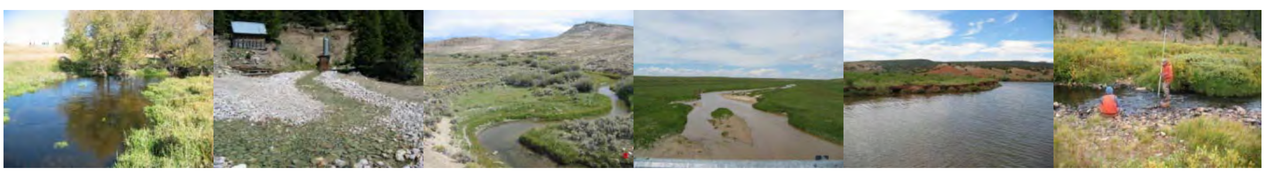
Wyoming
Water Quality Assessment and Impaired Waters List (2012 Integrated 305(b) and 303(d) Report)



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Department of Environmental Quality
WYOMING

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List of Acronyms

AFO	Animal Feeding Operation
ALUS	Aquatic Life Use Support
AML	Abandoned Mine Lands
AMPs	Allotment Management Plans
BLM	United States Bureau of Land Management
BMP	Best Management Practices
USBOR	United States Bureau of Reclamation
CBM	Coal Bed Methane
CCCD	Campbell County Conservation District
CCD	Cody Conservation District
CCNRD	Crook County Natural Resource District
CFR	Code of Federal Regulations
CFUs	Colony Forming Units
Chapter 1	Chapter 1 of the Wyoming Water Quality Rules and Regulations
CRM	Coordinated Resource Management
CRP	Conservation Reserve Program
CWA	Federal Clean Water Act
DCCD	Dubois County Conservation District
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EMAP	Environmental Monitoring and Assessment Program
HSCD	Hot Springs Conservation District
HUC	Hydrologic Unit Code (HUC)
LCD	Lincoln Conservation District
LDCD	Lake DeSmet Conservation District
LRCD	Laramie Rivers Conservation District
MCD	Meeteetse Conservation District
NCCD	Natrona County Conservation District
NCD	Niobrara Conservation District
NRCS	Natural Resource Conservation Service
PACD	Popo Agie Conservation District
PCFCD	Powell-Clarks Fork Conservation District
PCRD	Platte County Resource District
PFC	Proper Functioning Condition
PRBIWG	Powder River Basin Interagency Work Group
PRCD	Powder River Conservation District
SAR	Sodium Adsorption Ratio
SCCD	Sheridan or Sublette County Conservation Districts
SWCCD	Sweetwater County Conservation District
SCD	Shoshone Conservation District
SDDENR	South Dakota Department of Environment and Natural Resources
Section 205j	Section 205j of the CWA
Section 208	Section 208 of the CWA
Section 301	Section 301 of the CWA
Section 319	Section 319 of the CWA
SMCLs	USEPAs Secondary Maximum Contaminant Levels for Drinking Water
TA	Timberline Aquatics, Inc.
TCD	Teton Conservation District
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TRT	Technical Review Team

TSS	Total Suspended Solids
UAA	Use Attainability Analysis
UCCD	Uinta County Conservation District
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UW	University of Wyoming
WACD	Wyoming Association of Conservation Districts
WCCD	Washakie County Conservation District
WDEQ	Wyoming Department of Environmental Quality
WDH	Wyoming Department of Health
WGFD	Wyoming Game and Fish Department
WLA	Waste Load Allocation
WOGCC	Wyoming Oil and Gas Conservation Commission
WMP	Watershed Monitoring Program
WQD	Wyoming Water Quality Division
WWP	Western Watersheds Project
WWTF	Waste Water Treatment Facility
WYPDES	Wyoming Point Source Discharge Elimination System

1. Introduction

In 1972, Congress enacted the Federal Water Pollution Control Act, otherwise known as the Clean Water Act (CWA). The purpose of the CWA is to promote the restoration and/or maintenance of the chemical, physical, and biological integrity of our nation's surface waters and to support the "protection and propagation of fish, shellfish, and wildlife and recreation in and on the water". The U.S. Environmental Protection Agency (USEPA) is charged with administering the CWA. However, Section 101(b) of the CWA states that "it is the policy of Congress to recognize, preserve, and protect the primary responsibilities and rights of States to prevent, reduce, and eliminate pollution, to plan the development and use (including restoration, preservation, and enhancement) of land and water resources, and to consult with the Administrator in the exercise of his authority under this Act." Section 305(b) of the CWA requires that a report of the surface water quality condition of each state be provided every two years during even numbered years. In addition, Section 303(d) requires that a list of the impaired waters requiring Total Maximum Daily Loads (TMDLs) be provided. Wyoming's 2012 Integrated 305(b) and 303(d) Report combines the requirements of both CWA sections into a single document.

1.1 Section 305(b) Requirements

Section 305(b) of the CWA requires that each state prepare and submit a biennial report to USEPA by April 1st of even numbered years. The report must contain a description of the water quality of navigable waters of the state for the preceding year, including the extent to which current conditions allow for the "protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water". Section 305(b) also requires each state to report the water quality and the elimination of pollutants that would be necessary to provide for designated use support. Specifically, each state is to identify waters not meeting the above conditions, recommend strategies to achieve these objectives and to estimate the environmental impacts, economic and social costs and benefits, and the predicted timeline for project completion. Lastly, Section 305(b) requires that the sources and extent of non-point source pollution in each state be estimated, including a description of the current program used to mitigate these pollutants and associated financial costs.

1.2 Section 303(d) Requirements

Section 303(d) of the CWA requires that states identify and list waters for which the effluent limits outlined in Section 301 are not effective in attaining designated uses. Section 303(d) also requires that states develop a separate TMDL for each pollutant/segment combination on the 303(d) List. States are required to prioritize waters on the 303(d) List for TMDLs based on the severity of each pollutant/segment combination, or listing. TMDLs are to be completed on these impaired waters "to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife, and allow recreational activities in and on the water". Each state must submit a 303(d) List of impaired waters to USEPA by April 1st of each even numbered year. USEPA is required to review the 303(d) List within 30 days of submittal.

2. Watershed Management

Wyoming is ecologically diverse and contains a wide range of environments; these include shrub and grassland plains, alluvial valleys, volcanic plateaus, forested mountains, woodland and shrubland hills, glacial peaks, lava fields and wetlands (Chapman et al. 2003). There are seven level III ecoregions, which can be subdivided into 39 level IV ecoregions. This ecological diversity is evidenced by the wide variety of surface water types found in the state, which occur across 14 river basins (6 digit Hydrologic Unit Code (HUCs)) and 73 sub-basins (8 digit HUCs), and include approximately 280,804 miles of streams and 569,269 acres of lakes (1:24,000), reservoirs, ponds and wetlands.

Within the Wyoming Department of Environmental Quality (WDEQ), the Water Quality Division (WQD) is responsible for monitoring the surface and ground water quality in Wyoming. The Watershed Management Section of WQD evaluates and reports on the condition of Wyoming's surface waters to USEPA. The Watershed Management Section is divided into seven closely interrelated programs; including Surface Water Standards, Watershed Monitoring, TMDL Development, Nonpoint Source Pollution Planning and Grants, Water Quality Assessment, Section 401 Certification and Quality Assurance/Quality Control.

Wyoming's surface waters are classified according to their designated uses using a hierarchical system (see Appendix B) described in Chapter 1 of the Wyoming Water Quality Rules and Regulations. Wyoming's Watershed Monitoring Program is responsible for providing the majority of the information used in determining whether designated uses are supported for the surface waters of the state, but other groups, for example, the U.S. Geological Survey (USGS) and Wyoming's 34 Conservation Districts, also contribute substantially. These data are used to determine water quality condition following methods outlined in Wyoming's Method for Determining Water Quality Condition of Surface Waters and TMDL Prioritization Criteria for 303(d) Listed Waters. This methodology, last updated in 2008, is revised periodically to maintain consistency with changes in the state's water quality standards and to comply with Wyoming's "Credible Data" Law.

2.1 Watershed Monitoring Program

The WDEQ Watershed Monitoring Program (WMP) was initiated in 1992 with the collection of physical, chemical and biological data from "least impacted" streams as part of the Reference Stream Project. This dataset remains dynamic, and continues to be supplemented and refined as new reference streams are identified. In addition, existing reference streams are re-visited to document natural temporal variability. These data are used to define a range of expected conditions when evaluating the surface water quality of other Wyoming streams of unknown condition. In 1998, the WMP began monitoring streams, lakes and reservoirs to determine designated use support and remains committed to collecting the data necessary to provide conclusive use support determinations. The Manual for Standard Operating Procedures for Sample Collection and Analysis describes the data collection methods used by the WMP.

The 2010-2019 Watershed Monitoring Program Water Quality Strategy lists ten program objectives; these include: determining water quality standard attainment; identifying impaired waters; identifying causes and sources of impairment; assessing water quality status and trends at multiple scales; evaluating watershed program effectiveness; responding to complaints and emergencies; supporting the development and implementation of water quality standards; providing data and technical support toward the development and evaluation of Total Maximum Daily Loads (TMDLs); providing data and technical support toward the implementation and evaluation of nonpoint source (NPS) restoration projects; and supporting Wyoming Point Source Discharge Elimination System (WYPDES) permitting and compliance. To achieve these objectives, the Watershed Monitoring Program Monitoring Strategy includes stream reference station monitoring, rotating basin probability surveys and targeted monitoring, monitoring of high priority waters from the 1997 TMDL Workplan, lake and reservoir monitoring and continued monitoring for a statewide probabilistic survey. Monitoring for the 2010-2019 strategy focuses on a 5-year rotating river basin framework where probabilistic and targeted monitoring will be integrated. Using this approach, a probabilistic survey will be completed for each river basin every 5 years, and the results of these surveys will help to prioritize waters for targeted monitoring studies. Monitoring to expand WDEQs reference dataset will also occur within the basins under study. WDEQ re-evaluates its water quality monitoring strategy every ten years to allow for adjustment of management goals and objectives as priorities change. WDEQ also provides annual workplans to inform the public as well as other state and federal agencies about which waters are scheduled to be monitored by WDEQ during a given year and to provide the contact information for WDEQ regional offices.

Ambient Monitoring

WDEQ has contracted the USGS to conduct surface water quality sampling for two monitoring networks in Wyoming. One network is comprised of 19 water quality stations and one stream gaging station at locations across the state, where sampling is generally conducted on a quarterly basis. Parameters of interest vary between sites, and monitoring is often directed at known or suspected pollutants of concern. Parameters often include standard physico-chemical measures, major ions, trace metals, nutrients, sediment and pathogens. Study sites are used to monitor impaired streams, evaluate streams associated with point source discharges and to identify trends in the water quality of larger rivers. The second network includes an additional 44 water quality stations associated with coal bed methane (CBM) development, most of which are in northeastern Wyoming with a few in south central Wyoming. This network was created to determine whether there are effects of CBM discharges on water quality, to establish baseline conditions in less developed areas and to insure compliance with existing water quality standards and WYPDES permitting policies. Sampling locations for these networks are contained within WDEQ's 2010-2019 Watershed Monitoring Program Water Quality Strategy.

EMAP

The Environmental Monitoring and Assessment Program (EMAP) was established by the USEPA in the late 1980s to develop probability, or randomized, based monitoring tools (e.g. biological indicators, stream survey design, estimates of reference condition) to produce unbiased estimates of the ecological condition of perennial streams across large spatial scales. Within this program, Wyoming and 11 other western states were grouped into EMAP-West. USGS was contracted by WDEQ to complete the sampling and analyses in Wyoming and write a Scientific Investigations Report (Peterson et al. 2007). This study first compared the ecological status (i.e. chemical, physical, and biotic condition) of Wyoming's streams to those of the combined EMAP-West reference streams. Next, the ecological status of the three climatic regions within the state (i.e. plains, xeric, and mountain) were compared to these reference streams and used to estimate the suitability of Wyoming streams for aquatic life use support (ALUS). Lastly, the aquatic life other than fish designated use was assessed using both EMAP and Wyoming's Stream Integrity Index (WSII) and River Invertebrate Prediction and Classification System (RIVPACS) biological indices. Results suggested that Wyoming's perennial streams were similar in ecological condition, including biotic integrity, water chemistry, and habitat condition, to other western streams. The study estimated that riparian disturbance and low habitat complexity were the most important stressors in Wyoming streams, with 90% and 30% of xeric and mountain regions estimated as being most stressed, respectively. While the EMAP and Wyoming WSII indices rated streams similarly, RIVPACS differed substantially. Estimates of ALUS, based on Wyoming's two biotic indices, were 52% full support, 32% non-support, and 16% undetermined. Xeric regions had a higher ALUS (66%) than the mountains (51%).

Probability Monitoring

In an effort to better estimate the quality of Wyoming's surface waters, WDEQ added probability monitoring to the surface water monitoring program in 2004. Sampling locations are similar to those selected for EMAP in that they are randomly selected rather than targeted, and are intended to be representative of all of Wyoming's surface waters. This approach allows WDEQ to produce unbiased estimates of surface water quality at much larger statewide or regional spatial scales, whereas previous inference was limited to specific stream segments or watersheds. By sampling 15-20 study sites per year, within a 5 year rotating basin schedule, an estimate of the condition of all waters can be approximated by extrapolating to the rest of the surface waters of the state. Results of this monitoring will be reported by WDEQ's Watershed Monitoring Program in 2012 and will also be summarized in the 2014 Integrated Report.

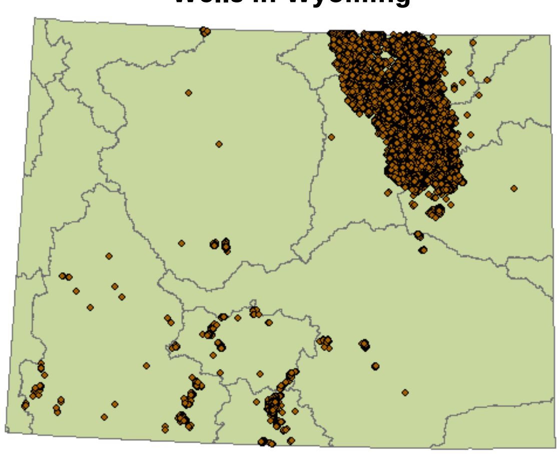
2.2 Monitoring by Conservation Districts

Since 1998, many of Wyoming's Conservation Districts, with the guidance and leadership of local watershed steering committees, have taken initiative to improve water quality in the state. All of Wyoming's 34 Conservation Districts are involved in water quality activities at some level; including monitoring waters within their districts, developing watershed plans to address known impairments and threats and assisting citizens in implementing best management practices (BMPs) to improve water quality (WACD, 2005). Most watershed planning is intended to address waters on the 303(d) List of impaired waters requiring TMDLs and to provide an opportunity for voluntary and incentive based implementation activities to improve water quality (WACD, 2009). These waters are usually given a low priority for TMDL development by WDEQ to provide an opportunity for restoration. Ultimately, the goal of watershed planning is to identify and implement BMPs that will result in the removal of waters from the 303(d) List (WACD, 2005 and 2007). Data were requested from all 34 of Wyoming's Conservation Districts for this report, and those activities that are believed to contribute to water quality assessment and/or restoration are described separately for each sub-basin in Section 8 of this report. In addition, a USEPA Section 319 Nonpoint Source Program Success Story involving Uinta County Conservation District (UCCD) is included in this report as an example of how Wyoming's Conservation Districts have successfully contributed to stream restoration (see Appendix A).

2.3 Coal Bed Methane Monitoring

The Powder River Basin Interagency Working Group (PRBIWG) was developed to address management issues associated with CBM development in the Powder River Basin in Wyoming and Montana. This group of multiple state (including WDEQ) and federal agencies meets periodically to address issues associated with CBM monitoring and permitting. The group's mission is to provide environmentally responsible CBM development through the use of proper BMPs. Through this cooperative effort, each agency is expected to achieve greater operational efficiency, enhance resource protection and better serve the public. Particular attention has been given to the possibility of cross-border effects of CBM discharge on downstream segments of the Powder River in Montana. To monitor the potential effects of CBM development on natural resources (e.g. water quality and quantity, aquatic life, wildlife and air), both the water quality and aquatic life monitoring task groups were formed and monitoring plans developed for the affected areas of NE Wyoming (see inset map). The USGS has been contracted to do most of the water quality and aquatic life monitoring in the affected region of Wyoming. Several internet resources are available; including a USGS website and fact sheet; the USGS Water Quality Monitoring Plan; and water quality and aquatic life monitoring plans. USGS (2009b) reported on the ecology of the Powder River Structural Basin in Wyoming and Montana for the years 2005 and 2006. The study indicated that the biological condition of the mainstem Tongue River and the Powder River above and below Salt Creek and between Crazy Woman and Clear Creeks decreased from upstream to downstream. Most streams in the Powder River basin, however, showed a general trend of increasing biological condition from upstream to downstream. A second USGS (2010) report for the Powder River Structural Basin, spanning the years 2005-2008, was completed in 2010. The goals of the

Distribution of Coal Bed Methane Wells in Wyoming



study were to determine the current aquatic ecological conditions and to identify, where possible, the current and future effects of CBM produced water on the aquatic life of the basin. The study found that relatively few of WDEQ's chronic or acute Aquatic Life other than Fish use criteria were exceeded during the study period. In general, tributaries to the Tongue River had macroinvertebrate communities less pollution tolerant than those in the mainstem Tongue River. The macroinvertebrate and algal communities along the Powder River were significantly more pollution tolerant between the confluence with Willow Creek downstream to the confluence with Crazy Woman Creek than the communities above and below this segment. The report was inconclusive as to these causes of these biological patterns. Fish communities were relatively similar throughout the Powder River. Alkalinity, which was used to indicate the influence of CBM produced water, was similar throughout most of the mainstem of the Powder River. An exception to this pattern was noted below the confluence with Burger Draw, where alkalinity was relatively high; however, the same location also had the highest diversity of fish of any site sampled during this study.

3. Determining Surface Water Quality

USEPA guidance recommends that states use the same assessment methodology to develop both the 303(d) List and the 305(b) Report, and Wyoming began using the same assessment methodology for both in 2000. Wyoming's Method for Determining Water Quality Condition of Surface Waters and TMDL Prioritization for 303(d) Listed Waters outlines the methodology used by WDEQ for making designated use support decisions for surface waters of the state. This methodology, which was last updated in 2008, has been publicly reviewed and meets all the requirements of Wyoming's Credible Data Law.

4. TMDL Prioritization

Section 303(d)(1) of the federal CWA requires states and tribes to "establish a priority ranking" for the segments identified as needing a TMDL. This ranking must evaluate the severity of the pollutant and the specific designated uses adversely impacted by the pollutant. However, the most severe water quality problems or the most toxic pollutants need not always be given the highest priority for TMDL development if circumstances warrant a lower priority. Consistent with 40 CFR § 130.7(b)(4), each state must also submit a priority ranking every two years within the 303(d) List of the Integrated Report, including waters targeted for TMDL development in the next two years. USEPA guidance encourages states to maintain a TMDL schedule within which TMDLs are completed in a time frame of no longer than 8 to 13 years from the time of initial listing. WDEQ anticipates that some TMDLs will take less than a year while others may take upwards of 3 years to finalize.

USEPA's 2006 Integrated Report Guidance recommends that priority rankings be clear and either in the form of a scheduled TMDL completion date or a tiered system such as high, medium and low. Prior to Wyoming's 2008 TMDL Workplan Update, WDEQ utilized a high, medium and low ranking system. Beginning with the 2010 Integrated Report, the prioritization for TMDL development was changed within the 303(d) List to include the approximate dates that each TMDL is expected to be initiated and completed. By including initiation and completion dates in the 303(d) List, the public will be better informed of the anticipated timeline of each TMDL.

The severity of impairment, USEPA's time frame and resources limitations were the primary considerations when developing the TMDL schedule. In general, factors for priority ranking are as follows:

1. **Timeliness.** Waterbodies that have been on the 303(d) List the longest will typically be scheduled for TMDL development before newly listed waterbodies.

2. **Hazards to Human and Environmental Health.** Waterbodies on the Section 303(d) List for pollutants posing a significant human or environmental health risk (i.e. priority pollutants) will

typically be scheduled for TMDL development sooner than waterbodies listed for to non-priority pollutants.

3. Quality of the Impaired Water. Higher quality waterbodies (Class 1 or 2) on the Section 303(d) List will typically be scheduled for TMDL development sooner than lesser quality (Class 3 or 4) waterbodies.

4. Timely Restoration. Waterbodies with ongoing implementation practices which are believed to have a high possibility of achieving full restoration within 8 years of initial listing will typically be scheduled for TMDL development later than waterbodies without such ongoing efforts.

5. Endangered Species. Waterbodies supporting aquatic species that are considered threatened, endangered or are species of concern will typically be scheduled for TMDL development before waterbodies without such species.

5. Wyoming's Nonpoint Source Program

The Wyoming Nonpoint Source Program operates under the Watershed Management Section of the WDEQ, WQD. Unlike point source pollution, which can be traced back to a single defined source, nonpoint source pollution is caused by surface water runoff diffuse in nature and often widespread, making it difficult to assess the source of the problem. Nonpoint source pollution occurs when runoff from rainfall or snowmelt travels over and/or percolates through the soil and picks up contaminants. These contaminants are deposited into streams, lakes, rivers, and groundwater. While some types of nonpoint source pollution can be natural in origin, Wyoming's Nonpoint Source Program typically only addresses those associated with anthropogenic land-disturbing activities such as urban development, road construction, agriculture, recreation, silviculture and mineral exploration. Common nonpoint source contaminants include fertilizers and pesticides from agricultural and residential activity; oil, grease, sediment and toxic chemicals from urban runoff; sediment from construction activity or stream bank erosion; and bacteria and nutrients from livestock and pet waste or failing septic systems.

After recognizing that nonpoint source pollution is a serious impediment to meeting the goals of the CWA and that more focus was needed in this area, Congress amended the CWA in 1987 to include Section 319, Nonpoint Source Management Programs, thus providing the basis for the implementation of the Wyoming Nonpoint Source Program. Funds can be made available to state, federal and local agencies, nonprofit organizations, and private individuals. Those projects having outcomes and targets that reduce the impacts of nonpoint source pollution and improve water quality are eligible. Nonpoint source pollution control funds are available each year on a competitive basis. Funds are awarded as reimbursement grants, meaning funds can be issued to the recipient only after proof of expenditure on eligible costs. All proposals submitted must identify at least 40 percent of the total project cost as non-federal cash or in-kind services match. The vision for the Wyoming Nonpoint Source Program is to sponsor projects that reduce or eliminate nonpoint source pollution in threatened, impaired, and high-quality waters of the state so all designated uses are fully supported for the benefit of all Wyoming citizens. The Nonpoint Source Program also administers funds available under Section 604(b)/205(j) of the CWA. Section 205(j) funds are available to local government agencies for the purpose of water quality management planning.

6. Emerging Surface Water Quality Threats

In response to four assessment reports by the Intergovernmental Panel on Climate Change (IPCC), USEPA released a document entitled: *NATIONAL WATER PROGRAM STRATEGY: Response to Climate Change* that summarizes the agency's strategies for addressing threats from climate change to aquatic systems. The document lists five anticipated impacts that may directly threaten the water quality of Wyoming's streams, lakes, reservoirs and wetlands; including increased water pollution associated problems from rising stream temperatures, an increase in extreme water related events (e.g. droughts and floods), reductions in available drinking water, water boundary movement and displacement, and the displacement of aquatic communities as water temperatures change. In the National Water Program Strategy, the USEPA lists mitigation, adaptation, and research of climate change as areas of focus, and outlines specific goals within each.

Aging forests, prolonged drought and warmer winters have allowed populations of pine beetle in Wyoming to reach epidemic status. To date, the USFS estimates that these insects have attacked and killed lodgepole and ponderosa pines across more than 1.5 million acres of forest in southern Wyoming and northern Colorado and expects nearly all mature trees to be killed in the Routt and Medicine Bow National Forests by 2012. In the Shoshone National Forest, the USFS estimates that approximately 823,000 (63%) of the 1.5 million forested acres are affected by the pine beetle epidemic. Rapid deforestation may result in elevated water yield (Potts 1985, CCSP, 2009) and soil erosion (CCSP, 2009) in effected watersheds, and these symptoms could be exacerbated by an increase in the frequency and severity of forest fires (USFS Bulletin 2007-2008). Some statistical models suggest that temperatures will increase in surface waters, and that the coldwater fisheries of Wyoming are particularly vulnerable to these changes (Rahel et. al. 1996; Trout Unlimited, 2007). The ultimate effects of global climate change on Wyoming's aquatic ecosystems are unknown.

7. Public Participation

The State of Wyoming encourages participation in the development of this biennial document by various public and private, government and non-government stakeholder groups. Many entities routinely submit water quality data and provide an important external review of the Integrated Report during WDEQ's public comment period. WDEQ acknowledges the important contributions of these groups to the review and improvement of this report.

8. Basin Descriptions and Surface Water Quality Summaries

In this section, an overview of each of the river basins in Wyoming is provided. Next, basins are subdivided into individual sub-basins (8 digit HUCs) and the water quality condition within each is summarized. Non-WDEQ informational sources are cited in the text and listed in the references section. WDEQ watershed monitoring assessment reports are also cited within the text, and links are provided to electronic copies of many of these documents.

8.1 Bear River Basin

The Bear River originates in the Uinta Mountains of Utah and then flows north into Wyoming. After entering Wyoming near Evanston, the river crosses between Utah and Wyoming again before ultimately flowing into Idaho near the community of Border. The Bear River flows into the Great Salt Lake in Utah, making it the largest river in the western hemisphere without an ocean outlet. Below Woodruff Narrows Reservoir the river valley widens and water is extensively diverted and utilized for irrigation of alfalfa, pasture land and grains. Streams in the basin are mostly perennial at higher elevations, but at lower elevations, stream flows often become intermittent or ephemeral. The basin contains many large reservoirs, hundreds of small stock ponds and reservoirs and extensive networks of irrigation canals.

Much of the geology of the Bear River Basin in Wyoming consists of fine-grained sedimentary formations which have been thrust faulted into steep, easily eroded, geologically young mountains. As a result, surface waters have a high natural load of fine sediment, containing salts, carbonates, sulfates, and/or phosphate, which are found in the parent geologic material. Streams in much of the basin are highly dependent on vegetation for physical stabilization and are typically very sensitive to disturbance.

The Bear River is apportioned among Idaho, Utah and Wyoming under the interstate compact agreement of 1958 (amended in 1978). Many streams which were historically perennial are now intermittent (ERI, 1992; NRCS, 2001; USGS, 2004), which may be due in part to irrigation diversions; however, channel down cutting, loss of riparian vegetation and damming may also contribute. Several studies associated with the Bear River and its tributaries in Wyoming and Bear Lake in Utah have been published (NRCS 2001; Waddell et al. 2003; ERI, 2005). Idaho, Utah and Wyoming are currently sponsoring a basin-wide coordinated surface water monitoring program on the Bear River which includes 13 monitoring stations that measure low and high elevation runoff, summer irrigation season streamflows and fall base flow. This work is still in progress and a final report has not been issued to date.

Water from the Bear River is diverted into Bear Lake in Idaho and Utah to increase storage. Oligotrophic conditions and high levels of calcium carbonate have given Bear Lake a naturally bright blue color. Recent studies, however, indicate that nutrient enrichment and subsequent algal growth have decreased water clarity. Both Idaho and Utah have conducted TMDL studies for the Bear River. The Bear River Watershed Information System provides additional water quality information for the basin.

In order to improve the water quality in Bear Lake and expand the range of Bonneville cutthroat trout, numerous water quality studies and improvement projects have been conducted in the basin, including several in Wyoming. Historically, Bonneville (Bear River) cutthroat trout were found throughout the Bear River and other Great Basin watersheds, but competition from non-native species, loss of aquatic habitat and water quality changes have caused populations of these fish to decline. The Bonneville cutthroat trout was petitioned for listing under the Endangered Species Act (ESA) as a threatened species throughout its range in 1998. In 2008, the U.S. Fish and Wildlife Service (USFWS) determined that listing was not warranted because a range wide status review indicated that self-sustaining Bonneville cutthroat trout populations are well distributed throughout their historic range and are being restored or protected in all currently occupied watersheds. WGFD has been working with Idaho, Nevada and Utah as part of a Bonneville Cutthroat Interagency team to develop conservation strategies and agreements to improve and sustain Bonneville cutthroat trout populations.

Upper Bear River Sub-basin (HUC 16010101)

Primary land uses in this sub-basin are grazing in the uplands, irrigated hay and small grain production along valley bottoms, oil and gas production and historic phosphate and coal mining.

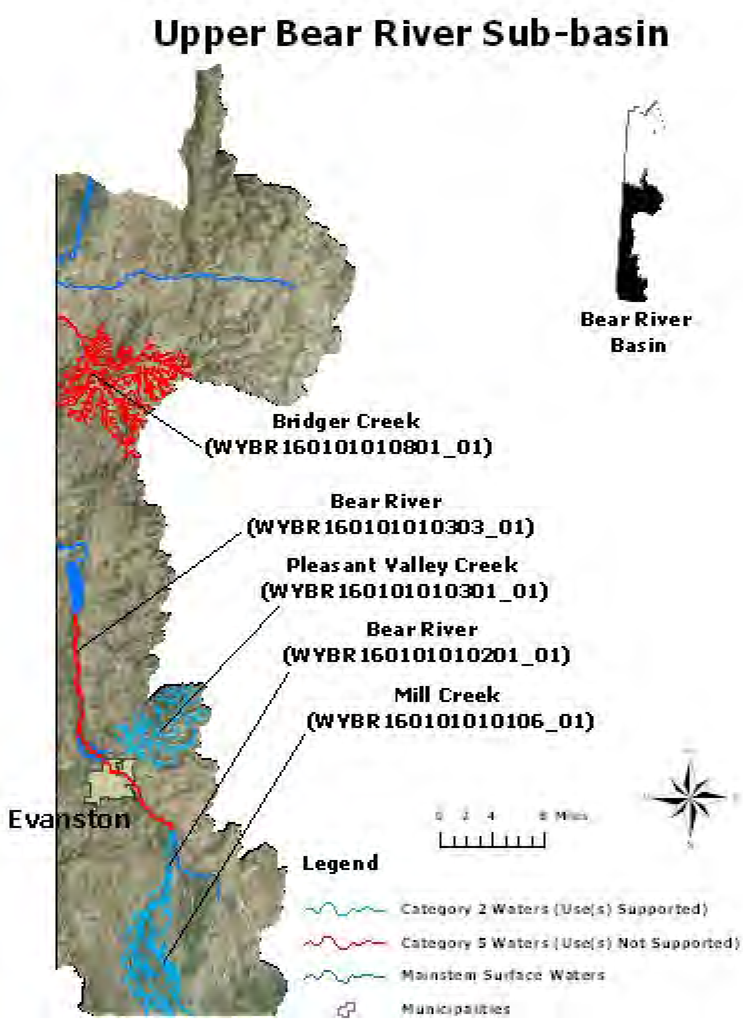
Assessment of Pleasant Valley Creek above Crompton Reservoir (WDEQ, 2001) showed that the Aquatic Life other than Fish use was fully supported and the presence of non-game fish indicated that the stream may be better protected as nongame fishery.

Monitoring by WDEQ in 1998-1999 on Sulphur Creek (WDEQ, 2002), both above and below Sulphur Creek Reservoir identified channel degradation. Potential sources of degradation include heavy riparian grazing and bank erosion, rapidly fluctuating flows below the reservoir and changes in seasonal flows in the upstream channel. These segments were monitored again in 2003, and verified that Sulphur Creek is properly classified as a cold water fishery.

Water quality assessments by WDEQ on the Bear River in 1995, 1996 and 1998 indicated that the cold water fishery use is supported above Sulphur Creek. Monitoring on the Bear River below Sulphur Creek (between Sulphur Creek and Woodruff Narrows Reservoir) in 1998 (WDEQ, 2001) indicated that this stream is not supporting its aquatic life other than fish uses due to sedimentation and this segment was added to the 303(d) List in 2002. Much of this reach is channelized and is poor quality trout habitat. A cooperative WGFD Riparian improvement project on the Bear River has been conducted in and near Evanston. Uinta County Conservation District (UCCD) has formed a watershed steering committee and a Bear River watershed plan has been approved by WDEQ.

Oil production has occurred in the Yellow Creek/Thief Creek drainage since the early 1900s. More recently, natural gas has also been produced and processed, and livestock grazing occurs throughout the drainage. Soils in this drainage are highly susceptible to erosion and contain naturally high levels of calcium, magnesium, chloride and sulfate. Only the upper part of Thief Creek and some reaches of Yellow Creek are perennial. These streams are reportedly incised and occur in highly erodible and unstable geologic materials (ARE, 1983; ERI, 1985). The influence of natural versus anthropogenic activities on erosion in this watershed is unknown.

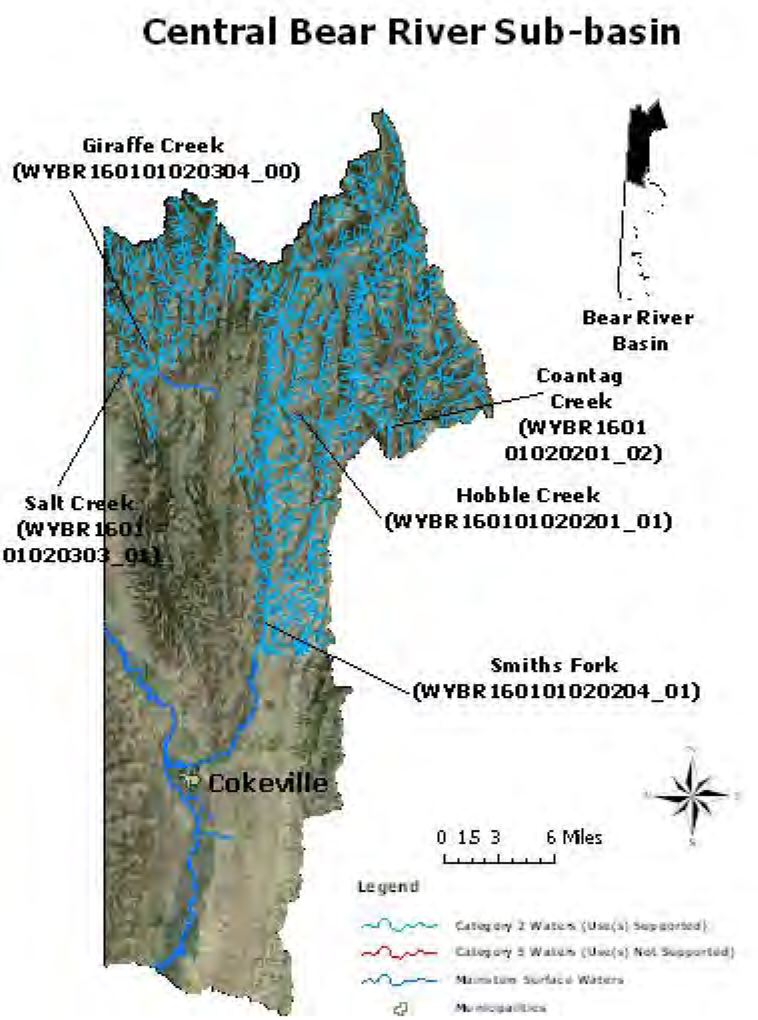
The Twin Creek watershed flows through highly erodible shales that contribute carbonates, salts and metals to streams. Both a road and railroad line, built along Twin Creek in the late 1800s, restrict lateral stream channel adjustments. Phosphate was mined in the drainage between 1910 and 1977, and a phosphate mill operated until about 1985 using ore mined in Idaho. A project to reclaim unstable tailings and eroding spoils piles spanning 140 acres was completed by WDEQ's Abandoned Mine Lands Division (AML) in 2008. While Twin Creek is mostly intermittent above its confluence with Rock Creek, Rock Creek and Clear Creek are perennial. The loss of perennial flows in upper Twin Creek since the 1970s is a resource concern (NRCS, 2001). WDEQ conducted monitoring in the Twin Creek drainage in 1998 and 2004 and results indicated that bank erosion and sediment loading are concerns.



The Bridger Creek watershed was placed on the 1998 303(d) List due to threats to the aquatic life other than fish use. ERI (1992) identified the watershed as a significant contributor of both sediment and phosphates to the Bear River. Extensive head cutting has occurred due to the re-routing and channelization of the lower 2,500 feet of the mainstem of Bridger Creek for road and railroad construction. The study also identified historic livestock and wildlife grazing on the BLM's Cumberland/Uinta Allotment, which have contributed to poor riparian vegetation cover and extensive down cutting of the stream channel, as being major sources of erosion and sedimentation during spring snowmelt runoff and rain storm events. In 1996, a Section 319 Bridger Creek Restoration Project (ERI, 1996) was completed to address these concerns. As part of this project, eleven small sediment retention reservoirs were constructed to trap sediment and reduce further head cutting and down cutting in the upper watershed. In addition, a large gravel pit in the lower watershed near the Utah border was modified into a sediment basin designed to reduce head cutting from an area near Highway 30/89 and to trap sediment from the upper watershed. Using samples collected during the winter and spring of 1995, it was estimated that the gravel pit reduced the sediment load reaching the Bear River by 58% while the phosphorus load increased by 37%. Livestock grazing management was also modified through the 1996 Cumberland/Uinta Allotment Operating Plan and the 2000 Cumberland/Uinta Allotment Cooperative Management Plan to enhance riparian vegetation and improve streambank stability. Greenline studies conducted by the BLM in 2008-09 indicated that the riparian community may be improving in condition; however, other physical indicators, such as those associated with water temperature and channel morphology are still unknown. In addition, sediment data collected before and after BMPs were implemented are largely lacking within the Bridger Creek watershed and on the Bear River above and below the confluence with Bridger Creek.

Central Bear River Sub-basin (HUC 16010102)

This sub-basin contains those waters in the Bear River Basin below Twin Creek, including those in the Smiths Fork and upper Salt Creek/Thomas Fork drainages. Land uses include historic phosphate mining, grazing, irrigated agriculture in the lowlands, wildlife habitat and recreation on [Bridger-Teton National Forest] and BLM lands. Cokeville Meadows National Wildlife Refuge was established in 1993, combining wetland and upland habitats along the Bear River south of Cokeville.



Primary land use along the main stem of Smiths Fork are irrigated pasture and hay production, recreation, seasonal grazing and some logging in the upper portions of the drainage. Channelization and willow removal, which were practices intended to increase crop production during the mid 1900s, have reportedly caused accelerated bank erosion and stream widening along much of the lower Smiths Fork. A Smiths Fork Steering Committee has been formed to improve water quality by increasing bank stability and wildlife habitat by modifying grazing practices and using controlled burns. Considerable acreage along the Smiths Fork has been incorporated into the NRCS's CRP riparian forest buffer program. The USFS' Smithfork Grazing Allotment is a 90,937-acre cattle and sheep grazing allotment located northeast of Cokeville. A major management concern on this allotment is the condition of riparian areas, upland springs and seeps due to past grazing and other activities; including the chemical spraying of vegetation, which eliminated most of the willows in the late 60's and early 70's, and numerous sheep to cattle conversions. With season-long grazing and a lack of upland water resources, livestock tend to concentrate in riparian areas for most of the growing season. Proper Functioning Condition (PFC) inventory data collected by the BLM indicate that most of the streams within the allotment are "functioning at risk", which means the riparian-wetland areas are functional, but susceptible to degradation. The BLM released the Smithfork Allotment Management Plan in March 2005. The plan provided grazing management strategies that are expected to improve riparian vegetation along stream corridors and upland spring sites, which may improve water quality in the Smiths and Thomas Fork Watersheds (BLM, 2005). Water quality assessments conducted by WDEQ (2002) on Coantag and Hobble Creeks and in the Smiths Fork drainage above North Smiths Fork indicate they fully support their aquatic life other than fish uses.

Land within the Salt Creek watershed near Idaho is managed primarily for recreation and grazing. Sediment and nutrients have been identified as possible water quality concerns in portions of this drainage, both in Idaho and Wyoming (ERI, 1992). Some reaches of Salt Creek have unstable banks due to naturally unstable geology and channel confinement imposed by the construction of a highway within the valley. A WDEQ (2005) study of Salt Creek indicated that riparian conditions are improving and that a fairly healthy macroinvertebrate community is present, but it is unclear whether the stream supports its cold water fisheries use during summer months. WGFD and BLM have completed several riparian improvement projects in the Coal and Little Muddy Creek watersheds to enhance Bonneville cutthroat trout populations. A WDEQ assessment of Giraffe Creek (WDEQ, 2001), a tributary to Salt Creek, indicates full support of the aquatic life other than fish designated use.

8.2 Belle Fourche River Basin

Primary land uses in the Belle Fourche River Basin are livestock grazing, hay production and mineral extraction. Mineral extraction includes rare earth, bentonite and coal mining, and oil, gas and CBM development. Rare earth mineral exploration and mining has significantly increased within the Black Hills National Forest in recent years. The USFS has suggested that these activities have the potential to significantly affect water quality in the Belle Fourche River watershed. There are two distinct topographic regions in this basin, the rolling plains of the Powder River geologic basin in the west and the Black Hills uplift in the east. Most streams originating in the plains are naturally intermittent; however, discharges from coal mines, CBM production, and the City of Gillette provide perennial flow to Donkey Creek, portions of the Belle Fourche River and several other plains streams.

The Belle Fourche River headwaters originate in the plains south of Gillette. The river flows northeast past the Bearlodge Mountains, where it then turns to the southeast and flows into South Dakota. Below Keyhole Reservoir, the Belle Fourche River has perennial flow due to reservoir releases and perennial tributaries originating in the Black Hills. Keyhole Reservoir (193,753 acre-feet) is located on the Belle Fourche River about 17 miles northeast of Moorcroft. The reservoir is operated by the Bureau of Reclamation (USBOR) and was initially built in the 1950s to provide a supplemental water supply to the Belle Fourche Reservoir in South Dakota and for flood control. The water in the reservoir is allocated 10% to Wyoming users and 90% to South Dakota users, subject to prior rights (Hoyer and Larson, 2005). The Belle Fourche River Compact of 1943 regulates water rights in the Belle Fourche River Basin.

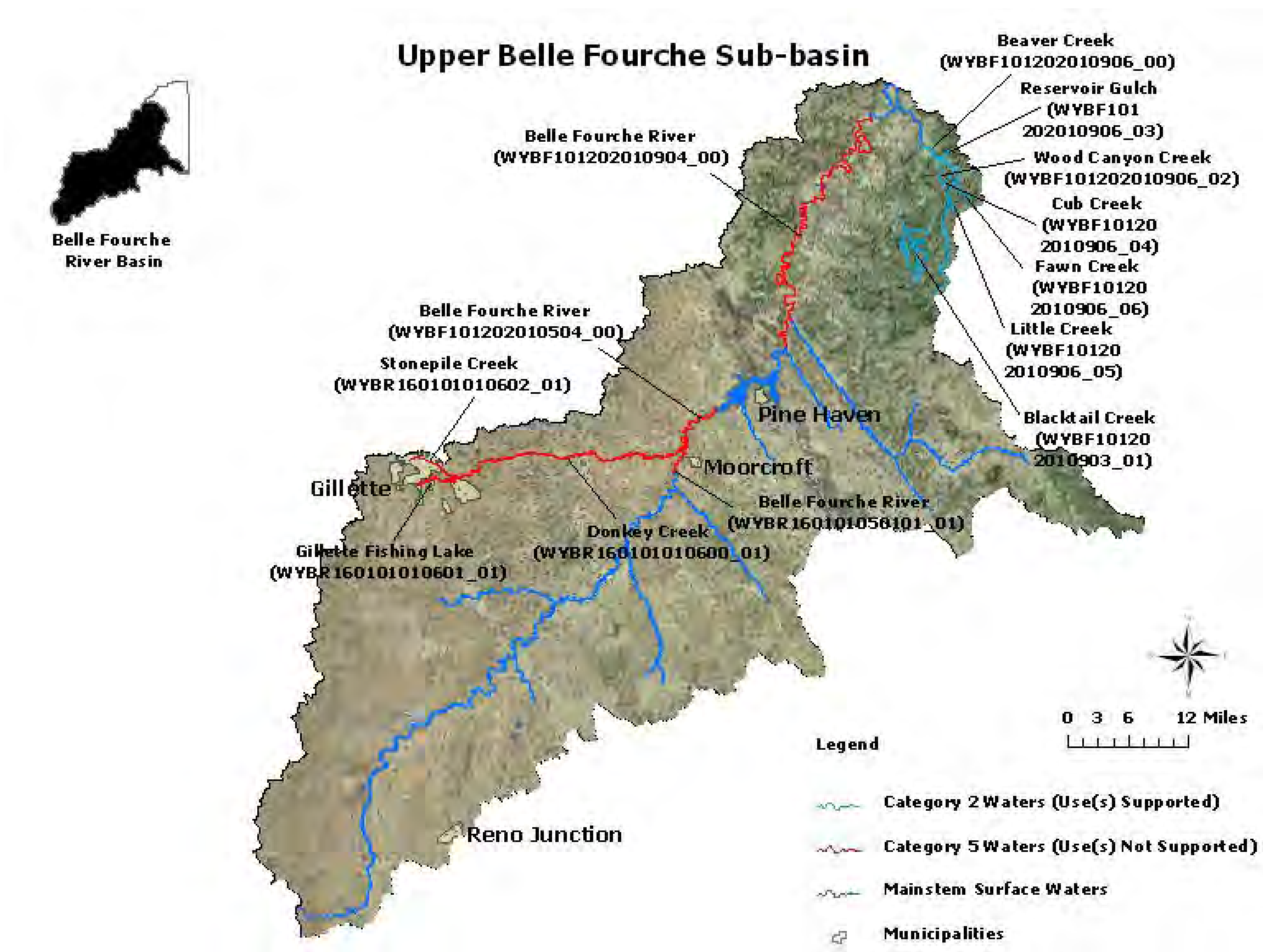
South Dakota's 2008 303(d) List included the Belle Fourche River from the Wyoming/South Dakota state line downstream to Fruitdale, South Dakota for fecal bacteria and total suspended solids (TSS). SDDENR completed a TMDL for TSS on the Belle Fourche River in early 2005 (Hoyer and Larson, 2005), which may have implications within Wyoming. The TMDL concluded that the most significant source of sediment in the river is likely from stream incision and bank failure. The study also indicated that releases of water from Keyhole Reservoir for irrigation, and the initiation of the Belle Fourche Irrigation District, have significantly increased TSS and specific conductivity in South Dakota. SDDENR has also completed a TMDL for fecal coliform (Foreman, 2007) that estimates a 46% reduction in fecal coliform bacteria would be necessary to bring the river into compliance with South Dakota's water quality standard. Bacterial source tracking used in the study provided no direct evidence that humans, livestock, or wildlife are fecal coliform sources for this segment of the Belle Fourche River. Bacterial concentrations were the highest during runoff events and water releases from Keyhole Reservoir, indicating that contamination may be occurring via overland flow and through re-suspension of reservoir sediments. CCNRD completed a watershed plan for the Belle Fourche River in 2005. The plan will likely be updated following completion of the Belle Fourche River TMDL.

Upper Belle Fourche Sub-basin (HUC 10120201)

The Upper Belle Fourche sub-basin includes those waters upstream of the confluence of Beaver Creek with the Belle Fourche River. Coal and CBM development are important land uses in the western portion of the sub-basin, while logging, wildlife habitat and recreation are common in the Black Hills to the east. Livestock grazing and hay production are common land uses throughout this sub-basin.

Gillette is the fourth largest community in Wyoming and lies at the headwaters of the Donkey Creek drainage. Monitoring by WDEQ (2000) and Campbell County Conservation District (CCCD) indicate that the contact recreational use of Donkey Creek is impaired due to exceedances of the fecal bacteria criterion, from the confluence with the Belle Fourche River upstream 61.4 miles to Brorby Boulevard within the City of Gillette. Stonepile Creek, a tributary to Donkey Creek, is also on the 303(d) List for not supporting its contact recreation uses. Data from the 2008 Little Powder River and Belle Fourche Drainages Watershed Implementation Section 319 Project show that this impairment extends from the confluence with Donkey Creek upstream to the junction of Highways 14/16 and 59. The plan will likely be updated following completion of the Belle Fourche River TMDL. Implementation strategies will focus on septic system improvements, education of urban and rural residents, urban sewage treatment, storm water runoff, solid waste management, small acreage land use management, and rural development issues. CCCD completed a Section 319 project in 2010, which included data spanning 2007-2009. These data indicated that *E. coli* concentrations at nearly all sampling sites along the currently listed segments of Stonepile and Donkey Creeks exceeded the state's primary recreational use criterion. The study also found elevated chloride and ammonia concentrations in both creeks, but because neither is classified as a fishery, the state's aquatic life acute and chronic chloride standards do not apply. CCNRD also completed a Section 319 project in 2010 for the upper Belle Fourche River Watershed, which included data spanning 2005-2009. Multiple *E. coli* samples during the sampling period showed that Donkey Creek exceeds the primary contact recreational use criterion from the confluence with the Belle Fourche River upstream to the Campbell County line. Escherichia coli samples were also collected from the Belle Fourche River from the Campbell County line to below the outfall of the Hulett WWTF that showed exceedances of the primary contact recreational use criterion. The study reported no chloride concentrations exceeding of the chronic Aquatic Life other than Fish criterion on the Belle Fourche River. However, USGS data indicate that exceedances of the chronic chloride criterion continue to occur.

Gillette Fishing Lake is currently on the 303(d) List for sediment and phosphate impairments. The source of these pollutants was investigated by CCCD using Section 205j funding, and data suggested that stormwater from the City of Gillette was the primary source. CCCD, in cooperation with the City of Gillette, has developed a Water Quality Improvement Plan to address these two impairments (WACD, 2005). Corrective actions by the City of Gillette included the installation of stormceptors and plans to build a wetland, both of which are expected to remove sediment and phosphorus from stormwater. There are also plans to dredge the lake to remove sediment and to install bank stabilization structures (WACD, 2002). The City of Gillette has received funding from the Wyoming Wildlife and Natural Resource Trust to help offset the costs of upgrading the Gillette Fishing Lake. These funds were utilized to purchase three floating islands that may mitigate nutrient concentrations within the Lake. The City of Gillette has agreed to manage the TMDLs for the sediment and phosphate impairments on Gillette Fishing Lake. The TMDLs, which were initiated in 2008, were recently delayed to allow a UAA submitted by the


Upper Belle Fourche Sub-basin
Belle Fourche River Basin
Beaver Creek (WYBF101202010906_00)
Reservoir Gulch (WYBF101 202010906_03)
Wood Canyon Creek (WYBF101202010906_02)
Cub Creek (WYBF10120 2010906_04)
Fawn Creek (WYBF10120 2010906_06)
Little Creek (WYBF10120 2010906_05)
Blacktail Creek (WYBF10120 2010903_01)
Belle Fourche River (WYBF101202010904_00)
Belle Fourche River (WYBF101202010504_00)
Stonepile Creek (WYBR160101010602_01)
Belle Fourche River (WYBR160101058101_01)
Donkey Creek (WYBR160101010600_01)
Gillette Fishing Lake (WYBR160101010601_01)
Pine Haven
Moorcroft
Gillette
Reno Junction
0 3 6 12 Miles
Legend
Category 2 Waters (Use(s) Supported)
Category 5 Waters (Use(s) Not Supported)
Mainstem Surface Waters
Municipalities

City of Gillette to be reviewed. The UAA was approved by WDEQ and USEPA in 2011, changing the classification of Gillette Fishing Lake from a cold water game fishery (2AB) to a warm water game fishery (2ABww). This classification change may affect the allowable pollutant loads associated with these TMDLs.

WDEQ currently identifies three segments of the Belle Fourche River as having impaired contact recreation uses (WDEQ 2004a, 2004b): from the confluence with Donkey Creek upstream 5.4 miles, from Arch Creek downstream to Sourdough Creek and from Keyhole Reservoir upstream to the confluence with Donkey Creek. USGS data (2006-2008) have shown high *E. coli* counts in the Belle Fourche River near Moorcroft. Crook County Natural Resource District (CCNRD) has conducted monitoring, implemented septic and animal feeding operation projects and has developed a watershed plan to address these impairments. Monitoring by USGS, as recently as 2009-2010, has indicated that the Belle Fourche River below Donkey Creek frequently exceeded WDEQ's aquatic life other than fish acute chloride criterion and that the concentration of ammonia occasionally exceeds the acute criterion protective of fisheries uses. Therefore, these pollutants were added to the 2008 303(d) List for the Belle Fourche River between Keyhole Reservoir and Donkey Creek. Seven TMDLs were initiated in 2009 for the upper Belle Fourche watershed 303(d) Listings. These include three for bacterial impairments on the Belle Fourche River, one each for the ammonia and chloride impairments on the Belle Fourche River and fecal coliform listings on Donkey and Stonepile Creeks.

Monitoring conducted by WDEQ (2004) indicated full support of cold water fishery and aquatic life uses in Blacktail Creek within Black Hills National Forest. Historic grazing practices and flow regulation from Cook Lake caused channel widening and elevated water temperatures in Beaver Creek. The system has since stabilized and WDEQ (2004) monitoring indicates that Beaver Creek and tributaries including Wood Canyon, Reservoir Gulch, Fawn Creek, Little Creek and Cub Creek are fully supportive of their aquatic life other than fish uses.

Lower Belle Fourche Sub-basin (HUC 10120202)

The Lower Belle Fourche Sub-basin includes the drainages that confluence with the Belle Fourche River between Beaver Creek and Redwater Creek. Logging, grazing, irrigated hay and small grain production, recreation, wildlife habitat and bentonite mining are primary land uses. It is currently unknown whether the contact recreation impairments that occur in the Upper Belle Fourche Sub-basin continue downstream into this sub-basin. While *E. coli* data collected along the Belle Fourche River by CCNRD in 2003 and 2004 (EDE, 2005) showed individual sample concentrations as high as 2,419 CFU/100 mL, 30-day geometric means, using a minimum of 5 samples, were all lower than WDEQ's 126 CFU/100 mL criterion protective of primary contact recreation. Foreman (2007) reported that 9 of 16 individual samples collected in South Dakota during 2004 and 2005 exceeded SDDENR's 400 CFU/100 mL single sample maximum criterion for fecal coliform bacteria, but insufficient samples were collected to determine a 30-day geometric mean using 5 individual samples, which is required for use support determinations.

Redwater Sub-basin (HUC 10120203)

The Redwater Sub-basin drains the eastern slope of the Bear Lodge Mountains and confluences with the Belle Fourche River in South Dakota. Logging, recreation, wildlife habitat, and hay and livestock production are the primary land uses. Springs originating at Ranch A discharge thousands of gallons of water per minute to Sand Creek, which is protected as a Class 1 water. The stream below the ranch is considered a high quality trout fishery by WGFD, and WDEQ data indicates that the creek a few miles below the springs is likely supporting its aquatic life other than fish and cold water fisheries uses.

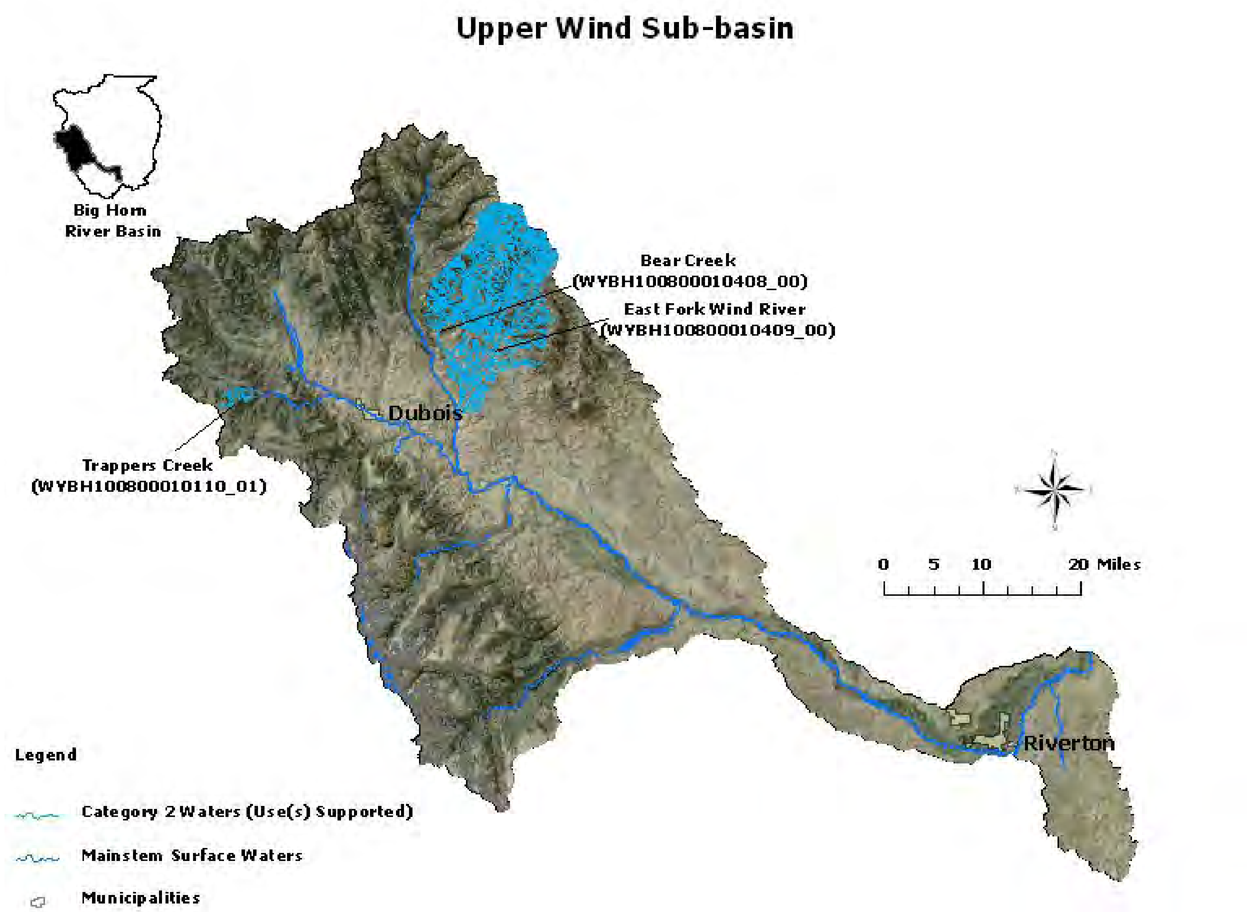
8.3 Big Horn River Basin

The Big Horn River Basin is bordered by the Absaroka Range to the west, the Wind River, Beaver Rim and Bridger Mountains to the south and the Bighorn Mountains to the east. Water quality is generally good within these mountain ranges (Ferguson, 2007), but gradually degrades as streams flow across the lower basin to the Bighorn River because of natural erosional processes that increase sediment and TDS loads. Accelerated erosion, irrigated agricultural runoff, discharge from oil and gas development and other human activities may also degrade water quality (USGS, 1956; USGS, 1999). Streams of the Absaroka Range carry very high natural sediment loads due to the easily erodible volcanic geology and the steep slopes associated with these geologically young mountains. Most of the lower portions of the Bighorn Basin have thin soils derived from highly erodible, saline, alkaline and/or phosphate-rich geologic materials. Much of the precipitation in the lower elevation portions of this arid basin comes from thunderstorms, and these events often cause flash flooding and severe erosion of the sparsely-vegetated soils. The Bighorn River carries a naturally high sediment load, but human activities have likely also elevated this pollutant. Anthropogenic impacts, thought to date to the 1880s, have affected sediment transport in some of the lower elevation portions of the basin. Historic livestock grazing practices (long term/high density grazing) removed the existing grasses and began a cycle of intense runoff and gullying that exacerbated naturally unstable conditions (Marston and Anderson, 1991). Wohl et. al. (2007) reported that many streams within the Bighorn Mountains and surrounding lowlands have been substantially impacted by cattle grazing, irrigated crop production, flow regulation and diversion, and timber harvest." The construction of dams and other activities have altered the natural flow regime of the basin and have also played a part in erosion (USGS, 1956; Bray, 1996).

Livestock grazing and irrigated hay production are currently the primary land uses in the basin. Large areas of the lower basin are also irrigated to produce a variety of crops and small grains. Oil and natural gas are the basin's primary natural resources, but bentonite, gypsum, and sand and gravel are mined in some areas as well. Recreation is an important land use in most of the basin, and some logging occurs at higher elevations. Portions of the Upper Wind River and Little Wind River Sub-basins are within the Wind River Indian Reservation and are not monitored by WDEQ.

Upper Wind Sub-basin (HUC 10080001)

The Upper Wind Sub-basin contains the headwaters of the Wind River, which flow into Boysen Reservoir. Primary land uses in the upper watershed are recreation, livestock grazing, wildlife habitat and timber production. Grazing, oil and gas production and irrigated agriculture are primary land uses in the lower watershed. *E. coli* sampling in the Wind River by WDEQ above the Wind River Reservation boundary indicates that pathogens are a concern. The Dubois Crowheart Conservation District (DCCD) collected chemical, biological and physical data at several sites along the Upper Wind River and its tributaries, and completed a provisional report in 2004 (DCCD, 2004). Habitat degradation has been documented by USFS within the Shoshone National Forest on West Brooks Lake Creek, a small tributary to Brooks Lake. Grazing management in the area has recently been changed, and monitoring by WDEQ and the USFS occurred in 2011 to document any improvements and refine the use support status of this stream. USFS and WDEQ have also monitored the Wind River (WDEQ, 2003) and Warm Springs Creek (WDEQ, 2003), but aquatic life use support for both remains inconclusive. WDEQ (2004) and USFS monitoring of Trappers Creek, a tributary to Warm Springs Creek, indicates full support of aquatic life and cold water fisheries uses. A watershed assessment by the USFS in 2008 concluded that Trappers Creek was recovering more rapidly than expected from past sedimentation problems. USFS monitoring indicates that the East Fork of the Wind River above Wiggins Fork and a tributary, Bear Creek, fully support their aquatic life uses. The USFS has stabilized stream banks along the Wind River near the Tie Hack Memorial and has worked with the grazing permittee to improve habitat and stream function.



Streambank stabilization and re-vegetation to control erosion and improve fish habitat in the Horse Creek drainage continues to be a successful cooperative effort between the USFS and WGFD. WDEQ and USFS data indicate that portions of Horse Creek are in good physical condition, but further monitoring is needed to determine use support. Provisional data collected by DCCD indicates that pathogens may be a concern in the lower watershed.

Little Wind Sub-basin (HUC 10080002)

The Little Wind Sub-basin includes several watersheds that confluence with the Little Wind River near Riverton. Primary land uses are grazing, irrigated agriculture and oil and gas production.

There have historically been concerns with physical degradation along Beaver Creek, but BLM data shows that conditions are generally improving. WDEQ (2004) monitoring of Little Beaver Creek indicated that aquatic life other than fish and cold water fisheries uses are supported; however, there was also evidence of heavy livestock grazing and erosion. WDEQ (2010) assessed the mainstem of Beaver Creek from its confluence with Little Beaver Creek upstream to its headwaters and found that while low dissolved oxygen concentrations at several study reaches were a concern, aquatic life other than fish and cold water fishery uses were fully supported.

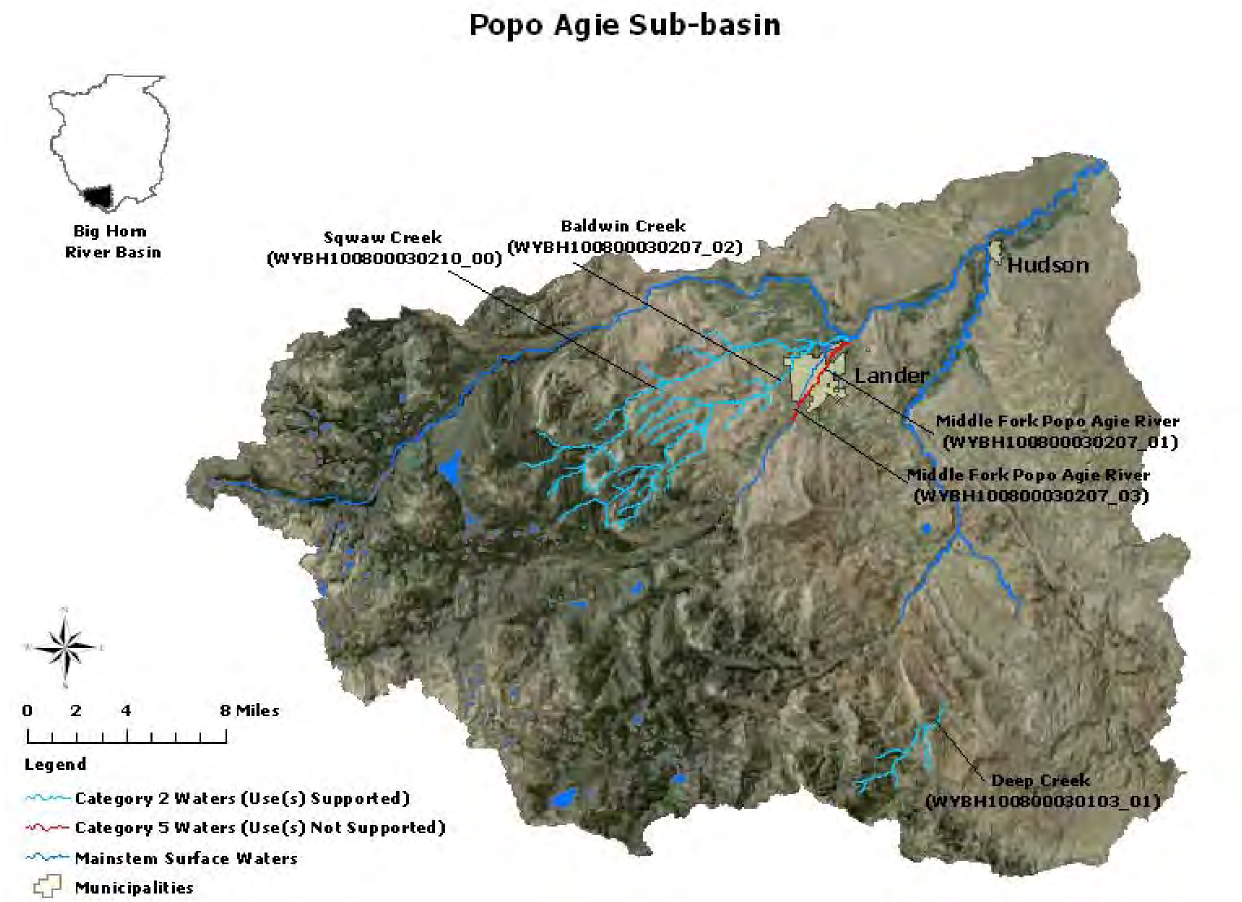
Popo Agie Sub-basin (HUC 10080003)

Popo Agie Conservation District (PACD) monitored 19 sites in the sub-basin from 1999-2002 to assist with watershed planning efforts, provide baseline data and to monitor trends in condition (PACD, 2001; WACD, 2004; PACD, 2005).

The headwaters of the Popo Agie Sub-basin are within the Shoshone National Forest. In the upper watershed, recreation and livestock grazing are the primary land uses, while irrigated agriculture and residential development are the primary land uses in the Lander area. The Middle Fork of the Popo Agie River near Lander was placed on the 303(d) List in 2002 for not supporting its contact recreational use due to exceedances of the fecal coliform criterion. The Popo Agie Conservation District (PACD) has developed a WDEQ approved watershed plan that includes monitoring to identify sources of fecal contamination. PACD sponsored a 2006 Section 319 watershed improvement project that funded the remediation of eligible septic systems in the watershed, implemented several agricultural BMPs and supported source identification and BMP effectiveness monitoring in the watershed.

A previous Section 319 watershed improvement project sponsored by PACD in the Squaw and Baldwin Creek drainages was successful in rehabilitating previous physical degradation to these streams, and data suggest that these streams are now supporting their aquatic life other than fish uses. Data indicate that Deep Creek, a tributary to Red Canyon Creek, also supports its aquatic life other than fish use.

Habitat degradation has been identified by WDEQ as a concern on portions of Twin Creek below Highway 287. A WDEQ monitoring report for the Twin Creek watershed is expected to be completed in 2012.



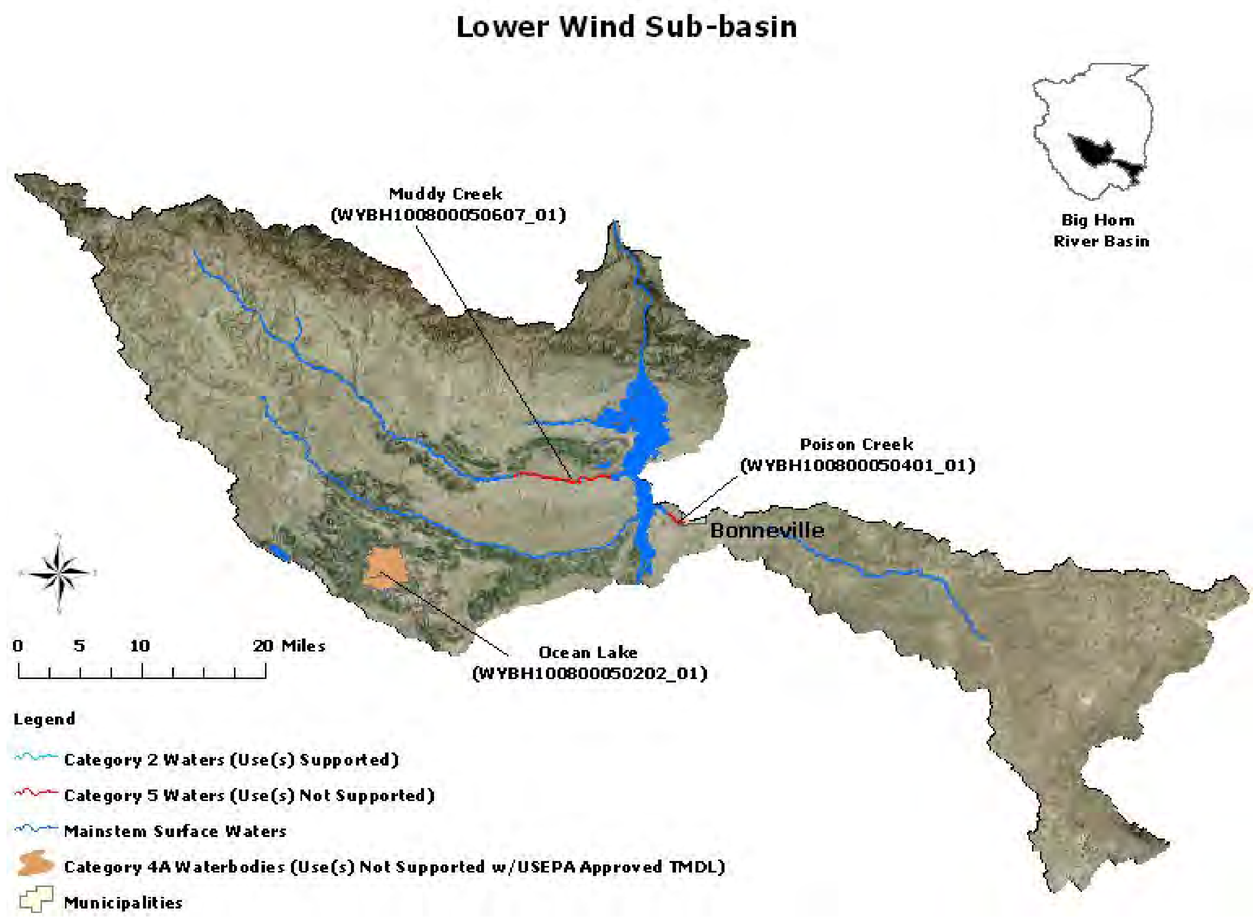
Muskrat Creek Sub-basin (HUC 10080004)

The Muskrat Creek Sub-basin is in the Gas Hills area east of Riverton. Primary land uses are livestock grazing, oil and gas production and uranium production. Since 1990, AML has remediated five former uranium mines. WDEQ visited Muskrat Creek in 1999 and found no stream flow in the creek. The Lower Wind River Conservation District (LWRCD) has established a monitoring site on Muskrat Creek near its confluence with the Wind River as part of a 2004 Section 319 project. However, the lack of flow in this watershed has prevented the collection of credible water quality data.

Lower Wind Sub-basin (HUC 10080005)

Primary land uses are grazing, irrigated agriculture and oil and gas production.

USGS and LWRCD data, collected as part of a Section 319 project, indicated that Poison and Muddy Creeks, both tributaries to Boysen Reservoir are not fully supporting their contact recreation uses and were added to the 303(d) List in 2002; Muddy Creek is impaired from the confluence with Boysen



Reservoir upstream to the Wind River Indian Reservation, and Poison Creek is impaired from the confluence with Boysen Reservoir upstream 2.1 miles.

Ocean Lake is very shallow and wave action frequently re-suspends sediment. The suspended sediment significantly reduces light penetration, limiting the growth of aquatic plants that would otherwise stabilize the deposited sediment and improve water quality. Ocean Lake was placed on the 303(d) List in 1996 for not supporting its aquatic life uses due to physical degradation from excessive sedimentation. There is also high nutrient loading to the lake. A watershed improvement project completed by the LWRCD has substantially reduced sediment loading to the lake. Monitoring conducted on Ocean Lake by WDEQ (2005) and WGFD has shown that most of the irrigation drains involved in the project have reduced sediment loads, but there are still areas contributing high loads. The LWRCD sponsored the formation of the Ocean Lake Watershed Steering Committee in 2005 to address anthropogenic water quality issues, and a watershed plan was approved by WDEQ in 2009. A TMDL for Ocean Lake was approved by USEPA in December of 2009.

Badwater Creek Sub-basin (HUC 10080006)

The Badwater Creek Sub-basin is located on the northeast side of Boysen Reservoir. Land uses are primarily livestock grazing and oil and gas production in the Lysite/Lost Cabin area. LWRCD has established a monitoring site on Badwater Creek near its confluence with Boysen Reservoir as part of a Section 319 project, but the lack of flow in this watershed has resulted in limited credible data. USGS data suggest that this watershed transports large sediment load to Boysen Reservoir during runoff.

Upper Big Horn Sub-basin (HUC 10080007)

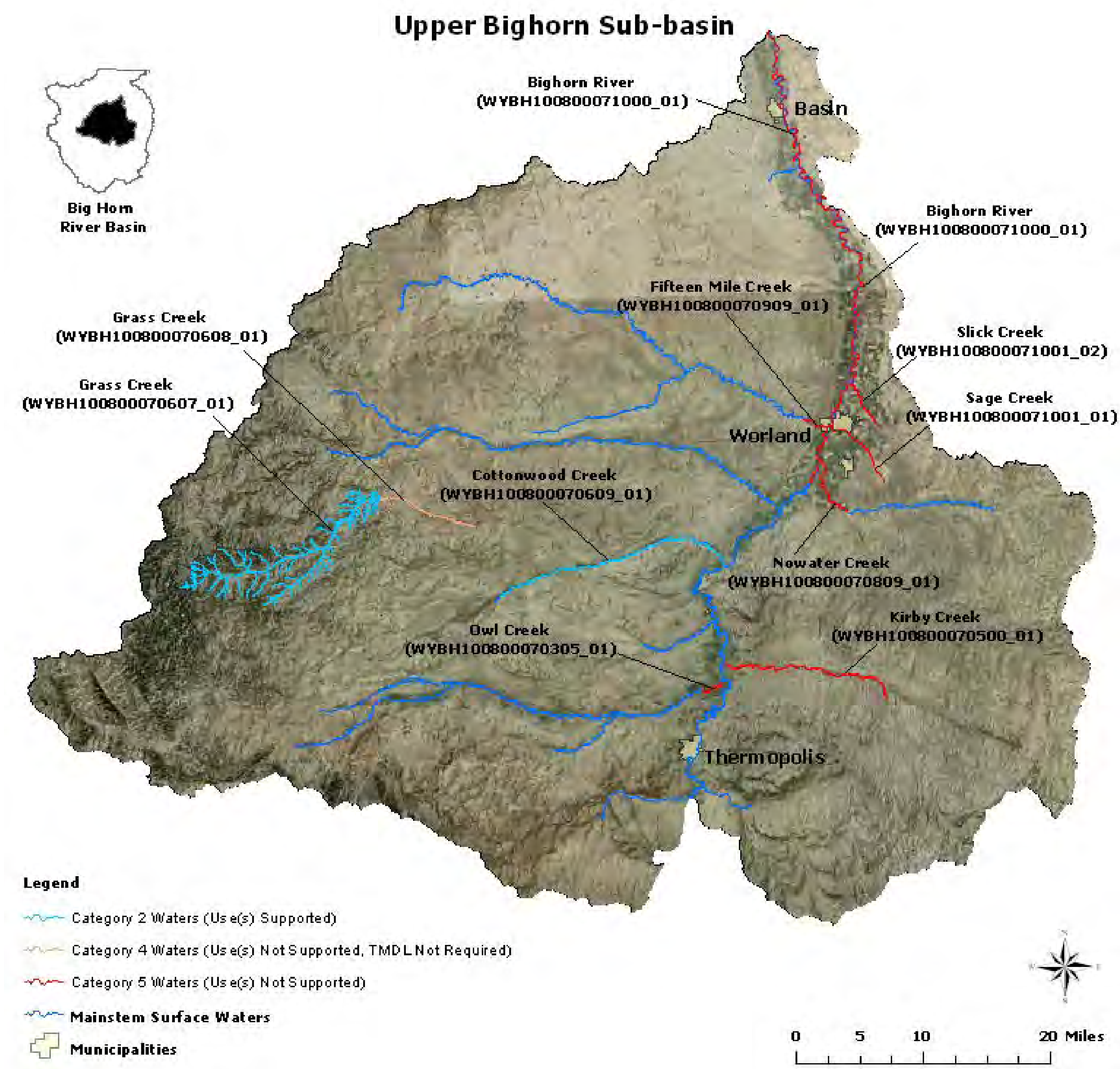
The headwaters of the Upper Bighorn Sub-basin are in the southern end of the Absaroka Range and the Owl Creek and Bridger Mountains. Grazing, irrigated agriculture, and oil and gas extraction are the primary land uses, but several hundred acres in the Owl Creek and Kirby Creek drainages have been mined for bentonite. Thermopolis Hot Springs contribute naturally high TDS and water temperatures to the Bighorn River (Darton, 1906). Numerous watershed studies have focused on the Fifteen Mile Creek drainage since the 1960s, which provide perspectives on the potential natural vegetation and the effects stream morphology changes and different grazing strategies.

The Bighorn River near Basin was placed on the 303(d) List in 2000 for exceedances of the fecal coliform criterion from below the Greybull River upstream to the Nowood River. USGS data collected during 2007-2008 also showed high levels of *E. coli* bacteria in the Bighorn River near Basin. Washakie County Conservation District (WCCD) has completed and implemented a WDEQ approved watershed plan for this watershed. WCCD plans to update this plan following the completion of the Big Horn River and Greybull TMDLs.

Alkali and Buffalo Creeks were visited by WDEQ between 2001 and 2004 but were dry. Owl, Lake, Red Canyon, and Kirby Creeks were also investigated during the same period, but data have yet to be summarized. Red Canyon and Owl Creeks flow through fine grained sandstone, siltstone and shales. Red Canyon Creek drains a watershed of easily eroded red soils developed from fine-grained red sandstone, siltstone and shale. The relative influence of natural versus anthropogenic activities on sedimentation has not been determined. In Owl Creek, sodium and sulfates, together with silt and clay, naturally affect water quality (Ogle, 1992). In 1995, AML reclaimed a historic sulfur mine which had been affecting water quality in the Owl Creek watershed. Owl Creek was listed in 2002 as threatened for not supporting its contact recreation use based on fecal bacteria data from WDEQ and USGS. Hot Springs Conservation District (HSCD) has sponsored the formation of the Owl Creek Watershed Planning Committee and has been monitoring *E. coli* levels in the creek. The committee finalized a watershed plan in 2006 and is implementing several BMPs as part of the plan (WACD, 2007).

Extensive erosion has occurred in the Kirby Creek drainage due to a combination of channel manipulation, historic overgrazing, and flow regime changes in the Bighorn River (Hurley, 2003; Bray, 1996). A USGS (2003) synoptic study found that *E. coli* counts exceeded 500 cfu/100mL at three locations along the creek. HSCD sponsored a Section 205j water quality assessment for the drainage, which was submitted to WDEQ (Hurley, 2003). The report further identified fecal bacteria as a problem in Kirby Creek, and the stream was placed on the 303(d) List in 2002. Section 319 funding is currently being used for two projects in the Kirby Creek watershed. One project, administered by the Coordinated Resource Management (CRM) group, aims to address the recreation impairment, while the other project, coordinated by the Kirby Creek steering committee (sponsored by the HSCD), will address additional water quality concerns. Structures have been installed in much of West Kirby Creek to stabilize banks and allow the stream to access its flood plain. BLM, CRM and HSCD have conducted several watershed improvement projects; including healthy rangeland assessments, removal and reclamation of abandoned oil wells and installation of riparian fencing. A formal commitment from HSCD to develop a watershed plan for Kirby Creek was received by WDEQ in 2006, and a Kirby Creek/Buffalo Creek Watershed Plan was approved in 2009.

The goals of the 2008 Kirby Creek Stan's Folly Stabilization Section 319 Project were to provide information for future project development directed at reducing sedimentation and *E. coli* loading in the watershed. The project provided a map of the physical profile of Kirby Creek for 4 miles in the Stan's Folly area. Several sites throughout the watershed were also monitored for various physical-chemical parameters, discharge and *E. coli*. A Use Attainability Analysis (UAA) to change the classification of Kirby



Creek from primary to secondary recreational use was submitted to WDEQ by HSCD in 2007 and is currently in review.

Cottonwood Creek receives discharges from the Hamilton Dome Oil Field, resulting in high concentrations of both chloride and selenium. However, because the discharge water from the oil field is used for irrigation and the oil field is an important part of the local economy, site specific criteria of 43 ug/L for selenium and 860 mg/L for chloride were adopted as part of a UAA for Cottonwood Creek that was approved by USEPA in 2008. WDEQ (2003, 2005) monitoring indicates that the aquatic life other than fish use is not supported in the upper Grass Creek watershed, a tributary to Cottonwood Creek. However, because this reach is impacted by flow alterations rather than a pollutant, it does not require a TMDL and has been placed in Category 4C.

USGS data indicate that occasional high counts of *E. coli* threaten the contact recreation use of Nowater, Sage, Fifteen Mile and Slick Creeks, and each stream was added to the 303(d) List in 2002. WCCD has a Section 319 project to improve AFO and septic systems and to conduct *E. coli* monitoring, and has completed a watershed plan. For the 2010 303(d) List, the status of the Bighorn River above Nowood River, and Fifteen Mile, Nowater, Sage and Slick Creeks were changed from threatened to not supporting their recreational uses after high levels of *E. coli* were again reported by WCCD in a 2009 Section 319 Report. In 2009, WCCD submitted Use Attainability Analyses (UAAs) for Fifteen Mile and Nowater Creeks to change the recreational use designation from primary to secondary. WDEQ has decided to delay the processing of all recreational use UAAs during the development of WDEQ's statewide recreational use UAA. WCCD (1999) monitoring of Nowater, Gooseberry, Cottonwood and Fifteen Mile Creeks was insufficient to make aquatic life other than fish use support determinations.

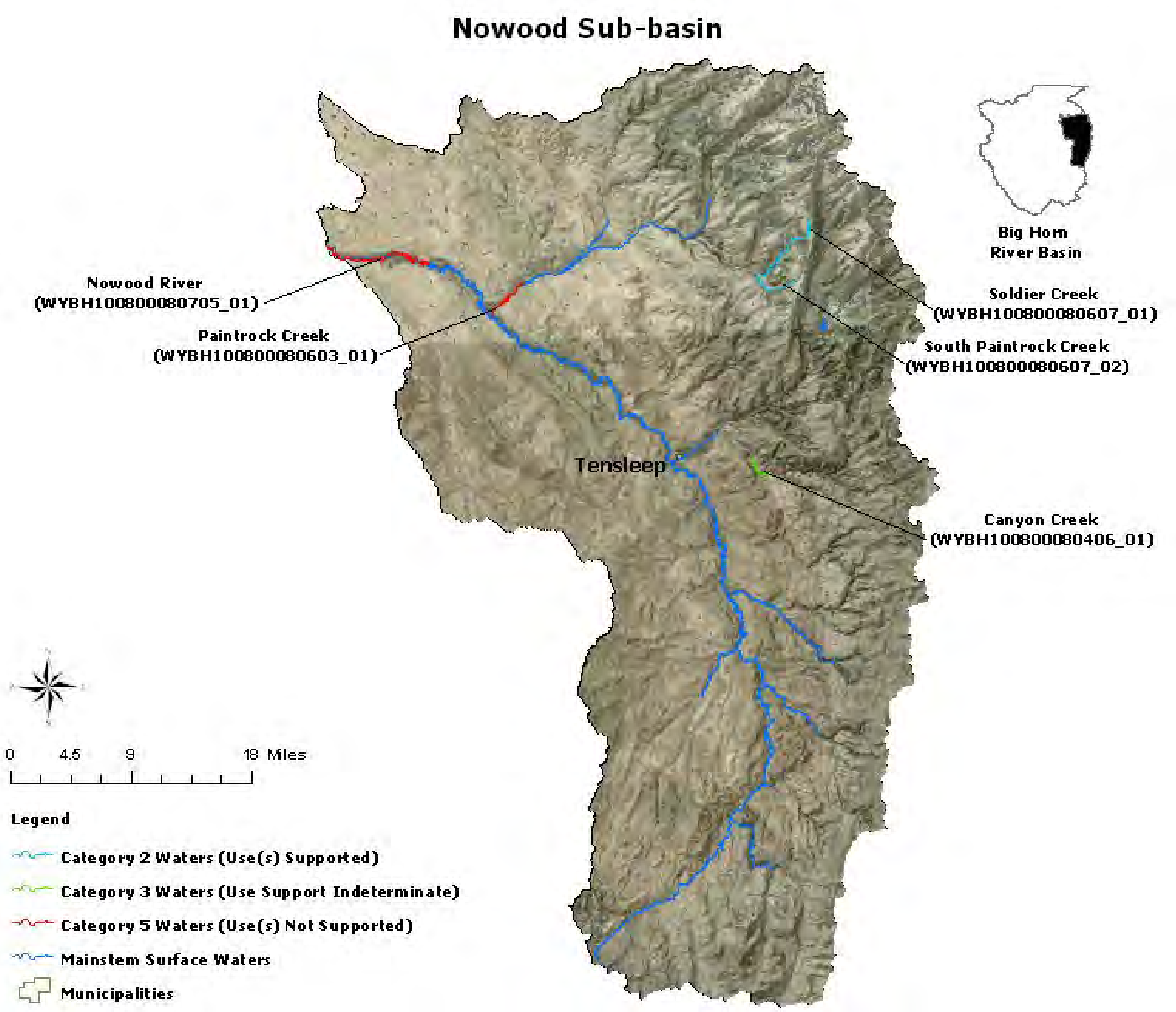
TMDLs are anticipated in July 2012 for the bacterial listings on Owl Creek, Kirby Creek, Nowater Creek, Fifteen Mile Creek, two segments of the Bighorn River, Sage Creek and Slick Creek.

Nowood Sub-basin (HUC 10080008)

The headwaters of the Nowood Sub-basin are on the southwestern edge of the Big Horn Mountains. Livestock grazing is the major land uses in the higher elevations, while in the lower elevations, irrigated agriculture is the primary land use and the largest consumptive water use. Bentonite is mined in Wild Horse Draw.

Fecal bacteria samples collected by WDEQ (2002) from the Nowood River indicate an exceedance of the contact recreation criterion from the confluence with the Bighorn River upstream an undetermined distance. As a result, the Nowood River was placed on the 303(d) List in 2002. Several homes and businesses in the town of Manderson have historically discharged largely untreated wastewater into the Nowood River, in an area just upstream from the Bighorn River. The town secured funding for a new mechanical wastewater treatment system which contains a microbe filter. Wastewater is first re-circulated through these filters to reduce nitrogen and total suspended solids and then exposed to UV treatment before being discharged. Reports indicate that the system is now operating properly, but potential effects on *E. coli* levels in the Nowood River are unknown. WCCD monitored the Nowood River and Buffalo and Otter Creeks in 1999 to determine aquatic life other than fish use support. The data were submitted to WDEQ for review, but were insufficient to make use support determinations. Additional monitoring by WCCD occurred in 2006 and 2007. Paintrock Creek, a tributary to the Nowood River, was added to the 303(d) List in 2002 because WDEQ data indicated that the contact recreational use is threatened by occasional high counts of fecal bacteria. The South Big Horn Conservation District (SBHCD) has a Section 319 grant and has collected samples on Paintrock Creek; however, data were not available for this report. A Watershed Plan has been approved by WDEQ and implementation efforts are underway on Paintrock Creek and the Nowood River (WACD, 2005). WDEQ (2010) monitored and assessed South Paintrock Creek near its confluence with Soldier Creek and found that drinking water and fish consumption uses were fully supported, while all other uses were indeterminate. The aquatic life other than fish and cold water fisheries uses have been difficult to assess because of the small size of the watershed, which is outside the experience of WDEQ's macroinvertebrate models. TMDLs are scheduled to be completed in July 2012 for the fecal coliform listings on the Nowood River and Paint Rock Creek.

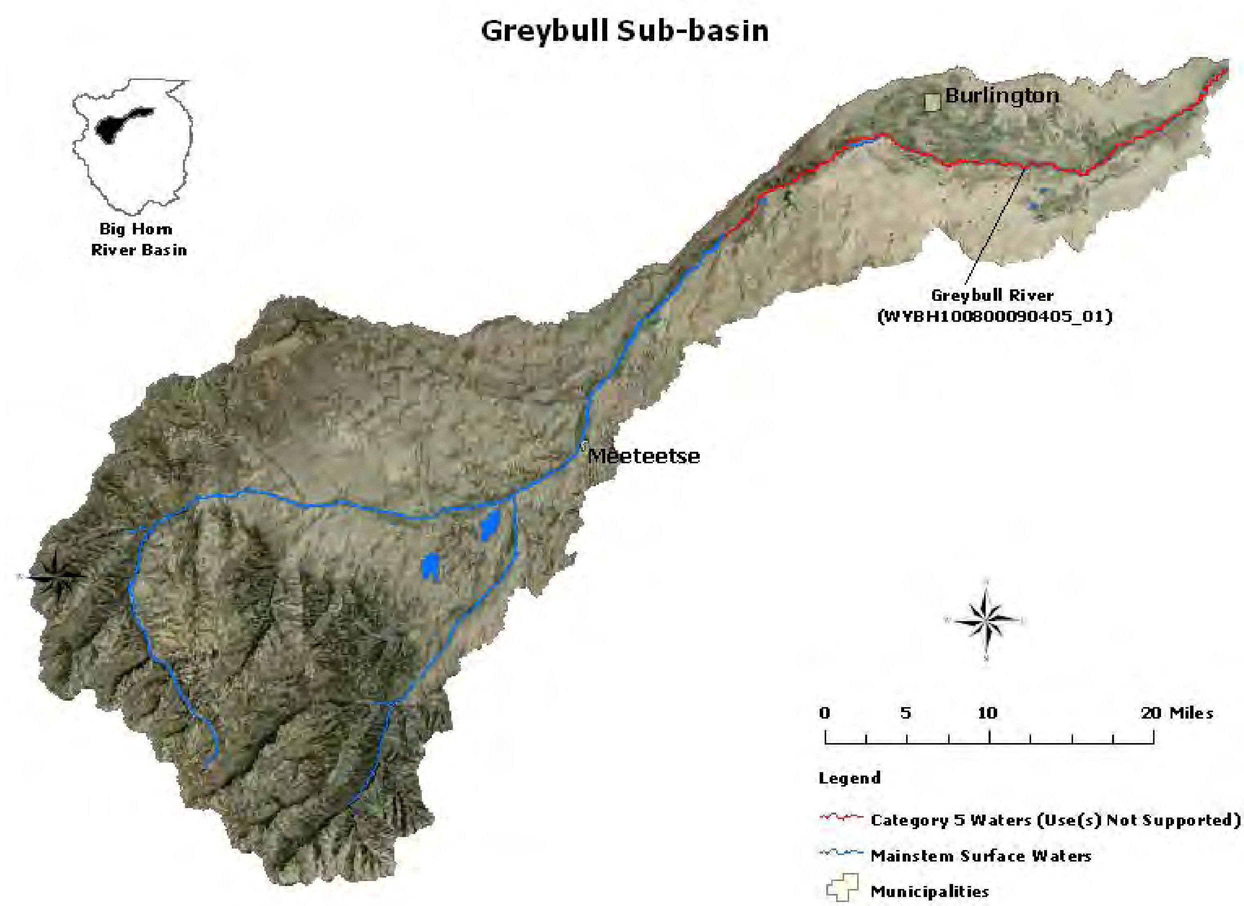
WGFD implemented the Buckskin Ed Restoration project, which involved using rotenone to remove non-native brook trout in Buckskin Ed Creek (Phase 1: 2008-2009) and Soldier and South Paintrock Creeks (Phase 2: 2010), with the goal of enhancing native Yellowstone cutthroat trout populations. Assessment of Soldier Creek, and tributaries to the South Paintrock Creek and Tensleep Creek, indicate full support of coldwater fisheries and aquatic life other than fish uses, respectively. WDEQ (2006) surveyed macroinvertebrates and diatoms in upper Canyon Creek and determined that it was likely reference



condition. However, some areas of the lower Canyon Creek watershed have had willows removed in the past, and this is thought to have caused some bank instability and increased water temperatures during the summer. WGFD surveys in 2007 and 2010 showed an increase in young of the year and 1 year old brown trout but a decrease in mountain whitefish from rarely collected to absent. WGFD stated that the trout population is limited by a lack of cover and clean spawning gravels. Indeed, the reach was reportedly composed almost entirely of sand and silt and was determined not to be a viable location for trout reproduction. It was suggested instead that recruitment likely occurs outside the stream reach. To improve habitat conditions in Canyon Creek, WGFD suggested that the banks should be stabilized with woody vegetation and that the reach should be given a significant rest from livestock grazing. A Section 319 Riparian Enhancement Project was completed by local citizens in 2009. Project activities included the installation of a fence along more than a mile of the stream to better manage livestock, planting trees and shrubs and monitoring to evaluate physical trends. The same reach of Canyon Creek was assessed by WDEQ (2010) in 2007 and 2009, at which time the use support status was indeterminate.

Greybull Sub-basin (HUC 10080009)

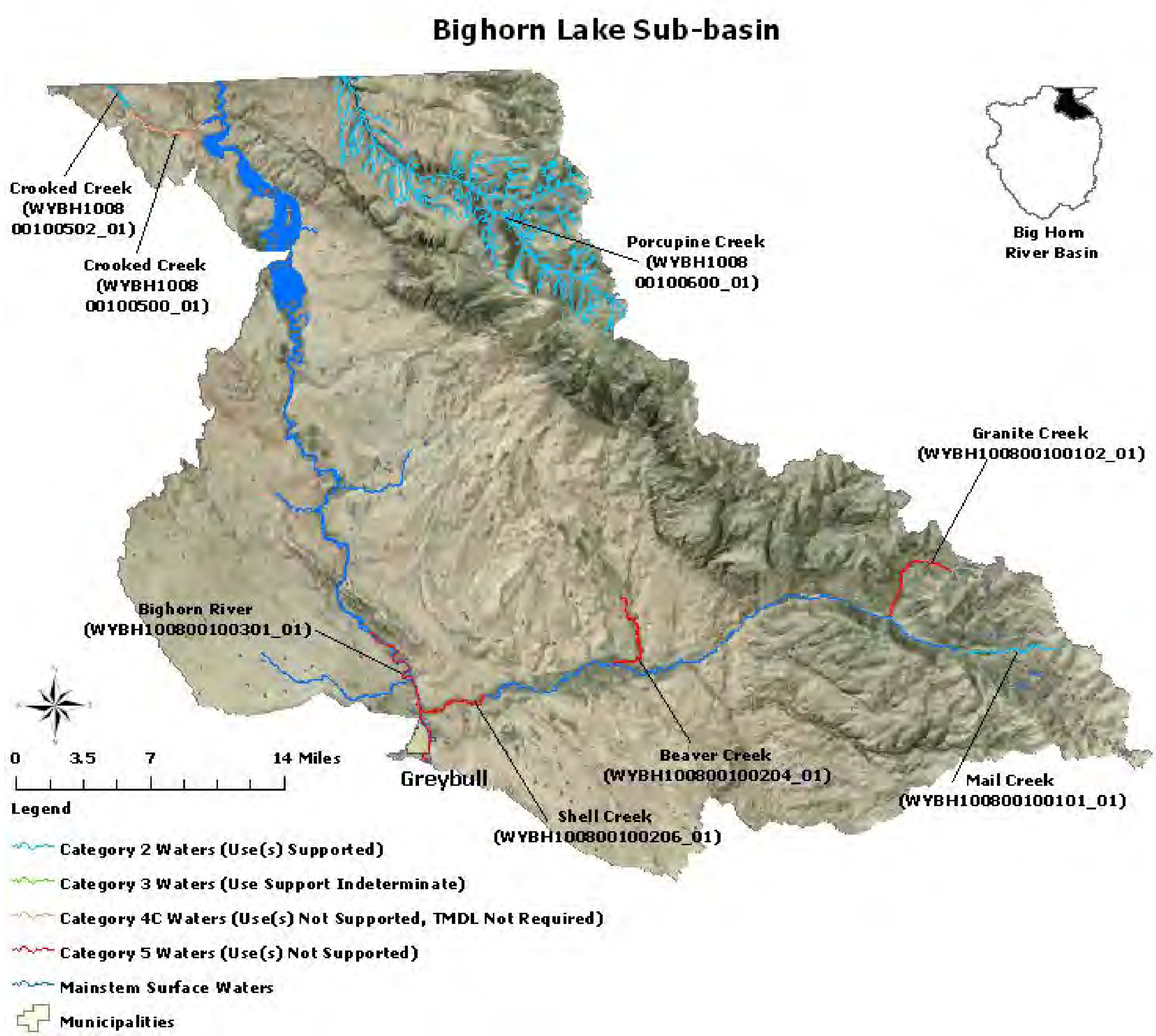
The headwaters of the Greybull Sub-basin are in the Absaroka Range within the Shoshone National Forest. Livestock grazing and oil and gas extraction are the major land uses, with some irrigated agriculture. The foothills portions of the sub-basin are a mixture of BLM, state and private lands, and the basin portions are primarily BLM, with private lands adjacent to streams. The sub-basin has three major irrigation reservoir projects, and summer flows in the Greybull River at the confluence with the Bighorn River are almost entirely irrigation return water. At times there may be minimal to no flow due to appropriations on the river (RPO, 1979).



A section of the Greybull River was placed on the 303(d) List in 2002 from the confluence with the Bighorn River upstream to Sheets Flat Bridge because it is not supporting its contact recreational use. Although high fecal bacteria counts were occasionally recorded as far upstream as Meeteetse by USGS between 2007-2008, samples have been collected too infrequently in these reaches to develop a valid five sample geometric mean. The Meeteetse Conservation District (MCD) and SBHCD have monitored the Greybull River. MCD showed in both the Sheets Flat *E. coli* Project (2007) and in the Greybull River *E. coli* Final Report (2009) that *E. coli* concentrations in the watershed are elevated during seasonal snowmelt runoff. This information suggests that the bacterial loading is likely from nonpoint sources, but specific sources remain unknown. High water temperatures during drought have raised concerns about the river's ability to support its cold water fishery use during low flows in summer. The Greybull River Watershed Plan was completed in 2010 by the Meeteetse Conservation District. Implementation activities and tasks are underway within the watershed in both Big Horn and Park Counties.

Bighorn Lake Sub-basin (HUC 10080010)

The Bighorn Lake Sub-basin includes those watersheds, other than Dry Creek and the Shoshone River, which drain into the Bighorn River or Bighorn Lake downstream of the Greybull River confluence. Livestock grazing, recreation and logging are the primary land uses, with bentonite mining on both sides of Shell Creek east of Greybull and also northeast of Spence. Gypsum is also mined in the area. Shell Creek is the largest watershed in the Bighorn Lake Sub-basin. Its headwaters are situated along the western slope of the Big Horn Mountains within the Bighorn National Forest, from which the creek flows across National Forest, BLM and private lands before it confluences with the Bighorn River. Lower elevation tributaries drain large areas of marine shales and other fine-grained geology, which results in naturally high TDS loading to the Bighorn River.



The Porcupine Falls area of the Porcupine Creek drainage is the site of a historic placer and lode gold mining operation, where mercury based amalgamation and potassium cyanide were used for gold extraction. In 1993, the USFS and USBOR began investigating whether mercury from the historic mine was present in Porcupine Creek, and data showed low mercury concentrations. WDEQ (2005) has monitored Porcupine Creek, including an investigation of mercury levels in fish tissue. Those data showed that aquatic life other than fish and fish consumption uses are fully supported.

Bighorn Lake was constructed between 1963-67 for the purposes of irrigation, electricity generation and flood control. The southern third of the reservoir is in Wyoming and the remainder is in Montana. WGFD has conducted fish tissue analysis of fish from Bighorn Lake, and because methylmercury concentrations in the larger predatory fish (channel catfish, sauger and walleye) exceed the USEPA guideline of 0.3 mg methylmercury/kg fish, Wyoming Department of Health issued a fish consumption advisory in December 2007. Wyoming does not currently have a numeric methylmercury criterion for fish tissue and thus Bighorn Lake was not added to the 303(d) List for this pollutant.

Fecal bacteria monitoring on the Bighorn River by WDEQ (2002) below its confluence with the Greybull River indicated that it is not supporting its contact recreation use; however, samples collected upstream from Bighorn Lake did not exceed the criterion. Therefore, a segment of the Bighorn River, from the Greybull River to a point 10.5 miles downstream, was added to the 303(d) List in 2002.

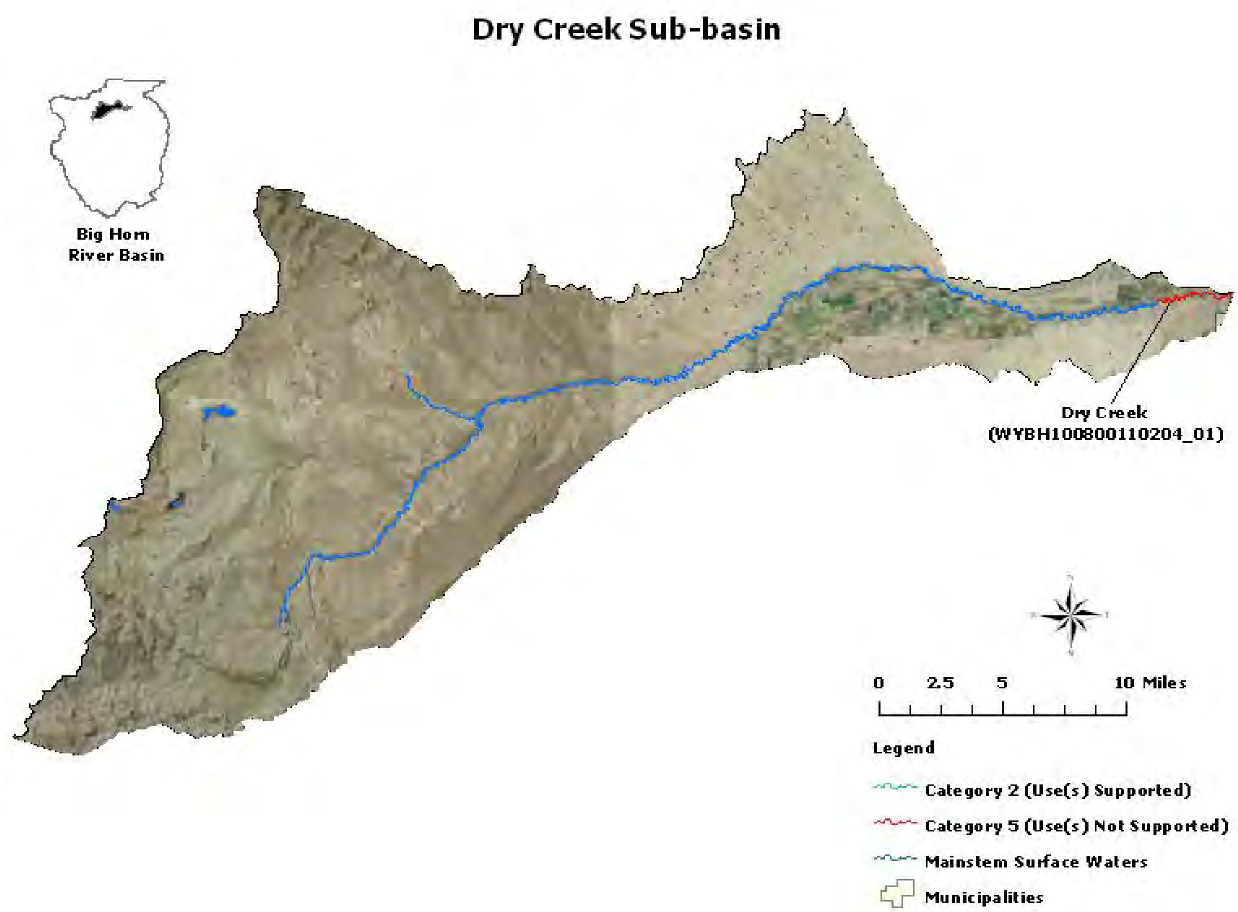
Fecal bacteria samples collected near the mouth of Shell Creek by WDEQ (2002) indicate that this creek does not meet its contact recreation use from the confluence with the Bighorn River to a point 5.3 miles upstream. WGFD data suggest that altered riparian areas and flow diversions in lower Shell Creek may degrade water quality from Shell Canyon to the Bighorn River. Granite Creek, a tributary to Shell Creek, was monitored in 2001 by WDEQ (2002) for aquatic life and contact recreation uses. Results indicated that Granite Creek is not meeting its contact recreation uses due to high levels of bacteria from its confluence with Shell Creek upstream approximately 5.8 miles to the vicinity of the Antelope Butte Ski Area. It was suspected that the septic system leach field at the Antelope Ski Area may have been a significant source of bacteria at the time of sampling. The ski area has not been active since the 2004-05 ski season, and the USFS is in the process of finding a new operator for the facility. WDEQ conducted additional *E. coli* monitoring on Granite Creek in the fall of 2005, and data did not show the high bacteria levels that were observed in 2001. USFS personnel have also been conducting monthly bacteria monitoring of Granite Creek below Antelope Butte since late 2004, and data suggest high *E. coli* concentrations in the creek. The maximum single sample concentrations during the primary contact recreation season (April 1st - September 30th) in 2005 and 2006 were 1,120 and 276 CFUs/100 mL, respectively, suggesting that loadings from sources other than the ski area are occurring in the watershed. Additional USFS monitoring on Granite Creek will assist in identifying sources and aid in the development and implementation of water quality improvement BMPs. Although Granite Creek is not meeting its contact recreation use, it does fully support its aquatic life other than fish use. Mail Creek, another tributary to Shell Creek, is in the Cloud Peak Wilderness Area and is a Class 1 water. Assessment of Mail Creek by WDEQ (2004) indicated that its aquatic life other than fish use is fully supported. Beaver Creek was added to the 303(d) List in 2002 due to high fecal bacteria counts recorded by the USGS, and it is threatened for its contact recreational use from Shell Creek to a point 7.9 miles upstream. SBHCD has conducted monitoring on Shell Creek and Beaver Creek using Section 319 funding (WACD, 2004), but results from that monitoring were not available for this report. TMDLs are anticipated to be completed in July 2012 for the bacterial listings on the Bighorn River and Granite, Beaver and Shell Creeks.

Crooked Creek flows into Wyoming from Montana and then flows into Big Horn Lake. Monitoring by WDEQ (2005) shows that its aquatic life other than fish uses are fully supported from an irrigation diversion in SWNW Section 29, T58N, R95W upstream to the Montana state line. However, de-watering downstream of this diversion have impaired the aquatic life other than fish use, and this reach was been placed in Category 4C in 2005 (Waters where use(s) are not supported, but a TMDL is not necessary.

Dry Creek Sub-basin (HUC 10080011)

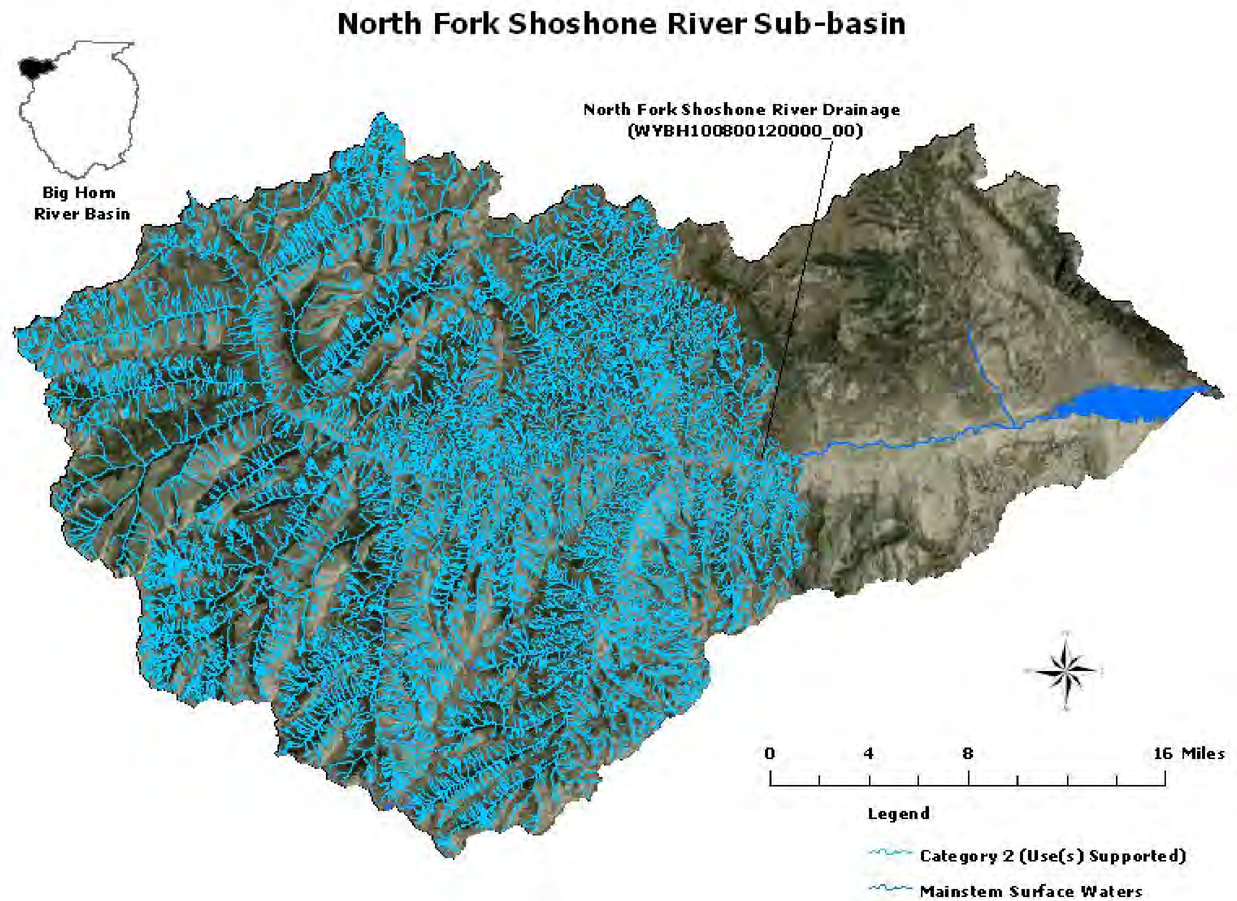
Land uses in the Dry Creek Sub-basin are primarily livestock grazing, recreation and oil and gas development. Much of this sub-basin has high sedimentation rates due to the presence of highly erodible soils and historic livestock grazing (RPO, 1979). Perennial native bunchgrasses have responded favorably to livestock grazing management changes that have been implemented in the watershed. Watershed improvement on the western half of the sub-basin is a high priority for the BLM.

According to the BLM, cattle and wild horses may avoid drinking the water in portions of Dry Creek below Oregon Coulee and Coalmine Gulch below the Oregon Basin Oil Field. BLM data indicate that livestock grazing practices may be inhibiting the growth of woody vegetation in the lower portion of the North Fork Dry Creek drainage, and this area is thought to contribute excessive sediment to the system. Lower Dry Creek was put on the 303(d) List in 2002 as threatened due to high fecal bacteria concentrations, which were recorded by USGS. SBHCD has conducted monitoring on Dry Creek as part of a Section 319 grant (WACD, 2004), but results from that monitoring were not available for this report. A watershed plan sponsored by SBHCD was approved in 2007 (WACD, 2007). A TMDL is expected to be completed in July 2012 for the fecal coliform listing on Dry Creek.



North Fork Shoshone River Sub-basin (HUC 10080012)

Primary land uses in this sub-basin are recreation, with livestock grazing and irrigated agriculture in the lower watersheds. The headwaters of the North Fork Shoshone River Sub-basin are located in the highly erodible volcanic geology of the northern Absaroka Range. Mass wasting and landslides are common, and a landslide event in the spring of 1997 contributed a significant amount of sediment to Middle Creek. Portions of this watershed burned in 1988 and again in 2001, which is thought to have further increased sediment loading. These events have raised concerns about the amount of sediment being deposited in Buffalo Bill Reservoir. Despite these conditions, numerous watershed assessments indicate that streams in this sub-basin are meeting their aquatic life other than fish uses above the Shoshone National Forest boundary.



South Fork Shoshone River Sub-basin (HUC 10080013)

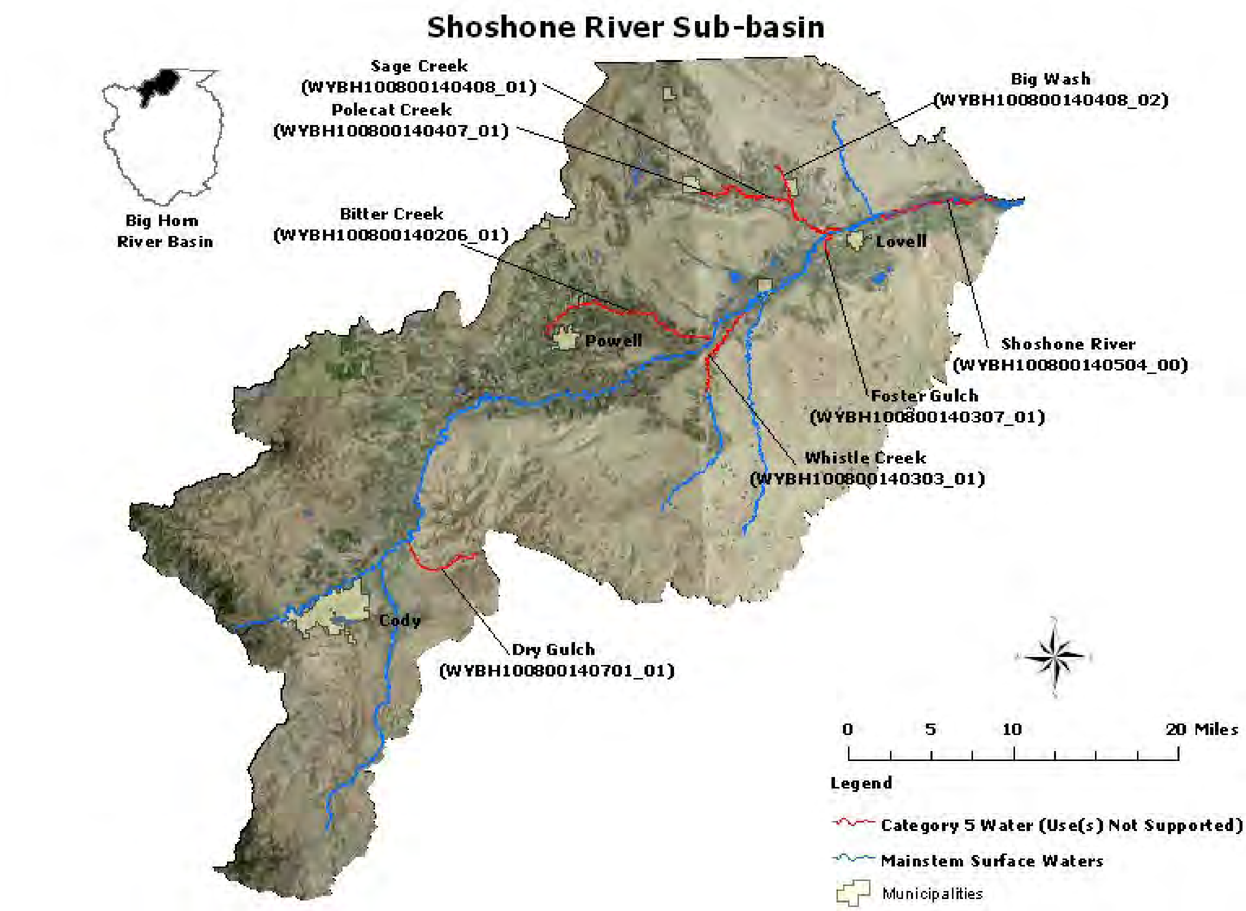
Most of the South Fork Shoshone River Sub-basin is within roadless or wilderness areas in the Shoshone National Forest, so human impact to water quality is minimal. The dominant geology at higher elevations is volcanic and very unstable, so natural sediment loading is very high. The South Fork of the Shoshone River has experienced considerable bank erosion along the mainstem from streambank modifications. Landowners have implemented restoration measures to allow flows to disperse energy onto floodplains to reduce erosion (WACD, 2004).

BLM data show watershed degradation in the upper drainages of Timber and Deer Creeks, and on Sheep Mountain, but were insufficient to make use support determinations. This degradation is thought to be due to past livestock grazing practices and high flow events.

Shoshone River Sub-basin (HUC 10080014)

Irrigation development in the Shoshone River Sub-basin began in the early 1900s and included the first federal reclamation project. Buffalo Bill Reservoir (originally called Shoshone Dam) was built to capture runoff from the North and South Forks of the Shoshone River and store water primarily for irrigation. The reservoir is also used for recreation and generating electricity. Sediment settles in Buffalo Bill Reservoir, effectively removing this pollutant from the Shoshone River downstream. These sediments can become an air quality issue however, when the reservoir is low and the sediments are exposed to the frequent high winds in the area. The USBOR has constructed dust abatement dikes to address this problem (WACD, 2004). Bottomlands and flat benches along the Shoshone River are extensively irrigated and farmed. Most of the other uplands are BLM land and are primarily grazed by livestock. Portions of the sub-basin have extensive oil and gas development, and bentonite and gypsum are presently being mined.

Most of the BLM land lying south of the river and northeast of Corbett Dam has been identified by the BLM as high priority for watershed improvement. The area contains large amounts of badlands geology, which naturally increases runoff and erosion. The BLM has indicated that roads and grazing may be increasing erosion in parts of the Deer, Coon and Whistle Creek



watersheds. The Cody Conservation District (CCD) completed a Section 319 project in the upper Shoshone River watershed in late 2005 to monitor *E. coli* levels. Data indicated that concentrations were minimal immediately below Buffalo Bill Reservoir, increase gradually downstream to a point below Corbett Dam, and do not suggest a threatened or impaired condition.

Sage Creek, which flows into the Shoshone River near Cody, may be a contributor of sediment and nutrients to the Shoshone River from irrigation return flows into Sage Creek and upper Hoodoo Creek (SCS, 1994). CCD monitoring of Sage Creek indicated that *E. coli* may also be a concern.

Although Dry Gulch is naturally ephemeral, it receives irrigation return flows, and thus has water during most of the primary contact recreation season. Sampling conducted by the CCD indicates that Dry Gulch exceeds the *E. coli* criterion, as does the Shoshone River. The Shoshone River was added to the 303(d) List in 2002 for fecal coliform and Dry Gulch was added for *E. coli* in 2008.

In 2007, a malfunction in the Willwood Dam caused a large sediment plume to be released into the Shoshone River, killing thousands of fish. Similar sediment releases have occurred in the past. The USBOR, which owns the dam, and the irrigation company that operates the dam are working with WDEQ and WGFD to remedy the problem.

The portion of Sulphur Creek (about 1.25 miles) on BLM land is very wide and shallow and BLM data indicate that riparian vegetation is in poor condition. Historically, this part of the stream experienced season-long cattle grazing, but a deferred rotation strategy is currently used on the majority of the BLM portion of this stream, which should improve the condition of the riparian vegetation. Produced water discharges from oil and/or gas development in the upper watershed have been permitted and allow for the discharge of TDS and other pollutants at concentrations protective of designated uses.

BLM data indicate that portions of Cottonwood Creek, north of Cody, are incised and actively eroding, likely in response to historic land uses such as mining, irrigation, livestock grazing, and the development of several springs for a fish hatchery and livestock watering. Currently, BLM is addressing water quality concerns associated with livestock grazing on the BLM portions of the watershed. The former Yellowstone Refinery property is located immediately adjacent to Cottonwood Creek, and the Solid and Hazardous Waste Division of WDEQ is currently working with the responsible party to clean up the refinery property. The clean up will address groundwater contamination and its potential impacts to Cottonwood Creek.

Sedimentation has been identified as a possible water quality problem in Alkali Creek, a water that has its headwaters on Heart Mountain and drains Ralston Flats (SCS, 1994).

Samples exceeding the fecal bacteria criterion for primary contact recreation were collected by WDEQ (2000) from Bitter Creek near Garland and the stream was added to the 303(d) List in 2000. The Powell-Clarks Fork Conservation District (PCFCD) has monitored water quality at five sites in the drainage and has completed a watershed plan. The resulting dataset, though incomplete, suggested that the recreation impairment may extend upstream as far as the Lane 8 Bridge (approximately 2.5 miles upstream of the City of Powell WWTP).

BLM data indicate that bentonite and gypsum mining and roads may be creating water quality problems around Little Sheep Mountain in the eastern part of the Shoshone River Sub-basin. Highly alkaline soils in the Lovell Lakes area may be due to flood irrigation and poor drainage of these naturally alkaline soils.

Salinity, excessive sediment, nutrients, and pathogens have been identified by BLM, WDEQ, WGFD and the NRCS as possibly impacting water quality in the Shoshone River. Extensive pesticide sampling by USGS indicates that pesticides are rarely above detection levels in the river. The Shoshone Conservation District (SCD) has monitored the Shoshone River for two years under a Section 319 Grant (WACD, 2004), but those data were not available for this report.

In 2000 and 2001, in response to concerns by an area physician who treated several cases of severe gastro-intestinal illness in patients who had been swimming in area waters, WDEQ conducted fecal bacteria monitoring in several of the drainages in the lower Shoshone River watershed. Several waters exceeded the fecal bacteria criterion and were added to the 303(d) List in 2002. These included a section of the Shoshone River from its confluence with Big Horn Lake to a point 9.7 miles upstream (WDEQ, 2002); Bitter Creek from its confluence with the Shoshone River to a point 13.9 miles upstream (WDEQ, 2000); Sage Creek from its confluence with the Shoshone River to a point 14.0 miles upstream (WDEQ, 2002); Polecat Creek, from its confluence with Sage Creek to a point 2.5 miles upstream (WDEQ, 2002); Big Wash, from its confluence with Sage Creek upstream to Sidon Canal (WDEQ, 2002); and Whistle Creek, from its confluence with the Shoshone River to a point 8.7 miles upstream (WDEQ, 2002).

Additionally, the lower reach of Foster Gulch was placed on the 2002 303(d) List as threatened because of high fecal coliform counts recorded by the USGS. While the sources of fecal contamination in these streams are unknown, a Section 208 study conducted in 1978 identified many cases of poorly operating septic systems in the watershed. PCFCD received a Section 319 grant to improve eligible septic systems in the Bitter Creek watershed. County commissioners and local conservation districts are also considering the establishment of a CWA-State Revolving Loan program to provide low interest loans for additional septic system improvements. Lastly, the SCD has initiated bacterial monitoring at 16 sites and a septic system improvement program has been initiated using district funds. The SCD completed a watershed plan which was approved by WDEQ in 2006 (WACD, 2007).

Information from SCD, WGFD, BLM and a Cooperative River Basin Study (SCS, 1994) suggest that salinity, oil, nutrients and streambank degradation may be additional problems in Sage and Polecat Creeks in northwest Big Horn County. Potential sources include bentonite mining, roads, farming and oil production. SCD has conducted monitoring on these streams, but the data were not available for this report (WACD, 2004).

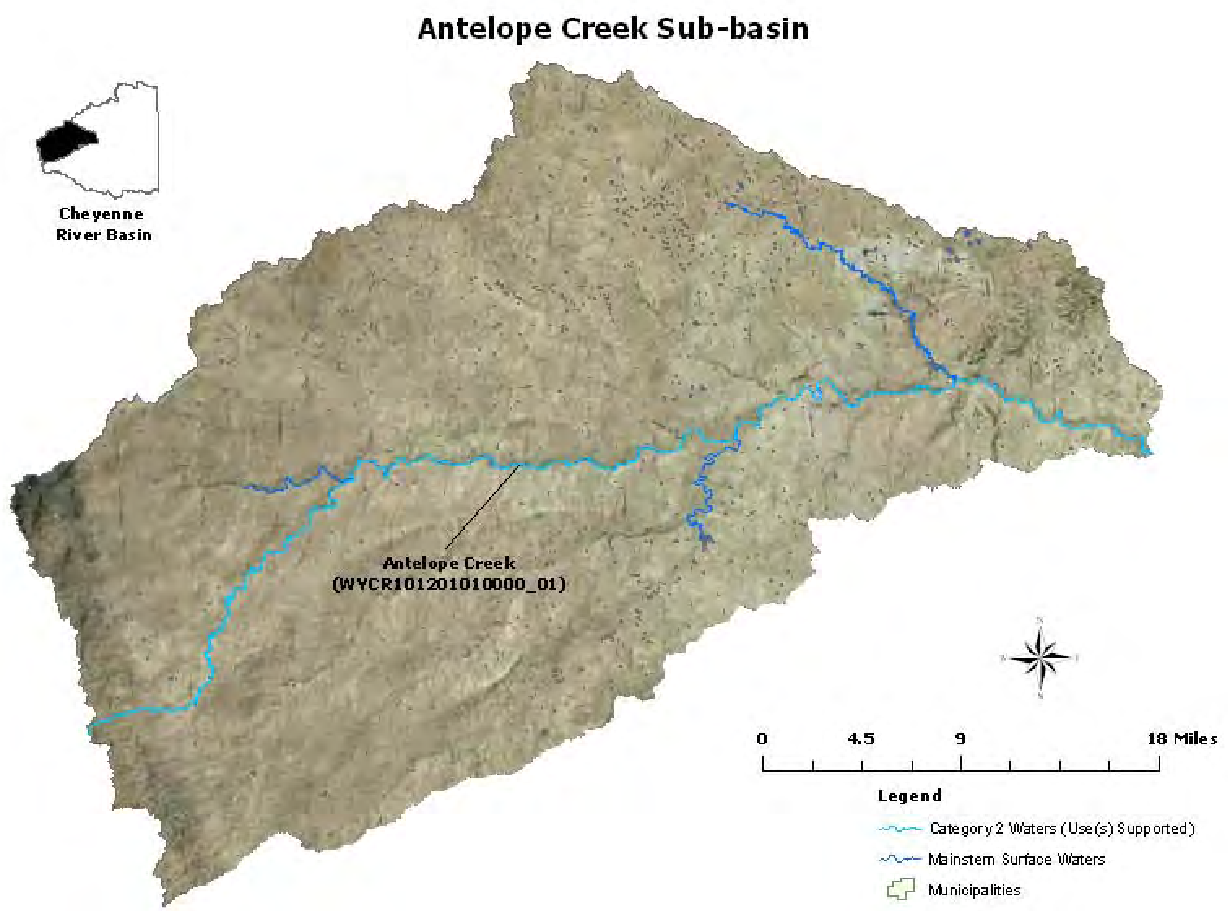
Little Big Horn River Sub-basin (HUC10080016)

The headwaters of the Little Bighorn River Sub-basin are in north central Wyoming, mostly within the Bighorn National Forest. Grazing, recreation and logging are the primary land uses. Stream habitat inventories were conducted by the USFS in the sub-basin and resulted in the implementation of fish habitat enhancement projects and changes in grazing management practices that have reduced sedimentation. WDEQ (2004) monitoring on the Little Bighorn River and West Pass Creek indicated full support of aquatic life other than fish uses.

8.4 Cheyenne River Basin

The Cheyenne River Basin is in east-central Wyoming and drains areas of the Powder River geologic basin and southern portion of the Black Hills uplift. Besides the southern Black Hills and some breaks and escarpments, most of the basin consists of rolling high plains. The Thunder Basin National Grasslands occupy a large portion of the central part of this basin. Primary land uses are livestock grazing, hay production, coal mining, oil and gas production and some CBM production. These activities occur primarily in the western portion of the basin. Lowland streams are usually intermittent or ephemeral, and most perennial streams originate in the Black Hills or Pine Ridge escarpment. Because the sedimentary rocks in the Powder River geologic basin contribute elevated levels of iron, manganese and sulfate to surface waters, several streams have had their secondary (aesthetic) drinking water criteria removed for iron and manganese.

Antelope Creek Sub-basin (HUC 10120101)



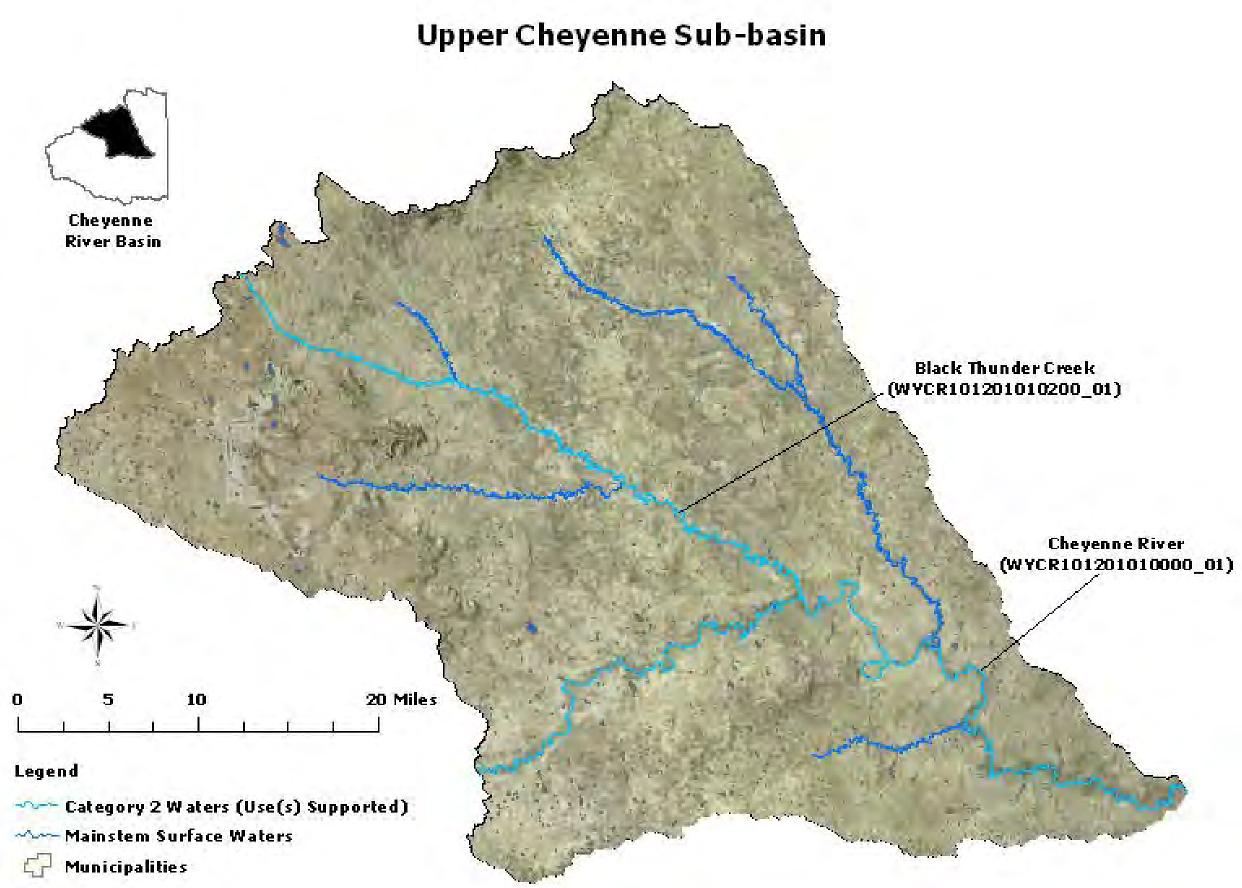
The headwaters of the Antelope Creek Sub-basin are east of Edgerton. Land uses are primarily grazing and oil production, along with coal mining in the northeastern third of the sub-basin.

Antelope Creek contains many beaver dam complexes in its lower reaches which store water, keeping it from reaching the Cheyenne River except during high flow periods. Concentrations of dissolved iron in Antelope Creek occasionally exceed the aquatic life other than fish chronic criterion; however, this is likely due to the natural geology and spring dominated hydrology. WDEQ (2007) monitoring indicated that the benthic macroinvertebrate community of Antelope Creek is comparable to reference condition for intermittent streams in this basin and is supporting its aquatic life other than fish use. WGFD data show a diverse community of native non-game fish and warm water game fish, indicating the creek should be classified as a 2ABww rather than 3B.

Dry Fork Cheyenne Sub-basin (HUC 10120102)

Land uses in the Dry Fork Cheyenne Sub-basin are primarily grazing and oil and gas development. Uranium exploration and mining occurred from the 1950s through the 1980s in the southern portion of this sub-basin, an area where all streams are intermittent or ephemeral.

Upper Cheyenne Sub-basin (HUC 10120103)



Coal mining occurs in the Upper Cheyenne Sub-basin east of Wright. Other land uses include grazing and oil and gas development. The Cheyenne River in this sub-basin typically has an intermittent flow regime, with flows reduced to standing pools of water fed by springs during the drier seasons. Assessment by WDEQ (2007) indicates that the Cheyenne River in this sub-basin, from Lance Creek upstream to the Dry Fork of the Cheyenne River fully supports its fisheries and aquatic life other than fish uses and contains a diverse assemblage of benthic macroinvertebrates and fish.
Little Thunder and Black Thunder Creeks are ephemeral or intermittent with some perennial spring fed pools and those created by beaver dams. Although Little Thunder Creek receives some discharge from oil treater and CBM production, most is lost to evaporation and infiltration, or is stored within beaver dam complexes before reaching Black Thunder Creek. Monitoring by WGFD on Black Thunder Creek identified a community of native nongame fish and warm water game fish, indicating that the stream may be more appropriately classified as a warm water game fishery (2ABww) rather than for aquatic life other than fish (3B). WDEQ (2007) found that the benthic macroinvertebrate community in Black Thunder Creek is comparable to reference condition for similar intermittent streams and that it is fully supporting its aquatic life other than fish use.

Niobrara Conservation District (NCD) has raised concerns about CBM produced water discharges in the Cheyenne River Basin and has conducted monitoring on the Cheyenne River since 1999; however, it is currently not known whether CBM discharges reach the Cheyenne River. NCD has also conducted monitoring on Snyder Creek, and data show that this creek has an ephemeral to intermittent flow regime.

Lance Creek Sub-basin (HUC10120104)

Land uses in the Lance Creek Sub-basin include livestock grazing and oil and gas development. NCD has conducted monitoring on Lance Creek, but results were not available for this report.

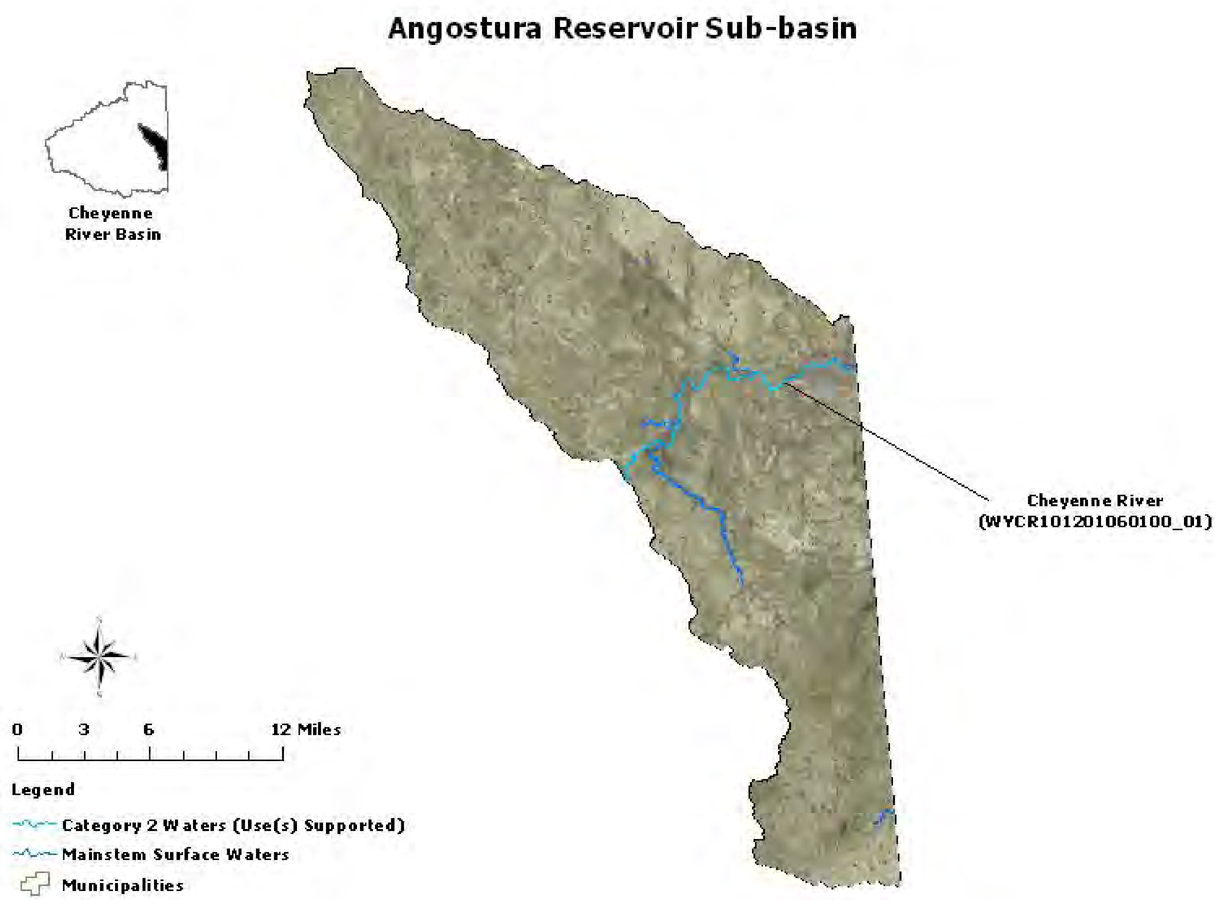
Lightning Creek Sub-basin (HUC 10120105)

Land uses in the Lightning Creek Sub-basin are mostly livestock grazing, with some oil and gas development. WDEQ uses a reach of Lightning Creek as a reference stream.

Angostura Reservoir Sub-basin (HUC10120106)

Land uses in the Angostura Reservoir Sub-basin are primarily livestock grazing, with some oil and gas development. The Cheyenne River in this sub-basin generally has perennial streamflow; however, during low flow, the river is reduced to standing pools fed by springs. Assessment by WDEQ (2007) indicates that while there are occasional exceedances of the dissolved iron criterion for aquatic life other than fish during extremely low flows, the source of the iron is thought to be natural due to the marine geology underlying much of the basin. The Cheyenne River from the confluence with Lance Creek downstream to the South Dakota state line upstream to its headwaters contains a diverse assemblage of macroinvertebrates and fish, and data indicate that it is fully supporting its aquatic life other than fish and warm water fisheries uses.

The Cheyenne River is listed as impaired on South Dakota's 2010 303(d) List for salinity, total dissolved solids (TDS) and specific conductance from the Wyoming/South Dakota state line to Beaver Creek and for TSS (total suspended solids) from Beaver Creek to Angostora Reservoir. TMDLs are currently being developed by SDDENR for these pollutant/segment combinations. The USGS has studied water quality on the lower Cheyenne River in Wyoming immediately upstream of the South Dakota state line as part of the CBM monitoring project. Data collected from 2004-2006 showed elevated SAR, EC, TDS and TSS values. It is currently unknown to what extent these pollutants are natural versus anthropogenic.

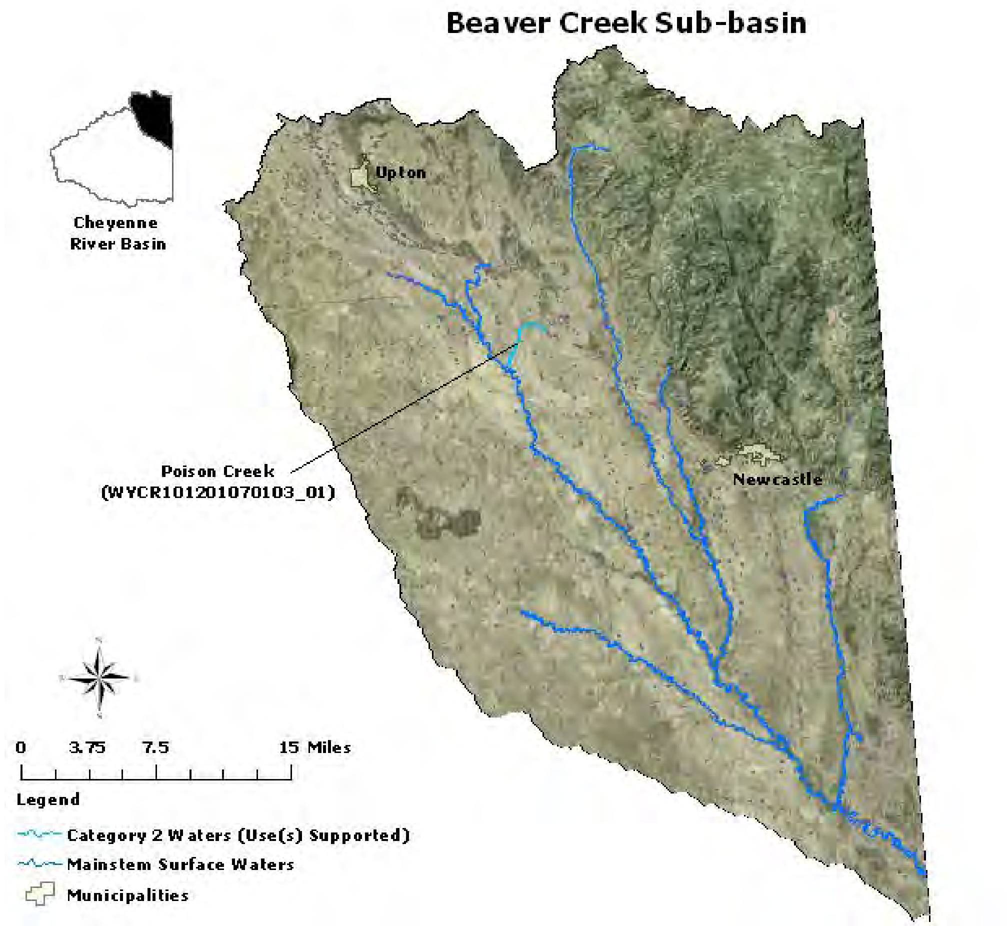


Beaver Creek Sub-basin (HUC 10120107)

Land uses in the Beaver Creek Sub-basin include livestock grazing, hay production and oil and gas development. Many of the streams in this sub-basin originate in the Black Hills and are perennial.

Poison Creek flows through the Osage Oil Field into Beaver Creek near Osage. Some small oil seeps reach Poison Creek, but the extent to which these seeps are natural versus anthropogenic is unknown. The Wyoming Oil and Gas Conservation Commission (WOGCC) determined it would be more cost effective to mitigate the oil seeps rather than to attempt to identify all causes, and has conducted cleanup efforts to prevent the contamination of Poison Creek and protect aquatic life other than fish and wildlife. WDEQ (2008) assessed and removed Poison Creek from the 303(d) List after determining that it was supporting its aquatic life other than fish and wildlife uses.

Salt Creek is named for the natural brine springs which contribute water to this creek. Salt Creek, in turn, contributes a large salt load to Stockade Beaver Creek. WDEQ has conducted monitoring on Beaver and Stockade Beaver Creeks.



Hat Creek Sub-basin (HUC 10120108)

The primary land use in the Hat Creek Sub-basin is grazing. WDEQ conducted a bioassessment of the Sage Creek watershed and data suggested full support of the aquatic life other than fish use.

8.5 Green River Basin

The primary agricultural land uses in the Green River Basin are livestock grazing and irrigated hay production. Snow melt runoff from higher elevations is the major water source for the Green River and most of its tributary systems. Almost all of these headwaters are in granitic or metamorphic rock and have some of the best water quality in the basin. In contrast, lower elevation stream reaches receive little precipitation and are mostly intermittent or ephemeral. As streams flow through the easily eroded sedimentary geology in the arid lower elevations, TDS values and sediment loads generally increase. Peak flows in the basin usually occur in May and June during snowmelt runoff and thunderstorms.

The Green River is part of the Colorado River Compact of 1922, and its waters are apportioned among several participating states. It is the largest tributary to the Colorado River and is subject to salinity control through the Colorado River Basin Salinity Control Program. There are relatively few salinity problems in Wyoming compared with the lower Colorado River Basin states. Irrigated agriculture can contribute to salinity by percolation, evaporation and return flows travelling across and through shallow soils developed on saline geologic materials. Salinity control measures to reduce irrigation related salinity input to the Green River have been implemented in the Big Sandy and Flaming Gorge sub-basins.

Extensive natural salt deposits of trona (sodium carbonate typically occurring with halite and gypsum) were first noted in late 1890s in the Green River Basin. Trona deposits were first prospected and mined in the late 1930s-40s, and these activities continue today. Wyoming's trona deposits are the world's largest natural source of trona. Coal deposits have also been mined in parts of the basin and oil development began around 1920 and continues today. Natural gas is produced throughout much of the basin and is currently an important industry for the region and state. There are currently concerns that energy development may increase TDS concentrations in the Colorado River Basin. USGS (2009) collected TDS and specific conductance data in an effort to establish regression relationships for sites on the Green River near the town of Green River. These relationships will allow TDS to be monitored more easily in the future using specific conductance measurements as a surrogate.

Upper Green Sub-basin (HUC 14040101)

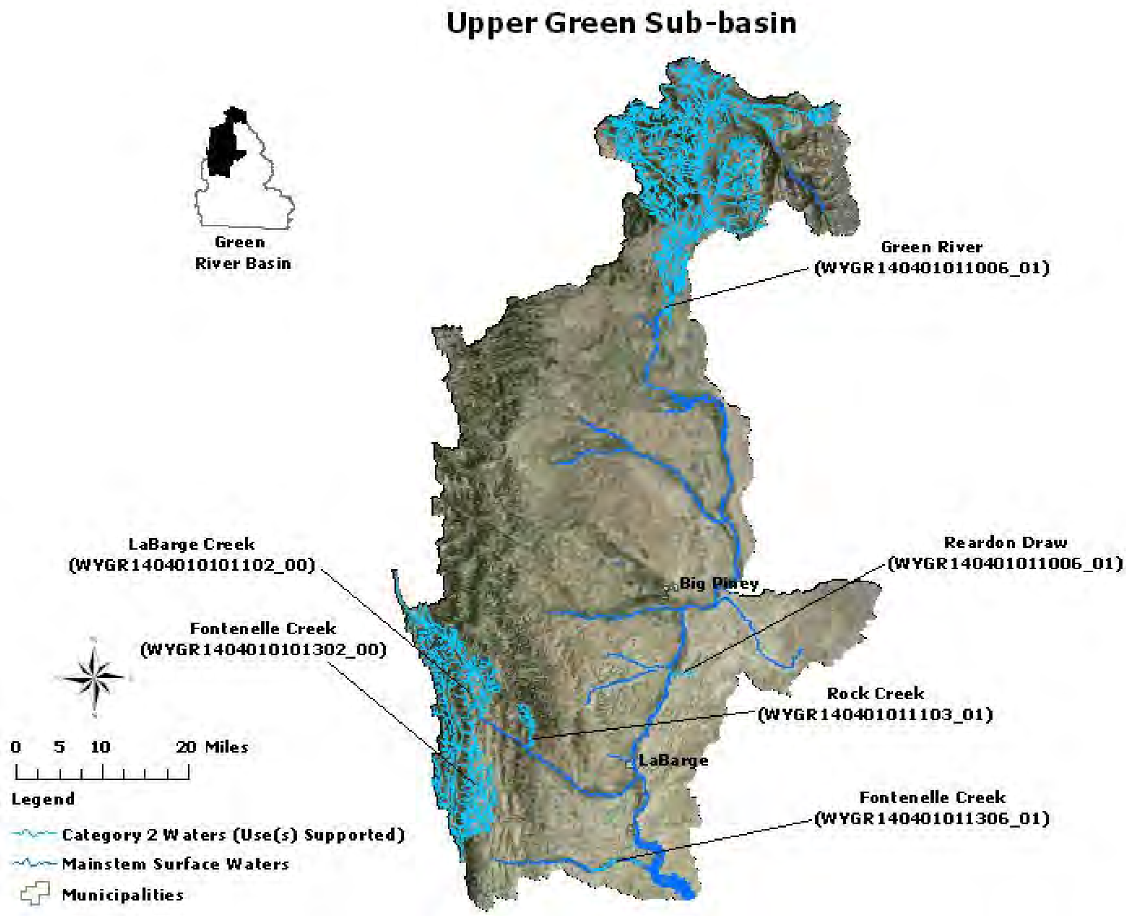
The Upper Green Sub-basin includes all tributaries to the Green River above Fontenelle Dam, except the New Fork Sub-basin. Fontenelle Reservoir is in the southern part of this sub-basin below LaBarge, Wyoming. The headwaters of this sub-basin are within the Bridger-Teton National Forest, primarily in hardened igneous and metamorphic geology. Lower elevation areas lie mostly in fine-grained sedimentary rocks which are a natural source of fine sediment and TDS in surface waters. Primary land uses are grazing, recreation, irrigated hay production and oil and gas development.


Kendall Warm Springs Dace
Photo by LuRay Parker (WGFD)

A 984 foot reach of Kendall Warm Springs is the only known habitat of the Kendall Warm Springs dace, a unique fish subspecies (see photo at right). This subspecies is the only Wyoming fish currently listed by the USFWS as federally endangered under the Endangered Species Act. Historic threats to this fish included habitat degradation, over-collection and pollution from detergents and soaps. The USFWS completed a five year review for this subspecies in 2007.

Only portions of Dry Piney Creek are perennial upstream of its confluence with the Green River (WGFD, 2002). WDEQ (2003) monitoring on Dry Piney Creek was inconclusive, so further monitoring will be conducted to determine designated use support. A gas processing facility and oil and gas wells are located in the upper portions of the LaBarge, Dry Piney, and South Piney Creek drainages. Oil seeps and ponds associated with oil wells and physical degradation have been identified as concerns by WDEQ. Seasonal dewatering of North, Middle and South Piney Creeks may limit macroinvertebrate communities (WGFD, 2002; WGFD, 2004). Sublette County Conservation District (SCCD) funded a baseline study (Marshall, 2007b) of the biological conditions of the Green River Basin (excluding the New Fork Basin) in Sublette County. The study compared samples collected from 19 sites between the years 2001-05 and evaluated biological trends within sites using WDEQ's WSII benthic macroinvertebrate model. The report indicated that the macroinvertebrate communities of Middle Piney Creek and Muddy Creek were in poor condition and that WWTF effluent and irrigation return flows may be having a negative effect. Credible data (chemical, physical and biological) were not reported for this study and thus no Aquatic Life other than Fish use support determinations were made by WDEQ.

Extensive monitoring by WDEQ in the watershed between Highway 191 and Green River Lakes indicates that streams in this portion of the watershed are supporting their aquatic life other than fish uses.



WDEQ monitoring of LaBarge and Fontenelle Creeks indicates that their aquatic life other than fish uses are supported in the upper drainages within the Bridger-Teton National Forest and in the lower mainstem of Fontenelle Creek, just above Fontenelle Reservoir. The WGFD identifies the upper LaBarge Creek Watershed as having good Colorado River cutthroat trout habitat. A reintroduction project for this fish has been underway since 1999, including the removal of non-native fishes and the re-establishment of a genetically pure population of Colorado River cutthroat trout during 2007-2008. A fish barrier has been installed on lower LaBarge Creek to restrict the upstream passage of exotic fishes and limit the opportunity for cutthroat trout hybridization with rainbow trout. WDEQ has identified physical degradation in portions of the lower drainage and seasonal dewatering for irrigation as concerns (WGFD, 2002). WDEQ (1998) data indicate that Rock Creek, a tributary to LaBarge Creek, fully supports its aquatic life other than fish use.

New Fork Sub-basin (HUC 14040102)

The headwaters of the New Fork Sub-basin are in granitic and metamorphic geologic materials of the Wind River Mountains in an area containing hundreds of glacial lakes. Geologic materials in the lower sub-basin include fine to coarse grain sedimentary rocks and are a natural source of fine sediment and TDS in the sub-basin. Land uses include recreation, logging, grazing, irrigated hay production and oil and gas development. Limited uranium exploration has also occurred in the Pinedale area.

Extensive natural gas development has been occurring in the Pinedale Anticline area of this watershed. One of the outcomes of the BLM's Pinedale Anticline EIS Record of Decision was the need for an expanded ground and surface water monitoring network in the Pinedale Anticline Project Area (PAPA). The operator of the gas field hired SCCD to conduct the surface water quality monitoring for this project. Chemical and biological monitoring began in 2000 at three locations on the New Fork River and five more sites were added by 2007. A summary report of this baseline study was completed by Marshall (2005), and included trend analyses of chemical and macroinvertebrate samples across 18 study sites. Results from a second study (Marshall, 2007a) suggest that the overall ecological condition of the New Fork River is not significantly different from expected values as defined by the baseline study. However, several lines of evidence suggest that the macroinvertebrate community at a study site located downstream of the majority of the Pinedale Anticline gas field development on the New Fork River is negatively affected by excess fine sediments and fine particulate organic matter. The site is below several pipelines constructed below the streambed and approximately 3 miles below the confluence with the East Fork New River, which is a sand dominated system. The relative influence of these and other potential sources is currently unknown. WDEQ monitoring indicates that the mainstem of the New Fork River from the confluence with the Green River upstream to Duck Creek and the entire watershed upstream of the confluence with Duck Creek, excluding Pole Creek is supporting its aquatic life other than fish use. USGS data collected from a water quality monitoring station during 2009 and 2010 indicate that the pH on Pine Creek above Fremont Lake may periodically be high or low and is a water quality concern.

Slate Creek Sub-basin (HUC 14040103)

The Slate Creek Sub-basin includes the Green River and its tributaries below Fontenelle Reservoir and above Bitter Creek, excluding the Big Sandy River. Land uses include grazing, oil and gas development and trona mining and processing. Geologic materials include sandstone, mudstone, limestone, oil shale and conglomerate. Soils in the area tend to be saline and alkaline, and can be very unstable. The Seedskadee National Wildlife Refuge, located adjacent to the Green River below Fontenelle Reservoir, supports a unique population of waterfowl and is an important recreational fishery.

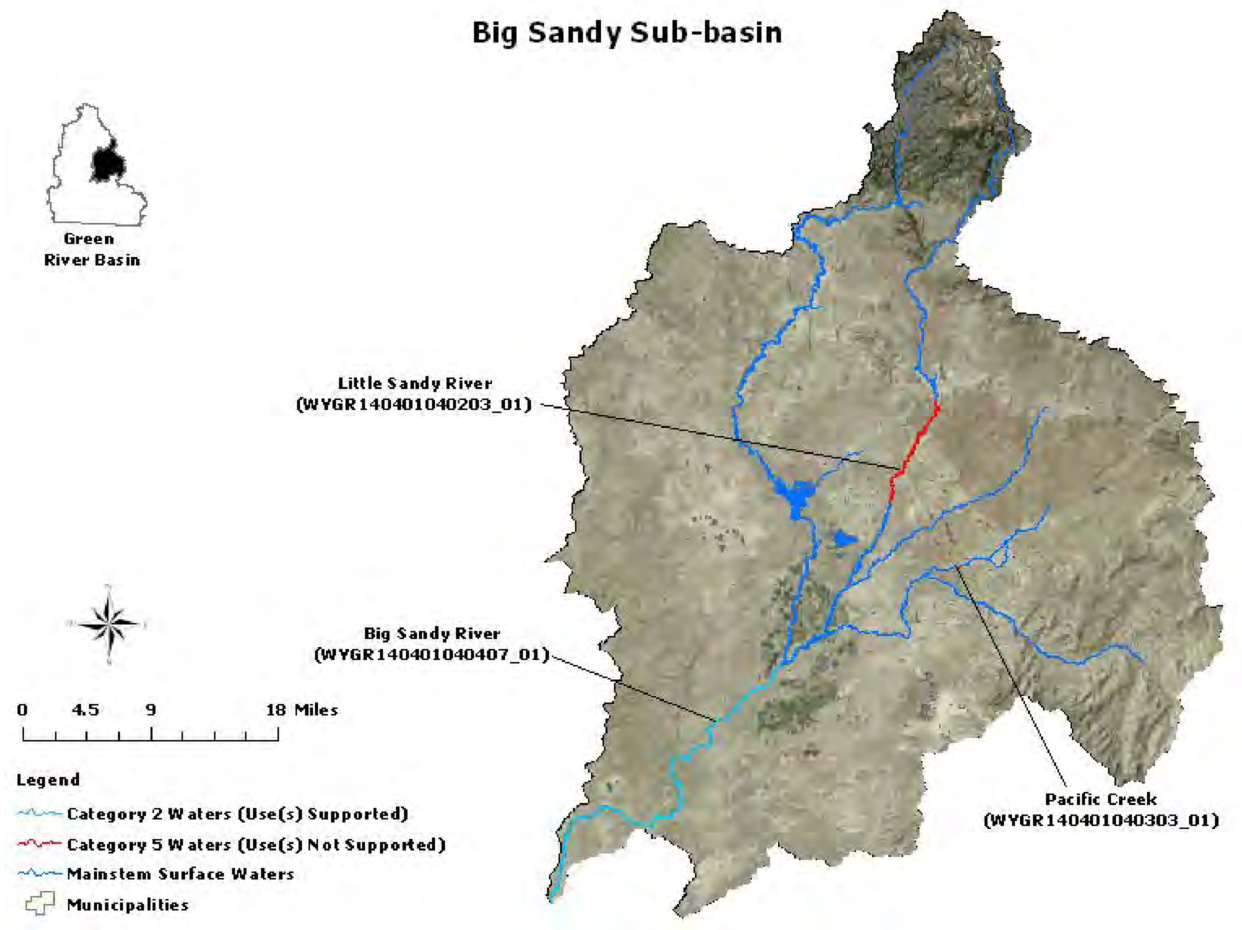
In August 2007, WDEQ and WGFD investigated two fish kills on the Green River in this sub-basin. These studies determined that the cause of the first fish kill near the City of Green River was the aerial application of malathion insecticide. The second fish kill was in the vicinity of Slate Creek, immediately downstream of Fontenelle dam, and included several hundred mountain whitefish and some juvenile trout. WDEQ investigated this site shortly thereafter, measuring TDS, TSS, total petroleum hydrocarbons (TPH DRO), DO, pH, temperature and conductivity at three locations within the affected reach. Unusual values included temperatures exceeding the cold water game fishery criterion of 20°C at all three locations (23.9, 24.6 and 24.9) and higher than expected pH values (8.7, 8.7 and 8.9). Blue-green algal blooms were noted within Fontenelle Reservoir in September 2007, but USBOR data did not indicate toxin formation. The occurrence of these organisms may suggest periodic elevated nutrients and water temperatures.

Big Sandy Sub-basin (HUC 14040104)

The headwaters of the Big Sandy Sub-basin are in the granitic geology of the southern Wind River Range, resulting in streambed substrata dominated by coarse sand from decomposed granite. Land uses in the Big Sandy Sub-basin are primarily grazing, irrigated hay production, recreation and oil and gas development.

Water is diverted from the Big Sandy River below Big Sandy Reservoir to irrigate lands in the Eden Project. Irrigation seepage into shallow aquifers has created saline seeps and springs below the Eden Project, which contributes approximately 149,180 tons of salt annually to the Green River (SCS, 1987). The USDA's Big Sandy River Unit Plan (1988) modified 15,700 acres of surface irrigation to low-pressure sprinkler irrigation in an effort to reduce salt loading by approximately 52,900 tons/year (CRBSCF, 2002). The program, managed through the NRCS, has converted 10,790 acres of irrigated lands to date, which has resulted in a salt load reduction of 42,319 tons/year. Effects of these salinity reductions on streams in the Big Sandy and Green River drainages have not been determined, but crop production and water savings have reportedly increased where irrigation conversion has occurred (SWCCD, 2004).

Erosion, unstable banks and a lack of woody riparian vegetation have also been identified as problems in this reach of the Big Sandy River. The primary sources of these problems are thought to be related to changes in flow regime since the construction of Big Sandy Reservoir, and to the partial conversion from sheep to cattle grazing, which changed vegetation use. Several riparian livestock exclosures were created in the 1980s to protect riparian areas along the Big Sandy River, between Little Sandy Creek and the Green River, and to enhance fish habitat. Rock sill structures have also been built in the Big Sandy River and in Bone Draw to raise the water table, improve channel conditions, and promote riparian vegetation growth to provide habitat for juvenile fish. The Big Sandy Working Group (BSWG), including BLM, grazing permit holders, WGFD, TU, Sweetwater County Conservation District (SWCCD), various other stakeholders and a facilitator, was formed in 1996. BSWG developed a 10 year goal and a 50 year vision statement to address these problems. Management changes included modifying grazing rotations, allotment boundaries and seasons, installing electric fencing to protect riparian areas, developing upland



water sources, and implementing the monitoring plan developed by BSWG (BLM-GR, 2003). WDEQ monitoring in 1998 indicated that the aquatic life other than fish use is supported within this reach.

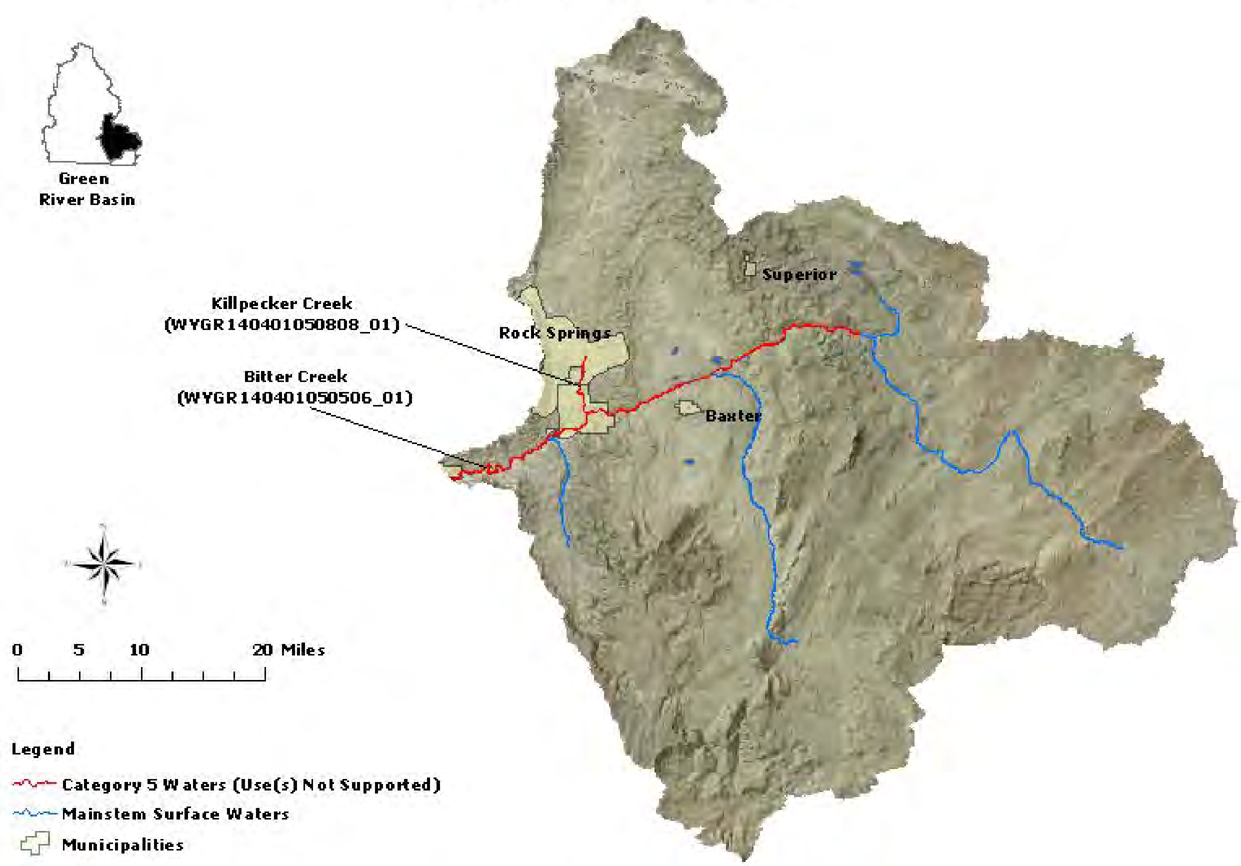
The Little Sandy River was placed on Wyoming's 1996 303(d) List as partially-supporting its aquatic life other than fish and coldwater fisheries uses along a 26.9 mile segment below Elkhorn Junction. Causes of the impairment were identified as siltation, chloride, salinity and TDS and the sources of these pollutants were livestock grazing and natural sources. The Little Sandy River was subsequently removed from the 1998 303(d) List because it was determined that quantitative or "credible data" were lacking to justify the listing. Subsequent monitoring by WDEQ on the Little Sandy River between 1998 and 2003 indicated that chloride, salinity and TDS were not a concern above Elkhorn Junction; however, areas of habitat degradation, streambank instability and sedimentation were identified along several miles of BLM, State and private lands below Elkhorn Junction. The BLM and grazing permit holders were already in the process of modifying the grazing management plan along the Little Sandy River within the Little Sandy Grazing Allotment to improve riparian and in-stream habitats; these changes included the installation of electric fencing and the rotation of stock within the allotment (BLM-GR, 2002). In 2004, WDEQ met with a stakeholder group including SCCD, SWCCD, BLM and the Little Sandy Grazing Association (LSGA) to discuss the study's findings and to conduct a watershed tour. In an effort to evaluate the effectiveness of BMPs on reducing sedimentation within the impacted reach, identify potential sources of sediment and determine designated use support, WDEQ committed to monitoring the reach of concern for a period of five years (2004-2008). The resulting study (WDEQ, 2012) found that a section of the Little Sandy River from the northern boundary of Section 33-Township 28 North-Range 104 West-downstream 17.7 miles to the Sublette/Sweetwater County line was not supporting its aquatic life other than fish and cold water fisheries uses, and this segment was added to the 2012 303(d) List. Excess sediment from accelerated bank erosion is the primary cause of the impairment, and sources have been identified as livestock and wildlife grazing along with historic habitat modifications. WDEQ has received a formal commitment from the above stakeholder group to complete a watershed based plan for the Little Sandy River Watershed.

In 2010, Western Watersheds Project (WWP) collected *E. coli* samples on Pacific Creek, including a geometric mean that exceeded both WDEQ's primary and secondary standards protective of recreational use. A segment of stream from Bar X Road to a point 0.4 miles upstream has been added to the 2012 303(d) List. The source of the bacteria is unknown.

Bitter Creek Sub-basin (HUC 14040105)

The Bitter Creek Sub-basin lies within sedimentary geology, and is composed mostly of fine grained rocks containing salts and other evaporite minerals. Due to the arid climate associated with the relatively low elevation basin terrain, most reaches in this drainage are intermittent or ephemeral. Snowmelt and

Bitter Creek Sub-basin



rainstorm events often transport high loads of sediment and dissolved salts. Land uses include livestock grazing, coal and phosphate mining, uranium exploration and oil and gas development.

Bitter Creek, a tributary to the Green River, drains a large arid area in the eastern portion of the sub-basin, including a small portion of the Red Desert Basin. Bitter Creek and Killpecker Creek (a tributary) near Rock Springs were monitored by WDEQ in 1998, and data indicated that both streams are impaired for recreational use due to elevated fecal bacteria. In addition, chloride samples indicated that Bitter Creek from Rock Springs downstream exceeds the acute criterion of 860 mg/L protective of aquatic life other than fish and it was added to the 303(d) List in 2002. Fish kills have been observed on Bitter Creek below Killpecker Creek, which may be related to high chloride concentrations. However, during 2009 sampling, the WGFD collected several game and nongame fish in Bitter Creek, and referred to the stream as "a local gem". Killpecker Creek is a major source of chloride to Bitter Creek, but as a Class 3B water, does not have a chloride criterion. Diurnal oxygen fluctuations and habitat degradation are concerns on both streams. A Section 319 watershed project administered by the SWCCD addressed the above concerns on Bitter and Killpecker Creeks. The study indicated that there were *E. coli* exceedances in Bitter Creek well upstream of Rock Springs during high flow events, which suggests that there may be a significant nonpoint source of bacteria in the upper watershed. Additionally, the fecal coliform impairment on Killpecker Creek was extended from Reliance downstream to the confluence with Bitter Creek. The SWCCD study further suggested that sources of *E. coli* in the lower reaches of Bitter and Killpecker Creeks may be septic system contamination, urban runoff and leaking sewage lines in contact with groundwater that eventually enters the creeks. Chloride data collected from Bitter Creek showed exceedances of the aquatic life other than fish chronic chloride criterion (230 mg/L) from Point of Rocks downstream to the confluence with Killpecker Creek, and exceedances of the aquatic life other than fish acute criterion from Killpecker Creek downstream to the Green River. The primary source of chloride is likely the surrounding geology and soils of the watershed, especially in the Killpecker Creek watershed. However, the surface application and infiltration of large amounts of irrigation water for turf grasses at recreational facilities adjacent to Killpecker Creek may dissolve and transport salts to the creek. A watershed plan for Bitter and Killpecker Creeks, sponsored by the Bitter Killpecker Creek Watershed Advisory Group and SWCCD was approved in 2007. The Bitter Killpecker Creek Watershed Advisory Group and SWCCD continue to be actively involved in watershed planning, monitoring, and implementation activities. The SWCCD recently received a 319 grant to continue educational outreach and implementation, as well as data analysis in preparation for the development of a TMDL.

Flaming Gorge Sub-basin (HUC 14040106)

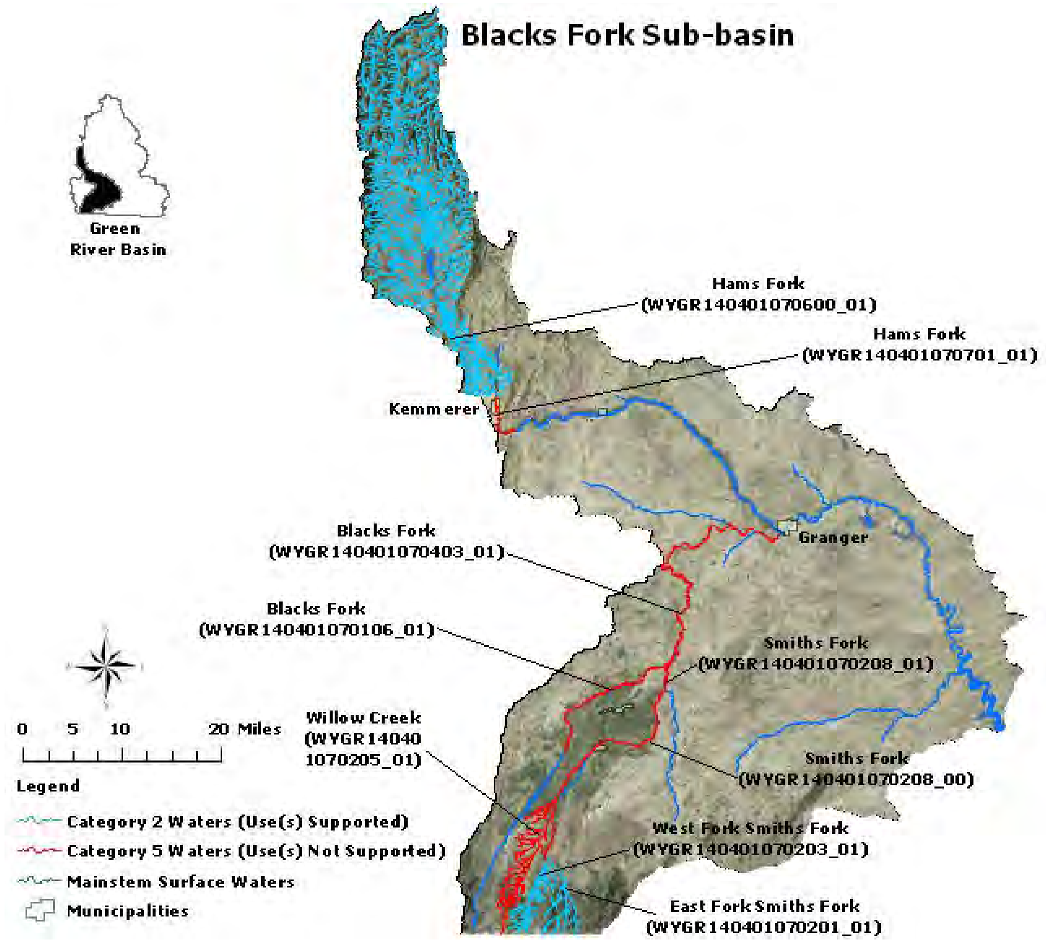
The Flaming Gorge Sub-basin includes all of the tributaries to the Green River and Flaming Gorge Reservoir between Bitter and Vermillion Creeks (in Colorado), except the Blacks Fork. Flaming Gorge Reservoir and the Flaming Gorge National Recreation Area are both within this sub-basin. The Green River and Black's Fork flow into the upper part of the reservoir, whereas the Henry's Fork flows into the lower part of the reservoir in Utah. Most of the sub-basin consists of fine grained, easily erodible sedimentary rocks that contain large amounts of evaporite minerals. Land uses include grazing, irrigated agriculture (mostly in the Henry's Fork drainage), recreation and oil and gas production.

The Little Mountain Watershed Enhancement project was initiated in 1990 to address declining Colorado River Cutthroat trout and mule deer populations. The project was sponsored by WGFD, BLM, landowners and other stakeholders. Project goals included restoring watershed function and decreasing the eutrophication of Flaming Gorge Reservoir via modification of livestock grazing management, prescribed burns, and the re-introduction of beaver to the sub-basin. The project area included Currant Creek and parts of the Trout, Sage and Red Creek watersheds. These waters have shown marked improvement of both riparian and upland areas, reduced sedimentation (Mizuyama, 1993) and increased perennial streamflows.

Blacks Fork Sub-basin (HUC 14040107)

The headwaters of the Blacks Fork Sub-basin are in the Uinta Mountains in northeastern Utah and the Tunp and Wyoming Ranges in Wyoming. The Black's Fork flows through the Bridger Basin before confluencing with Flaming Gorge Reservoir. Major tributaries include the Smiths Fork, which has its headwaters in Utah, and the Hams Fork. Land uses in this sub-basin include livestock grazing, irrigated hay production, trona and coal mining and oil and gas production. An Assessment Study of the Hams Fork Watershed was completed in July 2009 by the Lincoln Conservation District (LCD), but resulting data were not available for this report.

The Hams Fork below the Kemmerer was placed on the 1996 303(d) List for not supporting its aquatic life other than fish and cold water game fishery uses due to exceedances of the pH standard.



Elevated pH in this naturally alkaline water is thought to be primarily due to higher than normal photosynthesis from nutrient enrichment below the Kemmerer-Diamondville WWTF. The Kemmerer-Diamondville Joint Powers Board has committed to monitoring the river above and below the WWTF outfall, and will be cooperatively conducting monitoring with LCD. A TMDL was initiated in June 2010 for the pH listing on the Hams Fork and the second of two years of field sampling was completed in 2011. AML is currently working on the Kemmerer Coal Reclamation Project, part of which will address environmental degradation to the Hams Fork River from coal mine waste.

The lower Blacks Fork, from its confluence with the Hams Fork upstream to the confluence with Smiths Fork, is on the 303(d) List for exceeding the *E. coli* criterion associated with its contact recreational use. The sources of *E. coli* contamination remain unknown. Uinta County Conservation District (UCCD) has monitored water quality at 12 sites on the Blacks Fork as part of a Section 319 project. The Smiths Fork, from its confluence with the Blacks Fork upstream is on the 303(d) List because WDEQ (2000) showed non-support for contact recreation uses. UCCD monitored water quality at 5 locations on the main stem of the Smiths Fork as part of a Section 319 project, which showed that the impairment extends from the Blacks Fork up to the confluence with the East and West Smiths Forks. The Blacks and Smiths Forks are currently contained within the Blacks Fork and Smiths Fork Rivers Watershed Management Plan sponsored by UCCD. UCCD collected *E. coli* data in 2009 and 2010 showing that the Blacks and Smiths Forks are still exceeding the recreational use standards at several locations.

The East and West Forks of Smiths Fork, and Willow Creek above the Black's Fork, were added to the 1998 303(d) List due to threats to aquatic life use support from stream channel degradation. UCCD completed a Section 319 project in 1999 to improve stream channels and riparian areas. Data submitted by UCCD indicated improvement of the habitat in these streams, but were insufficient to determine use support (UCCD, 2001). WDEQ (2003) monitored these streams in 2003; data showed habitat improvement and that East and West Forks of Smiths Fork fully support their aquatic life uses. These streams were removed from the 303(d) List in 2004, and Section 319 Nonpoint Source Success Stories have been written for both. However, data collected on Willow Creek in 2003 indicated high temperatures, pH and a degraded biological community in the lower reach. These conditions contrast with the noted improvements in riparian habitat and management and may be related to drought. Willow Creek remains on the 303(d) List and WDEQ plans to allow several more years for stream health to recover before conducting further monitoring.

In 2008, BLM conducted an assessment of the Christensen Allotment, which includes a 0.5 mile section of Cottonwood Creek. The assessment indicated that resource conditions along the creek within the allotment do not meet standards for soils and riparian condition because of excessive soil erosion and a lack of adequate riparian vegetation. The assessment further suggested that these conditions are the result of historic large releases from Reed Reservoir and that livestock are not a significant contributor.

Muddy Creek Sub-basin (HUC 14040108)

The Muddy Creek Sub-basin drains the east slope of the Bear River Divide, north of Evanston, and Oyster Ridge, south of Kemmerer, before flowing into the Blacks Fork. Soils in this sub-basin, developed from shale, sandstone, and sand, tend to have high carbonate content and are often easily eroded by wind or water. The Oyster Ridge area has been mined for coal since the early 1900s and is the site of the historic Cumberland Mining District. Land uses include grazing, some irrigated hay production, oil and gas development and production, and coal mining.

Vermillion Sub-basin (HUC 14040109)

The Vermillion Sub-basin drains a portion of the southern Red Desert before flowing into the Green River in Colorado. Primary land uses are livestock grazing and oil and gas development. Perennial reaches in this sub-basin include portions of Vermillion Creek and the main stems of Coyote and Canyon Creeks. Vermillion Creek drains into the Green River in Colorado and contributes a TDS load of mostly sulfate and sodium, derived from the area's natural geology. In the Vermillion and Coyote Creek watersheds, BLM, WGFD, landowners, permittees, and the National and Wyoming Wildlife Federations are cooperating in an allotment management plan to reduce sediment loading and improve riparian areas. WDEQ (1998, 2003) has monitored portions of the Vermillion Sub-basin, but those data were inconclusive.

8.6 Little Missouri River Basin

In Wyoming, the Little Missouri Basin includes only the Little Missouri Sub-Basin. Land uses include livestock grazing, dry land and irrigated farming, bentonite mining in the lower drainages and oil production in the upper drainages. Streamflow is often intermittent, but pools typically persist, even during dry periods. Concerns with turbidity, siltation and flow alteration in the Little Missouri and the North Fork of the Little Missouri have been identified by Crook County Natural Resource District (CCCNRD). However, bentonite clays often remain suspended in water and therefore a certain degree of turbidity is natural. Approximately 500 acres of abandoned bentonite mine lands have been reclaimed by AML in the basin, although bentonite mining continues in the area.

Little Missouri Sub-basin (HUC 10110201)

A large wetland complex is being developed on the North Fork of the Little Missouri River at the site of a large breached earthen dam. This project is expected to improve both terrestrial and aquatic wildlife habitat. WDEQ monitored in this sub-basin in 2002, but results were inconclusive.

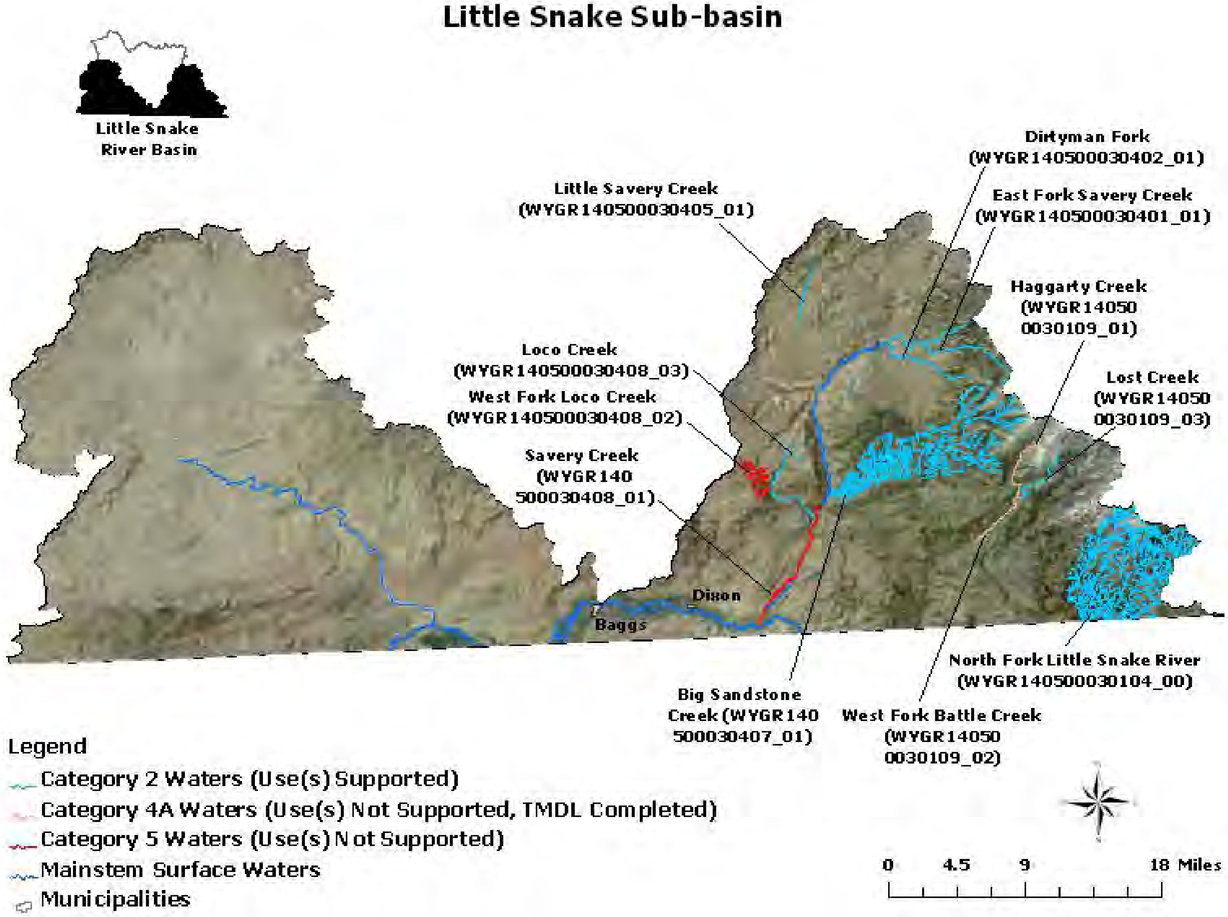
8.7 Little Snake River Basin

The Little Snake River Basin in Wyoming is bordered to the east by the Continental Divide and the Sierra Madre, the north by the Great Divide Basin and the west by the Green River Basin. The Little Snake River is a tributary to the Yampa River. The Sierra Madre Range is primarily composed of Precambrian igneous and metamorphic rocks which are relatively resistant to erosion. However, in the lower elevations of the basin, the geology consists of mostly fine grained sedimentary rocks, most of which are easily eroded and often contain high levels of salts.

Little Snake Sub-basin (HUC 14050003)

Haggarty Creek originates near the Continental Divide, then confluences with Lost Creek to form West Fork Battle Creek. Monitoring on Lost Creek by WDEQ indicates that it fully supports its aquatic life other than fish use. Haggarty Creek receives discharges from an inactive copper mine, the Ferris Haggarty/Osceola Tunnel, which dates from 1898. The creek was added to the 1996 303(d) List for high concentrations of copper, silver and cadmium released from the mine, which exceed the chronic aquatic

Little Snake Sub-basin



life other than fish criteria. AML funded a pilot project to remove some metals from the effluent and is presently working on a proposal to plug the upper shaft above the mine tunnel and reduce the volume of discharge. The copper criterion has also been exceeded on the West Fork of Battle Creek, downstream of the confluence with Haggarty Creek, so this stream was added to the 303(d) List in 2000. TMDLs for cadmium, copper and silver for Haggarty Creek and copper for West Fork Battle Creek were approved by USEPA in December 2011.

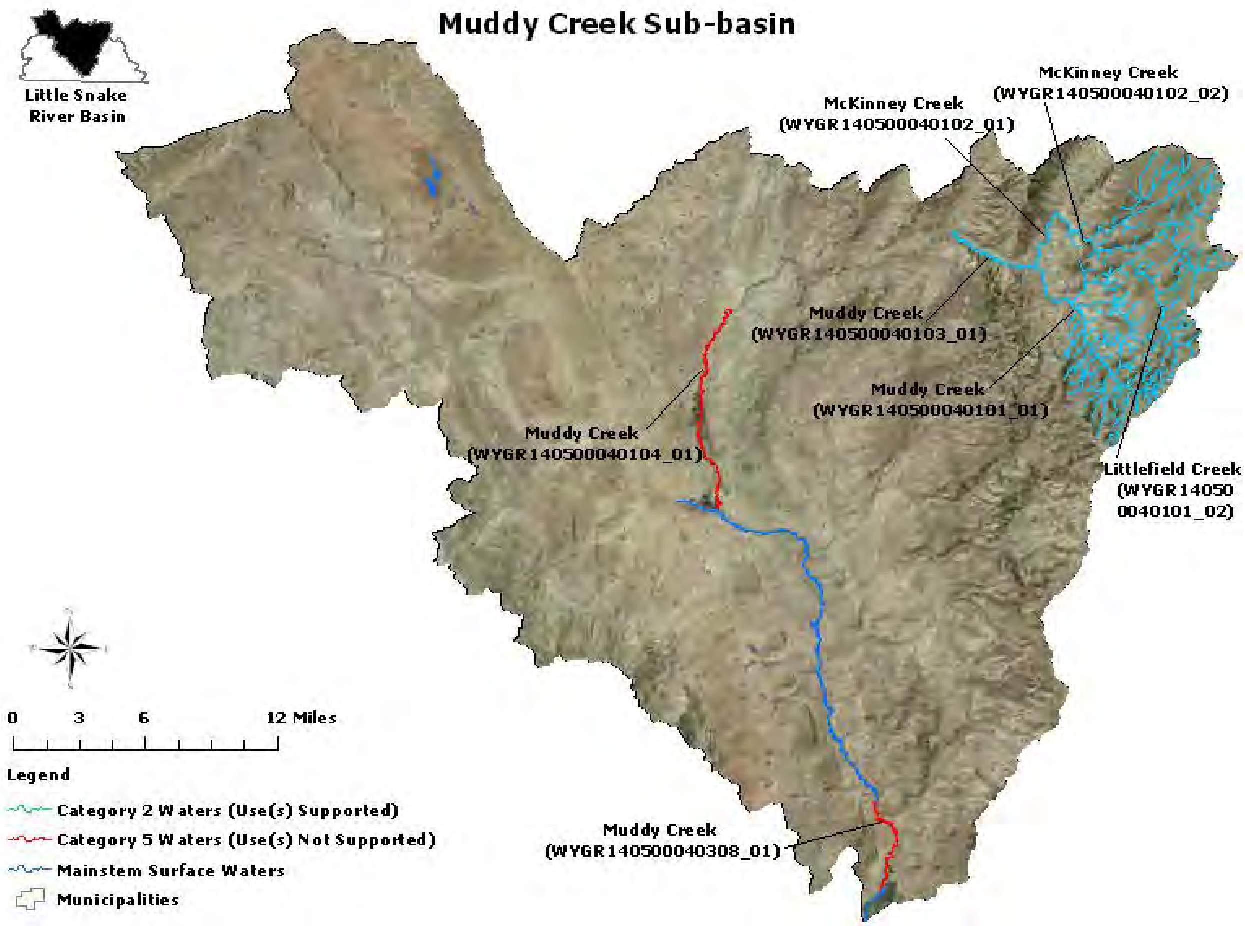
Monitoring by WDEQ in the Little Snake watershed indicates that aquatic life other than fish uses are fully supported in Dirtyman Fork, Loco Creek, portions of Savery Creek and North Fork Little Snake River within the Medicine Bow National Forest and much of the upper watershed of Little Savery Creek. However, physical degradation of West Fork Loco Creek and lower Savery Creek is considered a threat to aquatic life other than fish and these streams were added to the 303(d) List in 1996 and 1998, respectively. A Section 319 watershed improvement project was completed by the Little Snake River Conservation District (LSRCD) to address these issues.

Muddy Creek Sub-basin (HUC 14050004)

Unstable stream channels and a loss of riparian function have been identified as problems in much of the Muddy Creek Sub-basin. Three stream segments were added to the 1996 303(d) List for habitat degradation; including Lower Muddy Creek from the confluence with Red Wash upstream to the confluence with Antelope Creek (west of Highway 789); Muddy Creek from the confluence with Alamosa Gulch upstream to the confluence with Littlefield Creek; and McKinney Creek from the confluence with Muddy Creek upstream to the confluence with Eagle Creek. All three segments have been identified as having physical degradation from livestock grazing, which was considered a threat to the cold water fisheries and aquatic life other than fish uses.

In 1992, LSRCD, BLM, local landowners, grazing permittees, WGFD and other stakeholders initiated Coordinated Resource Management (CRM) to address these problems. As part of the CRM process, LSRCD has managed several Section 319 watershed improvement projects in the upper Muddy Creek drainage. Implementation measures included upland water development, cross fencing, re-vegetation and improved grazing management. Additional watershed function restoration has been implemented in the Grizzly Wildlife Habitat Management Area (GWHMA), which includes the upper Littlefield Creek drainage and portions of the upper Muddy Creek drainage. WGFD has been working with BLM, livestock grazing permit holders and LSRCD to implement new grazing strategies, the most important of which is to defer grazing for several years to allow willow re-establishment. BLM, in cooperation with TU, WGFD, LSRCD and NRCS, has planted a variety of woody riparian vegetation to help stabilize streambanks, removed a culvert and restored 0.75 miles of Muddy Creek in the upper watershed. LSRCD and WGFD data indicate that the management changes from both of these projects have resulted in considerable improvement to stream stability, aquatic habitat and riparian health, especially in the upper Muddy Creek tributaries. Data collected by LSRCD show that Muddy Creek and Littlefield Creek above their confluence, and McKinney Creek above Eagle Creek are meeting their aquatic life other than fish uses. No water quality parameters were found to exceed WDEQ's water quality standards and values remained relatively constant from 2008-2010. Colorado River cutthroat trout have been re-introduced into Littlefield Creek and will also likely be re-introduced into Muddy Creek above McKinney Creek. Several grazing management BMPs have also been implemented in the lower watershed, including changes in the timing and duration of grazing and cross fencing. Several projects have also been designed to address physical degradation of the stream channel, including wetlands development, re-establishment of floodplains and irrigation water management.

Over the last two decades, groups representing various local, state and federal agencies have produced a variety of information and data in the form of various reports, theses, technical manuscripts and raw data



relating to the Muddy Creek Watershed. In 2010, WDEQ hired Timberline Aquatics, Inc. (TA) to review and summarize this information and data and to produce a summary report including trend analysis for the impaired reaches of Muddy Creek and McKinney Creek described above. The summary report (TA, 2011) indicated, using credible physical, chemical and biological data, that the upper Muddy Creek and McKinney Creek segments are no longer threatened. As a result, these segments have been removed from the 2012 303(d) List. Most pronounced were improvements in the macroinvertebrate communities at these reaches, which were near reference condition, and the improvement in the stream channel, which continues to narrow, deepen and to form stable terraces. Channel stabilization has been enhanced by the recovery of the riparian community, which has helped to stabilize the naturally erosive soils of the watershed. The information and data summarized in TA (2011) for the lower Muddy Creek section do not satisfy Wyoming's credible data requirements. WDEQ will continue to work with LSRCD and will re-evaluate the use support status of this segment as more information becomes available.

Projected increases in CBM development in the Muddy Creek Sub-basin may lead to increases in surface disturbance, erosion and sediment loading. In response to concerns that energy development may increase TDS concentrations in the Colorado River Basin, USGS (2009) collected TDS and specific conductance data in an effort to establish regression relationships for sites on Muddy Creek near the town of Baggs. These relationships will allow TDS to be monitored more easily in the future using specific conductance measurements as a surrogate. Camp, Dresser, and McKee Inc. (CDM) has been monitoring the physical character and water quality of upper Muddy Creek in the Atlantic Rim area since 2008. The resulting Muddy Creek Monitoring Report (CDM, 2010) indicated that the studied section of Muddy Creek is highly erosive and dominated by fine sediments, but that this condition likely did not worsen over the study period.

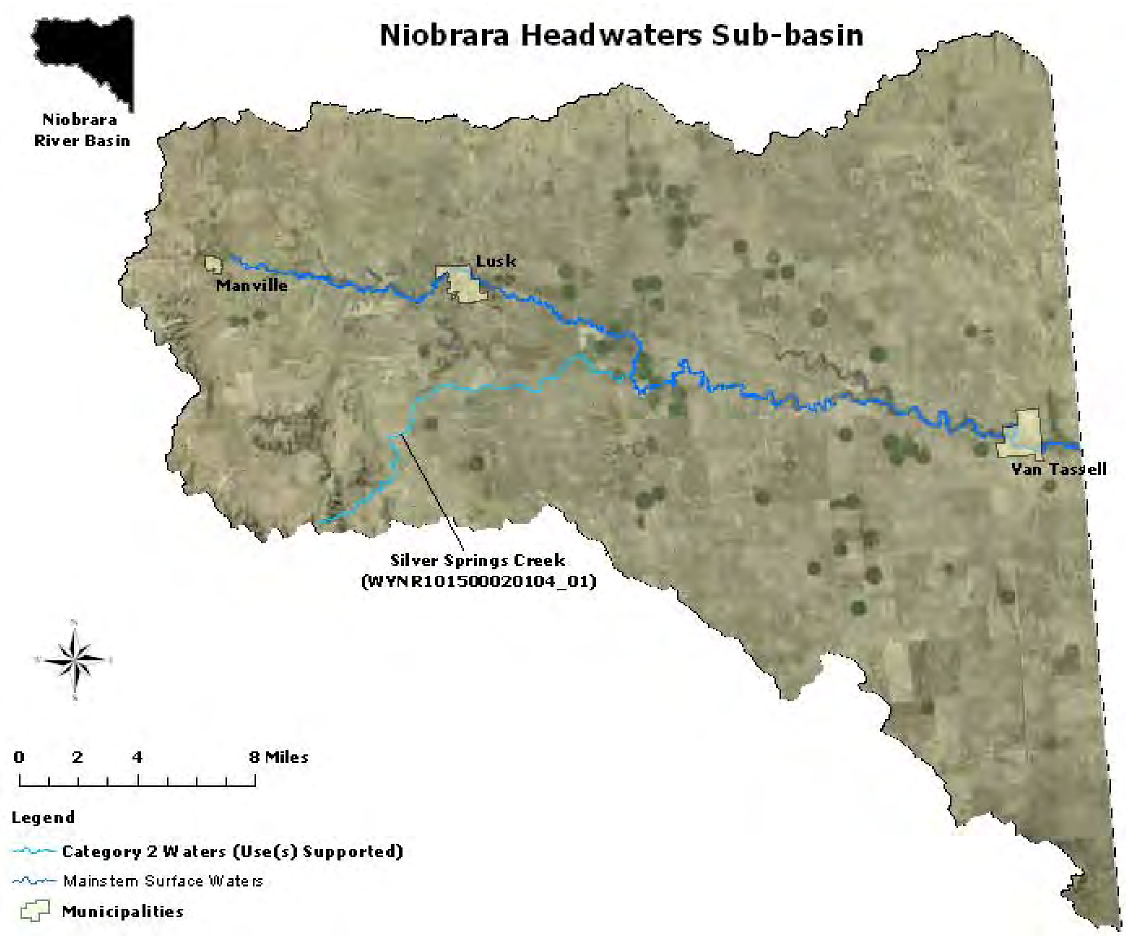
USGS data collected on Muddy Creek below Youngs Draw between 2006 and 2009 showed exceedances of the chronic aquatic life other than fish chloride and selenium criteria. Muddy Creek was placed on the 2010 303(d) List for both of these pollutants from below Youngs Draw upstream to Deep Creek.

8.8 Niobrara River Basin

The Niobrara Headwaters Sub-basin is the only sub-basin in the Niobrara River Basin in Wyoming. Land uses are primarily livestock grazing, with some dry land and sprinkler irrigated crop and hay production. Sandy soils make flood irrigation prohibitive and limit surface streamflow in streams.

Niobrara Headwaters Sub-basin (HUC 10150002)

A large stretch of the Niobrara River below Lusk may never flow, even during catastrophic flooding upstream, and the river channel is an undefined grassy swale. Further downstream, flows surface to form a slow moving, wetland-like stream, with abundant bull rushes and cattails. Historical accounts indicate that in the 1930s the lower stream channel was more defined, had higher flows and supported trout. The WGFD currently manages the Niobrara River and Van Tassel Creek for native nongame fish.



Silver Springs Creek, a tributary to the Niobrara River, is a Class 3B water. The creek only has perennial to intermittent flows in an approximately three mile reach from its headwaters downstream to about a half mile below Silver Springs. The numerous springs in this reach provide most of the flow, with snowmelt and rainfall events also contributing. The stream channel consists of numerous pools which can become disconnected during drier periods. Downstream, the flow regime is ephemeral, and the stream channel consists of a grassy swale. NCD monitored this watershed from 2001 to 2007, and macroinvertebrate data indicated a biological condition similar to reference condition. NCD reported that there are reproducing populations of several species of nongame fish, suggesting the upper reach may be better classified as 2C. Silver Springs Creek is fully supporting of its aquatic life use in the upper perennial/intermittent reaches.

8.9 North Platte River Basin

The North Platte River originates in North Park, Colorado and then flows north into Wyoming. Major tributaries in Wyoming include the Encampment, Medicine Bow, Sweetwater and Laramie Rivers. Because the North Platte River is dammed seven times as it travels through Wyoming to Nebraska, both its flow regime and water quality characteristics have been significantly changed from natural conditions. All water within the North Platte drainage in Wyoming is allocated for beneficial use (under a U.S. Supreme Court decree), much of which is irrigation.

Trout did not occur in the North Platte drainage until they were first stocked in the middle 1800s. Today however, many areas in the basin are famous for their trout fisheries. Walleye, the other principal game fish in the basin, have been stocked in Glendo and several smaller reservoirs. They are now abundant in many reservoirs within the basin.

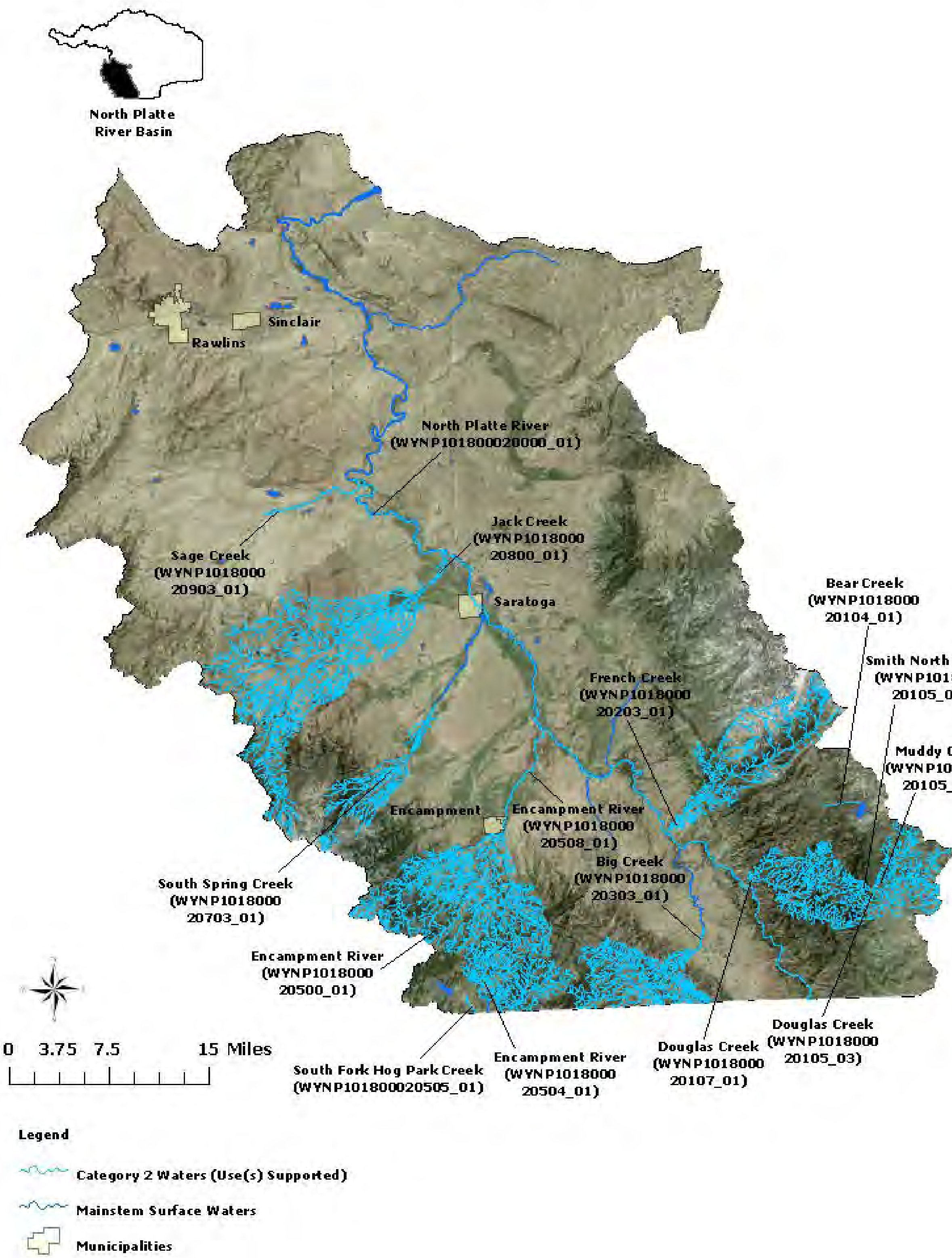
Upper North Platte Sub-basin (HUC 10180002)

The Upper North Platte Sub-basin consists of all waters upstream of Seminoe Reservoir to the Colorado state line. Like most other high elevation basins in Wyoming, the bottom lands are privately owned and irrigated for hay production. Generally, lower elevation uplands are grazed by livestock early and late in the year, and higher elevation uplands are grazed during summer. Logging currently occurs, mostly within the Medicine Bow National Forest, and much of these forests were also historically harvested for railroad ties. As part of this activity, some mountain streams were straightened and logs and boulders were removed.

There is some oil and gas production in the sub-basin and an oil refinery in the town of Sinclair. There are currently no large scale mining operations, but historically there was considerable gold and copper mining in both the Sierra Madre and Medicine Bow mountains, and iron oxide mining near Rawlins. AML has funded restoration projects in many of the formerly mined areas within the sub-basin. Limited coal mining has occurred in this sub-basin, and gravel mines remain scattered throughout.

Stream bank modifications along the North Platte River within Saratoga have reduced flooding, but increased erosion; recent stream bank stabilization should reduce erosion. Natural hot springs in and near Saratoga slightly elevate temperature and TDS in the river. WDEQ has conducted extensive monitoring on the mainstem of the North Platte River above Sage Creek and data indicate that the aquatic life other than fish use is supported. There are reports that nutrient and sediment loads to the river from Colorado may be increasing (WGFD, 2002). Monitoring of a reach of the river above Seminoe Reservoir was conducted in 2002, but aquatic life other than fish use support was inconclusive.

Upper North Platte Sub-basin



Tie driving probably occurred for longer on Douglas Creek than any other stream in the state, continuing from the late 1860s until 1940, when the Union Pacific stopped the use of hand hewn, river driven ties. Devils Gate Creek was too steep and rocky to drive ties, so an extensive flume was built to carry ties and logs to Douglas Creek. Another impact in the Douglas Creek drainage was mining; placer gold was first discovered near Keystone in 1868, and by 1870 hardrock ore bodies were also discovered and mined. Most gold production ceased by the 1890s; copper was mined between 1900 and 1918. Today, a number of gold dredgers still operate in the Douglas Creek watershed outside of the Platte River Wilderness Area boundary. Rob Roy Reservoir was completed in 1965 to regulate flows in Douglas Creek. Water is diverted via a pipeline to Lake Owen in the Upper Laramie River Sub-basin before it is piped further east to be used for a portion of Cheyenne's water supply. Since all the water is allocated in the drainage, water is diverted from the Little Snake drainage into the Encampment River to replace water taken from the North Platte Drainage. Fish habitat structures, primarily tree revetments, have been placed in Douglas Creek to improve aquatic habitat. Because of past mining, heavy metals were a concern in Rob Roy Reservoir, but monitoring conducted by USGS and the Cheyenne Board of Public Utilities as part of a Section 205j grant did not detect any high metal levels of concern for drinking water. Much of the lower watershed is in the Platte River Wilderness Area. Despite the historic impacts to Douglas Creek, the stream within the wilderness fully supports its aquatic life other than fish and cold water fishery uses. Dredging and roads have been identified by USFS as water quality concerns on Douglas Creek below Rob Roy Reservoir and above the wilderness boundary (MBRNF, 2003). Pelton Creek, a tributary to Douglas Creek, is used by the USFS as an example of how grazing management can improve water quality.

USFS reports indicate that impacts from historic mining are a concern on Bear Creek. Rambler Creek, a tributary to Bear Creek, drains the now abandoned site of the historic New Rambler Copper Mine. The site includes the mine itself and a broad delta of mine tailings and sediments. WDEQ monitoring of Bear Creek (WDEQ, 2010) between 2000 and 2008 showed that copper concentrations routinely exceed WDEQ's acute and chronic aquatic life other than fish criteria below the confluence with Rambler Creek, and are highest during snow melt run-off in spring. However, the aquatic macroinvertebrate community in Bear Creek, both above and below the confluence with Rambler Creek was comparable to both regional reference condition and to other high quality benthic communities in adjacent watersheds. These results suggest that the existing copper criteria for Bear Creek are likely overly protective and that the aquatic life other than fish use is fully supported from the confluence with Rob Roy Reservoir to a point 2.9 Miles upstream.

Roads and dredging were identified as water quality concerns on Smith North Creek; however, WDEQ (2004) monitoring indicates that the aquatic life other than fish use is fully supported.

Much of the forest surrounding the Muddy Creek drainage was cut for railroad ties in the 1930s, which is evidenced by remnants of an old splash dam used for driving ties harvested in the upper meadow. A road within the drainage has been a sediment pollution concern, thus WDEQ monitored and assessed the stream in 1998. While a couple of road crossings contribute sediment to the stream, data indicate that these impacts are minimal and that the stream meets its aquatic life other than fish uses. A majority of the Cottonwood, Savage Run and Mullen Creek drainages lie within the Savage Run Wilderness Area. Although considerable timber harvesting has occurred in these drainages (both outside the wilderness and inside the present boundary prior to its designation in 1978), much of these drainages exhibit good riparian and streambank condition, based on observations by WDEQ, and data do not suggest any water quality problems. French Creek, Brush Creek and Pass Creek were all modified to some extent for tie driving in the 1800s; timber has also been recently harvested in these drainages, creating a fairly large network of roads. In addition, much of the lower portions of each of these watersheds are irrigated via diversions from these streams. However, WDEQ monitoring in the French Creek drainage suggests that impacts from these sources, as well as historic placer and hard rock mining, do not affect water quality. Data collected by the USFS suggests that streambank condition on Fish Creek, a tributary to North Brush Creek, has been impacted by season-long grazing, but a grazing plan to reduce time of use is expected to address these issues (MBRNF, 2004).

A large watershed project has been completed in the Cedar Creek drainage to address erosion problems from prior irrigation water delivery. North Brush Creek, Cedar Creek, and the South Fork of Cedar Creek are in a monitoring program associated with the project conducted by the Saratoga-Encampment-Rawlins Conservation District (SERCD). A summary report has not yet been completed.

Based on WDEQ and USFS assessments, streams in the Big Creek drainage fully support their aquatic life other than fish uses within most of the Medicine Bow National Forest, and past problems with sediment loading from forest roads have been addressed (MBRNF, 2003).

The Encampment River originates in the Mt. Zirkel Wilderness Area in Colorado and then flows north into Wyoming. The stream continues north into the Encampment River Wilderness Area. Assessment by WDEQ (2004) indicates aquatic life other than fish uses are fully supported in the Encampment River and North Fork Encampment River. Streamflows in the Encampment River drainage are augmented by a trans-basin diversion of water from the Little Snake drainage into Hog Park Reservoir. Initially, the increased flows in Hog Park Creek caused some stream channel adjustments after the reservoir was completed in 1965, but the stream appears to have since stabilized. South Hog Park Creek was historically used to drive railroad ties, and as a result carried a large sediment load and was unstable. More recently, tree revetments and beaver dams have helped trap sediment, allowing the stream to re-established a more natural shape, which has ultimately improved the fishery. Assessment by WDEQ (2004) indicates that South Hog Park Creek is fully supporting its aquatic life other than fish uses. The North Fork of the Encampment River serves as a drinking water source for the Town of Encampment. Because of the potential development of Green Mountain resort and mountain community within the watershed, the town obtained Section 205(j) funding to develop a Source Water Protection Plan. Water quality monitoring was a component of that project, and the final report, completed in 2005, indicated full support of aquatic life other than fish and drinking water uses.

A diversion ditch in the Billie Creek drainage breached in the late 1990s, eroding a gully and depositing approximately 3,300 tons of sediment in Billie Creek and its floodplain. Restoration work to slow erosion on the gully was completed in 2001. Billie Creek was sampled in 2003 by WDEQ, and data indicate that it has a healthy benthic community. WDEQ and SERCD monitoring indicates that the Jack Creek and upper South Spring Creek drainages are also supporting their aquatic life other than fish uses.

Sage Creek has a naturally high sediment load due to the highly erosive soils and the arid climate in much of the watershed. The creek has been identified by several studies (WGFD, 1969; SCS, 1980; SERCD, 1998) as a significant contributor of sediment to the Upper North Platte River and was placed on the 303(d) List for this pollutant in 1996. Additionally, dam failures, road construction and past grazing practices have resulted in increased erosion and sediment loading, especially in the lower portion of the watershed. In 1997, SERCD, in cooperation with land owners, BLM, NRCS and WGFD, began the Sage Creek Watershed Section 319 projects, which together included the entire Sage Creek watershed. Resulting BMPs consisted of short duration grazing, riparian and drift fencing, off channel water development, improved road management, grade control structures, and water diversion and vegetation filtering to reduce sediment loading from Sage Creek to the North Platte. Monitoring data collected as part of the project showed reduced sediment loading to the North Platte River and improved riparian and range condition. Data indicate there are no longer impairments or threats to aquatic life or coldwater fisheries uses on Sage Creek, and it was removed from the 303(d) List in 2008. A USEPA Section 319 Nonpoint Source Success Story has been written for Sage Creek.

Hugus and Iron Springs Draw are intermittent and ephemeral drainages with Class 3B waters. According to the BLM, new and developing Allotment Management Plans (AMPs) are expected to result in improved watershed condition in these drainages. Sugar Creek flows through Rawlins and enters the North Platte River just upstream of Seminoe Reservoir. The Rawlins WWTF discharges to Sugar Creek, but the stream rarely flows all the way to its confluence with the North Platte River.

Pathfinder-Seminoe Sub-basin (HUC 10180003)

The Pathfinder-Seminoe Sub-basin includes those areas, other than the Sweetwater and Medicine Bow Rivers, which drain into the North Platte River, or its reservoirs, between Pathfinder dam and the inlet of Seminoe Reservoir. Streamflow of the North Platte River, as it passes through this sub-basin, is regulated by Seminoe, Kortes and Pathfinder Reservoirs. Primary land uses in this sub-basin are livestock grazing, irrigated hay production, coal mining and recreation. Underground coal mining began in the Hanna-Elmo area in the late 1860s to supply fuel for the transcontinental railroad. AML has completed three mine remediation projects in the Hanna area, which corrected erosion and standing water problems associated with coal slag piles and almost 200 coal mine related subsidence holes. Current coal mining activities are thought to have little impact on the water quality in this sub-basin or the Medicine Bow Sub-basin.

Pathfinder dam was completed in 1909, and provided the first regulation of flows on the North Platte River. The dam traps sediment in the reservoir and lowers the water temperature of the river downsteam. An extremely productive tailwater fishery resulted after Seminoe Dam was completed in 1939, and was appropriately named the "Miracle Mile". Completion of Kortes Reservoir below Seminoe dam shortened the Miracle Mile, but with the establishment and maintenance of minimum in-stream flow releases, it is still considered a premiere blue ribbon fishery and is designated a Class 1 water by WDEQ.

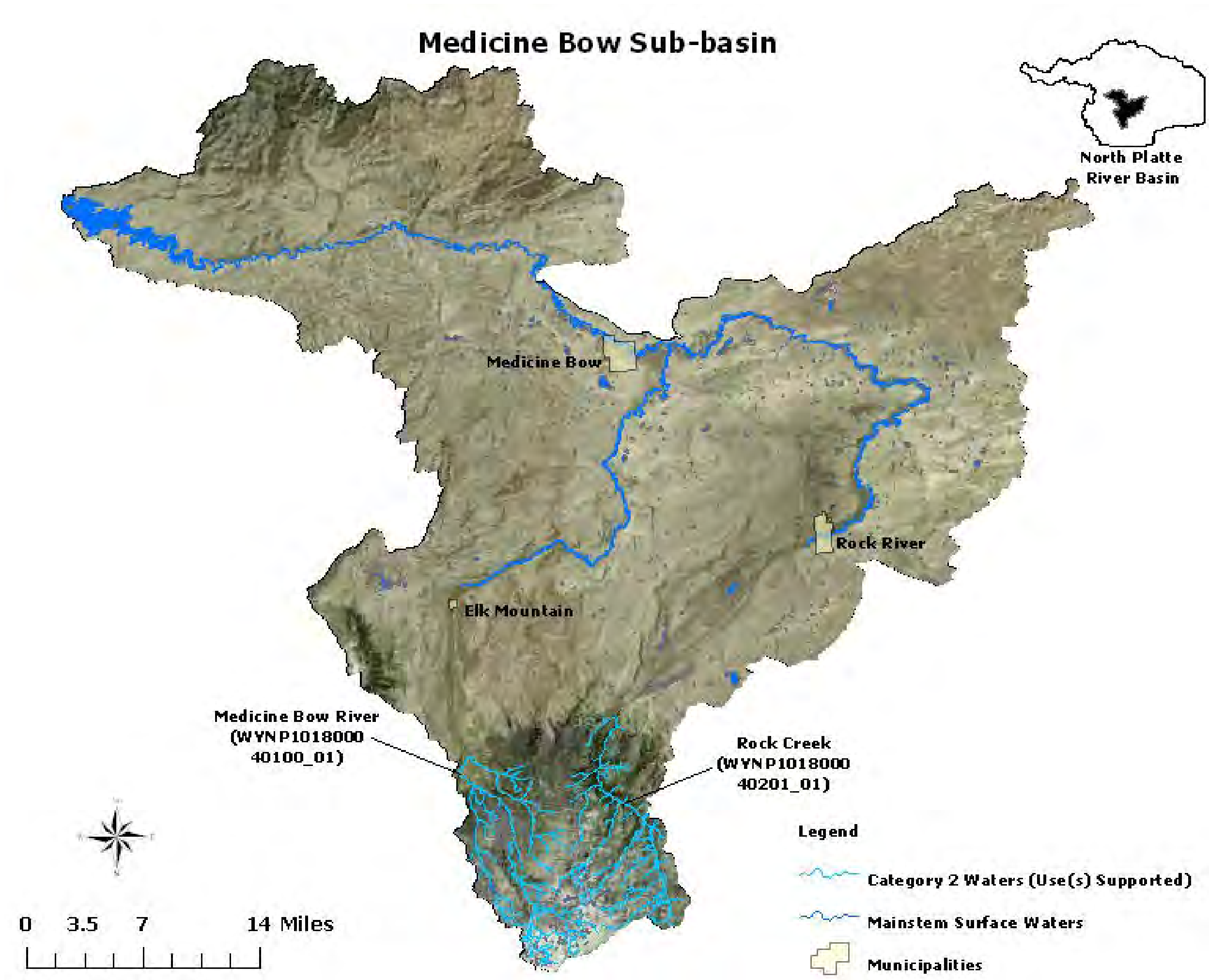
Deweese Creek, which flows into Pathfinder Reservoir, is one of the few perennial streams in this sub-basin and is considered by WDEQ as a reference stream for the Wyoming Basin Ecoregion.

WGFD has conducted tissue analysis for fish from Pathfinder and Seminoe reservoirs. Because methyl mercury concentrations in larger walleye exceeded the USEPA guideline of 0.3 mg methylmercury/kg fish, the Wyoming Department of Health (WDH) has issued a fish consumption advisory. Because Chapter 1 does not currently have a numeric methylmercury criterion for fish tissue, Pathfinder and Seminoe Reservoirs were not added to the 303(d) List for this pollutant.

Medicine Bow Sub-basin (HUC 10180004)

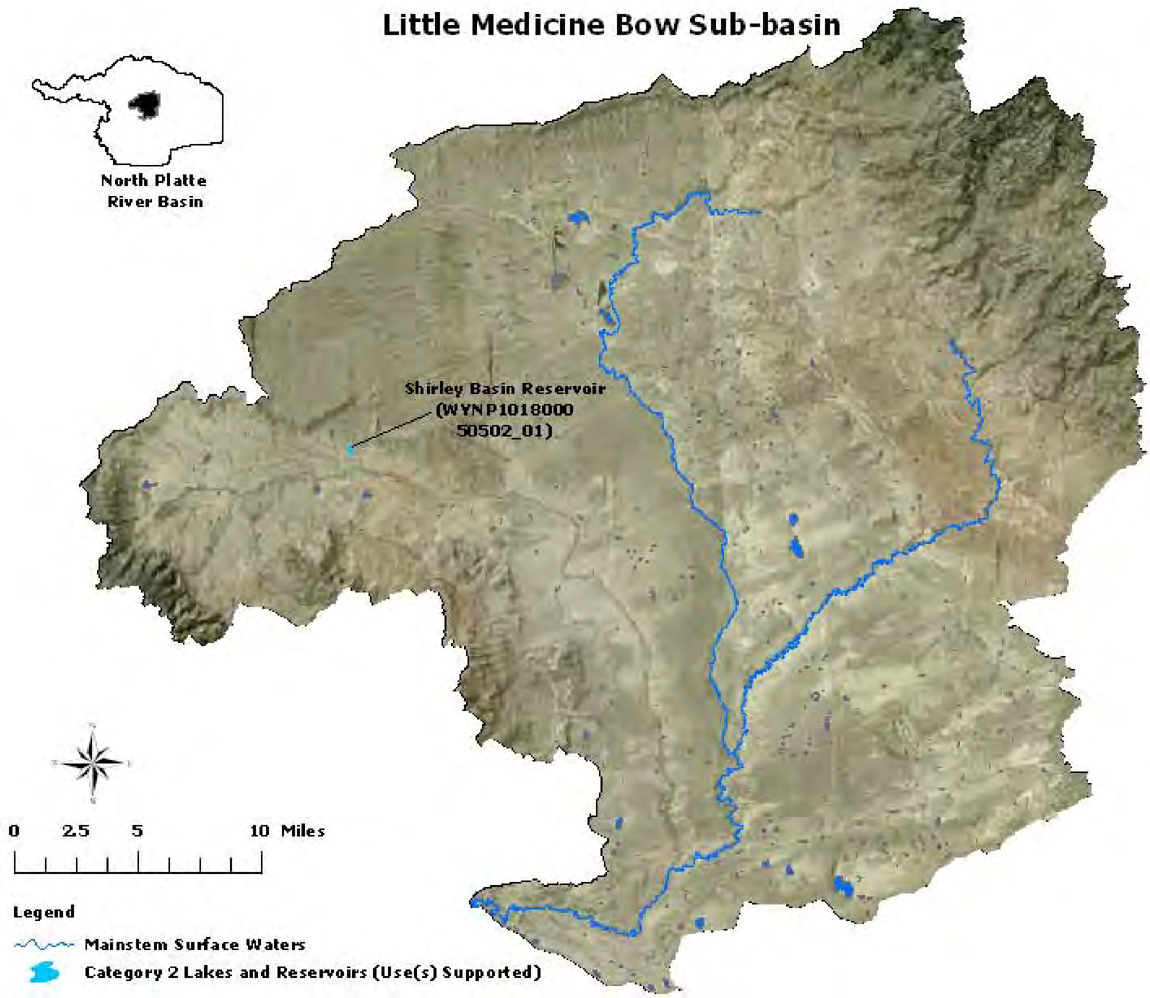
The headwaters of the Medicine Bow Sub-basin are on the north slope of the Snowy Range and drain into Seminoe Reservoir. Water quality characteristics change drastically as streams flow from the metamorphic geology of the mountains through the easily erodible, fine grained sedimentary geology of the basin. While CBM development is beginning in the watershed, current land uses mostly include logging in the mountains, grazing, irrigated hay production, recreation, coal mining and oil and gas development. Irrigation in the Medicine Bow River drainage (including Rock Creek) dates to around 1870. The transcontinental railroad reached this area in 1868 and coal production began in 1869 near the now-abandoned town of Carbon to supply fuel for the railroad. AML has completed ten site investigations and one remediation in this sub-basin, mostly related to coal and gravel production.

Water quality monitoring in the upper Medicine Bow River drainage above the town of Elk Mountain indicated full support of the aquatic life other than fish use. Extensive monitoring by WDEQ, other agencies, and universities, also indicates full aquatic life other than fish use support in the Rock Creek drainage above McFadden.



Little Medicine Bow Sub-basin (HUC10180005)

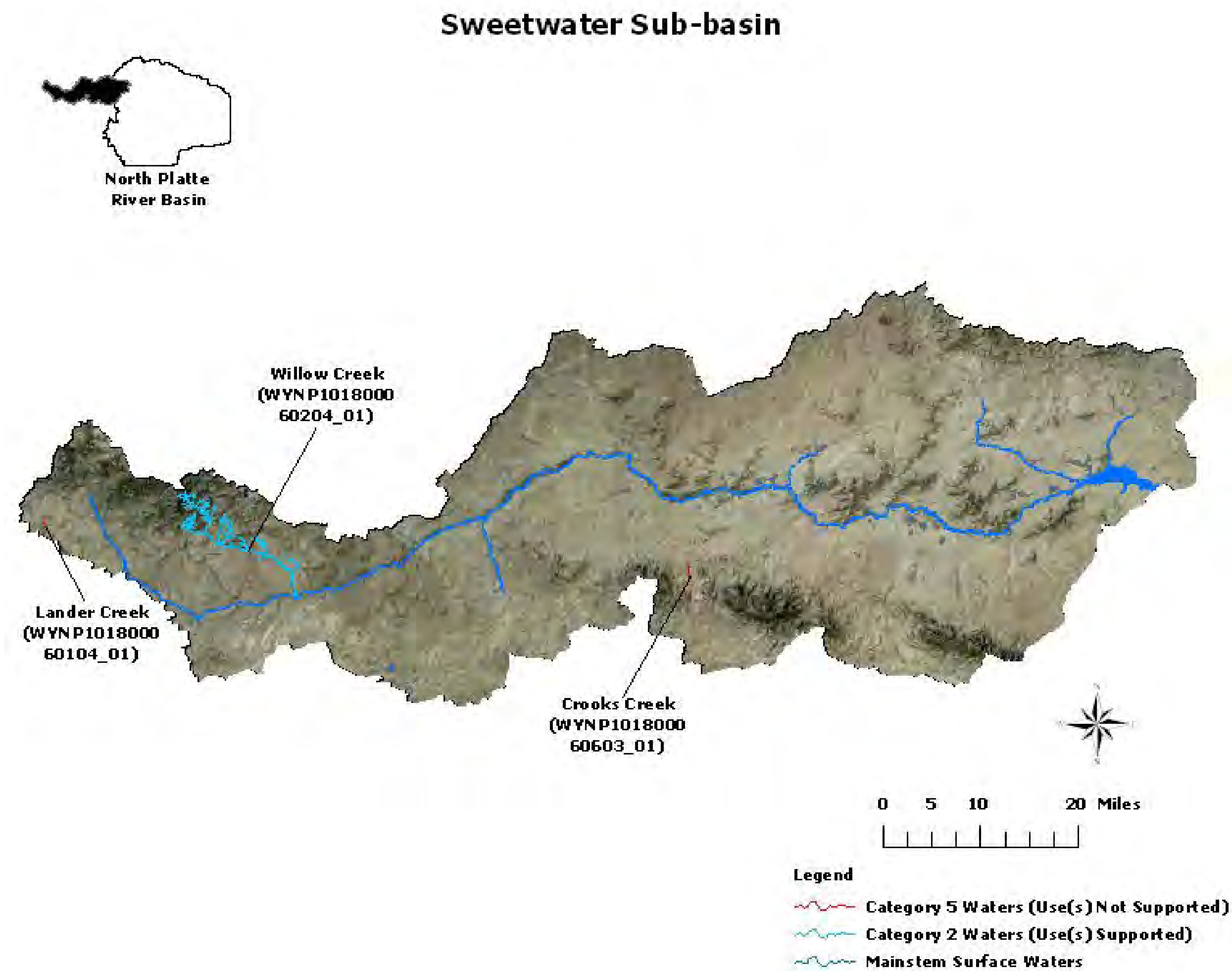
The Little Medicine Bow Sub-basin drains the northwestern edge of the Laramie Mountains and the Shirley Basin. Current land uses are primarily livestock grazing, oil and gas development and historic uranium mining (1955-1980s). AML reclaimed about 1,650 acres of open pit uranium mines in the Shirley Basin, and in the process, eroding radioactive mine waste piles containing elevated levels of selenium and heavy metals were removed. Leaching and runoff from these waste piles were impacting surface and ground water quality; however, reclamation has since improved water quality and reduced off-site sediment transport. The Little Medicine Bow River originally flowed through the uranium ore location. During mining operations in 1972, the river was moved to the east and shortened. The resulting channel was unstable and incised as much as fifty feet, drastically increasing the sediment input to the drainage. During reclamation, the river channel was returned to its former location. WDEQ completed monitoring on the Little Medicine Bow River in 2009 and an assessment report is expected in 2012.



Little Medicine Bow Sub-basin
North Platte
River Basin
Shirley Basin Reservoir
(WYNP1018000
50502_01)
0
2.5
5
10 Miles
Legend
Mainstem Surface Waters
Category 2 Lakes and Reservoirs (Use(s) Supported)

Sweetwater Sub-basin (HUC10180006)

The headwaters of the Sweetwater Sub-basin are in the South Pass area of the southern Wind River Mountains. The Sweetwater River is designated as Class 1 water above Alkali Creek. Land uses in this sub-basin include grazing, irrigated hay production, recreation and oil and gas development; historic uses have included gold and iron mining in the South Pass area and uranium mining in Jeffrey City.



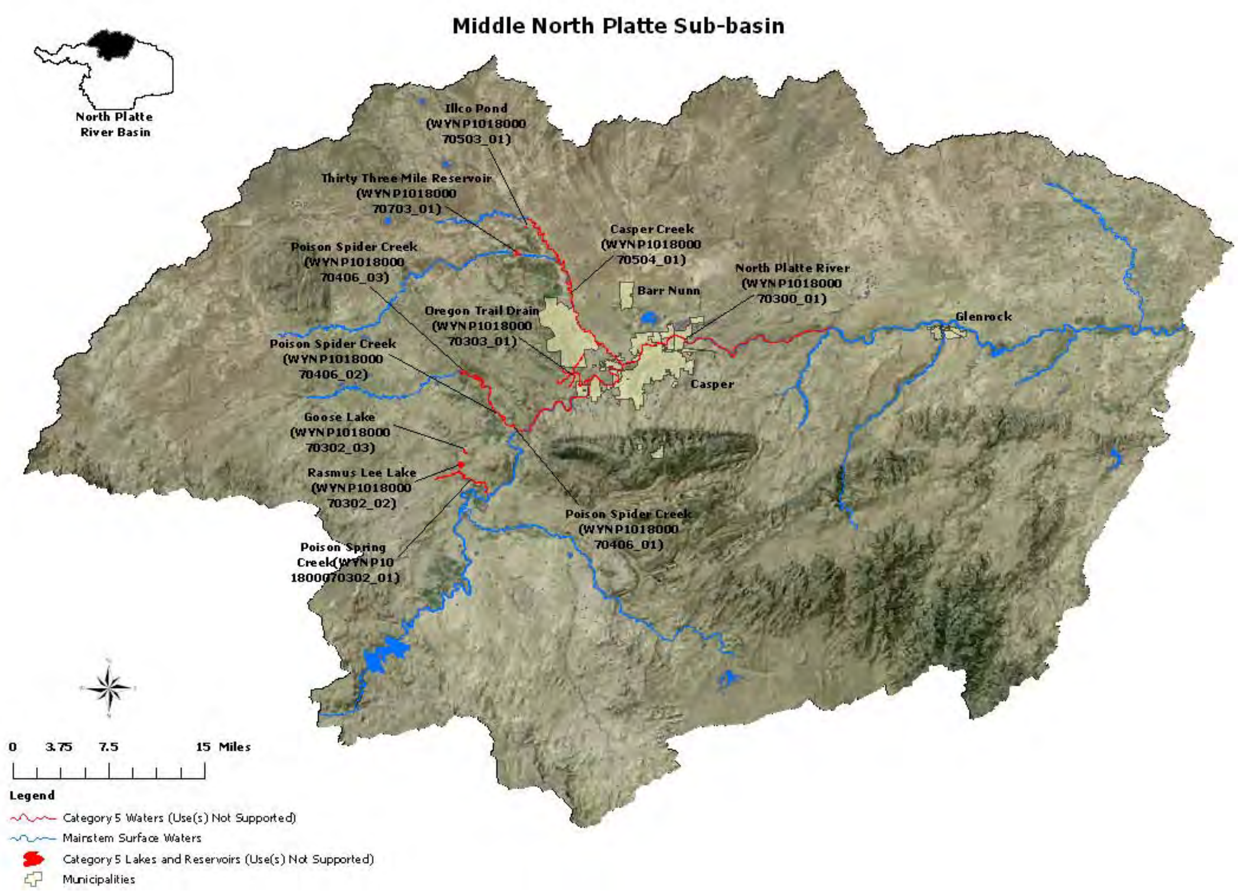
At the western end of the sub-basin, AML has remediated and/or stabilized over 100 sites in the old Atlantic City-South Pass mining districts. The Carissa Mine site, a gold mine which operated from the late 1860s to the early 1940s, included a tailings pond and pile along a perennial tributary to Willow Creek near South Pass City. Approximately 7,000 cubic yards of tailings and contaminated subsoil were removed from the drainage, including clearing 1,200 feet from the stream channel. These materials likely caused elevated levels of arsenic, cyanide and mercury in stream sediments and soils; however, sampling by BLM and WDEQ shows relatively low levels of these contaminants in the water column in Willow Creek. Mercury in streambed sediments does not appear to affect water quality, but this pollutant could be suspended if sediments are disturbed by dredging. Fish tissue sampling by the WGFD showed that mercury levels were below the FDA guideline for action limit in muscle, but higher in other tissues. This trend does not suggest a human health concern, but may be a concern for piscivorous wildlife such as blue herons. WDEQ assessment of Willow Creek shows full support of the aquatic life other than fish use.

Ambient monitoring of Crooks Creek, a tributary to the Sweetwater River near Jeffrey City, showed a significant amount of oil in sediments, and the stream was placed on the 303(d) List for oil and grease in 1998. The source of the oil is currently unknown.

In 2010, Western Watersheds Project (WWP) collected *E. coli* samples on Lander Creek, and a five sample geometric mean exceeded both WDEQ's primary and secondary standards protective of recreational use. The suspected source of the excess bacteria is livestock grazing. A 0.5 mile segment of Lander Creek between two unnamed tributaries and adjacent to County Route 132 was added to the 2012 303(d) List.

Middle North Platte Sub-basin (HUC10180007)

The Kendrick Reclamation Project uses water from Seminoe and Alcova Reservoirs for irrigation northwest of Casper. Much of the irrigated soil contains naturally high levels of selenium, which is readily dissolved and transported by water. Studies by the USGS, USFWS and the USBOR have determined that irrigation return flows contain high levels of selenium, resulting in selenium loading to the North Platte River and several other streams, wetlands and reservoirs within the project area. Patterson, et al. (2009) concluded that higher discharges in the North Platte River correlate with lower selenium concentrations. And that conversion from flood to sprinkler irrigation in the Kendrick Irrigation District may reduce loading, but increase selenium concentrations the North Platte River. Selenium loadings have resulted in exceedances of the chronic aquatic life other than fish criterion in several waters, including the North Platte River, Casper Creek and lower Poison Spider Creek and impairments to wildlife uses in some waters near Kendrick. Oregon Trail Drain, Poison Spring Creek, Goose Lake, Rasmus Lee Lake, Thirty Three Mile Reservoir, and Illco Pond were all added to the 303(d) List since 2000.



An infrastructure repair project has been completed to improve the water quality in Goose Lake, Rasmus Lee Lake, Thirty Three Mile Reservoir and Illco Pond to protect migratory birds. The Natrona County Conservation District (NCCD) has used Section 319 funding to manage and monitor selenium levels. Management practices include increasing irrigation efficiency through canal and lateral lining and piping. WDEQ approved a watershed plan submitted by the Kendrick Watershed Steering committee in 2006. The NCCD completed the Kendrick Watershed Plan Implementation – Phase 1 Section 319 Project Final Report in July 2011. Eleven selenium TMDLs were initiated in 2009 on the North Platte River, Poison Spring Creek, Rasmus Lee Lake, Goose Lake, Oregon Trail Drain, two segments of Poison Spider Creek, Illco Pond, Casper Creek and Thirty Three Mile Reservoir.

Garden Creek flows from Casper Mountain through the City of Casper. Like many urban streams, it has been channelized, and the stream is subject to "flashy" streamflows because of impervious surfaces in the urban portions of the watershed. A Section 319 stream restoration project, sponsored by the City of Casper and the NRCS, and using the help of volunteers, focused on installing log and rock structures in the creek within Nancy English Park. These structures allowed the stream to access its floodplain, provided habitat for non-game fish and facilitated the reestablishment of riparian vegetation.

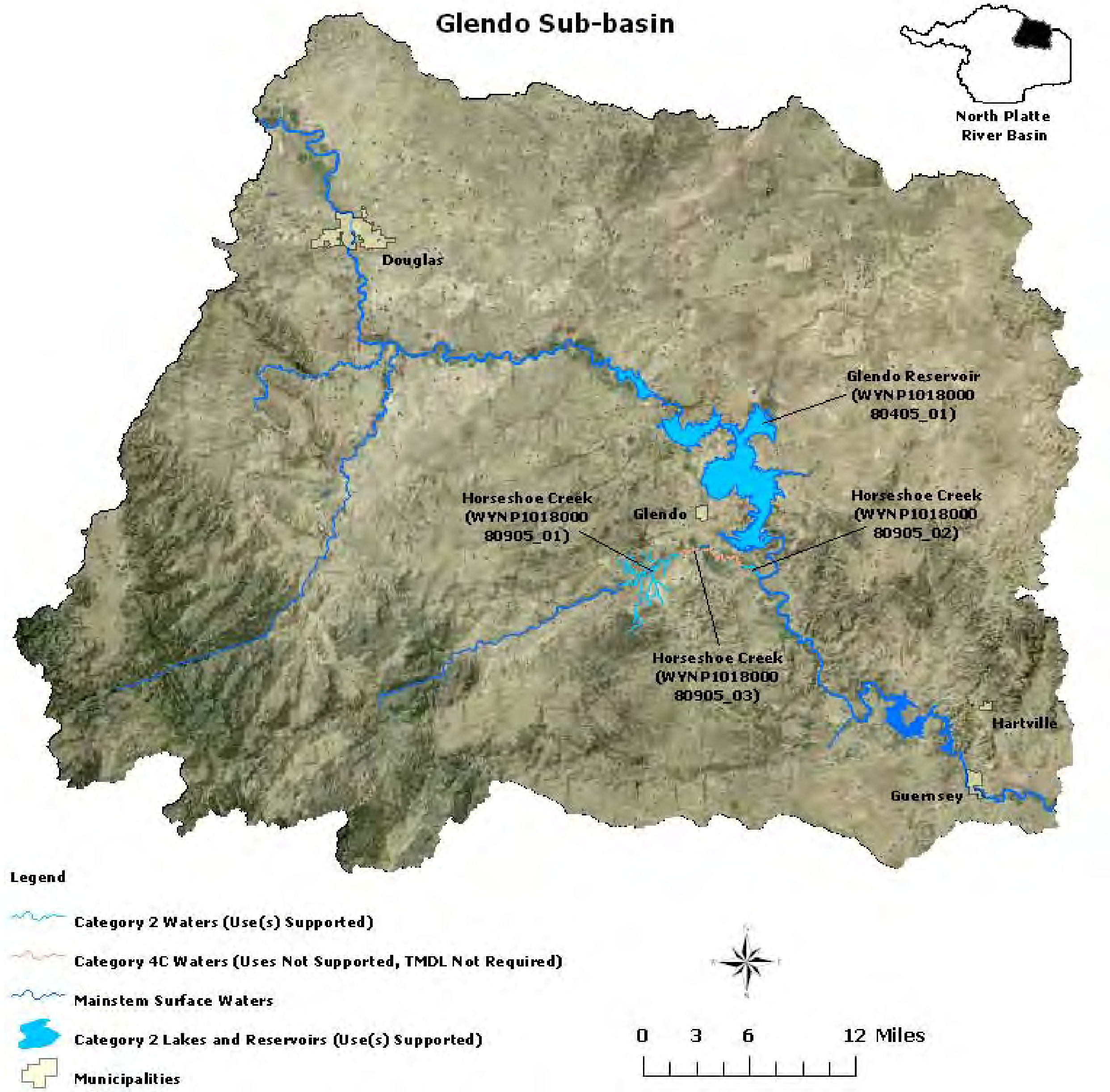
WGFD and BLM began a project in 2010 to reduce head cutting in Bolton Creek, stabilize the channel and raise the water table. WGFD transplanted aspen into the watershed and established a population of beavers. A culvert near the confluence with the North Platte, which was causing the headcutting, was replaced in 2011.

The occurrence of oil sheens in 2010 and 2011 along the North Platte River near Casper has prompted an investigation by WDEQ's Solid and Hazardous Waste Division to determine the source of this pollutant. Hydrocarbons were detected in a monitoring well adjacent to the river, which may suggest that a nearby oil refinery could be a source. BP will continue to investigate this issue, including collecting water samples, installing more monitoring wells and conducting a sediment study to determine whether the oil is entering the river via erosion and overland flow or through groundwater inputs through streambed sediments.

Glendo Sub-basin (HUC10180008)

Glendo Sub-basin is bordered by the Laramie Mountains to the southwest and includes all of the tributaries to the North Platte River below LaPrele Creek and above the Fort Laramie Canal. Primary land uses are livestock grazing, irrigated agriculture, oil and gas development and gravel and limestone quarrying. Sunrise Mining District is located east of Hartville Canyon in a tributary drainage of the North Platte River. Copper mining began in the 1870s and iron mining followed in the 1890s. An Abandoned Mine Lands (AML) reclamation project in the Sunrise Mining District has addressed several water quality impacts from the mining.

Glendo Reservoir was constructed between Pathfinder and Guernsey reservoirs in 1958. The North Platte River is regulated by dams at Glendo and Guernsey Reservoirs. Guernsey Reservoir is the site of the annual Guernsey "silt run", an event that has prompted an exception to the normal state turbidity criterion. Historically, suspended sediment had acted as a sealant for downstream irrigation canals. However, after Guernsey Reservoir was completed in 1927, water released from the reservoir had little suspended sediment because most of these materials settled and became trapped in the reservoir. The removal of these sediments led to canal leakage and bank collapses which in turn impeded water flow. In response, the annual silt run was initiated in 1936, which released accumulated sediment from Guernsey Reservoir over a ten day period. The silt run occurred approximately annually between 1936 and 1957 by reducing flows from Pathfinder and subsequently draining Guernsey. Since



1983, this event has been authorized in the WDEQ's turbidity standards. Monitoring by WDEQ (2009) between 2004 and 2006 indicated that Glendo Reservoir is fully supportive of all of its designated uses except drinking water and primary contact recreation, which were not assessed.

Horseshoe Creek originates in the Laramie Range and flows northeast to its confluence with the North Platte River just below Glendo Reservoir. Monitoring of Horseshoe Creek by WDEQ (2004) indicates that the lower 2 miles and a section from the confluence with Spring Creek to a point 12.5 miles upstream fully support their aquatic life other than fish and cold water fisheries uses. However, habitat degradation and a lack of perennial flows from the confluence with Spring Creek downstream approximately 7.3 miles prevent Horseshoe Creek from supporting its aquatic life other than fish and cold water fisheries uses. The habitat degradation appears to be primarily related to changes in flow regime in this reach, but heavy livestock grazing in some areas may also contribute. As a result, Horseshoe Creek was added to Category 4C in 2004 and is impaired but does not require a TMDL.

Lower North Platte Sub-basin (HUC10180009)

In Wyoming, this sub-basin includes all drainages other than the Laramie River which enter the North Platte River from the Fort Laramie Canal diversion downstream to the Nebraska state line. Primary land uses are irrigated agriculture, dry land farming and livestock grazing.

Upper Laramie Sub-basin (HUC10180010)

This sub-basin includes the City of Laramie and all of the drainages along the Laramie River above Wheatland Reservoir #2. Major drainages in the Upper Laramie Sub-basin include the Laramie and Little Laramie Rivers, the headwaters of each of which are in the Medicine Bow Mountains. Land uses are logging, recreation, and livestock grazing at higher elevations and livestock grazing, irrigated hay production and some oil and gas development in the lower elevations.

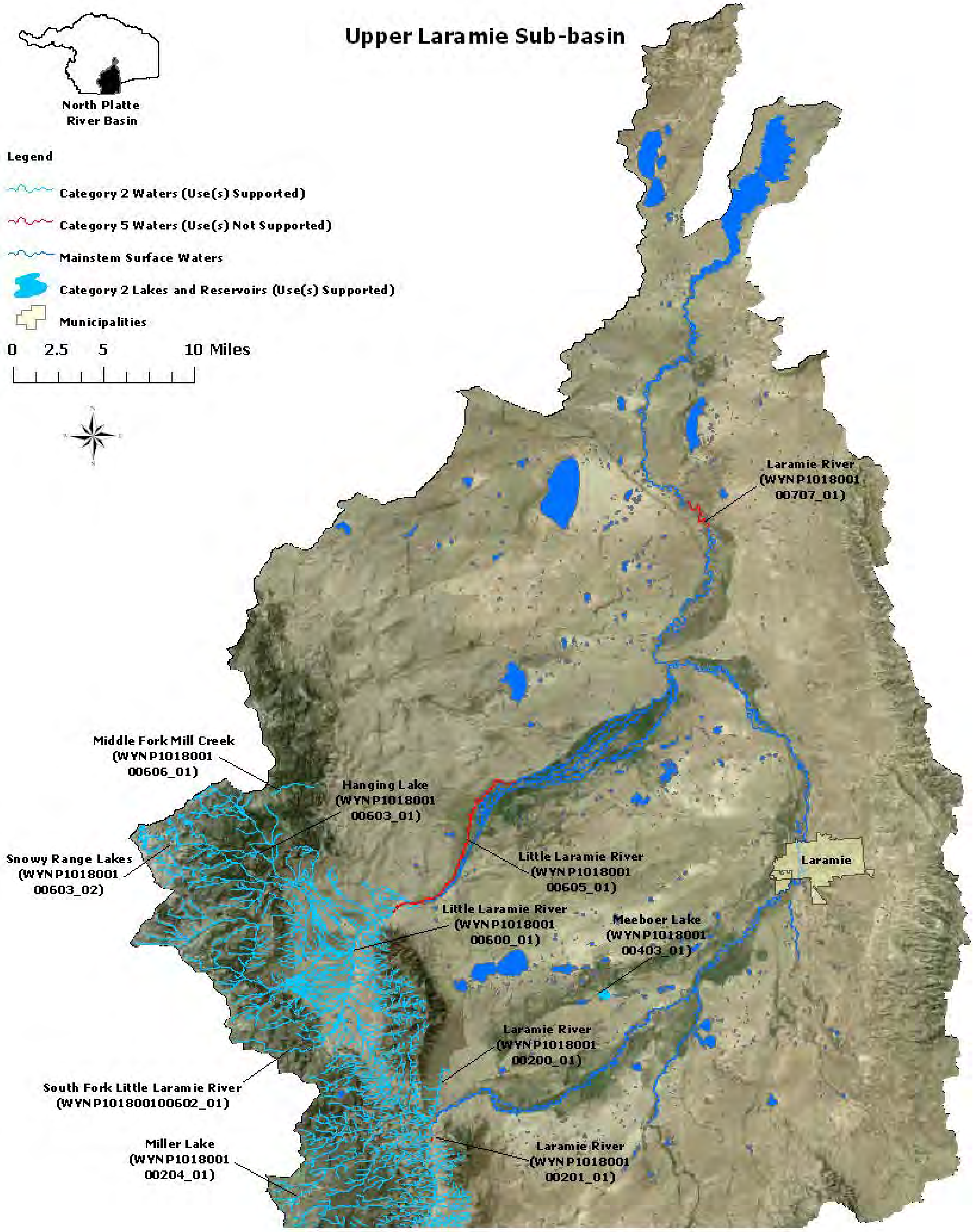
Water quality assessments by several universities, the USFS, and WDEQ (2004) in the Little Laramie drainage above Millbrook indicate that the majority of the streams and lakes are meeting their aquatic life other than fish uses. WDEQ (2004) assessment of the Middle Fork of Mill Creek also indicates full support of its aquatic life other than fish uses.

Hanging Lake is a small shallow subalpine lake located in the Little Laramie River watershed. Aside from snowmelt, water entering the lake is diverted from Nash Fork. It is managed as a "put and take" fishery, because it is very shallow (4.2 foot maximum depth) and winterkills. Water temperatures can exceed the criterion for coldwater game fish, and the abundant vegetation can cause high pH in the low conductivity water, which has little buffering capacity. Hanging Lake is meeting its aquatic life other than fish uses, given its natural potential (WDEQ, 2006).

Miller Lake, in the Evans Creek watershed near Fox Park, is another small, shallow reservoir (9 foot maximum depth). Because of the low conductivity of the water, it has little buffering capacity and the shallow lake is conducive to macrophyte growth, and pH can be high during photosynthesis. Miller Lake has a self-sustaining brook trout population and is stocked with rainbow trout. Although the lake sometimes winterkills, it is meeting its designated aquatic life other than fish and coldwater fisheries uses, given its natural potential (WDEQ, 2006).

Meeboer Lake is in the Laramie Plains Lake complex southwest of Laramie. Because it is a shallow lake, eleven feet at maximum depth, summer water temperatures can sometimes rise above the 20°C standard protective of coldwater fish; however, cooler refugia habitat are available for fish. In the past, the decay of abundant macrophytes during winter has caused low dissolved oxygen levels and subsequent fish kills, but an aerator was installed to address this issue. Assessment by WDEQ (2006) indicates full aquatic life other than fish use support given the natural potential of the lake.

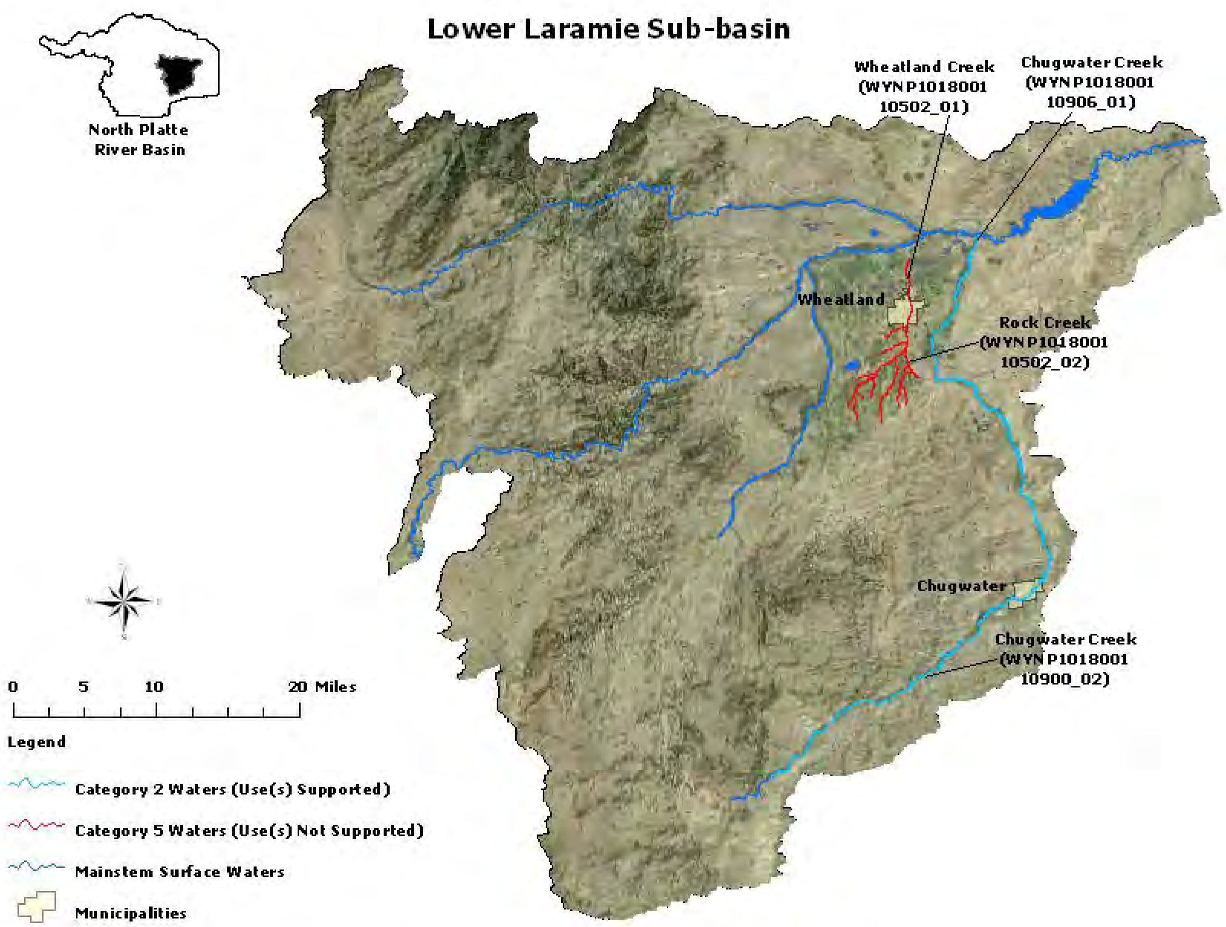
Water quality samples have been collected by the Laramie Rivers Conservation District (LRCD) on the Laramie and Little Laramie Rivers. LRCD sponsored a Section 319 project in 2010 to reduce fine sediment to the Laramie River form bank erosion, improve fish habitat and educate the public about stream habitat restoration. Data collected during fall 2010 and spring 2011 by LRCD showed that two segments of the Laramie River exceeded the *E. coli* criterion protective of primary contact recreational use, including a segment from State Highway 10 (near Woods Landing) to a point 0.3 miles upstream and a 2.9 mile segment below Bosler Junction. In addition, data showed that the Little Laramie River also exceeded the primary recreational use criterion from Mandell Lane upstream to Snowy Range Road. All three of these segments have been added to the 2012 303(d) List; sources of bacteria are currently unknown.


Upper Laramie Sub-basin
North Platte River Basin
Legend
Category 2 Waters (Use(s) Supported)
Category 5 Waters (Use(s) Not Supported)
Mainstem Surface Waters
Category 2 Lakes and Reservoirs (Use(s) Supported)
Municipalities
0 2.5 5 10 Miles
Laramie River (WYNP1018001 00707_01)
Middle Fork Mill Creek (WYNP1018001 00606_01)
Hanging Lake (WYNP1018001 00603_01)
Snowy Range Lakes (WYNP1018001 00603_02)
Little Laramie River (WYNP1018001 00605_01)
Laramie
Little Laramie River (WYNP1018001 00600_01)
Meeboer Lake (WYNP1018001 00403_01)
Laramie River (WYNP1018001 00200_01)
South Fork Little Laramie River (WYNP101800100602_01)
Miller Lake (WYNP1018001 00204_01)
Laramie River (WYNP1018001 00201_01)

Lower Laramie Sub-basin (HUC10180011)

This sub-basin contains the mainstem and tributaries of the Laramie River from Wheatland Reservoir #2 downstream to its confluence with the North Platte River. Land uses include irrigated agriculture, livestock grazing, dry land farming and some logging in the Laramie Range.

Ammonia and pH levels in Wheatland Creek often exceed water quality criteria in the winter and spring, indicating that aquatic life other than fish and nongame fishery uses are not fully supported. Monitoring has indicated that the City of Wheatland's WWTF is a primary source of ammonia and pH Waste Load Allocation (WLA) for ammonia has been approved by USEPA. Thus, Wheatland Creek was added to the 303(d) List in 1996 for exceedances of the pH and ammonia criterion protective of aquatic life other than fish. The city, in cooperation with WDEQ has installed a non-discharging treatment system to address these issues. Citizen concerns prompted WDEQ (2002) to begin monitoring fecal bacteria in the Wheatland/Rock Creek drainage. Data indicated that Rock Creek and a portion of Wheatland Creek for an undetermined distance above and below Highway 320 are not meeting their contact recreational uses, and these waters were placed on the 303(d) List in 2002. The Platte County Conservation District (PCNRD) sponsored watershed planning to identify and address sources of fecal contamination, and a Rock Creek watershed plan was approved in 2007. To date, 79 irrigation efficiency, 12 water quality improvement, 12 grazing management and 32 wildlife habitat enhancement projects have been implemented, primarily using NRCS funding. Two AFO relocation projects have also occurred in the drainage (WACD, 2007).



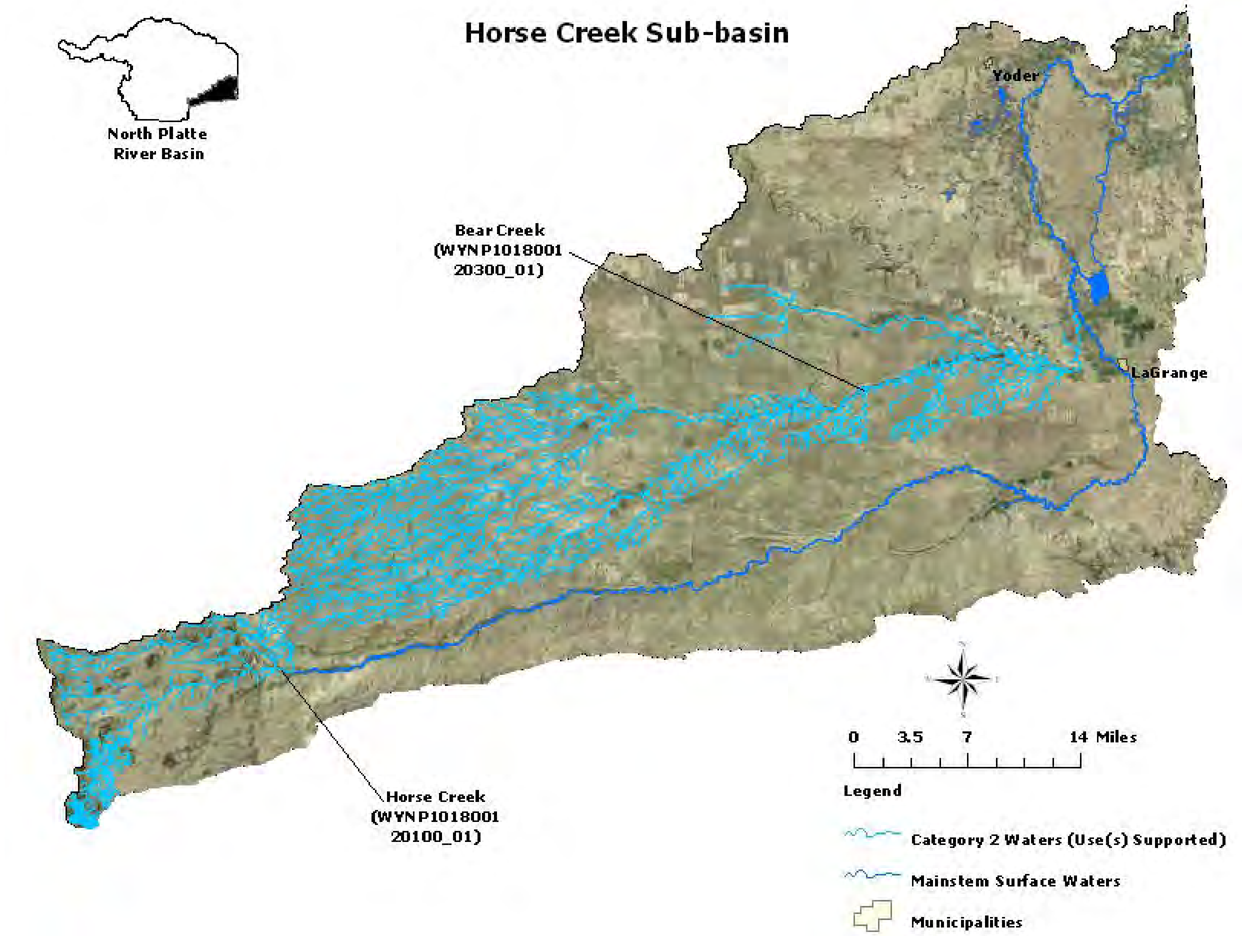
Assessments were conducted by WDEQ in 1998 on private land along Chugwater Creek. Results showed that the creek supported its aquatic life other than fish uses above Antelope Gap Road west of Wheatland, but nutrients were noted as a concern. The assessment indicated that the physical and biological character of the creek changed substantially within a reach below Antelope Gap Road. Specifically, the streambed was dominated by highly mobile sand, a substrate which is poor habitat for most macroinvertebrate taxa. WGFD fish data showed a corresponding reduction in fish community richness. As a result, the lower reach of Chugwater Creek was listed as threatened on the 303(d) List in 2000. PCNRD conducted monitoring on Chugwater Creek in 2000 and 2001 to better define the extent of the threatened reach, which was ultimately defined as being from the irrigation diversion in NE SW S26 T25N R67W upstream to an undetermined distance below Antelope Gap Road. PCRD data also showed very high nitrate levels in Chugwater Creek, approximately 10 times higher than those recommended by USEPA for streams which ultimately flow into reservoirs. Affects of such nutrient loading on Gray Rocks Reservoir are unknown. Restoration efforts by landowners, WGFD and Pheasants Forever to improve riparian conditions and wildlife habitat were later implemented along the threatened reach of Chugwater Creek, which mostly involved the installation of riparian fencing in grazed pastures. Additionally, the irrigation district built a small reservoir on a bench above the creek to improve irrigation efficiency by capturing excess irrigation water, and converted some surface irrigation to sprinkler irrigation.

In 2005, the Water and Waste Advisory Board met to consider comments about the decision by WDEQ to list Chugwater Creek and about a petition by PCNRD to delist the creek. It was decided that a technical review team (TRT), mediated by the Wyoming Department of Agriculture (WDA), would further investigate Chugwater Creek. The TRT consisted of a panel of four experts in each of the fields of water quality, geomorphology, range science and soil science to assist in making a final determination of the condition of the stream reach; including whether additional data were necessary to accurately assess creek conditions, an assessment of general watershed health and the preparation of a summary report of the recommendations. WDEQ and PCRD were available to respond to questions by the TRT, including during a site visit of Chugwater Creek. Chemical and physical parameters, including stream temperature, pH, electrical conductivity, dissolved oxygen and oxygen saturation, were measured during the visit, and locations in the upper, middle and lower watershed were assessed for impacts from sediment. The TRT concluded that the 1998 WDEQ assessment did not reflect current conditions and that excessive sedimentation was no longer evident in the listed reach. The TRT also noted that riparian areas had been fenced, grazing periodicity and duration had changed and that streambanks appeared stable. Little gravel was present during the study, which is a vital substrate during the reproduction of some fishes. The stream channel was described as having adjusted downward due to low flows from drought and water diversions, lessening the ability of the stream to transport sediment. The TRT suggested that water gaps supplied minimal off-channel sediment and that these were necessary for livestock management. Lastly, the TRT noted that vegetation was colonizing point bars along the reach. WDEQ concluded that the changed management practices within the Chugwater Creek watershed had addressed the sediment threats to this reach and it was removed from the 303(d) List in 2008.

Tunnel Reservoir dams the Laramie River and diverts water into Bluegrass Creek for irrigation in the Sybille Creek drainage. The reservoir is drained in the fall to prevent damage of the tunnel gates, but because the dam is bottom-release, the annual drawdown often discharges anoxic sediment from the reservoir bottom that results in fish kills downstream in the Laramie River. In 1997, the reservoir was modified to correct this problem.

Horse Creek Sub-basin (HUC10180012)

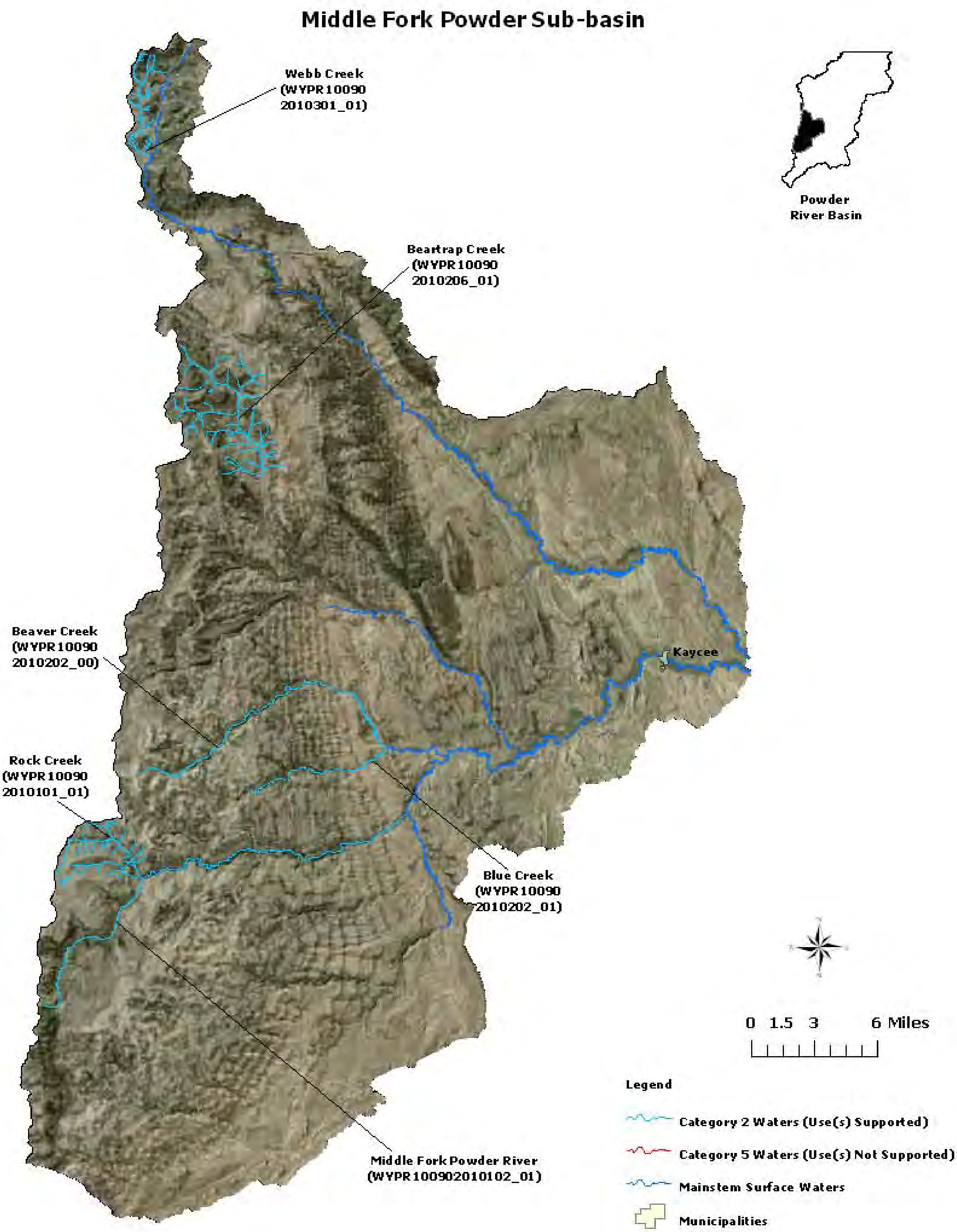
The headwaters of the Horse Creek Sub-basin are in the Laramie Mountains. Land uses are primarily livestock grazing and irrigated hay production, with considerable dry land and irrigated crop production at lower elevations. Historically, underground limestone mining occurred in the upper reaches of the sub-basin, but AML has completed work to re-route surface waters and prevent flows into mines.



Watershed assessments on upper Horse Creek show that aquatic life other than fish uses are fully supported. Watershed monitoring was conducted by WDEQ (2003) on Bear Creek and the South and North Forks of Bear Creek in 1999; results indicated that these streams are meeting their aquatic life other than fish uses. However, elevated temperature is a concern in the lower watershed.

8.10 Powder River Basin

The Powder River flows north from central Wyoming into Montana. Nearly all of the naturally perennial streams which reach the Powder River originate in the Big Horn Mountains. Wohl et. al. (2007) reported that many streams within the Bighorn National Forest have been substantially impacted by cattle ranching, irrigated crop production, flow regulation and diversion and timber harvest. The Big Horn Mountains are composed of igneous and metamorphic rocks flanked by well-indurated sedimentary rocks. The water quality of these mountain streams is generally high, except in areas where land use practices have led to excessive erosion and sediment loading. In the lowlands of the Powder River geologic basin, the geology primarily consists of fine grained sedimentary strata which are easily erodible and often high in dissolved constituents. Streams that originate in basin terrain are generally ephemeral and flow only in response to snowmelt or rainfall events unless receiving discharge water from industry (e.g. CBM). These streams are generally high in dissolved solids collected and are often naturally turbid. Due to these conditions, site specific criteria have been adopted and numeric secondary human health criteria for manganese and iron do not apply to most Class 2 waters originating in the basin. WDEQ, WGFD and USFWS have concerns about how aquatic communities may be affected by CBM development, but the effects of development on aquatic biota are unknown. WGFD biologists and a UW graduate student recently surveyed the basin from 2004-2008. Survey data confirmed that the Powder River still hosts the most diverse fish assemblage of any Wyoming river basin. However, biologists also noted the near absence of the sturgeon chub, a species that was common in the Powder River in the mid-1990s.



Middle Fork Powder Sub-basin (HUC10090201)

The headwaters of the Middle Fork Powder River flow through a steep canyon with little potential for disturbance. WDEQ data indicate that the Middle Fork Powder River above Buffalo Creek, and Rock Creek, an upper tributary, fully support their aquatic life other than fish uses. Blue Creek and upper Beaver Creek (WDEQ, 2003) were also assessed by WDEQ and fully support their aquatic life other than fish uses.

Beartrap Creek is a spring fed tributary of Red Fork. Historically, the upper Beartrap Creek drainage has been used as a stock driveway and holding ground. However, management practices have changed over the past twenty years, and livestock now have limited access to streams, are moved through relatively quickly and are only in the drainage for a short period in spring and fall. Log spill structures were installed by BLM and WGFD in 1989 to create additional pool and riffle habitats. Monitoring by WDEQ shows that both upper Beartrap Creek and Sawmill Creek are fully supporting their aquatic life other than fish uses. Monitoring by WDEQ (2004) in 1998 and 2003 indicates that Webb Creek, a class 2AB tributary to the North Fork of the Powder River, is fully supporting its aquatic life other than fish uses.

Upper Powder River Sub-basin (HUC10090202)

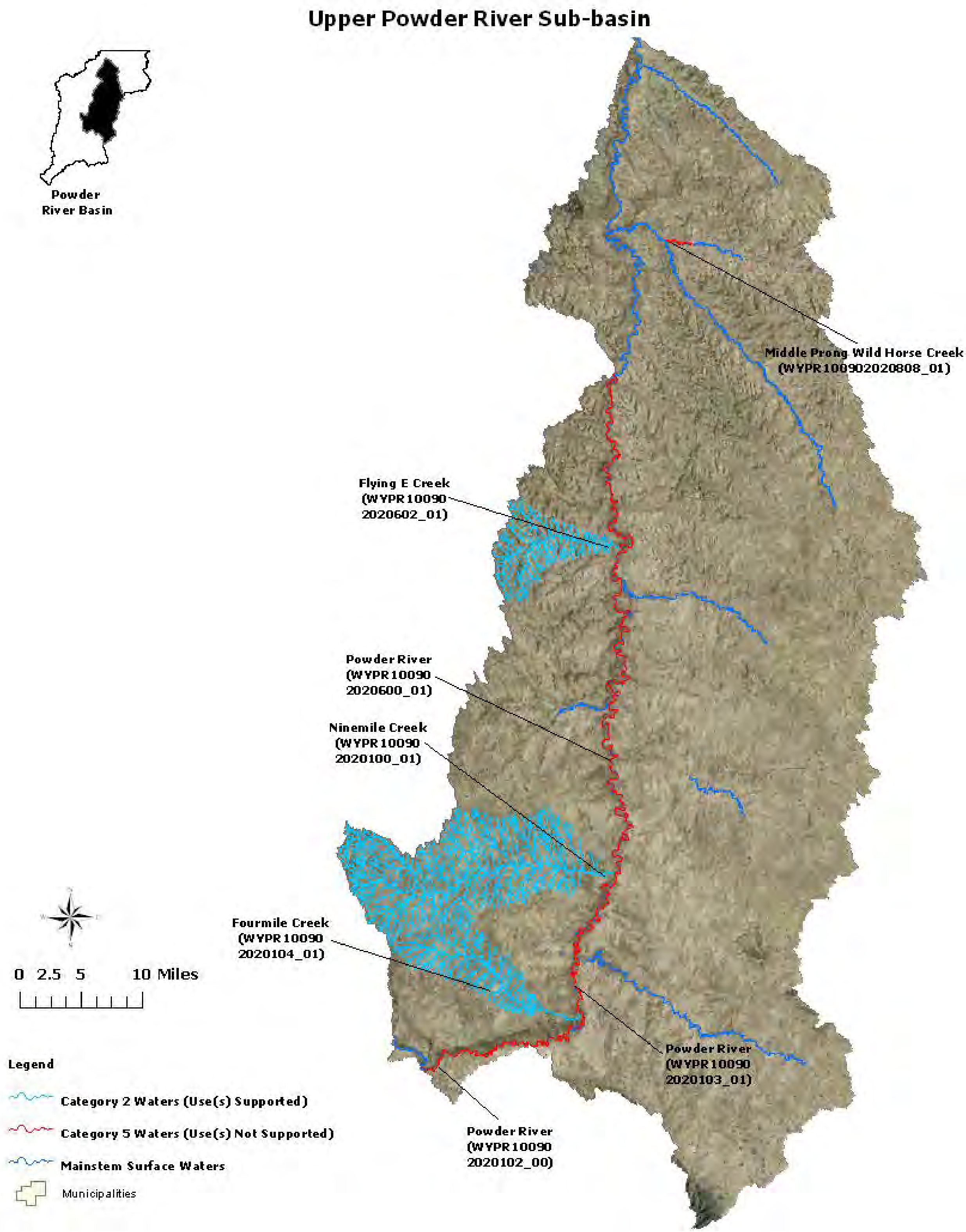
The Upper Powder Sub-basin encompasses most of the drainages into the Powder River main stem from the confluence of the North and Middle Forks downstream to the confluence of the Powder River and Clear Creek. Primary land uses are livestock grazing and oil and gas production. Except for the main stem reaches, most reaches in this semi-arid sub-basin are non-perennial.

The Powder River got its name from the large amounts of very fine sediment it naturally carries. Sturgeon chub, a native fish considered rare by WGFD and now found only in the Powder River in Wyoming, is believed to be adapted to, and actually require, turbid water.


Sturgeon Chub
Photo by David Ostendorf (MDC)

Monitoring by WDEQ in 1998 showed that Pumpkin Creek was an ephemeral or intermittent stream and was supporting its aquatic life other than fish uses. However, CBM development has since started in the watershed. As part of the watershed based permitting process, physical data were collected in the Pumpkin Creek drainage (WDEQ, 2003) to determine how much additional flow from CBM discharges the drainage could accommodate without physically degrading. This monitoring showed that parts of the drainage now have perennial flows that reach the Powder River, and identified areas of severe erosion and active headcutting. The 1998 data collected by WDEQ can no longer be considered representative of current conditions, and it is unknown whether Pumpkin Creek is fully supporting its aquatic life other than fish uses. Fortification Creek was also monitored by WDEQ in 1999 WDEQ (2004), and showed full support of the aquatic life other than fish use. Ninemile WDEQ (2005) and Fourmile WDEQ (2005) Creeks, located near Sussex, are ephemeral class 3B tributaries to the Powder River. Dikes and other small impoundments trap sediment and help support riparian vegetation. Assessments by WDEQ indicate that aquatic life other than fish uses are supported in these watersheds.

Analysis of chloride data in the Powder River Basin shows that the majority of chloride loading in the Powder River comes from Salt Creek. The Powder River below Salt Creek was added to the 1998 303(d)


Upper Powder River Sub-basin
Powder River Basin
Middle Prong Wild Horse Creek (WYPR100902020808_01)
Flying E Creek (WYPR10090 2020602_01)
Powder River (WYPR10090 2020600_01)
Ninemile Creek (WYPR10090 2020100_01)
Fourmile Creek (WYPR10090 2020104_01)
Powder River (WYPR10090 2020103_01)
Powder River (WYPR10090 2020102_00)
0 2.5 5 10 Miles
Legend
Category 2 Waters (Use(s) Supported)
Category 5 Waters (Use(s) Not Supported)
Mainstem Surface Waters
Municipalities

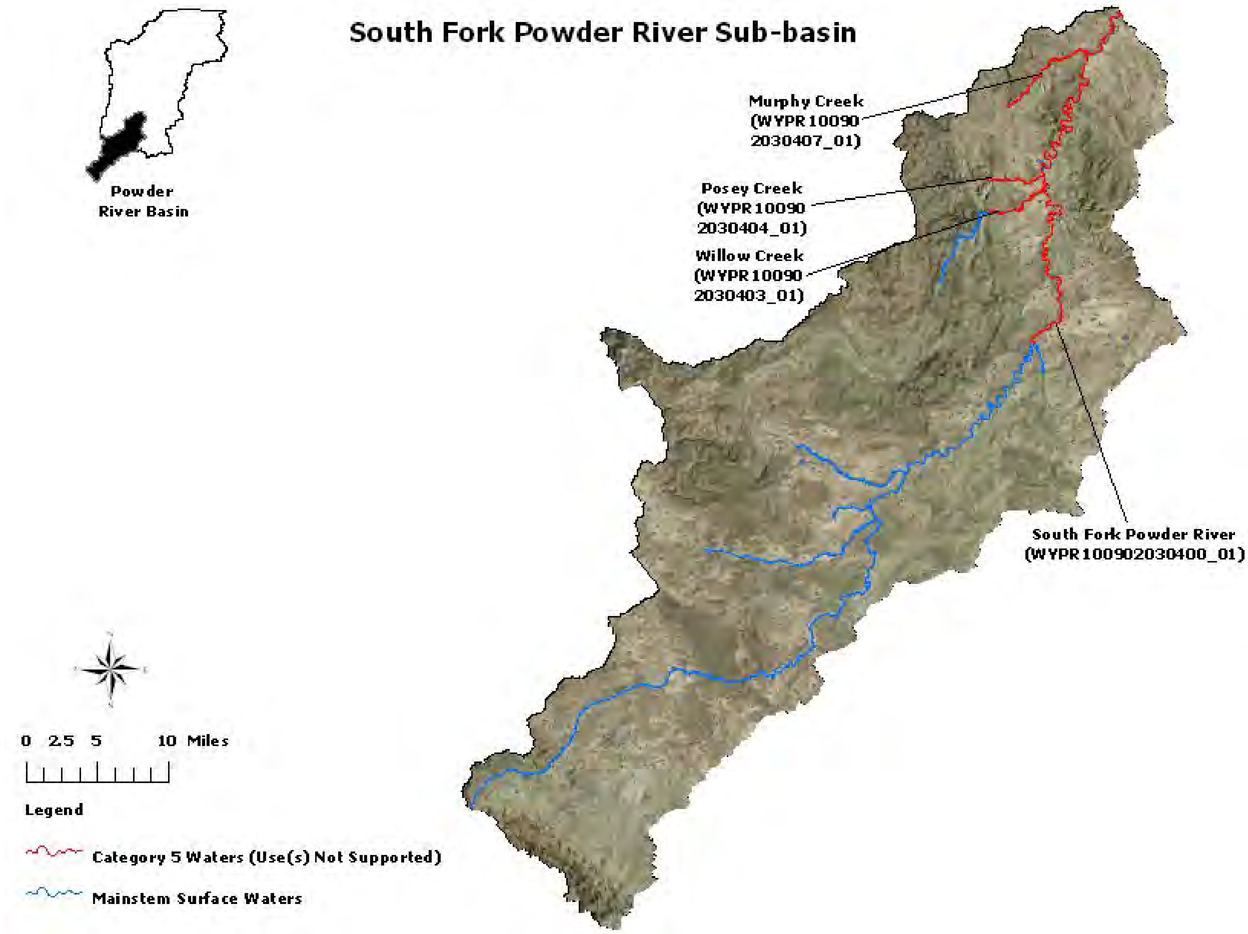
List for exceedances of the chloride criteria, which was 230 mg/L at that time. Although the Powder River below Salt Creek now has a site specific chloride criterion of 984 mg/L, because chloride concentrations occasionally exceed this criterion at the USGS sampling site near Sussex, the Powder River has remained on the 303(d) List for chloride. Although Salt Creek does not appear to exceed its site specific chloride criterion of 1,600 mg/L, a TMDL or Watershed-based Plan on the Powder River will need to address loading from Salt Creek. Data collected on the Powder River at the Sussex USGS station also showed exceedances of the state's aquatic life other than fish chronic selenium criterion and it was added to the 2000 303(d) List. Data collected on the Powder River and its tributaries while monitoring CBM development in the basin have indicated that the selenium impairment extends from the confluence with the South Fork Powder River downstream to the confluence with Crazy Woman Creek. The relatively low selenium concentrations found in Crazy Woman Creek apparently dilute the Powder River at this point and enable the river to meet the aquatic life other than fish chronic selenium criterion. Historic USGS and Powder River Conservation District (PRCD) data indicate that the primary source of the selenium may be the South Fork of the Powder River drainage, but Salt Creek also occasionally has high concentrations and contributes to the loading in the Powder River. It is unknown whether the selenium loading to the Powder River is natural or anthropogenic. Data collected by the USGS show that the Powder River exceeded the total arsenic criterion protective of drinking water use between the sampling site near Sussex downstream to the Arvada site during 2009 and 2010 and two segments of the river have been added to the 2012 303(d) List for this pollutant. Data from the USGS Salt Creek sampling station indicate that this tributary contributes arsenic to the Powder River, but the source of arsenic within the Salt Creek watershed is unknown.

Campbell County Conservation District (CCCD) monitored portions of this sub-basin under a Section 319 Project. Results indicated exceedances of the fecal bacteria criterion in the lower reach of the Middle Prong of Wild Horse Creek, and this water was added to the 303(d) List in 2006 from its confluence with Wild Horse Creek to a point 4.6 miles upstream. CCCD and NRCS have assisted landowners in implementing 13 water quality improvement projects in the watershed, but the effects of these actions on water quality is unknown. Local stakeholders and CCCD initiated watershed planning in this watershed in 2007 (WACD, 2007). CCCD completed a Section 319 project in 2010, which included data spanning 2007-2009. Data indicated that *E. coli* concentrations in 2008 and 2009 continued to exceed the primary recreational use criterion.

South Fork Powder Sub-basin (HUC10090203)

The South Fork Powder Sub-basin lies mostly in Natrona County, and extends into the Waltman area. Livestock grazing and oil and gas development are the primary land uses. The few perennial stream reaches in this sub-basin are primarily in the Rattlesnake Hills for the Wallace Creek headwaters, the lower portions of Willow and Cottonwood Creeks and the lower portion of the mainstem of South Fork. Cave Gulch and Okie Draw, tributaries to the South Fork Powder River, have perennial flow due to oil field discharges.

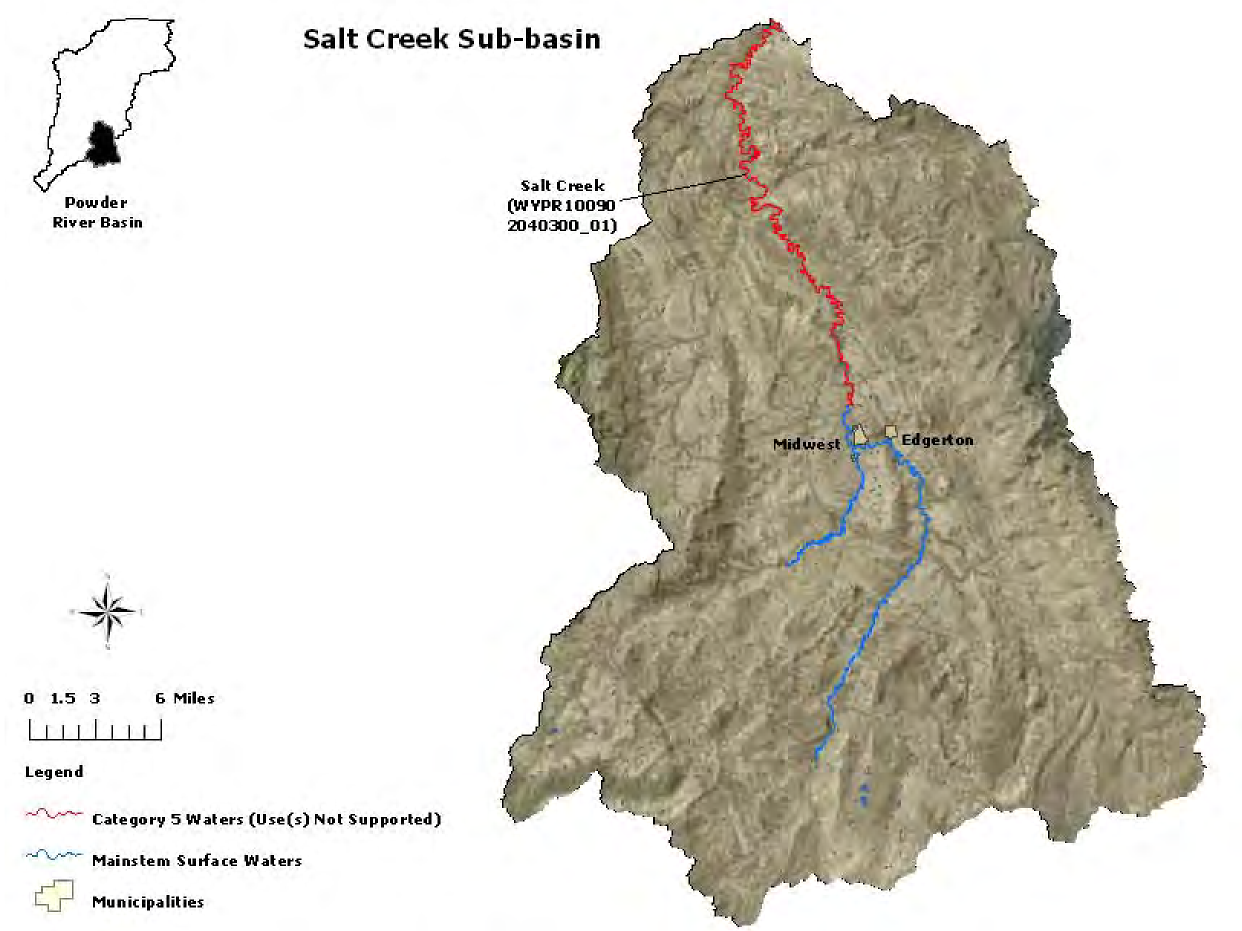
Data collected by USGS and the PRCD have showed exceedances of the aquatic life other than fish chronic selenium criteria on Willow Creek from the confluence with the South Fork Powder River to a point 10.5 miles upstream, and it was placed on the 303(d) List in 2006. Further monitoring by PRCD showed that both Posey and Murphy Creeks, each tributaries to the South Fork Powder River immediately downstream of the Willow Creek confluence, also exceed the aquatic life other than fish chronic selenium criterion and were added to the 2008 303(d) List. The source of the selenium for both creeks appears to be related to the natural geology of the area, but additional loading from anthropogenic sources may also occur in the Posey Creek watershed, as lands are irrigated and selenium is dissolved from marine shales. Another possible source may be oil treater discharges.



Salt Creek Sub-basin (HUC10090204)

The towns of Midwest and Edgerton are near the center of the Salt Creek Sub-basin. Land uses are primarily livestock grazing and oil and gas production. Soils of the area have developed from fine grained sandstone and calcareous shales, are dry, and easily eroded by wind or water.

Several natural oil seeps have been documented along Salt Creek in the Midwest area, which prompted the development of the oil fields beginning in 1908. While most reaches in this semi-arid sub-basin are non-perennial, Salt Creek now has perennial flow due to oil treater discharges. Even prior to these discharges, the creek naturally carried a high load of salts; however, studies conducted by PRCD have confirmed that the vast majority of perennial flow and chloride loading are from oil production discharge water. High chloride concentrations in the creek exceed Wyoming's aquatic life other than fish chronic criteria, and thus it was added to the 303(d) List. A UAA proposing a site specific chloride criterion of 1,600 mg/L for Salt Creek has been approved, and because there have been no exceedances of this criterion, chloride has been removed from the 303(d) List as a cause of impairment on Salt Creek. However, since Salt Creek is the primary contributor of chloride loading to the Powder River (HUC 10090202), any TMDL or Watershed Based Plan on the Powder River will need to address loading from Salt Creek. Data collected as part of the chloride UAA on Salt Creek showed exceedances of the chronic aquatic life other than fish criterion for selenium, and this pollutant was added on the 303(d) List in 2008. It is unknown whether the primary source of this selenium exceedance is natural or anthropogenic, but both of these sources are likely contributors. Salt Creek was also added to the 303(d) List of threatened waters in 1996 due to the regular occurrence of oil and produced water spills in the watershed. Most of the oil field infrastructure dates to the 1960s, and spills have been primarily due to a combination of the age of the infrastructure and bacterial corrosion in the injection lines. Most spills have been contained before they enter Salt Creek. At the request of WDEQ, the current operator has developed a long term upgrade and maintenance plan for the field to reduce the potential for large spills that may affect water quality. The operator is also phasing into CO_2 flood injection to enhance oil recovery, which will also reduce spills because it requires the replacement of both injection and production lines. Lastly, a biocide treatment has been added to many water flood lines since 2003 to reduce bacterial corrosion.

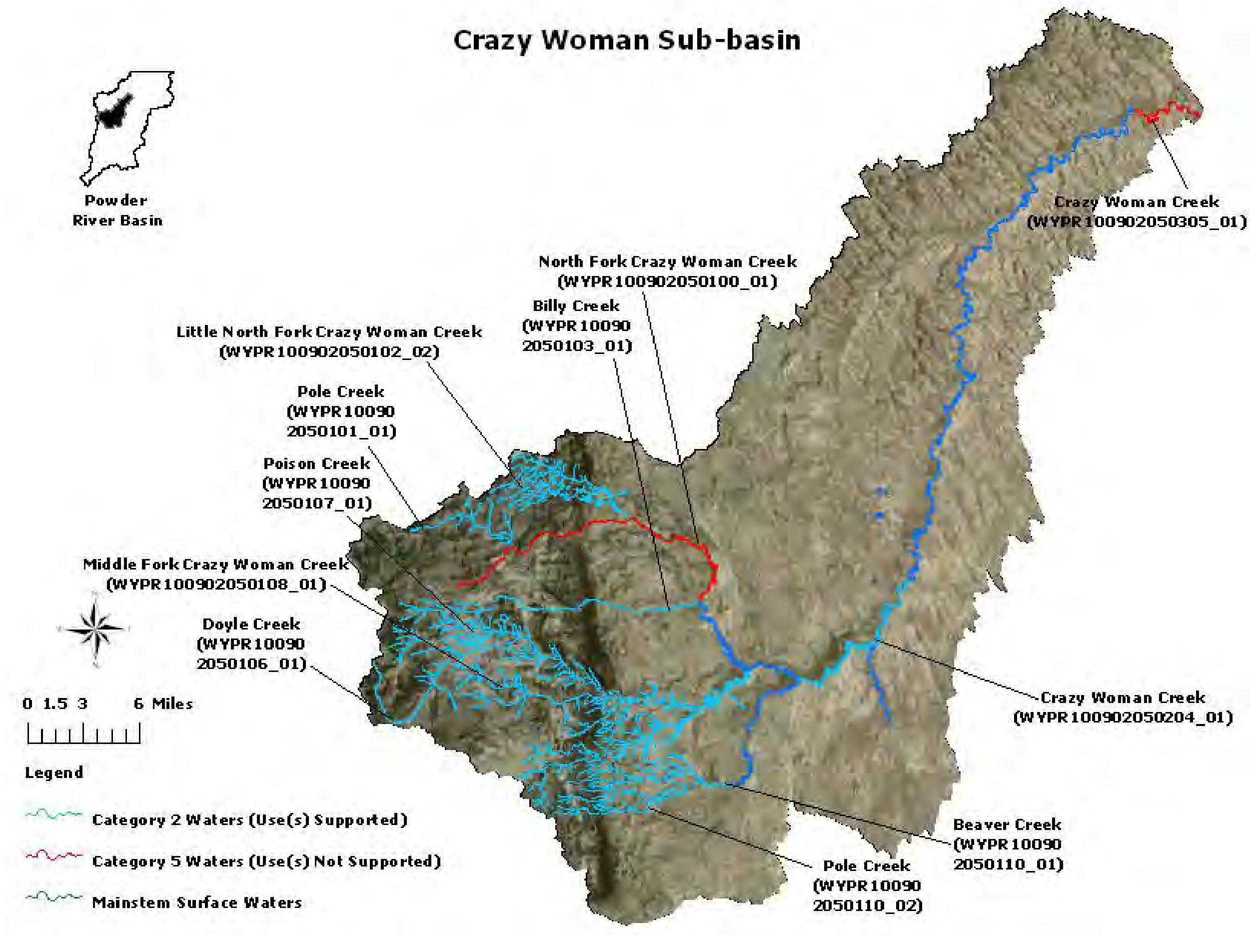


Crazy Woman Sub-basin (HUC10090205)

The headwaters of the Crazy Woman Sub-basin are on the eastern slope of the Big Horn Mountains. Land uses are primarily oil and gas development, recreation, grazing and irrigated agriculture.

North Fork of Crazy Woman Creek was added to the 1996 303(d) List due to water quality threats from habitat degradation, nutrients and bioindicators. A mistake was made in the listing process when bioindicators was added as a cause and it has thus been removed from the 2012 303(d) List. Several Section 319 projects have been conducted in this watershed, resulting in changes to both irrigation and livestock grazing practices in many areas. Considerable water quality data have been gathered in this watershed; however, it remains uncertain whether these practices are effective because effectiveness monitoring of the implemented BMPs has been inconsistent (BIO-WEST, 2001). WDEQ (2003) has conducted monitoring in the watershed, but the effectiveness of the above Section 319 project BMPs in improving physical degradation was not examined. A WDEQ summary report, including a use support determination for North Fork Crazy Woman Creek, is expected in 2012.

The USEPA has established National Secondary Drinking Water Regulations that set water quality standards for 15 contaminants, including manganese. USEPA does not enforce these secondary maximum contaminant levels (SMCLs). Instead, they are intended to serve as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color and odor. These contaminants are not considered to present a risk to human health at these SMCLs (USEPA, 1992). Wyoming's aesthetic drinking water criterion for manganese is set at the USEPA SMCL. Crazy Woman Creek exceeds the aesthetic drinking water criterion for manganese, primarily during low flows, but the aquatic life other than fish chronic criterion for manganese has not been exceeded. Lower Crazy Woman



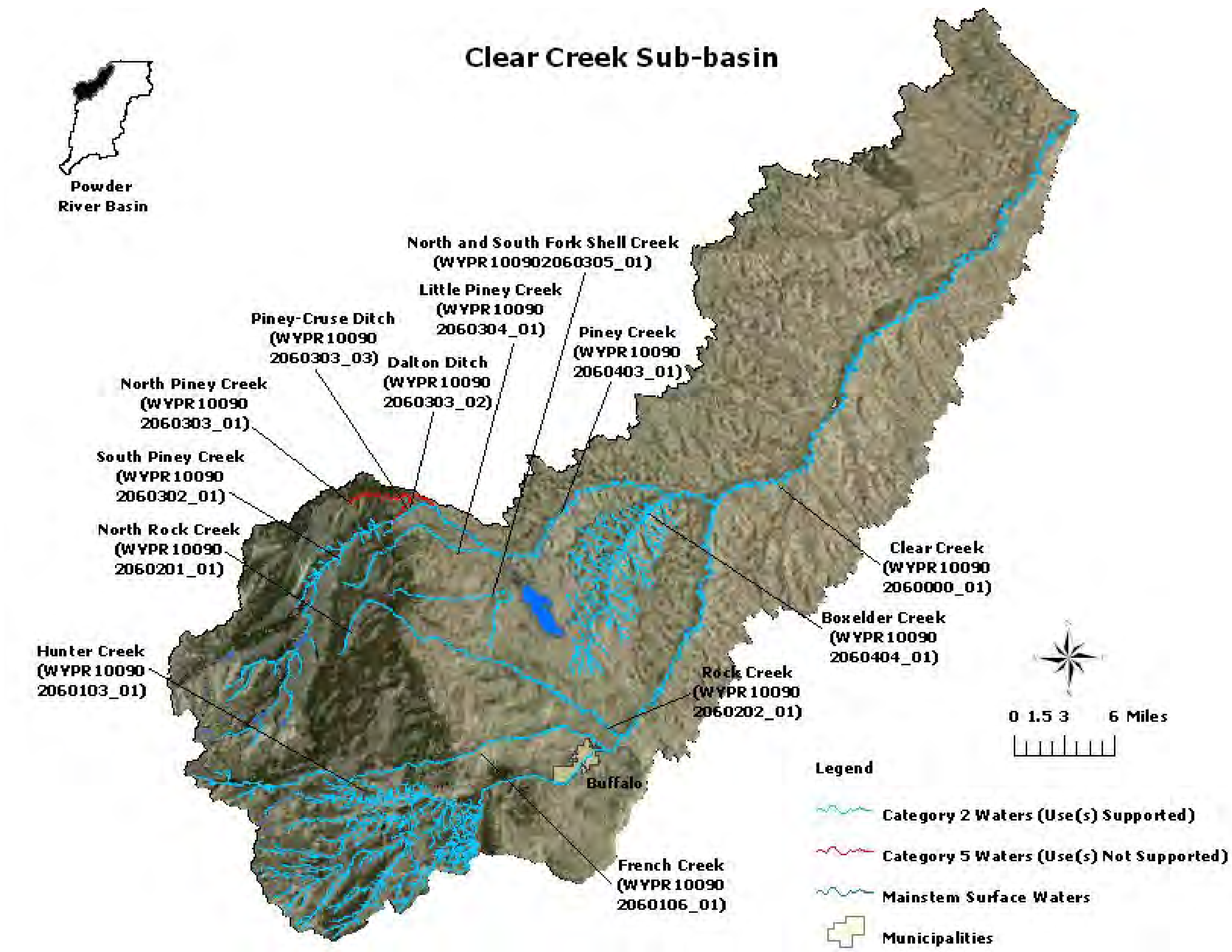
Creek was added to the 303(d) List in 2002 for manganese. However, high manganese concentrations are common in streams in the Powder River Structural Basin due to the natural geology (Wasatch and Fort Union Formations), and thus much of the basin does not have a human health criterion for this pollutant in Chapter 1. There are no known sources of anthropogenic manganese in Lower Crazy Woman Creek, and the creek will unlikely ever be used as a drinking water source due to its intermittent hydrology. Lake DeSmet Conservation District (LDCD) requested that the manganese drinking water criterion from Crazy Woman Creek be removed by WDEQ.

Several other streams in this watershed have been monitored by WDEQ and are fully supporting their aquatic life other than fish uses. These streams include: Crazy Woman Creek (from confluence of North and Middle Crazy Woman Creek to approximately 2 miles below Wallows Creek), Little North Fork Crazy

Woman Creek (2003), Pole Creek (2003), Poison Creek (2003), Middle Fork Crazy Woman Creek (2003), Doyle Creek (2002), South Fork Crazy Woman Creek (2003), Beaver Creek (2003) and Billy Creek (2004).

Clear Creek Sub-basin (HUC10090206)

The headwaters of Clear Creek, Piney Creek and Rock Creek are in granitic geology in the Cloud Peak Wilderness within the Bighorn National Forest. Recreation, livestock grazing and logging are land uses within the mountains, while livestock grazing, oil and gas development, irrigated agriculture and residential development are the primary land uses at lower elevations. Clear Creek is the last major tributary to join the Powder River upstream of the Wyoming-Montana state line. A Section 205j water



quality assessment project in Rock Creek and the North and South Fork Shell Creek drainages indicated that these watersheds were threatened by physical degradation of the stream channel and they were added to the 1996 303(d) List. The primary sources of degradation to Rock Creek were identified as heavy livestock grazing in small horse pastures near the stream. Landowners implemented best management practices (BMPs) specifically designed to improve irrigation efficiency. Data indicate that Rock Creek now supports its aquatic life other than fish use and it was removed from the 2004 303(d) List. Impacts to the North and South Fork Shell Creek drainages are primarily due to irrigation diversions and conveyance. LDCD completed a Section 319 Project which addressed these problems, primarily through the installation of more efficient irrigation systems. Biological data collected as part of the project were highly variable across collection dates and were inconclusive. WDEQ (2003, 2005) monitoring suggests that the BMPs used on the North and South Forks of Shell Creek were somewhat effective, but that additional data were needed. WDEQ conducted biomonitoring on these streams again in 2006. Several nongame fish were observed while sampling North and South Fork Shell Creeks, suggesting that these streams may be better classified as 2C. Data now indicate full support of the aquatic life other than fish use in these creeks. USEPA Section 319 Nonpoint Source Success Stories have been written for both Rock Creek and the North and South Forks of Shell Creek.

In response to citizen concerns of suspected sewage contamination from failed septic systems in surface waters, WDEQ (2005) collected *E. coli* samples in several waters in and near the town of Story. There are no other known sources of fecal contamination in the area. Results showed exceedances of the primary contact *E. coli* criterion in Dalton Ditch and North Piney Creek. Thus, North Piney Creek from the confluence with Piney Creek to a point 6.4 miles upstream, and Dalton and Piney-Cruse Ditches were added to the 2006 303(d) List. As part of a 2009 Section 205j planning grant, Sheridan County investigated impacts from septic systems on shallow groundwater and the possibility of linkages between potentially contaminated groundwater and surface water in the area. The high *E. coli* levels recorded in 2005 are considered a potential human health risk. These waters have been posted with health risk warnings and have been prioritized for TMDL development.

A short reach of Hunter Creek was impacted by excessive sediment from an adjacent road and was added to the 1998 303(d) List. Road modifications and changes in maintenance have since been implemented by the USFS to reduce this impact, and subsequent WDEQ data indicate that the Creek fully supports its aquatic life other than fish use. As a result, Hunter Creek was removed from the 2004 303(d) List. A Section 319 Nonpoint Source Success Story has been written for Hunter Creek.

WDEQ assessment data suggest that Little Piney Creek (WDEQ, 2002) and Boxelder Creek (WDEQ, 2003) support their aquatic life other than fish uses. WDEQ observed many nongame fish during the assessment of Boxelder Creek, and therefore this creek may be better classified as a nongame fishery.

Clear Creek was monitored by WDEQ (2004) in 1999, and data indicated full support of aquatic life other than fish uses; however, WGFD records indicate that streamflow alterations may sometimes have a negative effect on cold water fishes. Several stream restoration projects on Clear Creek have improved the connection between the stream and its floodplain and improved riparian condition. The potential impacts of future CBM development in the Clear Creek drainage are currently a concern. WDEQ’s CBM monitoring network is designed to assess these potential impacts.

WDEQ (2004) monitoring identified impacts to French Creek from flow augmentation; however, the stream is meeting its aquatic life other than fish use. Although the creek is not currently on the 303(d) List, LDCD has developed a watershed plan as a proactive measure to improve water quality in this watershed.

Middle Powder Sub-basin (HUC10090207)

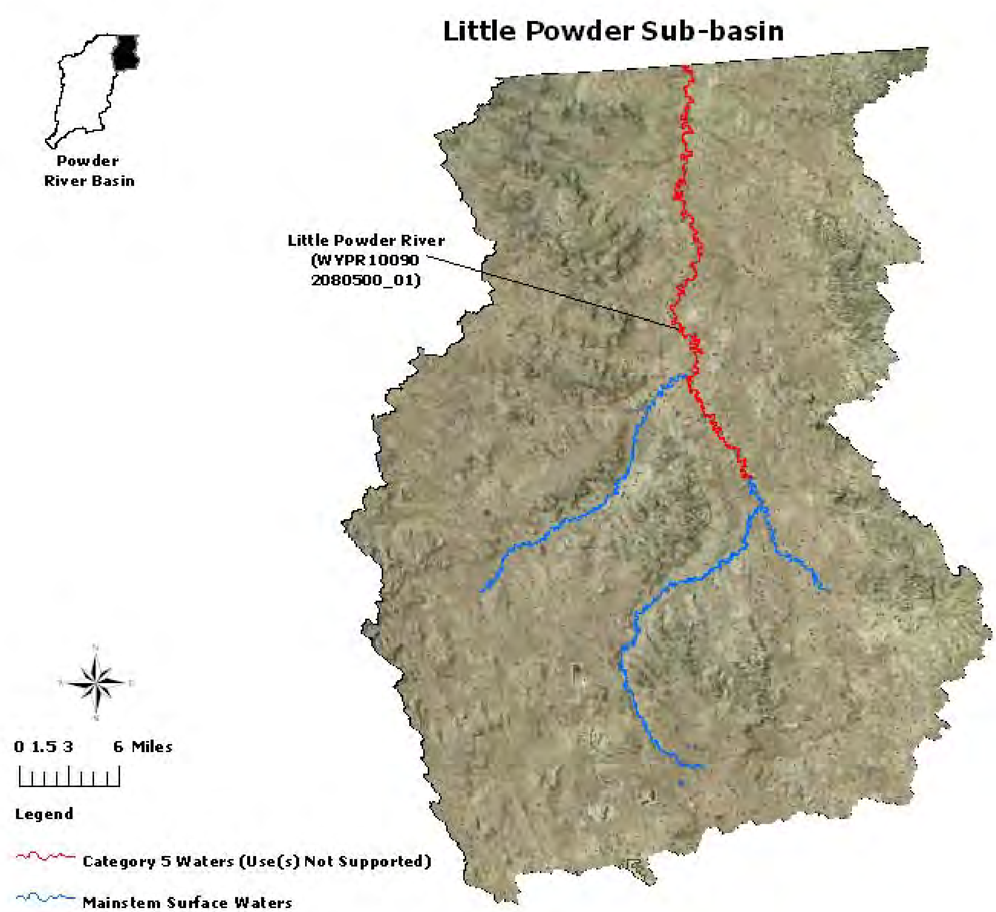
The Middle Powder Sub-basin includes the lower portion of the Powder River. Historic land uses have been primarily livestock grazing with some oil and gas development. CBM development has also become a major land use in much of the sub-basin. Except for the mainstem of the Powder River, reaches in this sub-basin are naturally ephemeral or intermittent. However, many of these streams (e.g. LX Bar, SA and Fence Creeks) now have perennial flows due to the discharge of CBM produced water.

WDEQ monitored the Powder River in 2000, but due to very low streamflows, the absence of reference streams and fluctuating environmental conditions from CBM development, data were considered inconclusive. Since 2005, water quality and biological (i.e. macroinvertebrates, fish and algae) data have been collected as part of a long term, interstate and interagency (e.g. WDEQ, USGS and BLM) monitoring program by PRBIWG. These data are primarily intended to support an adaptive management approach to CBM development, but may also be used by WDEQ to make use support determinations.

Little Powder Sub-basin (HUC10090208)

The Little Powder River originates near Gillette and flows north into Montana. Primary land uses in the Little Powder Sub-basin include coal mining, CBM development and livestock grazing. Moyer Spring is fed by water accumulated in porcelanite (clinker) beds and supports a small brook trout population. Moyer Spring Creek and the Little Powder River are Class 2AB waters, while all other creeks in the sub-basin are Class 3B waters.

WDEQ monitored the Little Powder River in 1999 and 2005, but aquatic life other than fish use support has not been determined. USGS data collected from the Little Powder River near the Montana border have shown exceedances of the fecal bacteria criterion, and the river was placed on the 303(d) List in 2002. A Section 319 project sponsored by CCCD reported in 2008 that the impairment extends upstream to the confluence with Spring Creek, and this information has been used to better define the extent of impairment in the 2010 303(d) List from the WY/MT state line upstream to the confluence with Spring Creek. CCCD and local citizens have sponsored a watershed plan for the river, and to date, 8 AFO and 14 septic improvement projects have been implemented (WACD, 2007). CCCD completed a Section 319 project in 2010, which included data spanning 2007-2009. These data indicated that *E. coli* concentrations in 2008 at Soda Well still exceed the primary recreational use criterion. CCCD completed a watershed plan for Little Powder River in 2006.

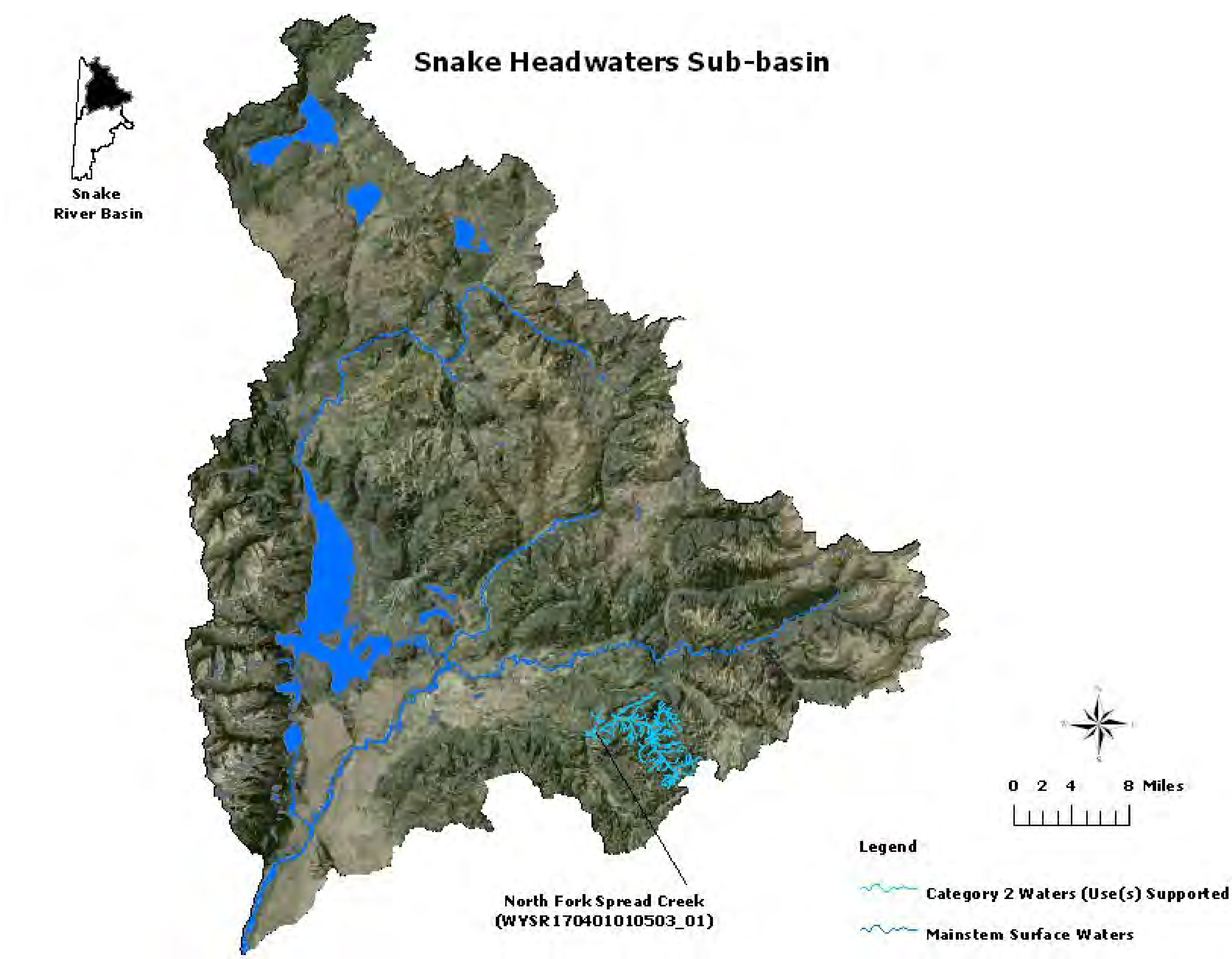


8.11 Snake River Basin

The headwaters of the Snake River are in the Sedimentary Subalpine Zone of the Middle Rockies Ecoregion. Major rivers include the Greys and Salt Rivers, which join at Palisades Reservoir along the Idaho border, and the Snake River, which confluences with the Columbia River in Idaho. In Wyoming, the Snake River moves a substantial amount of sediment during high flows because of the erosive geology in much of the basin. In Wyoming, the basin consists mostly of steep mountains with several intermountain valleys. Jackson Lake and Palisades dams were constructed for irrigation water storage for agriculture in Idaho. Outdoor recreation is the primary land use in the basin.

Snake Headwaters Sub-basin (HUC17040101)

Waters of the Snake Headwaters Sub-basin originate in southern Yellowstone National Park, Grand Teton National Park and the Grand Teton Wilderness Area. Several streams in the Snake River Headwaters Sub-basin were designated by Congress in 2009 as Wild and Scenic Rivers. These waters include Bailey, Blackrock, Crystal, Granite, Pacific, Shoal, Willow and Wolf Creeks; Buffalo, North and South Buffalo and Soda Forks; and the Gros Ventre and Hoback Rivers. Buffalo Fork, Pacific Creek and the Lewis River are the major tributaries to the Snake River in this sub-basin. Land use is primarily recreation, with areas of residential development, livestock grazing and irrigated hay production. A USGS (2007) study characterized the water quality of Cottonwood, Taggart, Lake and Granite Creeks.



The North Fork of Spread Creek was added to the 303(d) List in 1998 for habitat degradation. A watershed improvement project, sponsored by the USFS, has rehabilitated the stream. WDEQ monitoring indicates that the stream is now meeting its aquatic life uses, and it was removed from the 303(d) List in 2008. A USEPA Section 319 Nonpoint Source Success Story has been written for North Fork Spread Creek.

A USGS (2009) study indicated that during spring through fall, upper Fish Creek near Teton Village gains large quantities of groundwater. The middle and lower reaches of the creek were also gaining, but to a lesser extent. Concerns over excessive plant and algae growth in Fish Creek prompted a second USGS (2010) study designed to determine nutrient concentrations and sources, characterize the streambed substrate and characterize the algal, macrophyte and macroinvertebrate communities. The study reported several chemical and biological trends along the 15.5 mile study reach. In-stream nutrient concentrations were generally low and there were no significant correlations between nutrients and algae; however, the authors suggested that the abundant plant and algae observed in Fish Creek may rapidly assimilate nutrients. Nutrient concentrations in groundwater surrounding Fish Creek were consistently higher than concentrations in Fish Creek. The authors concluded that additional sampling would be necessary to conclusively determine the cause of the excessive algal growth in Fish Creek.

Gros Ventre Sub-basin (HUC17040102)

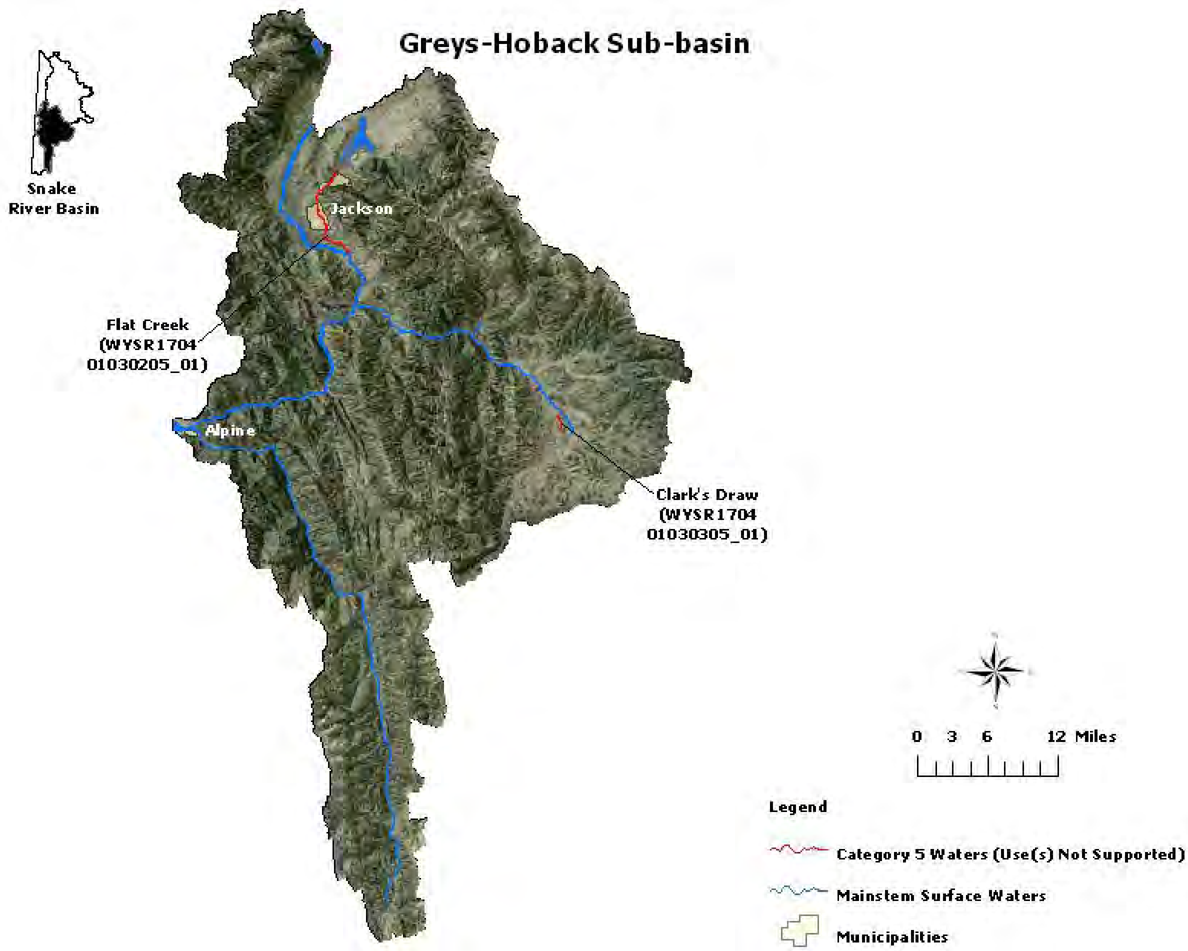
The headwaters of the Gros Ventre Sub-basin originate in the Bridger-Teton National Forest. Wildlife habitat, recreation, livestock grazing and irrigated hay production are the primary land uses.

The geology of the sub-basin is naturally erosive. Some areas of the sub-basin are thought to be impacted by heavy grazing and browsing by wildlife, which may be causing bank erosion and channel widening. The USFS, TU and TCD have been monitoring channel morphology, riparian vegetation and the health of the fishery within the sub-basin. However, a final report has not been submitted to WDEQ for review.

Greys-Hoback Sub-basin (HUC17040103)

Waters of the Greys-Hoback Sub-basin originate in the Bridger-Teton National Forest. Much of the southern part of this sub-basin is in the overthrust belt, which has naturally high rates of erosion due to a combination of poorly indurated sedimentary geology and the presence of geologically young mountains. Principal land uses are recreation, livestock grazing, hay production, and considerable residential development. Oil and gas exploration has historically occurred in the watershed and a potential for expanded development remains.

Water quality assessments conducted on Flat Creek by Teton Conservation District (TCD) indicate that the creek's ability to meet its aquatic life other than fish use is threatened, primarily by urban runoff, which contributes excess sediment to the stream and limits aquatic habitat. Flat Creek was added to the 303(d) List in 2000, and a watershed improvement project is underway to reduce sediment loading to the stream. This project includes education and monitoring, snow removal and storage planning and the installation of stormwater filtration systems to filter stormwater from the nearby rodeo grounds and five other urban sites. The Flat Creek Restoration Project was initiated in 2004, with the goals of improving habitat and allowing the creek to reach its ecological potential. The project is a cooperative effort between the Town of Jackson, TU, TCD, WGFD, and other stakeholders. The town of Jackson also has a commercial stormwater code, has initiated full time summer street sweeping, and has modified the type of salts it uses for ice control on roadways. A watershed plan was completed by TCD and approved by WDEQ in 2008. Section 319 funding was awarded to the Town of Jackson in 2009 for the Karns Meadow, Flat Creek Project. Karns Meadow is a portion of the floodplain of Flat Creek, located between the rodeo fairgrounds and Flat Creek. One major component of the project was the re-engineering of the wetland at Karns Meadow, which is expected to intercept and filter storm water run-off from the fairgrounds, including fine sediments. Teton Science Schools have also sponsored a Section 319 Project to restore a 1,300 ft section of Flat Creek on the north end of the Town of Jackson to a natural and stable channel with a functional riparian zone.



Investigations along the Hoback River indicate heavy sediment loadings from mass wasting, mudflows, slumping, snow and rock avalanches and landslides. The extent to which this natural process has been accelerated by human activity is unknown (Ryan et al, 2003).

In 2010, Western Watersheds Project (WWP) collected *E. coli* samples on Clark's Draw, which is a small tributary to the Hoback River near Bondurant. A five sample geometric mean exceeded both WDEQ's primary and secondary standards protective of recreational use. The primary source of the excess bacteria is livestock grazing, and a 1.9 mile segment adjacent to US Route 189, near town of Bondurant has been added to the 2012 303(d) List.

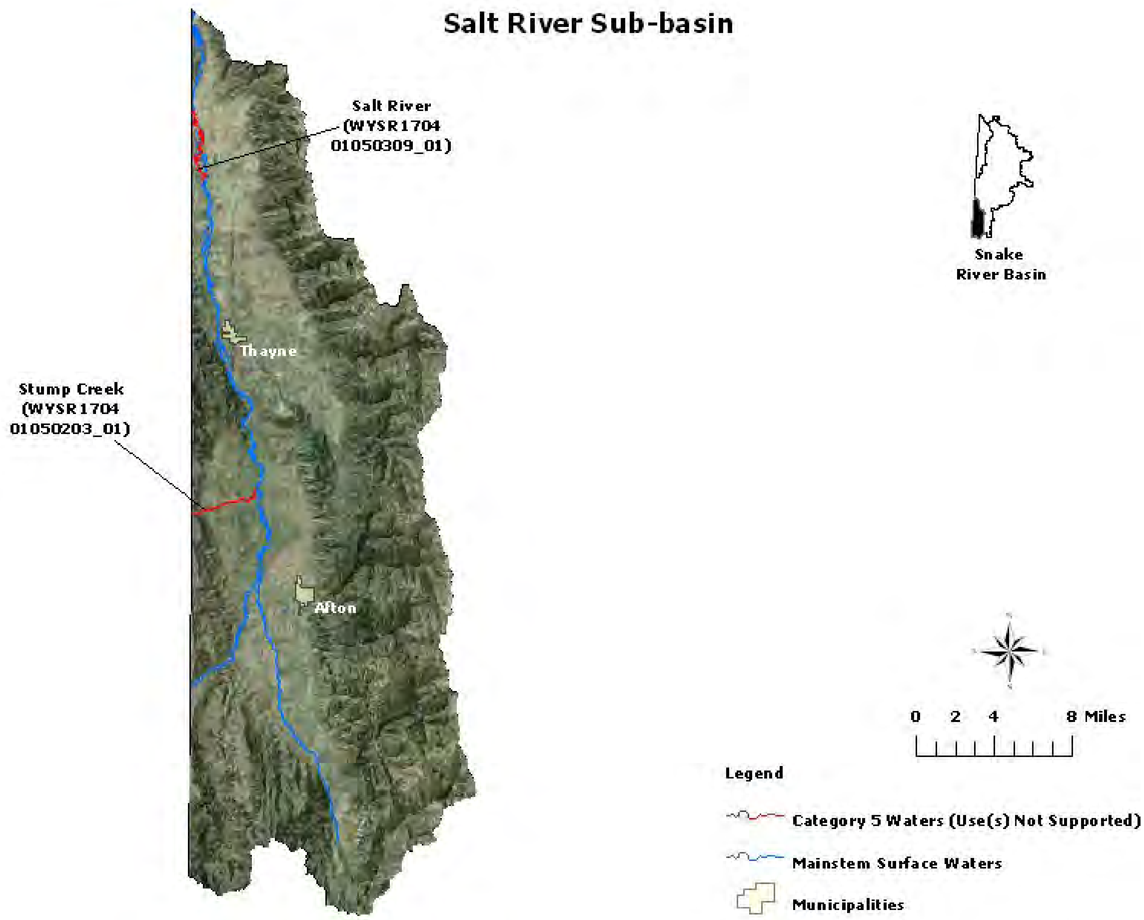
Palisades Sub-basin (HUC17040104)

The headwaters of the Palisades Sub-basin are on the west side of the Snake River Range in the Targhee National Forest. Land uses are primarily recreation and residential development. Much of this watershed is contained within the Palisades Wilderness Study Area and anthropogenic impact is minimal.

Salt River Sub-basin (HUC17040105)

The Salt River Sub-basin is located in Star Valley. Historically, land uses in the area have been primarily irrigated small grain and hay production, dairy farming and beef production. Currently much of Star Valley is undergoing residential development, while recreation, livestock grazing and logging are still the primary land uses in the mountains surrounding the valley.

In 2002, a lower reach of the Salt River was placed on the 303(d) List as threatened for not supporting its contact recreation use. *E. coli* sampling by Star Valley Conservation District (SVCD) has since indicated that contact recreation uses are not fully supported. Stump Creek flows into Wyoming from Idaho, and frequently exceeds the *E. coli* criterion near the state line. Stump Creek was added to the 303(d) List in 2008 for this pollutant. SVCD has collected data that indicate both the Salt River and Stump Creek have exceeded the recreational use criterion multiple times between 2008 and 2010.



Nutrient enrichment may also be an issue in some streams within the sub-basin, but it has not been determined whether the sources are from agriculture, residential development, or both. The SVCD has used Section 319 funding to provide public education on BMPs for agricultural nutrient management in an effort to reduce nutrient and fecal bacteria loading to streams in the watershed.

Phosphate mining at the Smoky Canyon Mine has impacted surface and groundwater resources in Idaho through selenium contamination. The Smoky Canyon Mine, along with other phosphate mines in the Idaho phosphate mining district, is under an Administrative Order of Consent in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) because of releases of selenium to the environment. CERCLA provides federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. A water quality grab sample taken in Crow Creek at the Idaho/Wyoming state line during spring runoff in May 2006 had a total recoverable selenium concentration of 5.2 µg/L, which is greater than the state's aquatic life other than fish chronic criterion of 5.0 µg/L. WDEQ monitored selenium concentrations within Crow Creek during June and October of 2008 at the WY/ID state line and near the town of Fairview. All measured concentrations were below the state's aquatic life other than fish chronic selenium criterion.

8.12 South Platte River Basin

The South Platte River Basin in Wyoming is relatively small (about 2,000 mi^2), and covers only about 2% of the state's total land area. The headwaters of larger streams in the basin are situated in Sherman granite of the Laramie Mountain Range. Streams are generally perennial in the mountains, but become intermittent on the plains as they flow southeast into Nebraska and Colorado. Native high plains fishes of the area are adapted to this hydrology, and often benefit because the extreme flow regime limits colonization by some exotic species. Because of the sandy soils and low stream flows in much of the basin, most irrigation requires the use of groundwater.

Cache la Poudre Sub-basin (HUC 10190007)

A small portion of the Cache La Poudre Sub-basin is in Wyoming in the Laramie Mountains, but ultimately drains south into Colorado. Land use is primarily livestock grazing, with some hay production.

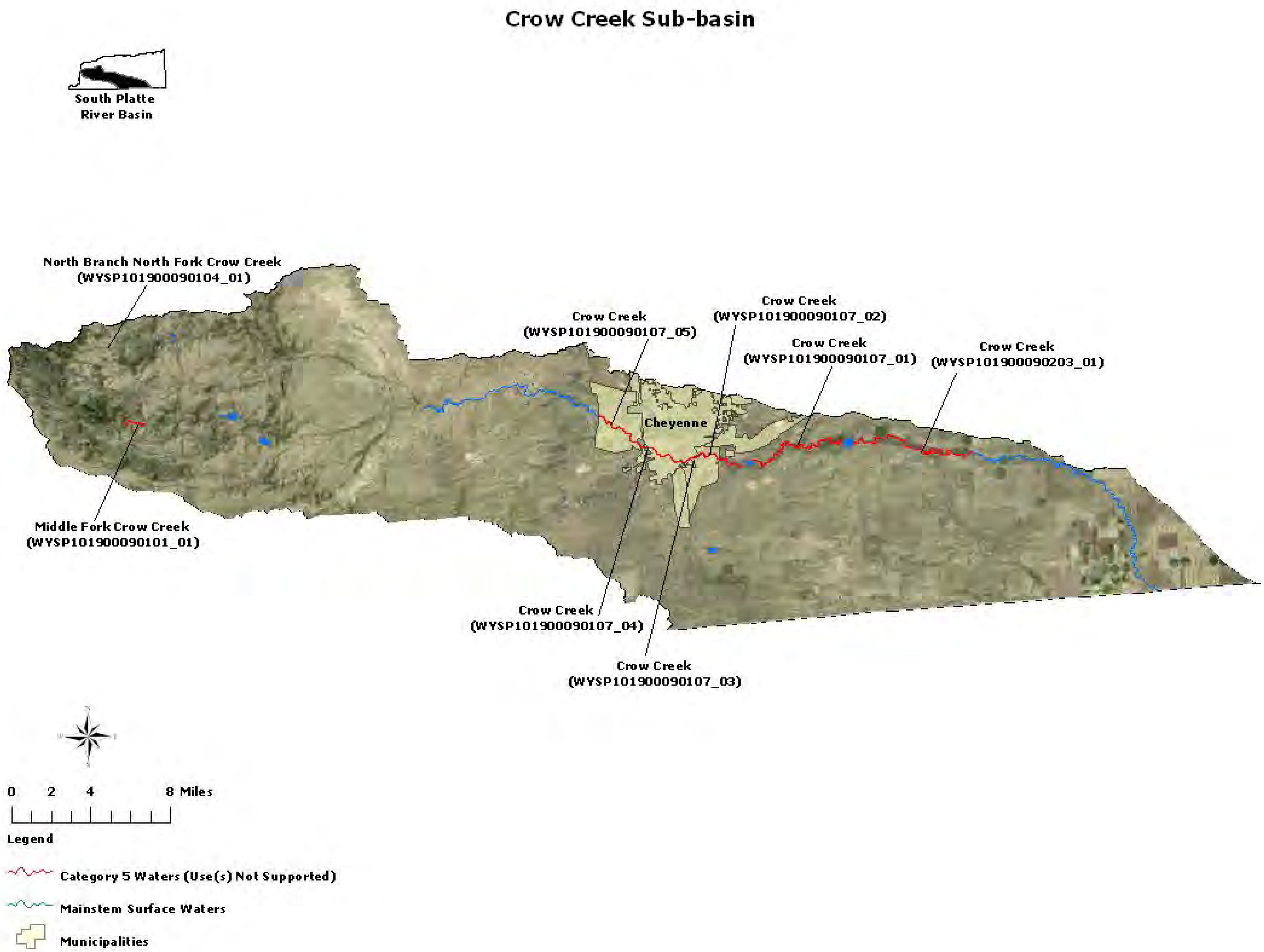
Lone Tree Creek Sub-basin (HUC 10190008)

The headwaters of the Lone Tree Sub-basin are in the Laramie Mountains. Livestock grazing is the primary land use, with limited irrigated and non-irrigated agriculture in the lower elevations.

Crow Creek Sub-basin (HUC 10190009)

The Crow Creek Sub-basin's headwaters are in the Laramie Range between Laramie and Cheyenne. Streamflows are supplemented by water from the Cheyenne Stage II Project, which pipes water from the Douglas Creek drainage in the upper North Platte Sub-basin to Crow Creek for a portion of Cheyenne's municipal water supply. Crystal, Granite and Upper North Crow Reservoirs are all in this sub-basin. Primary land uses are livestock grazing, residential development, irrigated hay production, and both irrigated and dry land cropping in the lower sub-basin.

The City of Cheyenne appears to have a major impact on the water quality of Crow Creek (King, 1995; BRW/Noblitt, 1978; Wright-McLaughlin, 1978). Crow Creek was placed on the 303(d) List in 1996 for exceeding the recreational use standard from Dry Creek upstream an undetermined distance above Roundtop Road and from Dry Creek an undetermined distance downstream. Data from the 2008, 2009 and 2010 Laramie County Conservation District (LCCD) *Crow Creek Watershed Cheyenne Area Water Quality Reports* were used to revise and combine the extent of these impairments in 2010 from Missile Road (below Cheyenne) upstream to Roundtop Road (above Cheyenne). Although Wyoming does not have numeric criteria for nitrates and phosphates for the protection of aquatic life other than fish, high levels of these nutrients have been an additional concern. WDEQ data show that concentrations of these nutrients increase more than ten-fold, to levels well above any EPA proposed criteria, as Crow Creek flows through Cheyenne. LCCD is monitoring water quality and working to provide important education to the public within the watershed. Within the City of Cheyenne, LCCD has also implemented BMPs to reduce pollutant loading in Crow Creek, including construction of wetlands, riparian fencing and buffer strips to trap pollutants, irrigation system improvements, animal feeding operation projects, small acreage grazing projects and storm drain stenciling. LCCD has initiated a Watershed Plan for Crow Creek


Crow Creek Sub-basin
South Platte River Basin
North Branch North Fork Crow Creek (WYSP101900090104_01)
Crow Creek (WYSP101900090107_05)
Crow Creek (WYSP101900090107_02)
Crow Creek (WYSP101900090107_01)
Crow Creek (WYSP101900090203_01)
Cheyenne
Middle Fork Crow Creek (WYSP101900090101_01)
Crow Creek (WYSP101900090107_04)
Crow Creek (WYSP101900090107_03)
0 2 4 8 Miles
Legend
Category 5 Waters (Use(s) Not Supported)
Mainstem Surface Waters
Municipalities

that has been approved by WDEQ. Two segments of Crow Creek were placed on the 303(d) List in 1996 for ammonia. The City of Cheyenne has since been developing plans to address municipal stormwater, and both of Cheyenne's WWTPs are now using tertiary treatment which has nearly eliminated ammonia loading to Crow Creek.

WDEQ (2009) monitoring in 2007-08 and USGS data collected near Archer showed that ammonia concentrations in Crow Creek are now below the criterion protective of aquatic life other than fish and cold water fisheries uses, and thus both segments were removed from the 2010 303(d) List. This study also showed that sedimentation from the City of Cheyenne's stormwater system is causing a section of Crow Creek from Happy Jack Road downstream to Hereford Reservoir #1 to not support its aquatic life other than fish use. In addition, total selenium exceeded the chronic criterion for aquatic life other than fish use from approximately 0.5 mile below Morrie Avenue downstream to Hereford Reservoir #1. Both of these segments were added to the 2010 303(d) List. While delineating the selenium, sediment and *E. coli* impairments along Crow for the 2010 303(d) List, the classification change from 2AB to 2C that occurs at Morrie Avenue was overlooked by WDEQ. This error was corrected for the 2012 303(d) List, resulting in seven additional impaired reaches along the same 2010 303(d) Listed section of Crow Creek. Although the number of impaired segments has changed, please note that the overall extent of impairment for the three pollutants will remain unchanged from 2010. For a complete summary of how these changes have affected the 2012 303(d) List, please see the Summary of 303(d) List Changes and the 303(d) List in Section 9.4 below. Although only three TMDLs were initiated in 2009 in the Crow Creek Sub-basin, ten TMDLs will ultimately be completed on the mainstem of Crow Creek due to the 303(d) List changes. TMDLs will include six for bacterial impairments, one for selenium and three for sediment.

The North Branch of North Fork Crow Creek and Middle Fork Crow Creek were placed on the 303(d) List in 2008 because for not meeting their contact recreational uses. Several years of data indicate that the high *E. coli* counts are primarily related to livestock grazing practices, but recreational users and wildlife may also contribute. The Crow Creek Watershed Steering Committee is addressing this issue, and the USFS, in cooperation with stakeholders, has developed Water Quality Action Plans which combine BMP implementation, monitoring and management of potential sources. The USFS has also released the Pole Mountain Improvements Project Scoping Statement to improve wildlife habitat, water quality, and livestock utilization in riparian areas on Pole Mountain. Weekly monitoring conducted by LCCD from 2005 through 2007 indicated that Middle Fork Crow Creek no longer exceeded the *E. coli* criterion, and thus Middle Crow Creek was removed from the 2008 303(d) List. However, data from the 2008, 2009, and 2010 Upper Crow Creek Watershed Monitoring Reports indicate that this stream once again exceeds the *E. coli* criterion and it was added to the 303(d) List in 2010. Water quality improvements have occurred on the North Branch of North Fork Crow Creek to address bacterial loading, but *E. coli* levels still periodically exceed the state's 30-day geometric mean criterion protective of primary recreational contact. The extent of the *E. coli* impairment on North Branch of North Fork Crow Creek was refined in 2010 to extend from FS Road 701 upstream 300 yards.

Sloans Lake, a popular recreation site in Cheyenne, is frequented by large numbers of ducks and geese, and also receives runoff from parks and streets. Although fecal bacteria levels occasionally exceed single sample maximum concentrations for primary contact recreation for a short period annually, the geometric mean has not been exceeded. During the summer, Laramie County Environmental Health Officials routinely monitor bacteria levels and close the lake to swimming when fecal bacteria levels exceed the criteria protective of primary contact recreation.

Although Dry Creek is naturally intermittent near its confluence with Crow Creek, various water inputs within Cheyenne have made it a perennial stream within the city limits. Laramie County sponsored a Section 319 project in 2010 with the goal of improving water quality in Crow Creek by constructing a wetland on lower Dry Creek. The project is expected to help trap sediment and other pollutants associated with urban runoff. WDEQ has observed nongame fish in Dry Creek.

Upper Lodgepole Sub-basin (HUC 10190015)

The headwaters of the Upper Lodgepole Sub-basin originate in the Laramie Range and Lodgepole Creek flows east through Pine Bluffs. Much of the stream is intermittent in the lower elevations with only isolated pools of standing water during the summer. The primary land uses are grazing in the upper sub-basin and irrigated and dry land crop production in lower areas. There has been considerable residential growth in the sub-basin in recent years, but the effects on water quality are unknown.

Lower Lodgepole Sub-basin (HUC 10190016)

A small portion of the Lower Lodgepole Sub-basin is in eastern Laramie County, but drains east into Nebraska. The sub-basin is small, with no perennial streams, and land uses are primarily dry land and sprinkler irrigated crop production, and grazing.

8.13 Tongue River Basin

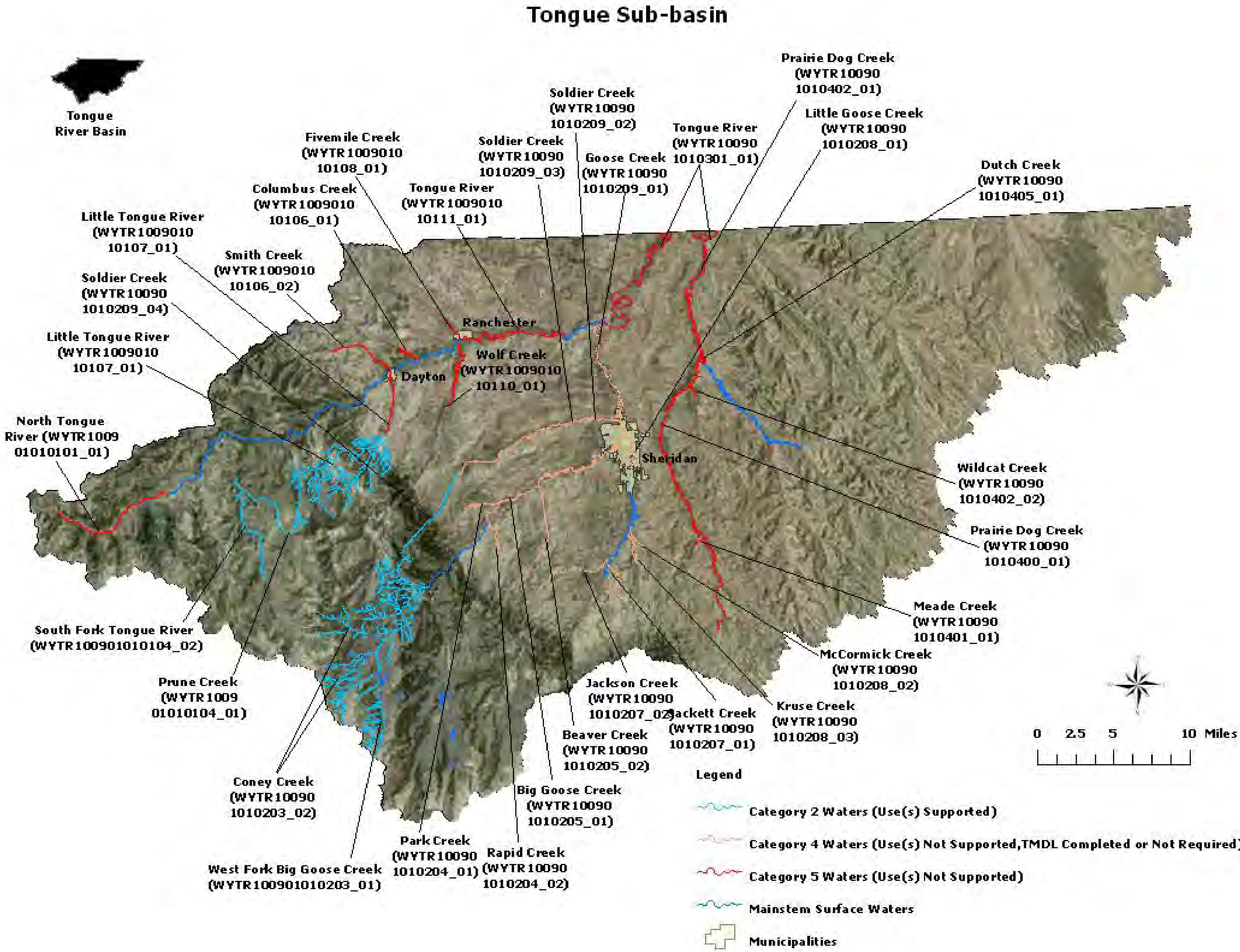
The Tongue River Basin originates in the Big Horn Mountains west of Sheridan. Land uses within the Bighorn National Forest are recreation, livestock grazing, and logging, while in the lower sub-basin, primary land uses are irrigated agriculture, livestock grazing, and coal mining, with increasing residential and CBM development. Wohl et al. (2007) reported that many streams within the Big Horn National Forest have been substantially impacted by cattle ranching, irrigated crop production, flow regulation and diversion, and timber harvest.

Tongue Sub-basin (HUC 10090101)

Big and Little Goose Creeks were placed on the 1996 303(d) List due to exceedances of the fecal coliform criterion. Subsequent monitoring by WDEQ in 1998 and 1999 revealed exceedances in several other locations within these watersheds, including Kruse Creek, Sacket Creek and Jackson Creek irrigation canal, which are all tributaries of Little Goose Creek; Beaver Creek, Park Creek, and Rapid Creek, which are tributaries of Big Goose Creek; and Goose and Soldier Creeks. Sheridan County Conservation District (SCCD) monitored fecal bacteria in the Goose Creek Watershed in 2001 and 2002, and results corroborate the 1998-1999 WDEQ data (SCCD, 2003). The SCCD study also resulted in the extension of the impaired reach of Goose Creek from the confluence of Big and Little Goose Creeks downstream to the Highway 339 bridge crossing, and indicated that McCormick Creek is not meeting its contact recreation uses from the confluence of Little Goose Creek upstream an undetermined distance. All of the streams listed above are on the 303(d) List. SCCD, with the guidance of a local watershed steering committee, developed a watershed plan for the Goose Creek watershed, which was approved by WDEQ in 2005. Implementation projects have begun, including septic system improvements, animal feeding operations, riparian buffer development, streambank stabilization, reservoir development, and changes in grazing management. A Section 205j Little Goose Creek Wastewater Treatment Feasibility Study was completed by Sheridan County in 2009.

Monitoring by WDEQ (2009) on Soldier Creek spanning the years 1998-2003 showed that the aquatic life other than fish use is impaired from PK ditch downstream to the confluence with Goose Creek and supported from PK ditch upstream to the headwaters of the creek. Because the impairment is thought to be caused by flow alterations in the watershed, the segment was placed in category 4C in 2010 and a TMDL is not necessary.

SCCD data collected in 2001 and 2002 showed exceedances of the temperature criteria for cold water fisheries in lower portions of the Goose Creek drainage and poor biotic condition close to Sheridan. Because the data were collected during near record low streamflows, definitive aquatic life other than


Tongue Sub-basin
Tongue River Basin
Prairie Dog Creek (WYTR10090 1010402_01)
Soldier Creek (WYTR10090 1010209_02)
Little Goose Creek (WYTR10090 1010208_01)
Tongue River (WYTR10090 1010301_01)
Fivemile Creek (WYTR1009010 10108_01)
Soldier Creek (WYTR10090 1010209_03)
Goose Creek (WYTR10090 1010209_01)
Dutch Creek (WYTR10090 1010405_01)
Columbus Creek (WYTR1009010 10106_01)
Tongue River (WYTR1009010 10111_01)
Little Tongue River (WYTR1009010 10107_01)
Smith Creek (WYTR1009010 10106_02)
Soldier Creek (WYTR10090 1010209_04)
Ranchester
Little Tongue River (WYTR1009010 10107_01)
Wolf Creek (WYTR1009010 10110_01)
Dayton
North Tongue River (WYTR1009 01010101_01)
Sheridan
Wildcat Creek (WYTR10090 1010402_02)
Prairie Dog Creek (WYTR10090 1010400_01)
Meade Creek (WYTR10090 1010401_01)
South Fork Tongue River (WYTR100901010104_02)
McCormick Creek (WYTR10090 1010208_02)
Prune Creek (WYTR1009 01010104_01)
Jackson Creek (WYTR10090 1010207_02)
Jackett Creek (WYTR10090 1010207_01)
Kruse Creek (WYTR10090 1010208_03)
Beaver Creek (WYTR10090 1010205_02)
0 2.5 5 10 Miles
Coney Creek (WYTR10090 1010203_02)
Big Goose Creek (WYTR10090 1010205_01)
Legend
Category 2 Waters (Use(s) Supported)
Category 4 Waters (Use(s) Not Supported,TMDL Completed or Not Required)
Category 5 Waters (Use(s) Not Supported)
Mainstem Surface Waters
Municipalities
Park Creek (WYTR10090 1010204_01)
Rapid Creek (WYTR10090 1010204_02)
West Fork Big Goose Creek (WYTR100901010203_01)

fish and cold water fisheries use determinations could not be made. SCCD and WDEQ monitoring indicated that stormwater discharges are contributing excessive fine sediment to, and causing physical degradation of, Little Goose Creek (2004) from the confluence with Goose Creek upstream to Brundage Lane in Sheridan and Goose Creek (2005) within Sheridan. Aquatic life other than fish and cold water fisheries uses are not supported, and both of these reaches were added to the 303(d) List for this pollutant in 2006. TMDLs for the 13 of the listed waters in the Goose Creek watershed were approved by EPA in 2010 and these waters were subsequently removed from the 303(d) List in 2012. These de-listed waters included 11 for fecal coliform on Park, Rapid, Big Goose, Beaver, Sackett, Jackson, Little Goose, McCormick, Kruse, Goose and Soldier Creeks; and two for sediment on Little Goose and Goose Creeks.

SCCD reports that Beaver Creek (a class 3B water) has perennial streamflow, even during drought conditions, and suggested that it should be reclassified to class 2AB (SCCD, 2000; SCCD, 2002).

WDEQ (2002) monitoring on the Tongue River concluded that the cold water fishery use of lower Tongue River is impaired due to high temperatures. The USGS began continuously monitoring temperature on the stream, and showed that the cold water temperature criterion was exceeded every day for a 30 day period in 2001. Elevated temperatures were again observed by USGS during the 2002-2004 water years. WDEQ has conducted continuous temperature monitoring on the Tongue River at several sites. It has not been determined to what extent these high temperatures are due to anthropogenic influences, but the data suggest that the loss of riparian cover and an irrigation diversion may contribute. Because of these consistently high temperatures, the Tongue River below Goose Creek was added to the 303(d) List in 2002.

Assessments conducted by SCCD (SCCD, 2000) indicate that the lower reach of the Little Tongue River from its mouth upstream to the confluence with Frisbee Ditch above the town of Dayton is not meeting its contact recreation uses, and it was added to the 303(d) List in 2002. SCCD data also identified concerns with the effects of habitat degradation on the biological community in and near Dayton. Above Frisbee Ditch, the Little Tongue River is fully supporting its aquatic life other than fish and coldwater fisheries uses.

Bacteria samples collected by SCCD on Smith Creek in Dayton, Columbus Creek near the Highway 14 crossing, Fivemile and Wolf Creeks near Ranchester, and the Tongue River between Monarch and Ranchester indicate that these streams are not supporting their contact recreational uses, and were added to the 303(d) List in 2002. SCCD developed a watershed plan for the Tongue River watershed from Ranchester upstream to the Bighorn National Forest boundary and has received a Section 319 Grant to address the above issues. Implementation measures include AFO projects, riparian buffer development, streambank stabilization, reservoir development and grazing management changes.

Prairie Dog Creek, a tributary to the Tongue River, receives trans-basin diversion water, and this additional streamflow has contributed to habitat degradation in portions of the stream channel (EnTech, Inc., 2001). A riparian improvement project implemented by the WGFD and a landowner has rehabilitated portions of the in-stream and riparian habitats. WDEQ (2003, 2005) and SCCD have conducted considerable monitoring in the Prairie Dog Creek watershed, and data indicate that most streams support their aquatic life other than fish uses, though isolated areas of poor habitat and high water temperatures in the lower watershed are concerns. *E. coli* counts in Prairie Dog Creek exceed the WDEQ criterion, indicating that it does not support its contact recreational use, so the stream was added to the 303(d) List in 2004. As part of a 2009 Sheridan County Watershed Improvement Project, SCCD, NRCS, and local citizens used a Section 319 grant to implement 31 projects designed to address bacterial impairments in the Tongue River, Goose and Prairie Dog Creek Watersheds; including six to replace septic systems, three streambank stabilization projects, and one large scale river restoration project. Effectiveness monitoring for these projects was planned for 2009-2011. Prairie Dog Creek is also on the 303(d) List for exceedances of the secondary (aesthetic) human health criterion for manganese. Concentrations of manganese in the creek are far below the human health criteria, but can cause the discoloration of water and the staining of cooking utensils. It is likely that the high manganese concentrations are due to the natural geology of the basin (Rice et al, 2002), and a site specific criterion for the watershed is being considered. SCCD completed the final report for the Prairie Dog Creek Watershed Assessment (2007-2008) in 2009. The report indicated that sedimentation may be affecting the macroinvertebrate community in Prairie Dog Creek and the impact of this pollutant is a concern. Data collected during this project resulted in seven additions to the 2012 303(d). The 2012 listings include: manganese and water temperature along lower Prairie Dog Creek, from I-90 to a point 47.2 miles downstream; temperature from the confluence with the Tongue River to a point 6.7 miles upstream; manganese and primary contact recreation on Meade Creek, a tributary to Prairie Dog Creek, from the confluence with Prairie Dog Creek upstream to the confluence with an unnamed tributary; primary contact recreation on Dutch Creek from the confluence with Prairie Dog Creek to a point 1.9 miles upstream; and primary contact recreation on Wildcat Creek from the confluence with Prairie Dog Creek to a point 0.8 miles upstream. SCCD completed a Watershed Based Plan for Prairie Dog Creek in 2011, which has been approved by WDEQ.

In 2004, the North Fork Tongue River was placed on the 303(d) List for non-support of its contact recreation use. In 2010, USFS data were used to modify the extent of the impairment from Road 171 upstream to the confluence with Pole Creek. A diverse stakeholder group, sponsored by the USFS, is working to manage this resource. Projects initiated by the stakeholder group include monitoring the watershed and using the resulting data to recommend, implement, and assess stocking rates and herding changes on the allotments within the watershed. These actions, along with federal land management and allotment planning is considered equivalent to watershed planning, and therefore the North Tongue River has been given a low priority for TMDL development.

USFS completed a channel stabilization project on the South Fork Tongue River in 2003 that helped to reduce sediment input to the South Tongue Watershed from the vicinity of the Dead Swede Campground. WDEQ (2008) monitoring conducted in 1993, 1995, 1998 and 2003 on the South Fork Tongue River indicated that it supports its aquatic life other than fish and cold water fisheries uses from Highway 14 upstream to the confluence with the East Fork South Fork Tongue River.

WDEQ monitoring of Prune Creek (2002), and Coney and West Fork of Big Goose Creeks (2002) indicates that these streams are supporting their aquatic life other than fish uses.

USFS and WDEQ have removed improperly designed fish habitat structures within a livestock grazing exclosure on Bull Creek that were causing channel widening and excessive sediment deposition.

8.14 Yellowstone River Basin

The headwaters of the Yellowstone River originate in the Teton Wilderness Area south of Yellowstone National Park (YNP). The river flows north into YNP and then into a large caldera, where it forms Yellowstone Lake. From the lake outlet, the river then flows north through the park, where it enters Montana and confluences with the Missouri River.

Yellowstone Headwaters Sub-basin (HUC 10070001)

In Wyoming, this sub-basin lies entirely within the Teton Wilderness Area and Yellowstone National Park (YNP); subsequently, all its waters are designated as Class 1. More than half of YNP lies in this sub-basin. Recreation and wildlife habitat are the primary land uses in the sub-basin. More than 3 million people visit YNP each year, but most of the sub-basin is remote wilderness and sees very few people.

Fecal contamination has been a concern because of several sewage spills in YNP. However, major overhauls of some sewage infrastructures have since occurred, which are expected to greatly reduce the risk of future spills.

Large portions of this sub-basin were involved in the 1988 Yellowstone wildfires and subsequent fires of lesser magnitude. However, any potential water quality impacts from these fires or from the many geothermal features in this sub-basin are considered natural, and are not considered impairments for the purposes of CWA reporting. Many areas within YNP have been heavily grazed by elk and/or bison and many water quality concerns have been reported (Houston, 1982; Singer, 1996; YNP 1997). For example, historical photos of the lower Lamar River Valley show thick stands of willows, which are very important for stabilizing this type of stream. Currently, most of the willows have been eradicated by sustained browsing by wildlife, and as a consequence, considerable bank erosion has occurred along the river. With the reintroduction of wolves to YNP, formerly sessile ungulates have become more mobile, and spend less time in riparian areas. As a result, riparian vegetation is recovering (Ripple and Beschta, 2003).

Soda Butte Creek, a tributary to the Lamar River, originates in Montana in an area of historic mining disturbance called the New World Mining District, including the McLaren mill tailings and the now defunct Republic Smelter. As a result of these impacts, Soda Butte Creek is considered impaired in Montana and has an approved TMDL (2003). Impacts to surface waters within YNP in Wyoming have not been conclusively determined (Broughton, 2001). In response to the environmental conditions present at the New World Mining District, the USFS and the state of Montana have initiated and completed considerable mine tailings relocation and reclamation work in the watershed and annual reports have indicated that water quality is improving in Soda Butte Creek at the Yellowstone National Park boundary (Tetra Tech, 2007).

Clarks Fork Yellowstone Sub-basin (HUC 10070006)

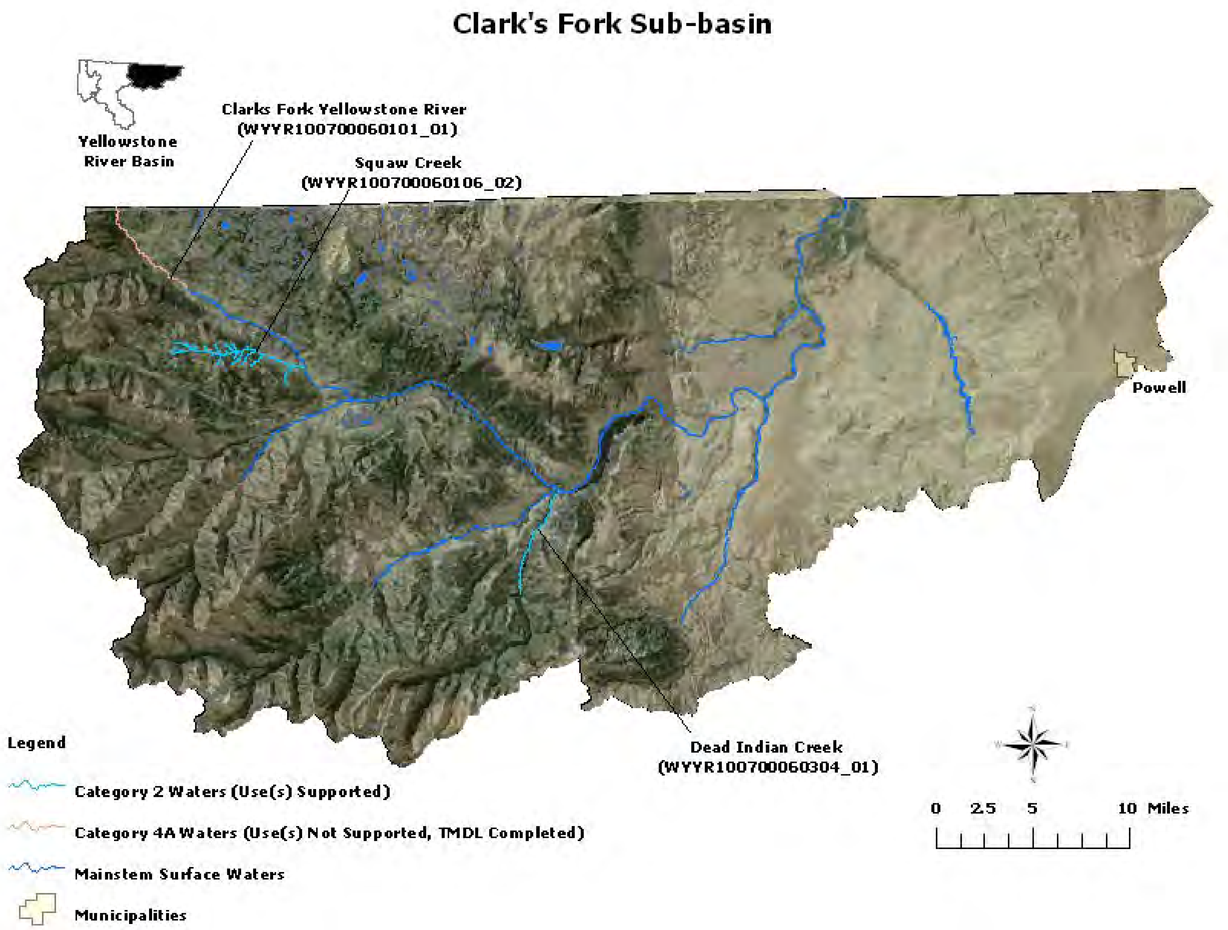
The Clarks Fork Yellowstone River headwaters originate in Montana before flowing southeast into Wyoming. Near its confluence with Sunlight Creek, the stream flows back into Montana where it confluences with the Yellowstone River. A 20.5 mile section of the Clarks Fork in the Shoshone National Forest is designated as a Wild and Scenic River and is designated by WDEQ as Class 1. The upper two-thirds of the sub-basin in Wyoming are primarily within the Shoshone National Forest, with small private properties. Land uses in the upper sub-basin are primarily recreation, with some logging, livestock grazing, irrigated hay production and historic mining. Portions of the upper sub-basin were involved in the 1988 Yellowstone wildfires and were salvage logged. Land uses in the lower sub-basin are primarily livestock grazing and irrigated agriculture, with some areas of oil and gas production. The USFS has developed a management plan for the Clarks Fork of the Yellowstone River.

The aquatic life other than fish use of the Clarks Fork of the Yellowstone is impaired due to exceedances of the aquatic life other than fish chronic copper, silver and cadmium criteria. The source of these metals was determined to be primarily from past mining activities in the New World Mine area in Montana. Remediation is currently taking place and TMDLs have been written in Montana. The Montana TMDLs fully address these impairments in Wyoming. The Montana TMDLs have satisfied the CWA requirements for Wyoming and these impaired reaches have been placed in Category 4A.

A Section 319 watershed improvement project on Squaw Creek moved a road from the riparian zone to reduce sediment loading to the stream. The final report from this project shows that this water quality threat has been removed and that the stream is now supporting its aquatic life other than fish and cold water fishery uses (Page and Zubik, 2001). Squaw Creek was therefore placed in Category 2 in 2000.

In 1997, a USFS stream bank stabilization project on Pilot Creek within the Shoshone National Forest successfully stabilized about 150 feet of stream bank and reduced sediment transport from this drainage into the Clarks Fork.

WDEQ (2005) assessment of lower Dead Indian Creek indicates that the stream fully supports its aquatic life other than fish and coldwater fisheries uses from the confluence with the Clarks Fork upstream to Dry Creek.


Clark's Fork Sub-basin
Yellowstone River Basin
Clarks Fork Yellowstone River (WYYR100700060101_01)
Squaw Creek (WYYR100700060106_02)
Powell
Dead Indian Creek (WYYR100700060304_01)
Legend
Category 2 Waters (Use(s) Supported)
Category 4A Waters (Use(s) Not Supported, TMDL Completed)
Mainstem Surface Waters
Municipalities
0 2.5 5 10 Miles

9. 2012 Surface Water Assessment Results

As of 2012, 18,713, or 3.3% of the 569,269 acres of Wyoming's Lakes, Reservoirs and Ponds had been assessed and use support status determined, whereas 17,515, or 6.2% of the 280,804 miles of Wyoming's streams had use support determinations. Wyoming's surface waters are classified by the state using a tiered system outlined in Chapter 1. This approach places waters into classes 1-4 (see Appendix C), with Class 1 waters being managed for the highest and Class 4 for the lowest water quality and designated uses, respectively. USEPA guidance (USEPA 2005, 2006) specifies that all surface waters of the state be placed into one of five designated use attainment categories (see Appendix B). Category 1 waters are those that support all their designated uses and have no water quality threats or impairments. Category 2 waters are those for which some designated uses are supported, but the status of others remains unknown. Category 3 waters are those waters for which insufficient data exists to make use support determinations. Category 4 waters are those waters which have a designated use that is impaired or threatened and either a TMDL has been completed (4A); other pollution control measures are expected to address the impairment (4B); or pollution (e.g. flow alteration) not a pollutant is the source of impairment (4C). Lastly, Category 5 waters, or those on the state's 303(d) List, are waters where one or more uses are either impaired or threatened and a TMDL is required. There are currently no known Category 1 streams in the state Wyoming. Summary statistics for the overall surface water quality conditions in Wyoming are described in Section 9.1 below. Lastly, Wyoming's Category 2, 3, 4, and 5 (2012 303 (d) List) surface waters are listed for each river basin in Tables 9.2-9.5.

9.1 Summary Statistics for Wyoming's Streams, Lakes and Reservoirs

Table 9.1.1 Designated use support summary statistics for Wyoming's streams.

Designated Use	Total Miles Monitored	Miles Assessed	Miles Fully Supporting	Miles Fully Supporting, but Threatened	Miles Not Supporting	Miles Not Assessed	Miles with Insufficient Information
Drinking Water	15,591	228	44	0	184	15,358	5
Aquatic Life other than Fish	17,515	16,745	15,814	348	584	706	63
Cold Water Fishery	15,383	14,759	14,324	156	279	592	32
Warm Water Fishery	344	321	171	0	150	17	6
Nongame Fishery	605	171	0	0	171	416	18
Fish Consumption	15,756	44	44	0	0	15,712	0
Recreation	17,498	950	0	0	905	16,477	70
Wildlife	17,515	11,158	11,158	0	0	5,579	778
Agriculture	17,515	11,158	11,158	0	0	5,579	778
Industry	17,515	11,158	11,158	0	0	5,579	778
Scenic Value	17,515	0	0	0	0	17,515	0

Table 9.1.2. Ranked summary statistics for the causes and sources of impairment for Wyoming's streams, including both Category 4 and Category 5 (2012 303(d) List) waters.

Causes and Sources of Wyoming's Impaired Streams			
Causes	**Miles**	**Sources**	**Miles**
E. Coli/Fecal Coliform	950	Unknown	1,166
Selenium	358	Natural Sources	477
Sediment	270	Livestock Grazing	389
Habitat Modification	176	Wildlife Grazing	18
Arsenic	120	Irrigated Crop Production	306
Chloride	99	Petroleum Production	170
Temperature	89	Municipal Stormwater	45
Manganese	64	Habitat Modification	54
Oil and Grease	47	Hardrock Mining	17
Flow Alterations	46	Municipal WWTPs	10
Ammonia	17	Hardrock Mining in MT	7
Copper	17		
Cadmium	12		
Silver	12		
pH	10		

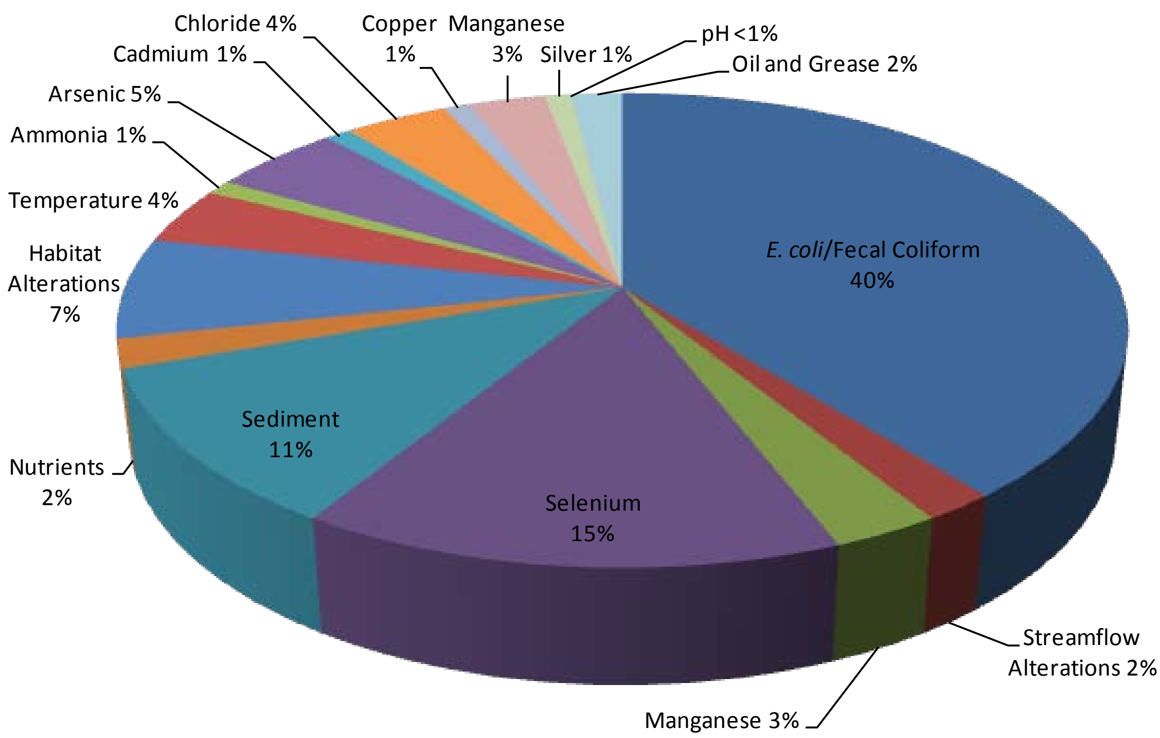


Figure 9.1.1 Pie chart showing the relative percentage of all of the causes for Wyoming's impaired stream miles for both Category 4 and Category 5 (2012 303(d) List) waters.

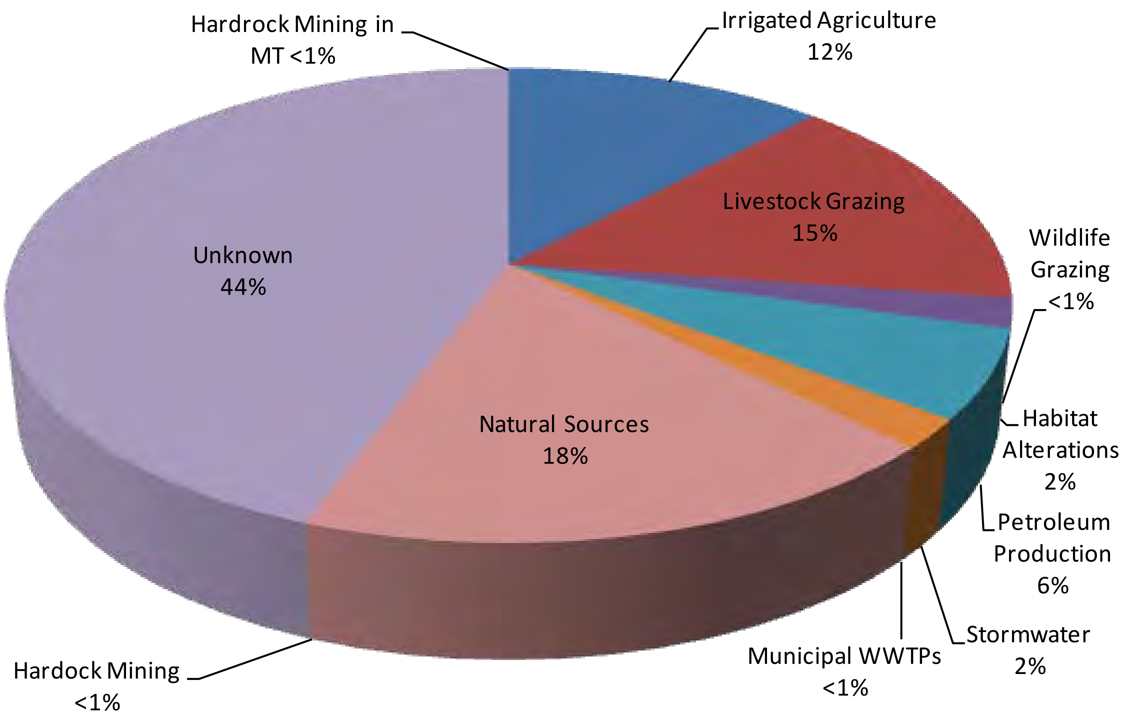


Figure 9.1.2. Pie chart showing the relative percentage of all of the pollutant sources for Wyoming's impaired stream miles for both Category 4 and Category 5 (2012 303(d) List) waters.

Table 9.1.3. Summary statistics for the 2012 USEPA categorization of Wyoming's Streams.

Summary of Categorizations of Wyoming's Assessed Streams				
Category	**Number of Units**	**Total Miles**	**Miles/Unit**	**Relative % Miles**
1	0	0	0	0
2	127	15,697	124	90
3	2	7.5	4	<1
4A	14	72	6	<1
4B	0	0	0	0
4C	4	46	12	<1
5	105	1,692	16	10

Table 9.1.4. Designated use support summary statistics for Wyoming's lakes and reservoirs.

Designated Use	Total Acres Monitored	Acres Assessed	Acres Fully Supporting	Acres Fully Supporting, but Threatened	Acres Not Supporting	Acres Not Assessed	Acres with Insufficient Information
Drinking Water	6,516.6	0	0	0	0	6,516.6	0
Aquatic Life other than Fish	18,713	18,713	12,475	0	6,238	0	0
Cold Water Fishery	12,491	12,491	12,475	0	15	0	0
Warm Water Fishery	6,076	6,076	0	0	6,076	0	0
Nongame Fishery	6,076	0	0	0	0	6,076	0
Fish Consumption	18,566	12,050	12,050	0	0	6,517	0
Recreation	18,713	0	0	0	0	18,713	0
Wildlife	18,713	12,475	12,475	0	0	0	6,238
Agriculture	18,713	12,475	12,475	0	0	0	6,238
Industry	18,713	12,475	12,475	0	0	0	6,238
Scenic Value	18,713	0	0	0	0	18,713	0

Table 9.1.5. Ranked summary statistics for the causes and sources of impairment for Wyoming's lakes and reservoirs, including both Category 4 and Category 5 (2012 303(d) List) waters.

Causes and Sources of Wyoming's Impaired Streams			
Causes	**Acres**	**Sources**	**Miles**
Sediment	6,091	Irrigated Crop Production	6,222
Phosphate	15	Unknown	6,091
Selenium	147	Natural Sources	147

Table 9.1.6. Summary statistics for the 2012 USEPA categorization of Wyoming's Lakes and Reservoirs.

Summary of Categorizations of Wyoming's Assessed Lakes and Reservoirs				
Category	**Number of Units**	**Total Acres**	**Acres/Unit**	**Relative % Acres**
1	0	0	0	0
2	6	12,475	2,079	67
3	0	0	0	0
4A	1	6,076	6,076	32
4B	0	0	0	0
4C	0	0	0	0
5	5	162	32	1

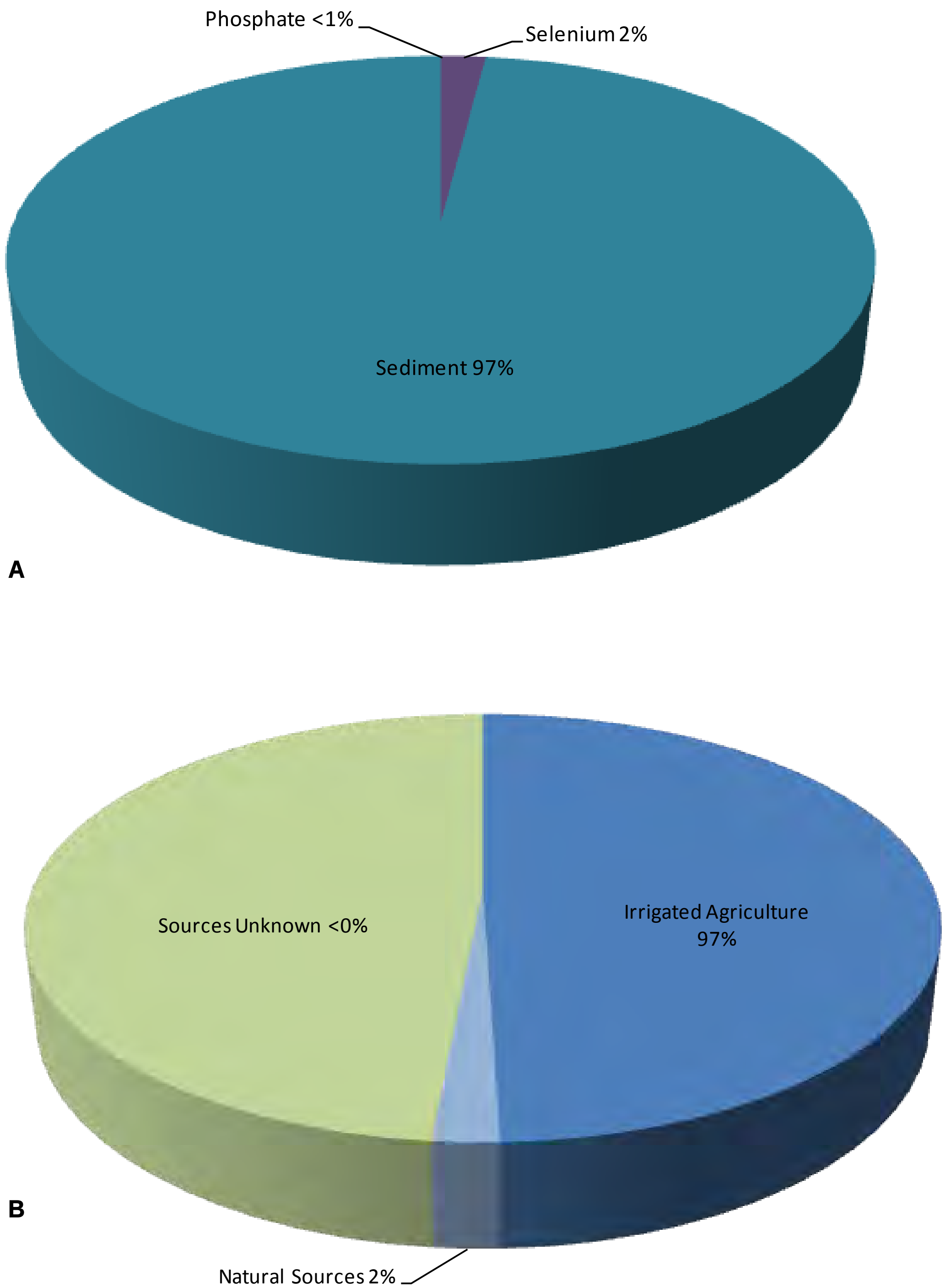


Figure 9.1.3. Pie charts showing the relative percentage of all of the causes (**A**, above) and sources (**B**, below) for Wyoming's impaired Lakes and Reservoirs for both Category 4 and Category 5 (2012 303(d) List) waters.

9.2 Category 2 Surface Waters

Table 9.2. Table of Wyoming's Category 2 Surface Waters, or waters that support one or more designated uses, but the use support of other uses is unknown.

Bear River Basin					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Mill Creek Watershed	WYBR160101010106_01	Entire Mill Creek watershed upstream of the confluence with the Bear River	2AB	32.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Bear River	WYBR160101010201_01	Entire Bear River watershed upstream of the confluence with Sulphur Creek, excluding the Mill Creek watershed	2AB	85.6 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Pleasant Valley Creek	WYBR160101010301_01	Entire Pleasant Valley Creek watershed upstream of the confluence with Crompton Reservoir	3B	64.5 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Hobble Creek	WYBR160101020201_01	Entire Hobble Creek watershed upstream of Smiths Fork, excluding the Coantag Creek watershed	2AB	126.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Coantag Creek	WYBR160101020201_02	Entire Coantag Creek watershed upstream of the confluence with Hobble Creek	2AB	55.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Smiths Fork	WYBR160101020204_01	Entire Smiths Fork watershed upstream of the confluence with Muddy Creek	2AB	280.7 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Salt Creek	WYBR160101020303_01	Entire Salt Creek watershed upstream of the Idaho border, excluding the Giraffe Creek and Coal Creek watersheds	2AB	105.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Giraffe Creek	WYBR160101020304_00	Entire Giraffe Creek watershed upstream of the confluence with Salt Creek	2AB	40.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Belle Fourche River Basin					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Blacktail Creek	WYBF101202010903_01	Entire Blacktail Creek watershed above USFS boundary	2AB	28.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Beaver Creek	WYBF101202010906_00	From the confluence with Lame Jones Creek to a point 32.1 miles upstream	2AB	32.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Belle Fourche River Basin (continued)					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Wood Canyon Creek	WYBF101202010906_02	From the confluence with Beaver Creek to a point 2.7 miles upstream	3B	2.7 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Reservoir Gulch	WYBF101202010906_03	From the confluence with Beaver Creek to a point 1.8 miles upstream	3B	1.8 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Cub Creek	WYBF101202010906_04	From the confluence with Beaver Creek to a point 2.1 miles upstream	2AB	2.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Little Creek	WYBF101202010906_05	From the confluence with Beaver Creek to a point 1.3 miles upstream	3B	1.3 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Fawn Creek	WYBF101202010906_06	From the confluence with Beaver Creek to a point 3.1 miles upstream	3B	3.1 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Bighorn River Basin					
305(b) Identifier	**Waterbody**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Trappers Creek	WYBH100800010110_01	Entire Trappers Creek watershed upstream of the confluence with Warm Springs Creek	2AB	13.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Bear Creek	WYBH100800010408_00	Entire Bear Creek watershed upstream of the confluence with the East Fork Wind River	2AB	79.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
East Fork Wind River	WYBH100800010409_00	Entire watershed upstream of the confluence with Wiggins Fork, excluding Bear Creek	2AB	465.2 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Little Beaver Creek	WYBH100800020301_01	Entire watershed upstream of the confluence with Beaver Creek	2AB	24.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Beaver Creek	WYBH100800020301_02	Entire mainstem, from the confluence with Little Beaver Creek to a point 19.7 Miles upstream	2AB	19.7 mi.	Cold Water Fishery, Aquatic Life other than Fish, Drinking Water, Fish Consumption, Wildlife, Agriculture, Industry
Deep Creek	WYBH100800030103_01	Entire watershed upstream of the confluence with Red Canyon Creek	2AB	10.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Baldwin Creek	WYBH100800030207_02	Entire watershed upstream of the confluence with the Middle Popo Agie River, excluding Squaw Creek	2AB	39.3 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Squaw Creek	WYBH100800030210_00	Entire watershed upstream of the confluence with Baldwin Creek	2AB	44.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Grass Creek	WYBH100800070607_01	Grass Creek above irrigated withdrawal in NENE S23 T46N R99W	2AB	124.2 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Bighorn River Basin (continued)					
305(b) Identifier	**Waterbody**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Cottonwood Creek	WYBH100800070609_01	From the confluence with the Bighorn River upstream to the confluence with Wagonhound Creek	2AB	29.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Soldier Creek	WYBH100800080603_01	From the confluence with South Paint Rock Creek to a point 7.4 miles upstream	2AB	7.4 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
South Paint Rock Creek	WYBH100800080603_02	From the confluence with Soldier Creek to a point 3.6 miles upstream	2AB	3.6 mi.	Drinking Water, Fish Consumption
Mail Creek	WYBH100800100101_01	From the confluence with Shell Creek to a point 5.6 miles upstream	2AB	5.6 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Crooked Creek	WYBH100800100502_01	From the Montana border to a point 3.0 miles upstream	2AB	3.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Porcupine Creek	WYBH100800100600_01	Entire watershed upstream of the Montana border, excluding the Deer Creek watershed	2AB	178.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
North Fork Shoshone River Drainage	WYBH100800120000_00	Entire watershed above the confluence with Half Mile Creek	2AB	3235.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Little Bighorn River	WYBH100800160100_01	Entire watershed upstream of the Montana border, excluding the Dry Fork Little Bighorn watershed	2AB	165.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
West Pass Creek	WYBH100800160107_01	Entire watershed upstream of the Montana border	2AB	43.7 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Cheyenne River Basin					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Antelope Creek	WYCR101201010000_01	From the confluence with the Cheyenne River to a point 85.6 miles upstream	3B	85.6 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Cheyenne River	WYCR101201030000_01	From the confluence with Lance Creek upstream to the confluence with Dry Fork Cheyenne River	2ABww	92.1 mi.	Warm Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Black Thunder Creek	WYCR101201030200_01	From the confluence with the Cheyenne River to a point 79.8 miles upstream	3B	79.8 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Cheyenne River Basin (continued)					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Cheyenne River	WYCR101201060100_01	From the confluence with Lance Creek downstream to the South Dakota border	2ABww	17.9 mi.	Warm Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Poison Creek	WYCR101201070103_01	From the confluence with Beaver Creek to a point 7.3 miles upstream	3B	7.3 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Green River Basin					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Green River	WYGR140401010200_01	Entire watershed between highway 189 and Green River Lakes	2AB	735.6 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
LaBarge Creek	WYGR140401011102_00	Entire watershed upstream of Little Fall Creek Road	2AB	160.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Rock Creek	WYGR140401011103_01	Entire watershed upstream of the confluence with LaBarge Creek	2AB	16.6 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Fontenelle Creek	WYGR140401011302_00	Entire watershed upstream of the confluence with Little Coal Creek	2AB	210.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Fontenelle Creek	WYGR140401011306_01	From the confluence with Fontenelle Reservoir to a point 13.2 miles upstream	2AB	13.2 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
New Fork River	WYGR140401020203_00	Mainstem from the confluence with the Green River upstream to Duck Creek; entire watershed upstream of the confluence with Duck Creek, excluding Pole Creek	2AB	419.3 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Pole Creek	WYGR140401020403_01	From the confluence with the New Fork River to a point 17.2 miles upstream	2AB	17.2 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Big Sandy River	WYGR140401040407_01	From the confluence with the Green River upstream to the confluence with the Little Sandy Creek	2AB	42.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
East Fork Smiths Fork	WYGR140401070201_01	Entire watershed from the confluence with West Fork Smiths Fork upstream to the Utah border	2AB	34.6 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Green River Basin (continued)					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
West Fork Smiths Fork	WYGR140401070203_01	Entire watershed from the confluence with East Fork Smiths Fork upstream to the Utah border	2AB	47.2 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Hams Fork	WYGR140401070600_01	Entire watershed upstream of Kemmerer, excluding the Willow Creek watershed	2AB	862.8 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Little Snake River Basin					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
North Fork Little Snake River	WYLS140500030104_00	Entire watershed upstream of the Colorado border	2AB	212.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Lost Creek	WYLS140500030109_03	From the confluence with West Fork Battle Creek to a point 5.2 miles upstream	2AB	5.2 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
East Fork Savery Creek	WYLS140500030401_01	From the confluence with Savery Creek to a point 17.0 miles upstream, including Hatch Creek	2AB	17.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Dirtyman Fork	WYLS140500030402_01	From the confluence with East Fork Savery Creek to a point 7.8 miles upstream	2AB	7.8 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Little Savery Creek	WYLS140500030405_01	From the confluence with McCarty Creek to a point 4.6 miles downstream	2AB	4.6 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Big Sandstone Creek	WYLS140500030407_01	Entire watershed upstream of the confluence with Savery Creek	2AB	177.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Loco Creek	WYLS140500030408_03	From the confluence with Savery Creek to a point 9.1 miles upstream	2AB	9.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Muddy Creek	WYLS140500040101_01	Entire watershed upstream of the confluence with Littlefield Creek	2AB	70.6 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Muddy Creek	WYLS140500040103_01	From the confluence with Alamosa Gulch upstream to the confluence with Littlefield Creek	2AB	13.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Littlefield Creek	WYLS140500040101_02	Entire watershed upstream of the confluence with Muddy Creek	2AB	35.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
McKinney Creek	WYLS140500040102_01	From the confluence with Muddy Creek upstream to the confluence with Eagle Creek	2AB	5.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
McKinney Creek	WYLS140500040102_02	Entire watershed upstream of the confluence with Eagle Creek	2AB	60.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Niobrara River Basin					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Silver Springs Creek	WYNR101500020104_01	From the confluence with the Niobrara River to a point 17.8 miles upstream	3B	17.8 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry

North Platte River Basin					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
North Platte River	WYNP101800020000_01	From the confluence with Sage Creek upstream to the Colorado border	1	77.3 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Bear Creek	WYNP101800020104_01	From the confluence with Rob Roy Reservoir to a point 2.9 Miles upstream	2AB	2.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Drinking Water, Fish Consumption, Wildlife, Agriculture, Industry
Smith North Creek	WYNP101800020105_01	Entire watershed upstream of the confluence with Douglas Creek	2AB	14.6 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Muddy Creek	WYNP101800020105_02	Entire watershed upstream of the confluence with Douglas Creek	2AB	44.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Douglas Creek	WYNP101800020105_03	From the confluence with Pelton Creek upstream to the confluence with Muddy Creek, excluding Smith North Creek	2AB	104.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Douglas Creek	WYNP101800020107_01	Entire watershed from the confluence with the North Platte River upstream to the confluence with Pelton Creek	1	150.4 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
French Creek	WYNP101800020203_01	Entire watershed upstream of the confluence with the North Platte River	2AB	192.8 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Big Creek	WYNP101800020303_01	Entire watershed upstream of the confluence with Spring Creek	2AB	221.2 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Encampment River	WYNP101800020500_01	Encampment River tributaries from the confluence with (and including) the North Fork Encampment River upstream to the confluence with (and including) the East Fork Encampment River; excluding Hog Park Creek	2AB	536.7 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

North Platte River Basin (continued)					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Encampment River	WYNP101800020504_01	From the confluence with the East Fork Encampment River to a point 10.0 miles downstream	1	10.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
South Fork Hog Park Creek	WYNP101800020505_01	From the confluence with Hog Park Creek upstream to the Colorado border	2AB	2.3 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Encampment River	WYNP101800020508_01	From the confluence with the North Platte River to a point 17.7 miles upstream	2AB	17.7 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
South Spring Creek	WYNP101800020703_01	Entire watershed upstream of the confluence with Centennial Creek	2AB	117.4 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Jack Creek	WYNP101800020800_01	Entire watershed upstream of the confluence with the North Platte River	2AB	534.7 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Sage Creek	WYNP101800020903_01	From the confluence with the North Platte River to a point 14.7 miles upstream	2AB	14.7 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Medicine Bow River	WYNP101800040100_01	Entire watershed upstream from the confluence with, and including, the East Fork Medicine Bow River	2AB	109.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Rock Creek	WYNP101800040201_01	Entire watershed upstream of the confluence with, and including, Overland Creek	2AB	99.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Shirley Basin Reservoir	WYNP101800050502_01	Within the Shirley Basin; NW S12 T26N R80W	2AB	15.5 ac.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Willow Creek	WYNP101800060204_01	Entire watershed upstream of the confluence with the Sweetwater River	2AB	36.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Glendo Reservoir	WYNP101800080405_01	Southeast of town of Douglas in Platte County	2AB	12,049.8 ac.	Cold Water Fishery, Aquatic Life other than Fish, Fish Consumption, Wildlife, Agriculture, Industry
Horseshoe Creek	WYNP101800080905_01	From the confluence with Spring Creek to a point 12.5 miles upstream	2AB	12.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Horseshoe Creek	WYNP101800080905_02	From the confluence with the North Platte River to a point 2.3 miles upstream	2AB	2.3 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Laramie River	WYNP101800100200_01	Entire watershed upstream of the confluence with Fox Creek, and including Fox Creek	2AB	354.7 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Miller Lake	WYNP101800100204_01	Near Fox Park in Albany County	2AB	7.6 ac.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

North Platte River Basin (continued)					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Meeboer Lake	WYNP101800100403_01	Adjacent to Mortensen Lake National Wildlife Refuge in Albany County	2AB	115.8 ac.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Little Laramie River	WYNP101800100600_01	Entire watershed above Millbrook, excluding the South Fork Little Laramie River	2AB	454.4 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
South Fork Little Laramie River	WYNP101800100602_01	From the intersection of State Highway 11 to a point 5.5 miles upstream	2AB	5.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Hanging Lake	WYNP101800100603_01	Adjacent to State Highway 130; within the Nash Fork Watershed	2AB	3.8 ac.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Snowy Range Lakes	WYNP101800100603_02	26 lakes within the upper North Fork Little Laramie Watershed	2AB	282.7 ac.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Middle Fork Mill Creek	WYNP101800100606_01	From the USFS boundary to a point 2.7 miles upstream	2AB	2.7 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Chugwater Creek	WYNP101800110900_02	From the intersection of Antelope Gap Road to a point 77.1 miles upstream	2AB	77.1 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Chugwater Creek	WYNP101800110906_01	From the confluence with the Laramie River upstream to Antelope Gap Road	2AB	9.7 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Horse Creek	WYNP101800120100_01	Entire watershed upstream of the confluence with South Fork Horse Creek	2AB	253.7 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Bear Creek	WYNP101800120300_01	Entire watershed upstream from the confluence with Horse Creek	2AB	1,045.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Powder River Basin					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Rock Creek	WYPR100902010101_01	Entire watershed upstream of the confluence with the Middle Fork Powder River	2AB	26.4 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Middle Fork Powder River	WYPR100902010102_01	From the confluence with Buffalo Creek to a point 26.4 miles upstream	1	26.4 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Beaver Creek	WYPR100902010202_00	From the confluence with Blue Creek to a point 19.0 miles upstream	2AB	19.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Blue Creek	WYPR100902010202_01	From the confluence with Beaver Creek to a point 8.8 miles upstream	2AB	8.8 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Beartrap Creek	WYPR100902010206_01	Entire watershed upstream of the confluence with the Middle Fork Powder River	2AB	48.8 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Powder River Basin (continued)					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Webb Creek	WYPR100902010301_01	Entire watershed upstream of the confluence with the North Fork Powder River	2AB	17.8 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Ninemile Creek	WYPR100902020100_01	Entire watershed upstream from the confluence with the Powder River	3B	543.7 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Fourmile Creek	WYPR100902020104_01	Entire watershed upstream from the confluence with the Powder River	3B	174.9 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Flying E Creek	WYPR100902020602_01	Entire watershed upstream from the confluence with the Powder River	3B	141.6 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Pole Creek	WYPR100902050101_01	Entire watershed upstream from the confluence with North Fork Crazy Woman Creek	2AB	17.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Little North Fork Crazy Woman Creek	WYPR100902050102_02	Entire watershed upstream from the confluence with North Fork Crazy Woman Creek	2AB	55.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Billy Creek	WYPR100902050103_01	From the confluence with Muddy Creek to a point 13.4 miles upstream	2AB	13.4 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Doyle Creek	WYPR100902050106_01	From the headwaters of Doyle Creek to a point 10.4 miles downstream	2AB	10.4 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Poison Creek	WYPR100902050107_01	Entire watershed upstream from the confluence with Middle Fork Crazy Woman Creek	2AB	70.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Middle Fork Crazy Woman Creek	WYPR100902050108_00	Entire watershed upstream from the confluence with North Fork Crazy Woman Creek, excluding Doyle Creek and Poison Creek	2AB	142.2 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Beaver Creek	WYPR100902050110_01	Entire watershed upstream from the confluence with South Fork Crazy Woman Creek, excluding Pole Creek	2AB	66.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Pole Creek	WYPR100902050110_02	Entire watershed upstream from the confluence with Beaver Creek	2AB	25.3 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Crazy Woman Creek	WYPR100902050204_01	From the confluence with South Fork Crazy Woman Creek to a point 23.6 miles downstream	2AB	23.6 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Powder River Basin (continued)					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Clear Creek	WYPR100902060000_01	Mainstem from the confluence with the Powder River upstream to the confluence with Grommund Creek and entire watershed upstream of the confluence with Grommund Creek	2AB	338.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Hunter Creek	WYPR100902060103_01	From the confluence with North Clear Creek to a point 2.7 miles upstream	2AB	2.7 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
French Creek	WYPR100902060106_01	From the confluence with Clear Creek to a point 22.3 miles upstream	2AB	22.3 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
North Rock Creek	WYPR100902060201_01	From the confluence with South Rock Creek to a point 9.6 miles upstream	2AB	9.6 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Rock Creek	WYPR100902060202_01	From the confluence with Clear Creek upstream to the confluence with South Rock Creek	2AB	19.3 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
South Piney Creek	WYPR100902060302_01	From Piney Creek upstream, excluding Kearney Creek	2AB	32.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Little Piney Creek	WYPR100902060304_01	From the confluence with Piney Creek to a point 14.0 miles upstream	2AB	14.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
North and South Fork Shell Creek	WYPR100902060305_01	Entire mainstem of each creek upstream from the confluence with South Creek Reservoir	3B	14.4 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Piney Creek	WYPR100902060403_01	From the confluence with Clear Creek upstream to North and South Fork Piney Creek	2AB	30.8 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Boxelder Creek	WYPR100902060404_01	Entire watershed upstream from the confluence with Piney Creek	3B	126.6 mi.	Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Snake River Basin					
Waterbody	**305 (b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
North Fork Spread Creek	WYSR170401010503_01	Entire watershed upstream of the confluence with Spread Creek	2AB	78.4 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Tongue River Basin					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Prune Creek	WYTR100901010104_01	From the confluence with the South Tongue River to a point 5.4 miles upstream	2AB	5.4 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
South Fork Tongue River	WYTR100901010104_02	From 0.3 miles above HWY 14 upstream to the confluence with East Fork South Fork Tongue River	1	11.4 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Little Tongue River	WYTR100901010107_01	Entire watershed upstream from the confluence with Frisbee Ditch	2AB	79.0 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
West Fork Big Goose Creek	WYTR100901010203_01	Entire watershed upstream of the confluence with Big Goose Creek, excluding Snail and Sawmill Creeks	2AB	95.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Coney Creek	WYTR100901010203_02	Coney Creek, including tributaries	2AB	13.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Soldier Creek	WYTR100901010209_04	From the headwaters to a point 7.3 miles downstream	2AB	7.3 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

Yellowstone River Basin					
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**	**Uses Supported**
Squaw Creek	WYYR100700060106_01	Entire watershed upstream from the confluence with the Clarks Fork Yellowstone River	2AB	17.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Dead Indian Creek	WYYR100700060304_01	From the confluence with the Clarks Fork Yellowstone River upstream to the confluence with Dry Fork	2AB	6.9 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

9.3 Category 3 Surface Waters

Table 9.3. Table of Wyoming's surface waters which have been assessed by WDEQ but there is insufficient data to determine whether any designated uses are supported.

Bighorn River Basin				
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**
Canyon Creek	WYBH100800080406_01	From the return of Hunsinger No. 1 Ditch upstream to Canyon Creek Ditch	2AB	4.3 mi.

Green River Basin				
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**
Reardon Draw	WYBH140101011006_01	From the confluence with the Green River to a point 3.2 miles upstream	2AB	3.2 mi.

North Platte River Basin				
Waterbody	**305(b) Identifier**	**Location**	**Class**	**Miles/Acres**
Bear Creek	WYNP101800020104_01	From the confluence with Rob Roy Reservoir to a point 2.9 Miles upstream	2AB	2.9 mi.

9.4 Category 4 Surface Waters

Table 9.4. Table of Wyoming's surface waters which are impaired or threatened for a designated use and either a TMDL has been completed and approved by USEPA (4A); other pollution control measures are expected to address the impairment (4B); or pollution, not a pollutant is the source of impairment (4C). All category 4A waterbodies are hyperlinked to their respective TMDLs.

Bighorn River Basin

Waterbody	305(b) Identifier	Location	Class/Category	Miles/Acres	Cause(s) of Impairment
Ocean Lake	WYBH100800050202_01	Within the Ocean Lake Wildlife Management Area	2ABww/4A	6075.8 ac.	Sediment
Grass Creek	WYBH100800070608_01	From an irrigation withdrawal in NENE S23 T46N R99W to a point 14.1 miles upstream	2AB/4C	14.1 mi.	Flow Alterations
Crooked Creek	WYBH100800100500_01	From the confluence with Bighorn Lake to a point 7.9 miles upstream	2AB/4C	7.9 mi.	Flow Alterations

North Platte River Basin

Waterbody	305(b) Identifier	Location	Class/Category	Miles/Acres	Cause(s) of Impairment
Horseshoe Creek	WYNP101800080905_03	From the confluence with Spring Creek to a point 7.3 miles downstream	2AB/4C	7.3 mi.	Flow Alterations

Little Snake River Basin

Waterbody	305(b) Identifier	Location	Class/Category	Miles/Acres	Cause(s) of Impairment
Haggarty Creek	WYLS140500030109_01	From the Ferris-Haggarty Mine downstream to the confluence with West Fork Battle Creek	2AB	5.6 mi.	Cadmium

Little Snake River Basin (continued)					
Waterbody	**305(b) Identifier**	**Location**	**Class/Category**	**Miles/Acres**	**Cause(s) of Impairment**
Haggarty Creek	WYLS140500030109_01	From the Ferris-Haggarty Mine downstream to the confluence with West Fork Battle Creek	2AB	5.6 mi.	Copper
Haggarty Creek	WYLS140500030109_01	From the Ferris-Haggarty Mine downstream to the confluence with West Fork Battle Creek	2AB	5.6 mi.	Silver
West Fork Battle Creek	WYLS140500030109_02	From the confluence with Battle Creek upstream to the confluence with Haggarty Creek	2AB	4.9 mi.	Copper

Tongue River Basin					
Waterbody	**305(b) Identifier**	**Location**	**Class/Category**	**Miles/Acres**	**Cause(s) of Impairment**
Park Creek	WYTR100901010204_01	From the confluence with Big Goose Creek to a point 2.8 miles upstream	2AB/4A	2.8 mi.	Fecal Coliform
Rapid Creek	WYTR100901010204_02	From the confluence with Big Goose Creek to a point 3.2 miles upstream	2AB/4A	3.2 mi.	Fecal Coliform
Big Goose Creek	WYTR100901010205_01	From the confluence with Little Goose Creek upstream to the confluence with Rapid Creek	2AB/4A	19.2 mi.	Fecal Coliform

Tongue River Basin (continued)					
Waterbody	**305(b) Identifier**	**Location**	**Class/Category**	**Miles/Acres**	**Cause(s) of Impairment**
Beaver Creek	WYTR100901010205_02	From the confluence with Big Goose Creek upstream to the confluence with Apple Run	2AB/4A	6.5 mi.	Fecal Coliform
Sackett Creek	WYTR100901010207_01	From the Confluence with Little Goose Creek upstream to the confluence with East Fork Sackett Creek	2AB/4A	3.1 mi.	Fecal Coliform
Jackson Creek	WYTR100901010207_02	From the Confluence with Little Goose Creek to a point 6.4 miles upstream	2AB/4A	6.4 mi.	Fecal Coliform
Little Goose Creek	WYTR100901010208_01	From the Confluence with Big Goose Creek upstream to Brundage Lane in Sheridan	2AB/4A	3.5 mi.	Fecal Coliform
Little Goose Creek	WYTR100901010208_01	From the Confluence with Big Goose Creek upstream to Brundage Lane in Sheridan	2AB/4A	3.5 mi.	Habitat Alterations, Sediment
McCormick Creek	WYTR100901010208_02	From the Confluence with Little Goose Creek to a point 2.2 miles upstream	2AB/4A	2.2 mi.	Fecal Coliform
Kruse Creek	WYTR100901010208_03	From the confluence with Little Goose Creek upstream to the confluence with East Fork Kruse Creek	2AB/4A	2.5 mi.	Fecal Coliform
Goose Creek	WYTR100901010209_01	From the confluence with Little Goose Creek downstream to the confluence with the Tongue River	2AB/4A	12.7 mi.	Fecal Coliform

Tongue River Basin (continued)					
Waterbody	**305(b) Identifier**	**Location**	**Class/Category**	**Miles/Acres**	**Cause(s) of Impairment**
Goose Creek	WYTR100901010209_01	From the confluence with Little Goose Creek downstream to the confluence with the Tongue River	2AB/4A	12.7 mi.	Habitat Alterations, Sediment
Soldier Creek	WYTR100901010209_02	From the confluence with Goose Creek to a point 3.1 miles upstream	2AB/4A	3.1 mi.	Fecal Coliform
Soldier Creek	WYTR100901010209_03	From 3.1 miles upstream from the confluence with Goose Creek to a point 17.0 miles upstream	2AB/4C	17.0 mi.	Flow Alterations

Yellowstone River Basin					
Waterbody	**305(b) Identifier**	**Location**	**Class/Category**	**Miles/Acres**	**Cause(s) of Impairment**
Clarks Fork Yellowstone River	WYYR100700060101_01	From the Montana border downstream to the confluence with Crazy Creek	1/4A	6.8 mi.	Cadmium
Clarks Fork Yellowstone River	WYYR100700060101_01	From the Montana border downstream to the confluence with Crazy Creek	1/4A	6.8 mi.	Copper
Clarks Fork Yellowstone River	WYYR100700060101_01	From the Montana border downstream to the confluence with Crazy Creek	1/4A	6.8 mi.	Silver

9.5 Category 5 Surface Waters (2012 303(d) List)

Summary of 303(d) List Changes

Water/pollutant segment combination additions, removals, and other changes from the 2010 303(d) List are discussed in Section 8 above, and a list of these changes is provided below.

New Listings

Little Sandy River (Green River Basin, WYGR140401040203_01) - Data collected by WDEQ between 2004 and 2008 indicated that the aquatic life other than fish and the non-game fisheries uses are not supported due to sediment from the northern boundary of Section 33-Township 28 North-Range 104 West-downstream 17.7 miles to the Sublette/Sweetwater County line.

Pacific Creek (Green River Basin, WYGR140401040303_01) - *E. coli* data collected by WWP in 2010 indicated that the primary contact recreational use criterion was exceeded from Bar X Road to a point 0.4 miles upstream.

Lander Creek (North Platte River Basin, WYNP101800060104_01) - *E. coli* data collected by WWP in 2010 indicated that the primary contact recreational use criterion was exceeded on a 0.5 section of Lander Creek between two unnamed tributaries and adjacent to County Route 132 (in NW S8 T29N R103W, within HUC 12 boundary 101800060104).

Laramie River (North Platte River Basin, WYNP101800100201_01) - *E. coli* data collected by LRCD in 2011 indicated that the primary contact recreational use criterion was exceeded from State Highway 10 to a point 0.3 miles upstream.

Little Laramie River (North Platte River Basin, WYNP101800100605_01) - *E. coli* data collected by LRCD in 2011 indicated that the primary contact recreational use criterion was exceeded from Mandel Lane upstream to Snowy Range Road.

Laramie River (North Platte River Basin, WYNP101800100707_01) - *E. coli* data collected by LRCD in 2011 indicated that the primary contact recreational use criterion was exceeded along a 2.9 mile section of stream intersecting Ione Lane, below Bosler Junction.

Powder River (Powder River Basin, WYPR100902020103_01) - Data collected by USGS spanning 2007-2010 indicated that the drinking water standard for arsenic was exceeded from the confluence with Salt Creek downstream to the confluence with Soldier Creek.

Powder River (Powder River Basin, WYPR100902020600_01) - Data collected by USGS spanning 2007-2010 indicated that the drinking water standard for arsenic was exceeded from the confluence with Soldier Creek downstream to the confluence with Crazy Woman Creek.

Clark's Draw (Snake River Basin, WYSR170401030305_01) - *E. coli* data collected by WWP in 2010 indicated that the secondary contact recreational use criterion was exceeded on a 1.9 mile segment adjacent to US Route 189, near town of Bondurant.

Crow Creek (South Platte River Basin, WYSP101900090107_02) - Data collected by WDEQ (2009) in 2007 and 2008 indicated that the aquatic life other than fish and the non-game fisheries uses are impaired due to excess sediment from 0.7 miles below Morrie Avenue downstream to Hereford Reservoir #1.

Crow Creek (South Platte River Basin, WYSP101900090107_02) - Data collected by WDEQ (2009) in 2007 and 2008 indicated that the aquatic life other than fish and the non-game fisheries uses are impaired due to selenium from 0.7 miles below Morrie Avenue downstream to Hereford Reservoir #1.

Crow Creek (South Platte River Basin, WYSP101900090107_03) - Data collected by WDEQ (2009) in 2007 and 2008 indicated that the primary contact recreational use criterion is impaired due to *E. coli* exceedances from 0.7 miles below Morrie Avenue upstream to Morrie Avenue.

Crow Creek (South Platte River Basin, WYSP101900090107_04) - Data collected by WDEQ (2009) in 2007 and 2008 indicated that the primary contact recreational use criterion is impaired due to *E. coli* exceedances from Morrie Avenue upstream to Happy Jack Road.

Crow Creek (South Platte River Basin, WYSP101900090107_04) - Data collected by WDEQ (2009) in 2007 and 2008 indicated that the aquatic life other than fish and the non-game fisheries uses are impaired due to sediment from Morrie Avenue upstream to Happy Jack Road.

Crow Creek (South Platte River Basin, WYSP101900090107_05) - Data collected by WDEQ (2009) in 2007 and 2008 indicated that the primary contact recreational use criterion is impaired due to *E. coli* exceedances Happy Jack Road upstream to Roundtop Road.

Crow Creek (South Platte River Basin, WYSP101900090203_01) - This impairment was originally added to the 1996 303(d) List for *E. coli*, was accidentally removed from the 303(d) List in 2010, and has been added back to the 303(d) List in the 2012 Integrated Report.

Prairie Dog Creek (Tongue River Basin, WYTR100901010400_01) - Data collected by SCCD between 2007-08 indicated that the secondary drinking water criterion for manganese was exceeded on multiple times from I-90 to a point 47.2 miles downstream .

Prairie Dog Creek (Tongue River Basin, WYTR100901010400_01) - Data collected by SCCD between 2007-08 indicated that the temperature criterion protective of cold water fisheries use was exceeded on multiple occasions from I-90 to a point 47.2 miles downstream .

Meade Creek (Tongue River Basin, WYTR100901010401_01) - *E. coli* data collected by SCCD between 2007-08 indicated that the primary contact recreational use criterion was exceeded from the confluence with Prairie Dog Creek upstream 1.1 miles to the confluence with an unnamed tributary.

Meade Creek (Tongue River Basin, WYTR100901010401_01) - Data collected by SCCD between 2007-08 indicated that the secondary drinking water criterion for manganese was exceeded on multiple times from the confluence with Prairie Dog Creek upstream 1.1 miles to the confluence with an unnamed tributary.

Prairie Dog Creek (Tongue River Basin, WYTR100901010402_01) - Data collected by SCCD between 2007-08 indicated that the temperature criterion for protective of cold water fisheries use was exceeded on multiple occasions from the confluence with the Tongue River to a point 6.7 miles upstream.

Wildcat Creek (Tongue River Basin, WYTR100901010402_02) - *E. coli* data collected by SCCD between 2007-08 indicated that the primary contact recreational use criterion was exceeded from the confluence with Prairie Dog Creek to a point 0.8 miles upstream.

Dutch Creek (Tongue River Basin, WYTR100901010405_01) - *E. coli* data collected by SCCD between 2007-08 indicated that the primary contact recreational use criterion was exceeded from the confluence with Prairie Dog Creek upstream 1.9 miles to the confluence with an unnamed tributary.

New De-Listings

McKinney Creek (Little Snake River Basin, WYLS140500040102_01) – Credible data indicate that McKinney Creek, from the confluence with Muddy Creek upstream to the confluence with Eagle Creek is meeting its aquatic life other than fish and cold water fisheries uses and this water has been removed from the 2012 303(d) List.

Muddy Creek (Little Snake River Basin, WYLS140500040103_01) – Credible data indicate that Muddy Creek, from the confluence with Alamosa Gulch upstream to the confluence with Littlefield Creek is meeting its aquatic life other than fish and cold water fisheries uses and this water has been removed from the 2012 303(d) List.

North Fork Crazy Woman Creek (Powder River Basin, WYPR100902050100_01) – The 1996 listing for bioindicators as a cause of habitat alterations on the North Fork Crazy Woman Creek was a mistake and this listing has been removed from the 2012 303(d) List.

The following impaired waters have USEPA approved TMDLs and have been removed from the 2012 303(d) List:

Ocean Lake (Bighorn River Basin, WYBH100800050202_01) - A TMDL was developed by WDEQ for the sediment impairment on Ocean Lake and was approved by USEPA in December 2009.

Haggarty Creek (Little Snake River Basin, WYLS140500030109_01) - A TMDL was developed by WDEQ for the copper impairment on Haggarty Creek and was approved by USEPA in December 2011.

Haggarty Creek (Little Snake River Basin, WYLS140500030109_01) - A TMDL was developed by WDEQ for the cadmium impairment on Haggarty Creek and was approved by USEPA in December 2011.

Haggarty Creek (Little Snake River Basin, WYLS140500030109_01) - A TMDL was developed by WDEQ for the silver impairment on Haggarty Creek and was approved by USEPA in December 2011.

West Fork Battle Creek (Little Snake River Basin, WYLS140500030109_02) - A TMDL was developed by WDEQ for the copper impairment on West Fork Battle Creek and was approved by USEPA in December 2011.

Park Creek (Tongue River Basin, WYTR100901010204_01) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the Fecal Coliform impairment on Park Creek and was approved by USEPA in September 2010.

Rapid Creek (Tongue River Basin, WYTR100901010204_02) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the Fecal Coliform impairment on Rapid Creek and was approved by USEPA in September 2010.

Big Goose Creek (Tongue River Basin, WYTR100901010205_01) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the Fecal Coliform impairment on Big Goose Creek and was approved by USEPA in September 2010.

Beaver Creek (Tongue River Basin, WYTR100901010205_02) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the Fecal Coliform impairment on Beaver Creek and was approved by USEPA in September 2010.

Sackett Creek (Tongue River Basin, WYTR100901010207_01) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the Fecal Coliform impairment on Sackett Creek and was approved by USEPA in September 2010.

Jackson Creek (Tongue River Basin, WYTR100901010207_02) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the Fecal Coliform impairment on Jackson Creek and was approved by USEPA in September 2010.

Little Goose Creek (Tongue River Basin, WYTR100901010208_01) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the Fecal Coliform impairment on Little Goose Creek and was approved by USEPA in September 2010.

Little Goose Creek (Tongue River Basin, WYTR100901010208_01) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the Sediment impairment on Little Goose Creek and was approved by USEPA in September 2010.

McCormick Creek (Tongue River Basin, WYTR100901010208_02) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the Fecal Coliform impairment on McCormick Creek and was approved by USEPA in September 2010.

Kruse Creek (Tongue River Basin, WYTR100901010208_03) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the Fecal Coliform impairment on Kruse Creek and was approved by USEPA in September 2010.

Goose Creek (Tongue River Basin, WYTR100901010209_01) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the Fecal Coliform impairment on Goose Creek and was approved by USEPA in September 2010.

Goose Creek (Tongue River Basin, WYTR100901010209_01) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the sediment impairment on Goose Creek and was approved by USEPA in September 2010.

Soldier Creek (Tongue River Basin, WYTR100901010209_02) - A TMDL was developed by SWCA Environmental Consultants for WDEQ for the Fecal Coliform impairment on Soldier Creek and was approved by USEPA in September 2010.

Other Changes

Crow Creek (South Platte River Basin) – The extent of the impairment for fecal coliform for the 303(d) Listed segment with the identifier WYSP101900090107_01 has been changed from "From Missile Road (HWY 217) upstream to Roundtop Road" has been changed to "From the outlet of Hereford Reservoir #1 downstream to Hereford Reservoir #2" to correct errors that were made while delineating several impairments on Crow Creek in 2010.

Crow Creek (South Platte River Basin) – The extent of the impairment for fecal coliform for the 303(d) Listed segment with the identifier WYSP101900090107_02 has been changed from "From Missile Road upstream (HWY 207) upstream to Roundtop Road" to "From 0.7 miles below Morrie Avenue downstream to Hereford #1" to correct errors that were made while delineating several impairments on Crow Creek for the 2010 Integrated Report.

Crow Creek (South Platte River Basin) – The extent of the impairment for sediment for the 303(d) Listed segment with the identifier WYSP101900090107_03 has been changed from "From Happy Jack Road downstream to Hereford Reservoir #1" to "From 0.7 miles below Morrie Avenue upstream to Morrie Avenue" to correct errors that were made while delineating several impairments on Crow Creek for the 2010 Integrated Report.

Crow Creek (South Platte River Basin) - The extent of the impairment for fecal coliform for the 2008 303(d) Listed segment with the identifier WYSP101900090203_01 has been changed from "From Dry Creek an undetermined distance downstream" to "From 0.7 miles below Morrie Avenue downstream to Hereford Reservoir #1" to correct errors that were made while delineating impairments for the 2010 Integrated Report. This impairment was removed from the 2010 303(d) List in error and has been replaced for the 2012 Integrated Report.

2012 303(d) List

Table 9.4. 303(d) List of Wyoming's Impaired Waters Requiring TMDL studies

Bear River Basin

Waterbody	305(b) Identifier	Class	Location	Miles/Acres	Uses / Use Support	Cause(s) / Source(s)	List Date	TMDL Date
Bear River	WYBR160101010303_01	2AB	From the confluence with Woodruff Narrows Reservoir upstream to the confluence with Sulphur Creek	36.5 mi.	Cold Water Fishery, Aquatic Life other than Fish	Sediment	2002	2012
					Not Supporting	Habitat Modification		
Bridger Creek	WYBR160101010801_01	3B	Entire watershed upstream of the Utah border	191.4 mi.	Aquatic Life other than Fish	Sediment	1998	2012
					Threatened	Grazing		

Belle Fourche River Basin

Waterbody	305(b) Identifier	Class	Location	Miles/Acres	Uses / Use Support	Cause(s) / Source(s)	List Date	TMDL Date
Belle Fourche River	WYBF101202010501_01	2ABww	From the confluence with Donkey Creek to a point 6.2 miles upstream	6.2 mi.	Recreation	Fecal Coliform	1996	2009
					Not Supporting	Unknown		
Belle Fourche River	WYBF101202010504_00	2ABww	From the confluence with Keyhole Reservoir upstream to the confluence with Donkey Creek	14.2 mi.	Recreation	Fecal Coliform	1996	2009
					Not Supporting	Unknown		
Belle Fourche River	WYBF101202010504_00	2ABww	From the confluence with Keyhole Reservoir upstream to the confluence with Donkey Creek	14.2 mi.	Warm Water Fishery, Aquatic Life other than Fish	Ammonia	2008	2009
					Not Supporting	Unknown		

Belle Fourche River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses**	**Cause(s)**	**List Date**	**TMDL Date**
					Use Support	**Source(s)**		
Belle Fourche River	WYBF101202010504_00	2ABww	From the confluence with Keyhole Reservoir upstream to the confluence with Donkey Creek	14.2 mi.	Warm Water Fishery, Aquatic Life other than Fish	Chloride	2008	2009
					Not Supporting	Unknown		
Donkey Creek	WYBF101202010600_01	3B	From the confluence with the Belle Fourche River upstream to Brorby Boulevard within the City of Gillette	61.4 mi.	Recreation	Fecal Coliform	2000	2009
					Not Supporting	Unknown		
Gillette Fishing Lake	WYBF101202010601_01	2AB	Within the City of Gillette	15.4 ac.	Cold Water Fishery, Aquatic Life other than Fish	Phosphate	1996	2008
					Not Supporting	Unknown		
Gillette Fishing Lake	WYBF101202010601_01	2AB	Within the City of Gillette	15.4 ac.	Cold Water Fishery, Aquatic Life other than Fish	Sediment	1996	2008
					Not Supporting	Unknown		
Stonepile Creek	WYBF101202010602_01	3B	From the confluence with Donkey Creek upstream to the junction of highways 14/16 and 59	7.6 mi.	Recreation	Fecal Coliform	2002	2009
					Not Supporting	Stormwater, Unknown		
Belle Fourche River	WYBF101202010904_00	2ABww	From the confluence with Arch Creek downstream to the confluence with Sourdough Creek	60.7 mi.	Recreation	Fecal Coliform	1996	2009
					Not Supporting	Unknown		

Bighorn River Basin								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses** / **Use Support**	**Cause(s)** / **Source(s)**	**List Date**	**TMDL Date**
Middle Fork Popo Agie River	WYBH100800030207_01	2AB	From the confluence with Baldwin Creek to a point 4.0 miles upstream	4.0 mi.	Recreation	Fecal Coliform	2002	2014
					Not Supporting	Unknown		
Poison Creek	WYBH100800050404_01	2AB	From the confluence with Boysen Reservoir to a point 2.0 miles upstream	2.0 mi.	Recreation	*E. coli*	2002	2012
					Not Supporting	Unknown		
Muddy Creek	WYBH100800050607_01	2AB	From the confluence with Boysen Reservoir upstream to the Wind River Indian Reservation	11.8 mi.	Recreation	*E. coli*	2002	2012
					Not Supporting	Unknown		
Owl Creek	WYBH100800070305_01	2AB	From the confluence with the Bighorn River to a point 3.8 miles upstream	3.8 mi.	Recreation	Fecal Coliform	2002	2010
					Threatened	Unknown		
Kirby Creek	WYBH100800070500_01	2C	From the confluence with the Bighorn River to a point 21.8 miles upstream	21.8 mi.	Recreation	Fecal Coliform	2002	2010
					Threatened	Unknown		
Nowater Creek	WYBH100800070809_01	3B	From the confluence with the Bighorn River to a point 6.6 miles upstream	6.6 mi.	Recreation	Fecal Coliform	2002	2010
					Not Supporting	Unknown		
Fifteen Mile Creek	WYBH100800070909_01	3B	From the confluence with the Bighorn River to a point 2.2 miles upstream	2.2 mi.	Recreation	Fecal Coliform	2002	2010
					Not Supporting	Unknown		

Bighorn River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses** / **Use Support**	**Cause(s)** / **Source(s)**	**List Date**	**TMDL Date**
Bighorn River	WYBH100800071000_01	2AB	From the Confluence with the Nowood River to a point 36.1 miles upstream	36.1 mi.	Recreation	*E. coli*	2002	2010
					Not Supporting	Unknown		
Bighorn River	WYBH100800071000_02	2AB	From the confluence with the Greybull River upstream to the confluence with the Nowood River	22.1 mi.	Recreation	Fecal Coliform	2000	2010
					Not Supporting	Unknown		
Sage Creek	WYBH100800071001_01	3B	From the confluence with the Bighorn River to a point 7.4 miles upstream	7.4 mi.	Recreation	Fecal Coliform	2002	2010
					Not Supporting	Unknown		
Slick Creek	WYBH100800071001_02	3B	From the confluence with the Bighorn River to a point 5.8 miles upstream	5.8 mi.	Recreation	Fecal Coliform	2002	2010
					Not Supporting	Unknown		
Paint Rock Creek	WYBH100800080603_01	2AB	From the confluence with the Nowood River to a point 5.2 miles upstream	5.2 mi.	Recreation	Fecal Coliform	2002	2010
					Threatened	Unknown		
Nowood River	WYBH100800080705_01	2AB	From the confluence with the Bighorn River to a point 13.4 miles upstream	13.4 mi.	Recreation	Fecal Coliform	2002	2010
					Not Supporting	Unknown		
Greybull River	WYBH100800090405_01	2AB	From the confluence with the Bighorn River upstream to Sheets Flats Bridge	44.7 mi.	Recreation	Fecal Coliform	2002	2010
					Not Supporting	Unknown		
Granite Creek	WYBH100800100102_01	2AB	From the confluence with Shell Creek upstream 5.8 miles, near the Antelope Butte Ski Area	5.8 mi.	Recreation	Fecal Coliform	2002	2010
					Not Supporting	Unknown		

Bighorn River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses** / **Use Support**	**Cause(s)** / **Source(s)**	**List Date**	**TMDL Date**
Beaver Creek	WYBH100800100204_01	2AB	From the confluence with Shell Creek to a point 7.9 miles upstream	7.9 mi.	Recreation / Threatened	Fecal Coliform / Unknown	2002	2010
Shell Creek	WYBH100800100206_01	2AB	From the confluence with the Bighorn River to a point 5.3 miles upstream	5.3 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2002	2010
Bighorn River	WYBH100800100301_01	2AB	From the confluence with the Greybull River to a point 10.5 miles downstream	10.5 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2002	2010
Dry Creek	WYBH100800110204_01	2ABww	From the confluence with the Bighorn River to a point 4.7 miles upstream	4.7 mi.	Recreation / Threatened	Fecal Coliform / Unknown	2002	2010
Dry Gulch	WYBH100800140107_01	3B	From the confluence with the Shoshone River to a point 7.0 miles upstream	7.0 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2008	2013
Bitter Creek	WYBH100800140206_01	2AB	From the confluence with the Shoshone River to a point 13.9 miles upstream	13.9 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2000	2013
Whistle Creek	WYBH100800140303_01	2AB	From the confluence with the Shoshone River to a point 8.7 miles upstream	8.7 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2000	2013
Foster Gulch	WYBH100800140307_01	2C	From the confluence with the Shoshone River to a point 2.0 miles upstream	2.0 mi.	Recreation / Threatened	Fecal Coliform / Unknown	2002	2013
Polecat Creek	WYBH100800140407_01	2AB	From the confluence with Sage Creek to a point 2.5 miles upstream	2.5 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2002	2013

Bighorn River Basin (continued)

Waterbody	305(b) Identifier	Class	Location	Miles/Acres	Uses / Use Support	Cause(s) / Source(s)	List Date	TMDL Date
Sage Creek	WYBH100800140408_01	2AB	From the confluence with the Shoshone River to a point 14.0 miles upstream	14.0 mi.	Recreation	Fecal Coliform	2002	2013
					Not Supporting	Unknown		
Big Wash	WYBH100800140408_02	3B	From the confluence with Sage Creek upstream to Sidon Canal	3.2 mi.	Recreation	Fecal Coliform	2002	2013
					Not Supporting	Unknown		
Shoshone River	WYBH100800140504_00	2AB	From the confluence with Bighorn Lake to a point 9.7 miles upstream	9.7 mi.	Recreation	Fecal Coliform	2002	2013
					Not Supporting	Unknown		

Green River Basin

Waterbody	305(b) Identifier	Class	Location	Miles/Acres	Uses / Use Support	Cause(s) / Source(s)	List Date	TMDL Date
Little Sandy River	WYGR140401040203_01	2AB	From the northern boundary of Section 33-Township 28 North-Range 104 West-downstream 17.7 miles to the Sublette/Sweetwater County line	17.7 mi.	Cold Water Game Fishery, Aquatic Life other than Fish	Sediment	2012	2023
					Not Supporting	Livestock and Wildlife Grazing, Historic Habitat Modifications		
Pacific Creek	WYGR140401040303_01	2AB	From Bar X Road to a point 0.4 miles upstream	0.4 mi.	Recreation	*E. coli*	2012	2023
					Not Supporting	Unknown		
Bitter Creek	WYGR140401050506_01	2C	From the confluence with the Green River upstream to Point of Rocks	58.1 mi.	Recreation	Fecal Coliform	2000	2012
					Not Supporting	Unknown		

Green River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses / Use Support**	**Cause(s) / Source(s)**	**List Date**	**TMDL Date**
Bitter Creek	WYGR140401050506_01	2C	From the confluence with the Green River upstream to Point of Rocks	58.1 mi.	Non-Game Fishery, Aquatic Life other than Fish / Not Supporting	Chloride / Natural Sources, Unknown	2002	2012
Killpecker Creek	WYGR140401050808_01	3B	From the confluence with Bitter Creek upstream to Reliance	6.3 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2000	2012
Blacks Fork	WYGR140401070106_01	2AB	From the confluence with the Smiths Fork upstream to Millburne	25.4 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2000	2012
Willow Creek	WYGR140401070205_01	2AB	Entire watershed upstream of the confluence with the Smiths Fork	73.0 mi.	Cold Water Game Fishery, Aquatic Life other than Fish / Threatened	Habitat Alterations / Grazing	1998	2012
Smiths Fork	WYGR140401070208_00	2AB	From the confluence with Cottonwood Creek upstream to the confluence with East and West Forks Smiths Fork	34.5 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2002	2012
Smiths Fork	WYGR140401070208_01	2AB	From the confluence with the Blacks Fork upstream to the confluence with Cottonwood Creek	4.0 mi.	Cold Water Game Fishery, Aquatic Life other than Fish / Not Supporting	Habitat Alterations / Unknown	2000	2012
Smiths Fork	WYGR140401070208_01	2AB	From the confluence with the Blacks Fork upstream to the confluence with Cottonwood Creek	4.0 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2002	2012

Green River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses** / **Use Support**	**Cause(s)** / **Source(s)**	**List Date**	**TMDL Date**
Blacks Fork	WYGR140401070403_01	2AB	From the confluence with the Hams Fork upstream to the confluence with the Smiths Fork	45.0 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2000	2012
Hams Fork	WYGR140401070701_01	2AB	From below the Kemmerer-Diamondville WWTF to a point 7.6 miles downstream	7.6 mi.	Cold Water Game Fishery, Aquatic Life other than Fish / Not Supporting	pH / Municipal WWTF	1996	2010

Little Snake River Basin								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses** / **Use Support**	**Cause(s)** / **Source(s)**	**List Date**	**TMDL Date**
Savery Creek	WYLS140500030408_01	2AB	From the confluence with Little Sandstone Creek downstream to the confluence with the Little Snake River	13.7 mi.	Cold Water Game Fishery, Aquatic Life other than Fish / Threatened	Habitat Alterations / Grazing	1998	2012
West Fork Loco Creek	WYLS140500030408_02	2AB	Entire West Fork Loco Creek watershed upstream from the confluence with Loco Creek	12.8 mi.	Cold Water Game Fishery, Aquatic Life other than Fish / Threatened	Habitat Alterations / Grazing	1996	2012
West Fork Loco Creek	WYLS140500030408_02	2AB	Entire West Fork Loco Creek watershed upstream from the confluence with Loco Creek	12.8 mi.	Cold Water Game Fishery, Aquatic Life other than Fish / Threatened	Nutrients / Grazing	1996	2012
West Fork Loco Creek	WYLS140500030408_02	2AB	Entire West Fork Loco Creek watershed upstream from the confluence with Loco Creek	12.8 mi.	Cold Water Game Fishery, Aquatic Life other than Fish	Temperature	1996	2012

Little Snake River Basin (continued)

Waterbody	305(b) Identifier	Class	Location	Miles/Acres	Uses / Use Support	Cause(s) / Source(s)	List Date	TMDL Date
Muddy Creek	WYLS140500040104_01	2C	From the confluence with Red Wash upstream to the confluence with Antelope Creek	17.5 mi.	Cold Water Game Fishery, Aquatic Life other than Fish	Habitat Alterations	1996	2012
					Threatened	Grazing		
Muddy Creek	WYLS140500040308_01	2C	From below the confluence with Youngs Draw upstream to the confluence with Deep Creek	7.7 mi.	Non-Game Fishery, Aquatic Life other than Fish	Selenium	2010	2022
					Not Supporting	Unknown, Natural		
Muddy Creek	WYLS140500040308_01	2C	From below the confluence with Youngs Draw upstream to the confluence with Deep Creek	7.7 mi.	Non-Game Fishery, Aquatic Life other than Fish	Chloride	2010	2022
					Not Supporting	Unknown, Natural		

North Platte River Basin

Waterbody	305(b) Identifier	Class	Location	Miles/Acres	Uses / Use Support	Cause(s) / Source(s)	List Date	TMDL Date
Lander Creek	WYNP101800060104_01	2AB	A 0.5 section of Lander Creek between two unnamed tributaries and adjacent to County Route 132 (in NW S8 T29N R103W, within HUC 12 boundary 101800060104)	0.5 mi.	Recreation	*E. coli*	2012	2023
					Not Supporting	Grazing		
Crooks Creek	WYNP101800060603_01	2AB	From the confluence with Mason Creek to a point 1.4 miles downstream	1.4 mi.	Cold Water Game Fishery, Aquatic Life other than Fish	Oil and Grease	1998	2012
					Not Supporting	Petroleum Production		

North Platte River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses**	**Cause(s)**	**List Date**	**TMDL Date**
					Use Support	**Source(s)**		
North Platte River	WYNP101800070300_01	2AB	From the confluence with Muddy Creek upstream to the confluence with Poison Spider Creek	36.8 mi.	Cold Water Game Fishery, Aquatic Life other than Fish	Selenium	1998	2009
					Not Supporting	Irrigated Crop Production, Natural Sources		
Poison Spring Creek	WYNP101800070302_01	3B	From Casper Canal downstream to the confluence with the North Platte River	8.2 mi.	Aquatic Life other than Fish	Selenium	2000	2009
					Not Supporting	Irrigated Crop Production, Natural Sources		
Rasmus Lee Lake	WYNP101800070302_02	3B	Within the Kendrick Reclamation Project	85.2 ac.	Aquatic Life other than Fish	Selenium	2000	2009
					Not Supporting	Irrigated Crop Production, Natural Sources		
Goose Lake	WYNP101800070302_03	3B	Within the Kendrick Reclamation Project	30.1 ac.	Aquatic Life other than Fish	Selenium	2000	2009
					Not Supporting	Irrigated Crop Production, Natural Sources		
Oregon Trail Drain	WYNP101800070303_01	3B	Within the Kendrick Reclamation Project	8.6 mi.	Aquatic Life other than Fish	Selenium	2000	2009
					Not Supporting	Irrigated Crop Production, Natural Sources		
Poison Spider Creek	WYNP101800070406_01	2AB	From the confluence with the North Platte River to the confluence with Iron Creek, within the Kendrick Reclamation Project	1.3 mi.	Cold Water Game Fishery, Aquatic Life other than Fish	Selenium	2000	2009
					Not Supporting	Irrigated Crop Production, Natural Sources		

North Platte River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses** / **Use Support**	**Cause(s)** / **Source(s)**	**List Date**	**TMDL Date**
Poison Spider Creek	WYNP101800070406_02	2C	From the confluence with Iron Creek to a point 5.8 miles upstream	5.8 mi.	Non-Game Fishery, Aquatic Life other than Fish	Selenium	2000	2009
					Not Supporting	Irrigated Crop Production, Natural Sources		
Poison Spider Creek	WYNP101800070406_03	3B	From the HUC 12 boundary (101800070406) to a point 6.0 miles downstream, within the Kendrick Reclamation Project	6.0 mi.	Aquatic Life other than Fish	Selenium	2000	2009
					Not Supporting	Irrigated Crop Production, Natural Sources		
Illco Pond	WYNP101800070503_01	3B	NE S13 T35N R81W, within HUC 12 boundary (101800070503)	1.1 ac.	Aquatic Life other than Fish	Selenium	2000	2009
					Not Supporting	Irrigated Crop Production, Natural Sources		
Casper Creek	WYNP101800070504_01	2AB	From the confluence with the North Platte River to a point 21.1 miles upstream, within the Kendrick Reclamation Project	21.1 mi.	Cold Water Game Fishery, Aquatic Life other than Fish	Selenium	2000	2009
					Not Supporting	Irrigated Crop Production, Natural Sources		
Thirty Three Mile Reservoir	WYNP101800070703_01	3B	Along South Fork Casper Creek, within Kendrick Reclamation Project	30.2 ac.	Aquatic Life other than Fish	Selenium	2000	2009
					Not Supporting	Irrigated Crop Production, Natural Sources		

North Platte River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses** / **Use Support**	**Cause(s)** / **Source(s)**	**List Date**	**TMDL Date**
Laramie River	WYNP101800100201_01	2AB	From State Highway 10 to a point 0.3 miles upstream	0.3 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2012	2023
Little Laramie River	WYNP101800100605_01	2AB	From Mandel Lane upstream to Snowy Range Road	15.7 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2012	2023
Laramie River	WYNP101800100707_01	2AB	A 2.9 mile section of stream intersecting Ione Lane, below Bosler Junction	2.9 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2012	2023
Wheatland Creek	WYNP101800110502_01	2C	From the confluence with Rock Creek downstream to Wheatland Highway	2.4 mi.	Non-Game Fishery, Aquatic Life other than Fish / Not Supporting	Ammonia / Municipal WWTF	1996	2014
Wheatland Creek	WYNP101800110502_01	2C	From the confluence with Rock Creek downstream to Wheatland Highway	2.4 mi.	Non-Game Fishery, Aquatic Life other than Fish / Not Supporting	pH / Municipal WWTF	1996	2014
Wheatland Creek	WYNP101800110502_01	2C	From the confluence with Rock Creek downstream to Wheatland Highway	2.4 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2002	2014
Rock Creek	WYNP101800110502_02	2C	Entire watershed above the confluence with Wheatland Creek	34.9 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2002	2014

Powder River Basin								
Waterbody	305(b) Identifier	Class	Location	Miles/Acres	Uses	Cause(s)	List Date	TMDL Date
					Use Support	Source(s)		
Powder River	WYPR100902020102_00	2ABww	From the confluence with Salt Creek upstream to the confluence with the South Fork Powder River	15.9 mi.	Warm Water Game Fishery, Aquatic Life other than Fish	Selenium	2000	2014
					Not Supporting	Irrigated Crop Production, Natural Sources, Unknown		
Powder River	WYPR100902020103_01	2ABww	From the confluence with Salt Creek downstream to the confluence with Soldier Creek	19.3 mi.	Warm Water Game Fishery, Aquatic Life other than Fish	Chloride	1998	2014
					Not Supporting	Petroleum Production		
Powder River	WYPR100902020103_01	2ABww	From the confluence with Salt Creek downstream to the confluence with Soldier Creek	19.3 mi.	Warm Water Game Fishery, Aquatic Life other than Fish	Selenium	2000	2014
					Not Supporting	Irrigated Crop Production, Natural Sources, Unknown		
Powder River	WYPR100902020103_01	2ABww	From the confluence with Salt Creek downstream to the confluence with Soldier Creek	19.3 mi.	Drinking Water	Arsenic	2012	2014
					Not Supporting	Petroleum Production		
Powder River	WYPR100902020600_01	2ABww	From the confluence with Soldier Creek downstream to the confluence with Crazy Woman Creek	100.6 mi.	Warm Water Game Fishery, Aquatic Life other than Fish	Selenium	2000	2014
					Not Supporting	Irrigated Crop Production, Natural Sources, Unknown		

Powder River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses / Use Support**	**Cause(s) / Source(s)**	**List Date**	**TMDL Date**
Powder River	WYPR100902020600_01	2ABww	From the confluence with Soldier Creek downstream to the confluence with Crazy Woman Creek	100.6 mi.	Drinking Water	Arsenic	2012	2014
					Not Supporting	Petroleum Production		
Middle Prong Wild Horse Creek	WYPR100902020808_01	3B	From the confluence with Wild Horse Creek to a point 4.6 miles upstream	4.7 mi.	Recreation	*E. coli*	2006	2014
					Not Supporting	Unknown		
South Fork Powder River	WYPR100902030400_01	2C	From the confluence with Cloud Creek to a point 47.2 miles downstream	47.2 mi.	Non-Game Fishery, Aquatic Life other than Fish	Selenium	2006	2014
					Not Supporting	Irrigated Crop Production, Natural Sources, Unknown		
Willow Creek	WYPR100902030403_01	2AB	From the confluence with the South Fork Powder River to a point 10.5 miles upstream	10.5 mi.	Cold Water Game Fishery, Aquatic Life other than Fish	Selenium	2006	2014
					Not Supporting	Irrigated Crop Production, Natural Sources, Unknown		
Posey Creek	WYPR100902030404_01	3B	From the confluence with the South Fork Powder River to a point 8.0 miles upstream	8.0 mi.	Aquatic Life other than Fish	Selenium	2008	2014
					Not Supporting	Irrigated Crop Production, Natural Sources, Unknown		

Powder River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses**	**Cause(s)**	**List Date**	**TMDL Dates***
					Use Support	**Source(s)**		
Murphy Creek	WYPR100902030407_01	3B	From the confluence with the South Fork Powder River to a point 12.2 miles upstream	12.2 mi.	Aquatic Life other than Fish	Selenium	2008	2014
					Not Supporting	Natural Sources, Unknown		
Salt Creek	WYPR100902040300_01	2C	From the confluence with the Powder River to a point 45.3 miles upstream	45.3 mi.	Non-Game Fishery, Aquatic Life other than Fish	Selenium	2008	2014
					Not Supporting	Petroleum Production, Natural Sources, Unknown		
Salt Creek	WYPR100902040300_01	2C	From the confluence with the Powder River to a point 45.3 miles upstream	45.3 mi	Non-Game Fishery, Aquatic Life other than Fish	Oil Spills	1996	2014
					Threatened	Petroleum Production		
North Fork Crazy Woman Creek	WYPR100902050100_01	2AB	From the confluence with Muddy Creek to a point 28.0 miles upstream	28.0 mi.	Cold Water Game Fishery, Aquatic Life other than Fish	Habitat Alterations	1996	2014
					Threatened	Grazing		
North Fork Crazy Woman Creek	WYPR100902050100_01	2AB	From the confluence with Muddy Creek to a point 28.0 miles upstream	28.0 mi.	Cold Water Game Fishery, Aquatic Life other than Fish	Nutrients	1996	2014
					Threatened	Grazing		
Crazy Woman Creek	WYPR100902050305_01	2ABww	From the confluence with the Powder River to a point 9.2 miles upstream	9.2 mi.	Drinking Water	Manganese	2002	2014
					Not Supporting	Natural, Unknown		

Powder River Basin (continued)

Waterbody	305(b) Identifier	Class	Location	Miles/Acres	Uses / Use Support	Cause(s) / Source(s)	List Date	TMDL Dates*
North Piney Creek	WYPR100902060303_01	2AB	From the confluence with Piney Creek to a point 6.4 miles upstream	6.4 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2006	2014
Dalton Ditch	WYPR100902060303_02	3B	Within and near the town of Story	0.3 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2006	2014
Piney-Cruse Ditch	WYPR100902060303_03	3B	From the confluence with North Piney Creek to a point 2.2 miles upstream	2.2 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2008	2014
Little Powder River	WYPR100902080500_01	2AB	From the WY/MT state line upstream to the confluence with Spring Creek	58.7 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2002	2014

Snake River Basin

Waterbody	305(b) Identifier	Class	Location	Miles/Acres	Uses / Use Support	Cause(s) / Source(s)	List Date	TMDL Date
Flat Creek	WYSR170401030205_01	1	From the confluence with the Snake River upstream to the confluence with Cache Creek	11.1 mi.	Cold Water Game Fishery, Aquatic Life other than Fish / Threatened	Habitat Alterations / Stormwater	2000	2012
Clark's Draw	WYSR170401030305_01	3B	A 1.9 mile segment adjacent to US Route 189, near town of Bondurant	1.9 mi.	Recreation / Not Supporting	*E. coli* / Grazing, Unknown	2012	2023
Stump Creek	WYSR170401050203_01	2AB	From the confluence with the Salt River upstream to the Idaho border	5.6 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2008	2013

Snake River Basin (continued)

Waterbody	305(b) Identifier	Class	Location	Miles/Acres	Uses / Use Support	Cause(s) / Source(s)	List Date	TMDL Date
Salt River	WYSR170401050309_01	2AB	A 7.5 mile section located 3.4 miles northwest of Etna	7.5 mi.	Recreation Not Supporting	*E. coli* Unknown	2002	2013

South Platte River Basin

Waterbody	305(b) Identifier	Class	Location	Miles/Acres	Uses / Use Support	Cause(s) / Source(s)	List Date	TMDL Date
Middle Fork Crow Creek	WYSP101900090101_01	2AB	A 1.5 mile section of creek at FS Road 700 crossing	1.5 mi.	Recreation Not Supporting	*E. coli* Grazing	2010	2015
North Branch North Fork Crow Creek	WYSP101900090104_01	2AB	From FS Road 701 upstream 300 yards	0.2 mi.	Recreation Not Supporting	*E. coli* Grazing	2004	2015
Crow Creek	WYSP101900090107_01	2C	From the inlet of Hereford Reservoir #2 upstream to the outlet of Hereford Reservoir #1	9.4 mi.	Recreation Not Supporting	Fecal Coliform Stormwater	1996	2010
Crow Creek	WYSP101900090107_02	2C	From 0.7 miles below Morrie Avenue downstream to the inlet of Hereford Reservoir #1	3.7 mi.	Non-Game Fishery, Aquatic Life other than Fish Not Supporting	Selenium Petroleum Production	2010	2010
Crow Creek	WYSP101900090107_02	2C	From 0.7 miles below Morrie Avenue downstream to the inlet of Hereford Reservoir #1	3.7 mi.	Recreation Not Supporting	*E. coli* Stormwater	2012	2010

South Platte River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses / Use Support**	**Cause(s) / Source(s)**	**List Date**	**TMDL Date**
Crow Creek	WYSP101900090107_02	2C	From 0.7 miles below Morrie Avenue downstream to the inlet of Hereford Reservoir #1	3.7 mi.	Non-Game Fishery, Aquatic Life other than Fish / Not Supporting	Sediment / Stormwater	2012	2010
Crow Creek	WYSP101900090107_03	2C	From Morrie Avenue to a point 0.7 miles downstream	0.7 mi.	Non-Game Fishery, Aquatic Life other than Fish / Not Supporting	Sediment / Stormwater	2010	2010
Crow Creek	WYSP101900090107_03	2C	From Morrie Avenue to a point 0.7 miles dowstream	0.7 mi.	Recreation / Not Supporting	*E. coli* / Stormwater	2012	2010
Crow Creek	WYSP101900090107_04	2AB	From Morrie Avenue upstream to Happy Jack Road	3.4 mi.	Recreation / Not Supporting	*E. coli* / Stormwater	2012	2010
Crow Creek	WYSP101900090107_04	2AB	From Morrie Avenue upstream to Happy Jack Road	3.4 mi.	Cold Water Game Fishery, Aquatic Life other than Fish / Not Supporting	Sediment / Stormwater	2012	2010
Crow Creek	WYSP101900090107_05	2AB	From Happy Jack Road upstream to Roundtop Road	3.1 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2012	2010
Crow Creek	WYSP101900090203_01	2C	From Missile Road (HWY 217) upstream to the outlet of Hereford Reservoir #2	10.1 mi.	Recreation / Not Supporting	*E. coli* / Unknown	1996	2010

Tongue River Basin								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses** / **Use Support**	**Cause(s)** / **Source(s)**	**List Date**	**TMDL Date**
North Tongue River	WYTR100901010101_01	1	From Road 171 upstream to the confluence with Pole Creek	11.1 mi.	Recreation / Not Supporting	Fecal Coliform / Grazing	2004	2013
Columbus Creek	WYTR100901010106_01	2AB	From the confluence with the Tongue River to a point 3.1 miles upstream	3.1 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2002	2013
Smith Creek	WYTR100901010106_02	2AB	From the confluence with the Tongue River to a point 5.8 miles upstream	5.8 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2002	2013
Little Tongue River	WYTR100901010107_02	2AB	From the confluence with the Tongue River upstream to the confluence with Frisbee Ditch	4.8 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2002	2013
Fivemile Creek	WYTR100901010108_01	3B	From the confluence with the Tongue River upstream to the confluence with Hanover Ditch	2.1 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2002	2013
Wolf Creek	WYTR100901010110_01	2AB	From the confluence with the Tongue River upstream to the confluence with East Wolf Creek	10.6 mi.	Recreation / Not Supporting	Fecal Coliform / Unknown	2002	2013
Tongue River	WYTR100901010111_01	1	From Monarch Road upstream to Wolf Creek Road	13.5 mi.	Recreation / Not Supporting	*E. coli* / Unknown	2010	2013

Tongue River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses** / **Use Support**	**Cause(s)** / **Source(s)**	**List Date**	**TMDL Date**
Tongue River	WYTR100901010301_01	2AB	From the confluence with Goose Creek downstream to the Montana border	22.1 mi.	Cold Water Fishery	Temperature	2002	2013
					Not Supporting	Unknown		
Prairie Dog Creek	WYTR100901010400_01	2AB	From I-90 to a point 47.2 miles downstream	47.2 mi.	Recreation	Fecal Coliform	2004	2013
					Not Supporting	Unknown		
Prairie Dog Creek	WYTR100901010400_01	2AB	From I-90 to a point 47.2 miles downstream	47.2 mi.	Recreation	Manganese	2012	2013
					Not Supporting	Natural Sources, Unknown		
Prairie Dog Creek	WYTR100901010400_01	2AB	From I-90 to a point 47.2 miles downstream	47.2 mi.	Cold Water Fishery	Temperature	2012	2013
					Not Supporting	Unknown		
Meade Creek	WYTR100901010401_01	2AB	From the confluence with Prairie Dog Creek upstream 1.1 miles to the confluence with an unnamed tributary	1.1 mi.	Recreation	*E. coli*	2012	2013
					Not Supporting	Unknown		
Meade Creek	WYTR100901010401_01	2AB	From the confluence with Prairie Dog Creek upstream 1.1 miles to the confluence with an unnamed tributary	1.1 mi.	Drinking Water	Manganese	2012	2013
					Not Supporting	Natural Sources, Unknown		
Prairie Dog Creek	WYTR100901010402_01	2AB	From the confluence with the Tongue River to a point 6.7 miles upstream	6.7 mi.	Drinking Water	Manganese	2002	2013
					Not Supporting	Natural Sources		
Prairie Dog Creek	WYTR100901010402_01	2AB	From the confluence with the Tongue River to a point 6.7 miles upstream	6.7 mi.	Recreation	Fecal Coliform	2004	2013
					Not Supporting	Unknown		

Tongue River Basin (continued)								
Waterbody	**305(b) Identifier**	**Class**	**Location**	**Miles/Acres**	**Uses**	**Cause(s)**	**List Date**	**TMDL Date**
					Use Support	**Source(s)**		
Prairie Dog Creek	WYTR100901010402_01	2AB	From the confluence with the Tongue River to a point 6.7 miles upstream	6.7 mi.	Cold Water Game Fish	Temperature	2012	2013
					Not Supporting	Unknown		
Wildcat Creek	WYTR100901010402_02	3B	From the confluence with Prairie Dog Creek to a point 0.8 miles upstream	0.8 mi.	Recreation	*E. coli*	2012	2013
					Not Supporting	Unknown		
Dutch Creek	WYTR100901010405_01	3B	From the confluence with Prairie Dog Creek upstream 1.9 miles to the confluence with an unnamed tributary	1.9 mi.	Recreation	*E. coli*	2012	2013
					Not Supporting	Unknown		

10. Groundwater

10.1 Groundwater Characterization Program

The Wyoming Department of Environmental Quality (WDEQ) is the designated agency for monitoring and evaluating groundwater quality conditions and assessing groundwater contamination problems for the state of Wyoming. Within the Water Quality Division of WDEQ, the Groundwater Section (GWS) carries out these functions.

As stated in the WDEQ's 2009-2010 Strategic Plan, groundwater is emerging as an important resource in part because Wyoming is developing rapidly and groundwater use is expected to increase markedly in the future. It is also a vital backup supply and provides flexibility in responding to hydrological variability and climate change.

As stated in Wyoming's Non-Point Source Management Plan (2000), one of the top priorities for programs within the Water Quality Division is to "Continue an ongoing assessment of the statewide condition of surface and groundwater in Wyoming aimed at identifying risks and impairments on a watershed basis."

It is increasingly important that the spatial distribution, present quality, and hydrologic connectivity of the groundwater resource be characterized and monitored for changes in storage and quality while growth and development are occurring.

A major goal of GWS is implementation of Wyoming's statewide Ambient Groundwater Monitoring Program in accordance with the state's Groundwater Quality Monitoring Strategy (2004-2008). Consistent with WDEQ's Non-Point Source Management Plan (2000), GWS is establishing baseline groundwater conditions to fulfill performance measures established in WDEQ's 2009-2010 Strategic Plan. This work is being funded by WDEQ, the US Geological Survey, and the US EPA through a 319 grant.

In Spring 2010 WDEQ initiated implementation of Wyoming's Statewide Ambient Groundwater Monitoring Program. The program will establish baseline groundwater conditions. Groundwater quality data will be used to:

- Establish ambient (i.e. background, baseline) groundwater quality conditions to serve as reference to which future groundwater quality data can be compared,
- Determine appropriate response strategies to protect existing and potential use of groundwater resources,
- Target resources for future groundwater monitoring, including problem identification monitoring, and,
- Identify areas where present groundwater management plans should be modified to prevent further degradation of groundwater quality.

The 2010 Wyoming's Groundwater Quality Report summarized the GWS's efforts to characterize the quality of Wyoming's groundwater. These efforts focus on data collection and improving capabilities for manipulating the available data, and for incorporating geographical information systems (GIS) and other graphic tools to improve the analysis of data and the presentation of the analytical results. The primary focus of recent activities has been to begin ambient groundwater quality monitoring for Wyoming aquifers, to document baseline groundwater quality conditions and to identify and protect sensitive aquifers.

The goal is to utilize water quality data to establish baseline conditions and, by doing so, help identify areas where groundwater quality has been affected by human activities. This will assist in understanding land use impacts and will allow GWS to use this water quality data to help prioritize groundwater protection efforts. The data will also be made available to the public.

Introduction

About 80 percent of Wyoming's population depends on groundwater for drinking water. In many areas, groundwater is the only source of water because surface water is not present or is unsuitable for use. Shallow aquifers serve the majority of rural households and also are often used for stock, irrigation, and industrial use (USGS, 2005).

Currently groundwater management in Wyoming is focused on the protection of groundwater from contamination, with particular attention to shallow aquifers. These aquifers are the most susceptible to water-quality degradation from anthropogenic activities. In general, groundwater in Wyoming is of good to high quality (USEPA, 1998); however, increased anthropogenic activities and changing land-use patterns create the potential for water-quality degradation.

In the mid 1990s, the University of Wyoming, in conjunction with Wyoming's 'Pesticides in Groundwater Strategy Committee', completed development of statewide, groundwater sensitivity maps in GIS format, illustrating the relative susceptibility to pollution of shallow aquifers throughout the state. Land use and aquifer use (e.g. drinking water) were used to identify areas of high priority for the statewide ambient monitoring program.

State-Wide Groundwater Ambient Monitoring

WDEQ has identified groundwater monitoring as an important part of water-quality monitoring, groundwater protection and groundwater restoration strategies.

Groundwater monitoring objectives are:

- Determining groundwater quality status and trends,
- Establishing and/or modifying groundwater standards,
- Identifying impaired ground waters,
- Identifying causes and sources of groundwater quality problems,
- Implementing groundwater quality protection programs,
- Determining interactive relationships between groundwater and surface waters, and,
- Evaluating effectiveness of groundwater protection programs.

Determining baseline groundwater quality conditions is the initial step toward completing several of these objectives. Aquifer prioritization for this project is based on three characteristics:

- Aquifer sensitivity,
- Current use, which is the degree of use of an aquifer as a drinking water supply, and,
- Land use, which identifies potential pollution sources.

Groundwater Monitoring Strategy and Assessment

Given the resources required to complete a baseline assessment (of ambient groundwater quality) for the entire state, implementation of the monitoring program will be undertaken using a phased approach similar to the approach taken for completing Wyoming's pesticides-groundwater sampling program. The first phase of the ambient groundwater monitoring program will begin with the Greater Green River Basin, with subsequent phases to move into other major drainage basins within the state.

Green River structural basin (GRB) was chosen because of recently completed and ongoing studies sponsored by the Wyoming Water Development Office (WWDO) that will assist in identifying suitable groundwater sampling sites.

In 2006 and 2007 the US Geological Survey (USGS) completed assessments of water availability, including quality, in Sweetwater and Carbon counties, respectively. As part of the WWDC river basin planning process, WWDO, Wyoming Geological Survey (WGS), Water Resource Data System (WRDS), and USGS are currently undertaking a project to create digital coverages of geology and hydrology in the GRB and to summarize all known water-quality data in GRB.

As part of the Department of the Interior Healthy Lands Initiative, USGS, the Bureau of Land Management and the US Fish and Wildlife Service, along with numerous Federal, state, county, and local partners, are undertaking studies of landscape changes in the GRB resulting from anthropogenic activities. Part of this study includes the design of a comprehensive groundwater monitoring network in the GRB. Results of this network design will help determine the best locations to include in the ambient groundwater monitoring network and are expected to be available concurrent with the final results of the WGS/ USGS project in March 2009.

The ambient groundwater monitoring network will initially focus efforts on aquifers that are used as drinking water sources and are uppermost as they are the most susceptible to contamination. They are also susceptible due to their relative lack of confinement, generally coarse nature, and thus their ability to readily transmit large volumes of water in relatively short timeframes. These "high priority" areas are those areas targeted for sampling under the statewide ambient groundwater monitoring program.

An inventory of monitoring wells (at contaminated sites), domestic wells, stock wells, and community wells in the GRB will be completed in alluvial and structural-basin aquifers. A database will be developed and wells will be stratified by aquifer, completion information, and suitability for inclusion in the Wyoming ambient groundwater monitoring network. Inventory and database will be completed in the fall of 2009.

From the original database of wells identified as suitable for monitoring, 20 to 30 wells will be selected for monitoring and sampling in each high-priority aquifer area. Problem identification wells, if needed, will be established in the same manner as baseline wells.

Samples will be analyzed for volatile organic compounds, dissolved organic carbon, nutrients, trace elements, bacteria, tritium and in some cases selected pesticides. Verified data will be published in Wyoming's Annual Data Report and will be permanently stored in the USGS water-quality database. Data from this project will be accessible through the NWIS-Web (http://waterdata.usgs.gov/wy/nwis/qwdata).

Much of the work necessary to identify, locate, and gain access to suitable wells will have been accomplished by this previous pesticide monitoring program effort. This effort, along with ongoing efforts of WGS, WWDC, and USGS in the Wyoming River Basin Planning Process, and USGS, U.S. Bureau of Land Management (BLM) and numerous state and local agencies as part of the Healthy Lands Initiative, Wyoming Landscape Conservation Initiative, will assist in identifying suitable wells.

Monitoring wells at existing GWS contaminated sites and underground storage tank sites may also be utilized in the monitoring network. Each site has up-gradient, uncontaminated, or background monitoring wells. A select number of these wells may used for ambient groundwater monitoring.

Wyoming Aquifer Types

In collaboration with the WSGS and the USGS, the University of Wyoming identified more than one hundred areas of high-priority aquifers for groundwater monitoring in Wyoming. These have been divided into 3 basic aquifer types: alluvial, structural basin, and the High Plains aquifer system. Some high-priority areas consist of a combination of two or more of these aquifer types.

Alluvial aquifers are unconsolidated sand and gravel aquifers generally found adjacent to principal surface drainages. They consist of unconsolidated materials. Structural basin aquifers include sedimentary rocks found within or flanking one of the eight major structural basins of the state. Structural basin aquifers in

Wyoming are most often used by municipalities that do not have access to surface water. The High Plains aquifer system is a thick sequence of interbedded sands and silts, unconsolidated to consolidated, interpreted as an ancient alluvial fan complex.

Alluvial Aquifers

Alluvial aquifers of Wyoming are generally considered unconfined aquifers. These aquifers are usually close to the land surface and have continuous layers of permeable material from the land surface to the base of the aquifer. These relatively shallow units are composed of sand, silt, and gravel lying on a bedrock surface. These are the most vulnerable of all aquifers because of their close proximity to the land surface. They consist mostly of river, floodplain, and terrace deposits that border the major rivers in the state. The most significant are located along the North Platte, the upper Snake, the Bear, and the Greybull Rivers.

Alluvial aquifers range in thickness from 10 to 100 feet but greater thicknesses can occur. Water in the valley-fill sediments is generally suitable for most purposes.

High Plains Aquifer System

In Wyoming, the High Plains aquifer occurs only in the southeast quarter of the state near Cheyenne and surrounding areas. It consists mostly of unconsolidated and unconfined sediments in the upper portions of the aquifer and more consolidated and partly confined in the lower.

The aquifer can exceed 1,000 feet in thickness in some places. It is developed for irrigation, municipal, industrial and rural residential water needs. Well yields of several hundred gallons per minute (gpm) are common, with yields of 1,000 gpm common locally.

Structural Basin Aquifers

Wyoming's structural basins are similar to one another in several ways. Mountains surround the basins and steeply dipping sediment outcrop on their slopes. These basins include the;

- Powder River, Bighorn,
- Wind River,
- Green River,
- great Divide/Washakie,
- Laramie,
- Shirley,
- Hanna, and,
- Denver/Julesburg basins.

Within each basin, the hydrologic units function as a regional aquifer system. Regional aquifer systems include geologic formations consisting of permeable sandstones, limestones, and siltstones, or formations with significant fracturing. Groundwater can be found in both confined and unconfined conditions within the regional aquifer system.

Groundwater from confined aquifers may discharge as a spring or from a flowing well. These aquifers are often less vulnerable to human activities because they are protected by the less permeable overlying layer. Groundwater flows from one formation to another under a variety of hydrologic conditions but formations that comprise regional aquifers can also behave locally as individual aquifers with minimal hydraulic connection.

Fractured bedrock aquifers, or solution-enhanced karst systems, constitute some of the most productive aquifers in Wyoming. Groundwater travel time can be rapid and may be several orders of magnitude faster than groundwater circulation in other aquifers. Under certain conditions, potential contaminants can readily reach the groundwater through fractures and solution cavities, thus greatly increasing the sensitivity of these aquifers to contamination.

Well yields in the eight different basins vary from 50 gpm to 4,000 gpm depending on the formation.

Aquifer Classification

The Wyoming Water Quality Rules and Regulations, Chapter 8 details how groundwaters of the State are classified according to quality, and existing use of the aquifer (e.g. domestic, irrigation, livestock, etc), if any.

Chapter 8 states that, protection shall be afforded all underground water bodies (including water in the vadose zone). Water being used for a purpose shall be protected for its intended use and used for which it is suitable. Water not being put to use shall be protected for all uses for which it is suitable. Groundwaters of the state are classified based on quality standards.

Class I groundwater is suitable for domestic use.

Class II groundwater is suitable for agricultural use.

Class III groundwater is suitable for livestock use.

Class IV groundwater is suitable for industry.

Class V groundwater is hydrocarbon commercial, mineral commercial, or geothermal.

Class VI groundwater may be unusable or unsuitable for use due to excessive concentrations of total dissolved solids or specific constituents or may be located in such a way, including depth below the surface, so as to make use economically and technologically impractical.

Other Emerging Issues in Groundwater Protection

Oil and Gas Development

Development, particularly in the western half of the state is rapid, with 20,000 to 40,000 new oil and gas wells anticipated to be drilled in the next decades.

Rural Residential Development

Concurrent with this oil and gas development is subdivision development due to population growth. This development also poses groundwater problems due to increased density of on-site septic systems.

In Situ Uranium Mining

Injection of solutions to recover uranium through in-situ leaching is being done in Wyoming. A network of groundwater monitoring wells is required to insure that contamination resulting from this injection is not affecting adjacent aquifers. Monitoring and preventing the release of compounds that can degrade water quality is a potential concern in this type of uranium production.

Coal Gasification and Oil Shale Development

Fracturing and heating of sub-surface coal and oil have both been conducted in Wyoming with the result of some groundwater contamination. These processes can release hydrocarbons to adjacent aquifers and must be carefully monitored to prevent contamination of groundwater.

Climate Change

Water and its availability and quality will be the main pressures on societies and the environment and will be challenges for water managers. It will be necessary to improve our understanding of the problems involved, the impacts on water resources and on water availability.

The relationship between climate change and water resources will be of primary concern and interest. The hydrologic cycle will be the delivery mechanism for many of the impacts of climate change. It will be important to evaluate the impacts of climate change on hydrological processes.

Carbon Sequestration

Global warming concerns lead to a need to sequester, or trap in the sub-surface, carbon dioxide (CO_2) generated from coal-burning power plants and other sources. Injecting CO_2 into the sub-surface can result in chemical changes that can impact groundwater resources. The hope is that gas injected deep underground will be immobile rather than entering the atmosphere as a heat-trapping pollutant.

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Appendix A - Stream Restoration Success Story

Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

Wyoming

Coordinated Efforts Reduced Sediment Input and Restored Waterbody

Waterbody Improved

Excess sediment in Wyoming's East and West Forks of Smiths Fork degraded the habitat to the point that the streams could no longer achieve their designated use of aquatic life. Landowners, federal grazing permit holders and state and federal agencies collaborated to implement various best management practices (BMPs) that reduced sediment input. As a result, water quality improved, and Wyoming removed both waterbodies from its 2004 303(d) list of impaired waters for sediment.

Problem

East Fork Smiths Fork (27 miles long) and West Fork Smiths Fork (9 miles long) combine to form Smiths Fork, which in turn flows into Blacks Fork. The Blacks Fork subbasin is located near the mouth of the Green River Basin of southwestern Wyoming. Wyoming placed both East and West Forks of Smiths Fork (Figure 1) on its 1998 Clean Water Act section 303(d) list because excess sediment physically degraded the stream channels and impaired aquatic life use support. Excess sedimentation negatively affected the streams' biota by blanketing gravel and cobble streambed substrates, often reducing important habitats and algal food resources for many benthic macroinvertebrate groups and limiting the reproductive success of fishes such as the endemic Colorado River cutthroat trout. Sources of sediment included grazing, vehicle traffic on nearby roads, recreational use, logging, irrigation return flows, riparian area deterioration and streambank destabilization.

East and West Forks of Smiths Fork are classified as a Class 2AB waters, which are those known to support game fish. Excess sediment impaired aquatic life by degrading in-stream habitat, violating the state's narrative standard, which states, "floating and suspended solids attributable to or influenced by the activities of man shall not be present in quantities which could result in significant aesthetic degradation, significant degradation of habitat for aquatic life, or adversely affect public water supplies, agricultural or industrial water use, plant life or wildlife."

Figure 1. Photos showing East Fork Smiths Fork (top) and West Fork Smiths Fork (bottom)

Project Highlights

To improve water quality in these two streams, the Uinta County Conservation District (UCCD) addressed some of the pollution sources using funding from a Clean Water Act section 319 nonpoint source control project. UCCD worked with farmers to reduce sedimentation from streambanks by repairing or replacing livestock water tanks that provide off-channel water sources. The farmers also constructed snow fences to divert spring snow melt to these tanks and lessen sediment input to the two streams from overland flow. The Uinta County government improved the surrounding infrastructure by repairing aging roads and bridges adjacent to the two streams. Volunteers planted assorted trees, shrubs and forbs in riparian zones to help stabilize stream banks and create a sediment buffer. Farmers constructed fences along the streams to protect these newly establishing plant communities, stream banks and channels from the effects of livestock grazing. The farmers also adopted grazing BMPs that both promote the recovery of these two streams and allow for continued grazing.

Results

The project efforts were successful. Physical, chemical and biological data collected by Wyoming Department of Environmental Quality in 2003 indicate that sedimentation was minimal and that riparian vegetation was thriving. Both the East Fork Smiths Fork and West Fork Smiths Fork are fully supporting their designated uses, and their water quality threats have been mitigated. Wyoming subsequently removed these two pollutant/segment combinations from its 303(d) list in 2004.

Partners and Funding

The project's funding included $123,300 from the U.S. Environmental Protection Agency, $66,333 from a nonfederal cash match and $16,000 from an in-kind nonfederal cash match. The project was successful in large part because of the close cooperation of a diverse Coordinated Resource Management Team including local landowners, federal grazing permit holders, U.S. Forest Service, the Bureau of Land Management, Wyoming Game and Fish Department, and the Natural Resources Conservation Service.

U.S. Environmental Protection Agency
Office of Water
Washington, DC

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Appendix B - Wyoming Surface Water Classifications & USEPA Categories

	SURFACE WATER QUALITY CLASSES	
CLASS 1	OUTSTANDING WATERS	
CLASS 2	FISHERIES & DRINKING WATER	
	2AB	Supports game fish and drinking water
	2A	Does not support game fish, but are used for public or domestic drinking water supplies
	2B	Supports game fish but does not support drinking water
	2C	Supports non-game fish, does not support drinking water
	2D	Effluent dependent waters which are known to support fish
CLASS 3	AQUATIC LIFE OTHER THAN FISH	
	3A	Isolated waters and wetlands not supporting fish or drinking water
	3B	Tributary waters including wetlands not supporting fish or drinking water
	3C	Perennial waters without natural quality to support fish or drinking water, but support wetlands
	3D	Effluent dependent waters which are known to support aquatic life other than fish
CLASS 4	AGRICULTURE, INDUSTRY, RECREATION, and WILDLIFE	
	4A	Artificial canals/ditches not known to support fish
	4B	Non-perennial streams with infrequent wetlands or lacks hydrologic potential to support/sustain aquatic life
	4C	Isolated waters that lack potential to support or sustain aquatic life (i.e. effluent dependent ponds)

Appendix B - *Continued*

FIVE PART CATEGORIZATION OF WATERS

USEPA guidance (U.S. EPA 2005; 2006) requires that all waters of the state be placed into one of five categories of designated use attainment in the Integrated Report. The following is a description of the five designated use attainment categories.

Category 1. All designated uses are supported, no use is threatened.
(As of 2006, Wyoming does not have any waters in this category because the intensive, long-term sampling data does not exist to determine if contact recreation, fish consumption and drinking water uses are always supported.)

Category 2. Some designated uses are supported, but unknown on others.
(All waters that are assessed as fully supporting some, but not all, of their designated uses are placed in this Wyoming's Method for Determining Water Quality Condition of Surface Water and TMDL Prioritization for 303(d) Listed Waters category. If the aquatic life uses are supported, it is generally assumed that agricultural, industrial, scenic value, fish consumption and wildlife uses are also supported, unless additional information/data suggest otherwise.)

Category 3. Insufficient data to determine if any designated uses are met.
(*All waters in Wyoming that have no data or insufficient data to make a use support determination are in this category by default.)*

Category 4. Water is impaired or threatened, but a Total Maximum Daily Load (TMDL) is not needed.
4A. Impaired waters with TMDLs approved by EPA.
4B. Other required pollution control requirements are expected to address all water pollutant combinations and attain water quality standards in a reasonable period of time.
4C. Pollution, but not any pollutant, is the sole source of impairment.
(A pollutant is a quantifiable water quality parameter for which a load can be calculated. Examples of pollution could include lack of flow or stream channelization (EPA 2005).)

Category 5. The 303(d) List of Impaired and Threatened Waters Requiring TMDLs.