian vegetation and reducing sediment impacts through restoration of eroding banks. Establishment of mature tree stands could be expected to significantly stabilize stream banks and provide significant shading to the channel, although it should be recognized that extensive cottonwood riparian communities cannot be expected given the soil characteristics of the area. Willow shrub communities would be more typical, although shading provided by willows would be modest. Strategies to reduce sediment yield could include livestock exclusion in riparian areas, and sloping and revegetation of unstable terraces and banks with revegetation treatments.

5.7 Dealing with Uncertainty and Margin of Safety

Based on the available data evaluated in Section 3.0 and consideration of the fact that the majority of the sediment load delivered to the South Fork Dearborn River, Middle Fork Dearborn River, and Flat Creek appears to be largely of natural origin, one could argue that no TMDLs are necessary. However, interpretation of the state's narrative water quality criteria is not a "black-and-white" exercise. The relevant narrative standards prohibit harmful or other undesirable conditions related to pollutant increases above "naturally" occurring levels. The beneficial uses listed as impaired (cold-water fishery and aquatic life) experience a high degree of "natural" variability as do many of the chemical and physical parameters used as targets or supplemental indicators. Are we certain that anthropogenic sediment loads are or are not significantly impacting the health of the aquatic communities? To be conservative and err on the side of water quality protection, TMDLs have been prepared. This fact alone provides a substantial margin of safety.

The phased restoration/alloction approach also provides a margin of safety by addressing the uncertainties regarding the identification/quantification of sediment sources outlined in Sections 5.1 to 5.3.

6.0 PROPOSED FUTURE STUDIES AND ADAPTIVE MANAGEMENT STRATEGY

This section presents proposed future studies to address data gaps and/or uncertainties identified previously. A conceptual strategy for reacting to the results of these, and other, future studies and/or new information that may become available is also presented (i.e., adaptive management strategy).

6.1 Proposed Supplemental Temperature and Flow Study for the Dearborn River

Montana's temperature standards were originally developed to address situations associated with point source discharges, making them somewhat difficult to apply when dealing with primarily nonpoint source issues, such as with the Dearborn River. For waters classified as B-1 (i.e., the Dearborn River), the maximum allowable increase over naturally occurring temperature (if the naturally occurring temperature is less than 67° Fahrenheit) is 1° (F) and the rate of change cannot exceed 2°F per hour. In practical terms, the temperature standards address a maximum allowable increase above "naturally occurring" temperatures to protect the existing temperature regime for fish and aquatic life. "Naturally occurring," means conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil, and water conservation practices have been applied (ARM 17.30.602(17)).

A modeling analysis is described in Section 3.8.1, in which water temperatures in the Dearborn River were estimated to be between one and two degrees Fahrenheit higher than natural as a result of the flow diversion. However, the uncertainty regarding the model predictions is relatively high (± 2 degrees). As a result, it is not possible to determine, with an adequate degree of certainty, whether or not the temperature standards in the Dearborn River are currently met. All that can be said at this point is that the temperature standard in the Dearborn River may currently be exceeded due to human-caused flow alteration. Further study is therefore required. This section of the document presents a conceptual phased plan for a supplemental temperature study in the Dearborn River.

6.1.1 Study Purpose

The primary goal of the proposed supplemental study is to answer the question: Is the State of Montana's water quality standard for temperature exceeded in the Dearborn River? If the results indicate that the temperature standard is met, no further study or action will be necessary. On the other hand, if the results indicate that the temperature standards are exceeded, this study is intended to:

- 1. Define the "natural" temperature regime for the Dearborn River and establish in-stream temperature goals (or targets) using a refined model-based analysis.
- 2. Identify, and determine the relative importance of, the sources or causes (e.g., natural, loss of shade, human-caused flow alteration) of the temperature problem.
- 3. Develop a restoration strategy to achieve the temperature goals, to the extent possible.

Conceptual Scope of Study

Task 1 - Dearborn River Water Balance

The diversion of a portion of the Dearborn River's flow into Flat Creek (during the summer) <u>may</u> be having a negative influence on recreation, habitat for fish and aquatic life, and water temperature. Additionally, there are other areas within the Dearborn Watershed where water is withdrawn for irrigation purposes. For example, diversion structures were noted during the aerial survey presented in Appendix D

in the South Fork (Gibson Renning Ditch), Middle Fork (4 diversions noted), and Flat Creek (multiple locations). However, the impacts of the human-caused flow alteration are not fully understood at this time due to a lack of flow data. A summer water balance for the Dearborn River, and significant tributaries such as the Middle Fork, South Fork, Flat Creek, Auchard Creek, Deadman Creek, and Sullivan Creek is necessary to determine the significance of human-caused flow alteration.

Due to the large size of the Dearborn River watershed and the long history of water-use in the basin, a basin-scale hydrologic investigation is proposed to answer the following questions:

- 1) What is the "natural" hydrologic regime of the Dearborn River and what are the expected "natural" summer flows (in this case, natural refers to in the absence of anthropogenic alteration)?
- 2) What is the extent of surface water-use in the basin and how is it used?
- 3) How efficient are the water use mechanisms in the basin?
- 4) What is the fate of all diverted water in the basin?
- 5) What is the effect of the timing, magnitude, duration and location of irrigation diversion/return flows?
- 6) Given all the water-use in the basin and the need for full support of <u>all</u> beneficial uses (e.g., agriculture, drinking water, recreation, fish and aquatic life, etc.), what are the maximum summertime flows that can be achieved in the basin, assuming that all reasonable land, soil, and water conservation practices are employed?

In general, answers to these questions will define the significance of human-caused flow alteration in the Dearborn River and in the primary tributaries. Answer to questions 1 and 6 will define the boundaries for future temperature modeling analyses.

Task 2 - Temperature Data Collection

Sufficient paired temperature and flow data were not available to complete a detailed modeling analysis. Additional data are required to more accurately simulate current water temperatures in the Dearborn River and to simulate the "natural" temperature regime. Ideally, the collection of additional temperature data would be coordinated with the collection of the additional flow data in Task 1.

Other data may also be necessary to refine the modeling analysis. The existing model was "calibrated" to only one sampling event and several key inputs were based on estimated rather than measured data. The model is most sensitive to several weather parameters including the following: air temperature, relative humidity, and wind speed. Other sensitive parameters include inflow temperature, possible sun, total shade, ground temperature, and wetted perimeter. Therefore consideration should be given to the collection of the following data:

- An onsite continuous air temperature meter should be placed somewhere between the Flat Creek diversion and the Dearborn River at Highway 287.
- Total shade and wetted width of the stream should be measured at strategic points along the Dearborn River during future flow monitoring events. Neither parameters are as sensitive as the weather parameters in the modeling analysis, but both are somewhat sensitive and were estimated for the purpose of the analysis presented in this report.

Finally, the temperature affects of the reported riparian degradation in the tributaries to the Dearborn River (see the "Bank Erosion and Riparian Condition" subsections within Sections 3.8.2 - 3.8.4) have not been considered in the temperature analysis presented in Section 3.8.1. Existing and potential shade

should be estimated at strategic locations within these tributaries to determine if riparian degradation is having an adverse affect on Dearborn River temperatures.

Task 3 - Temperature Modeling Analysis

The data provided through implementation of the steps described above should allow for completion of a revised modeling analysis. Stream temperatures will be simulated in the Dearborn River for the following scenarios: 1) current condition, 2) the "natural" flow regime, and 3) the "maximum" achievable flow condition. Modeling temperatures in the Dearborn River for the "natural" condition will define the temperature regime that may have existed in the absence of human-caused alteration. Modeling temperatures in the Dearborn River for the "maximum" achievable flow scenarios will define the temperature regime that is likely achievable given current agricultural practices assuming that all reasonable, land, soil, and water conservations practices are employed. Scenario 2 will be compared to the current condition scenario to determine compliance with the Montana temperature standard. If the results indicate that the temperature standards are not violated, no further action will be necessary. Conversely, if the results indicate that the temperature standards are exceeded, preparation of a TMDL will be necessary (Task 4).

Task 4 – Total Maximum Daily Load and Voluntary Water Quality Restoration Strategy

If further study indicates that the temperature standards are violated, a TMDL will be required and the preparation of a Voluntary Water Quality Restoration Strategy is recommended. DEQ will be responsible for the preparation of the TMDL and, ideally, would work with the watershed stakeholders to prepare a Voluntary Water Quality Restoration Strategy, assuming there is sufficient local interest. The total maximum daily load will establish in-stream temperature targets (or goals) that represent achievement of the temperature standard, will define the necessary actions to achieve the targets, and will be prepared in accordance with DEQ and EPA guidelines. Assuming that there are no point sources involved, implementation of the TMDL would be entirely voluntary and would depend upon the voluntary actions of the various watershed landowners and stakeholders.

6.1.2 Schedule and Commitments

Based on preliminary communications between EPA, DEQ and the Montana Department of Natural Resources and Conservation (DNRC), implementation of the Supplemental Temperature and Flow Study will be accomplished through a partnership between these three agencies, with DNRC taking the lead role in Task 1 and EPA and/or DEQ taking the lead role in the remaining tasks. Since Tasks 2 - 4 are dependant upon the results of Task 1, Task 1 will need to be completed first. It is envisioned that Task 1 will be initiated in 2005 or 2006 (depending upon availability of staff resources and funding) and will involve a two to three year study to ensure that a range of flow conditions are evaluated. The remaining tasks will be completed by no later than 2012.

6.2 Suspended Sediment Monitoring

It is well documented that high levels of suspended sediment can directly affect aquatic species health. Suspended sediment has also been widely used as an indicator of sediment accumulation in streambeds, which is also associated with aquatic life impairment (Waters, 1995). Further, in cases where long-term data sets are available suspended sediment data are relatively easy to apply within the TMDL process. For example, when suspended sediment and associated discharge data are available from a suitable "reference" stream, they can easily be used to establish flow-based, not-to-exceed concentration targets to represent a measure of compliance with the State's narrative standards for sediment. Further, in combination with the target values, suspended sediment load reductions can typically be easily estimated to provide for the "TMDL" component of the process (e.g., X% suspended sediment load reduction). Suspended sediment data provide a relatively easy means to assess compliance with Montana's narrative sediment criteria and also provide an efficient means by which to estimate the necessary sediment load reductions to achieve compliance with the standards. Unfortunately, there is insufficient suspended sediment data available for the Dearborn River, and there is little, if any, available reference data to use for comparison purposes. For that matter, there is a paucity of data in general that has direct relevance to Montana's sediment standards in many of the streams appearing on Montana's 303(d) list due to the probable causes of "siltation" and/or "suspended solids".

As a result, EPA and DEQ are pursuing a partnership with the USGS to begin collection of paired flow and suspended sediment data in streams appearing on Montana's 303(d) list due to "siltation" and/or "suspended solids". "Reference" or "least impaired" streams will also be considered in this study. Details regarding this proposal have not yet been fully defined, but the conceptual goal is to begin to compile data that will ultimately facilitate more accurate and efficient interpretation of Montana's narrative sediment standards on a regional basis. It is not envisioned that this proposed study, alone, would fully achieve that goal. This would be one component of the State's monitoring program. However, this is considered one of the steps towards achieving this goal. It is envisioned that the first step will involve compiling all available suspended sediment data (e.g., total suspended solids (TSS), suspended solids concentration (SSC), and/or turbidity data with corresponding flow data) to identify data gaps. This would be followed by the preparation of a sampling and analysis plan and implementation. A pilot monitoring program, involving the Dearborn River and a number of streams within the Eastern Front Region, is proposed as a starting point to evaluate the feasibility and utility of this effort.

6.3 Adaptive Management

First, adaptive management is built into Montana's TMDL process through the Montana Water Quality Act. DEQ is required to assess the waters for which TMDLs have been completed to determine whether compliance with water quality standards has been achieved. Such an evaluation will be required five years after EPA approves the TMDLs presented in this document. At that time, if water quality standards have not been achieved, in accordance with MCA 75-5-703(9), an evaluation will be conducted to determine if:

- the implementation of a new or improved suite of control measures is necessary
- more time is needed to achieve water quality standards, or
- revisions to components of the TMDL are necessary.

In other words, the Montana Water Quality Act provides for future adaptive management in cases where water quality standards have not been achieved 5-years after the TML has been approved. The potential adaptive management actions are specified directly above and in the act.

This, however, is only one component of the conceptual adaptive management strategy proposed in this document. Additional adaptive management components include:

- Additional flow/temperature studies to determine if temperature standards are, in fact, violated in the main stem of the Dearborn River (See Section 6.1). If the results indicate that they are, a TMDL will be prepared. If not, no further action will be required.
- Additional source assessment is proposed during the implementation phases of the siltation TMDLs for the South Fork Dearborn River, Middle Fork Dearborn River, and Flat Creek to

ensure that all significant sources have, in fact, been identified and to develop site-specific restoration plans (See Section 5.5.2).

- Additional suspended sediment monitoring is proposed for the main stem Dearborn River and several other streams within the region to begin to better define the "reference" condition (Section 6.2). In the future, this will provide information specific to the Dearborn River and also provide a means for comparison to other similar streams in the region. If, in the future, it is found that suspended sediment levels in the Dearborn River are higher than expected, additional actions can be taken by DEQ to attempt to correct the problem.
- The evaluations described in this document focused on siltation in the Dearborn River and several of its tributaries and thermal modification in the Dearborn River. However, potential water quality issues were identified suggesting that nutrients, or other stressors may be causing water quality problems in the watershed. Further study is proposed in Section 5.5.2). Future actions will be dependent upon the results of the further study.

7.0 PUBLIC INVOLVEMENT

Due to the lack of a formal, organized watershed stakeholder group in the Dearborn TPA, public involvement was generally limited to the elements required by the Montana Water Quality Act. The Lewis & Clark Conservation District was notified during the initial stages of project development and kept apprised of activities/progress throughout the project. The Conservation District was also partially relied upon to assist in obtaining landowner contact information to gain access for field activities. The Sampling and Analysis Plan prepared to direct field-sampling activities was provided to the Lewis & Clark Conservation District and landowners who provided access for sampling (if they were interested in having a copy) prior to initiation of field activities. Additionally, contacts were made with the Montana Department of Natural Resources, Montana Fish, Wildlife and Parks, U.S. Natural Resource Conservation Service, and USGS to request all available data as well as any information that they may have had regarding local activities.

The draft *Water Quality Assessment and TMDLs for the Dearborn River Planning Area* document was formally released for public review on November 19, 2004. The notice of availability was made through a press release to the following media sources: Cascade Courier, Great Falls Tribune, High Plains Warrior, KEIN-AM/KLFM - FM, Rural Montana, KTVH-TV, KBLL-AM, KFBB-TV, KMTF-TV, KXGF, KMON-AM, KRTV, KTGF- TV, the Helena Independent Record, the Queen City News, and the Associated Press. It was also posted on "Newslinks" which is a subscriber service for all media, and the notice and draft document were posted on DEQ's website (<u>http://www.deq.state.mt.us/index.asp</u>). Phone contacts and visits were also made with the Lewis and Clark Conservation District and NRCS to alert them that the document was available for review, provide them with copies of the draft document, and request their assistance in notifying their constituents within the Dearborn River Watershed. Additionally, phone contacts were attempted with all of the landowners within the watershed, that were previously contacted to obtain permission for sampling, to alert them of the document availability.

The formal public comment period extended from November 19, 2004 to December 20, 2004. A public informational meeting was held on November 8, 2004. A total of seven people attended the meeting. Formal written comments were submitted by four individuals. A summary of the public comments and the EPA/DEQ responses are presented in Appendix E.

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APPENDIX A: MULTI-RESOLUTION LAND CHARACTERISTICS (MRLC) CONSORTIUM DATA DESCRIPTION

Land Cover Classes:

Water

11 Open Water 12 Perennial Ice/Snow

Developed

21 Low Intensity Residential22 High Intensity Residential23 Commercial/Industrial/Transportation

Barren

31 Bare Rock/Sand/Clay32 Quarries/Strip Mines/Gravel Pits33 Transitional

Vegetated; Natural Forested Upland

41 Deciduous Forest42 Evergreen Forest43 Mixed Forest

<u>Shrubland</u>

51 Shrubland

Non-natural Woody

61 Orchards/Vineyards/Other

Herbaceous Upland

71 Grasslands/Herbaceous

Herbaceous Planted/Cultivated

81 Pasture/Hay82 Row Crops83 Small Grains84 Fallow85 Urban/Recreational Grasses

Wetlands

91 Woody Wetlands92 Emergent Herbaceous Wetlands

Land Cover Classification System Land Cover Class Definitions:

- Water All areas of open water or permanent ice/snow cover.
- **11. Open Water** areas of open water, generally with less than 25 percent or greater cover of water (per pixel).
 - 12. Perennial Ice/Snow All areas characterized by year-long cover of ice and/or snow.
- <u>Developed</u> areas characterized by high percentage (approximately 30 percent or greater) of constructed materials (e.g. asphalt, concrete, buildings, etc).
- 21. Low Intensity Residential Includes areas with a mixture of constructed materials and vegetation. Constructed materials account for 30-80 percent of the cover. Vegetation may account for 20 to 70 percent of the cover. These areas most commonly include single-family housing units. Population densities will be lower than in high intensity residential areas.
- **22. High Intensity Residential** Includes heavily built up urban centers where people reside in high numbers. Examples include apartment complexes and row houses. Vegetation accounts for less than 20 percent of the cover. Constructed materials account for 80-100 percent of the cover.
- **23.** Commercial/Industrial/Transportation Includes infrastructure (e.g. roads, railroads, etc.) and all highways and all developed areas not classified as High Intensity Residential.
- **Barren** Areas characterized by bare rock, gravel, sad, silt, clay, or other earthen material, with little or no "green" vegetation present regardless of its inherent ability to support life. Vegetation, if present, is more widely spaced and scrubby than that in the "green" vegetated categories; lichen cover may be extensive.
- **31. Bare Rock/Sand/Clay** Perennially barren areas of bedrock, desert, pavement, scarps, talus, slides, volcanic material, glacial debris, and other accumulations of earthen material.
- **32.** Quarries/Strip Mines/Gravel Pits Areas of extractive mining activities with significant surface expression.
- **33. Transitional** Areas of sparse vegetative cover (less than 25 percent that are dynamically changing from one land cover to another, often because of land use activities. Examples include forest clearcuts, a transition phase between forest and agricultural land, the temporary clearing of vegetation, and changes due to natural causes (e.g. fire, flood, etc.)
- <u>Forested Upland</u> Areas characterized by tree cover (natural or semi-natural woody vegetation, generally greater than 6 meters tall); Tree canopy accounts for 25-100 percent of the cover.
- **41. Deciduous Forest** Areas dominated by trees where 75 percent or more of the tree species shed foliage simultaneously in response to seasonal change.
- **42. Evergreen Forest** Areas characterized by trees where 75 percent or more of the tree species maintain their leaves all year. Canopy is never without green foliage.

- **43. Mixed Forest** Areas dominated by trees where neither deciduous nor evergreen species represent more than 75 percent of the cover present.
- <u>Shrubland</u> Areas characterized by natural or semi-natural woody vegetation with aerial stems, generally less than 6 meters tall with individuals or clumps not touching to interlocking. Both evergreen and deciduous species of true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions are included.
- **51. Shrubland** Areas dominated by shrubs; shrub canopy accounts for 25-100 percent of the cover. Shrub cover is generally greater than 25 percent when tree cover is less than 25 percent. Shrub cover may be less than 25 percent in cases when the cover of other life forms (e.g. herbaceous or tree) is less than 25 percent and shrubs cover exceeds the cover of the other life forms.
- <u>Non-natural Woody</u> Areas dominated by non-natural woody vegetation; non-natural woody vegetative canopy accounts for 25-100 percent of the cover. The non-natural woody classification is subject to the availability of sufficient ancillary data to differentiate non-natural woody vegetation from natural woody vegetation.
- **61. Orchards/Vineyards/Other** Orchards, vineyards, and other areas planted or maintained for the production of fruits, nuts, berries, or ornamentals.
- <u>Herbaceous Upland</u> Upland areas characterized by natural or semi- natural herbaceous vegetation; herbaceous vegetation accounts for 75-100 percent of the cover.
- 71. Grasslands/Herbaceous Areas dominated by upland grasses and forbs. In rare cases, herbaceous cover is less than 25 percent, but exceeds the combined cover of the woody species present. These areas are not subject to intensive management, but they are often utilized for grazing.
- <u>Planted/Cultivated</u> Areas characterized by herbaceous vegetation that has been planted or is intensively managed for the production of food, feed, or fiber; or is maintained in developed settings for specific purposes. Herbaceous vegetation accounts for 75-100 percent of the cover.
- **81. Pasture/Hay** Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops.
- **82.** Row Crops Areas used for the production of crops, such as corn, soybeans, vegetables, tobacco, and cotton.
- **83. Small Grains** Areas used for the production of graminoid crops such as wheat, barley, oats, and rice
- **84.** Fallow Areas used for the production of crops that are temporarily barren or with sparse vegetative cover as a result of being tilled in a management practice that incorporates prescribed alternation between cropping and tillage.

- **85.** Urban/Recreational Grasses Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses.
- <u>Wetlands</u> Areas where the soil or substrate is periodically saturated with or covered with water as defined by Cowardin et al.
 - **91. Woody Wetlands** Areas where forest or shrubland vegetation accounts for 25-100 percent of the cover and the soil or substrate is periodically saturated with or covered with water.
 - **92. Emergent Herbaceous Wetlands** Areas where perennial herbaceous vegetation accounts for 75-100 percent of the cover and the soil or substrate is periodically saturated with or covered with water

Dearborn River TMDL Planning Area: Appendix B

Table of Contents

SAMPLING AND ANALYSIS PLAN
DEARBORN RIVER MAINSTEM
MIDDLE FORK DEARBORN RIVER
SOUTH FORK DEARBORN RIVER
FLAT CREEK
WATER QUALITY DATA
BIOLOGICAL DATA AND REPORTS

SAMPLING AND ANALYSIS PLAN

DEARBORN RIVER MAINSTEM

	FISH KILL REPORT FORM
Waterbody Dear	born River
	number of person reporting kill
Tavatiator	
Investigators Geor	re Lilines
Date of fish kill	Date of investigation
Geographic extent of f	5 kill 8/2/289
Dead fish wer	e observed upstream of the Highway 287 bits
Portion of lake/stream	surveyed
Species and size of fish	killed Motthed Sculpins, Longnesse Dace
Number of fish killed (e.g. number per mile or number per acre)
Dead sculpin	e.g. number per mile or number per acre) and Longnesse Dace were observed scattered for water areas between the birdge & thermograph, especially in riffle areas
ghroughout Shell	low water areas between the under of mersing opport
Known or suspected ca	use of fish kill
Water temperson	fures exceeded critical thermal maximum.
Temperature measurem	nents 78F@ gage house @ 16:20
max on dhermayraph = 831	= 79F@ dhermographs@ 16;42 (N47.20116" W112.10/046
Dissolved oxygen measu	irements
Discharge measurement	is USGS gage (14073500) located at lower alked
end of area w	allent
Other measurements	
Thermograph data	
Water/fish samples colle	
Comments Eusite	and have been 500 + Pal
Handreds of front,	h substantially cooler water than surface water in
the Day and with	ining originates on left break within the rio-rap 12
immediately up	stream from sogage house, Upon spoking the fo
they would me	sue off the bank but once they got into the
not surface wait	h substantially cooler water than sortace water in spring originates on left bunk within the rip-rap 12 stream from boggage house. Upon spoking the to ove off the bank but once they got into the er, they would return to the cooler of area even when I stood on the bunk wigh
	I area teven when a should
spring intervence	

			Personnet: Laudlaw Banhon
001	11	Line +	Clork HUC 10030/189
Lat 4 0 1 4 2 1 4 2 1 4 2 1 1 4 2 1 1 1 1 1 1 1	action other than GPS? Y N	by method other than GPS? Y IN NITY what method used? If by map what is the map scale?	Obe): NAD
Samples Taken:		Sample ID/Elle I continue	
Water	Nutrients Metals Commons S	+	Sample Collection Procedure
Sediment		+	GKAB erro t
Macroinvertebrate [Macroinvertebrate Habitat Asmt.	Meeny-20 L	960-1
Algae/Macrophytes	Aduatic Plant Form	t	KICK HESS OTHER:
-	+-	XO	PERI-1) OTHER:
-		08- DAAC	CHLPHL-2 OTHER:
Habitat Assessment L	Stream Reach Asmt. Other		Dumman TWN
Substrate	□ Pebble Count □ % Fines □		the second secon
Transect [
Photographs [
Field Notes [
Other			
Measurements: 7	Time: // 00	Macroinvertebrate Kick Duration: 3. 6	
	Eet []		NOD Kick Length (PL): (60)
		owe visit comments;	
pH:	840		
SC: (mS/cm)	.275		
SC x 1000 =	umbo/cm		
DO: (mg/L)	902 1 98.2		
TUR: Clear Sight	t 🗆 Turbid 🗌 Opaque		
Turbidity Comments:	JTN TI		
	1.04 NTU		
		1 100 100 100 100 100 100 100 100 100 1	Hard N.V.

1					Station ID:	MIZORBIULO
1	Personnel: LA	dlaw }	Bowman		-	
I	**Distance from initial point	**Depth	"Velocity (at point)	**Width	"Area	**Discharge
1	15'	B	H			
8	17	.3	,/9			
	22	,68	.60		2 272.3	
	25	1.04	118			
	25	1.1	1.24			
	31	1.0	1.23			
	35	1.D	1.43			1
	35	1.15	.56			
	37	1,55	1.33			
	31	1.7	2.3			
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	43	1,25	1.69			
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MACROINVERTE	BRATE HABITAT ASSESSM	ENT FIELD FORM	RIFFLI	URUN PREVALENCE
Date: 7-24-0			03-0972	
Waterbody: Soul	born River Pelos	12	Site: MIADRAS	NIZOG
Personnel: (.Q.)	dlas idournas			
HABITAT	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
1.4. Riffle Development	Well-developed riffle; riffle as wide as stream & extends two times width of stream.	Riffle as wide as stream but length less than two times width.	Reduced riffle area that is not as wide as stream & its length less than two times width.	Purfles virtually non- existent
IA. score:	8-10	5-8	3-5	0.2
Commenta:				
1B. Benthic Substrate	Diverse substrate dominated by cobbie.	Substrate diverse with abundant cobble, but bedrock, boulders, fine gravel, or sand prevalent	Substrate dominated by bedrock, boulders, sand, or silt; cobble present.	Monotonous fine gravel, sand, silt, or bedrock substrate.
10. score: 10	3-10	6-8	3.5	0-2
Commenta:				
2. Embeddedness	Gravel, cobble, or boulder particles are between 0-25% surrounded by fine sediment (particles tess than 0.35 mm (-25")).	Gravel, cobble, or boulder particles are between 25-50 % surrounded by fine sediment.	Gravel, cobble, or boulder particles are between 50-75% surrounded by fine sediment.	Gravel, cobble, or boulder particles are over 75% surrounded by fine sediment.
2. score: 🕺	16-20	11-15	6-10	0-5
Comments:				
3. Channel Alteration (channelization, straightening, dredging, other alterations)	Channel alterations absent or minimal; stream pattern apparently in natural state.	Some channelization present, usually in areas of crossings, etc. Evidence of past atterations (before past 20 years) may be resent, but more recent channel alteration is not present.	New embankmenta present on both banks; d-80% of the stream reach channelized & disrupted.	Banks shored with gablen or sement; over 80% of the stream reach channelized & disrupted.
score: (i)	16-20	11-15	6-10	0-5
Commenta:				
4. Sediment Deposition	by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5- 30% of the bottom affected; slight deposition in pools.	new gravel, coarse sand on old & new bars; 30- 50% of the bottom affected; sediment deposits at obstructions, constrictions, & bends;	Neavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools aimcut absort due to substantial assiment deposition.
score: [C]	15-20	11.15	5-10	8-5
Commenta:		and the second sec		

5. Channel Flow Status	Water fills beseflow channel; minima amount of channel substrate exposed.	Water fills > 75% of the baseflow channel; < 25% channel substrate exposed.	Water fills 25-75% of the baseflow channel; riffle substrates mostly exposed.	Very little water in channel, & mostly present as standing pools.		
S. score:	16-20	11-15	5-10	0-5		
Comments:						
6. Bank Stability (score each bank) NOTE: Determine left or right side while facing downstream.	Banks stable; no evidence of erosion or bank failure; little apparent potential for future problems.	Moderately stable; Infrequent, small areas of erosion mostly healed over.	Moderately unstable; moderate frequency & size of erosional areas; up to 50% of banks in reach have erosion; high erosion potential during high flow.	Unstable; many eroded arras; "raw" areas Irequent along straight sections & bends; obvious bank sloughing; 60-100% of banks have erosion scars on sideslopes.		
Lacore: 10	9-10	6-6	3-5	8-2		
	Left Side / 💭	Average:				
	Right Side /)	bedrock to left side				
7. Bank Vegetation Protection (score each bank) NOTE: reduce scores for annual crops 8 weeds which do not hold soil well (e.g. knapweed).	Over 90% of the streambank surfaces covered by stabilizing vegetative disruption minimal or not evident; atmost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by vegetation; disruption evident, but not affecting hull plant growth potential to any great extent; more than one-half of potential plant height evident.	50-70% of the altreambank surfaces covered in vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less, than com-bail of potential plent height remaining.			
7. score: 10	9-10	6.1	3.5	0.2		
	Left Side	6-8 3-5 6-2				
	Flight Side 10	Comments: (bed ros	R downarding	an faffle		
8. Vegetated Zone Width (score each side)	Width of vegetated zone > 100 feet.	Width of vegetated zone 30-100 feet.	Width of vegetated zone 10-30 feet.	Width of vegetated zone < 10 feet.		
Lacorec D	3-10	6-8	3-8	0-2		
	Left Side /D	Average:				
	Right Side 10	Comments:				

TOTAL SCORE:

Score compared to maximum possible:

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			and the second se	ERUN PREVALENCE
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Personnel: / 6.	diana liberaman			
HABITAT	T			
PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
1A. Rittle Development	Well-developed riffle; riffle as wide as stream & extends two times width of stream.	Rittle as wide as stream but length less than two times width.	Reduced riffle area that is not as wide as stream & its length less than two times width.	Ruffles virtually non- existent
tA. score:	9-10	5-8	3.5	0-2
Commenta:				
1B. Benthic Substrate	Diverse substrate dominated by cobble.	Substrate diverse with abundant cobble, but bedrock, boulders, fine gravel, or sand prevalent	Substrate dominated by bedrock, boulders, sand, or silt; cobble present.	Monotonous fine gravel, sand, sill, or bedrock substrate.
1B, score: 10	9-10	6-8	3-5	0-2
Comments:	Ung mouth and	owied	11.5	
2. Embeddedness	Gravel, cobble, or boulder particles are between 0-25% surrounded by fine sediment (particles less than 6.35 mm (-25")).	Gravel, cobble, or boulder particles are between 25-50 % surrounded by fine sediment.	Gravel, cobble, or boulder particles are between 50-75% surrounded by fine sediment.	Gravel, cobble, or boulder particles are over 75% surrounded by fine sediment.
2. score:	16-20	11-15	6-10	0-5
Commenta:	in it is showed	-		
3. Channel Alteration (channelikation, straightening, dredging, other alterations)	Channel alterations absent or minimal; stream pattern apparently in natural state.	Some channelization present, usually in areas of crossings, etc. Evidence of past alterations (before past 20 years) may be resent, but more recent channel alteration is not present.	New embankments present on both banks; 40-80% of the stream reach channelized & disrupted,	Banks shored with gablen or cement; over 80% of the stream reach channelized & disrupted.
, score: 30	16-20	11-15	6-10	0-5
Comments:				
4. Sediment-Deposition	Little or no enlargement of bars & less than 5% of the bottom affected by sediment deposition.	Some new increase in har formation, mostly from coarse gravet; S- 30% of the bottom affected; slight deposition in pools.	new gravel, coarse sand on old & new bars; 30- 50% of the bottom affected; sediment deposits at obstructions, constrictions, & bends;	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
4. score:	15-20	11-15	6-10	0-5
Commenta:				

5. Channel Flow Status		aseflow channel; minima nannel substrate	Water filts > 75% of the baseflow channel; < 25% channel substrate exposed.	Water fills 25-75% of the baseflow channel; riffle substrates mostly exposed.	Very little water in channel, & mostly present as standing pools.		
5. score: 10		16-20	11-15	6-10	0-5		
Comments:							
 Bank Stability (score each bank) NOTE: Determine left or right side while facing downstream. 	or bank failu	r; no evidence of erosion re; little apparent future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over.	Moderately unstable; moderate frequency & size of erosional areas; up to 50% of banks in reach have erosion; high erosion potential during high flow.	Unstable; many eroded areas; "raw" areas frequent along straight sections & bends; obvious bank sloughing; 60-100% of banks have erosion scars on sideskopes.		
6. score: S. S.		8-10	6-8	3-5	0-2		
	Left Side	9	Average:				
	Right Side	8	Comments				
7. Bank Vegetation Protection (score each bank) NOTE: reduce scores for annual crops & weeds which do not hold soil well (e.g. knapweed).	covered by s vegetative di	the streambank surfaces tabilizing vegetation; supption minimal or not est all plants allowed to Y.	70-90% of the streambark surfaces covered by vegetation; disruption evident, but not affecting full plant growth potential to any great extent; more than one-half of potential plant height evident.	Less than 50% of the streambank surfaces covered by vegetation; extensive disruption of vegetation; vegetation removed to 2 inches or less.			
. score:		8-10	6-8	3-5	0-2		
	Left Side	8	Average:				
	Right Side		Commenta:				
t. Vegetated Zone Width (score sach side)	Width of vege	stated zone > 100 feet.	Width of vegstated zone 30-100 feet.	Width of vegetated zone 10-30 feet.	Width of vegetated zone < 10 feet.		
score: 15		8-10	6-8	3.5	0.2		
	Left Side	10:	Average				
	Right Side	9	Comments:				
OTAL SCORE:	B		Score compared to	maximum possibl	e:		

Waterbody Name County County Location MUC Station ID Witt # Location Albor Fails Creck MuC Lat	03-0824	Site Visit Form (One Station per page)	Trip ID: Control Date: 7/2//63
Ise Taken: Ise Taken: Cort Simple ID/File Location: Cut Macroinvertebrate Habitat Asmi. Simple ID/File Location: Macrophytes Macroinvertebrate Habitat Asmi. D3-0824 A Pibyli D3-0824 C D3-0824 C Pibyli D3-0824 C D3-0824 C Pibyli D3-0824 C D3-0824 C Reach D3-0824 C <thd< th=""><th>Name Not Dor Dor Processing #</th><th>County County County County Location Doc/Dro. Pacifical Dro. State Dro. Dro. Dro.</th><th>5 4 Clark HUC 100 30100 Clerch above FC diversion GPS Datum (Circle One): (NAD 27) NAD 83 WGS84</th></thd<>	Name Not Dor Dor Processing #	County County County County Location Doc/Dro. Pacifical Dro. State Dro. Dro. Dro.	5 4 Clark HUC 100 30100 Clerch above FC diversion GPS Datum (Circle One): (NAD 27) NAD 83 WGS84
Commons Commons Commons Commons ent Invertebrate Macroinvertebrate Macroinvertebrate Macrophytes Macroinvertebrate Macroinvertebrate D3_0824/A Pplyli Aquatic Plant Form D3_0824/A Pplyli Stream Reach Asmi. D3_0824/C Phylie Breach B3_0824/C Phylie Breach B3_0824/C Phylie Breach B3_0824/C etc Pebble Count % Fines etc Pebble Count % Fines etc Breach Bactoinvertebrate Kick Duration: w(cfs) W Macroinvertebrate Kick Duration: w(cfs) Macroinvertebrate Kick Duration: No Stem) Other Bactoinvertebrate Kick Duration: Macroinvertebrate Macroinvertebrate No	aken:	South the second se	IН
ent irverrebrate	E	-	Sample Collection Procedure
Invertebrate Macroinvertebrate Habitat Asmit D3-02-1 M Macrophytes Aguatic Plant Form D3-02-1 M Phyll a Aguatic Plant Form D3-02-1 M Phyll a Stream Reach Asmit 03-02-1 M Phyll a Stream Reach Asmit 00her Assessment Stream Reach Asmit Other It Assessment Stream Reach Asmit Other It Assessment Petble Count % Fines N et Internets Macroinvertebrate Kick Duration: N Votes Internets Est Site Visit Comments: N Macroinvertebrate Kick Duration: Macroinvertebrate Kick Duration: N N Math And Math Site Visit Comments: D D Math And And Site Visit Comments: D D D Math And And And And And D D		+	GRAB
Macrophytes Aquatic Plant Form Aquatic Plant Form B3-0824 C C B3-0824 C B3-0824 C B3-0824 C C C B3-0824 C C C B3-0824 C C C B3-0824 C C C C C C C C C C	Ø		SED-1
phyll a B B phyll a Stream Reach Asm. Other ate Pebble Count % Fines ate Pebble Count % Fines ct Pebble Count Macroinventetraite	13	1	KICK) HESS OTHER:
t Assessment Stream Reach Asmi. Other	Ø	D3-02-107	PERI-I OTHER:
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graphs Implies cotes Implies work Implies with Est. index Implies Stein Site Visit Comments: Stein Stein Stein Stein Stein Stein			
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Macroinvertebrate Kick Duration: 6 M + 6 Site Visit Comments: 000K 5000			
Site Visit Comments: Det Site Visit Comments:	Time: 1511	-	
Vem rat connents:		Le Mo	Kick Length (Pt.): 🕌 🔿
pH: 2011 2012 2012 2012 2012 2012 2012 201	w 13.44% A		Laganos
SC: (mS/cm) 270 pumbo/cm SC x 1000 = pumbo/cm DO: (mg/L) 2/2/ 7/2/ TUR: Clear Slight Turbid Opaque 1 Turbidity Comments 3/ //70	1		0
SC x 1000 = jumbo/cm DO: (mg/L) 9.9.4.4.5.7.9.5 TUR: Clear [] Slight [] Turbid [] Opaque [] Turbidity Comments: 9.07.0			
DO: (mg/L) 9.44/95/00 TUR: Clear Slight Turbid Opaque Turbidtity Comments: 54/070			
TUR: Clear Slight Turbid Opaque	9441 451		
Turbidity Comments: 54 NTO	ur 🖾 Slight 🗌 Turbid 🗍 Opaque 🦳		
	minents: 54 NTO		
-95 NTO	195 NTU		

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TOT Date:	AL DISCHA	ARGE:	1	Site Visit Code:	03-0824	
200020		and a second	un above a	INTISTER.	Station ID:	MIDDRENUR
		shall Ting	C. C. C. C. D.		Junior 10.	100000000000000000000000000000000000000
Liter 1	istance from	a statistic second and	"Velocity (at	NAMES OF COLUMN STREET, OC	Later and the second second second	In case of the second second
	titial point	Depth	point)	**Width	"Area	**Discharge
1 1	4,4 100		0	1		
2	all	0.62	1.21			
3 0	5.9	0.78	2:35			
	0.4	1.08	2.34			
5 12	. 4	1.27	2.24			
6 14	1.4	1.105	163			
7 14	6.4	1,20	2.58			
8 /8	5.4	1.18	2:32			
9 20		1,20	3.02			
10 22	. 4	1.25	3.25			
	4.4	1.08	2.36			
	6.4	1.25	2.74			
	8.1	1.12	2.13			
	34	6.95	1.48			
15 32		126	2.30			
16 34		128	3.05			
7 36.		1,10	2,83			
18 38		0.88	1.28			
19 40.		0.95	3.6/			
20 12		0.63	3.82			
1 14.		1.80	2.20			
2 46		0,60	1.04			
13 48		0.45	0.48			
4 50		0.10	1.08			
5 52	2 151	B	ø			
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Data Mgmt. Approved

			SUBS	TRATE	DEQ/MD	м		Revised 3/2003 DMA
Date:	7124103				Site Vi	sit Code	03-0	824
Waterbo	dy: De	who	a Rue	Noove F	STORET S	tation ID	MIDD	RENROS
Personne	el: Stal	M	na					
			Р	EBBLE C	OUNT		_	_
Row ID	Particle Categ	ory	Size (mm)	Riffle Count	(Other) Count	Chara	cteristic Gro	up: PEBL-CNT
		-		-		Sum	% of Total	Cum. Total
1	Silt / Clay		<1		1	0		0.00%
2	Sand		1-2		55	0	1	0.00%
3	Very Fine	_	2-4			0		0.00%
4	Fine		4-6		27	0		0.00%
5	Fine	-	6-8			0		0.00%
6	Medium	S	8 - 12	1	::	0		0.00%
7	Medium	GRAVELS	12 - 16	3	1	0		0.00%
8	Coarse	0	16 - 22		1:	0	1.1	0.00%
9	Coarse	1	22 - 32	**	3-4 9-7	0		0.00%
10	Very Coarse	1	32 - 45	÷	55	0		0.00%
11	Very Coarse	1	45 - 64	E	20	0		0.00%
12	Small		64 - 90	A	11	0		0.00%
13	Small	COBBLES	90 - 128	区::	5-	0		0.00%
14	Large	COB	128 - 180	NG	tr.	0		0.00%
15	Large		180 - 256	12		0		0.00%
16	Small		256 - 362	1		0		0.00%
17	Small	RS	362 - 512	*		0		0.00%
18	Medium	BOULDERS	512 - 1024			0		0.00%
19	Large	B	1024 - 2048			0		0.00%
20	Bedrock		> 2048			0		0.00%
21	Total # Samples			0	0	0	0.00%	

Pebble Count Data Entry Form

Waterbody Name Waterbody Name Station ID Lat Long Station ID Lat Long Lat Lat Long Lat Lat Long Lat Lat Lat Long Lat Lat Long Lat Lat Long Lat			(One Station per page)	Trip ID: Joseph Date: Date:
Verified? By GPS Datum (Crece On Sample ID/File Location: Commons Sample ID/File Location: Commons Mark and the map scale? Commons Mark and the control of the map scale? Mark Asmt. Commons Mark and the map scale? Mark Asmt. Mark and the map scale?	Name Dardos	Visit # Locat	County Lance & Clark	HUC 10030/02
Commons Sample ID/File Location: Commons Commons Kample ID/File Location: Commons Commons Kample ID/File Location: Nature Commons Comments Kample ID/File Location: Kample ID/File Locati Kample ID/File Location: Kample ID/File Location: Kample ID/	Lon Long obtained by method other	than GPS? Y 🗌 N 🗍 If Y wh	'erified? □ By GPS Datum (C at method used? If by map what is the map s	rele One): NAD 27 NAD 83 WGS84 ale?
Commons Co	ples Taken:		Samula ID/DULT and a	IН
Initial Asmt. Initial Asmt. Initial Asmt. I		S Metals Commone N	combine treat into Forcation:	Sample Collection Procedure
vitat Asmt. Other Other Naccoinvertebrate Kick Duration: K Naccoinvertebrate Kick Duration: K Ven			Contraction of the second second	GRAB
Other Other Other Other Nacroinvertebrate Kick Duration: K K K K K K K K K K K K K K K K K K K		Vertebrate Habitat Assort	1	. SED-1
Other PERL-1 OTHER Incs CHL PHL-2 Incs CHL PHL-2 Macroinvertebrate Kick Duration: Purpose: Macroinvertebrate Kick Duration: Kick Length (Pt) View Site Visit Comments:		Plant Form		
Other CH1.PHL-2 nes Purpose: nes Purpose: Macroinvertebrate Kick Duration: Kick Length (Pt) Site Visit Comments: Kick Length (Pt)	Ø		and have a lot	PERI-1 OTHER:
Macroinvertebrate Kick Duration: Site Visit Comments:		teach Acres Coher C	さんできょう くろうとうろう ひかき パーローをつき	CHLPHL-2 OTHER:
Macroinvertebrate Kick Duration: Site Visit Comments:	C			Purpose:
Macroinvertebrate Ktek Duration: Site Visit Comments: Vem		VUIL TO FINCE		
Macroinvertebrate Kick Duration: Site Visit Comments:	phs			
Macroinvertebrate Kick Duration: Site Visit Comments: Vem	1 Notes			
Macroinvertebrate Kick Duration: Site Visit Comments: Vem	T.			
Verm	Time:	Marrie	tioned from the second se	
			te Concersion Nick Duration:	Kick Length (Ft.):
H: C: (mS(cm) C: (mS(cm)) C: (mgL) O: (mgL) UR: Clear S Sight □ Turbid □ Opaque □ urbidity Comments:		-	A Comments:	
CC: (mS(cm) CC ± 1000 = µmho/cm DO: (mg/L)		Sec.	make to fall and	
EC x 1000 = µmho/cm D0: (mg/L) . D1: (mg/L) . UR: Clear Slight [] Turbid [] Opaque [] Nublidity Comments:	(mS/cm)		A THE PER TRANS	
O: (mg/L)	1000 ==	tunho/em	0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
UR: Ctear Sight Turbid Opaque	(mg/L) ·		10 - 10 - 00 - 00 - 00 - 00 - 00	at date I tool
	: Clear Slight Turbid dity Comments:	Opaque		
			and the second sec	
			A ST	

	TOTAL DISCHAR			Site Visit Code:	03-0712	
	Waterbody:		a a Hay			MIDDRBNR
	Personnel:	Hadaw	buinne	1.		
	2	1.	in a second second	1		In the second second
	**Distance from initial point	**Depth	**Velocity (at point)	**Width	"Area	**Discharge
1						
2				1		
3						
4						
5	1					
6						
7		A 3	2			
8			0			
9		1			1	
10					1 2	
11			1 de	3		
12			1.18	12/	-	
13			1841	1		
15			1			
6			1			100
7			1			
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Z.	alter + in					
8						
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Page 1 of 2

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wheed 4/2003 NOTE: First blank is used to mark the bank. Begin measurements from the left bank (determine left bank while looking downstream). Initial point is often the tape reading of the waterline & has no depth or velocity to measure. If this is the case, the first measurement is made at the first point where there is adequate depth (at least 0.2 ft) and measurable velocity. The value for the "Distance from initial point" field is not necessarily the tape reading. Make sure it is reflective of the true distance from the bank. If there is a sharp drop in water level near the bank, you must compensate for the discharge that is occurring near the bank. To do so, you must insert a "dummy" value in the first "distance" blank. This value should be equal to the second value (i.e. the first measurement). At points where there is stagnant water or backflow effects, begin and end measurements at the edge of where positive flow can Read depths on wading rod ignoring the "pile-up" effect of water on the rod. Velocity is measured at six-tenths depth from the water surface by moving the probe support so that the foot indicator marks align 25 to 30 cross-sections are adequate to reduce the level of error. Sections should be spaced so none contain more than 10% of the flow. Ideal measurements have less than 5% in a section. 顶路 Page 2 of 2 Data Mgmt. Approved

	Stream Classifi	cation	Revised 3/2003
Date: 017-03		Site Visit Code	: 03-0713
Waterbody: brackson	River la Hay 3	Station ID:	Mankenver
Personnel: TT(Ladlac	a Baunson)		
Bankfull Width (W _{bkl}) WIDTH of the stream channel, at bar	skfull stage elevation, in a ri	200. 2	- 6.04 Log
Mean DEPTH (d _{bk}) Mean DEPTH of the stream channel riffle section.	cross-section, at bankfull si	tage elevation, in a	-FL Stat los
Bnkfl. X-Section AREA (A _{bkt}) AREA of the stream channel cross-se	ection, at bankfull stage ele	vation, in a ritfle sectio	Sq. Ft. n.
Width/Depth RATIO (W _{bid} / d _b Bankfull WIDTH divided by bankfull m		tion.	<u> </u>
Maximum DEPTH (d _{mbkt})			Ft.
Maximum depth of the bankfull chann bankfull stage and thalweg elevations	el cross-section, or distanc , in a riffle section	e between the	
WIDTH of Flood-Prone Area (W _{fpa})	210.3	Ft.
Twice maximum DEPTH, or (2 x d _{max} WIDTH is determined. (riffle section)) = the stage/elevation at w	hich flood-prone area	
Entrenchment Ratio (ER)			-
The ratio of flood-prone area WIDTH ((riffle section)	divided by bankfull channel	WIDTH. (Wtpa / Wbed)	
Channel Materials (Particle S	ize Index) D50 _	N	mm.
The D50 particle size index represents sampled from the channel surface, be	s the median diameter of ch tween the bankfull stage ar	nannel materials, as nd thalweg elevations.	10 47 PEN
Water Surface SLOPE (S)			FL/FL (107) WPG
Channel slope = "rise" over "run" for a widths in length, with the "riffle to riffle" at bankfull stage.	reach approximately 20-30 water surface slope repres) bankfull channel senting the gradient	= Imle
Channel SINUOSITY (K)	_		map
Sinuosity is an index of channel patten livided by valley length (SL/VL); or est shannel slope (VS/S).	n, determined from a ratio of imated from a ratio of valle	of stream length y slope divided by	
Stream Type			
Comments:			
Comments: Upskiews Sog Dist 1805			
			Data Mgmt. Approved

			SUBS	TRATE	DEQ/MD	м		
Date:	6-17-03				Site V	isit Code	: D3-07	in.
Waterbo	dy: Machine							
	el: TT//a.dk				STORETS	Jaconio		
Personne		ur j		and the second second				
		_	P	EBBLE C		-		
Row ID	Particle Categ	ory	Size (mm)	Riffle Count	(Other) Count	Chara	cteristic Grou	p: PEBL-CNT
						Sum	% of Total	Cum. Total
1	Silt / Clay		<1	M		0		0.009
2	Sand		1-2	12.		0	1	0.00%
3	Very Fine		2-4			0		0.00%
4	Fine		4-6	*		0		0.00%
5	Fine	1	6-8	a		0		0.00%
6	Medium	S	8 - 12	11		0		0.00%
7	Medium	GRAVELS	12 - 16	8-0 1 .		0		0.00%
8	Coarse	G	16 - 22	ti -		0		0.00%
9	Coarse	1	22 - 32	区;		0		0.00%
10	Very Coarse		32 - 45	図:		0		0.00%
11	Very Coarse		45 - 64	X.::		0		0.00%
12	Small		64 - 90	X:		0		0.00%
13	Small	COBBLES	90 - 128	11		0		0.00%
14	Large	COB	128 - 180			0		0.00%
15	Large		180 - 256			0		0.00%
16	Small		256 - 362	1.1		0		0.00%
17	Small	BS	362 - 512			0		0.00%
18	Medium	BOULDERS	512 - 1024			0		0.00%
19	Large	B	1024 - 2048			0		0.00%
20	Bedrock		> 2048			0		0.00%
21	Total # Samples			0	0	0	0.00%	

Pebble Count Data Entry Form

	Stream Reach Assessment Form
Station ID:	12 DA BIN BOH Date: 0-17-03 Site Visit Code: 03-07/2
	Beachard River Reach Longth: 12 and
Waterbody Seg II	
Station ID's on rea	
Question 1, Stree	
8 = channel stable	a, no active downcutting occurring; old downcutting apparent but a new, stable riparian area has formed with el. There is perennial riparian vegetation will established in the riparian area. (Stage 1 and 5, Schumm's
	vidence of old downcutting that has begun stabilizing, vegetation is beginning to establish, even at the base o solid disturbance evident. (Stage 4).
4 = small headcut,	in early stage, is present. Immediate action may prevent further degradation (early Stage 2).
	nel incised, actively widening, limited new riparian area/floodplain, floodplain not well vegetated. The present is mainly pioneer species. Bank failure is common. (Stage 3)
	y incised, resembling a gully, little or no riparian area, active downcutting is clearly occurring. Only occasions s access the flood plain. Tributaries will also exhibit downcutting/headcuts. (Stage 2)
The presence of a	ctive headcuts should nearly always keep the stream reach from being rated sustainable.
Actual Score:	Potential Score:
Comments	
Question 2, Perce	ent of Streambanks with Active Lateral Cutting:
	erosion is in balance with the stream and its setting hal amount of active lateral bank erosion occurring
4 = there is a minim	
4 = there is a minin 2 = there is a mode	nal amount of active lateral bank erosion occurring
4 = there is a minin 2 = there is a mode 0 = there is excessi	nal amount of active lateral bank erosion occurring rate amount of active lateral bank erosion occurring
4 = there is a minin 2 = there is a mode	nal amount of active lateral bank erosion occurring rate amount of active lateral bank erosion occurring ve lateral bank erosion occurring
4 = there is a minin 2 = there is a mode 0 = there is excessi Actual Score: Comments Question 3, The St	hal amount of active lateral bank erosion occurring rate amount of active lateral bank erosion occurring ve lateral bank erosion occurring
<pre># = there is a minin 2 = there is a mode 0 = there is excessi Actual Score: Comments Duestion 3, The St = the stream exhit</pre>	hal amount of active lateral bank erosion occurring rate amount of active lateral bank erosion occurring ve lateral bank erosion occurring
there is a minim there is a mode there is a mode there is excessi Actual Score: Comments the stream exhit xpected in a stable	hal amount of active lateral bank erosion occurring rate amount of active lateral bank erosion occurring ve lateral bank erosion occurring
4 = there is a minim 2 = there is a mode 0 = there is excessi Actual Score: Comments Question 3, The St xpected in a stable = sediment clogge	al amount of active lateral bank erosion occurring rate amount of active lateral bank erosion occurring we lateral bank erosion occurringPotential Score: ream is in Balance with the Water and Sediment Being Supplied by the Watershed: bits no excess sediment/bedload deposition, sediment occurs on point bars and other locations as would be , dynamic system d gravel's are apparent in riffles or pools, or other evidence of excess sediment apparent
there is a minim there is a mode there is a mode there is excessi total Score: comments the stream exhit xpected in a stable sediment clogge mid-channel ban	al amount of active lateral bank erosion occurring rate amount of active lateral bank erosion occurring we lateral bank erosion occurringPotential Score: ream is in Balance with the Water and Sediment Being Supplied by the Watershed: bits no excess sediment/bedload deposition, sediment occurs on point bars and other locations as would be , dynamic system d gravel's are apparent in riffles or pools, or other evidence of excess sediment apparent
4 = there is a minin 2 = there is a mode 0 = there is excessi Actual Score: Comments Duestion 3, The St = the stream exhill xpected in a stable = sediment clogge = mid-channel ban = stream is braider	hal amount of active lateral bank erosion occurring rate amount of active lateral bank erosion occurring ve lateral bank erosion occurring Potential Score:
4 = there is a minim 2 = there is a mode 0 = there is excessi Actual Score: Comments Question 3, The St is = the stream exhit xpected in a stable = sediment clogge = mid-channel ban	hal amount of active lateral bank erosion occurring rate amount of active lateral bank erosion occurring ve lateral bank erosion occurring

10 A.						
	alant Call Dears	nt to Hold Water and	Act as a Reol	ing Medium	n:	
		rea with sufficient soil t				
		with sufficient soil to h				
		with sufficient soil to h				
0 = 35% or less of	the riparian area	with sufficient soil to he			ang meaium	
Actual Score:		- Potential Score:	3	-		
Comments						
Question 5, Perc ratings for most r	ent of StreCnba	nk with Vegetation ha	wing a Deep,	Binding Ro	ootmass: (see Ap	pendix I for stability
		nk comprised of plant s	pecies with d	eep, binding	root masses	
4 = 60% to 80% of	the streambank	comprised of plant spe	cies with deep	, binding roo	ot masses	
2 = 30% to 60% of	the streambank	comprised of plant spe	cies with deep	binding roo	t masses	
2 = 30 % to 00 % 01	of the streamban	k comprised of plant sp	ecies with de	ep binding m	oot masses	
	/1		1000			
Actual Score:	- 1	Potential Score:				
	0000	t was diff	Mart h	03 V.00	to grave	
Comments	0			0		
3 = No noxious wee 2 = 0-1% of the rips 1 = 1%-5% of the ri 0 = over 5% of the rips Actual Score:	arian area has no iparian area has r	noxious weeds	3			
Comments	-					
Juestion 7, Distur	bance-Caused L	Indesirable Plants:				
		as undesirable plants				
= 1%-5% of the rig						
		undesirable plants				
		s undesirable plants				
	and the set of the set		. 3			
ctual Score:		Potential Score:	~	-		
Comments				-		
			1.00			SBAF xis

Question 8, Wood potential for woody		blishment and Regenerati	ion: (Note: Skip this question if the riparian a	area has no
8 = all age classes	of native woody i	riparian species present (se	e table, Fig 2)	
and shrubs, there m	ay be one age c	parian species clearly abser lass of each absent. Often, class present indicate poter	nt, all others well represented. For sites with it will be the middle age group(s) that is (are) ntial for recovery.	potential for trees lacking, Having
		n shrubs and/or two age cla mature, decadent or dead pl	sses of riparian trees clearly absent, other(s) lants	well represented,
2 = disturbance indu dominate. Re-evalu	iced, (i.e., faculta ate Question 1, i	ative, facultative upland specific incisement, if this has happed	cles such as rose, or snowberry) or non-ripari ened.	an species
0 = some woody spe evaluated to ensure cedar	ecies present (>1 that it has poten	0% cover), but herbaceous tial for woody vegetation). C	species dominate (at this point, the site poter OR, the site has at least 5% cover of Russian	ntial should be re- olive and/or salt
Actual Score:	7	Potential Score:	8	
Comments	mare	suparians. Urg	Lupskee.an	
Question 9, Utilizat	tion of Trees an	d Shrubs: (Note: Skip this	question if the riparian area has no potential f	or woody
	able second year	r and older stems are brows	and	
		ear and older stems are brown		
	SM 255 Roll 100 SM	year and older stems are b		
	f the available se	cond year and older stems	are browsed. Many of the shrubs have either	r a "clubbed"
0 = there is noticeable	e use (10% or me	ore) of unpalatable and norr	mally unused woody species.	
Actual Score:	4	Potential Score:	1	
		1 01011110 00010.		
Comments	-			
Question 10, Riparia	an/Wetland Veg	stative Cover in the Ripar	ian Area/Floodplain and Streambank:	
= 85% or more of th	e riparian/wetlan	d plant cover has a stability	rating ≥ 6	
= 75%-85% of the rij	parian/wetland pl	lant cover has a stability rati	ng ≥ 6	
= 65%-75% of the rip	parian/wetland pl	lant cover has a stability rati	ng ≥ 6	
= 55%-65% of the rip	parian/wetland pl	ant cover has a stability rati	ng ≥ 6	
= less than 55% of th	he riparian/wetlar	nd plant cover has a stability	/ rating ≥ 6	
ctual Score:	6	Potential Score:		
	mush	- Arth-ArtChill (200-10000000-		
comments _	eal	downord ustra	5	
-				_
				100000
		3		SRAF vie

Question 11, Riparian Area/Floodplain Characteristics are Adequate to Dissipate Energy and Trap Sediment.

6 = active flood or overflow channels, large rock, or woody material present and adequate to dissipate energy and trap sediment. There is little surface erosion and no evidence of long, continuous erosional areas on floodplain/riparian area or streambank. There are no headcuts where either overland flow and/or flood channel flows return to the main channel.

4 = rock and/or woody material is present, but generally of insufficient size to dissipate energy. Some sediment trapping occurring. Occasional evidence of surface erosion. Generally not severe enough to have developed channels.

2 = inadequate rock and/or woody material available for dissipation of energy or sediment trapping. There is surface erosion (scouring) and occasional headcuts where overland flows or flood channel flows return to the main channel.

0 = riparian area/floodplain lacking any of these attributes: 1)adequate flood or overflow channels, 2) large rock, or 3) woody material suitable for energy dissipation and sediment trapping. Erosional areas are long and continuous. Lacking vegetation or substrate materials adequate to resist further erosion. Surface erosion is obvious on the floodplain/riparian area. Headcuts are present that have the potential to create meander cut-offs.

Actual Score:

Potential Score:

Comments

		SUMMARY				
QUESTION QUESTION QUESTION QUESTION QUESTION QUESTION	2: 3: 4: 5: 6:	Stream Incisement Lateral Cutting Stream Balance Sufficient Soil Rootmass Weeds Undesirable Plants		Actual Score 0 0 0 0 0 0 0 0	Possible Points 0, 2, 4, 6, 8 0, 2, 4, 6 0, 2, 4, 6 0, 2, 4, 6 N/A, 0, 1, 2, 3 N/A, 0, 2, 4, 6 0, 1, 2, 3 0, 1, 2, 3	Potential Score 0 0 0 0 0 0 0 0 0
QUESTION		Woody Species Establishment		0	N/A, 0, 2, 4, 6, 8	0
QUESTION		Browse Utilization		0	N/A, 0, 1, 2, 3, 4	0
QUESTION		Riparian/Wetland Vegetative Cover *		0	N/A, 0, 2, 4, 6, 8	0
QUESTION		Riparian Area/Floodplain Characteristics *		0	N/A, 0, 2, 4, 6	0
		1	otal	0	61	0
Potential Sc	ore for I	most Bedrock or Boulder streams (questions 1, 2, 3, 6, 7, 11)		0	(32)	0
P ¹ tential Sc	ore for i	nost low energy *E* streams (questions 1 - 7, 10, 11)		0	(49)	0
RATING:	÷.	Actual Score X 100 = % rati Potential Score	ng	#DIV/0!		
		80-100% = SUSTAINABLE 50-80% = AT RISK LESS THAN 50% = NOT SUSTAINABLE				
• Only in ce	rtain, sp	ecific situations can both of these receive an "N/A".				
						19
						DDAE ute

					and the second sec	
	Montana Depar	tment of Envir	onmental Qu	ality Suppleme	ntal Questions	
The search for the se					nual succettoris	
	e questions does not hese questions must		1	Contract of Contra		
Question 12. Fish	neries 'abita' / Stre	am Complexity	Note: the answe	ers to question 12	will be averaged	
	pools, wood, debri		egetation, bould	iers, root wads, u	ndercut banks an	d/or aquatic
6 = Fish habitat is o	common (see above)).				
	noticeably reduced. and/or aquatic vege			oody debris, under	rcut banks, overha	anging vegetation,
2 = Pools and habit	at features are spar	se or non-existen	t or there are fis	h barriers.		
0 = There is not end	ough water to suppo	rt a fishery				
N/A = Stream wouk	d not support fish un	der natural condit	tions			
Actual Score:	6	Potential Score	x 6			
		C	dia la la	Date wood		
	- manu	broder h	COLLEMAN.	the of the	J. G. G.	New York
Comments					7	
	enile and adult cover		1997 To 1997 Ave. 1997		igia are present.	
	r juvenile cover type	s are present. Hi	gh flow refugia	are reduced.		
) = High flow refugia				1.1		
V/A = Stream would	I not support fish und	ler natural conditi	ons			
Actual Score:		Potential Score				
	m 5500	late up	deno o	cels to pac	leto	
Comments	0		0.0	1. 19		Contraction (State
	-					
	bitat (salmonid stre pawning substrate, n		wning areas, ar	nd composition of	spawning substra	ate are excellent.
= Areal extent of s	pawning substrate, n	norphology of spa	wning areas, ar	nd/or quality of sp	awning substrate	reduced.
	pawning substrate, m					
	not support fish unde					ground to a solution
ctual Score:	2	Potential Score:	0			
	1.1.	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1	-		
	- 1052	11. 127(10)342	Laurante-			
omments	155					
					_	1
				10 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	So inter	8. m.
			5			SRAF.xls

12d. Fish Passa 8 = No potential fish	ge h passage barriers appi	arent.	
	assage barriers present		
	d not support fish under		
Actual Score:		Potential Score:	
Comments	-		
12e. Entrainment 8 = Entrainment of	fish into water diversion	is not an issue.	
4 = Entrainment of	fish into water diversion	s may be a moderate issue.	
) = Entrainment of	fish into water diversion	s may be a major issue.	
Actual Score:		Potential Score:	
Comments			
2a-e Avg. Score	Actual Score	0 Potential Score	<u>0</u>
Question 13. Sola	r Badiation		
- More than 75%	of the stream reach is a	adequately shaded by vegetation.	
SE MOTE that 75%	tream reach does not h	ave adequate shading or the water tem	perature is probably elevated by irrigation,
t = 50-75% of the s	tream reach does not h	ave adequate shading or the water term	perature is probably elevated by irrigation,
a = 50-75% of the s = Approximately 2	tream reach does not h 25-50% of the stream do	ave adequate shading or the water tem bes not have adequate shade.	
t = 50-75% of the s a = Approximately 2 b = More than 75%	tream reach does not h 25-50% of the stream do of the stream reach doe y irrigation, etc.	ave adequate shading or the water tem bes not have adequate shade. es not have adequate shade by vegetat	perature is probably elevated by irrigation,
4 = 50-75% of the s 3 = Approximately 2	tream reach does not h 25-50% of the stream do of the stream reach doe y irrigation, etc.	ave adequate shading or the water tem bes not have adequate shade.	
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% frastically altered by Actual Score:	tream reach does not h 25-50% of the stream do of the stream reach doe y irrigation, etc.	ave adequate shading or the water tem bes not have adequate shade. es not have adequate shade by vegetat	
 a = 50-75% of the s b = Approximately 2 b = More than 75% castically altered by actual Score: comments 	tream reach does not h 15-50% of the stream do of the stream reach doe y irrigation, etc.	ave adequate shading or the water tem bes not have adequate shade. es not have adequate shade by vegetat	
a = 50-75% of the s = Approximately 2 = More than 75% rastically altered by actual Score: Comments	e growth / Nutrients	ave adequate shading or the water tem bes not have adequate shade. es not have adequate shade by vegetat rotential Score:	
e = 50-75% of the s = Approximately 2 = More than 75% rastically altered by actual Score: Comments Comments Euestion 14. Algae = Algae not appare	e growth / Nutrients ent. Rocks are slippery.	ave adequate shading or the water tem bes not have adequate shade. es not have adequate shade by vegetat rotential Score:	
= 50-75% of the s = Approximately 2 = More than 75% rastically altered by ctual Score: comments uestion 14. Algae = Algae not appare = in small patches	tream reach does not h 15-50% of the stream do of the stream reach doe y irrigation, etc. 	ave adequate shading or the water tem bes not have adequate shade. es not have adequate shade by vegetat rotential Score:	
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 a = 50-75% of the s b = Approximately 2 c) = More than 75% trastically altered by actual Score: c) = Algae not appare c) = Algae not appare c) = in small patches c) = in large patches c) = Mats cover botto i/A = No water 	tream reach does not h 15-50% of the stream do of the stream reach doe y irrigation, etc. e growth / Nutrients ent. Rocks are slippery. or along channel edge or discontinuous mats om (hyper enriched cond	ave adequate shading or the water term bes not have adequate shade. es not have adequate shade by vegetat rotential Score:	ion or the water temperature is probably
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Question 15. Sur	face oils, turbio	lity, salinization, precipitants	on stream bottom and/or wat	er odor
6 = none				
4 = Slight				
2 = Moderate				
0 = Extensive				
N/A = No water				
Actual Score:	6	Potential Score:		
Comments				
Question 16. Bacte	ria			
4 = There are no kno	wn anthropoger	lc sources of bacteria		
2 = Likely sources of	bacteria are pre	sent. Wastewater or concentra	ted livestock operations are the	most common sources.
0 = Feedlots are com	imon or raw sev	age is entering the stream		
Actual Score:	4	Potential Score: 4		
Comments	_			
lies, caddis flies and/ ? = The stream is don) = Macroinvertebrate	or stone flies. ninated by pollut s are rare or ab:	erse community of macroinverte on tolerant taxa such as fly and sent		
I/A = Stream reach is	ephemeral			
ctual Score:	4	Potential Score:		
omments -				
-				
	1.1			
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
		7		SRAF xis

Quet. ion 18. Irrigation impacts (Assess during critical low flow periods or you may neet: to inquire locally about this. Evaluate effects from de-watering or inter-basin transfer of water.) 8 = There are no noliceable impacts from irrigation 6 = Changes in flow resulting from irrigation practices are noticeable, however flows are adequate to support aquatic organisms. 4 = Rows support aquatic organisms, but habitat, especially riffes are drastically reduced or impacted. 2 = The flow is low enough to severely impair aquatic organisms 0 = All of the water has been diverted from the stream N/A = Stream reach is ephemeral. Actual Score: Potential Score: 2 modules practices do not appear to significantly impact water quality or the riparian vegetation. Any impacts that occur appear to be antural. 6 = There are some signs of impact from landuse activities such as grazing, dryfand agriculture, irrigation, feedlots, mining, timber harvesting, urban, roads, etc. 4 = Impacts from landuse activities are obvious and occur throughout most of the stream reach. For example, there are obvious signs of human induced erosion, saline seeps or overgrazing within the watershed. 2 = Landuse impacts are significant an widespread. Visual observation and photo documentation would provide overwholding evidence that the stream has lost most of its natural features. The stream does not appear to be capable to support to stream significant and widespread. 2 = Landuse impacts are so intrusive that the stream has lost most of its natural features. The stream doe					
6 = Changes in flow resulting from irrigation practices are noticeable, however flows are adequate to support aquatic organisms. 4 = Flows support aquatic organisms, but habitat, especially riffles are drastically reduced or impacted. 2 = The flow is low enough to severely impair aquatic organisms 0 = All of the water has been diverted from the stream N/A = Stream reach is ephemeral. Actual Score: Potential Score: Potential Score:	Quet ion 18. Irrig Evaluate effects fro	ation impacts m de-watering o	(Assess during critical or inter-basin transfer o	low flow periods or you may need to in if water.)	quire locally about this.
organisms. 4 = Flows support aquatic organisms, but habitat, especially rifles are drastically reduced or impacted. 2 = The flow is low enough to severely impair aquatic organisms 0 = All of the water has been diverted from the stream N/A = Stream reach is ephemeral. Actual Score: Potential Score: Comments Councetion 19. Landuse activities – Sources 8 = Landuse practices do not appear to significantly impact water quality or the riparian vegetation. Any impacts that occur appear to be natural. 6 = There are some signs of impact from landuse activities such as grazing, dryland agriculture, irrigation, feedlots, mining, timber harvesting, urban, roads, etc. 4 = Ingacts from landuse activities are obvious and occur throughout most of the stream reach. For example, there are obvious signs of human induced erosion, saline seeps or overgrazing within the watershed. 2 = Landuse impacts are so intrusive that the stream has lost most of its natural features. The stream does not appear to be capable to support most forms of aquatic life Actual Score: Potential Score:	8 = There are no no	ticeable impact	s from irrigation		
2 = The flow is low enough to severely impair aquatic organisms 0 = All of the water has been diverted from the stream N/A = Stream reach is ephermeral. Actual Score:		resulting from i	rrigation practices are	noticeable, however flows are adequa	te to support aquatic
0 = All of the water has been diverted from the stream N/A = Stream reach is ephemeral. Actual Score:	4 = Flows support a	quatic organism	is, but habitat, especia	lly riffles are drastically reduced or imp	acted.
N/A = Stream reach is ephemeral. Actual Score:	2 = The flow is low (enough to sever	ely impair aquatic orga	anisms	
N/A = Stream reach is ephemeral. Actual Score:	0 = All of the water	has been diverte	ed from the stream		
Actual Score:					
Comments		0		2	
Question 19. Landuse activities – Sources 8 = Landuse practices do not appear to significantly impact water quality or the riparian vegetation. Any impacts that occur appear to be intrust. 6 = There are some signs of impact from landuse activities such as grazing, dryland agriculture, irrigation, feedlots, mining, timber harvesting, urban, roads, etc. 4 = Impacts from landuse activities are obvious and occur throughout most of the stream reach. For example, there are obvious signs of human induced erosion, saline seeps or overgrazing within the watershed. 2 = Landuse impacts are significant and widespread. Visual observation and photo documentation would provide overwhelming evidence that the stream is impaired. 0 = Land use impacts are so intrusive that the stream has lost most of its natural features. The stream does not appear to be capable to support most forms of aquatic life Actual 0 Total Potential Score:	Actual Score:		- Potential Score:	0	
Question 19. Landuse activities – Sources 8 = Landuse practices do not appear to significantly impact water quality or the riparian vegetation. Any impacts that occur appear to be natural. 8 = There are some signs of impact from landuse activities such as grazing, dryland agriculture, irrigation, feedlots, mining, timber harvesting, urban, roads, etc. 4 = Impacts from landuse activities are obvious and occur throughout most of the stream reach. For example, there are obvious signs of human induced erosion, saline seeps or overgrazing within the watershed. 2 = Landuse impacts are significant and widespread. Visual observation and photo documentation would provide overwhelming evidence that the stream is impaired. 0 = Land use impacts are so intrusive that the stream has lost most of its natural features. The stream does not appear to be capable to support most forms of aquatic life Actual 0 Total Potential Score: Comments	Comments			and the second	
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B = Landuse practices do not appear to significantly impact water quality or the riparian vegetation. Any impacts that occur appear to be natural. 6 = There are some signs of impact from landuse activities such as grazing, dryland agriculture, irrigation, feedlots, mining, timber harvesting, urban, roads, etc. 4 = Impacts from landuse activities are obvious and occur throughout most of the stream reach. For example, there are obvious signs of human induced erosion, saline seeps or overgrazing within the watershed. 2 = Landuse impacts are significant and widespread. Visual observation and photo documentation would provide overwhelming evidence that the stream is impaired. 0 = Land use impacts are so intrusive that the stream has lost most of its natural features. The stream does not appear to be capable to support most forms of aquatic life Actual Score:	Question 19. Land	use activities -	- Sources		
6 = There are some signs of impact from landuse activities such as grazing, dryland agriculture, irrigation, feedlots, mining, imber harvesting, urban, roads, etc. 4 = Impacts from landuse activities are obvious and occur throughout most of the stream reach. For example, there are obvious signs of human induced erosion, saline seeps or overgrazing within the watershed. 2 = Landuse impacts are significant and widespread. Visual observation and photo documentation would provide overwhelming evidence that the stream is impaired. 0 = Land use impacts are so intrusive that the stream has lost most of its natural features. The stream does not appear to be capable to support most forms of aquatic life Actual Score:	8 = Landuse practic	es do not appea	r to significantly impac	t water quality or the riparian vegetation	in. Any impacts that occur
A = Impacts from landuse activities are obvious and occur throughout most of the stream reach. For example, there are obvious signs of human induced erosion, saline seeps or overgrazing within the watershed. 2 = Landuse impacts are significant and widespread. Visual observation and photo documentation would provide overwhelming evidence that the stream is impaired. 2 = Landuse impacts are so intrusive that the stream has lost most of its natural features. The stream does not appear to be capable to support most forms of aquatic life 0 = Land use impacts are so intrusive that the stream has lost most of its natural features. The stream does not appear to be capable to support most forms of aquatic life Actual Score:	5 = There are some	signs of impact rban, roads, etc.	from landuse activitie	s such as grazing, dryland agriculture,	irrigation, feedlots, mining,
2 = Landuse impacts are significant and widespread. Visual observation and photo documentation would provide were whelming evidence that the stream is impaired. 2 = Land use impacts are so intrusive that the stream has lost most of its natural features. The stream does not appear to be capable to support most forms of aquatic life Actual Score:	town and from lot	where activities a	are obvious and occur	throughout most of the stream reach. overgrazing within the watershed.	For example, there are
0 = Land use impacts are so intrusive that the stream has lost most of its natural features. The stream does not appear to be capable to support most forms of aquatic life Actual Score:	2 = Landuse impact	s are significant	and widespread. Visu		on would provide
capable to support most forms of aquatic life Actual Score:				last meet of its potural features. The	stream does not annear to be
Actual Score:	0 = Land use impact capable to support n	ts are so intrusiv nost forms of aq	uatic life	lost most of its natural realities. The	inean does not appear to ex-
Comments					
Comments 0 Total Potential 0 Total Actual 0 Total Potential 0 BATING Total × 100 #DIV/0! BATING Total × 100 #DIV/0! OVERALL RATING (Total NRCS Actual + Total MT Supplement Actual) (Total NRCS Potential + Total MT Supplement Potential) ×100 #DIV/0! 75-100% = SUSTAINABLE 50-75% = AT RISK SUSTAINABLE ×100 #DIV/0!	Actual Score:	- 0.1	 Description of the sector sector 		
Total Actual 0 Total Potential 0 RATING Total × 100 #DIV/0! Potential × 100 #DIV/0! OVERALL RATING (Total NRCS Actual + Total MT Supplement Actual) ×100 #DIV/0! Total NRCS Potential + Total MT Supplement Potential) ×100 #DIV/0! 75-100% = SUSTAINABLE 50-75% = AT RISK ************************************		-tranu	o ucires s	WITH MERICON	
Total x 100 #DIV/0! Potential x 100 #DIV/0! OVERALL RATING (Total NRCS Actual + Total MT Supplement Actual) (Total NRCS Potential + Total MT Supplement Potential) x100 #DIV/0! 75-100% = SUSTAINABLE 50-75% = AT RISK AT RISK X100 X100	Comments	-			
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M12DRBNR05	Date-	7/24/2003	15:		
Dearborn River below confluence with Falls Creek, above Flat Creek Dive					
Geomorphol	logy Data				
parameter	value	units			
Bankfull Width		Ft			
Mean Depth		Ft			
Bnkfull X-sect area		Sq Ft			
Width/Depth					
Max Depth		Ft			
Flood prone width		Ft			
Entrenchement Ratio					
Water slope					
Channel Sinuosity					
BEHI Index Score (adjusted)					
BEHI Rating					
Channel D50	77	mm			
Percentage of Fines (<2mm)	4.92	2 %			
Stream Type					
Discharge	105.06	i cfs			

Stream Reach Habitat Assessments			
Parameter	Value	Units	
Stream Reach Assessment Score (NRCS)		%	
Stream Reach Assessment Score (MT adjusted)		%	
Macroinvertabrate Habitat Assessment Score	94.6	%	
OVERALL SITE RATING	S		
Stream Reach Assessment Score (NRCS)			
Stream Reach Assessment Score (MT adjusted)			
Macroinvertabrate Habitat Assessment Score			

Field Measurements of water chemistry					
parameter value units					
Flow	105.06	cfs			
Temperature, water	13.44	degree C			
pH	8.41				
Specific Conductance	0.27	mS/cm			
Dissolved Oxygen	9.94	mg/L			
Dissolved Oxygen, % Saturation	95.1	%			
Turbidity	0.76	NTU			

Lab Results from Field Samples			
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	0.6	mg/m^3	0.1
Benthic Chlorophyll a	19.7	mg/m^3	0.1
Total Phosphorus, TP	0.056	mg/L	0.004
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5
Nitrate + Nitrite	ND	mg/L	0.01
Total Nitrogen, TN		mg/L	

Macroinvertabrate Data Results					
parameter value units					
TOTAL SCORE (max =18)	15	score			
PERCENT OF MAX SCORE	83	%			
IMPAIRMENT CLASSIFICATION	NON IMPAI	RED			
USE SUPPORT	FULL SUPP	ORT			

۲L	
10	
10	
10	
0.1	
0.1	
0.004	
0.5	
0.01	

		Pebble Count Data			
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total
S/C	0.5	<1	2	1.64	1.64
S	1.5	1-2	4	3.28	4.92
FG	3	2-4		0.00	4.92
FG	5	4-6	3	2.46	7.38
FG	7	6-8	2	1.64	9.02
MG	10	8-12	6	4.92	13.93
MG	14	12-16	4	3.28	17.21
CG	18	16-22	6	4.92	22.13
CG	27	22-32	10	8.20	30.33
CG	38.5	32-45	7	5.74	36.07
CG	54.5	45-64	11	9.02	45.08
SC	77	64-90	15	12.30	57.38
SC	109	90-128	20	16.39	73.77
MC	154	128-180	23	18.85	92.62
LC	218	180-256	5	4.10	96.72
LC	309	256-362	3	2.46	99.18
SB	437	362-512	1	0.82	100.00
MB	768	512-1024		0.00	100.00
LB	1536	1024-2048		0.00	100.00
BR		>2048		0.00	100.00
	_	TOTALS	122	100.00	100.00
		D50 particle size (mm)	77		
		% Fines (<2mm)	4.92		
	M12DRBNR05	Date-	7/24/2003		15:17
	Dearborn River below c	onfluence with Falls Cr	eek, above Flat Cr	eek Diversio	n

M12DRBRNR04	Date-	7/22/2003	18:45
Dearborn River at Hwy 287	_		
			_
Geomorph	ology Data		
parameter	value	units	
Bankfull Width	75.00	Ft	
Mean Depth	2.60	Ft	
Bnkfull X-sect area	195.13	Sq Ft	
Width/Depth	28.83		
Max Depth	3.49	Ft	
Flood prone width	238.00	Ft	
Entrenchement Ratio	3.17		
Water slope	0.0010		
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating			
Channel D50	38.5	mm	
Percentage of Fines (<2mm)	10.89	%	
Stream Type	C4	border C4c du	le to low slope
Discharge	38.00	cfs	

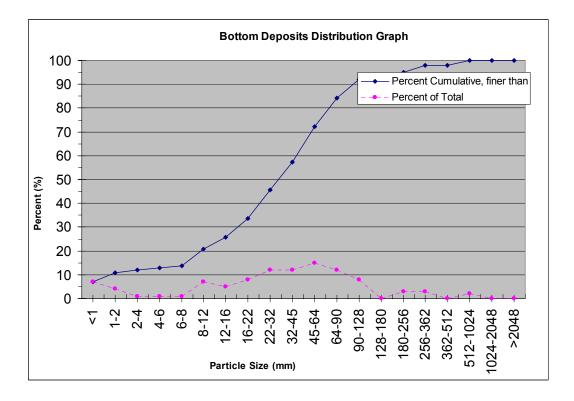
Stream Reach Habitat Assessments			
Parameter	Value	Units	
Stream Reach Assessment Score (NRCS)	85	%	
Stream Reach Assessment Score (MT adjusted)	91	%	
Macroinvertabrate Habitat Assessment Score	91.5	%	
OVERALL SITE RATING	S		
Stream Reach Assessment Score (NRCS)	Non Impaired, Fully Supporting		
Stream Reach Assessment Score (MT adjusted)			
Macroinvertabrate Habitat Assessment Score			

Field Measurements of water chemistry					
parameter value units					
Flow	38.00	cfs			
Temperature, water	26.94	degree C			
рН	8.21				
Specific Conductance	0.285	mS/cm			
Dissolved Oxygen	7.55	mg/L			
Dissolved Oxygen, % Saturation	94.8	%			
Turbidity	1.39	NTU			

Lab Results from Field Samples					
parameter value units					
Total Suspended Solids, TSS	ND	mg/L	10		
Volatile Suspended Solids, VSS	ND	mg/L	10		
TSS-VSS	ND	mg/L	10		
Water Column Chlorophyll a	1.8	mg/m^3	0.1		
Benthic Chlorophyll a		mg/m^3	0.1		
Total Phosphorus, TP	0.018	mg/L	0.004		
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5		
Nitrate + Nitrite	ND	mg/L	0.01		
Total Nitrogen, TN		mg/L			

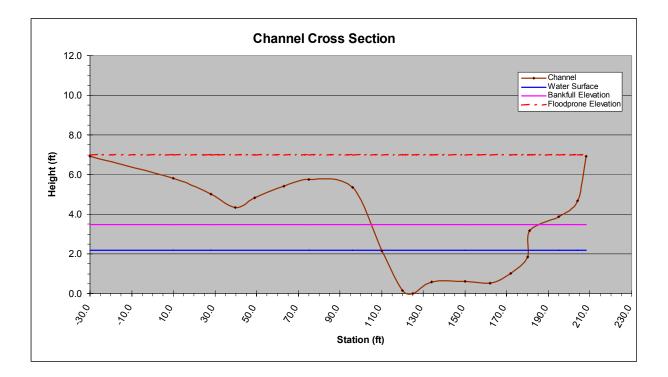
Macroinvertabrate Data Results			
parameter	value	units	
TOTAL SCORE (max =18)	9	score	
PERCENT OF MAX SCORE	50	%	
IMPAIRMENT CLASSIFICATION	MODERATI	E IMPAIRMEN	
USE SUPPORT	PARTIAL S	UPPORT	

			Pebble Coun	t Data	
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total
S/C	0.5	<1	7	6.93	6.93
S	1.5	1-2	4	3.96	10.89
FG	3	2-4	1	0.99	11.88
FG	5	4-6	1	0.99	12.87
FG		6-8	1	0.99	13.86
MG	10	8-12	7	6.93	20.79
MG	14	12-16	5	4.95	25.74
CG	18	16-22	8	7.92	33.66
CG	27	22-32	12	11.88	45.54
CG	38.5	32-45	12	11.88	57.43
CG	54.5	45-64	15	14.85	72.28
SC	77	64-90	12	11.88	84.16
SC	109	90-128	8	7.92	92.08
MC	154	128-180		0.00	92.08
LC	218	180-256	3	2.97	95.05
LC	309	256-362	3	2.97	98.02
SB	437	362-512		0.00	98.02
MB	768	512-1024	2	1.98	100.00
LB	1536	1024-2048		0.00	100.00
BR		>2048		0.00	100.00
	_	TOTALS	101	100.00	100.00
		D50 particle size (mm)	32-45		
		% Fines (<2mm)	10.89		
	M12DRBRNR04	Date-	7/22/2003		18:45
	Dearborn River at Hwy 28	7			



	BEHI Field Measures			BEHI Calculated Values			
	Parameter		Value	Units	Parameter	Value	Units
_					Slope	0.0010	
ina ion	Rod reading @ Upstream Edge of	Water	10.47	feet	Sinuousity		
Longitudinal Information					Max Depth	3.49	feet
orn	Rod reading @ Downstream Edge	of Water	11.07	feet	Floodprone Heig	ht 6.98	feet
	Stream Distance		625.00	feet	Mean Depth	2.60	feet
1	Straightline Distance			feet	Bankfull Width	75.00	feet
_	Left Edge of Bankfull		110.00	feet	Floodplrone Wid		
Cross-Sectional Information	Right Edge of Bankfull		185.00	feet	Bankfull Area	195.13	ft^2
tio	Rod reading @ Thalweg		11.22	feet	FloodproneArea		ft^2
Sec	Rod reading @ Bankfull Depth		7.73	feet	W/D Ratio	28.83	
oss-Section Information	Rod reading @ Floodplain Depth		4.24	feet	Cross Sectional		ft^2
č s	Left Edge of Floodprone depth		-30.00	feet	Entrenchment R	atio 3.17	
0	Right Edge of Floodprone depth		208.00	feet			
u	Bank Height			feet			
atic	Bankfull Height			feet	Bank Ht/Bank	full Ht	
Ĕ	Root Depth			feet	Root Depth/Ba	ank Ht	
Į	Root Density			%	Root Dens		%
1	Bank Angle			Degrees	Bank Angl		degrees
BEHI Information	Surface Protection			%	Surface Prote	ection	%
				6 11			.
SSS	Velocity at thalweg			ft/sec	Velocity Grad		ft/sec/ft
ar Bank Stress Information	Tape reading at thalweg			feet ft/sec	Near Bank str		
	velocity at left bank				Mean Shear s		
	tape reading at left bank Near bank stress			feet	A nb / A		
ar E Info	Mean shear stress						
Near Inf	Near bank x-sectional area			ft^2			
	M12DRBRNR04	Date-	7/22/2003		45		
	Dearborn River at Hwy 287	20	1/12/2000	10			

M12DRBRNR04	Date-	7/22/2003	18:4	5	
Dearborn River at Hwy 287					
BEHI Assoc	ciated Index Va	lue (from form)		Pos	sible Adjustment Factors
Bank Ht/Bankfull Ht					Bank Materials
Root Depth/Bank Ht				Bedrock is alv	vays Very Low
Root Density				Boulders are a	always Low
Bank Angle				Cobble decrea	ase the category by one unless the mixture
Surface Protection				of Sand/Grave	el is over 50%
Total In	dex Value			Gravel- adiust	the values up 5-10 pts depending on
Nu	meric Adjustr	nents:		sand composi	
Bank Materials Index adjustr	nont:			Sand- adjust the values up 10 pts	
	nent.			silt/clay- no ac	djustment
					Stratification
Bank Stratification Index adju				5-10 pts upwa	ard depending on position of unstable
Total adjuste	ed Index Value	e:			to bankfull stage
Bank E	rosion Potent	tial Rating:			



M12DRBNR06	Date-	7/24/2003	11:00
Dearborn River below confluence with	n Flat Creek on Dear	born Ranch	
Geomorph	ology Data		
parameter	value	units	
Bankfull Width		Ft	
Mean Depth		Ft	
Bnkfull X-sect area		Sq Ft	
Width/Depth			
Max Depth		Ft	
Flood prone width		Ft	
Entrenchement Ratio			
Water slope			
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating			
Channel D50		mm	
Percentage of Fines (<2mm)		%	
Stream Type			
Discharge	43.1	0 cfs	

Stream Reach Habitat Ass	sessments	;	
Parameter	Value	Units	
Stream Reach Assessment Score (NRCS)		%	
Stream Reach Assessment Score (MT adjusted)		%	
Macroinvertabrate Habitat Assessment Score	92.3	%	
OVERALL SITE RATIN	IGS		
Stream Reach Assessment Score (NRCS)			
Stream Reach Assessment Score (MT adjusted)			
Macroinvertabrate Habitat Assessment Score			

Field Measurements of water chemistry				
parameter	value	units		
Flow	43.10	cfs		
Temperature, water	19.5	degree C		
рН	8.4			
Specific Conductance	0.275	mS/cm		
Dissolved Oxygen	9.02	mg/L		
Dissolved Oxygen, % Saturation	98.3	%		
Turbidity	1.11	NTU		

Lab Results from	Field Samples		1
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	ND	mg/m^3	0.1
Benthic Chlorophyll a	23.9	mg/m^3	0.1
Total Phosphorus, TP	0.098	3 mg/L	0.004
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5
Nitrate + Nitrite	ND	mg/L	0.01
Total Nitrogen, TN		mg/L	

Macroinvertabrate Data Results				
parameter	value	units		
TOTAL SCORE (max =18)	9	score		
PERCENT OF MAX SCORE	50	%		
IMPAIRMENT CLASSIFICATION	MODERATE	IMPAIRMENT		
USE SUPPORT	PARTIAL SI	JPPORT		

BEHI Rating Channel D50

Percentage of Fines (<2mm) Stream Type Discharge

M12DRBRNR04	Date-	6/17/2003	18;00
Dearborn River at Hwy 287			
Geomorph	ology Data		
parameter	value	units	
Bankfull Width	75.00	Ft	
Mean Depth	2.60	Ft	
Bnkfull X-sect area	195.13	Sq Ft	
Width/Depth	28.83		
Max Depth	3.49	Ft	
Flood prone width	238.00	Ft	
Entrenchement Ratio	3.17		
Water slope	0.0010		
Channel Sinuosity			
BEHI Index Score (adjusted)			

38.5 mm

10.89 %

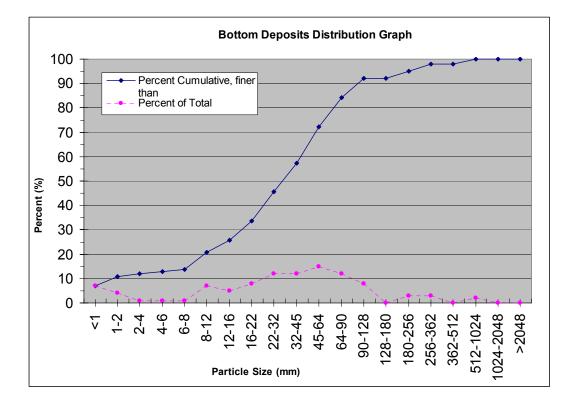
202.00 cfs

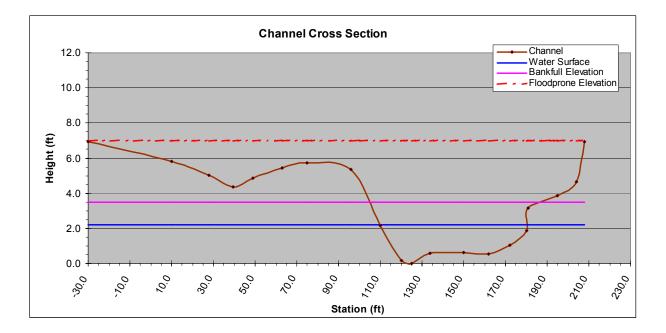
	Stream Reach Habitat Assessments					
Parameter	Value	Units				
Stream Reach Assessment Score (NRCS)	85	%				
Stream Reach Assessment Score (MT adjusted)	91	%				
Macroinvertabrate Habitat Assessment Score		%				
OVERALL SITE RATIN	IGS					
Stream Reach Assessment Score (NRCS)	Non Impaired, Fully Supporting					
Stream Reach Assessment Score (MT adjusted)						
Macroinvertabrate Habitat Assessment Score						

Field Measurements of water chemistry				
parameter	value	units		
Flow	202.00	cfs		
Temperature, water	17	degree C		
рН				
Specific Conductance		mS/cm		
Dissolved Oxygen		mg/L		
Dissolved Oxygen, % Saturation		%		
Turbidity		NTU		

Lab Results from Field Samples				
parameter	value	units	RL	
Total Suspended Solids, TSS	ND	mg/L	10	
Volatile Suspended Solids, VSS	ND	mg/L	10	
TSS-VSS	ND	mg/L	10	
Water Column Chlorophyll a	ND	mg/m^3	0.1	
Benthic Chlorophyll a	12.3	mg/m^3	0.1	
Total Phosphorus, TP	ND	mg/L	0.004	
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5	
Nitrate + Nitrite	ND	mg/L	0.01	
Total Nitrogen, TN		mg/L		

		Pebble Count Data						
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total			
S/C	0.5	<1	7	6.93	6.93			
S	1.5	1-2	4	3.96	10.89			
FG	3	2-4	1	0.99	11.88			
FG	5	4-6	1	0.99	12.87			
FG	7	6-8	1	0.99	13.86			
MG	10	8-12	7	6.93	20.79			
MG		12-16	5		25.74			
CG		16-22	8	7.92	33.66			
CG		22-32	12	11.88	45.54			
CG		32-45	12	11.88	57.43			
CG		45-64	15	14.85	72.28			
SC		64-90	12	11.88	84.16			
SC		90-128	8	-	92.08			
MC		128-180		0.00	92.08			
LC		180-256	3		95.05			
LC		256-362	3	2.97	98.02			
SB		362-512		0.00	98.02			
MB	768	512-1024	2	1.98	100.00			
LB	1536	1024-2048		0.00	100.00			
BR		>2048		0.00	100.00			
		TOTALS	101	100.00	100.00			
		D50 particle size (mm)	32-45					
		% Fines (<2mm)	10.89					
	M12DRBRNR04	Date-	6/17/2003		18;00			





	BEHI Field N	leasures		BEHI Calcul	ated Value	es
	Parameter	Value	Units	Parameter	Value	Units
_	Rod reading @ Upstream Edge			Slope	0.0010	
-ongitudinal Information	of Water	10.47	feet	Sinuousity		
nat	Rod reading @ Downstream			Max Depth	3.49	feet
orn Br	Edge of Water	11.07	feet	Floodprone Height	6.98	feet
- ou	Stream Distance	625.00	feet	Mean Depth	2.60	feet
	Straightline Distance		feet	Bankfull Width	75.00	feet
_	Left Edge of Bankfull	110.00	feet	Floodplrone Width	238.00	feet
Cross-Sectional Information	Right Edge of Bankfull	185.00	feet	Bankfull Area	195.13	ft^2
tio	Rod reading @ Thalweg	11.22	feet	FloodproneArea		ft^2
oss-Section Information	Rod reading @ Bankfull Depth	7.73	feet	W/D Ratio	28.83	
S-S	Rod reading @ Floodplain Dep	th 4.24	feet	Cross Sectional Area	195.13	ft^2
S E	Left Edge of Floodprone depth	-30.00	feet	Entrenchment Ratio	3.17	
Ū	Right Edge of Floodprone depth	n 208.00	feet			
5	Bank Height		feet			
atic	Bankfull Height		feet	Bank Ht/Bankfull Ht		
Ĕ	Root Depth		feet	Root Depth/Bank Ht		
for	Root Density		%	Root Density		%
	Bank Angle		Degrees	Bank Angle		degrees
BEHI Information	Surface Protection		%	Surface Protection		%
Δ						
Stress tion	Velocity at thalweg		ft/sec	Velocity Gradient		ft/sec/ft
n tr	Tape reading at thalweg		feet	Near Bank stress / Mean		
ar Bank Stre Information	velocity at left bank		ft/sec	Shear stress		
Bank format	tape reading at left bank		feet	A nb / A		
ë ë	Near bank stress					
Near Inf	Mean shear stress					
Ž	Near bank x-sectional area		ft^2			

MIDDLE FORK DEARBORN RIVER

Waterbody Name N. J. L. L. L. D.		(One Station per page) T	Trip ID: 200 DEOXO Date: 0 1
ined	Dackton	County 2000 L Clore	U U
ong obtained	Locat	Relation Thursday & Long	
	S? Y 🗆 N 🗆 If Y what	by method other than GPS? Y IN N If Y what method used? If by map what is the map scale?	GPS Datum (Circle One): NAD 27 NAD 83 WGS84 what is the map scale?
Samples Taken:		Sample ID/File Locations	
Water 🛛 🖾 Nutrients 🕅 M	Nutrients 🖾 Metals 🗖 Commons 🖾	Dauman.	Sample Collection Procedure
Sediment			UKAB
Macroinvertebrate	Macroinvertebrate Habitat Asmt.		· SED-1
Algae/Macrophytes			-
Chlorophyll a		the state of the s	reki-1 UTHEK:
Habitat Assessment	Stream Reach Asmt. Other	120101 244.00 100100	CHLPHL-2 OTHER:
Substrate Debble Count 7 % Fines 1	% Fines		Purpose:
Transect			
Photographs			
Field Notes			
Other			
Measurements: Time: /2 30	Macroinv	Macroinverteheate Kick Duration:	Victor A constraints
Q / Flow (cfs)	Est.	Site Visit Comments:	AKK LEBGII (FL):
Temp: ('C) W 15.69 A		read of the	
pH: S.11	2		
SC: (mS/cm) . Other software	1948 - 1948 -	hard among	
SC x 1000 =	µmho/cm	the Contraction of the Contracti	10000
DO: (mg/L)			
TUR: Clear Slight Turbid Opaque	Le la		
Turbidity Comments: 0, 73 N70 D			
02-01-01-02-02-02-02-02-02-02-02-02-02-02-02-02-			
		State - Contractor	11 P

.

171229.9	ISCHARGE:		Site Visit Code:	03-0100			
	Mildin Tark	ANS LOSEA	Station ID: 00/0012060				
Personnel	Laidhus là	auman					
**Distant		**Velocity (at point)	**Width	**Area	**Discharge		
	LEW 0,4	Ø					
2 131	0.55	0,10					
3 14	0.85	0,10					
4 15	0.75	0,62					
5 16	0,90	0.88					
6 17 1	The 29 0,90	8,96					
7 18	0.85	1,19					
8 19	0.8	1,09					
9 90	0,5	1.24					
10 7/	. 0.5	1.22					
11 22	0,5	1,43					
12 25	0.5	1,53					
13 21	0,4	1.54					
14 25	0.5	1.54					
15 24	Qlo	1.38			×		
16 27	0.65	/130 .					
7 28	0,70	1.27					
18 29	0,85	1.060					
19 30	0680	1.12					
20 31	0,60	0,91					
a 32	0150	0,60					
2 33	0.30	0,46					
3 341	REW Ø	1					
54							
5							
6							
7							
8							
9				_			
0							

Page 1 of 2

Data Mgmt. Approved

	Stream Classification		xd 3/2003
Date: 6-19-03	Site Visit Code	: 03-0720	
Waterbody: M. Adle So	Le Declar Station ID	: Mis mi bb	209
Per onnel: Ladard	134 William		-
Bankfull Width (W _{bkt}) WIDTH of the stream channel, a	bankfull stage elevation, in a riffle section	_Ft.	
Mean DEPTH (d _{bkt}) Mean DEPTH of the stream char riffle section.	inel cross-section, at bankfull stage elevation, in a	_Ft.	
Bnkfl. X-Soction AREA (A AREA of the stream channel cros	bid) is-section, at bankfull stage elevation, in a riffle sectio	Sq. Ft.	1
Width/Depth RATIO (Wbkf Bankfull WIDTH divided by bankf	/ d _{okt}) úll mean DEPTH, in a riffle section.	-	
Maximum DEPTH (d _{mbkt})		_Ft.	199
Maximum depth of the bankfull of bankfull stage and thalweg elevat	nannel cross-section, or distance between the ions, in a riffle section		S.Sec
WIDTH of Flood-Prone Are		Ft.	100
Twice maximum DEPTH, or (2 x of WIDTH is determined. (riffle section	d _{mbhd}) = the stage/elevation at which flood-prone area on)		1.5
Entrenchment Ratio (ER)	16		1.5
The ratio of flood-prone area WID (riffle section)	TH divided by bankfull channel WIDTH. (W_{tys} / W_{twt})		
Channel Materials (Particl	e Size Index) D50	_mm.	10.1
The D50 particle size index repres sampled from the channel surface	ents the median diameter of channel materials, as between the bankfull stage and thalweg elevations.		
Water Surface SLOPE (S) Channel slope = "rise" over "run" f vidths in length, with the "riffle to r it bankfull stage.	or a reach approximately 20-30 bankfull channel iffle" water surface slope representing the gradient	FL/FL Show Verythi Haget-G	Dolnea. 13k 170
Channel SINUOSITY (K)		Del Classe	Light
	attern, determined from a ratio of stream length restimated from a ratio of valley slope divided by	Higher .	4.60
Stream Type	0.000	186	5640
comments:	13000 365 5 T 1305	Data Mgmt. Ap	hanne

			รบธรา	TRATE I	DEQ/MD			evised 3/2003 DMA
Fate:	16-19.03	_	_	_	Site Vi	sit Code:	: 103-07	80
*/aterbody	r: Middle for	13	ANDRA	S	TORET S	tation ID:	and an and the	DRENT
Cersonnel	: La diano	TB	mannen					
		-	PE	BBLE CO	DUNT			
			T	Riffle	(Other)			
Row ID	Particle Categ	ory	Size (mm)	Count	Count	-		p: PEBL-CNT
	Same	+		四方		Sum	% of Total	Cum. Total
1	Silt / Clay	+	<1	14.4	-	0	-	0.00%
2	Sand		1-2			0	-	0.00%
3	Very Fine	-	2-4	in .		0	-	0.00%
4	Fine	-	4-6		-	0	-	0.00%
5	Fine	-	6-8	++	-	0		0.00%
6	Medium	/ELS	8 - 12	* *		0		0.00%
7	Medium	GRAVELS	12 - 16	1-1		0		0.00%
8	Coarse	-ľ	16 - 22	11		0	-	0.00%
9	Coarse	-	22 - 32	図:'		0		0.00%
10	Very Coarse		32 - 45	63.0		0		0.00%
11	Very Coarse	12	45 - 64	¥4		0		0.00%
12	Small	- 0	64 - 90	X::		0	_	0.00%
13	Small	COBBLES	90 - 128			0		0.00%
14	Large	CO	128 - 180	17		0		0.00%
15	Large		180 - 256			0		0.00%
16	Small		256 - 362	*		0		0.00%
17	Small	ULDERS	362 - 512		_	0		0.00%
18	Medium		512 - 1024			0	_	0.00%
19	Large	B	1024 - 2048			0		0.00%
20	Bedrock		> 2048			0		0.00%
21	Total # Samples			0	0	0	0.00%	

	Revision 3/20
	Stream Reach Assessment Form
Station ID:	M12MFDE204 Date: 6-19-03 Site Visit Code: 03-0720
Waterbody:	Middle Tore Drailwin- Below Jerrich Reach Length: My miles
Waterbody Se	eg ID: Personnel: La.da Bourner
Station ID's or	n reach:
	Stream Incisement:
8 = channel st	table, no active downcutting occurring; old downcutting apparent but a new, stable riparian area has formed withi annel. There is perennial riparian vegeta: on will established in the riparian area. (Stage 1 and 5, Schumm's
	as evidence of old downcutting that has begun stabilizing, vegetation is beginning to establish, even at the base o ds, solid disturbance evident. (Stage 4).
	dcut, in early stage, is present. Immediate action may prevent further degradation (early Stage 2).
	channel incised, actively widening, limited new riparian area/floodplain, floodplain not well vegetated. The t is present is mainly pioneer species. Bank failure is common. (Stage 3)
0 = channel de or rare flood e	septy incised, resembling a gully, little or no riparian area, active downcutting is clearly occurring. Only occasiona vents access the flood plain. Tributaries will also exhibit downcutting/headcuts. (Stage 2)
The presence	of active headcuts should nearly always keep the stream reach from being rated sustainable.
Actual Score:	X Potential Score:S
Comments	
	Percent of Streambanks with Active Lateral Cutting:
	bank erosion is in balance with the stream and its setting
	ninimal amount of active lateral bank erosion occurring
	noderate amount of active lateral bank erosion occurring
) = there is exc	cessive lateral bank erosion occurring
Actual Score:	Potential Score:
Comments	
Question 3, Th	e Stream is in Balance with the Water and Sediment Being Supplied by the Watershed:
	exhibits no excess sediment/bedload deposition, sediment occurs on point bars and other locations as would be table, dynamic system
= sediment clo	ogged gravel's are apparent in riffles or pools, or other evidence of excess sediment apparent
= mid-channel	I bars are common
= stream is bra	aided (except naturally occurring braided systems), having at least 3 active channels
ctual Score:	Potential Score:
omments	
Comments	

Question 4, Sufficient Soil Present to Hold Water and Act as a Rooting Medium:	
3 = more than 85% of the riparian area with sufficient soil to hold water and act as a rooting medium	
2 = 65% to 85% of the riparian area with sufficient soil to hold water and act as a rooting medium	
t = 35% to 65% of the riparian area with sufficient soil to hold water and act as a rooting medium	
0 = 35% or less of the riparian area with sufficient soil to hold water and act as a rooting medium	
Actual Score:	
Comments	
Question 5, Percent of Streambank with Vegetation having a Deep, Binding Rootmass: (see Appendix I for stal ratings for most riparian, and other, species)	bility
5 = more than 80% of the streambank comprised of plant species with deep, binding root masses	
S = more than 80% of the streambank comprised of plant species with deep, binding root masses 4 = 60% to 80% of the streambank comprised of plant species with deep, binding root masses	
 4 = 80% to 80% of the streambank comprised of plant species with deep binding root masses 2 = 30% to 60% of the streambank comprised of plant species with deep binding root masses 	
2 = 30% to 60% of the streambank comprised of plant species with deep binding root masses	
Actual Score: Potential Score:	
Comments	_
Question 6, Weeds :	
a = No noxious weeds are present	
= 0-1% of the riparian area has noxious weeds	
= 1%-5% of the riparian area has noxious weeds	
= over 5% of the riparian area has noxious weeds	
Actual Score: Polential Score:	
Comments	_
uestion 7, Disturbance-Caused Undesirable Plants:	
= 1% or less of the riparian area has undesirable plants	
= 1%-5% of the riparian area has undesirable plants	
= 5%-10% of the riparian area has undesirable plants	
= over 10% of the riparian area has undesirable plants	
ctual Score: Potential Score:	
comments	_
	-
2 SRAF.x	ds.

Question 8, Wood potential for woody	Species Establishment and Regeneration: (Note: Skip this question if the riparian area has no pecies)	
8 = all age classes of	f native woody riparian species present (see table, Fig 2)	
and shrubs, there m	native woody riparian species clearly absent, all others well represented. For sites with potential for by be one age class of each absent. Often, it will be the middle age group(s) that is (are) lacking. Hi id a young age class present indicate potential for recovery.	trees laving
or the stand is comp	of native riparian shrubs and/or two age classes of riparian trees clearly absent, other(s) well represe ised of mainly mature, decadent or dead plants	ented,
2 = disturbance indu dominate. Re-evalu	ced, (i.e., facultative, facultative upland species such as rose, or snowberry) or non-riparian species te Question 1, incisement, if this has happened.	
0 = some woody spe evaluated to ensure cedar	cies present (>10% cover), but herbaceous species dominate (at this point, the site potential should hat it has potential for woody vegetation). OR, the site has at least 5% cover of Russian olive and/o	be re- r salt
Actual Score:	Potential Score: 8	
Comments		
Question 9, Utiliza species)	ion of Trees and Shrubs: (Note: Skip this question if the riparian area has no potential for woody	
N 573 STA (11 0 5	ble second year and older stems are browsed	
	allable second year and older stems are browsed	
	vallable second year and older stems are browsed.	
1 = more than 50% c	the available second year and older stems are browsed. Many of the shrubs have either a "clubber ire high-lined or umbrella shaped.	d"
0 = there is noticeabl	use (10% or more) of unpalatable and normally unused woody species.	
Actual Score:	4 Potential Score: 4	
Photosi croor o	and heller hanne an model drawn	
2.0357.5.04	gread buffer between ag land + stream	-
Comments		
Question 10, Ripari	n/Wetland Vegetative Cover in the Riparian Area/Floodplain and Streambank:	
8 = 85% or more of th	e riparian/wetland plant cover has a stability rating ≥ 6	
	parian/wetland plant cover has a stability rating ≥ 6	
4 = 65%-75% of the r	parian/wetland plant cover has a stability rating ≥ 6	
	parian/wetland plant cover has a stability rating ≥ 6	
) = less than 55% of	he riparian/wetland plant cover has a stability rating ≥ 6	100
Actual Score:	Potential Score:	
Comments		
	3 SPAF.xbs	

Question 11, Riparian Area/Floodplain Characteristics are Adeq ate to Dissipate Energy and Trap Sediment.

6 = active flood or overflow channels, large rock, or woody material present and adequate to dissipate energy and trap sediment. There is little surface erosion and no evidence of long, continuous erosional areas on floodplain/riparian area or streambank. There are no headcuts where either overland flow and/or flood channel flows return to the main channel.

4 = rock and/or woody material is present, but generally of insufficient size to dissipate energy. Some sediment trapping occurring. Occasional evidence of surface erosion. Generally not severe enough to have developed channels.

2 = inadequate rock and/or woody material available for dissipation of energy or sediment trapping. There is surface erosion (scouring) and occasional headcuts where overland flows or flood channel flows return to the main channel.

0 = riparian area/floodplain lacking any of these attributes: 1)adequate flood or overflow channels, 2) large rock, or 3) woody material suitable for energy dissipation and sediment trapping. Erosional areas are long and continuous. Lacking vegetation or substrate materials adequate to resist further erosion. Surface erosion is obvious on the floodplain/riparian area. Headcuts are present that have the potential to create meander cut-offs.

Actual Score:

Potential Score:

Comments

			SUMMARY			
QUESTION	1:	Stream Incisement		Actual Score	Possible Points 0, 2, 4, 6, 8	Potential Score 0
QUESTION		Lateral Cutting		0	0, 2, 4, 6	0
QUESTION		Stream Balance		0	0, 2, 4, 6	0
QUESTION	- C - C - C - C - C - C - C - C - C - C	Sufficient Soil		0	N/A, 0, 1, 2, 3	0
QUESTION		Rootmass		0	N/A, 0, 2, 4, 6	0
QUESTION		Weeds		0	0, 1, 2, 3	0
QUESTION		Undesirable Plants		0	0, 1, 2, 3	0
QUESTION I		Woody Species Establishment		0	N/A, 0, 2, 4, 6, 8	0
QUESTION !		Browse Utilization		0	N/A, 0, 1, 2, 3, 4	0
QUESTION 1		Riparian/Wetland Vegetative Cove	er*	0	N/A, 0, 2, 4, 6, 8	0
QUESTION 1		Riparian Area/Floodplain Characte	eristics *	0	N/A, 0, 2, 4, 6	0
			Total	0	61	0
Potential Scor	re for m	(questions 1, 2, 3, 6, 7, 11)		0	(32)	0
Potential Scor	re for m	ost low energy *E* streams (questions 1 - 7, 10, 11)		0	(49)	0
RATING: =	č.	Actual Score Potential Score	X 100 = % rating	#DIV/0!		
	2	80-100% = SUSTAINABLE 50-80% = AT RISK LESS THAN 50% = NOT SUSTAI	NABLE			
Only in certe	ain, spe	cific situations can both of these red	ceive an *N/A*.			
						10000
			4			SRAF.xls

1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	Montana Department of Environmental Quality Supplemental Questions	
The score for the	ese questions does not have an effect on the rating above.	
Note: Answers to	o these questions must consider the potential of the stream.	
Question 12. Fi	isheries Ha' itat / Stream Complexity Note: the answers to question 12 will be averaged	
12a. Adult and a = Abundant dee	Juvenile He Iding/Escape Cover ep pools, woody debris, overhanging vegetation, boulders, root wads, undercut banks and/or aqua	tic
	is common (see above).	
4 = Fish habitat is boulders, root wa	is noticeably reduced. Most pools are shallow and/or woody debris, undercut banks, overhanging ver ads and/or aquatic vegetation are of limited supply.	getation,
e = Pools and hal	bitat features are sparse or non-existent or there are fish barriers.	
) = There is not e	enough water to support a fishery	
N/A = Stream wo	ould not support fish under natural conditions	
Actual Score:	Potential Score:	
Comments		
12b. Habitat Co	mplexity juvenile and adult cover types is present. High flow juvenile and adult refugia are present.	
	It or juvenile cover types are present. High flow refugia are reduced.	
= High flow refu		
	uld not support fish under natural conditions	
Actual Score:	Potential Score:	
Comments		-
2c. Spawning F	Habitat (salmonid streams only) of spawning substrate, morphology of spawning areas, and composition of spawning substrate are ex	cellent.
= Areal extent of	of spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduced.	
= Areal extent of	of spawning substrate, morphology of spawning areas, and/or quality of spawning substrate greatly re	duced.
/A = Stream wou	uld not support fish under natural conditions.	
ctual Score:	Potential Score:	
omments		
		-
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	5 SRAF	.408

Actual Score:					
NA = Stream would not support fish under natural conditions. Actual Score: Potential Score:	12d. Fish Passsa 8 = No potential fis	ge h passage barriers r	apparent.		
Actual Score: Potential Score:	0 = Potential fish p	assage barriers pres	sent.		
Comments 12e. Entrainment 8 = Entrainment of fish into water diversions may be a moderate issue. 4 = Entrainment of fish into water diversions may be a moderate issue. 0 = Entrainment of fish into water diversions may be a moderate issue. 0 = Entrainment of fish into water diversions may be a moderate issue. Actual Score: Potential Score: 2a-e Avg. Score Actual Score 0 Potential Score: 0 12a-e Avg. Score Actual Score 0 Potential Score: 0 Comments 0 12a-e Avg. Score Actual Score 0 Potential Score: 0 Potential Score: 0	N/A = Stream woul	d not support fish ur	nder natural conditi	ons.	
12e. Entrainment B = Entrainment of fish into water diversions may be a moderate issue. 0 = Entrainment of fish into water diversions may be a major issue. Actual Score:	Actual Score:		Potential Score:	<u> </u>	
B = Entrainment of fish into water diversions may be a moderate issue. 4 = Entrainment of fish into water diversions may be a major issue. 0 = Entrainment of fish into water diversions may be a major issue. Actual Score: Potential Score: Potential Score: 0 Potential Score: 0 Potential Score: 0 Potential Score: 0 Ouestion 13. Solar Radiation 5 = More than 75% of the stream reach is adequately shaded by vegetation. 4 = 50-75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably elevated by irrigation, etc. Actual Score: 12 = Algae not apparent. Rocks are slippery. = in small patches or along channel edge = in large patches or discontinuous mats = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) //A = No water ctual Score:	Comments				
0 = Entrainment of fish into water diversions may be a major issue. Actual Score: Potential Score: Potential Score: 12a-e Avg. Score Actual Score: 0 Potential Score: 0 Potential Score: 0 Ouestion 13. Solar Radiation 5 = More than 75% of the stream reach is adequately shaded by vegetation. 4 = 50-75% of the stream reach does not have adequate shading or the water temperature is probably elevated by irrigation, 3 = Approximately 25-50% of the stream does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 1 = Mate cover bottom (hyper	12e. Entrainment 8 = Entrainment of	fish into water diver	sions not an issue.		
Actual Score: Potential Score:					
Comments	0 = Entrainment of	fish into water divers	sions may be a maj	jor issue.	
12a-e Avg. Score Actual Score 0 Potential Score 0 Coustion 13. Solar Radiation Solar Radiation Solar Radiation S = More than 75% of the stream reach is adequately shaded by vegetation. Actual Score 0 Approximately 25-50% of the stream does not have adequate shade. O O O = More than 75% of the stream reach does not have adequate shade. O O O = More than 75% of the stream reach does not have adequate shade. O O O = More than 75% of the stream reach does not have adequate shade. O O O = More than 75% of the stream reach does not have adequate shade. O O O = More than 75% of the stream reach does not have adequate shade. O O O = More than 75% of the stream reach does not have adequate shade. O O O = More than 75% of the stream reach does not have adequate shade. O O O = More than 75% of the stream reach does not have adequate shade. O O O = More than 75% of the stream reach does not have adequate shade. O O O = More than 75% of the stream reach does not have adequate shade. O O O = More than 75% of the stream reach does not have adequate shade. O	Actual Score:		Potential Score:		
Councertion 13. Solar Radiation 6 = More than 75% of the stream reach is adequately shaded by vegetation. 4 = 50-75% of the stream reach does not have adequate shading or the water temperature is probably elevated by irrigation, 3 = Approximately 25-50% of the stream does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably elevated by irrigation, 3 = Approximately 25-50% of the stream does not have adequate shade by vegetation or the water temperature is probably drastically altered by irrigation, etc. 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably drastically altered by irrigation, etc. Actual Score:	Comments				
Question 13. Solar Radiation 6 = More than 75% of the stream reach is adequately shaded by vegetation. 4 = 50-75% of the stream reach does not have adequate shading or the water temperature is probably elevated by irrigation, 3 = Approximately 25-50% of the stream does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably elevated by irrigation, etc. 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably drastically altered by irrigation, etc. Actual Score:	12a-e Avg. Score	Actual Score	0	Potential Score	0
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Be More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably instically altered by inigation, etc. Actual Score: Potential Score: Comments Augustion 14. Algae growth / Nutrients Algae not apparent. Rocks are slippery. a in small patches or along channel edge a in large patches or discontinuous mats Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) // A = No water Potential Score: Low and a cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions)					perature is proceedly elevated by mighton,
trastically altered by irrigation, etc. Actual Score:Potential Score: Comments Detection 14. Algae growth / Nutrients a Algae not apparent. Rocks are slippery. a in small patches or along channel edge a in large patches or discontinuous mats a Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) //A = No water ctual Score: Potential Score: Potential Score:					
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Comments Duestion 14. Algae growth / Nutrients = Algae not apparent. Rocks are slippery. = in small patches or along channel edge = in large patches or discontinuous mats = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) WA = No water		4	Potential Score:	24	
Auestion 14. Algae growth / Nutrients = Algae not apparent. Rocks are slippery. = in small patches or along channel edge = in large patches or discontinuous mats = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) /A = No water ctual Score:	ciual Score.				
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ctual Score: <u>5</u> Potential Score: <u>6</u>	= in small patches = in large patches	or along channel ec or discontinuous ma	lge ats	s not apparent and rock	s not slippery (toxic conditions)
ante algos ou actor in shellow actoria	= in small patches = in large patches = Mats cover botto	or along channel ec or discontinuous ma	lge ats	s not apparent and rock	s not slippery (toxic conditions)
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omments	= in small patches = in large patches = Mats cover botto I/A = No water	or along channel ec or discontinuous ma m (hyper enriched c	ige ets conditions) or plant: Potential Score:	6	
	= in small patches = in large patches = Mats cover botto I/A = No water	or along channel ec or discontinuous me m (hyper enriched c	ige ets conditions) or plant: Potential Score:	6	
	= in small patches = in large patches = Mats cover botto I/A = No water ctual Score:	or along channel ec or discontinuous me m (hyper enriched c	ige ets conditions) or plant: Potential Score:	6	
	t = in small patches e = in large patches = Mats cover botto I/A = No water Actual Score:	or along channel ec or discontinuous me m (hyper enriched c	ige ets conditions) or plant: Potential Score:	6	

	3 1 34			A CONTRACTOR OF THE OWNER
	face oils, turbid	ity, salinization, precip	pitants on stream bottom and/or w	vater odor
6 = none				
l = Slight				
2 = Moderate				
) = Extensive				
N/A = No water	1.0			
Actual Score:	6	Potential Score:	6	
Comments				
Question 16. Bact				100
		nic sources of bacteria		
			oncentrated livestock operations are	the most common sources.
) = Feedlots are cor	mmon or raw sev	vage is entering the stre	am	
ctual Score:	4	Potential Score:	14	
	_			
Comments				
ies, caddis flies and = The stream is do = Macroinvertebra	minated by pollu	tion tolerant taxa such a	is fly and midge larva.	
I/A = Stream reach	is ephemeral			
ctual Score:	14	Potential Score:	4	
omments				
			7	SRAF.xds

Question 18. Irrig Evaluate effects fro	ation in acts (m de-watering o	Assess during critical low f r inter-basin transfer of wat	low periods or you may need to inquire ver.)	locally about this.
8 = There are no no				
6 = Changes in flow	resulting from in	rigation practices are notic	eable, however flows are adequate to	support aquatic
organisms.				
1.00			fles are drastically reduced or impacted	1.
2 = The flow is low	enough to sever	ly impair aquatic organism	6	
0 = All of the water	has been diverte	d from the stream		
N/A = Stream reach	is ephemeral.			
Actual Score:		Potential Score:	8	
Comments				
Question 19. Land	luse activities -	Sources		
I = Landuse practic ppear to be natural	es do not appear I.	to significantly impact wat	er quality or the riparian vegetation. A	
i = There are some imber harvesting, u		rom landuse activities such	h as grazing, dryland agriculture, irriga	tion, feedlots, mining,
= Impacts from lar bvious signs of hur	nduse activities a nan induced eros	re obvious and occur throu ion, saline seeps or overg	ghout most of the stream reach. For e razing within the watershed.	example, there are
= Landuse impacts verwhelming evide	s are significant and the stream of the stre	nd widespread. Visual ob m is impaired.	servation and photo documentation wo	ould provide
= Land use impact apable to support n			nost of its natural features. The stream	n does not appear to be
ctual Score:	9	Potential Score:	8	
cibili ocore.	End	int manna		
omments		÷		
otal Actual	0	Total Potential	0	- x-
ATING	Total Potential	د 100 <u> </u>	IDIV/0I	
VERALL RATING	-	Total NRCS Actual + Tota Total NRCS Potential + Tr	I MT Supplement Actual) x100 Mal MT Supplement Potential)	#DIV/0!
	75-100% = SU 50-75% = AT F LESS THAN 50			
		a	í.	SRAF.xls

Reference Longtrubinand, on x-section MANFEUL BANKFULL BANKFULL BANKFULL STA B5 +1 HI FS (I) EEV FS (I)	649	noil car	- Andrew			÷	CHANNEL MEASUREMENTS	SUREMENTS		112		Basin:	
IA BS(+) HI FG(A) ELEV FS(+) ELEV FS(+) ELEV NOTES C Z L2P L2P L L2P L L2P L2P <th>Ser.</th> <th>REFE</th> <th>RENCE</th> <th>LONGITU</th> <th>IDINAL OR CTION</th> <th></th> <th></th> <th>BANK</th> <th>FULL</th> <th>BANK H</th> <th>EIGHT</th> <th></th> <th></th>	Ser.	REFE	RENCE	LONGITU	IDINAL OR CTION			BANK	FULL	BANK H	EIGHT		
2 2.2.3 UBPE NUL NUL 662 EF F F F F 9 662 EF F F F 31 335 University DTURE 113 F F F 32 2335 University DTURE 113 F F F F 32 235 University DTURE 113 F F F F F 31 333 University DTURE 113 F	STA	BS (+)		FS (i)	0,07	FS (·)	ELEV	ES (1)	EI EV	EC LI	CI EV	and it	
6.67 BF 1 1 1 1 8357 1 1 1 1 2 1 1 1 1 1 1 3 2 2 1 1 1 1 1 3 2 2 1 1 1 1 1 1 3 2 2 1 1 1 1 1 1 1 3 2 2 1 1 1 1 1 1 1 1 3 2 2 1 <td>P</td> <td>6.63'</td> <td></td> <td>12 FE</td> <td></td> <td>ALL DAY</td> <td></td> <td>12.5</td> <td>No 100</td> <td>La na</td> <td>CLEV</td> <td>INN</td> <td>E</td>	P	6.63'		12 FE		ALL DAY		12.5	No 100	La na	CLEV	INN	E
W ST351 Telebrasic Teres 1 3 6.48 Amini- mini- standard 1 1 1 31 3.33 2.45 1 1 1 31 3.33 2.45 1 1 1 31 3.33 2.45 1 1 1 32 2.33 2.45 1 1 1 33 2.33 2.45 1 1 1 34 2.33 2.45 1 1 1 35 2.33 2.45 1 1 1 1 36 2.45 1 1 1 1 1 37 3.33 2.45 1 1 1 1 38 2.45 1 1 1 1 1 1 39 2.45 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0	6.67		記	Sale of the	SUP OIL	112020	None-					
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Waterbody Name County Personant Station ID	8 8 8
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SC: (mS/cm)	a now bon barn i watered
SC x 1000 = Itmbo/cm	n hydring
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Turbidity Comments: D/23 5 D.68	

w	Vaterbody:	MED @	lovers	Pas	03-0727 Station ID:	MIZMEDBRO
-	ersonnel:		e			
-			The second second second		Contractor and the	
	**Distance from initial point	**Depth	**Velocity (at point)	**Width	**Area	**Discharge
1	12 8 IEU	0,10	6			
2	1.0	0,10	(A			
3	1.5	0.20	0.04			
4	2.0	0120	0.08			
5	25	0.20	0.40			
6	3.6	0.30	0.34			
7	3.5	0,30	0,41			
8	4,0	0.30	0,48			
9	415	0.25	0,31			
10	5,0	0.25	0.78			
11	5.5	0.25	0,60			
12	65	0.25	p.Se			
13	615	0120	0,18			
4	7.0	0,20	123	_		
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MACROINVERTE	BRATE HABITAT ASSESSM	ENT FIELD FORM	RIFFLI	URUN PREVALENCE
Date: D	123/03	Site Visit Code	63-6727	
Naterbody: MFT	20 Kogers P	a 25	site: MI2MFDE	skoi
Personnel:		1000		
UNDITAT			-	
HABITAT	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
1A. Riffle Development	Well-developed riffle; riffle as wide as stream & extends two times width of stream.	Fulfie as wide as stream but length less than two times width.	Reduced niffle area that is not as wide as stream & its length less than two times width.	Riffles virtually non- existent
A. score:	1-10 /0	6-8	3-8	0-2
Comments:				
18. Benthic Substrate	Diverse substrate dominated by cobble.	Substrate diverse with abundant cobble, but bedrock, boulders, fine gravel, or sand prevalent.	Substrate dominated by bedrock, boulders, sand, or silt; cobble present.	Monotonous fine gravel, sand, silt, or bedrock substrate.
B. score:	9-10 /0	64	3-5	0-2
Comments:				
2. Embeddedness	Gravel, cobble, or boulder particles are between 0-25% surrounded by fine sediment (particles less than 6.35 mm (.25")).	Gravel, sobble, or boulder particles are between 25-50 % surrounded by fine sediment.	Gravel, cobble, or boulder particles are between S0-75% surrounded by fine sediment.	Gravel, cobble, or boulder particles are over 75% surrounded by fine sediment.
score:	16-20 M	11-15	6-10	0-5
Comments:				
3. Channel Alteration (channelization, straightening, dredging, other alterations)	Channel atterations absent or minimal; stream pattern opparently in natural state.	Some channelization present, usually in areas of crossings, etc. Evidence of past afterations (before past 20 years) may be resent, but more recent channel alteration is not present.	New embankments present on both banks; 40-80% of the stream reach channelized & disrupted.	flanks shored with gablen or cement, over 80% of the stream reach channelized & disrupted.
score:	16-20 /-7	11-15	6-10	0-5
Commenta:				
4. Sediment-Deposition	Little or no enlargement of bars & less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5- 30% of the bottom affected; slight deposition in pools.	affected; sediment	Heavy deposits of fine material, increased bar development; more than 30% of the bottom changing frequently; pools almost absent due to substantials ediment deposition.
score.	16-20 /49	11-15	6-10	0-5
Comments:	11			

5. Channel Flow Status	Water fills baseflow channel; minimi amount of channel substrate exposed.	al Water fills > 75% of the baseflow channel; < 25% channel substrate exposed.	Water fills 25-75% of the baseflow channel; riffle substrates mostly exposed.	Very little water in channel, & mostly present as standing pools.
5. score:	16-20 19	11-15	6-10	0-5
Commenta:				
6. Bank Stability (score each bank) NOTE: Determine left or right side while facing downstream.	Banks stable; no evidence of erosion or bank failure; little apparent potential for future problems.	n Moderately stable; infrequent, small areas of erosion mostly healed over.	Moderately unstable; moderate frequency & size of erosional area; up to 60% of banks in reach have erosion; high erosion potential during high flow.	Unstable; many eroded areas; "raw" areas frequent along straight sections & bends; obvious bank sloughing; 60-100% of banks have erosion scars on sideslopes.
6, score:	3-10 10	6-8	3.5	0-2
	Left Side 10	Average:	10	
	Right Side 10	Comments:		
7. Bank Vegetation Protection (score each bank) NOTE: refuce scores for samual crops & weeds which do not hold soil well (e.g. knapweed).	Over 90% of the streambank surface covered by stabilizing vegetation; vegetative disruption minimal or not evident; almost all plants allowed to grow naturally.	570-50% of the threamback surfaces covered by vegetation; disruption swident, but not affecting full plant growth potential to any great extent; more than one-half of potential plant height evident.	50-70% of the streambank surfaces Exverted in vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of potential plant height remaining.	Less than 50% of the streambank surfaces covered by vegetation; extensive disruption of vegetation; vegetation removed to 2 inches or less.
7. score:	9-10	6-8	3.5	0-2
	Left Side 10	Average:	10	
	Right Side 10	Comments:		
8. Vegetated Zone Width (score each side)	Width of vegetated zone > 100 feet.	Width of vegetated zone 30-100 feet.	Width of vegetated zone 10-30 feet.	Width of vegetated zone < 10 feet.
score:	B-10	6-8	3-5	0-2
	Left Side	Average:	9.5	
	Right Side	Comments:		

TOTAL SCORE:

Score compared to maximum possible:

				Personnel: Ladian / Conner
erbody Name on ID M12	WE	2 Muddle Fork Decision	County Lewis + Clork	- HUC 10050103
Lat Lat/Long obtained by	y met	Long Long Verified? By GPS Datum (Circle by method other than GPS? Y N If Y what method used? If by map what is the map scale?	Verified? By GPS Datum hat method used? If by map what is the mag	GPS Datum (Circle One): NAD 27 NAD 83 WGS84 what is the map scale?
Samples Taken:			Sample ID/File Location:	Someta Callentian D.
Water		Nutrients Metals Commons	034070010	rep van
Sediment				UNAD CED 1
Macroinvertebrate		Macroinvertebrate Habitat Asmt.	03- 01294	victo unos commo
Algae/Macrophytes		Aquatic Plant Form	1 STAR	MAN HESS UTHER:
Chlorophyll a	K		10504	
Habitat Assessment		Stream Reach Asmt. Cother		CHLPHL-2 OTHER:
Substrate		Pebble Count 7% Fines		Purpose: 04107
Transect				
Photographs				
Field Notes				
Other				
Measurements:	The	Time: 1415 Macroinv	Macroinvertebrate Kick Duration: 1	
Q / Flow (cfs)		Est.	New 14	AV MICK LEDGIN (PLC): 2.5
Temp: (C)	W	-	arbalans	
pH:		te y	2	
SC: (mS/cm)	_	(311		
SC x 1000 =		µmho/cm		
DO: (mg/L)		9.23 102.8 90		
N	ight [Slight Turbid Opaque		
Turbidity Comments:	5 / 18	Ms: 1.23 1070		
	1.0	24 1010		
			the second secon	

1.5	TAL DISCHAR					
	10: 7-22	503	N 1 1		03-0724	- min webod a
				21000 434	Station ID	· MIZMEDBRO
Per	rsonnel: []	I diaw 1	Sugara			
	Distance from Initial point	**Depth	**Velocity (at point)	**Width	"Area	"Discharge
1	2' LEW	0.	0			
2	31	0.20	0			
3	41	0.3	405			
4	5	0.45	0.75			
5	6	0,3	0,80		2.11	
6	7.0	0,5	100			
7	8.0	0.45	0,67		-	
8	9.0	1.50	0,50			
9	10.0	0.45	B			
10	11.0	0.40	0,29			-
11	12.0	6,40	0,62			
12	13.0	0,40	0,61			
13	14.0	0,40	0,92			
14	15,0	0,45	0,91			
15	16.0	0.45	1.09			
16	17.0	0,50	1,07			
17	18,1	0,47	0,72			
18	19.0	0.50	0.93			
10	18:0	0.35	0.de			
	21,0	0.35	0.81			
- · · · ·	22.0	0,30	0.48			
	23.0	0,30	0,48		-	
	24.0	0,20	6,36			
	25.0	0,15	0,11			
	26.0	0,10	0,01			
26	26.7 REW	0	0			
27						
8						
19						
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Page 1 of 2

Data Mgnt: Approved

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1.1.1.12				
MACROINVERTEI	BRATE HABITAT ASSESSM	ENT FIELD FORM	RIFFLE	FRUN PREVALENCE
Date: 7/	23/03	Site Visit Code:	03-0729	
Naterbody: N	FD @ Marphy's	When Hury 434	site: MID MED	BLDA
ersonnel:	/			
		-		
HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
1A. Riffle Development	Well-developed riffle; riffle as wide as stream & extends two times width of stream.	Riffle as wide as stream, but length less than two times width.	Reduced riffle area that is not as wide as stream & its length less than two times width.	Rifflet virtually non- existent
A. score:	9.10 9	6-8	3.5	8-2
Comments:	,			
	Diverse substrate dominated by	Substrate diverse with	Substrate dominated by	Monotonous fine gravel,
18. Benthic Substrate	cobble.	abundant cobble, but bedrock, boulders, fine gravel, or sand prevalent	bedrock, boulders, sand, or silt; cobble present.	sand, sill, or bedrock substrate.
B. score:	8-10	6-8 8	3-6	0-2
Comments:				
	Gravel, cobble, or boulder particles	Gravel, cobble, or	Gravel, cobble, or	Gravel, cobble, or
2. Embeddedness	are between 0-25% surrounded by fine sediment (particles less than 6.35 mm [_25"]).	boulder particles are between 25-50 % surrounded by fine sediment.	boulder particles are between 50-75% surrounded by fine sediment.	boulder particles are over 75% surrounded by fine sediment.
score:	16-20	11-15	6-10	0.5
Commenta:				
3. Channel Alteration (channelization, straightening, dredging, other alterations)	Channel alterations absent or minimal; stream pattern apparently in natural state.	Some channelization present, usually in areas of crossings, etc. Evidence of past alterations (before past 29 years) may be resent, but more recent channel, alteration is not present.	New embankments present on both banks; 40-60% of the stream reach channelized & disrupted.	Banks shored with gabion or cement; over 50% of the stream reach channelized & disrupted.
SCOTUS	16-20 / %	11-15	6-10	0-5
Comments:				
4. Sediment Deposition	Little or no enlargement of hars & less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5- 30% of the bottom affected; slight deposition in poots.	Moderate deposition of new gravel, coarse sand on old & new bars; 30- 50% of the bottom affected; sediment deposits at obstructions, constrictions, & bends; moderate deposition in pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools atmost absent due to substantial sediment deposition.
score:	18-20	11-15 13	5-10	0-5
	10.44			
Comments:				

DTAL SCORE:		Score compared to	maximum possible	
	Right Side 9	Comments:	4- 11-	
	Left Side 94 8	Average:	485	0-2
Vegetated Zone Width (score each side) score:	Width of vegetated zone > 100 feet.	Width of vegetated zone 30-100 feet, 6-8	Width of vegetated zone 10-30 feet. 3-5	Width of vegetated zone < 10 feet.
	Right Side 9	Commenta:		
	Left Side 9	Average:	9	
scor#!	9-10 07	6-8	3-5	0-2
7. Bank Vegetation Protection (score each bank) NOTE: reduce cores for annual crops & weeds which do net hold soil well (e.g. knapweed).	Over 50% of the streambank surfaces covered by stabilizing vegetation; vegetative disruption minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by vegetation; disruption evident, but not affecting full plant growth potential to any growth potential to any growth potential to any non-half of potential plant height evident.	50-70% of the streambank surfaces covered in vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of potential plant height remaining.	Less than 50% of the streambank surfaces covered by vegetation; extensive disruption of vegetation; vegetation removed to 2 inches or less.
	Right Side	Average: Comments:	e	
	Left Side		\$	10
score	3-10	5-8	3-5	o.2
5. Bank Stability (score each bank) NOTE: Determine left or right side while facing downstream.	Banks stable; no evidence of erosion or bank follure; little apparent potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over.	Moderately unstable; moderate frequency & size of erosional areas; up to 60% of banks in reach have erosion; high erosion potential during high flow.	Unstable: many eroded areas: "raw" areas frequent along straight sections & bends; obvious bank sloughing; 60-100% of banks have erolon scars on
Comments:	1			0.3
. score:	15-20 -7	exposed,	esposed.	present as standing pools. 0-5
5. Channel Flow Status	introduced of channel to be tools	Water fills > 75% of the baseflow channel; < 25% channel substrate	Water fills 25-75% of the baseflow channel; rittle substrates mostly	Very little water in channel, & mostly

Watcholdy Name Multiclice Contry Multiclice MULticlice MULticlice Station ID Multiclice Verified? By Multiclice MUL					Personnel: La dia a Baser 10202
ng obtained by method other than GF85Y V ND 11 Y what method used? If by map what is the map scale? ng obtained by method other than GF87Y V N T Y what method used? If by map what is the map scale? nst Taken: Sample IDFTile Location: Sample IDFTile Location: nst Taken: Sample IDFTile Location: Sample Collection Precedure nst Taken: Sample IDFTile Location: Sample Collection Precedure nst Taken: Macroinvertebrate Habitat Axmi. [] 0.3. D.D.2.9.0. GRAB Macroinvertebrate Macroinvertebrate Habitat Axmi. [] 0.3. D.D.2.9.0. GRAB Macroinvertebrate Stream Reach Asmi. [] 0.3. D.D.2.9.0. GRAB Aquatic Plant Form Stream Reach Asmi. [] 0.3. D.D.2.9.0. CHPRL-2. Assessment Stream Reach Asmi. [] 0.4. D.D.8.4 Parposet Assessment Perbole Count [] \$ Fines [] Parposet Assessment Count [] \$ Fines [] Context Assessment Perbole Count [] \$ Fines [] Context Assessment Perbole Count [] \$ Fines [] Context Assessment Perbole Count [] \$ Fines [] Context Assessment E Perbole Count [] S Fines [] Astend for [] Macroinvertebrate Kik Duration: <	tion ID Name	A H	Adde Fort Drates Loca	ion At Tracisal's Rand	
ter Taken: Sample ID/File Location: ent Nutrients Macroinvertebrate Macroinvertebrate 0.3. D724.0. finvertebrate Macroinvertebrate Macroinvertebrate 0.3. D724.0. 0.3. D724.0. Macrophytes Aquatic Plant Form 0.3. D724.0. 0.3. D724.0. 0.4. Macrophytes Aquatic Plant Form 0.3. D724.0. 0.3. D724.0. At Assessment Distribut 0.0. D124.0. 0.0. At Assessment Distribut Macroinvertebrate Macroinvertebrate At Assessment Distribut Macroinvertebrate Macroinvertebrate At Assessment At Assessment Macroinvertebrate Ma	/Long obtained b	y met	Long hod other than GPS? Y O N O If Y	Verified? By GPS Datum (what method used? If by map what is the map	Dec): NAD 27 NAD 83
Image: Solution in the image in the ima	Samples Taken:			Committee in the second	110
ent invertebrate Macroinvertebrate Habitat Asmit 03-01384 Macrophytics Macroinvertebrate Habitat Asmit 04 Macrophytics Macroinvertebrate Habitat Asmit 04 from Stream Reach Asmit 04 Aveesament Stream Reach Asmit 04 at Aveesament Aveesament Stream Reach Asmit 04 at Aveesament Stream Reach Asmit 04 at Aveesament 14 Aveesament	ther	Ø	Nutrients Metals Commons F	+	Sample Collection Procedure
Invertebrate Macrophytes Macrophytes Aguatic Plant Form Stream Reach Asmt. Aduatic Plant Form Stream Reach Asmt. Stream Reach Asmt. Aduatic Plant Form Stream Reach Asmt. Aduatic Plant Form Stream Reach Asmt. Aduatic Plant Stream Reach Asmt. Aduatic Plant Aduatic Plant	liment			Ś	GRAB
Macrophytes Aquatic Plant Form 0 - 078.4 phylla 0 - 078.4 t Assessment 5 ream Reach Annt. 0 ther 0 - 0.0 -	croinvertebrate		Macroinvertebrate Habitat Asmt [5]	62-1358 M	. SED-1
phyll a Peter Reach Amit. Other Peter Count % Fines Peter Reach Amit. Other Peter Reach Amit. Pete	ac/Macrophytes		Aquatic Plant Form	53-10 (2011)	KICK HESS OTHER:
I Assessment Stream Reach Annt. Other CHL ate Pebble Count % Fines Purp ate Purp Purp Purp<	orophyll a			H-0-20-20-000	PERI-1, OTHER:
Ite Petble Count % Fines ct	pitut Assessment		Stream Reach Asmr Contract		CHLPHL-2 OTHER:
ct taphs taphs taphs trements: Trime: trements: treme	ostrate		Pebble Count C & Fines		Purposet CNUX
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kotes Image: Si CD rements: Time: Si CD w (cls) Est. I (C) w K.S.A A (C) w K.S.A Stem) 29.4 000 = jumlocm gL) Step opque by Connents:	stographs				
rements: Time: 3: O. w (cfs) w K A A (C) w K A A (C) w K A A (C) w K A A Stem) 247 000 = µmho/m gcL) Slight [] Turhid [] Opnque [] ty Comments: A	ld Notes				
Time: 3: O Macroinvertebrate Kick Duration: 40 w. Kick La w Kick La Natroinvertebrate Kick Duration: 2.4 W.	cr				
Ett Ett Kick Id W 15.31 A Ett Kick Id W 15.31 A Site Visit Comments: A S 11 217 Imilio/cm A A 217 A A S 11 217 A A S 11 217 A A Imilio/cm Imilio/cm A A S 11 217 A A Imilio/cm Imilio/cm A A S 11 Turbid Opaque A	asurements:	Tim	[3:00		
W 16.54 A A A A A A A A A A A A A A A A A A A	Flow (cfs)		Ear	1000	Kick Length (Pt.):
217 217 µmio/cm µmio/cm 1 102.195 ight □ 1 urbid □ 1 1010 + 124 mio	np: ('C)	M	59 A	1	
Cem	pH:	0	19	10 10010000	X
うらい / 102 ight □ Turbid □ Opa : つし 185 a + 1	(mS/cm)		29.7	TON DAGON CIMORY	
「 」 も	x 1000 =	1	umho/cm		
ight 🗌 Turbid 🗍 O	: (mg/L)	5	1 102		
bidity Comments: Review + 1.24 mills	R: Clear Sh	ght [Turbid Conque		
	bidiry Comments:	G	4 N50 + 124 MO		
				1 () () () () () () () () () (

	Date: 7- 13-			Site Visit Code:	03-0708	121-122
	Waterbody: M.d.	du			Station ID:	THIZ ME DIBILON
1	Personnel: Baud	maxila	diaid			
1	**Distance from initial point	**Depth	"Velocity (at point)	"Width	**Area	**Discharge
1	2.0'	Ð	G	12 million		
2	30	.4		+		
3	40	.5	Ge,			
4	50	5	,26			
5	6.0	.55	.43			
6	7.0.	.5%	.97			
7	80	1.55	0			
8	9.0	16	. 81			
9	10:0	.65	.79			
10	11.0	,55	.95			
11	12.2	165	1.01			
12	13.0	.52	1.17			
3	14.0	. 4	1.10			
4	15.0	.3	.90			
5	16.0	,25	. 88			
6	17.0	.30	.95			
7	18.0	, 25	. 67			_
8	19.0	. 20	. 61			
9	0.00	120	.70		-	
0	0.16	120	.62			
1	200	46+	.08			
2	24,0	.19	10.8			
3	25.8	0	O.			
4		-				
5						_
8						
7						
8						
9						
0						

Page 1 of 2

Data Mont. Approved

21.1.1.12 MACROINVERTE	BRATE HABITAT ASSESSN	ENT FIELD FORM	RIFFL	E/RUN PREVALENCE
Date: 7-23-0	2	-	03-6798	and the the line
Waterbody: M. d.d.			Site: //)/2/A(PD)	ROW
Personnel: Land	Tais 1 Broman	0		
HABITAT	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
1A. Riffle Development	Well-developed riffle; riffle as wide as stream & extends two times width of stream.	Riffle as wide as stream but length less than two times width.	Reduced riffle area that is not as wide as stream & its length less than two times width.	Ruttles virtually non-
IA. score: 8	9-10	64	3.5	6.2
Comments:				
18. Benthic Substrate	Diverse substrate dominated by cobble.	Substrate diverse with abundant cobble, but bedrock, boulders, fine gravel, or sand prevalent	Substrate dominated by bedrock, boulders, sand, or silt; cobbie present.	Monotonous fine gravel, sand, silt, or bedrock substrate.
tB. score:	3-10	64	3.4	0-2
Comments:				
2. Embeddedness	Gravel, cobble, or bouider particles are between 0-25% surrounded by fine sediment (particles less than 6.35 mm (.25")).	Gravet, cobble, or boulder particles are between 25-50 % surrounded by fine sediment.	Gravel, cobble, or boulder particles are between 50-75% surrounded by fine sediment.	Gravel, cobble, or boulder particles are over 75% surrounded by fine andiment.
score:	16-20	11-15	6-10	0-5
Commenta:	and the second second			
3. Channel Alteration (channelization, straightening, dredging, other alterations)	Chainel alterations absent or minimal; stream pattern apparently in natural state.	Some channelization present, usually in areas of constings, etc. Evidence of past alterations (before past 20 years) may be resent, but more recent channel alteration is not present.	New embankments present on both banks; 40-8% of the stream reach channelized & disrupted.	Banks shored with gables or cement; over 80% of the stream reach channelized & disrupted.
score: (7)	16-20	11-15	8-10	0-5
Comments:	uptream bridge			
4. Sediment Deposition	Little of no enlargement of bars & less than 5% of the bottom affected by sediment deposition.	from coarse gravel; 5- 30% of the bottom affected; slight deposition in pools.	new gravel, coarse sand on old & new bars; 30- 50% of the bottom affected; sediment deposits at obstructions, constrictions, & bends;	Heavy deposits of fine material, increased bar development, more than 50% of the bottoin changing frequently; pools almost absent due to substantial sediment deposition.
score: 15	16-20	11-15	5-10	0-5
Comments:	digeston in glide	5 + proto /a	2004 30°0	

5. Channel Flow Status	Water fills baseflow channel; minima amount of channel substrate exposed.	Water fills > 75% of the baseflow channel; < 25% channel substrate	Water fills 25-75% of the baseflow channel; riffle substrates mostly	Very little water in channel, & mostly
	exposed,	exposed.	exposed.	present as standing pools.
5. score: 10	16-20	11-15	5-10	0-5
Comments:				
5. Bank Stability (score each bank) NOTE: Determine left or right side while facing downstream.	Banks stable; no evidence of erosion or bank failure; little apparent potential for future problems.	Moderately stable; Infrequent, small areas of erosion mostly heated over.	Moderately unstable; moderate frequency & size of erosional areas; up to 80% of banks in reach have erosion; high erosion potential during high flow.	Unstable; many ecoded areas; "raw" areas frequent along straight sections & bends; obvious bank aloughing; 60-100% of banks have erosion acces on aldealopes.
6, score;	5-10	6-8	3-5	0-2
	Left Side 9	Average		
	Biotel Side 9	Comments:		
	India and	Charles and the second		an an anna
7. Bank Vegetation Protection (score each bank) NOTE: reduce scores for annual crops & weeds which do not hold soil well (e.g. knapweid).	Over 90% of the streambank surfaces covered by stabilizing vegetation; vegetative disruption minimal or not evident; almost sil planta allowed to grow naturally.	streambank surfaces covered by vegetation; disruption evident, but not affecting full plant growth potential to any great extent; more than	50-70% of the streambank surfaces covered in vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less then one-half of potential plant height remaining.	Less then 50% of the Streambank surfaces covered by vegetation, extensive disruption of vegetation; vegetation removed to 2 inches or less.
7, score:	3-10	64	3-5	0-2
	Left Side	Average:		
	Right Side	Comments:		
E. Vegetated Zone Width (score each side)	Width of vegetated zone > 100 feet.	Width of vegetated zone 30-100 feet.	Width of vegetated zone 10-30 feet.	Width of vegetated zone < 10 feet.
Liscore: D	8-10	6-8	3-5	0-2
	Left Side	Average		
	Right Side	Commente		
		Secto compand t	o maximum possibl	

Waterbody Name	Location Veri 1 N If Y what 1	County Lean S + Elan ion Douvelean S + March 150 Verified? By GPS Datum (Creek	
ng obtained by meth es Taken:	Very Very Very Very Very Very Very Very	rified? By GPS Datum (Circ	HUC /00/30/00
Samples Taken: Water I Nutrients Metals Continuents Metals Materian Macrolivertebrate Macrolivertebrate Macrolivertebrate	Commons	method used? If by map what is the map scal	GPS Datum (Circle One): NAD 27 NAD 83 WGS84 what is the map scale?
Int Invertebrate	Commons	Samula ID/031- I construct	IE
ertebrate	Contraction of the second		Sample Collection Procedure
			GRAB
	Acmt	地理に うちょう いいのに ちょうしょう	. SED-1
	- anne		KICK HESS OTHER:
D		A - Nor A fin to	PERI-1 OTHER:
1		22-2313 & Liegho (with)	CHLPHL-2 OTHER:
Habitat Assessment _ Stream Reach Asmt Other _	ther		18
Substrate Debble Count 7% Fines			r ur pose:
Transect			
Photographs []			
Field Notes			
Other			
Measurements: Time: 1.30	Macroino	Macminuertebena Kisk Domeine	and the first of the second
	Site Vicit	Site Victor Comments	Kick Length (PL);
W 3.35 A	1101 4 1010	Comments:	
pH: \$.00	No. 10	a labor of direct	
SC: (mS/cm) and and mail and the set of the		a ration at a www.	
SC x 1000 = Jumho/cm			
DO: (mg/L) 40 / 81 4 34			
TUR: Clear 🔝 Slight 🗍 Turbid 🗍 Opaque 🗍			
Turbidity Comments: 2, % 10 500			
		CONTRACTOR OF A DAY	

	DTAL DISCHARG			City Vich Cad	03-0715	
	nte: <u>No.19-</u> sterbody: 1).d.d		_	Site visit Code:		MISHEDER
		Unio I da	ALCON .		Station 12.	1-1120 C. More-
-	a construction of the second sec	runay co	10			
	Distance from initial point	**Depth	"Velocity (1 point)	**Width	**Area	**Discharge
1	18' 250	6	0			
2	19.5	25	0,37			
3	240	,40	0.98			
4	22.5	.70	1.11			
5	24,0	170	1.05			
6	25.5	,60	0,98			
7	27,0	, 40	1.07			
8	28.5	160	1.33			_
9	30.0	165	1.55			-
10	31.5	170	1.26			
11	33,0	160	1.34			
12	3415	160	1.30			
13	36.0	160	1.11			
14	37.5	.60	1,19			
15	39.0	,50	0,23			
6	40.5	.45	0,57			
7	42.6	145	0,24			
18	43,5 fd. AREA		5			_
9	44.000	0	0			
0						
1						
2						
3						
5						
6						
8		-	2002			
9						
0					19-19-19-19-19-19-19-19-19-19-19-19-19-1	

Page 1 of 2

Data Myrri. Approved

			SUBST	RATE	DEQ/MD	M	P	levised 3/2003 DMA
Date:	6-19-03				Site V	isit Code	: 03-07	118
Waterboo	ty: Woldte Fra	1 3	callian.	s	TORETS	station ID	Midw	IF IDBEDD
Personne	1: Ladas	1.Bi	WINDLA					
			PE	B 3LE CO	DUNT			
Row ID	Particle Categ	ory	Size (mm)	i .iffle Count	(Other) Count	Chara	cteristic Grou	ip: PEBL-CNT
						Sum	% of Total	Cum. Total
1	Silt / Clay		<1	X::		0		0.009
2	Sand		1-2	15		0	1	0.009
3	Very Fine		2-4			0		0.00%
4	Fine		4 - 6	:	-	0		0.00%
5	Fine	1	6-8	**		0	1.5	0.00%
6	Medium	S	8 - 12	t1		0		0.00%
7	Medium	GRAVELS	12 - 16	Ø		0		0.00%
8	Coarse	0	16 - 22	LI.		0		0.00%
9	Coarse	1	22 - 32	M M	-	0	_	0.00%
10	Very Coarse	~	32 - 45	23		0	_	0.00%
11	Very Coarse	1	45 - 64	因.		0		0.00%
12	Small		64 - 90	対:		0		0.00%
13	Small	COBBLES	90 - 128	Ę.		0		0.00%
14	Large	COB	128 - 180	::		0		0.00%
15	Large		180 - 256			0		0.00%
16	Small		256 - 362			0		0.00%
17	Small	ERS	362 - 512			0		0.00%
18	Medium	BOULDERS	512 - 1024			0		0.00%
19	Large		1024 - 2048			0		0.00%
20	Bedrock		> 2048			0		0.00%
21	Total # Samples			0	0	0	0.00%	

Pebble Count Data Entry Form

		Stream Reach	Accorem	ant Form	Revision	3/200
Station ID: Mia	MENZERA	Date: 6		Site Visit Code:	03-0718	
		alorn-D.S. Hu		Reach Length:		
	DEALE GAS	N.17. UK	Personne	an ann ann an ann ann ann an ann. S		
Waterbody Seg ID:			Personne			-
Station ID's on reach				_		_
Question 1, Stream			100	1000 No.	7 2 10 2 1	-
the incised channel. ' model)	There is perenni	al riparian vegetation w	ill established	in the riparian area.	e riparian area has formed v (Stage 1 and 5, Schumm's	
6 = channel has evid the falling bands, soli			stabilizing, vej	getation is beginning	to establish, even at the ba	ise c
		resent. Immediate acti				
2 = unstable, channel vegetation that is pre-	l incised, actively sent is mainly pir	widening, limited new oneer species. Bank fa	riparian area/f ilure is commo	loodplain, floodplain on. (Stage 3)	not well vegetated. The	
or rare flood events a	ccess the flood p	plain. Tributaries will al	so exhibit dow	ncutting/headcuts.		iona
The presence of activ	e headcuts shou	ıld nearly always keep	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		sustainable.	
Actual Score:	8	Potential Score:	8			
Comments		S				
4 = there is a minimal	amount of active te amount of acti	ce with the stream and a lateral bank erosion o ve lateral bank erosion sion occurring Potential Score:	occurring			10
Comments						_
		e with the Water and				
	I NO EXCESS SEDI	ment/bedioad depositio	n, sealment o	ccurs on point bars	and other locations as would	o be
= the stream exhibits xpected in a stable, d	lynamic system					
= the stream exhibits xpected in a stable, d	lynamic system	arent in riffles or pools,	or other evide	nce of excess sedin	sent apparent	
= the stream exhibits expected in a stable, d = sediment clogged = mid-channel bars a	lynamic system gravel"s are appa are common					
 the stream exhibits expected in a stable, d e sediment clogged is e mid-channel bars a 	lynamic system gravel"s are appa are common	arent in riffies or pools, occurring braided syste				ł
 the stream exhibits table, d sediment clogged mid-channel bars a stream is braided (lynamic system gravel"s are appa are common					
6 = the stream exhibits expected in a stable, d 4 = sediment clogged s 2 = mid-channel bars a	lynamic system gravel"s are appa are common	occurring braided syste				
6 = the stream exhibits expected in a stable, d 4 = sediment clogged 2 = mid-channel bars a 0 = stream is braided (Actual Score:	lynamic system gravel"s are appa are common	occurring braided syste				

Question 4, Sufficie	ent Soil Present to Hold Water and Act as a Rooting Medium:
3 = more than 85% o	If the riparian area with sufficient soil to hold water and act as a rooting medium
2 = 65% to 85% of th	e riparian area with sufficient soil to hold water and act as a rooting medium
1 = 35% to 65% of th	e riparian area with sufficient soil to hold water and act as a rooting medium
0 = 35% or less of the	e riparian area with sufficient soil to hold water and act as a rooting medium
Actual Score:	<u> </u>
Comments	
Question 5, Percent	t of Streambank with Vegetation having a Deep, Binding Rootmass: (see Appendix I for stability arian, and other, species)
	the streambank comprised of plant species with deep, binding root masses
4 - 60% to 80% of the	e streambank comprised of plant species with deep, binding root masses
	e streambank comprised of plant species with deep binding root masses
	the streambank comprised of plant species with deep binding root masses
0 = 1655 than 30% of 1	C-1900
Actual Score:	Detential Score:
Comments	
1 = 1%-5% of the ripar	
Comments	
	nce-Caused Undesirable Plants:
	iparian area has undesirable plants
	ian area has undesirable plants
	arian area has undesirable plants
= over 10% of the rip	arian area has undesirable plants
ctual Score:	2 Potential Score: 3
comments _	
	o SRAF.xts

Question 8, Woo	ody Species Establishment and Regeneration: (Note: Skip this question if the riparian area has no v species)
	s of native woody riparian species present (see table, Fig 2)
6 = one age class and shrubs, there	of native woody riparian species clearly absent, all others well represented. For sites with potential for trees may be one age class of each absent. Often, it will be the middle age group(s) that is (are) lacking. Having and a young age class present indicate potential for recovery.
or the stand is cor	es of native riparian shrubs and/or two age classes of riparian trees clearly absent, other(s) well represented, nprised of mainly mature, decadent or dead plants
dominate. Re-eva	duced, (i.e., facultative, facultative upland species such as rose, or snowberry) or non-riparian species duate Question 1, incisement, if this has happened.
0 = some woody s evaluated to ensu- cedar	pecies present (>10% cover), but herbaceous species dominate (at this point, the site potential should be re- re that it has potential for woody vegetation). OR, the site has at least 5% cover of Russian olive and/or salt
Actual Score:	Potential Score: 2/2 Right & Laft Backs Very different
Comments	
Question 9, Utilia species)	zation of Trees and Shrubs: (Note: Skip this question if the riparian area has no potential for woody
4 = 0-5% of the av	allable second year and older stems are browsed
	available second year and older stems are browsed
	e available second year and older stems are browsed.
1 = more than 50%	6 of the available second year and older stems are browsed. Many of the shrubs have either a "clubbed" by are high-lined or umbrella shaped.
	able use (10% or more) of unpalatable and normally unused woody species.
Actual Score:	Potential Score:
Comments	
	arian/Wetland Vegetative Cover in the Riparian Area/Floodplain and Streambank:
	t the riparian/wetland plant cover has a stability rating ≥ 6
	e riparian/wetland plant cover has a stability rating ≥ 6
	e riparian/wetland plant cover has a stability rating ≥ 6
	e riparian/wetland plant cover has a stability rating ≥ 6
0 = less than 55% (of the riparian/wetland plant cover has a stability rating ≥ 6
Actual Score:	4 Potential Score: 6
	nords more without instead of seasons
Comments	
Optimonia -	
	3 SRAF.xls

Question 11, Riparian Area/Floodplain Characteristics are Adequate to Dissipate Energy and Trap Sediment. 6 = active flood or overflow channels, large rock, or woody material present and adequate to dissipate energy and trap sediment. There is little surface erosion and no evidence of long, continuous erosional areas on floodplain/riparian area or streambank. There are no headcuts where either overland flow and/or flood channel flows return to the main channel. 4 = rock and/or woody material is present, but generally of insufficient size to dissipate energy. Some sediment trapping occurring. Occasional evidence of surface erosion. Generally not severe enough to have developed channels. 2 = inadequate rock and/or woody material available for dissipation of energy or sediment trapping. There is surface erosion (scouring) and occasional headcuts where overland flows or flood channel flows return to the main channel. 0 = riparian area/floodplain lacking any of these attributes: 1)adequate flood or overflow channels, 2) large rock, or 3) woody material suitable for energy dissipation and sediment trapping. Erosional areas are long and continuous. Lacking vegetation or substrate materials adequate to resist further erosion. Surface erosion is obvious on the floodplain/riparian area. Headcuts are present that have the potential to create meander cut-offs. Potential Score: Actual Score: Comments SUMMARY Potential Actual Score Possible Points Score 0 0 0, 2, 4, 6, 8 QUESTION 1: Stream Incisement 0, 2, 4, 6 0 QUESTION 2: Lateral Cutting 0 0, 2, 4, 6 0 0 QUESTION 3: Stream Balance N/A, 0, 1, 2, 3 N/A, 0, 2, 4, 6 QUESTION 4: Sufficient Soil 0 0 QUESTION 5: Rootmass 0 0 Weeds 0 0, 1, 2, 3 0 QUESTION 6: 0, 1, 2, 3 Undesirable Plants 0 0 QUESTION 7: QUESTION 8: Woody Species Establishment 0 N/A, 0, 2, 4, 6, 8 0 QUESTION 9: Browse Utilization 0 N/A, 0, 1, 2, 3, 4 0 Riparian/Wetland Vegetative Cover * N/A, 0, 2, 4, 6, 8 0 OUESTION 10: 0 Riparian Area/Floodplain Characteristics N/A, 0, 2, 4, 6 0 **QUESTION 11:** Total 0 0 61 0 Potential Score for most Bedrock or Boulder streams 0 (32) (questions 1, 2, 3, 6, 7, 11) 0 0 (49)Potential Score for most low energy "E" streams (questions 1 - 7, 10, 11) X 100 = % rating #DIV/0! Actual Score RATING: Potential Score 80-100% = SUSTAINABLE 50-80% = AT RISK LESS THAN 50% = NOT SUSTAINABLE * Only in certain, specific situations can both of these receive an "N/A". SRAE vis

	Montana Department of Environmental Quality Supplemental Questions
	e questions does not have an effect on the rating above. hese questions must consider the potential of the stream.
	heries Habitat / Stream Complexity Note: the answers to question 12 will be averaged
12a. Adult and Ju 3 = Abundant deep	uvenile Holding/Escape Cover o pools, woody debris, overhanging vegetation, boulders, root wads, undercut banks and/or aquatic
6 = Fish habitat is	common (see above).
4 = Fish habitat is a boulders, root wad	noticeably reduced. Most pools are shallow and/or woody debris, undercut banks, overhanging vegetation is and/or aquatic vegetation are of limited supply.
2 = Pools and habi	tat features are sparse or non-existent or there are fish barriers.
0 = There is not en	ough water to support a fishery
N/A = Stream woul	Id not support fish under natural conditions
Actual Score:	3 Potential Score: 4
Comments	
12b. Habitat Com 6 = A mixture of juy	plexity venile and adult cover types is present. High flow juvenile and adult refugia are present.
3 = Primarily adult	or juvenile cover types are present. High flow refugia are reduced.
0 = High flow refugi	
N/A = Stream would	d not support fish under natural conditions
Actual Score:	Potential Score: 3
Comments	
12c. Spawning Ha 3 = Areal extent of :	abitat (salmonid streams only) spawning substrate, morphology of spawning areas, and composition of spawning substrate are excellent.
	spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduced.
	spawning substrate, morphology of spawning areas, and/or quality of spawning substrate greatly reduced.
V/A = Stream would	i not support fish under natural conditions.
Actual Score:	5 Potential Score: 6
Comments	
21. 17.225	
	5 SRAF.xls

12d. Fish Passa 8 = No potential fis		sapparent		
0 = Potential fish p				
		under natural conditi	005	
Actual Score:	2 101 support ion	Potential Score	100 March 100 Ma	
Acidal Score.				
Comments			_	
12e. Entrainment 8 = Entrainment of	fish into water dive	ersions not an issue.	4	
		ersions may be a mo		
0 = Entrainment of	fish into water dive	ersions may be a ma	jor issue,	
Actual Score:		Potential Score:		
Comments				
12a-e Avg. Score	Actual Score	0	Potential Score	0
iza-e Avy. Soois	r service a serve			
contest conservation	-			
8 = More than 75%	of the stream reac	h is adequately shad		
3 = More than 75% 1 = 50-75% of the s	of the stream reac tream reach does	not have adequate s	hading or the water tem	perature is probably elevated by irrigation,
4 = 50-75% of the s	of the stream reac tream reach does		hading or the water tem	perature is probably elevated by irrigation,
6 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 0 = More than 75%	of the stream reac tream reach does 25-50% of the strea of the stream reac	not have adequate s im does not have ad	hading or the water tem lequate shade.	operature is probably elevated by irrigation, ion or the water temperature is probably
3 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% trastically altered by	of the stream reac tream reach does 25-50% of the strea of the stream reac	not have adequate s im does not have ad h does not have ade	hading or the water tem lequate shade. quate shade by vegetat	
3 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% trastically altered by	of the stream reac tream reach does 25-50% of the strea of the stream reac	not have adequate s im does not have ad	hading or the water tem lequate shade. quate shade by vegetat	
3 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 9 = More than 75% inastically altered by Actual Score:	of the stream reac tream reach does 25-50% of the strea of the stream reac	not have adequate s im does not have ad h does not have ade	hading or the water tem lequate shade. quate shade by vegetat	
3 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 9 = More than 75% inastically altered by Actual Score:	of the stream reac tream reach does 25-50% of the strea of the stream reac	not have adequate s im does not have ad h does not have ade	hading or the water tem lequate shade. quate shade by vegetat	
3 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 9 = More than 75% (rastically altered by Actual Score: Comments	of the stream reac tream reach does 15-50% of the stream of the stream reac y irrigation, etc.	not have adequate s im does not have ade h does not have ade Potential Score:	hading or the water tem lequate shade. quate shade by vegetat	
B = More than 75% = 50-75% of the s = Approximately 2 = More than 75% inastically altered by actual Score: Comments Auestion 14. Algae	of the stream reac tream reach does 15-50% of the stream of the stream reac y irrigation, etc.	not have adequate s im does not have ade h does not have ade Potential Score:	hading or the water tem lequate shade. quate shade by vegetat	
S = More than 75% S = 50-75% of the s Approximately 2 O = More than 75% Instically altered by Actual Score: Comments Duestion 14. Algae = Algae not appare	of the stream reach tream reach does 15-50% of the stream of the stream reach y infigation, etc.	not have adequate s im does not have ade h does not have ade Potential Score: tts pery.	hading or the water tem lequate shade. quate shade by vegetat	
A province than 75% S = 50-75% of the s A pproximately 2 A proximately 2 A province than 75% A province than 75% A province than 75% A province than 75% A province that province that 75% A province that 75% A province that 75	of the stream reach tream reach does 15-50% of the stream of the stream reach y irrigation, etc. 3 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	not have adequate s im does not have ad h does not have ad Potential Score: tts pery. adge	hading or the water tem lequate shade. quate shade by vegetat	
S = More than 75% S = 50-75% of the s S = Approximately 2 S = More than 75% Inastically altered by Actual Score: Comments Usestion 14. Algae = Algae not appare = in small patches = in large patches	of the stream reach tream reach does 15-50% of the stream of the stream reach y irrigation, etc. 	not have adequate s im does not have ad h does not have add Potential Score: tts pery, adge nats	hading or the water tem lequate shade. quate shade by vegetat	
S = More than 75% S = 50-75% of the s S = Approximately 2 S = More than 75% Irrastically altered by Actual Score: Comments Duestion 14. Algae algae not appare in small patches in large patches = Mats cover botto	of the stream reach tream reach does 15-50% of the stream of the stream reach y irrigation, etc. 	not have adequate s im does not have ad h does not have add Potential Score: tts pery, adge nats	hading or the water tem lequate shade. quate shade by vegetat	ion or the water temperature is probably
B = More than 75% S = 50-75% of the s S = Approximately 2 S = More than 75% Irrastically altered by Actual Score: Comments tuestion 14. Algae algae not appare in small patches in large patches = Mats cover botto	of the stream reach tream reach does 15-50% of the stream of the stream reach y irrigation, etc. 	not have adequate s im does not have add h does not have add Potential Score: tts pery, adge nats conditions) or plant	hading or the water tem lequate shade. requate shade by vegetat	ion or the water temperature is probably
S = More than 75% S = 50-75% of the s S = Approximately 2 S = More than 75% Irrastically altered by Actual Score: Comments auestion 14. Algae a Algae not appare in small patches = in large patches = Mats cover botto /A = No water	of the stream reach tream reach does 15-50% of the stream of the stream reach y irrigation, etc. 	not have adequate s im does not have ad h does not have add Potential Score: tts pery, adge nats	hading or the water tem lequate shade. requate shade by vegetat	ion or the water temperature is probably
5 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% trastically altered by Actual Score: Comments Actual Score: Comments Auestion 14. Algae = Algae not appare = in small patches = in large patches	of the stream reach tream reach does 15-50% of the stream of the stream reach y irrigation, etc. 	not have adequate s im does not have add h does not have add Potential Score: tts pery, adge nats conditions) or plant	hading or the water tem lequate shade. requate shade by vegetat	ion or the water temperature is probably
S = More than 75% 4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% frastically altered by Actual Score: Comments Actual Score: a Algae not appare = in large patches = in large patches = Mats cover botto I/A = No water ctual Score:	of the stream reach tream reach does 15-50% of the stream of the stream reach y irrigation, etc. 	not have adequate s im does not have add h does not have add Potential Score: tts pery, adge nats conditions) or plant	hading or the water tem lequate shade. requate shade by vegetat	ion or the water temperature is probably

6 = none	ce oils, turbidity	, salinization, precip	itants on striam botto	m and/or v ater ode	or .
a contraction	- Vi				
4 = Slight					
2 = Moderate					
= Extensive					
I/A = No water					
	T.	Detection Convers	1		
ctual Score:		Potential Score:	6		
Comments					Contraction of the
omments		-			
= There are no know		sources of bacteria			
			incentrated livestock ope	erations are the mos	t common sources.
		e is entering the stree			
ctual Score:	2	Potential Score:	4		
ciual acore:					
omments					CONTRACTOR OF THE CONTRACTOR O
omments					
luestion 17. Macro		o community of mac	roinvertebrates. Stream	riffles usually have	an abundance of may
es, caddis flies and/		to contracting of finad	cirrencorates. exeam	innos accany nare i	in actinounce of may
= The stream is dom	ninated by pollution	n tolerant taxa such a	s fly and midge larva.		
= Macroinvertebrate	s are rare or abser	nt .			
A = Stream reach is	ephemeral				
Aug Canad	3	Potential Score: 4			
tual Score:	3	Potential Score: 4			
	3	Potential Score: 4			_
	3	Potential Score: 4			
	3	Potential Score: <u>4</u>			
	3	Potential Score: <u>4</u>			
	3	Potential Score: <u>4</u>			
	3	Potential Score: <u>4</u>			
	3	Potential Score: <u>4</u>			
	3	Potential Score: <u>4</u>			
	3	Potential Score: <u>4</u>			
omments	3	Potential Score: <u>4</u>			

Question 18. Irrigation impacts (Assess during critical low flow periods or you may need to inquire locally about this. Evaluate effects from de-watering or inter-basin transfer of water.)

8 = There are no noticeable impacts from irrigation

6 = Changes in flow resulting from irrigation practices are noticeable, however flows are adequate to support aquatic organisms.

4 = Flows support aquatic organisms, but habitat, especially riffles are drastically reduced or impacted.

Potential Score:

2 = The flow is low enough to severely impair aquatic organisms

0 = All of the water has been diverted from the stream

N/A = Stream reach is ephemeral.

Actual Score:

Comments

Question 19. Landuse activities - Sources

8 = Landuse practices do not appear to significantly impact water quality or the riparian vegetation. Any impacts that occur appear to be natural.

6 = There are some signs of impact from landuse activities such as grazing, dryland agriculture, imigation, feedlots, mining, timber harvesting, urban, roads, etc.

4 = Impacts from landuse activities are obvious and occur throughout most of the stream reach. For example, there are obvious signs of human induced erosion, saline seeps or overgrazing within the watershed.

2 = Landuse impacts are significant and widespread. Visual observation and photo documentation would provide overwhelming evidence that the stream is impaired.

0 = Land use impacts are so intrusive that the stream has lost most of its natural features. The stream does not appear to be capable to support most forms of aquatic life

Actual Score:	G	212	Potential Score:	8			
Comments		-				_	
Total Actual	0		Total Potential	0			
RATING	Total Potential	_×	100	#DIV/01			
OVERALL RATING		<u>(To</u> (To	tal NRCS Actual + tal NRCS Potentia	Total MT Supplement / I + Total MT Supplement	Actual) x100 ht Potential)	a. e	#DIV/0!
	75-100% = 5 50-75% = A LESS THAN	TRIS		ABLE			
							SRAF vis

	iona Streams	Page 15
134	5 4715 -13 -13 -15TU	$J = \frac{\frac{85.5}{-13}}{\frac{72.5}{2}} = FW$
	34 24 = BFH	72.5 = FW $4.0 = FH$
Tream TYPE, A	B C D DA	E F G
2		
Cobbie		
draval Cobbla Bo		
10 NO		
Ang 6	the second se	>2.2 <1.4 <1.4
P Ratio < 12 >1 uosity 1 - 1.2 > 1 ope .04099 .020	2 > 1.2 n/a volidble 39 < .02 < .04 < .005	< 12
6.02	E= 72.55 = 2.1	NOT R.B.
GD8 9.18	$w/D = \frac{34.5}{3.4} = 2$	14 69 2 °
9.18	77 = 2	1245 100 S
$\frac{1}{3}$, $\frac{1}{2}$,	1.2 Rosgen's representation of longitudinal plan views of major stream types. From Ro	sgen, 1996.
etzo styr	At Slope = 3.10 Ast Slope = 420 420	0.0073 - CATZO 137000 2010 16:00
		1600

			Personnel: Landlew Bewinen
2		County Lans 1 Clark	HUC 1003010 2
Lat 444 our 1049 Lat/Long obtained by me	Detection Long How on the second sec	Verified? By GPS Datum (hut method used? If by map what is the map	GPS Datum (Circle One): NAD 27 NAD 83 WGS84 what is the map scale?
Samples Taken:		Sample ID/File Location:	
Water	Nutrients N Metals Commons	D. Manuf	sample Collection Procedure
Sediment		Magnorized	GRAB
Macroinvertebrate	Macroinvertebrate Habitat Asmt		SED-1
Algae/Macrophytes	Actuatic Plant Recent		KICK HESS OTHER:
Chlorophult a	TITLO I WITH A ACCORDANCE		PERI-1 OTHER:
motopuyu a		03497310 (burkley a co	CHLPHL-2 OTHER:
Habitat Assessment	Stream Reach Asmt. Other		12
Substrate	Pebble Count 🖂 % Fines		rupose: UNNU
Transect			
Photographs E			
Field Notes			
Other			
Measurements: Ti	Time: 15-20 Macroine	Macminumaheata Mich Dumatan.	and a second
	Ea	Site Visit Comments.	Kick Length (Ft.):
Temp: (C) W	1	Comments.	
pH:	0.4D	1000 000 000 00 000	
SC: (mS/cm)	300 FC+ /144		
SC x 1000 =	tumbo/em		
DO: (mg/L) /0	35 mil- 91. 09m		
TUR: Clear Slight	Turbid Opaque		
Turbidity Comments:	. 2.31. Mai		
	1.5% NTO		
		A CONTRACTOR OF A CONTRACTOR O	

	Date: (-19.0)		Deciloan	Site Visit Code	: 03-0721	mame)ara
	Vaterbody: M.d.		Care Inc.	Neur Mart	15 19 3 Station ID	CARD OF CALLS AND CO.
		n up / mass	and a statement			
	"Distance from initial point	**Depth	**Velocity (at point)	++Width	**Area	**Discharge
1	14 LEW	130	170			
2	17	1355	175			
3	18	,35	178			
4	\$21	,35	1.13			
5	120	135	1,33			
6	22	135	,90			
7	23	135	.89			
8	23.4 REN	ø	1			
9						
10			- /			
11						
12						
13		/				
14		Light	106 35KM	took fi	nos au chi	-1
15		Licenses	DICE STATE	- Tove to	and garren	0
16					1.1.1	
18						
19			0			-
20						
21						
22						
23						
24						
25						
16						
7						
8						
9						
0					1.	

M12MFDBR01	Date-	7/23/2003	11:30
Middle Fork Dearborn, Upstream near R	loger's Pass		
Geomorpho	logy Data		
parameter	value	units	
Bankfull Width		Ft	
Mean Depth		Ft	
Bnkfull X-sect area		Sq Ft	
Width/Depth			
Max Depth		Ft	
Flood prone width		Ft	
Entrenchement Ratio			
Water slope	0.0259		
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating			
Channel D50	27	mm	
Percentage of Fines (<2mm)		%	
Stream Type			
Discharge	0.56	cfs	

Stream Reach Habitat Ass	sessments	6
Parameter	Value	Units
Stream Reach Assessment Score (NRCS)		%
Stream Reach Assessment Score (MT adjusted)		%
Macroinvertabrate Habitat Assessment Score	96.5	%
OVERALL SITE RATIN	IGS	
Stream Reach Assessment Score (NRCS)		
Stream Reach Assessment Score (MT adjusted)		
Macroinvertabrate Habitat Assessment Score		

Field Measurements of water chemistry					
parameter	value	units			
Flow	0.56	cfs			
Temperature, water	9.86	degree C			
рН	8.38				
Specific Conductance	0.241	mS/cm			
Dissolved Oxygen	10.81	mg/L			
Dissolved Oxygen, % Saturation	95.5	%			
Turbidity	0.46	NTU			

Lab Results from Field	d Samples		
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	0.3	mg/m^3	0.1
Benthic Chlorophyll a	11.6	mg/m^3	0.1
Total Phosphorus, TP	0.033	mg/L	0.004
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5
Nitrate + Nitrite	0.09	mg/L	0.01
Total Nitrogen, TN		mg/L	

Macroinvertabrate Data Results						
parameter	value	units				
TOTAL SCORE (max =18)	16	score				
PERCENT OF MAX SCORE	89	%				
IMPAIRMENT CLASSIFICATION	NON IMPAIRED					
USE SUPPORT	FULL SUPF	ORT				

M12MFDBR04	Date-	7/23/2003	13:00
Middle Fork Dearborn, Below Ingersoll's Rd.	-		

Geomorphology Data						
parameter	value	units				
Bankfull Width	27.00	Ft				
Mean Depth	0.65	Ft				
Bnkfull X-sect area	17.60	Sq Ft				
Width/Depth	41.42					
Max Depth	1.69	Ft				
Flood prone width	123.70	Ft				
Entrenchement Ratio	4.58					
Water slope	0.0068					
Channel Sinuosity						
BEHI Index Score (adjusted)						
BEHI Rating		•				
Channel D50	27	mm				
Percentage of Fines (<2mm)		%				
Stream Type	C4					
Discharge	5.98	cfs				

Stream Reach Habitat Asse	ssments		
Parameter	Value	Units	
Stream Reach Assessment Score (NRCS)	100	%	
Stream Reach Assessment Score (MT adjusted)	99.3	%	
Macroinvertabrate Habitat Assessment Score	86.9	%	
OVERALL SITE RATING	S		
Stream Reach Assessment Score (NRCS)	Non Impaired, Fully Supporting		
Stream Reach Assessment Score (MT adjusted)			
Macroinvertabrate Habitat Assessment Score			2.75 40'

Field Measurements of water chemistry				
parameter	value	units		
Flow	5.98	cfs		
Temperature, water	18.59	degree C		
pH	8.19			
Specific Conductance	0.297	mS/cm		
Dissolved Oxygen	9.64	mg/L		
Dissolved Oxygen, % Saturation	102.9	%		
Turbidity	1	NTU		

Lab Results from Field Samples				
parameter		value	units	RL
Total Suspended Solids, TSS		ND	mg/L	1
Volatile Suspended Solids, VSS		ND	mg/L	1
TSS-VSS		ND	mg/L	10
Water Column Chlorophyll a		2.1	mg/m^3	0.1
Benthic Chlorophyll a		34.9	mg/m^3	0.
Total Phosphorus, TP		0.031	mg/L	0.004
Total Kiejdahl Notrogen, TKN		ND	mg/L	0.
Nitrate + Nitrite		ND	mg/L	0.0
Total Nitrogen, TN			mg/L	

Macroinvertabrate Data R	esults	
parameter	value	units
TOTAL SCORE (max =18)	11	score
PERCENT OF MAX SCORE	61	%
IMPAIRMENT CLASSIFICATION	SLIGHT IMP	PAIRMENT
USE SUPPORT	PARTIAL S	UPPORT

RL	
10	
10	
10	
0.1	
0.1	
0.004	
0.5	
0.01	

M12MFDBR02	Date-	7/23/2003	14:1
Middle Fork Dearborn, Downstream	of Hwy 434		
Geomorp	hology Data		
parameter	value	units	
Bankfull Width	34.50	Ft	
Mean Depth	2.20	Ft	
Bnkfull X-sect area		Sq Ft	
Width/Depth	15.68		
Max Depth	2.40	Ft	
Flood prone width	72.50	Ft	
Entrenchement Ratio	2.10		
Water slope	0.0074		
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating		-	
Channel D50	27	mm	
Percentage of Fines (<2mm)		%	
Stream Type	B4c	almost a C	
Discharge	5.94	cfs	

Stream Reach Habitat Ass	sessments	;
Parameter	Value	Units
Stream Reach Assessment Score (NRCS)	85	%
Stream Reach Assessment Score (MT adjusted)	86.8	%
Macroinvertabrate Habitat Assessment Score	82.7	%
OVERALL SITE RATIN	GS	
Stream Reach Assessment Score (NRCS)		npaired, Fully ing, threatened
Stream Reach Assessment Score (MT adjusted)		
Macroinvertabrate Habitat Assessment Score		

Field Measurements of water chemistry			
parameter	value	units	
Flow	5.94	cfs	
Temperature, water	20.5	degree C	
рН	8.27		
Specific Conductance		mS/cm	
Dissolved Oxygen	9.23	mg/L	
Dissolved Oxygen, % Saturation	102.8	%	
Turbidity	1.24	NTU	

Lab Results from Field Samples			
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	1.3	3 mg/m^3	0.1
Benthic Chlorophyll a	14.	7 mg/m^3	0.1
Total Phosphorus, TP	0.02	3 mg/L	0.004
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5
Nitrate + Nitrite	ND	mg/L	0.01
Total Nitrogen, TN		mg/L	

Macroinvertabrate Data Results			
parameter	value	units	
TOTAL SCORE (max =18)	11	score	
PERCENT OF MAX SCORE	61	%	
IMPAIRMENT CLASSIFICATION	SLIGHT IMP	PAIRMENT	
USE SUPPORT	PARTIAL SI	JPPORT	

	BEH	II Field Me	asures		В	EHI Calcı	ulated Valu	es
	Parameter		Value	Units	Parameter		Value	Units
_					Slope		0.0074	
Longitudinal Information	Rod reading @ Upstream Ec	ge of Water	6.08	feet	Sinuousity			
nati	Rod reading @ Downstream	Edge of			Max Depth		2.40	feet
git o	Water		9.18	feet	Floodprone	Height	4.80	feet
	Stream Distance		420.00	feet	Mean Dept	h	2.20	feet
	Straightline Distance			feet	Bankfull Wi	idth	34.50	feet
=	Left Edge of Bankfull		0.00	feet	Floodplrone	e Width	72.50	feet
Cross-Sectional Information	Right Edge of Bankfull		34.50	feet	Bankfull Ar	ea		ft^2
oss-Section Information	Rod reading @ Thalweg		4.80	feet	Floodprone	Area		ft^2
Sec	Rod reading @ Bankfull Dep	th	2.40	feet	W/D Ratio		15.68	
for	Rod reading @ Floodplain D	epth	0.00	feet	Cross Sect	ional Area	0.00	ft^2
ٽ <u>ت</u>	Left Edge of Floodprone dep	th	0.00	feet	Entrenchm	ent Ratio	2.10	
0	Right Edge of Floodprone de	pth	72.50	feet				
Ľ	Bank Height			feet				
atic	Bankfull Height		2.40	feet	Bank Ht/E	Bankfull Ht	0.00	
Ĕ	Root Depth			feet	Root Dept	th/Bank Ht		
ē	Root Density			%	Root D	Density		%
	Bank Angle			Degrees	Bank	Angle		degrees
BEHI Information	Surface Protection			%	Surface F	Protection		%
_								
Stress tion	Velocity at thalweg			ft/sec		Gradient		ft/sec/ft
on	Tape reading at thalweg			feet		k stress /		
ar Bank Stre Information	velocity at left bank			ft/sec		ear stress		
Bank	tape reading at left bank			feet	A nl	b/A		
E S	Near bank stress							
Near Inf	Mean shear stress			6140	_			
Z	Near bank x-sectional area			ft^2				
	M12MFDBR02	Date-	7/23/2003	14	:15			
	Middle Fork Dearborn, Dov	vnstream of	Hwy 434					

M12MFDBR01	Date-	6/19/2003	15:20
Middle Fork Dearborn, Upstream near Roger's P	Pass		

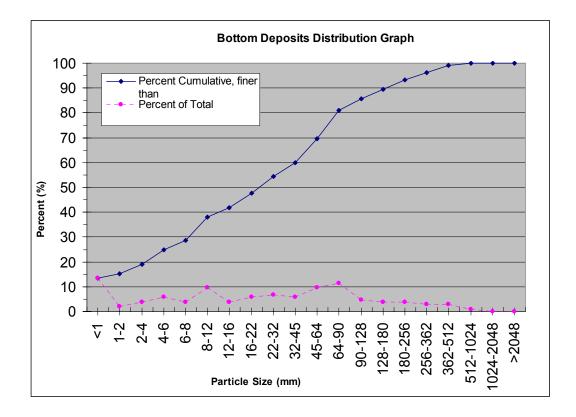
Geomorphology Data				
parameter	value	units		
Bankfull Width		Ft		
Mean Depth		Ft		
Bnkfull X-sect area		Sq Ft		
Width/Depth				
Max Depth		Ft		
Flood prone width		Ft		
Entrenchement Ratio				
Water slope	0.0259			
Channel Sinuosity				
BEHI Index Score (adjusted)				
BEHI Rating				
Channel D50	27	mm		
Percentage of Fines (<2mm)	15.24	%		
Stream Type				
Discharge	2.40	cfs		

Stream Reach Habitat Assessments					
Parameter	Value	Units			
Stream Reach Assessment Score (NRCS)		%			
Stream Reach Assessment Score (MT adjusted)		%			
Macroinvertabrate Habitat Assessment Score		%			
OVERALL SITE RATINGS					
Stream Reach Assessment Score (NRCS)					
Stream Reach Assessment Score (MT adjusted)					
Macroinvertabrate Habitat Assessment Score					

Field Measurements of water chemistry					
parameter	value	units			
Flow	2.40	cfs			
Temperature, water	10.29	degree C			
рН	8.4				
Specific Conductance	0.2	mS/cm			
Dissolved Oxygen	10.25	mg/L			
Dissolved Oxygen, % Saturation	91	%			
Turbidity	1.97	NTU			

Lab Results from Field Samples			
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	0.6	mg/m^3	0.1
Benthic Chlorophyll a	9.2	mg/m^3	0.1
Total Phosphorus, TP	0.005	mg/L	0.004
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5
Nitrate + Nitrite	0.04	mg/L	0.01
Total Nitrogen, TN		mg/L	

		Pebble Count Data					
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total		
S/C	0.5	<1	14	13.33	13.33		
S	1.5	1-2	2	1.90	15.24		
FG	3	2-4	4	3.81	19.05		
FG	5	4-6	6	5.71	24.76		
FG	7	6-8	4	3.81	28.57		
MG	10	8-12	10	9.52	38.10		
MG	14	12-16	4	3.81	41.90		
CG	18	16-22	6	5.71	47.62		
CG	27	22-32	7	6.67	54.29		
CG	38.5	32-45	6	5.71	60.00		
CG	54.5	45-64	10	9.52	69.52		
SC	77	64-90	12	11.43	80.95		
SC	109	90-128	5	4.76	85.71		
MC	154	128-180	4	3.81	89.52		
LC	218	180-256	4	3.81	93.33		
LC	309	256-362	3	2.86	96.19		
SB		362-512	3		99.05		
MB	768	512-1024	1	0.95	100.00		
LB	1536	1024-2048		0.00	100.00		
BR		>2048		0.00	100.00		
		TOTALS	105	100.00	100.00		
		D50 particle size (mm)	22-32				
		% Fines (<2mm)	15.24				
	M12MFDBR01	Date-	6/19/2003	15:20			
	Middle Fork Dearborn, Upstream near Roger's Pass						



M12MFDBR04	Date-	6/19/2003	12:30
Middle Fork Dearborn, Below Ingersoll's Rd.			

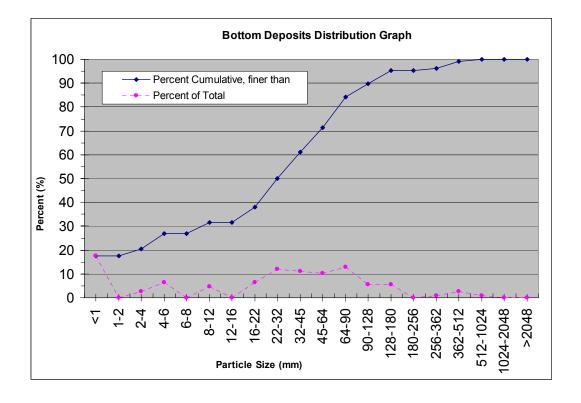
Geomorphology Data			
parameter	value	units	
Bankfull Width	27.00	Ft	
Mean Depth	0.65	Ft	
Bnkfull X-sect area	17.60	Sq Ft	
Width/Depth	41.42		
Max Depth	1.69	Ft	
Flood prone width	123.70	Ft	
Entrenchement Ratio	4.58		
Water slope	0.0068		
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating			
Channel D50	27	mm	
Percentage of Fines (<2mm)	17.59	%	
Stream Type			
Discharge	13.58	cfs	

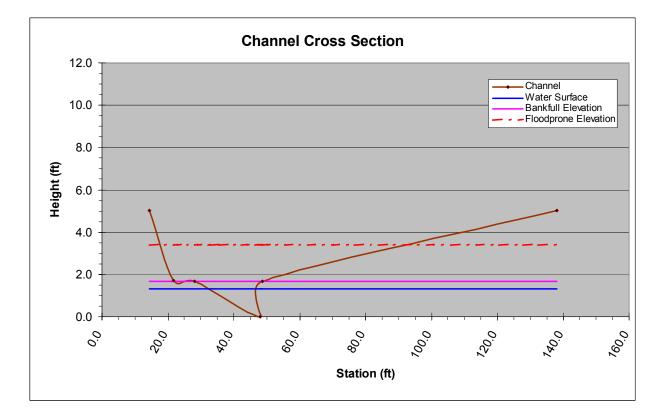
Stream Reach Habitat Assessments				
Parameter	Value	Units		
Stream Reach Assessment Score (NRCS)	100	%		
Stream Reach Assessment Score (MT adjusted)	99.3	%		
Macroinvertabrate Habitat Assessment Score		%		
OVERALL SITE RATING	S			
Stream Reach Assessment Score (NRCS)	Non Impaired, Fully Supporting			
Stream Reach Assessment Score (MT adjusted)				

Field Measurements of water chemistry			
parameter	value	units	
Flow	13.58	cfs	
Temperature, water	15.69	degree C	
рН	8.11		
Specific Conductance	0.246	mS/cm	
Dissolved Oxygen	8.88	mg/L	
Dissolved Oxygen, % Saturation	89.5	%	
Turbidity	2.85	NTU	

Lab Results from Field Samples				
parameter	value	units	RL	
Total Suspended Solids, TSS	ND	mg/L	10	
Volatile Suspended Solids, VSS	ND	mg/L	10	
TSS-VSS	ND	mg/L	10	
Water Column Chlorophyll a	0.6	mg/m^3	0.1	
Benthic Chlorophyll a	16.8	mg/m^3	0.1	
Total Phosphorus, TP	ND	mg/L	0.004	
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5	
Nitrate + Nitrite	ND	mg/L	0.01	
Total Nitrogen, TN		mg/L		

		Pebble Count Data			
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total
S/C	0.5	<1	19	17.59	17.59
S	1.5	1-2		0.00	17.59
FG	3	2-4	3	2.78	20.37
FG	5	4-6	7	6.48	26.85
FG		6-8		0.00	26.85
MG	10	8-12	5	4.63	31.48
MG	14	12-16		0.00	31.48
CG	18	16-22	7	6.48	37.96
CG	27	22-32	13	12.04	50.00
CG	38.5	32-45	12	11.11	61.11
CG	54.5	45-64	11	10.19	71.30
SC	77	64-90	14	12.96	
SC	109	90-128	6	5.56	89.81
MC	154	128-180	6	5.56	
LC	218	180-256		0.00	95.37
LC	309	256-362	1	0.93	96.30
SB	437	362-512	3	2.78	99.07
MB	768	512-1024	1	0.93	100.00
LB	1536	1024-2048		0.00	100.00
BR		>2048		0.00	100.00
		TOTALS	108	100.00	100.00
		D50 particle size (mm)	22-32		
		% Fines (<2mm)	17.59		
	M12MFDBR04	Date-	6/19/2003		12:30
	Middle Fork Dearborn,	Below Ingersoll's Rd.			





	BEHI Field Me	asures		BEHI Calculated Values		
	Parameter	Value	Units	Parameter	Value	Units
_	Rod reading @ Upstream Edge			Slope	0.0068	
-ongitudinal Information	of Water	4.60	feet	Sinuousity		
nat	Rod reading @ Downstream			Max Depth	1.69	feet
orn	Edge of Water	6.40	feet	Floodprone Height	3.38	feet
۲ آ	Stream Distance	263.50	feet	Mean Depth	0.65	feet
	Straightline Distance		feet	Bankfull Width	27.00	feet
_	Left Edge of Bankfull	21.70	feet	Floodplrone Width	123.70	feet
Cross-Sectional Information	Right Edge of Bankfull	48.70	feet	Bankfull Area	17.60	ft^2
oss-Section Information	Rod reading @ Thalweg	8.35	feet	FloodproneArea		ft^2
Sec	Rod reading @ Bankfull Depth	6.66	feet	W/D Ratio	41.42	
for	Rod reading @ Floodplain Depth	4.97	feet	Cross Sectional Area	17.60	ft^2
ĕ ۲	Left Edge of Floodprone depth	14.30	feet	Entrenchment Ratio	4.58	
0	Right Edge of Floodprone depth	138.00	feet			
r L	Bank Height		feet			
BEHI Information	Bankfull Height		feet	Bank Ht/Bankfull Ht		
Ë	Root Depth		feet	Root Depth/Bank Ht		
ē	Root Density		%	Root Density		%
=	Bank Angle		Degrees	Bank Angle		degrees
<u>.</u>	Surface Protection		%	Surface Protection		%
_						
Stress tion	Velocity at thalweg		ft/sec	Velocity Gradient		ft/sec/ft
b tre	Tape reading at thalweg		feet	Near Bank stress /		
s S atic	velocity at left bank		ft/sec	Mean Shear stress		
ar Bank Stre Information	tape reading at left bank		feet	A nb / A		
Ë B	Near bank stress					
Near Inf	Mean shear stress					
ž	Near bank x-sectional area		ft^2			

		M12M	FDBR02			
Middle	Fork	Dearborn.	Downstream	of	Hwv	434

Date-

9:30

6/19/2003

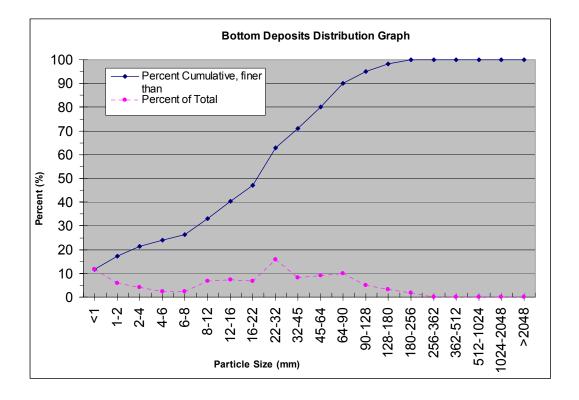
Geomorp	hology Data	
parameter	value	units
Bankfull Width	34.50	Ft
Mean Depth		Ft
Bnkfull X-sect area		Sq Ft
Width/Depth		
Max Depth	2.40	Ft
Flood prone width	72.50	Ft
Entrenchement Ratio	2.10	
Water slope	0.0074	
Channel Sinuosity		
BEHI Index Score (adjusted)		
BEHI Rating		
Channel D50		mm
Percentage of Fines (<2mm)	17.36	%
Stream Type		
Discharge	13.72	cfs

Stream Reach Habitat Assessments				
Parameter	Value	Units		
Stream Reach Assessment Score (NRCS)	85	%		
Stream Reach Assessment Score (MT adjusted)	86.8	%		
Macroinvertabrate Habitat Assessment Score		%		
OVERALL SITE RATIN	IGS			
Stream Reach Assessment Score (NRCS)	Non Impaired, Fully Supporting, threatened			
Stream Reach Assessment Score (MT adjusted)				
Macroinvertabrate Habitat Assessment Score				

Field Measurements of water chemistry			
parameter	value	units	
Flow	13.72	cfs	
Temperature, water	13.35	degree C	
рН	8		
Specific Conductance	0.208	mS/cm	
Dissolved Oxygen	9.39	mg/L	
Dissolved Oxygen, % Saturation	90.2	%	
Turbidity	2.8	NTU	

Lab Results from Field Samples			
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	0.6	mg/m^3	0.1
Benthic Chlorophyll a	22.2	mg/m^3	0.1
Total Phosphorus, TP	ND	mg/L	0.004
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5
Nitrate + Nitrite	ND	mg/L	0.01
Total Nitrogen, TN		mg/L	

			Pebble Cour	nt Data	
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total
S/C	0.5	<1	14	11.57	11.57
S	1.5	1-2	7	5.79	17.36
FG	3	2-4	5	4.13	21.49
FG		4-6	3		23.97
FG		6-8	3		26.45
MG	10	8-12	8	6.61	33.06
MG	14	12-16	9		40.50
CG	18	16-22	8	6.61	47.11
CG	27	22-32	19	15.70	62.81
CG	38.5	32-45	10	8.26	71.07
CG	54.5	45-64	11	9.09	80.17
SC		64-90	12	9.92	90.08
SC	109	90-128	6	4.96	95.04
MC	154	128-180	4	3.31	98.35
LC	218	180-256	2	1.65	100.00
LC	309	256-362		0.00	100.00
SB	437	362-512		0.00	100.00
MB	768	512-1024		0.00	100.00
LB	1536	1024-2048		0.00	100.00
BR		>2048		0.00	100.00
	_	TOTALS	121	100.00	100.00
		D50 particle size (mr	m)		
		% Fines (<2mm)	17.36		
<u></u>	M12MFDBR02	Date-	6/19/2003		9:30
	Middle Fork Dearborn, Dov	wnstream of Hwy 43	4		



	BEHI Field Me	asures		BEHI Calcu	lated Valu	ies
	Parameter	Value	Units	Parameter	Value	Units
_	Rod reading @ Upstream Edge			Slope	0.0074	
-ongitudinal Information	of Water	6.08	feet	Sinuousity		
tud	Rod reading @ Downstream			Max Depth	2.40	feet
orn	Edge of Water	9.18	feet	Floodprone Height	4.80	feet
n ji	Stream Distance	420.00	feet	Mean Depth		feet
-	Straightline Distance		feet	Bankfull Width	34.50	feet
_	Left Edge of Bankfull	0.00	feet	Floodplrone Width	72.50	feet
Cross-Sectional Information	Right Edge of Bankfull	34.50	feet	Bankfull Area		ft^2
oss-Section nformation	Rod reading @ Thalweg	4.80	feet	FloodproneArea		ft^2
Sec	Rod reading @ Bankfull Depth	2.40	feet	W/D Ratio		
for	Rod reading @ Floodplain Depth	0.00	feet	Cross Sectional Area	0.00	ft^2
ln is	Left Edge of Floodprone depth	0.00	feet	Entrenchment Ratio	2.10	
O O	Right Edge of Floodprone depth	72.50	feet			
uo	Bank Height		feet			
BEHI Information	Bankfull Height		feet	Bank Ht/Bankfull Ht		
Ĕ	Root Depth		feet	Root Depth/Bank Ht		
Į	Root Density		%	Root Density		%
-	Bank Angle		Degrees	Bank Angle		degrees
표	Surface Protection		%	Surface Protection		%
Stress tion	Velocity at thalweg		ft/sec	Velocity Gradient		ft/sec/ft
bn tre	Tape reading at thalweg		feet	Near Bank stress /		
atic	velocity at left bank		ft/sec	Mean Shear stress		
ar Bank Stre Information	tape reading at left bank		feet	A nb / A		
ë ë	Near bank stress					
Near Inf	Mean shear stress					
Ž	Near bank x-sectional area		ft^2			

SOUTH FORK DEARBORN RIVER

				Personnel: Shell Fin +
Waterbody Name Str1	457	Visit#	B Marth County Course Clark HUC 10030103 Location of DESP/ Rin	A HUC JOGGIOG
Lat/Long obtained b	y met	Long hod other than GPS? Y N If Y w	Latt Long Long Long Long Verified? [] By GPS Datum (Circle (Lav/Long obtained by method other than GPS? Y [] N [] If Y what method used? If by map what is the map scale?	GPS Daturn (Circle One): NAD 27 NAD 83 WGS84 what is the map scale?
Samples Taken:			Samula ID/Ella I acadam.	
Water		Nutrients Metals Commons	-	Sample Collection Procedure
Sediment			-	GRAB
Macroinvertebrate		Macroinvertebrate Habitat Acres [7]	03 - 704 0A	SED-1
Aleae/Macroohytes			Ville Dee	KICK HESS OTHER:
Chloronhull a	+		Parala A	PERI-) OTHER:
in the second second	-		03-0184.0	CHLPHL-2 OTHER:
Habitat Assessment		Stream Reach Asmt. Other		Dumono, Tar V.
Substrate		Pebble Count 7% Fines		A ut prost: 1 milet
Transect				
Photographs				
Field Notes				
Other				
Measurements:	Time:	9.45	Macroinvertehrate Kick Densition	
Q/How (cfs)		Fat C	Site Viet Comments.	Kick Length (PL): U.O.
Temp: (C)	A	-		
pH:	2	1		
SC: (mS/cm)	×	X,219		
SC x 1000 =	2	umbolem		
DO: (mg/L)	-	18.08 \$AUT.		
R: Clear Sh	ight [TUR: Clear Slight Turbid Opaque		
Turbidity Comments;	11	71 MIN \$108 WTO		
			and the second second	
			A CONTRACT OF A	

	TOTAL DISCHA				Az ana	
		7123/03		Site Visit Code:	03-0724	winte head
1		FD @			Station ID	: MI2SE OBROY
	Personnel:	42/Tr.				
E	**Distance from	**Depth	"Velocity (nt	**Width	"Area	"Discharge
-	initial point		point)	Station of the		and the second
1	1.0 100		0			
2	2.0	0,20	0,01			
3	30	0,45				
4	4.0	0.52	0.07			
5	5.0	0.50	0.17			
6	6.0					
7	7.0	0.35	0.18			
В	80	0.25	0.18			
9	9.0	0.35	0.18			
10	10.0	0,30	0.19			
11	11.0	0,35	6.17			
12	12.0	0.35	0,06			
13	13.0	0,38	B. M.		_	
14	14,0	0.35	0,58			
15	15.0	0.40	0.25			
6	16.0		1.19			
	19.0	0.50	8.23			
	18.0				_	
19	19,0	0.50	0.15 0.11			
0	21.0	0.15 5.4D	2.08			
21	22.4	0,20	0,13			
2	23.0 REV		0,05			
3	23.0 184	0115	R.			
54		-				
5		-				
6				-		
7						1.1.1.1.1.1.1.1.1
8						
9						
0						

Data Mgmt. Approved

21.1.1.12				/
	BRATE HABITAT ASSESSM	IENT FIELD FORM	DIED	E/RUN PREVALENCE
1	260			DIGUTTALENCE
Date: 7/2 Waterbody: 5	DA a th	Site Visit Code	site: M125512	105.00
Personnel:	La daw Bowinn		Side: 1912-55-00	acoq
	Failure Jracence	State State of the		
HABITAT	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
1A. Riffle Development	Well-developed niffle; niffle as wide as stream & extends two times width of stream,	Riffle as wide as stream but length less than two times width.	Reduced niffle area that is not as wide as stream & its length less than two times width.	Riffles virtually non- existent
1A. score	9/10 8-10	64	24	0-2
Comments:	1			
1B. Benthic Substrate	Diverse substrate dominated by cobbie.	Substrate diverse with abundant cobble, but bedrock, boulders, fine gravet, or sand prevalent	Substrate dominated by bedrock, boulders, sand, or silt; cobble present.	Monotonous fine gravel, sand, silt, or bedrock substrate.
18. score	8-10	9/ 64	3.5	0-2
Comments:				
2. Embeddedness	Gravel, cobble, or boulder particles are between 0-25% surrounded by fine sediment (particles less than 8.35 mm [.25"]).	Gravel, cobble, or boulder particles are between 25-50 % surrounded by fine sediment.	Gravel, cobble, or boolder particles are between 50-75% surrounded by fine sediment,	Gravet, cobble, or boulder particles are over 75% surrounded by fine sediment.
L score:	16-20 18	11-15	6-10	0-5
Commenta:			1	
3. Channel Alteration (channelization, straightening, deedging, other alterations)	Channel alterations absent or minimal; stream pattern apparently in natural state.	Some channelization present, usually in areas of crossings, etc. Evidence of past alterations (before past 29 years) may be resent, but more recent channel alteration is not present.	New embankments present on both banks; 40-40% of the stream reach channelized & disrupted.	Banks shored with gabien or sement, over 80% of the stream reach channelized & disrupted.
score	15-20 16	11-15	6-10	0-5
Commenta:	Rund Cargings			
4. Sediment Deposition	less than 5% of the bottom affected by sediment deposition.	Some new increase in her formation, mostly from coarse gravel; 5- 30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, coarse sand on old & new bars; 30- 30% of the bottom affectod; sediment deposits at obstructions, constrictions, & bends; moderate deposition in pools prevalent.	Heavy deposits of fine material, increased har development; more than 50% of the bottom changing frequently; pools almost atsent due to substantial sediment deposition.
score:	16-20	11-15 [5]=	6-10	D-5
Comments:		Sarre Cores	About	

5. Channel Flow Status	Water fills traseflow channel; minima amount of channel substrate exposed.	Water fills > 75% of the baseflow channel; < 25% channel substrate exposed.	Water fills 25-75% of the baseflow channel; riffle substrates mostly exposed.	Very little water in channel, & mostly present as standing pools.	
5. score:	16-20	11-15 /5	6-10	0.5	
Comments:			10000		
6. Bank Stability (score each bank) NOTE: Determine left or right side while facing downstream.	Banks stable; no evidence of erusion or bank failure; ittle apparent potential for future problems.	Moderately stable: infrequent, small aross of erosion mostly healed over.	Moderately unstable; moderate frequency & size of erosional areas; up to 50% of banks in reach have erosion; high erosion potential during high flow.	Unstable; many eroded sreas; "raw" areas frequent along straight sections & bends; ohvious bank aloughing; G0-100% of banks have erosion scars on sideslopes,	
6. score:	9-10	6-8	3-5	0-2	
	Left Side	Average:	9		
	Right Side 9	Comments:			
7. Bank Vegetation Protection (score each bank) NOTE: reduce scores for annual crops & weeds which do not hold soil well (e.g. knapweed).	Over 90% of the streambank surfaces covered by stabilizing vegetation; vegetative disruption minimal or not evident; almost all plants allowed to grow naturally.	70-00% of the streambank surfaces covered by vegetation; disruption evident, but not affecting full plant growth potential to any great extent; more than one-ball of potential plant height evident.	50-70% of the streambank surfaces covered in vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of potential plant height remaining.	Less than 50% of the streambank surfaces covered by vegetation; extensive disruption of vegetation; vegetation removed to 2 inches or less.	
. score:	9-10	6-8	3-5	0-2	
	Left Side 9	Average:	9		
	Right Side 9	Comments			
L Vegetated Zone Width (score each side)	Width of vegetated zone > 100 feet.	Width of vegetated zone 38-100 feet.	Width of vegetated zone 10-30 feet.	Width of vegstated zone < 10 feet.	
score:	3-10 7	6-8	3-5	0-2	
	Left Side 9	Average:	9		
	Right Side 9	Commente:			

TOTAL SCORE:

Score compared to maximum possible:

				Personnel: Landlard Bountary
Waterbody Name	200	Visit# 1	County Level 010 & Clark Location 5 Fork 016 Mare 0334	10 10 10 2010 2010 2010 2010 2010 2010
Lat 4 7:04 58.31	y met	Long <u>11. 23.0</u>	Verified? Day GPS Dati what method used? If by map what is the	GPS Datum (Circle One): NAD 27) NAD 83 WGS84 what is the map scale?
Samples Taken:			Sample ID/File Location:	Conside Collection in 1
Water		Nutrients 🖾 Metals 🔲 Commons 🗌		GRAB
Sediment				SED-1
Macromvertebrate	-	Macroinvertebrate Habitat Asrnt.	OS- BTAY M	KICK HESS OTHER:
Algac/Macrophytes		Aquatic Plant Form	03-01344	PERI-1 OTHER:
Chlorophyll a	-		03-01arC	CHI.PHI.2 OTHED.
Habitat Assessment		Stream Reach Asmt. Other		
Substrate		Pebble Count 7% Fines		Furpose:
Transect				
Photographs				
Field Notes				
Other				
Measurements:	Time:	151.46	Macrointestabena Kiel Dunstan	11.
Q / Flow (cfs)		Fer	-	A Stock Longth (Ft.):
Temp: (C)	W	-		
pH:	140	1		
SC: (mS/cm)		3/6		
SC x 1000 =	_	umho/em		
DO: (mg/L)	00	8.6.7 103.7 912		
TUR: Clear Sh	light [TUR: Clear Slight Turbid Onaque		
Turbidity Comments: 8,75	Be.	25 0,65		

	Nate: 7-22 Vaterbody: So	1	Uptream	Site Visit Code:		MIZSFOBRO
1.5		dhio B				
1	"Distance from	**Depth	**Velocity (at point)	Width	**Area	**Discharge
1	10	0	0	5		
2	11	.25	0			
3	1L	12	.03			4
4	(3	.2	0			
5	14	.28	.78			
6	15	,4	.77			
7	16	.4	.46			
8	17	.38	1.01			
9	18	,38	.44			
10	19	,30	157			
11	61	135	,10			
12	31	14	.67			
13	22	,38	.08			
14	23	.30	.18			
15	24	.25				
16	26	ia .	0			
7	2/4	D.	0			
8						
9						
0						
1			_			
2						
3						
4						
5						
6						
7						
9						

21.1.1.12				1
MACROINVERTE	BRATE HABITAT ASSESSI	MENT FIELD FORM	DIECH	E/RUN PREVALENCE
			and the second	ERON PREVALENCE
Date: 7-22-0	3	Site Visit Code		
C. C. C. C. P. D. C.	h Fork Dearborn		Site: MIASFOR	1203
Personnel:				
	1			the second second
HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
1A. Riffle Development	Well-developed raffle; riffle as wide as stream & extends two times width of stream.	Riffle as wide as stream but length less than two times width.	Reduced niffle area that is not as wide as stream & its length less than two times width.	Raffles virtually non- existent
IA. score:	5-10	6-8	3-5	0-2
Commenta:			//	
1B. Benthic Substrate	Diverse substrate dominated by cobble.	Substrate diverse with abundant cobble, but bedrock, boulders, fine gravel, or sand prevalery	Substrate dominated by bedrock, boulders, sand, or silt; cobble present.	Monotonous fine gravel, sand, silt, or bedrock substrate.
B. score: 7	5-10	6-8	3-5	0-2
Commenta:	cobble, graves			1.00
2. Embeddedness	Gravel, cobble, or bouider particles are between 0-25% surrounded by fine sediment (particles less than 6.35 mm (.25°)).	Gravel, cobble, or boulder particles are between 25-50 % surrounded by fine sediment,	Gravel, cobble, or boulder particles are between 50-75% surrounded by fine sediment.	Gravel, cobble, or boulder particles are over 75% surrounded by fine sediment.
SEORE: 15	16-29	11-15	6-10	0.5
Comments:	some but not go	ater than 7	5410	
3. Channel Alteration (channelization, draightening, dredging, other atterations)	Channel alterations absent or minimal, stream pattern apparently in natural state.	Some channelization present, usually in areas of crossings, etc. Evidence of past attractions (before past 20 years) may be resent, but more recent channel alteration is not present.	New embankments present on both banks; 40-80% of the stream reach channelized & disrupted.	Banks shored with gablen or cement; over 80% of the stream reach channelized & disrupted.
score: 14	16-20	11-15	6-10	0-5
Comments:				
	I this or no animosome to the set			
	Little or no enlargement of bars & less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5- 30% of the bottom affected; slight deposition in pools.	new gravel, coarse sand on old & new bars; 30- 50% of the bottom affected; sediment deposits at obstructions, constrictions, & bends;	Heavy deposits of line material, increased bar development, more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
score: //p	16-20	11-15	6-10	0-5

5. Channel Flow Status	Water fills baseflow channel; minima amount of channel substrate exposed.	Water Fills > 75% of the baseflow channel; < 25% channel substrate exposed.	Water fills 25-75% of the baseflow channel; riffle substrates mostly exposed.	Very little water in channel, & mostly present as standing pools.
S. score:	16-20	11-15	6-10	0-5
Commenta:				
6. Bank Stability (score each bank) NOTE: Determine set or right side while facing downstream.	Banks stable; no evidence of eronion or bank failure; fittle apparent potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over.	Moderately unstable; moderate frequency & size of erosional areas; up to 00% of banks in teach have erosion; high erosion potential during high flow.	Unstable; many eroded areas; "raw" areas frequent along straight sections & bends; obvious bank slooghing; 60-100% of banks have erosion scars on aldeslopes.
E. score: 8,5	9-10	6-8	3-5	0-2
	Left Side 8	Average:		
	Right Side 9	Commenta		
7. Bank Vegetation Protection (score each bank) NOTE: reduce scores for annual crops & weeds which do not held soil well (e.g. knapwed).	Over 90% of the streambank surfaces covered by stabilizing vegetation; vegetative disruption minimal or not evident; almost all plants allowed to grow naturally.	streambank surfaces covered by vegetation; disruption svident, but not affecting full plant growth potential to any great extent; more than	50.70% of the streambank surfaces covered in vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of potential plant height remaining.	Less than 50% of the streambank surfaces covered by vegetation; extensive disruption of vegetation; vegetation removed to 2 inches or less.
7. score: 10	5-10	6-8	3-4	0-2
	Left Side			
	Can Short	Average:		
	Right Side	Commenta:	1	
 Vogetated Zone Width (score each side) 	Width of vegetated zone > 100 feet.	Width of vegetated zone 30-100 feet.	Width of vegetated zone 10-30 feet.	Width of vegetated zone < 10 feet.
Lacore: 10	9-10	6.4	3-5	0-2
	Left Side	Average:		
-	Right Side	compland of	to the sides	large Buffer
TOTAL SCORE:		Score compared to		

1			Valley and second second	Trip ID: 200 - DE BER Date: 702/0 Personnel: Landloub / Bouomier
	34	An Perk Drarburn	Location Design of Shark Jack Jack	6 HUC 1003003
Lat _1 _0 715	by meth	Long 1129576 3*	Verified? By GPS Datum hat method used? If by map what is the ma	GPS Datum (Circle One): NAD 27 NAD 83 WGS84 what is the map scale?
Samples Taken:			Sample ID/File Location:	Samula Pathatian D.
Water		Nutrients 🖸 Metals 📋 Commons 🖾	03+070340	GRAB
Sediment				SFD.1
Macroinvertebrate	Ø	Macroinvertebrate Habitat Asmt.	D3- D12 SIVI	VICE III Comme
Algae/Macrophytes	Ø	_	034 P00340	ALCA HESS OTHER:
Chlorophyll a	bs		2010	TERI-LO UHER:
Habitat Assessment		Stream Reach Asnt. Chor C		CHLPHL-2 OTHER:
Substrate		Pebble Count 7 % Fines 7		Purpose: (MDC
Transect.				
Photographs				
Field Notes				
Other				
Measurements:	Time:	14:00	Macroinvertebrate Kiek Doreston: 2	
Q / Flow (cfs)		Est C Site Viel	Site Vielt Commenter	Nack Length (Pt.): 00
Temp: (°C)	A	18.55° A		
pH:		\$39		
SC: (mS/cm)		274		
SC x 1000 =		274 umbolem		
DO: (mg/L)	6	Sto well 100 95		
TUR: Clear Slight		D Opaque		
Turbidity Comments:	1			
			AR THAT I WANTED TO THE OWNER	

	te: 7-22			61-18-14 G	: 03-0723	
-		- THE REAL PROPERTY OF	where it		and Rand Station ID	0.05 <00800
100			aronan U	S DIRECT	COLT DOD DIStation ID	CITE CADE OBLE
Pe	rsonnel: La.	alace je	and an an a			
10	Distance from Initial point	**Depth	**Velocity (at point)	Width	**Area	**Discharge
1	3.5	0	0	0		
2	4.5	.35	D	1		
3	5.5	.32	,20			-
4	6.5	. 60	, Dla	1		
5	7.5	.50	.50	1		
6	8.5	.85	.64			
7	9.5	.90	.65			
8	10.5	.95	.44	. d.		
9	11.5	1.0	.49			
10	12.5	1.0	.34	E.		
11	13,6	9	,34	1		
12	14.5	,85	,55			
3	65	.85	,54			
4	145	, 85	14			
5	17.5	, 85.	0			
6	19.5	.25	.30			
7	19,5		,15			
8	20.5	1.05	,01			
9	215	.92	101			
0	22.5	.50	0			
1	23.0	0	0			
2				_		
3						
4				-		
5				-		
5						
7	_					
3						
1						

1

Data Mgmi, Approved

				1			
1.1.1.12							
MACROINVERTE	BRATE HABITAT ASSESSM	ENT FIELD FORM	RIFFLE	ERUN PREVALENCE			
ate: 7-20-0	3	Site Visit Code	: 63 0703				
Vaterbody: 6 4	ick beatborn ins a	staction lare	Site: MI2.5FD60	LOI			
ersonnel: [.A.c	llaw Bowman						
	-						
HABITAT PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR			
1A. Riffle Development	Well-developed niffle; niffle as wide as stream & extends two times width of stream.	Riffle as wide as stream but length less than two times width.	Reduced riffle area that is not as wide as stream & its length less than two times width.	Riffles virtually non- existent			
A score: 9	9-10	64	3-5	0-2			
Comments:							
18. Denthic Substrate	Diverse substrate dominated by cobble.	Substrate diverse with abundant cobble, but bedrock, boulders, fine gravel, or sand prevalent	Substrate dominated by bedrock, boulders, sand, or silt; cobble present,	Monotonous fine gravel, sand, silt, or bedrock substrate.			
18. score: 7	9-10	6-4	3.5	0.2			
Comments:	mix of cobble						
	Gravel, cobble, or bouider particles	Gravel, cobble, or	Gravel, cobbie, or	Gravel, cobble, or			
2. Embeddedness	are between 0-25% surrounded by fine sediment (particles less than 6.35 mm (.25")).	boulder particles are between 25-50 % surrounded by fine sediment.	boulder particles are between 50-75% surrounded by fine sediment.	bouider particles are over 75% surrounded by fine sediment.			
Liscore: 15	16-20	11-15	6-10	0-5			
Comments:	looks great						
	Channel atterations absent or	Some channelization	New embankments	Banks shored with			
3. Channel Alteration (channelization, straightening, dredging, other alterations)	minimal; stream pattern apparently in natural state.	present, usually in areas of crossings, etc. Evidence of past alterations (before past 29 years) may be resent, but more recent channel alteration is not present.	present on both banks; 40-80% of the stream reach channelized & disrupted.	gabion or cement; over 80% of the stream reach channelized & diarupted.			
. score: 20	16-20	11-15	6-10	0.5			
Comments:							
	Little or no enlargement of bars &	Roma new Instructor for	Nuderate depending of	the second s			
4. Sediment Deposition	Little or no enlargement of bars & less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5- 30% of the bottom affected; slight deposition in pools.	on old & new bars; 30- 50% of the bottom affected; sediment deposits at obstructions, constrictions, & bends;	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; puts almost absent due to substantial sediment deposition.			
score:	16-20	11-15	6-10	0-5			
	10.40	11114	4-10	0.0			

5. Channel Flow Status	Water fills baseflow channel; minima amount of channel substrate exposed.	Water filts > 75% of the baseflow channel; < 25% channel substrate exposed.	Water fills 25-75% of the baseflow channel; riffle substrates mostly exposed.	Very little water in channel, & mostly present as standing pools.	
5. score: 5	16-20	11-15 6-10		0.5	
Comments:	lower flacs the	June but			
6. Bank Stability (score each bank) NOTE: Determine left or right side while facing downstream.	Banks stable; no evidence of erosion or bank failwe; little apparent potential for future problems.	Moderately stable; Infrequent, small areas of erosion mostly healed over.	Moderately unstable; moderate frequency & size of erosional areas; up to 60% of banks in reach have erosion; high erosion potential during high flow.	Unstable; many eroded areas; "raw" areas frequent along straight sections & bends; obvious bank sloughing; 60-100% of banks have erosion scars on sideslopes.	
6. score: M	9-10	6-8	3-5	0-2	
	Left Side / 0	Average:	9		
	Right Side 8	Comments	6.05500		
7. Bank Vegetation Protection (score each bank) NOTE: reduce scores for annual crops & weeds which do not held soil well (e.g. knapwed).	Over 30% of the streambank surfacer covered by stabilizing vegetation; vegetative disruption minimal or not evident; almost all plants allowed to grow naturally.	To-90% of the streambank surfaces covered by vegetation; disruption evident, but not affecting full plant growth potential to any great extent; more than one-bail of potential plant height evident.	50-70% of the streambank surfaces covered in vegetation; disruption obvious; patches of bare soil or cleaely cropped vegetation common; less than one-half of potential plant height remaining.	Less than 50% of the streambank surfaces covered by vegatation; extensive disruption of vegetation; vegetation removed to 2 inches or less.	
T. score: 4	9-10	6-8	3-5	0.2	
	Left Side G	Average: Comments:			
8. Vegetated Zone Width (score each side)	Width of vegetated zone > 100 feet.		Width of vegetated zone 10-30 feet.	Width of vegetated zone < 10 feet.	
score: 10	9-10	6-8	3.4	0-2	
and the second s	Left Side / D	Average:			
	Right Side	Comments:			

* Reparts Ste

Waterbody Name County County County Station ID Visit # Location County Lat Long Visit # Location GPS Datum (Circle Circle Ci	County Leader HUC 100 3010 3 ion Observation By GPS Datum (Circle One): NAD 27 NAD 83 WGS84 what method used? If by map what is the map scale? Description NAD 83 WGS84
- 7 2 2	000): NAD 27 NAD 83
0 0	
nt Commons X Metals Commons int X Macroinvertebrate Habitat Asmt. Aacrophytes Aquatic Plant Form A.A.1 - K	
	Sample Location: Sample Collection Procedure
	GRAB
hytes	SED-1
D	KICK HESS OTHER:
Total and the second se	11 11
Habitut Assessment X Stream Panet A and D out. 17	OLIGOLIAND PRATAR & CHLPHL-2 OTHER:
Ē	Purpose:
Photographs 🖂	
Field Notes	
Other	
Measurements: Time: 5 Macroinvertebrate	Macroinvertebrute Kick Durenton
Est.	water bureauon; Kick Length (FL);
-	
płt	
SC: (mS/cm)	MANUMERS N. BEEN BIC
SC x 1000 = umho/cm	1 22 alth 01643
DO: (mg/L)	
TUR: Clear Slight Turbid Concern	
Turbidity Comments:	
	10 10 10 10 10 10 10 10 10 10 10 10 10 1

	TAL DISCHAR				102 MUN	
Da	te: (0 - 1	1-03		Site Visit Code:	03-0710	ALA 01.2
		of Rarb		m as plac	Station ID:	MIDSCOBROI
Per			Bowmp C			
	Distance from	ELECTRON PROPERTY.		**Width	"Area	**Discharge
ALC: N	initial point	**Depth	point)	Width	Auton	Discharge
	15.6 LEW	0,35	0,22			
2 2	6	0,6	0,53			
-	2	0.7	0.59			
4 2	8	0,9	1.18			
5	29	0,9	1161			
	6	1.1	1.27			
7	1	1.2	1,30			
_	12	1.3	6.80			
-	15	1.4	0.77			
10 3	1	1.25	0.55			
11	35	1,05	0.58			
100	36 .	1,13	0.61			
13	37	1.15	0,75			
14	39	1.17	0.79			
15	37	1.05	0,63			
16	40	1,00	6,69			
	4/	1.10	9.28			
10	42	1.10	0,13			
	43	0,70	0			
20	14,2-000	Ø	P			
21						
2						
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19

Data Mgnt. Approved

Personnel: La dia Row ID Particle Categ 1 Silt / Clay 2 Sand 3 Very Fine 4 Fine 5 Fine 6 Medium 7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	Start.	obin-Blac Bewina		STORET S	Station ID:		p: PEBL-CNT Cum. Total
Waterbody: 5 Tell 1 Personnel: La dia Row ID Particle Catego 1 Silt / Clay 2 Sand 3 Very Fine 4 Fine 5 Fine 6 Medium 7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	ory	PE Size (mm) <1 1-2 2-4 4-6 6-8	BBLE CO	UNT	Chara Chara Sum 0 0	Mia SPl	p: PEBL-CNT Cum. Total
Personnel: La dia Row ID Particle Categ 1 Silt / Clay 2 Sand 3 Very Fine 4 Fine 5 Fine 6 Medium 7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	ory	PE Size (mm) <1 1-2 2-4 4-6 6-8	BBLE CO	(UNT	Chara Sum 0	cteristic Grou	ip: PEBL-CNT
Row ID Particle Categ 1 Silt / Clay 2 Sand 3 Very Fine 4 Fine 5 Fine 6 Medium 7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	ory	PE Size (mm) <1 1-2 2-4 4-6 6-8	BBLE Cl Riffle Count	(Other)	Sum 0 0		Cum. Total
1 Silt / Clay 2 Sand 3 Very Fine 4 Fine 5 Fine 6 Medium 7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large		Size (mm)	Riffle Count	(Other)	Sum 0 0		Cum. Total
1 Silt / Clay 2 Sand 3 Very Fine 4 Fine 5 Fine 6 Medium 7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large		<1 1-2 ² 2-4 ⁴ 4-6 ⁵ 6-8 ⁵	Count		Sum 0 0		Cum. Total
1 Silt / Clay 2 Sand 3 Very Fine 4 Fine 5 Fine 6 Medium 7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large		<1 1-2 ² 2-4 ⁴ 4-6 ⁵ 6-8 ⁵	:: Ø		0	% of Total	0.00%
2 Sand 3 Very Fine 4 Fine 5 Fine 6 Medium 7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	ELS	1-2 ² 2-4 -/ 4-6 ^{5,6} 6-8 ⁵	:: Ø		0		A STATE
2 Sand 3 Very Fine 4 Fine 5 Fine 6 Medium 7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	ELS	2-4 4 4-6 ⁵⁴ 6-8 ⁸	1				0.00%
4 Fine 5 Fine 6 Medium 7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	ELS	4-6 ^{5.6} 6-8 ³⁵	-	-	0		
5 Fine 6 Medium 7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	ELS	6-8			-		0.00%
6 Medium 7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	ELS	6-8	-		0	1	0.00%
7 Medium 8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	ELS	18	120		0	-	0.00%
8 Coarse 9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	- m	8 - 12	::		0		0.00%
9 Coarse 10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	AV	12 - 16	11		0		0.00%
10 Very Coarse 11 Very Coarse 12 Small 13 Small 14 Large	9	16 - 22	X		0	-	0.00%
11 Very Coarse 12 Small 13 Small 14 Large	Ĩ.	22-32	Ø		0		0.00%
12 Small 13 Small 14 Large	-	32 - 45	M		0		0.00%
13 Small 14 Large		45 - 64	Ħ		0		0.00%
14 Large		64 - 90			0		0.00%
	COBBLES	90 - 128			0		0.00%
	COB	128 - 180	27		0	_	0.00%
15 Large		180 - 256	a *		0		0.00%
16 Small		256 - 362	**		0		0.00%
17 Small	RS	362 - 512	· · ·		o		0.00%
18 Medium	BOULDERS	512 - 1024			0		0.00%
19 Large	181	1024 - 2048	2		0		0.00%
20 Bedrock	1-1	> 2048			0		0.00%

Pebble Count Data Entry Form

Station ID: Mixed DMOD1 Date: G-17003 Si Waterbody: Date: Date: G-17003 Si Waterbody: Date: Personnel: Ri Station ID's on reach:	ut a new, stable riparian area has formed within riparian area. (Stage 1 and 5, Schumm's on is beginning to establish, even at the base o her degradation (early Stage 2). Iain, floodplain not well vegetated. The itage 3) wncutting is clearly occurring. Only occasional ng/headcuts. (Stage 2)
Waterbody:	ach Length: ut a new, stable riparian area has formed within riparian area. (Stage 1 and 5, Schumm's on is beginning to establish, even at the base o her degradation (early Stage 2). lain, floodplain not well vegetated. The stage 3) wncutting is clearly occurring. Only occasional ng/headcuts. (Stage 2)
Station ID's on reach: Question 1, Stream Incisement: 8 = channel stable, no active downcutting occurring; old downcutting apparent bithe incised channel. There is perennial riparian vegetation will established in the model) 6 = channel has evidence of old downcutting that has begun stabilizing, vegetation the tailing bands, solid disturbance evident. (Stage 4). 4 = small headcut, in early stage, is present. Immediate action may prevent furtion that is present is mainly pioneer species. Bank failure is common. (Son exchannel deeply incised, resembling a gully, little or no riparian area, active do or rare flood events access the flood plain. Tributaries will also exhibit downcutting the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts always keep the stream reach from the presence of active headcuts always keep the stream reach from the presence of active headcuts always keep the stream the stream and its setting the the stream shot the str	riparian area. (Stage 1 and 5, Schumm's on is beginning to establish, even at the base o her degradation (early Stage 2). lain, floodplain not well vegetated. The itage 3) wncutting is clearly occurring. Only occasiona ng/headcuts. (Stage 2)
Question 1, Stream Incisement: 8 = channel stable, no active downcutting occurring; old downcutting apparent bithe incised channel. There is perennial riparian vegetation will established in the model) 6 = channel has evidence of old downcutting that has begun stabilizing, vegetation the falling bands, solid disturbance evident. (Stage 4). 4 = small headcut, in early stage, is present. Immediate action may prevent furth 2 = unstable, channel incised, actively widening, limited new riparian area/floodprogetation that is present is mainly pioneer species. Bank failure is common. (So = channel deeply incised, resembling a gully, little or no riparian area, active do for rare flood events access the flood plain. Tributaries will also exhibit downcuttle the presence of active headcuts should nearly always keep the stream reach from Actual Score: Comments Question 2, Percent of Streambanks with Active Lateral Cutting: a the lateral bank erosion is in balance with the stream and its setting a there is a minimal amount of active lateral bank erosion occurring a there is excessive lateral bank erosion occurring b there is excessive lateral bank erosion occurring c there is excessive lateral bank erosion occurring c there is excessive lateral bank erosion occurring c there is excessive lateral bank erosion occurring <td>riparian area. (Stage 1 and 5, Schumm's on is beginning to establish, even at the base o her degradation (early Stage 2). lain, floodplain not well vegetated. The itage 3) wncutting is clearly occurring. Only occasiona ng/headcuts. (Stage 2)</td>	riparian area. (Stage 1 and 5, Schumm's on is beginning to establish, even at the base o her degradation (early Stage 2). lain, floodplain not well vegetated. The itage 3) wncutting is clearly occurring. Only occasiona ng/headcuts. (Stage 2)
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the falling bands, solid disturbance evident. (Stage 4). 4 = small headcut, in early stage, is present. Immediate action may prevent furth 2 = unstable, channel incised, actively widening, limited new riparian area/floodp vegetation that is present is mainly pioneer species. Bank failure is common. (\$ 0 = channel deeply incised, resembling a gully, little or no riparian area, active do 0 = channel deeply incised, resembling a gully, little or no riparian area, active do 0 = channel deeply incised, resembling a gully, little or no riparian area, active do 0 = channel deeply incised, resembling a gully, little or no riparian area, active do 0 = channel deeply incised, resembling a gully, little or no riparian area, active do 0 = channel deeply incised, resembling a gully, little or no riparian area, active do 0 = channel deeply incised, resembling a gully, little or no riparian area, active do 0 = channel flood events access the flood plain. Tributaries will also exhibit downcutil The presence of active headcuts should nearly always keep the stream reach fro Actual Score: Potential Score:	ner degradation (early Stage 2). Iain, floodplain not well vegetated. The Itage 3) wncutting is clearly occurring. Only occasiona ng/headcuts. (Stage 2)
2 = unstable, channel incised, actively widening, limited new riparian area/floodply vogetation that is present is mainly pioneer species. Bank failure is common. (\$ 0 = channel deeply incised, resembling a gully, little or no riparian area, active do or rare flood events access the flood plain. Tributaries will also exhibit downcutil the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts should nearly always keep the stream reach from the presence of active headcuts always keep the stream reach from the presence of active the attribution to active lateral bank erosion occurring the there is a moderate amount of active lateral bank erosion occurring there is excessive lateral bank erosion occurring there is excessive lateral bank erosion occurring there is a moderate amount of active lateral bank erosion occurring there is a moderate amount of active lateral bank erosion occurring there is excessive lateral bank erosion occurring there is excessive lateral bank erosion occurring the presence of the stream to active the presence of	iain, floodplain not well vegetated. The itage 3) wncutting is clearly occurring. Only occasiona ng/headcuts. (Stage 2)
vegetation that is present is mainly pioneer species. Bank failure is common. (S 0 = channel deeply incised, resembling a gully, little or no riparlan area, active do or rare flood events access the flood plain. Tributaries will also exhibit downcutil The presence of active headcuts should nearly always keep the stream reach fro Actual Score: Potential Score: Comments Duestion 2, Percent of Streambanks with Active Lateral Cutting: = the lateral bank erosion is in balance with the stream and its setting = there is a moderate amount of active lateral bank erosion occurring = there is excessive lateral bank erosion occu	itage 3) wncutting is clearly occurring. Only occasiona ng/headcuts. (Stage 2)
trare flood events access the flood plain. Tributaries will also exhibit downcutil the presence of active headcuts should nearly always keep the stream reach fro Actual Score: Potential Score: Comments Duestion 2, Percent of Streambanks with Active Lateral Cutting: = the lateral bank erosion is in balance with the stream and its setting = there is a moderate amount of active lateral bank erosion occurring = there is excessive lateral bank erosion occurring = there is excessive lateral bank erosion occurring = there is excessive lateral bank erosion occurring ctual Score: Potential Score:	ng/headcuts. (Stage 2)
Actual Score: Potential Score: Comments Duestion 2, Percent of Streambanks with Active Lateral Cutting: a the lateral bank erosion is in balance with the stream and its setting between is a moderate amount of active lateral bank erosion occurring between is a moderate amount of active lateral bank erosion occurring between is excessive lateral bank erosion occurring between its excessi	vm being rated sustainable.
Comments Duestion 2, Percent of Streambanks with Active Lateral Cutting: a = the lateral bank erosion is in balance with the stream and its setting b = there is a minimal amount of active lateral bank erosion occurring c = there is excessive lateral bank erosion occurring b = there is excessive lateral bank erosion occurring c = there is excessive lateral bank erosion occurring b = there is excessive lateral bank erosion occurring c = there is excessive lateral bank erosion occurring b = there is excessive lateral bank erosion occurring c = there is excessive lateral bank erosion occurring b = there is excessive lateral bank erosion occurring c = there is excessive lateral bank erosion o	
Duestion 2, Percent of Streambanks with Active Lateral Cutting: is = the lateral bank erosion is in balance with the stream and its setting is = there is a minimal amount of active lateral bank erosion occurring is = there is a moderate amount of active lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is excessive lateral bank erosion occurring is = there is = there is excessive lateral bank erosion occurring is = there is = there is excessive lateral bank erosion occurring is = there is = there is excessive lateral bank erosion <td></td>	
Duestion 2, Percent of Streambanks with Active Lateral Cutting: = the lateral bank erosion is in balance with the stream and its setting = there is a minimal amount of active lateral bank erosion occurring = there is a moderate amount of active lateral bank erosion occurring = there is excessive lateral bank erosion occurring ctual Score: Potential Score:	
e = there is a moderate amount of active lateral bank erosion occurring = there is excessive lateral bank erosion occurring Actual Score: Potential Score:	
= there is excessive lateral bank erosion occurring ctual Score: Potential Score:	
ctual Score: 6 Potential Score: 6	
iomments	
uestion 3, The Stream is in Balance with the Water and Sediment Being St	
 the stream exhibits no excess sediment/bedload deposition, sediment occurs xpected in a stable, dynamic system 	on point bars and other locations as would be
= sediment clogged gravel's are apparent in riffles or pools, or other evidence of	excess sediment apparent
= mid-channel bars are common	
= stream is braided (except naturally occurring braided systems), having at leas	t 3 active channels
ctual Score: Potential Score:	
omments	

			Act as a Rooting Medium:	
			to hold water and act as a rooting medium	
			hold water and act as a rooting medium	
1 = 35% to 35% of th	e riparian area v	with sufficient soil to h	hold water and act as a rooting medium	
0 = 35% or less of the	e riparian area v		hold water and act as a rooting medium	
Actual Score:	3	Potential Score:		
Comments				
Question 5, Percent	t of Streamban	k with Vegetation h	aving a Deep, Binding Rootmass: (see Appendix I for st	ability
ratin_s for most ripa			enacise with doon hinding root masses	
5 = more than 80% of	the streambank	comprised of plant	species with deep, binding root masses incles with deep, binding root masses	
4 = 60% to 80% of the) streambank co	mprised of plant spo	cies with deep binding root masses	
2 = 30% to 60% of the) streambank co	imprised of plant spo	necise with deen hinding not masses	
			pecies with deep binding root masses	
Actual Score:	6	Potential Score:	_6	
Comments				_
Question 6, Weeds :				
3 = No noxious weeds				
e = 0-1% of the riparia	n area has noxi	ous weeds		
I = 1%-5% of the ripar				
) = over 5% of the rips	urian area has n	oxious weeds		
Actual Score:	3	Potential Score:	3	
Comments	_			
- Question 7, Di turbar	nce-Caused Ur	desirable Plants:	Construction of the American Street, St	
= 1% or less of the ri	parian area has	undesirable plants		
= 1%-5% of the ripar	ian area has un	desirable plants		
= 5%-10% of the ripa	irian area has u	ndesirable plants		
= over 10% of the rip			and the second sec	
ctual Score:	3	Potential Score:	3	
comments			14	
-				

Ouestion 8 Wor	
potential for wood	dy Species Establishment and Regeneration: (Note: Skip this question if the riparian area has no y species)
8 = all age classes	of native woody riparian species present (see table, Fig 2)
and shrubs, there	of native woody riparian species clearly absent, all others well represented. For sites with potential for trees may be one age class of each absent. Often, it will be the middle age group(s) that is (are) lacking. Having and a young age class present indicate potential for recovery.
or the stand is con	s of native riparian shrubs and/or two age classes of riparian trees clearly absent, other(s) well represented, prised of mainly mature, decadent or dead plants
dominate. Re-eva	duced, (i.e., facultative, facultative upland species such as rose, or snowberry) or non-riparian species luate Question 1, incisement, if this has happened.
0 = some woody s evaluated to ensur cedar	pecies present (>10% cover), but herbaceous species dominate (at this point, the site potential should be re- e that it has potential for woody vegetation). OR, the site has at least 5% cover of Russian olive and/or salt
Actual Score:	B Potential Score:
Comments	
Question 9, Utiliz	ation of Trees and Shrubs: (Note: Skip this question if the riparian area has no potential for woody
	ailable second year and older stems are browsed
	available second year and older stems are browsed
	e available second year and older stems are browsed.
1 = more than 50%	of the available second year and older stems are browsed. Many of the shrubs have either a "clubbed" y are high-lined or umbrella shaped.
	ble use (10% or more) of unpalatable and normally unused woody species.
Actual Score:	
	Potential Score:
	Potential Score: <u>7</u>
Comments	Potential Score:
Comments	Potential Score: 7
	Y Potential Score: Y Potential Score: Y rian/Wetland Vegetative Cover in the Riparian Area/Floodplain and Streambank:
Question 10, Ripa	rian/Wetland Vegetative Cover in the Riparian Area/Floodplain and Streambank:
Question 10, Ripa = 85% or more of	rian/Wetland Vegetative Cover in the Riparian Area/Floodplain and Streambank: the riparian/wetland plant cover has a stability rating ≥ 6
Question 10, Ripa 3 = 85% or more of 5 = 75%-85% of the	arian/Wetland Vegetative Cover in the Riparian Area/Floodplain and Streambank: the riparian/wetland plant cover has a stability rating ≥ 6 e riparian/wetland plant cover has a stability rating ≥ 6
Question 10, Ripa = 85% or more of = 75%-85% of the = 65%-75% of the	trian/Wetland Vegetative Cover in the Riparian Area/Floodplain and Streambank: the riparian/wetland plant cover has a stability rating ≥ 6 eriparian/wetland plant cover has a stability rating ≥ 6 e riparian/wetland plant cover has a stability rating ≥ 6
Question 10, Ripa 3 = 85% or more of 5 = 75%-85% of the 1 = 65%-75% of the 2 = 55%-65% of the	trian/Wetland Vegetative Cover in the Riparian Area/Floodplain and Streambank: the riparian/wetland plant cover has a stability rating ≥ 6 eriparian/wetland plant cover has a stability rating ≥ 6 eriparian/wetland plant cover has a stability rating ≥ 6 eriparian/wetland plant cover has a stability rating ≥ 6
Question 10, Ripa 3 = 85% or more of 5 = 75%-85% of the 4 = 65%-75% of the 2 = 55%-65% of the 0 = less than 55% of	trian/Wetland Vegetative Cover in the Riparian Area/Floodplain and Streambank: the riparian/wetland plant cover has a stability rating ≥ 6 e riparian/wetland plant cover has a stability rating ≥ 6 e riparian/wetland plant cover has a stability rating ≥ 6 e riparian/wetland plant cover has a stability rating ≥ 6 if the riparian/wetland plant cover has a stability rating ≥ 6
Question 10, Ripa 3 = 85% or more of 5 = 75%-85% of the 4 = 65%-75% of the 2 = 55%-65% of the 0 = less than 55% of	trian/Wetland Vegetative Cover in the Riparian Area/Floodplain and Streambank: the riparian/wetland plant cover has a stability rating ≥ 6 eriparian/wetland plant cover has a stability rating ≥ 6 eriparian/wetland plant cover has a stability rating ≥ 6 eriparian/wetland plant cover has a stability rating ≥ 6
3 = 85% or more of 5 = 75%-85% of the 4 = 65%-75% of the 2 = 55%-65% of the	trian/Wetland Vegetative Cover in the Riparian Area/Floodplain and Streambank: the riparian/wetland plant cover has a stability rating ≥ 6 e riparian/wetland plant cover has a stability rating ≥ 6 e riparian/wetland plant cover has a stability rating ≥ 6 e riparian/wetland plant cover has a stability rating ≥ 6 if the riparian/wetland plant cover has a stability rating ≥ 6
Question 10, Ripa 3 = 85% or more of 5 = 75%-85% of the 4 = 65%-75% of the 2 = 55%-65% of the 0 = less than 55% of Actual Score:	trian/Wetland Vegetative Cover in the Riparian Area/Floodplain and Streambank: the riparian/wetland plant cover has a stability rating ≥ 6 e riparian/wetland plant cover has a stability rating ≥ 6 e riparian/wetland plant cover has a stability rating ≥ 6 e riparian/wetland plant cover has a stability rating ≥ 6 if the riparian/wetland plant cover has a stability rating ≥ 6
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Question 11, Riparian Area/Floodplain Characteristics are Adequate to Dissipate Energy and Trap Sediment. 6 = active flood or overflow channels, large rock, or woody material present and adequate to dissipate energy and trap sediment. There is little surface erosion and no evidence of long, continuous erosional areas on floodplain/riparian area or streambank. There are no headcuts where either overland flow and/or flood channel flows return to the main channel. 4 = rock and/or woody material is present, but generally of insufficient size to dissipate energy. Some sediment trapping occurring. Occasional evidence of surface erosion. Generally not severe enough to have developed channels. 2 = inadequate rock and/or woody material available for dissipation of energy or sediment trapping. There is surface erosion (scouring) and occasional headcuts where overland flows or flood channel flows return to the main channel. 0 = riparian area/floodplain lacking any of these attributes: 1)adequate flood or overflow channels, 2) large rock, or 3) woody material suitable for energy dissipation and sediment trapping. Erosional areas are long and continuous. Lacking vegetation or substrate materials adequate to resist further erosion. Surface erosion is obvious on the floodplain/riparian area. Headcuts are present that have the potential to create meander cut-offs. Potential Score: Actual Score: Comments SUMMARY Potential Possible Points Score Actual Score 0 0, 2, 4, 6, 8 0 Stream Incisement QUESTION 1: 0 0, 2, 4, 6 0 Lateral Cutting QUESTION 2: Stream Balance 0 0, 2, 4, 6 0 QUESTION 3: N/A, 0, 1, 2, 3 0 Sufficient Soil QUESTION 4: N/A, 0, 2, 4, 6 0 QUESTION 5: Rootmass 0 0, 1, 2, 3 QUESTION 6: Weeds 0 0, 1, 2, 3 0 QUESTION 7: **Undesirable Plants** N/A, 0, 2, 4, 6, 8 N/A, 0, 1, 2, 3, 4 0 QUESTION 8: Woody Species Establishment 0 0 QUESTION 9: Browse Utilization 0 N/A, 0, 2, 4, 6, 8 Riparian/Wetland Vegetative Cover * 0 0 **OUESTION 10:** Riparian Area/Floodplain Characteristics N/A, 0, 2, 4, 6 0 QUESTION 11: Total 0 61 0 Potential Score for most Bedrock or Boulder streams 0 (32)0 (questions 1, 2, 3, 6, 7, 11) 0 (49)0 Potential Score for most low energy "E" streams (questions 1-7, 10, 11) Actual Score X 100 = % rating #DIV/0! RATING: Potential Score 80-100% = SUSTAINABLE 50-80% = AT RISK LESS THAN 50% = NOT SUSTAINABLE Only in certain, specific situations can both of these receive an "N/A". SRAF.xls

	Montana Depa	artment of Enviror	mental Quality Supplement	tal Questions
	e questions does n	ot have an effect on t st consider the poten	he rating above.	
			te: the answers to question 12	vill be averaged
	ivenile Holding/Es			nii oo areragaa
8 = Abundant deep	pools, woody deb	ris, overhanging veg	etation, boulders, root wads, ur	dercut banks and/or aquatic
	common (see abov			
4 = Fish habitat is boulders, root wad	noticeably reduced. s and/or aquatic ve	Most pools are shal getation are of limited	low and/or w ody debris, under I supply.	cut banks, overhanging vegetation,
2 = Pools and habi	tat features are spa	irse or non-existent o	r there are fish barriers.	
0 = There is not en	ough water to supp	ort a fishery		
N/A = Stream woul	d not support fish u	nder natural conditio	ns	
Actual Score:	6	Potential Score:	6	
- N - 3	& Chellon	1 high	gradient, Itos	Trads vot
Comments (-prese	it but	not characte	ristics
12b. Habitat Com 6 = A mixture of juv	plexity enile and adult cov	er types is present.	ligh flow juvenile and adult refu	gia are present.
3 = Primarily adult of	or juvenile cover typ	es are present. High	flow refugia are reduced.	
) = High flow refugi	a are lacking.			
N/A = Stream would	d not support fish u	nder natural condition	15	
Actual Score:		Potential Score:	3	
Comments	-		2	
	bitat (salmonid st spawning substrate,		ming areas, and composition of	spawning substrate are excellent.
 Areal extent of a Areal extent of a 	pawning substrate, pawning substrate,	, morphology of spaw , morphology of spaw	ning areas, and/or quality of sp	awning substrate reduced.
 3 = Areal extent of s 4 = Areal extent of s 	pawning substrate, pawning substrate,	, morphology of spaw , morphology of spaw	ning areas, and/or quality of sp	
3 = Areal extent of s 4 = Areal extent of s 5 = Areal extent of s	pawning substrate, pawning substrate, pawning substrate,	, morphology of spaw , morphology of spaw	ning areas, and/or quality of sp ning areas, and/or quality of sp	awning substrate reduced.
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124. Fish Passage Bar No potential fish passage barriers apparent. 0 = Potential fish passage barriers present. NA = Stream would not support fish under natural conditions. Actual Score: Potential Score:				
0 = Potential fish passage barriers present. NA = Stream would not support fish under natural conditions. Actual Score: Potential Score: Potential Score: Comments L2e. Entrainment of fish into water diversions not an issue. 4 = Entrainment of fish into water diversions may be a moderate issue. 5 = Entrainment of fish into water diversions may be a moderate issue. 6 = Entrainment of fish into water diversions may be a moderate issue. 6 = Entrainment of fish into water diversions may be a major issue. Actual Score: Potential Score: Pote	12d. Fish Passsa 8 = No potential fish	ge h passage barriers	apparent.	
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Comments Comme	N/A = Stream would	d not support fish u	inder natural conditions.	
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Actual Score:				
Domments	= Entrainment of f	fish into water dive		
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22-8 Avg. Score Actual Score	Comments			
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Actual Score:	Approximately 2	5-50% of the strea	m does not have adequate shade.	
	Approximately 2	5-50% of the strea of the stream react	m does not have adequate shade.	
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6 = none		dity, salinization, precipitants on stream bottom and/or	water odor
4 = Slight			
2 = Moderate			
) = Extensive			
V/A = No water		and the second se	and the second s
	G	and G	
ctual Score:		Potential Score:	
Comments			
ommenus			
uestion 16. Bacte	ela		
		nic sources of bacteria	
		esent. Wastewater or concentrated livestock operations a	re the most common sources.
		wage is entering the stream ,	
ctual Score:	4	Potential Score:	
cium ocore.	+ 6		
omments			
orninena			
uestion 17. Macro			
			ally have an abundance of may
= The stream has a	healthy and div	verse community of macroinvertebrates. Stream riffles usu	ally have an abundance of may
= The stream has a es, caddis flies and/	healthy and div or stone flies.		ally have an abundance of may
= The stream has a es, caddis flies and/ = The stream is don	healthy and div or stone flies. ninated by pollu	verse community of macroinvertebrates. Stream riffles usu ition tolerant taxa such as fly and midge larva.	ally have an abundance of may
= The stream has a es, caddis flies and/	healthy and div or stone flies. ninated by pollu is are rare or ab	verse community of macroinvertebrates. Stream riffles usu ition tolerant taxa such as fly and midge larva.	ally have an abundance of may
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 The stream has a es, caddis flies and/ The stream is don Macroinvertebrate Macroinvertebrate A = Stream reach is tual Score: 	healthy and div or stone flies. ninated by pollu is are rare or ab	verse community of macroinvertebrates. Stream riffles usu ition tolerant taxa such as fly and midge larva. osent	ally have an abundance of may
 The stream has a es, caddis flies and/ The stream is don Macroinvertebrate Macroinvertebrate A = Stream reach is tual Score: 	healthy and div or stone flies. ninated by pollu is are rare or ab	verse community of macroinvertebrates. Stream riffles usu ition tolerant taxa such as fly and midge larva. osent	ally have an abundance of may
 The stream has a es, caddis flies and/ The stream is don Macroinvertebrate Macroinvertebrate A = Stream reach is tual Score: 	healthy and div or stone flies. ninated by pollu is are rare or ab	verse community of macroinvertebrates. Stream riffles usu ition tolerant taxa such as fly and midge larva. osent	ally have an abundance of may

Question 18. Irrig Evaluate effects fro	ation impacts m de-watering	(Assess during critical I or inter-basin transfer of	ow flow periods or you may need to inquire lo water.)	cally about this.
8 = There are no no	oticeable impa	ts from irrigation		
3 = Changes in flov organisms.	v resulting from	irrigation practices are r	noticeable, however flows are adequate to sup	oport aquatic
= Flows support a	quatic organis	ms, but habitat, especial	y riffles are drastically reduced or impacted.	
= The flow is low	enough to seve	erely impair aquatic organ	hisms	
= All of the water	has been diver	ted from the stream		
I/A = Stream reach				
			8	
Actual Score:	D_	Potential Score:		
North March				
Comments				
uestion 19. Land	luse activities	- Sources		
ppear to be natura	L.		water quality or the riparian vegetation. Any	
= There are some nber harvesting, u	signs of impac rban, roads, et	t from landuse activities 0.	such as grazing, dryland agriculture, irrigation	n, feedlots, mining,
			hroughout most of the stream reach. For exa	mple, there are
bvious signs of hur	nan induced e	osion, saline seeps or o	vergrazing within the watershed.	
- Landuse impact	s are significar	t and widespread. Visua	d observation and photo documentation would	d provide
verwhelming evide	nce that the str	eam is impaired.		
= Land use impact	s are so intrus	ve that the stream has k	est most of its natural features. The stream d	oes not appear to be
apable to support n	nost forms of a	quatic life		
ctual Score:	8	Potential Score:	8	
		ne smil	scale. logging ? cath	le grozine
Daents	- ALS	inally Isma	(had Etse)	1947 - 1946 - 1946 - 1946 - 1946 - 1946 - 1946 - 1946 - 1946 - 1946 - 1946 - 1946 - 1946 - 1946 - 1946 - 1946 -
A Merica ina	-	0		
tal Actual	0	Total Potential	0	
And a second second	-	-		
ATING	Total	x 100	#DIV/0!	
11112	Potential			
ERALL RATING		(Total NRCS Actual +	Total MT Supplement Actual) x100	#DIV/0!
		(Total NRCS Potential	+ Total MT Supplement Potential)	
		USTAINABLE		
	50-75% = AT	RISK	31 5	
	LESS THAN	50% = NOT SUSTAINA	JLC	
				COAE via
				CDAE vie

Name	VIE	Aural	A for a Clock	Personnel: <u>Brancia fla dana T</u> HUC <u>Jazolaza</u> Parkana
Lat <u>V / / / / / / / / / / / / / / / / / / </u>	y meth	Long 112° /1 ° b4, 3 v	Lat <u>V(F)) = 9(e-10)</u> Long <u>112 e 11 0 41 5</u> Verified? By GPS Datum (Circle Ono); NAD 23 Lat/Long obtained by method other than GPS? Y N N AT method used? If by map what is the map scale?	One) NAD 27 NAD 83 WGS84
Samples Taken:	1		Sample ID/Eile Looniton:	
Water		Nutrients [7] Metals [7] Commons [7]	100 00 11 1 00 00 00 00 00 00 00 00 00 0	sample Collection Procedure
Sediment	Ø		Contraction of the second	GRAB
Macroinvertebrate		Macroinvertebrate Habitat Asmt		. SED-1
Algae/Macrophytes		Acutatic Plant Even		KICK HESS OTHER:
Chlomohull =	X			PERI-1 OTHER:
a mynywa	10		03-9 11C (24-5 1 4 24-60)	CHLPHL-2 OTHER:
Habitat Assessment		Stream Reach Asmt. Other		15.6
Substrate		Pebble Count 7% Fines		and the second sec
Transect				
Photographs				
Field Notes				
Other				
Measurements:	Time:	15/36	Macroinvertebrate Kick Duestone	and a second
Q / Flow (cfs)		Est. T Site Vis	Site Visit Comments.	Nick Length (FL):
Temp: (C)	A			
pH:			alle half and	
SC: (mS/cm)			100000000000000000000000000000000000000	
SC x 1000 =		umbo/cm		
DO: (mg/L)				
UR: Clear Slig	ght [TUR: Clear Slight Turbid Opaque		
Turbidity Comments:				
			And the second se	
			16 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	

Date:	L DISCHARG	151 2.2	1	Site Visit Code:	03-0711	
Waterb	ody: Soul	h foll-r	arthuesa		Station ID:	MIDSEDBE-
Person		ta das	Provinsion			
	tance from	**Depth	**Velocity (at point)	**Width	**Area	"Discharge
1 /4	3 LEW	13	Ø			
2 15		.4	139			
3 16		: 65	156			
	13	175	.79			
	3	.70	.71			
6 /4		,60	.6%	_		
7 20.	3	155	.73			
8 21.	3	.55	.77			
9 22	3	.55	-85			
	3	.50	.81			
11 2%	3	. 50	183			
12 25	.3	.55	.78			
13 26		.60	.53			
14 07	3	.60	.68			
15 2%	3	.50	.85			
16 27		.55	404			
17 30	3	.100	,76		1.1	
18 31.		165	.70			
19 321		170	.63			
the second se	3	,59	.65		25	
L	3	. 65	.55			
2 35.		155	.50			
3 36.		.50	,40			
4 37.	5	0	0			
5						
6						
7					1	
8						
19						
0						

Data Myret. Approved

	1 17 1							
Date:	6-17-0			_	and the second s		: 03-07	
Waterboo	ty: 5nth h	DIK	garburn	5	STOI ET S	tation ID	MIDSE	066-04
Personne	H: La. daw	160	WARK			_		
		-	PI	EBBLE C	OUNT			
				Riffle	(Other) Count			
Row ID	Particle Catego	bry	Size (mm)	Count	Count	Sum	% of Total	Cum. Total
1	Silt / Clay		<1	::		0		0.009
2	Sand		1-2	EI		0	1 1	0.009
3	Very Fine		2-4	II		0		0.009
4	Fine		4-6			0		0.00%
5	Fine	1	6-8	57		0		0.00%
6	Medium	- s	8 - 12	Ø		0		0.00%
7	Medium	GRAVELS	12 - 16	図:::		0		0.00%
8	Coarse	GR	16 - 22	窗		0		0.00%
9	Coarse	14	22 - 32	图::		0		0.00%
10	Very Coarse		32 - 45	Ø		0		0.00%
11	Very Coarse		45 - 64	Ø:		0		0.00%
12	Small		64 - 90	П		0		0.00%
13	Small	COLLLES	90 - 128	5		0		0.00%
14	Large	COE	128 - 180	*		0		0.00%
15	Large		180 - 256	*		0		0.00%
16	Small	OULDERS	256 - 362	•		0		0.00%
17	Small		362 - 512	**		0		0.00%
18	Medium		512 - 1024			0		0.00%
19	Large	1.00.1	1024 - 2048			0		0.00%
20	Bedrock		> 2048			0		0.00%
21	Total # Samples			0	0	0	0.00%	

		Stream Read	ch Assessme	ent Form		
Station ID:	0-17-03	Date:	6-17-03	Site Visit Code:	03-0711	
Waterbody: 5nu	th Fork K	aborn- Civili	lene	Reach Length:		
Waterbody Seg ID:	- 0		Personne	: Indiais	Bowmen	
Station ID's on reach						
Question 1, Stream	Incisement:					
8 = channel stable, n the incised channel. model)	e active downcu There is perenni	itting occurring; old do al riparian vegetation	will established i	in the riparian area.	(Stage 1 and 5, 3	Schumm's
6 = channel has evid the falling bands, so	ence of old dow id disturbance ev	ncutting that has begu vident. (Stage 4).	n stabilizing, vej	getation is beginnin	g to establish, ev	en at the base o
		resent. Immediate ad				
2 = unstable, channe vegetation that is pre	l incised, actively sent is mainly pi	y widening, limited ner oneer species. Bank	w riparian area/f failure is commo	loodplain, floodplaii on. (Stage 3)	n not well vegetat	ed. The
0 = channel deeply in or rare flood events a	cised, resemblin ccess the flood	ng a gully, little or no ri plain. Tributaries will	parian area, act also exhibit dow	ive downcutting is on incutting/headcuts.	slearly occurring. (Stage 2)	Only occasional
The presence of activ	ve headcuts sho	uld nearly always kee			d sustainable.	- 10
Actual Score:	8	Potential Score:	8			
and the second						
Comments					10 C C C	
					4	
Question 2, Percen		ks with Active Latera	I Cutting:			
Question 2, Percent 5 = the lateral bank e	rosion is in balar	ks with Active Latera	I Cutting: id its setting	190		R
Question 2, Percent 5 = the lateral bank et 4 = there is a minimal	rosion is in balar amount of activ	ks with Active Latera the with the stream an e lateral bank erosion	I Cutting: Id its setting occurring		4	茂
Question 2, Percent 6 = the lateral bank et 4 = there is a minimal 2 = there is a modera	rosion is in balar amount of activ te amount of act	ks with Active Latera the with the stream ar e lateral bank erosion ive lateral bank erosion	I Cutting: Id its setting occurring			re.
Question 2, Percent 5 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive	rosion is in balar amount of activite amount of activite lateral bank ero	ks with Active Latera the with the stream ar e lateral bank erosion ive lateral bank erosio ision occurring	I Cutting: Ind its setting occurring In occurring			茂.
Question 2, Percent 5 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive	rosion is in balar amount of activ te amount of act	ks with Active Latera the with the stream ar e lateral bank erosion ive lateral bank erosion	I Cutting: Ind its setting occurring In occurring			茂.
Question 2, Percent 6 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive Actual Score:	rosion is in balar amount of activite amount of activite lateral bank ero	ks with Active Latera the with the stream ar e lateral bank erosion ive lateral bank erosio ision occurring	I Cutting: Ind its setting occurring In occurring			元 元
Guestion 2, Percent 6 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive Actual Score: Comments	rosion is in balar amount of activite amount of act lateral bank ero	ks with Active Latera nee with the stream an e lateral bank erosion ive lateral bank erosion ision occurring Potential Score: _	I Cutting: Ind its setting occurring In occurring C		e Watershed:	茂.
Question 2, Percent 5 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive Actual Score: Comments Question 3, The Stro 5 = the stream exhibit	rosion is in balar amount of activities amount of activities and bank ero	ks with Active Latera the with the stream ar e lateral bank erosion ive lateral bank erosio ision occurring	d Cutting: I Cutting: occurring In occurring C d Sediment Bel	ng Supplied by th		ns as would be
Question 2, Percent 5 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive Actual Score: Comments Question 3, The Street = the stream exhibit xpected in a stable, o	rosion is in balar amount of activities amount of activities and bank ero amount of activities bank ero bank er	ks with Active Latera ace with the stream an e lateral bank erosion ive lateral bank erosion ision occurring Potential Score: e with the "/ater and	d Cutting: I Cutting: occurring In occurring d Sediment Bell tion, sediment o	ng Supplied by th	and other locatio	ns as would be
Question 2, Percent 5 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive Actual Score: Comments Question 3, The Strong a the stream exhibit expected in a stable, of a sediment clogged	amount of activite amount of activite amount of activite amount of activite lateral bank ero	ks with Active Latera ace with the stream an e lateral bank erosion ive lateral bank erosion ive lateral bank erosion ision occurring Potential Score: Potential Score: e with the "/ater and iment/bedios d deposi	d Cutting: I Cutting: occurring In occurring d Sediment Bell tion, sediment o	ng Supplied by th	and other locatio	ns as would be
Question 2, Percent 5 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive Actual Score: Comments Question 3, The Stress a = the stream exhibit expected in a stable, of a = sediment clogged 2 = mid-channel bars	amount of active te amount of active lateral bank ero am is in Balance s no excess sedi dynamic system gravel's are app are common	ks with Active Latera nee with the stream an e lateral bank erosion ive lateral bank erosion ive lateral bank erosion ision occurring Potential Score: Potential Score: ee with the ``/ater and iment/bedios.d deposit arent in riffles or pools	d Cutting: d its setting occurring in occurring d Sediment Bel tion, sediment o s, or other evide	ing Supplied by th ccurs on point bars nce of excess sedi	and other locatio	ns as would be
Question 2, Percent 5 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive Actual Score: Comments Question 3, The Street a = the stream exhibit expected in a stable, of a sediment clogged = mid-channel bars	amount of active te amount of active lateral bank ero am is in Balance s no excess sedi dynamic system gravel's are app are common	ks with Active Latera ace with the stream an e lateral bank erosion ive lateral bank erosion ive lateral bank erosion ision occurring Potential Score: Potential Score: e with the "/ater and iment/bedios d deposi	d Cutting: d its setting occurring in occurring d Sediment Bel tion, sediment o s, or other evide	ing Supplied by th ccurs on point bars nce of excess sedi	and other locatio	ms as would be
Question 2, Percent 5 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive Actual Score: Comments Question 3, The Street 5 = the stream exhibit expected in a stable, of 4 = sediment clogged 2 = mid-channel bars 0 = stream is braided	am is in Balance and is in Balance am is in Balance s no excess sed dynamic system gravel's are app are common (except naturally	ks with Active Latera nee with the stream and e lateral bank erosion ive lateral bank erosion ision occurring Potential Score: Potential Score: e with the "/ater and iment/bedios d deposi arent in riffles or pools	d Cutting: d its setting occurring in occurring d Sediment Bel tion, sediment o s, or other evide	ing Supplied by th ccurs on point bars nce of excess sedi	and other locatio	ms as would be
Question 2, Percent 5 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive Actual Score: Comments Question 3, The Strie Set the stream exhibit expected in a stable, or 4 = sediment clogged 2 = mid-channel bars 0 = stream is braided Actual Score:	amount of active te amount of active lateral bank ero am is in Balance s no excess sedi dynamic system gravel's are app are common	ks with Active Latera nee with the stream and e lateral bank erosion ive lateral bank erosion ision occurring Potential Score: Potential Score: e with the "/ater and iment/bedios d deposi arent in riffles or pools	d Cutting: d its setting occurring in occurring d Sediment Bel tion, sediment o s, or other evide	ing Supplied by th ccurs on point bars nce of excess sedi	and other locatio	ms as would be
Question 2, Percent 5 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive Actual Score: Comments Question 3, The Strie is the stream exhibit expected in a stable, of a = sediment clogged a = mid-channel bars a = stream is braided actual Score:	am is in Balance and is in Balance am is in Balance s no excess sed dynamic system gravel's are app are common (except naturally	ks with Active Latera nee with the stream and e lateral bank erosion ive lateral bank erosion ision occurring Potential Score: Potential Score: e with the "/ater and iment/bedios d deposi arent in riffles or pools	d Cutting: d its setting occurring in occurring d Sediment Bel tion, sediment o s, or other evide	ing Supplied by th ccurs on point bars nce of excess sedi	and other locatio	ns as would be
Question 2, Percent 5 = the lateral bank et 4 = there is a minimal 2 = there is a modera 0 = there is excessive Actual Score: Comments Question 3, The Street 5 = the stream exhibit expected in a stable, of 4 = sediment clogged 2 = mid-channel bars 0 = stream is braided	am is in Balance and is in Balance am is in Balance s no excess sed dynamic system gravel's are app are common (except naturally	ks with Active Latera nee with the stream and e lateral bank erosion ive lateral bank erosion ision occurring Potential Score: Potential Score: e with the "/ater and iment/bedios d deposi arent in riffles or pools	d Cutting: d its setting occurring in occurring d Sediment Bel tion, sediment o s, or other evide	ing Supplied by th ccurs on point bars nce of excess sedi	and other locatio	ns as would be

			ct as a Rooting Medium:	
3 = more than 85%	of the riparian ar	ea with sufficient soil to	hold water and act as a rooting medium	
2 = 65% to 85% of t	he riparian area	with sufficient soil to ho	ld water and act as a rooting medium	
1 = 35% to 65% of t	he riparlan area	with sufficient soil to hol	ld water and act as a rooting medium	
0 = 35% or less of the			d water and act as a rooting medium	
Actual Score:	_ 3	Potential Score:	3	
Comments				
Question 5, Percer ratings for most rip	nt of Streamban parian, and othe	k with Vegetation hav r, species)	ving a Deep, Binding Rootmass: (see A	ppendix I for stability
			ecies with deep, binding root masses	
			es with deep, binding root masses	
			es with deep binding root masses	
			cies with deep binding root masses	
Actual Score:		Potential Score:		
Comments				
Question 6, Weeds				
3 = No noxious weed				
e = 0-1% of the ripar				
= 1%-5% of the rip	arian area has no	xious weeds		
) = over 5% of the rip	barian area has n	oxious weeds		
Actual Score:		Potential Score:	Tealoun	
Comments				
Question 7, Disturb				
= 1% or less of the				
= 1%-5% of the rips				
= 5%-10% of the rip				
= over 10% of the ri	parian area has	undesirable plants		
ctual Score:	3	Potential Score:	3	
omments				
			*	P.P. 4

Question 8, Woody potential for woody sp		lishment and Regene	ration: (Note: Skip this	question if the riparian area has no	
8 = all age classes of	native woody rig	parlan species present	(see table, Fig 2)		
and shrubs, there may	y be one age cla	arian species clearly ab ass of each absent. Of lass present indicate po	ten, it will be the middle a	esented. For sites with potential for tre ge group(s) that is (are) lacking. Havi	ees ing
		shrubs and/or two age ature, decadent or dea		clearly absent, other(s) well represent	ed,
		ive, facultative upland s cisement, if this has ha		snowberry) or non-riparian species	
0 = some woody spec evaluated to ensure th cedar	ies prc sent (>10 nat it has potenti	% cover), but herbace al for woody vegetation	ous species dominate (at). OR, the site has at lea	this point, the site potential should be st 5% cover of Russian olive and/or st	alt
Actual Score:	8	Potential Score:	8		
Comments					_
Question 9. Utilizatio	on of Trees and	f Shrubs: (Note: Skip t	his guestion if the riparia	n area has no potential for woody	_
species)			and the second second second		
4 = 0-5% of the availab	ble second year	and older stems are br	owsed	1.12	
3 = 5%-25% of the ava	ailable second ye	ear and older stems are	browsed		
2 = 25%-50% of the av	vailable second ;	year and older stems a	re browsed.		
1 = more than 50% of growth form, or they ar			ms are browsed. Many	of the shrubs have either a "clubbed"	
0 = there is noticeable	use (10% or mo	re) of unpalatable and	normally unused woody	species.	
Actual Score:	4	Potential Score:	4		
Comments					
- Question 10, Riparia	n/Wetland Vege	tative Cover in the Ri	parian Area/Floodplain	and Streambank:	-
8 = 85% or more of the	riparian/wetland	d plant cover has a stat	bility rating ≥ 6		
6 = 75%-85% of the rip	arian/wetland pl	ant cover has a stability	$rating \ge 6$		
4 = 65%-75% of the rip	arian/wetland pl	ant cover has a stability	$rating \ge 6$		
2 = 55%-65% of the rip	arian/wetland pl	ant cover has a stability	$rating \ge 6$		
0 = less than 55% of th	e riparian/wetlar	d plant cover has a sta	bility rating ≥ 6		
Actual Score: _	8	Potential Score:	8		
Comments _	1.1				_
-					
			3	SRAF.xis	

Question 11, Riparian Area/Floodplain Characteristics are Adequate to Dissipate Energy and Trap Sediment. 6 = active flood or overflow channels, large rock, or woody material present and adequate to dissipate energy and trap sediment. There is little surface erosion and no evidence of long, continuous erosional areas on floodplain/riparian area or streambank. There are no headcuts where either overland flow and/or flood channel flows return to the main channel. 4 = rock and/or woody material is present, but generally of insufficient size to dissipate energy. Some sediment trapping occurring. Occasional evidence of surface erosion. Generally not severe enough to have developed channels. 2 = inadequate rock and/or woody material available for dissipation of energy or sediment trapping. There is surface erosion (scouring) and occasional headcuts where overland flows or flood channel flows return to the main channel. 0 = riparian area/floodplain lacking any of these attributes: 1)adequate flood or overflow channels, 2) large rock, or 3) woody material suitable for energy dissipation and sediment trapping. Erosional areas are long and continuous. Lacking vegetation or substrate materials adequate to resist further erosion. Surface erosion is obvious on the floodplain/riparian area. Headcuts are present that have the potential to create meander cut-offs. Potential Score: Actual Score: Comments SUMMARY Potential Actual Score Possible Points Score 0, 2, 4, 6, 8 0 0 QUESTION 1: Stream Incisement Lateral Cutting 0 0, 2, 4, 6 0 QUESTION 2: 0, 2, 4, 6 0 Stream Balance 0 QUESTION 3: N/A, 0, 1, 2, 3 N/A, 0, 2, 4, 6 Sufficient Soll 0 0 QUESTION 4: Rootmass 0 0 **OUESTION 5:** 0 0, 1, 2, 3 QUESTION 6: Weeds Undesirable Plants 0 0, 1, 2, 3 QUESTION 7: Woody Species Establishment QUESTION 8: 0 N/A, 0, 2, 4, 6, 8 0 Browse Utilization 0 N/A, 0, 1, 2, 3, 4 Ö QUESTION 9: Riparian/Wetland Vegetative Cover * N/A, 0, 2, 4, 6, 8 QUESTION 10: Riparian Area/Floodplain Characteristics N/A, 0, 2, 4, 6 0 QUESTION 11: 0 0 Total 61 0 0 Potential Score for most Bedrock or Boulder streams (32)(questions 1, 2, 3, 6, 7, 11) 0 (49)0 Potential Score for most low energy "E" streams (questions 1 - 7, 10, 11) #DIV/0! X 100 = % rating RATING: Actual Score Potential Score 80-100% = SUSTAINABLE 50-80% = AT RISK LESS THAN 50% = NOT SUSTAINABLE * Only in certain, specific situations can both of these receive an *N/A*.

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	Montana Department of Environmental Quality Supplemental Questions	
Taken of the product of the second second		
Note: Answers to t	se questions does not have an effect on the rating above. these questions must consider the potential of the stream.	
Question 12. Fish	herles Habitat / Stream Complexity Note: the answers to question 12 will be averaged	
12a. / dult and Ju 8 = Abundant deep	uvenile Holding/Escape Cover p pools, woody debris, overhanging vegetation, boulders, root wads, undercut banks and/or a	quatic
6 = Fit h habitat is a	common (see above).	
4 = Fc h habitat is r bould irs, root wad	noticeably reduced. Most pools are shallow and/or woody debris, undercut banks, overhanging is and/or aquatic vegetation are of limited supply.	vegetation,
2 = Pools and habi	itat features are sparse or non-existent or there are fish barriers.	
0 = There is not en	nough water to support a fishery	
N/A = Stream would	Id not support fish under natural conditions	
Actual Score:	Potential Score: 8	
Comments		
12b. Habitat Com	nplexity venile and adult cover types is present. High flow juvenile and adult refugia are present.	-
	or juvenile cover types are present. High flow refugia are reduced.	
0 = High flow refugi		
	Id not support fish under natural conditions	
Actual Score:	6 Potential Score: 0	
Hotodi Guoron		
a sea anna chuige th		
Comments		-
12c. Spawning Ha	abitat (salmonid streams only) spawning substrate, morphology of spawning areas, and composition of spawning substrate ar	e excellent.
2c. Spawning Ha = Areal extent of s	abitat (salmonid streams only) spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc	
2c. Spawning Ha = Areal extent of s = Areal extent of s	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar	ed.
2c. Spawning Ha = Areal extent of s = Areal extent of s = Areal extent of s	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.
2c. Spawning Ha = Areal extent of s = Areal extent of s = Areal extent of s //A = Stream would	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduce spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great spawning substrate great spawning spawning areas, and spawning areas, and spawning spawning spawning spawning spawning areas, and spawning areas, and spawning spawning spawning spawning spawning areas, and spawning areas, and spawning spawning areas, and spawning areas, areas, and spawning areas, areas	ed.
12c. Spawning Ha 3 = Areal extent of s 4 = Areal extent of s 5 = Areal extent of s 4/A = Stream would	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.
12c. Spawning Ha 3 = Areal extent of a 4 = Areal extent of a 0 = Areal extent of a 0 = Areal extent of a 4/A = Stream would Actual Score:	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.
2c. Spawning Ha 3 = Areal extent of s 4 = Areal extent of s 5 = Areal extent of s 6 = Areal extent of s 6 /A = Stream would Actual Score:	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.
12c. Spawning Ha 3 = Areal extent of a 4 = Areal extent of a 0 = Areal extent of a 0 = Areal extent of a 4/A = Stream would Actual Score:	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.
12c. Spawning Ha 3 = Areal extent of a 4 = Areal extent of a 0 = Areal extent of a 0 = Areal extent of a 4/A = Stream would Actual Score:	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.
2c. Spawning Ha = Areal extent of s = Areal extent of s = Areal extent of s = Areal extent of s #/A = Stream would actual Score:	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.
2c. Spawning Ha = Areal extent of s = Areal extent of s = Areal extent of s = Areal extent of s #/A = Stream would actual Score:	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.
12c. Spawning Ha 3 = Areal extent of a 4 = Areal extent of a 0 = Areal extent of a V/A = Stream would Actual Score:	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.
12c. Spawning Ha 3 = Areal extent of a 4 = Areal extent of a 0 = Areal extent of a 0 = Areal extent of a 4/A = Stream would Actual Score:	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.
12c. Spawning Ha 3 = Areal extent of a 4 = Areal extent of a 0 = Areal extent of a V/A = Stream would Actual Score:	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.
12c. Spawning Ha 3 = Areal extent of a 4 = Areal extent of a 0 = Areal extent of a 0 = Areal extent of a 4/A = Stream would Actual Score:	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.
12c. Spawning Ha 8 = Areal extent of s 4 = Areal extent of s 0 = Areal extent of s	spawning substrate, morphology of spawning areas, and composition of spawning substrate ar spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduc spawning substrate, morphology of spawning areas, and/or quality of spawning substrate great id not support fish under natural conditions.	ed.

N/A = Stream would not support lish under natural conditions. Actual Score:		
0 = Potential fish passage barriers present. N/A = Stream would not support fish under natural conditions. Actual Score: Potential Score: Comments 12e. Entrainment of fish into water diversions not an issue. 4 = Entrainment of fish into water diversions may be a moderate issue. 4 = Entrainment of fish into water diversions may be a major issue. Actual Score: Potential Score: Potential Score: Potential Score: Potential Score: Potential Score: Potential Score: Comments 12a-e Avg. Score Actual Score: Question 13. Solar Radiation 5 = More finan 75% of the stream reach is adequately shaded by vegetation. 4 = 50-75% of the stream reach does not have adequate shade. 0 = Approximately 25-50% of the stream does not have adequate shade. 0 = More finan 75% of the stream reach does not have adequate shade. 0 = Approximately 25-50% of the stream does not have adequate shade. 0 = Approximately 25-50% of the stream reach does not have adequate shade. 0 = More finan 75% of the stream reach does not have adequate shade. 0 = More finan 75% of the stream reach does not have adequate shade. 0 = Approximately 25-50% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than finance 2 = More than apparent. 0 = Intain thap apatches or discortinuous mats	8 = No potential fish	passage barriers apparent.
Actual Score:	0 = Potential fish pa	ssage barriers present.
Comments 20: Entrainment of fish into water diversions not an issue. 4 = Entrainment of fish into water diversions may be a moderate issue. 0 = Entrainment of fish into water diversions may be a moderate issue. 0 = Entrainment of fish into water diversions may be a moderate issue. Actual Score:	N/A = Stream would	not support fish under natural conditions.
12e. Entrainment B = Entrainment of fish into water diversions may be a moderate issue. 4 = Entrainment of fish into water diversions may be a major issue. 0 = Entrainment of fish into water diversions may be a major issue. Actual Score: Potential Score: 2 = Avg. Score Actual Score 0 = Optential Score: 0 Potential Score: 0 Comments 0 5 = More than 75% of the stream reach is adequately shaded by vegetation. 4 = 50-75% of the stream reach does not have adequate shade. 0 = Approximately 25-50% of the stream cosh thave adequate shade by vegetation or the water temperature is probably elevated by irrigation. 3 = Approximately 25-50% of the stream cosh thave adequate shade by vegetation or the water temperature is probably drastically altered by irrigation, etc. 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably drastically altered by irrigation, etc. Actual Score: 3 Potential Score: 4 = in large parent. Rocks are alignery. = in large patches or discontinuous mats = in large patches or discontinuous mats = in large patches or discontinuous mats = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditi	Actual Score:	Potential Score:
Comments	Comments	
4 = Entrainment of fish into water diversions may be a moderate issue. 0 = Entrainment of fish into water diversions may be a major issue. Actual Score:	8 = Entrainment of f	sh into water diversions not an issue.
Actual Score:	4 = Entrainment of f	sh into water diversions may be a moderate issue.
Comments	0 = Entrainment of f	sh into water diversions may be a major issue.
12a-e Avg. Score Actual Score 0 Potential Score 0 Question 13. Solar Radiation 6 More than 75% of the stream reach is adequately shaded by vegetation. 4 = 50-75% of the stream reach does not have adequate shading or the water temperature is probably elevated by irrigation 3: Approximately 25-50% of the stream does not have adequate shade. 0 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably drastically altered by irrigation, etc. 3 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably drastically altered by irrigation, etc. 3 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably drastically altered by irrigation, etc. 3 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably drastically altered by irrigation, etc. 3 Actual Score: 3 Potential Score: 4 0 = More than 75% of the stream selepery. 4 4 0 = Magae not apparent. Rocks are slippery. 4 5 0 = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) 0 = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions)	Actual Score:	Potential Score;
12a-e Avg. Score Actual score	Comments	
Question 13. Solar Radiation 6 = More than 75% of the stream reach is adequately shaded by vegetation. 4 = 50-75% of the stream reach does not have adequate shading or the water temperature is probably elevated by irrigation 3 = Approximately 25-50% of the stream does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably drastically altered by irrigation, etc. Actual Score:	12a-e Avg, Score	Actual Score 0 Potential Score 0
6 = More than 75% of the stream reach is adequately shaded by vegetation. 4 = 50-75% of the stream reach does not have adequate shading or the water temperature is probably elevated by irrigation. 3 = Approximately 25-50% of the stream does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably frastically altered by irrigation, etc. 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably frastically altered by irrigation, etc. 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably frastically altered by irrigation, etc. 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably frastically altered by irrigation, etc. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade. 0 = Mats cover 0 = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) 1/4 = No water 1/4 = No water 1/4 = No water 1/4 = No water		Padiation
a = 50-75% of the stream reach does not have adequate shading or the water temperature is probably elevated by irrigation a = Approximately 25-50% of the stream does not have adequate shade. b = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably restricted by irrigation, etc. b = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably restricted by irrigation, etc. b = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably restricted by irrigation, etc. b = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably restricted by irrigation, etc. b = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably restricted by irrigation, etc. b = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably restricted by irrigation, etc. b = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably restricted by irrigation, etc. c = Mase not apparent. Nutrients e = n large patches or discontinuous mats e = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) t/A = No water ctual Score:	Question 13. Solar	the stream reach is adequately shaded by vegetation.
3 = Approximately 25-50% of the stream does not have adequate shade. 0 = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably trastically altered by irrigation, etc. Actual Score: 3 Potential Score: 4 Comments	5 = More than 75 A C	is the stream does not have adequate shading or the water temperature is probably elevated by irrigatic
b = More than 75% of the stream reach does not have adequate shade by vegetation or the water temperature is probably drastically altered by irrigation, etc. Actual Score:		
drastically altered by irrigation, etc. Actual Score:		
Comments Question 14. Algae growth / Nutrients S = Algae not apparent. Rocks are slippery. = in small patches or along channel edge = in large patches or discontinuous mats > Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) VA = No water Inctual Score:) = More than 75% o frastically altered by	If the stream reach does not have adequate shade by vegetation or the water temperature is probably irrigation, etc.
Duestion 14. Algae growth / Nutrients a Algae not apparent. Rocks are slippery. a in small patches or along channel edge a in large patches or discontinuous mats b Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) WA = No water inctual Score:	Actual Score:	3_ Potential Score:
a = Algae not apparent. Rocks are slippery. a = in small patches or along channel edge a = in large patches or discontinuous mats a = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) VA = No water Actual Score: D Potential Score: D Actual	Comments	
B = Algae not apparent. Rocks are slippery. a = in small patches or along channel edge P = in large patches or discontinuous mats D = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) WA = No water Actual Score:		
B = Algae not apparent. Rocks are slippery. a = in small patches or along channel edge P = in large patches or discontinuous mats D = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) WA = No water Actual Score:	Question 14. Algae	growth / Nutrients
= in small patches or along channel edge = in large patches or discontinuous mats = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) //A = No water		
= in large patches or discontinuous mats = Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) VA = No water ctual Score:		
= Mats cover bottom (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions) I/A = No water inctual Score:		
VA = No water Actual Score: 6 Mass 10 Arcono	= Mats cover botton	n (hyper enriched conditions) or plants not apparent and rocks not slippery (toxic conditions)
Actual Score: 6		
Mass in aftering	ert - Ho Hato	E la
	ctual Score:	
Comments		MASS IN STREAM
	Comments	

Question 15. Su	
6 = none	rface oils, turbidity, salinization, precipitants on stream bottom and/or water odor
4 = Slight	
2 = Moderate	
0 = Extensive	
N/A = No water	
Actual Score:	Potential Score:
Comments	
Question 16. Bac	teria
	nown anthropogenic sources of bacteria
2 = Likely sources of	of bacteria are present. Wastewater or concentrated livestock operations are the most common sources.
	mmon or raw sewage is entering the stream
Actual Score:	Potential Score: 4
Comments	
lies, caddis flies an	a healthy and diverse community of macroinvertebrates. Stream riffles usually have an abundance of ma d/or stone files.
	ominated by pollution tolerant taxa such as fly and midge larva.
= Macroinvertebra	
and the second	tes are rare or absent
I/A = Stream reach	
I/A = Stream reach ctual Score:	is ephemeral
I/A = Stream reach ctual Score:	is ephemeral
/A = Stream reach ctual Score:	is ephemeral
/A = Stream reach ctual Score:	is ephemeral
/A = Stream reach	is ephemeral
/A = Stream reach ctual Score:	is ephemeral
I/A = Stream reach	is ephemeral
I/A = Stream reach	is ephemeral
I/A = Stream reach ctual Score:	is ephemeral
I/A = Stream reach ctual Score:	is ephemeral

Question 18. Irrig Evaluate effects fro	ation impacts (om de-watering o	(Assess during critical I r inter-basin transfer of	ow flow periods o water.)	r you may need to inquire loca	ally about this.
8 = There are no no					
organisms.				er flows are adequate to supp	port aquatic
4 = Flows support a	equatic organism	s, but habitat, especial	ly riffles are drasti	cally reduced or impacted.	
2 = The flow is low	enough to sever	ely impair aquatic orga	nisms		
0 = All of the water	has been diverte	d from the stream			
N/A = Stream reach	n is ephemeral.				
Actual Score:	6	Potential Score:	8		
Actual Score.	1015	dia me	stream	how there - a	ampley
Comments		TRUE S			
Commenta					
	ture estivition	Sources	in the second second		
Question 19. Land	use activities -	r to significantly impact	water quality or t	he riparian vogetation. Any in	npacts that occur
appear to be natura	£.				
6 = There are some timber harvesting, u	signs of impact rban, roads, etc.	from landuse activities	such as grazing,	dryland agriculture, irrigation,	feedlots, mining,
4 = Impacts from lar obvious signs of hur	nduse activities a man induced ero	tre obvious and occur t sion, saline seeps or o	throughout most o vergrazing within	of the stream reach. For exar the watershed.	nple, there are
	s are significant	and widespread. Visu		d photo documentation would	provide
0 = Land use impact capable to support n	ts are so intrusiv nost forms of aq	e that the stream has I uatic life	ost most of its nat	tural features. The stream do	es not appear to be
Actual Score:		Potential Score:	8		
Comments					
	0	Total Potential	0		
Total Actual		Total Potential _			
RATING	<u>Total</u> Potential	x 100 _	#DIV/0!		
OVERALL RATING		(Total NRCS Actual + (Total NRCS Potential	Total MT Suppler + Total MT Supp	nent Actual) x100 lement Potential)	#DIV/01
	75-100% = SU 50-75% = AT LESS THAN 5		BLE		
					and the

M12SFDBR02	Date-	7/22/2003	15:45			
South Fork of Dearborn at Thompsons Ranch, above Hwy 434						
Geomorph	ology Data					
parameter	value	units				
Bankfull Width		Ft				
Mean Depth		Ft				
Bnkfull X-sect area		Sq Ft				
Width/Depth						
Max Depth		Ft				
Flood prone width		Ft				
Entrenchement Ratio						
Water slope						
Channel Sinuosity						
BEHI Index Score (adjusted)						
BEHI Rating						
Channel D50	27	mm				
Percentage of Fines (<2mm)	25.64	! %				
Stream Type						
Discharge	1.85	cfs				

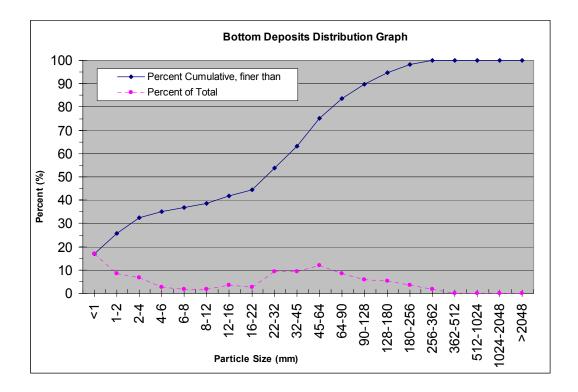
Stream Reach Habitat Assessments					
Parameter	Value	Units			
Stream Reach Assessment Score (NRCS)		%			
Stream Reach Assessment Score (MT adjusted)		%			
Macroinvertabrate Habitat Assessment Score	84.2	%			
OVERALL SITE RATIN	IGS				
Stream Reach Assessment Score (NRCS)					
Stream Reach Assessment Score (MT adjusted)					
Macroinvertabrate Habitat Assessment Score					

Field Measurements of water chemistry						
parameter value units						
Flow	1.85	cfs				
Temperature, water	24.16	degree C				
рН	8.43					
Specific Conductance	0.316	mS/cm				
Dissolved Oxygen	8.67	mg/L				
Dissolved Oxygen, % Saturation	103.2	%				
Turbidity	0.8	NTU				

Lab Results from Field Samples				
parameter	value	units	RL	
Total Suspended Solids, TSS	ND	mg/L	10	
Volatile Suspended Solids, VSS	ND	mg/L	10	
TSS-VSS	ND	mg/L	10	
Water Column Chlorophyll a	1.2	2	0.1	
Benthic Chlorophyll a	25	5	0.1	
Total Phosphorus, TP	0.019	9	0.004	
Total Kiejdahl Notrogen, TKN	ND		0.5	
Nitrate + Nitrite	ND		0.01	
Total Nitrogen, TN				

Macroinvertabrate Data Results					
parameter value units					
TOTAL SCORE (max =18)	13	score			
PERCENT OF MAX SCORE	72	%			
IMPAIRMENT CLASSIFICATION	SLIGHT IMF	PAIRMENT			
USE SUPPORT	PARTIAL SI	JPPORT			

	Pebble Count Data					
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total	
S/C	0.5	<1	20	17.09	17.09	
S	1.5	1-2	10	8.55	25.64	
FG	3	2-4	8	6.84	32.48	
FG	5	4-6	3	2.56	35.04	
FG	7	6-8	2	1.71	36.75	
MG		8-12	2	1.71	38.46	
MG		12-16	4	3.42	41.88	
CG		16-22	3	2.56	44.44	
CG		22-32	11	9.40	53.85	
CG		32-45	11	9.40	63.25	
CG	54.5	45-64	14	11.97	75.21	
SC		64-90	10	8.55	83.76	
SC		90-128	7	5.98	89.74	
MC		128-180	6	5.13	94.87	
LC		180-256	4	3.42	98.29	
LC		256-362	2	1.71	100.00	
SB		362-512		0.00	100.00	
MB	768	512-1024		0.00	100.00	
LB	1536	1024-2048		0.00	100.00	
BR		>2048		0.00	100.00	
		TOTALS	117	100.00	100.00	
		D50 particle size (mm)				
		% Fines (<2mm)	25.64			
-	M12SFDBR02	Date-	7/22/2003		15:45	
	South Fork of Dearborn at Thompsons Ranch, above Hwy 434					



M12SFDBR04	Date-	7/23/2003	9:45
South Fork Dearborn, at Confluence wi	th Dearborn River		
Geomorpholo	ogy Data		
parameter	value	units	
Bankfull Width		Ft	
Mean Depth		Ft	
Bnkfull X-sect area		Sq Ft	
Width/Depth			
Max Depth		Ft	
Flood prone width		Ft	
Entrenchement Ratio			
Water slope			
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating			
Channel D50	1	8 mm	
Percentage of Fines (<2mm)		%	
Stream Type			
Discharge	1.15	5 cfs	

Stream Reach Habitat Asse	ssments	
Parameter	Value	Units
Stream Reach Assessment Score (NRCS)	98.4	%
Stream Reach Assessment Score (MT adjusted)	97.1	%
Macroinvertabrate Habitat Assessment Score	84.6	%
OVERALL SITE RATING	S	
Stream Reach Assessment Score (NRCS)		aired, Fully porting
Stream Reach Assessment Score (MT adjusted)		
Macroinvertabrate Habitat Assessment Score		

Field Measurements of water chemistry		
parameter	value	units
Flow	1.15	cfs
Temperature, water	16.72	degree C
pH	8.4	
Specific Conductance		mS/cm
Dissolved Oxygen	10.08	mg/L
Dissolved Oxygen, % Saturation	104	%
Turbidity	1.4	NTU

Lab Results from Field S	amples		
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	ND	mg/m^3	0.1
Benthic Chlorophyll a	15.4	mg/m^3	0.1
Total Phosphorus, TP	0.039	mg/L	0.004
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5
Nitrate + Nitrite	ND	mg/L	0.01
Total Nitrogen, TN		mg/L	

Macroinvertabrate Data Results				
parameter value units				
TOTAL SCORE (max =18)	13	score		
PERCENT OF MAX SCORE	72	%		
IMPAIRMENT CLASSIFICATION	SLIGHT IMP	PAIRMENT		
USE SUPPORT	PARTIAL S	UPPORT		

M12SFDBR01	Date-	7/22/2003	14:00
South Fork Dearborn, Upstream site	on Blacktail Ranch		
Geomorp	hology Data		
parameter .	value	units	
Bankfull Width		Ft	
Mean Depth		Ft	
Bnkfull X-sect area		Sq Ft	
Width/Depth			
Max Depth		Ft	
Flood prone width		Ft	
Entrenchement Ratio			
Water slope			
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating			
Channel D50	2	27 mm	
Percentage of Fines (<2mm)		%	
Stream Type			
Discharge	4.8	4 cfs	

	1	
Parameter	Value	Units
Stream Reach Assessment Score (NRCS)	100	%
Stream Reach Assessment Score (MT adjusted)	99.3	%
Macroinvertabrate Habitat Assessment Score	89.6	%
OVERALL SITE RATIN	IGS	
Stream Reach Assessment Score (NRCS)	Non Impaire	d, Fully Supporting
Stream Reach Assessment Score (MT adjusted)		
Macroinvertabrate Habitat Assessment Score		

Field Measurements of water chemistry		
parameter	value	units
Flow	4.84	cfs
Temperature, water	18.55	degree C
рН	8.39	
Specific Conductance	0.274	mS/cm
Dissolved Oxygen	9.36	mg/L
Dissolved Oxygen, % Saturation	100	%
Turbidity	1.28	NTU

Lab Results from Fie	Id Samples		
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	ND	mg/m^3	0.1
Benthic Chlorophyll a	20.2	mg/m^3	0.1
Total Phosphorus, TP	0.078	mg/L	0.004
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5
Nitrate + Nitrite	ND	mg/L	0.01
Total Nitrogen, TN		mg/L	

Macroinvertabrate Data Results			
parameter value units			
TOTAL SCORE (max =18)	10	score	
PERCENT OF MAX SCORE	56	%	
IMPAIRMENT CLASSIFICATION	SLIGHT IMP	PAIRMENT	
USE SUPPORT	PARTIAL SI	JPPORT	

11:15

6/17/2003

M12SFDBR01	Date-
South Fork Dearborn, Upstream site on Blackta	il Ranch

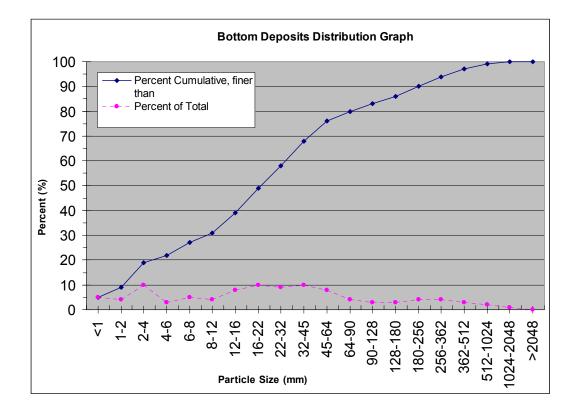
Geomorphology Data			
parameter	value	units	
Bankfull Width		Ft	
Mean Depth		Ft	
Bnkfull X-sect area		Sq Ft	
Width/Depth			
Max Depth		Ft	
Flood prone width		Ft	
Entrenchement Ratio			
Water slope			
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating			
Channel D50	27	mm	
Percentage of Fines (<2mm)	9.00	%	
Stream Type			
Discharge	13.98	cfs	

Stream Reach Habitat Assessments					
Parameter	Value	Units			
Stream Reach Assessment Score (NRCS)	100	%			
Stream Reach Assessment Score (MT adjusted)	99.3	%			
Macroinvertabrate Habitat Assessment Score		%			
OVERALL SITE RATINGS					
Stream Reach Assessment Score (NRCS)	Non Impaired, Fully Supporting				
Stream Reach Assessment Score (MT adjusted)					

Field Measurements of water chemistry				
parameter	value	units		
Flow	13.98	cfs		
Temperature, water		degree C		
рН				
Specific Conductance		mS/cm		
Dissolved Oxygen		mg/L		
Dissolved Oxygen, % Saturation		%		
Turbidity		NTU		

Lab Results from Field Samples				
parameter	value	units	RL	
Total Suspended Solids, TSS	ND	mg/L	10	
Volatile Suspended Solids, VSS	ND	mg/L	10	
TSS-VSS	ND	mg/L	10	
Water Column Chlorophyll a	0.9	mg/m^3	0.1	
Benthic Chlorophyll a	16.5	mg/m^3	0.1	
Total Phosphorus, TP	ND	mg/L	0.004	
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5	
Nitrate + Nitrite	ND	mg/L	0.01	
Total Nitrogen, TN		mg/L		

		Р	ebble Co	unt Data	
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total
S/C	0.5	<1	5	5.00	5.00
S	1.5	1-2	4	4.00	9.00
FG	3	2-4	10	10.00	19.00
FG	5	4-6	3	3.00	22.00
FG			5	5.00	27.00
MG	10	8-12	4	4.00	31.00
MG		12-16	8	8.00	39.00
CG	18	16-22	10	10.00	49.00
CG		22-32	9	9.00	58.00
CG		32-45	10	10.00	68.00
CG	54.5	45-64	8	8.00	76.00
SC	77	64-90	4	4.00	80.00
SC	109	90-128	3	3.00	83.00
MC	154	128-180	3	3.00	86.00
LC		180-256	4	4.00	90.00
LC	309	256-362	4	4.00	94.00
SB	437	362-512	3		97.00
MB	768	512-1024	2	2.00	99.00
LB	1536	1024-2048	1	1.00	100.00
BR		>2048		0.00	100.00
		TOTALS	100	100.00	100.00
		D50 particle size (mm)	22-32		
		% Fines (<2mm)	9.00		
M12SFDBR01	Date-	6/17/2003	11	1:15	
South Fork Dearborn, Up	ostream site on Bla	acktail Ranch			



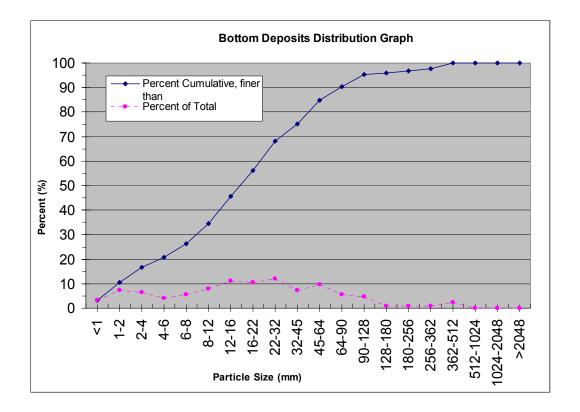
M12SFDBR04	Date-	6/17/2003	15:2
South Fork Dearborn, at Confluence wit	th Dearborn River		
Geomorpholo	gy Data		
parameter	value	units	
Bankfull Width		Ft	
Mean Depth		Ft	
Bnkfull X-sect area		Sq Ft	
Width/Depth			
Max Depth		Ft	
Flood prone width		Ft	
Entrenchement Ratio			
Water slope			
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating			
Channel D50	18	3 mm	
Percentage of Fines (<2mm)	10.40) %	
Stream Type			
Discharge	8.85	5 cfs	

Stream Reach Habitat Assessments			
Parameter	Value	Units	
Stream Reach Assessment Score (NRCS)	98.4	%	
Stream Reach Assessment Score (MT adjusted)	97.1	%	
Macroinvertabrate Habitat Assessment Score		%	
OVERALL SITE RATINGS			
Stream Reach Assessment Score (NRCS)	Non Impaired, Fully Supporting		
Stream Reach Assessment Score (MT adjusted)			

Field Measurements of water chemistry				
parameter	value	units		
Flow	8.85	cfs		
Temperature, water		degree C		
рН				
Specific Conductance		mS/cm		
Dissolved Oxygen		mg/L		
Dissolved Oxygen, % Saturation		%		
Turbidity		NTU		

Lab Results from Field Sa	amples		
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	ND	mg/m^3	0.1
Benthic Chlorophyll a	27.6	mg/m^3	0.1
Total Phosphorus, TP	ND	mg/L	0.004
Total Kiejdahl Notrogen, TKN	0.5	mg/L	0.5
Nitrate + Nitrite	ND	mg/L	0.01
Total Nitrogen, TN		mg/L	

S 1.5 1-2 9 7.20 10 FG 3 2-4 8 6.40 10 FG 5 4-6 5 4.00 20 FG 7 6-8 7 5.60 20 MG 10 8-12 10 8.00 34 MG 14 12-16 14 11.20 44 CG 18 16-22 13 10.40 56 CG 22-32 15 12.00 66 CG 38.5 32-45 9 7.20 77 CG 38.5 32-45 9 7.20 77 CG 54.5 45-64 12 9.60 84 SC 77 64-90 7 5.60 90 SC 109 90-128 6 4.80 99 LC 218 180-256 1 0.80 99 LC 309			Pebble Count Data			
S 1.5 1-2 9 7.20 10 FG 3 2-4 8 6.40 10 FG 5 4-6 5 4.00 20 FG 7 6-8 7 5.60 20 MG 10 8-12 10 8.00 3- MG 14 12-16 14 11.20 44 CG 18 16-22 13 10.40 56 CG 22-32 15 12.00 66 CG 38.5 32-45 9 7.20 73 CG 38.5 32-45 9 7.20 73 CG 38.5 32-45 9 7.20 73 CG 54.5 45-64 12 9.60 84 SC 77 64-90 7 5.60 90 LC 218 180-256 1 0.80 90 LC 309		Mean size	Particle Size (mm)	Sum	% Total	Cum. Total
FG 3 2-4 8 6.40 10 FG 5 4-6 5 4.00 20 FG 7 6-8 7 5.60 20 MG 10 8-12 10 8.00 34 MG 14 12-16 14 11.20 44 CG 18 16-22 13 10.40 56 CG 27 22-32 15 12.00 66 CG 38.5 32-45 9 7.20 78 CG 54.5 45-64 12 9.60 84 SC 77 64-90 7 5.60 99 LC 218 180-256 1 0.80 99 LC 218 180-256 1 0.80 99 LC 309 256-362 1 0.80 99 SB 433 362-512 3 2.40 100 MB <td>S/C</td> <td>0.5</td> <td><1</td> <td>4</td> <td>3.20</td> <td>3.20</td>	S/C	0.5	<1	4	3.20	3.20
FG 5 4-6 5 4.00 200 FG 7 6-8 7 5.60 200 MG 10 8-12 10 8.00 34 MG 14 12-16 14 11.20 44 CG 18 16-22 13 10.40 56 CG 27 22-32 15 12.00 66 CG 38.5 32-45 9 7.20 77 CG 54.5 45-64 12 9.60 86 SC 77 64-90 7 5.60 90 SC 109 90-128 6 4.80 99 MC 154 128-180 1 0.80 90 LC 218 180-256 1 0.80 90 LC 309 256-362 1 0.80 90 SB 433 362-512 3 2.40 1000 <t< td=""><td>S</td><td>1.5</td><td>1-2</td><td>9</td><td>7.20</td><td>10.40</td></t<>	S	1.5	1-2	9	7.20	10.40
FG 7 5.60 200 MG 10 8-12 10 8.00 34 MG 14 12-16 14 11.20 44 CG 18 16-22 13 10.40 56 CG 27 22-32 15 12.00 66 CG 38.5 32-45 9 7.20 77 CG 54.5 45-64 12 9.60 86 SC 77 64-90 7 5.60 90 SC 109 90-128 6 4.80 99 MC 154 128-180 1 0.80 90 LC 218 180-256 1 0.80 90 90 LC 309 256-362 1 0.80 90 90 LC 309 256-362 1 0.80 90 90 B 1536 1024-2048 0.00 100 100	FG	3	2-4	8	6.40	16.80
MG 10 8-12 10 8.00 34 MG 14 12-16 14 11.20 44 CG 18 16-22 13 10.40 56 CG 27 22-32 15 12.00 66 CG 38.5 32-45 9 7.20 75 CG 54.5 45-64 12 9.60 84 SC 77 64-90 7 5.60 99 SC 109 90-128 6 4.80 99 MC 154 128-180 1 0.80 99 LC 218 180-256 1 0.80 99 LC 309 256-362 1 0.80 99 B 437 362-512 3 2.40 100 MB 768 512-1024 0.00 100 100 BR 2048 0.00 100 100 100 <tr< td=""><td>FG</td><td>5</td><td>4-6</td><td>5</td><td>4.00</td><td>20.80</td></tr<>	FG	5	4-6	5	4.00	20.80
MG 14 12-16 14 11.20 44 CG 18 16-22 13 10.40 56 CG 27 22-32 15 12.00 66 CG 38.5 32-45 9 7.20 75 CG 54.5 45-64 12 9.60 86 SC 77 64-90 7 5.60 90 SC 109 90-128 6 4.80 90 MC 154 128-180 1 0.80 90 LC 218 180-256 1 0.80 90 LC 309 256-362 1 0.80 90 SB 4437 362-512 3 2.40 100 MB 768 512-1024 0.00 100 100 BR 2048 0.00 100 100 100 100 D50 particle size (mm) 16-22 7 7 10.40	FG	7	6-8	7	5.60	26.40
CG 18 16-22 13 10.40 56 CG 27 22-32 15 12.00 66 CG 38.5 32-45 9 7.20 77 CG 54.5 45-64 12 9.60 84 SC 77 64-90 7 5.60 90 SC 109 90-128 6 4.80 93 MC 154 128-180 1 0.80 90 LC 218 180-256 1 0.80 90 LC 309 256-362 1 0.80 90 SB 433 362-512 3 2.40 100 MB 768 512-1024 0.00 100 100 LB 1536 1024-2048 0.00 100 100 D50 particle size (mm) 16-22 100.00 100 100 D50 particle size (mm) 10.40 10.40 10.40 10.40	MG	10	8-12	10	8.00	34.40
CG 27 22-32 15 12.00 66 CG 38.5 32-45 9 7.20 75 CG 54.5 45-64 12 9.60 84 SC 77 64-90 7 5.60 90 SC 109 90-128 6 4.80 93 MC 154 128-180 1 0.80 90 LC 218 180-256 1 0.80 90 LC 309 256-362 1 0.80 90 SB 437 362-512 3 2.40 100 MB 768 512-1024 0.00 100 100 LB 1536 1024-2048 0.00 100 100 DS0 particle size (mm) 16-22 7 7 5.00 100 D50 particle size (mm) 16-22 7 7 5.25 7				14	11.20	45.60
CG 38.5 32-45 9 7.20 7.75 CG 54.5 45-64 12 9.60 84 SC 77 64-90 7 5.60 90 SC 109 90-128 6 4.80 99 MC 154 128-180 1 0.80 90 LC 218 180-256 1 0.80 90 LC 309 256-362 1 0.80 90 LC 309 256-362 1 0.80 90 MB 768 512-1024 0.00 100 MB 768 512-1024 0.00 100 BR >2048 0.00 100 100 BR >2048 0.00 100 100 D50 particle size (mm) 16-22 100.00 100 % Fines (<2mm)		18	16-22	13	10.40	56.00
CG 54.5 45-64 12 9.60 84 SC 77 64-90 7 5.60 90 SC 109 90-128 6 4.80 93 MC 154 128-180 1 0.80 90 LC 218 180-256 1 0.80 90 LC 309 256-362 1 0.80 90 LC 309 256-362 1 0.80 90 LC 309 256-362 1 0.80 90 SB 437 362-512 3 2.40 100 MB 768 512-1024 0.00 100 100 LB 1536 1024-2048 0.00 100 100 BR >2048 0.00 100 100 100 100 D50 particle size (mm) 16-22 7 7 5.25 100.00 100 W12SFDBR04 Date- 6/17						68.00
SC 77 64-90 7 5.60 90 SC 109 90-128 6 4.80 93 MC 154 128-180 1 0.80 96 LC 218 180-256 1 0.80 96 LC 309 256-362 1 0.80 96 LC 309 256-362 1 0.80 97 SB 437 362-512 3 2.40 100 MB 768 512-1024 0.00 100 100 LB 1536 1024-2048 0.00 100 100 BR >2048 0.00 100 100 100 100 D50 particle size (mm) 16-22 7 7 5.25 100.00 100 M12SFDBR04 Date- 6/17/2003 15:25 15:25 15:25		38.5	32-45		7.20	75.20
SC 109 90-128 6 4.80 99 MC 154 128-180 1 0.80 99 LC 218 180-256 1 0.80 99 LC 309 256-362 1 0.80 99 SB 437 362-512 3 2.40 100 MB 768 512-1024 0.00 100 100 LB 1536 1024-2048 0.00 100 100 BR >2048 0.00 100 100 100 100 D50 particle size (mm) 16-22 9 100.00 100		54.5	45-64	12	9.60	84.80
MC 154 128-180 1 0.80 99 LC 218 180-256 1 0.80 99 LC 309 256-362 1 0.80 99 SB 437 362-512 3 2.40 100 MB 768 512-1024 0.00 100 100 LB 1536 1024-2048 0.00 100 100 BR >2048 0.00 100 100 100 100 BR >2048 0.00 100		77	64-90	7	5.60	90.40
LC 218 180-256 1 0.80 99 LC 309 256-362 1 0.80 99 SB 437 362-512 3 2.40 100 MB 768 512-1024 0.00 100 LB 1536 1024-2048 0.00 100 BR >2048 0.00 100 D50 particle size (mm) 16-22 100.00 100 M12SFDBR04 Date- 6/17/2003 15:25		109	90-128	6	4.80	95.20
LC 309 256-362 1 0.80 97 SB 437 362-512 3 2.40 100 MB 768 512-1024 0.00 100 LB 1536 1024-2048 0.00 100 BR >2048 0.00 100 JCO D50 particle size (mm) 16-22 100.00 M12SFDBR04 Date- 6/17/2003 15:25		154	128-180	1	0.80	96.00
SB 437 362-512 3 2.40 100 MB 768 512-1024 0.00 100 LB 1536 1024-2048 0.00 100 BR >2048 0.00 100 JCD particle size (mm) 16-22 100.00 100 M12SFDBR04 Date- 6/17/2003 15:25 15:25		218	180-256	1	0.80	96.80
MB 768 512-1024 0.00 100 LB 1536 1024-2048 0.00 100 BR >2048 0.00 100 JCD TOTALS 125 100.00 100 JCD particle size (mm) 16-22 100.00 100 M12SFDBR04 Date- 6/17/2003 15:25 15:25		309	256-362	1	0.80	97.60
LB 1536 1024-2048 0.00 100 BR >2048 0.00 100		437	362-512	3	2.40	100.00
BR >2048 0.00 100 TOTALS 125 100.00 100 D50 particle size (mm) 16-22 100.00 100 % Fines (<2mm)	MB	768	512-1024		0.00	100.00
TOTALS 125 100.00 100 D50 particle size (mm) 16-22 100.00 100 % Fines (<2mm)	LB	1536	1024-2048		0.00	100.00
D50 particle size (mm) 16-22 6 % Fines (<2mm) 10.40 6 M12SFDBR04 Date- 6/17/2003 15:25	BR		>2048		0.00	100.00
% Fines (<2mm) 10.40 M12SFDBR04 Date- 6/17/2003 15:25		-	TOTALS	125	100.00	100.00
M12SFDBR04 Date- 6/17/2003 15:25			D50 particle size (mm)	16-22		
			% Fines (<2mm)	10.40		
		M12SFDBR04	Date-	6/17/2003		15:25
South Fork Dearborn, at Confluence with Dearborn River		South Fork Dearborn.	at Confluence with Dea	rborn Rive	r	



FLAT CREEK

Waterbody Name Fl			fored tool motions and	Trip ID: 2003-DROLV Date: 4/0/12 Personnet: La. d I & Bauman
at <u>17° 19° 47.0°</u>	$\frac{F aJ}{aF037} \frac{O(2a}{118} \frac{L}{118}$ $\frac{aF037}{a} \frac{118}{200} \frac{118}{118} \frac{33}{200} \frac{100}{10}$ we the other than GPS7 Y \square N	Location	Waterbody Name $F _{\mathcal{O}} + \mathcal{O}(\mathcal{R}, \mathcal{L})$ County $\underline{L}_{\mathcal{O},\mathcal{O},\mathcal{O}} + \mathcal{O} _{\mathcal{O},\mathcal{H}}$ Station ID $\underline{\mathcal{M}}(\mathcal{A}, \mathcal{C}) = \mathcal{O}(\mathcal{R}, \mathcal{L})$ Visit # Location $\overline{\mathcal{P}}(\mathcal{A}, \mathcal{L}, \mathcal{C}, \mathcal{R}, \mathcal{L}) = \mathcal{O}(\mathcal{R}, \mathcal{L})$ Lat $\underline{\mathcal{L}} + \mathcal{P}^{\circ} + \mathcal{H}^{\circ} + \mathcal{U}^{\circ} + \mathcal{D}^{\circ}$ Long $\underline{\mathcal{H}}(\mathcal{R}, \mathcal{O}, \mathcal{O}, \mathcal{O})$ Verified? By GPS Datum (Circle C Lat/Long obtained by method other than GPS? Y \square N \square If Y what method used? If by map what is the map scale?	+ Clout HUC 100 30103 Flat Clock Rd Insor old DEa F-1) GPS Datum (Circle One): NAD 27 NAD 83 WGS84 What is the man scale?
Samples Taken:			Committee in the second s	IН
Water [3]	Nutrients KI Metals Commons	mmone []	D.2. C. L. C.	Sample Collection Procedure
			000 K 100	GRAB
Macroinvertebrate	Macroinvertebrate Habitat Asmt. [, SED-1
Algae/Macrophytes	Aquatic Plant Form			KICK HESS OTHER:
Chlorophyll a				reki-1 01
Habitat Assessment	Stream Reach Asmt. Cheer	Ģ		
	Pebble Count C & Fines			Purpose: TMD/
Transect				
Photographs 🛛				
Field Notes 🖸				
Other				
Measurements: Time:	e: 20:30	Manimum	and the second	
t		CTA- VI-	PRACTOUNCEREDIATE NACK DURATION:	Kick Length (Pt.):
Temm. (C) w		Site Visit	Site Visit Comments:	
	V	20 mpled	pled upstream of lands	*
SC: (mS/cm)				
SC x 1000 =	umholem			
DO: (mg/L)				
TUR: Clear Slight X Turbid Oppone	Turbid 🗍 Opaque 🗍			
Turbidity Comments:	7.39			
			ALT STATES	1

Waterbody Name HUC	Site Visit Form STORET Project ID: ITTUL Number of the station per page) (One Station per page) Trip ID: SU03 - DShSUU Date: [1] Personnel: [.0.010.00] Personnel: [.0.010.00] Decomposition
Long Long Verified? By GPS Datum (Circle On- ong obtained by method other than GPS? Y N If Y what method used? If By map what is the map scale? ong obtained by method other than GPS? Y N If Y what method used? If By map what is the map scale? Sample ID/File Location: Sample ID/File Location: r Nutrients [] Metals [] Commons Sample ID/File Location: Sample ID/File Location: Sample ID/File Location: r Macrophytes Aquatic Plant Form Onher Sample ID/File Location: Sample ID/File Location: r It Assessment Barream Reach Asmt. Other Sample ID/File Location: Macrophytes r Aquatic Plant Form Stream Reach Asmt. Other Sample ID/File Location: Macrophytes r Assessment Stream Reach Asmt. Other Macrophytes Sample ID/File Location: Macrophytes r Assessment Stream Reach Asmt. Other Macrophytes Macrophytes r Assessment Stream Reach Asmt. Other Macrophytes Macrophytes r Assessment Stream Reach Asmt. Other Macrophytes Macrophytes r Asse	County La County
Ples Taken: Simple ID/File Location: r Nutrients (Metals Commons (Me	rified? By GPS Datum (Circle method used? If by map what is the man scale
Commons Co	Samula ID/Rila Location.
ment Iment coinvertebrate Macroinvertebrate Habitat Asnt. eMacrophytes Macroinvertebrate Habitat Asnt. eMacrophytes Aquatic Plant Form eMacrophytes Aquatic Plant Form explayIa Stream Reach Asnt. forphylla Stream Reach Asnt. forphyla Stream Reach Asnt.	Development of the rocation:
Induction Macroinvertebrate Macroinvertebrate eMhacrophytes Aquatic Plant Form Control erobit Stream Reach Asmt. Other orophyll a Control % Fines rophyll a Control % Fines rophyle Control % Fines lot Site Visit Comments: K lot Control Control lot Control Site Visit Comments:	
eMacrophytes Aquatic Plant Form cophyll a C 30106 tat Assessment Stream Reach Asmt. ophyll a C 30106 tat Assessment Stream Reach Asmt. other Other tat Assessment Stream Reach Asmt. off Stream Reach Asmt. off Pebble Count sect Pebble Count ographs Incoments off Macroinvertebrate Kick Duration: r Incoments: r Indot info/ Site Visit Comments: info/ Site Visit Comments: info/ Site Visit Comments:	
cophylla C iat Assessment Stream Reach Asmt. Other iat Assessment Stream Reach Asmt. Other iat Assessment Peoble Count % Fines iat Assessment Peoble Count % Fines ist Assessment Macroinvertebrate Kick Duration: Purpose: ist C(s) W A ist C(s) W Macroinvertebrate Kick Duration: ist C(s) Macroinvertebrate Kick Duration: Kick Length (R) intovic(fs) Site Visit Comments: Macroinvertebrate Kick Duration: intovic Intovic Site Visit Comments:	
Int Assessment Stream Reach Arms. Other Intel Perble Count % Fines sect Purpose:	03=01 (3.6
trate	
sect	
ographs Notes In the set of t	
I Notes I r mteriority aurements: Time: Piow (cfs) Macroinvertebrate Kick Duration:	
Time: Time: A surements: Time: State Visit Comments: low (cfs) w A p: (C) w A p: (C) w A p: (C) w A low (atter state atter	
surrements: Time: Est. now (cfs) macroinvertebrate Kick Duration: p: (C) w A p: (C) w A mis/cm) w A noo unbold 1000 unbold ins/cm) w is: Clear Site Visit Comments: indity Comments: clear	
Plow (cfs) Est.	staboata Mich Duration.
p: (C) W A A A A A A A A A A A A A A A A A A	Commenter
(mS/cm) 8.5.7 (mS/cm) 9.0.1 1000 = 0.4.5.7 (mg/L) 9.5.7.7% 8.5 : Clear Slight 図, Turbid 〇 Opaq idity Comments:	+
SC: (mSkem) 404 SC x 1000 = 0:457 jumho/em DO: (mg/L) 35:7% 5:45 TUR: Clear Slight S Turbid Opaque D Turbidity Comments:	
SC x 1000 = 0.457 µmho/cm DO: (mg/L) 95.7% 8.45 TUR: Clear Slight S Turbid Opaque D Turbidity Comments:	
DO: (mg/L) ローン・ローン・ローン・ローン・ローン・ローン・ローン・ローン・ローン・ローン・	
TUR: Clear Slight 🖾 Turbid 🗌 Opaque 🗌 Turbidity Comments:	
Turbidity Comments:	
	A STATE OF STATE STATE OF STAT

		118/03	2 Month	Site Visit Code:	03.0713	MIZFLATED
		diano 100			Station ID:	MILPLATED
ŝ	**Distance from	Contraction of the local division of the loc	"Velocitý (at	"Width	**Area	**Discharge
	initial point	**Depth	point)	widin	Alea	Oischarge
1	(0) /8	0	0			
2	18	0.8	0.05			
3	20	1145	0.12			
4	22		0.29			
5	24	1.5	6,49			
6	26	1.5	0.54			
7	28	1.5	0.44	-		
8	30	1.5	0.54			_
9	32	1.35	0.42		1	
10	26	1.35	0.53			
11	38	1.35	0.43 -			
12	40	2011	0,28			
13	42	1.05	0.30			
15	44	1.2	0.39			
16	46	1.9	0.32			2
17	48	1.35	0.35			
18	50	1.4	0.41			
19	52	1.5	0.29			
20	54	1.35	0.14			
21	56	1.3	0113			
22	58	lit	0.12			
23	60	1.05	0.05			
24	62	3,6	0.01			
5	64	ь	0			
26						
7						
8						
9						
0						

Page 1 of 2

Data Myre. Approved

			SUBST	TRATE I	DEQ/MD	M		
Date:	h-18-03				Site V	isit Code:	03-67	113
Waterboo	ly: Flat Cree	k-1	At Marit	S	TORETS	Station ID:	MIZELA	+Co4
Personne	1: Ladas	B	uman					
			PI	BBLE CO	DUNT			
			() () () () () () () () () () () () () (Riffle	(Other) Count	Chara	stadatia Ora	up: PEBL-CNT
Row ID	Particle Categ	ory	Size (mm)	Count	Count	Sum	% of Total	Cum. Total
1	Silt / Clay	1	<1	(jii)		0		0.009
2	Sand		1-2			0	110	0.00%
3	Very Fine		2-4	, Dit jair i		0		0.009
4	Fine		4-6	am 104-377		0		0.009
5	Fine		6-8	1		0		0.009
6	Medium	S	8 - 12	UNIT: 15		0		0.009
7	Medium	GRAVELS	12 - 16	1		0		0.009
8	Coarse	0	16 - 22	1		0		0.00%
9	Coarse		22 - 32	ha		0		0.00%
10	Very Coarse		32 - 45	U FRI IN		0		0.00%
11	Very Coarse	-	45 - 64	ant -		0		0.00%
12	Small		64 - 90			0		0.00%
13	Small	COBBLES	90 - 128	117		0		0.00%
14	Large	Ö	128 - 180	111		0		0.00%
15	Large		180 - 256	101		0		0.00%
16	Small		256 - 362	-40		0		0.00%
17	Small	ERS	362 - 512	0		0		0.00%
18	Medium	BOULDERS	512 - 1024			0		0.00%
19	Large	- m	1024 - 2048	W. 1149 003		0	_	0.00%
20	Bedrock		> 2048	EPA Datala par net mittage		0		0.00%
21	Total # Samples	÷		Dall P	0	0	0.00%	

Pebble Count Data Entry Form

Stream Reach Assessment Form Station ID:							Revision 3/200
Waterbody: Motor Mathematical Activation Personnet: Waterbody Seg ID:		10.000	Stream Reach	Assessment	Form	03 1000	
Waterbody Seg ID:	Station ID:	DFIDEC04	Date: 10	- 18-03	Site Visit Code:	03-0113	-
Station ID's on reach:	Waterbody:	Hat Clean	At Mouth		Reach Length:		
Ouestion 1, Stream Incleament: 8 = channel stable, no active downcutting occurring; old downcutting apparent but a new, stable riparian area has formed with the inclead channel. There is perennial riparian vegetation will established in the riparian area. (Stage 1 and 5, Schumm's model) 6 = channel has evidence of old downcutting that has begun stabilizing, vegetation is beginning to establish, even at the base the failing bands, solid disturbance evident. (Stage 4). 4 = small headcut, in early stage, is present. Immediate action may prevent further degradation (early Stage 2). 2 = unstable, channel incised, actively widening, limited new riparian area./filoodplain, floodplain not well vegetated. The vegetation that is present is mainly pioneer species. Bank failure is common. (Stage 3) 0 = channel deeply incised, resembling a gully, little or no riparian area. active downcutting is clearly occurring. Only occasion or rare flood events access the flood plain. Tributaries will also exhibit downcutting the downcutting the presence of active headcuts should nearly always keep the stream reach from being rated sustainable. Actual Score:	Waterbody Seg ID			Personnel:		_	
a - channel stable, no active downcutling occurring; old downcutling apparent but a new, stable inparian area has formed with the incised channel. There is perennial riparian vegetation will established in the riparian area. (Stage 1 and 5, Schumm's model) a - channel has evidence of old downcutling that has begun stabilizing, vegetation is beginning to establish, even at the base the falling bands, solid disturbance evident. (Stage 4). a - small headcut, in early stage, is present. Immediate action may prevent further degradation (early Stage 2). a - unstable, channel incised, actively widening, limited new riparian area/floodplain, floodplain not well vegetated. The vegetation that is present is mainly ploneer species. Bank failure is common. (Stage 3) b - channel deeply incised, resembling a gully, little or no riparian area/floodplain, floodplain not well vegetated. The vegetation that is present access the flood plain. Tributaries will also exhibit downcutting/headcuts. (Stage 2) c - channel deeply incised, resembling a gully, little or no riparian area. Active downcutting is clearly occurring. Only occasio or rare flood events access the flood plain. Tributaries will also exhibit downcutting/headcuts. (Stage 2) c - channel deeply incised, resembling a gully, little or no riparian area/floodplain, floodplain, floodpl	Station ID's on rea	ch:					-
the incised channel. There is perennial riparian vegetation will established in the riparian area. (Stage 1 and 5, Schumm's model) 6 = channel has evidence of old downcutting that has begun stabilizing, vegetation is beginning to establish, even at the base the falling bands, solid disturbance evident. (Stage 4). 4 = small headcut, in early stage, is present. Immediate action may prevent further degradation (early Stage 2). 2 = unstable, channel incised, actively widening, limited now riparian area, active downcutting is clearly occurring. Only occasio or rare flood events access the flood plain. Tributaries will also exhibit downcutting is clearly occurring. Only occasio or rare flood events access the flood plain. Tributaries will also exhibit downcutting indicated stables. Actual Score: Potential Score:	Question 1, Strea	m Incisement:					
the falling bands, solid disturbance evident. (Stage 4). 4 = small headout, in early stage, is present. Immediate action may prevent further degradation (early Stage 2). 2 = unstable, channel incised, actively widening, limited new riparian area/floodplain, floodplain not well vegetated. The vegetation that is present is mainly pioneer species. Bank failure is common. (Stage 3) 0 = channel deeply incised, resembling a gully, little or no riparian area, active downcutting is clearly occurring. Only occasie or rare flood events access the flood plain. Tributaries will also exhibit downcuting/headouts. (Stage 2) The presence of active headouts should nearly always keep the stream reach from being rated sustainable. Actual Score: Potential Score:	the incised channe model)	I. There is perenn	al riparian vegetation wil	I established in t	he riparian area.	(Stage 1 and 5,	Schumma
2 = unstable, channel incised, actively widening, limited new riparian area/locdplain, floodplain not well vegetated. The vegetation that is present is mainly pioneer species. Bank failure is common. (Stage 3) 0 = channel deeply incised, resembling a gully, little or no riparian area, active downcutting is clearly occurring. Only occasio or rare flood events access the flood plain. Tributaries will also exhibit downcutting/headcuts. (Stage 2) The presence of active headcuts should nearly always keep the stream reach from being rated sustainable. Actual Score:	the falling bands, s	olid disturbance e	vident. (Stage 4).				
vegetation that is present is mainly pioneer species. Bank traiture is common. (stage 3) 0 = channel deeply incised, resembling a gully, little or no riparian area, active downcuting is clearly occurring. Only occasio or rare flood events access the flood plain. Tributaries will also exhibit downcuting/headcuts. (Stage 2) The presence of active headcuts should nearly always keep the stream reach from being rated sustainable. Actual Score: Potential Score: Comments	4 = small headcut,	in early stage, is p	resent. Immediate actio	on may prevent f	urther degradatio	on (early Stage 2)	
or rare flood events access the flood plain. Tributaries will also exhibit downdulungmeadods. (dugle 2) The presence of active headcuts should nearly always keep the stream reach from being rated sustainable. Actual Score: Potential Score: Comments	vegetation that is p	resent is mainly pi	oneer species. Bank fai	lure is common.	(Stage 3)		
The presence of active headcuts should nearly always keep the stream reach from being rated sustainable. Actual Score:	0 = channel deeply or rare flood events	incised, resembling access the flood	ng a gully, little or no ripa plain. Tributaries will als	rian area, active so exhibit downc	downcutting is o utting/headcuts.	(Staye z)	Only occasiona
Comments	The presence of a	tive headcuts sho	uld nearly always keep t	the stream reach	from being rate	d sustainable.	
Question 2, Percent of Streambanks with Active Lateral Cutting: 6 = the lateral bank erosion is in balance with the stream and its setting 4 = there is a minimal amount of active lateral bank erosion occurring 2 = there is a moderate amount of active lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excess sediment/bedioad deposition, sediment occurs on point bars and other locations as would expected in a stable, dynamic system 4 = sediment clogged gravel's are apparent in riffles or pools, or other evidence of excess sediment apparent 2 = mid-channel bars are common 0 = stream is braided (except naturally occurring braided system	Actual Score:		Potential Score:	8			
65 = the lateral bank erosion is in balance with the stream and its setting 4 = there is a minimal amount of active lateral bank erosion occurring 2 = there is a moderate amount of active lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring Actual Score:	Comments						
A = there is a minimal amount of active lateral bank erosion occurring 2 = there is a moderate amount of active lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring Actual Score: Potential Score: Comments Question 3, The Stream is in Balance with the Water and Sediment Being Supplied by the Watershed: 5 = the stream exhibits no excess sediment/bedload deposition, sediment occurs on point bars and other locations as would expected in a stable, dynamic system 4 = sediment clogged gravel's are apparent in rifles or pools, or other evidence of excess sediment apparent 2 = mid-channel bars are common 0 = stream is braided (except naturally occurring braided systems), having at least 3 active channels Actual Score: Potential Score: Mathematical active channels	Question 2, Perce	ent of Streamban	ks with Active Lateral (Cutting:			
2 = there is a moderate amount of active lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring 0 = there is excessive lateral bank erosion occurring Actual Score:	6 = the lateral bank						13
E there is a moderate amount of active table of oscille occurring E there is excessive lateral bank erosion occurring Actual Score: Potential Score: Comments Duestion 3, The Stream is in Balance with the Water and Sediment Being Supplied by the Watershed: E the stream exhibits no excess sediment/bedload deposition, sediment occurs on point bars and other locations as would expected in a stable, dynamic system E sediment clogged gravel's are apparent in riffles or pools, or other evidence of excess sediment apparent E mid-channel bars are common E stream is braided (except naturally occurring braided systems), having at least 3 active channels Actual Score: Potential Score: Muthatter			e lateral bank erosion or	ccurring			
Actual Score:							
Comments Comments Cuestion 3, The Stream is in Balance with the Water and Sediment Being Supplied by the Watershed: a = the stream exhibits no excess sediment/bedioad deposition, sediment occurs on point bars and other locations as would expected in a stable, dynamic system a = sediment clogged gravel's are apparent in riffles or pools, or other evidence of excess sediment apparent a = sediment clogged gravel's are apparent in riffles or pools, or other evidence of excess sediment apparent a = mid-channel bars are common b = stream is braided (except naturally occurring braided systems), having at least 3 active channels Actual Score:	2 = there is a mode	rate amount of ac	tive lateral bank erosion				
Question 3, The Stream is in Balance with the Water and Sediment Being Supplied by the Watershed: 6 = the stream exhibits no excess sediment/bedload deposition, sediment occurs on point bars and other locations as would expected in a stable, dynamic system 4 = sediment clogged gravel's are apparent in riflies or pools, or other evidence of excess sediment apparent 2 = mid-channel bars are common 0 = stream is braided (except naturally occurring braided systems), having at least 3 active channels Actual Score:	2 = there is a mode	rate amount of ac ve lateral bank en	tive lateral bank erosion osion occurring	occurring			
6 = the stream exhibits no excess sediment/bedload deposition, sediment occurs on point bars and other locations as would expected in a stable, dynamic system 4 = sediment clogged gravel's are apparent in rifles or pools, or other evidence of excess sediment apparent 2 = mid-channel bars are common 0 = stream is braided (except naturally occurring braided systems), having at least 3 active channels Actual Score:	2 = there is a mode 0 = there is excess	rate amount of ac ve lateral bank en	tive lateral bank erosion osion occurring	occurring			
expected in a stable, dynamic system 4 = sediment clogged gravel's are apparent in riffles or pools, or other evidence of excess sediment apparent 2 = mid-channel bars are common 0 = stream is braided (except naturally occurring braided systems), having at least 3 active channels Actual Score:Potential Score:	2 = there is a mode 0 = there is excess Actual Score:	rate amount of ac ive lateral bank ere	tive lateral bank erosion osion occurring Potential Score:	occurring			
e = mid-channel bars are common = stream is braided (except naturally occurring braided systems), having at least 3 active channels Actual Score: Potential Score: 	2 = there is a mode 0 = there is excession Actual Score: Comments Question 3, The S	rate amount of ac ve lateral bank ere 	tive lateral bank erosion psion occurring Potential Score: ce with the Water and 1	occurring	3 Supplied by th	ne Watershed:	
e stream is braided (except naturally occurring braided systems), having at least 3 active channels	e = there is a mode = there is excession actual Score: Comments Comments Comments = the stream exhi- ixpected in a stable	rate amount of ac ve lateral bank ere 	tive lateral bank erosion psion occurring Potential Score: ce with the Water and s liment/bedload depositio	Sediment Being	g Supplied by th urs on point bars	ne Watershed: s and other locati	ons as would be
actual Score: 4 Potential Score: 6	e = there is a mode = there is excession actual Score: Comments Comments Comments = the stream exhi- ixpected in a stable	rate amount of ac ve lateral bank ere 	tive lateral bank erosion psion occurring Potential Score: ce with the Water and s liment/bedload depositio	Sediment Being	g Supplied by th urs on point bars	ne Watershed: s and other locati	ons as would be
sed want apparent in eaching which the	e = there is a mode = there is excession actual Score: Comments Question 3, The S = the stream exhi- expected in a stable = sediment clogge = mid-channel ba	tream is in Balan bits no excess sec dynamic system ad gravel's are app rs are common	tive lateral bank erosion asion occurring Potential Score:	Sediment Being n, sediment occ or other evidenc	3 Supplied by th urs on point bars e of excess sed	ne Watershed: s and other locati iment apparent	ons as would be
Comments	e = there is a mode = there is excession actual Score: Comments Question 3, The S = the stream exhi- expected in a stable = sediment clogge = mid-channel ba	tream is in Balan bits no excess sec dynamic system ad gravel's are app rs are common	tive lateral bank erosion asion occurring Potential Score:	Sediment Being n, sediment occ or other evidenc	3 Supplied by th urs on point bars e of excess sed	ne Watershed: s and other locati iment apparent	ons as would be
	2 = there is a mode 0 = there is excession Actual Score: Comments Question 3, The S 3 = the stream exhibit expected in a stable 4 = sediment clogge 2 = mid-channel ba 0 = stream is braided	tream is in Balan bits no excess sec dynamic system ad gravel's are app rs are common	tive lateral bank erosion psion occurring Potential Score:	Sediment Being on, sediment occ or other evidence ems), having at I	g Supplied by th urs on point barn the of excess sed east 3 active cha	ne Watershed: s and other locati iment apparent	ons as would be
	2 = there is a mode 0 = there is excession Actual Score: Comments Question 3, The S 0 = the stream exhi- expected in a stable 1 = sediment clogge 2 = mid-channel ba 0 = stream is braided Actual Score:	tream is in Balan bits no excess sec dynamic system ad gravel's are app rs are common	tive lateral bank erosion psion occurring Potential Score:	Sediment Being on, sediment occ or other evidence ems), having at I	g Supplied by th urs on point barn the of excess sed east 3 active cha	ne Watershed: s and other locati iment apparent	ons as would be
	2 = there is a mode 0 = there is excession Actual Score: Comments 2 uestion 3, The S 0 = the stream exhibit pected in a stable 1 = sediment clogge 2 = mid-channel ba 0 = stream is braided Actual Score:	tream is in Balan bits no excess sec dynamic system ad gravel's are app rs are common	tive lateral bank erosion psion occurring Potential Score:	Sediment Being on, sediment occ or other evidence ems), having at I	g Supplied by th urs on point barn the of excess sed east 3 active cha	ne Watershed: s and other locati iment apparent	ons as would be

		to Hold Water and A				
		a with sufficient soll to				
2 = 65% to 85% of t	he riparian area wi	th sufficient soil to he	old water and	act as a rooting me	dium	
		th sufficient soil to he				
0 = 35% or less of th	ne riparian area wit	th sufficient soil to he	id water and	act as a rooting me	dium	
Actual Score:	2	Potential Score:	2			
	jazil	rocke				
Comments						-
Question 5, Percer ratings for mot t rip	t of Streambank	with Vegetation ha	ving a Deep	Binding Rootmas	s: (see Appendix I	for stability
		comprised of plant s	pecies with d	eep, binding root ma	15565	
		nprised of plant spec				
		nprised of plant spec				
		omprised of plant sp				
Actual Score:		Potential Score:				
Comments			4			
Question 6, Weeds						
3 = No noxious week						
e - 0-1% of the ripari						
= 1%-5% of the rip						
= over 5% of the rip	arian area has no:	xious weeds				
Actual Score:	2	Potential Score:	3.	-		
Comments						_
uestion 7, Disturb	ance-Caused Und	lesirable Plants:				
= 1% or less of the						
= 1%-5% of the rips						
= 5%-10% of the rip						
= over 10% of the ri						
ctual Score:		Potential Score: _	3			
	_			_		
Comments						

			ration: (Note: Skip this question if the riparian area has no
potential for wood	ly species)		
3 = all age classe	s of native woody	riparian species present	(see table, Fig 2)
and shrubs, there mature individuals	may be one age o and a young age	class of each absent. Oft class present indicate po	
or the stand is con	mprised of mainly	mature, decadent or deal	
dominate. Re-eva	aluate Question 1,	incisement, if this has he	
0 = some woody s evaluated to ensu cedar	re that it has poter	ntial for woody vegetation	ous species dominate (at this point, the site potential should be n). OR, the site has at least 5% cover of Russian olive and/or sal
Actual Score:	_6	Potential Score:	6
Comments			1
Question 9, Utili species)	zation of Trees an	nd Shrubs: (Note: Skip t	this question if the riparian area has no potential for woody
4 = 0-5% of the av	ailable second yea	ar and older stems are br	rowsed
		year and older stems are	
		d year and older stems a	
1 = more than 509	6 of the available s		ems are browsed. Many of the shrubs have either a "clubbed"
0 = there is notice	able use (10% or n	nore) of unpalatable and	normally unused woody species.
Actual Score:	4	Potential Score:	4
Commente	-		
Comments			
Question 10, Rip	arian/Wetland Ve	getative Cover in the R	liparian Area/Floodplain and Streambank:
8 = 85% or more o	f the riparian/wetla	and plant cover has a stal	bility rating ≥ 6
5 = 75%-85% of th	e riparian/wetland	plant cover has a stabilit	ly rating ≥ 6
4 = 65%-75% of th	e riparian/wetland	plant cover has a stabilit	y rating ≥ 6
2 = 55%-65% of th	e riparian/wetland	plant cover has a stability	y rating ≥ 6
0 = less than 55%	of the riparian/wet	and plant cover has a sta	ability rating ≥ 6
Actual Score:	- 9.	Potential Score:	8
Comments			
			a SPIAF xis
			g SPAF.xis

Question 11, Riparian Area/Floodplain Characteristics are Adequate to Dissipate Energy and Trap Sediment. 6 = active flood or overflow channels, large rock, or woody material present and adequate to dissipate energy and trap sediment. There is little surface erosion and no evidence of long, continuous erosional areas on floodplain/riparian area or streambank. There are no headcuts where either overland flow and/or flood channel flows return to the main channel. 4 = rock and/or woody material is present, but generally of insufficient size to dissipate energy. Some sediment trapping occurring. Occasional evidence of surface erosion. Generally not severe enough to have developed channels. 2 = inadequate rock and/or woody material available for dissipation of energy or sediment trapping. There is surface erosion (scouring) and occasional headcuts where overland flows or flood channel flows return to the main channel. 0 = riparian area/floodplain lacking any of these attributes: 1)adequate flood or overflow channels, 2) large rock, or 3) woody material suitable for energy dissipation and sediment trapping. Erosional areas are long and continuous. Lacking vegetation or substrate materials adequate to resist further erosion. Surface erosion is obvious on the floodplain/riparian area. Headcuts are present that have the potential to create meander cut-offs. Potential Score: Actual Score: Comments SUMMARY Potential Possible Points Score Actual Score 0.2.4.6.8 0 Stream Incisement 0 QUESTION 1: 0, 2, 4, 6 0 Lateral Cutting 0 QUESTION 2: Stream Balance 0, 2, 4, 6 0 QUESTION 3: N/A, 0, 1, 2, 3 Sufficient Soil 0 0 QUESTION 4: 0 N/A, 0, 2, 4, 6 Rootmass QUESTION 5: 0, 1, 2, 3 0 Weeds QUESTION 6: Undesirable Plants 0 0, 1, 2, 3 0 QUESTION 7: Woody Species Establishment N/A, 0, 2, 4, 6, 8 0 QUESTION 8: N/A, 0, 1, 2, 3, 4 **Browse Utilization** 0 0 QUESTION 9: Riparian/Wetland Vegetative Cover * N/A, 0, 2, 4, 6, 8 0 QUESTION 10: N/A, 0, 2, 4, 6 0 QUESTION 11: Riparian Area/Floodplain Characteristics 0 0 Total 0 61 0 Potential Score for most Bedrock or Boulder streams 0 (32)(questions 1, 2, 3, 6, 7, 11) Potential Score for most low energy "E" streams 0 (49)0 (questions 1 - 7, 10, 11) X 100 = % rating #DIV/0! RATING: = Actual Score Potential Score 80-100% = SUSTAINABLE 50-80% = AT RISK LESS THAN 50% = NOT SUSTAINABLE Only in certain, specific situations can both of these receive an "N/A". SRAF.xls

0.1		
	Montana Department of Environmental Quality Supplemental Questions	
The score for the	se questions does not have an effect on the rating above. these questions must consider the potential of the stream.	
	heries Habitat / Stream Complexity Note: the answers to question 12 will be averaged	
12a. Adult and J 8 = Abundant dee	uvenile Holding/Escape Cover p pools, woody debris, overhanging vegetation, boulders, root wads, undercut banks and/or ac	uatic
6 = Fish habitat is	common (see above).	
boulders, root was	noticeably reduced. Most pools are shallow and/or woody debris, undercut banks, overhanging is and/or aquatic vegetation are of limited supply.	vegetation
2 = Pools and hab	itat features are sparse or non-existent or there are fish barriers.	
0 = There is not er	hough water to support a fishery	
N/A = Stream wou	Id not support fish under natural conditions	
Actual Score:	6 Potential Score: 6	
Comments		
12b. Habitat Con	nplexity venile and adult cover types is present. High flow juvenile and adult refugia are present.	
	or juvenile cover types are present. High flow refugia are reduced.	
) = High flow refug		
	Id not support fish under natural conditions	
	Potential Score:	
Actual Score:		
Actual Score: Comments	Potential Score:	
Actual Score: Comments	Potential Score:	excellent
Actual Score: Comments 2c. Spawning H = Areal extent of = Areal extent of	abitat (salmonid streams only) spawning substrate, morphology of spawning areas, and composition of spawning substrate are spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduce	id.
Actual Score: Comments 12c. Spawning H 3 = Areal extent of 4 = Areal extent of	abitat (salmonid streams only) spawning substrate, morphology of spawning areas, and composition of spawning substrate are	id.
Actual Score: Comments 12c. Spawning H 3 = Areal extent of 4 = Areal extent of 0 = Areal extent of	abitat (salmonid streams only) spawning substrate, morphology of spawning areas, and composition of spawning substrate are spawning substrate, morphology of spawning areas, and/or quality of spawning substrate reduce	id.
Actual Score: Comments 22c. Spawning H 3 = Areal extent of 4 = Areal extent of 0 = Areal extent of V/A = Stream woul	Botential Score: Potential Score: Potential Score: Description Description Potential Score: Description Description Potential Score: Description Descrinterview Descrinterview Descriptinterview Descriptin	id.
Actual Score: Comments 12c. Spawning H 3 = Areal extent of 4 = Areal extent of 0 = Areal extent of V/A = Stream woul Actual Score:	Botential Score: Potential Score: Pote	id.
Actual Score: Comments 12c. Spawning H 3 = Areal extent of 4 = Areal extent of 0 = Areal extent of V/A = Stream woul Actual Score:	Botential Score: Potential Score: Pote	id.
Actual Score: Comments 12c. Spawning H 3 = Areal extent of 4 = Areal extent of 0 = Areal extent of V/A = Stream woul Actual Score:	Botential Score: Potential Score: Pote	id.
Actual Score: Comments 12c. Spawning H 8 = Areal extent of 4 = Areal extent of 0 = Areal extent of V/A = Stream woul Actual Score:	Botential Score: Potential Score: Pote	id.
Actual Score: Comments 12c. Spawning H 8 = Areal extent of 4 = Areal extent of 0 = Areal extent of V/A = Stream woul Actual Score:	Botential Score: Potential Score: Pote	id.
Actual Score: Comments 12c. Spawning H 8 = Areal extent of 4 = Areal extent of 0 = Areal extent of	Botential Score: Potential Score: Pote	id.
Actual Score: Comments 12c. Spawning H 8 = Areal extent of 4 = Areal extent of 0 = Areal extent of N/A = Stream woul Actual Score:	Botential Score: Potential Score: Pote	id.
Actual Score: Comments 12c. Spawning H 8 = Areal extent of 4 = Areal extent of 0 = Areal extent of N/A = Stream woul Actual Score:	Botential Score: Potential Score: Pote	id.
Actual Score: Comments 12c. Spawning H 3 = Areal extent of 4 = Areal extent of 0 = Areal extent of V/A = Stream woul Actual Score:	Botential Score: Potential Score: Pote	id.
Actual Score: Comments 12c. Spawning H 8 = Areal extent of 4 = Areal extent of 0 = Areal extent of V/A = Stream woul Actual Score:	Botential Score: Potential Score: Pote	id.

12d. Fish Passa 8 = No potential fis	ge h passage barriers	apparent.			
0 = Potential fish p					
N/A = Stream woul	d not support fish a	under natural conditions.			
Actual Score:	2	Potential Score:	-		
Comments		and the second second		-	_
12e. Entrainment 8 = Entrainment of					-
		rsions may be a moderate issue.			
0 = Entrainment of		rsions may be a major issue.			
Actual Score:	8	Potential Score: 3			
	_				-
Comments					
					-
12a-e Avg. Score	Actual Score	0 Potential Sc	ore	0	
Question 13, Sola	r Radiation			al.	
Question 13. Sola 5 - More than 75%	r Radiation of the stream reac	h is adequately shaded by veget	ation to/	rograpping	
Question 13. Sola 6 = More than 75%	r Radiation of the stream reac	h is adequately shaded by veget	ation to/	rog roge hy	ited by irrigation.
4 = 50-75% of the s	tream reach does	not nave adequate shading of the	2 Wellor Isimperia	tog so perform	ited by irrigation,
4 = 50-75% of the s 3 = Approximately 2	5-50% of the strea	m does not have adequate shad	e.	are a proceedly corre	
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75%	fream reach does 5-50% of the strea of the stream reac	not nave adequate shading of the	e.	are a proceedly corre	
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by	fream reach does 5-50% of the strea of the stream reac	m does not have adequate shad	e. by vegetation of	are a proceedly corre	
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by	fream reach does 5-50% of the strea of the stream reac	m does not have adequate shade h does not have adequate shade	e. by vegetation of	are a proceedly corre	
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score:	fream reach does 5-50% of the strea of the stream reac	m does not have adequate shade h does not have adequate shade	e. by vegetation of	are a proceedly corre	
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score:	fream reach does 5-50% of the strea of the stream reac	m does not have adequate shade h does not have adequate shade	e. by vegetation of	are a proceedly corre	
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score: Comments	5-50% of the stream reach of the stream reach r irrigation, etc.	m does not have adequate shade h does not have adequate shade Potential Score:6	e. by vegetation of	are a proceedly corre	
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score: Comments Question 14. Algae	s growth / Nutrien	m does not have adequate shade h does not have adequate shade Potential Score:6	e. by vegetation of	are a proceedly corre	
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score: Comments Question 14. Algae 5 = Algae not appare	5-50% of the stream reach of the stream reach irrigation, etc.	rn does not have adequate shade h does not have adequate shade Potential Score:6_	e. by vegetation of	are a proceedly corre	
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% frastically altered by Actual Score: Comments Question 14. Algae 5 = Algae not appare 5 = in small patches	s growth / Nutrien or along channel of	not have adequate shading of the m does not have adequate shade Potential Score:6	e. by vegetation of	are a proceedly corre	
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score: Comments Question 14. Algae 3 = Algae not appare 4 = in small patches 2 = in large patches	s-50% of the stream reach of the stream reach rinigation, etc.	not have adequate shading of the m does not have adequate shade Potential Score:6	e. by vegetation of	the water temperate	ure is probably
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score: Comments Question 14. Algae 3 = Algae not appare 4 = in small patches 2 = in large patches 0 = Mats cover botto	s-50% of the stream reach of the stream reach rinigation, etc.	not have adequate shading of the m does not have adequate shade Potential Score:6	e. by vegetation of	the water temperate	ure is probably
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score: Comments Cuestion 14. Algae 3 = Algae not appare 4 = in small patches 2 = in large patches 9 = Mats cover botto I/A = No water	s-50% of the stream reach of the stream reach rinigation, etc.	not have adequate shading of the internation of the internation of the international structure is the international score:	e. by vegetation of	the water temperate	ure is probably
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score: Comments Question 14. Algae 3 = Algae not appare 4 = in small patches 2 = in large patches 0 = Mats cover botto 4/A = No water	s growth / Nutrien or along channel e or discontinuous n m (hyper enriched	not have adequate shading of the international of t	e. by vegetation of	slippery (toxic condi	tions)
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score: Comments Question 14. Algae 3 = Algae not appare 4 = in small patches 2 = in large patches 0 = Mats cover botto 4/A = No water	s growth / Nutrien or along channel e or discontinuous n m (hyper enriched	not have adequate shading of the internation of the internation of the international structure is the international score:	e. by vegetation of	the water temperate	tions)
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score: Comments Question 14. Algae 3 = Algae not appare 4 = in small patches 2 = in large patches 9 = Mats cover botto I/A = No water Actual Score:	s growth / Nutrien or along channel e or discontinuous n m (hyper enriched	not have adequate shading of the international of t	e. by vegetation of	slippery (toxic condi	tions)
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score: Comments Question 14. Algae 3 = Algae not appare 4 = in small patches 2 = in large patches	s growth / Nutrien or along channel e or discontinuous n m (hyper enriched	not have adequate shading of the international of t	e. by vegetation of	slippery (toxic condi	tions)
4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered by Actual Score: Comments Duestion 14. Algae 3 = Algae not appare 4 = in small patches 2 = in large patches 2 = in large patches 3 = Mats cover botto VA = No water Actual Score:	s growth / Nutrien or along channel e or discontinuous n m (hyper enriched	not have adequate shading of the international of t	e. by vegetation of	slippery (toxic condi	tions)

Cuestion 15. Su	rface oils, turbic	dity, salinization, preci	pitants on stream t	bottom and/or water odor
5 = none				
4 = Slight				
2 = Moderate				
0 = Extensive				
N/A = No water				
Actual Score:	6	Potential Score:	6	
Comments		-	-	
Question 16. Bac				
		nic sources of bacteria		
2 = Likely sources	of bacteria are pr	esent. Wastewater or o	concentrated livestoc	k operations are the most common sources.
) = Feedlots are co	mmon or raw sev	wage is entering the str	eam	
Actual Score:	NA	Potential Score:		
Comments	-			
lies, caddis flies an e = The stream is d = Macroinvertebra	ominated by pollu	ution tolerant taxa such	as fly and midge larv	va.
I/A = Stream reach	is ephemeral			
ctual Score:		Potential Score:	4	
omments				
			7	SRAF.xts

Question 18. Irrigation impacts (Assess during critical) low flow periods or you may need to inquire locally about this. Evaluate effects from de-watering or inter-basin transfer of water.)

8 = There are no noticeable impacts from irrigation

6 = Changes in flow resulting from irrigation practices are noticeable, however flows are adequate to support aquatic organisms.

4 = Flows support aquatic organisms, but habitat, especially riffles are drastically reduced or impacted.

Potential Score

2 = The flow is low enough to severely impair aquatic organisms

0 = All of the water has been diverted from the stream

N/A = Stream reach is ephemeral.

Comments

Actual Score:

Question 19. Landuse activities - Sources

8 = Landuse practices do not appear to significantly impact water quality or the riparian vegetation. Any impacts that occur appear to be natural.

6 = There are some signs of impact from landuse activities such as grazing, dryland agriculture, irrigation, feedlots, mining, timber harvesting, urban, roads, etc.

4 = Impacts from landuse activities are obvious and occur throughout most of the stream reach. For example, there are obvious signs of human induced erosion, saline seeps or overgrazing within the watershed.

2 = Landuse impacts are significant and widespread. Visual observation and photo documentation would provide overwhelming evidence that the stream is impaired.

0 = Land use impacts are so intrusive that the stream has lost most of its natural features. The stream does not appear to be capable to support most forms of aquatic life

Actual Score:		Potential Score:			
Comments					-
Total Actual	0	Total Potential	0		-
RATING	Total Potential	_x 100	#DIV/01		
OVERALL RATING		(Total NRCS Actual + (Total NRCS Potentia	Total MT Supplement Actual) I + Total MT Supplement Poter	x100	#DIV/0!
	50-75% = AT	USTAINABLE I' RISK 50% = NOT SUSTAIN/	ABLE		
			8	,	SRAF.xls

		(One station per page)	Trip ID: 5005 DCBW Date: 5//505 Personnel: (a. Alous) Bouwton
Name	Visit #	Lewis -	1 Clark HUC 10030103
Lat	→ Long AST Y N N IT	LatLong LongLongLongVerified? □ ByGPS Datum (Circle C Lat/Long obtained by method other than GPS? Y □ N □ If Y what method used? If by map what is the map scale?	GPS Datum (Circle One): NAD 27 NAD 83 WGS84 what is the map scale?
Samples Taken:		Sample ID/File Location.	
Water	Nutrients 🖾 Metals 🗌 Commons	+-	Sample Collection Procedure
Sediment		-	UKAB
Macroinvertebrate	Macroinvertebrate Habitat Asmt.		VIEW VIEW AND
Algae/Macrophytes	Aquatic Plant Form		NICK HESS OTHER: DEDI 1 COLUMN
Chlorophyll a		DS-DING (with 1 West	1
Habitut Assessment	Stream Reach Asmt. Other	1 10100 1	
Ø	Pebble Count 🛛 % Fines		Purpose: TANDA
Transect			
Photographs 🔄			
Other			
Measurements: Time:	14.00	Macroinvertabrate Kick Duracione	an a sur
Q / Flow (cfs)	Est	Site Visit Commenter	Kick Length (FL):
Temp: (C) W	_		*
pH: 6.	65		
SC: (mS/cm)	.240		
SC x 1000 =	umho/cm		
DO: (mg/L) (9.06 13.4%		
TUR: Clear Slight Turbid Opaque	Turbid Opaque		
Turbidity Comments: 7 0	Turbinity 10,8 NTA		
		A CONTRACTOR OF	

	Date: 6/13/ Waterbody: FA		Altord C		: 03- 0715 Station ID	· MIATIA COS
	And in case of the local division of the loc	idlaw 18				C-Second second
	**Distance from initial point	"Depth	**Velocity (at point)	Width	**Area	**Discharge
1	LOW \$\$ 15.4 4	1.28 ft	0,70			
2	16.5	1.22	1.91			
3	17,5	1.12	1,77			
4	18.5	1,00	2.11			1
5	19.5	0.95	2.15	1.00	-	
6	20.5	0.95	2.06			
7	21.5	1.05	2.17			
8	27.5	1.09	2:01			
9	23.5	0.95	1.32			
10	24.5	0.90	2116			
11	25.5 .	0.82	2.30			
12	26.6	0.85	2110			
13	27.5	0,90	2.14			
14	28.5	02.78	2:06			
15	29.5	0,65	2.00			
16	730,5	0.65	2.04			
7	34.5	0,60	1.89			
8	32.5	0.62	0.36			
9	Eew 13.5	0.50	- 0.0			
0						
1				_		
2						
3						
4						
5						
6						
7						
8						
9						
0						

			SUBST	TRATE I	DEQ/MD	M		Revised 3/2003 DMA
Date:	6-18-0	3			Site V	isit Code	03-071	5
Waterboo	ty: Flat Co	ak.	pls Mil	hond labors	TORETS	station ID:	MIZTIA	1005
Personne	st: Landle	EW.	Bown	a. '				
			PI	BBLE CO	DUNT			
Row ID	Particle Categ	ory	Size (mm)	Riffle Count	(Other) Count	Chara	cteristic Gro	up: PEBL-CNT
						Sum	% of Total	Cum, Total
1	Silt / Clay		<1	ATTIN		0		0.009
2	Sand		1-2			0		0.009
3	Very Fine		2-4	11		0		0.009
4	Fine		4-6	W.		0		0.009
5	Fine	100	6-8			0		0.009
6	Medium	ST	8 - 12	加州市		0		0.00%
7	Medium	GRAVELS	12 - 16			0		0.00%
8	Coarse	9	16 - 22	所時期		0		0.00%
9	Coarse		22 - 32	ध्वत भी औ ध्वत ग		0		0.00%
10	Very Coarse	2	32 - 45	Jeff gar defi 111 14e day		0		0.00%
11	Very Coarse	1	45 - 64			0		0.00%
12	Small		64 - 90	NAL IN		0		0.00%
13	Small	COBBLES	90 - 128	u	_	0		0.00%
14	Large	- S	128 - 180	·		0		0.00%
15	Large		180 - 256			0		0.00%
16	Small		256 - 362			0	_	0.00%
17	Small	ERS	362 - 512			0		0.00%
18	Medium	BOULDERS	512 - 1024			0		0.00%
19	Large	m i	1024 - 2048			0		0.00%
20	Bedrock		> 2048			0		0.00%
21	Total # Samples			0	0	0	0.00%	

Pebble Count Data Entry Form

		Stream Reach	Assessme	ent Form
Station ID:	121/0+005	Date: ()	18/43	Site Visit Code: 03-0715
	Plat Cek			Reach Length:
			Personnel	
Waterbody Seg II	1		reisonnei	
Station ID's on re-	100 C			
Question 1, Stre		a		the second second second
8 = channel stable the incised chann model)	e, no active downcu el. There is perenni	ting occurring; old down al riparian vegetation wi	ll established i	ent but a new, stable riparian area has formed withir in the riparian area. (Stage 1 and 5, Schumm's
the falling bands,	solid disturbance ev	vident. (Stage 4).		getation is beginning to establish, even at the base o
	승규는 아님께서 집에 가지 않는 것을 많을 것이다.			t further degradation (early Stage 2).
vegetation that is	present is mainly pic	oneer species. Bank fai	ilure is commo	
or rare flood event	ts access the flood p	plain. Tributaries will als	so exhibit down	ive downcutting is clearly occurring. Only occasional ncutting/headcuts. (Stage 2)
The presence of a	ctive headcuts sho		100	ch from being rated sustainable.
Actual Score:		Potential Score:	8	
Comments	apread	inson out	ade ba	ors outhor
0	ant of Circomboni	s with Active Lateral C	Sutting	
		ce with the stream and i		
		e lateral bank erosion oc		
		ve lateral bank erosion		
	sive lateral bank eros		9	
Actual Score:	3	Potential Score:	6	and the second sec
	50%	endura		
Comments	18 - C - C	0		
Comments				
	tream is in Balance	e with the Water and S	ediment Beir	ng Supplied by the Watershed:
Ducstion 3, The S				ng Supplied by the Watershed: ocurs on point bars and other locations as would be
uestion 3, The S = the stream exh xpected in a stable	ibits no excess sedii e, dynamic system	ment/bedload deposition	n, sediment oc	
Question 3, The S = the stream exh xpected in a stable = sediment clogg	ibits no excess sedi e, dynamic system ed gravel's are appa	ment/bedload deposition	n, sediment oc	ccurs on point bars and other locations as would be
Auestion 3, The S = the stream exh xpected in a stable = sediment clogg = mid-channel ba	ibits no excess sedi e, dynamic system ed gravel's are appa irs are common	ment/bedload deposition arent in riffles or pools, c	n, sediment oc or other evider	ccurs on point bars and other locations as would be
Auestion 3, The S = the stream exh xpected in a stable = sediment clogg = mid-channel ba = stream is braide	ibits no excess sedi e, dynamic system ed gravel's are appa irs are common	ment/bedload deposition arent in riffles or pools, c	n, sediment oc or other evider	ccurs on point bars and other locations as would be nce of excess sediment apparent
Question 3, The S = the stream exh xpected in a stable = sediment clogg = mid-channel ba	ibits no excess sedi e, dynamic system ed gravel's are appa irs are common	ment/bedload deposition arent in riffles or pools, o occurring braided system	n, sediment oc or other evider	ccurs on point bars and other locations as would be nce of excess sediment apparent

Question 4, Suffic	ient Soil Present to Hold Water and Act as a Rooting Medium:
	of the riparian area with sufficient soil to hold water and act as a rooting medium
	the riparian area with sufficient soil to hold water and act as a rooting medium
	the riparian area with sufficient soil to hold water and act as a rooting medium
	the riparian area with sufficient soil to hold water and act as a rooting medium
Actual Score:	Potential Score:
Comments	
Question 5, Perce	nt of Streambank with Vegetation having a Deep, Binding Rootmass: (see Appendix I for stability parlan, and other, species)
	of the streambank comprised of plant species with deep, binding root masses
4 = 60% to 80% of 1	the streambank comprised of plant species with deep, binding root masses
2 = 30% to 60% of 1	the streambank comprised of plant species with deep binding root masses
2 = 30% to 00% 010	If the streambank comprised of plant species with deep binding root masses
Actual Score:	Potential Score:
Comments	
Question 6, Weeds	
3 = No noxious wee	
	rian area has noxious weeds
	parian area has noxious weeds
	iparian area has noxious weeds
Actual Score:	2 Potential Score: 3
Comments	
Question 7. Disturt	pance-Caused Undesirable Plants:
	riparian area has undesirable plants
	arian area has undesirable plants
	parian area has undesirable plants
	riparian area has undesirable plants
Actual Score:	C Potential Score: 3
widdi Goole.	
Comments	

		Haberry and the second	attens (Notes Chin the masting if the deader area has an
potential for woody	species)		ration: (Note: Skip this question if the riparian area has no
8 = all age classes of	of native woody r	iparian species present	(see table, Fig 2)
and shrubs, there m mature individuals a	ay be one age c ind a young age	lass of each absent. Of class present indicate po	
or the stand is comp	prised of mainly n	nature, decadent or dea	
dominate. Re-evalu	ate Question 1, i	incisement, if this has ha	
0 = some woody spe evaluated to ensure cedar	that it has poten	tial for woody vegetation	ous species dominate (at this point, the site potential should be re-). OR, the site has at least 5% cover of Russian olive and/or salt
Actual Score:	2	Potential Score:	
Comments	ugalien	n spason	
Question 9, Utiliza	tion of Trees an	d Shrubs: (Note: Skip t	his question if the riparian area has no potential for woody
4 = 0-5% of the avail	lable second yea	r and older stems are br	owsed
		year and older stems an	
2 = 25%-50% of the		year and older stems a	re browsed.
1 = more than 50% o	of the available se		re browsed. Ims are browsed. Many of the shrubs have either a "clubbed"
1 = more than 50% of growth form, or they	of the available se are high-lined or	econd year and older ste umbrella shaped.	
1 = more than 50% o growth form, or they 0 = there is noticeable	of the available se are high-lined or	econd year and older ste umbrelia shaped. tore) of unpalatable and	ems are browsed. Many of the shrubs have either a "clubbed" normally unused woody species.
1 = more than 50% o growth form, or they 0 = there is noticeable	of the available se are high-lined or le use (10% or m	econd year and older ste umbrella shaped. tore) of unpalatable and	ems are browsed. Many of the shrubs have either a "clubbed" normally unused woody species.
1 = more than 50% of growth form, or they	of the available se are high-lined or le use (10% or m	econd year and older ste umbrella shaped. tore) of unpalatable and	ems are browsed. Many of the shrubs have either a "clubbed" normally unused woody species.
1 = more than 50% of growth form, or they 0 = there is noticeabl Actual Score: Comments	of the available si are high-lined or le use (10% or m 3	econd year and older ste umbrella shaped. nore) of unpalatable and Potential Score:	ems are browsed. Many of the shrubs have either a "clubbed" normally unused woody species.
1 = more than 50% o growth form, or they 0 = there is noticeabl Actual Score: Comments Question 10, Ripard	of the available si are high-lined or le use (10% or m 	econd year and older ste umbrella shaped. nore) of unpalatable and Potential Score:	ems are browsed. Many of the shrubs have either a "clubbed" normally unused woody species.
1 = more than 50% of growth form, or they 0 = there is noticeabl Actual Score: Comments Question 10, Ripari 3 = 85% or more of th	of the available si are high-lined or le use (10% or m 	econd year and older ste umbrella shaped. nore) of unpalatable and Potential Score: getative Cover in the R	ems are browsed. Many of the shrubs have either a "clubbed" normally unused woody species.
1 = more than 50% of growth form, or they 0 = there is noticeabl Actual Score: Comments Question 10, Ripart 3 = 85% or more of the 5 = 75%-85% of the r	of the available si are high-lined or le use (10% or m 3 an/Wetland Veg he riparian/wetlar riparian/wetland p	econd year and older ste umbrella shaped. nore) of unpalatable and Potential Score: getative Cover in the R nd plant cover has a stal	ems are browsed. Many of the shrubs have either a "clubbed" normally unused woody species.
1 = more than 50% of growth form, or they 0 = there is noticeabl Actual Score: Comments Question 10, Ripari 8 = 85% or more of the 5 = 75%-85% of the r 4 = 65%-75% of the r	of the available si are high-lined or le use (10% or m 3 ian/Wetland Veg he riparian/wetlar riparian/wetland p	econd year and older ste umbrella shaped. nore) of unpalatable and Potential Score: getative Cover in the R nd plant cover has a stabilit	ems are browsed. Many of the shrubs have either a "clubbed" normally unused woody species. <u>4</u> iparian Area/Floodplain and Streambank: bility rating ≥ 6 y rating ≥ 6 y rating ≥ 6
1 = more than 50% of growth form, or they 0 = there is noticeabl Actual Score: Comments Question 10, Ripari 8 = 85% or more of the 6 = 75%-85% of the r 4 = 65%-75% of the r 2 = 55%-65% of the r	of the available si are high-lined or le use (10% or m 3 ian/Wetland Veg he riparian/wetland p riparian/wetland p riparian/wetland p	econd year and older ste umbrella shaped. nore) of unpalatable and Potential Score: petative Cover in the R and plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit	ems are browsed. Many of the shrubs have either a "clubbed" normally unused woody species. <u>4</u> iparian Area/Floodplain and Streambank: bility rating ≥ 6 y rating ≥ 6 y rating ≥ 6 y rating ≥ 6 y rating ≥ 6
1 = more than 50% of growth form, or they 0 = there is noticeabl Actual Score: Comments Question 10, Ripari 8 = 85% or more of the 6 = 75%-85% of the r 4 = 65%-75% of the r 2 = 55%-65% of the r 0 = less than 55% of	of the available si are high-lined or le use (10% or m 3 ian/Wetland Veg he riparian/wetland p riparian/wetland p riparian/wetland p	econd year and older ste umbrella shaped. nore) of unpalatable and Potential Score: getative Cover in the R and plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit	iparian Area/Floodplain and Streambank: bility rating ≥ 6 y rating ≥ 6 y rating ≥ 6 y rating ≥ 6 y rating ≥ 6
1 = more than 50% of growth form, or they 0 = there is noticeabl Actual Score: Comments Question 10, Ripari 8 = 85% or more of the 6 = 75%-85% of the r 4 = 65%-75% of the r 2 = 55%-65% of the r	of the available si are high-lined or le use (10% or m 3 ian/Wetland Veg he riparian/wetland p riparian/wetland p riparian/wetland p	econd year and older ste umbrella shaped. Potential Score: petative Cover in the R nd plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit	iparian Area/Floodplain and Streambank: bility rating ≥ 6 y rating ≥ 6 y rating ≥ 6 y rating ≥ 6 y rating ≥ 6
1 = more than 50% of growth form, or they 0 = there is noticeabl Actual Score: Comments B = 85% or more of the B = 75%-85% of the r 4 = 65%-75% of the r 2 = 55%-65% of the r 0 = less than 55% of Actual Score:	of the available si are high-lined or le use (10% or m 3 ian/Wetland Veg he riparian/wetland p riparian/wetland p riparian/wetland p	econd year and older ste umbrella shaped. Potential Score: petative Cover in the R nd plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit	iparian Area/Floodplain and Streambank: bility rating ≥ 6 y rating ≥ 6 y rating ≥ 6 y rating ≥ 6 y rating ≥ 6
1 = more than 50% of growth form, or they 0 = there is noticeabl Actual Score: Comments B = 85% or more of the B = 75%-85% of the r 4 = 65%-75% of the r 2 = 55%-65% of the r 0 = less than 55% of Actual Score:	of the available si are high-lined or le use (10% or m 3 ian/Wetland Veg he riparian/wetland p riparian/wetland p riparian/wetland p	econd year and older ste umbrella shaped. Potential Score: petative Cover in the R nd plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit	iparian Area/Floodplain and Streambank: bility rating ≥ 6 y rating ≥ 6 y rating ≥ 6 y rating ≥ 6 y rating ≥ 6
1 = more than 50% of growth form, or they 0 = there is noticeabl Actual Score: Comments B = 85% or more of the B = 75%-85% of the r 4 = 65%-75% of the r 2 = 55%-65% of the r 0 = less than 55% of Actual Score:	of the available si are high-lined or le use (10% or m 3 ian/Wetland Veg he riparian/wetland p riparian/wetland p riparian/wetland p	econd year and older ste umbrella shaped. Potential Score: petative Cover in the R nd plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit plant cover has a stabilit	iparian Area/Floodplain and Streambank: billty rating ≥ 6 y rating ≥ 6 y rating ≥ 6 ability rating ≥ 6

Question 11, Riparian Area/Floodplain Characteristics are Adequate to Dissipate Energy and Trap Sediment. 6 = active flood or overflow channels, large rock, or woody material present and adequate to dissipate energy and trap sediment. There is little surface erosion and no evidence of long, continuous erosional areas on floodplain/riparian area or streambank. There are no headcuts where either overland flow and/or flood channel flows return to the main channel. 4 = rock and/or woody material is present, but generally of insufficient size to dissipate energy. Some sediment trapping occurring. Occasional evidence of surface erosion. Generally not severe enough to have developed channels. 2 = inadequate rock and/or woody material available for dissipation of energy or sediment trapping. There is surface erosion (scouring) and occasional headcuts where overland flows or flood channel flows return to the main channel. 0 = riparian area/floodplain lacking any of these attributes: 1)adequate flood or overflow channels, 2) large rock, or 3) woody material suitable for energy dissipation and sediment trapping. Erosional areas are long and continuous. Lacking vegetation or substrate materials adequate to resist further erosion. Surface erosion is obvious on the floodplain/riparian area. Headcuts are present that have the potential to create meander cut-offs. Potential Score: Actual Score: Comments SUMMARY Potential Actual Score **Possible Points** Score Stream Incisement Lateral Cutting 0, 2, 4, 6, 8 0 0 QUESTION 1: 0, 2, 4, 6 0 0 QUESTION 2: 0, 2, 4, 6 0 Stream Balance 0 QUESTION 3: 0 N/A, 0, 1, 2, 3 QUESTION 4: Sufficient Soil N/A, 0, 2, 4, 6 QUESTION 5: Rootmass 0 0 0, 1, 2, 3 0 QUESTION 6: Weeds 0 0, 1, 2, 3 QUESTION 7: **Undesirable Plants** 0 0 Woody Species Establishment 0 N/A, 0, 2, 4, 6, 8 0 QUESTION 8: N/A, 0, 1, 2, 3, 4 **Browse Utilization** 0 0 QUESTION 9: Riparian/Wetland Vegetative Cover * 0 N/A, 0, 2, 4, 6, 8 QUESTION 10: QUESTION 11: Riparian Area/Floodplain Characteristics * 0 N/A, 0, 2, 4, 6 0 0 0 Total 61 Potential Score for most Bedrock or Boulder streams 0 0 (32)(questions 1, 2, 3, 6, 7, 11) 0 (49)0 Potential Score for most low energy "E" streams (questions 1 - 7, 10, 11) X 100 = % rating #DIV/0! Actual Score RATING: Potential Score 80-100% = SUSTAINABLE 50-80% = AT RISK LESS THAN 50% = NOT SUSTAINABLE * Only in certain, specific situations can both of these receive an *N/A*.

COAC

1				Die Cumplement	Ounthan	
		tment of Environ			Il Questions	
The score for these Note: Answers to the	e questions does no hese questions mus	t have an effect on t t consider the poter	the rating above trial of the strea	a. m.		
Question 12. Fish	neries Habitat / Stre	am Complexity No	ote: the answer	s to question 12 wil	I be averaged	
12a. Adult and Ju 8 = Abundant deep	venile Holding/Esc pools, woody debri	ape Cover s, overhanging veg	etation, bouide	ers, root wads, und	ercut banks and	/or aquatic
6 = Fish habitat is o	common (see above).				
4 = Fish habitat is r	noticeably reduced. s and/or aquatic veg	Most pools are sha	llow and/or woo d supply.	dy debris, undercu	t banks, overhar	nging vegetation,
2 = Pools and habit	tat features are spar	se or non-existent o	or there are fish	barriers.		
0 = There is not en	ough water to suppo	rt a fishery				
N/A = Stream would	d not support fish un	der natural conditio	ns			
Actual Score:		Potential Score:	8	-		
Comments		- 21				
12b. Habitat Com 6 = A mixture of juv	plexity enile and adult cove	r types is present.	High flow juven	ile and adult refugir	a are present.	-
3 = Primarily adult of	or juvenile cover type	es are present. Higi	h flow refugia a	re reduced.		
) = High flow refugi	a are lacking.					
N/A = Stream would	f not support fish un	der natural condition	ns			
Actual Score:	_3_	Potential Score:	4	-		
Comments				19		
12c. Spawning Ha 3 = Areal extent of s	bitat (salmonid stro pawning substrate,	eams only) morphology of spav	vning areas, an	d composition of sp	pawning substra	te are excellent,
= Areal extent of s	pawning substrate,	morphology of spav	vning areas, an	d/or quality of spaw	ming substrate r	educed.
) = Areal extent of s	pawning substrate,	morphology of spaw	vning areas, an	d/or quality of spaw	ming substrate g	reatly reduced.
I/A = Stream would	not support fish und	fer natural condition	15.			
Actual Score:	<u>~~</u> .	Potential Score:	4	-		
Comments						-
			5			SRAF.xls

12d. Fish Passsa 8 = No potential fis	ge h passage barriers appar	rent.	
0 = Potential fish pe	assage barriers present.		
N/A = Stream would	d not support fish under r	natural conditions.	
Actual Score:	Po	otential Score:	
Comments			
	lish into water diversions		
		may be a moderate issue.	
0 = Entrainment of t	lish into water diversions		
Actual Score:	Po	otential Score: <u>6</u>	
Comments	da not lanau	0.	
12a-e Avg. Score	Actual Score	0 Potential Score	0
Question 13. Sola	Radiation		
		lequately shaded by vegetation.	
			mperature is probably elevated by irrigation,
		s not have adequate shade.	
) = More than 75% (trastically altered by	rirrigation, etc.		ation or the water temperature is probably
Actual Score:	Po	tential Score:	
Comments	hegendes a	n polential	
Question 14. Algae	growth / Nutrients	and the second	
	ent. Rocks are slippery.		
	or along channel edge		
	or discontinuous mats		
		tions) or plants not apparent and roc	ks not slippery (toxic conditions)
I/A = No water			
ctual Score:	Pot	ential Score:	
comments			
			COAF-IN

**				
Question 15. Surf	ace oils, turbidity,	salinization, precipitants o	on stream bottom and/or wate	rodor
6 = none				
4 = Slight				
2 = Moderate				
0 = Extensive				
N/A = No water				
Actual Score:	6	Potential Score:	_	
Comments				
Question 16. Bacto	aria			-
4 = There are no kno				
2 = Likely sources of	bacteria are presen	t. Wastewater or concentra	ted livestock operations are the	most common sources.
= Feedlots are con	nmon or raw sewage	e is entering the stream		
Actual Score:		Potential Score: 4		
Comments	Caudra			
) = Macroinvertebrate	minated by pollution es are rare or absen	tolerant taxa such as fly and t	l midge larva.	
I/A = Stream reach i	s ephemeral			
Actual Score:	2-3	Potential Score:		
comments		-		_
		11		
		7		SRAF.xla

Question 18. Irrig Evaluate effects fro	ation impacts m de-watering	(Assess during critical low flow periods or you may need to inquire locally about th or inter-basin transfer of water.)	nis.
8 = There are no no			
organisms.		irrigation practices are noticeable, however flows are adequate to support aquatic	
4 = Flows support a	quatic organism	ms, but habitat, especially riffles are drastically reduced or impacted.	
2 = The flow is low	enough to seve	orely impair aquatic organisms	
0 = All of the water	has been divert	ted from the stream	
N/A = Stream reach	is ephemeral.		
Actual Score:	_4	Potential Score:	
Comments	- upohe	an ruich romes a	
Question 19. Land	luse activities	- Sources	
appear to be natural	L :	ar to significantly impact water quality or the riparian vegetation. Any impacts that	
5 = There are some imber harvesting, u	signs of impact rban, roads, etc	t from landuse activities such as grazing, dryland agriculture, irrigation, feedlots, m c.	nining,
Impacts from lar byjous signs of hur	nduse activities nan induced ero	are obvious and occur throughout most of the stream reach. For example, there osion, saline seeps or overgrazing within the watershed.	are
	s are significant	t and widespread. Visual observation and photo documentation would provide	
= Land use impact apable to support n	s are so intrusions of ac	we that the stream has lost most of its natural features. The stream does not appr quatic life	ear to be
ictual Score;	4	Potential Score:	
Comments			
Total Actual	0	_ Total Potential0	
ATING	Total Potential	_x 100#DIV/0!	
VERALL RATING		(Total NRCS Actual + Total MT Supplement Actual) x100 [Total NRCS Potential + Total MT Supplement Potential)	#DIV/0!
	50-75% = AT	USTAINABLE FRISK 50% = NOT SUSTAINABLE	
			E vie

Waterbody Name County Station ID Visit # Lat Long Lat/Long obtained by method other than GPS? Y N If Y what method used? If by map what is the map scale? Samples Taken: Sample ID/File Location: Water Nutrients Metals Commons Macroinvertebrate Macroinvertebrate Habitat Asmt. Algae/Macrophytes Aquatic Plant Form	County Location County Verified? By GPS Datum (C If Y what method used? If by map what is the map s Sample ID/File Location: nons Sample ID/File Location:	HUC 10030103 GPS Datum (Circle One): NAD 27 NAD 83 WGS84 vhat is the map scale? Cample Collection Procedure GRAB SED-1 SED-1 SED-1 CHLPHL-2, OTHER:
Lat/Long obtained by method other than GPS? Y [] N [] If Y what Samples Taken: Mater Sediment Adgae/Macrophytes Algae/Macrophytes Chlorophyll a	rified? [By GPS Datum (c method used? If by map what is the map s Sample ID/File Location:	Dae): NAD 27 NAD 83 Sample Collection Procedur GRAB SED-1 SED-1 KICK HESS OTHER: PERL-1 OTHER: CH1.PH1-2 OTHER.
Samples Taken: Nutrients Metals Commons Water Image: Sediment Image: Sediment Image: Sediment Macroinvertebrate Image: Macroinvertebrate Image: Sediment Algae/Macrophytes Image: Aquatic Plant Form Image: Sediment Chlorophylil a Image: Sediment Image: Sediment	Sample ID/File Location:	
Int I Commons Common Commo		Sample Collection Procedure GRAB . SED-1 KICK HESS OTHER: PER-1 OTHER: CHI PHL-2 OTHER:
Alacroinvertebrate Habitat Asmi. Aquatic Plant Form		GRAB SED-1 KICK HESS OTHER: PERL1 OTHER: CHI PHL-2 OTHER:
	1 1 1 2	. SED-1 KICK HESS OTHER: PERI-1 OTHER: CHI PHL-2 OTHER:
	1.1.0	KICK HESS OTHER: PERI-1 OTHER: CHI PHL-2 OTHER:
	1.0	PERI-1 OTHER: CHLPHL-2 OTHER:
	-	CHLPHL-2 OTHER.
Habitat Accessment	-1	The second secon
TIMITECOAse		Purpose:
Substrate Debble Count 6 Fines		
Transect		
Photographs 🔲		
Field Notes		
Other		
Measurements: Time: 13 2.0 Marchine	Marroinvertabrens Viat Press	
Q/Flow (cfs) Fat T Site Victor	Site Victo Comments NACK Duration:	Kick Length (PL):
w 15/12 A	Comments:	
pH: 0.4.5		
SC: (mS/cm) C. 233		
SC x 1000 = timbolem		
DO: (mgL) 9. 474 / 9.0%		
TUR: Clear Slight 🗌 Turbid 🗍 Opaque		
Turbldity Comments: . NTU		

	Date: 6-18			Site Visit Code:	03-0714	
1	Waterbody:	at crk	burgers and		Station ID	: MIZFIAKOL
	Personnel:	_				
	**Distance from initial point	**Depth	**Velocity (at point)	**Width	**Area	"Discharge
1	1-1	0	0	6		
2	15	.4	.13			
3	16	.85	,50			
4	17	1.28	1,50			
5	18	1.8	1,46			
6	PL	2.1	1.50			
7	20	0.6	173			
8	21	3.0	1.97			
9	22	3.0	1.15			
0	23	3.0	2.07			
1	24	2.9	2.00			
2	25	2.8	1.97			
3	26	24	2.10			
4	27	2,55	2.04			
5	28	2.5	2.06			-
6	29	2.5	1.73			
7	30	25	1.87			
8	31	249	1.54			
9	36	2.1	1.19			
P	33	1.8	1:25			
1	34	1.4	0.55			
2	35	0,75	0.09			
3	.36	0	D		_	
-						
5			_			
					- N C - 93	
-						

Cala Mgrit. Approved

03-0714			(One Station per page)	Trip ID: 3.65 DEDOV Date: 6-18.03
Waterbody Name Station ID MAL	and the second se	Creek.	County County County County Lectors & Clark HUC	Personnet: La Alland Document
Lat <u>4 7 15 44</u> , Lat/Long obtained by	y me	U N Long 112° 03' 30' 8 method other than GPS? Y N N IY	Lat $\underline{++15} + \underline{+70} + \underline{-00} + -00$	GPS Datum (Circle One) (NAD 27) NAD 83 WGS84 what is the map scale?
Samples Taken:			Samule ID/Elle Location.	
Water		Nutrients Metals Commons	1	Sample Collection Procedure
Sediment			+	GRAB
Macroinvertebrate		Macroinvertableste Urbitet A		SED-1
Algae/Macrophytee	+			KICK HESS OTHER:
bloomholl a	-	Aquatic Flant Form		PERI-1 OTHER:
споторпуп а	3 (WALL SHUDDED SHUDDED	CHI PHI .2 OTHER.
Habitat Assessment		Stream Reach Asmt. Other		44
Substrate	\boxtimes	_		Furpose: TIMDL
Transect		_		
Photographs				
Field Notes	Ø			
Other				
Measurements:	T	Time: /3.30	Macaniavaetahesia Viab Damisian	
Q / How (cfs)		Het D	Site Visit Concentration ALCK Duration:	Kick Length (PL):
Temp: (C) 2151	M		VISIO COMMENTS:	
pH: 2.44	0.	8.44 RCM	man in a le	
SC: (mS/cm) . 477		CCP.	Canol CINANAMENTA	
	1	IImbolem		
DO: (mg/L) //,3 -	a non			
UR: Clear Sh	ight	TUR: Clear 🗌 Slight 🕅 Turbid 🗌 Opaque 🗍		
Turbidity Comments:		7.39 NTU		
			1 6 4/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1 1/1	-

Date: 10-18-03	Site Visit Code:	03-0714
Waterbody: Flit Licete	Station ID:	MIZFlatC08
Personnel: Laidlang Knutson ske	g Barman	
Bankfull Width (W _{bkt})	and the second se	Ft.
Mean DEPTH (d _{bkf}) Mean DEPTH of the stream channel cross-section, at ban iffle section.		Ft.
Bnkfl. X-Section AREA (A _{bkt}) AREA of the stream channel cross-section, at bankfull sta	and the second se	iq. Ft.
Nidth/Depth RATIO (W _{bkf} / d _{bkf}) lankfull WIDTH divided by bankfull mean DEPTH, in a riff	le section.	1.00
Maximum DEPTH (dmbkd)	F	4
faximum depth of the bankfull channel cross-section, or d ankfull stage and thalweg elevations, in a riffle section \swarrow	= 10	X
VIDTH of Flood-Prone Area (Wtpa)	=107 P7 F	t. (1.52
wice maximum DEPTH, or $(2 \times d_{ebbt})$ = the stage/elevatio /IDTH is determined. (riffle section)	n at which flood-prone area	11 × 1
ntrenchment Ratio (ER)		1220
he ratio of flood-prone area WIDTH divided by bankfull ch iffle section)	annel WIDTH. (W _{the} / W _{bid})	
hannel Materials (Particle Size Index) D50	m	ım.
ne D50 particle size index represents the median diamete impled from the channel surface, between the bankfull sta		
Tater Surface SLOPE (S) nannel slope = "rise" over "run" for a reach approximately dths in length, with the "riffle to riffle" water surface slope bankfull stage.	20-30 bankfull channel	t./Ft.
hannel SINUOSITY (K)		
nuosity is an index of channel pattern, determined from a rided by valley length (SL/VL); or estimated from a ratio of annel slope (VS/S).		
ream Type	<u></u>	
mments:		

	Date: 6-18.			Site Visit Code:		
	Waterbody: Flo				Station II	: MISPlatec
	Personnel:	Total	- 73-49:2	24		
	**Distance from initial point	**Depth	"Velocity (at point)	**Width	"Area	**Discharge
1	49.	,9	15			
2	50	1.3	ø			
3	51	1,5	ø			
4	52	1.6	Æ			
5	53	1.2	ø			
6	54	1.2	5			
7	65	1.15	1\$1			
8	66	1.5	326,14			
9	57	1.4	,25			
10	68	15	,21			
11	69	1.5	158			
12	6\$	1.8	,75			
13	61	2.1	,96			
14	62	2,5	.92			
15	63	27	,79			
16	64	25	,82			
17	65	2.3	,46			
18	66	2.4	,56			
19	47	2.3	,5¢			
20	68	2.1	.33			
21	69	2.0	,28			
22	70	1,85	,26			
23	71	1.3	K			
24	72	.9	U			
25	73	15,65	B			
6		000000				
7	alian .					
8						
29						
30						

Data Mgnt. Approved

					EQ/MD	100		
	6-19-03		_	_	Site Vi	sit Code:	03-6	114
Waterbod	y: Plat Creek	. Be	las B.r.	Ital S	TORET S	tation ID;	MIDA	atc.08
	1: However wate pla							
croonine	in the set out to	part 1.		BBLE CC	UNT	_	_	
_		-	PE	Riffle	(Other)	-	_	
Row ID	Particle Catego	ory	ize (mm)	Count	Count	Chara	cteristic Grou	p: PEBL-CNT
		-	Ĩ.	1		Sum	% of Total	Cum. Total
1	Silt / Clay		<1	THANKIN		0		0.00%
2	Sand	-	1-2	IIII		0		0.00%
3	Very Fine	_	2-4	DNI		0		0.00%
4	Fine	_	4-6	THE WE		0		0.00%
5	Fine	2	6-8	181		0	1	0.00%
6	Medium	S	8 - 12	AND N INS.		0		0.00%
7	Medium	GRAVELS	12 - 16	Mil		0		0.00%
8	Coarse	0	16 - 22	NUNU		0		0.00%
9	Coarse	a.	22 - 32	THURN I		0		0.00%
10	Very Coarse	1	32 - 45	MILLIN		0		0.00%
11	Very Coarse		45 - 64	HI I		0		0.00%
12	Small	_	64 - 90			0		0.00%
13	Small	COBBLES	90 - 128			0		0.00%
14	Large	COB	128 - 180			0	·	0.00%
15	Large		180 - 256			0		0.00%
16	Small		256 - 362			0		0.00%
17	Small	RS	362 - 512			0		0.00%
18	Medium	BOULDERS	512 - 1024			0		0.00%
19	Large	8	1024 - 2048			0	_	0.00%
20	Bedrock		> 2048			0		0.00%
21	Total # Samples	1		0	0	0	0.00%	

Pebble Count Data Entry Form

			CHI	ANNEL MEA	CHANNEL MEASUREMENTS	-	×		There is a set of the
REFERENCE		LONGITUDINAL OR X-SECTION	D. D	LEVEL	BANKFULL	FULL	BANK HEIGHT	EIGHT	B. 44
STA BS (+) H	H	FS (-) ELEV	FS.(.)	ELEV	FS (i)	FIEV	EC //	citru	Straight line -
6.63 W	ind.	incipates 8'					10101	CLEV	NUTES
14.4		STRAIN STRAIN	South State	No. of Street	and the second	E State		- Martin	
1043		Starting and and		Contraction of the local division of the loc	L-Harter	1000	Tata Tata	THE NEW	
10,79		State of the state	Ser and		No. of Street, or Stre	「日本の一部			
the Augu	が	The second second	Nielth	and the second	The second second		APPA AN		
11.43 520	30	coursed preset	1		3111114		HALL AND	All the second	
13.98 (ED	EOW	「ない」の語言	C	A LINE A		の時代の日日			
5 15.07			1.45	in the second		The second second			
15.7		The second second	1.65		The second		The sure		
6.6 1513		日田に市の方法	135	William S	and a state of the	Nonare -			
5 16.06		語が見てきません	大学な	The second		No. of Contraction	Color Series	三日本に	
S 16.62 Th	Thulun	田田市市市	STY	and the second	Population -	The second second	10 - 10	日のの注語	
3 15.4%		A STATE SAN AND	1144	Pullar.	1				
74.0 14.29 125	Secu		0.22	Contract for	a della d	Seal I		N THE	
5.7 /1.83									
11.23 Bus	Buch	and the second	The second	House	10.00		0.51		
8,92	1			and a set		States of		1111	
· 5.09			Phinting and	Statistics.		The second se	1111	福田市	

			Berne Berne		and Form	Revision 3/200
		-	tream Read			
Station ID:1					Site Visit Code:	
Waterbody. Flat	czeek	12/00	Birdtail	pd	et: Laidlaw Lout	
Waterbody Seg ID:		_		Personn	et: Laidland Knut	son Boroman
Station ID's on reach						
Question 1, Stream	Incisement					
the incised channel. 1 model)	There is pere	ennial riparia	an vegetation v	vill established	arent but a new, stable ripa d in the riparian area. (Stag	e 1 and 5, Schumm's
the falling bands, soli	d disturbanc	e evident. (3	Stage 4).		egetation is beginning to es	
					ent further degradation (ear	
vegetation that is pres	sent is mainly	y pioneer sp	becies. Bank f	ailure is comm		
or rare flood events a	ccess the flo	od plain. T	ributaries will a	also exhibit do	ctive downcutting is clearly wncutting/headcuts. (Stage	e 2)
The presence of activ	e headcuts s	should near	ty always keep	the stream re	each from being rated susta	inable.
Actual Score:	6	Pot	ential Score:	8	-	
Comments		27				10 X-
Question 2, Percent	of Streamb	anks with	Active Latera	Cutting:		
i = the lateral bank er						
= there is a minimal						
= there is a moderat	e amount of	active later	al bank erosio	n occurring		
= there is excessive	lateral bank	erosion occ	urring			
ctual Score:	_/	_ Pote	ential Score:	6	-	
Comments	_	_				
uestion 3, The Stree	am is in Bal	ance with 1	he Water and	Sediment Be	eing Supplied by the Wat	ershed:
= the stream exhibits xpected in a stable, d			dload deposit	ion, sediment	occurs on point bars and o	ther locations as would be
= sediment clogged	gravel's are a	apparent in	riffies or pools	, or other evid	ence of excess sediment a	pparent
= mid-channel bars a	re common					
= stream is braided (except natur	ally occurrin	ng braided sys	tems), having	at least 3 active channels	
ctual Score: _	3	Pote	ntial Score: _	5	-	
		-				
omments						

Duestion 7, Disturbance-Caused Undesirable Plants: 8 = 1% or less of the riparian area has undesirable plants 2 = 1%-5% of the riparian area has undesirable plants = 5%-10% of the riparian area has undesirable plants 9 = over 10% of the riparian area has undesirable plants 2 = 0 = 0 = 10% of the riparian area has undesirable plants		ficient Soil Preser	nt to Hold Water and Act as a Rooting Medium:	
1 = 35% to 65% of the riparian area with sufficient soil to hold water and act as a rooting medium 0 = 35% or less of the riparian area with sufficient soil to hold water and act as a rooting medium Actual Score:	3 = more than 85	% of the riparian a	rea with sufficient soil to hold water and act as a rooting medium	
0 = 35% or less of the riparian area with sufficient soil to hold water and act as a rooting medium Actual Score:	2 = 65% to 85%	of the riparian area	with sufficient soil to hold water and act as a rooting medium	
Actual Score: 3 Potential Score: 3 Comments	1 = 35% to 65%	of the riparian area	with sufficient soil to hold water and act as a rooting medium	
Comments Question 5, Percent of Streambank with Vegetation having a Deep, Binding Rootmass: (see Appendix I for stabilit ratings for most riparian, and other, species) 6 = more than 80% of the streambank comprised of plant species with deep, binding root masses 4 = 60% to 80% of the streambank comprised of plant species with deep binding root masses 2 = 30% to 80% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses Actual Score: Potential Score: 2 = 0.1% of the riparian area has noxious weeds 2 = 0.1% of the riparian area has noxious weeds 2 = 1% of the riparian area has noxious weeds 2 = 1% of the riparian area has undesirable Plants: 1% or less of the riparian area has undesirable plants 1% or less of the riparian area has undesirable plants 1% or less of the riparian area has undesirable plants 1% of less of the riparian area has undesirable plants 1%	0 = 35% or less of	of the riparian area	with sufficient soll to hold water and act as a rooting medium	
Question 5, Percent of Streambank with Vegetation having a Deep, Binding Rootmass: (see Appendix I for stabilit ratings for most riparian, and other, species) 6 = more than 80% of the streambank comprised of plant species with deep, binding root masses 4 = 60% to 80% of the streambank comprised of plant species with deep, binding root masses 2 = 30% to 60% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = other streambank comprised of plant species	Actual Score:	3	Potential Score: 3.	
ratings for most riparian, and other, species) 6 = more than 80% of the streambank comprised of plant species with deep, binding root masses 4 = 60% to 80% of the streambank comprised of plant species with deep, binding root masses 2 = 30% to 60% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plants 1 = 1% of less of the riparian area has undesirable plants 1 % of less of the riparian area has undesirable plants 1 % of of the	Comments			
6 = more than 80% of the streambank comprised of plant species with deep, binding root masses 4 = 60% to 80% of the streambank comprised of plant species with deep binding root masses 2 = 30% to 60% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses Actual Score:				ility
4 = 60% to 80% of the streambank comprised of plant species with deep binding root masses 2 = 30% to 80% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses Actual Score:				
2 = 30% to 60% of the streambank comprised of plant species with deep binding root masses 0 = less than 30% of the streambank comprised of plant species with deep binding root masses Actual Score:				
0 = less than 30% of the streambank comprised of plant species with deep binding root masses Actual Score:				
Actual Score:				
Question 6, Weeds : 3 = No noxious weeds are present 2 = 0-1% of the riparian area has noxious weeds 1 = 1%-5% of the riparian area has noxious weeds 0 = over 5% of the riparian area has noxious weeds Actual Score: / Potential Score: Z Comments				
Question 6, Weeds : 3 = No noxious weeds are present 2 = 0-1% of the riparian area has noxious weeds 1 = 1%-5% of the riparian area has noxious weeds 0 = over 5% of the riparian area has noxious weeds Actual Score: / Potential Score: Z Comments	Comments	Zicht Ba	nk-lacking very, cover-sleep-40% cover	
2 = 0-1% of the riparian area has noxious weeds 1 = 1%-5% of the riparian area has noxious weeds 0 = over 5% of the riparian area has noxious weeds Actual Score: / Potential Score: Z Comments	Question 6, Wee			
Image: style intering in a real has noxious weeds Image: style intering interingenet intering interingenet intering intering intering intering in	3 = No noxious we	eds are present		
a over 5% of the riparian area has noxious weeds Actual Score: / Potential Score: Z Comments	2 = 0-1% of the rip	arian area has noo	dous weeds	
Actual Score: Potential Score: Comments buestion 7, Disturbance-Caused Undesirable Plants: = 1% or less of the riparian area has undesirable plants = 1%-5% of the riparian area has undesirable plants = 5%-10% of the riparian area has undesirable plants = over 10% of the riparian area has undesirable plants	= 1%-5% of the	riparian area has n	oxious weeds	
Comments	e over 5% of the	riparian area has	noxious weeds	
Duestion 7, Disturbance-Caused Undesirable Plants: = 1% or less of the riparian area has undesirable plants = 1%-5% of the riparian area has undesirable plants = 5%-10% of the riparian area has undesirable plants = over 10% of the riparian area has undesirable plants	Actual Score:	/	Potential Score: Z -	
Duestion 7, Disturbance-Caused Undesirable Plants: 8 = 1% or less of the riparian area has undesirable plants 2 = 1%-5% of the riparian area has undesirable plants = 5%-10% of the riparian area has undesirable plants = over 10% of the riparian area has undesirable plants actual Score: 2 Potential Score: 2	Comments			_
e = 1%-5% of the riparian area has undesirable plants = 5%-10% of the riparian area has undesirable plants = over 10% of the riparian area has undesirable plants		rbance-Caused U	ndesirable Plants:	
= 5%-10% of the riparian area has undesirable plants = over 10% of the riparian area has undesirable plants			s undesirable plants	
= over 10% of the riparian area has undesirable plants	= 1% or less of th			
	= 1% or less of the r	iparian area has u	ndesirable plants	
ctual Score: Potential Score:	= 1% or less of the r = 1%-5% of the r = 5%-10% of the	iparian area has u riparian area has r	ndesirable plants undesirable plants	
	= 1% or less of the r = 1%-5% of the r = 5%-10% of the	iparian area has u riparian area has r	ndesirable plants undesirable plants	
iomments	s = 1% or less of the = 1%-5% of the = 5%-10% of the = over 10% of the	iparian area has u riparian area has e riparian area has	ndesirable plants undesirable plants undesirable plants	

12				
Question 8, Wood potential for woody		blishment and Regene	ration: (Note: Skip this question	I the riparian area has no
B = all age classes	of native woody r	iparian species present	(see table, Fig 2)	
6 = one age class of and shrubs, there in mature individuals (native woody right nay be one age c and a young age	parian species clearly a lass of each absent. O class present indicate p	bsent, all others well represented, ten, it will be the middle age group otential for recovery.	(s) that is (are) lacking. Having
or the stand is com	prised of mainly r	nature, decadent or dea		
dominate. Re-evalu	uate Question 1,	incisement, if this has h		
0 = some woody sp evaluated to ensure cedar	ecies present (>1 that it has poten	0% cover), but herbace tial for woody vegetation	ous species dominate (at this poin n). OR, the site has at least 5% co	t, the site potential should be re- ver of Russian olive and/or salt
Actual Score:	æ	Potential Score:	8	
Comments				
Question 9, Utiliza	ation of Trees ar	nd Shrubs: (Note: Skip	this question if the riparian area ha	s no potential for woody
20223023	ilable second yea	ir and older stems are t	rowsed	
		year and older stems a		
		i year and older stems		
1 = more than 50% growth form, or they	of the available s	econd year and older st	ems are browsed. Many of the sh	rubs have either a "clubbed"
0 = there is noticeat	ble use (10% or m	nore) of unpalatable and	i normally unused woody species.	
Actual Score:	_1_	Potential Score:		
Comments				
Question 10, Ripa	rian/Wetland Ve	getative Cover in the I	Riparian Area/Floodplain and Str	eambank:
		nd plant cover has a st		
		plant cover has a stabil		
		plant cover has a stabil		
		plant cover has a stabili		
		and plant cover has a s		+-97
Actual Score:		Potential Score:		
Comments	-			
anii utanti				The second s
				14 20
			3	SRAF.xls

Question 11, Riparian Area/Floodplain Characteristics are Adequate to Dissipate Energy and Trap Sediment. 6 = active flood or overflow channels, large rock, or woody material present and adequate to dissipate energy and trap sediment. There is little surface erosion and no evidence of long, continuous erosional areas on floodplain/riparian area or streambank. There are no headcuts where either overland flow and/or flood channel flows return to the main channel. 4 = rock and/or woody material is present, but generally of insufficient size to dissipate energy. Some sediment trapping occurring. Occasional evidence of surface erosion. Generally not severe enough to have developed channels. 2 = inadequate rock and/or woody material available for dissipation of energy or sediment trapping. There is surface erosion (scouring) and occasional headcuts where overland flows or flood channel flows return to the main channel. 0 = riparian area/floodplain lacking any of these attributes: 1)adequate flood or overflow channels, 2) large rock, or 3) woody material suitable for energy dissipation and sediment trapping. Erosional areas are long and continuous. Lacking vegetation or substrate materials adequate to resist further erosion. Surface erosion is obvicus on the floodplain/riparian area. Headcuts are present that have the potential to create meander cut-offs. 6 Potential Score: Actual Score: Comments SUMMARY Potential Actual Score Possible Points Score 0 0, 2, 4, 6, 8 0 QUESTION 1: Stream Incisement QUESTION 2: Lateral Cutting 0 0, 2, 4, 6 0, 2, 4, 6 QUESTION 3: Stream Balance 0 0 N/A, 0, 1, 2, 3 0 QUESTION 4: Sufficient Soll N/A, 0, 2, 4, 6 0 QUESTION 5: Rootmass 0 0, 1, 2, 3 QUESTION 6: Weeds Undesirable Plants 0, 1, 2, 3 0 QUESTION 7: Woody Species Establishment 0 N/A, 0, 2, 4, 6, 8 0 QUESTION 8: N/A, 0, 1, 2, 3, 4 N/A, 0, 2, 4, 6, 8 Browse Utilization QUESTION 9: 0 0 Riparian/Wetland Vegetative Cover * Ö QUESTION 10: 0 N/A, 0, 2, 4, 6 Riparian Area/Floodplain Characteristics * QUESTION 11: 0 0 Total 0 61 0 Potential Score for most Bedrock or Boulder streams 0 (32)0 (questions 1, 2, 3, 6, 7, 11) Potential Score for most low energy "E" streams 0 (49)0 (questions 1 - 7, 10, 11) #DIV/0! Actual Score X 100 = % rating RATING: Potential Score 80-100% = SUSTAINABLE 50-80% = AT RISK LESS THAN 50% = NOT SUSTAINABLE * Only in certain, specific situations can both of these receive an "N/A".

N	Montana Dep	artment of Environ	nmental Qualit	y Supplemental Quest	ions
The score for these lote: Answers to the	questions does in the second s	not have an effect on t ust consider the poter	the rating above. Itial of the stream	4	
Question 12. Fish	eries Habitat / S	tream Complexity N	ote: the answers f	to question 12 will be aven	aged
12a. Adult and Ju	venile Holding/E	scape Cover		, root wads, undercut ban	
6 = Fish habitat is c					
4 = Fish habitat is n	oticeably reduced		llow and/or woody d supply.	y debris, undercut banks, o	overhanging vegetation,
		arse or non-existent o		arriers.	
0 = There is not end					
		under natural conditio	Ins		
Actual Score:	_6	Potential Score:			
Comments					
3 = Primarily adult o 0 = High flow refugia	enile and adult co r juvenile cover ty a are lacking.	ver types is present. I pes are present. High under natural condition Potential Score:	h flow refugia are	and adult refugia are pre-	ient.
Comments					
2c. Spawning Hat = Areal extent of s	bitat (salmonid s pawning substrate	treams only) e, morphology of spav	whing areas, and r	composition of spawning s	substrate are excellent.
= Areal extent of sp	pawning substrate	a, morphology of spaw	vning areas, and/	or quality of spawning sub	strate reduced.
= Areal extent of sp	pawning substrate	, morphology of spaw	vning areas, and/o	or quality of spawning sub	strate greatly reduced.
I/A = Stream would	not support fish u	inder natural condition	15.		
ctual Score:		Potential Score:	5		
Comments					Sec. 1
				Super Set	
			5		SRAF.xds

12d. Fish Passa 8 = No potential fis	ige sh passage barriers :	apparent.	
	assage barriers pre		
		nder natural conditions.	
Actual Score:		Potential Score: 8	
Comments			
12e. Entrainment 8 = Entrainment of	t fish into water diver	sions not an issue.	
		sions may be a moderate issue.	
0 = Entrainment of	fish into water divers	sions may be a major issue.	
Actual Score:		Potential Score: 5	
Comments	Hoadquites	present upstream through	ut drawage
12a-e Avg. Score	Actual Score	0 Potential Score	0
Question 13. Sola	ar Rediation		
Anepriou in . oon			
		is adequately shaded by vegetation.	
6 = More than 75%	of the stream reach	is adequately shaded by vegetation.	perature is probably elevated by irrigation,
8 = More than 75% 4 = 50-75% of the s	of the stream reach stream reach does n	ot have adequate shading or the water tem	perature is probably elevated by irrigation,
5 = More than 75% 4 = 50-75% of the a 3 = Approximately 2	of the stream reach stream reach does n 25-50% of the stream	ot have adequate shading or the water tem n does not have adequate shade.	
8 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 0 = More than 75%	of the stream reach stream reach does n 25-50% of the stream of the stream reach	ot have adequate shading or the water tem	
5 = More than 75% 4 = 50-75% of the a 3 = Approximately 2	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water tem n does not have adequate shade. does not have adequate shade by vegetati	
8 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 0 = More than 75%	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water tem n does not have adequate shade.	
6 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% frastically altered b	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water tem n does not have adequate shade. does not have adequate shade by vegetati	
6 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% drastically altered b Actual Score:	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water term in does not have adequate shade. does not have adequate shade by vegetati Potential Score:	
a = More than 75% a = 50-75% of the s b = Approximately 2 b = More than 75% grastically altered b Actual Score: Comments Question 14. Alga	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water tem In does not have adequate shade. does not have adequate shade by vegetati Potential Score:	
a = More than 75% a = 50-75% of the s b = Approximately 2 b = More than 75% grastically altered b Actual Score: Comments Question 14. Alga	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water tem In does not have adequate shade. does not have adequate shade by vegetati Potential Score: s	
6 = More than 75% 4 = 50-75% of the s 8 = Approximately 2 9 = More than 75% frastically altered b Actual Score: Comments Question 14. Alga = Algae not appar	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water term in does not have adequate shade. does not have adequate shade by vegetati Potential Score: s ery.	
6 = More than 75% 4 = 50-75% of the a 3 = Approximately 2 b = More than 75% frastically altered b Actual Score: Comments	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water term in does not have adequate shade. does not have adequate shade by vegetati Potential Score: s ery. dge	
6 = More than 75% 4 = 50-75% of the a 3 = Approximately 2 b = More than 75% frastically altered b Actual Score: Comments Comments Cuestion 14. Alga a Algae not appar a in small patches a in large patches	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water term in does not have adequate shade. does not have adequate shade by vegetati Potential Score: s ery. dge	ion or the water temperature is probably
6 = More than 75% 4 = 50-75% of the a 3 = Approximately 2 b = More than 75% frastically altered b Actual Score: Comments Comments Cuestion 14. Alga a Algae not appar a in small patches a in large patches	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water term in does not have adequate shade. does not have adequate shade by vegetati Potential Score:	ion or the water temperature is probably
6 = More than 75% 4 = 50-75% of the a 3 = Approximately 2 b = More than 75% frastically altered b Actual Score: Comments Comments 2 Luestion 14. Alga a Algae not appar = in small patches = Mats cover botto	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water term in does not have adequate shade. does not have adequate shade by vegetati Potential Score:	ion or the water temperature is probably
6 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% frastically altered b Actual Score: Comments 2 uestion 14. Alge a Algee not appar = in small patches = mats cover botto UA = No water	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water term in does not have adequate shade. does not have adequate shade by vegetati Potential Score:	ion or the water temperature is probably
6 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% frastically altered b Actual Score: Comments 2 uestion 14. Alga a Algae not appar = in small patches = Mats cover botto VA = No water ctual Score:	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water term in does not have adequate shade. does not have adequate shade by vegetati Potential Score:	ion or the water temperature is probably
6 = More than 75% 4 = 50-75% of the s 3 = Approximately 2 0 = More than 75% frastically altered b Actual Score: Comments 2 uestion 14. Alga a Algae not appar = in small patches = Mats cover botto VA = No water ctual Score:	of the stream reach stream reach does n 25-50% of the stream of the stream reach y irrigation, etc.	ot have adequate shading or the water term in does not have adequate shade. does not have adequate shade by vegetati Potential Score:	ion or the water temperature is probably

		 (Assess during critical low flow periods or you may need to inquire or inter-basin transfer of water.) 	locally about this.
8 = There are no n	oticeable impai	cts from irrigation	
6 = Changes in flo organisms.	w resulting from	ririgation practices are noticeable, however flows are adequate to s	upport aquatic
4 = Flows support	aquatic organis	ms, but habitat, especially riffles are drastically reduced or impacted	
2 = The flow is low	enough to seve	erely impair aquatic organisms	
) = All of the water	has been diver	ted from the stream	
N/A = Stream reac	h is ephemeral.		
Actual Score:	6	Potential Score: 8	
	Dotte	cam-there are duession ditches	
Comments			
Question 19. Lan			
3 = Landuse practic appear to be natural		ar to significantly impact water quality or the riparian vegetation. An	y impacts that occur
= There are some mber harvesting, u	signs of impac irban, roads, et	t from landuse activities such as grazing, dryland agriculture, irrigati c.	on, feedlots, mining,
		are obvious and occur throughout most of the stream reach. For ex	cample, there are
bvious signs of hu	man induced er	osion, saline seeps or overgrazing within the watershed.	
e = Landuse impact	ts are significan	t and widespread. Visual observation and photo documentation wo	uld provide
verwhelming evide	nce that the str	eam is impaired.	
= Land use impac apable to support r		ve that the stream has lost most of its natural features. The stream quatic life	does not appear to be
ctual Score:	4	Potential Score:	
Guill Coores	cattle	0(0.2.06	
omments	- mora	acces	
ommorina			
otal Actual	0	Total Potential0	
ATING	Total	x 100#DIV/0!	
	Potential		
VERALL RATING		(Total NRCS Actual + Total MT Supplement Actual) x100	#DIV/0!
VENALL NATING		(Total NRCS Potential + Total MT Supplement Potential)	
	75-100% = SI	JSTAINABLE	
	50-75% = AT	RISK	
	LESS THAN S	50% = NOT SUSTAINABLE	
			CDAC -

6 = none	Surface oils, turbidity, salinization, precipitants on stream bottom	
4 = Slight		
2 = Moderate		
E Charlender		
0 = Extensive		
N/A = No water		
Actual Score:	Potential Score:	
Comments		
Question 16. Ba 4 = There are no	acteria known anthropogenic sources of bacteria	
	s of bacteria are present. Wastewater or concentrated livestock opera	tions are the most common sources.
	common or raw sewage is entering the stream	
Actual Score:	Potential Score:	
Comments	Livesber	
4 = The stream h lies, caddis flies (acroinvertebrates as a healthy and diverse community of macroinvertebrates, Stream riff and/or stone files. a dominated by pollution tolerant taxa such as fly and midge larva.	les usually have an abundance of may
4 = The stream h lies, caddis flies a 2 = The stream is	as a healthy and diverse community of macroinvertebrates. Stream riff and/or stone files.	les usually have an abundance of may
4 = The stream h flies, caddis flies (2 = The stream is	as a healthy and diverse community of macroinvertebrates, Stream riff and/or stone files. I dominated by pollution tolerant taxa such as fly and midge larva. prates are rare or absent	les usually have an abundance of may
4 = The stream h flies, caddis flies a 2 = The stream is 0 = Macroinverteb	as a healthy and diverse community of macroinvertebrates, Stream riff and/or stone files. I dominated by pollution tolerant taxa such as fly and midge larva. prates are rare or absent	les usually have an abundance of may
4 = The stream hi files, caddis files i 2 = The stream is 0 = Macroinvertet N/A = Stream read Actual Score;	as a healthy and diverse community of macroinvertebrates, Stream riff and/or stone files. dominated by pollution tolerant taxa such as fly and midge larva. brates are rare or absent ch is ephemeral	les usually have an abundance of may
4 = The stream hi lies, caddis flies i 2 = The stream is 0 = Macroinvertet V/A = Stream read Actual Score:	as a healthy and diverse community of macroinvertebrates. Stream riff and/or stone flies. a dominated by pollution tolerant taxa such as fly and midge larva. brates are rare or absent ch is ephemeral Potential Score:	les usually have an abundance of may
4 = The stream hi lies, caddis files a 2 = The stream is 0 = Macroinvertet 4/A = Stream read Actual Score:	as a healthy and diverse community of macroinvertebrates. Stream riff and/or stone flies. a dominated by pollution tolerant taxa such as fly and midge larva. brates are rare or absent ch is ephemeral Potential Score:	les usually have an abundance of may
4 = The stream hi files, caddis files i 2 = The stream is 0 = Macroinvertet N/A = Stream read Actual Score;	as a healthy and diverse community of macroinvertebrates. Stream riff and/or stone flies. a dominated by pollution tolerant taxa such as fly and midge larva. brates are rare or absent ch is ephemeral Potential Score:	les usually have an abundance of may
4 = The stream h files, caddis files a 2 = The stream is 0 = Macroinverteb N/A = Stream rea	as a healthy and diverse community of macroinvertebrates. Stream riff and/or stone files. a dominated by pollution tolerant taxa such as fly and midge larva. brates are rare or absent ch is ephemeral Potential Score: <u>wat sampled at this time</u>	les usually have an abundance of may

Waterbody Name Holl Con L Station ID MICHARCO Visit # Lat Hong obtained by method other than GPS? Y [Samples Taken: Water Natroinvertebrate Nutrients Matroinvertebrate Hab	A Ore Long Visit # Location Long Long Ve od other than GPS? Y N If Y what Nutrients [] Metals Commons [] Macroinvertebrate Habitat Asmt. [] Aquatic Plant Form [] Aquatic Plant Form [] Pebble Count [] % Fines []	Waterbody Name County County Lat Lat Long Verified? Lat Long Desturn (Creeled Internet	HUC CO 3010 C Me): NAD 27 NAD 83 me): NAD 27 NAD 83 Sample Collection Procedur GRAB SED-1 KICK HESS OTHER: PER-1 OTHER: PER-1 OTHER: PUrpose:
Station ID NICLEAFOOS Vi Lat 41918 19 20 Long 12 Lat/Long obtained by method other than Gi Samples Taken: Water Nutrients Marcoinvertebri Marcoinvertebrate Amoric Plane E	ve S? Y 🗌 N 🗍 If Y what S? Y 🗍 N 🗍 If Y what etals 🗍 Commons 🗐 the Habitat Asmt. 🗍 orm 🗐 mm 🗐 smt. 🗍 Other []	infied? By GPS Datum method used? If by map what is the map Sample ID/File Location:	1 2 8 1
ong obtained by method other than Gi ples Taken: r ment	Version S' Y [] N [] If Y what S' Y [] N [] If Y what etais [] Commons [] fie Habitat Asmt. [] fie Habitat Asmt. [] fie Habitat Asmt. [] fie Habitat Asmt. []	rified? By CPS Datum method used? If by map what is the map Sample ID/File Location:	me): NAD 27 NAD 83 Sample Collection Procedur GRAB SED-1 KICK HESS OTHER: PERL-1 OTHER: CHLPHL-2 OTHER: Purpose:
Samples Taken: Water Nutrients M Sediment Macroinvertebra Macroinvertebrate Macroinvertebra AletteMacronbytese Amoric Planet E	etals Commons fire Habitat Asmt. [] other [] % Fines [] % Fines []	Sample ID/File Location: 0.5-0-10-00 0.3-0-10-00 0.3-0-10-00 0.3-0-10-00 0.3-0-10-00	
ertebrate	Commons	03-01200 03-0120 03-0120 03-0120 03-0120	Sumpte Contection Frocedure GRAB SED-1 KICK HESS OTHER: PERI-1 OTHER: CHLPHL-2 OTHER: Purpose:
	the Habitat Asmt. [2] smm [3] smt. [] Other [] [% Fines []	03-010-00 03-0120-0 03-0120-0	UKAJB SED-1 KICK HESS OTHER: PERI-1 OTHER: CHLPHL-2 OTHER: Purpose:
	tte Habitat Asmt. Z	03-0182M 03-0125C	KICK HESS OTHER: PERI-1_OTHER: CHLPHL-2_OTHER: Purpose:
Aleae/Macrophytes	orm [] srnt. [] Other [] % Fines []	03.472.5C	KICK HESS OTHER: PERI-1_OTHER: CHLPHL-2_OTHER: Purpose: 7.0000
÷	smt. [] Other [] % Fines []	Destroy	PERI-1 OTHER: CHLPHL-2) OTHER: Purpose: 7000
-	smt. 🗌 Other 🗍 % Fines 📋		CHLPHL-2> OTHER: Purpose: 72001
	smt. L Other L		
1	% Fines		1
Substrate L Pebble Count % Fines			
oths			
Field Notes			
Other			
Measurements: Time: 9.46	Macenture	1.64	
	Fiet	Site Viet Commences Alock Duration: 1. 2. 5 M. C. 4. 5	S Kick Length (Pt.): 35
Temp: (*C) W 18-32 A	-	Comments:	
1			
SC: (mS/cm) , 3/3			
SC x 1000 =	umbo/cm		
DO: (mg/L) 9.83 /// 1	10 41.3.2		
r 🗌 Slight 🗌 Turbid 🗍 C			
Turbidity Comments: 7.08 /0.			
	1000	AN TO A LOUGH AND	

	AL DISCHAR			Cite Visit Cadar	03-6700	
			15 1104 20			D: MIA FIA + CO3
		Alaw Tho		<u>v</u>	Station	D. Principals cos
Perso	nnel: Court	11200 100	unnari			
**Dit	stance from	**Depth	**Velocity (at point)	**Width	**Area	"Discharge
1	2	0	0	D		1
2	3	6		1		
3	4	,35	.,25	1		
4	5	15	,65		_	
5	4	.5	. 68			
6	7	. 6	. 1.4	1		
7	8	.66	. 66	1		
8	9	.7	.87	1		
9	10	. 48	.91	1		
0	11	. (1)	. 98			
1	12	.85	.97		_	
2	13	. 85	.93			
3	14	,95_	.85			
4	12	195	.56			
5	134	1.0	. 95		_	
6	17	.8	1.09			-
7	18	.90	1.04			
8	19	.90	1.01			
9	20	, 50	1.12			
0	21	. 60	1.40		2	
1	60	170	1.14			
2	23	156	0			
3	23.5	0	0			
4						
5						
6						
7	-					-
8						
9						-
0						

Outa Mgnt. Approved

Date:	Site Visit Code:	
Waterbody:	Station ID:	
Personnel:		
BEIN Int [long 479] Bankfull Width (Weid) WIDTH of the stream channel, at bankfull	いるに、「いた?O?'ららら、 ステーーFt. stage elevation, in a rille section	
Mean DEPTH (d _{bk}) Mean DEPTH of the stream channel cross iffle section.	Ft.	
Bnkfl. X-Section AREA (A _{bkf}) AREA of the stream channel cross-section	sq. Ft.	
Width/Depth RATIO (W _{bid} / d _{bid}) Bankfull WIDTH divided by bankfull mean I	DEPTH, in a riffle section.	3
Maximum DEPTH (d _{mbkt})	Ft.	1.0
Maximum depth of the bankfull channel cro ankfull stage and thalweg elevations, in a	ss-section, or distance between the riffle section	
WIDTH of Flood-Prone Area (W _{tpa}) Ft.	- 2763
wice maximum DEPTH, or (2 x d _{meat}) = the VIDTH is determined. (riffle section)	e stage/elevation at which flood-prone area	
Entrenchment Ratio (ER)		
he ratio of flood-prone area WIDTH divide iffle section)	d by bankfull channel WIDTH. (W_{tpa} / W_{bM})	
Channel Materials (Particle Size In	ndex) D50mm.	
he D50 particle size index represents the r ampled from the channel surface, between	median diameter of channel materials, as the bankfull stage and thalweg elevations.	
/ater Surface SLOPE (S)	Ft/Ft.	
hannel slope = "rise" over "run" for a reach idths in length, with the "riffle to riffle" wate bankfull stage.	h approximately 20-30 bankfull channel ir surface slope representing the gradient	
hannel SINUOSITY (K)	13.05 6 Sas"/ Ussheam Ilight	- 10.92-
nuosity is an index of channel pattern, det vided by valley length (SL/VL); or estimate annel slope (VS/S).	ermined from a ratio of stream length d from a ratio of valley slope divided by	1
tream Type		
omments:		
		ata Mgmt, Approved

	y: Flat Creek						03-07	
Personne		_		S	TORET S	tation ID:	MIDFIA	40.03
	: Laidha 12	au i	04.0	_				
burkhul	is all vi	200th	and PE	BBLE CO	DUNT			
Row ID	Particle Catego	ory	Size (mm)	Riffle Count	(Other) Count		(all ut ach cteristic Grou	p: PEBL-CNT
					-	Sum	% of Total	Cum. Total
1	Silt / Clay		<1	2	NNI	0		0.00%
2	Sand		1-2	図:		0		0.00%
3	Very Fine		2-4			0		0.00%
4	Fine		4 - 6	* *		0		0.00%
5	Fine	1	6-8	-		0		0.00%
6	Medium	S	8 - 12		100	0		0.00%
7	Medium	GRAVELS	12 - 16	1.		0		0.00%
8	Coarse	Ö	16 - 22			0		0.00%
9	Coarse	1	22 - 32	Ø		0		0.00%
10	Very Coarse	1	32 - 45	1.1		0		0.00%
11	Very Coarse		45 - 64	N.Y		0		0.00%
12	Small		64 - 90	Ø		0		0.00%
13	Small	COBBLES	90 - 128	₫.		0		0.00%
14	Large	COB	128 - 180	1.1		0		0.00%
15	Large		180 - 256			0		0.00%
16	Small		256 - 362	*		0		0.00%
17	Small	ERS	362 - 512			0		0.00%
18	Medium	BOULDERS	512 - 1024			0		0.00%
19	Large	8	1024 - 2048			0		0.00%
20	Bedrock		> 2048			0		0.00%
21	Total # Samples			0	0	0	0.00%	

Pebble Count Data Entry Form

REFERENCE LONGITUDIMALOR WATER LEVEL BANKFULL BANKFULL BS (+) HI FS () ELEV FS () ELEV BS (+) HI FS () ELEV FS () ELEV C G (L C C C C C 7 U (L C C C C C 7 U (L C C C C C 7 U (L C C C C C C 7 U (L C C C C C C C 7 U (L C C C C C C C 7 U (L C C C C C C C 7 U (L C C C C C C C 7 U (L C C C C C C C 10.23 L C C C C	TILE TRACT	CC 23				Ċ	CHANNEL MEASUREMENTS	SUREMENT	0			Dasan
BS(+) HI FS() ELV FS()		REFER	ENCE	LONGITUL	DINALOR	WATER	LEVEL	BANK	FULL	BANK H	EIGHT	
Weith Res (A) ELEV FS (A) ELEV FS (A) ELEV 7 (G) 1 1 1 1 1 1 1 7 (G) 1	STA	BC (+)		"Eeri	A DE LA					- THE		48
7.05 9.01 2.05 9.0 2.14 9.0 8.94 9.0 9.95 9.0 9.95 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.134 9.0 1.135 9.0 1.136 1.16 1.137 9.0 1.138 1.16 1.138 1.16 1.138 1.16 1.138 1.16 1.139 1.16 1.139 1.16 1.130 1.16 1.13	-	1.01		Lo el	ELEV	12(-)	ELEV	FS (-)	ELEV	FS [-]	ELEV	NOTES
7.65 1.44 2.84 8.84 8.84 9.85 9.85 1.34 1.34 1.34 1.34 1.34 1.34 1.34 1.34 1.34 1.34 1.34 1.34 1.34 1.34 1.34 1.34 1.34 1.35 1.54 1.55 <td>1</td> <td>12-21</td> <td></td> <td></td> <td>SE WIL</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>and the</td> <td></td>	1	12-21			SE WIL						and the	
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Dite:

			Personnel: LA. Alow Bowpan
rbody Name on ID (7)/2, 7	Visit # 2 Locat	Flat Clark A Marth	E HUC 10% 30/03
Lat/Long obtained by meth	Lat Long Long Circle (Lat/Long obtained by method other than GPS? Y N If Y what method used? If by map what is the map scale?	Verified? By GPS Datum hat method used? If by map what is the ma	GPS Datum (Circle One): NAD 27 NAD 83 WGS84 what is the map scale?
Samples Taken:	1.0	Simula ID/Eila I anntinu.	1 H
Water	Nutrients Metals Commons	Daukdraw	Sample Collection Procedure
Sediment		N.N.N.C. 11 100	GRAB
Macroinvertebrate	Macroinvertebrate Habitat Asmt	HG 2051.00	, SED-I
Algae/Macrophytes	Aquatic Plant Form		KICK HESS OTHER:
1		H1840-CD	PERI-1 > OTHER:
Habitat Association	[03-05510	CHLPHL-2 OTHER:
	Stream Keach Asmt. Other		
Substrate	Pebble Count 7% Fines		1
Transect			
Photographs			
Field Notes			
Other			
Measurements: Time:	Casi		11
F	L and	ALLANDED TALE NICK DUTATION: O/ (3)-() (3)-() (2)-()	SC Kick Length (Pt.): 30 th
Temp: ('C) W		The visit Confinents:	
pH:		NO OF ACUTE THE	be in itacia
SC: (mS/cm)	366		
SC x 1000 =	umho/cm		
DO: (mg/L) 10.	India Inty Co.		
r 🗆 Sligh	Turbid 🗍 Onione 🗍		
Turbidity Comments: 3,	54 ND		
3.	21 NV		
-		A STATE OF	

	otal DISCHA			Site Visit Code:	03-0821	
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		T. CRCCA-	Indurry			
<u>P</u>	ersonnel:			1.	and so and	
1	"Distance from initial point	* Dupth	"Velocity (at point)	**Width	"Area	"Discharge
1	Z'	D	15			
2	4	5	H			
3	6	195	,03			
4	g	1.05				
5	10	1.05	./9			
6	12	175	.16			
7	14	1.0	.15			
8	16	1.0	.22			
9	/8	19	,15			
10	20	,75	,20			
11	22	,85	, 22			
12	24	.62	.18			
13	26	.45	17			
14	2.9	.65	20			
15	30	,82	./3			
16	32	.8	17			
17	34	.9	.05			
18	36	1.1	.05			
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Data Mgmt. Approved

1.1.1.12				1
ACROINVERTER	BRATE HABITAT ASSESSM	ENT FIELD FORM	RIFFLE	RUN PREVALENCE
ate: 7-04-0	3	Site Visit Code	03-0821	
	Creek Af March		Site: Mill Tlad	FCAY
ersonnel: 10.	das Bassian		side fait as files	Ser. I.
erserinen. 121.0	distance (construction of the			
HABITAT	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
1A. Rillie Development	Well-developed riffle; riffle as wide as stream & extends two times width of stream.	Rittle as wide as stream but length leas than two times width.	Reduced riffle area that is not as wide as stream & its length less than two times width.	Riffles virtually non- existent
A score: \$5	9-10	6.8	3-5	0.2
				1 - C - C
Comments:			1	
18. Benthic Substrate	Diverse substrate dominated by cobble.	Substrate diverse with abundant cobble, but bedrock, boulders, fine gravel, or sand prevalent.	Substrate dominated by bedrock, boulders, sand, or silt; cobble present.	Monotonbus fine gravel, sand, silt, or bedrock substrate.
B. score:	9-10	64	3-5	0-2
	mostly protoce	26000	and a second second	
Comments:	TARGET I CARDING	1.9.5		ston or and
2. Embeddedness	Gravel, cobble, or boolder particles are between 0-25% surrounded by fine sediment (particles less than 0.25 mm (.25°)).	Gravel, cobble, or boulder particles are between 25-50 % aurrounded by fine sediment.	Gravel, cobble, or boulder particles are between 50-75% surrounded by fine sediment.	Gravel, cobble, or boulder particles are over 75% surrounded by fine sediment.
score: 10	16-20	11-15	6-10	0-5
Comments:				
o ominientes.		Some channelization	New embankments	Banks shored with
3. Channel Alteration (channelization, traightening, dredging, other alterations)	Channel alterations absent or minimal; abream pattern apparently in natural state.	Some channelization present, usuably in areas of crossings, etc. Evidence of past attentions (before past 20 years) may be resent, but more recent channel atteration is not present.	New embanaments present on both banks; 40-80% of the stream reach channelized & disrupted.	Banks shored with gables or cament; over 80% of the stream reach channelized & disrupted.
score: "LD	16-29	11-15	6-10	0-5
Comments				
Comments:				
8. Sediment Deposition	Little or no enlargement of bars 8 less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5- 30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, coarse sand on old & new bars; 36- 30% of the bottom affected; sediment deposits at obstructions, constrictions, & bends; moderate deposition in pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
score: 15	16-20	11-15	5-10	0.5

5. Channel Flow Status	Water fills baseflow channel; minima amount of channel substrate exposed.	Water fills > 75% of the baseflow channel; < 25% channel substrate exposed.	Water fills 25-75% of the baseflow channel; riffle substrates mostly exposed.	Very little water in channel, & mostly present as standing pools.
5. acore: 1%	16-29	11-15	5-10	0.5
Comments:				
6. Bank Stability (score each bank) NOTE: Determine left or right side while facing downstream.	Banks stable; no evidence of erosion or bank failure; little apparent potential for future problems.	Moderately stable: infrequent, small areas of erosion mostly healed over.	Moderately unstable; moderate frequency & size of encisional areas; up to 60% of benks in reach have enoslos; high erosion potential during high flow.	Unstable; many eroded areas; "raw" areas frequent along straight sections & bends; dovious bank sloughing; 60-100% of banks have erosion scars on sideslopes.
K score: /0	5-10	6-8	3-5	0-2
_	Left Side 10	Average:		
	Right Side /()			
7. Bank Vegetation Protection (score such bank) NOTE: reduce scores for annual crops 5 weeds which do not hold soll well (s.g. knapweed).	Over 90% of the streambank surfaces covered by stabilizing vegetation; vegetative disruption minimal or not evident; almost all plants allowed to grow naturally.	atreambank surfaces covered by vegetation; disruption evident, but not affecting full plant	50-70% of the streambank surfaces covered in vegetation; disruption covious; patches of bate soil or closely cropped vegetation common; less than one-half of potential plant height remaining.	Less than 50% of the streambank surfaces covered by vegetation; extensive disruption of vegetation; vegetation removed to 2 inches or less.
score: 10	9-10	6-8	3-5	0-2
	Left Side / 🖒	Average:		
	Right Side 10	Commenta		
I. Vegetated Zone Width (score each side)	Width of vegetaled zone > 100 feet.		Width of vegetated zone 10-30 feet.	Width of vegetated zone < 10 feet.
score: 70	8-10	64	3-5	0-2
	Left Side 10	Average:		
	Right Side 10	Commenta:		

Waterbody Name County Lot County Lot				(One Station per page)	Trip ID: 302 D2BUN Date: 721 42 Personnet: 54 / r + 1.
Verified? By GPS Datum (crete One); (NAD 27) NAD 83 If Y what method used? If by map what is the map scale? Sample Collection Procedur Commons Commons Sample ID/File Location: Sample Collection Procedur Commons Collection: Sample ID/File Location: Sample Collection Procedur Commons Collection: Collection: Sample Collection Procedur Commons Collection: Creation: Sample Collection Procedur Commons Collection: Creation: Sample Collection Procedur Connors Collection: Creation: Sample Collection Procedur Connors Collection: Creation: Sample Collection Procedur Other Collection: Creation: Creation: Other Connest Perpose: Creation: Interventered Kick Duration: Kick Length (Pi): 35 Site Visit Comments:	aterbody Name	aple	visit# 2	County Audio 4	L Calo
Commons Commons Continents Continents Commons Commons Continents Contraction: Contract Contra	t /Long obtained h	by met	hod other than GPS? Y C N I If Y wh	'erified? □ By GPS Datum at method used? If by mup what is the m	Date): NAD 27
Commons S OS SSASS	mples Taken:			Samula UMENta Lanation.	\vdash
Inter US-US32AA Other US-US32AA Inter US-US32AA Macroinvertebrate Kick Duration: Z Net Site Visit Comments:	stor	Ø		-	Sample Collection Procedure
Itiat Asmt.	diment			-	(UKAB.)
Other Other Other Other Inss Image: Stress of the stress o	scroinvertebrate	2		02.0504.00	1-000
Other Other Intes Image: Comparison of the second	gae/Macrophytes		Aquatic Plant Form	5 Providence	KICK) HESS OTHER:
Other Other Ines Image: Image	lorophyll a	Ø		Local and	PEREL OTHER:
Macroinvertebrate Kick Duration: Kick Length (PL): Site Visit Comments:	bitat Assessment	-			CHLPHL-2) OTHER:
Macroinvertebrate Kick Duration: 2 MA Kick Length (PL): Site Visit Comments:	bstrate		Pebble Count C & Finance		11
Macroinvertebrate Kick Duration: 3 MAC Kick Length (Pt.): Site Visit Comments:	insect		COUR = AL		
Macroinvertebrate Kick Duration: 3 MA Kick Length (Pt.): Site Visit Comments:	otographs				
Macroinvertebrate Kick Duration: 3 Au Kick Length (PL): Site Visit Comments:	id Notes				
Macroinvertebrate Kick Duration: 3 MACOINVERTEBRIA (PL): Site Visit Comments:	ter				
Vcm Nick Length (H.):	asurements:	The		ſ	
	Flow (cfs)			2	Kick Length (P.): GO
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	thidity Comments		0,4 \$ 10.5		
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	DTAL DISCHAP	RGE:		Site Visit Code:	03-0823	
		Tat Creek	B/~ Mi	Pard Colony		MIRFlatCo:
	and the second se	Twi/ Shad		-		
	and the second se	1		and the second second line		Income and the second second
	Distance from Initial point	**Depth	"Velocity (at point)	**Width	**Area	**Discharge
1	\$ 3.0183	ø	ø			
2	4. =	0,30	0,43			
3	5,0	0.39	0.94			
4	6.0	0.32	1.25			
5	7.0	0.48	1.44		_	
6	8.0	0.50	1.73			
7	9.0	5. GI	2.1%			
в	10.0	0.63	256		_	
9	11.0	0,68	1.75			
the second se	12.0	0,80	1,54			
11	11.0	0.78	1.88			
12	14.0	1.00	1.85			
adding the lot of the	15.0	1.12	1.73			
	160	1.25	0,40			
15	16,5 REJ	\$,20	Ø			
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Data Mgnt. Approved

1.1.1.12				- /
	BRATE HABITAT ASSESSM	ENT FIELD FORM	01001	URUN PREVALENCE
IN ON ON TENTE	1			
Date: 7/2	4/03	Site Visit Code	: 03-0923 site: M125/01	
Vaterbody:		Yolu Millard	Site: M125/al	005
ersonnel:	and Ting			
HABITAT	a subscription of		1	
PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
tA. Rittle Development	Well-developed riffle; riffle as wide as stream & extends two times width of stream.	Rittle 25 wide as stream but length less than two times width.	Reduced riffle area that is not as wide as stream & its length less than two times width.	Rittles virtually non- existent
A score:	5-10 EC	64 815	3-5	0-2
Commenta:				
18. Benthic Substrate	Diverse substrate dominated by cobble.	Substrate diverse with abundant cobble, but bedrock, boulders, fine gravel, or sand prevalent	Substrate dominated by bedrock, bouiders, sand, or silt; cobble present.	Monotonous fine gravel, sand, silt, or bedrock substrate.
8. 10.000	9-10	47	3-5	0-2
Comments:				and the second se
2. Embeddedness	Gravel, cobble, or bouider particles are between 0-25% surrounded by fine sediment (particles less than 6.35 mm [.257]).	Gravel, cobble, or boulder particles are between 25-50 % sarrounded by fine sediment,	Gravel, cobble, or boulder particles are between 50-75% surrounded by fine sediment.	Gravel, cobble, or boulder particles are over 75% surrounded by fine sediment.
score:	16:20 /6	11-15	E-10	0-5
Comments:				
3. Channel Alteration (channelization, traightening, dredging, other alterations)	Channel alterations absent or minimal; stream pattern apparently in natural state.	Some channelization present, usually in areas of crossings, etc. Evidence of past alterations (before past 20 years) may be resent, but more recent channel alteration is not present.	New embankments present on both backs; 40-80% of the stream reach channelized & disrupted.	Banks shored with gabion or camant; over 80% of the stream reach channelized & disrupted.
scorel	16-20 /9	11-15	6-10	0.5
Comments:	5 C			
6. Sediment Deposition	Little or no enlargement of bars & leas than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravet, 5- 30% of the bottom affected; slight deposition in pools.	constrictions, & bends;	Heavy deposits of fine material, increased bar development; more than 50% of the hottom changing frequently; pools alminist absent due to substantial sediment deposition.
score	16-20	11.15 12	5-10	0-5
		the free		

5. Channel Flow Status	Water fills, baseflow channel; minima amount of channel substrate exposed,	Water fills > 75% of the baseflow channel; < 25% channel substrate exposed.	Water fills 25-73% of the baseflow channel; nifle substrates mostly exposed.	Very little water in channel, & mostly present as standing pools.
5. score:	16-20 / 8	11-15	6-10	0-5
Comments:				
Souther that				the second s
6. Bank Stability (score each bank) NOTE: Determine lett or right side while facing downstream.	Banks statile; no evidence of erasion or bank failure; little apparent putential for future problems,	infrequent, small areas of erosion mostly healed over.	size of erosional areas; up to 60% of banks in reach have erosion; high erosion potential during high flow.	Unstable; many eroded areas; "raw" areas frequent along straight sections & bends; obvious bank sloughing; 60-100% of banks have erosion scars on sideslopes.
E. score:	3-10	5-8	3-5	0-2
	Left Side 7		7	
		Average: Commenta:		
	Right Side 7			
7. Bank Vegetation Protection (score each bank) NOTE: refuce accres for annual crops & weeds which do not hold sell well (e.g. knapweed).	Over 90% of the streambank surfaces covered by stabilizing vegetation; vegetative disruption minimal or not evident; almost all plants allowed to grow naturally.	streambank surfaces covered by vegetation; disruption evident, but not affecting full plant growth potential to any great extent; more than	50-76% of the streambank surfaces covered in vegetation; disruption devious; patches of bare soil or closely sropped vegetation common; less than one-half of potential plant height remaining.	Less than 50% of the streambank surfaces covered by vegetation; extensive disruption of vegetation; vegetation removed to 2 inches or less.
7. score:	8-10	64	3-5	0-2
	Left.Side 0	Average:	85	
	Right Side 🧹	Comments:	01.5	
	P			
I. Vegetated Zone Width (score each side)	Width of vegetated zone > 100 leet.	Width of vegetated zone 30-100 feet.	Width of vegetated zone 10-30 feet.	Width of vegetated zone < 10 feet.
score:	8-10	6-8	2-5	0-2
	Left Side g		9	
	Right Side	Comments:		
	night alox -7			
OTAL SCORE:		Score compared to	o maximum possibl	e:

Waterbody Name Tot Outy Location Location Location MUC 100.50100 NAD 83 WG844 Lat Long Verified? By GPS Datum (Gree Oue): (NAD 27) NAD 83 WG844 Lat Long Verified? By GPS Datum (Gree Oue): (NAD 27) NAD 83 WG844 Lat Long obtained by method other than GPS? Y N YY what method used? If Y what method used? NAD 83 WG844 Sample Tiken: Sample Liferine Materinivertebrate Sample Liferine Sample Collection Procedure Materinivertebrate Materinivertebrate Materinivertebrate Sample Liferine Sample Collection Procedure AlgeoMacrophysic AlgeoMacrophysic Materinivertebrate Sample Liferine Sample Collection Procedure AlgeoMacrophysic Materinivertebrate Materinivertebrate Sample Collection Procedure Sample Collection Procedure AlgeoMacrophysic Materinivertebrate Materinivertebrate Cittable Cittable AlgeoMacrophysic Interventebrate Materinivertebrate Cittable Cittable AlgeoMacrophysic Stemen Reach Annt Other <th>2 2</th> <th></th> <th></th> <th>(One Station per page)</th> <th>Trip ID: 3005-0RPEND Date: 7.2 Personnel: Aard/aux 1600000</th>	2 2			(One Station per page)	Trip ID: 3005-0RPEND Date: 7.2 Personnel: Aard/aux 1600000
Verified? By GPS Datum (Crede Oue); (NAD 27) NAD 83 Int Y what method used? If by map what is the map scale? Sample Collection Proceedure Sample Collection Proceedure Commons Sample ID/File Location: Sample Collection Proceedure Sample Collection Proceedure Intex Dother D.3-08/35/30 RRAB SED-1 Intex Dother D.3-08/35/30 RRAB SED-1 Intex Dother D.3-08/35/30 RRAB SED-1 Intex Dother Dother PERL-1 OTHER: Intex Dother Dother Purpose: MIX Intex Dother N/A Kick Length (PL): N/A Intex Site Visit Comments: N/A Kick Length (PL): N/A		it #	Location	County Lows 1 (1)	VUO
Commons Sample ID/File Location: Commons Sample ID/File Location: Commons C 208 25 いう C 208 25 いう C 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ong obtained	Long hod other than GPS? Y N	Veri If Y what n	fied? By GPS Datur sethod used? If by map what is the m	Dae): NAD 27 NAD 83
Commons Commons Controls Commons Controls Commons Controls Commons Controls Commons Controls	1.00		3	amela ID/001- 10	I H
Other Other Other 0.3-0805 C Macroinvertebrate Kick Duration: N/A Kick Variation: N/A		Nutrients 🖾 Metals 🗍 Cor	+	C DODED	Sample Collection Procedure
Nitat Asm. 0 Other 0.3-0 & S > S > S > S > S > S > S > S > S > S	Jiment 🔲			0.02.000	GRAB
Other 0.3- 0 & S S C Other 0.3- 0 & S S C Intes 0 Macroinvertebrate Kick Duration: N A K Site Visit Comments:	croinvertebrate	Macroinvertebrate Habitat As			SED-1
Other D3-0605C PERt-1 O Other CHLPHL-2 Purpose: Purpose: Acconitivertebrate Kick Duration: N A Kick Length (h) Kite Visit Comments: N A Kick Length (h)	zae/Macrophytes	Aquatic Plant Form			KICK HESS OTHER:
Other CHLPHL.2 Ines Purpose: Macroinvertebrate Kick Duration: N A Kick Length (h Site Visit Comments:	iorophyll a		-	12	PERI-1 OTHER:
Macroinvertebraie Kick Duration: NAA	bitat Assessment	Stream Reach Acres Con-	5	0	CHLPHL-2 OTHER:
Macroinvertebrate Kick Duration: NIA Site Visit Comments:	Natrate D	Pabhla Count D & U.			M
Macroinvertebrate Kick Duration: MA Site Visit Comments:	Insert	Source county of Lines			
Acroinvertebrate Kick Duration: NIA Site Visit Comments:	otorranhs				
Acroinvertebrate Kick Duration: WA Site Visit Comments:	Id Notes				
Macroinvertebrate Kick Duration: WA Site Visit Comments:	her				
Site Visit Comments: N.A. Vicm Site Visit Comments:		91		Ш	
		100 100	Stee Viete C		Kick Length (Pt.): ////A
: (ms/cm) 8.4 b : (ms/cm) 3.6 3 x 1000 = µmho/cm : (mg/L) 9.6 7 5.4 R: Clear Slight □ Turbid □ Opaque □ bidity Comments: 58.0 f	M	A 0C	TISIA DIIC	omments:	
: (ms/sm) . 3.6.3 x 1000 =		1			
x 1000 =	: (mS/cm)	263			
2. (mg/L) 気化子 気が R: Clear Slight 1 Turbid [Opaque] bidity Comments: ふる がり	x 1000 =				
R: Clear 집 Slight Turbid Opaque D bidity Comments: 주중 NFU					
bildity Comments: AS AVU	R: Clear Shight	Turbid Onaone			
158. M(U	bidity Comments: ./	S MU			
	15	S. NN			
				A service and a links	

	TOTAL DISCHA	RGE: 24-03		Site Vielt Code	03-0825	
		and a second	Duecsino		A Contractor	MIDELATCO
		and a second	Baussian			
	**Distance from initial point	**Depth	**Velocity (at	**Width	"Area	"Discharge
1	1	.00	0			
2	2	,32	,60	1		
3	3	, 50	1.65	1		
4	4	1.15	1.60	1		
5	5	1.50	1.85	1		
5	6	1.50	1.98	1		
7	7	1.45	2.50	1		
1	8	1.50	305			
	9	1.40	3.01	/		
0	10	1.40	3.12	1		
1	11	1.40	2.68	1		
2	12 .	1.35	318	1		-
3	13	1.4	2.38	1		
4	14	1,4	2.81			1
5	16	1.4	2.60	1		
5	16	1.35	274	1		
4	17	1.3	2.44			
3	12	1.3	3.31	1		
1	19	1.3	1.32			
4	70	0,9	1.12			
+	21,0	0.6	. 60			
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Data Mpmi. Approved

				1
21.1.1.12	BRATE HABITAT ASSESSN			odenou de componences
MACROINVERTE	BRATE HABITAT ASSESSI	NENT FIELD FORM	RIFFL	E/RUN PREVALENCE
Date: 7-24-	-03	Site Visit Cod	· 03-0805	5
Waterbody: Dev	burg Kyr above Fi	C. diversion	Site: MIRA	1+006
Personnel: Sad	1 tina	State of the second second second		
HABITAT	F	1	-	
PARAMETER	OPTIMAL	SUB-OPTIMAL	MARGINAL	POOR
1A. Riffle Development	Well-developed niffle; niffle as wide as stream & estends two times width of stream.	Rittle as wide as stream but length less than two times width.	Reduced riffle area that is not as wide as stream & its length less than two times width.	Riffles virtually non- existent
TA. score:	8-10 10	4	3.6	0-2
Comments:				1 0.2
	Diverse substrate dominated by	Substrate diverse with	Robetrate desident of	1
18. Benthic Substrate	cobble.	abundant cobble, but bedrock, boulders, fine gravel, or sand prevalent	Substrate dominated by bedrock, boulders, sand, or silt; cobble present, t	Monotonous fine gravel, sand, silt, or bedrock substrate,
1B, score:	9-10 /0	6-8	3-5	0-2
Commenta:				
2. Embeddedness	Gravel, cobble, or boulder particles are between 0-25% surrounded by fine sediment (particles less than 6.35 mm (.25")).	Gravel, cobble, or boulder particles are between 25-50 % surrounded by fine sediment,	Gravel, cobble, or boulder particles are between 50-75% swrounded by fine sediment.	Gravel, cobble, or boulder particles are over 75% surrounded by fine sediment.
Locore	15-20 20	11-15	6-10	0-5
Comments:		100		
3. Channel Alteration (channelization, straightening, dredging, other atterations)	Channel siterations absent or minimal; stream pattern apparently in natural state.	Some channelization present, usually in areas of crossings, etc. Evidence of past alterations (before past 20 years) may be resent. but more recent channel alteration is not present.	New embankments present on both backs; 40-80% of the stream reach channelized & disrupted.	Banks shored with gabion or coment, over 80% of the stream reach channelized & disrupted.
score:	18-20 /9	11-15	6-10	0.5
Comments:				
	less than 5% of the bottom affected by sediment deposition.	30% of the bottom affected; slight deposition in pools.	new gravel, coarse sand on old & new bars; 30- 50% of the bottom affected; sediment deposits at obstructions, constrictions, & bends;	Heavy deposits of line material, increased bar development; more than 50% of the hottom changing frequently; pools almost absent ther to substantial sediment deposition.
\$0078.	18.20 / 9	11-15	6-10	0-5
Comments:				

5. Channel Flow Status	Water fills baseflow channel; minimat amount of channel substrate exposed.	Water fills > 75% of the baseflow channel; < 25% channel substrate exposed.	Water fills 25-75% of the baseflow channel; riffle substrates mostly exposed.	Very Sitle water in channel, & mostly present as standing pools.
5. score:	16-20 /2	11-15	6-10	0-5
Comments:	Low flows; Mul	cobble expo	sed on ethos	- Net BAD
6. Bank Stability (score each bank) NOTE: Determine left or right side while facing downstream.	Banks stable; no evidence of erosion or back failure; little apparent potential for future problems.	Moderately stable: infrequent, small areas of eroxion mostly healed over.	Moderately unstable? moderate frequency & size of erosional areas; up to 60% of banks in reach have erosion; high erosion potential during high flow.	Unstable; many eroded areas; "raw" areas frequent along straight sections & bends; obvious bank sloughing; D0-100% of banks have erosion scars on sidestopes.
6. Score:	8-10	64	3-5	0-2
	Left Side	Average	9	
	Right Side	Comments		
7. Bank Vegetation Protection (score each bank) NOTE; reduce scores for annual crops & wretis which do not hold soil well (e.g. knagwwed).	Over 90% of the streambark surfaces covered by stabilizing vegetation: vegetative disruption minimal or not avident; almost all plants allowed to grow naturally.	70-50% of the streambenk surfaces covered by vegetation; disruption evident, but not affecting hull plant growth potential to any great extent; more than one-half of potential plant height evident.	50-70% of the streambank surfaces covered in vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of potential plant height remaining.	Less than 10% of the streambank surfaces covered by vegetation; extensive disorption of vegetation; vegetation removed to 2 inches or less.
7. score:	5-10	6-8	3-4	0-2
	Left Side 9	Average	9	
	Right Side 9	Comments		
8. Vegetated Zone Width (score each side)	Width of vegetated zone > 100 feet.	Width of vegetated zone 20-100 feet.	Width of vegetated zone 10-30 feet.	Width of vegetated zone < 10 feet.
8. 800981	8-10	6-8	3-5	0-2
	Left Side 9	Average:	9	
01	Right Side 9	Comments:		
TOTAL SCORE:		Score compared t	o maximum possib	le:

Waterbody Name Flat County Lack County Lack J CharL Station ID	2+ Creek 2+ Creek Long	County Lews 4 Clevel Location EAA Verified? By GPS Datum If Y what method used? If by map what is the ma Sample ID/File Location: nons 0.3-082.6.0.0 0 0.5-082.6.0	County Luce 4 Clear HUC 100 301 003 Int Creat Rond Int GPS Datum (Create One) (NAD 27) NAD 83 WGS84 Int GPS Datum (Create One) (NAD 27) NAD 83 WGS84 Int GPS Datum (Create One) (NAD 27) NAD 83 WGS84 Int GPS Datum (Create One) (NAD 27) NAD 83 WGS84 Int GPS Datum (Create One) (NAD 27) NAD 83 WGS84 Interview Sample Collection Procedure GPS Datum GPS Datum Section Sample Collection Procedure GPAB GPAB Section Sample Collection Procedure GPAB GPAB Section Section GPAB GPAB Section GPAB SED 1 GPAB Section SED 1 OTHER: GPAB Section CHLPHL-2 OTHER: GPAB Section Purpose: TMO Purpose: TMO
LatLongLong	Vet GPS? Y [] N [] If Y what Metals [] Commons [3] Form [] Form [] Asmt. [] Other []	ified? □ ByGPS Datum method used? If by map what is the ma Sample ID/File Location: 53-0£26.00	Diele (NAD 27) NAD 83 Sample Collection Procedur GRAB SED-1 SED-1 KICK HESS OTHER: PERI-1 OTHER: CHLPHL-2, OTHER: Purpose: 700/1
Samples Taken: Water Sediment Solutions Solution Solution Solution Solution Solution Solution Solution Solution Plan According Science Data Science	Metais Commons A	Sample ID/File Location: 6-3-0826400 D3-08260	
	Commons C	03-0826C	Sample Collection Procedure GRAB SED-1 KICK HESS OTHER: PERI-1 OTHER: PERI-1 OTHER: CHLPHL-2, OTHER: Purpose: 7700/4
	Form [] Form [] Asmt. [] Other []	D3-082.60	HESS IL-2) e: 7)
	Form Form Other Other Form Form	D3-082.6C	HESS 0T 1L-2) e: 7)
口区口	Form Form Asmt. Other	03-08260	
回口	Asmt. [] Other []	03-08260	int in the second se
C	Asmt. Other	2.42.70 C.62.7	
]	Fines		
	~ rines		
Photographs			
Field Notes			
Other			
Measurements: Time: 18-000	Macroleura	Mucrolin unstabuted which recently and a	
	Ect Case Viola	Clear Viete Contrate Nick Duration: 10/14	Kick Length (Ft.):
Temp: (*C) W / 5 1 % A	-lev	Comments:	
pH: § 50			
SC: (mS/cm) . 259			
SC x 1000 =	umbo/em		
DO: (mg/L) 9. 51 mc/c	94.6 Th		
TUR: Clear Slight Turbid Oppone	Dadue		
Turbidity Comments: 5,65			
010 PYS			
		SA LINE CARLES AND AND	
2			

	TOTAL DISCH	ARGE:		Cite Main Carden	03-0826	
	Manufacture of the local division of the loc	Flat Crark	-	Site Visit Code:		MIZFIA+CO7
	Personnel:		Bowman		Station 12.	THE CENCY CO. P
	**Distance from	See Law of each other states of the	"Velocity (at	**Width		a sufficient sufficient
	initial point	Deput	point	-width	**Area	**Discharge
1	1	1.0	.09			
2	2	1.2	.67			
3	3	1.2	1.84			
4	4	1.3	3.10	_		
5	-	1.6	2.03		_	
6	6	0.9	2.45			
7	6	1.0	2.95			
8	G	A 9	2.87			
9	10	1.2	270			
11	10	1.20	3.15			
12	12	1.2	3.17			
13	13	1.2	2.48			
14	14	0.9	0.61			
15	15	0.6	0.05			
6	16	0.65	36			
7	17	0.62	1.37			
8	18	0,65	1.67			
9	19	0,45	0			
0						
1						
2						
3	-					
4	_	1				
5						
8						
7	20					
1						
4						

Page 1 of 2

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Waterbody Name HUC DOUBLE Station ID Location Visit # Location Location Lat Long Visit # Location NAD 23 NAD 83 Lat/Long obtained by method other than GPS Y N FY what method used f f by map what is the map scale? Sample Collection Proce Simples Taken: Sample DYFile Location: Sample Collection Proce Sample Collection Proce Substrate Macroinvertebrate Habitat Asni, IC 03-08-08-00 Sample Collection Proce Algeo/Microphytics Macroinvertebrate Macroinvertebrate Sample Collection Proce Algeo/Microphytics Ageo/Microphytics 03-08-08-00 Sample Collection Proce Algeo/Microphytics Ageoint Plant Form 03-08-08-00 Sample Collection Proce Algeo/Microphytics Ageoint Plant Form 03-08-08-00 Sample Collection Proce Algeo/Microphytics Ageoint Plant Form 03-08-08-00 Sample Collection Proce Substrate Proble Count Sareas Sample Coll			(One Station per page)	Trip ID: 6003-D2020 Date:
Verified? By GPS Datum (Crecte On Control used? If by map what is the map scale? Commons Sample ID/File Location: Sample ID/File Location: Commons 0.3 - 0.8 - 0.8 - 0.9	Vaterbody Name T	visit# 2	Lewis + Clark	HUC [00 30/62]
Commons C Sample ID/File Location:	at/Long obtained by me	Long	Verified? By GPS Datum (0 that method used? If by man what is the most of	Due): (NAD 27)
Commons Common			e distri aire er man dann f	calci
Image: Section of the sectio			-	Sample Collection Procedure
Image: New York D3-06.30 M Other 0.3-05.30 C Other 0.3-05.30 C Milecton 0.3-05.30 C Milecton <td< td=""><td>ediment 🛛</td><td></td><td>+</td><td>GRAB</td></td<>	ediment 🛛		+	GRAB
Other 03-0%20 C Other 03-0%20 C Ines 03-0%20 C Matroin vertebrate Kick Duration: 2 Site Visit Comments: A	1		ha hitoh an	SED-1
Other 03-0%30 C Ines 03-0%30 C Macroinvertebrato Kick Duration: Andres Kein Site Visit Comments:			14 000 1 0	KICK, HESS OTHER:
Other	ilorophyll a 🖂		63-0220H	PERI-1 OTHER:
Macroinvertebrato Kick Duration: 2 A.A.4.5 K	bitht Assessment	Stream Barak And Direction	20100000	CHLPHL-2 OTHER:
Macroinvertebraic Kick Duration: 2 And S	ubstrate	Debth Court of an other		Purpose: TMD.F
Macroinvertebrate Kick Duration: 2 M. Auf Site Visit Comments:	ansect	second Count 1 to Fines		
Macroinvertebrate Kick Duration:	otographs			
Macroinvertebrate Kiek Duration: 2 mondrs Site Visit Comments:	eld Notes			
Macroinvertebraic Kiek Duration: 2 Mudd Site Visit Comments:	her			
Site Visit Comments:	T	16.00		
		He D	S more	Kick Length (Ft.):
I: C 4 5 I: (ms/cm) 4 5 jumbo/cm I: 1000 = jumbo/cm jumbo/cm jumbo/cm I: I: 11 jumbo/cm jumbo/cm I: Clear Slight Turbid Opeque Ibidity Comments: 4 4 jumbo/cm		21 98 A	Isit Comments:	
: (ms/em) 455 :x 1000 = µmho/cm :: (mg/L) 11 31 million :: (mg/L) 11 31 million R: Clear Slight Comments: 4 9 million mbldity Comments: 4 9 million	E	0		
1000 = jurtho/cm 1001 = jurtho/cm 1101 = jurtho/cm 111 = jurtho/cm <td>C: (mS/cm)</td> <td></td> <td></td> <td></td>	C: (mS/cm)			
2: (mg/L) IV 3U on IV 12470 R: Clear Slight Trubid Opaque D thidity Comments: 4 9 MrD	X 1000 =	timholom		
R: Clear Slight Turbid Opaque Didity Comments: 4 9 MD		Cold and		
bldity Comments: 4-98 NM Cr.4P	JR: Clear Slight	Turbid Comme		
Cr 1/b	rbidity Comments: 4	-9% Mil)		
	0	1 dp		
			ALL THE THE ALL AND AL	

Date	: 7-23-	50	5	Site Visit Code:	03-0820	
Wat	erbody: Nat	- Cleek	Below Budle			MIZFLATCO8
Pers	ionnel: La	aidlaw	Borowie	_	_	
	istance from initial point	**Depth	"Velocity (at point)	**Width	"Area	"Discharge
1	2	,40	,03	D		
2	35	. 65	.16	1.5		
3	5.0	1.0	121	1.5		
4	6.5	1.15	.36	1:5		
5	80	1.0	.26	15		
6	96	1.05	,35	1.5		
7	11.0	1.22	15	1.5		
8	18.15	1.32	.34	1.5		
9	14.0	1.25	. 29	1.5		
10	15,5	1.40	.17	1.5		
11	17.0	1.45	.19	1.5		
12	18,5	1.45	.23	1.5		
13	10.0	1.57	,02	1.5		
14	21.5	1.5	.03	1.5		
15	03.0	1.32	O	1.5		
16	24.5	.98	0	1.5		
7	26.0	,48	0	15		
18	27.3	0	0			
9						
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2						
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9					1000	
0						

Page 1 st 2

Data Mgmt. Approved

M12FLATC06	Date-	6/18/2003	17:20
Flat Creek, Diversion from the Dearborn River			

Geomorphology Data					
parameter	value	units			
Bankfull Width		Ft			
Mean Depth		Ft			
Bnkfull X-sect area		Sq Ft			
Width/Depth					
Max Depth		Ft			
Flood prone width		Ft			
Entrenchement Ratio					
Water slope					
Channel Sinuosity					
BEHI Index Score (adjusted)					
BEHI Rating					
Channel D50		mm			
Percentage of Fines (<2mm)		%			
Stream Type					
Discharge	76.2	22 cfs			

Stream Reach Habitat Assessments					
Parameter	Value	Units			
Stream Reach Assessment Score (NRCS)		%			
Stream Reach Assessment Score (MT adjusted)		%			
Macroinvertabrate Habitat Assessment Score		%			
OVERALL SITE RATINGS					
Stream Reach Assessment Score (NRCS)					
Stream Reach Assessment Score (MT adjusted)					
Macroinvertabrate Habitat Assessment Score					

Field Measurements of water chemistry					
parameter	value	units			
Flow	76.22	cfs			
Temperature, water	13.12	degree C			
рН	8.43				
Specific Conductance	0.227	mS/cm			
Dissolved Oxygen	9.47	mg/L			
Dissolved Oxygen, % Saturation	90	%			
Turbidity	1	NTU			

Lab Results from Field Samples					
parameter	value	units	RL		
Total Suspended Solids, TSS	ND	mg/L	10		
Volatile Suspended Solids, VSS	ND	mg/L	10		
TSS-VSS	ND	mg/L	10		
Water Column Chlorophyll a	2.1	mg/m^3	0.1		
Benthic Chlorophyll a	30.7	mg/m^3	0.1		
Total Phosphorus, TP	0.009	mg/L	0.004		
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5		
Nitrate + Nitrite	ND	mg/L	0.01		
Total Nitrogen, TN		mg/L			

M12FLATC02	
Flat Creek on Flat Creek Rd, just above Culvert	

Date-

20:30

6/18/2003

Geomorphology Data				
parameter	value	units		
Bankfull Width		Ft		
Mean Depth		Ft		
Bnkfull X-sect area		Sq Ft		
Width/Depth				
Max Depth		Ft		
Flood prone width		Ft		
Entrenchement Ratio				
Water slope				
Channel Sinuosity				
BEHI Index Score (adjusted)				
BEHI Rating				
Channel D50		mm		
Percentage of Fines (<2mm)		%		
Stream Type				
Discharge		cfs		

Stream Reach Habitat Assessments					
Parameter	Value	Units			
Stream Reach Assessment Score (NRCS)		%			
Stream Reach Assessment Score (MT adjusted)		%			
Macroinvertabrate Habitat Assessment Score		%			
OVERALL SITE RATIN	IGS				
Stream Reach Assessment Score (NRCS)					
Stream Reach Assessment Score (MT adjusted)					
Macroinvertabrate Habitat Assessment Score					

Field Measurements of water chemistry		
parameter	value	units
Flow		cfs
Temperature, water		degree C
рН		
Specific Conductance		mS/cm
Dissolved Oxygen		mg/L
Dissolved Oxygen, % Saturation		%
Turbidity	7.29	NTU

Lab Results from Field Samples				
parameter	value	units	RL	
Total Suspended Solids, TSS	ND	mg/L	10	
Volatile Suspended Solids, VSS	ND	mg/L	10	
TSS-VSS	ND	mg/L	10	
Water Column Chlorophyll a	ND	mg/m^3	0.1	
Benthic Chlorophyll a	8.3	mg/m^3	0.1	
Total Phosphorus, TP	ND	mg/L	0.004	
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5	
Nitrate + Nitrite	ND	mg/L	0.01	
Total Nitrogen, TN		mg/L		

M12FLATC05	Date-	6/18/2003	17:0
Flat Creek DS of Milford Colony	•		
Geomorph	ology Data		
parameter	value	units	
Bankfull Width		Ft	
Mean Depth		Ft	
Bnkfull X-sect area		Sq Ft	
Width/Depth			
Max Depth		Ft	
Flood prone width		Ft	
Entrenchement Ratio			
Water slope			
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating			
Channel D50	2	7 mm	
Percentage of Fines (<2mm)	13.1	6 %	
Stream Type			
Discharge	30.8	4 cfs	

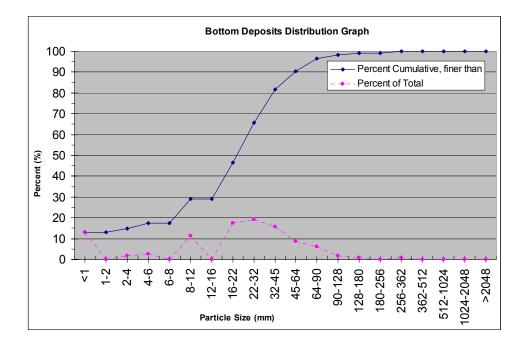
Stream Reach Habitat Assessments					
Parameter	Value	Units			
Stream Reach Assessment Score (NRCS)		%			
Stream Reach Assessment Score (MT adjusted)		%			
Macroinvertabrate Habitat Assessment Score		%			
OVERALL SITE RATIN	IGS				
Stream Reach Assessment Score (NRCS)					
Stream Reach Assessment Score (MT adjusted)					
Macroinvertabrate Habitat Assessment Score					

Field Measurements of water chemistry				
parameter	value	units		
Flow	30.84	cfs		
Temperature, water	21.96	degree C		
рН	8.69			
Specific Conductance	0.29	mS/cm		
Dissolved Oxygen	9.06	mg/L		
Dissolved Oxygen, % Saturation	103.6	%		
Turbidity	10.8	NTU		

Lab Results from F	ield Samples		1
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	ND	mg/m^3	0.1
Benthic Chlorophyll a	3	1 mg/m^3	0.1
Total Phosphorus, TP	0.01	2 mg/L	0.004
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5
Nitrate + Nitrite	ND	mg/L	0.01
Total Nitrogen, TN		mg/L	

Macroinvertabrate Data Results				
parameter	value	units		
TOTAL SCORE (max =18)	8	score		
PERCENT OF MAX SCORE	44	%		
IMPAIRMENT CLASSIFICATION	MODERATE	E IMPAIRMENT		
USE SUPPORT	PARTIAL S	JPPORT		

		Pebble Count Data			
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total
S/C	0.5	<1	15	13.16	13.16
S	1.5	1-2		0.00	13.16
FG		2-4	2	1.75	14.91
FG		4-6	3	2.63	17.54
FG		6-8		0.00	17.54
MG	10	8-12	13	11.40	28.95
MG		12-16		0.00	28.95
CG	18	16-22	20	17.54	46.49
CG		22-32	22	19.30	65.79
CG		32-45	18	15.79	81.58
CG	54.5	45-64	10	8.77	90.35
SC	77	64-90	7	6.14	96.49
SC	109	90-128	2	1.75	98.25
MC	154	128-180	1	0.88	99.12
LC	218	180-256		0.00	99.12
LC	309	256-362	1	0.88	100.00
SB	437	362-512		0.00	100.00
MB	768	512-1024		0.00	100.00
LB	1536	1024-2048		0.00	100.00
BR		>2048		0.00	100.00
		TOTALS	114	100.00	100.00
		D50 particle size (mm)	22-32		
		% Fines (<2mm)	13.16		
M12FLATC05	Date-	6/18/2003	17	7:00	
Flat Creek DS of Milford C	olony				



M12FLATC08	Date-	6/18/2003	13:30
Flat Creek below Birdtail Rd on Dearborn Ranch	1		

Geomorphology Data				
parameter	value	units		
Bankfull Width	33.00	Ft		
Mean Depth	3.67	Ft		
Bnkfull X-sect area	120.96	Sq Ft		
Width/Depth	9.00			
Max Depth	5.49	Ft		
Flood prone width	100.00	Ft		
Entrenchement Ratio	3.03			
Water slope	0.0017			
Channel Sinuosity	2.59			
BEHI Index Score (adjusted)	29.00			
BEHI Rating	M	oderate		
Channel D50	10	mm		
Percentage of Fines (<2mm)	15.79	%		
Stream Type				
Discharge	17.35	cfs		

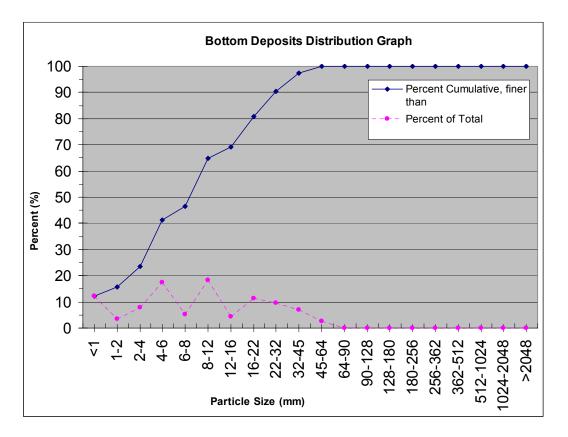
Stream Reach Habitat Assessments			
Parameter	Value	Units	
Stream Reach Assessment Score (NRCS)	94.8	%	
Stream Reach Assessment Score (MT adjusted)	94.1	%	
Macroinvertabrate Habitat Assessment Score	%		
OVERALL SITE RATINGS			
Stream Reach Assessment Score (NRCS)	Non Impaired, Fully Supporting		
Stream Reach Assessment Score (MT adjusted)			

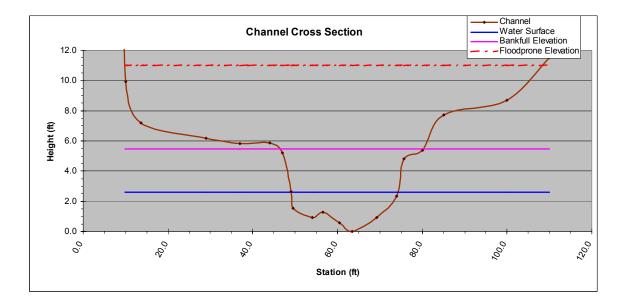
Field Measurements of water chemistry					
parameter value units					
Flow	17.35	cfs			
Temperature, water	21.51	degree C			
рН	8.44				
Specific Conductance	0.477	mS/cm			
Dissolved Oxygen	11.3	mg/L			
Dissolved Oxygen, % Saturation	126.6	%			
Turbidity	7.39	NTU			

Lab Results from Field Samples			
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	0.9	9 mg/m^3	0.1
Benthic Chlorophyll a	12.9	mg/m^3	0.1
Total Phosphorus, TP	0.06	mg/L	0.004
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5
Nitrate + Nitrite	ND	mg/L	0.01
Total Nitrogen, TN		mg/L	

Macroinvertabrate Data Results				
parameter value units				
TOTAL SCORE (max =18)	6	score		
PERCENT OF MAX SCORE	33	%		
IMPAIRMENT CLASSIFICATION	MODERATE IMPAIRMENT			
USE SUPPORT	PARTIAL S	JPPORT		

		Pebble Count Data				
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total	
S/C	0.5	<1	14	12.28	12.28	
S	1.5	1-2	4	3.51	15.79	
FG	3	2-4	9	7.89	23.68	
FG	5	4-6	20	17.54	41.23	
FG	7	6-8	6	5.26	46.49	
MG	10	8-12	21	18.42	64.91	
MG	14	12-16	5	4.39	69.30	
CG	18	16-22	13	11.40	80.70	
CG	27	22-32	11	9.65	90.35	
CG	38.5	32-45	8	7.02	97.37	
CG	54.5	45-64	3	2.63	100.00	
SC	77	64-90		0.00	100.00	
SC	109	90-128		0.00	100.00	
MC	154	128-180		0.00	100.00	
LC	218	180-256		0.00	100.00	
LC	309	256-362		0.00	100.00	
SB	437	362-512		0.00	100.00	
MB	768	512-1024		0.00	100.00	
LB	1536	1024-2048		0.00	100.00	
BR		>2048		0.00	100.00	
		TOTALS	114	100.00	100.00	
		D50 particle size (mm)	8-12			
		% Fines (<2mm)	15.79			
M12FLATC08	Date-	6/18/2003	1	3:30		
Flat Creek below Birdtai	Flat Creek below Birdtail Rd on Dearborn Ranch					





	BEHI Field M	easures		BEHI Calcula	ted Value	es
	Parameter	Value	Units	Parameter	Value	Units
	Rod reading @ Upstream Edge			Slope	0.0017	
-ongitudinal Information	of Water	12.03	feet	Sinuousity	2.59	
nat	Rod reading @ Downstream			Max Depth	5.49	feet
orm	Edge of Water	14.25	feet	Floodprone Height	10.97	feet
i j	Stream Distance	1340.00	feet	Mean Depth	3.67	feet
	Straightline Distance	517.00	feet	Bankfull Width	33.00	feet
=	Left Edge of Bankfull	47.00	feet	Floodplrone Width	100.00	feet
Cross-Sectional Information	Right Edge of Bankfull	80.00	feet	Bankfull Area	120.96	ft^2
oss-Section Information	Rod reading @ Thalweg	16.62	feet	FloodproneArea		ft^2
Sec	Rod reading @ Bankfull Depth	11.13	feet	W/D Ratio	9.00	
for	Rod reading @ Floodplain Depth	5.65	feet	Cross Sectional Area	120.96	ft^2
õ –	Left Edge of Floodprone depth	10.00	feet	Entrenchment Ratio	3.03	
U U	Right Edge of Floodprone depth	110.00	feet			
u	Bank Height	11.00	feet			
atic	Bankfull Height	5.88		Bank Ht/Bankfull Ht	1.87	
Ĕ	Root Depth	1.00	feet	Root Depth/Bank Ht	0.09	
Į	Root Density	25.00		Root Density	25	%
-	Bank Angle		Degrees	Bank Angle		degrees
BEHI Information	Surface Protection	50.00	%	Surface Protection	50	%
SS	Velocity at thalweg		ft/sec	Velocity Gradient	0.06	ft/sec/ft
Stress tion	Tape reading at thalweg	63.00		Near Bank stress / Mean		
k S atic	velocity at left bank		ft/sec	Shear stress		
ar Bank Stre Information	tape reading at left bank	49.00	feet	A nb / A		
a je	Near bank stress					
Near Inf	Mean shear stress					
z	Near bank x-sectional area		ft^2			

BEHI Associated Index Value (from form)		Possible Adjustment Factors	
Bank Ht/Bankfull Ht	6.00	Bank Materials	
Root Depth/Bank Ht	8.00	Bedrock is always Very Low	
Root Density	6.00	Boulders are always Low	
Bank Angle	5.00	Cobble decrease the category by one unless the mixture	
Surface Protection	4.00	of Sand/Gravel is over 50%	
Total Index Value	29.0	Gravel- adjust the values up 5-10 pts depending on	
Numeric Adjustments:		sand composition	
Bank Materials Index adjustment:		Sand- adjust the values up 10 pts	
Dank Materials much adjustment.		silt/clay- no adjustment	
		Stratification	
Bank Stratification Index adjustment:		5-10 pts upward depending on position of unstable	
Total adjusted Index Value:	29.0	layers relative to bankfull stage	
Bank Erosion Potential Ra	ting:	Moderate	

M12FLATC04	Date-	6/18/2003	9:1
Flat Creek at confluence with Dearbo	orn River on Dearborn	n Ranch	
Geomorp	hology Data		
parameter	value	units	
Bankfull Width		Ft	
Mean Depth		Ft	
Bnkfull X-sect area		Sq Ft	
Width/Depth			
Max Depth		Ft	
Flood prone width		Ft	
Entrenchement Ratio			
Water slope			
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating			
Channel D50	15	4 mm	
Percentage of Fines (<2mm)	2.8	0 %	
Stream Type			
Discharge	19.5	1 cfs	

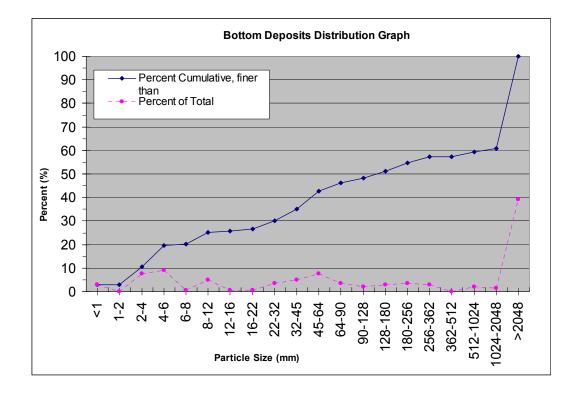
Stream Reach Habitat Assessments			
Parameter	Value	Units	
Stream Reach Assessment Score (NRCS)		%	
Stream Reach Assessment Score (MT adjusted)		%	
Macroinvertabrate Habitat Assessment Score		%	
OVERALL SITE RATIN	IGS		
Stream Reach Assessment Score (NRCS)			
Stream Reach Assessment Score (MT adjusted)			
Macroinvertabrate Habitat Assessment Score			

Field Measurements of water chemistry					
parameter value units					
Flow	19.51	cfs			
Temperature, water	18.51	degree C			
рН	8.37				
Specific Conductance	0.401	mS/cm			
Dissolved Oxygen	8.95	mg/L			
Dissolved Oxygen, % Saturation	95.7	%			
Turbidity		NTU			

Lab Results from Field Samples			
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	ND	mg/m^3	0.1
Benthic Chlorophyll a	16.6	6 mg/m^3	0.1
Total Phosphorus, TP	0.034	mg/L	0.004
Total Kiejdahl Notrogen, TKN	3.0	8 mg/L	0.5
Nitrate + Nitrite	ND	mg/L	0.01
Total Nitrogen, TN		mg/L	

Macroinvertabrate Data Results				
parameter value units				
TOTAL SCORE (max =18)	5	score		
PERCENT OF MAX SCORE	28	%		
IMPAIRMENT CLASSIFICATION	MODERATE IMPAIRMENT			
USE SUPPORT PARTIAL SUPPORT				

		Pebble Count Data					
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total		
S/C	0.5	<1	4	2.80	2.80		
S	1.5	1-2		0.00	2.80		
FG	3	2-4	11	7.69	10.49		
FG	5	4-6	13	9.09	19.58		
FG	7	6-8	1	0.70	20.28		
MG	10	8-12	7	4.90	25.17		
MG		12-16	1	0.70	25.87		
CG	18	16-22	1	0.70	26.57		
CG		22-32	5	3.50	30.07		
CG		32-45	7	4.90	34.97		
CG	54.5	45-64	11	7.69	42.66		
SC		64-90	5	3.50	46.15		
SC	109	90-128	3	2.10	48.25		
MC	154	128-180	4	2.80	51.05		
LC		180-256	5	3.50			
LC	309	256-362	4	2.80	57.34		
SB	437	362-512		0.00	57.34		
MB	768	512-1024	3	2.10	59.44		
LB	1536	1024-2048	2	1.40	60.84		
BR		>2048	56	39.16	100.00		
		TOTALS	143	100.00	100.00		
		D50 particle size (mm)	128-180				
		% Fines (<2mm)	2.80				
M12FLATC04	Date-	6/18/2003	9	:15			
Flat Creek at confluence	Iat Creek at confluence with Dearborn River on Dearborn Ranch						



M12FLATC06	Date-	7/24/2003	16:45		
Flat Creek, Diversion from the Dearborn River					
Geomorphology D	ata				
parameter	value	units			
Bankfull Width		Ft			
Mean Depth		Ft			
Bnkfull X-sect area		Sq Ft			
Width/Depth					
Max Depth		Ft			
Flood prone width		Ft			
Entrenchement Ratio					
Water slope					
Channel Sinuosity					
BEHI Index Score (adjusted)					
BEHI Rating					
Channel D50		mm			
Percentage of Fines (<2mm)		%			
Stream Type					
Discharge	57.91	cfs			

Stream Reach Habitat Assessments					
Parameter	Value	Units			
Stream Reach Assessment Score (NRCS)		%			
Stream Reach Assessment Score (MT adjusted)		%			
Macroinvertabrate Habitat Assessment Score		%			
OVERALL SITE RATINGS					
Stream Reach Assessment Score (NRCS)					
Stream Reach Assessment Score (MT adjusted)					
Macroinvertabrate Habitat Assessment Score					

Field Measurements of water chemistry						
parameter value units						
Flow	57.91	cfs				
Temperature, water	14.7	degree C				
рН	8.46					
Specific Conductance	0.263	mS/cm				
Dissolved Oxygen	9.67	mg/L				
Dissolved Oxygen, % Saturation	95.4	%				
Turbidity	0.46	NTU				

Lab Results from Field Samples				
parameter value units				
Total Suspended Solids, TSS	ND	mg/L	10	
Volatile Suspended Solids, VSS	ND	mg/L	10	
TSS-VSS	ND	mg/L	10	
Water Column Chlorophyll a	1.8	mg/m^3	0.1	
Benthic Chlorophyll a	5.7	mg/m^3	0.1	
Total Phosphorus, TP	ND	mg/L	0.004	
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5	
Nitrate + Nitrite	0.056	mg/L	0.01	
Total Nitrogen, TN		mg/L		

M12FLATC02	Date-	7/24/2003	18:0
Flat Creek on Flat Creek Rd, just above (Culvert		
Geomorpholog	gy Data		
parameter	value	units	
Bankfull Width		Ft	
Mean Depth		Ft	
Bnkfull X-sect area		Sq Ft	
Width/Depth			
Max Depth		Ft	
Flood prone width		Ft	
Entrenchement Ratio			
Water slope			
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating			
Channel D50		mm	
Percentage of Fines (<2mm)		%	
Stream Type			
Discharge	34.47	cfs	

Stream Reach Habitat Assessments				
Parameter	Value	Units		
Stream Reach Assessment Score (NRCS)		%		
Stream Reach Assessment Score (MT adjusted)		%		
Macroinvertabrate Habitat Assessment Score		%		
OVERALL SITE RATINGS				
Stream Reach Assessment Score (NRCS)				
Stream Reach Assessment Score (MT adjusted)				
Macroinvertabrate Habitat Assessment Score				

Field Measurements of water chemistry						
parameter value units						
Flow	34.47	cfs				
Temperature, water	15.11	degree C				
pН	8.5					
Specific Conductance	0.259	mS/cm				
Dissolved Oxygen	9.51	mg/L				
Dissolved Oxygen, % Saturation	94.6	%				
Turbidity	3.55	NTU				

Lab Results from Field Samples			
parameter	value	units	RL
Total Suspended Solids, TSS	ND	mg/L	10
Volatile Suspended Solids, VSS	ND	mg/L	10
TSS-VSS	ND	mg/L	10
Water Column Chlorophyll a	3.6	mg/m^3	0.1
Benthic Chlorophyll a	19.2	mg/m^3	0.1
Total Phosphorus, TP	0.069	mg/L	0.004
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5
Nitrate + Nitrite	ND	mg/L	0.01
Total Nitrogen, TN		mg/L	

M12FLATC05	Date-	7/24/2003	13:3
Flat Creek DS of Milford Colony			
Geomorpl	nology Data		
parameter	value	units	
Bankfull Width		Ft	
Mean Depth		Ft	
Bnkfull X-sect area		Sq Ft	
Width/Depth			
Max Depth		Ft	
Flood prone width		Ft	
Entrenchement Ratio			
Water slope			
Channel Sinuosity			
BEHI Index Score (adjusted)			
BEHI Rating			
Channel D50	27	mm	
Percentage of Fines (<2mm)	13.16	%	
Stream Type			
Discharge	13.44	cfs	

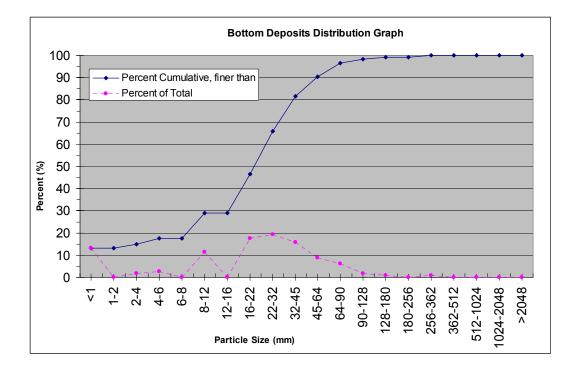
Stream Reach Habitat Assessments				
Parameter	Value	Units		
Stream Reach Assessment Score (NRCS)		%		
Stream Reach Assessment Score (MT adjusted)		%		
Macroinvertabrate Habitat Assessment Score	80	%		
OVERALL SITE RATIN	IGS			
Stream Reach Assessment Score (NRCS)				
Stream Reach Assessment Score (MT adjusted)				
Macroinvertabrate Habitat Assessment Score				

Field Measurements of water chemistry					
parameter value units					
Flow	13.44	cfs			
Temperature, water	17.68	degree C			
рН	8.32				
Specific Conductance	0.273	mS/cm			
Dissolved Oxygen	9.14	mg/L			
Dissolved Oxygen, % Saturation	96	%			
Turbidity	10.45	NTU			

Lab Results from Field Samples							
parameter value units							
Total Suspended Solids, TSS	14	mg/L	10				
Volatile Suspended Solids, VSS	ND	mg/L	10				
TSS-VSS	14	mg/L	10				
Water Column Chlorophyll a	2.1	mg/m^3	0.1				
Benthic Chlorophyll a	22.2	mg/m^3	0.1				
Total Phosphorus, TP	0.069	mg/L	0.004				
Total Kiejdahl Notrogen, TKN	0.6	mg/L	0.5				
Nitrate + Nitrite	ND	mg/L	0.01				
Total Nitrogen, TN		mg/L					

Macroinvertabrate Data Results						
parameter value units						
TOTAL SCORE (max =18)	8	score				
PERCENT OF MAX SCORE	44	%				
IMPAIRMENT CLASSIFICATION MODERATE IMPAIRMENT						
USE SUPPORT PARTIAL SUPPORT						

		Pebble Count Data					
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total		
S/C	0.5	<1	15	13.16	13.16		
S	1.5	1-2		0.00	13.16		
FG	3	2-4	2	1.75	14.91		
FG	5	4-6	3	2.63	17.54		
FG		6-8		0.00	17.54		
MG	10	8-12	13	11.40	28.95		
MG	14	12-16		0.00	28.95		
CG		16-22	20	17.54	46.49		
CG	27	22-32	22	19.30	65.79		
CG		32-45	18		81.58		
CG	54.5	45-64	10	8.77	90.35		
SC	77	64-90	7	6.14	96.49		
SC	109	90-128	2	1.75	98.25		
MC		128-180	1	0.88	99.12		
LC		180-256		0.00	99.12		
LC	309	256-362	1	0.88	100.00		
SB	437	362-512		0.00	100.00		
MB	768	512-1024		0.00	100.00		
LB	1536	1024-2048		0.00	100.00		
BR		>2048		0.00	100.00		
		TOTALS	114	100.00	100.00		
		D50 particle size (mm)	22-32				
		% Fines (<2mm)	13.16				
	M12FLATC05	Date-	7/24/2003		13:30		
	Flat Creek DS of Milford Colony						



M12FLATC03	Date-	7/22/2003	9:45
Flat Creek Upstream of Hwy 200, on Dear	born Ranch prop	erty	
Geomorpholo	ogy Data		
parameter	value	units	
Bankfull Width	23.00	Ft	
Mean Depth	2.15	Ft	
Bnkfull X-sect area	49.39	Sq Ft	
Width/Depth	10.71		
Max Depth	3.15	Ft	
Flood prone width	63.00	Ft	
Entrenchement Ratio	2.74		
Water slope	0.0046		
Channel Sinuosity	1.23	1	
BEHI Index Score (adjusted)	30.10)	
BEHI Rating	MDDI	ERATE-HIGH	
Channel D50		mm	
Percentage of Fines (<2mm)	31.97	%	
Stream Type	C4	borderline E4, just	<mark>t needs m</mark> ore sinuol
Discharge	13.42	cfs	

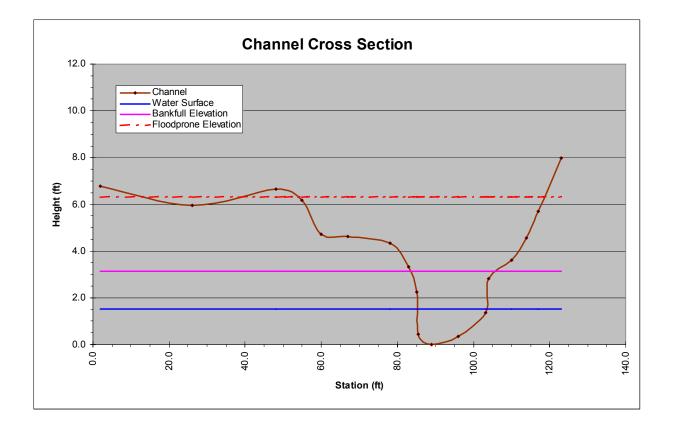
Stream Reach Habitat Assessments					
Parameter	Value	Un	nits		
Stream Reach Assessment Score (NRCS)		%			
Stream Reach Assessment Score (MT adjusted)		%			
Macroinvertabrate Habitat Assessment Score		%			
OVERALL SITE RATIN	IGS				
Stream Reach Assessment Score (NRCS)					
Stream Reach Assessment Score (MT adjusted)					
Macroinvertabrate Habitat Assessment Score					

Field Measurements of water chemistry							
parameter value units							
Flow	13.42	cfs					
Temperature, water	18.32	degree C					
рН	8.01						
Specific Conductance	0.313	mS/cm					
Dissolved Oxygen	9.83	mg/L					
Dissolved Oxygen, % Saturation	104.3	%					
Turbidity	10.14	NTU					

Lab Results from Field Samples							
parameter value units							
Total Suspended Solids, TSS	ND	mg/L	10				
Volatile Suspended Solids, VSS	ND	mg/L	10				
TSS-VSS	ND	mg/L	10				
Water Column Chlorophyll a	2.4	4	0.1				
Benthic Chlorophyll a	31.	6	0.1				
Total Phosphorus, TP	0.02	5	0.004				
Total Kiejdahl Notrogen, TKN	ND		0.5				
Nitrate + Nitrite	ND		0.01				
Total Nitrogen, TN							

Macroinvertabrate Data Results						
parameter value units						
TOTAL SCORE (max =18)	5	score				
PERCENT OF MAX SCORE	28	%				
IMPAIRMENT CLASSIFICATION MODERATE IMPAIRMENT						
USE SUPPORT PARTIAL SUPPORT						

		Pebble Count Data				
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total	
S/C	0.5	<1	27	22.13	22.13	
S	1.5	1-2	12	9.84	31.97	
FG	3	2-4		0.00	31.97	
FG	5	4-6	3	2.46	34.43	
FG	7	6-8		0.00	34.43	
MG	10	8-12	3	2.46	36.89	
MG	14	12-16	4	3.28	40.16	
CG	18	16-22	4	3.28	43.44	
CG	27	22-32	9	7.38		
CG	38.5	32-45	16	13.11	63.93	
CG	54.5	45-64	16	13.11	77.05	
SC	77	64-90	10	8.20	85.25	
SC	109	90-128	11	9.02	94.26	
MC	154	128-180	4	3.28	97.54	
LC	218	180-256	1	0.82	98.36	
LC	309	256-362	2	1.64	100.00	
SB	437	362-512		0.00	100.00	
MB	768	512-1024		0.00	100.00	
LB	1536	1024-2048		0.00	100.00	
BR		>2048		0.00	100.00	
		TOTALS	122	100.00	100.00	
		D50 particle size (mm)	27			
		% Fines (<2mm)	31.97			
	M12FLATC03	Date-	7/22/2003		9:45	
	Flat Creek Upstream of	Hwy 200, on Dearborn	Ranch property	-		



	BEHI Field Measures			BEHI Calcu	lated Value	es
	Parameter	Value	Units	Parameter	Value	Units
_	Rod reading @ Upstream Edge			Slope	0.0046	
-ongitudinal Information	of Water	10.92	feet	Sinuousity	1.23	
nat	Rod reading @ Downstream			Max Depth	3.15	feet
orn	Edge of Water	13.05	feet	Floodprone Height	6.30	feet
o ju	Stream Distance	467.50	feet	Mean Depth	2.15	feet
_	Straightline Distance	381.00	feet	Bankfull Width	23.00	feet
_	Left Edge of Bankfull	83.00	feet	Floodplrone Width	63.00	feet
Cross-Sectional Information	Right Edge of Bankfull	106.00	feet	Bankfull Area	49.39	ft^2
oss-Section Information	Rod reading @ Thalweg	13.60	feet	FloodproneArea		ft^2
Sec	Rod reading @ Bankfull Depth	10.45	feet	W/D Ratio	10.71	
for	Rod reading @ Floodplain Depth	7.30	feet	Cross Sectional Area	49.39	ft^2
š L	Left Edge of Floodprone depth	55.00	feet	Entrenchment Ratio	2.74	
U U	Right Edge of Floodprone depth	118.00	feet			
Ľ	Bank Height	4.00	feet			
BEHI Information	Bankfull Height	2.82	feet	Bank Ht/Bankfull Ht	1.42	
Ĕ	Root Depth	0.50	feet	Root Depth/Bank Ht	0.13	
lo	Root Density	20.00		Root Density	20	%
1	Bank Angle	40.00	Degrees	Bank Angle	40	degrees
표	Surface Protection	80.00	%	Surface Protection	80	%
_						
Stress tion	Velocity at thalweg		ft/sec	Velocity Gradient		ft/sec/ft
on	Tape reading at thalweg		feet	Near Bank stress /		
ar Bank Stre Information	velocity at left bank		ft/sec	Mean Shear stress		
Bank format	tape reading at left bank		feet	A nb / A		
а ę	Near bank stress					
Near Inf	Mean shear stress					
z	Near bank x-sectional area		ft^2			

M12FLATC03	Date-	7/22/2003	9:	45		
Flat Creek Upstream of Hwy 20	0, on Dearborn					
BEHI Associated Index Value (from form)			Pos	sible Adjustment Factors		
Bank Ht/Bankfull Ht			5.20		Bank Materials	
Root Depth/Bank Ht			8.00	Bedrock is alv	vays Very Low	
Root Density			6.40	Boulders are a	always Low	
Bank Angle			3.00	Cobble decrease the category by one unless the mixt		
Surface Protection			1.50	of Sand/Grave		
Total Index Value 24.1			24.1	Gravel- adjust the values up 5-10 pts depending on		
Nume	eric Adjustment	S:		sand composition		
Bank Materials Index adjustment			0	Sand- adjust t	he values up 10 pts	
	•		0	silt/clay- no adjustment		
			6		Stratification	
Bank Stratification Index adjustm	ent:		0	5-10 pts upwa	rd depending on position of unstable	
Total adjusted	Index Value:		30.1		to bankfull stage	
Bank Ero	sion Potential R	Rating:			MDDERATE-HIGH	

M12FLATC08	Date-	7/23/2003	16:00
Flat Creek below Birdtail Rd on Dearborn	Ranch		
Geomorphol	ogy Data		
parameter	value	units	
Bankfull Width	33.00	Ft	
Mean Depth	3.67	Ft	
Bnkfull X-sect area	120.96	Sq Ft	
Width/Depth	9.00		
Max Depth	5.49	Ft	
Flood prone width	100.00	Ft	
Entrenchement Ratio	3.03		
Water slope	0.0017		
Channel Sinuosity	2.59		
BEHI Index Score (adjusted)	29.00)	
BEHI Rating	٨	loderate	
Channel D50	10	mm	
Percentage of Fines (<2mm)	15.79	%	
Stream Type	E4	Sinuousity and W.	D made it E over C
Discharge	5.39	cfs	

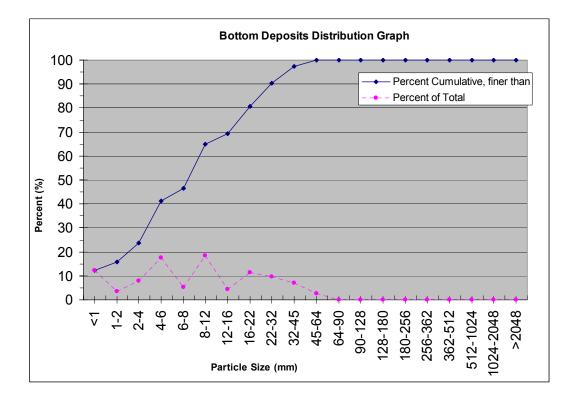
Parameter	Value	Units
Stream Reach Assessment Score (NRCS)	94.8	%
Stream Reach Assessment Score (MT adjusted)	94.1	%
Macroinvertabrate Habitat Assessment Score	66.2	%
OVERALL SITE RATIN	IGS	
Stream Reach Assessment Score (NRCS)	Non Impaire	d, Fully Supporting
Stream Reach Assessment Score (MT adjusted)		
Macroinvertabrate Habitat Assessment Score		

Field Measurements of water chemistry						
parameter value units						
Flow	5.39	cfs				
Temperature, water	21.98	degree C				
рН	8.4					
Specific Conductance	0.438	mS/cm				
Dissolved Oxygen	11.26	mg/L				
Dissolved Oxygen, % Saturation	129	%				
Turbidity	5.72	NTU				

Lab Results from Field Samples				
parameter	value	units	RL	
Total Suspended Solids, TSS	ND	mg/L	10	
Volatile Suspended Solids, VSS	ND	mg/L	10	
TSS-VSS	ND	mg/L	10	
Water Column Chlorophyll a	0.9	mg/m^3	0.1	
Benthic Chlorophyll a	32.8	8 mg/m^3	0.1	
Total Phosphorus, TP	0.057	mg/L	0.004	
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5	
Nitrate + Nitrite	ND	mg/L	0.01	
Total Nitrogen, TN		mg/L		

Macroinvertabrate Data Results					
parameter value units					
TOTAL SCORE (max =18)	6	score			
PERCENT OF MAX SCORE	33	%			
IMPAIRMENT CLASSIFICATION	MODERATE	IMPAIRMENT			
USE SUPPORT	PARTIAL SI	JPPORT			

		Pebble Count Data					
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total		
S/C	0.5	<1	14	12.28	12.28		
S	1.5	1-2	4	3.51	15.79		
FG	3	2-4	9	7.89	23.68		
FG	5	4-6	20	17.54	41.23		
FG	7	6-8	6	5.26	46.49		
MG	10	8-12	21	18.42	64.91		
MG		12-16	5	4.39	69.30		
CG	18	16-22	13	11.40	80.70		
CG		22-32	11	9.65	90.35		
CG	38.5	32-45	8	7.02	97.37		
CG	54.5	45-64	3	2.63	100.00		
SC	77	64-90		0.00	100.00		
SC	109	90-128		0.00	100.00		
MC		128-180		0.00	100.00		
LC		180-256		0.00	100.00		
LC	309	256-362		0.00	100.00		
SB	437	362-512		0.00	100.00		
MB	768	512-1024		0.00	100.00		
LB	1536	1024-2048		0.00	100.00		
BR		>2048		0.00	100.00		
		TOTALS	114	100.00	100.00		
		D50 particle size (mm)	8-12				
		% Fines (<2mm)	15.79				
	M12FLATC08	Date-	7/23/2003		16:00		
	Flat Creek below Bird	tail Rd on Dearborn Ra	nch				



	BEHI Field Measures			BEHI Calculated Values			es	
	Parameter		Value	Units	Parameter		Value	Units
_	Rod reading @ Upstream E	Edae of			Slope		0.0017	
ina	Water		12.03	feet	Sinuousity		2.59	
-ongitudinal Information	Water Rod reading @ Downstream Edge of Water Stream Distance				Max Depth		5.49	feet
orn git			14.25	feet	Floodprone H	eight	10.97	feet
이별	Stream Distance		1340.00	feet	Mean Depth		3.67	feet
-	Straightline Distance		517.00	feet	Bankfull Width	ו	33.00	feet
-	Left Edge of Bankfull		47.00	feet	Floodplrone V	Vidth	100.00	feet
Cross-Sectional Information	Right Edge of Bankfull		80.00	feet	Bankfull Area		120.96	ft^2
ti ti	Rod reading @ Thalweg		16.62	feet	FloodproneAr	ea		ft^2
Sec	Rod reading @ Bankfull De	epth	11.13	feet	W/D Ratio		9.00	
oss-Section Information	Rod reading @ Floodplain		5.65	feet	Cross Section	al Area	120.96	ft^2
õ É	Left Edge of Floodprone de	pth	10.00	feet	Entrenchment	Ratio	3.03	
Ö	Right Edge of Floodprone of	lepth	110.00	feet				
Ľ	Bank Height		11.00	feet				
atic	Bankfull Height		5.88	feet	Bank Ht/Ba	nkfull Ht	1.87	
Ë	Root Depth		1.00	feet	Root Depth/	/Bank Ht	0.09	
Įõ	Root Density		25.00	10.0	Root De		25	
÷ E	Bank Angle		70.00	Degrees	Bank A	ngle	70	degrees
BEHI Information	Surface Protection		50.00	%	Surface Pro	otection	50	%
				-				
Stress tion	Velocity at thalweg			ft/sec	Velocity G		0.06	ft/sec/ft
on	Tape reading at thalweg		63.00		Near Bank			
k S ati	velocity at left bank			ft/sec	Mean Shea			
Bank	tape reading at left bank		49.00	feet	A nb /	Ϋ́Α		
ar Bank Stre Information	Near bank stress							
Near Inf	Mean shear stress			64.0				
Z	Near bank x-sectional area			ft^2				
	M12FLATC08	Date-	7/23/2003	1	6:00			
	Flat Creek below Birdtail	Rd on Dearb	orn Ranch					

M12FLATC08	Date-	7/23/2003	16:00	0
Flat Creek below Birdtail R	d on Dearbo	orn Ranch		
BEHI Associated Index Value (from form)				Possib

BEHI Associated Index Value (from form)		Possible Adjustment Factors	
Bank Ht/Bankfull Ht	6.00	Bank Materials	
Root Depth/Bank Ht	8.00	Bedrock is always Very Low	
Root Density	6.00	Boulders are always Low	
Bank Angle	5.00	Cobble decrease the category by one unless the mixture	
Surface Protection	4.00	of Sand/Gravel is over 50%	
Total Index Value 29.0		Gravel- adjust the values up 5-10 pts depending on	
Numeric Adjustments:		sand composition	
Bank Materials Index adjustment:		Sand- adjust the values up 10 pts	
		silt/clay- no adjustment	
		Stratification	
Bank Stratification Index adjustment: 29.0		5-10 pts upward depending on position of unstable	
		layers relative to bankfull stage	
Bank Erosion Potential Rating:		Moderate	

M12FLATC04		Date-	7/24/2003	10:00			
Flat Creek at confluence with Dearborn River on Dearborn Ranch							
Geomorph	ology Dat	ta					
parameter	V	alue	units				
Bankfull Width			Ft				
Mean Depth			Ft				
Bnkfull X-sect area			Sq Ft				
Width/Depth							
Max Depth			Ft				
Flood prone width			Ft				
Entrenchement Ratio							
Water slope							
Channel Sinuosity							
BEHI Index Score (adjusted)							
BEHI Rating							
Channel D50		154	mm				
Percentage of Fines (<2mm)		2.80	%				
Stream Type							
Discharge		4.08	cfs				

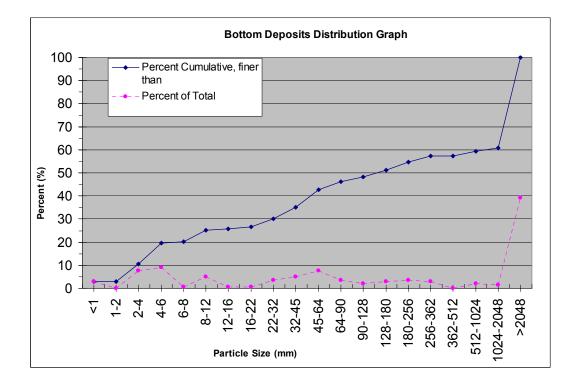
Stream Reach Habitat Ass	sessments	6	
Parameter	Value	Units	
Stream Reach Assessment Score (NRCS)		%	
Stream Reach Assessment Score (MT adjusted)		%	
Macroinvertabrate Habitat Assessment Score	86.5	%	
OVERALL SITE RATIN	IGS		
Stream Reach Assessment Score (NRCS)			
Stream Reach Assessment Score (MT adjusted)			
Macroinvertabrate Habitat Assessment Score			

Field Measurements of water chemistry						
parameter value units						
Flow	4.08	cfs				
Temperature, water	19.92	degree C				
рН	8.4					
Specific Conductance	0.366	mS/cm				
Dissolved Oxygen	10.14	mg/L				
Dissolved Oxygen, % Saturation	111.4	%				
Turbidity	3.28	NTU				

Lab Results from Field Samples					
parameter	value	units	RL		
Total Suspended Solids, TSS	ND	mg/L	10		
Volatile Suspended Solids, VSS	ND	mg/L	10		
TSS-VSS	ND	mg/L	10		
Water Column Chlorophyll a	ND	mg/m^3	0.1		
Benthic Chlorophyll a	14.3	mg/m^3	0.1		
Total Phosphorus, TP	0.019	mg/L	0.004		
Total Kiejdahl Notrogen, TKN	ND	mg/L	0.5		
Nitrate + Nitrite	ND	mg/L	0.01		
Total Nitrogen, TN		mg/L			

Macroinvertabrate Data Results				
parameter	value	units		
TOTAL SCORE (max =18)	5	score		
PERCENT OF MAX SCORE	28	%		
IMPAIRMENT CLASSIFICATION	MODERATE	IMPAIRMENT		
USE SUPPORT	PARTIAL SI	JPPORT		

		Pebble Count Data					
	Mean size	Particle Size (mm)	Sum	% Total	Cum. Total		
S/C	0.5	<1	4	2.80	2.80		
S	1.5	1-2		0.00	2.80		
FG	3	2-4	11	7.69	10.49		
FG	5	4-6	13	9.09	19.58		
FG	7	6-8	1	0.70	20.28		
MG	10	8-12	7	4.90 0.70 0.70	25.17		
MG	14	12-16	1		25.87		
CG	18	16-22	1		26.57		
CG	27	22-32	5	3.50	30.07		
CG	38.5	32-45	7	4.90	34.97		
CG	54.5	45-64	11	7.69	42.66		
SC	77	64-90	5	3.50	46.15		
SC	109	90-128	3	2.10	48.25		
MC		128-180	4	2.80	51.05		
LC	218	180-256	5	3.50	54.55		
LC	309	256-362	4	2.80	57.34		
SB	437	362-512		0.00	57.34		
MB	768	512-1024	3	2.10	59.44		
LB	1536	1024-2048	2	1.40	60.84		
BR		>2048	56	39.16	100.00		
		TOTALS	143	100.00	100.00		
		D50 particle size (mm)	128-180				
		% Fines (<2mm)	2.80				
	M12FLATC04	Date-	7/24/2003		10:00		
	Flat Creek at confluence with Dearborn River on Dearborn Ranch						



BIOLOGICAL DATA AND REPORTS

APPENDIX C: DEARBORN RIVER MACROINVERTEBRATE AND PERIPHYTON ANALYSIS

DEARBORN RIVER MACROINVERTEBRATE AND PERIPHYTON ANALYSIS

The following tables and figures provide additional detail for the macroinvertebrate and periphyton data collected in the Dearborn River watershed. Macroinvertebrate data were collected from five sites in the Dearborn River between 2000 and 2003, and five samples were collected during that time.

DEARBORN RIVER

Ilue TV	0.3 19 63.7 17 2.92 15 83	
	19 63.7 17 2.92 15 83	
	19 63.7 17 2.92 15 83	
	63.7 17 2.92 15 83	
	17 2.92 15 83	
	2.92 15 83	
	15 83	
	83	
	0	I
İ	Serratella	2
	Epeorus	1
	Eukiefferiella	3
	1.75 - no stress	
	26.97 - minor stress	
ena 0		
ntrus 1		
ıs 8		
stress		
inor stress		
	ntrus 1 Is 8 stress	26.97 - minor stress 26.97 - minor stress 2000

Table C-1. Selected benthic macroinvertebrate metrics, dominant taxa, and Montana revised tolerance and periphyton values for the Dearborn River.

	Sample Site ID	Metrics/Variables	2000		2002		2003	
Chart ID	Site Name		Value	тν	Value	тν	Value	тν
		%clingers			53.4			
		no. clinger taxa			12			
		НВІ			4.14			
		Total score			10			
		% score			56			
					Zaitzevia	5		
		dominant taxa			Hydropsyche	4		
					Rhithrogena	0		
		Periphyton						
		Siltation Index						
		Disturbance Index						
		Macroinvertebrates						
		%tolerant taxa	24.56				14.6	
		no. EPT taxa	7				14	
		%clingers	26.32				74.9	
		no. clinger taxa	8				17	
		НВІ	3.89				3.75	
	M12DBRNR04	Total score	9				9	
DB-4		% score	50				50	
	Dearborn @ 287						Brachycentrus	1
		dominant taxa					Rheotanytarsus	6
							Claasenia	2
							Hydropsyche	4
		Periphyton						
		Siltation Index					6.9 - no stress	
		Disturbance Index					39.87 - minor stress	
		Macroinvertebrates						
		%tolerant taxa					20.1	
		no. EPT taxa					15	
		%clingers					75.3	
DB-5		no. clinger taxa					20	
	M12DBRNR06	НВІ					3.8	
		Total score					9	
	Dearborn blw. Flat	% score					50	
							Hydropsyche	4
		dominant taxa					Claasenia	2
							Brachycentrus	1
		Periphyton						
		Siltation Index					8.56 - no stress	
		Disturbance Index					17.84 - no stress	

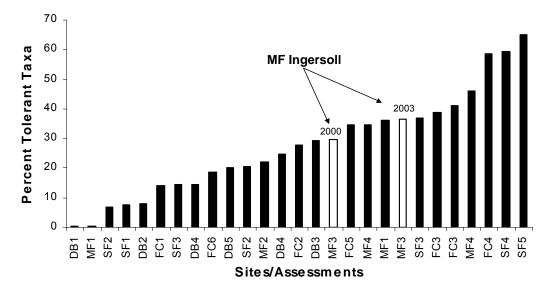


Figure C-1. Range of values for the metric Percent Tolerant Taxa over a 4-year sampling period, arranged in ascending order, by site. Several sites were sampled in both 2002 and 2003; a few sites had samples collected only in 2000.

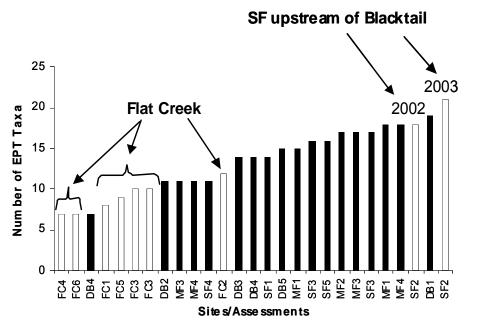


Figure C-2. Range of values for the metric Number of EPT Taxa over a 4-year sampling period, arranged in ascending order by site. Several sites were sampled both 2002 and 2003.

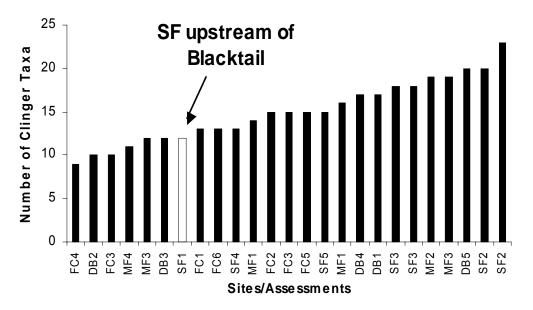


Figure C-3. Range of values for the metric Number of Clinger Taxa over a 4-year sampling period, arranged in ascending order by site. Several sites were sampled in both 2002 and 2003; a few sites had samples collected only in 2000.

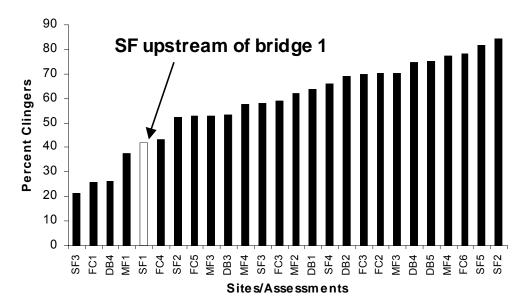


Figure C-4. Range of values for the metric Percent Clingers over a 4-year sampling period, arranged in ascending order, by site. Several sites were sampled in both 2002 and 2003; a few sites had samples collected only in 2000.

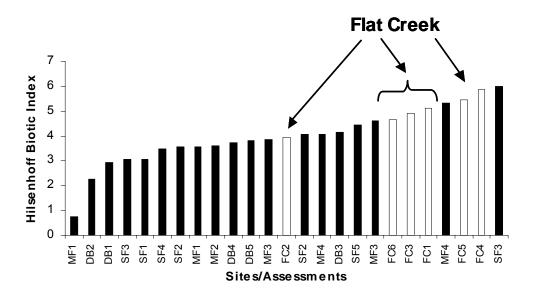


Figure C-5. Range of values for the metric Hilsenhoff Biotic Index over a 4-year sampling period, arranged in ascending order, by site. Several sites were sampled in both 2002 and 2003; a few sites had samples collected only in 2000.

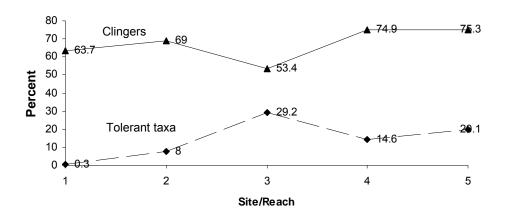


Figure C-6. Percent Clingers and Percent Tolerant Taxa from five reaches sampled on the Dearborn River mainstem from 2000-2003; the most recent data from each site are used. Reach numbers refer to Table C-1.

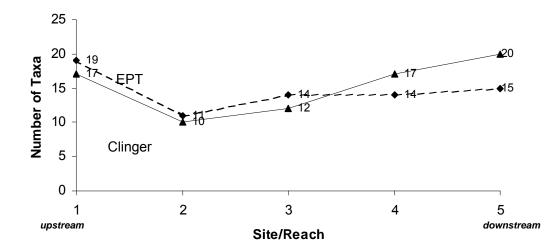


Figure C-7. Number of EPT Taxa and Clinger Taxa sampled from five reaches on the Dearborn River mainstem from 2000-2003; the most recent data from each site are used. Reach numbers refer to Table C-1.

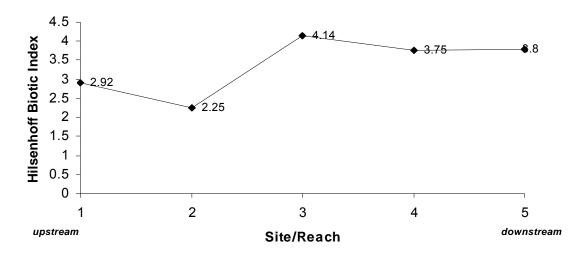


Figure C-8. Hilsenhoff Biotic Index from samples taken along five reaches of the Dearborn River mainstem from 2000-2003; the most recent data from each site are used. Reach numbers refer to Table C-1.

SOUTH FORK DEARBORN RIVER

Table C-2. Selected benthic macroinvertebrate metrics, dominant taxa, and Montana revised tolerance, and periphyton values for the South Fork of the Dearborn River

chart	Sample Site ID		2000		2002	-	2003	
ID	Site Name	Metrics/Variables	Value	тν	Value	тν	Value	тν
		Macroinvertebrate						
		%tolerant taxa	7.69					
		no. EPT taxa	14					
		%clingers	41.76					
	SFD-1	no. clinger taxa	12					
		HBI	3.08					
SF-1	SF Dearborn	Total score	14					
01-1	100yds u/s first	% score	78					
	bridge and below		Orthocladius	7				
	Blacktail	dominant taxa	Psychoglypha	0				
			Serratella	2				
		Periphyton						
		Siltation Index						
		Disturbance Index						
		Macroinvertebrate		<u> </u>				
		%tolerant taxa			20.7		6.8	
		no. EPT taxa			18		21	
		%clingers			52.6		84.5	
		no. clinger taxa			20		23	
	MASCEDDDA	HBI Total score			4.06		3.55	
SF-2	M12SFDBR01	% score			13 72		10 56	
	SF Dearborn u/s	% score			Orthocladius	7	Simulium	4
	Blacktail	dominant taxa			Pagastia	2	Serratella	2
	Blacktail				Zaitzevia	5	Epeorus	1
		Periphyton			Zanzevia	J	Epeorus	
					11.09 - no			
		Siltation Index			stress			
					16.91 - no			
		Disturbance Index			stress			
		Macroinvertebrate						
		%tolerant taxa			14.4		36.9	
		no. EPT taxa			17		16	
		%clingers			21.23		57.9	
		no. clinger taxa			18		18	
		HBI			6.01		3.04	
	M12SFDBR02	Total score			12		13	
SF-3	SE Doorbern u/o	% score			67 Factore for a formation in a formation of the second second second second second second second second second se	~	72	
	SF Dearborn u/s 434	deminent towo			Eukiefferiella	3	Agapetus	0
	-54	dominant taxa			Tvetenia	4	Lepidostoma	1 4
		Derinhuter			Skwala	3	Ochrotrichia	4
		Periphyton			21.04 55			
		Siltation Index			31.84 - no stress			
					6.87 - no			<u> </u>
		Disturbance Index			stress			
SF-4	SFD-4	Macroinvertebrate						1
		%tolerant taxa	59.25					
	SF Dearborn d/s	no. EPT taxa	11					

chart	Sample Site ID		2000		2002		2003	
ID	Site Name	Metrics/Variables	Value	тν	Value	тν	Value	тν
	434	%clingers	66.14					
		no. clinger taxa	13					
		HBI	3.47					
		Total score	9					
		% score	50					
		dominant taxa	Optioservus	3				
		uominant taxa	Sweltsa	0				
		Periphyton						
		Siltation Index						
		Disturbance Index						
		Macroinvertebrate						
		%tolerant taxa					65.1	
		no. EPT taxa					16	
		%clingers					81.7	
		no. clinger taxa					15	
	M12SFDBR04	HBI					4.44	
SF-5		Total score					13	
51-5	SF Dearborn @	% score					72	
	Confluence						Optioservus	3
		dominant taxa					Zaitzevia	5
							Nixe	4
		Periphyton						
		Siltation Index						
		Disturbance Index						

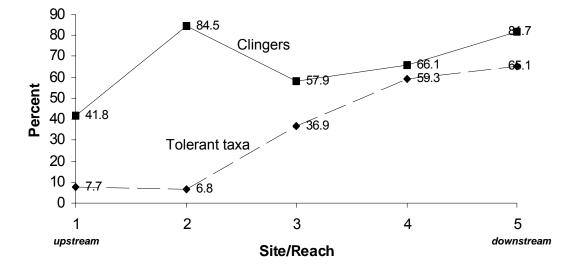


Figure C-9. Percent clingers and percent tolerant along 5 sites of the South Fork Dearborn River, sampled from 2000-2003; the most recent data from each site are used. Reach numbers refer to Table C-2.

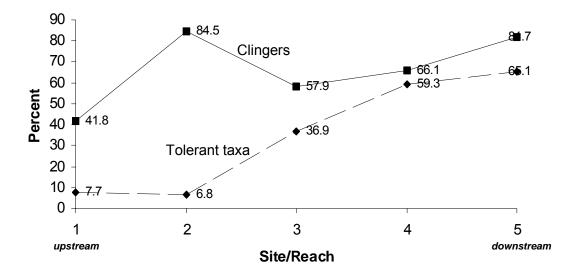


Figure C-10. Percent clingers and percent tolerant along 5 sites of the South Fork Dearborn River, sampled from 2000-2003; the most recent data from each site are used. Reach numbers refer to Table C-2.

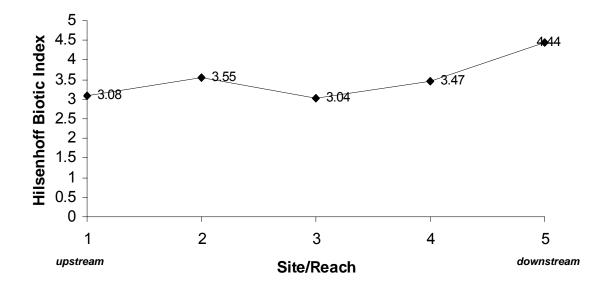


Figure C-11. Hilsenhoff Biotic Index from samples collected along 5 sites of the South Fork Dearborn River, sampled from 2000-2003; the most recent data from each sites are shown. Reach numbers refer to Table C-2.

MIDDLE FORK DEARBORN RIVER

Table C-3. Selected benthic macroinvertebrate metrics, dominant taxa, and Montana revised tolerance, and periphyton values for the Middle Fork of the Dearborn River Middle Fork of the Dearborn River River River River River River River

Middle Fork of the Dearborn River Biological Data Summary Table										
Chart	Sample Site ID	Macroinvertebrate	2000		2002		2003			
ID	Site Name	Metrics/Variables	Value	тν	Value	тν	Value	тν		
		Macroinvertebrates								
		%tolerant taxa			36.1		0.3			
		no. EPT taxa			18		15			
		%clingers			37.5		85.6			
		no. clinger taxa			16		14			
		НВІ			3.58		0.77			
	M12MFDBR01	Total score			14		16			
		% score			78		89			
MF-1	MF Dearborn @				Baetis	5	Epeorus	1		
	Rogers Pass	dominant taxa			Drunella	1	Cinygmula	0		
					Hydrobaenus	8	Drunella	1		
		Periphyton								
					4.43 - no					
		Siltation Index			stress					
		Disturbance Index			55.38 - mod.					
		Disturbance index			stress					
		Macroinvertebrates								
		%tolerant taxa	22.1							
		no. EPT taxa	17							
		%clingers	62.2							
		no. clinger taxa	19							
	MFD-2	НВІ	3.6							
MF-2		Total score	10							
IVIT-2	MF Dearborn	% score	56							
	u/s 200	dominant taxa	Pagastia	2						
			Ochrotrichia	4						
			Orthocladius	7						
		Periphyton								
		Siltation Index								
		Disturbance Index								
		Macroinvertebrates								
		%tolerant taxa	29.55				36.7			
		no. EPT taxa	11				17			
		%clingers	52.9				70.3			
		no. clinger taxa	12				19			
		HBI	4.6				3.86			
ME 2	M12MFDBR04	Total score	10				11			
MF-3	MF Dearborn @	% score	56				61			
	Ingersoll		Polypedilum	7			Zaitzevia	5		
	ingerson	dominant taxa	Orthocladius	7			Brachycentrus	1		
			Optioservus	3			Optioservus	3		
			Zaitzevia	5						
		Periphyton								
		Siltation Index	1	1		1		1		
		Disturbance Index								
MF-4	M12MFDBR02	Macroinvertebrates								
		%tolerant taxa	1		34.6		46.1			
	MF Dearborn	no. EPT taxa	1	1	11	1	18	1		
				L		I	10	I		

	Mic	Idle Fork of the Dearborr	n River Biolog	gical Da	ata Summary Ta	able		
Chart	Sample Site ID	Macroinvertebrate	2000		2002		2003	
ID	Site Name	Metrics/Variables	Value	тν	Value	тν	Value	тν
	d/s 434	%clingers			57.7		77.4	
		no. clinger taxa			11		18	
		HBI			5.34		4.08	
		Total score			8		11	
		% score			44		61	
					Tanytarsus	7	Zaitzevia	5
		dominant taxa			Optioservus	3	Optioservus	3
					Zaitzevia	5	Brachycentrus	1
		Periphyton						
		Siltation Index			11.38 - no stress			
		Disturbance Index			22.54 - no stress			

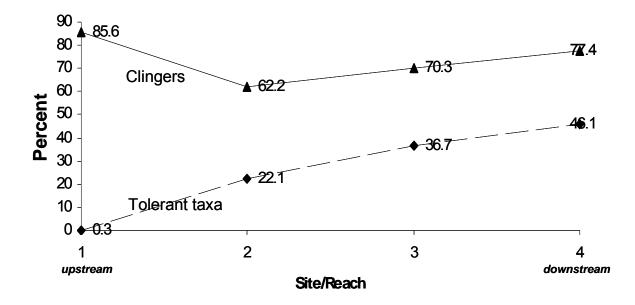


Figure C-12. Percent clingers and tolerant taxa from samples collected along 4 sites of the Middle Fork Dearborn River, sampled from 2000-2003; the most recent data from each site are shown. Reach numbers refer to Table C-3.

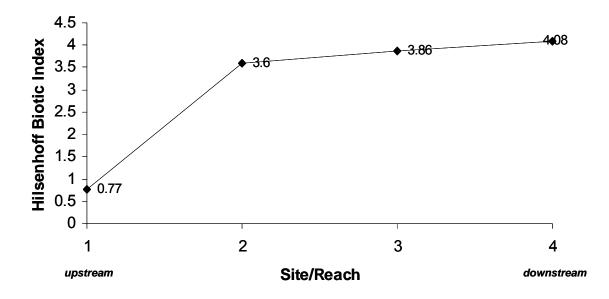


Figure C-13. Hilsenhoff Biotic Index from samples collected along 4 sites of the Middle Fork Dearborn River, sampled from 2000-2003; the most recent data from each site are shown. Reach numbers refer to Table C-3.

FLAT CREEK

	Flat Creek Macroinvertebrate Data Summary Table										
	Sample Site ID	Macroinvertebrate	2000		200	2	2003				
chart ID	Site Name	Metrics/Variables	Value	тν	Value	тν	Value	тν			
		Macroinvertebrates									
		%tolerant taxa	14.1								
		no. EPT taxa	8								
		%clingers	25.7								
		no. clinger taxa	13								
	M12FLATC02	HBI	5.11								
FC-1		Total score	9								
FU-1	Flat creek on	% score	50								
	Flat Crk Rd.		Orthocladius	7							
		dominant taxa	Eukiefferiella	3							
			Cricotopus	8							
		Periphyton									
		Siltation Index									
		Disturbance Index									
		Macroinvertebrates									
		%tolerant taxa					27.7				
		no. EPT taxa					12				
		%clingers					70.3				
		no. clinger taxa					15				
	M12FLATC05	HBI					3.94				
FC-2		Total score					8				
	Flat creek @	% score					44				
	Milford						Brachycentrus	1			
		dominant taxa					Baetis	5			
							Optioservus	3			
		Periphyton									
		Siltation Index					25.96 - no stress				
		Disturbance Index					18.6 - no stress				
		Macroinvertebrates									
		%tolerant taxa	41				38.8				
		no. EPT taxa	10				10				
		%clingers	59				70.1				
		no. clinger taxa	10				15				
	M12FLATC03	HBI	4.58				4.9				
FC-3		Total score	7				5				
FC-3	Flat creek u/s	% score	39				28				
	Hwy 200						Hydropsyche	4			
		dominant taxa					Brachycentrus	1			
							Optioservus	3			
		Periphyton									
		Siltation Index					33.79 - no stress				
		Disturbance Index					14.48 - no stress				
FC-4	F-7	Macroinvertebrates									
		%tolerant taxa	58.68								
	Flat creek u/s	no. EPT taxa	7								
	Birdtail Rd	%clingers	43.11								
		no. clinger taxa	9								
		HBI	5.85								

Table C-4. Selected benthic macroinvertebrate metrics, dominant taxa, and Montana revised tolerance values for Flat Creek

		Flat Creek Macroinv	ertebrate Data S	umma	ry Table			
	Sample Site ID	Macroinvertebrate	2000		200	2	2003	
chart ID	Site Name	Metrics/Variables	Value	тν	Value	тν	Value	тν
		Total score	4					
		% score	22					
			Simulium	4				
		dominant taxa	Baetis	5				
			Tricorythodes	5				
		Periphyton						
		Siltation Index						
		Disturbance Index						
		Macroinvertebrates						
		%tolerant taxa					34.6	
		no. EPT taxa					9	
		%clingers					52.7	
		no. clinger taxa					15	
	M12FLATC08	HBI					5.45	
FC-5		Total score					6	
FC-5	Flat creek blw.	% score					33	
	Birdtail						Baetis	5
		dominant taxa					Hydropsyche	4
							Cheumatopsyche	7
		Periphyton						
		Siltation Index					24.53 - no stress	
		Disturbance Index					4.34 - no stress	
		Macroinvertebrates						
		%tolerant taxa					18.7	
		no. EPT taxa					7	
		%clingers					78.3	
		no. clinger taxa					13	
	M12FLATC04	HBI					4.65	
FC-6		Total score					5	
10-0	Flat creek @	% score					28	
	Mouth	dominant taxa					Hydropsyche	4
							Antocha	5
							Optioservus	3
		Periphyton						
		Siltation Index					14.29 - no stress	
		Disturbance Index					2.98 - no stress	

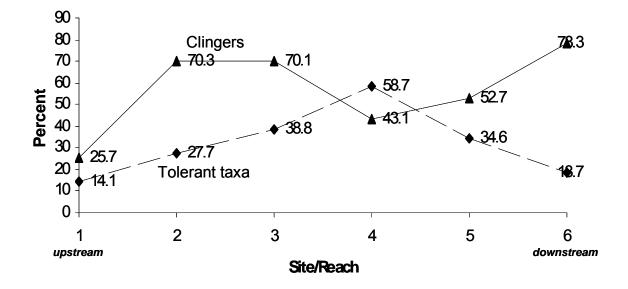


Figure C-14. Percent clingers and tolerant taxa from samples collected along 6 sites of the Flat Creek mainstem, sampled from 2000-2003; the most recent data from each site are shown. Reach numbers refer to Table C-4.

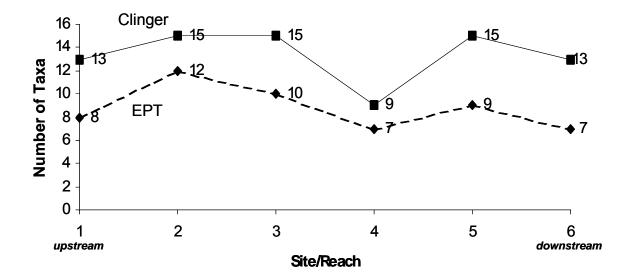


Figure C-15. Number of clinger and EPT taxa from samples collected along 6 sites of the Flat Creek mainstem, sampled from 2000-2003; the most recent data from each site are shown. Reach numbers refer to Table C-4.

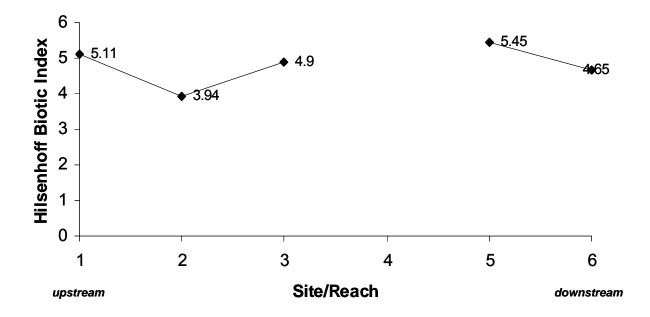
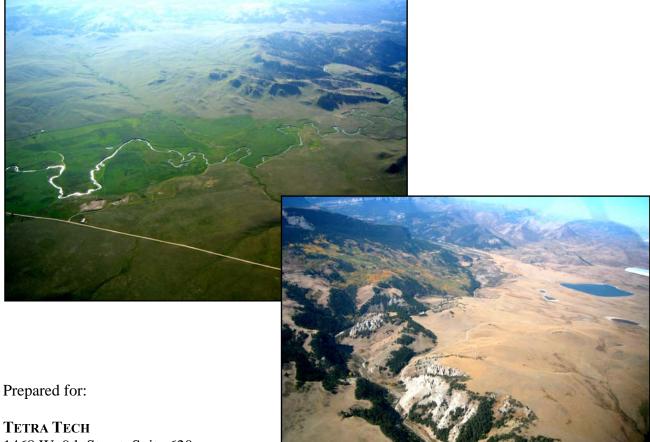


Figure C-16. Hilsenhoff Biotic Index from samples collected along 6 sites of the Flat Creek mainstem, sampled from 2000-2003; the most recent data from each site are shown. Reach numbers refer to Table C-4.

APPENDIX D: CHANNEL AND RIPARIAN AERIAL ASSESSMENT

DEARBORN TMDL PLANNING AREA

Channel and Riparian Aerial Assessment



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Project #: 110487.3

TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	METHODS	1
3.0	RESULTS	3
	3.1 Channel Morphology and Condition	4
	3.1.1 Background	4
	3.1.2 Channel Characteristics	
	3.2 Riparian Condition	
	3.3 Temporal Changes in Channel Condition	18
	3.3.1 Channel Widths	18
	3.3.2 Temporal Changes in Canopy Coverage	19
	3.4 Sediment Source Areas	26
	3.4.1 In-Channel Sources	26
	3.4.2 Mass Failure	30
	3.4.3 Headcutting/Incised Reaches	31
	3.4.4 Upland Sources	32
	3.5 Cultural Features	
40	SUMMARY AND CONCLUSIONS	35
	4.1 Potential Impairments	
	4.2 Restoration Focus Areas	

APPENDICES (AVAILABLE UPON REQUEST FROM MONTANA DEQ)

Appendix A – Variable Definitions

Appendix B – Aerial Photographs from 1995

Appendix C – Aerial Photograph Stills from 2003 Reconnaissance

Appendix D – Data Tables from 1955, 1964, and 1995 Photo Interpretation

Appendix E – *Riparian Condition Maps*

FIGURES

- Figure 1. Watershed Map with Reaches Delineated
- Figure 3-1. Example Boxplot
- Figure 3-2 Channel Width in the Dearborn Watershed in 1995
- Figure 3-3. Dearborn Reach DR1
- Figure 3-4. Dearborn Reach DR2
- Figure 3-5. Dearborn Reach DR3
- Figure 3-6. Dearborn Reach DR4
- Figure 3-7. Dearborn Reach DR5
- Figure 3-8. Dearborn Reach DR6
- Figure 3-9. Central Portion of South Fork SF1 "Least Impaired"
- Figure 3-10. Central Portion of South Fork SF1 "Impaired"
- Figure 3-11. Upper Portion of South Fork SF2 "Least Impaired"
- Figure 3-12. Lower Portion of South Fork SF2 "Impaired"
- Figure 3-13. Middle Fork Dearborn (MF1) "Least Impaired" Reach
- Figure 3-14. Middle Fork Dearborn (MF1) "Transitional" Reach
- Figure 3-15. Middle Fork Dearborn (MF1) "Impaired" Reach
- Figure 3-16. Middle Fork Dearborn (MF2) Reach
- Figure 3-17. Flat Creek Reach FC1 Unconfined Lower Reach
- Figure 3-18. Flat Creek Reach FC1 Confined Lower Reach
- Figure 3-19. Flat Creek Reach FC2 Reach
- Figure 3-20. Flat Creek Reach FC3 Reach
- Figure 3-21. Flat Creek Reach FC4 Reach
- Figure 3-22. Estimated Bankfull Width in the Dearborn Planning Area in 1955, 1964, and 1995
- Figure 3-23. Conifer/Deciduous Coverage in the Dearborn Mainstem in 1955, 1964, and 1995
- Figure 3-24. Woody Shrub Coverage in the Dearborn Mainstem in 1955, 1964, and 1995
- Figure 3-25. Herbaceous Coverage in the Dearborn Mainstem in 1955, 1964, and 1995
- Figure 3-26. Bare Ground in the Dearborn Mainstem in 1955, 1964, and 1995
- Figure 3-27. Conifer/Deciduous Coverage in Flat Creek in 1955, 1964, and 1995
- Figure 3-28. Woody Shrub Coverage in Flat Creek in 1955, 1964, and 1995
- Figure 3-29. Herbaceous Coverage in Flat Creek in 1955, 1964, and 1995
- Figure 3-30. Bare Ground in Flat Creek in 1955, 1964, and 1995
- Figure 3-31. Slumps in Dearborn Mainstem Reach 6
- Figure 3-32. Dry ravel/rilling in the Dearborn Mainstem Reach 4
- Figure 3-33. Gullies in the Dearborn Mainstem Reach 5
- Figure 3-34. Typical Smaller Contributing Drainages to the Dearborn Mainstem Reach 5
- Figure 3-35. Hogan Creek, Tributary to Flat Creek Reach 4
- Figure 3-36. Upper Hogan Creek, Tributary to Flat Creek Reach 4
- Figure 3-37. Milford Colony
- Figure 3-38. Milford Colony

TABLES

- Table 3-1Stream Channel Characteristics Dearborn Watershed, 1995
- Table 3-2
 Dearborn Mainstem Riparian Vegetation Features
- Table 3-3Riparian Vegetation Feature
- Table 3-4Riparian Vegetation Impact on the Dearborn South Fork (SF1)
- Table 3-5Riparian Vegetation Impact on the Dearborn Middle Fork (MF1)
- Table 3-6Riparian Vegetation Characteristics on Flat Creek
- Table 3-7Temporal Changes in Channel Width
- Table 3-8
 Temporal Changes in Tree/Woody Shrub Canopy Coverage
- Table 3-9Bank Erosion, Middle Fork Reach MF1
- Table 3-10Bank Erosion, Flat Creek
- Table 3-11Cultural Features Dearborn River

1.0 INTRODUCTION

An assessment of channel and riparian vegetation in the Dearborn River watershed was conducted using aerial methods to provide support for TMDL planning. The Dearborn River watershed is a tributary to the Missouri River in western central Montana, north of Helena. This assessment includes the Dearborn River, the Middle and South forks of the Dearborn, and Flat Creek.

The overall objectives of the aerial assessment were as follows:

- Provide information about surface physical stream corridor conditions as required to support determinations of impairment and beneficial use status.
- Identify potential causes and sources of natural resource concerns when feasible.
- Establish a baseline of current resource conditions and indicators along the stream corridor for future trend monitoring
- Support recommendations for natural resource restoration and protection strategies along the stream corridor and important uplands within the watershed.
- Serve as a source of background information and interpretations to support future requests for technical and financial assistance to carry out watershed planning efforts.

Assessment methods included interpretation of available aerial photographs and aerial reconnaissance. These are described in the following section.

2.0 METHODS

The aerial assessment included both photo interpretation and fixed-wing rapid aerial assessment. Photo interpretation was accomplished prior to the flights so interpretations could be confirmed during the flyovers. Aerial photos considered in the Dearborn assessment included flights from 1955, 1964, and 1995 (**Table 2-1**).

Source	Date	Coverage
NRCS	1955	Central Dearborn Mainstem, portions of Flat Creek
NRCS	1964	Central Dearborn Mainstem, portions of Flat Creek
NRCS, Digital Orthoquads	1995	Complete Coverage of Watershed

Table 2-1Aerial Photo Sources

Still photographs of the 2003 aerial reconnaissance are found in **Appendix C** (separate volume). Plots of the 1995 aerial photos with 2003 still photo inserts are found in **Appendix D**. These photo inserts were captured from continuous video coverage recorded in Hi-8 format and are a subset of photos found in **Appendix C**.

Specifically, the photo assessment included the following:

- Define Rosgen Level 1 classification and reach breaks,
- Stream length changes/meander cutoffs/sinuosity measurements,
- Channel bar/aggradation/incisement conditions and other indicators of vertical stability problems,

- Bank erosion and trend over time based on historic aerial photographs (channel width measured to evaluate movement of the stream and identify stream widening/narrowing),
- Riparian conditions and plant community characteristics (e.g. plant community, percent canopy cover/density),
- Location of major wetlands,
- Major sediment sources or mass wasting in the project area,
- Major land use changes,
- Potential reference condition metrics,
- Location of roads/culverts/channel intersections,
- Location of major water diversions,
- Areas that appear to be adversely impacted and require field investigations.

The aerial assessment involved two fixed-wing flights over the listed reaches and major tributaries. Video (Hi-8 format) and still photographs were recorded at an oblique angle (approx. 30 degrees ahead from vertical) from an elevation of 4500 ft and an average air speed of 90 mph. A second flight was made to confirm physical feature attribute data along the stream corridor. An aircraft with 2 crewmembers (a pilot, and a technician to record features) conducted the inventory.

Documentation of physical features was based on the visual observation and interpretation of the technician. Recorded features included:

Point Features

- Impoundments Reservoirs on or immediately adjacent to the stream corridor,
- Instream Structures Diversions, turnouts, pump sites,
- Headcuts Active downcutting on side drainages,
- Potential Water Quality Point Sources Corrals, feedlots, sewage discharge, irrigation return flows, dump sites, etc. along or adjacent to the stream corridor,
- Stream Crossings Bridges, pipelines, culverts, ford crossings,
- Riparian Characteristics -
- Vegetation attributes (trees, shrub, mixed, grass sedge),
- Density (% Canopy Coverage),
- Point of reference characterized by apparent disturbance (low density, limited age class distribution, or species diversity, low vigor) by any source,
 - Point of reference characterized by apparent low levels of disturbance,
- Other Car bodies, gravel pits, construction sites, etc. located along the stream.

Linear Features

- Bank Erosion Accelerated, active erosion of stream banks,
- Mass Bank Sloughing Natural sloughing of high terraces/banks,
- Rock Riprap Round river stone, angular rock or other bank armor,
- Channelized Segment –artificial (human-induced) manipulation of the channel,
- Other (incised channel, etc.).

Data was marked on 1995 digital orthoquads (DOQ's). Variables measured are detailed in **Appendix A** and data tables are found in **Appendix B**.

3.0 RESULTS

This section presents an analysis of channel and riparian condition for the Dearborn River Watershed. Analysis of results is grouped into stream reaches with identification as follows:

- DR: Dearborn Mainstem (6 Reaches, DR1, DR2, DR3, DR4, DR5, DR6).
- SF: South Fork of the Dearborn (2 reaches, SF1, SF2).
- MF: Middle Fork of the Dearborn (2 reaches, MF1, MF2).
- FC: Flat Creek (4 reaches, FC1, FC2, FC3, FC4).

Reach locations are depicted in **Figure 1** (pocket insert). Point observations for each variable were made at 10 to 70 locations within each reach depending on reach length and variability. This corresponded to a transect/point observation interval of approximately 1100 to 2500 feet within each delineated reach. Reference point numbers are found on the aerial photo sheets.

Results of analyses are presented as boxplots showing the central tendency (median) and distribution of data (Figure 3-1).

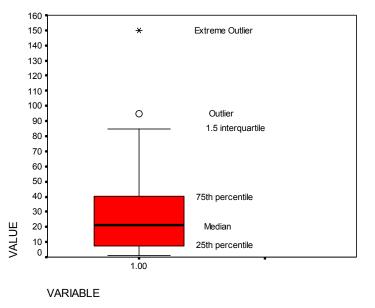


Figure 3-1. Example Boxplot

The central black bar is the median or 50th percentile value, which is equivalent to the average when data are normally distributed. The 25th and 75th percentiles are shown as the lower and upper extents of the box. The "whiskers" represent the value of 1.5 times the interquartile range. Circles represent outliers in the distribution of data, and asterisks represent extreme outliers. Normally distributed data would have a symmetrical form around the median value.

3.1 Channel Morphology and Condition

3.1.1 Background

Dearborn River

The mainstem of the Dearborn River is primarily an alluvial, gravel bed river (Rosgen Type C4) with a small to moderately extensive floodplain. Significant reaches of the channel are confined by deeply dissected terrain and canyon walls. Areas of lateral and vertical bedrock control are present, and this confinement has resulted in limited lateral floodplain development in some reaches. A short section of unstable braided channel is present in the transition from the headwaters near Falls Creek/Bean Lake (Reach DR6).

Middle Fork Dearborn

The Middle Fork of the Dearborn River is a C4 channel in the foothills/plains; however, a significant portion of the total stream length is a steeper gradient, headwaters B3/4 and A3 type channel. The channel makes this transition to B type morphology upstream of Highway 200 which then parallels the Middle Fork of the Dearborn to the headwaters. The extensive road fill slopes from Highway 200 do not encroach on the floodplain or result in geomorphic impacts to the perennial reaches of the Middle Fork. Lower reaches of the Middle Fork are predominately C4 type channel. Channel stability appeared to be closely related to riparian health. Increased channel width and bank instability were associated with loss of riparian vegetation.

South Fork Dearborn

The South Fork has characteristics similar to the Middle Fork, and much of the headwater zone is relatively undisturbed, steep forested terrain. Some land use (vegetation removal) impacts on channel morphology are apparent in the central reaches, and riparian vegetation is largely limited to willow and other shrub species. The river becomes an alluvial, gravel substrate channel (Rosgen C4) in the lower reaches. Channel stability appeared correlated to riparian vegetation health to some extent.

Flat Creek

Flat Creek is a low gradient, meandering channel with fine to very fine gravel bed materials (Rosgen C4/F4 channel type, tending towards C5/F5 in upper reaches). Flat Creek serves as a conveyance for irrigation water diverted from the mainstem of the Dearborn and channel morphology reflects this altered flow regime. Channel cross section is enlarged due to diverted irrigation flows and some channel erosion/instability is present in localized areas. Observed channel instability is likely the result of increased flows due to irrigation diversion and conversion of riparian vegetation to agricultural uses. Grazing and agricultural uses (pasture and cropland) were widespread in Flat Creek. Grazing appeared to be of higher intensity in the lower reaches.

3.1.2 Channel Characteristics

Dearborn Mainstem

Six reaches were defined for the Dearborn mainstem (**Table 3-1**). Much of the mainstem channel was a Rosgen C4 channel type, although local inclusions of coarser substrate C3 or bedrock controlled channel appeared to be present in some areas.

Channel width ranged from 100 to 120 feet, generally increasing in the downstream direction. Channel width measures approximate bankfull width, but may be biased slightly high due to the tendency to include recently deposited gravel, or older un-vegetated gravel deposits near bankfull elevation in this measurement. The uppermost reach (DR6) had a short braided section that was a D4 channel type. Channel slope decreased from 0.008 in the upper reach (DR6) to 0.005 in the lower reach (DR1), and sinuosity ranged from 1.1 to 1.25 overall.

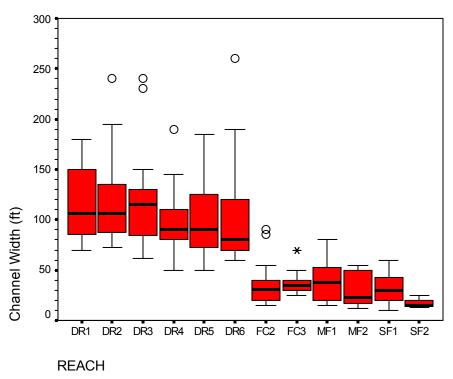


Figure 3-2 Channel Width in the Dearborn Watershed in 1995

Bank stability was assessed using 1995 aerial photos and video coverage. Stability scores were intended to approximate Rosgen Bank Erosion Hazard Index (BEHI) values. Banks rated "high" were generally vertical banks or high terraces with primarily herbaceous riparian vegetation. Moderate scores were assigned to banks that had sparse or patchy woody vegetation and steep to moderately sloped banks. Banks that had abundant woody vegetation and moderate to low angled banks were assigned a "low" score. This aerial assessment method was a coarse, screening level tool and could not evaluate for all the factors (e.g. bank height ratio, surface protection, etc) required to make a BEHI assessment. Nevertheless, it provided a simplified

approach to rapid assessment of bank stability which was able to discern potential sediment source areas.

BEHI scores were similar for Dearborn mainstem reaches DR1, DR2, and DR4, with 8 to 12.3% of banks with "high" scores, and 87-92% in the moderate to low (i.e. stable) category. Reach DR3 had a higher proportion of banks in the high category (27%). Unlike downstream reaches DR1 and DR2, which are located in dissected "canyonland" topography, DR3 had an unconfined channel and active floodplain. Elevated width to depth ratios and meander cutoffs were therefore characteristic of this reach. BEHI ranking in reaches DR5 and DR6 indicated more instability than downstream reaches, with 21 to 47% of banks falling in the high (i.e. unstable) category. In particular, reach DR6 showed a significant proportion of unstable banks due to the braided (Rosgen D4) morphology. Aerial photos from 1955 and 1964 were not available to assess whether this braided character was related to flood damage in 1964. However, the location of reach DR6 in the transition from confined valley to unconfined plains is a common location for sediment adjustments to occur, and braided D or unstable C morphology is frequently observed.

	Reach	Channel			Channel	BEHI R	Rating (% of I	Reach)	Overall Channel
Reach	Length (mi)	Туре	Slope	Sinuosity	Width (ft)	High	Mod	Low	Stability
DR1	8.88	C4	0.005	1.15	115	8.1	38.3	53.6	Good
DR2	9.52	C4	0.006	1.25	117	12.3	42.1	45.6	Good
DR3	8.00	C4	0.007	1.13	120	27.4	35.3	37.3	Fair-Good
DR4	8.15	C4	0.007	1.22	100	11.8	41.2	47.1	Good
DR5	7.436	C4	0.008	1.04	100	21.2	28.8	50.0	Fair
DR6	6.53	D4	0.008	1.1	107	47.1	26.2	26.6	Poor
SF1	5.83	C4	0.012	1.22	34	8.3	25.0	65.7	Fair to Good
SF2	5.56	B4/A3	0.017	1.09	17	0.0	9.0	84.7	Good to Excellent
MF1	6.17	C4	0.015	1.25	39	10.6	35.3	54.1	Fair to Good
MF2	1.32	B4/A3	0.025	1.09	30	0.0	19.4	80.6	Good-Excellent
FC1	7.49	C4	0.007	1.6	49	11.2	17.7	71.1	Fair
FC2	4.43	C5/E5	0.006	1.55	36	13.1	36.9	50.0	Poor-Fair
FC3	4.35	C5/E5	0.006	1.28	38	14.0	30.8	55.2	Fair
FC4	11.64	C5/E5	0.006	1.3	19	8.4	33.3	58.3	Fair

 Table 3-1 Stream Channel Characteristics – Dearborn Watershed, 1995

A reference reach representative of unconfined C4 channel morphology was not readily apparent in the central reaches of the Dearborn. Review of aerial photography and 2003 aerial reconnaissance indicated that much of the C4 channel outside of the "canyon" or confined areas was laterally active with frequently high width to depth ratios and variable density of tree/woody shrub riparian vegetation.

Overall, BEHI scores were consistent with unimpacted bank conditions in reaches DR1, DR2, and DR4 for this channel type and geologic setting. Human impacts were not associated with "high" scores in these reaches and these banks were generally natural landscape features. Reach DR3 had a significant proportion of banks in the "high" category. Reach DR3 was an

unconfined alluvial channel and BEHI scores would be expected to be higher for this reach. However, human impacts were apparent in portions of this reach and high BEHI rankings also appeared to be related to degraded riparian vegetation in some areas. The upper reaches DR5 and DR6 also had a large proportion of high BEHI scores. In particular, DR6 ranked poorly due to natural braided channel morphology. High BEHI scores were not related to human impacts and are likely related to natural processes rather than land use issues.

Dearborn South Fork

Two reaches were defined for the Dearborn South Fork (**Table 3-1**). Rosgen classification suggests that the lower reach (SF1) was a C4 channel type, and the upper reach (SF2) was a B4 to A3 channel. Analysis for the upper reach extended into the beginning of the forested headwaters.

Average channel width in SF1 was 34 feet, and the upstream reach SF2 averaged 17 feet. Channel slope decreased from 0.017 in the upper reach (SF2) to 0.012 in the lower reach (SF2), and sinuosity was 1.09 and 1.22, respectively.

Bank stability in the South Fork was generally good, with only 8.3% of banks in reach SF1 showing high BEHI scores, and <1% unstable banks in the upper reach SF2. Reach SF1 did show evidence of moderate instability with 25% of banks in this category. SF2 had significantly less bank in the moderate category (9%); the majority of the channel banks (85%) ranked good for stability (i.e. "low" BEHI ranking).

The relative differences in SF1 and SF2 bank stability are related primarily to channel type, and secondarily to vegetation and/or land use. SF2 is primarily forested A and B channel types in the headwaters, and has a relatively limited component of C channel in the lower part of the reach. SF2 is inherently more stable than SF1 because of this morphology.

Vegetation does appear to play a role in channel morphology and stability in the lower reach SF1. This is apparent from examination of aerial photography and visually comparing adjacent reaches with different vegetation densities. Hay/pasture and grazing in SF1 were associated with higher BEHI scores. The influence of riparian vegetation modification is more pronounced in the Middle Fork than the South Fork, however.

Dearborn Middle Fork

Two reaches were defined for the Dearborn Middle Fork (**Table 3-1**). The lower reach (MF1) was a Rosgen C4 channel type, and the upper reach (MF2) was a B4 at the lower end, and an A3 channel type in the headwaters. Analysis for the upper reach MF2 extended only partway into the forested headwaters because overhead canopy and small channel size limited quantitative measures. Average channel width in MF1 was 39 feet, and the upstream reach MF2 averaged 30 feet.

Bank stability assessment in the Middle Fork reach MF1 showed 11% of banks in reach MF1 with high BEHI scores and 35% with moderate scores. The upper reach MF2 had no banks with high BEHI scores. It should be noted that the aerial assessment did not cover detailed

assessment of the uppermost reaches of MF2 due to dense canopy cover. Had this been feasible, the overall BEHI rating of reach MF2 would improve substantially due to more stable channel types/reaches in the headwaters.

Vegetation appeared to play a strong role in channel morphology and stability in the lower reach MF1. This is apparent from examination of aerial photography and visually comparing adjacent reaches with different vegetation densities. High and moderate BEHI scores were associated with loss of riparian vegetation and agricultural impacts.

Flat Creek

Four reaches were defined for Flat Creek (**Table 3-1**). The lower reach (FC1) was a Rosgen C4 channel type. Morphology suggested that substrate is predominately coarse gravel with bedrock control in some areas. Central reaches FC2 and FC3 appeared to be Rosgen types C5 or E5 channel types. The uppermost reach FC4 was also classified as a C5/E5 channel type. Average channel width in the lower reach of Flat Creek (FC1) was 49 feet, central reaches (FC2 and FC3) averaged 36 and 38 feet respectively. Flat Creek Reach FC4 had an average width of 19 feet.

Flat Creek appeared slightly incised in the central reaches. This suggested that Flat Creek has experienced downcutting (tending to F5 channel type) due to the diversion of irrigation water and is re-establishing equilibrium C or E morphology.

BEHI assessment indicated that 8.4 to 11.2% of bank length in Flat Creek scored "high". Moderate bank erosion scores accounted for 18-37% of total bank length. Reaches FC1, FC2, FC3, and FC4 were similar in the distribution of bank stability. It should be noted that eroding banks originated both from human impacts and also areas where the active channel intersected natural terraces and hillsides. Eroding banks associated with topographic features can be related to human impacts; however, they can also be natural and unrelated to land use. In this case, the majority of eroding banks were associated with human impacts.

Flat Creek is a highly altered system with diverted irrigation water and extensive conversion of riparian areas to pasture or cropland. Loss of beaver from the system may also be a significant factor in modified channel morphology. Reference reaches were not apparent in Flat Creek. Prior to conversion to an irrigation conveyance, the channel of Flat Creek was certainly a narrower, more stable channel. Given the current flow regime and corresponding geomorphic adjustments, potential "reference" or "equilibrium" conditions and potential bank stability criteria would be best defined through field investigation.

3.2 Riparian Condition

Fully functioning, healthy riparian vegetation communities can reduce stream bank erosion, filter sediment, dissipate the energy of flood flows, and provide a healthy and contiguous environment for both terrestrial and aquatic biota.

The distribution and composition of the riparian vegetation community is a function of the physical and chemical properties of the soils, moisture, elevation, and aspect. Site characteristics can be altered by both natural and man-induced causes. For example, an extreme flood event in

the Dearborn River drainage in 1964 significantly altered the physical characteristics of many stream floodplains as well as the character of the riparian vegetation communities. The effects from 1964 flooding are still evident in the riparian community (see **Section 3.3**). Man's actions can also have an effect on the riparian vegetation community. Riparian harvest, the presence of roads, stream crossings, agricultural encroachment, irrigation, and grazing can all have deleterious effects on riparian vegetation communities.

A potentially significant anthropogenic factor in riparian vegetation communities is grazing. Present-day grazing pressure is mainly related to cattle although at the turn of the century large bands of sheep were prevalent. Contemporary grazing pressure is not necessarily more intense than pre-settlement conditions. Lewis reported observing vast numbers of buffalo along the rivers in 1806 while traveling through the Dearborn-Sun area, including "not less than 10,000 buffalo" within a two-mile radius near the Sun River confluence with the Missouri. It should be recognized that interpretations of "unimpaired" riparian condition necessarily have a somewhat short-sighted perspective relative to historical "reference" conditions.

With this caveat, interpretation of "unimpaired" or reference riparian characteristics in the following discussion is generally a spatial comparison between "least impaired" reaches (i.e., maximum observed riparian coverage) vs. "impaired" reaches (i.e., areas that show evidence of conversion to agricultural uses or elevated grazing pressure). A description of selected features of the riparian corridor is presented on a stream-by-stream basis in the following sections.

The riparian buffer width was estimated by measurement from 1995 aerial photos and is reported for each of the study reaches. Riparian buffer width was measured as the distance that natural riparian vegetation extended from the streambank across the floodplain. Three classes of vegetation were delineated and the percent cover of each was reported for each of the study reaches. The vegetative community types included coniferous/deciduous tree, woody shrub, herbaceous, and bare ground.

Finally, a qualitative assessment of the integrity of the riparian buffer was conducted. For the purposes of this analysis, buffer integrity was ranked as good, fair, or poor. A "good" ranking represented a natural riparian vegetation community that extends uninterrupted from the edge of the active stream channel to the apparent topographic extent of the floodplain. A "fair" ranking represented a riparian buffer that showed evidence of possible vegetation alterations from grazing or other land use, but was generally intact along the stream channel. A "poor" ranking represents a natural riparian vegetation community that was restricted to the immediate proximity of channel margins, and/or a riparian buffer with obvious evidence of riparian harvest or conversion from a natural vegetation community to agriculture or impervious surfaces. In general, these rankings could be equated to "fully functioning, functioning at-risk, and non-functioning" type classification.

It should be noted that the aerial assessment techniques applied in this study are not adequately sensitive to detect all potential impacts to the riparian vegetative community. For example, the potential deleterious effects of low intensity or moderate grazing would not likely be detectable. Grazing impacts would likely only be noted in relatively extreme cases. Nonetheless, a "poor"

ranking clearly raises a "red flag" that the condition of the riparian corridor may be limiting water quality and a "good" ranking likely eliminates the potential concern.

Dearborn Mainstem

Riparian vegetation was primarily open stands of deciduous cottonwood type (6 to 33% coverage), with extensive areas of herbaceous understory (30-64% coverage) and woody shrub components (19-39% coverage) (**Table 3-2**).

	Riparian	Vegetation Type (% of reach)							
Reach	Buffer Width (ft)	Con/Dec (%)	Woody Shrub (%)	Grass/Sedge (%)	Total Woody (%)	Bare Ground/ Disturbed (%)			
DR1	45	16	19	56	34	10			
DR2	42	19	27	49	46	5			
DR3	43	6	25	64	31	5			
DR4	46	12	27	60	39	1			
DR5	72	33	22	41	55	5			
DR6	136	11	39	30	50	20			

 Table 3-2 Dearborn Mainstem Riparian Vegetation Features

Although tree components were not the dominant vegetation component for the Dearborn mainstem, the overall coverage was good relative to the site potential. Riparian vegetation generally appeared to be in a seral state with multiple age classes of Cottonwood in active alluvial reaches (e.g. reach DR3). Upper reaches DR4, DR5, and DR6 had increasing amounts of coniferous overstory relative to deciduous Cottonwood.

Average riparian buffer width was fairly constant, ranging from 42 to 48 feet in reaches DR1 to DR4. Upper reaches DR5 and DR6 showed progressively greater riparian buffer widths (72 and 136 feet, respectively). This riparian buffer width appeared low relative to channel width (100 feet), but it should be noted that floodplain extents were limited by topographic features in many locations. Microsite factors (e.g. floodplain elevation, aspect, shading, etc.) also played an important role in vegetation distribution.

Representative photos for each Dearborn Mainstem Reach are found in Figures 3-3 to 3-8.

Figure 3-3. Dearborn Reach DR1



Figure 3-5. Dearborn Reach DR3

Figure 3-4. Dearborn Reach DR2



Figure 3-6. Dearborn Reach DR4





Figure 3-7. Dearborn Reach DR5



Figure 3-8. Dearborn Reach DR6



Shade provided by riparian vegetation to the stream channel was very limited on all reaches of the Dearborn mainstem. This resulted in part from low to moderate tree densities and canopy coverage, but also because tree heights and offset from the channel resulted in minimal shade projected to the water surface (e.g. **Figure 3-3**). Channel widths exceeding 100 feet limited effective shading potential from even mature Cottonwood stands adjacent to the river. The majority of shade to the Dearborn mainstem was related to topographic influences (see **Figures 3-3**, **3-4**, **3-7**).

Impervious/urban impacts on the mainstem of the Dearborn were infrequent and were limited to isolated road crossings and channel modifications. Bare ground or disturbed areas were present as gravel bar deposits or rock formations. Bare ground was largely unrelated to anthropogenic influences. Bare ground was especially characteristic of the braided reach in DR6 (20%).

Potential reference conditions for riparian vegetation in the Dearborn mainstem were difficult to establish based on clear delineation of pristine or un-impacted reach locations within the watershed. Review of historic aerial photographs and 2003 aerial reconnaissance did not suggest that reach-specific or localized grazing pressure had resulted in riparian impairment over most of the Dearborn. Upstream and downstream comparisons of adjoining reaches did not generally indicate any localized impairment to riparian condition or coverage related to human influence. Conversion of riparian communities to cropland or pasture was not characteristic of any reach of the Dearborn mainstem except for reach DR3. Reach DR3 showed some impacts from loss of riparian vegetation. Elsewhere in the Dearborn mainstem, human influence appeared minimal. Existing conditions likely represent relatively unimpacted vegetation characteristics. Much of the Dearborn mainstem is relatively inaccessible with a small, confined floodplain not well-suited to agricultural uses. This may account for the apparent low level of human impacts.

Dearborn Middle and South Fork

The distribution of riparian vegetation components in the Middle and South Forks is found in **Table 3-3** and is discussed in the subsequent sections separately for each stream reach.

		Vegetation Type (% of reach)							
Reach	Riparian Buffer Width (ft)	Con/Dec (%)	Shrub		Total Woody (%)	Bare Ground/ Disturbed (%)			
SF1	28	3	49	46	52	2			
SF2	61	18	31	51	49	<1			
MF1	78	4	37	59	40	1			
MF2	36	11	6	76	16	8			

Table 3-3	Riparian	Vegetation	Features

Dearborn South Fork

Riparian vegetation in lower Reach SF1 was characterized by isolated stands of deciduous cottonwood (3%) with extensive areas of herbaceous understory (46%) and woody shrub components (49%) (**Table 3-3**). Upper reach SF2 was mixed stands of deciduous cottonwood or conifers (18%) with extensive areas of herbaceous understory (51%) and woody shrub

components (31%). Tree and woody shrub species increased towards the headwaters, and the upper portions of reach SF2 transitioned to a dominant coniferous overstory. Average riparian buffer width was 28 feet in reach SF1 and 61 feet in SF2.

Impervious/urban impacts on the South Fork of the Dearborn were infrequent, and were limited to isolated road crossings and channel modifications. Bare ground or disturbed areas were present as gravel bar deposits and were related to floodplain/land use in some cases.

Figures 3-9 and 3-10 contrast the 'good' and 'poor' riparian conditions for the South Fork of the Dearborn in the lower reach SF1. Woody species were predominately shrub/willow in 'good' reaches. Loss of riparian corridor due to conversion to agricultural uses resulted in reduced riparian buffer widths in many locations.

Figure 3-9. Central Portion of South Fork SF1 'Good'

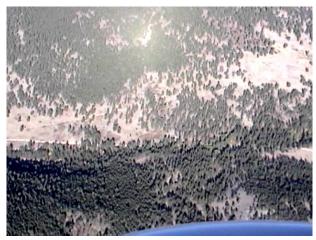


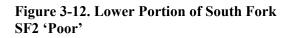
Figure 3-10. Central Portion of South Fork SF1 'Poor'



The headwaters portion of the South Fork SF2 was primarily coniferous forest and did not show any significant influence from anthropogenic activities (**Figure 3-11**). Portions of the central and lower section of South Fork reach SF2 appeared to reflect the impacts of logging and riparian vegetation clearing (**Figure 3-12**). The aerial assessment could not determine whether grazing also impacted riparian coverage in this reach.

Figure 3-11. Upper Portion of South Fork SF2 'Good'







Assessment of riparian vegetation impacts indicated that approximately 50% (20,593 feet) of riparian corridor was rated "poor" in lower reach SF1 (**Table 3-4**). An additional 29% (12,042 feet) was considered "fair", and 21% (8,725 feet) was in "good" condition. Cropland and conversion to pasture accounted for riparian impacts. Locations of reaches coded by impact are found in **Appendix E**.

Impairment Status	Length	(%)
Good	8,725	21%
Fair	12,042	29%
Poor	20,593	50%
Total	41,361	100%

Table 3-4.	Rivarian	Vegetation	Impact on the	Dearborn So	uth Fork (SF1)
	1 mp an vanv	, egenment	impact on me		

The upper reach of the South Fork SF2 showed post-1995 impacts from logging/riparian clearing along 5910 feet of channel. This resulted in a "poor" rating for this segment of the reach, although overall the headwaters were in "good" condition relative to site potential.

Vegetation assessment for the South Fork indicated that riparian coverage was sub-optimal in the lower reach SF1 and had significant conversion to herbaceous vegetation types. Riparian vegetation was lacking in woody shrub and tree components and was not in optimal condition relative to site potential. The upper reach SF2 had limited impacts from riparian clearing.

Dearborn Middle Fork

Riparian vegetation in lower reach MF1 was characterized by isolated stands of deciduous cottonwood (4%) with extensive areas of herbaceous understory (59%) and woody shrub components (37%) (**Table 3-3**). Upper reach MF2 was mixed stands of deciduous cottonwood or conifers (11%) with extensive areas of herbaceous understory (76%) and woody shrub components (6%). Tree and woody shrub species increased towards the headwaters, and the upper portions of reach MF2 transitioned to a dominant coniferous overstory. Vegetation coverage values were biased in reach MF2 because the aerial assessment focused on the lower end with more human impacts. Average riparian buffer width was 78 feet in reach MF1 and 36 feet in MF2.

Impervious/urban impacts on the Middle Fork of the Dearborn were generally limited to isolated road crossings. Bare ground or disturbed areas were present as gravel bar deposits and were related to land use/riparian vegetation loss in some locations.

Figures 3-13 to 3-15 contrast 'good' and 'poor' riparian conditions for the Middle Fork in the lower reach MF1. Woody species in the lower reach of the Middle Fork (MF1) were primarily woody shrubs. Tree components were not a significant part of the overall riparian coverage in 'good' reaches (**Figure 3-13**). Extensive clearing of riparian vegetation was apparent in the lower reach of the Middle Fork (**Figures 3-14 and 3-15**). The upper reach MF2 in the headwaters of the Middle Fork was mainly coniferous forest and was not significantly impacted by land use (**Figure 3-16**). Encroachment on riparian vegetation by Highway 200 was minimal except in a short section at the lower end of reach MF2.

Figure 3-13. Middle Fork Dearborn (MF1) 'Good' Reach



Figure 3-15. Middle Fork Dearborn (MF1) 'Poor' Reach



Figure 3-14. Middle Fork Dearborn (MF1) 'Fair' Reach



Figure 3-16. Middle Fork Dearborn (MF2) Reach



Assessment of riparian vegetation impacts indicated that approximately 65% (20,593 feet) of riparian corridor was rated "poor" in lower reach MF1 (**Table 3-5**). An additional 29% (12,042 feet) was considered "fair", and 21% (8,725 feet) was in "good" condition. Cropland and conversion to pasture accounted for riparian impacts. Locations of reaches coded by impact are found in **Appendix E**.

Impairment Status	Length	(%)
Good	9,743	29%
Fair	1,837	7%
Poor	21,286	65%
Total	32,886	100%

 Table 3-5. Riparian Vegetation Impact on the Dearborn Middle Fork (MF1)

Overall, riparian vegetation in MF1 was lacking in deciduous tree and woody shrub components and was not in optimal condition relative to site potential. The headwaters reach MF2 appeared to be in good condition with a full complement of conifer/deciduous overstory in most areas except for a short section in the lowermost portions near Highway 200.

Flat Creek

Vegetation metrics for Flat Creek indicated that riparian tree and woody shrub coverage was extremely low for most reaches. Tree components were less than 1% in all reaches except downstream reach FC1 (9%). Overall, woody shrubs comprised about 21% of the riparian corridor (**Table 3-6**), and herbaceous species averaged 77%.

		Vegetation Type (% of reach)					
Reach	Riparian Buffer Width (ft)	Con/Dec (%)	Woody Shrub (%)	Grass/Sedge (%)	Total Woody (%)	Bare Ground/ Disturbed (%)	
FC1	47	9	12	79	21	0	
FC2	61	<1	35	64	35	<1	
FC3	78	<1	21	77	21	2	
FC4	36	<1	4	93	4	2	

 Table 3-6 Riparian Vegetation Characteristics on Flat Creek

The lowermost reach FC1 had the highest frequency of tree components, although herbaceous species were the dominant vegetation type (**Figure 3-17**). Average riparian buffer width was 47 feet in reach FC1 and was composed of about 79% herbaceous vegetation and 21% mixed conifer/deciduous and woody shrubs

Vegetation in the upstream reaches FC2, FC3, FC4 was largely herbaceous, with lesser amounts of remnant and decadent woody shrub species. Riparian buffer width (36 to 78 feet) was low in these upper reaches of Flat Creek relative to potential (**Figures 3-19 to 3-21**).

Impervious/urban impacts on Flat Creek were associated with road crossings and channel modifications. Bare ground or disturbed areas were relatively localized and had minor impacts to riparian vegetation.

Flat Creek would not be expected to support a significant Cottonwood overstory given the relatively arid plains location, channel type, and fine-grained floodplain substrate. Willow, snowberry and other shrubs would be expected to be the dominant riparian component in this geologic setting. It should be noted that less visible forms of woody species (e.g. sandbar willow) were not easily identified with aerial assessment. As a result, woody shrub components may be underestimated. Nevertheless, it is apparent that the high proportion of herbaceous vegetation likely does not represent optimal conditions for reaches FC2, FC3, and FC4. Flat Creek would potentially support a much more extensive woody shrub component especially given the augmented flow regime. The entire length of Flat Creek was considered to be in the "poor" category for riparian impacts.

Figure 3-17. Flat Creek Reach FC1 Unconfined Lower Reach

Figure 3-19. Flat Creek Reach FC2 Reach

Figure 3-18. Flat Creek Reach FC1 Confined Lower Reach



Figure 3-20. Flat Creek Reach FC3 Reach



Figure 3-21. Flat Creek Reach FC4 Reach





3.3 Temporal Changes in Channel Condition

A review of historic aerial photos was undertaken to evaluate changes in channel conditions over time. Aerial photo coverage for 1955, 1964, and 1995 was limited to the central portion of the study area on the mainstem of the Dearborn and portions of Flat Creek. Channel geometry including active channel width, stability, and riparian coverage were assessed and compared for those areas with coverage for the time period. The full set of coverage for the Dearborn reaches including 1955, 1964, and 1995 flights was available for reaches DR1, DR2, and DR3. The Flat Creek reaches FC1, FC2, FC3 also had coverage for these years. Dearborn Reaches DR4, DR5, and DR6 had coverage for 1955 and 1995 only, and no coverage was available for the Middle and South Forks of the Dearborn.

3.3.1 Channel Widths

Channel width was measured as the distance between the vegetative indicators that defined bank margins. In this analysis, topographic limits such as terraces, hillsides, and rock walls also helped define channel extents. Channel width approximates bankfull width in many cross sections but would exceed true bankfull measures especially for the 1964 measurements. For example, the measures of width in 1964 are larger than the geomorphic bankfull width because they include large expanses of gravel bar deposits and disturbed floodplain surfaces. Greatly increased width following the 1964 flood reflects loss of vegetation within the bankfull floodplain in addition to probable enlargement of channel cross section.

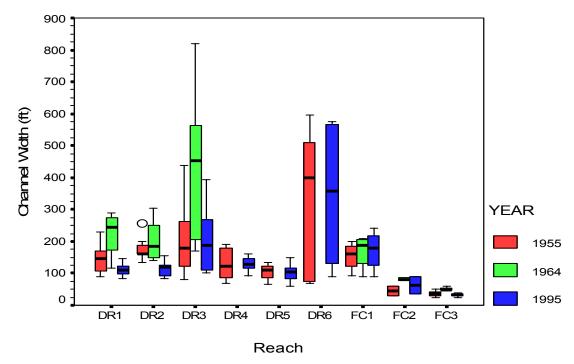


Figure 3-22. Estimated Channel Width in the Dearborn Planning Area in 1955, 1964, and 1995

In general, measurements showed that channel widths increased substantially following the 1964 flood, and that 1995 widths were comparable to pre-flood (1955) values (**Figure 3-22**).

Channel response to the 1964 flood resulted in significantly increased channel widths. In Dearborn reach DR1, channel width increased about 50%, from a 1955 value of 146 feet to 223 feet post-flood (**Table 3-7**). The Dearborn reach DR2 increased about 17% from a 1955 value of 176 feet to 205 feet post-flood, and reach DR3 nearly doubled in width to 429 feet. By 1995 these reaches had returned to pre-flood channel widths. DR1 and DR2 were narrower in 1995 compared to 1955. For reaches DR4 and DR5, 1964 data was not available. However, 1955 and 1995 measures show channel widths to be nearly identical.

Reach	Channel Width (ft)			
Reach	1955	1964	1995	
DR1	146	223	111	
DR2	176	206	117	
DR3	206	429	203	
DR4	129	NA	130	
DR5	104	NA	106	
DR6	342	NA	346	
FC1	153	169	172	
FC2	45	81	62	
FC3	37	52	33	

Table 3-7. Temporal Changes in Channel Width

Flat Creek reaches FC2 and FC3 also showed significant increases in channel width post-1964 flood. FC1 appeared relatively unaffected with channel widths increasing only slightly in 1964.

To state the obvious, a major decrease in channel stability occurred along with channel width increases after the 1964 flood. No metrics were calculated for bank erosion to demonstrate this point. Recovery of channel widths in 1995 to dimensions near (or less than) 1955 values indicates a strong trend for channel recovery following the 1964 flood. It is reasonable to assume that rebuilding of floodplain soils on exposed gravel deposits and re-establishment of climax floodplain vegetation communities is still continuing in the present day. Full recovery from the 1964 flood event has been gradual in many alluvial channels along the Rocky Mountain front. Exposed gravel floodplain surfaces are widespread in the portions of the Teton River, Birch Creek, and elsewhere in the area.

3.3.2 Temporal Changes in Canopy Coverage

A review of historic aerial photos was undertaken to evaluate changes in riparian vegetation over time. Conifer/deciduous tree, woody shrub, herbaceous, and bare ground classes were quantified. Aerial photo coverage for 1955, 1964, and 1995 was for the Dearborn, and portions of Flat Creek. The full set of coverage for the Dearborn reaches including 1955, 1964, and 1995 flights was available for reaches DR1, DR2, and DR3. The Flat Creek reaches FC2 and FC3 also had coverage for these years. Dearborn Reaches DR4, DR5, and DR6 had coverage for 1955 and 1995 only, and no coverage was available for the Middle and South Forks of the Dearborn.

Dearborn Mainstem

Changes in riparian coverage and composition were variable in the Dearborn mainstem (**Table 3-8**). The composite of conifer/deciduous trees and woody shrubs suggested that woody vegetation was unchanged in reach DR1 from 1955 to 1995. Dearborn reach DR2 decreased from 34% in 1955 to 27% in 1964, and increased to 46% in 1995. Reach DR3 also decreased from 1955 to 1964 (34% to 23%), and increased to 31% coverage in 1995. Reaches DR4 and DR5 both showed a 10-15% decrease in woody vegetation from 1955 to 1995. No data was available for 1964 in the upper reaches of the Dearborn.

Reach	Canopy Coverage (%)			
Keach	1955	1964	1995	
DR1	33.6	34.7	34.1	
DR2	33.9	26.8	46.4	
DR3	34.0	22.5	30.5	
DR4	49.6	NA	38.9	
DR5	69.3	NA	54.6	
DR6	NA	NA	49.5	
SF1	NA	NA	51.8	
SF2	NA	NA	48.7	
MF1	NA	NA	40.4	
MF2	NA	NA	16.3	
FC1	NA	NA	20.9	
FC2	30.5	30.5	35.0	
FC3	19.9	18.3	21.4	
FC4	NA	NA	4.3	

 Table 3-8. Temporal Changes in Tree/Woody Shrub Canopy Coverage

Boxplots of individual riparian vegetation components are shown in (**Figures 3-23 to 3-26**). Conifer and deciduous tree coverage in reach DR1 was similar in 1955 and 1995, and was significantly higher in 1964 (**Figure 3-23**). Reach DR2 was similar in 1955 and 1964, and increased in 1995. Reach DR3 showed little change in tree coverage from 1955 to 1995. Reach DR4 decreased from 1955 to 1995, and reach DR5 increased tree coverage over the same time period. No historic data was available for reach DR6.

Overall, woody shrub coverage tended to increase in the upstream direction, with median values of 10-20% in the lower reaches, and values of 25-50% in the upper reaches. Shrub component was generally similar in 1955 and 1995 for most reaches, with the exception of reach DR5 that showed a decrease in woody shrub coverage. Trees increased in this reach over the same time period.

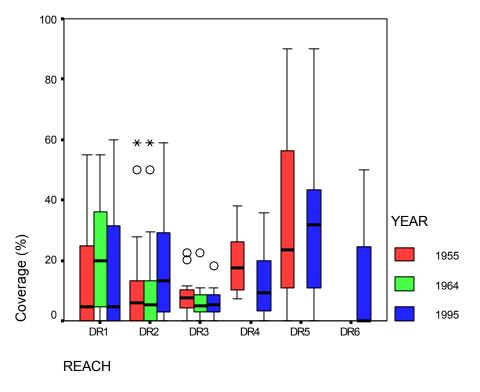
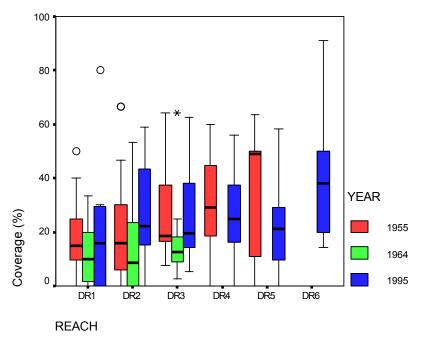


Figure 3-23. Conifer/Deciduous Coverage in the Dearborn Mainstem in 1955, 1964, and 1995

Figure 3-24. Woody Shrub Coverage in the Dearborn Mainstem in 1955, 1964, and 1995



Overall, herbaceous coverage tended to increase in the downstream direction with median values of 60-70% in the lower reaches, and values of 20-40% in the upper reaches (**Figure 3-25**). Herbaceous coverage in reach DR1 was similar in 1955 and 1995, and showed a small increase in 1964. Reach DR2 herbaceous coverage decreased from 1955 to 1995, and showed corresponding increases in trees and shrubs. Reach DR3 showed a drop in herbaceous coverage in 1964, and was slightly higher in 1995 than 1955. Reaches DR4 and DR5 showed significant increases in herbaceous coverage from 1955 and 1995. Decreases in shrub coverage were also noted during this period. No 1955 or 1964 data was available for reach DR6.

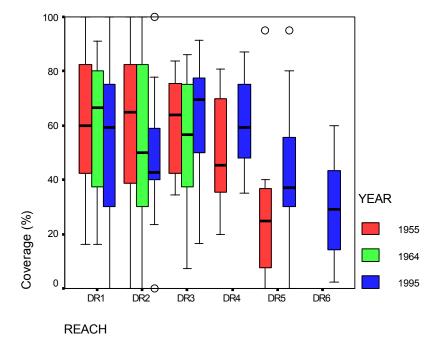


Figure 3-25. Herbaceous Coverage in the Dearborn Mainstem in 1955, 1964, and 1995

Overall, bare ground was a minor component in riparian areas, generally less than 10% (**Figure 3-26**). Significant increases in disturbed, bare ground was observed following the 1964 flood in DR2 and DR3. This increase in disturbed ground returned to pre-flood levels in 1995.

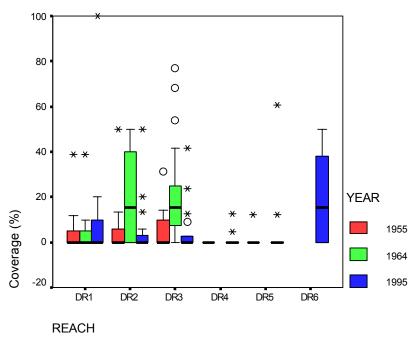


Figure 3-26. Bare Ground in the Dearborn Mainstem in 1955, 1964, and 1995

In summary, the lower three reaches of the Dearborn (DR1, DR2, and DR3) generally showed similar or greater tree and woody shrub coverage in 1995 as compared to 1955. With the exception of reach DR1, tree coverage as a proportion of total riparian vegetation did not change significantly as a result of the 1964 flood. Woody shrub coverage did tend to decrease in these reaches in 1964, but returned to pre-flood (1955) levels by 1995.

Flat Creek

Aerial coverage was available for 1955, 1964, and 1995 for Flat Creek reaches FC2 and FC3. Tree coverage in Flat Creek was generally minimal with the exception of FC1 (9%). No significant changes in tree coverage were apparent for Flat Creek reaches FC2 and FC3 from 1955 to 1995.

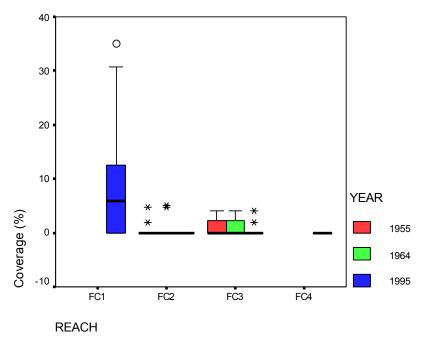


Figure 3-27. Conifer/Deciduous Coverage in Flat Creek in 1955, 1964, and 1995

The proportion of woody shrub coverage tended to increase in Flat Creek reach FC2 and FC3 from 1955 to 1995. The increase amounted to 5 to 10% greater woody coverage in 1995 relative to 1955 (**Figure 3-28**). Herbaceous coverage also tended to decrease over the same time period reaches FC2 and FC3 (**Figure 3-29**). No historical coverage was available for reaches FC1 and FC4.

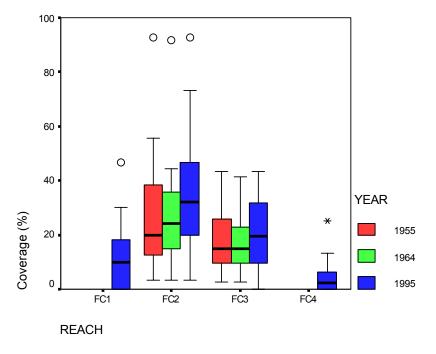
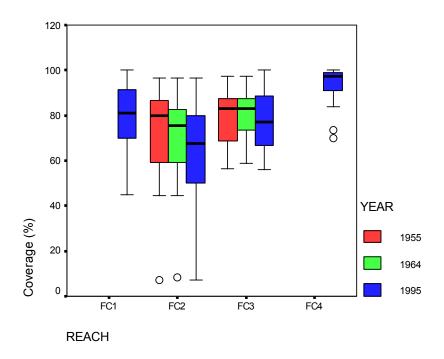


Figure 3-28. Woody Shrub Coverage in Flat Creek in 1955, 1964, and 1995

Figure 3-29. Herbaceous Coverage in Flat Creek in 1955, 1964, and 1995



Bare ground was infrequent in Flat Creek and amounted to less than 1% overall. A slight increase in bare ground was observed in 1964 in reach FC2, but was otherwise unchanged from 1955 to 1995.

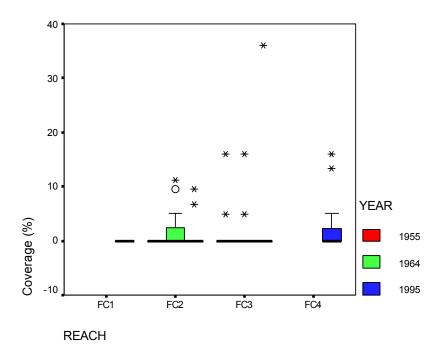


Figure 3-30. Bare Ground in Flat Creek in 1955, 1964, and 1995

In summary, the central reaches of Flat Creek appeared to show an increase in woody shrub coverage and a decrease in herbaceous coverage from 1955-1995.

3.4 Sediment Source Areas

Potential sediment source areas were inventoried based on 1995 digital orthophotos and the results of 2003 aerial reconnaissance. Sediment sources inventoried included bank erosion, mass failure of terraces/slopes, headcutting from tributary drainages, incised reaches, and delivery from upland sources.

On the mainstem Dearborn and portions of Flat Creek an additional review of historic aerial photos was undertaken to evaluate changes in sediment sources over time and to help interpret trends. Aerial photo coverage for 1955, 1964, and 1995 was limited to these areas and was not conducted on other waterbodies in the project area.

3.4.1 In-Channel Sources

Overall, sediment sources in the Dearborn planning area were predominately derived from inchannel scour and fill processes. The bank stability (Section 3.2.1) assessment showed that significant sediment sources exist in portions of most stream segments. Eroding banks were classified as either "natural" or "anthropogenic" based on professional judgment considering factors such as adjoining land use, apparent channel modifications, vegetation alterations, and visual comparison to potential channel characteristics of up and downstream reaches. Length of eroding banks was quantified for the lower Middle Fork reach MF1 and Flat Creek (all reaches).

Dearborn Mainstem

Very little evidence of channel or riparian modification was apparent on the mainstem of the Dearborn based on aerial assessment. Much of the channel is located in deeply incised terrain with a confined floodplain. No cultivated farmland is present within the floodplain of the Dearborn mainstem except in reach DR3. Potential human impacts in most of the Dearborn would be largely limited to riparian vegetation alterations associated with grazing pressure and bank trampling. Review of aerial photographs and 2003 aerial reconnaissance did not indicate that any obvious grazing or land use conversion had impacted riparian or bank conditions in the Dearborn mainstem overall. Pre-1955 conditions are unknown, and the possibility exists that more intensive historical grazing (e.g. intensive sheep and cattle grazing) could have altered riparian communities to some extent. This issue cannot be addressed directly in this study.

Examination of historic photos as well as upstream-downstream comparisons did not show any strong localized riparian modification, associated bank instability, or grazing-related sediment sources with the exception of reach DR3. Conversion of riparian areas to hay/pasture may play a role in bank stability within portions of the upper 2.5 miles in this reach. Reach DR3 was an unconfined C4 channel which would be expected to have significant natural erosion and depositional processes. Sediment in the Dearborn mainstem appears to be derived almost entirely from natural alluvial channel processes.

Middle Fork

The Middle Fork of the Dearborn showed little influence of anthropogenic, in-channel sediment sources in the headwaters (MF2). This section of the channel is situated in deeply dissected, forested terrain and no significant channel or riparian modifications were present. Logging activity and road systems in the headwaters did not appear to contribute elevated quantities of sediment. Highway 200 has the potential to contribute sediment from cut/fill slopes and applied road sand. However, the aerial assessment did not show any apparent delivery of sediment from the road to the Middle Fork. Long delivery distance from the road to the channel is likely to limit sediment contribution in most locations. A possible pathway for road runoff was investigated on the ground but did not appear to be a source of significant sediment delivery to the channel. Spring snowmelt does have the potential to deliver road sand to the Middle Fork, but a comprehensive field investigation was beyond the scope of this study. Evaluating this potential source of sediment would require additional field work to determine if concentrated flow pathways are present.

The lower reach of the Middle Fork (MF1) showed evidence of channel instability related to land use/riparian modification for agriculture. In-channel sediment sources were present due to human-induced channel instability in some areas. An estimate of eroding bank lengths was made from the 1995 digital orthoquads and interpretation of the 2003 aerial video flight (**Table 3-9**). Bank erosion was classified into "high", "moderate", and "low" categories. These rankings are intended to correspond to probable Rosgen Bank Erosion Hazard Index (BEHI) values. Banks in the high and moderate categories were evaluated to determine if anthropogenic factors were a contributing factor to bank instability. Human land use impacts were assumed if

riparian conversion to agriculture or grazing effects on streambanks appeared to be a significant factor in bank stability. An evaluation of bank stability in adjoining upstream and downstream reaches assisted in this interpretation.

Table 5-7 Bunk Liosion, maate 1 ofk Reach m1 1					
Category	Length (ft)	%	% Anthropogenic related		
High	3486	10.6	45%		
Moderate	11609	35.3	40%		
Low	17791	54.1	NA		
Total	32886	100.0	NA		

Table 3-9 Bank Erosion, Middle Fork Reach MF1

Approximately 45% of eroding banks (1,569 feet) in the high category were associated with human related impacts. In several areas, eroding terraces were natural or not primarily related to human impacts. For example, a natural stream position along the valley margin can result in an eroding terrace feature that is mostly unrelated to adjoining land use.

Eroding banks in the moderate category associated with land use impacts totaled 4640 feet, accounting for 40% of eroding banks in this category. The remaining 60% of banks in the moderate category were not directly associated with land use impacts and represented natural, relatively unimpaired bank conditions for this channel type (Rosgen C4). The entire reach of the lower Middle Fork (MF1) has experienced some level of grazing pressure and conversion of riparian vegetation to agricultural uses. Drawing a clear distinction between human-impacted and natural banks from an aerial assessment was difficult. Additional challenges include the diffuse nature of possible grazing impacts and the potential for "response" reaches to reflect upstream impairment (e.g. increased sediment load) rather than immediate land use impacts. The value of 40% (4640) feet of streambank in the moderate category is intended to represent a conservative estimate of stream length directly impacted by land use activities.

South Fork

The headwaters of the South Fork (SF2) were steep, forested terrain and did not show evidence of anthropogenic sediment sources or accelerated bank erosion. The lower reach of SF2 had a 5900 foot segment of riparian area that was cleared/logged and some increases in sediment yield may be possible. Channel stability appeared to be impacted to some extent and additional investigation on the ground may be warranted.

The lower reach (SF1) of the South Fork had several miles where the riparian corridor had been converted to agricultural purposes (pasture and grazing). Some impacts to bank stability and channel shading were apparent but were generally of a diffuse nature. A BEHI assessment was not completed and additional field assessment may be required to evaluate these areas as potential sediment sources.

Flat Creek

Flat Creek has significant anthropogenic sources of sediment related to the altered flow regime and related channel adjustments. Diverted irrigation water greatly exceeds pre-development flow rates and results in an enlarged channel cross section and actively eroding banks. Grazing and conversion of riparian areas to pasture and cropland have also contributed to sediment impairments. Flat Creek serves as an irrigation conveyance with flows exceeding 70 cfs diverted into the channel from the Dearborn mainstem. Prior to diversion of water the channel was likely a stable, meandering E type channel (transitioning to C) with a riparian zone composed predominately of willow-woody shrub species, and possibly lesser amounts of Cottonwood in the lower reaches. Sediment yield from eroding streambanks would have been relatively low compared to current conditions. Auchard Creek, a small tributary to the Dearborn (and parallel to Flat Creek), shows good channel stability and few actively eroding banks.

Present day channel morphology and channel adjustments have significantly increased sediment yield from Flat Creek. No pre-modification or reference data were available; however, it is likely that the majority of increased sediment yield from eroding banks on Flat Creek can be attributed to land use impacts. Loss of beaver from the system may also contribute to channel alterations including downcutting and bank erosion.

An estimate of eroding bank lengths was made from the 1995 digital orthoquads and interpretation of the 2003 aerial video flight (**Table 3-10**). Bank erosion was classified into "high", "moderate", and "low" categories. These rankings are intended to correspond to probable Rosgen Bank Erosion Hazard Index (BEHI) values.

Table 5-10 Bank Erosion, Full Creek						
Reach/Category	Total Length (ft)	%	% Anthropogenic related			
FC1						
High	4593	11.2	80%			
Moderate	7259	17.7	60%			
Low	29,158	71.1				
Total	41,010	100.0				
FC2						
High	3066	13.1	90%			
Moderate	8635	36.9	90%			
Low	11,701	50.0				
Total	23,401	100.0				
FC3						
High	3215	14.0	90%			
Moderate	7074	30.8	90%			
Low	12,678	55.2				
Total	22,967	100.0				
FC4						
High	7802	8.4	90%			
Moderate	30,929	33.3	90%			
Low	54,149	58.3				
Total	92,880	100.0				
Grand Total	32886	100.0				

Table 3-10 Bank Erosion, Flat Creek

In reach FC1, approximately 80% of eroding banks in the high category were associated with land use impacts totaling 3674 feet. Natural eroding terraces and hillsides not primarily related to land use accounted for 20% of eroding banks in the "high" category. Eroding banks in the moderate category associated with land use impacts totaled 4355 feet, accounting for 60% of

eroding banks in this category. Approximately 40% of banks in the moderate category were not directly attributable to land use impacts and represented natural variability for this channel type (Rosgen C4).

Reaches FC2, FC3, and FC4 showed similar distributions of eroding banks in each category. Banks in the high category ranged from 8.4 to 14% of total reach length and 90% of these banks were related to human impacts. Total length of impacted banks in the high category was 2759, 2894, and 7022 feet in reaches FC2, FC3, and FC4, respectively.

Banks in the moderate category ranged from 31% to 37% of total reach length. Like banks in the "high" category, 90% of the banks in the moderate category were associated with agricultural impacts and alterations related to increased flow in Flat Creek. Total length of impacted banks in the moderate category was 7771, 6366, and 27,836 feet in reaches FC2, FC3, and FC4, respectively.

Although values of 80-90% human impacted banks may appear to be an extreme number, it should be noted that extensive riparian conversion to pasture and cropland as well as grazing impacts were widespread in Flat Creek. Sustained summer irrigation flow greatly exceeds the natural hydrograph of Flat Creek. This increased flow from irrigation diversion appeared to be a significant factor in bank stability. As a result of these considerations nearly all bank erosion in the "high" and "moderate" categories was attributed to human impacts.

3.4.2 Mass Failure

Mass failure was an uncommon source for sediment within the Dearborn and tributaries. A single location on the Dearborn mainstem showed evidence of active mass failure in Reach DR6, and was related to natural processes. Shallow-seated slumps were located on unconsolidated parent material, and contributed sediment directly to the Dearborn mainstem in this location (**Figure 3-31**). Limited areas of dry ravel/rilling were present but infrequent on steep slopes adjacent to the active channel in Reach DR4 (**Figure 3-32**). These natural sources of sediment would be expected to contribute fines to the channel during extreme rainfall events and also during peak flow events that erode the toe of the slope.

Figure 3-31. Slumps in Dearborn Mainstem Reach 6



Figure 3-32. Dry Ravel/Rilling in the Dearborn Mainstem Reach 4



No anthropogenic related sources of mass failure or delivery of sediment to the Dearborn mainstem were observed. No mass failure was observed in the Middle or South forks of the Dearborn.

A significant major source of mass failure was sloughing of high banks along Flat Creek. This was considered under the bank erosion category of sediment sources since it is primarily related to fluvial action and bank stability.

3.4.3 Headcutting/Incised Reaches

Active headcutting and sediment delivery to listed reaches was not characteristic of small channels draining upland areas. No active gully formation was observed in either ephemeral or perennial tributaries. Vertical stability in tributaries was good, and headcut formation in rangeland did not appear to be a significant source of sediment in the Dearborn Planning Area.

A series of three gullies were observed along reach DR5 in the Dearborn mainstem (**Figure 3-33**). These gullies appeared stable and may be a remnant of heavy precipitation/surface runoff in the spring of 1964 or other intense rainfall events.

The majority of smaller drainages and tributaries to the Dearborn mainstem appeared to be vertically stable, and were not a significant source of sediment to the Dearborn (**Figure 3-34**). The Middle and South forks of the Dearborn did not show any significant sources of sediment from influent tributaries.

Incised channel conditions were observed in portions of Flat Creek and were most probably related to the increased flow regime of diverted irrigation water. Loss of beaver from Flat Creek may also contribute to apparent localized changes in base level.

Figure 3-33. Gullies in the Dearborn Mainstem Reach 5



Figure 3-34. Typical Smaller Contributing Drainages to the Dearborn Mainstem



3.4.4 Upland Sources

Upland sources did not appear to contribute appreciable quantities of sediment to the Dearborn mainstem or tributaries. Perennial and intermittent tributaries appeared stable, and rangeland did not show evidence of surface erosion, rilling, or other signs of accelerated soil loss due to anthropogenic influences. Forested headwaters were largely pristine and unroaded in the mainstem and South Fork of the Dearborn. The Middle Fork of the Dearborn had minor impacts from Highway 200 in the upper headwaters (in the ephemeral portion). Sediment contribution from cut/fill slopes and road sand from Highway 200 appeared to be minimal due to the long delivery distance to the channel.

Hogan Creek (Tributary to Flat Creek, above the listed reach) showed pronounced turbidity during the 2003 aerial survey (**Figure 3-35**). Sediment sources appeared to originate from channel incisement, exposed soils and relatively poor vegetation coverage in this drainage. Soils appeared to be fine-textured and relatively arid. No obvious anthropogenic influence appeared to account for turbid water originating from Hogan Creek, although grazing may contribute to sparse vegetation coverage. Several small impoundments (presumably for stockwater) on Hogan Creek likely limit the potential delivery of sand/silt fractions to Flat Creek (**Figure 3-36**). In addition, the relative loading of sediment from Hogan Creek is likely to be low due to the low elevation and runoff volume.

Upland sources of sediment in Hogan Creek warrant additional field investigation to establish whether they are a significant contributor to impairment in Flat Creek.



Figure 3-35. Hogan Creek, Tributary to

Figure 3-36. Upper Hogan Creek, Tributary to Flat Creek Reach 4.



3.5 Cultural Features

An inventory of cultural, anthropogenic channel modifications was undertaken using 1995 aerial photos and aerial reconnaissance in 2003 (**Table 3-11**). Overall, the main cultural feature was stream crossings including bridges and fords. Stream crossings did not appear to have any significant up or downstream impacts on channel function other than minor localized effects. Very little bank stabilization/rip-rap or channelization was apparent in the reaches studied and did not account for any significant impacts to channel morphology.

No impoundments were observed in the primary reaches studied, although a number of small stockwater impoundments were present in smaller tributary streams to Flat Creek (e.g. Hogan Creek). These impoundments are unlikely to contribute significantly to either thermal or sediment impairments to Flat Creek and may help sustain summer baseflows in some cases. Small impoundments in Hogan Creek may reduce sediment loading to Flat Creek though this influence is likely to be minimal based on contributing area and water yield for the drainage.

Diversion structures were present in the Dearborn mainstem (Dearborn Canal), South Fork (Gibson Renning Ditch), Middle Fork (4 diversions), and Flat Creek (multiple locations). An assessment of diversion rates/capacity was beyond the scope of this study, and additional field investigation may be warranted to determine the influence of these diversions on flow and thermal impairments.

No major anthropogenic point sources for sediment or temperature impairment were noted. The Milford Colony has several lagoons/holding ponds located along the riparian corridor of Flat Creek (**Figures 3-37**, **3-38**). Water quality in these lagoons is unknown and potential impacts to Flat Creek could not be determined in this study. The possible influence of these features on water quality may warrant additional investigation, although the potential to affect sediment or thermal impairments is likely to be minimal.

Figure 3-37. Milford Colony



Figure 3-38. Milford Colony



Reach	Rip-rap/other stabilization	Channelization	Impoundments	Instream Structures/ Diversions	Stream Crossings	Potential Water Quality Point Sources	Other (gravel pits, construction)
DR1	NA	NA	NA	NA	Train Bridge at Mouth Ford near pt. 3 Ford above pt. 5 Ford near pt. 11	NA	NA
DR2	NA	NA	NA	NA	NA	NA	NA
DR3	Minor rip-rap near bridge	NA	NA	Ditch near SF Mouth	Hwy 285 Bridge Small bridge nr pt. 2	NA	NA
DR4	NA	NA	NA	NA	Hwy 200 Bridge	NA	NA
DR5	NA	NA	NA		Bridge near pt. 16	NA	
DR6	250 ft at pt 13	NA	NA	Bean Ditch near pt 12 Dearborn Canal bl pt. 14	Bridge near pt. 8 Siphon out below pt. 6	NA	NA
SF1	NA	NA	NA	NA	Ford near mouth Bridge bl pt. 11 2 Bridges abv pt. 14 Bridge abv pt. 19	NA	NA
SF2	NA	NA	NA	Gibson-Renning ditch diversion nr pt 3	2 bridges nr pt 3 Bridge or ford blw pt 5? Bridge or ford abv SF-9 Bridge or ford between SF-10 and 11 Bridge or ford blw SF-10 Bridge nr SF-13	NA	NA
MF1	NA	NA	NA	2 Gillette ditch Borho Ditch diversion	Bridge nr pt 10 Bridge nr pt 17	NA	NA
MF2	Riprap by Hwy 200 blw MF-12 - 500ft	NA	NA	Nitch ditch Dueringer ditch	Hwy 200 bridge Bridge abv MF-10 NA Ford? Blw MF-14		NA
FC1	NA	NA	NA	NA	NA	NA	NA
FC2	NA	NA	NA	NA	Ford nr pt. 15 Bridge-end of reach	NA	
FC3	Minor	NA	NA	Garino ditch Diversion Diversion a Hamilton ditch diversion between 11 and 12	Bridge and ford between pt 7 and 8 Ford between pt 21 and 22 Ford between pt 19 and 20	NA	NA
FC4	Minor	NA	Hogan Cr.	NA	NA	Milford Colony	NA

 Table 3-11 Cultural Features – Dearborn River

4.0 SUMMARY AND CONCLUSIONS

This study is based on an aerial reconnaissance conducted in October 2003 and the interpretation of historic aerial photographs from 1995, 1964, and 1995. Channel morphology, riparian condition, and source areas were evaluated to assess potential sources of impairment in the Dearborn planning area.

4.1 Potential Impairments

Dearborn Mainstem

The study indicated that anthropogenic influences have not substantially degraded the condition of riparian vegetation or channel function on most reaches of the Dearborn mainstem. No significant human impacts related to land use, conversion of riparian areas to pasture/cropland, or grazing were apparent except in reach DR3. Conversion of riparian areas to hay/pasture may play a role in bank stability within portions of the upper 2.5 miles in this reach. Most reaches of the mainstem had a small, confined floodplain that was relatively inaccessible and not well suited for agriculture. This probably explains the lack of human impacts to the channel and riparian community.

The 1964 flood had significant influence on channel stability and riparian vegetation in the Dearborn mainstem. Gravel bars, eroding banks and loss of riparian vegetation were apparent throughout much of the Dearborn in the post-flood aerial photos. Increased channel width and reduced riparian coverage were especially prevalent in alluvial reach DR3. Geologic structural constraints appeared to limit impacts from extreme flooding in other reaches. Riparian and channel conditions were generally comparable in 1955 and 1995, suggesting that the channel recovered from flood effects in the subsequent 41 years.

The deciduous cottonwood overstory in the Dearborn mainstem appeared to be in a seral state with multiple age classes of trees represented in many locations. This appeared to be related to natural fluvial processes rather than agricultural land use impacts with the exception of reach DR3. Shade provided by riparian vegetation did not appear to be substantial even in mature deciduous or coniferous riparian communities adjacent to the channel.

Sediment source areas were limited to natural processes including morphologically active channel segments, natural terraces and slopes, and natural bank erosion. Overall, land use and human impacts did not account for any significant increase in sediment sources or impairment. Reach DR3 had several locations with eroding banks that may be attributable to loss of riparian woody vegetation and impacts from agricultural uses.

Comparison of historic photos did not indicate any significant trend in human-related impacts to channel stability or riparian vegetation on the mainstem. Except for reach DR3, upstream and downstream comparisons also did not show any reach-specific impacts from human activities. In summary, the mainstem of the Dearborn appeared to be near full potential for riparian vegetation and channel/streambank stability given natural factors.

South Fork of the Dearborn

The South Fork of the Dearborn showed evidence of human impacts on riparian vegetation in both reaches studied. The upper reach SF2 was in good overall condition with a mature overstory of dominantly coniferous vegetation. A single 5910 foot segment of channel showed loss of riparian vegetation due to logging/riparian clearing that occurred after 1995. This resulted in loss of shade to the channel, but streambank stability appeared to be good overall.

The lower reach SF1 showed widespread impacts to riparian vegetation from agricultural activities. Approximately 50% of the total length ranked "poor" in terms of riparian condition. Eroding banks were associated with loss of riparian vegetation in several locations. Impairment to channel function did not appear to be severe in many instances, however.

Middle Fork of the Dearborn

The Middle Fork of the Dearborn is a steep, forested channel in the headwaters portion (reach MF2). Highway 200 and limited residential development are present along the riparian corridor. The Middle Fork showed minimal impacts to riparian vegetation and bank stability from human impacts in the upper reach MF2. No delivery of sediment from Highway 200 was apparent based on aerial reconnaissance and limited ground observation.

The lower reach of the Middle Fork (MF1) showed significant impacts to the riparian vegetation community. Approximately 65% of the riparian vegetation was ranked "poor" due to conversion of riparian vegetation to agricultural uses including grazing, pasture, and hay meadows. Bank stability and overall channel condition were sub-optimal; approximately 40-45% of the eroding banks were associated with human impacts.

Flat Creek

Flat Creek is a substantially altered system due to the diversion of irrigation water from the Dearborn mainstem. Sustained irrigation diversion and increased baseflow have resulted in impacts including enlarged channel cross section and probable channel downcutting. Flat Creek has adjusted to this altered flow regime to a large extent however eroding banks continue to contribute elevated sediment to the Dearborn mainstem. Grazing and conversion of riparian vegetation to pasture and agricultural use has significantly reduced woody species relative to site potential and contributed to sediment impairments. Almost no shade is provided by riparian overstory in most of Flat Creek except for the lower reach FC1.

Most of the increased sediment from eroding banks can be attributed to human impacts in Flat Creek. An estimated 80-90% of eroding banks in the "high" category were related to agricultural practices including increased flow, grazing, hay production, and cropping. Although woody species coverage increased from 1955-1995, riparian vegetation appeared to be sub-optimal relative to site potential.

4.2 Restoration Focus Areas

Dearborn Mainstem

The Dearborn mainstem had reaches with high channel instability (e.g. reach DR6), but these areas were related to natural channel process and do not appear to reflect existing or historical anthropogenic impacts. Evidence for this includes 1) the lack of human-related activity, 2) the lack of significant channel alterations, and 3) inherent instability related to geology and fluvial process. Therefore, no active restoration of riparian vegetation or channel planform/geometry is recommended for reaches of the Dearborn mainstem with the possible exception of reach DR3.

Reach DR3 was an unconfined Rosgen C4 type channel with channel instability in the upstream area. Conversion of riparian vegetation to hay/pasture has likely accelerated bank erosion in several areas. Recommended restoration activities include stabilization and revegetation of eroding banks with bioengineered geotextile treatments. Fencing and/or establishment of woody riparian buffer would help improve long-term stability.

Middle Fork of the Dearborn

No mitigation or restoration activities are recommended for the headwaters reach MF2 of the Middle Fork due to the relative lack of human impacts. Additional field investigation may be warranted to verify that no significant impacts from road sand occur on the Middle Fork.

Numerous areas of the lower reach of the Middle Fork have experienced some riparian impacts and channel instability mainly related to agricultural practices. Conversion of riparian corridors to pasture/agricultural uses has resulted in reduced riparian coverage. Approximately 4500 feet of channel showed a relatively high level of impacts to channel stability, and an additional 6600 feet had moderate impacts. Suggested restoration activities in the Middle Fork include improving woody riparian coverage and restoration of over-widened channel cross sections to reference conditions along impacted segments. Bank restoration can be accomplished with soft bioengineering methods (i.e. geotextile coir fabric wraps) and woody shrub/tree revegetation. Fencing or grazing rest-rotation in riparian areas would be beneficial to promote increased coverage of woody species. Offstream water sources may need to be developed.

South Fork of the Dearborn

The upper reach of the South Fork of the Dearborn is a steep, forested headwaters channel with minimal anthropogenic impacts. The headwaters are relatively undisturbed conifer forest in good condition and do not require any restoration or further assessment. The lower end of the upper reach (SF2) appears to have experienced some impacts from both logging/land clearing operations in the riparian area. Natural recovery from logging impacts would be expected to result in improving conditions in this reach. Some agricultural impacts (pasture/grazing/cropping) are present in reach SF2. Additional field assessment is recommended to determine if riparian clearing and agricultural impacts to the channel represent a significant impairment.

The lower reach SF1 experienced impacts from grazing and removal of riparian vegetation. Channel and riparian conditions were generally better than the lower reach of the Middle Fork. Additional field assessment in reach SF1 would be beneficial to establish whether any active restoration is required. Suggested restoration activities in the South Fork include improving land use practices and possibly riparian fencing to promote riparian vegetation recovery.

Flat Creek

Riparian vegetation appears to have been significantly degraded due to livestock grazing (see discussion of FC2, FC3 and FC4 above), and to a lesser extent, 1964 flood effects. There are extensive portions of Flat Creek that are most likely impaired due to reduced channel shading and poor habitat as a result of degraded riparian vegetation.

The flow regime in Flat Creek is largely artificial. Restoration to pristine conditions is therefore not a realistic objective at this time. There are, however, steps that can be taken to reduce water quality impacts and improve habitat conditions while continuing to accommodate the current flow regime. Suggested restoration activities include promoting recovery or enhancing riparian vegetation, and reducing sediment impacts through restoration of eroding banks. Restoration activities in Flat Creek to address thermal impairment should seek to increase shading through enhancement of woody riparian components. Establishment of mature tree stands could be expected to provide significant shading to the channel, although it should be recognized that extensive Cottonwood riparian communities would not be expected to be typical of this edaphic setting. Willow shrub communities would be more typical, though shading provided by willow would be modest. Strategies to reduce sediment yield would include sloping and revegetation of unstable terraces/banks with geotextile/revegetation treatments.

APPENDIX E: RESPONSE TO PUBLIC COMMENTS

Response to Comments

As described in Section 6.0, the formal public comment period extended from November 19, 2004 to December 20, 2004 for the draft "Water Quality Assessment and TMDLs for the Dearborn River Planning Area". Four individuals submitted formal written comments and one individual met with EPA in person to present comments verbally. Their comments have been summarized/paraphrased and organized by topic below. The original comment letters are located in the project files at DEQ and may be reviewed upon request.

Responses prepared by EPA and DEQ follow. 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 introduction (i.e., Section 1.0) has been modified to include a description of the technical approach used in the Dearborn TPA.
- Section 6.0 (entitled "Proposed Monitoring Strategy for the Dearborn River" in the draft document) has been revised and is now entitled "Proposed Future Studies and Adaptive Management Strategy". The revised section presents proposed future studies to address identified data gaps and/or uncertainties. A conceptual adaptive management strategy is also included in this section.
- A "Public Involvement" section (i.e., Section 7.0) has been added to the final document.
- A supplemental evaluation of the macroinvertebrate data collected in the mainstem Dearborn River, focusing on use of a Fine Sediment Index (Relyea, 2005), was conducted and is now included in Section 3.8.1. The results of this supplemental analysis are similar to the results from the previous analysis and, in general do not suggest fine sediment impairments in the mainstem Dearborn River.
- The analysis of temperature conditions in the Dearborn River was updated to include continuous (every 15-minute) data available for the period 1995 to 2004. These data did not add significantly to the temperature analysis that was reported in the draft document because they do not provide additional insight as to natural temperatures in the Dearborn River.

A. Temperature and Flow Issues

A1. Comment: The analysis regarding temperature pollution in the Dearborn River was inadequate and needs to be reevaluated.

Response: First, as stated in the draft document, we agree that the temperature analysis is inadequate and that further study is necessary. The question that needs to be answered is this: Is Montana's temperature standard violated in the Dearborn River? Montana's temperature standards were originally developed to address situations associated with point source discharges, making them somewhat awkward to apply when dealing with primarily nonpoint source issues, such as with the Dearborn River. For waters classified as B-1 (i.e., the Dearborn River), the maximum allowable increase over naturally occurring temperature (if the naturally occurring temperature is less than 67° Fahrenheit) is 1° (F) and the rate of change cannot exceed 2°F per hour. If the naturally occurring temperature is greater than 67° F, the maximum allowable increase above "naturally occurring" temperatures to protect the existing temperature regime for fish and aquatic life. So, it is not possible to directly apply Montana's temperature standard to the Dearborn River without knowing what the "naturally occurring"

temperature regime is in the Dearborn River. Since temperature data were not collected in the Dearborn River before it was impacted by human's actions, it will never be possible to know definitively what the "naturally occurring" temperature regime is for the Dearborn River.

We began the process by compiling all available temperature and flow data for the Dearborn River and tributaries and we also installed three continuous temperature recorders in the Dearborn River. We then sought similar data from streams that may be considered suitable reference streams for the Dearborn River (i.e., minimally impacted streams with similar hydrologic/geomorphic characteristics in similar settings). Streams that meet these characteristics would generally need to be along the Front Range and may include the Sun River, Teton River, Dupuyer Creek, Cut Bank Creek, Little Prickly Pear Creek and possibly others. Unfortunately, we were unable to locate a suitable reference stream that was not already significantly impacted by human activity and/or with sufficient data for comparison purposes. That left us with the modeling option that is articulated in Section 3.8.1.

We are well aware of the fact that there is a great deal of uncertainty associated with this approach. The results suggested a 1.2 °F increase in temperature associated with irrigation withdrawals. The model error was plus or minus 2.1 degrees. These results do not allow us to confidently answer the question: Is Montana's temperature standard violated in the Dearborn River? Therefore, we not only agree with the comment that *the analysis regarding temperature pollution in the Dearborn River was inadequate and needs to be reevaluated*, but we proposed additional study in Section 6.0 of the document to develop a better understanding of the potential temperature issues. Note that Section 6.0 of the document has been modified in response to public comment and DEQ/EPA have committed to a supplemental temperature study.

A2. Comment: This analysis did not consider all of the available temperature data. For example, FWP has spring through fall temperature data (recorded every half hour) from 1997 through 2004 near the Hwy 287 Bridge and the USGS collected data every 15 minutes through the period of record, and hourly readings (or better) are available through the USGS data archives (Steve Lynn, USGS, personal communications, 12/17/04). These data should be analyzed and reconsidered in regard to the TMDL for temperature.

Response: We were not aware of these additional temperature data. The FWP data were not mentioned during our conversation with Mr. Travis Horton (FWP) on June 24, 2004. In response to this comment, we contacted Mr. Horton and obtained the FWP temperature data. Temperature data were requested from USGS on April 7, 2004 and the only 15-minute data that were provided were for the period October 1, 2001 to June 16, 2003. These 15-minute temperature data are presented in Figure 3-10 of the public review draft report and were used during the analysis. In response to this comment, we contacted Steve Lynn on January 7, 2005 and obtained all of the available temperature data (which cover the period October 1, 1995 to September 30, 2004). These data were added to the final report but did not added significantly to the temperature analysis that was reported in the draft document because they do not provide additional insight as to natural temperatures in the Dearborn River. The data will be utilized in the proposed supplemental temperature study presented in Section 6.0 of the final document.

A3. Comment: The cumulative influence of riparian alterations in the basin (tributaries and mainstem) and their effect on water temperature throughout the basin should be evaluated.

Response: We agree and this is addressed in Section 6.0 of the final document.

A4. Comment: The narrative on page 13 of the draft document regarding the use of the head gate at the Flat Creek diversion is in error. The head gate is used on an as needed basis.

Response: Comment noted. The final document has been modified to address this comment.

B. Fish

B1. The following two comments suggested that the draft document did not adequately describe or consider the cold-water fishery. They also pointed out a potential relationship between temperature, nutrients, sediment and whirling disease. A single response is provided for these two similar comments.

B1a. Comment: The description of the cold-water fishery in the Dearborn River was not accurate. The Dearborn River is the main spawning and rearing tributary to the Blue Ribbon trout fishery in the Missouri River. Rainbow trout ascend the Dearborn River annually from March through May, spawn, and then return to the Missouri River. After hatching most rainbow trout rear for one winter in the Dearborn River basin before migrating to the Missouri River during spring runoff. Therefore, habitat and environmental conditions in the Dearborn River Basin set year class strengths for the rainbow trout population in the Missouri River. FWP has over 20 years of data relating to the production of trout in the Dearborn River, and impacts from low flows and high water temperatures are evident in these data. In addition, FWP has 5 years of data estimating the annual numbers of emigrating rainbow and brown trout.

Comment: The TMDL is thoroughly inadequate in how it describes the fishery of the B1b. Dearborn watershed. The description of connectedness with the Missouri River fishery is especially poor. For example, the agencies should have more rigorously reviewed - and consulted with FWP on - data used for estimating populations by age-class in the river. This includes correlating juvenile abundance (especially yearling fish) in the Missouri and the data on young of the year from screw trap capture in the Dearborn. These data can help determine how water years, temperature and possibly sediment transport affect annual production of Missouri River trout spawned in the Dearborn. We note that the Middle and South Forks, as well as Flat Creek, have populations of resident trout. There are very little data on these populations, so it's difficult to determine with any certainty whether the targets and threshold values in the TMDL are protective enough... Finally, there is no accounting in the TMDL for the relationship between temperature, nutrients and sediment to spore densities for whirling disease. Infection levels of whirling disease in fish in the middle and south forks are alarming, averaging a 4.9 in 2003 samples. A 4.9 is extremely hot, meaning there is essentially no recruitment in the sample population. Whirling disease occurrence is directly related to habitat conditions and temperature. It may be that the sediment targets, thresholds and supplemental indicators used for this TMDL are wholly inadequate for maintaining "increasing or stable" trends for coldwater fish populations.

Response: We have added a discussion of the Dearborn River fishery in Section 2.0 to enhance the description of the fishery provided in the final document.

Relative to whirling disease, it should be noted that this document focused on water quality standards compliance associated with discharges of pollutants (i.e., fine sediment and temperature). Montana's water quality standards for both sediment and temperature address allowable increases over "naturally occurring" levels. In general, if sediment and temperature levels are similar to "natural", including a consideration of all "reasonable land, soil, and water conservation practices" (ARM 17.30.602(21)), it is assumed that the water quality standards have

been met. At this point in time, neither the Montana Water Quality Act nor the federal Clean Water Act provide for more protection relative to the potential relationship between these two pollutants and whirling disease.

Finally, based on the available data, the Middle Fork Dearborn River, South Fork Dearborn River, and Flat Creek are considered impaired by fine sediment. Sediment load reductions have been proposed (Sections 5.1.1, 5.2.1, and 5.3.1), targets have been established (Section 5.4), and a phased conceptual restoration strategy has been proposed beginning with supplemental monitoring activities (Section 5.5 and 5.6). Implementation of this plan should result in reduced fine sediment levels. Therefore, to the extent that whirling disease is linked to fine sediment levels in these tributaries, whirling disease should also be addressed.

At this point in time, limited information is available on the relationship between whirling disease, temperature, fine sediments, and other habitat conditions. We are not aware of any studies, research, or literature that specifically correlate whirling disease with in-stream fine sediment levels in any measurable way. If future studies result in the establishment of such a correlation, TMDL targets can be modified if deemed appropriate, and in compliance with the State's water quality standards, at that time.

C. Fine Sediment/Pebble Counts

C1. Comment: At several points throughout the public review draft (e.g., p 79) statements were made concluding that excessive fine sediments were not impacting aquatic life or were not a significant impact to aquatic life. These statements are not supported by field data since not all types of aquatic life were investigated. Investigations on aquatic life were limited to algae and macroinvertebrates, and did not consider the various life-history stages of the many fish species. For example, fine sediments have been shown to cause suffocation of salmonid eggs in redds, or to prevent emergence of newly hatched fish. Increased nutrients, fine sediments, and organic materials may increase whirling disease infection levels in rainbow trout by creating more habitat for tubifex worms. Whirling disease has recently become a problem in the Dearborn River basin. Infection rates in the South Fork and the Middle Fork of the Dearborn are among the highest infection rates observed in Montana.

Response: Montana's 303(d) list addresses "aquatic life" and "cold-water fish" as two separate beneficial uses that must be supported. When we refer to aquatic life in the document, we are not referring to or including fish. We are well aware of the fact that fine sediments can affect the various life-history stages of many fish species. All of the targets and supplemental indicators presented in Table 3-4 have either a direct or indirect link to support of both the "aquatic life" and "cold-water fish" beneficial uses.

- **C2.** The following four comments all pertain to the use of pebble count data and, therefore, are addressed together. Combined, the comments suggested that:
 - Too much reliance was placed on the use of the pebble count data
 - The pebble count data may or may not be spatially or temporally representative
 - No discussion of statistical certainty was provided.

C2a. Comment: Reliance on pebble count data without any discussion of data quality objectives associated with these measures is not in accordance with EPA's guidance on data quality objectives. Pebble counts are a biased measure, particularly in estimating the finer

gradations. In addition, this is most commonly used as a geomorphic measure. Studies applying this method to evaluate fine sediment stress typically train field observers to avoid the larger particle bias. There was no mention of training to reduce this type of bias. In addition, the document contains no discussion of the precision, accuracy, or representativeness of substrate conditions along the length of the Dearborn River.

C2b. Comment: The only nominally valid data related to sediment we found are from Wolman pebble counts. However, pebble counts are inherently biased towards the larger fractions in sediment. It is unclear whether the agencies reviewed whether bias occurred because the TMDL does not include a Quality Assurance Plan addressing precision, accuracy and representativeness in the data. We note that even if the quality of the pebble counts meets standards, too few were done in too few places to provide a statistically valid representation of substrate conditions in the Dearborn River and its main tributaries. Basically, the agencies have taken limited data and stretched it to make sweeping conclusions about long reaches of stream.

C2c. Comment: The EPA reports the results of five pebble counts for the entire river without addressing the representativeness of this sampling scheme. Do these few sampling sites adequately describe substrate composition for the entire Dearborn?

C2d. Comment: Statistical certainty is another technical aspect of natural resource planning that is left out of this TMDL document. The pebble count data are an example of this; the EPA removes siltation as a pollutant largely based on data without determining whether pebble counts reflected the "real" substrate composition in the river. It is not scientifically credible to make these decisions without replicating samples and performing statistics.

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 <u>one</u> measure of potential sediment impairment associated with the aquatic life and cold-water fisheries beneficial use. Pebble counts were developed and have been regularly used by state and federal agencies to ascertain the amount of surface fines affecting streams (CDPHE 2002, EPA TMDL Sediment Guidance Year 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 <u>all</u> of the other targets and supplemental indicators to reach conclusions about water quality impairment.

It should further be recognized that the highest observed percentile for fine sediment (<2mm) was 11 percent at the most downstream station in the watershed. This value was well below the proposed target of 20 percent. The remaining fine sediment values ranged from 4.9 to 6.5 percent in the upstream reaches. Despite the small sample size in the Dearborn mainstem, we feel that the statistical likelihood of a substantial number of observations approaching or exceeding the 20 percent fine sediment threshold is low.

The following QAPP was used to guide all data collection activities in the Dearborn River and several other Montana watersheds during the 2003 field season:

Tetra Tech, Inc. 2003. *Data Collection for Physical, Chemical, and Biological Characterizations of the Montana TMDL Planning Areas (TPAs)*. Prepared for the U.S. Environmental Protection Agency. June 23, 2003.

This QAPP addresses the issues of methods, precision, accuracy, and representativeness. Furthermore, the personnel who conducted the pebble count analysis were trained individuals with extensive field experience who understood how the data were to be used and the importance of collecting unbiased results.

C3. Comment: Do these pebble counts reflect substrate composition in trout spawning areas?

Response: Pebble counts were not intended to reflect substrate conditions in spawning areas. The pebble counts were designed to reflect substrate condition where the biological samples (i.e., macroinvertebrates) were collected. Pebble count data, when used in combination with macroinvertebrate data, are thought to provide insight into overall watershed health relative to sediment. Thus, while substrate conditions in trout spawning habitat were not specifically measured, it is felt that the methods employed herein, provided a watershed scale perspective regarding potential fine sediment impairments.

C4. Comment: The pebble count data also ignore the important issue of seasonality. Pebble count data were collected at various times; however, the authors do not attempt to evaluate substrate composition in critical periods. The Dearborn River is an important spawning area for the Missouri River fishery, yet there are no data to evaluate substrate characteristics during spawning and incubation of either spring or fall spawning fishes. Pebble counts performed after spring runoff will miss conditions present during spring spawning and will also reflect the effect of scouring during high flows. Addressing seasonality will greatly strengthen determinations associated with siltation as a pollutant of concern.

Response: We acknowledge that seasonality in pebble count data may exist to some extent. However, we feel that the existing data indicate that fine sediment (<2mm) is unlikely to exceed the target of 20 percent regardless of season (see response in C2d above). Given pragmatic sampling considerations during elevated spring run-off, Wolman pebble counts were designed to be conducted during baseflow periods. Baseflow periods represent low stream power conditions and potentially the <u>maximum</u> accumulation of fine sediment. Pebble counts taken during elevated flow conditions would likely result in similar or lower fine sediment results. Additionally, sampling during baseflow reduces year-to-year variability because the observations are made during the same timeframe.

D. Aerial Survey

D1. The following two comments suggested that too much reliance was placed on the results of the aerial survey and field verification should have been conducted. A single response for both comments is provided.

D1a. Comment: The document over extends the appropriate use of the aerial photo analysis. Similar to other types of information used in this report, there is no discussion of data quality objectives. In other watersheds, assessments of aerial imagery are treated appropriately as a coarse screen that guides field sampling. It is simply not credible to use aerial photo analyses without validating the results on the ground. Detecting eroding banks from aerial photos is easier

when observing lateral bank migration, and much of the Dearborn is laterally confined; thus, this type of methodology would underestimate bank erosion.

D1b. Comment: In our opinion, the EPA overextends the aerial photo survey in this TMDL plan. The proper role of an aerial survey is an initial investigation to guide further studies. In other words, it is an initial screen, not an end in itself. The EPA uses this aerial survey without conducting a field assessment to verify results. Field verification is especially important when addressing sediment loading from eroding banks. Many eroding banks may not be visible from aerial photos. Moreover, the use of lateral channel migration as an indication of eroding banks may not work in a laterally confined system like the Dearborn River. Without field verification, we have serious concerns about applying the results of the aerial survey effort to decisions regarding sediment loading and riparian function. We encourage the EPA to conduct the necessary field assessments to resolve this deficiency.

Response: The basis for our technical approach is described in Section 1.1 of the final document. This project relied on the results of the aerial photo analysis because (1) historical photos were available from 1955, 1964, and 1995 to assess trends and the impacts of the 1964 flood, (2) the low-level (4500 feet) survey conducted in 2003 provided source assessment information on the <u>entire</u> watershed, and (3) limited access across private property precluded the collection of watershed-scale data via any other means. Private lands comprise 71 percent of the watershed and total approximately 390 square miles.

The results of the aerial photo analysis generally matched observations made on the ground. For example, on-the-ground Bank Erodibility Hazard Index (BEHI) surveys were conducted at two sites on Flat Creek during the summer of 2003 and generally matched the findings of the aerial assessment report. Visual assessments made during sampling also were consistent with the findings of the aerial assessment report. Also, for the Middle and South Forks, private and/or public roads parallel the streams for much of their length. Field crews drove or walked much of these watersheds conducting visual surveys with the intent of verifying observations made from the air. Finally, EPA and DEQ floated the reach of the Dearborn River from Highway 287 downstream to the confluence with the Missouri River in 2002.

D2. Comment: Riparian measures consisted entirely of qualitative evaluations during the aerial photo assessments and a qualitative questionnaire with very low spatial coverage. As with other data presented in this document, there is no discussion of data quality objectives for these data. Qualitative questionnaires have high interobserver bias, and thus may not be reliable when eliminating probable causes of impairment.

Response: Data quality objectives are discussed in the QAPP. Data regarding riparian condition (i.e. coverage, presence/absence, large scale modifications) was used only in the context of the supplemental indicators. As described in Section 3.3, the supplemental indicators were not considered sufficiently reliable to be used alone as a measure of impairment. "Riparian Condition", and all of the supplemental indicators were only used when one or more of the target threshold values were exceeded to provide supporting and/or collaborative information when used in context with all of the other available data.

Three individuals familiar with the Dearborn Watershed worked collaboratively to assess and review riparian assessments made from aerial photos. All staff recognized the inherent limitations of a remote sensing method to draw any detailed conclusions about riparian health. However, it should be recognized that extremes in riparian coverage and function (e.g. wide,

extensive riparian corridor versus total riparian removal) can be reliably evaluated from aerial photos. This "screening level" of analysis was considered appropriate to identify potential major impacts.

D3. The following two comments suggested that ground-truthing should have been completed to verify the result of the aerial surveys. A single response is provided below.

D3a. Comment: The aerial evaluation of riparian health and channel stability is fine for a coarse filter review. However, few conclusions can be made from this sort of examination without validating conditions on the ground. The agencies should have tested conclusions made from the aerial reviews with fieldwork, perhaps using vegetative transects, channel transects, or even at least a Pfankuch type evaluation. We note that the consultant's report is riddled with expressions like "appeared to", "did not appear to", etc. Therefore it's clear even the consultants are unsure about making firm conclusions from their reviews of two sets of aerial imagery and last year's over flight. Without a description of the quality assurance expected from these qualitative "data", the conclusions are highly suspect. For instance, we note that it can sometimes be difficult to make any conclusions of eroding banks from the air, especially in confined channel types, which is the case of the Dearborn on much of its length. We also note that evaluating riparian health from the air can be tricky without an on-the-ground perspective. For example, it appears the aerial evaluations were made from inspections during dry years or seasons when bank saturation - a condition that can trigger instability - wasn't present.

D3b. Comment: On-the-ground bank stability surveys should have been used to verify conclusions made about bank stability from aerial photographs.

Response: On-the-ground Bank Erodibility Hazard Index (BEHI) surveys were conducted at two sites on Flat Creek during the summer of 2003 and generally matched the findings of the aerial assessment report. Visual assessments made during sampling also were consistent with the findings of the aerial assessment report. Also, for the Middle and South Forks, private and/or public roads parallel the streams for much of their length. Field crews drove or walked much of these watersheds conducting visual surveys with the intent of verifying observations made from the air. Finally, EPA and DEQ floated the reach of the Dearborn River from Highway 287 downstream to the confluence with the Missouri River in 2002.

D4. Comment: Criteria used to classify sediment sources as "natural" or human caused in the aerial survey were not apparent.

Response: The aerial survey relied upon fixed wing aerial reconnaissance, and review of historic aerial photos. The primary human activity potentially influencing sediment sources is related to agricultural land use in the watershed. Sediment sources were classified as "human caused" primarily based on the extent of riparian vegetation removal and apparent impacts on channel stability associated with riparian alterations. Adjacent stream reaches with intact or greater riparian coverage provided a basis for comparison and interpretation of potentially impacted reaches. Another human cause for sediment source specific to Flat Creek is channel enlargement and eroding banks related to irrigation flow augmentation. Sediment sources within Flat Creek were generally attributed to human cause due to this flow alteration. Natural sediment sources were considered to be those areas not clearly associated with riparian modification or intensive agricultural land uses. Eroding landscape features such as terraces/hillsides were included in the natural sources category.

This approach provided a qualitative, screening level method of identifying potential human caused sediment sources. We agree that not all potentially human caused erosion or sediment sources would be identified using this approach. For example, intense grazing within riparian areas may result in channel modifications or localized erosion that might not be identified unless visible channel instability resulted. Potential sources within confined channels were also difficult to assess using this approach.

E. Habitat/Riparian Condition

E1. The following two comments suggested that anthropogenic impacts can exacerbate the effects of naturally occurring disturbances. A single response is provided below.

E1a. Comment: Some habitat degradation due primarily to naturally occurring disturbances (the 1964 flood and forest fires) in the Dearborn River basin were discounted as not being influenced by human activity; however, there was and is an anthropogenic effect both before and after such events that must be considered (e.g., land use activities in the Dearborn River basin may have exacerbated the effect of the 1964 flood).

E1b. Comment: Although we agree that naturally occurring events (floods, forest fire, etc) have an impact on the form and function of lotic systems, we believe that anthropogenic impacts exacerbate the effects of these events. The anthropogenic influences can include more destructive fires (due to years of fire suppression and build up of fuels), less stable riverbanks due to land management activities, etc. Inferring that the events were natural and their damage unpreventable discounts the anthropogenic influences. Finally, we propose that many of the habitat survey results could have been influenced by the long-term drought in the Dearborn River basin, and suggest some discussion on these potential influences.

Response: We agree that the effects of naturally occurring disturbances might have been exacerbated by anthropogenic activities. This may be especially relevant in unconfined channel types where riparian vegetation plays an important role in stable channel morphology. However, quantifying the extent to which this might have occurred in the Dearborn River is very difficult. The decision that anthropogenic activities were not, in general, a significant factor is due in part to the fact that the vast majority of the watershed is relatively undisturbed. For example, the available land use data suggest that anthropogenic land uses (i.e., pasture/hay, small grains, commercial/industrial, fallow, row crops, and low intensity residential) account for less than 4 percent of the total watershed area. Furthermore, some anthropogenic activities fall within the definition of "natural conditions" per the provisions of 75-5-306 MCA (i.e., Natural refers to "conditions or materials present in the runoff or percolation over which man has no control <u>or from developed land where all reasonable land, soil and water conservation practices have been employed.</u>"

E2. Comment: The cumulative habitat degradation impacts in the tributaries (increased sediment, decreased flow, increased temperature, etc) should be evaluated on the mainstem Dearborn River. In other words, the habitat impacts in tributaries are causing habitat problems in the mainstem river.

Response: There is no indication based on the available data that that habitat degradation in the tributaries is currently causing problems associated with sediment in the mainstem Dearborn River. The Dearborn has percent fine sediment values well below threshold target values.

However, we do agree that habitat alterations may have an affect on downstream water temperatures. This has been addressed in the final document in Section 6.0.

E3. Comment: It is unclear why the NRCS habitat survey was only conducted in the lower reach of the Flat Creek drainage. We argue that this area is not representative of habitat conditions in the upstream reach. If more sites cannot be inventoried in the upper basin, the results from the one reach downstream should not be considered as part of the analyses.

Response: Habitat surveys were conducted at two additional sites along Flat Creek (including one farther upstream) but were mistakenly left out of the draft report. In addition, the reported score for the site below Birdtail Road was wrong. The corrected scores appear in the final report and suggest that habitat is at risk below Birdtail Road and at Milford and sustainable at the mouth.

We agree that the habitat in the lower reach of Flat Creek is not representative of conditions upstream. However, the aerial survey we conducted allowed us to view and assess (at least at the "coarse" level) habitat conditions along the entirety of Flat Creek. Further, collecting additional field data upstream (where conditions are poorer) would not have resulted in a different conclusion regarding impairment status (i.e., Flat Creek would still be considered impaired and a sediment TMDL would be deemed necessary).

E4. The following two comments questioned the methods for sample site selection and suggested that the results of the riparian surveys were averaged across major ecotones. A single response is provided below.

E4a. Comment: It was not clear how sites were selected for habitat monitoring throughout the planning area. In the tributaries, the results from surveys were averaged across major ecotones. Had the results been considered excluding the headwater forested areas of the Middle and South Fork the conclusions may have been different.

E4b. Comment: Conclusions on riparian health seem to have been averaged across eco-types. This misrepresents conditions on the ground. For instance, we note that when looking at the South Fork of the Dearborn, the agencies combine the more stable channel conditions from forested uplands on public land with those found on the heavily damaged pasture sites on private land. Averaging them together, it's easier to conclude the South Fork is in decent shape. However, by bracketing the evaluations by shorter stream reaches and by eco-type and channel type, the conclusions will be different. We note that data seems to be used selectively. For example, the agencies make conclusions about Flat Creek's stability based on an NRCS cross-section located where the channel is naturally confined. This is misleading. There should also be corresponding data upstream or downstream in meandering meadow reaches.

Response: Sampling locations were selected to represent upstream, downstream, and transitional reaches of the subject streams. Sites were chosen based on the presence of historic sampling locations, changes in land use or landform, and the confluence with tributaries.

The location of the sampling sites was taken into consideration during the analysis and conclusions were not made based on averaging the values. For example, the impairment summary for the Middle Fork (page 82) states: *"When averaged, the targets are all met and do not indicate water quality impairment associated with sediment. However, examination of the results from some of the individual samples suggests potential localized areas of minor sediment*

related impairments." We disagree that the conclusions might have been different if we had bracketed the evaluations by eco-type, channel-type, etc. We still think the conclusion would have been that the Middle Fork, South Fork, and Flat Creek are impaired and that sediment TMDLs are necessary.

E5. Comment: My family has lived in the Flat Creek drainage since the late 1800's. Historically, there were never willows along Flat Creek.

Response: We recognize that willow and other shrub communities can be quite variable and reflect a combination of site characteristics (geology, soils, hydrology, etc), climate, land use, and other factors. Flow in Flat Creek is enhanced due to irrigation diversion, which may also alter willow establishment and survival. Other potential factors include historical grazing (presettlement bison, post-settlement sheep, etc). The relative impact of these influences is difficult to quantify. Flat Creek does currently support a variable coverage of willows and other riparian species. We would agree that willow coverage was potentially different at the turn of the century than the present day.

F. Methods

F1. The following three comments suggested that EPA and DEQ should have developed a QAPP and SAP. A single response is provided below.

F1a. Comment: The development of this TMDL document did not follow the typical pattern and method used on past TMDLs developed in Montana. In the past cases, a logical, orderly approach was employed where an initial, phase 1 assessment involved compilation and synthesis of available data, identification of data gaps, and development of quality assurance project plan (QAPP). The lack of the QAPP sets the stage for a technically poor plan that over extends the use of low-quality data. Field investigations directly related to the Dearborn River TMDL plan were negligible and apparently not guided by a QAPP or sampling and analysis plan (SAP), both of which are EPA requirements.

F1b. Comment: It appears the agencies did not attempt to fill data gaps with new information. Instead, it appears the available data--most of vague quality--were made to fit into pre-determined conclusions about watershed health, water quality and pollutant allocation.

F1c. Comment: Nowhere in the document did we find a methodical description of all available data that were reviewed. Nor did we find a description of data gaps, or the Quality Assurance Plan DEQ/EPA employed when both agencies apparently agreed the limited data used were valid. The result has been a hodge podge description of data reviewed. Moreover, it is difficult to determine whether any of the data used meets EPA's quality assurance quality control requirements.

Response: The development of the Dearborn River TMDL did in fact follow the pattern described in this comment. Available data were first compiled and analyzed, data gaps were identified, a Sampling and Analysis Plan was prepared, a quality assurance project plan (QAPP) was prepared, and additional data were collected. The field sampling that occurred in summer 2003 and the low-level aerial survey were both intended to fill identified data gaps. A description of all of the data that were reviewed appears throughout Section 3.0 of the document and raw data are available in Appendix B.

The following QAPP was used to guide data collection activities in the Dearborn River and several other Montana watersheds during the 2003 field season:

Tetra Tech, Inc. 2003. *Data Collection for Physical, Chemical, and Biological Characterizations of the Montana TMDL Planning Areas (TPAs)*. Prepared for the U.S. Environmental Protection Agency. June 23, 2003.

The SAP and QAPP are both available for public review (the QAPP document is 439 pages long) upon request.

F2. Comment: It appears that in preparing this plan, the EPA was more concerned with administrative outcomes, namely meeting strict time demands. Although we do understand time constraints, the focus should be on producing a technically sound plan that truly restores and protects aquatic resources in the Dearborn River watershed. With a reprieve in the TMDL deadlines, we hope that the EPA shifts priorities to improving water quality and restoring fisheries, rather than solely meeting administrative goals

Response: DEQ and EPA selected the Dearborn TPA as a pilot project to evaluate the feasibility of completion of all necessary TMDLs relying primarily on currently available data, use of remote sensing techniques, and application of modeling techniques. This approach is described in Section 1.1 of the final document. The Dearborn TPA was selected for this approach because, with the exception of the headwaters region, the Dearborn TPA is largely under private ownership with limited access. Also, when this approach was originally conceived in July of 2002, all necessary TMDLs for the Dearborn TPA were scheduled for completion by December 31, 2003. We disagree that the Dearborn analysis was technically insufficient. Qualified technical experts assessed available and newly collected data that met defined data quality objectives and appropriately applied the TMDL regulations to the information. We do agree, however, that data gaps exists, such as the remaining question of temperature impairment on the mainstem of the Dearborn, and that data uncertainty is too high to make a final decision regarding temperature impairment. Therefore, as noted in our response to comment #A1, we have outlined follow-up studies to better support final decision making.

F3. Comment: Another concern regarding EPA's approach and lack of technical standards relates to the other watersheds assigned to EPA for TMDL development. This plan does not compare favorably to other TMDLs in terms of technical merit and public involvement. Unless the EPA follows its own guidelines for watershed monitoring and planning, TMDLs developed by the EPA will be less likely to protect and restore our waters. The technical insufficiencies of the Dearborn TMDL also have ramifications for the quality of plans approved by the EPA is responsible for approval of TMDLs. Our concern is that if the EPA produces substandard TMDLs, they will likewise approve substandard TMDLs.

Response: EPA and MDEQ have established a joint approach to development of TMDLs/Watershed Restoration Planning in Montana. By standardizing the steps, from assessment of all currently available data, determination of data gaps, following the MDEQ approved Quality Assurance Project Plans for sampling and analysis, consistent use of laboratories, application of defensible analytical tools, confirmation of impairment status, identification of pollutant sources, setting of targets, allocation of loads, forthright presentation of data uncertainty, proposed follow up actions and internal/external peer and public review, both agencies are attempting to meet a level of technical rigor that is scientifically defensible given the

constraints of time and the state of the science. The Dearborn TPA process followed this standardized protocol.

Although EPA and MDEQ have established a consistent approach, each case will dictate a slightly different application based on the unique circumstances within the watershed. As described in our response to Comment F2, the Dearborn TPA is largely under private ownership with limited access. These unique features are the reason DEQ and EPA selected the Dearborn TPA as a pilot project to evaluate the feasibility of completion of all necessary TMDLs relying primarily on currently available data, use of remote sensing techniques, and application of modeling techniques. Based on the results, we feel that this approach was adequate for the tributaries (Middle Fork, South Fork, and Flat Creek) and the siltation listing on the mainstem of the Dearborn River. However, the level of certainty associated with this approach was inadequate regarding the temperature analysis in the mainstem Dearborn River. The document acknowledges the uncertainty associated with the temperature analysis and EPA and DEQ have committed to the completion of a supplemental flow and temperature study in Section 6.0.

G. Public Notice and Document Availability

G1. Comment: We have concerns regarding the level of public involvement incorporated in this process. Specifically, it appears that the EPA did not follow the example of other watersheds in Montana, where a local watershed group, local fisheries managers, conservation groups, landowners, and other stakeholders or interested parties were part of the process. The lack of stakeholder participation is a considerable concern in getting landowners to accept and implement plans. Also, failure to include local natural resource professionals results in a document that does not reflect an informed understanding of the river's fisheries. We strongly recommend that the EPA include more stakeholders to produce a TMDL document that incorporates the knowledge of individuals working and living in the watershed.

Response: Due to the lack of a formal, organized watershed stakeholder group in the Dearborn TPA, public involvement was generally limited to the elements required by the Montana Water Quality Act. The Lewis & Clark Conservation District was notified during the initial stages of project development and kept apprised of activities/progress throughout the project. The Conservation District was also partially relied upon to assist in obtaining landowner contact information to gain access for field activities. The Sampling and Analysis Plan prepared to direct field-sampling activities was provided to the Lewis & Clark Conservation District and landowners who provided access for sampling (if they were interested in having a copy) prior to initiation of field activities. Additionally, contacts were made with the Montana Department of Natural Resources, Montana Fish, Wildlife and Parks, U.S. Natural Resource Conservation Service, and USGS to request all available data as well as any information that they may have had regarding local activities.

Further opportunities provided to the public regarding review of the draft document are described in Comment G2 below.

G2. Comment: Not providing public notice to organizations such as ours who have long demonstrated an interest in water quality and watershed health. We learned about the impending release the recent spate of draft TMDLs only through a reporter, right before the comment deadline for the Flathead Headwaters TMDL. Thus we couldn't plan appropriately for the type of review we like to do, which includes consultation with additional professionals.

Response: The draft Water Quality Assessment and TMDLs for the Dearborn River Planning Area document was formally released for public review on November 19, 2004. The notice of availability was made through a press release to the following media sources: Cascade Courier, Great Falls Tribune, High Plains Warrior, KEIN-AM/KLFM - FM, Rural Montana, KTVH-TV, KBLL-AM, KFBB-TV, KMTF-TV, KXGF, KMON-AM, KRTV, KTGF- TV, the Helena Independent Record, the Queen City News, and the Associated Press. It was also posted on "Newslinks" which is a subscriber service for all media, and the notice and draft document were posted on DEQ's website. We also made phone contact, and visited, with the Lewis and Clark Conservation District and NRCS to alert them that the document was available for review, provide them with copies of the draft document, and request their assistance in notifying their constituents within the Dearborn River Watershed. Additionally, we made phone contact with all of the landowners within the watershed, that we previously made contact with to obtain permission for sampling, to alert them of the document availability.

We regret that your organization was not specifically notified, but feel that adequate public notice was, in fact, provided. DEQ is currently in the process of developing an improved TMDL public notification/information program. In the future, we hope to ensure that all interested parties are provided adequate notification.

G3. Comment: A final consideration directed primarily at DEQ relates to the timing of releasing TMDLs for public review. This year, the DEQ bombarded the public with plans at the year's end. The number of plans released so close in time presents a hardship to parties interested in more than one watershed. We suggest that DEQ stagger the release of these documents so as not to shortchange the public participation process. Once again the reprieve in the deadline should allow DEQ/EPA more flexibility in planning the release of these plans.

Response: The courts and our constituents have been asking for DEQ and EPA to increase the pace of TMDL development since the program officially began in Montana in the late 1990's. The pace of TMDL development in Montana has increased annually since the year 2000 and is expected to continue to increase. This, inevitably, will result in an increased burden on the public to review more and more TMDL documents on an annual basis.

To date, the timing of the release of public review drafts has largely been driven by a rigorous, court-imposed schedule with annual milestones. Given a court-imposed schedule, Montana's TMDL Program has operated on a calendar year basis since the year 2000, with TMDL documents scheduled for completion by the end of December every year. This has resulted in the release of most of the public review drafts in October, November, or December on an annual basis.

Nonetheless, DEQ appreciates the challenges the public may face when multiple draft documents are published at the same time. DEQ is working to address numerous issues including:

- developing standard procedures for notification of document availability,
- pre-specifying convenient locations for the public to review the drafts (such as local libraries),
- standardizing text viewing software for review of the documents electronically, and
- creating a streamlined process for receiving and recording public comment.

It is also important to note that DEQ is strategizing on ways to better inform the public on upcoming public draft releases so that the public can prepare and schedule appropriately with the timing of the release of each draft document.

Further, although many public review draft TMDL documents will continue to be released in the last three months of the year, some future modifications to the release of TMDL documents are planned. For example, a phased approach will be taken for some of the larger and more complex TMDL Planning Areas, where the required TMDL elements will be presented in a series of "volumes". The first volume for a given TMDL Planning Area may contain the first two sections or chapters of the typical TMDL document (i.e., Watershed Characterization and water quality Impairment Status). The remaining sections of the typical TMDL document (i.e., source assessment, total maximum daily loads, targets, allocations, margin of safety, etc.) will be presented in subsequent volumes, as appropriate based on the scale and complexity of the TMDL Planning Area. In 2005, it is envisioned that the first "volumes" (i.e., Volume I) of several TMDL documents will be released during the first half of the year. Subsequent volumes will then be made available to the public when they are completed. This will provide the public with more time to review DEQ's more complex TMDL documents and will ensure that the entire public review time period is spread out throughout the year, rather than waiting for the last three months of the year.

Additionally, some TMDL documents are scheduled for completion throughout 2005. These will be made available for public review as soon as they are completed, thus avoiding the last three months of the year.

G4. Comment: When we examined the Dearborn TMDL on the website last week, we found not all the pages were available. Thinking it could be a problem with our version of Acrobat Reader, we double-checked with several other TMDLs on the DEQ site. We had no problem reading those, leading us to conclude that perhaps the problem was with DEQ. After several hours of investigation, including calls to DEQ, we finally found an administrative staffer at the agency that helped us understand the problem; not all the TMDL documents on DEQ's site were done using the same version of Acrobat, but the agency hadn't bothered to tell the public. Thus, though technically the problem was on our end, DEQ could have facilitated things and saved time for reviewers by simply noting on its website that the public needs different versions of Acrobat Reader for reviewing different TMDLs.

Response: In an effort to produce documents that are easy for the average person to read and understand, we often include large numbers of graphics and photographs. This results in large electronic files that are often difficult to download. In the future, we will ensure that all downloadable document files are small enough for the average person with a "home computer" to download and will also improve our website to make all necessary directions for downloading more obvious.

H. Miscellaneous Topics

H1. Comment: I believe that "the fires in 1989" caused the biggest sediment problems in the Dearborn drainage. I observed turbid flows in the Flat Creek diversion for at least a couple of years after the fire. Ice scour during spring floods has caused many of the bank erosion problems.

Response: We agree that the 1989 fires and ice scour have contributed to the current sediment problem in the Dearborn drainage. Table 2-6 of the report indicates that approximately 7 percent

of the watershed (primarily in the headwaters) consists of "standing burnt forest". However, we believe that there are also localized problems caused by human activities, especially in Flat Creek.

H2. Comment: This study was conducted during a period of drought that has occurred for at least the last 5 years.

Response: We agree that the current drought conditions have likely biased some of the observed problems and attempted to address this by evaluating the 1955, 1964, and 1995 aerial photographs. Future study of the Dearborn River drainage is recommended once the current drought ends.