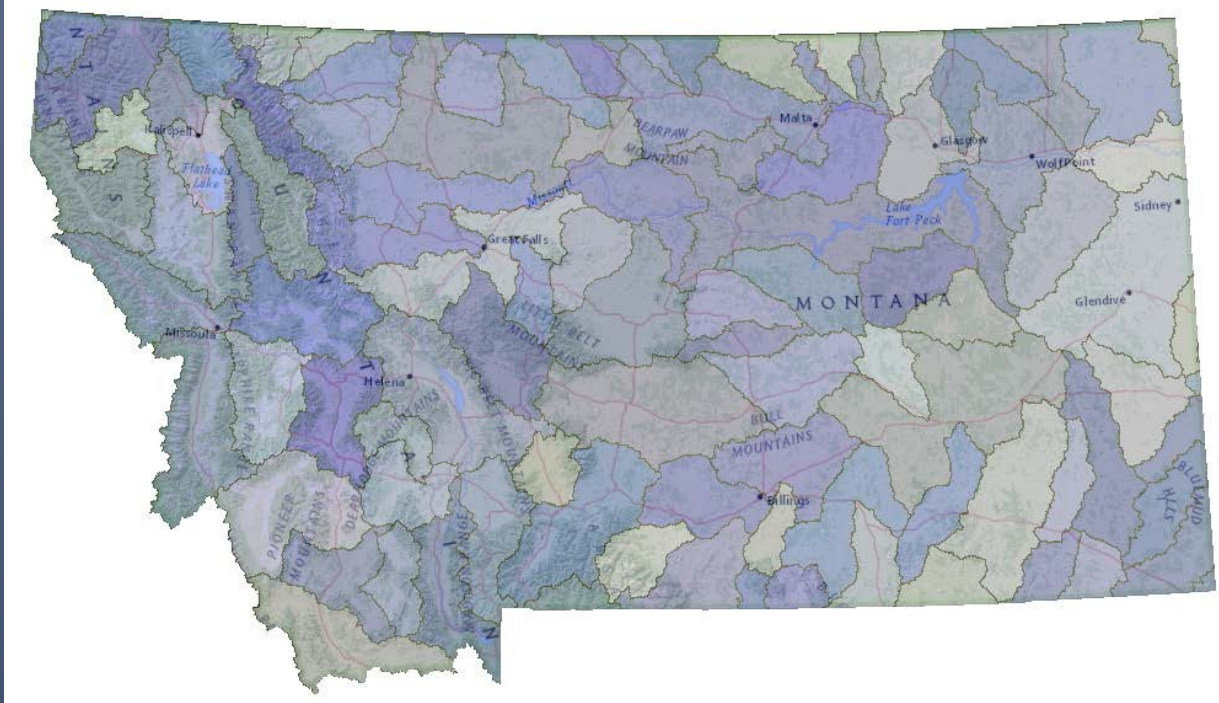
2017



WATERSHED RESTORATION PLANNING IN MONTANA: AN INTRODUCTORY GUIDE

AN OVERVIEW OF THE STEPS YOU'LL TAKE TO DEVELOP A WATERSHED RESTORATION PLAN IN MONTANA

AUTHORED BY: ETHAN KUNARD, MADISON CONSERVATION DISTRICT

Funding and support of this document provided by Montana Department of Environmental Quality and Soil and Water Conservation Districts of Montana

Contents

Introduction

How to use this guide

This document is intended to provide a basic understanding of the necessary steps to create a Watershed Restoration Plan (WRP). In addition to explaining the required elements needed for section 319 project funding, this guide will also give illustrations of how these elements fit within your plan by providing examples from WRPs in Montana. Though this document provides information to get you started on developing your watershed plan, it is intended only to compliment other available resources. There are many sources that can provide greater detail on developing and implementing your plan, and a list of these resources can be found in Appendix A. In addition, this document contains hyperlinks throughout the text. If you're reading this document electronically, you can click on the links (i.e., underlined blue text) which will direct you to online sources of information.

What's inside this document

Within this document, you will find information about the following topics:

- **EXPLANATION** of a Watershed Restoration Plan
- The **STEPS** needed to prepare a Watershed Restoration Plan
- Developing a **TIMELINE** for your Watershed Restoration Plan
- Developing an **EDUCATION & OUTREACH** component for your plan
- Developing a **STAKEHOLDER** group
- **GATHERING** information about watershed conditions
- **PRIORITIZING** watershed concerns
- Developing **GOALS** for your watershed
- Explaining the **EPA's 9 ELEMENTS** of a Watershed Restoration Plan
- Other useful **RESOURCES** to help you get started

What is a Watershed Restoration Plan?

A Watershed Restoration Plan is a document that identifies opportunities throughout your watershed to reach management objectives and obtain improved water quality for your watershed. A WRP can help your community identify its natural resource management goals, and will focus on streams that have been identified by the Montana Department of Environmental Quality (DEQ) as impaired or those that can be protected.

Through the development of your plan, you will identify key stakeholders in your watershed, and will carry out an outreach campaign to educate your community about the importance of healthy landscapes and clean water. Once you've gathered information, developed watershed goals, and identified priority concerns, you can begin to identify the pathways to improving watershed health and water quality in your watershed. In addition, this plan will help identify the technical and financial resources needed to implement projects, and will explain how to track progress once implementation of your plan begins.

Steps for Developing your WRP

The process you undergo to develop your WRP will be unique to your specific watershed. For example, the timing for each step may depend on factors such as: the existing partnerships in your watershed, the amount of data and information available, and the capacity you have to conduct education and outreach. Furthermore, you likely won't approach each of the nine EPA required elements in the sequential order in which they are addressed in this document. Instead, determine the approach that is best suited to your watershed.

Figure 1 shows an example of the steps you may take when working on watershed restoration planning and implementation. This figure also highlights (in white) the EPA required nine minimum elements that must be addressed in your plan in order to be eligible for federal Clean Water Act section 319 funding. These nine elements will be discussed in greater detail later in this document.

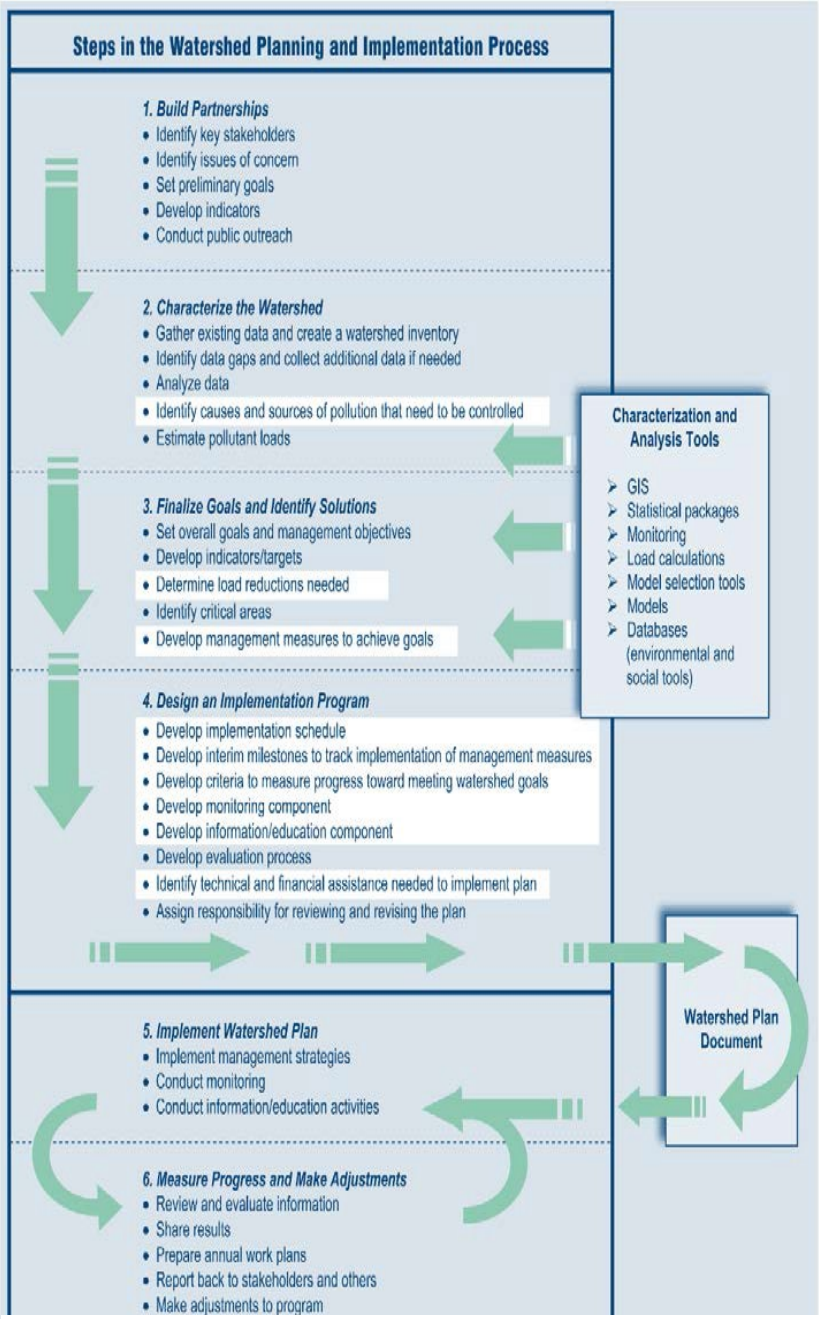


Figure 1: Steps in the Watershed Planning and Implementation Process (EPA, 2008).

Engaging Stakeholders and Partners

It is common to work with a diversity of partners and stakeholders throughout development and implementation of a WRP. Partners may be those organizations or individuals with similar goals and/or resources, or may be those Identifying partnerships is a great early step as you begin developing the

elements of your plan. You may have existing relationships with these partners, or you may need to reach out to some of them and build these relationships. In either case, it can be helpful to create a list of the stakeholders and partners, including those who can help or hinder the process. This list could include landowners, community members, agency personnel, technical advisors, local government officials, conservation districts, watershed groups, or other community organizations. In addition to establishing a partner/stakeholder group, it may be useful to develop a framework under which this group communicates and makes decisions. For instance, there are many different models where stakeholders can participate and make decisions. As an example, some stakeholders may simply be advisors or supporters, while other stakeholders are decision-makers. Alternatively, some stakeholder groups operate more collaboratively and make consensus-based decisions. The structure you choose will depend on your individual watershed community.

In addition to formalizing your stakeholder group, it will be helpful to discuss with stakeholders what their role is, and explain how you expect them to contribute to the process throughout the proposed timeline. For example, your stakeholders and partners will likely want to know how much time is expected of them to contribute to the process. Additionally, if there are particular needs you have from certain partners (e.g., providing data, historical information, outreach assistance, etc.), be sure that they are prepared to provide that level of commitment.

Engaging the Community – Education and Outreach

One of the important elements of your watershed planning process is developing a plan for education and outreach (E/O). Since the remedies to reducing pollutant loads in your watershed will all have people-based solutions, it is important to educate the community on nonpoint source pollution issues, and inform them of possible solutions to those issues. This is particularly important due to the voluntary implementation of watershed restoration practices. Constructing an informed watershed community can result in a more productive climate throughout development and implementation of your watershed plan.

There may be several phases to your E/O efforts. For example, you may have one set of education goals early in the stakeholder/partner development process, and you might have a different set of goals as you begin approaching landowners to identify water quality improvement practices. The figure below shows an example of the phases for which you might want to consider developing an E/O program in support of your watershed plan.

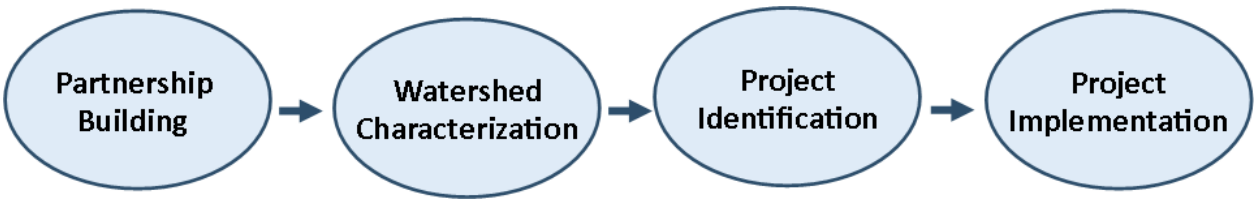


Figure 2: Illustrating the stages which education and outreach can be implemented.

Some items you might want to consider with your education and outreach efforts include:

- What are the goals of your E/O efforts?
- What are the different audiences you want to reach?
- How are you delivering the message?

- Who is delivering that message?

Developing Education and Outreach Goals

Before getting started with E/O, it might be helpful to assess what the educational needs are within your community. Assessing your watershed community's needs will help you setup E/O goals. Some example goals might be:

- To identify the natural resource issues important to your community and how watershed restoration efforts may align with identified issues.
- To educate the community on nonpoint source pollution issues in your watershed
- To engage community members in working with your organization to improve water quality conditions
- To gain support for the WRP development effort
- To obtain input and feedback from the community on what streams and water uses are of greatest value

Identifying Your Audience

To effectively deliver a message, it should be tailored toward a specific audience. Therefore, take into consideration some basic information about your particular audience such as: background knowledge on watersheds, individual interests/concerns in the watershed, and their role within the process.

Delivering your E/O Message

The methods you choose for delivering your E/O message might depend on the target audience you are trying to reach. As an example, some E/O delivery methods might include:

- Electronic Newsletter
- Printed Newsletter
- Facebook/Social Media
- Newspaper Articles/Press Releases
- Community Meetings
- Brochures
- Direct Phone Calls/Email
- One-on-one in person meetings

Constructing Your Message

Try to deliver a simple and clear message your target audience can understand. To organize your outreach effectively, you might consider formatting your message by answering the following questions (examples provided in italics):

1. What is the problem? *(Some of our streams are not healthy.)*
2. Why does that matter to your audience? *(Healthy water supports the agriculture, recreation, tourism, and livelihoods on which our community depends.)*
3. What are the solutions for addressing the problem? *(Through thoughtful planning, we can make improvements across the landscape that result in healthy water.)*
4. What are the benefits to developing the solution(s)? *(These solutions will ensure that we have clean and abundant water to support our community and its future generations.)*

Defining the Scope of your Plan

An important step in developing your WRP is determining the scope and extent of your plan. A good watershed plan is comprehensive, but also realistic. Therefore, you'll want to determine the most reasonable scale for your watershed plan. For example, you may want to consider such things as:

- Geographic scope (which streams/watersheds should be included?). DEQ recommends starting with the same geographic area that was used for the Total Maximum Daily Load (TMDL) document or TMDL Planning Area (TPA).
- Pollutant groups (are you attempting to address all identified pollutant groups?)
- Prior successes (do you have opportunistic relationships that can be expanded upon?)
- Additional waterbodies or areas of concern (are there areas not included in TMDLs the community wants to address in the WRP?)

Prioritizing Concerns

Developing a strategy for prioritizing concerns within your WRP is a critical step in this process. Ultimately, the concerns you prioritize in your watershed will guide the development of your restoration plan. If prioritizing concerns becomes a challenge, it might be helpful to create a framework for ranking concerns in your watershed. Some things you might want to consider include:

- What streams in your community are valued the most?
- Which water uses (i.e., beneficial uses) does the community value the most?
- Which streams are of greatest concern to the community?
- Which impairments (e.g., *E. coli*, sediment, nutrients, etc.) are of most concern to the community?
- Which streams will require the least amount of effort and resources to restore beneficial uses?

The images below shows examples of two visual approaches to obtain community feedback on priority locations and priority water uses during a public meeting. The image on the left asked community participants to locate on maps the waterbodies in their watersheds that were of concern to them using stickers. The image on the right asked participants to use rank concerns using stickers as well.

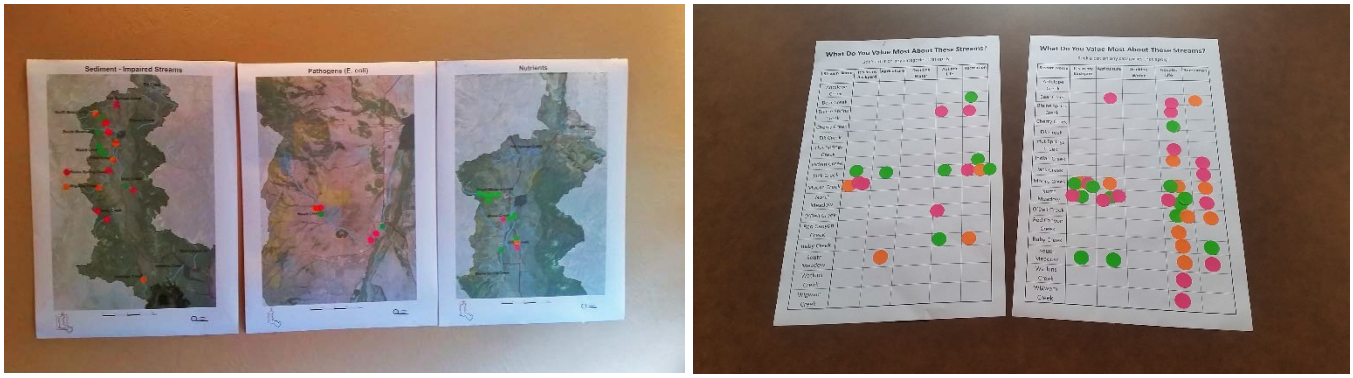


Figure 3: Example of public feedback obtained through visual aids.

Priority Concerns

(Examples from Big Hole Watershed Committee, 2012)

- Repair damaged riparian zones
- Improve irrigation infrastructure, add water measurement and fish passage devices
- Take all measures possible to improve stream flows and water temperatures. This includes the use of wetlands, voluntary irrigation reductions, etc.
- Protect completed restoration and protect lands in good condition
- Protect the river corridor with land use planning
- Promote collaboration among stakeholders

Priority Regions

- Section C & D of the Candidate Conservation Agreements with Assurances areas
- USFS Restoration Watersheds Saginaw and Moosehorn
- BLM Allotments in the North Fork Big Hole watershed and the Big Hole-Wisdom watershed
- Stream reaches identified as having sparse or moderate riparian vegetation density

Identify and Develop WRP Goals

After narrowing the scope of your plan, and identifying key priorities within your watershed, begin discussing with stakeholders what the goals are for your WRP. The initial goals should incorporate stakeholder concerns and priorities and should be comprehensive enough to address the water quality impairment concerns in the watershed. These goals may start out broad, but you will work toward developing more specific goals and objectives later in the process. Examples of initial goals might include:

- Restoring water quality to protect fisheries
- Meeting sediment standards to improve aquatic habitat
- Maintain healthy watershed with expected population growth
- Restore water quality for recreation

To provide an example, the bulleted list below illustrates some of the goals of the Lake Helena WRP (Lake Helena Watershed Group, 2015).

- Inform citizens, landowners, water users, local governments and business interests about current water quality, areas where significant progress can be made in the next seven years and high priority restoration projects
- Guide the landowner in best management practices (BMPs) that can improve the water quality of surface and groundwater on or near his or her property
- Identify priority areas and a pollutant that will be the focus of restoration work in the next seven years

Introducing the Nine Required EPA Elements

The steps outlined so far are important initial steps to consider when developing your WRP. In order to be eligible for section 319 funding, however, the U.S. Environmental Protection Agency (EPA) requires that WRPs address, at a minimum, nine elements that they consider to be critical for successful watershed restoration outcomes. Each of these nine elements are broken down and explained in subsequent sections of this document. These explanations are meant to provide a better understanding of how you might approach each of these elements, but are not intended to provide all the information you need to complete each step. Therefore, each section provides additional references where you can find more information. The minimum elements that need to be addressed in your plan are:

1. Identification of pollutant causes and sources
2. Load reduction estimate
3. Identification of NPS management measures
4. Technical and financial assistance needed
5. Education and outreach
6. Implementation schedule
7. Milestones
8. Short term criteria
9. Monitoring

The order in which you develop these elements may not be in the same order in which they are presented above. By the end of your WRP development process, however, you will have covered all of these components and will have them integrated into your plan.

1. Identification of Pollutant Causes and Sources

Identifying water quality pollutants (i.e., impairments), and the causes and sources of those pollutants, will provide the foundation on which to develop your watershed plan. All of the subsequent steps you take in your plan will result from the waterbody segments and pollutant groups you identify as not meeting their desired conditions. In this step, you are characterizing your watershed and answering the following questions:

- What types of information and data do you need to consider in your watershed characterization?
- What data currently exist in your watershed?
- Are these data sufficient to tell you about the condition of your watershed?
- What are the impaired waterbody segments in your watershed?
- What is likely causing those segments to be impaired?

Types of Information and Data to Consider

There are a lot of things to consider when creating a comprehensive profile of your watershed. For the development of a WRP, however, the most important place to start is with water quality information. Additionally, it might be important to consider things like fishery data, soils, geology, climate, vegetation cover, land use, population, recreation use, or conservation easements (Table 1).

Table 1: Sources of information to help characterize watersheds.

Type of Information	Source	Link
Climate	NOAA, Montana Climate Office	https://www.ncdc.noaa.gov/ http://climate.umt.edu/
Conservation Easements	Montana Cadastral	http://geoinfo.msl.mt.gov/Home/msdi/cadastral
Fisheries	Montana FWP	http://fwp.mt.gov/fishing/mFish/
GIS Clearinghouse	Montana State Library	http://geoinfo.msl.mt.gov/home
Groundwater	Montana Bureau of Mines and Geology	http://mbmggwic.mtech.edu/
Land Cover	Montana Natural Heritage Program	http://mtnhp.org/mapviewer/?t=1
Land Management	MT Natural Heritage Program	http://mtnhp.org/stew.asp
Land Use/Land Cover	NRCS	http://geoinfo.msl.mt.gov/Home/msdi/land_use_land_cover
Montana Water Quality Assessments and TMDLs	Montana DEQ	http://deq.mt.gov/Water/WQPB/tmdl http://deq.mt.gov/Water/WQPB/cwaic
Population	US Census Bureau	https://www.census.gov/geo/maps-data/
Snowpack	NRCS	http://www.wcc.nrcs.usda.gov/snow/snow_map.html
Soils	NRCS	https://www.nrcs.usda.gov/wps/portal/nrcs/site/soils/home/
Streamflow	USGS, MBMG	https://waterdata.usgs.gov/mt/nwis/ http://mbmg.mtech.edu/swamp/
Wetland	MT Natural Heritage Program	http://mtnhp.org/wetlands/

Finding Data in your Watershed

There should be numerous sources that contain data and information in your watershed. A good place to start is with DEQ's water quality assessment records, and if available, TMDL information. Both can be found online at the Montana Clean Water Act Information Center, or by contacting DEQ.

Water quality assessment reviews all available data for a waterbody and determines if beneficial uses are supported. These decisions are by DEQ's Monitoring and Assessment Section. They can be a helpful first resource when a TMDL is not available. TMDLs provide information on existing loads and allowable loads for the various pollutant groups on impaired waterways. They can also identify source information by providing categories based on surrounding land use.

Box 1 on the following page provides an example of nutrient source and data information contained within the Lower Gallatin TMDL. If you do not have TMDLs to provide pollutant loading information refer to Chapter 8 in the EPA Handbook provided in Appendix A, and work directly with the DEQ.

Example: Pollutant and Source Identification in a TMDL

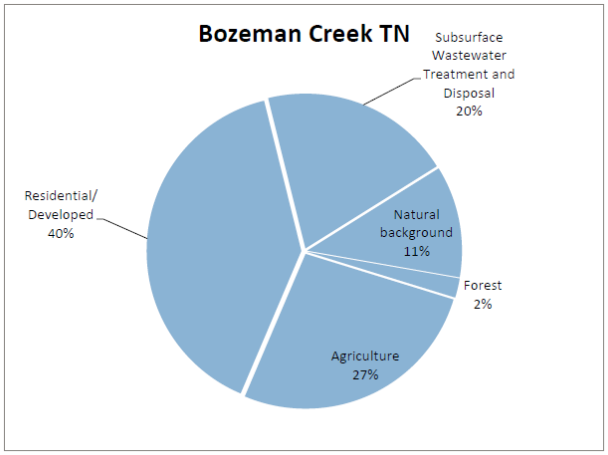


Figure 6-3. Existing TN sources for Bozeman Creek

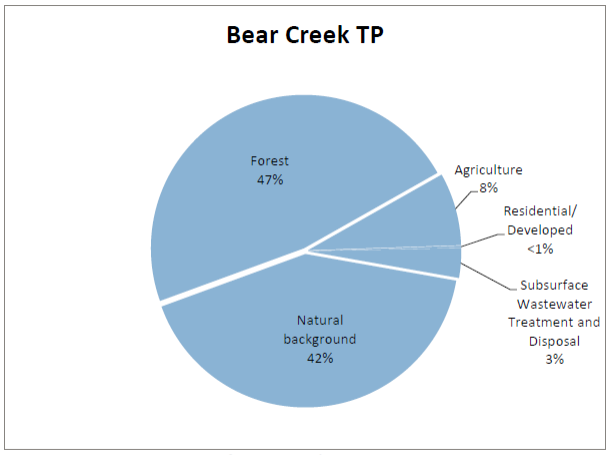


Figure 6-17. Existing TP sources for Bear Creek

Table 6-6. Nutrient Data Summary for Bozeman Creek

Nutrient Parameter	Sample Timeframe	n	min	max	mean	80th percentile
Nitrate+Nitrite	2004-2011	35	0.170	0.860	0.548	0.708
TN	2004-2011	31	0.270	1.700	0.757	0.850
TP	2004-2011	32	0.031	0.111	0.048	0.056
Chlorophyll-*a*	2004-2008	3*	6.7	112.0	54.9	112.0
AFDW	NA	0	NA	NA	NA	NA
Macroinvertebrate HBI	2004-2011	11	3.464	5.641	4.380	4.638

Box 1: Example of nutrient values and source identification for Bozeman Creek in the Lower Gallatin Planning Area TMDL. The table lists information about the number (n) of samples that were collected, as well as the minimum, maximum, and mean results in mg/L (Montana DEQ, 2013).

The TMDL will also identify:

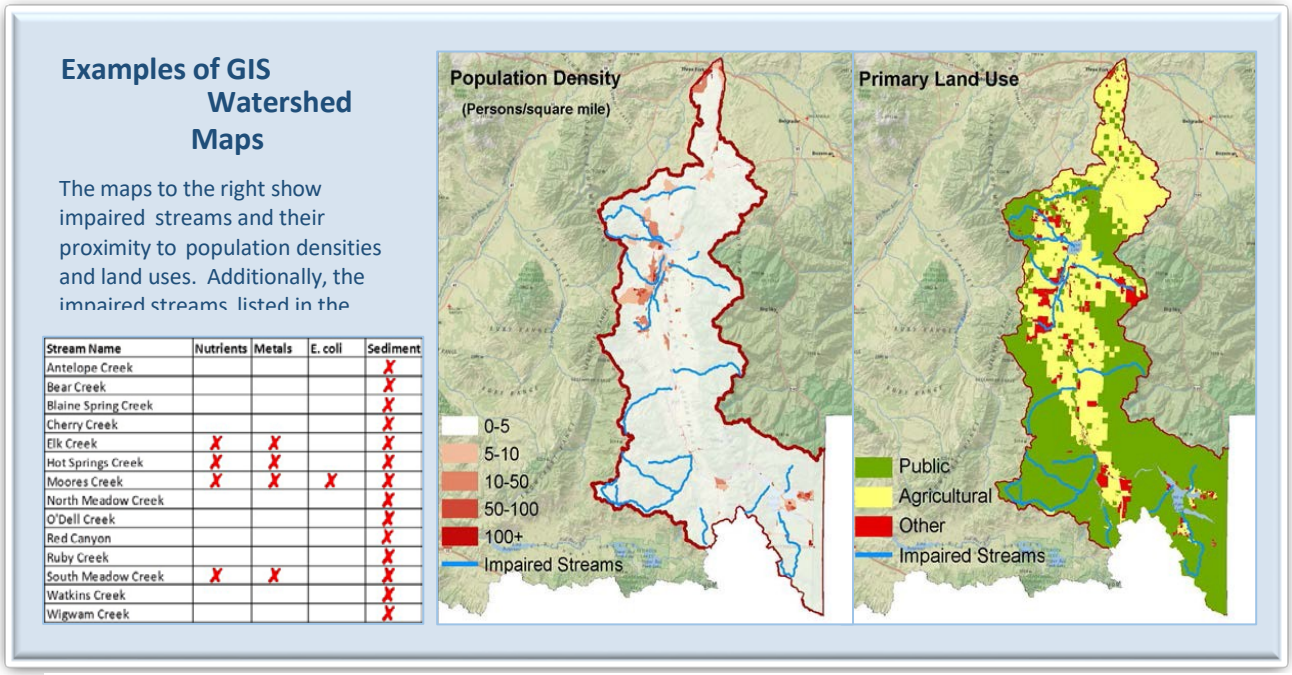
- Linkages between water quality problems and pollutant sources
- Estimates of total acceptable loading rate that achieves water quality standards
- Acceptable loading rates between sources
- Data available for different pollutant groups (e.g., sediment, pathogens, nutrients, metals)

In addition to the data and information available in the TMDL, there may be other sources of information available for your watershed that will help further identify pollutant sources that may not have been captured at the coarser TMDL scale. For instance, local volunteer monitoring data can be very helpful in this phase of the process. Other types of water quality data might be available through local wastewater treatment plants or water quality districts. Furthermore, additional watershed information is available from federal, state, or local agencies and/or organizations in your area. Often times, you can find this information online. For example, the Montana State Library's Geographic Information Clearinghouse provides free and readily available resources online. The table below lists additional sources of online data relevant to Montana. This list is not exhaustive, and there are many

other resources available in addition to these examples. Additional resources are available in Appendix A.

Displaying Data for Watershed Characterization

Once you've compiled the available data for your watershed it will be helpful to organize it in a way that is illustrative and informative for stakeholders. One of the most powerful tools for this type of analysis is Geographic Information System (GIS) software. There are free products available online, or there are more comprehensive tools for purchase. Using GIS can allow you to link pollutants, impaired waterbody segments, surrounding land uses, population density, and other parameters in a geographic context that provides a visual image. For example, the images in Box 2 (below) provide examples of using GIS to show the relationships of impaired streams to other watershed information.



Box 2: Examples of using GIS to develop Watershed Maps

In addition to using GIS to map out potential sources of pollutants, it might also be helpful to use other online mapping applications that allow you to do visual assessments through virtual tours. For example, Google Earth provides detailed aerial imagery that can help you better understand conditions across the landscape. Furthermore, conducting visual assessments on the ground with landowners can be extremely valuable in identifying potential pollutant sources. If this type of assessment is not feasible, however, you may be able to obtain information by talking to landowners and/or stakeholders in your watershed.

Identifying Healthy Watersheds

In addition to identifying the impairments in your watershed, it is also important to acknowledge the places in your watershed that are currently healthy. This can be useful for several reasons. For example, your watershed plan should not only aim to improve waterbodies with impairments, but it should also be directed to maintain water quality in places that are currently in good condition. You should work with stakeholders to identify these priority areas of protection within your watershed, and then consider developing a plan to implement measures that protect these important areas. These important areas might include tributaries, wetlands, or

important habitat.

Once you have identified these priority places, you should discuss with stakeholders the steps that will need to be taken to ensure the areas maintain a healthy state. This might include landowner education and outreach, pursuing conservation easements, or developing a monitoring plan to provide assurances that conditions are maintained in a favorable state. Furthermore, if these areas are identified in your WRP, they may also qualify for project funding through the 319 program. Contact DEQ for more information regarding projects aimed towards protecting healthy watersheds.

2: Load Reduction Estimate

Earlier in your process you and your stakeholders identified a set of water quality goals to address within your WRP. Now, you will apply those goals to more specific objectives that target the pollutants and sources you've identified through your watershed assessment and characterization. The targets and objectives you identify here will later result in specific practices that help you obtain the needed load reductions. As you work through this process you will need to focus on the following:

- Turning your water quality goals into more specific objectives
- Identifying targets (i.e., indicators) and target values to meet objectives
- Identifying the load reductions needed to meet targets

Turning Goals into Objectives

You can now develop objectives that help you address your goals by using information you collected on pollutants and their sources. Table 2 (below) shows an example relationship between goals and the management objectives that can be developed to target sources of pollution previously identified.

Table 2: Example relationships between goals, targets, and management objectives (modified from EPA, 2008).

Water Quality Goal	Target	Cause or Source	Management Objective
Support designated uses for aquatic life; reduce fish kills	Dissolved oxygen Phosphorus Temperature	Elevated phosphorus causing increased algal growth and decreased dissolved oxygen Cropland runoff	Reduce phosphorus loads from cropland runoff and fertilizer application
Reduce flood levels	Peak flow volume and velocity	Inadequate stormwater controls, inadequate road culverts	Minimize flooding impacts by improving peak and volume controls on urban sources and retrofitting inadequate road culverts
Restore aquatic habitat	Riffle-to-pool ratio, percent fine sediment	Upland sediment erosion and delivery, streambank erosion, near-stream land disturbance (e.g., livestock, construction)	Reduce sediment loads from upland sources; improve riparian vegetation and limit livestock access to stabilize streambanks

Selecting Targets and Target Values

After developing management objectives that aim to address your water quality goals, you will need to identify the targets most helpful to evaluate those objectives. The second column in Table 2 above shows targets for the identified goals. Targets should reflect a particular pollutant type or parameter (dissolved

oxygen, flow, etc.), and have a quantifiable target value (e.g., >4 mg/L, 4 cfs, etc.). The target values represent the ideal condition you will aim to achieve to meet your objectives (Table 3). Most often targets and target values will reflect an environmental element, but they might also be representative of a social or programmatic element.

If TMDLs are completed, you can easily find target values for each pollutant group in the TMDL document. If TMDLs are not available, you can use targets that have been adopted by the state, or by your region (e.g., metals and nutrients). Otherwise, you can work with DEQ to help determine targets for pollutant groups that are linked to watershed-specific conditions (e.g., sediment and temperature). More information on these targets can be found in Appendix A. In addition, Table 3 (below) shows example indicators paired with management objectives.

Table 3: Example target values for management objectives shown in Table 2 (modified from EPA, 2008).

Management Objective	Target Value
Reduce phosphorus loads from cropland runoff and fertilizer application	*Dissolved oxygen*: Daily average of 4 mg/L (from water quality standards) *Phosphorus*: Daily average of 25 µg/L (based on literature values)
Minimize flooding impacts by improving peak and volume controls on urban sources and retrofitting inadequate road culverts	*Peak flow volume*: Peak flow for 1-yr, 24-hr storm of 400 cfs
Reduce sediment loads from upland sources; improve riparian vegetation and limit livestock access to stabilize streambanks	*Riffle-to-pool ratio*: 1:1 ratio (based on literature values) *Percent fine sediment*: <10 percent of particles <4 mm (based on reference conditions)

Identifying Load Reductions

After identifying the target parameters and measured values that are most helpful for evaluating your objectives, you will need to estimate the load reductions needed to meet those target values. The TMDL for your watershed will contain information that can be helpful for this process. However, if a TMDL is not available, you can work with the DEQ to develop these values for impaired waterbodies. Box 1 on Page 11 showed an example of nutrient parameters selected to show current conditions on Bozeman Creek for the Lower Gallatin Planning Area TMDL. In addition to providing information about observed conditions, the TMDL also contains target values that are shown below in Table 4. Together, this information can be used to help identify the needed reductions for that particular waterbody. When interpreting these load reduction estimates, consult with DEQ for their assistance.

Table 4: TN and TP targets for streams in the Lower Gallatin Planning Area TMDL (Montana DEQ, 2013).

Stream segment	TN target (mg/L)	TP target (mg/L)
Bozeman Creek	≤0.270	≤0.080
East Gallatin between Bozeman and Bridger Creeks	≤0.290	≤0.050
East Gallatin between Bridger and Hyalite Creeks	≤0.300	≤0.030
Lower Hyalite Creek	≤0.260	≤0.090
East Gallatin between Hyalite Creek and Smith Creek	≤0.290	≤0.060
East Gallatin between Smith Creek and mouth	≤0.300	≤0.030

Using this same waterbody as an example, Table 5 shows how the WRP identified the needed load reductions for those indicators to meet the targets in the TMDL. Furthermore, the EPA example shown below in Table 6 shows two hypothetical examples of management scenarios and the estimated load reductions that can be expected from various sources.

Table 5: Showing the effectiveness of project/treatment methods at reducing pollutant loads in the Lower Gallatin Watershed Restoration Plan (RESPEC, 2014).

Stream Segment	Pollutant	Percent Reduction	Project Types / Treatments
Bozeman Creek - confluence of Limestone Creek and Bozeman Creek to the mouth (East Gallatin River)	Sediment	37%	Streambank Stabilization and Revegetation
			Riparian Buffer Enhancement
			Unpaved Road Improvements
			Stormwater BMPs
	Total Nitrogen	63%	Residential and Urban BMPs
			Agricultural BMPs
			Forestry BMPs
			On-Site Subsurface Wastewater Treatment System Upgrades
	E. coli	15%	Residential and Urban BMPs
			Agricultural BMPs

Table 6: Comparing load reductions of two management scenarios that both meet the overall allowable load of 400kg/yr. of phosphorus (a 26% reduction). Scenario 1 makes a 26% reduction from all sources, whereas Scenario 2 makes reductions from only some of the sources. The total reduction, however, is the same (EPA, 2008).

Source	Existing Phosphorus Loading (kg/yr)	Scenario 1		Scenario 2	
		% Load Reduction	Allowable Load (kg/yr)	% Load Reduction	Allowable Load (kg/yr)
Roads	78	26	58	20	62
Pasture/Hay	21	26	16	10	19
Cropland	218	26	162	55	98
Forest	97	26	72	0	97
Landfill	7	26	5	0	7
Residential	6	26	5	0	6
Groundwater	111	26	83	0	111
Total	**539**	**26**	**400**	**26**	**400**

3: Identification of NPS Management Measures

Once you've outlined the required load reductions needed to meet target values, you canstart to identify specific management measures and practices that help you reach those targets. These measures might be specific restoration activities, or they may be general best management practices.

Since the implementation of these activities is voluntary, an education and outreach plan targeted to stakeholders and landowners will be critical as you identify potential practices. It is important to consider input from stakeholders so the practices you identify have a greater chance of being successful when you implement your WRP. Furthermore, to help develop sound management practices you might consider screening each project idea by answering the following questions:

- Are the site features suitable for incorporating the practice (i.e., is the practice feasible)?
- How effective is the practice at achieving management goals and loading targets?
- How much does it cost (and how do the costs compare between alternatives)?
- Is it acceptable to stakeholders? (EPA, 2008)

Additionally, it might be helpful to get input from agencies and/or organizations that have experience designing and implementing restoration practices. You can also use existing resources that contain best management practices (BMPs) that have proven to be successful in addressing water quality issues. For example, the EPA and NRCS each have a list of recommended practices you can use to develop your own set of actions for your watershed plan. Additionally, the DEQ's Nonpoint Source Management Plan includes an appendix with BMPs. Table 7 provides examples of practices that might be adopted in a WRP.

Table 7: EPA example of BMPs for agriculture and forestry (modified from EPA, 2008).

	Structural Practices	Nonstructural Practices
Agriculture	• Contour buffer strips • Grassed waterway • Herbaceous wind barriers • Mulching • Live fascines • Live staking	• Brush management • Conservation coverage • Conservation tillage • Educational materials • Erosion and sediment control plan • Nutrient management plan
Forestry	• Broad-based dips • Culverts • Establishment of riparian buffer • Mulch • Revegetation of firelines with adapted herbaceous species • Temporary cover crops • Windrows	• Education campaign on forestry-related nonpoint source controls • Erosion and sediment control plans • Forest chemical management • Fire management • Operation of planting machines along the contour to avoid ditch formation • Planning and proper road layout and design • Preharvest planning • Training loggers and landowners about forest management practices, forest ecology, and silviculture

Another thing to consider when identifying management practices is creating an inventory of the successful projects that have taken place in the watershed. You can then evaluate the effectiveness of those practices from an environmental, social, and programmatic standpoint to help guide the identification of new projects or practices.

Additionally, you should consider developing a framework for evaluating the proposed practices that allow you to rank projects based on:

- Effectiveness at reducing pollutant loads (estimate of load reduction)
- Locations suitable for the practice
- Landowner buy-in
- Technical and financial assistance needed
- Secondary project benefits

The figure below shows EPA examples of a framework for ranking management practices for their effectiveness at reducing pollutant loads, as well as the type of management scenarios for which it can be applied.

Table 8: Effectiveness of management practices that address different pollution sources [1]AFO = Animal Feeding Operation,[2] (H=high, M=medium, L=low).

Pollution Sources (✓ = Management practice applies)						Management Practice	Load Reduction (H, M, or L)[2]
AFO[1]	Ag Practices	Industry Runoff	Urban Runoff	Disturbed Areas	Stream Erosion		
		✓		✓		Construction site mgt	L
	✓			✓	✓	Grazing mgt	M
✓	✓					Nutrient mgt	M
	✓			✓		Cover crop	H
✓	✓			✓	✓	Fencing	H
✓	✓			✓	✓	Filter strip	H
	✓			✓		Mulching	L
	✓	✓	✓	✓	✓	Riparian buffer	M
	✓			✓	✓	Seeding	M
				✓	✓	Tree planting	L
					✓	Brush layer	H
✓	✓				✓	Brush trench	H
✓	✓			✓	✓	Erosion control fabric	H

4: Technical and Financial Assistance Needed

Technical Assistance

You'll likely need to identify your technical assistance needs early in your process before beginning any major work on your plan. For example, you may need technical help with collecting, organizing, and analyzing watershed data. Furthermore, you might need assistance with understanding and estimating pollutant loads in your watershed.

In addition to identifying your technical needs for developing your watershed assessment and estimating load reductions, you'll need to identify technical assistance needs for implementing the management practices you developed in the previous step. This assistance might include:

- Project management
- Project design
- Grant writing
- Monitoring (e.g., data collection, data management)
- Education and outreach assistance

The DEQ can provide technical assistance to meet some of these needs, and should be consulted frequently throughout your WRP development. Depending on your needs, there might also be assistance available through other organizations and agencies such as local conservation districts, the Bureau of Land Management (BLM), Department of Natural Resources Conservation (DNRC), Natural Resources Conservation Service (NRCS), Fish Wildlife and Parks (FWP), U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), or Montana State University Extension. Alternatively, you may need to look at hiring a private consultant to assist with some of these needs, or possibly increasing your organization's staffing.

Financial Assistance

Ultimately, the goal of developing a watershed plan is to implement projects to improve water quality. Being successful in the implementation of your plan requires an understanding of the financial costs to restoring the watershed and reducing pollutant loads. Therefore, identifying your various financial needs is important for setting realistic milestones in your WRP.

The costs you include in your plan should contain both programmatic costs and project/practice specific costs. For example, it is important to understand the financial needs of your program in developing and executing your WRP. These costs might include:

- Administration and project management
- Staffing salaries or in-kind
- Education and outreach efforts
- Meeting costs and/or facilities
- Monitoring, monitoring equipment, data management, data analysis

In addition to the program costs to successfully implement your WRP, you will also need to identify the project/practice specific costs of implementing your management measures. You may need to consult with technical advisors when estimating these project costs, or you might be able to use past projects as references. Be sure that the costs include:

- Project engineering and designInstallation and maintenance of projects/practices
- Regulatory fees and permits
- Monitoring costs

Funding Sources

In addition to identifying the funding needed to implement your watershed plan, you should also identify potential funding sources. A good fundraising approach incorporates diverse funding strategies and sources, such as federal, state, and local government programs, as well as private sources of funding. Below are examples of public entities in Montana that fund watershed restoration and protection projects.

- Environmental Protection Agency
- Department of Environmental Quality
- Fish Wildlife & Parks
- Natural Resources Conservation Service
- Department of Natural Resources Conservation
- National Fish & Wildlife Foundation
- U.S. Fish & Wildlife Service

5: Education & Outreach

The topic of education and outreach is covered earlier in this document. However, it is important to keep in mind that you might need to revisit your E/O strategy frequently throughout the WRP development and implementation phases to ensure community members and stakeholders are staying engaged with the process. If your strategies for E/O have not been successful, you may need to evaluate your techniques and adjust as needed.

For more resources on education and outreach you can visit the EPA Handbook or visit the EPA Outreach Toolbox. Additionally, you might consult with neighboring watershed groups or conservation districts for guidance on successful E/O campaigns in your local area.

6: Implementation Schedule

After creating goals and objectives, you are ready to move forward with developing more specific tasks. These tasks can be organized to create a WRP implementation schedule or timeline. The implementation schedule can be at the individual project scale, or may be organized by milestones (see Section 7: Milestones below).

Items to include in your implementation timeline may include:

- Anticipated implementation year
- Resource concerns addressed
- Management practice being implemented
- Project lead(s)
- Project location
- Implementation costs

- Potential funding sources
- Priority ranking of projects

Below is an example of a WRP timeline from the Big Hole River Watershed Restoration Plan.

Table 9: Example of a project timeline from the Big Hole River Watershed Restoration Plan (Big Hole Watershed Committee, 2012).

Projected Goal Year	Management Measures - Project, Status	Watershed Category	Lead	Possible Funding Sources
2013	Heidi Hirschy Swamp Creek Fence	Water temperature, sediment, nutrients	CCAA	$25,000 - CCAA
2012	Headgates (3) on Rock Creek	Water temperature, stream flow	CCAA	$75,000 - NRCS
2012	Rock Creek Fish Incubators	Fish & Wildlife	CCAA	$10,000 - CCAA
2012	Stock watering system (10 tanks) - Rock Creek	Sediment, stream flow, water temperature	CCAA	$60,000 - CCAA
2013	Harrington Ranch - Fence Lower Swamp Creek	Water temperature, sediment, nutrients	CCAA	$30,000 - CCAA
2014	Hardened Cattle Crossings on Swamp Creek (2)	Sediment	CCAA	$20,000 - CCAA

Furthermore, you can then develop task schedules for each individual project or practice. This can help to ensure stakeholders understand the expectations and time frames associated with the different phases of a project. A project specific timeline might include time frames for the following:

- Identifying and coordinating with landowner(s) and stakeholders
- Project design
- Developing a project budget
- Developing a fundraising plan
- Project implementation
- Project monitoring
- Project evaluation

7: Milestones

Milestones are sequential steps along a path with a defined beginning and ending, and are developed as a means of tracking your WRP implementation timeline and progress toward meeting restoration goals. Similar to mile-markers on a highway, milestones help determine if you are making progress toward a stated end-goal. Milestones should be measurable, and they should include expected completion dates or timelines. It is often helpful to break milestones into different time scales as shown below.

- Short-term (1 to 3 years)
- Mid-term (3 to 7 years)
- Long-term (7 to 10 years or longer)

Below are excerpts of milestones from three different WRPs in Montana. These milestones used in the

Ruby, Upper Gallatin, and Ninemile Creek Watershed Restoration Plans provide unique examples of how these milestones can be developed and illustrated to meet the tracking needs of each watershed plan.

Table 10: Grazing-related sediment milestones from the Ruby WRP. This top text includes the sediment goals. In addition to the target activities and the milestones needed to accomplish those activities, the table also includes estimated load reductions and an expected timeline for completion (Ruby Watershed Council, 2015).

Grazing-related sediment goals:
Reduce sediment loading from upland and streamside grazing sources by 15%

- Current estimated inputs: 17,683 tons/yr
- Estimated inputs after 15% reduction: 15,030 tons/yr

Sediment Target	Milestone	Estimated Load Reduction	Timetable
Install off-stream watering sources for livestock	2 off-stream watering sources installed	530 tons/yr (3%)	Completed 2020
Install riparian fencing	4 miles of riparian fencing installed	707 tons/yr (4%)	Completed 2019
Intercept upland erosion sources with vegetated buffer	4 upland erosion sources intercepted/revegetated	707 tons/yr (4%)	Completed 2018
Adoption of grazing-management plans	1 landowner adopting NRCS-approved grazing management plan	707 tons/yr (4%)	Completed 2019

Table 11: Milestones developed for the Upper Gallatin River WRP (Gallatin River Task Force, 2014).

Measureable Milestones	2012	2013	2014	2015	2016	2017
West Fork Nitrogen Reduction Plan (WFNRP)						
WFNRP Implementation						
- Implementation of 2 WFNRP projects each year						
- Riparian mapping and prioritization						
- Meet nitrogen loading reduction goals (Section 2)						
Traction Sand Reduction Plan/Implementation						
- Traction Sand Reduction Plan approved by MDOT and local snow plowers						
- Plan implementation						
Water Quality Monitoring						
- 50 data points collected each year						
Education and Outreach						
- Annual meeting presentation						
- Email, newsletters, website, Facebook						
- Annual press release in local newspaper						
- Winter Maintenance E&O						

VII. Interim milestones

Mine Reclamation

- Four of six mine reclamation projects are anticipated to be completed by the end of 2014. These projects will be on Twin Creek, Josephine Creek, Kennedy Creek, and Sawpit Creek. It is expected that post-restoration the percentage of fine surface sediment in riffles < 6mm will be ≤14.8%. These creeks are all tributaries of Ninemile creek and will significantly decrease sediment load to the creek and restore fish passage to the tributaries.
- Reclamation of Kennedy Creek and Josephine Creek mine sites will yield a load reduction in sedimentation/siltation from mining of 1418 tons/yr. This will be quantified by performing a Bank Erosion Hazard Index (BEHI) assessment.
- Reclamation work on Twin Creek and Sawpit Creek will yield a 100% load reduction in sedimentation/siltation from mining. It is expected that the percentage of fine surface sediment in riffles < 6mm will be ≤14.8% after reclamation. The success of this reduction will be assessed with a suite of monitoring including Wolman Pebble Counts (decrease in % of fine sediment) and fish population monitoring.
- Phase 1 of the Upper Ninemile Creek mine reclamation project will be completed by 2015.

Box 3: Interim milestones for mine reclamation-focused projects from the Ninemile Creek WRP. (Littman and Roberts, 2013)

Developing milestones is often one of the hardest elements for groups to address in their WRPs, and it is advised to consult with Montana DEQ on how best to go about developing milestones for your particular watershed.

8: Short-Term Criteria for Evaluating Effectiveness

To ensure you are achieving milestones, and are effectively reducing pollutant loads, you will need to develop criteria to evaluate your progress. To help you determine the evaluation criteria, you might refer back to the indicators you developed previously in the "load reduction estimate" section. These indicators and evaluation criteria will be specific to your watershed plan, and they should be quantifiable. For instance, they could include water quality criteria (e.g., <2 mm sediment substrate, dissolved oxygen, water temperature, etc.), or they might reflect actions (e.g., 1,000 feet of streambank restored, 2 corrals moved off-stream, etc.). These criteria should be evaluated to determine if the plan is being successfully implemented to reduce pollutant loads. If you find, through your monitoring, that the criteria indicate the plan is not successfully reaching its goals, you may need to make changes to the plan.

Table 12 on the following page shows an example of criteria that were selected to address various pollutant groups in the Ruby WRP.

Table 12: Improvement criteria selected to address water quality issues in the Ruby Watershed Restoration Plan (Ruby Watershed Council, 2015).

Table 9: Criteria indicators that may be used to measure progress toward meeting water quality targets. Criteria that may require technical assistance are noted with an asterisk.	
Water Quality Issue	**Criteria**
Riparian/Floodplain Alterations	• Percent of woody riparian vegetation along a reach or segment of stream (recruitment of individuals per lineal foot; percentage of reach length showing increasing trend) • Number of feet of riparian fencing installed • Number of off-stream water or water gap structures installed • Adoption rate or acreage placed into grazing management plans • Acreage of floodplain reconnected with stream
Sediment Loading	• DEQ sediment assessment indicators: percent fine sediment in riffles and pool tails, width:depth ratios, entrenchment ratios, residual pool depth, pools/mile, and percent greenline shrub and bare cover (to be measured against targets for each stream)* • Length of roads improved or number of sediment loading sites (erosion features) stabilized, intercepted, improved, or replaced. Modeled WEPP trends after elimination of erosion features.* • Percent of vegetated and stable banks along a stream reach or segment
Nutrient loading	• Nitrogen and phosphorus levels and load reductions (TN: <3mg/l; TP: 0.03 mg/l)* • Presence of Chlorophyll-*a* (Benthic algae: 150 mg/Chla/m2)* • Number and extent of nuisance algae blooms
Temperature/low-flow alterations	• Improving trends in temperature and flow changes over time*
Metals	• DEQ metals assessment indicators* • Metals load reductions (lbs/day)

9: Monitoring

The last element to develop in your WRP is monitoring. Monitoring will allow you to measure targets, as well as track progress of goals, objectives, and milestones. Therefore, monitoring should be designed to provide data that clearly measures the indicators selected previously in section 2 of this document. An example of monitoring indicators might include temperature, nutrients, sediment, or fecal coliform.

Some important things to consider when designing a monitoring program include:

- The indicators/criteria for the particular project
- The time period data needs to be collected
- The frequency of data collection
- Uncontrollable variables (e.g., weather & climate)
- Land use changes that could affect results
- Minimum number of sites to monitor trend analysis (See DEQ Standard Operating Procedures)
- Access to monitoring sites
- Funding and staff time available for monitoring

In addition to considering the above bullets, consult with the DEQ when developing your monitoring plan to provide consistency with methods used for the impairment assessments in your watershed. Furthermore, if looking to use citizen scientists in your monitoring, Montana State University Extension Water Quality has useful resources for developing "stream teams" in Montana. Engaging the community in monitoring can be particularly useful if your organization has limited capacity with staffing. The DEQ also has funding to support volunteer monitoring lab analysis costs.

Tables 14 and 15 below provide examples of monitoring techniques and parameters used by two different watershed plans to measure pollutant and/or resource concerns.

Table 13: Monitoring techniques used for nutrients, pathogens, and sediment in the Lower Gallatin WRP (RESPEC, 2014).

Monitoring Techniques – Lower Gallatin WRP	
Pollutant Type	**Monitoring Technique**
Nutrients	Water samples and stream discharge measurements
Pathogens	Water samples and stream discharge measurements
Sediment	Riffle pebble counts, riffle and pool-tail-out, 49-point grid toss measurements, channel cross-sections, residual pool depths, pool and large woody debris frequency, streambank erosion assessments, riparian greenline assessments, macroinvertebrate indices

Table 14: Monitoring techniques - Possible monitoring techniques to measure the effectiveness of projects or BMPS that address riparian habitat, sediment, nutrients, temperature, or fishery issues in the Beaverhead WRP (Beaverhead Watershed Committee, 2013).

Monitoring Techniques – Beaverhead WRP	
Pollutant Type	**Monitoring Technique**
Riparian habitat	Setting permanent photograph points; NRCS riparian assessments (when feasible)
Sediment	Modeling; in-field measurements when appropriate (pebble counts, bank pins, physical bank measurements, etc.)
Nutrients	Sampling water for TN or TP; potentially sampling soil for TN and TP when appropriate; assessing chlorophyll-a or algal growth (including photo points)
Temperature and flow	Tracking temperature and streamflow trends and improvements using data from USGS gages, USFS, FWP, or other gaged networks, and site-specific projects
Fisheries	Conducting fish counts, red counts, etc., in partnership with FWP

Evaluation Framework for Adaptive Management

One final component of your WRP to consider is an evaluation framework. It is important for stakeholders to ensure the plan is being effective, and also to identify improvements that can be made within the plan or within the implementation of the plan. This evaluation framework should take into consideration the goals, objectives, and milestones in your plan, and should also use the monitoring information as a means of tracking the effectiveness of the management practices. Additionally, you should consult with stakeholders to see if their needs and goals are being addressed through the implementation of the plan. Based on your evaluation, you should be able to identify opportunities for improvements to keep your plan up-to-date and effective. Developing these revisions may require you to regroup with stakeholders and determine how the plan should be adapted. It may make sense to do this as projects are completed, or on a regularly occurring schedule (e.g., every year or every two years).

Some things to consider when developing an evaluation framework include:

- Components of your plan that need to be evaluated (e.g., goals, milestones, criteria)
- Timing and frequency of evaluation
- Methods for evaluation (e.g., data analysis, stakeholder interviews, etc.)
- Format for storing and displaying evaluation information (e.g., spreadsheets, GIS, etc.)

Finalizing Your Plan

Once you have incorporated all of the necessary components into your plan, it will be ready for review by DEQ. At this time, DEQ may provide comments and suggestions to ensure your plan addresses all of the requirements necessary. Note, DEQ's WRP review and approval process this may take upwards of a month or more, and you may need to plan accordingly if applying for grants specific to your WRP. Once the plan is approved, you will be ready to introduce it to the public through another E/O effort. Again, you will want to identify the most useful outlets for your outreach, and you may want to expand your audience. Consider asking your partners and stakeholders to help reach an even wider group of people.

Additional Resources

This guide is just one of many resources to help you get started with the process of developing a WRP. Appendix A contains a list of other helpful resources you can utilize to better understand the components that make a successful WRP.

Appendix A: Additional Resources

DEQ-Accepted Montana Watershed Restoration Plans

DEQ Water Quality Circulars

Engaging Stakeholders in your Watershed

EPA Handbook for Developing Watershed Restoration Plans

EPA Guide for Monitoring and Evaluating Nonpoint Source Watershed Projects

Establishing Volunteer Monitoring Programs

Montana 319 Funding Information

Montana Nonpoint Source Management Plan -2012

Montana Base Numeric Nutrient Standards

Montana TMDLs

Montana DEQ Water Quality Standards

NRCS Conservation Practices

National Management Measures and BMPs

Works Cited

Beaverhead Watershed Committee. (2013). *Beaverhead Watershed Restoration Plan.* Dillon.

Big Hole Watershed Committee. (2012). *Big Hole River, Montana Watershed Restoration Plan.* Divide: Big Hole Watershed Committee.

EPA. (2008, April 18). *EPA Handbook for Developing Watershed Plans to Restore and Protect our Waters.* Retrieved from Environmental Protection Agency: https://www.epa.gov/sites/production/files/2015-09/documents/2008_04_18_nps_watershed_handbook_handbook-2.pdf

Lake Helena Watershed Group. (2015). *Lake Helena Watershed Restoration Plan 2016-2023.* Helena.

Littman and Roberts. (2013). *Watershed Restoration Plan for the Ninemile Creek TMDL Planning Area*. Missoula.

Montana DEQ. (2013). *Lower Gallatin Planning Area TMDLs & Framework Water Quality Improvement Plan.* Helena, MT: Montana Dept. of Environmental Quality.

RESPEC. (2014). *Lower Gallatin Watershed Restoration Plan.* Bozeman, MT.

Ruby Watershed Council. (2015). *Ruby Watershed Plan.* Sheridan.

The Blue Water Task Force, Inc. (2012). *Upper Gallatin River Watershed Restoration Plan.* Big Sky.