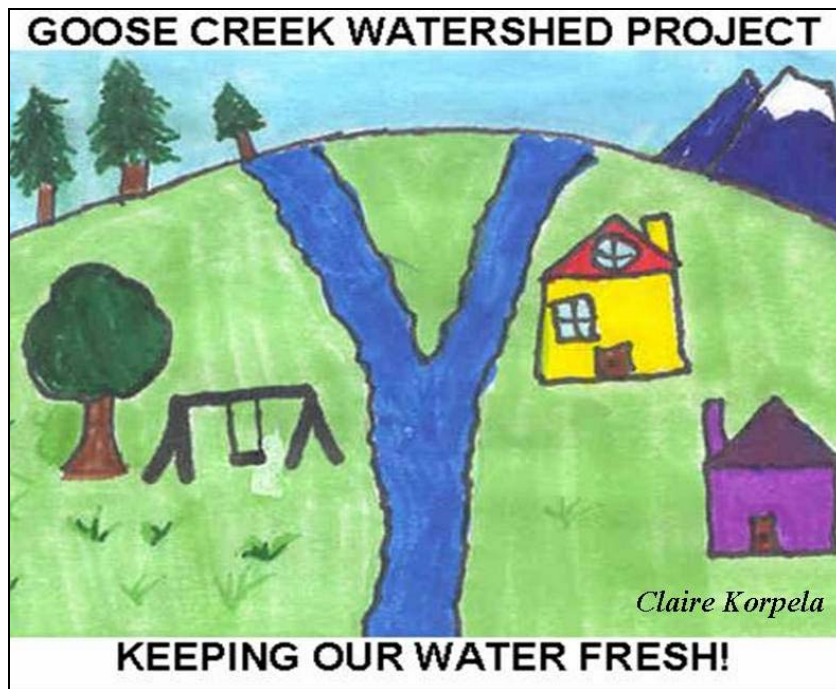


THE GOOSE CREEK WATERSHED MANAGEMENT PLAN

Developed locally by landowners, watershed residents, the Sheridan County Conservation District, the Natural Resources Conservation Service, Sheridan County officials, City of Sheridan officials, the Sheridan County Planning Commission, and the Wyoming Department of Environmental Quality.



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1. EXECUTIVE SUMMARY

SCCD hosted a public meeting at Sheridan College during November 2003 to inform members of the public about water quality results from the 2001 – 2002 watershed assessment, potential options for watershed planning, and the available means for implementing water quality improvement projects. After the presentation, a questionnaire concerning options for future watershed planning was completed by each member of the attending public. All those completing the questionnaire opted to pursue locally-led, voluntary watershed planning with incentive-based implementation efforts. As a result, the first public, Goose Creek watershed planning meeting was held during January 2004. During these monthly planning meetings, watershed concerns and issues were identified, categorized, and then addressed by stating issue objectives and action items. A timeline for completing the action items was then constructed with completion dates and responsible parties listed.

During the planning meetings, issues and concerns were identified, discussed, and placed into one of the following categories:

- Water Quality;
- Water Quantity;
- Upland Areas, Riparian Corridors, and Stream Channels;
- General Information and Education;
- Financial Conditions; and
- Watershed Plan Implementation.

Bacterial pathogens were identified as the primary **Water Quality** issue because of public health and safety concerns, exceedences of Wyoming Water Quality Standards, and non-attainment of the recreation beneficial use for local streams. Rural and urban storm water and other miscellaneous activities were also addressed within the water quality category. The importance of sufficient **Water Quantity** to improve and maintain water quality was identified and discussed extensively during the planning meetings. However, due to current Wyoming water laws, the planning committee has limited means for increasing instream flows within the watershed. Several action items were developed to improve the overall health of **Upland Areas, Riparian Corridors, and Stream Channels**. The action items identified for this category have the potential to improve plant community health, stream water temperatures, water quality, fish and aquatic life habitat, stream stability, community property values, and other valued concerns. The planning committee agreed that significant improvements in resource management and watershed health could potentially be achieved by conducting a **General Information and Education** campaign covering a myriad of topics. Conservation and mitigation practices are generally expensive, and as a result, the committee identified several needs for improving **Financial Conditions** such as obtaining project matching fund grants, etc. Lastly, the committee agreed to include activities to promote continued **Watershed Plan Implementation** and guidance to ensure this project is successful, now and into the future.

2. INTRODUCTION

2.1 Mission Statement

During a 2004 public meeting, the Goose Creek Watershed Planning Committee (GCWPC) prepared a mission statement to guide this planning and implementation project, which is as follows: “Establish and maintain a voluntary watershed plan that engages local citizens in the remediation of water quality issues in the Goose Creek watershed, now and into the future.”

2.2 Purpose and Resource Description

Big and Little Goose Creeks originate in the Big Horn Mountains west of Sheridan, Wyoming and pass through the Big Horn National Forest (BHNF), several ranches, rural sub-divisions, and through the towns of Big Horn and Sheridan. Near the center of Sheridan, Big and Little Goose Creek join to form Goose Creek. Each of these streams are classified by the Wyoming Department of Environmental Quality (WDEQ) as Class 2AB – Coldwater Fisheries and are closely tied to local agriculture, recreational uses, and drinking water supplies.

Accessible to over 27,000 Sheridan County residents, these streams and their tributaries are used extensively throughout the year. Local citizens of all ages commonly recreate on these streams, especially in Sheridan’s city parks and along recreational pathways. Sheridan was settled around these streams and today they remain highly accessible – Big Goose Creek flows through Kendrick Park, Little Goose Creek flows through Emerson and Washington Parks, and Goose Creek passes by Thorne-Rider Park. Due to their extensive use, easy access, and direct contact with the public it is essential that these waterways are of highest quality.

The United States Geological Survey (USGS) has collected quarterly water quality samples within the Goose Creek watershed for several years. During the course of this sampling, a number of fecal coliform samples were found to have elevated concentrations of bacteria. The WDEQ used data collected by the USGS during the 1993 through 1997 water years to place Big and Little Goose Creek on Table A of the 1998 Section 303(d) list of impaired waters.

In 1998 and 1999, the WDEQ implemented a more detailed monitoring program on Big and Little Goose Creeks following their placement on the 1998 303(d) list. The objective of the monitoring program was to determine the geometric means for fecal coliform bacteria at various stream locations during a 30-day period within the recreation season. Results of the WDEQ sampling revealed elevated fecal coliform bacteria concentrations on Goose Creek, Big Goose Creek, and Little Goose Creek that exceeded Wyoming water quality standards. Exceedences of these standards resulted in a non-attainment of the designated use for Recreation and Human Consumption. These exceedences subsequently triggered the Federal Clean Water Act requirement for establishment of a Total Maximum Daily Load (TMDL) restriction. The purpose of a TMDL is to restore compliance of the waterbody with Water Quality Standards.

The 1998 and 1999 sampling campaign conducted by WDEQ did not adequately identify the potential sources and magnitude of fecal coliform contamination. Moreover, sampling and supporting analyses to determine attainment of the other designated uses applicable to these waterbodies (e.g. protection and

propagation of fish and wildlife, scenic value, human health-fish consumption, and aquatic life use) was inadequate both in the number of parameters monitored and in the frequency of sampling.

At the time when the Goose Creeks Watershed Assessment (GCWA) was initiated in 2000, Beaver Creek, Big Goose Creek, Goose Creek, Jackson Creek, Kruse Creek, Little Goose Creek, Park Creek, Rapid Creek, Sackett Creek, and Soldier Creek were placed on Wyoming's 303(d) list (Table A) for fecal coliform bacteria impairments as a result of WDEQ's 1998 and 1999 monitoring. The Goose Creek watershed along with these impaired streams is shown on the map provided in Appendix A. To address these impairments in lieu of the development of a TMDL, the Goose Creek Drainages Advisory Group (GCDAG) was formed as a collaborative partnership among the Sheridan County Conservation District (SCCD), the Sheridan County Commission (SCC), and the City of Sheridan. Additional rural, urban, and locally interested parties also serve on this committee. In July 2000, the GCDAG received \$217,500 in federal Clean Water Act Section 319 funding, from the United States Environmental Protection Agency (EPA). The grant, which was disseminated through WDEQ, allowed the GCDAG to design and implement a comprehensive watershed assessment. The federal dollars were required to be matched with \$145,000 in non-federal cash or services. The match responsibility was divided among the three sponsors.

During 2000, the GCDAG (in consultation with WDEQ) laid plans for conducting the GCWA. The design included collecting credible chemical, physical, biological, bacteriological, and habitat information on Goose Creek, Big Goose Creek, Little Goose Creek, and on eight tributaries within the watershed. By collecting these credible data, GCDAG would be able to evaluate attainment of designated uses applicable to each waterbody and define temporal (seasonal) and spatial (among sample stations) changes in water quality to identify impaired segments. Completion of the GCWA would be the technical basis for the watershed planning and mitigation efforts.

During August 2002, SCCD submitted a request for Clean Water Act Section 319 funding to WDEQ to initiate Goose Creek watershed planning and implementation. SCCD received funding in 2003 to administer and guide a public Goose Creek watershed planning process, develop a watershed plan, implement remediation projects, develop a progress register, and conduct follow-up water quality monitoring.

SCCD hosted the first Goose Creek watershed planning meeting during November 2003 and presented water quality results from the 2001 – 2002 GCWA, options for watershed planning, and available programs for the implementation of water quality mitigation projects. At the close of the meeting, members of the public completed a questionnaire that included options for future watershed planning. All those completing the questionnaire opted to pursue locally-led, voluntary watershed planning with incentive-based implementation efforts. As a result, the first meeting of the GCWPC was held during January 2004. Watershed concerns and issues were identified during this meeting. During the monthly, public meetings that followed, the GCWPC categorized watershed concerns, developed objectives and action items, prepared a timeline for objectives to be achieved, and finalized the watershed plan.

2.3 Authority for Planning

Under Wyoming Statute, 11-16-103 Legislative declarations and policy, the SCCD is required 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.”

Wyoming Statute 11-16-122 (b) grants the Conservation Districts the ability 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 the Wyoming Association of 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 Goose Creek watershed landowners (GCWPC) and the Sheridan County Conservation District have adhered to this principle. The landowners have followed the steps for watershed planning as outlined in the *Watershed Strategic Plan*. In addition, the GCWPC and the SCCD have followed the guidance set forth in the June 7, 2002 letter sent to all Conservation Districts from the WDEQ, the Wyoming Association of Conservation Districts, the Natural Resources Conservation Service, and the Wyoming Department of Agriculture. This letter contained an outline with the required elements of a watershed plan; these elements are contained within this watershed plan. This watershed plan was developed in accordance with WDEQ FY 2002-2003 guidelines.

2.4 Public Participation Process

During September 2003, a “start-up” committee was formed to initiate the Goose Creek watershed planning process. The group consisted of local landowners, local officials, and SCCD/NRCS personnel who discussed options for public notification about the process, how to inform the public about the issues, and when to conduct a public meeting. After the September meeting, SCCD distributed approximately 1,600 postcards and newsletters to watershed residents (those living near perennial streams were targeted most intensively) to publicize the water quality concerns and to advertise the November 2003 landowner/public meeting. A public notice advertising the meeting was also placed in the Sheridan Press.

SCCD and NRCS staff held a landowner/public meeting in November to discuss the results of the 2001 – 2002 Goose Creek watershed assessment, possible options for watershed planning, and improvement projects and programs for which the SCCD and/or NRCS offer technical and financial assistance to landowners. At the end of the meeting, the landowners and public were asked to complete a questionnaire prepared by SCCD. Every person attending the meeting preferred the option of locally

led, watershed planning with voluntary, incentive based mitigation over the option of allowing TMDL's to be implemented.

Beginning in January 2004 and concluding in September 2004, monthly Goose Creek planning meetings were held to develop the watershed plan. The GCWPC meetings averaged about 20 members of the public which included landowners, watershed residents, SCCD, NRCS, Sheridan County officials, City of Sheridan officials, and the Sheridan County Planning Commission. During the planning process, SCCD would update the draft plan and the GCWPC would typically review the changes at the following planning meeting. A draft version of the plan was also submitted to WDEQ during June 2004 for a preliminary review by the TMDL Coordinator. SCCD received comments back from WDEQ which recommended scheduling periodic updates to the plan and involving Federal agencies in the planning process to the extent practicable. These comments have been incorporated into Section 4.6 and 5.6, respectively.

A final draft of the plan was completed by the GCWPC and SCCD during September 2004. On October 4, 2004 the plan was distributed for a 45 day public comment period as required by the Wyoming Administrative Procedures Act (W.S. 16-3-101). After receiving comments through November 19, 2004, SCCD incorporated public comments and finalized the plan during December 2004. Comments to the plan are shown in Appendix B. The plan was then submitted to WDEQ and the Sheridan County Clerk.

3. WATERSHED ASSESSMENT AND CONCERNS

During April 2001, SCCD, under the direction of the GCDAG, initiated the monitoring program, which included collecting pH, water temperature, conductivity, dissolved oxygen, total residual chlorine, fecal coliform, turbidity, alkalinity, biochemical oxygen demand, chloride, total hardness, sulfate, ammonia, nitrate nitrogen, total phosphorus, and total suspended solids samples. In total, 46 monitoring stations were utilized on Goose Creek, Big Goose Creek, Little Goose Creek, and the eight tributaries. Five stations were installed on Goose Creek, 15 on Big Goose Creek, and 18 on Little Goose Creek. In addition, each of the eight tributaries was monitored at a single, lower station located near its mouth. Fecal coliform and turbidity samples were collected five times during the months April, May, August, and October to comply with WDEQ's fecal coliform monitoring protocol. Continuous temperature recorders were used to monitor water temperatures at 15-minute intervals at the lowermost Goose Creek station, three Big Goose Creek stations, and three Little Goose Creek stations. Benthic macroinvertebrate samples were collected and habitat assessments were conducted at 19 sites on Goose Creek, Big Goose Creek, and Little Goose Creek during September. Year 2001 monitoring concluded in October.

Year 2002 monitoring was similar to the previous year's monitoring with a few exceptions. BOD samples were not taken during 2002 because of the high cost and that approximately 96% of all 2001 samples were analyzed as non-detectable and did not warrant further monitoring. *E. coli* samples were collected once during April, May, and October, and five times during August to coincide with fecal coliform monitoring. The *E. coli* samples were collected in anticipation of WDEQ changing the pathogen indicator standard from fecal coliform to *E. coli* in 2004. Fecal coliform samples were collected at three sites during April and September while disturbing stream bed sediment with a rake. This sampling was conducted to determine if higher fecal coliform concentrations were present in the sediment and to determine if the bacteria could survive through the winter months. Thirteen pesticides and herbicides were monitored during a single June monitoring event at three sites located on Goose Creek, Big Goose Creek, and Little Goose Creek. During 2002, an additional three continuous temperature recorders were installed to monitor water temperatures on Soldier Creek, Beaver Creek, and Jackson Creek. Year 2002 monitoring concluded during October.

Water quality within the three major waterbodies, Goose Creek, Big Goose Creek, and Little Goose Creek, generally improved from downstream to upstream with few exceptions. The water in Big Goose Creek and Little Goose Creek leaving the BHNH was of very high quality with rare occurrences of high fecal coliform concentrations. After leaving the mountain foothills, fecal coliform concentrations and water temperatures in Big Goose Creek and Little Goose Creek increased while traveling through the agricultural, rural, and suburban areas south and west of Sheridan, Wyoming. Land uses and population densities along these streams steadily increase toward Sheridan which is reflected in changes to water quality. Water quality in lower Big Goose Creek, lower Little Goose Creek, and Goose Creek was of lesser quality. In contrast, water quality appeared to improve with several water quality parameters at the lowermost station on Goose Creek located near Acme, Wyoming. Comparisons of current WDEQ, GCWA, and USGS fecal coliform data to historic USGS data on lower Goose Creek indicate bacteria concentrations have declined significantly since the 1970's and early 1980's. This decline appears to correspond with the timing of facility upgrades made at the Sheridan Waste Water Treatment Plant in 1983 and 1984.

Goose Creek sites throughout Sheridan exceeded the fecal coliform standard on at least one occasion. The lowermost site did not have a geometric mean that exceeded 200 CFU/100 mL during the assessment. The lower Big Goose Creek sites to approximately 4 miles west of Sheridan each exceeded the fecal coliform standard during the assessment while the upper sites had geometric means less than 200 CFU/100 mL. The lower Little Goose Creek sites to the County Road 60 bridge also exceeded the fecal coliform standard. The upper Little Goose Creek sites never violated the standard during this assessment. Soldier Creek, Park Creek, Rapid Creek, McCormick Creek, Kruse Creek, Jackson Creek, Sackett Creek, and the Coffeen Avenue storm drain also exceeded the fecal coliform standard during the assessment. Current and historic WDEQ and USGS fecal coliform monitoring generally revealed higher fecal coliform concentrations on Goose Creek, Big Goose Creek, and Little Goose Creek than those found during the 2001-2002 GCWA. During 1998 and 1999 monitoring, WDEQ found fecal coliform impairments on upper Goose Creek throughout Sheridan, on Big Goose Creek from its mouth to the canyon, and on Little Goose Creek from its mouth to the canyon. Lower fecal coliform concentrations found during the GCWA may be attributable to below normal discharge observed while collecting these samples. Sampling conducted following stream substrate raking suggested that higher bacteria populations are present within bed sediment which may be re-suspended during higher flows.

Water temperatures in Goose Creek, lower Big Goose Creek, and lower Little Goose Creek were often found to exceed the 20°C instream limit set forth in the Wyoming Water Quality Standards. Instantaneous measurements with field meters occasionally recorded temperatures in excess of 20°C, however, the time at which these samples were taken often did not correspond with the actual daily high water temperatures. Continuous water temperature data collected from Goose Creek, lower Big Goose Creek, and Little Goose Creek showed routine daily exceedences of the maximum instream temperature standard from May until September. Continuous temperature data and 2001 – 2002 instantaneous temperature measurements suggest the entire length of Goose Creek, Big Goose Creek from its mouth to the canyon, and Little Goose Creek from its mouth to the canyon regularly exceed the water temperature standard.

Evaluation of 2001, 2002, and historic macroinvertebrate data suggested that Goose Creek was not meeting its beneficial use for aquatic life from the Plachek Pit upstream to the confluence of Big and Little Goose Creeks. Lower Big Goose Creek and lower Little Goose Creek were also determined not to meet their aquatic life beneficial uses.

4. WATERSHED IMPROVEMENT ACTIONS AND RECOMMENDATIONS

This section describes several factors that have been organized into broad categories that may be directly or indirectly responsible for affecting the overall health of the Goose Creek watershed. In each of the following subsections, one or more concerns/issues were identified and categorized by the Goose Creek Watershed Planning Committee. For each of the issues, objectives and action items were prepared to accomplish specified goals through the implementation of Best Management Practices, information and education efforts, and by various other means.

It is difficult to quantify strong positive correlations between individual improvement projects, practices, or educational activities and water quality improvements in the short term. Because the bacterial impairments identified in Sheridan County are the result of a combination of sources, including humans, domestic animals, and wildlife, it is impossible to address impairments by focusing on single sources. In order to expect tangible improvements in water quality, it is necessary to address as many potential contributors as possible. This is best accomplished through an incentive-based, voluntary program that encourages widespread cooperation and participation from landowners. The education that comes from individual projects may do more, in the long term, than the projects themselves, and more for water quality improvement, than short term monitoring may be able to identify.

In the following sections, “Special Statements” may be used in categories where a legitimate concern exists, but the GCWPC has limited ability to carry out specific action items.

4.1 Water Quality

4.1.1 *Issue: Rural and urban septic systems are likely contributors of bacteria to local streams.*

Objective: Demonstrate progress towards reducing septic system contributions to local water quality.

Action Items:

- Develop and maintain a local working group for the SCCD septic system program to develop criteria (including provisions for confidentiality on requests for assistance), and guide the program into the future.
- The SCCD/NRCS will administer the septic system cost share program for Goose Creek watershed residents that have the potential to affect local water quality.
- The SCCD/GCWPC will conduct an outreach campaign to educate watershed residents about the proper function of septic systems and to promote the septic system cost-share program.
- The GCWPC will consider sponsoring a feasibility study to evaluate potential sewage treatment options and/or the need for expanding central sewer lines to rural areas.
- Sheridan County and the City of Sheridan, in coordination with WDEQ, the GCWPC, and other qualified individuals will review the *201 Intergovernmental Agreement* and the *Sheridan County Regulations for a Permit to Construct, Install, or Modify Small Wastewater Facilities and Related Design Standards* to determine if best available technologies for septic systems are being incorporated. This review may indicate further studies are necessary to determine if water resources are being adequately protected.

- The City of Sheridan and Sheridan County will identify and map septic systems in or near riparian areas, and within City limits, as feasible.
- The City of Sheridan will investigate the condition of sanitary sewer creek crossings, identify those needing repair or replacement, and estimate repair costs. Replacement will be pursued as funding is allowed.
- The GCWPC will evaluate alternative funding sources for public sewer development including the formation of sewer improvement districts.
- The GCWPC will evaluate alternative individual sanitation system technologies and systems for the treatment of multiple dwellings.

4.1.2 *Issue: Domestic animal wastes, including Animal Feeding Operations (AFO's), are likely contributors of bacteria to local streams.*

Objective: Continue to demonstrate progress towards reducing livestock (and other domestic animal) contributions of bacteria to local streams and find new means to improve the local AFO program.

Action Items:

- SCCD/NRCS will continue to administer and fund the local AFO program.
- Provide public education and information about the proper management of domestic animal waste (to include all domestic stock, animals, and pets) to Goose Creek watershed residents.
- Identify ways to improve the AFO program delivery to high priority areas.
- Provide education and assistance to landowners with winter feeding grounds that potentially affect local water quality.
- Educate small acreage, rural residential livestock owners about proper grazing management and provide information about the AFO program.
- Deliver an education program to affiliates of the agricultural industry (Extension Agent, veterinarians, Future Farmers of America, etc.) concerning the potential impacts animal waste may have on local water quality.

4.1.3 *Issue: Wildlife are likely contributors of bacteria to local streams.*

Special Statement: Wildlife are likely contributors of fecal coliform bacteria to local streams, however; the GCWPC has limited ability to address the issue apart from education efforts.

Objective: Raise the awareness of watershed residents that wildlife potentially contribute bacteria to local streams.

Action Items:

- Provide public education concerning potential wildlife impacts on water quality, and the impacts of feeding and thereby artificially concentrating wildlife near sensitive riparian areas.
- Provide information on the impact of feeding wildlife near surface water through local "Backyard Conservation" organizations.

4.1.4 *Issue: Urban and rural storm water allows untreated run-off to directly enter local streams.*

Objective: Minimize, to the extent practicable, the quantities of sediment and other pollutants entering local streams through proper use of Best Management Practices (BMP's).

Action Items:

- Encourage local municipalities, Sheridan County, and/or WYDOT to improve and/or install storm water BMP's to the extent feasible (storm drain stenciling, settling basins, street snow management, street sweeper management, oil/grease traps, etc.).
- Continue to use the EnviroScape Model as an educational tool concerning storm water.
- Complete storm water inlet marking and conduct a public education/outreach campaign related to the City of Sheridan's storm water system and potential impacts to the watershed.
- Develop a GIS layer showing City of Sheridan storm water components with appropriate attribute data.
- Enhance the City of Sheridan's storm water system maintenance program by identifying timelines for routine maintenance and establishing record keeping criteria.
- Review the City of Sheridan routine street maintenance protocols and identify potential improvements that will reduce suspended solids impacts.
- Evaluate options for identifying undesirable connections to the City of Sheridan storm drain system (i.e. sanitary sewer service line connections) particularly in those segments of storm sewer that have shown elevated levels of fecal coliform and/or *E. coli* in sample results.
- Within the City of Sheridan, identify physical storm sewer improvements that will reduce levels of suspended solids entering the watershed. Work to include these improvements into the City of Sheridan – Capital Improvement Plan as funding will allow.
- Work with stakeholders in the private sector to improve Best Management Practice implementation to minimize potential storm water impacts during development and construction periods.
- Work with volunteer and non-profit entities to improve the awareness of watershed condition and protection. Examples may include a river rakers program, watershed signage, and poster development (similar to the Goose Creek watershed poster) for storm sewers.

4.1.5 *Issue: Other activities within the watershed may prevent streams from meeting their intended beneficial uses. Specifically, waters should be of high enough quality to support fisheries, aquatic life, agricultural/irrigation uses, and be safe for all uses, including recreation.*

Objective: Reduce the potential impacts of miscellaneous activities that may affect local surface water and groundwater and aquatic life habitat.

Action Items:

- The SCCD will continue to participate in the Sheridan County Household Hazardous Waste Collection Day.
- Provide public education about the availability of local used oil disposal tanks.
- Provide information to watershed residents and building contractors concerning proper fertilizer, pesticide, herbicide use, sediment management and available BMP's.
- Provide information and assistance to landowners regarding the need for fish-friendly irrigation structures.
- Provide technical and financial assistance to landowners for improvement projects, including miscellaneous erosion control measures, reclamation of rural dump sites, etc, where appropriate and feasible.

Objective: Raise awareness concerning the inter-relationships among water quality parameters.

Action Items:

- Provide information concerning the inter-relationships among temperature, dissolved oxygen, sediment, bacteria, nutrients, etc.

4.2 Water Quantity

Special Statement: The GCWPC has limited ability to address water quantity, however; the group recognizes that low stream flows are a significant water quality concern and will encourage instream flow and reservoir storage opportunities where feasible.

4.2.1 *Issue: Low stream flows have affected water quality, stream temperatures, the sustainability of fisheries, and the recreational uses of streams within the watershed.*

Objective: Improve public awareness concerning the relationship between water quantity and water quality and the benefits of efficient water conservation practices and opportunities.

Action Items:

- The GCWPC will provide public information on Wyoming water law, the benefits/need for adequate quantities of water in streams, and the benefits of urban and rural water conservation.
- Continue to implement irrigation upgrades and water conservation efforts through the NRCS and the Local Work Group.
- Consider sponsoring a study through the Wyoming Water Development Commission (WWDC), the Environmental Protection Agency (EPA), or other agencies to evaluate the water quantity and quality relationships of rural wells and septic systems vs. public water and sewer systems in the Big and Little Goose Creek valleys.

4.3 Upland Areas, Riparian Corridors, and Stream Channels

4.3.1 *Issue: Many upland areas within the watershed have bare ground and/or poor vegetative cover allowing increased storm water run-off, increased erosion, and decreased infiltration.*

Objective: Maintain and promote healthy upland vegetative communities to decrease storm water run-off, decrease erosion, and increase infiltration rates.

Action Items:

- Provide education on proper grazing management to small acreage landowners owning livestock (horses, cattle, llamas, etc.).
- Provide education about the hydrologic water cycle and water balances that will include information about infiltration, filtering, retention, bank storage, burning, etc.
- The SCCD/NRCS will continue to provide technical and cost-share assistance to promote proper grazing management, including proper design and installation of stock water systems, cross-fences, and grazing systems.

4.3.2 *Issue: Vegetative buffer zones along the riparian corridor are needed for additional filtering capacity, reduced run-off, increased infiltration, and stream shading.*

Objective: Maintain and promote healthy riparian buffer zones which improve water quality through sediment removal, nutrient uptake, and lower water temperatures.

Action Items:

- Provide technical and cost-share assistance to landowners who desire better riparian management with USDA program funding and SCCD grant funding.
- Provide landowners with education about riparian buffer technologies, grazing management, recommended development set-back distances, etc.

4.3.3 *Issue: Many streams, or stream segments, within the watershed are unstable and contribute excessive sediment which affect many different water quality parameters and have a negative impact on aquatic life.*

Objective: Maintain and promote, to the extent practicable, stream channel systems (including irrigation diversions and returns) with natural channel forming succession and sediment transport rates.

Action Items:

- The SCCD will provide information from the existing Regional Curves study to define the existing morphological characteristics of streams within the watershed. Appropriate bankfull characteristics (as they relate to a given drainage area) will be used as an additional source of information for designing stream restoration, and other construction projects impacting live streams.
- Provide landowner education about the importance of maintaining natural stream channels, the potential negative effects of improper stream bed manipulation, and the potential regulatory impacts of performing non-permitted stream channel construction.
- Provide technical and financial assistance to landowners interested in performing stream channel restoration projects (bank protection, removal of undesirable materials (car bodies, etc.), fish habitat structures, etc.).

4.4 General Information and Education

4.4.1 *Issue: The success of the Goose Creek watershed planning and implementation projects will depend in large part upon voluntary public participation, confidence, and trust in the process.*

Objective: Increase community awareness of the Goose Creek watershed project and encourage voluntary participation through public outreach and project salesmanship efforts.

Action Items:

- Provide information about the Goose Creek watershed project to include a list of all resource brochures developed for public education.
- SCCD will explore using a website for use as a watershed / resource education tool.

- Continue to provide educational outreach (using various types of media) as future resource issues are identified.
- Provide public information about successful conservation and restoration projects to encourage future voluntary public participation. Tours of successful projects may be coordinated as landowner permission allows.
- Develop a watershed project logo/mascot that will be used on all project related educational materials and implementation efforts to increase public awareness of watershed efforts.

4.5 Financial Conditions

4.5.1 *Issue: Conservation efforts can be expensive or unaffordable for landowners and municipalities. Funding resources are required to encourage restoration projects which improve water quality and water quantity.*

Objective: Increase SCCD/GCWPC and public knowledge of existing funding resources to potentially provide a greater array of project funding capabilities.

Action Items:

- SCCD will summarize current funding sources and uses, summarize available funding sources not utilized, and summarize current needs not met with any known funding source.
- Conduct an information and education effort to educate landowners about projects, programs, and funding opportunities.
- Identify and partner with groups such as Trout Unlimited for funding restoration projects.
- Send a letter to the Sheridan County Congressional Delegation stressing the need for funding to evaluate potential opportunities, and install small community sewer systems.

4.6 Watershed Plan Implementation

Special Statement: The SCCD and GCWPC intends to implement all action items contained within this plan, however; some action items may not be necessary or may need to be revised in the future. In addition, future action items may need to be included that have not yet been considered. Therefore, there is a need for the plan (and plan implementation) to be dynamic and ever-changing to meet the needs of current watershed issues, for now and into the future.

4.6.1 *Issue: A successful Goose Creek watershed planning and implementation program will require on-going effort directed by the planning committee with guidance from the SCCD. The plan must be dynamic to accommodate future concerns and technologies.*

Objective: Maintain an energetic planning committee, with SCCD supervision, to actively implement a dynamic watershed plan that addresses current and future watershed concerns.

Action Items:

- Maintain an active planning committee and schedule regular committee meetings (minimum annually) to review, revise, and guide the plan as necessary.

- Develop and maintain a Goose Creek watershed progress register to document completed improvement projects and other activities within the watershed. The progress register will be the primary means for demonstrating progress towards resource improvement.
- Modify the existing SCCD sampling and analysis plan (SAP) and, if necessary, modify the Quality Assurance Project Plan (QAPP) for interim and follow-up monitoring.
- Conduct follow-up monitoring and evaluate trends in water quality.
- Continue to include local, State, and Federal agencies in the planning process, as appropriate.
- Review and update this plan on an as-needed basis (minimum annually).

5. ACTION REGISTER / MILESTONE TABLES

The following tables provide information concerning the estimated completion dates for action items contained within Section 4 and also list the primary parties that will perform the action items. Dates for completing action items are given within a five year period commencing with the initiation of the planning meetings (January 2004 – December 2008). After December 2008, watershed concerns will need to be re-evaluated and the plan will be revised as necessary. These tables are organized to follow the structure provided in Section 4.

Table 5.1 Water Quality

Action Item	Performed By	Inclusion Date(s)
<i>Issue: Rural and urban septic systems are likely contributors of bacteria to local streams.</i>		
Develop and maintain a local working group for the SCCD septic system program to develop criteria (including provisions for confidentiality on requests for assistance), and guide the program into the future.	SCCD, NRCS	6/04 – 12/08
The SCCD/NRCS will administer the septic system cost share program for Goose Creek watershed residents that have the potential to affect local water quality.	SCCD, NRCS	8/04 – 12/08
The SCCD/GCWPC will conduct an outreach campaign to educate watershed residents about the proper function of septic systems and to promote the septic system cost-share program.	SCCD, GCWPC	8/04 – 12/08
The GCWPC will consider sponsoring a feasibility study to evaluate potential sewage treatment options and/or the need for expanding central sewer lines to rural areas.	GCWPC, City, County	7/05 – 12/08
Sheridan County and the City of Sheridan, in coordination with WDEQ, the GCWPC, and other qualified individuals will review the <i>201 Intergovernmental Agreement</i> and the <i>Sheridan County Regulations for a Permit to Construct, Install, or Modify Small Wastewater Facilities and Related Design Standards</i> to determine if best available technologies for septic systems are being incorporated. This review may indicate further studies are necessary to determine if water resources are being adequately protected.	WDEQ, City, County, GCWPC	1/05 – 1/07
The City of Sheridan and Sheridan County will identify and map septic systems in or near riparian areas, and within City limits, as feasible.	City, County	1/05 – 1/07
The City of Sheridan will investigate the condition of sanitary sewer creek crossings, identify those needing repair or replacement, and estimate repair costs. Replacement will be pursued as funding is allowed.	City	7/05 – 12/08
The GCWPC will evaluate alternative funding sources for public sewer development including the formation of sewer improvement districts.	GCWPC, SCCD, City, County	10/04 – 12/08
The GCWPC will evaluate alternative individual sanitation system technologies and systems for the treatment of multiple dwellings.	GCWPC, SCCD	10/04 – 12/08
<i>Issue: Domestic animal wastes, including Animal Feeding Operations (AFO's), are likely contributors of bacteria to local streams.</i>		

Action Item	Performed By	Inclusion Date(s)
SCCD/NRCS will continue to administer and fund the local AFO program.	SCCD, NRCS	1/04 – 12/08
Provide public education and information about the proper management of domestic animal waste (to include all domestic stock, animals, and pets) to Goose Creek watershed residents.	SCCD	1/04 – 12/08
Identify ways to improve the AFO program delivery to high priority areas.	SCCD, NRCS	1/04 – 12/08
Provide education and assistance to landowners with winter feeding grounds that potentially affect local water quality.	SCCD, NRCS	1/06 – 1/07
Educate small acreage, rural residential livestock owners about proper grazing management and provide information about the AFO program.	SCCD, NRCS	1/06 – 1/07
Deliver an education program to affiliates of the agricultural industry (Extension Agent, veterinarians, Future Farmers of America, etc.) concerning the potential impacts animal waste may have on local water quality.	SCCD	1/06 – 1/07
<i>Issue: Wildlife are likely contributors of bacteria to local streams.</i>		
Provide public education concerning potential wildlife impacts on water quality, and the impacts of feeding and thereby artificially concentrating wildlife near sensitive riparian areas.	SCCD	3/05 – 11/05
Provide information on the impact of feeding wildlife near surface water through local “Backyard Conservation” organizations.	SCCD	3/05 – 11/05
<i>Issue: Urban and rural storm water allows untreated run-off to directly enter local streams.</i>		
Encourage local municipalities, Sheridan County, and/or WYDOT to improve and/or install storm water BMP’s to the extent feasible (storm drain stenciling, settling basins, street snow management, street sweeper management, oil/grease traps, etc.).	SCCD	10/05 – 12/08
Continue to use the EnviroScape Model as an educational tool concerning storm water.	SCCD	1/04 – 12/08
Complete storm water inlet marking and conduct a public education/outreach campaign related to the City of Sheridan’s storm water system and potential impacts to the watershed.	City	7/04 – 12/08
Develop a GIS layer showing City of Sheridan storm water components with appropriate attribute data.	City	7/04 – 1/07
Enhance the City of Sheridan’s storm water system maintenance program by identifying timelines for routine maintenance and establishing record keeping criteria. Review the City of Sheridan routine street maintenance protocols and identify potential improvements that will reduce suspended solids impacts.	City	1/05 – 1/07
Evaluate options for identifying undesirable connections to the City of Sheridan storm drain system (i.e. sanitary sewer service line connections) particularly in those segments of storm sewer that have shown elevated levels of fecal coliform and/or <i>E. coli</i> in sample results.	City	7/05 – 12/08
Within the City of Sheridan, identify physical storm sewer improvements	City	7/05 – 12/08

Action Item	Performed By	Inclusion Date(s)
that will reduce levels of suspended solids entering the watershed. Work to include these improvements into the City of Sheridan – Capital Improvement Plan as funding will allow.		
Work with stakeholders in the private sector to improve Best Management Practice implementation to minimize potential storm water impacts during development and construction periods.	City, SCCD	1/05 – 7/07
Work with volunteer and non-profit entities to improve the awareness of watershed condition and protection. Examples may include a river rakers program, watershed signage, and poster development (similar to the Goose Creek watershed poster) for storm sewers.	City, SCCD	1/05 – 12/08
<i>Issue: Other activities within the watershed may prevent streams from meeting their intended beneficial uses. Specifically, waters should be of high enough quality to support fisheries, aquatic life, agricultural/irrigation uses, and be safe for all uses, including recreation.</i>		
The SCCD will continue to participate in the Sheridan County Household Hazardous Waste Collection Day.	SCCD, City, County	1/04 – 12/08
Provide public education about the availability of local used oil disposal tanks.	SCCD	1/04 – 12/08
Provide information to watershed residents and building contractors concerning proper fertilizer, pesticide, herbicide use, sediment management and available BMP's.	SCCD	1/05 – 6/05
Provide information and assistance to landowners regarding the need for fish-friendly irrigation structures.	SCCD, NRCS	1/04 – 12/08
Provide technical and financial assistance to landowners for improvement projects, including miscellaneous erosion control measures, reclamation of rural dump sites, etc, where appropriate and feasible.	SCCD, NRCS	1/04 – 12/08
Provide information concerning the inter-relationships among temperature, dissolved oxygen, sediment, bacteria, nutrients, etc.	SCCD	1/04 – 12/08

Table 5.2 Water Quantity

Action Item	Performed By	Inclusion Date(s)
<i>Issue: Low stream flows have affected water quality, stream temperatures, the sustainability of fisheries, and the recreational uses of streams within the watershed.</i>		
The GCWPC will provide public information on Wyoming water law, the benefits/need for adequate quantities of water in streams, and the benefits of urban and rural water conservation.	GCWPC	5/06 – 10/06 5/07 – 10/07
Continue to implement irrigation upgrades and water conservation efforts through the NRCS and the Local Work Group.	SCCD, NRCS	1/04 – 12/08
Consider sponsoring a study through the WWDC, EPA, or other agencies to evaluate the water quantity and quality relationships of rural wells and septic systems vs. public water and sewer systems in the Big and Little Goose Creek valleys.	GCWPC, SCCD	1/08 – 12/08

Table 5.3 Upland Areas, Riparian Corridors, and Stream Channels

Action Item	Performed By	Inclusion Date(s)
<i>Issue: Many upland areas within the watershed have bare ground and/or poor vegetative cover allowing increased storm water run-off, increased erosion, and decreased infiltration.</i>		
Provide education on proper grazing management to small acreage landowners owning livestock (horses, cattle, llamas, etc.).	SCCD, NRCS	1/04 – 12/08
Provide education about the hydrologic water cycle and water balances to landowners and general public that will include information about infiltration, filtering, retention, bank storage, burning, etc.	SCCD	1/07 – 1/08
The SCCD/NRCS will continue to provide technical and cost-share assistance to promote proper grazing management, including proper design and installation of stock water systems, cross-fences, and grazing systems.	SCCD, NRCS	1/04 – 12/08
<i>Issue: Vegetative buffer zones along the riparian corridor are needed for additional filtering capacity, reduced run-off, increased infiltration, and stream shading.</i>		
Provide technical and cost-share assistance to landowners who desire better riparian management with USDA program funding and SCCD grant funding.	SCCD, NRCS	1/04 – 12/08
Provide landowners with education about riparian buffer technologies, grazing management, recommended development set-back distances, etc.	SCCD, NRCS	1/07 – 1/08
<i>Issue: Many streams, or stream segments, within the watershed are unstable and contribute excessive sediment which affect many different water quality parameters and have a negative impact on aquatic life.</i>		
The SCCD will provide information from the existing Regional Curves study to define the existing morphological characteristics of streams within the watershed. Appropriate bankfull characteristics (as they relate to a given drainage area) will be used as an additional source of information for designing stream restoration, and other construction projects impacting live streams.	SCCD, NRCS	10/05 – 12/05
Provide landowner education about the importance of maintaining natural stream channels, the potential negative effects of improper stream bed manipulation, and the potential regulatory impacts of performing non-permitted stream channel construction.	SCCD	1/04 – 12/08
Provide technical and financial assistance to landowners interested in performing stream channel restoration projects (bank protection, removal of undesirable materials (car bodies, etc.), fish habitat structures, etc.).	SCCD, NRCS	1/04 – 12/08

Table 5.4 General Information and Education

Action Item	Performed By	Inclusion Date(s)
<i>Issue: The success of the Goose Creek watershed planning and implementation projects will depend in large part upon voluntary public participation, confidence, and trust in the process.</i>		
Provide information about the Goose Creek watershed project to include a list of all resource brochures developed for public education.	SCCD	1/04 – 12/08
SCCD will explore using a website for use as a watershed / resource education tool.	SCCD	11/04 – 12/05
Continue to provide educational outreach (using various types of media) as future resource issues are identified.	SCCD	1/04 – 12/08
Provide public information about successful conservation and restoration projects to encourage future voluntary public participation. Tours of successful projects may be coordinated as landowner permission allows.	SCCD, NRCS	1/04 – 12/08
Develop a watershed project logo/mascot that will be used on all project related educational materials and implementation efforts to increase public awareness of watershed efforts.	GCWPC	9/04 – 5/05

Table 5.5 Financial Conditions

Action Item	Performed By	Inclusion Date(s)
<i>Issue: Conservation efforts can be expensive or unaffordable for landowners and municipalities. Funding resources are required to encourage restoration projects which improve water quality and water quantity.</i>		
SCCD will summarize current funding sources and uses, summarize available funding sources not utilized, and summarize current needs not met with any known funding source.	SCCD	10/04 – 6/05
Conduct an information and education effort to educate landowners about projects, programs, and funding opportunities.	SCCD	1/04 – 12/08
Identify and partner with groups such as Trout Unlimited for funding restoration projects.	SCCD, GCWPC	1/04 – 12/08
Send a letter to the Sheridan County Congressional Delegation stressing the need for funding to evaluate potential opportunities, and install small community sewer systems.	GCWPC, City, County	7/05 – 7/06

Table 5.6 Watershed Plan Implementation

Action Item	Performed By	Inclusion Date(s)
<i>Issue: A successful Goose Creek watershed planning and implementation program will require ongoing effort directed by the planning committee with guidance from the SCCD. The plan must be dynamic to accommodate future concerns and technologies.</i>		
Maintain an active planning committee and schedule regular committee meetings (minimum annually) to review, revise, and guide the plan as necessary.	SCCD	1/04 – 12/08
Develop and maintain a Goose Creek watershed progress register to document completed improvement projects and other activities within the watershed. The progress register will be the primary means for demonstrating progress towards resource improvement.	SCCD	1/04 – 12/08
Modify the existing SCCD sampling and analysis plan (SAP) and, if necessary, modify the Quality Assurance Project Plan (QAPP) for interim and follow-up monitoring.	SCCD	12/04 – 4/05
Conduct follow-up monitoring and evaluate trends in water quality.	SCCD	4/05 – 12/05
Continue to include local, State, and Federal agencies in the planning process, as appropriate.	SCCD	1/04 – 12/08
Review and update this plan on an as-needed basis (minimum annually).	GCWPC, SCCD	1/04 – 12/08

6. MONITORING AND EVALUATION

The existing, on-going monitoring network for the Goose Creek watershed will continue to be utilized to observe fecal coliform and *E. coli* levels within the watershed, although not on a continual basis. The SCCD has an approved QAPP to guide the water quality monitoring program, which includes the development of project specific SAPs for any monitoring activities. The existing SAP for the Goose Creek Watershed Assessment was approved by WDEQ and will be used as a guideline and modified as appropriate for future interim and follow-up monitoring on the watershed.

The most successful component of the Goose Creek watershed planning and implementation effort may be increasing public awareness and the ability of individual projects and education activities to encourage more widespread and continuous improvement efforts.

The SCCD will attempt to provide information on bacterial load reduction estimates based on the type of improvement project or practice being installed or implemented. However, because of the complexity of non-point source pollution, it is understood that these are only theoretical estimates of what actually occurs on the watershed in the short term. Rather than attempting to use these estimates to make conclusions as to the overall impact on the watershed, SCCD will use the existing monitoring network to look for long term monitoring trends.

7. POTENTIAL FUTURE IMPLEMENTATION EFFORTS

During the 2004 Goose Creek watershed planning meetings, several ideas/issues were discussed as beneficial, large-scale projects; however, at the time of these discussions, the GCWPC either did not have the ability or the authority to include these ideas as action items within the plan. These ideas are discussed below and may be revisited and included in future planning efforts.

The City of Sheridan and nearby rural and suburban developments are growing at a steady, rapid pace and continue to place and increasing demand on public water supply. Much of the area, including Sheridan, receives public water from the Sheridan Area Water Supply (SAWS) which diverts and treats Big Goose Creek water for domestic use. A large portion of this water is also pumped from Sheridan up the Little Goose valley to service rural residents, subdivisions, and the Town of Big Horn. The potential exists to use Lake DeSmet water to supplement domestic needs within the Goose Creek drainage. Sheridan and Johnson Counties comprise the Lake DeSmet Coalition with Sheridan County having 45% of the water shares and Johnson County having 55% of the water shares. As a result, water from Lake DeSmet could be diverted through existing ditches or piped into the Sheridan area. Options for developing this water resource are currently being discussed by local officials. The development of this resource will be supported by the GCWPC within its abilities and authorities.

The Sheridan Waste Water Treatment Plant (WWTP) currently services most of the City of Sheridan and lower Big and Little Goose valleys. The density of homes within the Big and Little Goose valleys continues to increase and therefore, the GCWPC feels rural sewage treatment in these areas is necessary to protect local groundwater and surface water quality. However, the flows entering the Sheridan WWTP are nearing the design capacity of the plant. Sufficient capacity exists to service new homes constructed in and near Sheridan; however, the addition of sewage from the Big and Little Goose valleys is not possible without the expansion of the Sheridan WWTP or the construction of additional plant(s) on upper reaches of Big and/or Little Goose Creeks. The GCWPC supports rural sewage treatment in these areas, but also recognizes the enormity of potential project costs. The GCWPC will consider funding a feasibility study (if grant monies can be secured) to evaluate treatment options as discussed in Section 4.1.1.

The GCWPC briefly discussed some ideas that may be incorporated into the plan during a future revision. These ideas include:

- The use of DNA analysis to help identify fecal waste sources;
- Conduct public outreach campaign(s) by holding a number of “neighborhood” meetings; and
- Incorporate Goose Creek watershed concerns into Sheridan’s Vital Community Plan.