EXECUTIVE SUMMARY

MISSION

The mission of the Shoshone River Watersheds Steering Committee is to support voluntary land use and other practices within urban, suburban, agricultural, and wild-land areas that will address human influenced water quality issues related to non point source pollution within the Shoshone River watersheds. Consideration will be given to historic, custom, cultural, and natural background influences within the watersheds. These activities will be aimed at improving water quality and associated natural resources while preventing the need for government regulatory agency enforcement actions.

PURPOSE

The purpose of the Shoshone River Watersheds Plan is to:

1. Evaluate and summarize the overall condition of the Shoshone River watersheds, considering historical, current, and possible future land use practices and hydrology;
2. Initiate proactive voluntary efforts thereby maintaining local stewardship and avoiding potential State and Federal regulatory actions due to water quality concerns;
3. Document existing Best Management Practices (BMPS) within the Shoshone River Watersheds and continue development and use of existing BMPs, as well as other practices that benefit watershed health and water quality;
4. Research options for improving and maintaining water quality and overall watershed health while maintaining a focus on voluntary and incentive based installment of Best Management Practices (BMPs) for water quality enhancement;
5. Continue and/or expand basic water quality monitoring activities within the Shoshone River watersheds to evaluate the impacts of the watershed planning processes on water quality
6. Develop and maintain a positive cooperative relationship between stakeholders, agencies, and others with vested interest in the watershed.
7. Facilitate the implementation of goals and objectives of this watershed plan.
8. Provide a forum for dynamic, long term watershed planning.

CLEAN WATER ACT

The Clean Water Act (CWA) was adopted by Congress for two primary purposes. That is to:

- Restore and maintain the chemical, physical, and biological integrity of the nation's waters; and
- Where attainable, to achieve water quality that promotes protection and propagation of fish, shellfish, and wildlife, and provide for recreation in and on the water. This goal is commonly expressed by the phrase "fishable/swimable".

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

In order to ensure compliance with the CWA, the State of Wyoming is required to adopt water quality standards (laws or regulations) to enhance water quality and protect public health and welfare. Under Section 305(b) of the CWA, the State of Wyoming must also report on the condition of their water(s) to the U.S. Environmental Protection Agency (EPA) once every two years. This report, prepared by the Wyoming Department of Environmental Quality (WDEQ), is known as the 305(b) report. Under section 303(d) of the CWA, States must identify those waters within its boundaries that are not meeting the water quality standards ("impaired waters") applicable to that waterbody based on its designated use(s). A designated use is that use that a waterbody is capable of attaining although it may or may not be currently attained by that specific segment or body of water. States are required to address impaired waterbodies by establishing water quality standards and pollution control activities designed to achieve and maintain the designated uses.

CONSERVATION DISTRICT'S ROLE

Following the enactment of the Clean Water Act (CWA), the U.S. EPA has delegated water quality assessment and regulatory responsibilities to the Wyoming Department of Environmental Quality (WDEQ) which is the regulatory agency responsible for enforcement of the CWA as it applies to Wyoming waters. Local Conservation Districts, by statutory authority, have assumed the responsibility of leading information and education programs and providing technical and financial assistance to their constituents to conserve Wyoming's natural resources, and to protect the quality of life of all Wyoming citizens. Conservation Districts serve as a liaison between WDEQ and local land mangers within the Shoshone River Watershed to address water quality concerns and to investigate historical, custom, cultural, and background conditions as they apply to environmental compliance with regard to water quality standards. The Cody and Powell Clarks Fork Conservation Districts have also endorsed the formation of the Shoshone River Watershed Plan Steering Committee to develop a locally-led, comprehensive watershed management plan to improve water quality while preserving the economic sustainability of activities and maintaining multiple use within the Shoshone River Watershed.

WDEQ 303(d) LIST OF IMPAIRED WATERBODIES

Currently, Shoshone River is on the Wyoming 2004 Section 303(d) List, Table C: 303(d) waterbodies that are threatened but lack credible data sufficient to warrant classification as impaired. A Non-Point Source (NPS) water quality impairment requires either a local watershed planning effort or a Total Maximum Daily Load (TMDL), given there is credible data to indicate that the stream reach does not support all of its designated uses. If a waterbody is designated for protection of primary contact recreation (any recreational or other surface use of the water that could be expected to result in ingestion of the water or immersion), the water quality standard for the State of Wyoming states that fecal coliform concentrations shall not exceed a geometric mean of 200 (under current standards) fecal groups per 100 milliliters (based on a minimum of 5 samples, taken during separate 24 hour periods, in a 30-day time span). These standards are currently being used by WDEQ and it is recognized that they may change in time.

A New proposed standard is under consideration that would use E. Coli in lieu of fecal coliform and that would create primary and secondary contact recreation standards. If a water body is designated for protection of secondary contact recreation (any recreational or other surface water use in which contact with the water is either incidental or accidental and that would not be expected to result in ingestion of the water or immersion) E. coli concentrations cannot exceed 630 organisms per 100 milliliters of water based on a minimum of not less than 5 samples obtained during separate 24 hour periods for any 30-day period. Waters on table "A" must meet the guidelines for primary contact recreation unless otherwise noted during the recreational period of the year (May 1 through September 1). Waters not listed in table "A" must meet the requirements of Secondary Contact Recreation. During the period of October 1 through April 30 primary contact recreation streams need meet only standards of secondary contact. This water was initially listed in 2002 based on a USGS one time sample.

MONITORING ACTIVITIES

PUBLIC AWARENESS

Powell-Clarks Fork (PCFCD) and Cody (CCD) Conservation Districts hosted a public meeting in 2006 to inform the public and the land managers within the Shoshone River Watershed of the 303(d) listing issue and to discuss possible solutions. The Districts invited presenters to explain potential implications of the listing of Shoshone River and the attendees were informed of the option of a local watershed assessment and planning effort being acceptable to WDEQ to address the water quality impairment. The presenters included representatives of Wyoming Association of Conservation Districts (WACD) and The Natural Resource Conservation Service (NRCS). The majority of the citizens attending these meetings agreed that CCD and PCFCD should provide leadership to move forward with a locally led watershed assessment and planning effort. In addition, approximately 14 citizens agreed to serve on an advisory group to provide leadership for the watershed assessment and planning process. Additional meetings were held among Conservation District staff and board members, Natural Resource Conservation Service (NRCS) staff and Shoshone River Watersheds Steering Committee members (hereafter referred to as the Committee). The Committee was formally created

in February 2007. The Shoshone River Watershed Steering Committee has continued to work with Conservation Districts and the NRCS to finalize the Shoshone River Watershed Plan.

The Shoshone River Watersheds Plan will be available for public comment before being submitted to WDEQ for final approval. Once the watershed plan is adopted by WDEQ, the Shoshone River Advisory Group and PCFCD and CCD will continue with implementation of the plan and continue to work towards the goal of removal of Shoshone River from the WDEQ 303(d) list of impaired waterbodies.

BACKGROUND INFORMATION

SHOSHONE RIVER WATERSHED DESCRIPTION

HISTORY

The Shoshone River Watershed makes up about 1.75 million acres and lies within the Big Horn Basin. The Big Horn Basin is a large depression that sits in north central Wyoming. The size of the basin is roughly 10,000 square miles and the basin is bounded by the Beartooth, Absaroka, Washakie, Owl Creek, Big Horn, and Pryor mountains. The Basin opens at its north end as it enters Montana (Lageson and Spearing, 1988). These mountain systems were generally uplifted during the Laramide orogeny. This mountain building period is generally accepted as ending 35 – 50 million years ago. The basin has three major geologic "zones". The first is made up of the high mountains that ring the basin. The mountains are Precambrian "basement rocks" that have been uplifted such that much of the other strata above them have been eroded away. These rocks, once the lower pieces of the continent, are now the highest points in basin.

The second geologic section of the basin is the "shoulder" section that sits between the mountains and the lower flat basin expanse. This section runs from five to ten miles wide and forms a series of hills and benches at the foot of the higher mountains. These shoulders are made of younger aged materials, typically sedimentary, such as the famous red Chugwater formation from the Triassic period.

The nature of the basin continues to change as it approaches the center of the basin, where materials again decrease in age. The center of the basin is mostly the Paleocene Fort union formation and the Eocene Willwood formation, the latter corresponding with the Wind River and Wasatch formations common in the rest of Wyoming.

As you progress through the basin you see dramatic changes in geology and therefore the associated deposited materials. Higher elevations tend to have materials that are more difficult to erode, larger sizes of materials, and higher energy streams. The lower sections of the basin have more easily erodable small materials, but also have generally decreased stream energy to move these materials. The result is a system that methodically moves materials from the mountains, depositing larger stones and materials as it loses energy with associated losses in elevation. As it moves through the basin it begins to erode and transport the finer grained materials of the Eocene. The changes can be seen in the stream bed-loads within the basin. As you move from the mountains, the

beds tend to become increasingly silty and lose much of the sand, rock, and gravel, that armor streambeds in the higher basin. Larger streams maintain these coarser materials longer, and therefore tend to have larger size materials in their beds. This is important as these materials help to armor streambeds, trap smaller particles, and create fishery habitat.

The headwaters of the Shoshone River Watershed lie in the Absaroka Range. The Absaroka Range is a rugged 155 mi long northwest trending mountain range in northwestern Wyoming and southwestern Montana and forms the core of the Absaroka volcanic providence (Sundell 1993). The Absaroka volcanic providence is composed chiefly of Eocene andesitic volcanic rocks including sandstone, siltstone, claystone, conglomerate, and breccia. Volcanism occurred between 53 and 38 million years ago when 10,000-ft high andesitic stratovalcanos formed and were rapidly eroded and redistributed into a 6,000 ft thick blanket of reworked, epiclastic volcanic rocks. The present erosion cycle carves a spectacular, rugged, mountainous topography into a thick volcanic pile that overlies a Paleozoic, Mesozoic and Tertiary sedimentary and tectonic basin. An important feature of the Absaroka Range is the occurrence of ubiquitous mass wasting phenomena. Rock slides, rockfall, slump, earthflow, mudflow, soil creep, and virtually all combinations of and transitions between these processes are common, particularly in the southeastern Absaroka Range encompassing the Shoshone River watershed.

Within the Shoshone River Watersheds elevation ranges from 12,244 to 3,640 feet, a change of nearly 9,000 feet in elevation from highest to lowest points. Precipitation in the basin ranges from as high as 60 inches per year in the high mountain headwaters to less than 6 inches per year in parts of the dry basin (Wyoming Water Atlas, 1990). As a result, there are interesting and varied processes affecting the geomorphology (the geologic study of landscape evolution over time) in the basin. The upper mountain areas have high energy streams that easily move materials that are deposited by active hillslope geomorphic processes. This creates a steep, rugged, and beautiful landscape that is characteristic, and even defines Wyoming's mountain systems. The geomorphology in the lower elevations of the basin is less spaectacular but equally important in defining the look and shape of the landscapes. Low precipitation contributes to low vegetative cover. This is combined with soft sedimentary rocks and flashy precipitation. The result is a natural high desert environment that is prone to erosion. Sheet, rill, gully, and wind erosion are all present. High rates of erosion, slow rates of soils formation and limited precipitation combine to form an environment where change is easily noted and amplified. It is difficult or impossible to say what level of geomorphic change would be considered "natural" in the basin, but anthropogenic (human induced) practices have significant capacity for positive, and/or negative impact on those rates of change.

The soils of the watershed are reflective of the natural environment and the geomorphic history of the area. All soils reflect their formative environment, the climate, vegetation, relative topography, parent material, and formation time. As expected, the mountain soils tend to be coarse in nature, having higher levels of sand and gravel. These soils are the result of alluvial, hillslope, and fluvial deposits that remove many fine materials. The soils of the basin section of the watershed are varied. It is not uncommon to find sandy, rocky, clayey and loamy soils in close proximity to each other. Soils

within agricultural areas have generally been mapped by the USDA NRCS. The NRCS and other agencies house these data.

People have lived in the Shoshone River Watershed for more than 11,000 years (Frison, 1993). The Mummy Cave Site on the North Fork of the Shoshone River showed 38 different culture levels dating back 9,500 years (McCracken, 1978). The "Boulder Ridge sheep trap, a complex of drive lines" on the South Fork of the Shoshone River is evidence of early human manipulation of the environment (Frison, 1978). The Horner Site on the Shoshone River dates to 9,400 years B.P. and includes materials from north Dakota (Knife River Flint), northwest Wyoming (Hartville Uplift Chert) and the Texas Panhandle (Alibates dolomite)(Frison, 1991). The Horner site is considered a buffalo procurement and slaughter site. Geologic study indicates no landform that would serve as a natural trap. " The presence of some sort of corral structure similar to buck fence has been postulated" (Frison, 1991). In 1808 George Drouilard drew a map for William Clark and said "the Ap-sha-troo-kee band of Crow Indians winter here (at the convergence of the North and South Forks of the Shoshone River) where there is an abundance of dry grass on which there horses live during the winter" (Nabokov & Loendorf, 2004). That the Shoshone River Watershed was considered Crow country was codified in the Fort Laramie Treaty of 1851.

White trappers undoubtedly visited the area on occasion, including John Coulter, Jeremiah Johnson, Jim Bridger and others. John Coulter went through the watershed in an area commonly known as "Coulter's Hell". This site was the location of the original town of Cody. Coulter was known to have explored portions of the South Fork of the Shoshone and to have crossed the mountains here to the Yellowstone area. Jim Bridger led wagon trains through the area. There was a crossing of the Shoshone River approximately 8 miles east of Powell. The names of some of these pioneers can be seen in the sandstone cliffs south of Cowley.

The first settlers in the valley were ranchers. Henry Clay Lovell ventured in to the basin in 1882 and 1883. M&L (Mason Lovell) was a large ranch in the late 1800's, and resided in the eastern portions of the watershed. At its peak the ranch ran some 25,000 to 30,000 head of cattle within the Big Horn Basin. As early as 1888 this same ranch began experimenting with moving cattle to summer ranges in the Big Horn Mountains. The M&L ranch was eventually sold in 1909. The Western portion of the watershed had ranches that included the Valley, TE, and Carter ranches, all of which were associated with William "Buffalo Bill" Cody.

Around 1900 Gov. DeForest Richards (at the behest of William Cody), knowing of Mormon irrigation expertise had the Secretary of State, Fennimore Chatterton, issue an invitation to church leaders from Utah and Idaho to set up irrigation systems in the Basin. In a personal visit to Salt Lake City the invitation was made. The Mormons were instructed by their president, Lorenzo Snow, to colonize the basin. A group of 13 men made a journey to explore the basin for colonization. A call for volunteers brought 200 Mormons, led by Byron Sessions and Charles A. Welch. Early Mormon projects included a highway from Cody to Yellowstone, a railroad from Montana to Cody, and the Sidon Canal. Other notable irrigation endeavors included the Cody and Lakeview Canals.

In 1904 irrigation improvements in the valley again grew with the Bureau of Reclamation building the Shoshoni Dam, Later called the Buffalo Bill Reservoir. The

construction of the dam led to the eventual creation of the Shoshone, Deaver, Willwood, and Heart Mountain irrigation districts.

The land use within the watershed is varied. Private land owners account for about 466,000 acres. State management is significant at around 54,000 acres, including trust lands, wildlife management areas, and state parks. Federal land management makes up the bulk of the acreage with over 1.2 million acres. The Bureau of Land Management controls the greater portion of the federal lands within the lower basin (421,000 acres) with the National Park Service (22,000 acres) and Forest Service (773,000 acres; 563,000 of which are in federally designated wilderness) also managing large areas. The Forest Service manages the bulk of the public land within the upper more mountainous sections of the watershed.

Urban areas are represented by the municipalities of Cody (population 8,539), Powell (5,687), Lovell (2,131), Byron (470), and Cowley (477), as well as smaller communities such as Deaver, Frannie, Wapiti, Garland, and Ralston. All of the major municipalities have wastewater treatment facilities. (Rural population numbers see census and develop pie chart) Drinking water supplies for all of the communities and a large part of the rural inhabitants, are supplied by the Shoshone Municipal Pipeline, the exception being some areas upstream of the Buffalo Bill Reservoir. The water treatment facility is located west of Cody and derives its water from the Buffalo Bill Reservoir. The agronomy of the area is based on such crops as alfalfa, sugar beets, dry beans, corn, malting barley, small grains and pasture crops. Seed crops are significant and include alfalfa, beans, and grasses (both native and domestic). Major livestock production includes cattle, sheep, and horses. There are 224,000 acres of irrigated agriculture, and roughly 1.5 million acres of rangeland. The majority of the rangeland within wilderness areas is utilized almost exclusively for recreation and wildlife, whereas commercial grazing is the prominent use of other rangeland.

Wildlife and Recreational Natural Resources

Recreational use, including hunting, camping, boating, wildlife viewing, hiking, horse back riding, off road vehicle use, and fishing, are significant within the watershed and make up an important part of the economy within the basin. The area is a destination for recreationists from throughout the world.

Big game populations are significant in the watershed. Numbers are not tracked on a watershed basis, but the population is healthy. Statewide the number of elk herds is 35, with over 90,000 individuals. Mule Deer numbers have declined since a peak in the 1930's-1950's, but they remain a prevalent game animal. Other utilization of terrestrial natural wildlife resources in the area include but are not limited to antelope, moose, bighorn sheep, whitetail deer, predators, furbearers, small game hunting, bird watching, etc. (Economic numbers, Tex Taylor, Check with steering committee, Game and Fish) There are several terrestrial species of specific concern within the watershed that have the potential to impact local use and the economy. The Gray Wolf, Grizzly Bear, Sage Grouse, Bald Eagle, and possibly lynx, can all be found in numbers that could be considered significant, based on their potential to impact land use and management decisions within the watershed.

Aquatic wildlife in the watershed is also diverse, and its management and conservation are important to the overall quality of the environment and life within the basin. Sport fisheries generally concentrate on trout fishing. Within the watershed, streams containing trout are prevalent. Trout can be found throughout the watershed. The North Fork and the Shoshone River from the Buffalo Bill Reservoir to the Willwood Dam are classified as Blue Ribbon trout fisheries by the State (Wyoming Game and Fish Stream and Lake Inventory). The Buffalo Bill Reservoir and its management are very important to trout habitat.

Issues

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Yellowstone Cutthroat Trout are considered a species of concern within the watershed. As a trout fishery, the Shoshone River drainage was historically and exclusively "Native" Yellowstone Cutthroat range. Three conservation populations of Yellowstone Cutthroat Trout (May et. al, 2003) are present within the watershed. Rainbow, Brown, Lake, and Brook Trout have been stocked and become naturalized within the watershed. Kruse (1997) has shown hybridization occurring in many of the tributaries. The earliest recorded stockings of exotic salmonids occurred in 1915 (Lenihan 1915, 1916) and were Rainbow. Major impoundments include the Buffalo Bill Reservoir, Newton Lakes, Beck Lake Complex, Deaver Reservoir, and others within Park County. (Look at page 75, plate 22 resident fishing)

In addition to private land owners, many interested groups have participated in activities to improve overall conservation and/or recreational opportunities within the watershed and Big Horn Basin as a whole. Those groups include, but are not limited to: The Rocky Mountain Elk Foundation, The Shoshone Project Irrigation Districts, The Greater Yellowstone Coalition, Backcountry Horseman, The Nature Conservancy, Trout Unlimited, the Foundation for North American Wild Sheep, the Park County Recreation Districts, Big Horn Basin Resource Conservation and Development, and others. These groups have representation in the local communities.

Members of the East Yellowstone Chapter of Trout Unlimited (TU) participated actively in this planning process with the goal of helping to "Preserve, Protect and Enhance Coldwater Fisheries in the Big Horn Basin". The Shoshone River listing was of particular concern to TU because of the watershed's population of native Yellowstone Cutthroat trout.

Wildlife resources, and their associated value to individuals, communities, agencies and organizations have been, and will continue to be important within the Shoshone River Watershed.

Climate

The climate of the area is largely dessert in nature. The average annual precipitation is less than seven inches per year, and has varied from as little as three inches to as much as eleven. Temperature extremes range from 51 degrees below zero to 112 degrees Fahrenheit.

Soils

Agricultural land is generally loam type soils, but there is commonly heavy clay in subsurface layers, adding to poor drainage. All of the irrigated areas have been mapped by the NRCS, but the mapping is old and in non-digital format. Some saline soils exist within the districts and the salinity is sufficient to impair use.

Minerals

There are mining operations in the watershed including bentonite, gypsum and gravel. Other mineral development is oil and gas exploration and development. Coal bed methane exploration is beginning to progress. Multiple bentonite plants exist in the watershed and a wallboard manufacturing plant is located in Cody. The mineral extractive industries are important to the local economies in the watershed.

PREVIOUS STUDIES AND WORK PERTINENT TO THIS WATERSHED PLAN

The Conservation Districts, along with the NRCS, federal agencies, and interested groups have assisted with many voluntary projects. Within the Shoshone Watershed, conservation districts have participated in implementing activities including but not limited to sprinklers, gated pipe, concrete ditches, and flood irrigation systems, drainage systems, well development, spring development, well monitoring, land leveling, pipelines, off-site water, riprap for erosion control, sand gates, head-gates, diversion dams, water measuring devices, and other water management tools, small reservoir development, upland vegetation habitat improvement projects, riparian area and wetland improvements, stream-bank re-vegetation, implementation of Animal Feeding Operation (AFO) and Confined Animal Feeding Operation (CAFO) improvement projects, Continuous Conservation Reserve Program (CCRP) projects, post-burn rangeland reclamation, forest improvement projects, and other best management practices for range improvements. In addition, invasive species projects have also been undertaken in cooperation with Park County Weed and Pest Control District. Over the recorded history of the watershed, as technology has changed and increased knowledge of environmental and scientific concerns has become available, management practices have adapted and changed as well. The use of management practices has been and will continue to be predicated on the economic feasibility of implementation.

Other activities related to conservation have been undertaken by groups such as Trout Unlimited. Some of these have included fall fish rescue efforts with the assistance of local irrigation districts, an annual Shoshone River clean-up, trail improvements to increase stream access, installing fish screens on irrigation structures, fish passages, assisting with forest service sponsored small dam renovations, and other projects.

ADD note from Kari – see highlighted below
The National Forest portion of the watershed, North Fork Shoshone River (10080012) and the south Fork Shoshone River (10080013), lie above the Bighorn Reservoir and are dominated by designated wilderness areas (Washakie and North Absaroka).

These watersheds are characterized as snow dominated with a single peak discharge occurring in the mid to early June. Summer thunderstorms are capable of short duration spikes in the hydrograph with instantaneous peaks on the North Fork reaching as high as 20,000 cfs and on the South Fork 10,000 cfs. Base flow for each of these drainages can be as low as 100 cfs and 50 cfs respectively. Because stream flow is a function of snowpack, annual flows are variable.

Natural sediment source areas include erosion from uplands and scouring of stream banks. Both snow and rainstorm derived flows carry large amounts of sediment. Volumes are mobilized during the snowmelt season and summer thunderstorms.

Water chemistry in the North Fork is controlled predominately by chemical weathering that takes place below the soil surface and in the altered rock zone with differing chemical process occurring for both pack and base flows. However, water chemistry is also driven by individual rain storms (Miller 1974). Furth physical, chemical and biologic analysis was conducted in 1993, 1994, 1995 and 1996, and no water quality issues were identified (Schriener, Benvenger, King, & Johnson et al).

Specific this watershed assessment is the bacterial water quality investigations which occurred on the North Fork. In 1979, bacteria concentrations were described as low, with no State water quality violations. However, elevated (not exceeding) pathogen levels did occur below certain lodge facilities. Wildlife use in the upper areas of the watershed were described as being the major source of bacteria with fewer contributions coming from human impacts. In 2006 and 2006, bacteriological water quality was again studied. Part of the basis for the study was its status as a highly valued and heavily used recreation area that serves as a major travel route for Yellowstone National Park visitors. However, its extensive use also elevates the potential for water quality deterioration. Water samples were collected on the mainstem of the North Fork as was as its tributaries. Samples were collected both above and below heavily used recreation areas (i.e., lodges, trailheads, administrative site, and administrative boundaries). There were no State of Wyoming water quality violations. This project was developed with the assistance of the Wyoming Department of Environmental Quality and results were submitted to them.

CONSERVATION DISTRICT AUTHORITY FOR WATERSHED PLANNING PROCESS

Under Wyoming Statute, 11-16-103 Legislative declarations and policy, the conservation districts have the authority to "provide for the conservation of the soil and water resources of this state, and for the control and prevention of soil erosion and for flood prevention or the conservation, development, utilization, and disposal of water, and thereby to stabilize ranching and farming operations, to preserve natural resources, protect the tax base, control floods, prevent impairment of dams and reservoirs, preserve wildlife, protect public lands, and protect and promote the health, safety and general welfare of the people of this state." The conservation districts in the Shoshone River watershed are Cody, Powell Clarks Fork, and Shoshone conservation districts.

Wyoming Statute 11-16-122 (b) authorizes the Conservation Districts to "conduct surveys, investigations and research and disseminate information relating to . . . the conservation, development, utilization and disposal of water. . . in cooperation with the government of this state or its agencies . . . (v)," to "develop comprehensive plans for . . . conservation of soil and water resources . . .[that] specify in detail the acts, procedures, performances, and avoidances necessary or desirable to carry out the plans (xvi)," and to "make public the plans and information and bring them to the attention of owners and occupiers of land within the district (xvii)."

In 1996 Wyoming Conservation Districts, the Natural Resources Conservation Service and the Wyoming Department of Agriculture saw an increasing need for Conservation Districts to represent local interests and take the lead in watershed planning efforts. As a result they developed the Watershed Strategic Plan to guide watershed planning efforts across the state. This document insists that "any Watershed effort led by a conservation District should be landowner driven. . .[and] any participation on behalf of any landowner is strictly voluntary." By taking an active role in the planning process, the Shoshone River Watershed landowners and the local Conservation Districts have adhered to this principle. The landowners have followed the steps for watershed planning as outlined in the Watershed Strategic Plan. They have identified and prioritized concerns, set goals and objectives, and developed a watershed management plan. Included in the Shoshone River Watershed Plan are elements to solicit funds, implement the plan, and evaluate the plan.

Issues and Concerns

Natural Background Chemical, Physical and Biological Water Quality-

Background information on the Shoshone River is limited in some respects, but the United States Geological Survey has kept data on certain parameters at given locations over time within the watershed. Other groups such as but not limited to the US Forest Service, Wyoming Game and Fish, US Bureau of Reclamation, Wyoming DEQ, irrigation districts, US Bureau of Land Management, local municipalities, and NPDES permit holders have conducted independent sampling efforts in the past. There is significant importance in having adequate data on the nature of the Shoshone River and its innate water quality. The current impairment on the Shoshone is for fecal coliform (E. coli). Budgetary constraints have had significant impact on the types and quality of data available on the Shoshone. In general it will be important to understand what the data on the Shoshone has been able to indicate in the past and how it might change within the watershed in the future. This information should be utilized and made available to users and land managers within the watershed.

In addition to existing data there is a need to collect better data within the watershed to better understand background levels of pollutants and how those values may change over time. Although it may be impossible to truly understand non-impacted background levels of pollutants, changes over time can show significant trends that impact the quality of the Shoshone and its watershed. The nature of the Shoshone River and its tributaries is such that a significant portion of the watershed's contributing waters are not managed (Yellowstone, wilderness, etc.). It is very important to document the nature waters within the Shoshone drainage so that management decisions can be made in a conscientious and informed manner.

Incorporation of Water Quality Management in Planning and Zoning

The Shoshone River watershed, like much of the west, is going through a period of significant population growth. This growth is directly related to the overall quality of life and environment within the watershed and it surrounding areas. Although growth is inevitable, the management of this growth and proper implementation of planning and zoning ordinances has the opportunity to significantly impact the quality of water within the watershed.

Growth within the watershed is not limited to municipalities, but also includes large areas of rural development. There are significant environmental concerns associated with this development that include but are not limited to, septic system suitability, impervious surfaces (drives, roofs, parking areas, etc.), sedimentation, livestock, pet waste, and general increase in non-point sources of pollution. The increase in rural subdivisions is contributing to loss of agricultural land use and stewardship. Many land owners are not fully aware of best land use practices and the limits of the land, vegetation, and water resource. Public awareness and education opportunities exist for property owners.

There is a definite opportunity to improve the subdivision review process and develop better recommendations and predictions on suitability for various uses. The value of a technical review on all development activities is underappreciated when correlating development activities to water quality. Blanket regulations and guidelines may offer valuable direction, but often lack the precision necessary to adequately anticipate site specific problems.

Stream Classification-

The Clean Water Act requires that all waters of the State be classified as to their appropriate uses. These uses are not what a stream is currently used for but is a classification that reflects what a stream could be used for. This assessment reflects the potential of a given stream. These "designated uses" are recorded and carry with them a set of numeric and narrative water quality criteria. Water quality criteria therefore change with use designation. Misclassification of streams can have significant economic, recreational and social impacts within a watershed. The correct classification of a stream gives users and land managers quality information for developing appropriate management plans and prioritization. These data can be used to facilitate better resource management and utilization.

Loss of Contact Recreation – The Effects of Loss

Water quality and the loss thereof has the potential to make contact recreation undesirable or unsafe, limit the economics of recreation, and adversely affect the quality of life in a watershed associated with an impaired stream. Various factors that can adversely affect water quality and that are specifically related to contact recreation include pathogens as well as contaminants that may affect the clarity, temperature, and/or other aesthetic values of the water.

Recreational use of the waters in the watershed are significant. Rafting, fishing, camping, hunting, swimming, boating, and many other activities draw recreation enthusiasts to the area. Cody Wyoming and the surrounding area are considered the "gateway to Yellowstone" and as such attract a large portion of the 3 million plus visitors to the greater Yellowstone area each year.

The perceived "pristine" nature of the environment in this watershed has significant value both socially and economically. Maintaining the health of the watershed and stream system is critical to maintaining the quality of life and the economy of the area. In addition to the obvious positive affects of maintaining water quality, proactive care of water quality eliminates the possibility of the negative regulatory impacts and stigma associated with the presence of an impaired stream.

Fish Consumption Safety

The Shoshone River Watershed has traditionally had a high quality of fish as it relates to fish consumption. Because of the interest in fishing within the watershed it is important that this resource is conserved. Most negative issues related to fish consumption ultimately originate in sources that are outside of the potential for remediation through best management practices. Specific concern as it relates to fish consumption is largely confined to predatory species that live in or close to Big Horn Lake and are related to methyl mercury.

Other chemicals may have the potential to negatively affect the fishery and fish consumption. These can include herbicides, insecticides, fertilizers, fire retardant, heavy metals, petroleum byproducts and other pollutants. Education and pollution prevention related to these items is important to maintaining water quality within the watershed.

Soil Erosion

Soil is the upper level of organic and mineral material that acts as in interface between geologic parent materials and vegetation on the earth surface. When in place it is integral to the health of plants and animals within a system. Soil formation is a process that takes thousands of years and that is slowed in arid environments. Just as the maintenance of soils is important to the plant and animal communities in a given area, the excessive erosion of the soil resource has the potential to dynamically impact a system in a negative manner. Watersheds are dynamic systems, and as such there is a certain level of natural soil erosion. However, excessive erosion can be caused by anthropogenic activity as well as by unexpected natural events. In general, is in the best interest of the watershed to minimize anthropogenic inputs to erosion as much as possible. Having noted this fact, it is important to understand that defining and maintaining the proper function of a given stream and the balance in sediment transport within a stream is complex.

Some of the human induced inputs to soil erosion include but are not limited to: Off Road Vehicle (ORV) use, improper grazing (vegetation management), industry, timbering, recreation horseback riding, improper irrigation practices, resource extraction, urban and suburban construction, tillage and cropping practices, road development, impervious surfaces, storm-water control, and others. These and other factors can lead to widening of stream channels, increased water temperatures, imbalanced sediment budgets, stream canopy loss, modification of natural hydrographs, down cutting of stream channels, and other undesirable affects.

Ground Water Quality

Water resources within a watershed are not limited to those waters that can be observed on the surface. Certain ground water resources are acutely tied to the use of and

quality of surface waters. It is often difficult to ascertain the nexus of surface and ground waters, but a connection nonetheless exists. Ground water can become impaired due to activities on the surface, and since it is often a principle source of drinking water maintaining its quality is of significant importance within the watershed.

There are varied causes of pollution to groundwater. Some groundwater is not potable due natural contaminants that are a direct result of geologic interaction. High arsenic and sulfur levels, salts, and other elemental contaminants are not uncommon. In addition to these contaminants, significant levels of anthropogenic pollution can occur in the form of petroleum byproducts, septic waste, pesticide, herbicides, household chemicals, automotive waste, and industrial solvents.

Issues and Concerns

- Natural Background- chemical physical and biological, sediment
  - Goals- Educational efforts to inform on data availability
  - ID data sources – portal
  - Cooperate in opportunities utilize, analyze data
  - Improved Sampling and Analysis
- State of water quality sampling (inventory), and classification etc.
- Loss of contact recreation, the effects of the loss
- Fish consumption safety
- Agricultural soil erosion
- Ground water quality
- Point source inputs
- Sedimentation – aquatic habitat loss, geomorphic process effects,
- Water quantity and water banking – wetlands, flood irrigation recharge,
- Grazing management

- Riparian management
- Extractive industries (mining, oil, coalbed methane, etc)
- Roads types and effects
- Forest management
- BLM management
- Pesticide management
- Small acreages
- Growth patterns (urban sprawl)
- Waste management, rural septics
- AFOs CAFOs
- Unmanaged ORV
- Invasive species (terrestrial and aquatic)
- Education and outreach
- Connectivity of systems
- Irrigation, infrastructure, efficiencies, fish loss
- Reservoir management
- Stock ponds and small reservoirs
- Pet waste management
- Recreation management, commercial and/or public
    - River Access- education of on availability of formal access points vs. informal access- legal use of streams etc.
    - Human waste
    - Sediment loading – Access points, etc.
    - Introduction of foreign organisms
    - Documentation of Contact Recreational use
- Economic-social impacts/benefits
- Affects of climate change
- Storm-water runoff
- Historical?