



# Wyoming State Water Plan

Wyoming Water Development Office  
6920 Yellowtail Rd  
Cheyenne, WY 82002  
Phone: 307-777- 7626



[Home Page](#)
[News & Information](#)
[River Basin Plans](#)
[Basin Advisory Groups](#)
[Planning Products](#)

## Powder/Tongue River Basin Water Plan Technical Memoranda

**SUBJECT:** **Appendix U**  
**Water Quality Issues**

**PREPARED BY:** HKM Engineering Inc.

**DATE:** February 2002

### **INTRODUCTION**

The purpose of this water quality memorandum is to identify ongoing watershed management planning efforts, define opportunities for potential cooperation and coordination among these efforts, and identify water quality issues within the Powder/Tongue River Basin Water Plan area. Groundwater quality is addressed separately in the Available Groundwater Determination Memorandum (HKM 2002).

### **Background**

The quality of water refers to its physical, chemical, radiological, biological and bacteriological properties. The concentration levels of various constituents within the water dictate the potential uses of the water source. Quality of a water source can be impacted by natural processes or by human actions. The success of a water development project is dependent on the ability of the source to meet the water quality needs of the proposed uses. In addition, the project itself must protect existing and potential uses of waters of the state and adhere to interstate salinity standards.

The major factors affecting the Powder/Tongue River Basin's water quality are characterized in Appendix A.

### **Statutory Bases**

The State of Wyoming passed enabling legislation known as the Environmental Quality Act in 1973. The purpose of the law was directed at the concern that pollution "will imperil public health and welfare, create public and private nuisances, be harmful to wildlife, fish and aquatic life, and impair domestic, agricultural, industrial, recreational and other beneficial uses" (Environmental Quality Act of 1973). The declared policy of the law was to enable the state "to prevent, reduce and eliminate pollution; to preserve and enhance the water and reclaim the land of Wyoming; to plan development, use, reclamation, preservation and enhancement of the air, land, and water resources of the state; to preserve and exercise the primary responsibilities and rights of the State of Wyoming; to secure cooperation between agencies of the state, agencies of the other states, interstate agencies, and federal government in carrying out these objectives" (Environmental Quality Act of 1973).

The Water Quality Division (WQD) of the Department of Environmental Quality (DEQ) is the designated state agency for water quality management in the State of Wyoming. The WQD has developed a large number of water quality protection programs. These programs deal with point sources (PS) and non-point sources (NPS) of pollution and their potential impacts on surface water and groundwater. Appendix B contains a synopsis of those programs and some federal programs regulating areas not covered by the DEQ or where Wyoming does not have primacy over the federal program.

The federal government has provided many authorities to protect and clean up water quality and the environment. Examples of these authorities include the Clean Water Act, Safe Drinking Water Act, Federal Insecticide, Fungicide and Rodenticide Act, Pollution Prevention Act, National Environmental Protection Act, Solid Waste Disposal Act, Toxic Substance Control Act, Clean Air Act, and others. Most of the federal programs dealing with water quality allow the states to obtain primacy to administer the federal programs. But even if a state has primacy for a federal program, the U.S. Environmental Protection Agency (EPA) has the ability to take action if a state is not administering a program to the federal agency's satisfaction. And in some cases, the EPA is required to intercede if a state fails to take appropriate action.

Add to these authorities the Memorandum of Cooperation signed by Montana and Wyoming in September, 2001 to allow coal bed methane development to proceed as long as water quality in the Powder and Little Powder Rivers isn't impacted. This agreement details comprehensive sampling within Montana, but it also requires the two states to establish an undefined monitoring program to ensure the standards established in the agreement are met (Wyoming DEQ, 2001, "Montana and Wyoming Powder River ...," sect. V).

## EXISTING WATER QUALITY STANDARDS: SURFACE WATER

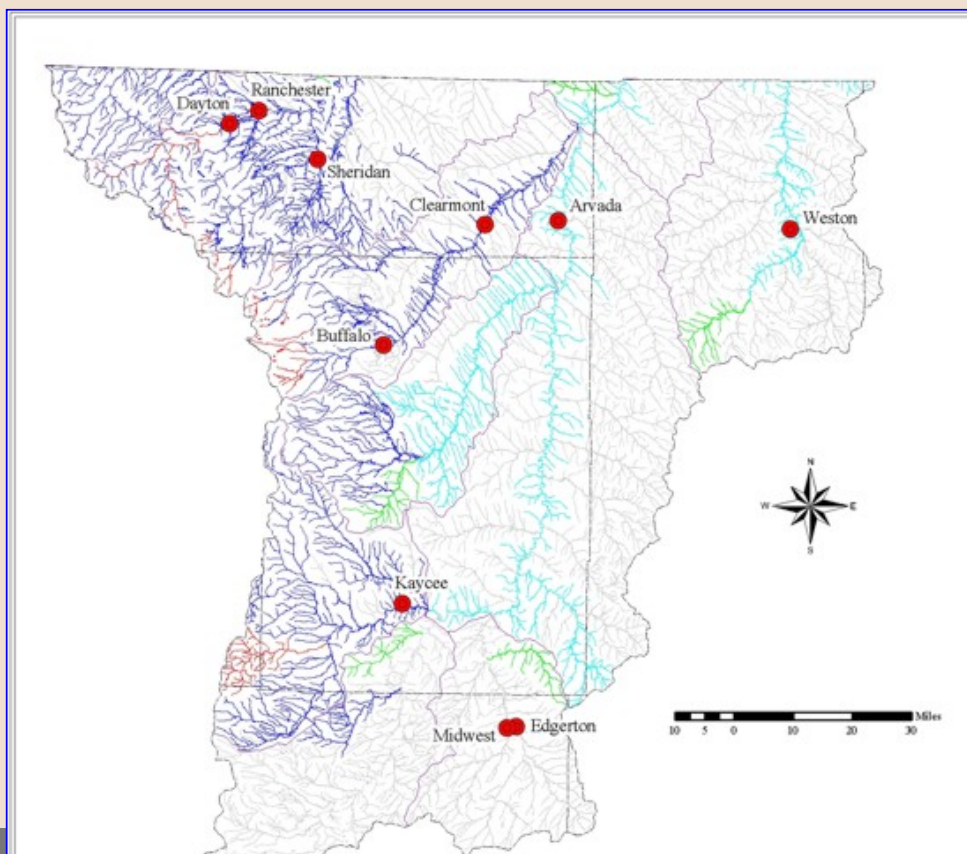
As a result of the Environmental Quality Act, the WQD developed and implemented surface water quality standards contained in Chapter 1, Wyoming Water Quality Rules and Regulations in 1974 (updated in 2001). Chapter 1 contains numerical and narrative standards to establish effluent limitations for those discharges requiring control via permits to discharge in the case of point sources and best management practices in the case of nonpoint sources. The water quality standards apply to all periods of flow conditions as described in Section 4 of Chapter 1.

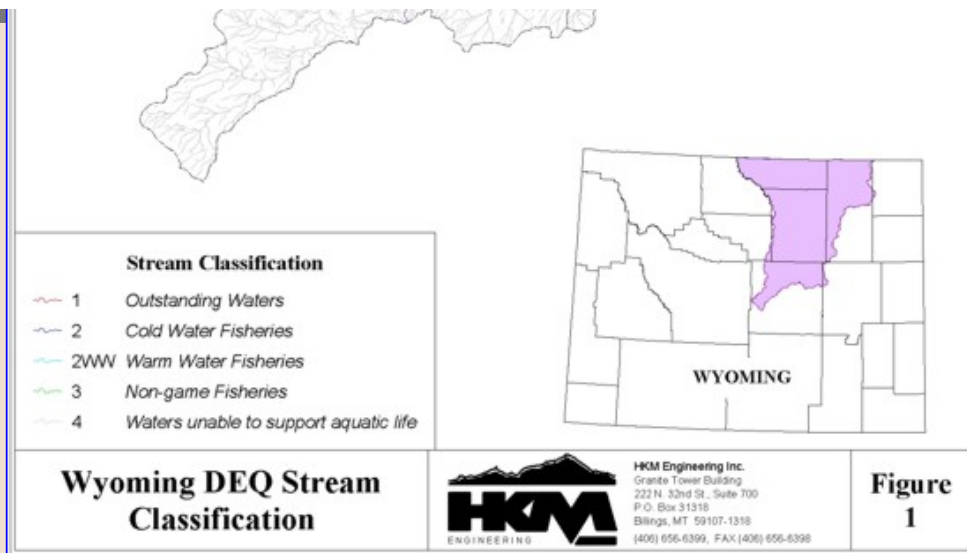
The stream classes are broken into four major classes with various subcategories within each class.

1. Class 1 – (Outstanding waters) Protected for all uses in existence at the time or after destination.
2. Class 2 – (Fisheries and drinking water) Known to support fish or drinking water supplies or capable of doing so.
  - a. Class 2AB – (Fisheries) Supports warm- or cold-water game fish or spawning or nursery areas in addition to drinking water, nongame fisheries, fish consumption, aquatic life other than fish, primary contact recreation, wildlife, industry, agriculture and scenic value uses.
  - b. Class 2A – (Drinking water) Not known to support or have potential to support fisheries, but supports all other uses of Class 2AB waters.
  - c. Class 2B – (Fisheries only) Supports fisheries, but not drinking water supply uses in addition to the other non-drinking water uses under Class 2AB.
  - d. Class 2C – (Warm-water non-game fisheries) Similar to Class 2B, but does not include game and cold-water fishery uses.
3. Class 3 – (Aquatic life other than fish) Intermittent, ephemeral, or isolated waters not capable of supporting fish but capable of supporting other aquatic life. These often include wetlands. Includes uses for life other than fish, recreation, wildlife, industry, agriculture, and scenic value.
  - a. Class 3A – (Isolated waters) Isolated waters including wetlands incapable of supporting fish or drinking water uses.
  - b. Class 3B – (Tributary waters) Incapable of supporting fish or drinking water supply uses; intermittent and ephemeral, but can sustain aquatic life.
  - c. Class 3C – Perennial streams with water quality limitations that negate fishery or drinking water uses, such as geothermal waters or those with naturally high concentrations of dissolved salts or metals.
4. Class 4 -- (Agriculture, industry, recreation, and wildlife) Incapable of sustaining aquatic life, but suited to contact recreation, wildlife, industry, agriculture, and scenic uses.
  - a. Class 4A – (Artificial channels) Canals and ditches not known to support fish.
  - b. Class 4B – (Intermittent and ephemeral) Lack the hydrologic potential to sustain aquatic life.
  - c. Class 4C – Incapable of sustaining aquatic life out of natural or human-induced factors.

Appendix A of Chapter 1 of the *Wyoming Water Quality Rules and Regulations* contains a listing of the classification of all surface water named on the USGS 1:500,000 *Hydrologic Map of Wyoming*. The current stream classifications of the Powder/Tongue River Basin are included as part of this study and are illustrated in Figure 1.

States are required to report on specific designated uses (identified in the EPA 1998 305(b) *Guidelines*), including aquatic life support, primary contact recreation (swimming), fish consumption, and drinking water supply.





[click to enlarge](#)

## ONGOING WATER QUALITY PROGRAMS

### Department of Environmental Quality: Total Maximum Daily Loads

The 1972 Clean Water Act requires states to designate Total Maximum Daily Loads (TMDLs) for pollutants in impaired water bodies. The DEQ determines impairment based on whether a water body can meet the beneficial uses assigned to it in its current state (and level of pollutants). The DEQ provides a good description of the program and its recent history on its web site:

*A Total Maximum Daily Load (TMDL) is the amount of pollutant which a stream can accept and still meet its designated uses. TMDLs must be established for each pollutant which is a source of stream impairment. They must be measurable and must consider both point and nonpoint source pollutant loads, natural background conditions, and a margin of safety.*

*Section 303(d) of the Clean Water Act requires states to:*

- 1) Identify all waters of the state which are impaired--i.e. they contain pollutants which adversely affect the designated use of the water.*
- 2) Prioritize all impaired waterbodies for development of TMDLs. Prioritization is to take into consideration public health and environmental risk. Therefore, point source discharges generally are a higher priority than nonpoint sources of clean sediment.*
- 3) Establish and adopt TMDLs for all impaired waterbodies or for waterbodies which would be impaired if a TMDL was not established.*

*If a state does not comply with Section 303(d), the Environmental Protection Agency is required to perform these activities.*

*Every two years, the state must evaluate its water quality data, and submit an updated impaired water body list to the Environmental Protection Agency (EPA) for approval. This list is generated from the Statewide Water Quality Assessment (also known as the 305(b) Report) which also must be submitted every two years. Due to the lack of water quality data available, the Water Quality Division began using surveys in 1990 to determine stream status. These surveys were sent to Conservation Districts, U.S. Forest Service, BLM, Game and Fish, etc. The "professional judgment" of these entities was utilized to place streams on the impaired water body list (also known as the 303(d) list). In addition to waters which are actually impaired, the state must list those waters for which a TMDL will be established within the next two years. Therefore, the state also lists streams which have discharge permits due for renewal and which require a wasteload allocation (approximately 150 of the state's facilities with discharge permits have wasteload allocations).*

*The state has provided public notice and has submitted the 303(d) list to EPA, as required by the Clean Water Act, since 1990. Since the early 1980's the state has established TMDLs for point source discharges, where necessary, to achieve in-stream designated uses. We anticipate that approximately 5% of these dischargers may be affected by nonpoint source contributions of similar pollutants (such as fecal coliforms or ammonia). In 1989, the State adopted a Nonpoint Source Management Plan to address nonpoint sources of pollution. Under this voluntary program, the state provides Clean Water Act Section 319 funds to local entities for projects which address nonpoint source pollution. Though never formally adopted as a TMDL, many of these projects are comprehensive watershed plans which contain all the components of a TMDL.*

*On December 9, 1996, Sierra Club Legal Defense Fund, on behalf of Wyoming Outdoor Council, Biodiversity Associates, and American Wildlands, filed a lawsuit in Denver Federal Court to require Region VIII EPA to implement the TMDL program in Wyoming. The litigants claim that the state has not adequately monitored its streams, has not listed all impaired streams, and has not developed sufficient point or nonpoint source TMDLs. The EPA filed for, and was granted, a change of venue. The case is assigned to the federal court in Casper. The Wyoming Association of Conservation Districts has intervened in the lawsuit. Suits involving twenty-eight states are in some stage of litigation and settlement over TMDLs. Although Wyoming has not*

*intervened in the lawsuit, we are attempting to respond to the issues brought forth by the litigants.*

*Three positions were added to the watershed management unit to assist with TMDLs, and a workplan was submitted to EPA. The state's workplan establishes a five-year timeframe for monitoring streams on the 1996 303(d) list and a ten-year schedule for adopting TMDLs on those streams with credible data indicating TMDLs need to be established. Four additional staff positions were hired in July, 1998 to perform the necessary monitoring and assist local stakeholders in establishing locally sponsored watershed plans, or where necessary, develop TMDLs.*

*The state has established a workgroup to assist and make recommendations to the agency on implementation of the workplan, future 303(d) lists, and listing criteria and priorities. The 1998 draft list contains: those waterbodies which have adequate data to determine non-support of designated uses, waterbodies which have point source permits with wasteload allocations due for reissuance in the next two years, and waterbodies where nonpoint source projects are currently addressing the sources of pollution. Those streams which were on the 1996 list but do not meet the above criteria for the new 1998 list were proposed for delisting where adequate data exists to show designated use support. Those streams with insufficient data will be monitored some time during the next five years to determine whether they should or should not be listed. A public notice was issued on the 1998 303(d) list on December 22, 1997. The comment period closed February 6, 1998. The DEQ responded to comments received and evaluated and analyzed supplemental data which was submitted prior to finalizing the 1998 list. The list was submitted to EPA for approval on March 30, 1998. EPA approved the state's submittal in June, 1998. The state will work with EPA and with local, state and federal agencies to monitor water quality in the state, and where needed, to establish workable, implementable voluntary watershed management plans. Where no local entity comes forward to sponsor a watershed plan for impaired watersheds, the state will establish TMDLs.*

*The 1996 303(d) list contained 366 stream segments. The 1998 list consists of the following:*

- *14 waterbodies with credible data indicating impairment*
- *29 waterbodies which have permits with wasteload allocations due for renewal*
- *20 waterbodies with credible nonpoint source threats*
- *33 waterbodies with credible data to delist-- they are meeting their beneficial uses*
- *335 waterbodies about which there is insufficient credible data to know whether they should be listed or not.*

*(<http://deq.state.wy.us/wqd/watershed/tmdlinfo.htm>, 7 Dec. 2001)*

The DEQ has recently increased surface water monitoring to address 1999 amendments to the Environmental Quality Act under W.S. 35-11-103(c) and 302(b) directed at "credible data." A program developed in 1993, dubbed the Beneficial Use Reconnaissance Program (BURP), has been generating stream water quality data around Wyoming for four years. Unfortunately, staffing constraints in the agency have restricted the movement of the data through quality assurance/quality control (QA/QC) efforts and into reports. According to DEQ BURP staff, the agency has performed its QA/QC on data collected through 1998, though reports on those data are still pending (Eisenhauer, 13 Dec. 2001).

The status of data has put many reports in limbo for now. Interviews with WQD staff charged with collecting data reveal the following concerns:

<b>Stream</b>	<b>Potential Concerns</b>	<b>Likely to be in 303(d) listing?</b>
Prairie Dog Creek	Decreased flows in October bring problems with sulfates, nitrates, and total dissolved solids	unknown
Tongue River (Interstate to state line)	High temperature for cold-water fishery	unknown
Powder River	Data collected within last year; not processed yet	unknown
Coney Creek	Twin Lakes Reservoir construction brought sedimentation concerns	no
West Fork Big Goose	Twin Lakes Reservoir construction brought sedimentation concerns	no
Sourdough Creek	Sediment in cold-water fishery	no
Little Sourdough		unknown
Little and Big Goose Creeks	Fecal coliform present; contact recreation not supported	yes
Powder River	Suspended sediments and nutrients make the river unsuited for irrigation	no
Little Powder	Reach sampled in 1999; no report yet	unknown

*(Eisenhauer, Gianakos, and Zumberge, 7 Dec. 2001)*

The most current 303(d) list, the 2000 303(d) list supplied by the DEQ, is shown on the next page.



**Table A (Water bodies with water quality impairments) 2000 303(d) list – Powder/Tongue River Basin**

Waterbody Name	Location	State Impairment	Priority	Use Impairment/Threat	303(d) Listing Date
Beaver Creek	Impairment from Big Goose Creek to an unknown dist. upstream	Fecal coliform	Low	Contact Recreation	2000
Goose Creek	Unknown distance below Sheridan Wastewater Treatment Plant	Fecal coliform	Low	Contact Recreation	2000
Little Goose Creek	Impairment from Sheridan to above Big Horn	Fecal coliform	Low	Contact Recreation	1996
Big Goose Creek	From Sheridan to above Beckton	Fecal coliform	Low	Contact Recreation	1996
Jackson Creek	Impairment from Little Goose Creek to an unknown distance upstream	Fecal coliform	Low	Contact Recreation	2000
Kruse Creek	Impairment from Little Goose Creek to an unknown distance upstream	Fecal coliform	Low	Contact Recreation	2000
Park Creek	Impairment from Little Goose Creek to an unknown distance upstream	Fecal coliform	Low	Contact Recreation	2000
Rapid Creek	Impairment from Little Goose Creek to an unknown distance upstream	Fecal coliform	Low	Contact Recreation	2000
Sackett Creek	Impairment from Little Goose Creek to an unknown distance upstream	Fecal coliform	Low	Contact Recreation	2000
Soldier Creek	Impairment from Little Goose Creek to an unknown distance upstream	Fecal coliform	Low	Contact Recreation	2000
Powder River	Impairment from Salt Creek to an unknown distance downstream	Selenium	High	Warm-Water Fishery	1998
		Chlorides	High	Warm-Water Fishery	2000

**Table B (Water bodies with Waste Load Allocation permits expiring) 2000 303(d) list – Powder/Tongue River Basin**

Waterbody Name	Location	State Impairment	Use Impairment/Threat	NPDES permit expiration date
Tongue River	Unknown distance below Ranchester Wastewater Treatment Plant	Total residual chlorine, fecal coliform	Cold-water fishery, contact recreation	8/31/00
Middle Fork Powder R.	Unknown distance below Kaycee Wastewater Treatment Plant	Total residual chlorine, fecal coliform	Cold-water fishery, secondary recreation	6/30/00
Clear Creek	Unknown distance below Buffalo Wastewater Treatment Plant	Ammonia, total residual chlorine, fecal coliform	Cold-water fishery, secondary recreation	11/30/01
	Unknown distance below Clearmont Wastewater Treatment Plant	Ammonia, total residual chlorine, fecal coliform	Cold-water fishery, contact recreation	9/30/00

**Table C (Water bodies with water quality threats) 2000 303(d) list – Powder/Tongue River Basin**

Waterbody Name	Location	State Impairment	Priority	Use Impairment/ Threat	303(d) Listing Date
Salt Creek (Powder River)	USGS near Sussex (impairment in Powder River)	Oil spills, total dissolved solids	Med.	Agriculture, wildlife	1996
North Fork Crazy Woman Creek	Reaches within T49N, R82W	Physical degradation, nutrients, total dissolved solids	Low	Cold-water fishery	1996
Hunter Creek	S10, T50N, R84W (11 mi. west of Buffalo)	Heavy Siltation	Low	Cold-water fishery	1998
Rock Creek	Watershed below Forest boundary, tributary to Clear Creek	Physical degradation	Low	Cold-water fishery	2000
North Fork Shell Creek	Above Shell Creek Reservoir	Physical degradation	Low	Agriculture	2000
South Fork Shell Creek	Above Shell Creek Reservoir	Physical degradation	Low	Agriculture	2000

(DEQ, *Wyoming's 2000 305(b) State Water Quality Assessment Report*, June 2000, Appendix B)

The 303(d) list doesn't tell the whole water quality impairment story. Streams and other water bodies with TMDLs assigned to them are removed from the list, and streams that haven't yet undergone a rigorous assessment of data supporting listing or delisting aren't mentioned. According to the DEQ's *Wyoming's 2000 305(b) State Water Quality Assessment Report*, Beartrap Creek on the Middle Fork of the Powder River will not be listed because stock is being kept from the creek's riparian zones and new pool and riffle habitat is supporting aquatic life uses. Hunter Creek, a tributary to Clear Creek, will not be listed for sediment generated by a nearby road because the road is being modified and maintained to reduce sediment-laden runoff. The report also mentions the possibility of delisting the North Fork of the Crazy Woman as a result of an improvement project designed to reduce physical degradation of the channel.

The DEQ work reviewed so far has focused on the surface water assessment side of the program that is usually associated with nonpoint sources of pollution (though not always). Within its Water Quality Division, the DEQ also responds to another of the Clean Water Act's sections, this one addressing point- source pollutants. The National Pollutant Discharge Elimination System (NPDES) is responsible for point-source pollutant permits required throughout Wyoming such as those from wastewater treatment plants, coal bed methane wells, and construction sites as small as one acre (effective in 2003). The DEQ maintains its database of NPDES permits in its Cheyenne office. Because of the far-reaching impact of NPDES permitting, this database represents a huge source of information on water quality in this basin – and an ongoing one.

#### **Wyoming Water Development Commission: Three Horses Study**

The Wyoming Water Development Commission hired a consultant to review coal bed methane impacts on the drainage areas of Dead, Spotted, and Wild Horse creeks. The consultant is to test for metals, electrical conductivity parameters, and hydraulics, then propose alternatives to handling coal bed methane water. The \$100,000 project was awarded in June, 2001. EnTech, the consulting firm, expects to have an initial report out by March 2002. This project is sponsored by the Campbell County and Lake DeSmet Conservation Districts (Engels, 7 Dec. 2001).

#### **Wyoming State Geological Survey: Interactive Geologic, Geohydrologic and Geochemical Database and Model**

Through a \$400,000 grant from the Wyoming Water Development Commission, this project will re-map coals more than 15 feet below ground surface and subsurface aquifers in the northern portion of the Powder/Tongue River Basin. This project is particularly interesting to well drillers because it incorporates water quality data from coal and coal bed methane firms, associating water quality with aquifers. The Water Resources Data System (WRDS) at the University of Wyoming's Department of Civil Engineering will be expanded to include information and data on the depth, water quality and hydrology of known formations/aquifers in the Powder/Tongue River Basin. Relationships between these formations/aquifers and permitted water wells will also be defined and included in WRDS.

A similar project has already been completed for the Little Snake River Basin (access the online, interactive mapping at <http://www.wrds.uwyo.edu/wrds/view/view.html>). Project principles in the Wyoming State Geological Survey and WRDS hope to complete the 18-month project by November, 2002.

As of late December, 2001, project cooperators were still seeking funding to perform the same work in the southern part of the basin.

#### **Wyoming Association of Conservation Districts: Watershed Planning**

The Clean Water Act allows the EPA and DEQ to allow "local agencies" to provide watershed planning in lieu of the imposition of TMDLs. The Wyoming Association of Conservation Districts has been interested in providing that planning for local control over the effort. Particularly in the past two years, the member districts have created and implemented watershed management plans, beginning with baseline data and

running through recommendations for inclusion on the 303(d) list.

### Sheridan County Conservation District's Tongue River Watershed Assessment

In cooperation with the Natural Resources Conservation Service (NRCS), the Sheridan County Conservation District initiated an assessment of the Tongue River watershed between the Bighorn National Forest boundary and the Town of Ranchester. The project received funding through the EPA's Section 205(j) funding administered by the DEQ in 1996 and 1998 for monitoring through 1999.

The report submitted in the wake of the conservation district's work encompasses data collected by the DEQ, Wyoming Game and Fish Department, the USGS, Ranchester Public Works Department, the NRCS, and the Wyoming State Board of Control (State Engineer's Office), though some of it is used on a provisional basis because the data had not been checked for quality.

In general, the study found the water quality in the study area good to excellent with few exceptions. Most notably, the Tongue and many of its tributaries exceed DEQ/EPA thresholds for fecal coliform and temperature, given the Tongue's current rating as a coldwater fishery. The conservation district recommends that the section of the Tongue on the 303(d) list be shortened and that the lower part of the study area be reclassified as a warm-water fishery. According to the report, this is historically justified.

As for the fecal coliform exceedences, the report notes significant reductions in fecal coliform counts since 1985 in the middle reach of the Tongue, thanks in part to an upgrade of the Dayton wastewater treatment plant in the mid-1980s. Nevertheless, the district's report agrees that the Tongue and numerous tributaries be listed on the 303(d) list for fecal coliform contamination and temperature pollution.

Stream recommended for 303(d) listing	Contaminant(s)
Tongue River	fecal coliform, temperature
Smith Creek	fecal coliform, turbidity, temperature
Columbus Creek	fecal coliform, turbidity, temperature, narrative biological criteria
Wolf Creek	fecal coliform, turbidity, temperature
Five Mile Creek	fecal coliform, turbidity, temperature, narrative biological criteria

(Sheridan County Conservation District, iv-xvii)

Although this is not an ongoing project, it is provided here as an example of the work being performed by the conservation districts throughout the basin. Indeed, the Sheridan County Conservation District teamed with the City of Sheridan and Sheridan County in 2001 to receive a \$365,000 grant from the federal Section 319 Funds to perform a rigorous water-testing program on Big and Little Goose creeks.

Other conservation district work includes:

Group	Work	Dates	Result
Campbell County C.D.	Quality sampling at least inclusive of private lands to establish baseline data	Just beginning work at the end of 2001	Baseline for data analysis; "proprietary"
Campbell County C.D., Campbell County, and City of Gillette	Using Section 319 funds to develop and air an advertisement designed to reduce silt and phosphate contributions to Gillette Fishing Lake; build a storm water runoff structure to prevent runoff entering the lake.	Grant obtained, Aug. 1998; video aired 2001	Video aired 2001; unknown status
Lake DeSmet C.D.	Final Report for establishment of Best Management Practices (BMPs), Crazy Woman Creek	Sampling 1991-1998	Report released 2001
Powder River C.D.	Watershed inventory and assessment	Public meetings began, Jan. 1999	Juxtaposition of historical quality data and current impairments

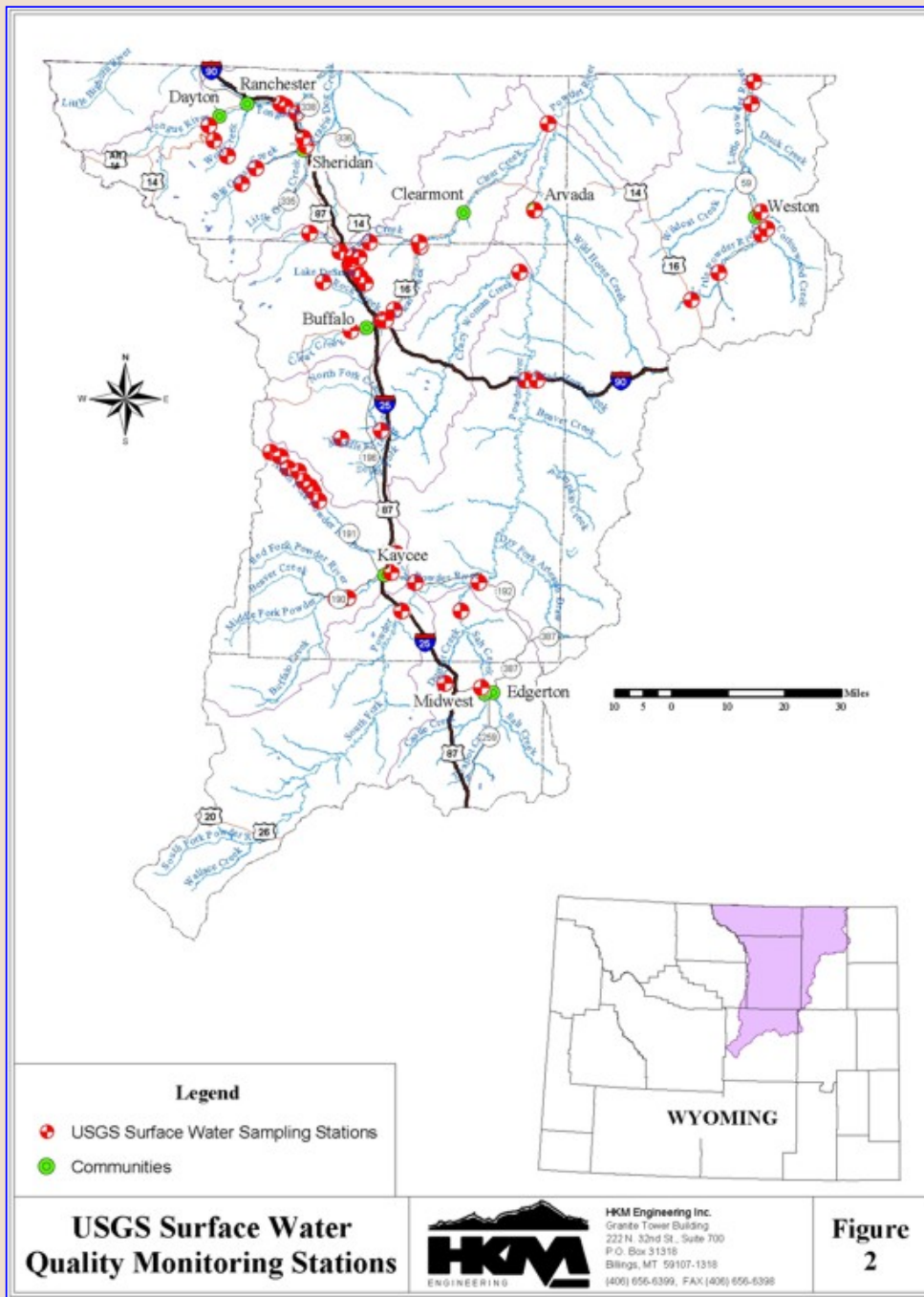
(Lohse, 4 Dec. 2001; Carroll, 19 Nov. 2001; <http://www.conservewy.com/watershedprogress.html>, Jan. 2000)

This is not meant to be an exhaustive list. Efforts to contact district personnel were not always successful, and project-specific data are sometimes difficult to obtain from people contacted.

### U.S. Geological Survey: Monitoring Program and Interest-Specific Studies

The U.S. Geological Survey (USGS) also has the data and analysis in place to provide a glimpse of water quality in the basin.

The USGS maintains 66 surface water-quality monitoring stations in a network in the basin (Figure 2). In addition, the federal agency has compiled reports on areas of specific water quality-related study, all of which add to the picture of the basin: the National Water-Quality Assessment (NAWQA), the Pathogen Indicator Synoptic Study, and the Pesticide Monitoring Program. Short descriptions of each of these programs follow.



[click to enlarge](#)

**National Water Quality Assessment (NAWQA)**

NAWQA is established to describe the status and trends in the quality of a large, representative part of the Nation's surface and ground water resources, and to provide a sound, scientific understanding of the primary factors affecting the quality of these resources. The study encompasses the Yellowstone River Basin, which includes all the Powder and Tongue River basins in addition to those of the Wind, Bighorn, and Clark's Fork Rivers.

Suspended sediment is one of two indicators of water quality in the program's *Environmental Setting* report. The fact that the Powder River contributes about 30 percent of the annual sediment load in the entire NAWQA Yellowstone Basin study area while only supplying approximately five percent of the flow indicates the exceptional suspended sediment load found in this river (USGS, *Environmental Settings...*, p. 42).

This program also found some evidence that oil and gas activity in the Powder River Basin contributes much of the dissolved solids that can be found in already high numbers in a plains river like the Powder (USGS, *Environmental Settings...*, p. 45). Researchers found that the Salt Creek's watershed, loaded with saline water, contributes 25 to 30 percent of the dissolved solids at the creek's confluence with the Powder.

Note: The NAWQA study implicates the oil production water discharged into Salt Creek for the high salinity in the creek. This contradicts at 1993 study conducted by the Wyoming Water Research Center that cleared produced water from oil activity in the area of the stream



toxicity (Boelter, Lamming, Farag, and Bergman, 1993).

#### Big Goose Creek

A carp from the Big Goose near Acme showed a higher concentration of DDT than seen elsewhere in the study (USGS, *Organic Compounds and Trace Elements in Fish Tissue ...*, p. 14). This carp and a sucker also demonstrated higher PCB levels than found elsewhere in the study area, though the study area was significant for its low levels of PCB on a national scale (p. 16).

#### Tongue River

In the program's analysis of fish-tissue samples, the Tongue River at the state line hosted the smallmouth bass with the smallest concentration of mercury in the study area (p. 35). But the sediments of the Tongue contained the highest concentration of methyl mercury, the most toxic of mercury forms (p. 36). The 1998 bed sediment analyses also showed the highest concentration of Manganese in the study area (770 µg/g dry weight) (p. 29). The site on the Tongue at the state line also demonstrated the presence of PCBs, though they are suspected of coming from the Big Goose's influence (p. 16).

None of the findings indicate exceedences of DEQ or EPA thresholds.

#### Pathogen Indicator Synoptic Study

This program studied fecal coliform levels on a spatial distribution basis as part of the Clean Water Act requirements. Researchers planned a synoptic for pathogen indicators in summer 2000, focusing on the Goose Creek area. Point and non-point sources of bacteria in the basins include sewage treatment plants, animal waste, septic systems, and wildlife. Sampling conducted during the period of June-August, 2000 coincided with historical high fecal-coliform concentrations, when land-use activity is increased and contact recreation use may be occurring.

About 100 sites were selected on the Bighorn River, tributaries to the Bighorn River, Goose Creek, and tributaries to Goose Creek for a one-time sampling event. Sites were also selected in the Wind River Basin.

Samples were analyzed for fecal coliform and *Escherichia coli* (*E. coli*). Selective agar media include mFC (fecal coliform), and mTEC (*E. coli*). Field measurements determine discharge, temperature, pH, specific conductance, dissolved oxygen, alkalinity, and turbidity. Samples also indicate suspended sediment concentration to provide data for a sediment synoptic study.

The provisional data supplied by the USGS follow:

Site #	Station Number	Station Name	Sample dates	Coliform, Fecal, UM-MF, (colonies per 100 mL)	E. Coli Water whole total UREASE (colonies per 100 mL)
1	443559107122501	E F Big Goose Creek On Fs Rd 26, Nr Big Horn, Wy	27-Jun-00	530	580
2	443654107110101	Rapid Cr On Forest Service Rd 26, Nr Big Horn, Wy	27-Jun-00	130	67
3	443638107070201	Tepee Creek Near Campground, Near Big Horn, Wy	27-Jun-00	360	380
4	06301500	West Fork Big Goose Creek Near Big Horn, Wyo.	27-Jun-00	55	53
5	06303700	Little Goose Creek Ab Davis Ck, Nr Big Horn, Wy	27-Jun-00	K10.0	K4
6	443900107002201	L Goose C @ Bradford Brinton Mem, Nr Big Horn, Wy	27-Jun-00	97	28
7	444014106593401	Little Goose Creek On CR103, Near Big Horn, Wy	28-Jun-00	100	K150
8	444101106591501	Little Goose Creek On CR28, Near Big Horn, Wy	28-Jun-00	120	90
9	444246106572801	L Goose Creek At Bridge On Hwy 87, Near Banner, W	28-Jun-00	280	200
10	444415106565001	L Goose C @ Hwy87 Brg Bl Woodland Pk VII, Nr Sheridan	28-Jun-00	270	200
11	444634106565401	L Goose Creek Bel Brundage St Bridge, In Sheridan	28-Jun-00	K190	140
12	06304500	Little Goose Cr At Sheridan Wy	28-Jun-00	190	150
13	444319107085201	Big Goose Creek Below Kane Draw Nr Sheridan, Wyo	28-Jun-00	23	K15
14	06302200	Big Goose Creek Above Park Creek, Near Sheridan, Wy	28-Jun-00	380	260
15	444503107061601	Big Goose Creek At County Road 81 Nr Sheridan, Wy	28-Jun-00	800	>400

16	444550107042601	Big Goose Creek Bel Beaver Creek, Nr Sheridan, Wy	29-Jun-00	800	--
17	444637107014701	Big Goose Creek On Hwy 331 Nr Sheridan, Wy	29-Jun-00	1100	--
18	444631107010901	Big Goose Creek Three Miles West Of Sheridan, Wyo	29-Jun-00	670	>300
19	444803106574701	Big Goose Creek In Kendrick Park, In Sheridan, Wy	29-Jun-00	560	K400
20	444916107013401	Soldier Creek On Cr74, Near Sheridan, Wy	29-Jun-00	1500	E800
21	444911106574601	Soldier Creek Near Mouth, In Sheridan, Wy	29-Jun-00	1100	K670
22	444848106573701	Goose Creek At 11Th Street, In Sheridan, Wyo	29-Jun-00	600	--
23	06305500	Goose Creek Below Sheridan, Wy	29-Jun-00	380	240
24	06305700	Goose Creek Nr Acme, Wy	29-Jun-00	300	170

K indicates results based on colony count outside the acceptable range (non-ideal colony count)

E indicates estimated value

-- indicates no value determined at this time

(<http://wy.water.usgs.gov/projects/pathogen/index.htm>, 12 Dec. 2001)

### U.S. Environmental Protection Agency: CBM Water Disposal Study

Region 8 of the EPA is currently updating its Best Available Technology (Economically Achievable) listing to include entries on coal bed methane produced waters. The agency has hired a contractor, the Eastern Research Group (ERG), to gather the technical and environmental data from sources in Wyoming, particularly the Powder River Basin. The study focuses on the Powder River and Raton basins for their production of waters that can be put to beneficial uses as they are discharged. The study considers zero discharge via reinjection, infiltration and evaporation, and beneficial use of the effluent in agriculture and wildlife water use, including reverse-osmosis processing. The information from the study will be used to establish baselines for NPDES permits in Indian reservations where the EPA still has primacy. In addition, the EPA hopes the guidelines will be used on a wide basis for permitting throughout states supporting CBM activity. According to EPA environmental engineer on region's NPDES team, the program had spent approximately \$150,000 on the study by mid-December and was projected to produce a draft report in March and a final report in June of 2002 (EPA, 11 May 2001; Reed, 17 Dec. 2001).

### CURRENT WATER QUALITY-RELATED ISSUES

Certain issues define the best chances to improve or enhance the water quality of this basin – or at least protect it. They are detailed here in industrial, agricultural, and municipal categories.

#### Industrial

The dominating theme is obviously coal bed methane and the water produced by each methane well. The development of the methane boom in the basin has already affected much of the basin's surface water and has the potential to affect all of the basin's surface waters within the low-lying areas. Potential impacts from these flows include:

- Discharge water quality
  - As the development moves west from the area around Gillette, the quality of the produced water appears to decline in general, with higher concentrations of sodium, barium, manganese, and iron playing a role.
- Discharge water quantity
  - Increased flows have the capacity to dilute contaminants present in existing flows or increase the turbidity of streams – or both
  - Flow constant in some ephemeral streams
    - increases sediment movement/transport
    - creates new riparian areas
    - sodden soils can pull salts from subsurface clays
  - Disposal
    - evaporation ponds and concentration of potential contaminants

Issues surrounding industrial activities that have long been present in the basin also represent opportunities. Oil and gas activities outside coal bed methane production are credited with putting Salt Creek on Table C of the 2000 303(d) list, and the same creek is cited for saline discharge from produced water. On the Tongue River, only the Bighorn Coal Mine remains, and that has been in the process of final reclamation for some years. But coal activity on the Little Powder drainage is the most significant land use in the area, and the constant interaction of the DEQ with the coal mining companies through NPDES permits allows for significant opportunities in water quality enhancements.

#### Agricultural

Agriculture plays a large part in the surface water quality of the basin. The Wyoming Association of Conservation Districts realized this and has been creating and implementing Best Management Practices to improve water quality as part of its watershed planning efforts. Among the top issues are riparian-area stock activities, pesticide use, and issues stemming from concentrated animal feeding operations (CAFOs)

and animal feeding operations (AFOs).

## **Municipal**

In 1987, Congress amended the Clean Water Act to require the establishment of a comprehensive two- phased approach to control storm water discharges. The Phase I regulations were published in the Federal Register on November 16, 1990, and concentrate primarily on:

- Discharges associated with industrial activity, including construction projects disturbing more than five acres.
- Discharges from municipal separate storm sewer systems (MS4s) serving a population of 100,000 or more.

Municipalities under 100,000 population have had fewer requirements under the Phase I regulations. They have been required to get permit coverage for storm water discharges from airports, power plants, and uncontrolled sanitary landfills that they own or operate. The state or EPA may require, on a case-by- case basis, permits for storm water discharges from other activities owned or operated by municipalities under 100,000 population if considered necessary to control contaminated runoff.

The Phase II Final Rule, published in the *Federal Register* on December 8, 1999, requires NPDES permit coverage for storm water discharges from:

- Certain regulated small municipal separate storm sewer systems (MS4s); and
- Construction activity disturbing between 1 and 5 acres of land (i.e., small construction activities).

In addition to expanding the NPDES Storm Water Program, the Phase II Final Rule revises the "no exposure" exclusion and the temporary exemption for certain industrial facilities under Phase I of the NPDES Storm Water Program. This phase goes into effect in early 2003.

Obviously, the Powder/Tongue River Basin doesn't contain municipalities affected by the Phase I program, but small construction activities dot the area constantly, and municipalities are made wary by the open-ended nature of the applicability of Phase II.

Wastewater treatment plants have been covered under the NPDES permitting requirement since the Environmental Quality Act created W. S. 35-11-302.

## **COOPERATION**

Cooperation among entities working with water quality is common. A very fine example of this is the Sheridan County Conservation District's Tongue River Assessment report, which combined data from a range of local, state, and federal agencies.

The water quality picture could be improved though cooperation between DEQ and the State Engineer's Office water commissioners/ hydrographers. Though SEO personnel have no official duties involved in water quality monitoring or enhancement, their work with irrigation and municipal diversions begs their involvement. This is not to say that commissioners need to be given additional tasks of sampling or enforcement, but that their "on-the-ground" knowledge of water quality and quantity developments could be of tremendous help to WQD staff and should be encouraged.

## **REFERENCES**

Boelter, Ann M., Lamming, Fred N., Farag, Aida M. and Bergman, Harold L., "Environmental Effects of Saline Oil-field Discharges on Surface Waters," Wyoming Water Resources Center Research Brief RB93-104, 1993.

Carroll, Dee, Campbell County Conservation District program assistant, telephone interview, 19 Nov. 2001.

Department of Environmental Quality, "Basin Summaries, 1998 Wyoming 305(b) Water Quality Assessment," web site: <http://deq.state.wy.us/wqd/305b/wp305.htm> accessed 18 Dec. 2001.

Department of Environmental Quality, Water Quality Division, Draft Source Water Protection Program, Jan. 2000.

Department of Environmental Quality, Water Quality Division, Draft Wyoming Nonpoint Source Management Plan Update, Dec. 1999.

Department of Environmental Quality, Environmental Quality Act of 1973, Chapter 11, web site: <http://legisweb.state.wy.us/statutes/titles/title35/chapter11.htm> accessed 19 Dec. 2001.

Department of Environmental Quality, Water Quality Division, *Five-Year Comprehensive Monitoring Plan*, Watershed Program, June 1998.

Department of Environmental Quality, Water Quality Division, Current Edition, *Wyoming Water Quality Rules and Regulations*, Chapters 1-22.

Department of Environmental Quality, "Wyoming's Program to Address Total Maximum Daily Loads," web site: <http://deq.state.wy.us/wqd/watershed/tmdlinfo.htm> accessed 7 Dec. 2001.

Department of Environmental Quality, Water Quality Division, *Wyoming Wellhead Protection Program*, June 1998.

Department of Environmental Quality, Wyoming's 2000 305(b) State Water Quality Assessment Report, web site: <http://deq.state.wy.us/wqd/watershed/01452-doc.pdf> June 2000.

Eisenhauer, Jim, DEQ WQD senior analyst, telephone interview, 13 Dec. 2001.

Engels, David, EnTech Inc. principal, telephone interview, 7 Dec. 2001.

Environmental Protection Agency, "May 11, 2001 Kick-Off Letter LT051101.pdf," (coalbed methane produced water BAT establishment program) web site: <http://www.epa.gov/Region8/water/wastewater/cbm/LT051101.pdf> accessed 19 Dec. 2001.

Gianakos, Laura, DEQ/WQD environmental analyst, telephone interview, 18 Dec. 2001.

Lohse, Nikki, Lake DeSmet Conservation District manager, telephone interview, 4 Dec. 2001.

Peterson, David A., and Boughton, Gregory K., *Organic Compounds and Trace Elements in Fish Tissue and Bed Sediment from Streams in the Yellowstone River Basin, Montana and Wyoming, 1998: Water Resources Investigations Report 00-4190*, Department of the Interior, USGS, Cheyenne, Wyoming, 2000.

Reed, Mike, EPA environmental engineer on NPDES Team, Region 8, telephone interview, 17 Dec. 2001.

Sheridan County Conservation District, "Tongue River Watershed Assessment 205j Final Report 1996- 1999," Sheridan, Wyoming, 2000.

USGS, "Pathogen Indicator Synoptic Study," web site: <http://wy.water.usgs.gov/projects/pathogen/index.htm> accessed 12 Dec. 2001.

University of Wyoming, Wyoming Water Resources Center, and Wyoming State Geological Survey, *Ground Water Vulnerability Assessment: SDVC Report 98-01*, Vols. I and II, 1998.

Wyoming Association of Conservation Districts, "Watershed Planning Progress Report for Streams on the 1998 Table A 303(d) List," web site <http://www.conservewy.com/watershedprogress.html> Jan.2000.

Wyoming Department of Environmental Quality and Montana Department of Environmental Quality, "Montana and Wyoming Powder River Interim Water Quality Criteria Memorandum of Cooperation," 7 Sept. 2001.

Zelt, Ronald B.; Boughton, Greg K.; Miller, Kirk A.; Mason, John P.; and Gianakos, Laura M., *Environmental Setting of the Yellowstone River Basin, Montana, North Dakota, and Wyoming*, Water Resources Investigations Report 98-4269, U.S. Dept. of the Interior, USGS, Cheyenne, Wyoming, 1999.

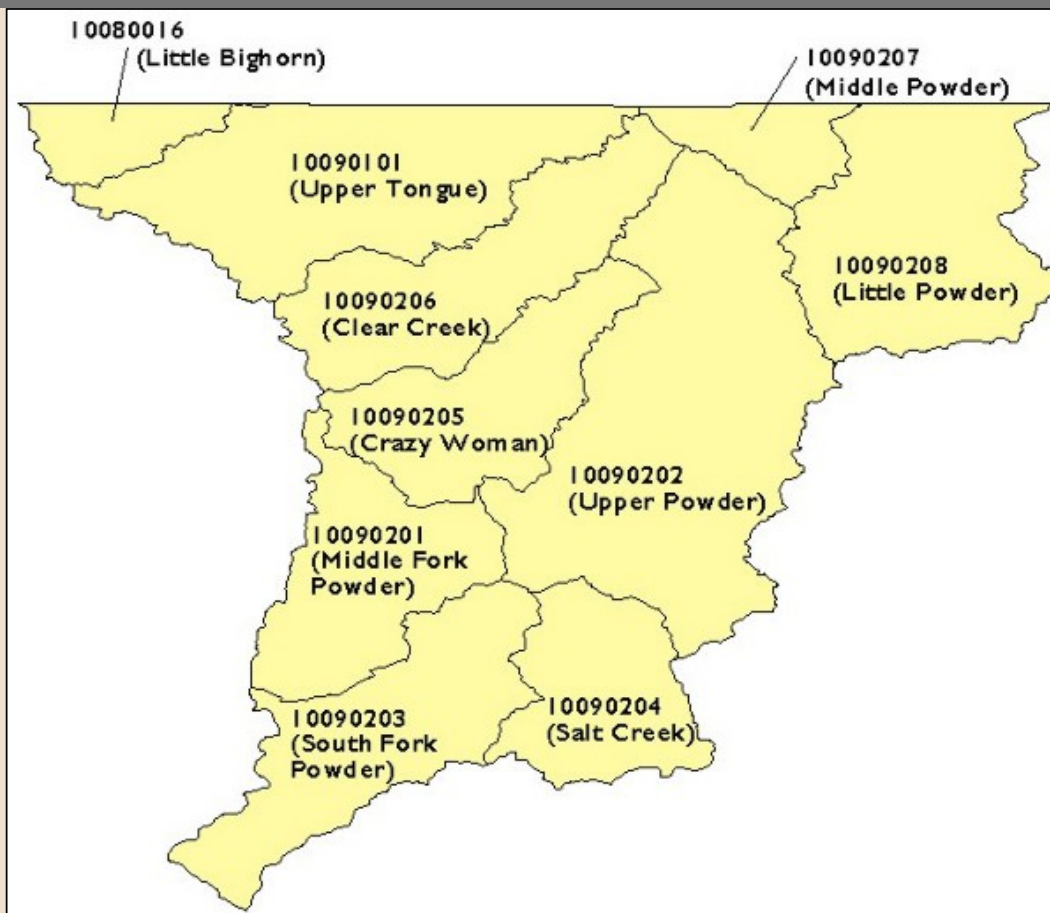
Zumberger, Jeremy, DEQ/WQD senior analyst; and Eisenhauer, Jim, DEQ/WQD senior analyst, personal interview, 7 Dec. 2001.

---

## APPENDIX A: WATER QUALITY CHARACTERIZATION

The basic water quality picture in the Powder/Tongue River Basin comes best and easiest from the DEQ through the discussions that accompany its Wyoming's 2000 305(b) State Water Quality Assessment Report. The comments are based on the Hydrologic Unit Codes (HUCs) that define the basin in drainages. (See figure below.)





Excerpts of the text from the DEQ follow:

#### **10080016 (Little Bighorn)**

*A small portion of the Little Bighorn River drainage headwaters lies within [this hydrologic unit]. The river and its headwaters tributaries drain into Montana. Except for a few main stem miles near the border, reaches in this waterbody are within the Bighorn National Forest and are reported as fully supporting all designated beneficial uses. Stream habitat inventories were collected by the Bighorn National Forest. Chapter 1 Wyoming Water Quality Rules and Regulations defines all surface waters within National Forests as Class 2, with some exceptions. Non-perennial National Forest reach miles are protected by the state as Class 2 waters. According to the WG&F Basin Plan, the Little Bighorn is believed to be a historic range for Yellowstone Cutthroat Trout, although there is little current evidence that any of these original populations exist. However, these drainages are being managed by WG&F as Unique Species fisheries, with plans to establish and maintain Yellowstone Cutthroat Trout populations in selected areas. Grazing, recreation, timbering and some recreational gold mining are the primary land uses. Fish habitat enhancement and changes in grazing management practices have addressed some past evaluation concerns about the effects of increasing sedimentation on water quality. Perennial reach miles are reported as fully supporting all designated beneficial uses. The Little Bighorn River is in the WQD Proposed Comprehensive Five Year Monitoring Plan.*

#### **10090101 (Upper Tongue)**

*...consists of a single watershed originating in the Bighorn Mountains west of Sheridan. The eastern quarter of the watershed contains non-perennial streams. The western quarter of the watershed is within the Bighorn National Forest with a portion lying in the Cloud Peak Wilderness area. Chapter 1 Wyoming Water Quality Rules and Regulations defines all surface waters within the wilderness area as Class 1; surface waters within the National Forest are Class 2, with some exceptions. Non-perennial wilderness and National Forest reach miles are protected by the state as Class 1/Class 2 waters. Land uses in the National Forest are recreation, ranching and timbering. The North Fork of the Tongue above a point source discharge has been evaluated with biological criteria being developed by WQD. This area of the North Fork demonstrates less ALUS capacity than the upper North Fork or the South Fork of the Tongue. For this report, five miles of the North Fork to the confluence with the Tongue are assessed as partially supporting ALUS. The remainder of the National Forest/wilderness perennial reach miles (235) are reported as fully supporting all designated beneficial uses. Irrigated agriculture and many active or former gravel pit operations and two large coal mines are located in the middle portion of the Tongue and/or its tributaries.*

*Goose Creek /Tongue River - Previous evaluations indicate concerns with sediment transport, vegetation decline and dissolved oxygen levels, together with other issues. At the confluence of the Tongue River and Goose Creek, both waters flow through an extensive coal mine area where both AML and the active mine owner are addressing mine fires, reclaiming subsidence pits and eroding spoil piles, including remediation of area where Goose Creek is eroding a spoils pile. In this area, AML has completed reclamation of ten Tongue River former coal mine sites known as Hidden Water and Ash Creek, and plans to complete six more. Some inactive gravel pits have either naturally revegetated or are being used as stock ponds.*

*Big Goose/Little Goose Creeks - Most of the irrigated agriculture and its supporting communities lie in the center one half of the watershed, in and west of the Big Goose Creek and Little Goose Creek drainages. Biological testing by WQD and previous evaluations listed impacts from agriculture (irrigation and confined animals) and land development. In addition, these evaluations indicated a concern with hydrocarbon contamination to Big Goose Creek from a spill. This contamination was actually a small seepage into one part of Big Goose Creek at the north end of Sheridan which was immediately and successfully remediated. No cold water fishery areas were threatened. This portion of the drainage contains active gravel pits and extensive areas of mostly reclaimed abandoned underground coal mines.*

*AML has completed reclamation of two coal mine sites and will complete one more. Approximately nine gravel pits and three coal mine sites have naturally revegetated. AML performed investigations of the area's mine sites and tailings in 1997 and proposed site reclamation plans. Reclamation permission has not been given for some sites under private control. The approximately 198 perennial reach miles in this part of the basin are evaluated as fully supporting but threatened for ALUS. The Tongue River is in the WQD Proposed Comprehensive Five Year Monitoring Plan.*

#### **10090201 (Middle Fork Powder)**

*...stream headwaters originate in the granitic materials and snowpack of the southeastern face of the Bighorn Mountains. The Middle Fork Powder River headwaters are within the Bighorn National Forest. Chapter 1 Wyoming Water Quality Rules and Regulations defines all surface waters within National Forests as Class 2, with some exceptions. National Forest non-perennial reach miles are protected by the state as Class 2 waters. The approximately 33 perennial reach miles within the National Forest are evaluated as fully supporting all designated beneficial uses. At lower elevations, streams flow through limestone, shale, sandstone and conglomerate which are a natural source of high TDS and sediment values. Land uses are primarily ranching, oil and gas development, bentonite and coal production, timbering and recreation. Approximately 13 miles of the Middle Fork Powder River in the area of Middle Fork Canyon is a WG&F Class I (highest value as a fishery resource) trout stream.*

*Beartrap Creek - a spring fed tributary of Red Fork, and the site of an historic stock use area known locally as the Government Stock Drive. During the past 100 years, the Beartrap Creek drainage has been used as a sheep and cattle route to summer pasture, although currently the primary use is by sheep. Historically, very large herds were moved through the drainage and sometimes remained there for weeks, with a recognized impact on land surfaces, riparian areas and water quality. Management practices have changed over the past twenty years. Today, stock have controlled access to creek water, are moved through very early in the season and are in the drainage intermittently for a short time in spring and fall. Water quality has steadily improved. Recent evaluation information indicates that riparian areas and stream banks are in good condition, and given the naturally occurring type of bank soils there appears to be a normal benthic community in the stream. In a cooperative effort between BLM and WG&F, log overpour structures were installed 1989 to create additional pool and riffle habitat, and by 1991 Beartrap Creek was evaluated as having good water quality with an increasing fish population. The approximately 32 perennial reach miles in this drainage are assessed as fully supporting all designated beneficial uses. Beartrap Creek is in the WQD Proposed Comprehensive Five Year Monitoring Plan.*

*AML found a number of reclaimed gravel pits in the North Fork Powder River drainage, and conducted site investigations of former gravel, bentonite and coal mining areas in the North and Middle Forks and Dry Creek drainages. North and west of Kaycee, three abandoned bentonite mines were remediated. Project work, including post-remediation monitoring, lasted from 1992 through 1996. The sites were treated with chemical amendments, mine pits were backfilled, erosion was practically eliminated by regrading and revegetating. This work resulted in a drastic reduction in sediment (clay and silt) transported into the Powder River. The Beartrap Creek - North Fork drainages (approximately 170 perennial reach miles) are evaluated as fully supporting all designated beneficial uses. The Middle Fork Powder River is in the WQD Proposed Comprehensive Five Year Monitoring Plan.*

#### **10090202 (Upper Powder)**

*...encompasses most of the Powder River main stem and except for the main stem, most reaches in this semi-arid waterbody are non-perennial. Monitoring data show many of the state's highest TDS values occur along the Powder River. Geologic materials (claystone, sandstone, conglomerate and shale) in the Powder River basin are the parent materials for fine grained, highly erodible soils, and the source of the Powder River's high sediment and TDS loads and fine sand and silt stream bed. Sturgeon chub, a native fish considered rare by WG&F and now found only in the Powder River, are believed to be adapted to and require turbid water. Primary land uses are ranching, oil and gas production and uranium/vanadium mining. Irrigated agriculture occurs along the Powder River and in the northwestern portion of the waterbody. Recent available monitoring data for the upper end of this waterbody indicate that elevated levels of sediment, mercury and cadmium may be transported into the Powder River Main Stem from the Salt Creek drainage in Wyoming Waterbody 10090204, but with available information it is not possible to determine what proportion is due to natural causes. Previous evaluations indicated concerns with a number of non-perennial reaches on the western side of the Powder River main stem below Dead Horse Creek. Data which could be used for an assessment are not available at this time. Since the 1950s, uranium and vanadium mining, in situ leaching and milling have occurred at times in the Dry Fork, Cottonwood Creek and Willow Creek drainages (all non-perennial tributaries to the Powder River), an area known locally as the Pumpkin Buttes uranium district. Pumpkin Buttes was the site of the first commercial uranium mining in the United States. The original Dry Fork channel flowed north through the middle of one uranium mine site. Because of naturally occurring soil and climate conditions, stabilization during remediation of mined areas has been an ongoing concern. The climate is semi-arid, which results in dry soils that are easily eroded by the intense spring precipitation events common to this area. Naturally occurring conditions (infrequent short duration intense rainfall, highly erodible geological parent materials) result in occasional high turbidity streamflow, intermittent standing water and sediment transport and deposition. Measurable flows from small watersheds may not occur for several years. USEPA 1998 305(b) Guidelines state that waterbodies not meeting their designated beneficial uses (for example; fishing, aquatic life) due to naturally occurring conditions (conditions not caused by or related to past or present human activity) or catastrophic conditions are not to be*

reported as water quality limited. Data are not available for the lower end of the Powder River main stem. Perennial reach miles in this waterbody are reported as unassessed for 1998. The Powder River is in the WQD Proposed Comprehensive Five Year Monitoring Plan.

#### 10090203 (South Fork Powder)

...lies mostly in Natrona County, extending into the Waltman area. The few perennial reach miles in this waterbody are primarily in the Rattlesnake Hills headwaters area of Wallace Creek, the lower portions of Willow and Cottonwood Creeks and the lower portion of the South Fork main stem. The climate is semi-arid, the soils very sandy and easily eroded by the intense spring precipitation events common to this area. Naturally occurring conditions (infrequent short duration intense rainfall, highly erodible geological parent materials) result in occasional high turbidity streamflow, intermittent standing water and sediment transport and deposition. Measurable flows from small watersheds may not occur for several years. USEPA 1998 305(b) Guidelines state that waterbodies not meeting their designated beneficial uses (for example; fishing, aquatic life) due to naturally occurring conditions (conditions not caused by or related to past or present human activity) or catastrophic conditions are not to be reported as water quality limited. Ranching and oil and gas development are the primary land uses. A large gas development project began in the Waltman area in 1997. Data which could be used for an assessment of this project and other portions of this waterbody are not available at this time. Perennial reach miles in this waterbody are reported as unassessed for 1998. The South Fork Powder River is in the WQD Proposed Comprehensive Five Year Monitoring Plan.

#### 10090204 (Salt Creek)

Midwest and Edgerton lie almost in the center of [this unit.] Land uses are primarily ranching and oil and gas production. Several natural oil seeps have been documented along Salt Creek in the Midwest area. Most reaches in this semi-arid waterbody are non-perennial. The lower portion of Salt Creek, now listed as perennial, is naturally non-perennial but decades of discharge water caused the classification change. Soils developed from fine grained sandstone and calcareous shales, are dry and easily eroded by wind or water. Naturally occurring conditions (infrequent short duration intense rainfall, highly erodible geological parent materials) result in occasional high turbidity streamflow, intermittent standing water and sediment transport and deposition. Measurable flows from small watersheds may not occur for several years. Sturgeon chub, a native fish considered rare by WG&F and now found only in the Powder River below Salt Creek, are believed to be adapted to and require the sediment and TDS load delivered in part by Salt Creek. Available monitoring data for a station on Salt Creek indicate elevated levels of manganese, arsenic and chloride but with available information it is not possible to determine the proportion due to natural causes. USEPA 1998 305(b) Guidelines state that waterbodies not meeting their designated beneficial uses (for example; fishing, aquatic life) due to naturally occurring conditions (conditions not caused by or related to past or present human activity) or catastrophic conditions are not to be reported as water quality limited. Perennial reach miles in this waterbody are reported as unassessed for 1998. Salt Creek has a CWA 319(h) federal grant project in place and is in the WQD Proposed Comprehensive Five Year Monitoring Plan.

#### 10090205 (Crazy Woman)

...headwaters are on the east side of the Bighorn Mountains. Approximately 120 headwaters perennial reach miles are in the Bighorn National Forest. Chapter 1 Wyoming Water Quality Rules and Regulations defines all surface waters within National Forests as Class 2, with some exceptions. National Forest non-perennial reach miles are protected by the state as Class 2 waters. The perennial reach miles within the National Forest are reported as fully supporting all designated beneficial uses. Land uses are primarily timbering, oil and gas development, recreation, ranching and irrigated agriculture (along the foot of the Bighorn Mountains). AML completed seventeen site investigations in this watershed, about half at locations where gravel and coal are believed to have been mined. Data which could be used for an assessment are not available at this time. Non-forest perennial reach miles are reported as unassessed for 1998. The Crazy Woman Creek watershed has been an area of concern listed in previous evaluations. Crazy Woman Creek has a watershed improvement project in place and is in the WQD Proposed Comprehensive Five Year Monitoring Plan.

#### 10090206 (Clear Creek)

Clear Creek, Piney Creek and Rock Creek headwaters in [this unit] are in granitic geologic materials in the Cloud Peak Wilderness area within the Bighorn National Forest. Chapter 1 Wyoming Water Quality Rules and Regulations defines all surface waters within wilderness areas as Class 1 waters; National Forest surface waters are Class 2, with some exceptions. Wilderness and National Forest non-perennial reach miles are protected by the state as Class 1/Class 2 waters. The approximately 250 perennial reach miles within the National Forest and wilderness area are assessed as fully supporting all designated beneficial uses. Below the Forest boundary, the main stems of Rock Creek, Piney Creek and Clear Creek are perennial but tributary reaches are non-perennial. Historic monitoring data shows an elevated sulfate level believed to be due to natural causes in the Piney Creek-Clear Creek drainage. USEPA 1998 305(b) Guidelines state that waterbodies not meeting their designated beneficial uses (for example; fishing, aquatic life) due to naturally occurring conditions (conditions not caused by or related to past or present human activity) or catastrophic conditions are not to be reported as water quality limited. Timbering, oil and gas development, recreation, ranching and irrigated agriculture are the primary land uses. Previous evaluations expressed concern with low flows and sediment transport due to irrigation withdrawals in portions of Piney Creek and Clear Creek. Piney, Rock and Clear Creeks are in the WQD Proposed Comprehensive Five Year Monitoring Plan. AML site inventory work indicates many areas of small unreclaimed coal, gravel and scoria mining sites. Data which could be used for an assessment are not available at this time. The perennial reach miles outside the National Forest and wilderness area boundary are reported as unassessed for 1998.

#### 10090207 (Middle Powder)

... covers the middle portion of the Powder River, and is the waterbody where the Powder River flows into Montana. Clear Creek,



in Wyoming Waterbody 10090206, is the last major tributary to join the Powder before the state boundary. Land uses are primarily related to ranching. AML reclaimed six sites related to coal mining. Except for the Powder River main stem, reaches in this waterbody are non-perennial. Data which could be used for an assessment are not available at this time. Perennial reach miles in this waterbody are reported as unassessed for 1998. The Lower Powder River is in the WQD Proposed Comprehensive Five Year Monitoring Plan.

### 10090208 (Little Powder)

Almost all perennial reach miles in [this unit] are in the Little Powder River main stem north of the confluence of Cottonwood Creek, although a very short distance (.5 mile) of perennial flow occurs below Moyer Spring in the southern part of this waterbody. Moyer Spring is fed by water accumulated in scoria beds, and according to the WG&F basin plan and other evaluation information, the half mile perennial section of Moyer Creek is the only coldwater fish habitat in this waterbody. A coal company working in the Dry Fork area has reclamation plans in place which will add a storage reservoir as a water source for cattle, wildlife and irrigation. Inflow will be from Dry Fork flow and groundwater. The impounded water will be released into the Dry Fork channel on demand, and it is believed that this water impoundment may improve water quantity and quality in the Dry Fork. As part of the reclamation plan, outflow water quality will be monitored for many years and provide a long term water quality record. Little Powder River and tributary headwaters are non-perennial, and located in clinker beds of the coal deposits north of Gillette and west of the Little Powder River.

Clinker beds - Clinker, also known as baked shale or scoria, is a term used to describe rock heated to different temperatures by natural, self-igniting coal bed fires which have occurred at various times during the past three million years. Local stream beds commonly contain large amounts of clinker. Clinker has distinctive color ranges--yellow-orange-red or grey-black-green- -is highly fractured, and has a high infiltration rate and resulting low water runoff. Clinker beds store large amounts of rainfall and snow melt. This water may eventually be discharged to streams, springs and aquifers. Long term erosion and infiltration of clinker beds and associated ash layers is believed to be a potential significant natural influence on soil, surface and ground water minerals, and on water quality and quantity.

In this waterbody, the most extensive land use is coal mining. Other land uses are oil and gas development, ranching and irrigated agriculture. Historic data collected at a monitoring station at the northern end of this waterbody showed dissolved selenium levels equal to the chronic value for aquatic life and elevated sulfate levels, both of which were attributed to natural causes. USEPA 1998 305(b) Guidelines state that waterbodies not meeting their designated beneficial uses (for example: fishing, aquatic life) due to naturally occurring conditions (conditions not caused by or related to past or present human activity) or catastrophic conditions are not to be reported as water quality limited. More recent evaluation data collected twice in one year showed dissolved manganese levels in excess of the human health limit. However, not enough monitoring data which could be used for an assessment are available at this time. Perennial reach miles are reported as unassessed for 1998. The Little Powder River is in the WQD Proposed Comprehensive Five Year Monitoring Plan.

(<http://deq.state.wy.us/wqd/305b/wp305.htm>, 18 Dec. 2001)

## APPENDIX B: WATER QUALITY PROGRAMS

The following table is intended to provide a synopsis of water-quality programs in operating in the Powder/Tongue River Basin. For more in-depth examination of some of the programs, see the main body of this memo.

<b>Water Quality Programs</b>				
<b>Program</b>	<b>Implementing Agency</b>	<b>Authority</b>	<b>Type</b>	<b>Program Description</b>
NPDES	DEQ/WQD	EQA Article 3 Chapter 2, 4, 7, 10, 18	SW PS	Any discharge to surface waters of the state requires a permit to discharge. Each permitted discharge must meet effluent limitations within the TMDL allocations and maintain the use of the receiving water body. There are currently 70 NPDES permits in the study area that are classified as not being a storm water permit. There are several hundred storm water permits in the study area. Information on this program is available at <a href="http://deq.state.wy.us/wqd">http://deq.state.wy.us/wqd</a> .
Permit to Construct	DEQ/WQD	EQA Article 3 Chapters 3, 5, 11, 12, 15, 20	SW GW PS	Any public water supply system or any facility capable of causing or contributing to pollution is required to obtain a permit to construct prior to commencing construction. This program is directed at ensuring facilities are designed, constructed and operated to protect ground water and surface water resources. Chapter 5 requires certified operators for public water and sewage facilities.



Nonpoint Source Management and Control	DEQ/WQD	EQA Article 3, Section 319 of CWA	SW GW NPS	The state nonpoint source control program is a voluntary and incentive based program. The program seeks to control through education and encouragement of Best Management Practices, including demonstration, information and education, and restoration projects. Assessments and demonstration projects are selected for funding by the Wyoming Nonpoint Source Task force. The NPS Program manages Wyoming's allocations provided as grants by Section 319 and 205(j) of the Clean Water Act. Wetlands program uses a certification process to approve or deny federal permit actions concerning wetlands. Wetlands banking was established to expedite permitting. It allows industry, landowners, or others to build credits for the construction, restoration or enhancement of wetlands. These credits can be bought and sold as a means to expedite the mitigation of wetland impacts. The Nonpoint Source Management Plan is available at <a href="http://deq.state.wy.us/wqd">http://deq.state.wy.us/wqd</a> .
Water Quality Assessments & Impaired Surface Water Bodies	DEQ/WQD	EQA Article 3, S. 305(b) & 303(d) of CWA	SW GW NPS PS	Section 305(b) of the Clean Water Act requires each state to assess and report on the quality of waters on a 2 year frequency. Section 303(d) requires each state every two years to list water bodies which are water quality impaired or threatened. This report and list are available at <a href="http://deq.state.wy.us/wqd/watershed/00902-doc.pdf">http://deq.state.wy.us/wqd/watershed/00902-doc.pdf</a> .
Surface Water Monitoring	DEQ/WQD	EQA Article 3	SW PS NPS	The WQD is progressing toward a more comprehensive monitoring and assessment program. In 1996, the Legislature passed a credible data law requiring the WQD to ensure all data used in listing impaired or threatened waters requiring scientifically valid data to be used. This credible data law has significantly increased monitoring of surface water in Wyoming. Monitoring efforts by WQD to comply with the credible data law are contained in the 305(b) report.
404 Permit	US Army Corps of Engineers	Clean Water Act	SW PS NPS	A permit is required from the Army Corps of Engineers to discharge dredge or fill material into navigable waters.
401 Certifications	DEQ/WQD	EQA Article 3	SW PS NPS	Any application for a Army Corps of Engineers 404 dredge and fill permit requires a certification from WQD that the dredge or fill will comply with all the requirements of Sections 301, 302, 303, 306 & 307 of the Clean Water Act.
Spill Program	DEQ/WQD	EQA Article 3 Chapter 4	SW GW PS	Any person owning or having control over oil or a hazardous substance, which after release, enters or threatens to enter waters of the state shall take action to stop and contain the release, notify WQD, correct the cause, clean up the release and dispose of the waste in an acceptable manner.
Source Water Protection	DEQ/WQD	EQA Article 3	SW GW	Wyoming has developed a voluntary source water protection program as required by each state under Section 1453 of the SDWA. Source water assessment involves four steps: delineate the area which contributes water to the well or surface water intake; inventory of potential sources of contamination; complete an analysis of the susceptibility of the well or intake to contamination from the previous inventory; and draft up a report summarizing the findings.

Wellhead Protection Program	DEQ/WQD	EQA Article 3	GW	Wyoming has developed and received approval from EPA endorsing its wellhead protection program developed pursuant to Section 1428 of the SDWA. The program is voluntary and allows public water supply systems to protect groundwater sources of supply.
Underground Injection Control Wells	DEQ/WQD DEQ/LQD OGCC	EQA Article 3 Chapters 13 & 16 Article 4 W.S. 30-5-101 thru 305	PS GW	<p>Any person who construct, installs, or operates a Class I, IV, or V underground injection control well must first obtain a permit from the DEQ/WQD. Class I wells are deep injection wells that discharge into a Class VI groundwater formation and include hazardous waste wells of which there are none in Wyoming. Commercial Class II wells are regulated as a Class I well. Class IV wells inject hazardous waste into shallow aquifers and are prohibited. Class V wells are wells other than the other 4 classifications, injecting into or above underground sources of drinking water such as drain fields, air conditioning return wells, dry wells, etc.</p> <p>Any person injecting into a Class III well must obtain a permit or license from DEQ/WQD. A Class III well injects into or above a drinking water for the purpose of extracting minerals. The most common in situ mining wells in Wyoming are uranium and soda ash.</p> <p>Any person injecting into a noncommercial Class II well is required to obtain a permit from the Wyoming Oil and Gas Conservation Commission. Class II wells inject fluids which are brought to the surface in connection with natural gas storage operations or conventional oil and gas production, fluids for enhanced recovery of oil or natural gas and for storage of hydrocarbons.</p>
State Pesticide Management Plan (SMP)	WY Dept. of Agriculture	W.S. 35-7-350 thru 374	NPS SW GW	The Department of Agriculture has developed a SMP directed at the protection of water resources from the application of pesticides. The SMP program has received EPA approval.
SMP GW Monitoring	WY Dept. of Agriculture	W.S. 35-7-350 thru 374	GW	Utilizing pesticide registration fees and funding from 319 grants, the USGS has been contracted to conduct a statewide assessment of the contamination of groundwater caused by pesticides. Of the counties completed at the time of this report, no levels above drinking water maximum contaminant levels have been found. Monitoring results can be accessed at <a href="http://wy.water.usgs.gov/projects/tests/pesticides/.html">http://wy.water.usgs.gov/projects/tests/pesticides/.html</a> .
Mines	DEQ/LQD	EQA Article 4	PS NPS SW GW	License or permits are required for any mining operation or operation by which solid minerals are intended to be extracted from the earth. This includes surface and underground mining. The extraction of sand, gravel, dirt, scoria, limestone, dolomite, shale, ballast, or feldspar by a landowner for noncommercial use does not require a permit nor does an area of less than 10 surface acres under certain conditions.

Abandoned Mines	DEQ/AML	Article 12	PS NPS SW GW	The abandoned mines program accomplishes reclamation of eligible properties adversely affected by mining prior to August 3, 1977. Eligible Public facilities and utilities adversely affected by mining prior to August 3, 1977 and the construction of new public facilities or utilities in communities impacted by coal or mineral mining and processing practices.
Landfills & Hazardous Wastes	DEQ/SHWD	EQA Article 5	PS SW GW	No person, except when authorized by a SHWD permit, shall locate, construct, operate or close a solid waste management facility or modify the design, construction or operation of a solid waste management facility. The SHWD has primacy of the federal RCRA program regulating hazardous waste generators and transporters, hazardous waste treatment, storage and disposal facility operators, and hazardous waste corrective actions. EPA regulates superfund sites in Wyoming.
Superfund Sites	USEPA	CERCLA		
Well Construction & Abandonment	WY State Engineer (SEO)	SEO Regulations	PS GW	The state engineer has regulations requiring adequate design, construction and abandonment of wells to protect groundwater resources.
Wellhead Protection Program	DEQ/WQD	EQA Article 3	GW	Wyoming has developed and received approval from EPA endorsing its wellhead protection program developed pursuant to Section 1428 of the SDWA. The program is voluntary and allows public water supply systems to protect groundwater sources of supply.
Underground Storage Tanks	DEQ/WQD	EQA Article 14	PS SW GW	Wyoming has primacy of the federal RCRA program regulating underground storage tanks (UST). This program regulates the design, construction and operation of USTs and provides financial responsibility for UST and commercial above ground storage tank owner/operators. In addition, a cleanup fund exists to remediate contamination caused by leaking USTs.
Watershed Planning	Wyoming Association of Conservation Districts	Clean Water Act	SW	Districts throughout the state have had an interest in providing watershed planning in lieu of the imposition of TMDLs in the interest of imposing local control in place of federal action. Their actions range from the establishment of baseline water quality data to creation and implementation of Best Management Practices to improve water quality and ongoing monitoring.
National Water Quality Assessment	USGS	1991 USGS (Dept. of Interior)	SW GW	To address the need for consistent and scientifically sound information for managing the Nation's water resources the U.S. Geological Survey began a full-scale National Water-Quality Assessment (NAWQA) Program ( <a href="http://water.usgs.gov/nawqa/">http://water.usgs.gov/nawqa/</a> ) in 1991. This program is unique compared to other national water-quality assessment studies in that it integrates the monitoring of the quality surface and groundwaters with the study of aquatic ecosystems. In more than 50 major river basins and aquifers covering nearly all 50 states, USGS scientists collect and interpret data about water chemistry, hydrology, land use, stream habitat, and aquatic life.

Pathogen Indicator Synoptic Study	USGS		SW	<p>As part of the Yellowstone Study Unit surface-water-quality assessment, a synoptic for pathogen indicators was planned for summer 2000. Additionally, this synoptic provides the potential to couple with a planned ground-water land-use study (rural ranchettes) that will be addressing similar issues although the sampling timeframes are different. The pathogen study is planned for the Wind/Bighorn River and Goose Creek Basins.</p>
Pesticide Monitoring Program	USGS		GW	<p>As part of the Yellowstone Study Unit surface-water-quality assessment, a synoptic for pathogen indicators was planned for summer 2000. Additionally, this synoptic provides the potential to couple with a planned ground-water land-use study (rural ranchettes) that will be addressing similar issues although the sampling timeframes are different. The pathogen study is planned for the Wind/Bighorn River and Goose Creek Basins.</p>
Coal Bed Methane Water Disposal Study	EPA		SW	<p>The federal agency is performing an economic analysis to assess disposal options for CBM produced water. This will help establish the Best Available Technology (Economically Achievable) that will guide NPDES permits where the EPA still has primacy. It also has the capacity to be applied more generally wherever CBM-related NPDES permits are required (like in Wyoming).</p>

[To the 2002 Powder/Tongue River Basin Water Plan](#)