February 19, 2018

DEQ
Montana Department of Environmental Quality

DRAFT 2018 Water Quality Integrated Report

Public Review Draft | Montana Department of Environmental Quality

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Fellow Montanans-

I'm pleased to present you with Montana Department of Environmental Quality's 2018 Integrated Report on water quality. Clean water is vital to aquatic life, public drinking water systems, recreation, agriculture, and other industries

This report highlights success we have had restoring water quality across Montana. Successfully protecting and restoring water quality takes a commitment from everyone, including landowners, industries, municipalities, local watershed groups and volunteers, as well as local, state; and federal agencies and workers. We are happy to report that sixteen pollutants on the Clark's Fork Yellowstone River, Stillwater River, Soda Butte Creek, Miller Creek, Fisher Creek, Careless Creek and Jim Creek have been restored to meeting water quality standards.

You can find more information about these waterbodies starting on page 55.

The 2018 Integrated Report also includes a summary of the work the Montana Department of Environmental Quality does every day to protect water quality and implement the provisions of the Clean Water Act for all Montanans.

By working collaboratively and using solid, peer-reviewed data such as that contained in this report, we continue to work to protect water resources important to all Montanans. Thank you for your interest in Montana's water quality and please let us know if you have any questions or suggestions about our work.

Tom Livers

Tom Livers Director
Montana Department of Environmental Quality

Why Do We Create an Integrated Report?

The Federal Water Pollution Control Act, commonly referred to as the Clean Water Act, is the primary federal law governing water pollution control. Its objective is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing or strictly regulating pollution sources.

As the state agency responsible for implementing certain components of the federal Clean Water Act (CWA), and as directed under Montana's Water Quality Act (MCA 75-5-702), the Montana Department of Environmental Quality (DEQ) is required to prepare a biennial Integrated Report (IR) to report on the condition of waterbodies under state jurisdiction.

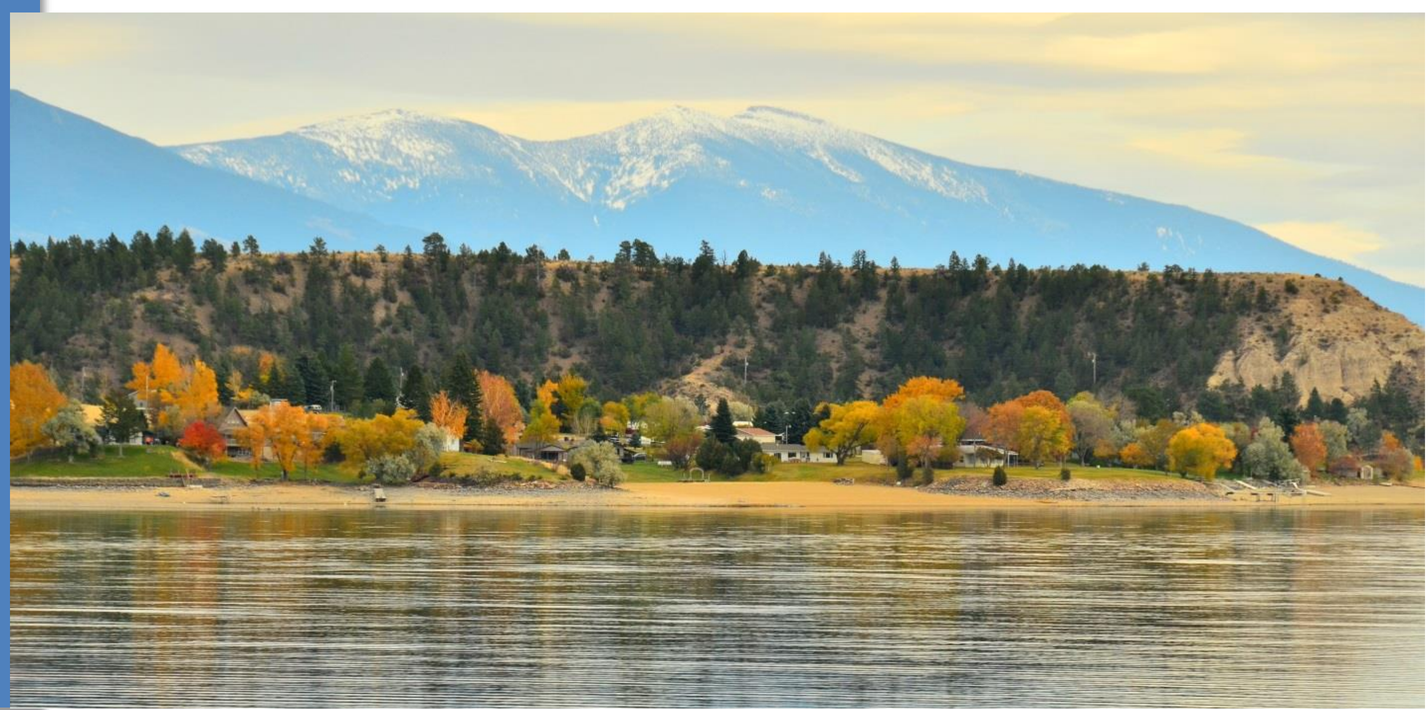
DEQ oversees efforts to measure the quality of only those waterbodies under state jurisdiction; this includes rivers and streams, lakes and reservoirs. The state does not manage waterbodies on tribal lands nor actively assess waters in national parks or wilderness areas.

Clean Water Act aside; we are committed to the transparency of DEQ operations so that Montanans have access to how their tax dollars are being spent. Accountability helps ensure that we are providing efficient and effective services to our stakeholders.

What is the Integrated Report

The Integrated Report presents background information about the waters of Montana, the state water pollution control programs, and special concerns affecting water quality. It presents surface water monitoring and assessment summaries, including a discussion about public health issues, provides an overview of Montana's ground water monitoring and assessment program and a summary of public participation. It describes the quality of our surface waters and provides an analysis of the extent to which all such waters provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife; safe drinking water; allows for recreational activities in and on the water; and of other designated uses.

It is important to note that this information is for a subset of the state's total waters and may not be representative of the waters that were not assessed. Because we target our limited monitoring resources to waters that we suspect are impaired, there may be a lower percentage of impaired waters among the non-assessed (and total) waters than among the assessed waters. Information about specific causes and sources of impairment may be incomplete because we may not have sufficient data to document the specific pollutant or source responsible for the impairment. It is also important to understand that assessment methodologies are dynamic and change as new information and assessment techniques become available. Such changes can also affect monitoring strategies designed to determine if waterbodies are supporting their beneficial uses. Periodic updates of the methodology are intended to result in more accurate and reliable assessments and better management of water resources in the future.



What Do the State's Water Quality Programs Do For Montanans?

Our programs support and implement measures that ensure clean rivers, streams, and lakes remain part of Montana's natural heritage as provided for in the state's constitution.

Water Quality Standards (Goals)	Water Quality Standards (Standards) are the foundation of the water quality based control program mandated by the Clean Water Act. Standards form the legal basis for controls on the amount of pollution entering Montana waters from sources such as industrial facilities, wastewater treatment plants and storm sewers. Standards are also the technical basis for reducing runoff from rural and urban areas. A standard can consist of either numeric or narrative limits for a specific physical or chemical parameter. Ultimately, a water quality standard is developed to help protect and maintain water quality necessary to meet and maintain designated or assigned uses, such as swimming, recreation, public water supply, and/or aquatic life.
Monitoring & Beneficial Use Assessments	DEQ works with other federal and state agencies and organizations to collect water quality data, monitor surface waters and determine whether waterbodies are supporting their beneficial uses and meeting water quality goals.
Surface Water	DEQ monitors surface water quality conditions and trends statewide, and assesses sources and severity of pollution problems. We develop and convey pertinent and reliable information on the condition of Montana's environment to resource managers and the public. The program has responsibility for the operation of statewide water quality monitoring networks; we conduct inventories of pollution sources; and identify impaired streams, lakes, and watersheds.
Groundwater	The Montana Bureau of Mining and Geology monitors long-term water level conditions and water chemistry. The program has over 80 active projects related to surface water and ground water in Montana. The Ground Water Information Center (GWIC) database contains more than 213,000 water-well records
TMDL Development	The Total Maximum Daily Load (TMDL) program identifies sources of pollution to rivers, streams, and lakes within Montana and determines how much pollution those waters can sustain and still fully support all designated uses. We then write plans that outline how to reduce pollution (causes of impairment) to those waters and we can assist local communities with finding solutions to restore and maintain clean water. Our goal is for all of Montana's waters to be healthy enough to fully support fish and other aquatic life, to provide clean drinking water for people and livestock, and to allow for water-based recreation (i.e., swimming and fishing).
Pollution Discharge Permits	Our Water Protection Bureau issues permits under the Montana Pollution Discharge Elimination System (MPDES) and Montana Ground Water Pollution Control System (MGWPCS) programs designed to protect the state's water quality. Activities of program staff include public education, application review, effluent limits and best management practices determinations, data review and management, regulation and guidance preparation, and field inspections.

Restoration Plan Development	A Watershed Restoration Plan (WRP) is a tool developed and designed by local watershed groups to guide them in planning for and implementing restoration activities in their watershed. The Nonpoint Source program provides technical guidance and assistance during the development and implementation of these plans. A WRP is a dynamic document that once developed, should be reviewed and updated, if appropriate.
Community Assistance & Support	The Water Quality Division encourages businesses, local governments and citizens to adopt new products, technologies, and practices that limit environmental damage to state waters caused by point source pollution. Towards that end, we provide financial and technical assistance through our Engineering Bureau to overcome market and institutional barriers hindering the implementation of cleaner business and public works practices and the installation of infrastructural equipment.
Nonpoint Source Project Grants	The state of Montana receives grant funds annually from EPA through Section 319 of the Clean Water Act to distribute throughout the state to groups interested in implementing projects to reduce nonpoint source pollution to our waters. These funds support a wide variety of activities including education, training, and restoration and/or protection projects. DEQ solicits project proposals from eligible applicants who have an approved WRP. Funds are distributed competitively to support the most effective and highest priority projects.
Source Water Protection	Surface water (rivers, streams, and lakes) or ground water can serve as sources of drinking water, referred to as source water. Source water provides water for public drinking water supplies and private water wells. Public utilities treat most water used for public drinking water supplies. Protecting source water from contamination can reduce treatment costs and reduces risks to public health from exposures to contaminated water. Our Water Quality Division (WQD) performs source water assessments to provide water utilities, community governments, and others with information needed to protect drinking water sources.
State Revolving Funds	The Montana Legislature established two State Revolving Fund (SRF) Loan Programs - one for water pollution control projects (wastewater and nonpoint source projects) and the other for drinking water projects. Both programs provide at or below market interest rate loans to eligible Montana entities. These programs are funded with capitalization grants from the U.S. Environmental Protection Agency and are matched 20 percent with state-issued general obligation bonds. Combined, these two sources of funds create the "state revolving fund" from which loans are made and borrower repayments revolve to provide loans for future infrastructure projects. Through our Engineering Bureau, we are the administering agency of these funds and assure that the technical and programmatic requirements of the program are met. The Department of Natural Resources and Conservation (DNRC) issues the state's general obligation bonds and makes loans to the project borrowers. Cooperatively, DEQ and DNRC administer the State Revolving Fund Loan Programs.
Public Water Supplies	Working together, our Public Water Supply and Engineering Bureaus work to assure that public health is maintained through a safe and adequate supply of drinking water and that applications for proposed subdivisions are reviewed to ensure compliance with the Sanitation in Subdivisions Act[1]. These goals are achieved through technical and engineering reviews, licensing, certifications, compliance monitoring, training, and technical assistance. Included in these reviews are evaluations of water quality impacts from wastewater disposal systems in accordance with Montana's nondegradation and mixing zone rules

Since 1996 DEQ Has…

- Developed 1,445 TMDLs addressing 1,675 causes of water quality impairment.

- Supported the development of 28 WRPs – 22 of which have been finalized and accepted.
  1. *reduced sediment loading to streams by an estimated 1,200 tons/year*
  2. *reduced nitrogen and phosphorus loading to streams by an estimated 7,000 pounds and 700 pounds/year respectively*

- Administered over $186 million in state revolving fund loans

- Distributed over $38 million in federal 319 grant funds to local watershed groups and organizations

- Issued over 7,000 surface water discharge permits (MPDES permits) which includes
  1. Over 170 Individual surface and/or groundwater permits
  2. Over 7,100 General permit authorizations

- Assessed 20,686 miles of streams & 493,343 acres of lakes to determine their water quality condition

EXECUTIVE SUMMARY

The Montana Department of Environmental Quality (DEQ) prepares this biennial Integrated Report (IR) to present the status of water quality for waterbodies under state jurisdiction. Specifically, this IR describes the condition and trends of Montana's streams and lakes, contaminants found in groundwater, and the safety of drinking water during the previous 2-year period; thus, the 2018 IR reports on the condition of the state's water quality for the years 2015–2016.

DEQ oversees assessing the quality of waterbodies under state jurisdiction, specifically, those waters that are not within federally-recognized Indian Reservations. We do not actively assess waters in national parks or wilderness areas and focus primarily on perennial rivers and streams and lakes greater than 5 acres. As of this reporting, we have assessed the water quality of 20,686 stream miles and 493,343 lake/reservoir acres, roughly 38% and 77%, respectively, of the total number of waterbodies under the state's jurisdiction, i.e., management authority.

WATER QUALITY REPORTING

Both state and federal laws have been implemented to govern water pollution control. Their objective is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing or strictly regulating pollution sources. The Montana Department of Environmental Quality (DEQ) is required under these laws to report on the condition of waterbodies under state jurisdiction. We are also committed to the transparency of DEQ operations so that Montanans have access to the quality of the waters they recreate in, drink from, and use for other purposes.

WHY DO WE REPORT ON WATER QUALITY?

The 2018 Integrated Report documents the condition of the state's water quality for the years 2015–2016, fulfilling requirements under the federal Clean Water Act by reporting on elements found in two sections of the act:

- Section 303(d), a list of threatened, or "impaired," waterbodies in the state that need a TMDL (Total Maximum Daily Load)
- Section 305(b), a report on the overall condition of waterbodies under state jurisdiction and the status of the state's delegated water quality programs

Limited financial and personnel resources prevent us from monitoring all of the waters under state jurisdiction every reporting cycle; we therefore develop our monitoring priorities to align with priority goals identified via an integrated planning process which includes point and nonpoint source water quality management needs.

For more information about water quality reporting, visit cwaic.mt.gov.

The Cornerstones of Water Quality Reporting

Two important concepts form the cornerstones for reporting on water quality: beneficial use and Total Maximum Daily Load.

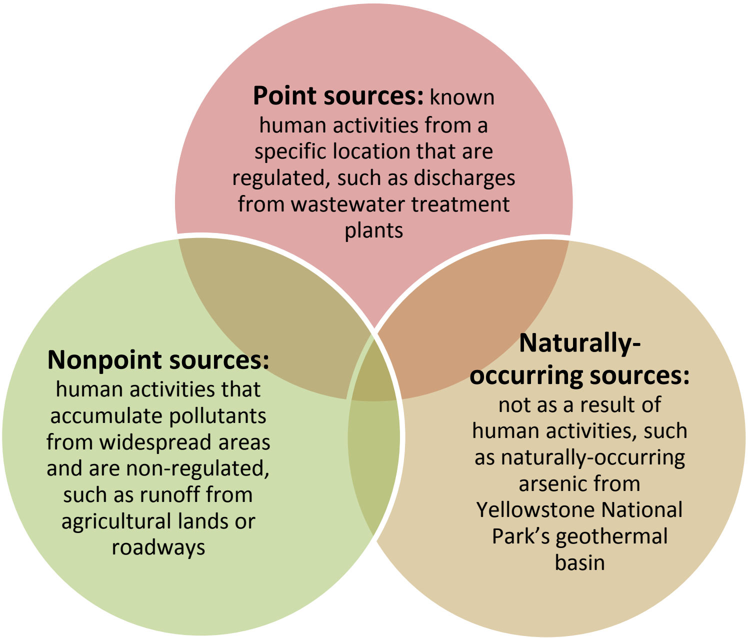
Beneficial Use

Beneficial uses are the various ways a particular waterbody can be used, such as for drinking water, habitat for fish and waterfowl, recreation, or agricultural or industrial purposes. Once beneficial uses are officially designated, we can establish appropriate water quality criteria and non-degradation rules that will maintain water quality to protect those uses. Thus, beneficial uses are really goals for achieving water quality. Each goal has a standard that establishes the maximum amount of any particular pollutant while still allowing a waterbody to maintain a given beneficial use. Together, water quality criteria, beneficial uses, and non-degradation form water quality standards, which are the benchmarks to aim for in protecting and maintaining water quality.

If a waterbody is deemed "impaired," it means one or more of its beneficial uses are limited or harmed to some extent. Federal law requires states to assess waterbodies to determine whether they are supporting their beneficial uses—and to what extent—based on the presence or absence of pollutants. From the results, DEQ classifies each assessed waterbody into one of three main categories:

- **Fully supporting:** the waterbody meets all water quality standards and supports all assessed beneficial uses
- **Not fully supporting:** one or more water quality standard is exceeded, limiting to some extent the assessed beneficial use
- **Threatened:** the waterbody currently meets water quality standards, but will likely exceed a standard if current trends continue

In Montana, the most common threats to beneficial uses are too much sediment, nutrients, or metals, all of which alter physical and chemical properties of a waterbody. These threats can come from one or a combination of three source types:



Sources of Pollution

Keep in mind that land uses and other human activities that affect beneficial uses can change over time; therefore, managing and improving water quality throughout our vast state can be challenging and requires careful monitoring, development of effective quality standards, and a plan to restore water quality, called a Total Maximum Daily Load.

Total Maximum Daily Load

A Total Maximum Daily Load (TMDL) is a regulatory term under the Clean Water Act. TMDL is a calculation of the maximum amount of a contaminant (pollutant) that a waterbody can receive and still meet water quality standards. That is, support its beneficial uses. The formula for calculating a TMDL allocates pollutants among both point and nonpoint sources, while also accounting for naturally-occurring conditions that can degrade water quality. In addition, TMDLs must consider the uncertainty in predicting how well reducing a pollutant will result in meeting water quality standards. The TMDL calculation also considers seasonal variations, such as temperature and water flow, which can affect how waterbodies respond to certain pollutants.

DEQ uses TMDLs to set water quality targets for watersheds; thus, TMDLs provide both a way to measure water quality and to plan for improving it. TMDLs evaluate how much of any given pollutant is present (its "loading"), where it comes from (its source), and by how much it needs to be reduced so the waterbody can attain its water quality goals. TMDLs may also address threatened waterbodies by setting loading limits on pollutants known to be contributing to declining trends in water quality.

We use a watershed approach to develop TMDLs and water quality restoration plans. In this way, many rivers, streams, and lakes within a watershed can be efficiently addressed in a single TMDL document. We work with watershed stakeholders during TMDL development so that local watershed groups and/or other interested parties can use completed TMDLs as tools to help guide local activities for improving water quality.

Benefits of a Watershed Approach for TMDLs

- *targets priority water-quality problems*
- *promotes stakeholder involvement*
- *integrates knowledge and authority of multiple agencies and experts*
- *uses monitoring and data analysis to evaluate load reductions*

A TMDL defines explicitly what is needed for a waterbody to meet its water quality criteria for each pollutant identified during the study. Therefore, until all necessary TMDLs are established and implemented for each pollutant affecting a particular waterbody, that waterbody will likely be limited in supporting one or more of its beneficial uses.

WHAT'S NEW SINCE THE LAST IR: 2018 IR AT A GLANCE

As of this reporting, we have assessed the water quality of 20,686 stream miles and 493,343 lake/reservoir acres, roughly 38% and 77%, respectively, of the total number of waterbodies under the state's jurisdiction (i.e., management authority) and priority (Category 3 waters have not been assessed).

This cycle we:

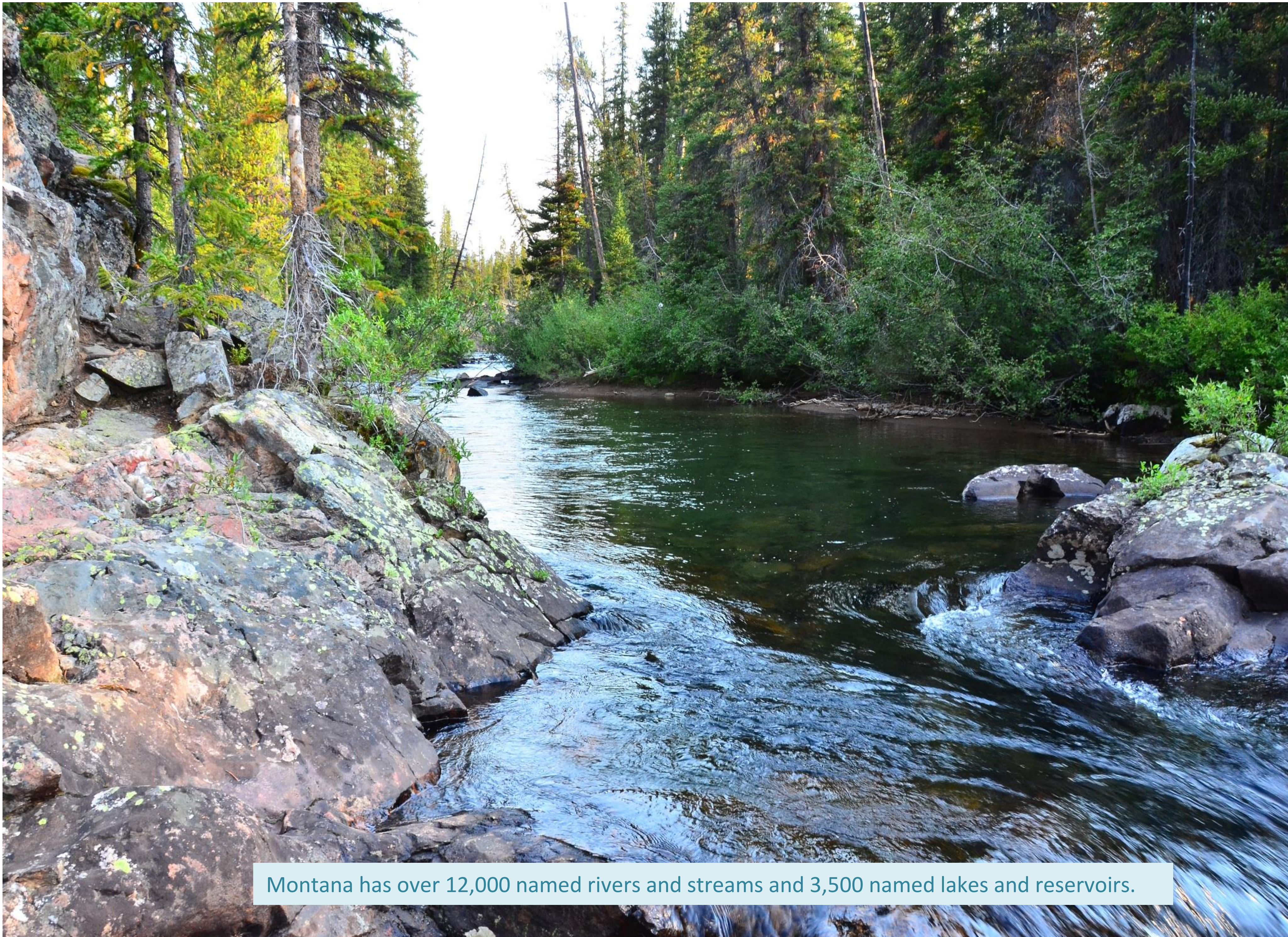
- Confirmed restored water quality on 7 waterbodies from 16 pollutants due to restoration activities
- Created 13 new Assessment Units (AUs)
- Assessed use support on 62 AUs
- Retired 3 AUs
- Received approval on 1 TMDLs
- Delisted 54 AU/Pollutant combinations from the 2016 303(d) list
- Added 14 AUs to the 303(d) list
- Changed the category of 28 AUs based on new information (**Figure 1**)
- Amended the use support of 212 AUs

2016 Cycle					
Category	River		Lake / Reservoir		Total Count
	Miles	Count	Acres	Count	
1	2,235	120	60,360	15	135
2	843	45	9,407	11	56
3	2,337	119	24,994	16	135
4A	4,858	376	6,150	4	380
4B					0
4C	1,923	93	11,446	3	96
5	9,542	331	402,115	22	353
5, 5N	911	28	3,758	1	29
Total	**22,649**	**1,112**	**518,230**	**72**	**1,184**

2018 Cycle					
Category	River		Lake / Reservoir		Total Count
	Miles	Count	Acres	Count	
1	2,233	120	59,408	14	134
2	836	48	12,429	14	62
3	2,242	119	24,773	15	134
4A	4,727	372	6,150	4	376
4B					0
4C	1,856	93	11,520	4	97
5	10,123	343	400,078	19	362
5, 5N	911	28	3,758	1	29
Total	**22,928**	**1,123**	**518,116**	**71**	**1,194**

Figure 1: Use Class Comparison

MONTANA'S WATER RESOURCES



Montana has over 12,000 named rivers and streams and 3,500 named lakes and reservoirs.

BASINS IN MONTANA

DEQ organizes its report on surface water quality by the basins and watersheds that the waters are contained within. We use geographic information systems (GIS) to help with spatial analysis, mapping, and water quality assessments.

For program management purposes, we group the state's waters into 4 state administrative basins, which contain 16 sub-major basins delineated by the U.S. Geological Survey's hydrologic unit code system (**Figure 2**). The four state administrative basins are:

- Columbia – all waters west of the Continental Divide, including the Clark Fork, Flathead, and Kootenai rivers
- Lower Missouri – Missouri River basin from the Marias River confluence to the North Dakota border, including Montana headwaters of the St. Mary River in the Upper South Saskatchewan River basin
- Upper Missouri – Missouri River basin from the headwaters downstream to the confluence with the Marias River
- Yellowstone – all waters of the Yellowstone River within Montana and the Little Missouri/Belle Fourche watershed in southeast Montana

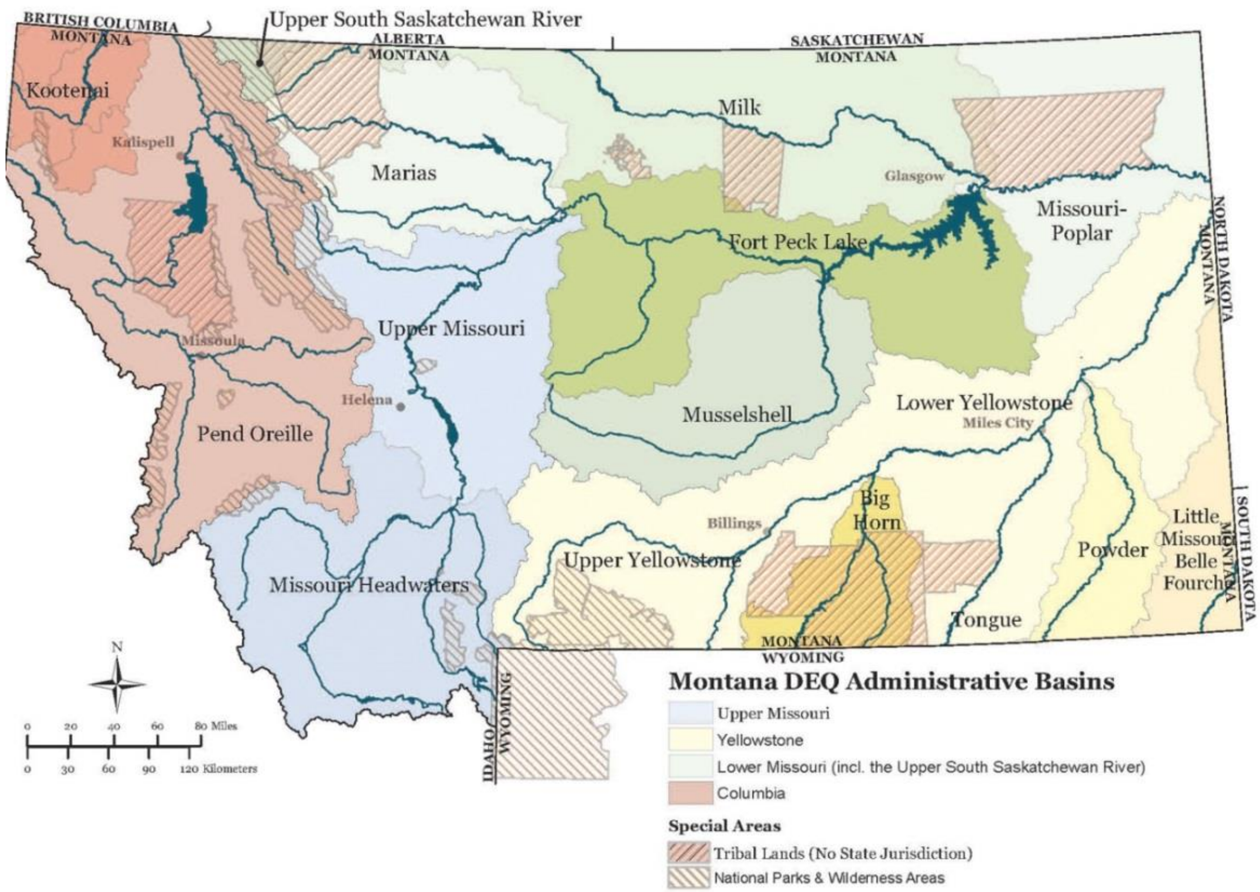


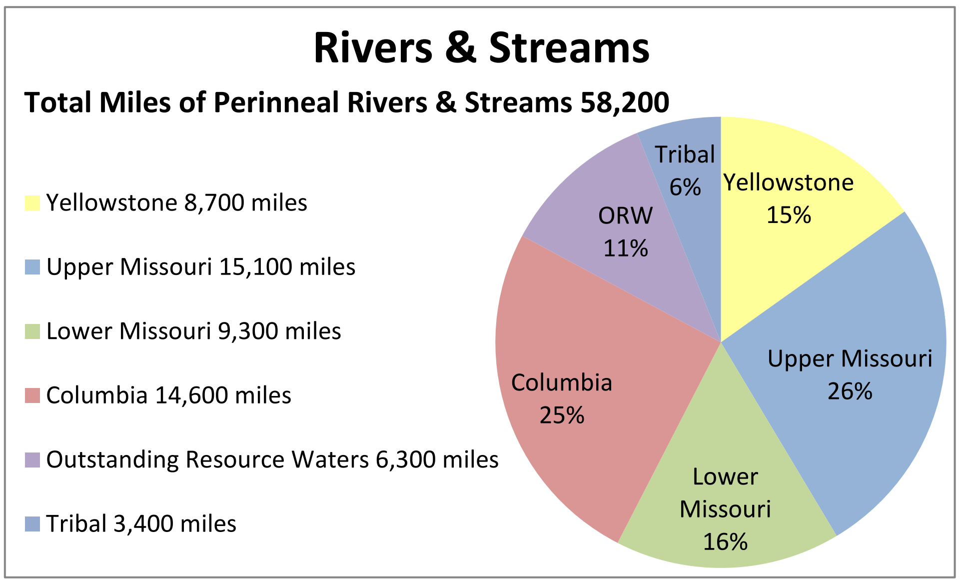
Figure 2. Basins of Montana

Perennial Surface Water Location

DEQ does not have delegated authority over all of the waters in the state. The tribal governments and/or the U.S. Environmental Protection Agency (EPA) are responsible for managing the quality of waters located within the reservations of federally-recognized tribes. In addition, the state has established a few assessment areas within national parks and wilderness areas but, because these areas are managed under federal laws restricting activities, does not actively monitor or assess their conditions for this report. Waters within national parks and wilderness areas are designated outstanding resource waters (ORW).[2]

Figures 2 and 3 present a picture of the waters in the state by their location in DEQ's administrative basins and the tribal and ORW waters.

Stream miles and lake size estimates used in this report come from the high resolution National Hydrography Dataset.[3] We calculate the total length of streams from all linear waters in the dataset. Because of potential sources of error, and in order to report these numbers as accurately as possible with the available data, the summary of state waters are given in the nearest 100 miles for streams, while the total lake area is based on named waters of at least 5 acres.



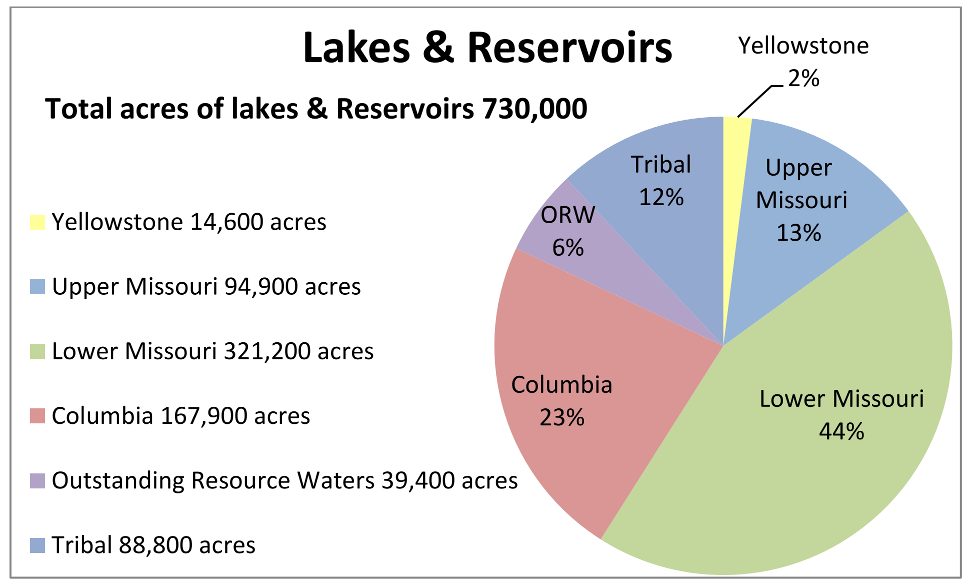


Figure 3. Surface Water in Montana

SURFACE WATERS

Surface waters include rivers, streams, lakes, reservoirs, and wetlands.

Streams

Streams belong to one of three general categories based on their flow characteristics and relative position of their streambed to the local shallow groundwater table. Perennial streams total approximately 58,200 stream miles, but the 307,000 miles of small, intermittent or ephemeral streams account for most of Montana's stream miles.

Perennial Streams:

Below the local shallow groundwater table and typically flow on the surface throughout the year

Intermittent Streams:

Below the local shallow groundwater table during part of the year and flow in response to groundwater recharge and precipitation.

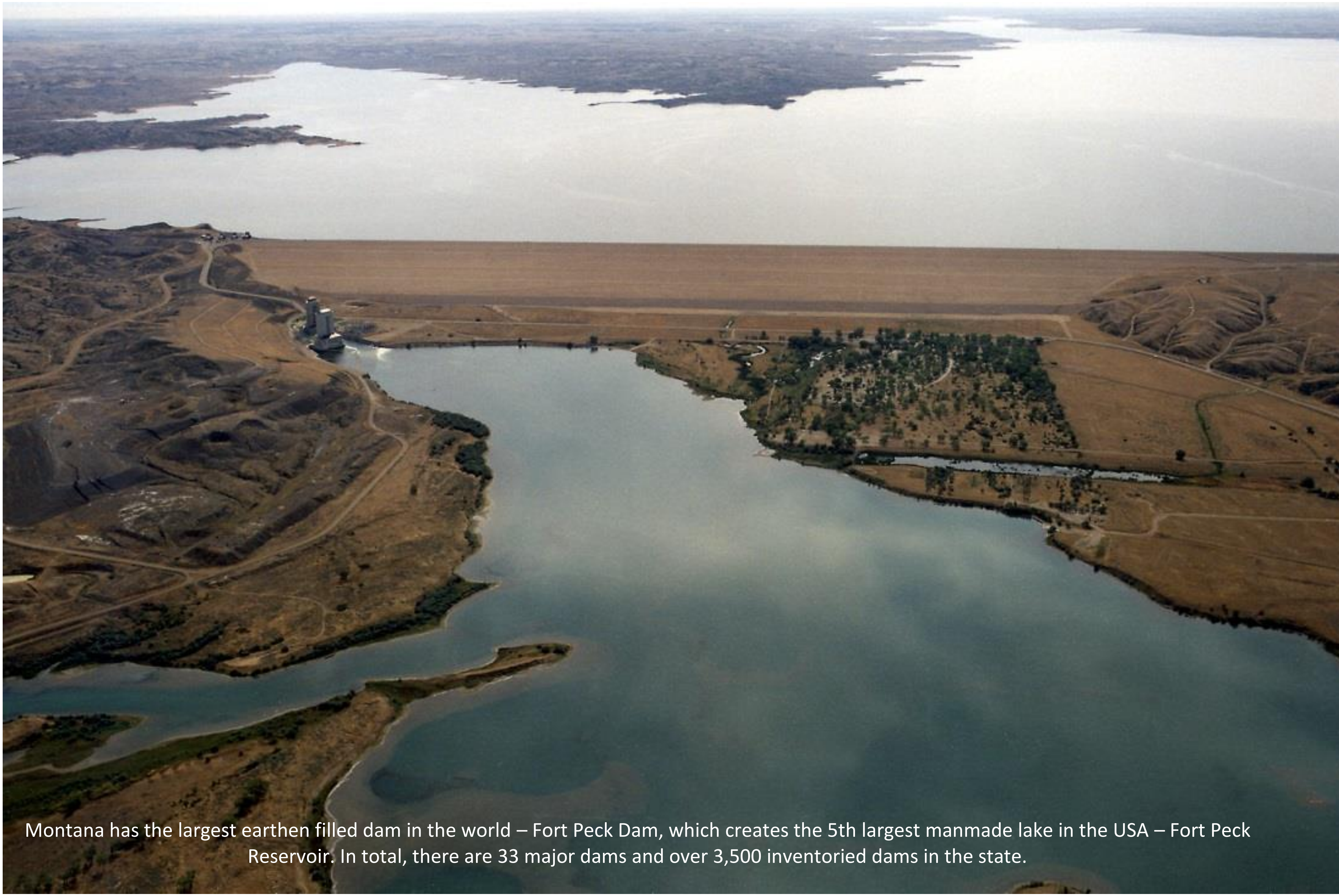
Ephemeral Streams:

Above the local shallow groundwater and flow only in response to snowmelt or rainfall. Dry most of the year and typically exist in the semi-arid and mountain headwater regions.

Lakes

Montana has 1,417 named lakes, reservoirs, and ponds that are 5 acres or greater covering about 730,000 acres.

These waterbodies include various natural lakes – alpine lakes and closed basin lakes (i.e., lakes with no surface outlet), as well as large reclamation and/or hydropower reservoirs, and a lake formed from an earthquake that damned the Madison River – Quake Lake.



Montana has the largest earthen filled dam in the world – Fort Peck Dam, which creates the 5th largest manmade lake in the USA – Fort Peck Reservoir. In total, there are 33 major dams and over 3,500 inventoried dams in the state.

Wetlands

Wetlands are areas where water covers the soil or is present either at or near the surface of the soil year-round or for varying periods during the year, including during the growing season. The presence of water determines the nature of soil development and the types of plant and animal communities living in the soil and on its surface.

Approximately two-thirds of Montana's wetlands (>2 million acres) and riparian areas (>600,000 acres) are mapped.

Montana's wetland habitat types

GROUNDWATER AQUIFERS

Groundwater is any water that flows or seeps downward or is stored below the ground in rock crevices or other pores of geologic materials. Groundwater feeds springs and wells, and the upper surface of the saturated zone is the water table. The quality and availability of groundwater varies greatly across the state.

Surficial Aquifers

Typical of western Montana, surficial aquifers are shallow, typically less than 50 feet (15 m) thick consisting of permeable unconsolidated (loose) deposits like sand and gravel. These are referred to as alluvial deposits. Most alluvium is geologically quaternary (less than 2.5 million years) in age. The aquifers are replenished by streams and from precipitation and can vary in volume considerably as the water table fluctuates. Therefore, the temperature and flow from water-table springs vary. Being shallow, they are susceptible to contamination by fuel spills, industrial discharge, landfills, and saltwater. The groundwater continuously moves along the hydraulic gradient from areas of recharge to streams and other places of discharge. They provide a high level of water storage.

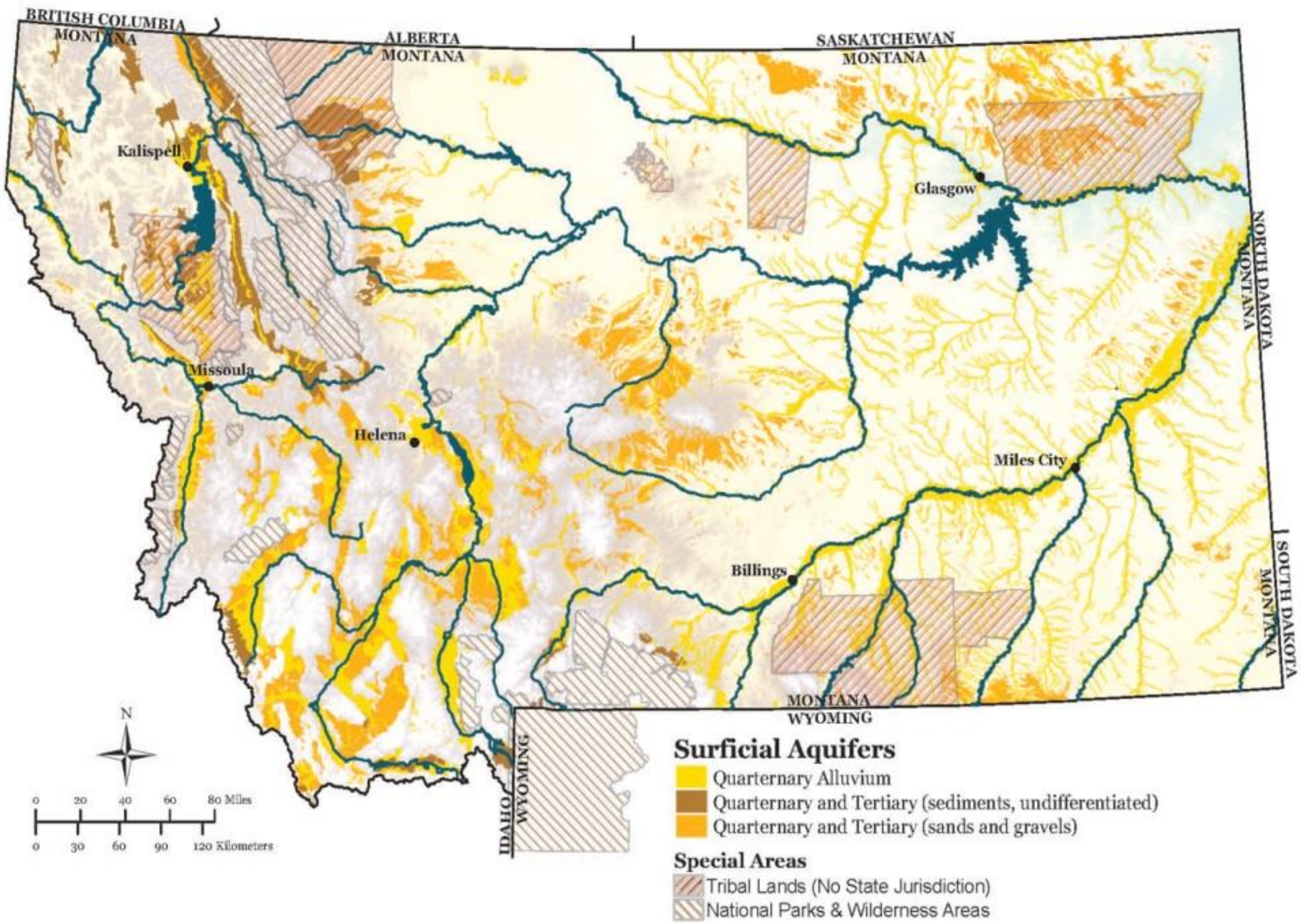


Figure 4. Surficial Aquifers[4]

Bedrock Aquifers

Found mainly in eastern Montana, bedrock aquifers are where water is confined within hard bedrock layers. Bedrock is the hard rock that lies below all the sand, gravel and soil near the ground surface. Water can travel through porous bedrock, or through cracks, fractures and crevasses in the hard bedrock. In some areas of eastern Montana, thick shale formations near the surface make access to water difficult or produce poor-quality water. Also, aquifers in the east typically yield less water than those in western Montana. To reach higher-quality water, wells have to be drilled deeper, which is more costly. Bedrock aquifers in Montana are found in formations as old as 540 million years (Paleozoic).

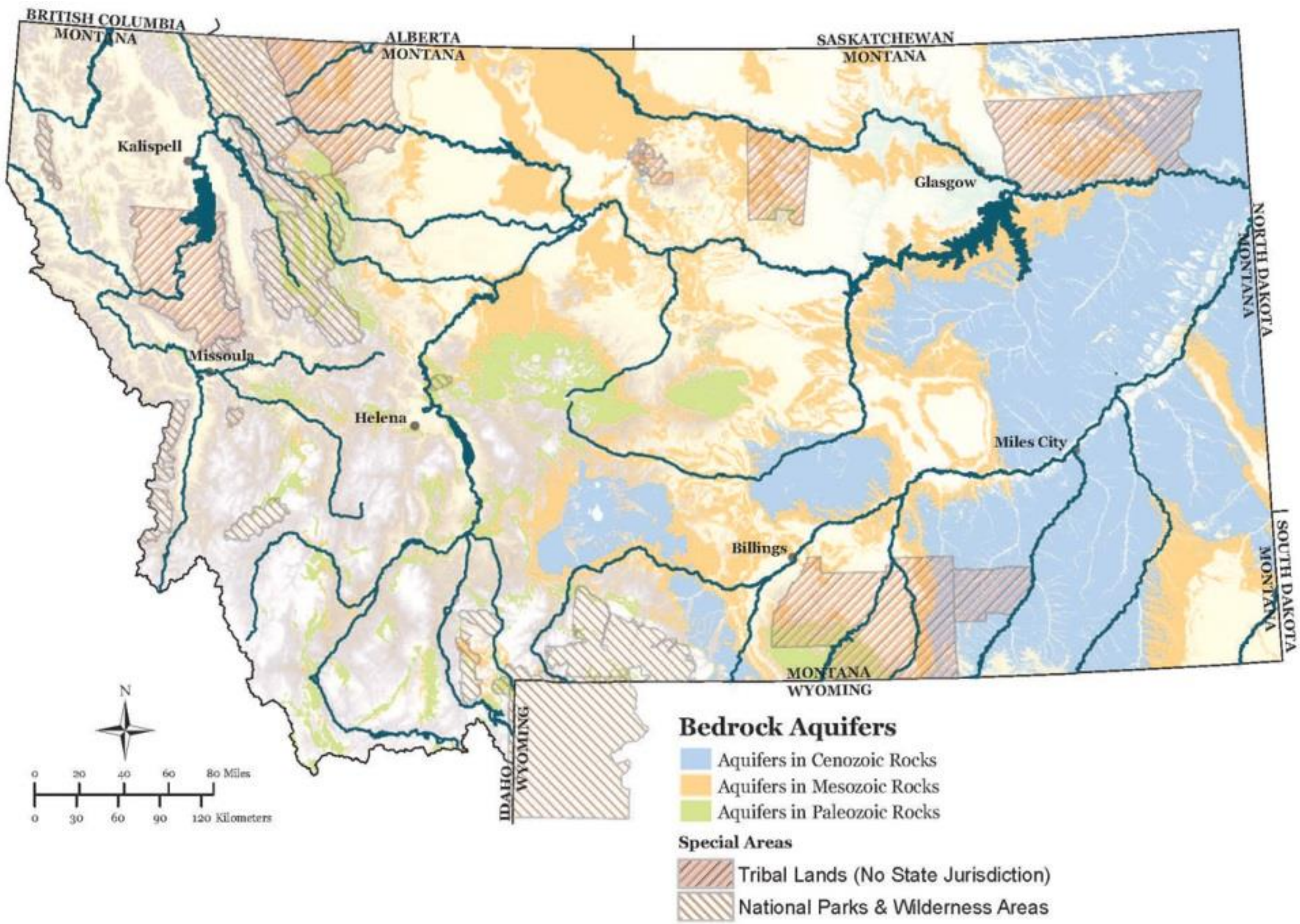


Figure 5. Bedrock Aquifers[5]

Beneficial Uses & Water-Use Classification

In the 1950s, Montana classified its waterbodies according to the present and future beneficial uses they should be capable of supporting.[6] Montana's water-use classification system identifies the following five main beneficial use categories.[7]

Aquatic Life

Water used to support aquatic life is broadly defined as those waters that support the populations of macro- and micro-invertebrates, aquatic plants, fish, waterfowl, furbearers, and other animals normally associated with a healthy ecosystem. Healthy aquatic life depends on an environment free from harmful levels of chemical pollutants, sediment, and/or total dissolved solids (e.g., minerals, salts). Aquatic life is also sensitive to water temperature changes and other actions that disrupt the naturally-occurring hydrologic regime.

Recreation

Recreation includes primary and secondary contact recreation, such as swimming or boating, respectively. Both excess algae growth and E. coli bacteria can harm the recreational use of waterbodies.

Drinking Water

Water used for human consumption includes drinking, culinary, and food processing uses. Safe drinking water depends on non-harmful levels of toxins and carcinogens. For carcinogens such as arsenic, levels in the water need to be below that which could result in an increased cancer risk from lifelong exposure via drinking or consuming fish from the same waters.

Agriculture & Industry

Generally, if a waterbody supports the other use classes, it will—in most cases—also support agricultural and industrial uses. However, additional salinity and toxicity information may be required to determine suitability for use in agriculture or industry.

Use Classes for Surface Waters

Classes for Montana's surface waters group the designated uses of waters with similar quality conditions. These conditions identified existing and anticipated beneficial uses of a waterbody or waterbodies mostly by geographical area. Classes are notated with letters A, B, and C and are further subdivided using numbers 1, 2, and 3 (**Table 1**).

Table 1. Designated Beneficial Uses by Waterbody Class

Beneficial Uses	**Water Use Classification**							
	A-Closed	A-1	B-1	B-2	B-3	C-1	C-2	C-3
Aquatic Life/Fishes (salmonid)	X	X	X	X		X	X	
Aquatic Life/Fishes (non-salmonid)					X			X
Drinking Water (human health)	X	X	X	X	X			M
Recreation	X	X	X	X	X	X	X	X
Agriculture	X	X	X	X	X	X	X	M
Industry	X	X	X	X	X	X	X	M
X = Beneficial Use; M= Marginal Use (i.e., might exist)								

Use Classes for Groundwater

The state established groundwater classifications for use based on quality and actual uses as of October 1982, as opposed to anticipated or potential uses for surface waters. Groundwater has four use classes, denoted by Roman numerals I, II, III, and IV, and which are defined by specific conductance levels (**Table 2**). Specific conductance is a measure of water's ability to conduct an electrical current. Waters high in salts and dissolved minerals have a high specific conductivity, while waters with fewer dissolved salts and minerals have lower conductance. Specific conductance, therefore, is an important measure of water quality because it indicates how much dissolved salts and minerals are in that water and therefore, what class it is in. As specific conductance increases, consumptive uses decrease. State water quality standards are associated with the specific uses.

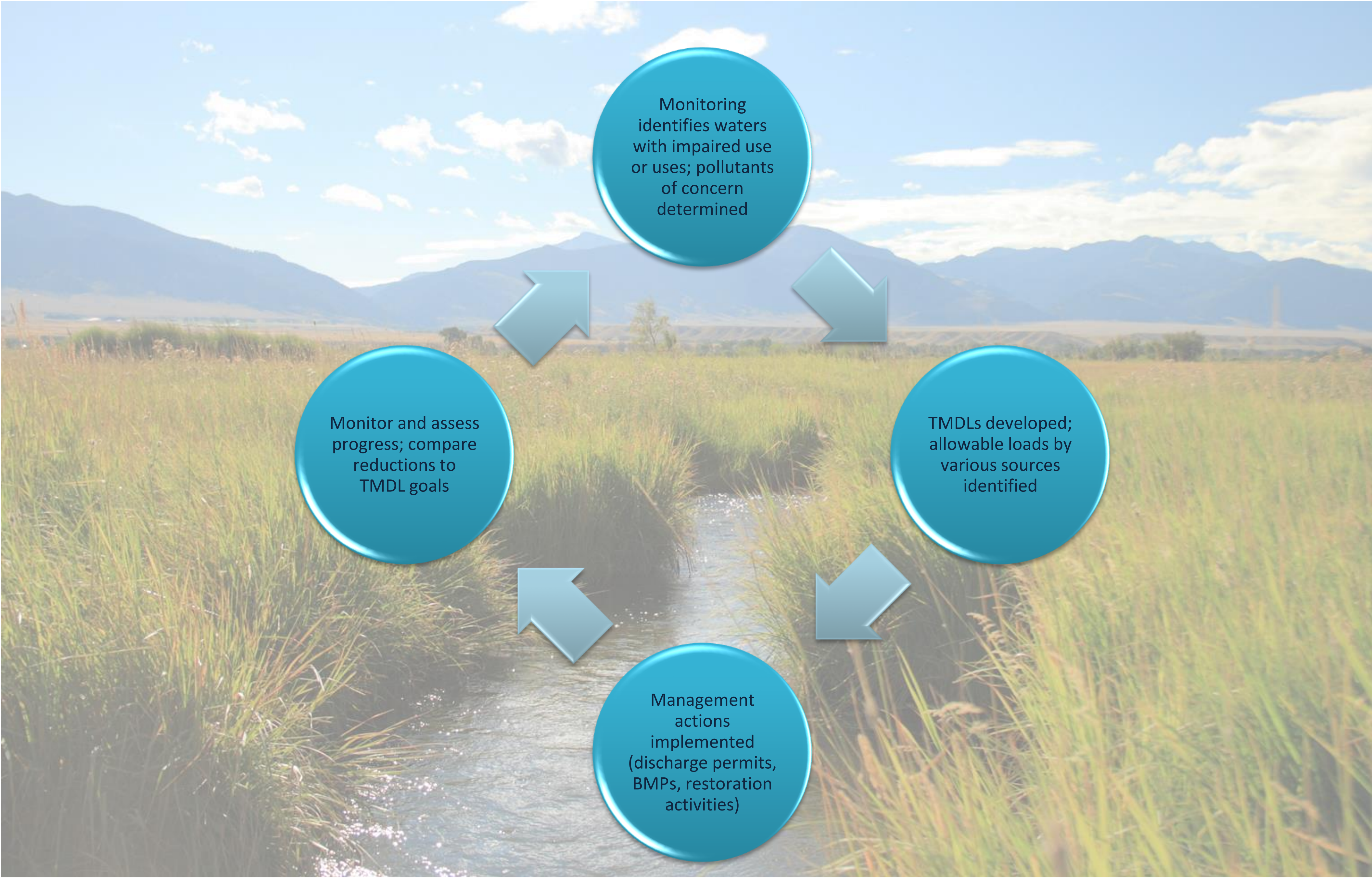
Table 2. Groundwater Classifications

Classification	I	II	III	IV
Specific Conductance @ 25°C	< 1,000 µS/cm	1,000 to 2,500 µS/cm	2,500 to 15,000 µS/cm	>15,000 µS/
Beneficial Uses				
Public & Private Water Supply	X	M		
Food Processing	X	M		
Irrigation	X	X	M	
Stock Water	X	X	X	
Commercial & Industrial Use	X	X	X	X

X = Beneficial Use; M= Marginal Use (i.e., may exist)

CONTROLLING WATER POLLUTION IN MONTANA

Montana's water pollution control programs help state waters achieve the federal Clean Water Act's broad goal of being fishable and swimmable, i.e., meeting water quality standards.



POLLUTION: POLLUTANTS VS NON-POLLUTANTS

Pollutant - chemicals from mine sites

A form of pollution that is any substance introduced into a waterbody–naturally or by human activity–that harms water quality for a specific use, such as aquatic life. Common pollutants include nutrients, metals, or many substances discharged from industrial sites or wastewater treatment facilities. Some pollutants occur naturally but can still harm water for a specific use, such as arsenic that seeps into water from the Yellowstone geothermal basin.

Non-Pollutant (Pollution) - altered riparian habitat

A change in the environment caused by humans that affects the waterbody or its biological community. For example, a manmade physical change would be building a diversion dam or removing riparian vegetation, which can block fish passage or cause streambanks to collapse, respectively. Both of these changes can harm water quality in different ways and can also result in adding one or more pollutants; e.g., erosion may lead to excess sediment building up in streams.

The difference between a pollutant and a non-pollutant

Waterbody Use Support Status

We evaluate waterbodies by what is called an assessment unit (AU), each of which represents a homogenous segment of a waterbody. Creating AUs is a useful way to analyze waterbodies in order to assess water quality status (i.e., use support). For integrated reporting purposes, all assessed waterbodies are assigned to categories, which define the status of the waterbody (**Table 3**).

Category 1:

- All beneficial uses have been assessed for the waterbody and all uses are fully supported

Category 2

- Some, but not all, beneficial uses have been assessed and all assessed uses are fully supported for the waterbody

Category 3

- Insufficient data prevents assessing the use support of any beneficial use for the waterbody

Category 4A

- All required TMDLs are in place to correct identified impairments or threats

Category 4B

- The waterbody has a pollutant control program in place to correct issues, which stands in lieu of a TMDL

Category 4C

- The waterbody is impaired or threatened by causes that cannot be resolved with a TMDL (e.g., low flow, habitat changes, dams, etc.)

Category 5

- The waterbody has at least one impaired or threatened use, but a required TMDL or other control program is not yet in place

Category 5N

- The waterbody has at least one standard that is not being met, and available data/information indicates that the cause could be a natural condition (i.e., no human-caused sources have been identified)

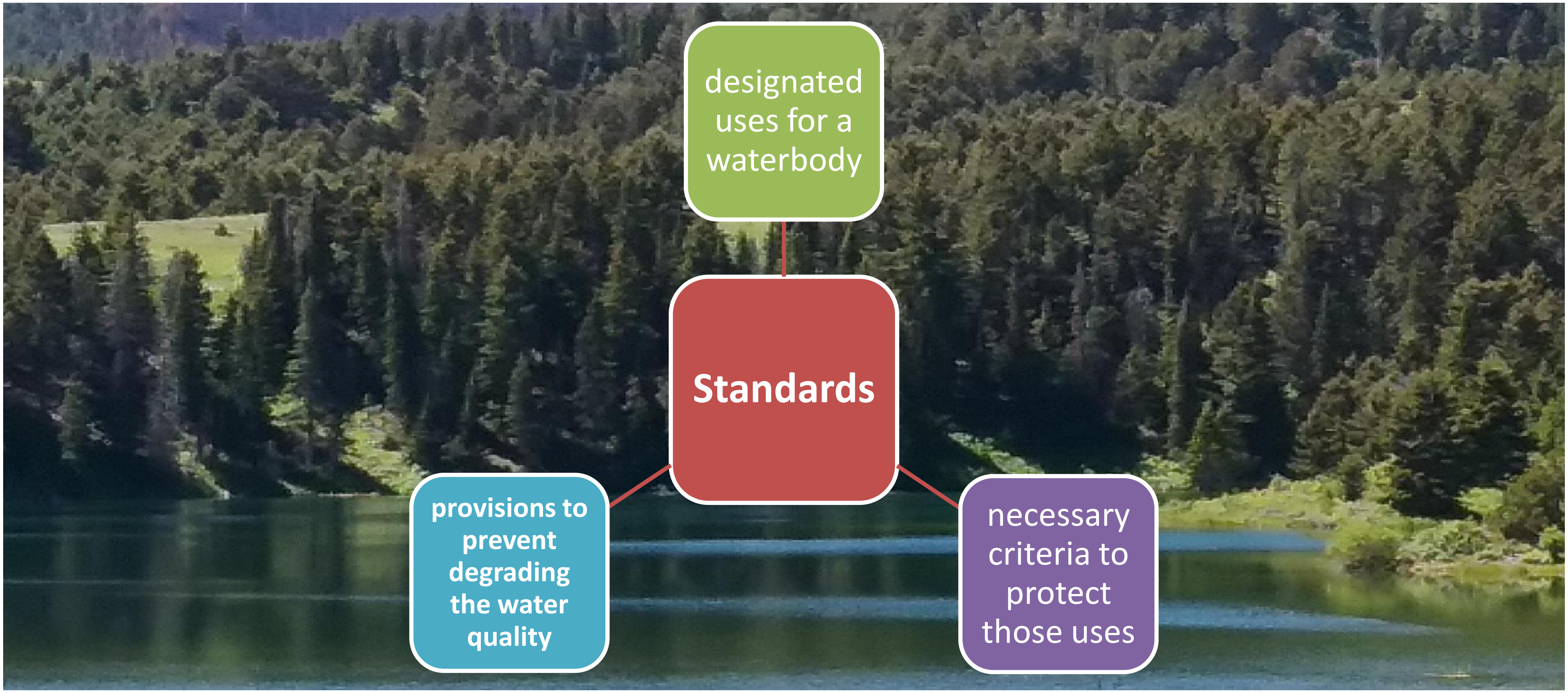
Category 5-Alt

- The waterbody has an impaired or threatened use, and an alternative restoration approach is currently being pursued in lieu of a TMDL

* Category 5N is not an EPA category but a Montana defined category

Table 3. Waterbody Use Support Categories

Water Quality Standards



These three components form the foundation of Montana's water pollution control programs.

Rulemaking Process

The Board of Environmental Review (BER) adopts water quality standards into the Administrative Rules of Montana (ARM). This rule-making process involves the Water Pollution Control Advisory Council, the governor's office, EPA, and the public. We review Montana's water quality standards every three years and update or modify existing standards as needed.

Water Quality Criteria

States either develop their own criteria or implement federal criteria for evaluating water quality. These criteria must accurately reflect the latest scientific knowledge. They are based solely on data and scientific judgments about pollutant concentrations and their effects on the environment, aquatic life, and human health. Montana water quality criteria include both numeric and narrative criteria. Water quality criteria for each use class are detailed in the Administrative Rules of Montana.[8]

Numeric Criteria

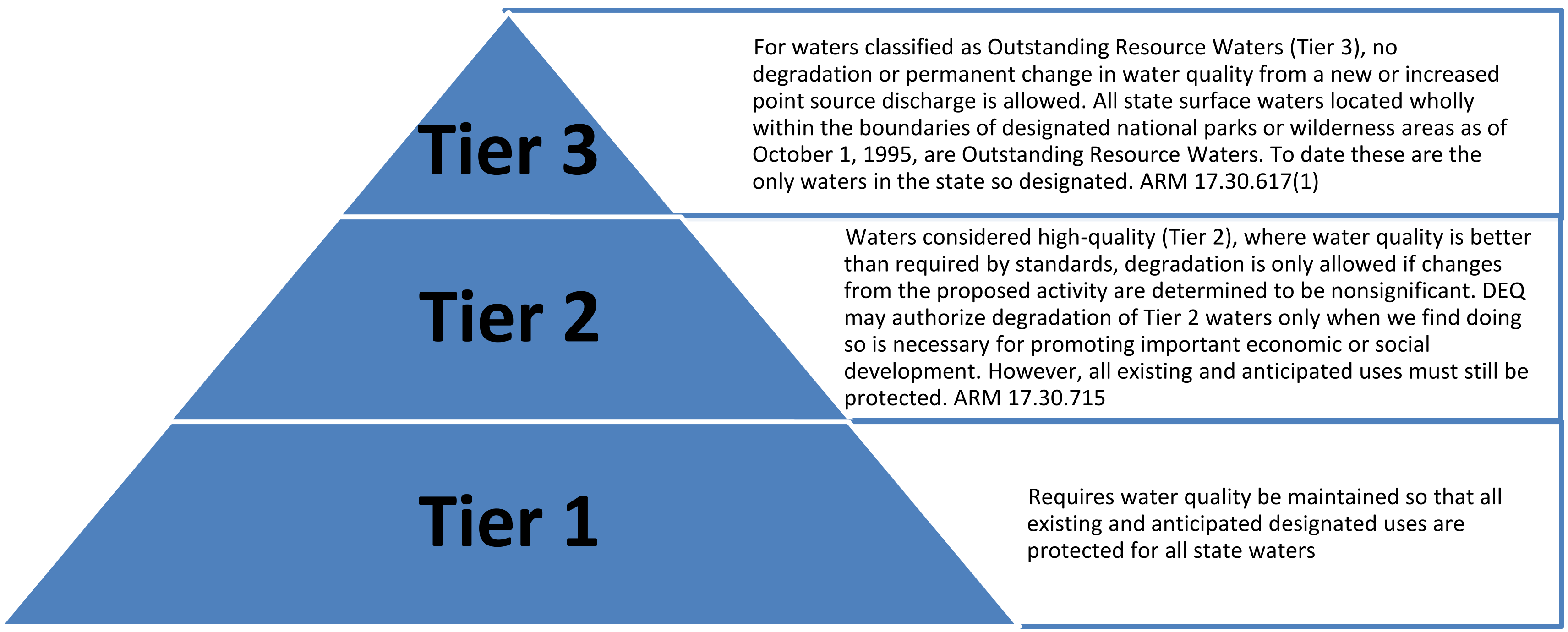
Most of Montana's water quality criteria are numeric; that is, the criteria define precise, measurable concentrations of pollutants that if exceeded would harm the use. Montana's numeric water quality criteria are published in Circular DEQ-7 and Circular DEQ-12A; however, the state also has numeric criteria for the New World Mining District (temporary standards),[9] algal biomass and nutrients on the Clark Fork River,[10] and electrical conductivity and sodium adsorption ratio for waters in the basins of the Rosebud, Tongue, Powder, and Little Powder rivers.[11]

Narrative Criteria

Some pollutants have narrative water quality criteria, which are statements (instead of specific quantities) that describe the desired water quality condition in terms of allowable ranges and maximums (e.g., water pH and temperature) or in terms of specific variation from natural conditions (e.g., water turbidity and color).

Each use class defined in the rule has narrative criteria, and some narratives define an allowable change from naturally-occurring conditions. For example: True color must not be increased more than five color units above naturally-occurring color.[12] Naturally-occurring conditions are determined by reviewing historical data for a waterbody, if available, or by comparing conditions with a reference waterbody. Reference waterbodies are unaltered or otherwise in their most natural condition and provide a baseline for what a relatively pristine, undisturbed similar waterbody might be like if fully supporting its uses.

Nondegradation Policy

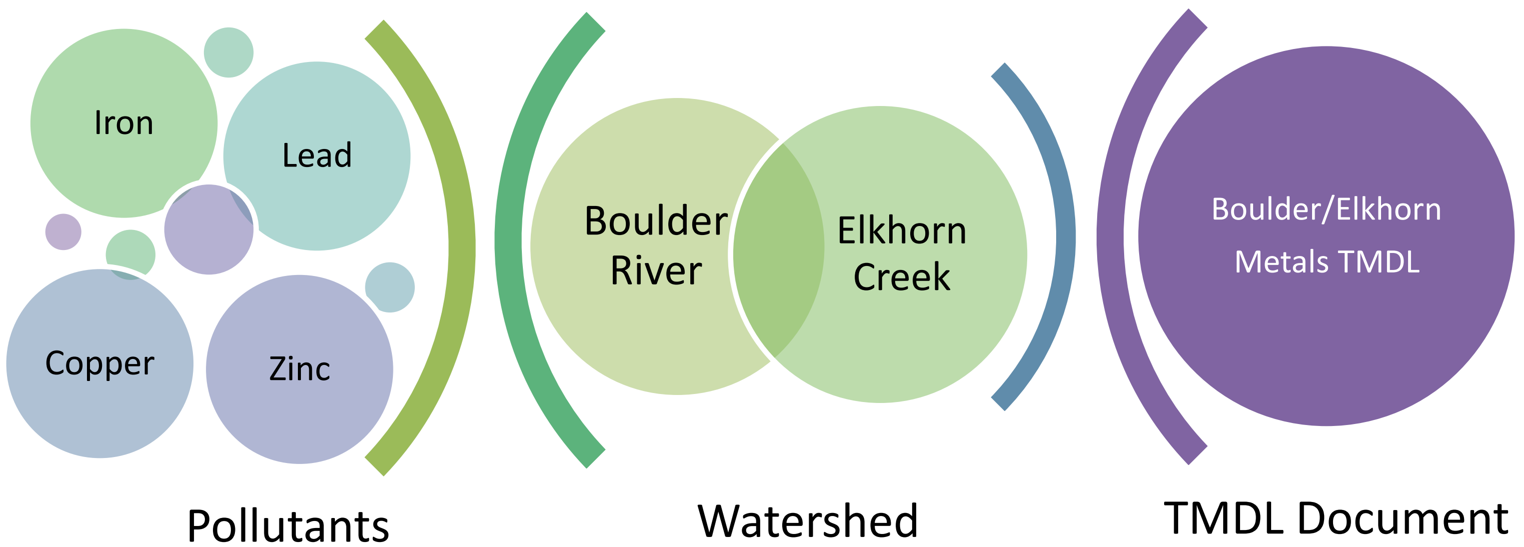


Montana's nondegradation policy,[13] applicable to new or increased sources of pollutants

TOTAL MAXIMUM DAILY LOAD PROGRAM

A Total Maximum Daily Load (TMDL) is the maximum amount of a pollutant a waterbody can receive from all sources combined and still meet its water quality standards (i.e., support its beneficial uses).

DEQ develops TMDLs for impaired and threatened waterbodies – essentially a plan for restoring and protecting a waterbody's' beneficial uses. Because water quality is best addressed through integrated efforts within a defined geographic area (i.e., a watershed), we normally combine multiple TMDLs into one project. A single waterbody can be impaired or threatened from multiple pollutants, which means it may require multiple TMDLs. For example, if one stream segment is



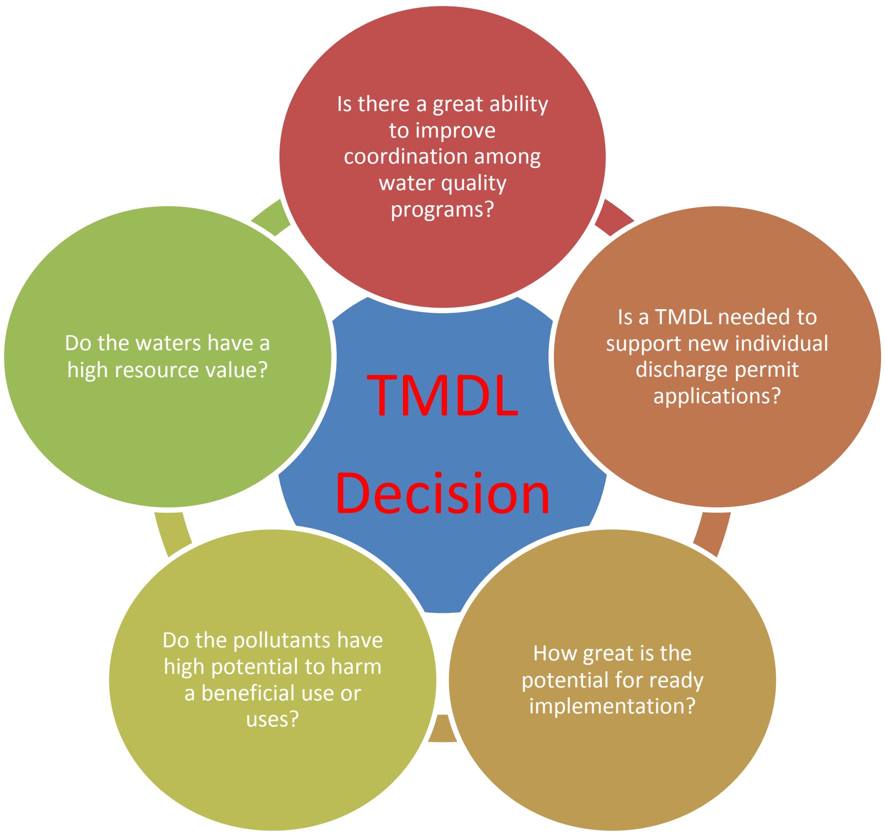
impaired by sediment, copper, and iron, that segment has three waterbody–pollutant combinations that must be addressed by three separate TMDLs.

Developing a TMDL generally takes 2 to 3 years for each project area, depending on the complexity of the system and available data and resources. After stakeholders and the public review a TMDL, we submit it to EPA for approval.

As part of TMDL public outreach, we have created an interactive TMDL project website that identifies current TMDL priority areas and provides a rationale on how these priorities were determined. The website also includes our method for setting TMDL priorities. Because of the large number of existing TMDL documents, in addition to working on new TMDL development in priority areas, it is anticipated that a significant amount of future work will address updates and improvements to these documents with regard to local stakeholder implementation.

Prioritizing TMDLs

To determine a watershed's TMDL development priority, DEQ applies factors defined in state law[14] and consults with the statewide TMDL advisory group.



Factors that most influence priority

- **High Priority:** Watersheds with TMDL completion anticipated within the next 2 years.
- **Medium Priority:** Watersheds where TMDL completion is anticipated by 2022.
- **Low Priority:** All other watersheds that require TMDLs or waters that have TMDL alternative restoration approach(s) in place.

Development and Implementation

Developing a TMDL for an impaired waterbody is a problem-solving exercise. The problem is excess pollutants entering a waterbody and impairing or threatening designated uses. The solution is to identify three factors:

- the total acceptable pollutant loading (amounts)
- all the significant pollutant-contributing sources
- where pollutant-loadings can be reduced to achieve an acceptable load

TMDLs are implemented by people and often function as information tools. Individual pollutant allocations for point sources (referred to as wasteload allocations) are managed using discharge permits, which DEQ issues through the Montana Pollutant Discharge Elimination System (MPDES). Pollutant allocations for nonpoint sources (referred to as load allocations) are managed voluntarily by land management agencies, watershed groups, conservation districts, landowners, and interested citizens.

Point Source Control Program

Pollutants can arise from different source types, one of which is called a point source; that is, pollutants arising as a result of human activities from a specific location, such as discharges from an industrial facility, and via an identifiable conveyance, such as a pipe. Point sources are regulated, meaning that facilities must have a permit to discharge pollutants from point sources into waterbodies.

In Montana, the Board of Environmental Review adopts rules governing all issues related to the state's permitting process, while EPA governs the pretreatment and municipal biosolids control programs in Montana.

Montana Pollutant Discharge Elimination System Program

State and federal regulations require industries or works (e.g., construction sites, wastewater treatment plants, etc.) to have a permit before they can discharge wastes or pollutants from any point source into state waters. Montana's Pollutant Discharge Elimination System (MPDES) is the permitting program that controls point source discharges of wastewater.

Discharge permits provide a regulatory process for defining limitations of pollutant amounts, which may be developed for each point source as part of the TMDL process. If a waterbody doesn't have an approved TMDL for existing pollutant discharges, DEQ imposes effluent limitations that will protect water quality.

In addition to permits issued to individual dischargers, general permits are issued for categories of discharges that affect waters statewide or within a limited geographic range (**Figure 5**). General permits must conform to all the criteria applicable to individual discharges. Further, general permits may contain additional provisions that DEQ deems necessary to protect water quality.

Figure 5: MPDES General Permits

Montana Ground Water Pollution Control System Program

In addition to controlling the discharge of pollutants from point sources into surface waters, we control pollutant discharges into groundwater through the Montana Ground Water Pollution Control System (MGWPCS) permitting process. The Montana Board of Environmental Review has adopted rules governing such discharges, which define a “source” as any point source or disposal system, including a waste-holding pond that under normal operating conditions may reasonably be expected to discharge pollutants into groundwater.

Typical permitted facilities include residential wastewater treatment systems, metal ore mills, lumber mills, wood product manufacturers, breweries, and community water treatment plants.

Pollution control standards for groundwater in Circular DEQ-7 are set to protect human health and include an insignificance number based on DEQ’s nondegradation policy.[15, 16] The rules include a water-use classification system for groundwater based on natural specific conductance and groundwater standards to protect those uses.

Groundwater rules do not require minimum treatment standards for discharge from mechanical treatment. The level of treatment or pollutant control is based on compliance with the applicable water quality standards after dilution within a DEQ-approved mixing zone (i.e., an area of groundwater allowed to mix with effluent before compliance is measured).

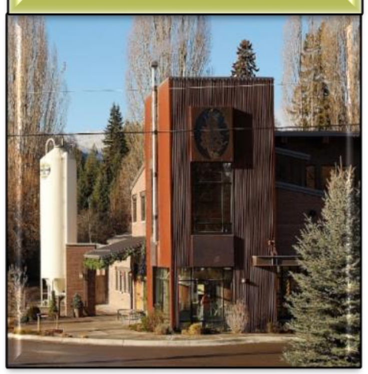
Lumber mill

Water Treatment

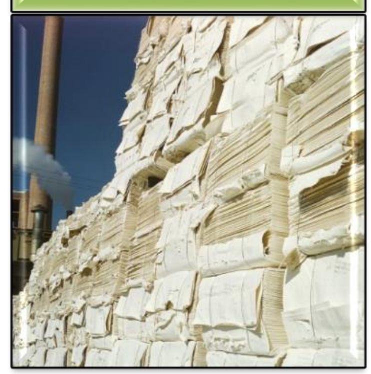
Ore mills

Wastewater Treatment

Breweries



Wood Products Manufacturing



Nonpoint Source Control Program

Like point sources of pollutants, nonpoint sources (NPS) arise from human activities. Unlike point sources, however, NPS pollutants are generally not regulated because they accumulate from diffuse sources over widespread areas, such as runoff from agricultural or urban areas. When rainfall and snowmelt moves over and through the ground, it collects and carries naturally occurring and manmade pollutants into rivers, lakes, wetlands, and groundwater.

DEQ promotes using best management practices (BMPs) to reduce NPS pollution. In addition, when NPS pollutants limit the beneficial uses of a waterbody, our watershed approach to developing TMDLs provides an effective way to allocate pollutant load reductions to achieve full beneficial use support.

Primary Categories of Nonpoint Source Pollution

There are ten major activities that contribute to NPS pollution and include agriculture, mining, and land development, among others.

Agriculture

Ranches and farms cover two-thirds of the state—about 60 million acres. Approximately 65% is rangeland-pasture and 30% is cropland.[17]

Nonpoint Source	Activity	Pollutant	Non-Pollutant
Agriculture 	Pesticide Application Irrigation Livestock Watering Riparian Habitat Disturbance (trampling) Removal of Native Riparian Vegetation	Sediment Nutrients Salinity Temperature Bacteria Pesticides	Habitat Loss Flow Alteration Channelization

Best Management Practices (BMPs) *include operational, management techniques, and structural controls to reduce or eliminate pollutants entering waterbodies and to improve the quality of water runoff. The goal is to reduce or eliminate NPS pollutants entering creeks, streams, rivers, ponds, lakes, and wetlands. Example BMP techniques include reducing the use of chemical fertilizers and pesticides. Example BMP structural controls include building retention ponds to capture pollutants, or water treatment measures, like using filters.*

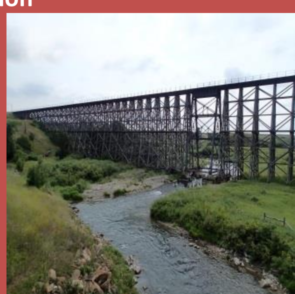
Forestry

Forests cover nearly a quarter of the state – 22.5 million acres and contain the headwaters for many rivers and streams. Approximately 64% is under federal management (USFS or BLM), 20% private, 8% commercial, and 4% each Indian Trust and State.[18] These lands provide drinking water for communities, habitat for Montana's diverse wildlife, and some of the West's best fishing.

Nonpoint Source	Activity	Pollutant	Non-Pollutant
Forestry 	Logging Road Construction	Sediment Nutrients Temperature	Habitat Loss Flow alterations

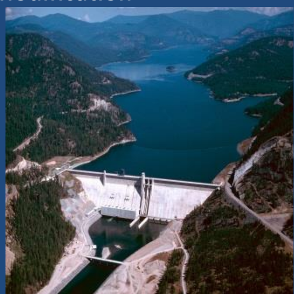
Transportation

The network of public roads and highways in Montana is extensive with approximately 73,775 miles of roadways and ramps. Of these, 11,275 miles are maintained by the Montana Department of Transportation[19]. Remaining miles are maintained by other entities, such as, counties or cities, forest service and BLM.

Nonpoint Source	Activity	Pollutant	Non-Pollutant
Transportation 	Road Construction Road Maintenance Accidental Spills Atmospheric Deposition	Sediment Oil & Grease Metals	Habitat Loss Channel Degradation

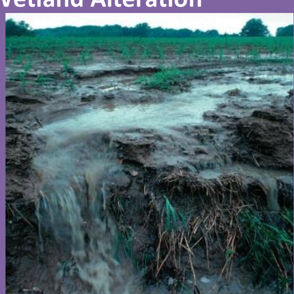
Hydrologic Modification

Manmade changes to the natural flow of a waterbody can affect an entire watershed. Examples of changes include dams, weirs, water diversions, bank stabilization structures (e.g., riprap), shallow groundwater pumping, and other modifications that remove water from its natural flow course.

Nonpoint Source	Activity	Pollutant	Non-Pollutant
Hydrologic Modification 	Channel Straightening Channel Widening Channel Relocating Water Diversion Dam Construction	Temperature Sediment transport Dissolved Oxygen	Bank Stability Instream Flows

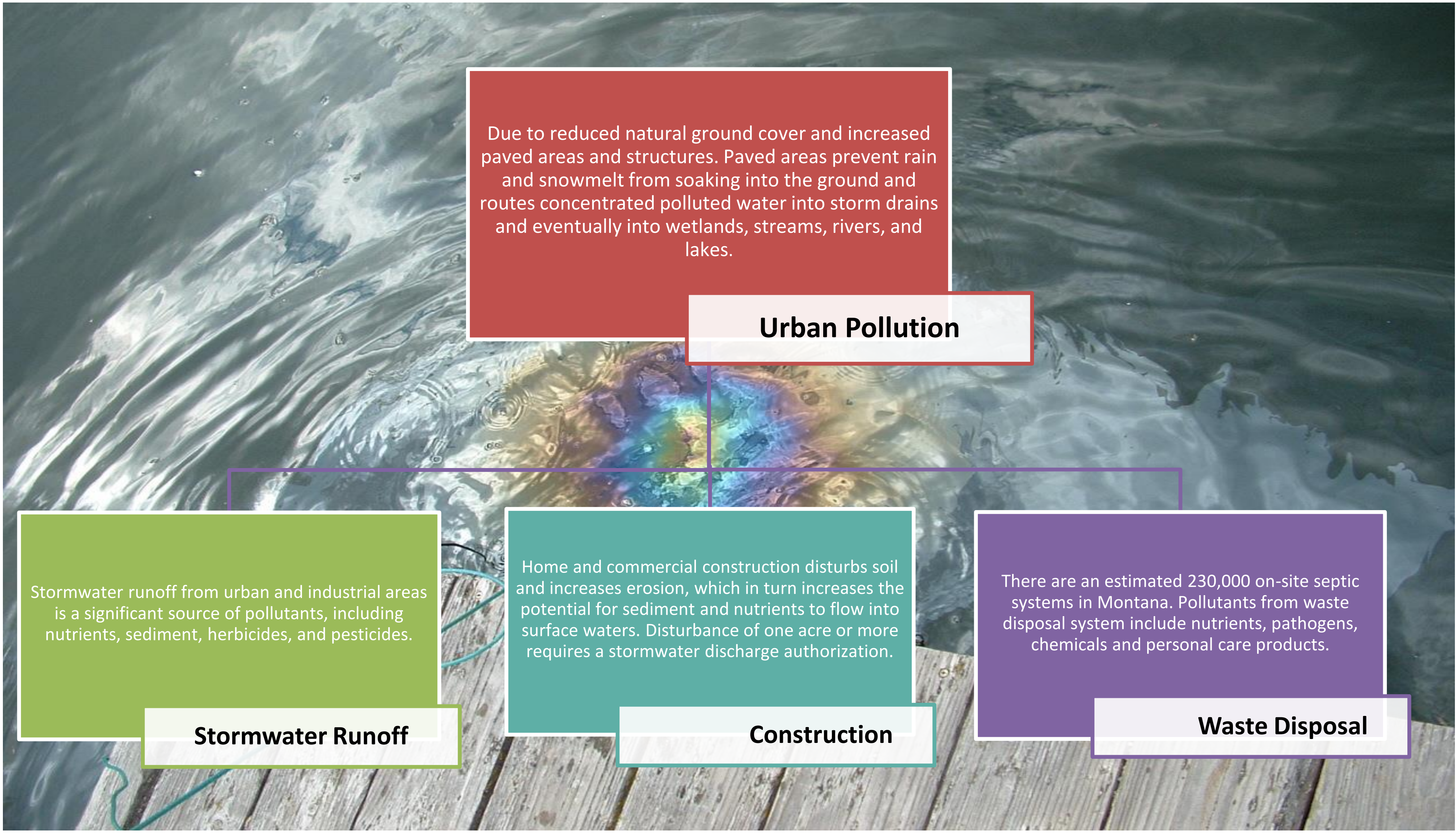
Riparian and Wetland Alteration

When complex riparian systems are simplified or reduced by changing their vegetation, soils, and/or water-flow patterns, their ability to filter pollutants and stabilize banks diminishes. Many riparian and wetland areas have been converted to manicured lawns or small-acreage pastures for domestic livestock, increasing the amount of nutrients, sediment, and bacteria in waterbodies and leading to nuisance or toxic algae blooms, elevated water temperatures, greater channel erosion, and greater property damage from flooding.

Nonpoint Source	Activity	Pollutant	Non-Pollutant
Riparian & Wetland Alteration 	Rural Development	Sediment Nutrients Bacteria	Algae Blooms Channel Erosion Habitat Loss

Urban / Suburban

The vast majority of Montana is rural, meaning that the majority of our towns are small population centers. Nonetheless, all developed areas increase the types and amount of pollutants that can enter waterbodies. For Montana's 7 largest urban areas discharge permits for stormwater systems are required to reduce the harmful effects of urban stormwater runoff.[20]



Pollution in urban areas comes in a variety of sub-categories.

Mining and Industry

Increased concentrations of heavy metals and sediments in waterbodies are the most common causes of NPS pollution associated with mining. State and federal permits regulate active mines; however, abandoned and inactive mines and other industrial sites are significant sources of pollutants in many of Montana's watersheds. Programs throughout DEQ work together to mitigate damage caused by historical mine and industrial sites and to against protect water quality degradation from new mine developments.

Nonpoint Source	Activity	Pollutant	Non-Pollutant
Mining and Industry 	Abandoned Mines	Metals Sediment	Habitat Loss Erosion

Recreation

Boating, fishing, hiking, and other recreational activities can harm waters in different ways. The major NPS pollution concerns include increased sediments (from roads and trails, shoreline and streambank trampling); loss of habitat (disturbed stream banks and stream bottoms); inappropriate waste disposal; and spills or discharges of gasoline, oil, and other petroleum products. A growing concern is the proliferation of aquatic nuisance species, which can be unknowingly and widely distributed by boaters, fishers, and hikers.

Nonpoint Source	Activity	Pollutant	Non-Pollutant
Recreation 	Boating Fishing Hiking/Mountain Biking Off-Highway Vehicles Camping	Oil & Grease Sediment Bacteria	Habitat Loss Invasive Species

Atmospheric Deposition

Atmospheric deposition happens when pollutants in the air fall to the ground. Usually the pollutants come from outside the region, yet they affect waterbodies and whole watersheds. Because these pollutants are not generated locally, they are hard to control.

Limiting the effects of atmospheric deposition requires significant agreement and coordination among state, regional, national, and international governments. The goal of the nonpoint source program is to develop a more complete understanding of the effects of atmospheric deposition on water quality and recommend appropriate public policies.

Nonpoint Source	Activity	Pollutant	Non-Pollutant
Atmospheric Deposition	Farming Industry Other Human Activity	Nitrogen Mercury Chemicals (PCBs)	

Climate Change

Global climate changes can have far reaching harmful effects on our environment. Specific to water quality, climate change is associated with warming temperatures contributing to higher stream temperatures and more intense watershed disturbances (e.g., rain events, flooding, high stream flows, landslides, large forest fires), which would likely lead to negative effects on aquatic life, including native fish populations. Warmer temperatures will change precipitation patterns, such as winter rain events that could speed melting of the snowpack. Periodic droughts could also reduce snowpack that would in turn affect the way water is stored and used, diminishing the amount available for release to maintain flows needed for optimal stream temperatures and aquatic habitat.

Nonpoint Source	Activity	Pollutant	Non-Pollutant
Climate Change	Human Activity Other	Temperature	Flow alterations Habitat modifications

Wetlands Program

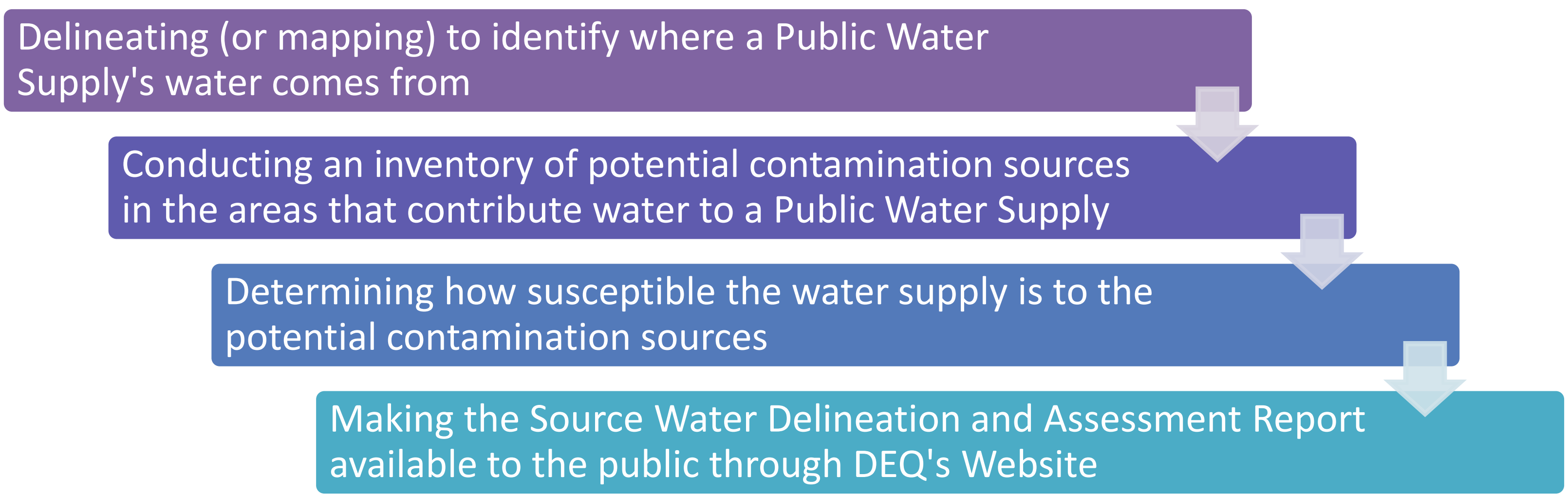
Montana’s overarching wetland goal is no net loss of the state’s remaining wetland resource (as of 1989) and an overall increase in the quality and quantity of wetlands. To assist in that goal, DEQ developed Montana’s Wetland Program Plan in 2011,[21] which provides state leadership to conserve wetlands for the benefits they provide, including improving water quality by filtering pollutants, maintaining water quantity, providing important habitat, and reducing the detrimental effects of flooding. The Wetlands program is dedicated to developing a network of statewide reference standards for wetlands, tracking wetland losses and gains in both quantity and quality, and evaluating the effectiveness of ongoing restoration and management.

Community Support Programs

The water quality division supports numerous community support programs designed to help rural Montana communities maintain and/or restore the quality of their waters for future generations. Communities with effective programs to prevent drinking water contamination may enjoy substantial savings in the costs of complying with the federal Safe Drinking Water Act or similar state regulations. For example, water purveyors that prevent pollutants from entering water supply reservoirs will have lower costs for treating the water. Further, they may also be eligible for waivers from some monitoring requirements, thereby reducing costs.

Source Water Protection Program

Under the 1996 federal Safe Drinking Water Act, the state is required to implement a source water assessment program. The aim is to delineate areas that provide a source for public drinking water, which applies to both existing and new supply sources. During delineation, geologic and hydrologic conditions are evaluated and, when identified, are protected as sources of drinking water. The assessment process identifies businesses, activities, or land uses that generate, use, store, transport, or dispose of certain contaminants in source water protection areas. The susceptibility to contamination from these sources is then estimated. Delineation and assessment identify significant threats to drinking water supplies and provide suppliers of public water with the information they need to protect their water sources.



Four major elements of Source Water Delineation and Assessment Reports (SWDAR)

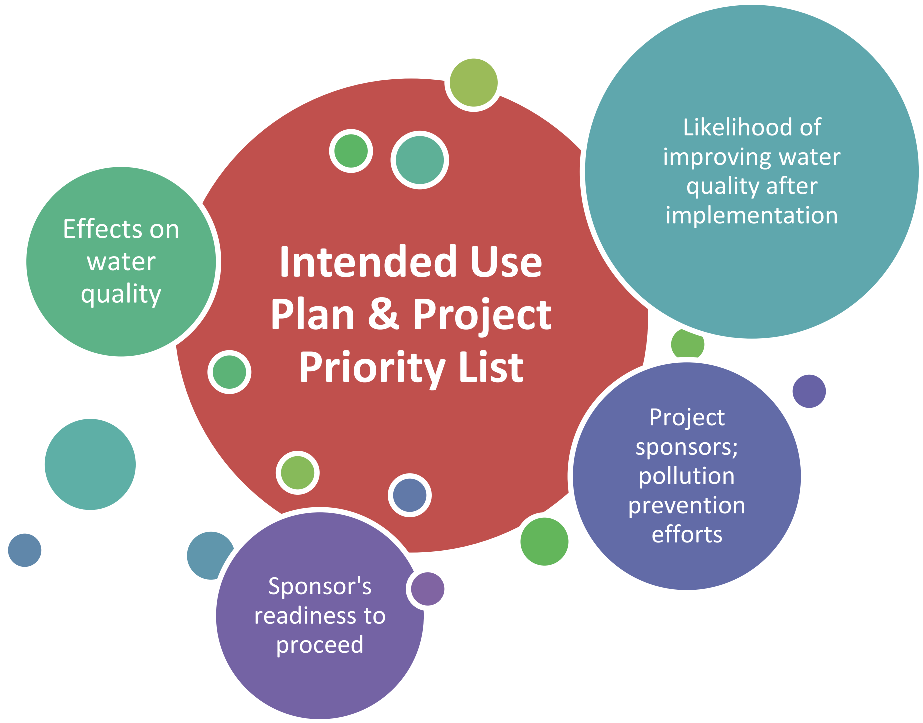
DEQ's source water protection program can help communities avoid costs related to contamination, which may include:

- treating and/or remediating water supplies
- finding and developing new water supplies and/or providing emergency replacement water
- abandoning a drinking water supply due to contamination
- paying for consulting services and staff time
- conducting public information campaigns when incidents arouse public and media interest in source water pollution
- meeting the regulations of the Safe Drinking Water Act

Water Pollution Control State Revolving Fund

Established in the 1987 amendments to federal Clean Water Act[22], the Water Pollution Control State Revolving Fund (WPCSRF) gave EPA the authority to make capitalization grants to the states. Along with state matching funds, the grants provide financial assistance for constructing water pollution control projects.

The long-term goal of WPCSRF is to maintain, restore, and enhance the chemical, physical, and biological integrity of Montana's waters for the benefit of the overall environment and to protect public health, while maintaining a long-term, self-sustaining program. Each year, Montana's WPCSRF prepares an Intended Use Plan and Project Priorities List



Intended Use Plan and Project Priorities List project ranking criteria

The WPCSRF also provides technical assistance to municipal wastewater treatment facilities, including inspecting their operations and maintenance as well as comprehensively evaluating their performance to optimize water treatment efforts, training for wastewater operators, technical assistance for engineers and the public.

DRINKING WATER STATE REVOLVING FUND

In 1995 the Montana Legislature created the Drinking Water State Revolving Fund (DWSRF)[23], a program that offers loans with at- or below-market interest rates to eligible Montana entities wishing to improve the infrastructure of public drinking water facilities. DWSRF also funds other activities related to public health and compliance under the federal Safe Drinking Water Act.

DEQ oversees the program by providing technical expertise and preparing an annual plan for intended use for each capitalization grant application, while DNRC administers the financial aspect, including overseeing loans and the sale of state general obligation bonds.

WPCSRF

Available for municipalities to finance all or a portion of the treatment works project costs or to buy or refinance debt obligations of municipalities

Available for municipalities or private persons to finance all or a portion of the costs of non-point source pollution control projects

WPCSRF Project examples:

- wastewater treatment plant improvements
- interceptors
- collectors
- lagoon rehabilitation
- lagoons
- storm drains
- land used for treatment purposes
- project design
- inspection
- facility plans
- non-point source pollution control

DWSRF

Available for municipalities, public or private community water systems & non-profit non-community water systems to finance all or a portion of the treatment works project costs or to buy or refinance debt obligations

WPCSRF Project examples:

- acquisition of land that is integral to the project
- consolidating water supplies
- engineering
- new sources
- treatment
- source water protection
- storage
- distribution

Cost–Benefit Assessment of Pollution Control

The federal Clean Water Act requires states to report on the economic and social benefits of actions necessary to achieve the clean water objective.[24] Because several state, federal, and private entities implement water quality improvements in Montana, expense details are complex and not readily available for preparing a comprehensive cost-benefit assessment. Furthermore, most benefits are non-monetary and thus hard to calculate.

Below is a summary of the program costs and benefits associated primarily with our point source and nonpoint source efforts. Costs are estimated for state fiscal years 2015 (July 1, 2014 – June 30, 2015) and 2016 (July 1, 2015 – June 30, 2016). Because of how we collect data, benefits are estimated for calendar years 2015 and 2016.

Summary of Montana's Clean Water Costs

The average annual cost for Montana's point- and nonpoint source pollution programs from all funding sources, plus wetland and drinking water protection, was approximately $101.3 million in FY 2015 and FY 2016 (**Figure 6**); however, this figure does not include enforcement, permitting, or public drinking water programs, which are quite small expenses compared with $101.3 million.

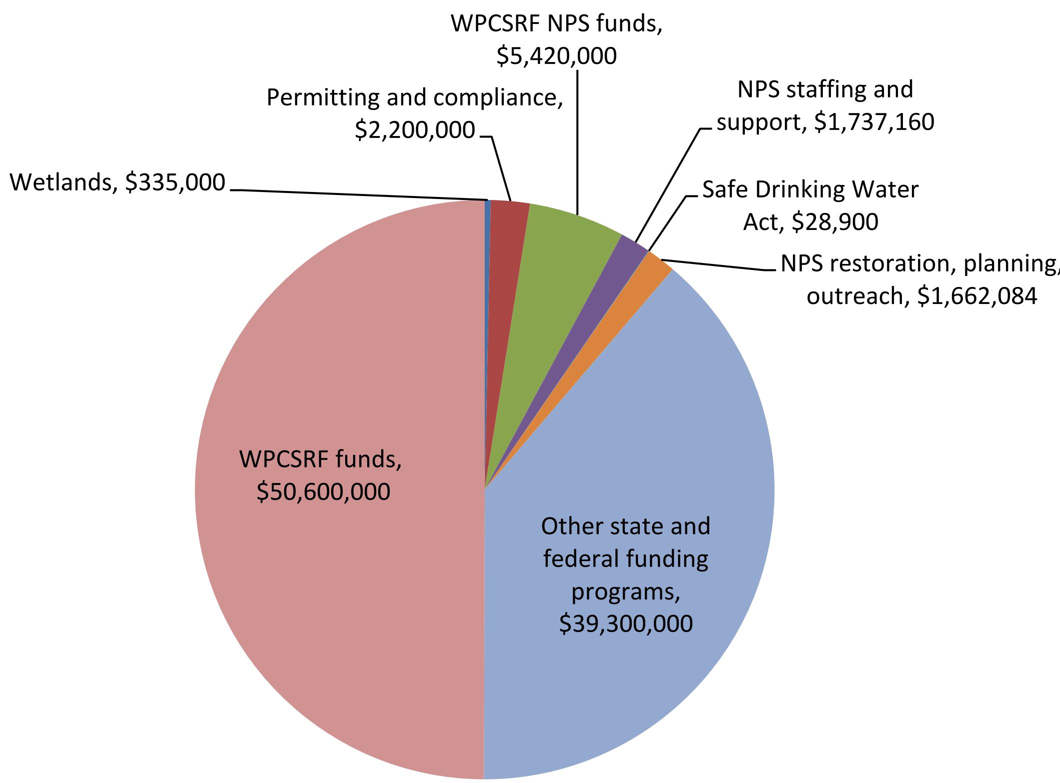


Figure 6. Summary of Average Annual Costs for CWA Programs in Montana (FY 2015 and FY 2016)

Benefits of Complying With the Clean Water Act

While the benefits of clean water and a healthy environment may be challenging to quantify in pure economic numbers, their derived benefits and importance to all plants and animals (including humans) cannot be understated. Indeed, several aspects of water quality management programs are simply designed to prevent the deterioration of current conditions (e.g., by preserving water quality standards and controlling point sources of pollutants). Without water quality management the benefits of aesthetics, recreational activities and drinking water supplies, to name a few, would be diminished or lost.

Point Source Program Achievements

In calendar years 2015 and 2016, Montana's Water Pollution Control State Revolving Fund (WPCSRF) program benefited water quality and public health in the following ways:

- Improved quality of various state waters by upgrading, expanding, or replacing 12 inadequate secondary treatment systems that empty into state waters.
- Improved water quality and reduced operating expenses of five municipal wastewater projects by reducing infiltration and inflow in the collection systems and replacing leaky pipes to prevent stormwater runoff or groundwater from entering the system.
- Reduced nutrient and other pollutant loading to state waters by providing nine loans for projects involving advanced treatment processes, such as nutrient removal and disinfection
- Protected water quality by funding approximately 12 projects, helping state waters maintain or improve their capacity for designated uses.
- Reorganized within the newly formed Water Quality Division in an effort to bring all water programs into one unified management structure.

Nonpoint Source Program Achievements

In calendar years 2015 and 2016, Montana's Nonpoint Source program benefited water quality and public health in the following ways:

- Accepted Watershed Restoration Plans (WRPs) for Lake Helena, Kootenai River Basin, Ruby River and Little Blackfoot watersheds.
- Supported the development of 4 WRPs (Flathead, Rock, Thompson, and Madison) and has a contract with Soil and Water Conservation Districts of Montana (SWCDM) for the development of additional WRPs and the creation of a WRP guidance document.
- Awarded $800,000 in 319 funding to watershed groups for implementing restoration projects and providing education and outreach efforts, furthering goals outlined in the Nonpoint Source Management Plan.
- Continued working with the Montana Watershed Coordination Council (MWCC), whose mission is to unite and support Montana's watershed communities, by providing funding and support.
- Reorganized within the newly formed Water Quality Division in an effort to bring all water programs into one unified management structure.
- Hosted and co-chaired the Lake Koocanusa Monitoring and Research Working Group meeting.
- Spearheaded an Association for Clean Water Administrators (ACWA) survey on how states use frequency and duration in their human health and aquatic life standards with regard to assessment, permitting, and TMDLs.

Wetland Achievements

- In conjunction with partners from the Montana Natural Heritage Program, MT FWP, USFWS, and Joint Ventures, developed a statewide map of priority areas to concentrate and coordinate efforts to protect and restore wetlands of ecological significance.
- Conducted 69 wetland ecological integrity assessments in the Musselshell watershed.
- Conducted 80 wetland recon assessments in the Red Rock watershed.
- Worked with Montana State University and The Trust for Public Land to better understand the effects and potential of wetland restoration for improving water quality in the East Gallatin watershed.
- Worked with a contracted engineering firm to develop a cost-benefit analysis for passive restoration projects, including sediment and water storage through beaver habitat restoration.
- Partnered with the Montana Watercourse to host two professional development courses focusing on bio-engineering and stream restoration techniques.
- Partnered with the Montana Natural Heritage Program to host five wetland plant identification courses for resource professionals.

PROGRAM PRIORITIES

MONITORING AND ASSESSING WATER QUALITY & DEVELOPING TMDLS

DEQ's water quality planning priorities for 2016 through 2022 include monitoring and assessment activities to support TMDL development in 10 basins and the Yellowstone river system (**Figure 7**). These "in progress" areas include all high and medium TMDL priorities on the 303(d) list.

We use a team approach to better coordinate our TMDL projects, which provides a smoother transition from monitoring and assessment to TMDL development. In addition, this approach helps us coordinate with external stakeholders.

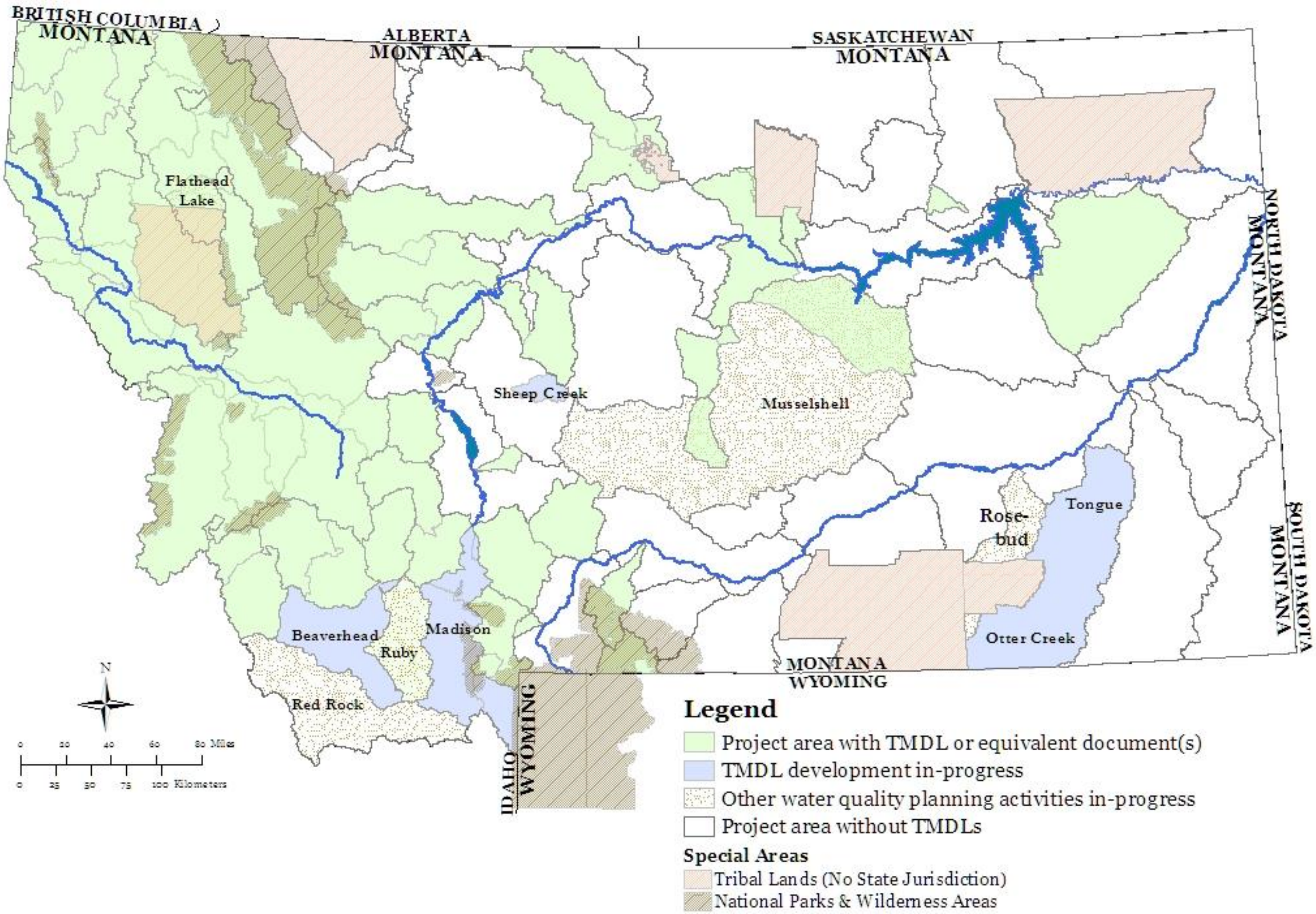


Figure 7. Water Quality Planning Priority Areas

REDUCING NONPOINT SOURCES OF POLLUTION

Our priorities are to support implementation of TMDLs, and are focused on areas where:

- Watershed restoration plans are completed and accepted – 22 plans have been accepted and 6 more are being developed (**Figure 8**).
- There is potential for local watershed groups to implement watershed restoration plans where TMDLs are being developed.
- CWA Section 319 funding has been or will be awarded through a competitive bid process.
- The Natural Resources Conservation Service and DEQ have jointly selected watersheds for National Water Quality Initiative funding.
- Substantial restoration activities have taken place based on the recommendations contained in a TMDL and may warrant a new beneficial use support assessment.
- Nonpoint source loading above a permitted point source can be reduced which may contribute to future economic benefit for a downstream community
- Additional resource benefits like improved fish habitat, increased natural water storage, or wetland protection can be realized

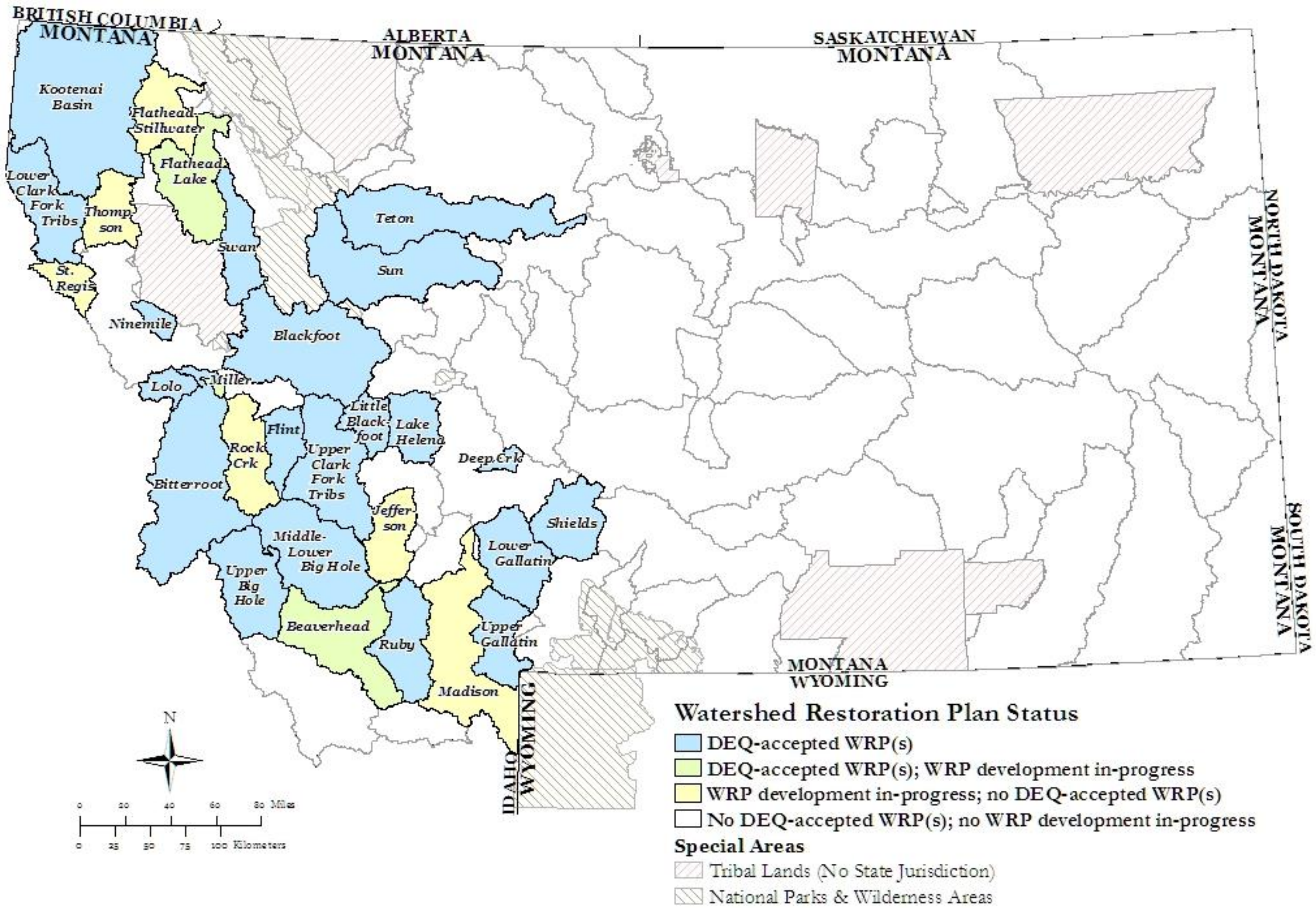
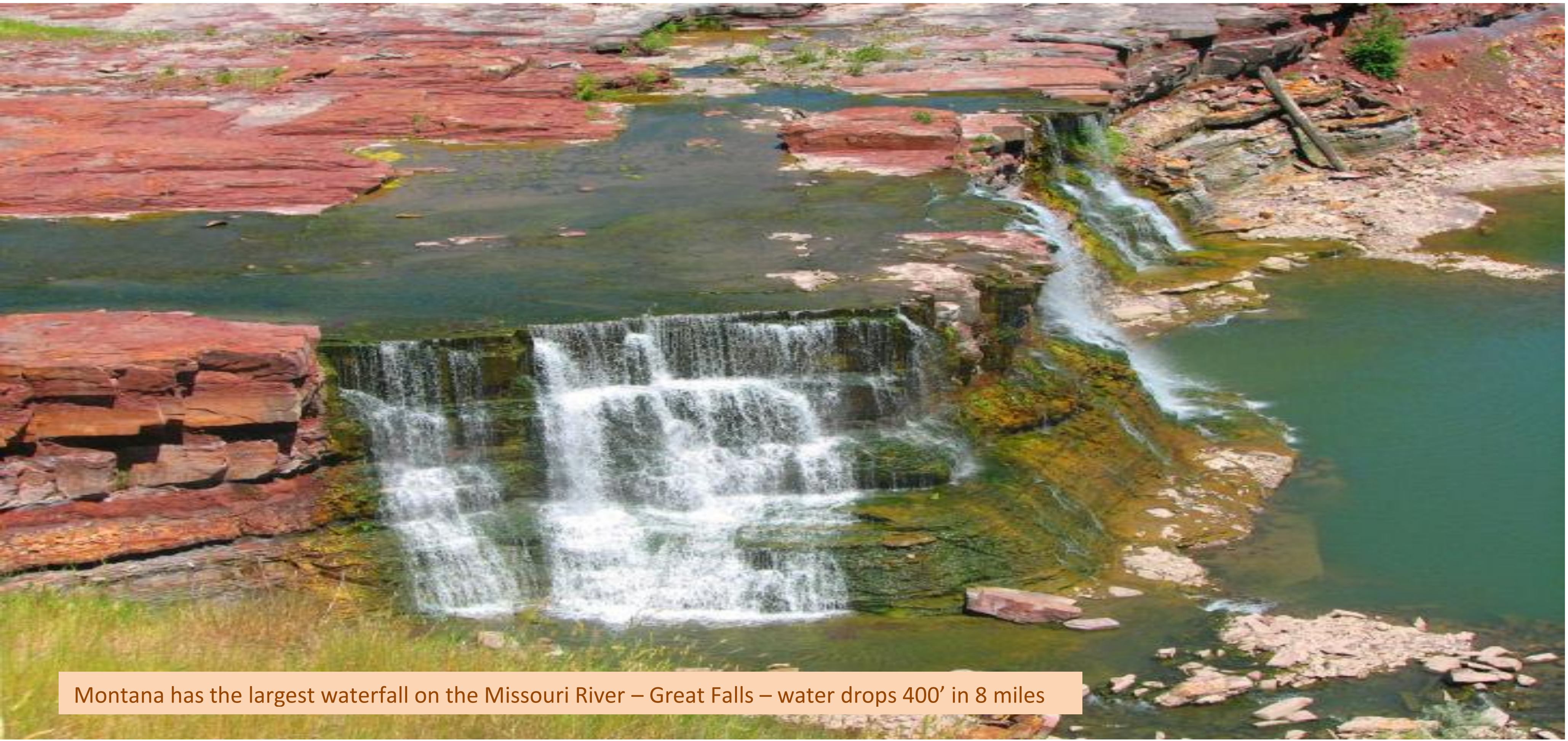


Figure 8. Watershed Restoration Plan Status

Developing Water Quality Standards

Our priorities for the development or refinement of water quality standards include the following for the next two years:

- Complete our technical analysis for the upper Yellowstone River to determine numeric nutrient criteria for the Yellowstone River from the Bighorn River upstream to above of Livingston.
- Conduct technical analysis for the middle Missouri river to determine numeric nutrient criteria for the Missouri River from Holter Dam to Loma.
- Develop water quality standard rules to address new state regulation for natural conditions and variances.
- Research actions that will assist communities with wastewater lagoons to meet ammonia water quality criteria.
- Complete technical analyses to develop site specific selenium criteria for Lake Koocanusa.
- Complete technical analysis for the Yellowstone and Madison/Missouri basins to define the level of arsenic concentrations for determining appropriate water quality standards.
- Evaluate established reference streams around the state to determine whether they can still be used as reference sites. We will collect additional data to enhance our datasets and refine water quality standards, and systematically sample the network to analyze long-term trends.
- Complete our technical analysis to develop numeric nutrient criteria in Flathead Lake, including stakeholder outreach.
- Evaluate the current dissolved oxygen threshold and the periphyton nutrient increaser taxa in southern Montana. If necessary, we will modify the current dissolved oxygen standard in prairie streams.



Montana has the largest waterfall on the Missouri River – Great Falls – water drops 400’ in 8 miles

Surface Water Monitoring & Assessment

DEQ works with other federal and state agencies and organizations to collect water quality data, monitor surface waters and determine whether waterbodies are supporting their beneficial uses and meeting water quality standards.

Monitoring & Assessment

DEQ's water quality program monitors and assesses the status of water quality by collecting data to characterize the physical, chemical, and biological integrity of surface waters. We also develop and test water quality assessment methods to interpret water quality standards.

Our monitoring and assessment efforts are focused on the roughly 48,500 miles of perennial streams and on significant (i.e., > 5 acres) publicly-owned lakes that have public access. We also focus efforts on waterbodies where specific concerns have been identified and on waters that are more likely to have water quality issues, regardless of flow characteristics.

Our program uses a rotating watershed approach to gather data from both fixed and targeted stations. In other words, we monitor different watersheds over time. This method is more efficient and takes advantage of limited financial and personnel resources. In addition, we collect data from sites in watersheds we have identified as potentially at risk and in need of protecting or restoring.

Also, we support large-scale projects to track water quality trends or new threats independent of our rotating watershed monitoring.

Coordinating and collaborating with other entities is essential for implementing Montana's statewide monitoring and assessment strategy. We have partnerships and cooperative agreements with the US Bureau of Land Management, the US Forest Service, the University of Montana, US Geological Survey, and several state conservation districts, as well as local nonprofit watershed groups and other organizations. In addition, we coordinate with local volunteer monitoring groups when we have mutual objectives. By collaborating on data collection, assessment, and other projects, we can better meet our water quality improvement goals.

Data collected by DEQ's Monitoring, Standards, TMDL and Nonpoint Source programs, and many of our partners, is processed and managed in our water quality data system (MT-eWQX) and then submitted to the National Water Quality data warehouse (STORET/WQX) at EPA where it is publicly accessible.

We collect data to

ASSESS whether state waters are supporting their beneficial uses and meeting water quality standards

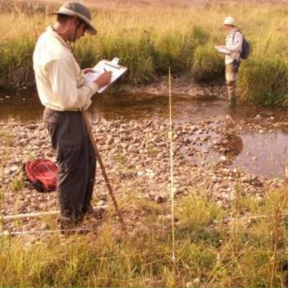
IDENTIFY threatened or impaired waterbodies and the potential causes of harm

EVALUATE the effectiveness of pollution control and restoration activities

DOCUMENT statewide water quality status and trends

DEVELOP numeric criteria for water quality standards

CALIBRATE water quality and watershed models






Monitoring Projects

DEQ undertook several monitoring projects during 2015–2016:

Fixed-Station Network

Fixed station monitoring focuses efforts toward determining if there are changes in water quality over time. We lead coordinated efforts to monitor water quality trends in the Clark Fork and Yellowstone rivers and participate in trend monitoring along the upper Missouri River.

Rotating Watersheds Monitoring

Monitoring in rotating watershed projects focuses on determining water quality conditions and supporting data collection for source assessment and restoration planning. In 2015–2016, we collected data in priority watershed planning areas, which included sampling in the Red Rock, Yellowstone River, and Musselshell River watersheds.

Targeted Water Quality Monitoring

These projects collected samples in areas that have potential threats to water quality. This includes creating a report about data in eastern Montana to investigate potential water quality contamination from past and current oil and gas extraction. We also work with the US Army Corps of Engineers and Montana Fish, Wildlife & Parks to collect data for assessing the effects of coal mining in Canada on Lake Koocanusa.

Reference Sites

Montana’s narrative water quality standards are based on reference condition; that is, comparing current conditions with a relatively pristine waterbody—its reference condition—of a similar nature. In the early 1990s, we initiated a project to define the water quality and biological characteristics of minimally disturbed streams.[25] The project established a network of reference sites and defined reference conditions to guide water quality assessment decisions. At present, we have 185 reference sites across the state.

In 2015 and 2016, the standards section revisited established reference stream sites around the state to determine whether they were still useful as reference sites. We collected additional data from these sites to enhance existing datasets and to refine water quality standards, and we carried out systematic sampling to allow for long-term trend analysis.

Water Quality Standards Development

In 2015-2016 we continued measuring dissolved oxygen in southeastern Montana to evaluate its current threshold. If necessary, we will modify the current dissolved oxygen standard in prairie streams.

Also in 2015-2016 we monitored Canyon Ferry Lake to develop nutrient criteria using a CE-QUAL model. And we sampled the Yellowstone and Missouri River to develop a demonstration of non-anthropogenic arsenic levels.

Watershed Modeling

The models we have developed or will develop, including a salinity watershed model for the Tongue River, large river nutrient models for the Yellowstone and Missouri Rivers, and a loading simulation model for Flathead Lake, will be used to inform water quality standards and/or TMDL allocations.

Quality Assessment Methodology

DEQ has developed methods to assess water quality for nutrients, sediment, and heavy metals – the most common pollutants harming Montana's surface waters. The methods allow us to rigorously and consistently assess water quality, which in turn allows us to make reproducible and defensible decisions about whether a waterbody is supporting its beneficial uses.

Identify Available Data

DEQ solicits outside data and information from

- local, state, and federal agencies
- volunteer monitoring groups, private entities, and nonprofit organizations
- others involved in water quality monitoring and management

Outside data and information are combined with the results of DEQ's monitoring to provide a basis for assessing water quality. We use data from outside sources only if that data meets our rigorous quality standards

Evaluate Data Quality

Our pollutant-based assessment methods have specific objectives for making decisions and assessing the validity and reliability of the data we collect. Our data quality assessment process considers the technical, representativeness, currency, quality, and spatial and temporal components of readily available data and information for each of the data types (biological, chemical, and physical/habitat). Data quality assessments are conducted individually per beneficial use and pollutant group (e.g., aquatic life & fishes – sediment).

Make Use Support Decision

All waters are assigned a use class and designated beneficial uses. During an assessment of water quality for any given waterbody, beneficial uses are evaluated indepently to determine whether water quality standards are attained and the beneficial use is fully supported for that waterbody.

Accessing Assessment Records

Our documentation for assessment methods can be can be found online at http://deq.mt.gov/Water/WQPB/qaprogram. This site includes the most current applied assessment methods as well as older methods applied to assessments conducted between 2000 and 2008 that have yet to be updated.

Access to all electronic assessment reports, information, and maps is available on the CWAIC website at http://cwaic.mt.gov. Here, you can run queries of the state's water quality assessment records for the current and two previous reporting cycles. CWAIC also provides access to Montana's Water Quality Integrated Report documents and online mapping tools.

Summary of Current Water Quality Assessments

DEQ evaluates waterbodies by defining assessment units (AUs), each of which represents a homogenous segment of a waterbody. Creating AUs is a useful way to assess beneficial use support and identify impairments for a given waterbody segment. For the current reporting period, we have defined 1,194 AUs, which includes 1,123 rivers and streams and 71 lakes and reservoirs.

Assessed waterbodies are put into categories that define their water quality condition. Those that do not meet water quality standards are listed as one of the following:

- impaired by pollutants (Category 5 or 5,5N)
- impaired by pollution only (Category 4C)
- those with all necessary TMDLs completed and approved (Category 4A)

The current reporting period

In total 3,408 AU–cause combinations are identified as impairing Montana's surface waters (Appendix A). An AU–cause combination is a specific waterbody segment and its associated cause listing. A waterbody may have multiple causes harming its uses and not all causes require a TMDL.

We have assessed a total of 1,060 AUs of which there are 391 listed in Category 5 or 5,5N and in need of a TMDL (**Figure 9**) for 960 total pollutant causes on the 303(d) list (Appendix B)

Of the 66 specific impairment causes listed in 2018, the two most common were sediment-related (pollutant) and alterations of streamside vegetative cover (pollution).

Grazing in riparian or shoreline zones is the most common confirmed source associated with impairments. Of the 2,897 identified AU–source combinations listed, only 666 (23%) have been confirmed at the time of the assessment decision.

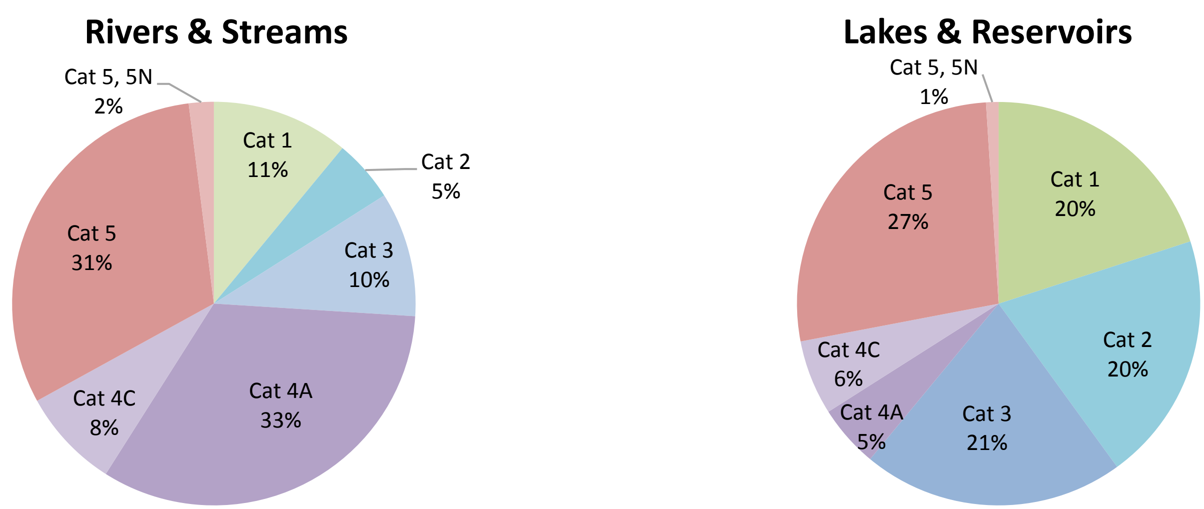


Figure 9. Assessed waterbodies under state jurisdiction, by reporting category

Rivers and Streams

To date, of the more than 54,800 miles of perennial rivers and streams under the state's jurisdiction, we have defined approximately 22,900 miles as assessment units. Most of the assessed rivers and streams are not fully supporting the aquatic life use, which is reflected in the prominence of listings for sediment- and flow-related impairment. Conversely, most of the assessed waters do fully support their drinking water, recreation, agriculture, and industrial uses (**Figure 10**).

The current reporting period:

- Montana's rivers and streams have 61 identified causes of impairment; the most common are sediment-related (pollutant) and alterations of streamside vegetative cover (pollution).
- Of 87 identified impairment sources identified, 55 have been confirmed; the most common confirmed source was riparian, or shoreline, grazing by livestock.

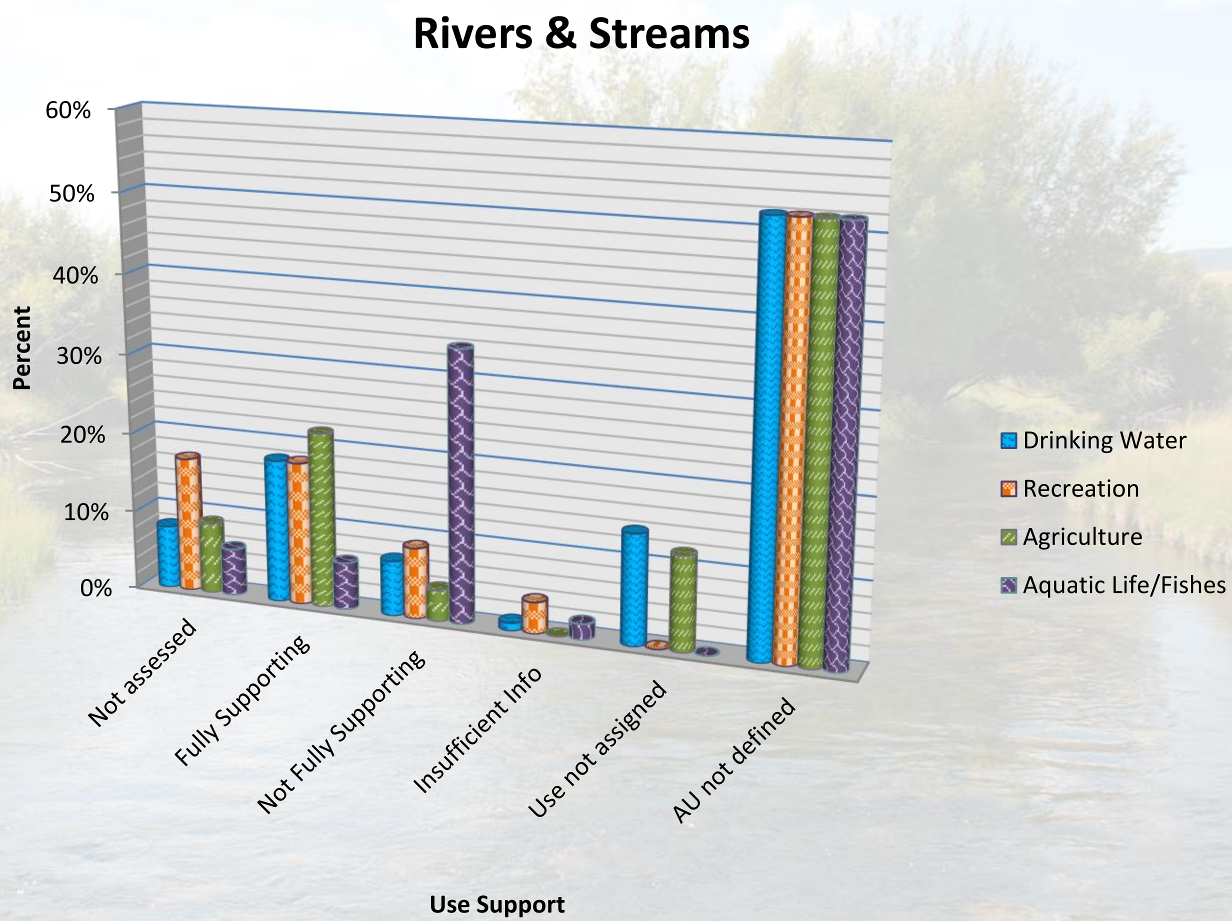


Figure 10. Beneficial use status of rivers and streams under state jurisdiction

Lakes and Reservoirs

To date, of the 641,200 acres of lakes and reservoirs under state jurisdiction, DEQ has defined over 518,100 acres as unique assessment units. The majority of the assessed lakes and reservoirs do not fully support the aquatic life or drinking water uses but do fully support recreational uses (**Figure 11**).

The current reporting period:
Montana's lakes and reservoirs have 30 identified causes of impairment; the most common causes are phosphorus (pollutant), other flow regime alterations (pollution), and salinity (pollutant).

Of 35 identified impairment sources identified for Montana's lakes and reservoirs, 8 are confirmed; these include agricultural, point source/urban, and climate-related sources.

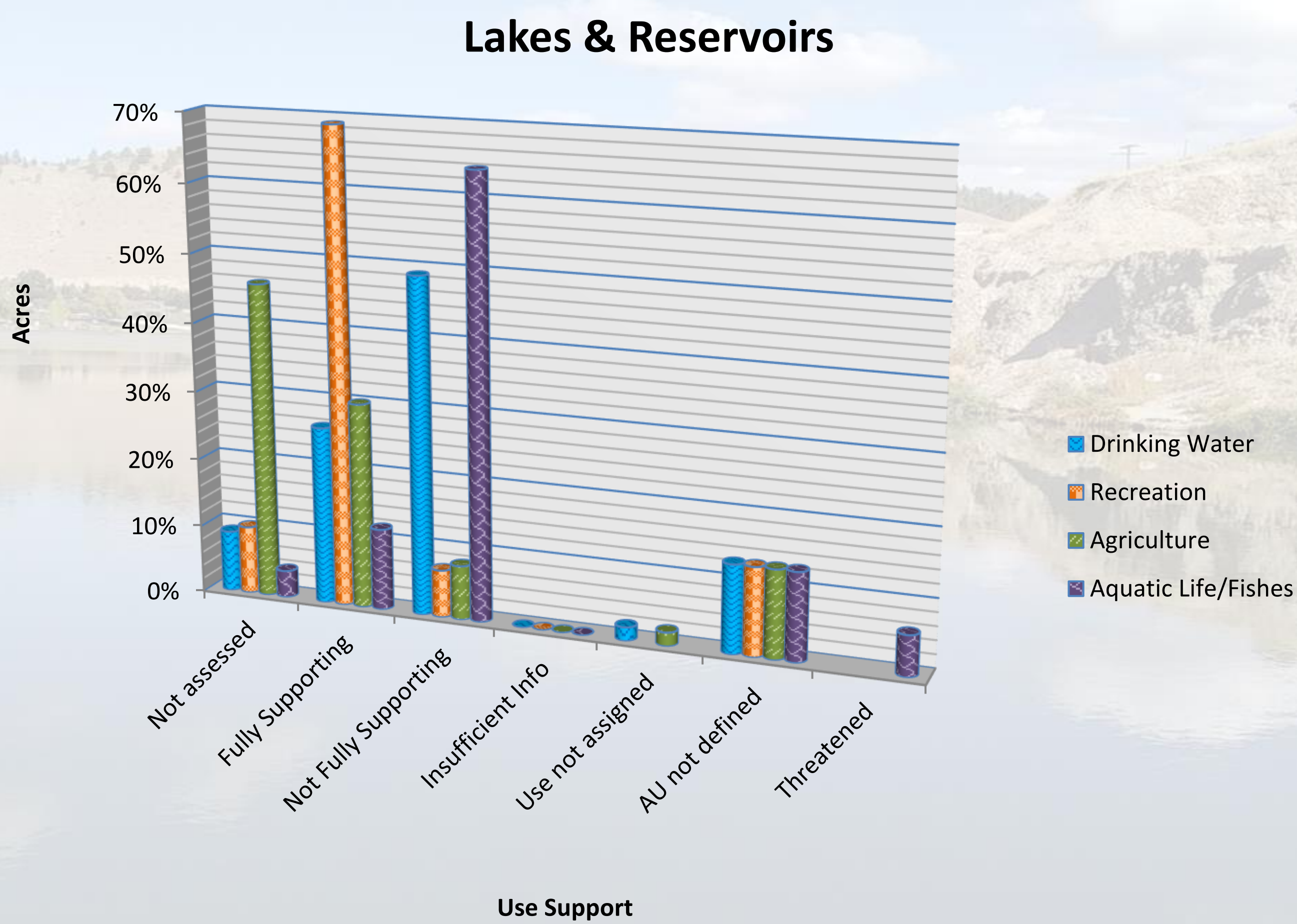


Figure 11. Beneficial use status of all lakes and reservoirs under state jurisdiction

Although we have limited data to evaluate lakes in the state, we have conducted some assessments of lake nutrient (trophic) status (i.e., biological productivity and water quality trends). Of the 71 lake assessment units (518,100 acres), 59 have been assessed for the status of nutrient. Similarly, of these 59 lakes, 6 have been assessed for trends in nutrient levels (**Table 4**).

Oligotrophic: Deep clear lakes with low nutrients levels, little organic matter, and a high dissolved-oxygen level.

Mesotrophic: Moderate nutrients levels and moderately productive in aquatic animal and plant life.

Eutrophic: High nutrient levels and highly productive in aquatic animal and plant life.

Hypereutrophic: Extremely rich in nutrients and minerals.

Dystrophic: Acidic and supporting many plants but few fish due to the abundance of organic matter.

Defining Nutrient (Trophic) Status of Waterbodies

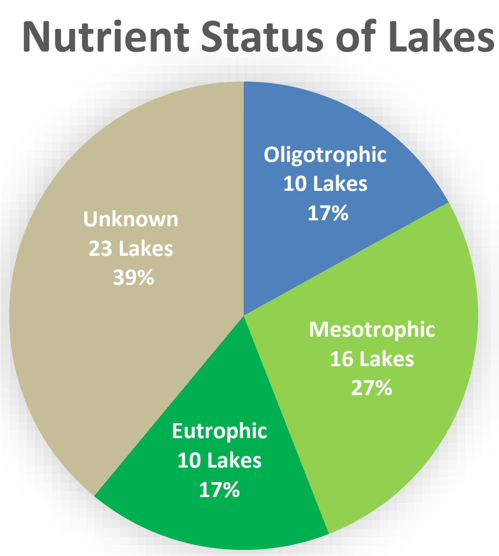
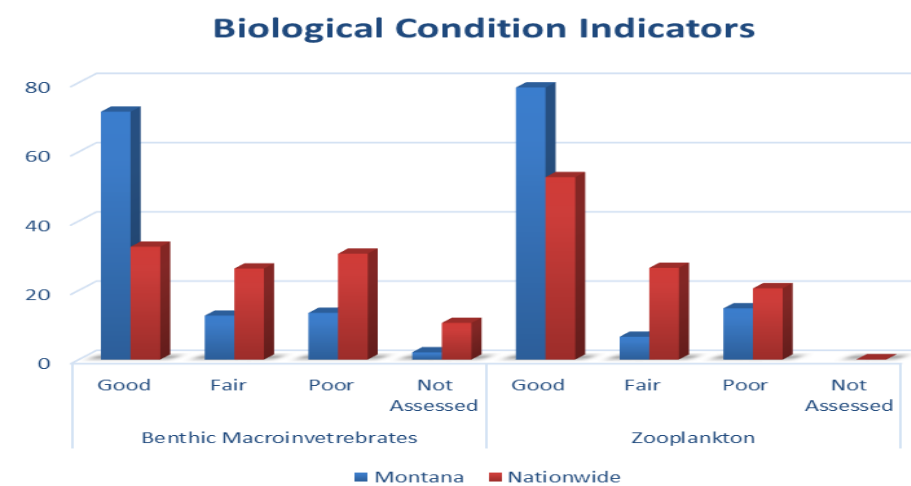


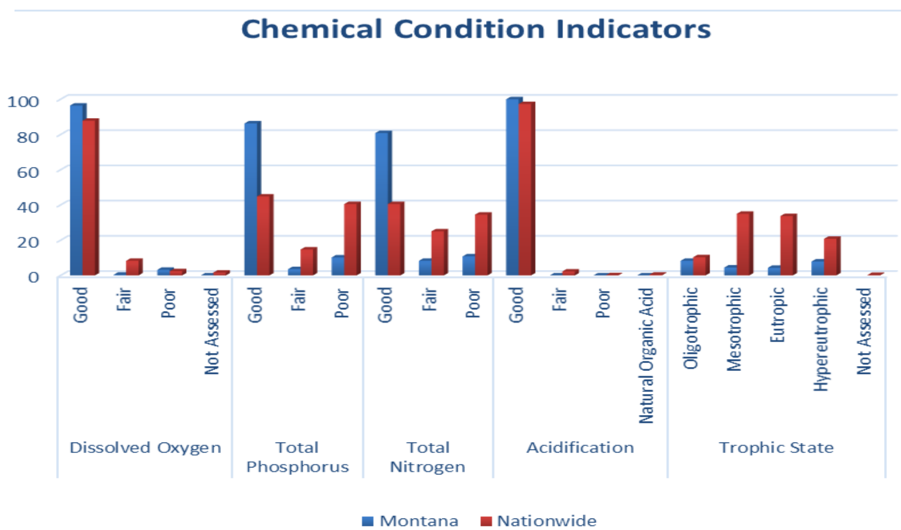
Table 4. Water Quality Trends for Lakes and Reservoirs

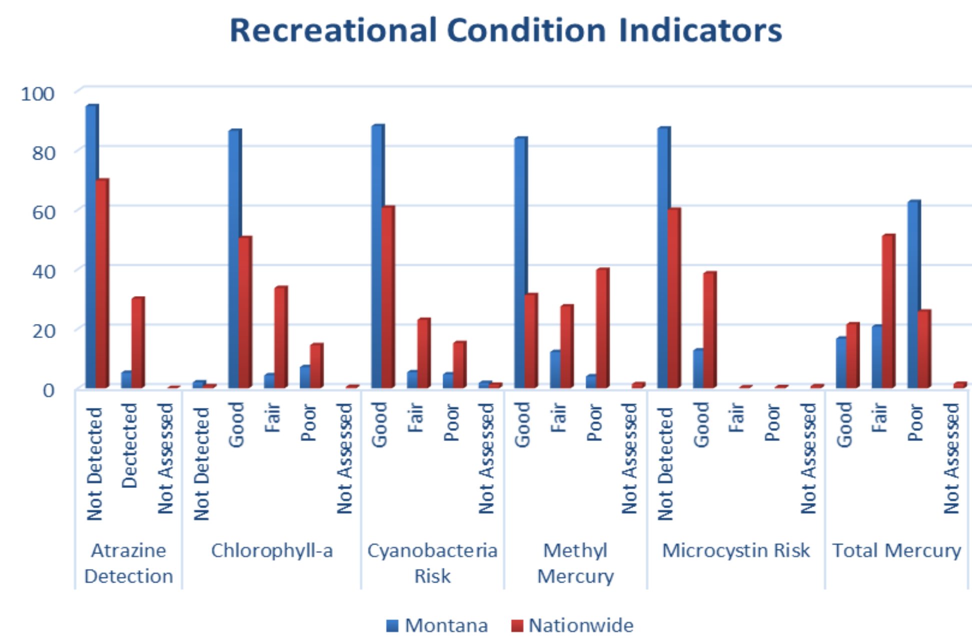
Trend	Number of Lakes	Total Size (Acres)
Stable	4	**24,016**
Degrading	2	**30,392**
Unknown	53	**457,318**
Total Assessed for Trends	**59**	**511,726**

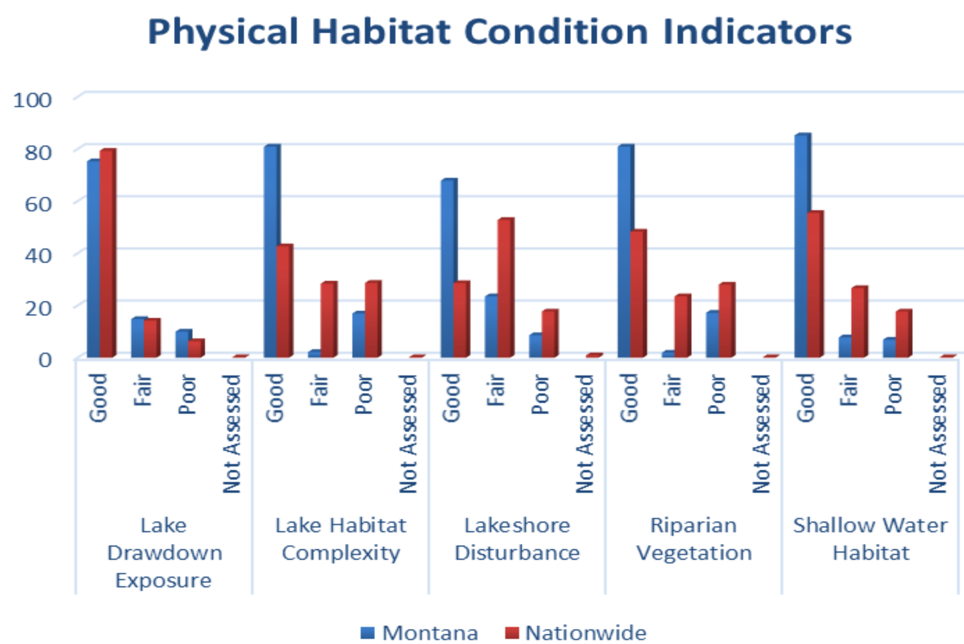
Montana Lakes Assessment

Under the Clean Water Act (CWA), the EPA and states must periodically report on the condition on the nation's water resources. In 2012, EPA randomly sampled the nation's lakes as part of it National Lakes Assessment[26]. In 2017, DEQ had the data that EPA collected from Montana lakes analyzed. The analysis suggests that Montana Lakes are less disturbed than the national average for most of the indicators that were used and are generally in good condition[27]. The analysis also suggests that Montana lakes in the Western Mountains are generally less disturbed that those in the Northern Plains









Category 5 Pollutant Delistings

During the current reporting cycle, 54 pollutant causes were delisted (i.e., removed) from the 2016 303(d) List (**Table 5**). For the complete list, see Appendix D. Of these, one was delisted due to an approved TMDL (4A); however, other causes are still impairing at least one beneficial use. 52 were delisted for achieving water quality standards. This could be due to improvement of land management practices, restoration activities performed, changes in water quality standards or because the original basis for the listing was incorrect due to obsolete methods and/or technology. One AU was delisted because the water quality standards are no longer applicable (Category 3) for the waterbody.

Table 5. Number of Pollutant Causes Delisted from 2016 303(d) List (Category 5)

2018 Category	Delisting reason		Total
1	Applicable WQS attained according to new assessment method	7	
	Applicable WQS attained but reason for recovery unspecified	6	
	Applicable WQS attained because original basis for listing was incorrect	1	
	Applicable WQS attained; based on new data	15	
	Applicable WQS attained, due to restoration activities	1	
	Refinement of terminology of listing cause	22	
			52
3	WQS no longer applicable	1	
			1
4A	TMDL approved or established by EPA	1	
			1
	Total Pollutant Causes Delisted		**54**

WQS: water quality standards

Successes: Pollutant Restorations

The numbers above don’t tell the whole story, however, as there are causes that were not category 5 but category 4A that have been found to no longer be impairing one or more beneficial use. These are Montana’s success stories and include 16 pollutant listings on 7 waterbodies **(Table 6)**.

Table 6. Pollutant Causes no longer impairing uses

AU ID	Waterbody Name	Cause
MT43D001_020	Clarks Fork Yellowstone	Cadmium, Silver, Lead, Zinc
MT43C001_010	Stillwater River	Iron
MT43B002_031	Soda Butte Creek	Copper, Iron, Lead
MT43B002_040	Miller Creek	Aluminum, Cadmium, Iron, Lead, Zinc
MT43D002_110	Fisher Creek	Silver
MT40A002_050	Careless Creek	Sedimentation/Siltation
MT76K003_010	Jim Creek	Sedimentation/Siltation

Careless Creek Sediment

Even prior to the development of the 2001 Sediment TMDL for Careless Creek, local landowners and irrigators began working to address extensive streambank erosion. Long used for an irrigation water conveyance, and impacted by over-grazing, Careless Creek had down-cut several feet, releasing thousands of tons of sediment into the Musselshell River. The Deadman's Basin Water Users Association made major improvements to their irrigation infrastructure, minimizing and stabilizing irrigation water-induced stream flows within Careless Creek. At the same time, local landowners worked with the Musselshell Watershed Coalition, local conservation district personnel, the USDA Natural Resources Conservation Service, Montana DEQ, and other partners to identify and characterize sediment sources, install bio-engineered streambank stabilization projects, reconnect an abandoned stream segment, implement improved grazing management practices, and monitor trends in water quality. Together, these efforts have helped reduce sediment loading and improve the overall health of the Careless Creek watershed.

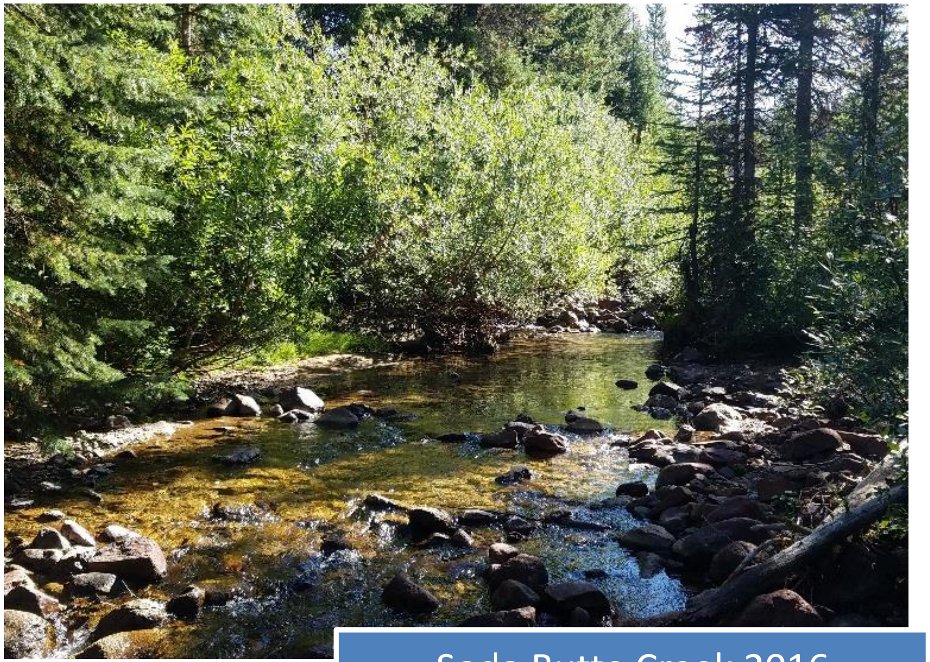
Jim Creek Sediment

The restoration of Jim Creek in the Swan River watershed from excessive sediment loading was largely a result of improvements in forestry practices, called for in Montana's Streamside Management Zone law, passed in 1991. Additionally, implementation of forestry best management practices (BMPs) by the Flathead National Forest and supported by Swan Valley Connections and its partners, resulted in minimizing sediment reaching Jim Creek, and restoring aquatic life to fully support. BMPs included road de-commissioning, road surface erosion control, culvert upgrades, and bridge work. Swan Valley Connections has provided the leadership, coordination, management and administration for TMDL implementation in the watershed. Major partners include the Flathead National Forest, the Department of Environmental Quality, Department of Natural Resource and Conservation, the Swan Lakers and Flathead Biological Station, the Department of Fish, Wildlife and Parks, and the Department of Transportation.

Cooke City Metals (Clarks Fork Yellowstone, Stillwater River, Soda Butte Creek, Miller Creek, Fisher Creek)

The New World Mining District is located high in the Beartooth Mountains near Cooke City and the northern edge of Yellowstone National Park. The District and associated infrastructure sit in the headwaters of the Stillwater River, Soda Butte Creek, Clarks Fork Yellowstone River, and smaller streams. From the 1870s to the 1950s, the District produced many tons of gold, silver, lead, zinc, and copper. Unfortunately, mining in the District left behind a legacy of toxic waste and highly polluted streams. In 1996, the US government received $22.5 million for cleanup in a settlement with Crown Butte Mines. Using the settlement money, and with support from various partners, the US Forest Service remediated much of the environmental damage in the headwaters within the District. In 2010, the US Forest Service and the Trust for Public Land purchased 772 acres of mining claims in the District, effectively ending the possibility of further mining.

Soda Butte Creek 2008



Soda Butte Creek 2016

In 2014, with financial support from the Office of Surface Mining and the Montana DNRC Reclamation and Development Grant program, the Montana DEQ Mine Waste Cleanup Bureau completed a roughly $22 million cleanup of the McLaren Tailings in the headwaters of Soda Butte Creek.

PUBLIC HEALTH ISSUES

Maintaining healthy water quality is an important public health consideration in Montana. DEQ aids in protecting public water supplies, ensuring safe drinking waters, and notifying the public of any health and safety issues related to water quality (e.g., fish kills).

SPILL REPORTS

During 2015–2016, a total of 79 spills affecting surface water quality were reported to DEQ – most were regarding fuel or materials spilled due to truck accidents. In March 2016, however, a storage pond for treated sewage water ruptured, releasing about 35 million gallons of treated sewage into the West Fork of the Gallatin River. All incidents were investigated, and their reports are available from our Enforcement Program[28].

FISH KILLS

During 2015–2016, seven significant fish kills were reported to the Montana Department of Fish, Wildlife & Parks (FWP)[29]:

- In August of 2016 FWP closed over 100 river miles of the Yellowstone River due to Proliferative Kidney Disease (PKD). Influenced by low water and high temperatures, the disease killed more than 4,000 whitefish and small numbers of other species including rainbow trout, Yellowstone cutthroat, longnose suckers, sculpin and longnose dace.
- In 2014 and 2015 dozens of brown trout were found dead in the Big Hole River. The culprit was a fungus called Saprolegnia.
- In June 2016 FWP crews found 25 dead black crappie in Bailey Reservoir, there were also a die-off of 24 fish in Noxon Reservoir at Marten Creek Bay around the same time
- In October 2015 and again in April 2016 discharges of oil or grease spilled into Spring Creek in Billings killing over 50 fish in each incident.
- In March 2016 36 dead fish were found in 3-Mile Pond NW of Helena, the cause of the deaths is unknown

FISH CONSUMPTION ADVISORIES

Every year, DEQ works with Montana Department of Public Health and Human Services and Montana FWP to issue fish consumption advisories for certain Montana waters where testing confirmed elevated levels of contaminants, specifically mercury and polychlorinated biphenyls (PCBs). More detailed information is available online at http://fwpiis.mt.gov/content/getItem.aspx?id=28187.

PUBLIC WATER SUPPLIES

DEQ regulates approximately 1,279 public water systems in Montana. Public water systems can be community (e.g., towns), non-transient non-community (e.g., schools, camps, or other businesses), or transient non-community systems (e.g., rest stops or parks). An annual compliance report lists and explains the number of Safe Drinking Water Act requirement violations according to drinking water standards, water treatment requirements, or a water quality monitoring/reporting requirement.[30]

DRINKING WATER QUALITY IN MONTANA

Most Montana residents have safe, potable drinking water. Many springs, wells, streams, and lakes that supply public drinking water originate from naturally protected mountain watersheds. Federal and state laws further protect surface water and groundwater sources against significant degradation. One surface water sources serving the public is so pristine that disinfection is the only required treatment before consumption. Most groundwater sources are naturally protected against contamination and do not require treatment before use.

Montana has 242 public water systems that use surface water as a primary or secondary source (**Figure 12**); groundwater under direct Influence of surface water (GWUDISW) is the source for 6 of these systems. For regulatory purposes, GWUDISW systems are considered surface waters.[31] Of the 242 systems, 175 are purchased; that is, they rely on other water systems for their primary or supplemental supply of water. Although relatively few, the largest public water systems in Montana use surface water and collectively serve 449,303 people daily.

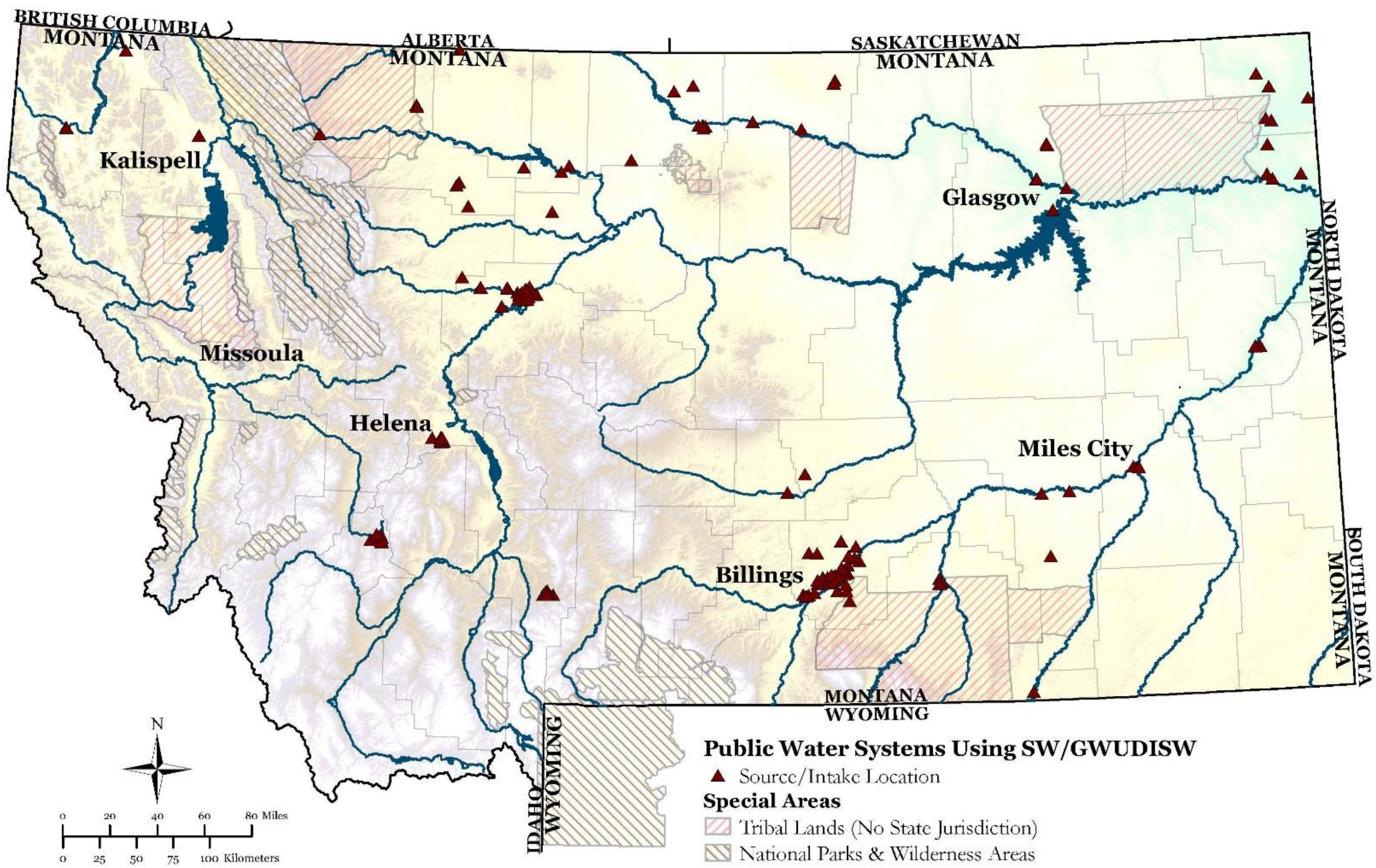


Figure 12. Distribution of Public Water Supply Using Surface Water Sources

GROUNDWATER SYSTEMS

Most public water systems in Montana, a total of 1,938, use groundwater as a primary or secondary source (**Figure 13**). For this reason it is important that this critical groundwater resource be allocated and managed properly to conserve and protect it for current and future generations.

Most water systems comply with regulations, and, typically, violations are a result of facility owners being late to report required water sampling or failing to conduct required sampling. In 2015 and 2016, these accounted for the most significant public water system violations, along with coliform bacteria contamination[32]. The complexity of the new Revised Total Coliform Rule (RTCR) was problematic for water system owners.

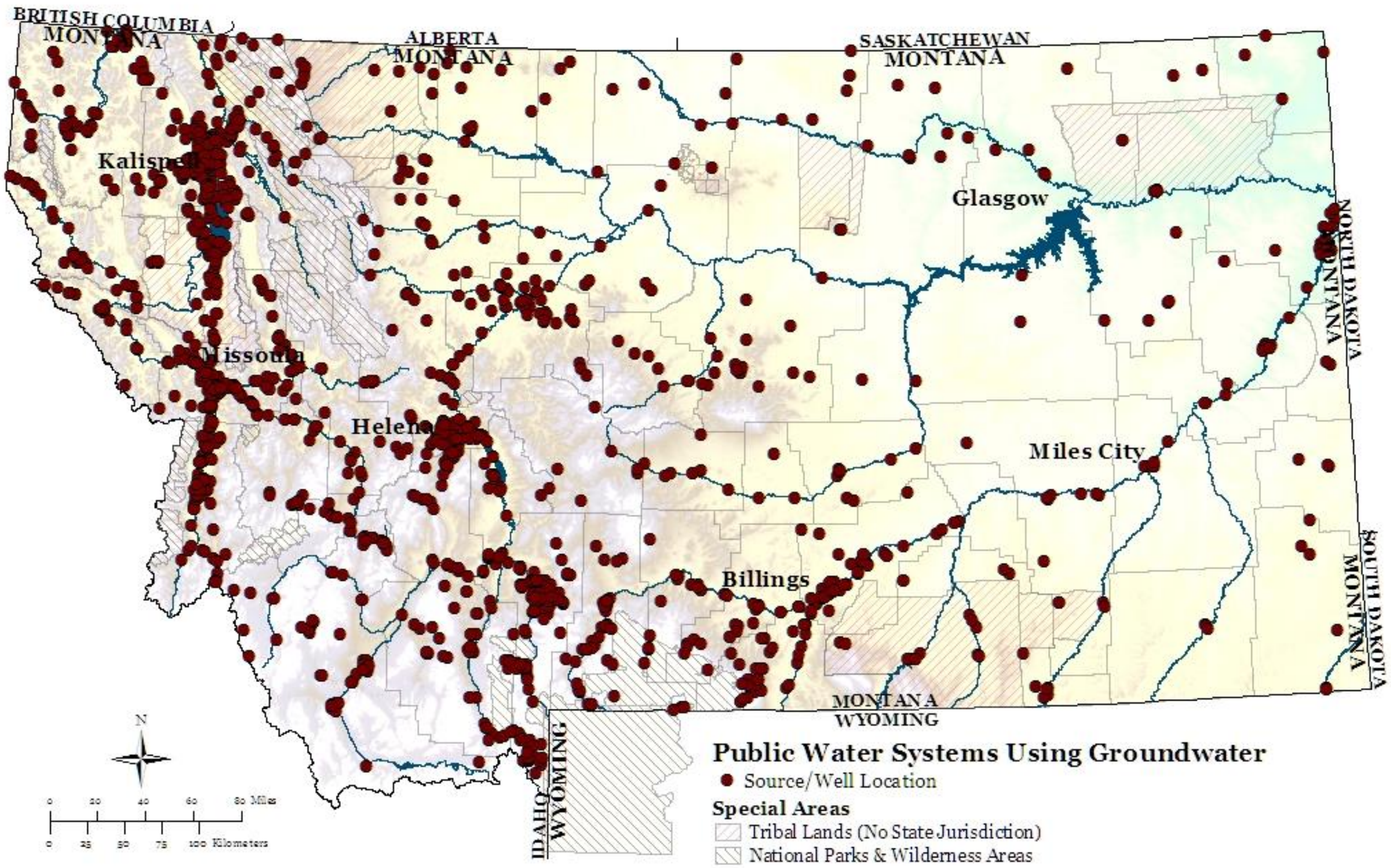


Figure 13. Distribution of Public Water Supply Using Groundwater Sources

Groundwater Monitoring & Assessment

Montana's population relies heavily on groundwater. About 61% of the state's population gets their drinking water from groundwater; about 32% get their drinking water from private wells. In addition to DEQ, other state and federal agencies monitor and assess Montana's groundwater:

- Montana Bureau of Mines and Geology
- Montana Department of Agriculture
- Montana Department of Natural Resources & Conservation
- United States Geological Survey

The Montana Ground Water Information Center (GWIC) database, maintained by the Montana Bureau of Mines and Geology, contains more than 213,000 water-well records.

Groundwater Uses

Montanans withdraw an estimated 7,630 million gallons per day (mgpd) of fresh-water from surface and groundwater sources.[33] Groundwater provides 2–3% of this withdrawal amounting to about 268 mgpd. The largest groundwater withdrawals are for:

irrigation – 127 mgpd
drinking – 87 mgpd
industrial – 37 mgpd
livestock – 12 mgpd

Groundwater use is highest in western Montana, where the predominant uses are domestic and irrigation supported by high-yield aquifers. Use for livestock is common throughout Montana but is most prevalent in eastern counties, where ranching is an important industry.

Since 1975, Montanans have constructed more than 115,315 domestic wells, 14,056 livestock wells, and about 6,709 irrigation wells.[34]

Monitoring & Assessment

The 1991 Montana Legislature established the Montana Ground Water Assessment Program[35], directing the Montana Bureau of Mines and Geology (MBMG) to characterize Montana's hydrogeology and to monitor long-term water level conditions and water chemistry. In 2009, the Montana Legislature established the Ground Water Investigation Program (GWIP) within MBMG to conduct detailed groundwater investigations in areas with the most serious concerns[36]. The Ground Water Information Center (GWIC) http://mbmggwic.mtech.edu maintains and distributes data generated by the assessment, investigations, and monitoring programs as well as data generated by many other groundwater projects.

Contaminants & Sources[37]

The water chemistry data evaluated for this report were collected by the groundwater monitoring, assessment, and investigations programs (388 samples) and other MBMG programs (413 samples) within specific study areas. Of the 423 samples evaluated for this report, 42% came from unconsolidated aquifers (**Figure 14**).

To be included in the dataset for this report, the water quality sample must

- have been collected between July 1, 2015, and June 30, 2017
- have an identifiable geologic source and represent "ambient" water quality (i.e., not collected as part of an effort to determine the extent of contamination by the evaluated parameter)
- have come from a well or spring

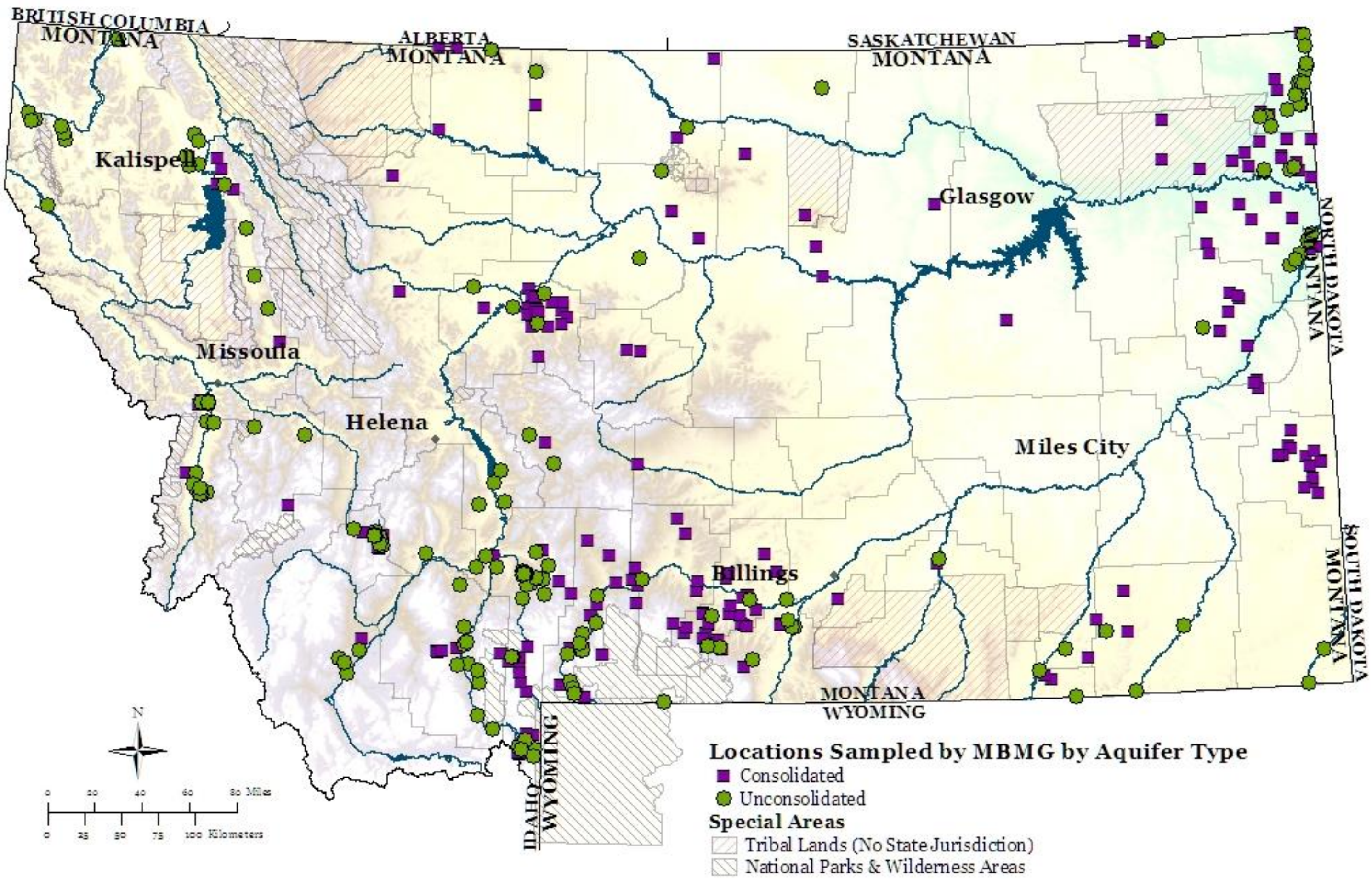


Figure 14. Distribution of samples from wells and springs completed in unconsolidated and consolidated aquifers

MBMG evaluates groundwater quality for various parameters using established maximum contaminant levels (MCLs), secondary maximum contaminant levels (SMCLs), or DEQ adopted standards (Circular DEQ-7).

Groundwater is tested for the presence of eight general contaminants by aquifer type **(Table 7)**.

Pollutant	Number of samples	Standard		% of samples over standards	% Unconsolidated Aquifer	% Consolidated Aquifer
TDS	413	500 mg/L	SMCL	45%	33%	53%
Nitrate	413	10 mg/L	MCL	2%	1%	3%
Fluorine	413	4 mg/L	MCL	5%	1%	8%
Sulfate	413	250 mg/L	SMCL	25%	17%	32%
Chloride	413	250 mg/L	SMCL	3%	0%	5%
Arsenic	413	10 µg/L	MCL	9%	12%	6%
Iron	413	0.3 mg/L	SMCL	0%	21%	14%
Manganese	413	0.05 mg/L	SMCL	25%	29%	22%
Aluminum	413	50 µg/L	SMCL	1%		
Antimony	413	6 µg/L	MCL	0%		
Barium	413	1000 µg/L	DEQ-7	1%		
Beryllium	413	4 µg/L	MCL	0%		
Cadmium	413	5 µg/L	MCL	0%		
Chromium	413	100 µg/L	MCL	0%		
Copper	413	1300 µg/L	MCL	0%		
Lead	413	15 µg/L	MCL	17%		
Nickel	413	100 µg/L	DEQ-7	0%		
Selenium	413	50 µg/L	MCL	1%		
Silver	413	100 µg/L	DEQ-7	0%		
Thallium	413	2 µg/L	MCL	0%		
Uranium	413	30 µg/L	MCL	2%		
Zinc	413	2000 µg/L	DEQ-7	0%		
Strontium	413	4000 µg/L	DEQ-7	4%		

Table 7. Groundwater Contaminants

MCLs: The maximum level of a contaminant allowed in public drinking water supplies, established by EPA (2012[a]). MCLs are set to ensure that the contaminant does not pose significant risk to public health and are legally enforceable standards that apply to public water systems.

SMCLs: Non-enforceable guidelines for contaminants that may cause unpleasant cosmetic effects (e.g., skin or tooth discoloration) or affect the aesthetics of drinking water (e.g., taste, odor, or color).

DEQ Adopted Standards: *Circular DEQ-7* standards mostly–but not always– match each parameter's MCL. If a numeric DEQ-7 value is available, but it differs from a parameter's MCL, the DEQ-7 value is compared with concentrations in the sample sets.

GROUNDWATER MANAGEMENT STRATEGY

DEQ makes an effort to educate the public and raise awareness about groundwater protection. This is needed because groundwater supplies the drinking water for most public and private users in Montana and because contaminated groundwater is difficult to clean up. The rate and scale of groundwater degradation is increasing because of the growth and development in areas that use septic systems and an increase in agricultural use of groundwater for irrigation and livestock watering. The latter is a result of basin closures for surface water rights. Use for irrigation and livestock can potentially reduce the amount of water that gets recharged into the groundwater system, while increasing the harmful effects of fertilizers, pesticides, and animal wastes leeching into groundwater.

Protection

As part of their daily business, several DEQ bureaus and other state agencies address many of the protection strategies laid out in the Montana Ground Water Plan.[38] Multiple agencies are responsible for implementing various groundwater protection strategies.

The 1989 Montana Agricultural Chemical Ground Water Protection Act[39] identifies the Montana Department of Agriculture (MDA) as responsible for the preparation, implementation, and enforcement of agricultural chemical ground water management plans, providing public education, and conducting ground water monitoring.

Groundwater Monitoring & Education

MDA conducts ambient groundwater monitoring for agricultural chemicals through a state-wide permanent monitoring network. If agricultural chemicals are found in groundwater, they will verify, investigate, and determine an appropriate response. Their education program offers initial and re-certification training for applicators of commercial and government pesticides. They also provide or assist in training and educating the public about pesticides.

Statewide Groundwater–Pesticide Projects

MDA's Groundwater Protection Program conducts both statewide monitoring and regional-scaled special projects. Statewide monitoring is conducted at established permanent monitoring well locations while special projects sites are selected based on agricultural setting, soil type, groundwater table, and sampling access of the wells. These projects provide a snapshot of pesticide and nitrate levels in groundwater, and are used to correlate land use patterns with groundwater pesticide and nitrate concentrations.

Groundwater Enforcement Program

MDA is responsible for primary enforcement of the Montana Agriculture Chemical Ground Water Protection Act while DEQ is responsible for adopting water quality standards for agricultural chemicals (pesticides and fertilizers). MDA ensures compliance by conducting statewide comprehensive inspections of agricultural chemical users, dealers, and manufacturers; by collecting groundwater and soil samples; and by investigating and monitoring incidents and spills that could harm groundwater. When necessary, MDA implements compliance actions and orders to prevent or remediate problems in groundwater associated with agricultural chemicals

Remediation

In order to protect human health and the environment; prevent exposure to hazardous or harmful substances released into soil, sediment, surface water, or groundwater; and to ensure compliance with applicable state and federal regulations, DEQs Remediation Program oversees

- investigation and cleanup of groundwater at state and federal Superfund sites
- implementation of corrective actions for leaking underground storage tanks
- reclamation of abandoned mines
- remediation of groundwater contaminated by agricultural and industrial chemicals

Currently, the Groundwater Remediation Program is actively working on 91 sites[40], coordinating remediation activities with the Montana Department of Agriculture when pesticides affect groundwater.

GROUNDWATER–SURFACE WATER INTERACTIONS

The 1986 provisions of the Safe Drinking Water Act introduced the Surface Water Treatment Rule[41], which requires using filtration and treatment techniques for public water systems that use surface water or groundwater under the direct influence of surface water. The rule requires each state to assess all public water suppliers that use groundwater to determine whether their sources come from groundwater under the direct influence of surface water. DEQ performs these assessments.

LOCAL WATER QUALITY DISTRICTS

Communities establish Local Water Quality Districts to protect, preserve, and improve the quality of surface water and groundwater within their districts.

We collaborate with the districts to support their water quality programs. The districts meet annually to review programs and activities and share ideas about how each approaches and manages local water quality issues. Each district prepares an annual report about its activities, which allows for assessment of these activities in meeting the districts' program objectives.

GROUNDWATER UNDER DIRECT INFLUENCE OF SURFACE WATER (GWUDISW)

GWUDISW is defined as any water beneath the surface of the ground either with significant occurrence of insects or other macro organisms, algae, or large-diameter pathogens such as *Giardia lamblia* or *Cryptosporidium* or significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions.

Compared to surface water, groundwater sources NOT under the influence of surface water (springs, wells, infiltration galleries) are typically much more likely to be free of pathogenic organisms (*Giardia Lamblia, Cryptosporidium*, bacteria, viruses) than surface water. At the surface the higher temperatures and oxygen levels in the water allow these organisms to more easily reproduce. If the source is classified as GWUDISW, then a filtration and disinfection system must be installed.

According to chlorofluorocarbon dating, the water at Giant Springs takes 26 years to travel underground before returning to the surface.

Managing Water Quality Data

DEQ constantly works to improve our assessment, data management, and reporting abilities and systems. We have made several program improvements, and we report cases where errant data is discovered and corrected. As a result of our continuing efforts to improve the data management system for Montana Water Quality Act and federal Clean Water Act section 305(b) reporting, we have identified inconsistencies or data entry errors and resolved or corrected them to better represent water quality assessment decisions. Our goal is to improve reporting abilities, clarify assessment data and related information, and make the assessment process transparent for stakeholders and interested parties. Details of the changes mentioned below can be found in Appendix E and I.

Corrected Assessment Unit (AU) Metadata and Data Entry Errors

During data management activities and report development, we discovered and corrected some basic data entry and GIS indexing errors. In addition, we revised some Assessment Unit (AU) location descriptions to improve clarity.

Changes in AU Categories and Use Support Designations

The reporting category for some waterbodies has been changed due to assessment activities or TMDLs. The details are contained in Appendix E.

Changes to AUs

During the reporting cycle, we defined 9 new AUs and split 2 existing AUs resulting in 13 new AUs for assessment purposes. We also retired 1 AU, Hailstone Lake, as the dam impounding it was removed.

Changes to AU Use-Class Assignments

While managing the data and generating this Integrated Report, we discovered and corrected errors in mapping of AU endpoints, as a result 2 changes were made in use-class assignments from B-1 to A-1.

Changes to Causes Associated with Assessment Units

This cycle EPA has made major changes in their data management system. The changes instituted in ATTAINS (Assessment and Total Maximum Daily Load Tracking and Implementation System) has required us to change some impairment causes in our system to match theirs. The major changes to our reporting are that the cause Solids (Suspended/Bedload) was changed to Sediment, and the causes Low Flow Alterations and Other Flow Regime Alterations were changed to Flow Regime Modification. The change from Solids (Suspended/Bedload) to Sediment created duplicate listing in 19 AUs resulting in the delisting of the duplicate cause.

Also, in an effort to assure that impairment causes are correctly associated with the use being harmed, many AUs were updated to move causes from the Primary Contact Recreation and Agriculture uses and assign them to the Aquatic Life use.

PUBLIC PARTICIPATION

Because state and federal laws recognize the challenge of determining the extent of water quality impairments from nonpoint sources, DEQ is directed to assemble and evaluate all existing and readily available water quality data and information to compliment the data collected under our monitoring program for ambient water quality. To comply with this requirement, we request information about water quality from other groups who might have information that could be useful for updating water quality assessments. These collaborators include: known local watershed groups; federal, state, and local agencies; state university programs; private groups; and individuals who have an interest in water quality issues.

CALL FOR DATA

In February 2017, we reached out with a “call for data” via e-mail and letters to local watershed groups; federal, state, and local agencies; state university programs; private groups; and individuals with interest in Montana’s water quality requesting data and/or information they might have that could be useful for updating our water quality assessments noted in this report. Further, the call for data was posted on DEQ’s website. DEQ received no response to this call for data.

PUBLIC COMMENT

State and federal laws also require us to consult with the public when developing methods for assessing water quality and setting priorities for TMDL planning. Additionally, state law requires a 60-day public comment period for our draft 303(d) list.

To initiate the 60-day comment period, we place public notices in major Montana newspapers, giving formal notice of the comment period. The comment period is also made public via press releases issued to Montana’s media outlets; posts on our website; and emails to members of the Integrated Report listserv.

The public can submit comments on the draft Integrated Report via a Public Comment Submittal Application on our CWAIC website at http://www.cwaic.mt.gov or send comments to the standard mailing address:

Department of Environmental Quality
2016 Integrated Report Comments
WQPB, IMTS
PO Box 200901
Helena, MT 59620-0901

GLOSSARY

303(d) list	A compilation of impaired and threatened waterbodies in need of water quality restoration. Specifically, TMDLs are prepared by DEQ and submitted to EPA for approval per the requirements of section 303(d) of the federal Clean Water Act of 1972.
305(b) report	A general overview report of state water quality conditions, which DEQ prepares and submits to EPA per the requirements of section 305(b) of the federal Clean Water Act of 1972.
assessment	A complete review of waterbody conditions relative to designated beneficial uses (see beneficial uses)
beneficial uses	The uses that a waterbody is capable of supporting (e.g., drinking water, aquatic life support, livestock watering, etc.).
bedrock aquifer	An aquifer composed of geologically older consolidated bedrock.
best management practices (BMPs)	Activities, prohibitions, maintenance procedures, or other management practices used to protect and improve water quality.
degradation	A change that reduces the quality of high-quality waters for a beneficial use.
hydrologic unit code (HUC)	A standardized mapping system devised by the US Geological Survey for the hydrology of the United States.
load allocation	The portion of the loading capacity attributed to (1) the existing or future nonpoint sources of pollution and (2) natural background sources.
macroinvertebrates	Animals that do not have backbones and are visible to the human eye (e.g., insects, worms, clams, and snails).
Montana Water-Use Classification System	Montana state regulations[42] assigning state surface waters to one of nine use classes. The class to which a waterbody is assigned defines the beneficial uses that it should support.
naturally-occurring	The present condition of water or material and substances in the water that occur outside of human influence or resulting from developed land where all reasonable land, soil, and water conservation practices have been applied.[43]
nonpoint source (NPS)	A source of pollution that originates from diffuse runoff, seepage, drainage, or infiltration.[44]
non-pollutant	A change in the environment caused by humans that affects the waterbody or its biological community (e.g., a dam or habitat alterations)
not fully supporting waterbody	A waterbody or stream segment for which sufficient credible data shows it does not comply with applicable WQS.[45]
parameter	A physical, biological, or chemical property of a waterbody that can be measured to determine the quality of that waterbody.[46]
pathogens	Bacteria or other disease-causing agents that may be present in water.
point source	A discernible, confined, and discrete conveyance, such as a pipe, ditch, or channel from which pollutants are or may be discharged.[47]
pollutant	A form of pollution that is any substance introduced into a waterbody, naturally or by human activities, that harms water quality relative to water quality standards for a specific use, such as for drinking for which a TMDL may be defined.
pollution	A change in the environment caused by humans that affects the waterbody or its biological community (includes both pollutants and non-pollutants).
prioritization	DEQ's ranking of impaired waterbodies, determined in consultation with the statewide advisory group, for preparing Water Quality Improvement Plans (specifically TMDL plans).
reference condition	The condition of a waterbody capable of supporting its present and future beneficial uses when all reasonable land, soil, and water conservation practices have been applied.
riparian area	Plant communities alongside waterbodies that are affected by the waterbodies' hydrologic features. Riparian areas are usually transitional between streams and upland areas.
segment	A defined portion of a waterbody.
state water	A body of water under the jurisdiction of the state of Montana.
sub-major basin	The aggregation of several watersheds or HUCs into a larger drainage system.
sufficient credible data	Monitoring data, alone or in combination with narrative information, which supports a finding as to whether a waterbody complies with applicable WQS.48

surficial aquifer	Aquifer composed largely of geologically younger unconsolidated sedimentary deposits that are found near the land surface. These accumulations of sediment can be deposited by streams (alluvium), glacial ice (till), or glacial meltwater (outwash). Surficial aquifers are often unconfined or partially confined and therefore more susceptible to potential contamination sources located at or near the land surface. The terms sedimentary deposits, unconsolidated deposits, and surficial aquifers are often used interchangeably.
suspended solids	Materials such as silt that may be contained in water and do not dissolve.
threatened waterbody	A waterbody for which sufficient credible data show is fully supporting its designated uses but is threatened for a particular designated use because of: (a) proposed sources that are not subject to pollution prevention or control actions required by a discharge permit, the nondegradation provisions, or reasonable land, soil, and water conservation practices; or (b) documented adverse pollution trends.[49]
Total Maximum Daily Load (TMDL)	The maximum amount of a pollutant that a waterbody can receive while still meeting water quality standards. TMDLs include the sum of the individual wasteload allocations for point sources and load allocations for both nonpoint sources and natural background.[50]
true color	The color of water from which the turbidity (presence of suspended matter) has been removed
wasteload allocation	The portion of the receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution (e.g., permitted waste treatment facilities).
waterbody	A lake, reservoir, river, stream, creek, pond, marsh, wetland, or other body of water above the ground surface.
Water Quality Integrated Report (or Integrated Report or IR)	A document that EPA requires each state to prepare and that provides an overview of the status of state water quality monitoring and planning programs. It combines in one document the information previously submitted to EPA in separate 303(d) list and 305(b) report documents.
water quality restoration plan (WRP)	A written plan for improving water quality so specific waterbodies can achieve full support of their beneficial uses.
water quality standards (WQS)	The standards adopted in ARM 17.30.601 et seq. and Circular DEQ-7 to protect, maintain, and improve suitability and usability of water for public water supplies, wildlife, fish and aquatic life, agriculture, industry, recreation, and other beneficial uses.

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[5] ibid
[6] 75-5-301, MCA
[7] ARM 17.30.621-629
[8] ARM 17.30.6 *et seq*.
[9] ARM 17.30.630
[10] ARM 17.30.631
[11] ARM 17.30.670
[12] ARM 17.30.623 (g)
[13] ARM 17.30.701 *et seq*.
[14] 75-5-702(7), MCA
[15] 75-5-303, MCA
[16] ARM 17.30.701 *et seq*.
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[28] http://deq.mt.gov/DEQAdmin/ENF/statusreports
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[31] 40 CFR 141.2, ARM 17.38.209, ARM 17.38.219, and Public Water Supply Circular PWS-5
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[34] John LaFave, MBMG, Personal Communication 12/22/2017
[35] 85-2-901, MCA
[36] 85-2-525, MCA
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[42] ARM 17.30.606 - 658
[43] 75-5-306(2), MCA
[44] ARM 17.30.602(18)
[45] 75-5-103(14), MCA
[46] 75-5-103(27), MCA
[47] 75-5-103(29), MCA
[48] 75-5-103(35) MCA
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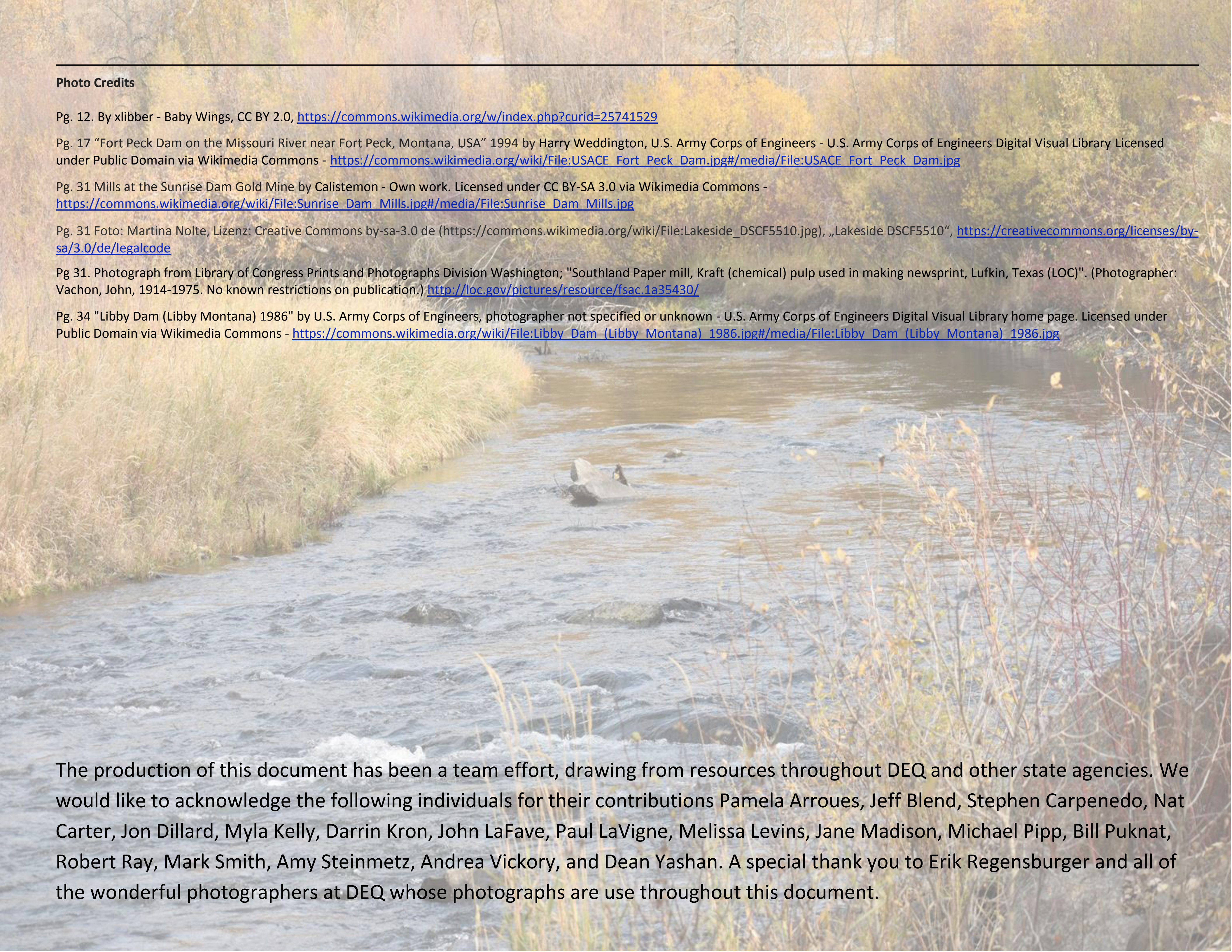

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