EXECUTIVE SUMMARY

In 1999, Popo Agie Conservation District (PACD) initiated a community based watershed planning effort for the Popo Agie Watershed. The purpose of the planning effort was to provide an opportunity for local people to identify and assess the natural resource concerns and opportunities within the watershed, determine what conditions were desired, and formulate alternatives to achieve those desired results based upon voluntary incentive-driven opportunities.

Public meetings were held to discuss the proactive approach to identifying and resolving natural resource concerns and pursue opportunities locally to insure that landowners and community members supported the process. The public nominated individuals to serve as their representatives on the Popo Agie Watershed Steering Committee. The steering committee members represented a diversity of community interests. Watershed concerns and opportunities were identified at the public meetings and were categorized by the steering committee into four overriding themes:

- Water Quality
- Water Quantity
- Upland Health
- Riparian/Wetland Health

To provide technical information to the district and steering committee, local and statewide expertise was identified and requested to serve on Technical Advisory Groups (TAGs) for the four resource themes.

The steering committee developed the following purpose statement, goal for each resource theme, objectives, and action items for the Popo Agie Watershed.

Steering Committee Purpose Statement

This plan will be used as a tool to guide sound natural resource management that sustains the beauty and ecological health of the Popo Agie Watershed, enhances diverse and dependable economic opportunities, and promotes the social and cultural heritage of the area.

Water Quality Goal: Maintain, protect, and enhance water quality to sustain the beneficial uses and ecological health of the watershed.

Water Quantity Goal: Encourage, maintain, and enhance water resources to provide for beneficial uses and ecological health while mitigating, where possible, risk to public safety and property.

Upland Goal: To maintain ecosystems and resources capable of sustaining ecological, economic, and social values in which upland health is a fundamental component.

Riparian/Wetland Goal: To maintain ecosystems and resources capable of sustaining ecological, economic, and social values in which riparian and wetland health is a fundamental component.

Beginning in 1999, PACD collected four years of water quality data at a total of 39 sites from the alpine reaches of the watershed to the confluence of the Popo Agie River with the Little Wind River. The data was compiled into two reports, and provides recommendations based on credible, scientific data. In 2002, a segment of the Middle Fork of the Popo Agie River was listed as impaired by the Wyoming Department of Environmental Quality (WDEQ) because water quality data demonstrated that the stream segment was not meeting acceptable surface water quality standards for fecal coliform levels. As a result, the segment of the Middle Fork of the Popo Agie River was placed on the Clean Water Act (CWA) Section 303(d) List of Impaired Waterbodies. The District and the Popo Agie Watershed Steering Committee elected to integrate the water quality impairment into the watershed planning process to address this concern.

To further understand the watershed and its function the District partnered with Wyoming Water Development through a Level I Watershed Study to provide an in-depth resource inventory and analysis of the physical attributes of the watershed. This comprehensive watershed assessment was conducted by Anderson Consulting Engineers, Inc. over an eighteen month period. The assessment provided a detailed watershed description and inventory to include: land uses and management activities; surface geology and soils interpretations; discharge and water supply needs for beneficial uses; channel structure and morphology; water storage needs and opportunities; and an irrigation infrastructure inventory and rehabilitation plan.

Finally, PACD and NRCS began an investigation into a Public Law 566 Project, Lander Flood Protection and Stream Restoration Project for the Middle Fork of the Popo Agie River. The purpose of the project is to reduce the threat to life and property from flooding and improve stream form and function on the Middle Fork of the Popo Agie River. The project boundaries begin in Sinks Canyon at the confluence with Sawmill Creek to the confluence of the Middle Fork of the Popo Agie River with Baldwin Creek below the City of Lander.

The Popo Agie Conservation District Board of Supervisors approved the Popo Agie Watershed Plan on Wednesday, August 31, 2005.

Steve Dutcher, Chairman

Jack Corbett, Vice-Chairman

Bryan Hamilton, Treasurer

Carrie Johnson, Member

Gerald Caskey, Member

The Popo Agie Watershed Plan was approved by the Wyoming Department of Environmental Quality.

Wyoming Department of Environmental Quality

10/7/05
Date

PROJECT BACKGROUND

Mission Statement

The Popo Agie Conservation District will engage our community in a collaborative effort to create a watershed plan that reflects the values, interests, and goals as defined by the District's constituents.

By acknowledging the diversity of the resources within the Popo Agie Watershed, our intent is to provide the leadership and assistance for maintaining and improving: 1) Natural Resources, 2) Economic Sustainability, 3) Water Quality, 4) Water Quantity, and 5) Customs and Cultures.

The Popo Agie Conservation District will provide the tools to implement a successful watershed plan through education, voluntary participation, and incentive-driven opportunities.

Definition of Watershed Planning

Watershed planning is a process for local constituents to identify and assess their natural resource concerns and opportunities, determine the condition that meets their needs, and formulate alternatives to achieve their goals based upon voluntary, incentive-driven opportunities. There are several legislative acts at the federal and state levels that guide watershed planning, with associated agencies to administer public planning requirements and oversee local efforts (Figure 1).

Clean Water Act

A watershed planning process is driven in part by the Clean Water Act (CWA), which was adopted by Congress for two primary purposes:

- 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 water. This goal is commonly known by the expression "fishable/swimable".

The U.S. Environmental Protection Agency (EPA) has primary responsibility to ensure that provisions of the CWA are met. EPA has delegated this authority to the Wyoming Department of Environmental Quality (WDEQ) to ensure Wyoming's compliance with the CWA. EPA retains responsibility for CWA compliance for states or tribal governments without delegated authority.

Wyoming Department of Environmental Quality

In order to ensure compliance with the CWA, WDEQ has established a system for evaluating and protecting surface waterbodies. Since not all waters of the State are utilized for the same purposes, WDEQ has designed a classification system based on "designated uses" which reflect both current and potential water uses. Each classification is protected for its specified uses plus all the uses contained in each lower classification (Class 1 waters are the exception and are based instead on value determinations, and are protected for all uses).

The Little, Middle, and North Forks of the Popo Agie River are Wyoming Class 2 Waterbodies: Fisheries and Drinking Water (WDEQ, 1998, Chapter 1, Water Quality Rules and Regulations). Class 2 waters are those that are known to support fish or drinking water supplies, or where those uses are attainable. Class 2 waters may be perennial, intermittent, or ephemeral, and are protected for the uses indicated in the four subcategories: 2AB, 2A (drinking water), 2B (game fish populations), and 2C (non-game fish populations). A Class 2 designation indicates that the three forks of the Popo Agie River are 1) presently supporting fisheries; 2) have the hydrologic and natural water quality potential to support fisheries; 3) include nursery areas or food sources for fisheries; and 4) drinking water supplies.

The WDEQ pollution control program is designed to serve the interests of the state and achieve related goals, objectives, and policies to achieve the highest possible water quality. Designated uses which apply to Class 2 streams are:

1) Agriculture: agricultural use including irrigation and stock water.

2) Fisheries: water quality, habitat conditions, spawning and nursery areas, and food sources necessary to sustain populations of game and non-game fish (excludes exotic species which are considered "pests").

3) Industry: maintaining a level of water quality useful for industrial purposes.

4) Drinking water: Potable water or water supplies suitable for human consumption after receiving conventional drinking water treatment.

5) Recreation: refers to maintenance of a level of water quality which is safe for human contact, but does not guarantee the availability of water for any recreational purpose.

6) Scenic value: Aesthetics of the aquatic systems themselves (odor, color, taste, settleable solids, floating solids, suspended solids, and solid waste) and is not necessarily related to general landscape appearance.

WDEQ has also established water quality criteria (numeric and/or narrative standards) for surface waters in Wyoming to ensure that water quality is sufficient to support all of the designated uses (WDEQ 2002). Water quality standards are used in determining if a stream segment is meeting its designated uses. The Popo Agie Conservation District compares data collected in the watershed to WDEQ water quality standards. An exceedence of these known standards may be an indicator of a water quality issue or concern. Exceedences which occurred during PACD monitoring have been explored in the data analysis process. Those issues that emerged during water quality monitoring have been incorporated into the watershed plan.

In addition to establishing a system for evaluating water, WDEQ must also report the condition of the State's water. Under Section 305(b) of the CWA, the State of Wyoming must report to the U.S. Environmental Protection Agency once every two years. In addition to the 305(b) report, WDEQ must also identify those waters that are not meeting the water quality criteria. This requirement is mandated under Section 303(d) of the CWA, and identifies "impaired waterbodies". The Popo Agie Watershed currently has one impaired waterbody within its boundaries: The Middle Fork of the Popo Agie River for fecal coliform bacteria. The State of Wyoming is required to address impaired waterbodies by establishing water quality standards and pollution control activities designed to achieve and maintain designated uses.

Popo Agie Conservation District

Local conservation districts have statutory authority to assume the responsibility and leadership for information and education programs related to water quality, providing technical and financial assistance to their constituents to conserve Wyoming's natural resources, protect the quality of life, and preserve the tax base. The Popo Agie Conservation District (PACD) has assisted local stakeholders in developing appropriate and acceptable solutions to address water quality concerns and investigate conditions as they apply to compliance with known standards. PACD has also endorsed the formation of the Popo Agie Watershed Planning Steering Committee to develop a locally-led, voluntary and incentive-based watershed management plan to improve water quality while preserving the economic sustainability of agriculture, recreation, wildlife, and municipalities in the Popo Agie Watershed. In order to guide the watershed planning process, the Popo Agie Conservation District collected credible water quality data in the Popo Agie Watershed from 1999 to 2002 at a total of 39 sites. The Popo Agie Watershed planning process has been funded primarily through Clean Water Act Section 319 grants, PACD mill levy funding, and a variety of other local, state, and federal partnerships.

Public Involvement in the Planning Process

PACD hosted multiple public meetings to provide information to, and gather input from, the public and land managers within the Popo Agie Watershed. Meetings were held in Lander, and included presenters to explain current natural resource-related activities in the watershed as well as potential for development of existing water resources. Approximately twenty local citizens were selected to serve on the Popo Agie Watershed Planning Steering Committee. The Steering Committee was intended as a cross-section of the community, which would provide expertise to guide the planning process, represent local issues and concerns, and help to identify future goals and projects. PACD will continue to plan and work toward fulfilling the goals set forth in this planning document including the removal of the Middle Fork of the Popo Agie River from the 303(d) List of Impaired Waterbodies.

Public Comment Period

The draft plan was available for a 45-day public comment period from June 15 to July 30, 2005, prior to being submitted to WDEQ for final approval. The watershed plan was approved by the Popo Agie Conservation District and WDEQ. A copy of the document has also been filed with the Fremont County Clerk.

Purpose for Watershed Planning

In March 1999, the Popo Agie Conservation District (PACD) received a grant from the Wyoming Association of Conservation Districts (WACD) to expand the watershed planning effort for the Middle Fork of the Popo Agie River to include the entire Popo Agie Watershed. The District was committed to engage the community in a collaborative effort to create a watershed plan that reflected the values, interests, and goals defined by the Popo Agie Watershed's residents. In order to fulfill its commitment, PACD held a series of public meetings to explain the watershed planning process and ensure support for the planning effort. The public identified resource issues and concerns within the watershed and nominated individuals within the community to represent those issues and concerns, and a Steering Committee was formed from those nominees.

Given the lack of extensive surface water quality data and the projected increase of water use activities over the next 20 years in the Popo Agie Watershed (Lander 2020 Report 1999), a comprehensive watershed assessment and water quality monitoring effort was needed. The Water Quality Technical Advisory Group (TAG) assisted PACD in developing a water quality monitoring project to collect surface water quality data in the Popo Agie Watershed. This was utilized in the watershed planning process to support and identify the focus of the watershed plan.

The Popo Agie Watershed Management Plan was developed to address several resources concerns including water quality, water quantity, upland and rangeland condition, and riparian habitat. The Popo Agie Watershed Management Plan was also developed to facilitate and coordinate local, state, and federal efforts to address these resource issues.

This planning process achieved local input and participation by creating the Popo Agie Watershed Planning Steering Committee. The Steering Committee consists of several local stakeholders including representatives from the urban communities, rural and agricultural communities, and resource management agencies. The Steering Committee originally selected representatives based on areas of expertise to serve on Technical Advisory Groups: Upland, Riparian, Water Quality, Water Quantity, and Geographic Information Systems (GIS). The GIS TAG was incorporated into other groups, and the technology was utilized to gather and present data for each of the four primary TAG groups.

The watershed management plan will be used as a tool to accomplish improved natural resource management for a productive and quality life through education and voluntary cooperation. The plan describes existing natural resource conditions, defines watershed goals, identifies and plans for future conditions and social/economic resources. The plan describes practices that landowners and resource management agencies can implement to improve natural resource management, prioritize watershed activities, and incorporate a defensible and credible monitoring plan to chart progress. The plan will coordinate the existing and future efforts of local partnerships, and enhance dialog within the community.

This comprehensive plan incorporates PACD policy as a primary plan component to assist with the coordination of other local, state, and federal agencies' planning efforts within the watershed. The watershed plan builds upon the existing successes achieved by PACD as the first entity to

study a watershed from source water to usage to establish a baseline condition for both water quality and quantity. This data allows local constituents to identify and resolve issues that may affect the water resource in the absence of outside intervention. The solutions presented in the watershed plan are possible because the conservation district has willingly taken the lead in water quality monitoring and locally-led mitigation efforts.

Authority for Watershed Planning

Wyoming conservation districts are entrusted pursuant to Wyoming Statute 11-16-103 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 the 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".

Furthermore, Wyoming Statute 11-16-122 grants conservation districts the authority to "conduct surveys, investigations and research and disseminate information relating to range management, the character of soil erosion, flood prevention or the conservation, development, utilization and disposal of water, and the prevention and control measures and works of improvement needed. But in order to avoid duplication of research activities, no district shall initiate any research program except in cooperation with the government of this state or its agencies, or with the United States or its agencies."

Based upon these statutes, PACD has the legal authority to initiate watershed planning. PACD embarked on this process after Wyoming Association of Conservation Districts, Natural Resource Conservation Service, and the Wyoming Department of Agriculture recognized an increasing need for local representation in natural resource management decisions and policies, and encouraged conservation districts to assume leadership roles in locally-led watershed planning.

Justification for Developing a Watershed Plan

The Popo Agie Watershed Plan is intended to provide guidelines for cooperative natural resource management as well as tasks and actions for the Popo Agie Conservation District to implement and monitor in the watershed. The plan will provide voluntary opportunities for landowners, as well as funding mechanisms, technical assistance, and long-term evaluation. The watershed plan is based on the Beneficial Use Reconnaissance Protocol (BURP) data collected by PACD from 1999 to 2002 (PACD 2001, 2004). This data has established baseline condition for the Popo Agie Watershed, and has provided recommendations to help residents maintain and improve ambient water quality conditions. Primary recommendations include:

- Maintenance monitoring of select sites every five years to assure stable water quality conditions.
- Address the 303(d) impairment on the Middle Fork of the Popo Agie River.

- Monitor and mitigate long-term effects of drought in the watershed.
- Address riparian habitat issues such as bank erosion, turbidity, etc.

In addition to PACD BURP reports, the watershed plan is based upon recommendations from the Popo Agie Watershed Level 1 study conducted by Anderson Consulting Engineers, Inc. A Level 1 Study is a qualitative geomorphic characterization developed by Dave Rosgen, which classifies streams on the basis of channel and flood plain geometry. The recommendations set forth in the ACE report include:

- Improve irrigation facilities and practices to conserve water.
- Irrigation structures system rehabilitation.
- Additional or improved measurement devices to improve operation and management of the irrigation diversions.
- Implement more efficient on-farm application methods for irrigation water.
- Further investigate impaired channel reaches (See Rosgen Level 1).
- Provide landowner incentives to conserve water.
- Administration of water rights.
- Further investigate potential water developments such as reservoir storage sites for multiple benefits (low-flow augmentation, flood control, municipal, irrigation, etc.).
- If water conservation or augmentation from storage is achieved, investigate cooperative agreements to direct or shepherd flows to reaches impacted by low flows. Investigate creative strategies for funding/financing projects.

Introduction to the Planning Process

The Popo Agie Watershed is located in southwest Fremont County, Wyoming (Figure 1). The Popo Agie Watershed Management Plan will be used as a tool to accomplish improved management for a productive economy and improved quality of life within the watershed. This plan utilizes a combination of education, voluntary cooperation, and incentive programs. The watershed plan:

- Describes existing natural resource conditions, as well as cultural and social/economic resources.
- Describes practices that land users can utilize to improve natural resource management, prioritize watershed activities, and incorporate a defensible and credible monitoring plan.
- Coordinate the existing and future local partnerships.
- Enhance dialogue with the community.

- Incorporates PACD policy as a plan component to assist with the other local, state, and federal agencies' planning efforts within the watershed.
- Builds upon existing successes achieved by PACD.
- Enhances coordination and strengthen partnerships with the Northern Arapahoe and Eastern Shoshone Tribes.
- Serves as a business plan to secure funding.
- Guides PACD activities and projects.

Although several previous studies in the Popo Agie Watershed had identified water quality and water quantity issues, the development of the Popo Agie Watershed Plan began in earnest in 1998 when several waterbodies within the Popo Agie Watershed were identified in the 1998 303(d) List of Impaired Waterbodies. Six streams were identified at that time on Table E of the 303(d) list as waters "requiring further monitoring", either due to inconclusive data, or no primary credible data. The Popo Agie Conservation District (PACD) applied for and received a grant through Section 319 of the Clean Water Act to initiate a watershed planning effort. PACD received funding and training to gather credible data to assess existing water quality conditions and address water quantity priorities.

In addition, PACD established a steering committee comprised of local community members, for the development of the locally led watershed planning effort. The committee intended to work toward the acquisition of credible scientific data to maintain and improve water resources for all users in the Lander Valley and Popo Agie Watershed. The committee also intended to solve water resource issues through the development of a watershed plan to assist local stakeholders in resolving theses resource concerns. The following section lists events and accomplishments related to the watershed planning process.

1995-1998

A Section 319 Clean Water Act grant from the Wyoming Department of Environmental Quality (WDEQ) was awarded to implement BMPs on both the Squaw and Baldwin Creek drainages to reduce nonpoint source pollution.

1996

PACD requested assistance from Natural Resources Conservation Service (NRCS) to assist in the development of a watershed planning effort for the following resource concerns: flood prevention, watershed protection, agricultural water management, water quality and quantity, riparian restoration, and streambank stabilization.

1996-1998

In response to an U.S. Environmental Protection Agency (EPA) citation, the City of Lander engages consultants to design a water treatment system to meet projected municipal water quality and quantity needs.

1998

State Aquifer Sensitivity and Vulnerability Study for Fremont County indicated the three main forks of the Popo Agie are highly sensitive and vulnerable to nonpoint source pollution.

PACD receives two grants through the Section 319 Clean Water Act. Established a local steering committee to provide oversight and guidance for the locally led watershed planning effort. PACD began water quality monitoring in the Popo Agie Watershed to establish baseline condition utilizing physical, chemical, and biological parameters. The research design was developed by the Water Quality Technical Advisory Group (TAG) consisting of local experts selected from the steering committee, WDEQ staff, and PACD staff.

1999

Wyoming State Legislature defines "credible data" as scientifically valid chemical, physical and biological monitoring data, and requires credible data must be provided as justification for listing a Wyoming waterbody as 'impaired'.

PACD begins collecting valid chemical, physical, and biological data in the Popo Agie Watershed from headwaters (alpine) to basin (confluence) reaches in order to address Table E of the 1998 303(d) list.

Lander Valley 2020 Community Meeting: Citizens expressed concerns over water related issues. The Lander 2020 Water Planning Committee developed a report on water resources in the Lander Valley. Their report found:

1. Little data was available on surface water quality to establish a baseline condition for the watershed, including chemical, physical, and biological information.
2. Groundwater resources have not been fully evaluated; herbicide pollution may exist; the Tensleep Aquifer is untapped and poor quality groundwater use is common.
3. A comprehensive plan for spring flood control was needed.
4. Little data was available on water quantity; surface water availability is unpredictable, and delivery of irrigation water is inefficient.
5. There is little coordination of water resource management by local, state, and federal agencies.

Two public meetings were held to explain the planning process to landowners and ensure support for the effort. The second meeting defined the planning effort, identified resource concerns, and nominated a Steering Committee to guide the planning process.

2000

Hydrologic drought causes extreme low flows during the month of August in Lander, Wyoming. The Department of Health posts the Middle Fork of the Popo Agie River as unsafe for recreational contact (swimming and wading) due to levels of fecal coliform bacteria in excess of the water quality standard. City of Lander municipal water reserves in Worthen Meadows Reservoir reach exceedingly low levels. Below average snow pack and precipitation pose potential water shortages for all users in the Middle Fork for the following summer.

The Popo Agie Watershed Planning Steering Committee identified the purpose, defined goals, and created guidelines for the watershed plan. The Steering Committee also selected TAGs representing Water Quality, Water Quantity, Upland Habitat, and Riparian Habitat.

2001

Preliminary investigation report for flood mitigation on the Middle Fork of the Popo Agie River, as requested by the City, County, and PACD was completed. The report defines preliminary flood mitigation alternatives and hydrologic assessment. Sponsoring agencies request NRCS to pursue technical and financial assistance through PL-83-566 Small Watershed Protection and Flood Prevention Projects.

PACD receives an additional two years of Section 319 grant funding for watershed assessment and implementation of management plans. Preliminary 1999-2000 water quality monitoring results and recommendations were published. The Water Quality TAG assisted PACD in designing an additional two-year water quality monitoring study. BURP data was collected on 19 sites within the watershed, including stations on smaller tributaries of the Middle Fork and Little Popo Age Rivers to assess possible contributions/effects on surface water quality from basin reaches and tributaries.

PACD receives Wyoming Water Development grant to:

1. Provide an updated watershed description and Level 1 inventory;
2. Provide information on existing and potential irrigation problems (flow rates, water quality);
3. Offer a management approach which addresses appropriate land and water management methods within the watershed while also considering private property and water rights;
4. Address irrigation supply systems, conceptual designs for mitigation of stream bank erosion, channel stabilization approaches and improvements to irrigation water control and management practices;
5. Provide recommendations and solutions that are practical and economic.

2002

BURP data collection continued for 19 sites in the watershed. PACD collected additional bacterial data at 9 sites on the Middle Fork of the Popo Agie River in cooperation with WDEQ. The supplemental bacterial monitoring project was intended to identify potential sources of coliform bacteria and determine the extent of the water quality impairment. Data was reviewed by the Water Quality TAG. Their recommendation was to continue supplemental bacterial monitoring for the Middle Fork during the 2003 recreation season.

Aerial photography of the Middle Fork of the Popo Agie River is conducted to provide current data for the flood mitigation process. Draft Environmental Impact Statement (EIS) is begun for the PL-566 Lander flood mitigation project. A Notice of Intent was issued and published in the Federal Register on November 26, 2002 concerning flood prevention and stream rehabilitation for the Middle Fork of the Popo Agie River through Lander.

2003

Public scoping meeting was held to gather public input regarding potential alternatives and concerns of local citizens for the proposed flood prevention and stream channel restoration for the Middle Fork. Proposed alternatives included: diversion through or around town with channel restoration; flood wall and channel restoration; and upstream storage and channel restoration. The scoping meeting and written comment period generated 24 additional alternatives and 95 issues/concerns/opportunities to address in the flood mitigation planning process. Survey and design activities for the flood project continued.

Anderson Consulting Engineers, Inc. published the Popo Agie River Watershed Study, Level 1 funded through the Wyoming Water Development Commission. The Squaw Creek Bioengineering Demonstration Project was completed at the Museum of the America West property to address soil erosion and streambank instability. The project included pole plantings, root wads, a willow mattress, a willow fascine, vertical willow bundles, a stream barb, vortex weirs, and fish lunkers.

PACD continued to collect and analyze bacterial samples for the Middle Fork in cooperation with WDEQ. PACD enlisted Boy Scouts to stencil storm drains in Lander with the message "Dump No Waste-Drains to Stream" to raise awareness for non-point source water pollution.

2004

Flood mitigation becomes priority for NRCS. Design alternatives and economic feasibility study were conducted.

In accordance with ACE, Inc. recommendations for the Taylor Ditch Group, PACD facilitated the creation of the Taylor Watershed Improvement District (WID). The formation of the Taylor WID enables agricultural producers to make critical repairs to the Taylor Ditch infrastructure by providing technical assistance and access to funding sources. PACD completed the final BURP data report for 2001-2002 water quality monitoring. Data was reviewed by the Water Quality TAG, Steering Committee, Habitech Inc., and WDEQ. Supplemental bacterial monitoring continued on the Middle Fork of the Popo Agie River. PACD enlisted Boy Scouts to apply decals bearing the message "Keep it Clean-Drains to Popo Agie River" to raise awareness for nonpoint source pollution.

WATERSHED CONDITION & ASSESSMENT

Existing Water Quality Data

The following is a summary of agencies and organizations that have been involved in water quality related research and monitoring in the Popo Agie Watershed including both historical and current resource data available and known about the watershed:

- Squaw and Baldwin Creeks water quality monitoring data. PACD 95-98.
- PACD BURP data summary reports, 1999-2000, 2001-2002. **
- Summary & Analysis of Historical Water Quality Data for the Popo Agie Conservation District, Earl DeGroot, Western Management Services, 1997
- Lander 202 Water Planning Committee Report**
- Popo Agie Watershed Upland TAG Report 11/2003**
- Red Canyon/Three Quarter Circle Land and Cattle Co. Hyperspectral Imagery
- Wind - Bighorn - Clarks Fork River Basin Study, 1973
- Enterprise River Basin Study
- Cemetery Ditch River Basin Study
- Taylor-Dutch Flat Ditch River Basin Study
- Nicol-Table Mountain River Basin Study
- Electro-shocking, Squaw & Baldwin Creeks, WG&F
- Lander Front Report - Wyoming Game and Fish Department
- Factors Affecting the Distribution and Life History of Sauger, WG&F.
- Response of American Dippers to variations in stream water quality
- Fremont County Published Soil Survey Reports
- Fremont County Land Use Plan
- Fremont County Digitized Irrigated Soils, Fremont County GIS
- Fremont County record of noxious weeds in Popo Agie Watershed, 2003.
- DEQ Water Quality Monitoring Data (Historical and Current)
- Wyoming State Engineers Division III Water Resources
- WWDC Level 1 Study, Popo Agie River Watershed, July 2003**
- University of Wyoming Spatial Data
- Sagebrush Thinning Research Plot, Onion Flats, UW Extension
- NRCS Irrigation On-Farm Report for Wind River Basin, 1993
- Riparian Assessment for Wind River Reservation and Middle Fork of the Popo Agie, NRCS Riparian Team, Bozeman, MT
- NRCS Centralized Forecasting System - Streamflow Forecasts
- SNOTEL Snow Survey (Historical and Current)
- PL 5-66 Flood Mitigation project for Lander, in progress**
- Flood plain survey for the Middle Fork of the Popo Agie, NRCS, Lander City, 1998
- NRCS Natural Resources Inventory
- Wind River Reservation Soil Survey, in progress.
- BIA Reservation Range Survey, 1960
- Wind River Environmental Quality Commission data
- Wind River Reservation Management Plan-River and Stream, 1986

- BLM Allotment Management Plans
- BLM Resource Management Plan for the Lander Resource Area, in progress
- Shoshone National Forest Plan, USFS
- Allotment Management Plan, USFS
- Maxon Basin, Special Interest Area, USFS
- Wilderness Fire Management Plan, USFS
- Wilderness Management Plan, USFS
- Range Unit 20, North Fork Popo Agie, USF&WS
- USGS Water Resources Data for Wyoming
- USGS NAWQA Synoptic Study for the Wind River, June-July 2000

***denotes primary documents utilized for reference in developing the watershed plan.*

Watershed Description

The Popo Agie Watershed consists of three main forks of the Popo Agie River (Figure 2). The City of Lander, Town of Hudson, and rural residents rely on the three forks of the Popo Agie River as their source for drinking water, agricultural irrigation, and other beneficial uses. The watershed is approximately 522,300 acres. Land ownership is divided among the Wind River Reservation (4.4%), United States Forest Service (37.5%), Bureau of Land Management (24.6%), Department of Defense (0.3%), State of Wyoming (7%), and private land (25.5%). Surface water bodies make up 0.6% of the area. The watershed is predominantly rangeland, while forested areas, and irrigated hay and pasturelands also make up a portion of the watershed (USDA-NRCS, Riverton, WY data).

All three forks of the Popo Agie originate at an elevation over 12,000 feet in the Wind River Mountains. The North Fork of the Popo Agie River originates at the Continental Divide near Lonesome Lake and terminates at its confluence with the Middle Fork of the Popo Agie River at about 5,200 feet (near WYPO Bridge, 1.5 miles north of Lander) where the river is then called the Popo Agie. The Middle Fork originates near Bills Park. The Little Popo Agie River headwaters are at Christina Lake near the Continental Divide. The Little Popo Agie terminates at its confluence with the Popo Agie at 5,080 feet, near the town of Hudson. The Popo Agie eventually drains into the Little Wind River near Arapahoe, Wyoming, where the watershed terminates.

Little Popo Agie River

The Little Popo Agie channel is 58.38 miles long and drains 238,630 acres (Popo Agie Conservation District data). Overall sinuosity for the Little Popo Agie, from the headwaters to the confluence with the Popo Agie is 1.88. Gradient for the entire channel is 0.017 ft/ft (NRCS 2001). The Little Popo Agie drainage has the greatest total land compared to the North and Middle Forks. Irrigated acres on Little Popo Agie tributaries amount to 6,662 acres. The tributaries included in this count are: Twin Creek (686 ac), Deep Creek (114 ac), Beason Creek (1,027 ac), Red Canyon Creek (98 ac), Little Popo Agie (4,664 ac), and Weiser Creek (73 ac).

Middle Fork of the Popo Agie River

The length of the Middle Fork of the Popo Agie is 54 miles and it drains 166,120 acres. Sinuosity, measured from the headwaters to the confluence with the Little Wind River is 1.33. Gradient for the length of the Middle Fork channel is 0.019 ft/ft. Irrigated acres on Middle Popo Agie tributaries amount to 11,503 acres. The tributaries included in this count are: Baldwin Creek (1,078 ac), Squaw Creek (578 ac), Squaw Creek and Middle Popo Agie (597 ac), and Middle Popo Agie (9,250 ac).

North Fork of the Popo Agie River

The North Fork of the Popo Agie has a channel length of 43.19 miles and drains 117,600 acres. Sinuosity for the North Fork, from the headwaters to the confluence with the Middle Fork is 1.35. Gradient for the entire channel is 0.026 ft/ft. Irrigated acres on North Popo Agie tributaries amount to 7,080 acres. The tributaries included in this count are: North Fork Popo Agie (4,660 ac), Baldwin Creek and North Popo Agie (2,329 ac), and Upper Little Wind-Ray Canal (91 ac). Stream order, gradient, and sinuosity are described by site in Site Descriptions: Appendix 2. The total number of irrigated acres for the Popo Agie Watershed is 26,941. There are 195,769 irrigated acres within the entire Wind River Basin (USDA-NRCS, Riverton, WY data).

Vegetation

Vegetation in the Popo Agie Watershed varies by elevation and land use (Figure 3). The watershed is dominated by shrubland (44.01%) and grasslands and herbaceous species (33.13%). The third largest vegetative community is evergreen forest (18.30%) followed by irrigated pasture and hayland (5.23%). Other vegetation classes include wetlands, residential landscaping, mixed forest, and other cropland. National Land Classification Data System (NLCD) data was used to determine vegetation type and cover in the watershed.

Climate

Climate within the Popo Agie Watershed can vary widely depending on the elevation. Elevation ranges from over 13,000 feet above sea level at Wind River Peak, to 5,000 feet above sea level near Hudson. The Wind River Mountain Range west of Lander obstructs moisture arriving from the west, putting Lander in a rain shadow and creating a semi-arid climate. Weather conditions become drier farther east and northeast of the mountain range. Temperature varies widely depending on elevation and seasonal factors Figure 4 displays the mean monthly high and low temperatures for Lander. Mean highs range from the mid 80's in July to the low 30's in January and December. Mean lows range from single digits in January and December to the mid-50's in July.

Figure 5 displays the Isohyetals (lines of equal precipitation) within the watershed. This figure clearly shows the relationship between elevation and precipitation in amounts. The data used to generate this figure were obtained from Wyoming Geographic Information Science Center (WGISC). These data represent the results of the PRISM spatial climate data generated at the Oregon Climate Center, Oregon State University. As indicated in this figure, the mean annual precipitation varies greatly from a minimum of approximately 7 to 9 inches at the watershed mouth to over 21 to 23 inches along the crest of the Wind River Mountain Range. On average,

Lander receives approximately 13.2 inches of annual precipitation, most of which arrives during the April, May, and October. Lander averages 108 inches of snowfall per year, much of it in April. The heaviest precipitation in Lander occurs when upslope conditions are present, or a low pressure system from the south meets a high pressure system from the north. Annual precipitation for the city of Lander in 1999 was 13.49 inches. In 2000 Lander received 8.61 inches, while in 2001 and 2002 the city of Lander received 5.36 inches and 8.09 inches respectively (National Weather Service Data, Lander, WY).

Geology

Geology in the Popo Agie Watershed varies by elevation and drainage sub-basin (Figures 6 & 7).

Little Popo Agie Drainage

Contrary to the North and Middle forks of the Popo Agie, the Little Popo Agie does not originate in any Metamorphic or Igneous rock, but runs entirely through Marine shales and other sedimentary layers. The Little Popo Agie originates in the Cambrian Phosphoria formation, whereas the North and Middle forks flow from granites, gneisses, and schists. Downstream from the Phosphoria are Triassic formations, including the Popo Agie formation, Alcova limestone, and the Red Peak and Dinwoody formations. These overlay the Phosphoria and can be found on the back side of Table Mountain and upper Willow Creek and run parallel to the Wind Rivers. Downstream from the Triassic between Lander and Hudson lie the Jurassic, including the Cloverly, Morrison, Sundance, Gypsum Springs, and Nugget Formations.

The Cretacious period formations follow. These formations include the Cody, Mowry, Thermopolis, and Lower Thermopolis Shales, as well as the Muddy Sandstone and Frontier formations (Love et al. 1979). These 'marine shales' can be found in the Government Draw and Twin Creek areas. The Jurassic and Cretaceous shales and sandstones are highly erosive and saline (D. Dahms, University of Missouri Geology Professor, Personal Communication, July 2001). There is also some alluvium present along the riverbed. The Little Popo Agie also flows through two dome formations- the Dallas and the Derby. These dome formations are slanted at a 21 degree angle, which exposes more of the surface of these sedimentary beds to hydrology (D. Dahms, University of Missouri Geology professor, Personal Communication, July 2001).

Middle Fork of the Popo Agie Drainage

The geology of the Middle Popo Agie is mainly pre-Cambrian (Igneous and Metamorphic) rock formations at the mountain elevations. The Frye Lake area is a good example of this. The main rock types found here are Granites, Granodiorites, Gneisses, and Schists. At the upper end of Sawmill Canyon and Sinks Canyon the formations are primarily Gallatin, Gros Ventre, and Flathead, which are all Cambrian rocks. Moving down the Canyons are the Madison limestone formation from the Mississipian era, the Tensleep Sandstone, and Amsden formation from the Pennsylvanian era. The Sinks is in the Pinedale stage moraines. Just below the Sinks is the Phosphoria formation, followed by the glacial moraines from the Pleistocene (Bull Lake stage, Pinedale stage, and Buffalo stage). Below Sinks Canyon the Triassic formations occur again, and then the Cretaceous runs into Lander. On the other side of Lander the Middle Fork encounters the marine shales of the Triassic and Creatceous periods (Love et al. 1979).

North Fork of the Popo Agie Drainage

The North Fork of the Popo Agie is similar to the Middle Fork in that they both originate in the Igneous and Metamorphic rock types. The North Fork also runs through the Permian, into Triassic, and then the Cretaceous formations. One major difference on the North Fork is the substantial alluvial bed below the sedimentary formations. Milford and N. 2nd Street areas north of Lander are examples of this alluvial bed. This alluvial material is eventually overtaken by the marine shales and other sedimentary beds as the North Fork of the Popo Agie River runs east toward the City of Lander. At the confluence of the North and Middle Forks, the river runs through sedimentary rocks again (Love et al. 1979).

Soils

Most of the soils in the watershed are Cryalfs, Cryolls, Orthents and Argids (Figure 8). They are moderately fine-textured, well-drained, and have a cold temperature regime. These soils may have humid or dry moisture regimes. The deep, steep loams and fine sand loams (Farlow and Duncom series) are on mountain fronts. The deep or shallow, sloping loams (Sinkson and Thermopolis Series) are on alluvial fans and uplands. The deep and nearly level loams (Lupinto and Lander Series) are on stream terraces and flood plains (Young 1981).

Land Ownership and Land Use

The majority of land in the Popo Agie River watershed consists of publicly owned federal lands (Figure 9). Land ownership information was obtained from the Fremont County Assessor's Office and incorporated into the project GIS. Federally administered public lands comprise approximately 63 percent of the watershed. The upper reaches of the basin lie within the Shoshone National Forest and are administered by the USDA Forest Service, which encompasses approximately 195,400 acres (37.4 percent) of the Popo Agie River watershed. A large portion, nearly 85,000 acres of the National Forest, has been designated as the Popo Agie Wilderness Area. In the basin reaches of the watershed, the majority of land consists of publicly owned federal lands administered by the USDI Bureau of Land Management. These lands cover approximately 130,400 acres, or 25.6 percent of the watershed. The Wind River Indian Reservation covers approximately 7.0 percent of the watershed and state owned lands comprise approximately 6.5 percent. The remainder of the watershed is either privately owned (approximately 23 percent) or municipal.

Land use varies in the Popo Agie Watershed. Industries include oil and gas development, as well as historical coal extraction. Agriculture is another dominant industry in the watershed and includes both irrigated acreage and rangeland.

Water Use Management

The Popo Agie Watershed has a rich and diversified community and economy which are dependent upon several water uses:

1) *Domestic Water Resources:* There are two communities within the watershed that derive their municipal water supplies from the Popo Agie River system and related resources. The

City of Lander utilizes stream flow from the Middle Fork of the Popo Agie River which is captured, and stored, in Worthen Meadows Reservoir. The Town of Hudson also receives municipal water supplies from the Popo Agie River System through groundwater wells, which are refurbished through the Little Popo Agie River and irrigation.

2) *Agriculture Water Resources:* Production agriculture is the dominant consumptive use (96%) in the watershed. Crops produced include alfalfa, wheat, oats, and irrigated pasture.

3) *Wildlife:* Wildlife resources are dependent upon available water. Abundant populations of deer, elk, and antelope populate the area, as well as countless resident and migratory birds. Common fish species include brook trout, rainbow trout, brown trout, mountain sucker, and white sucker. Rarer fish species include sauger, Yellowstone cutthroat trout, and golden trout.

4) *Recreation:* Opportunities are available in the watershed and may focus on the river system and associated amenities.

Social/Economic

Lander is the largest municipality in the Popo Agie Watershed with a population of nearly 7,000 residents. Hudson is the only other incorporated town in the watershed with a population of approximately 400 residents. There is also significant rural subdivision development occurring in the watershed in areas such as Sinks Canyon, Baldwin and Squaw Creeks, Red Canyon, and the North Fork of the Popo Agie River. According to the Fremont County Planning Department, 802 rural acres were converted into subdivisions from 2000 to 2004 in the Lander area.

While Fremont County has an unemployment rate of 6.4% (US Census Bureau 2001), the Lander area has many employment resources including education (28.5%), retail trade (12.0%), agriculture (9.5%), construction (8.4%), professional (5.2%), transportation and utilities (4.6%), and manufacturing (3.0%). However, public administration including local, state, and federal government employ the greatest percentage of the available workforce in the watershed due in part to Lander, which is the Fremont County government seat. Lander also contains several regional state and federal government offices.

WATERSHED ISSUES, GOALS, & OBJECTIVES

Resource Issues and Concerns

Many groups, private landowners, and land management agencies have identified current or projected natural resource issues and concerns. This plan addresses these issues by the four themes originally identified by the Steering Committee: Water Quality, Water Quantity, Riparian, and Upland.

Water Quality

Fecal coliform bacteria

Coliform bacteria are used as indicators of the presence of pathogens from animals, and because fecal coliform bacteria do not reproduce in surface water, a test for both their presence and concentration can be used to define localized point or nonpoint source pollution (WDEQ 1999). In 1997 the U.S. Geological Survey (USGS) began intensive study of the Yellowstone River Basin as part of the National Water Quality Assessment (NAWQA) Program. In June of 2000, the Popo Agie Watershed, a part of the Wind/Bighorn River system, was included in this synoptic study because the presence of fecal-indicator bacteria in elevated concentrations had been previously documented (J. States, consultant, written communication, 2001). Results of the NAWQA study confirmed that fecal coliform bacteria density exceeded recommended levels in the Middle Fork of the Popo Agie River within the city limits of Lander (Clark and Gamper 2000).

In July of 2000, water samples collected from the Middle Fork of the Popo Agie River near Main Street in Lander, WY indicated a potential exceedence of the numerical standard for fecal coliform bacteria. The Wyoming Department of Environmental Quality (WDEQ) was notified and subsequent sampling for calculation of a geometric mean was conducted by the WDEQ water quality division field staff. Those results confirmed a concentration of fecal coliforms in excess of Wyoming surface water quality standards. Subsequently, the Middle Fork of the Popo Agie River was included in Table A of the 303(d) List of Waters Requiring TMDLs. Table A lists waterbodies with known water quality impairments, and classifies the extent of the Middle Fork's concern as "undetermined distances upstream and downstream of the City of Lander."

The Popo Agie Watershed Steering Committee recommended to PACD that this water quality impairment of the Middle Fork of the Popo Agie River be integrated into the ongoing watershed planning process. This process includes assessment, monitoring, and mitigation, as an alternative to a Total Maximum Daily Load (TMDL) regulatory action. This supplemental bacterial monitoring process was initiated to address the 303(d) water quality impairment for fecal coliform bacteria. PACD initiated an intensive monitoring program, supplemental to the regular Beneficial Use Reconnaissance Protocol (BURP) study in effect from 1999 to 2002. The supplemental bacterial monitoring study focuses on identifying spatial boundaries of the impairment, generally identify possible contributions, and implement voluntary mitigation of potential bacterial contributions with Best Management Practices.

Data from 2002-2004 indicates that during this time period, private or municipal wastewater treatment systems are most likely not responsible for the detected bacteria levels. Bacterial counts would far exceed the recorded levels if a consistent private or municipal wastewater treatment source was present in close proximity to an established sampling station. In addition, there is little evidence to support an agricultural source according to the data collected by PACD during the initial study period. The majority of irrigated lands in proximity to the Middle Fork of the Popo Agie River received very little overland flow or surface runoff from precipitation events during the reported study period. Surface runoff can transport animal waste directly into a stream, although weather patterns, reported limited precipitation and severe drought conditions, particularly in 2002 and 2003. Other possible influences may include wildlife, waterfowl, domestic pets, and exposure from recreational users.

Based upon preliminary 2002 data, the Water Quality TAG members suggested a number of recommendations regarding the fecal coliform impairment.

1) Continue to monitor during the recreation season (June 1-September 30), but remove early and late sample dates since the past two years of data have yielded little information for May and October.

2) In the absence of a recognizable point source, take precautions in periods of low flow to insure public health and safety (i.e. post the river).

3) Continue, and enhance public education and outreach regarding fecal coliform bacteria and related health concerns; proper septic system design and maintenance, responsible pet ownership, and desirable recreation periods.

4) Include the City of Lander and Parks & Recreation supervisor in upcoming meetings.

5) Pipe the Patton-Crowley ditch through City Park.

6) Continue side-by-side samples with DEQ personnel whenever possible to ensure accurate and comparable results.

PACD continued to monitor coliform bacterial and E. coli in 2003 and 2004. To date, no apparent or consistent point source has been identified. However, there are a number of programs, projects, and Best Management Practices that can be implemented to reduce nonpoint source pollution, thereby reducing public health and environmental risks from bacterial contamination with the intent that this stream segment will once again comply with state water quality rules and regulations.

Sulfate

Although sulfate is not a priority pollutant according to Chapter 1, the recommended level for sulfates in surface waters in Wyoming set forth by WDEQ is based upon research which suggests sulfate has negative, cumulative effects on aquatic communities. This threshold has been established based on macroinvertebrate reactions to sulfate levels. There are recorded instances where sulfate in water chemistry samples exceeded the recommended level of 150 mg/l

in the Popo Agie Watershed. Surface geology is one likely source of elevated sulfate levels because erosive formations such as marine shales and other sedimentary layers (Chugwater and Nugget sandstones, Gypsum Springs formation) may affect the chemical composition of surface water by elevating sulfates (Hopper, WY Dept. of Agriculture Analytical Services, Personal Communication, December 2001). These geologic formations are generally present upstream of the sites where elevated sulfate levels were detected by PACD, particularly in the Little Popo Agie Watershed where this surface geology is predominately sedimentary formations from the mouth of the Little Popo Agie Canyon to its confluence at the Town of Hudson.

In addition to unique geology, the Popo Agie Watershed contains three active permits for oil production. Oil production can contribute to elevated sulfate levels in surface waters, although PACD water quality data suggests that the elevated sulfates in the Popo Agie Watershed are most likely due to natural geological formations and are not exacerbated by anthropogenic causes.

In order to address the issue of sulfates and possible cumulative effects on macroinvertebrate communities and fisheries, PACD will continue to include this chemical parameter in future monitoring. The district may also investigate improved oil treatment in areas where higher sulfates have been documented, although data does not reveal that oil production is the cause of elevated sulfates because elevated levels also occur in areas not influenced by oil production.

Drought

The Popo Agie Watershed experienced a severe hydrological drought during much of the 1999-2002 water quality monitoring project period (Curtis & Grimes 2004). Drought causes noticeable decreases in water levels, which may exacerbate nonpoint source pollution by concentrating certain pollutants such as:

- Silt cover
- TSS
- Turbidity
- Water Temperature
- Presence of pollution tolerant insects
- Absence of pollution intolerant insects
- Concentration of coliform bacteria
- Concentration of other chemical parameters

To address the long-term water quality effects of drought, PACD has recommended in both the 1999-2000, and 2001-2002 Final Reports that repeating certain sites within the Popo Agie Watershed once every five years will ensure that these streams are continuing to meet surface water quality standards during hydrologic drought conditions. This monitoring schedule will also evaluate the effectiveness of projects and practices implemented to enhance surface water quality and improve irrigation water management.

Water Quantity

Irrigation

Irrigation within the Popo Agie River basin is heavily dominated by conventional flood irrigation methods. When compared with alternative methods, flood irrigation is one of the most inefficient application methods (efficiency of flood irrigation is between 40 and 60 percent). This rate implies that approximately half of the water applied to the crop is lost to deep percolation, runoff, or evaporation. Improved irrigation methods in the Popo Agie Watershed might include: center pivot and lateral move sprinkler systems, side roll or LEPA sprinkler systems, gated pipe, and information-based irrigation systems.

Flood Mitigation

Flood prevention and control has historically been an issue in the Popo Agie Watershed. Extensive economic losses and property damage have occurred during flood events in the City of Lander. The Popo Agie Conservation District is working cooperatively with several agencies and local governments to establish a flood mitigation project and plan for the City of Lander. The intent of the project is to reduce or eliminate flooding and improve stream form and function in time of storm events on the Middle Fork of the Popo Agie River from the mouth of Sinks Canyon to the confluence with Squaw-Baldwin Creek.

Preliminary alternatives included diverting flood water for upstream storage, rehabilitating the stream bed to accommodate high flow, and building an overflow channel. Additional alternatives gathered at a public scoping meeting in 2003 have been categorized according to three criteria: economic, environmental, and social feasibility. Alternatives that meet all three criteria will be recommended for detailed evaluation. In addition to evaluating alternatives, property value will also be re-assessed. The investigation into economic impacts of flood damage will include bridges, roads, residential and commercial property, and other items that could be affected by flood.

Riparian and Wetland Condition

Approximately 2% of the total land area in the Popo Agie Watershed is classified as herbaceous or woody wetland (riparian area). Although the percentage of land area occupied by wetland and riparian area is minimal, these areas provide necessary functions in the watershed. In addition to providing recreation opportunities, riparian areas and wetlands filter surface runoff, enhance fisheries, and provide rich wildlife habitat. Because riparian areas and wetlands are limited in this arid climate, several conditions can affect their integrity and condition.

Habitat Enhancement Projects

Habitat enhancement projects are valuable amenities for the Popo Agie Watershed. Potential projects include streambank stabilization utilizing traditional rock riprap and/or bioengineering techniques, revegetation, and grade stabilization structures. Such efforts to reduce soil erosion, silt cover, and provide additional riparian vegetation would improve long-term aquatic and terrestrial habitat conditions.

Upland Condition

Stewardship practices in the Popo Agie Watershed are directed toward achieving plant communities that are resilient, diverse, and able to recover from natural and human disturbance. Indicators of upland health may include, but are not limited to:

- Plant composition and diversity (species, age class, structure, successional stages, desired plant community);
- Bare ground and litter;
- Erosion (rills, gullies, pedestals, capping);
- Water infiltration rates;
- Vegetative cover.

In November, 2003 the Popo Agie Watershed Planning Upland TAG published a report which took into consideration the lack of available data. The report stated that there were unassessed range lands that do not meet entity standards and that additional and updated resource assessments and monitoring are necessary.

Other Recommendations

Public Education

PACD recommends ongoing landowner education and participation regarding water quality, riparian/wetland, water quantity, and upland condition issues. Possible topics include non-point source contamination from bacterial sources (septic systems, animal feeding operations, pet ownership); soil erosion and streambank stability; the value and function of riparian habitat; grazing management; and many more. PACD also recommends ongoing education in local area schools regarding these issues as well as field trips for water quality monitoring and other issues. Public workshops are an effective means of communicating these issues to an adult audience. Media outlets and PACD publications have also stimulated interest in natural resource issues and should continue to be utilized.

WATER QUALITY GOALS

Maintain, protect, and enhance water quality to sustain the beneficial uses and ecological health of the watershed.

Issue 1. Address the Wyoming Department of Environmental Quality 2002 listing of the Middle Fork of the Popo Agie River on Table A, 303(d) List of Impaired Waterbodies.

Objective 1: Continue to monitor bacteria levels in the Middle Fork of the Popo Agie River.

Action Items

a) Collect *E. coli* samples, pH, flow, temperature, and turbidity at each bacterial monitoring station during the 2005 and 2006 recreation seasons utilizing approved WDEQ collection and analysis protocols described in a WDEQ approved Sampling and Analysis Plan (SAP).

b) Work cooperatively with WDEQ field staff to ensure comparable and credible supplemental bacterial monitoring results including direct communication, split samples, and/or side-by-side samples.

c) Involve the Water Quality TAG with decisions regarding study design, sample frequency, data interpretation, and data analysis.

d) Invite the City of Lander and Parks and Recreation Supervisor to participate in the Water Quality TAG.

e) Report levels of *E. coli* in excess of the current recommended standards as published in Chapter 1, Wyoming Surface Water Quality Standards to WDEQ.

f) Annually compile approved data that has undergone quality assurance and quality control procedures (QA/QC) in report form and submit to the Water Quality TAG and WDEQ for review.

Objective 2: Voluntarily mitigate potential point and nonpoint sources of bacterial contamination on the Middle Fork of the Popo Agie River.

Action Items

a) Supplemental bacterial data will be used by PACD to identify possible contributions and assist landowners with voluntarily resolution of water quality issues relating to the bacterial impairment.

b) Work cooperatively with the City of Lander to explore opportunities to eliminate possible fecal contributions near City Park and other public areas by investigating the feasibility of piping the Patton-Crowley Ditch through the City Park.

c) Assist the City of Lander with education regarding sanitation concerns due to pet waste (Code 11-2-7) with a campaign which will include 100 vinyl pet waste decals, 2 news releases, and a free informational brochure.

d) Work cooperatively with other local agencies and entities to educate new rural property owners regarding proper installation and maintenance of private septic systems by utilizing informational displays, workshops, and distributing educational brochures to the public.

e) Work cooperatively with homeowners to voluntarily mitigate possible effects of failing private wastewater treatment systems by investigating cost-share and loan opportunities for septic rehabilitation. Apply for 319 grant funding in order to offer cost-share opportunities for homeowners to renovate five septic systems per year for the course of the grant.

f) Work cooperatively with agricultural producers to mitigate possible effects of Animal Feeding Operations (AFO) and Confined Animal Feeding Operations (CAFO) by assisting with identification, assessment, and technical design.

g) Assist interested producers with locating funding and technical assistance through voluntary conservation programs. Utilize quarterly PACD Newsletter, web page, news releases, informative displays, and PACD's IWM program to notify producers regarding funding opportunities and gather interest and participation in cost-share programs.

h) Continue nonpoint source pollution education efforts including, but not limited to: storm drain decal projects; informative pamphlets; public displays at the PACD office, local workshops and trade shows, Winter Fair, County Fair, and other public venues; media campaigns; PACD newsletter and web page; Popo Agie Watershed Poster. Topics may include proper septic system design, construction, and maintenance; responsible pet ownership; AFO/CAFO and manure management; and human health risks and concerns.

<u>Objective 3:</u> Pursue de-listing opportunities when supplemental bacterial monitoring data indicates that the bacterial impairment for the Middle Fork of the Popo Agie River has been resolved.

<u>Action Items</u>

a) Compile and submit all supplemental bacterial monitoring data for the study period (2002-2006) on the Middle Fork of the Popo Agie River to WDEQ for review.

b) Petition to remove the Middle Fork of the Popo Agie River from Table A, 303(d) List of Impaired Waterbodies.

c) If necessary, continue to compile data annually until requirements to petition to remove the stream segment from the 303(d) List of Impaired Waterbodies are met. In the event that the petition is denied, continue with Objective 3 Action Items until impairment is definitively resolved and petition to de-list the Middle Fork of the Popo Agie River has been granted.

Issue 2. As rural development continues to increase, the density of private dwellings encroaching on riparian areas and delineated wetland has the potential to affect water quality.

<u>Objective 1:</u> Educate rural landowners as to the importance of riparian areas and wetlands in a properly functioning ecosystem.

Action Items

a) Utilize media outlets (local newspaper and radio), quarterly newsletter, PACD web page, Rural Living Handbook, workshops and other public forums to promote public interest and involvement in local habitat restoration projects through the use of the Squaw Creek Bioengineering Demonstration Video and annual tour of the Squaw Creek Project.

b) Utilize local media and public forums to describe the ability of riparian areas and wetlands to filter non-point source pollution before pollutants are conveyed to local waterways.

<u>Objective 2:</u> Promote voluntary habitat restoration projects on public and private lands to reduce non-point source pollution in the watershed.

Action Items

a) Promote one habitat restoration project on public and/or private lands each year by pursuing funding mechanisms and other opportunities for streambank restoration and rehabilitation projects through voluntary conservation programs.

b) Photo-document each restoration process and monitor the effectiveness of practices and projects.

WATER QUANTITY GOALS

Encourage, maintain, and enhance water resources to provide for beneficial uses and ecological health while mitigating, where possible, risk to public safety and property.

Issue 1. Irrigation water conservation and efficiency.

Objective 1: Utilize Anderson Consulting Engineers, Inc. Final Report, Popo Agie River Watershed Study Level 1 recommendations to identify potential irrigation improvement projects.

Action Items

a) Solicit interest for potential irrigation projects through ditch group/company meetings, PACD newsletter and web page, and press releases.

b) Pursue funding opportunities through voluntary conservation programs to implement improvements for 2,500 feet of irrigation water delivery systems annually.

c) Reduce conveyance loss through the installation of ditch lining materials, conveyance pipelines, siphons, headgates, measuring devices, improved diversion structures and other conservation practices.

d) Coordinate technical aspects of projects including survey, design, and construction.

Objective 2: Improve water efficiencies for irrigation delivery systems to reduce conveyance loss.

Action Items

a) Assist with the development of entities (Irrigation Districts, Watershed Improvement Districts) to utilize grant/loan programs to rehabilitate irrigation ditch systems in the next five years.

b) Coordinate technical assistance including survey, design, and construction phases to ensure these services are effective and appropriate for each project.

c) Continue to offer annual cost-share assistance to irrigation companies/groups for improvements to delivery systems through PACD's Irrigation Water Management Program.

Objective 3: Improve water efficiencies for on-farm irrigation systems.

Action Items

a) Publicize availability of cost-share programs for on-farm improvements and irrigation system renovation in quarterly PACD newsletter and website including eligibility requirements and annual application deadlines. Assist with annual press releases, bulk mailings, and other means of raising awareness for voluntary conservation programs for agricultural producers and other rural landowners.

b) Assist landowners and other agency partners with the coordination of potential projects to increase on-farm irrigation efficiency.

c) Assist private landowners with pursuit of funding opportunities through voluntary conservation programs.

Issue 2. Water use/demand versus water resource availability.

Objective 1: Develop a plan and identify water uses for the Popo Agie Watershed.

Action Items

a) Evaluate USFWS recommendation for minimum flow requirements for fish in the Middle Fork of the Popo Agie (30 cfs) to encourage maintenance of minimum flows during drought conditions.

b) Evaluate the current and future water use projections for the City of Lander and the Town of Hudson, necessary water levels to service agriculture at sustainable levels, and the recreation and environmental ecosystem maintenance needs of water within the watershed.

c) Further investigate potential reservoir storage sites identified in Anderson Consulting Engineers, Inc. for multiple benefits (municipal, recreation, wildlife, and agriculture) to alleviate future drought/water shortage conditions (include economic, social, funding, and administrative feasibility).

d) Encourage installation of measuring devices and other conservation measures on streams and irrigation systems.

e) Summarize existing information from the State Engineer's Office and other studies to define consumptive use by user in order to identify loss and gain of water and generate a water budget.

f) Further investigate the feasibility of potential weather modification project opportunities to increase snow pack and available water supply.

<u>Objective 2:</u> Promote conservation ethics for all uses/users to improve water efficiency.

<u>Action Items</u>

a) Each summer, utilize PACD web page, PACD newsletters, and local media to encourage home owners in the watershed to install water conserving plumbing devices (low flow faucets, low flow toilets, garden hose timers, Energy Star ™ certified appliances).

b) Encourage municipalities to provide incentives for water conserving customers.

c) Continue to publish water conservation tips for households in PACD quarterly newsletters.

d) Offer water conservation education activities in local schools each August through May.

e) Publish water conservation information for landscapes in Spring and Summer PACD newsletters.

f) Publish water conservation information for irrigation.

g) Continually promote the use of Xeriscape ™ landscaping methods to conserve municipal water supplies.

Issue 3. Flooding and associated threat to property and public safety.

<u>Objective 1:</u> Continue to sponsor the PL-566 Watershed Protection and Flood Prevention project for the City of Lander in order to develop a proactive approach to flood prevention and flood control.

<u>Action Items</u>

a) Coordinate Planning Team meetings and public meetings.

b) Represent local constituents and local issues in the planning process.

c) Incorporate stream rehabilitation and restoration in the flood prevention project via the PL-566 Watershed Protection and Flood Prevention project for the City of Lander through cooperation with project sponsors.

d) Restore natural flood plain based on alternatives presented in the PL-566 project.

e) Improve vegetation and landscaping to assist with managing flood flows.

f) Assist with planning efforts in the community which concentrate development away from flood-prone areas.

g) Recommend the installation of in-stream structures to reduce flood velocity in the PL-566 project.

h) Recommend enhancements to riparian habitats as a portion of the PL-566 project.

i) Investigate potential reservoir storage opportunities in the PL-566 project.

RIPARIAN & WETLAND GOALS

To maintain ecosystems and resources capable of sustaining ecological, economic, and social values in which riparian and wetland health is a fundamental component.

Issue 1. Streambank stabilization and channel restoration.

Objective 1: Maintain and restore ecological health in the Popo Agie Watershed.

Action Items

a) Investigate voluntary project opportunities for streambank stabilization and channel restoration including traditional and/or bioengineering techniques.

b) Each year, conduct public education and outreach in local schools, public forums, PACD newsletter and web page, and media outlets regarding causes and effective remediation techniques for streambank erosion.

c) Publish a Rural Living Handbook for the Lander Area for distribution through PACD, Fremont County Planning, and local real estate agencies to educate landowners regarding successful streambank stabilization techniques.

Issue 2. More effective land management which considers the unique and critical ecological role of riparian areas and wetlands.

Objective 1: Utilize BMP's to more effectively riparian areas and wetlands across the watershed.

Action Items

a) Seek appropriate funding sources through voluntary conservation programs to assist interested landowners with installation of BMP's.

b) Utilize technical resources available through local, state, federal, and tribal partnerships.

c) Promote appropriate distance for development to occur without disrupting riparian and wetland habitat through subdivision reviews.

d) Promote sustaining valuable habitats for viable and diverse plant and animal populations.

e) Promote habitat, water depth, sustainable flow duration, and temperature necessary for productive fisheries, waterfowl breeding sites, and other wildlife needs throughout the watershed.

Issue 3. Channel manipulation/alteration which changes natural hydrology.

<u>Objective 1:</u> Raise awareness regarding stream dynamics and effects of channel disturbance and manipulation.

<u>Action Items</u>

a) Educate contractors and landowners regarding hydrological effects of channel manipulation utilizing quarterly PACD newsletters and web page, workshops, media outlets, and other public venues as well as the Rural Living Handbook.

UPLAND CONDITION GOALS

To maintain ecosystems and resources capable of sustaining ecological, economic, and social values in which upland health is a fundamental component.

Issue 1. Lack of available data/incomplete data for upland areas of the Popo Agie Watershed.

Objective 1: Collaborate with local, state, and federal agencies to collect credible data to assist in upland management and land use planning.

Action Items

a) Participate as cooperating agencies in the Shoshone National Forest and Bureau of Land Management Resource Management Plan processes.

b) Encourage joint cooperative monitoring between private, local, state, and federal partners.

c) Participate in two grazing demonstration projects and develop information/education associated with grazing demonstration projects.

Issue 2. Landowner participation in voluntary incentive programs to implement conservation practices.

Objective 1: Identify available programs and funding opportunities for federal, state, tribal, and private lands.

Action Items

a) Compile database of available programs and funding opportunities for public access and provide landowners with contact information.

b) Encourage participation from landowners for voluntary conservation programs and practices of state, federal, tribal, and private lands by publicizing available programs and funding opportunities as programs become available.

c) Coordinate survey, design, construction, and monitoring/evaluation of conservation practices and assist, when necessary with the preparation of applications for conservation programs.

d) Assist with locating funding and technical assistance through voluntary programs for permittees to implement voluntary conservation practices on federal lands (planning, inventory, survey, and design).

Issue 3. Education of the landowners and the general public in principles of conservation and range management.

Objective 1: Provide informational opportunities, publications, and documents to the public regarding land use and range management.

Action Items

a) Coordinate the development of a grazing matrix with examples of scenarios for rangeland soils and vegetation.

b) Publicize principles of grazing and range management through quarterly PACD newsletters and web page, workshops, media outlets, and other public venues as well as the Rural Living Handbook.

c) Sponsor one grazing or range management seminar every two years for agricultural producers and the general public. Educate landowners regarding the economic and ecological benefits of conservation practices including: stocking rates, rotational grazing systems, fencing, herding, water developments, weed and pest management, and windbreaks/shelterbelts.

Issue 4. Limitations of small acreages (ability to support livestock/stocking rates) and associated impacts of subdivisions/ranchettes on wildlife habitat, water quality, soil erosion, and invasive plants.

Objective 1: Educate rural landowners on small acreages (less than forty acres).

Action Items

a) Sponsor workshops for rural landowners and the general public annually.

b) Publish and distribute a free Rural Living Handbook for landowners and publicize Handbook through quarterly PACD newsletters and web page, workshops, media outlets, and other public venues.

Issue 5. Land uses and associated impacts: recreation, oil/gas/mineral development, road development, subdivisions.

Objective 1: Recommend containment of off-road vehicle (ORV) use to established roads.

Action Items

a) Provide information/education regarding effects of ORV use on water quality in quarterly PACD newsletters and web page, workshops, media outlets, and Rural Living Handbook.

b) Facilitate awareness of established trails and appropriate land use ethics in quarterly PACD newsletters and web page, workshops, media outlets, and other public venues.

Issue 6. Weed infestation and invasive plants.

<u>Objective 1:</u> Work cooperatively with landowners and agencies to reduce the spread of noxious weeds and invasive plants.

<u>Action Items</u>

a) Encourage appropriate grazing management recommendations.

b) Encourage alternative weed management practices (goats, biological control, mowing, burning, etc.).

c) Publicize weed management information in quarterly PACD newsletters and web page, workshops, media outlets, and other public venues.

d) Participate in the Popo Agie Weed Management Area.

MILESTONE TABLE

Water Quality Goals					
Issue 1. Address Table A, 303(d) list bacterial impairment, Middle Fork.					
Objective 1: *Continue to monitor bacterial levels in the Middle Fork of the Popo Agie River.*					
Action Items	**2005**	**2006**	**2007**	**2008**	**2009**
a) Collect *E. coli* samples, pH, flow, temperature, turbidity during recreation season.	**X**	**X**			
b) Work cooperatively with WDEQ.	**X**	**X**	**X**	**X**	**X**
c) Involve Water Quality TAG.	**X**	**X**	**X**	**X**	**X**
d) Invite City of Lander Parks & Recreation Supervisor to TAG.	**X**				
e) Report levels of E. coli in excess of standard.	**X**	**X**			
f) Annually report data to WDEQ.	**X**	**X**			
Objective 2: *Voluntarily mitigate potential point/nonpoint sources of bacterial contamination on the Middle Fork.*					
Action Items	**2005**	**2006**	**2007**	**2008**	**2009**
a) Use data to identify possible contributions and assist landowners.	**X**	**X**			
b) Work cooperatively with the City of Lander.	**X**	**X**	**X**	**X**	**X**
c) Assist the City of Lander with information/education for pet waste campaign.	**X**	**X**	**X**	**X**	**X**
d) Educate rural property owners regarding private septic systems.	**X**	**X**	**X**	**X**	**X**
e) Work w/ homeowners to mitigate possible effects of 5 septic systems per year.		**X**	**X**		
f) Work cooperatively with agricultural producers regarding AFO/CAFO.	**X**	**X**	**X**	**X**	**X**
g) Assist producers locate funding and technical assistance.	**X**	**X**	**X**	**X**	**X**
h) Continue nonpoint source (NPS) pollution education.	**X**	**X**	**X**	**X**	**X**

Objective 3: *Pursue de-listing opportunities when supplemental bacterial monitoring data indicates that the bacterial impairment for the Middle Fork of the Popo Agie River has been resolved.*					
Action Items	**2005**	**2006**	**2007**	**2008**	**2009**
a) Compile and submit data to WDEQ for review.	**X**	**X**			
b) Petition to remove the Middle Fork from the 303(d) List.	**X**	**X**			
c) Compile data until Middle Fork is removed 303(d) List/continue until resolved.			**X**		
Issue 2. As rural development continues to increase, density of private dwellings has the potential to affect water quality.					
Objective 1: *Educate potential landowners as to the importance of riparian areas/wetlands in a properly functioning ecosystem.*					
Action Items	**2005**	**2006**	**2007**	**2008**	**2009**
a) Utilize media outlets, newsletter, web page, Rural Living Handbook, workshops, and public forums to promote public interest in projects.	**X**	**X**	**X**	**X**	**X**
b) Utilize media outlets to promote public awareness of the ability of riparian areas and wetlands to filter NPS pollution.	**X**	**X**	**X**	**X**	**X**
Objective 2: *Promote voluntary habitat restoration projects on public and private lands.*					
Action Items	**2005**	**2006**	**2007**	**2008**	**2009**
a) Promote voluntary restoration projects through conservation programs.	**X**	**X**	**X**	**X**	**X**
b) Photo-document restoration projects.	**X**	**X**	**X**	**X**	**X**

Water Quantity Goals

Issue 1. Improving irrigation water conservation and efficiency.

Objective 1: *Utilize Anderson Consulting Engineers Level 1 Study recommendations for irrigation projects.*

Action Items	2005	2006	2007	2008	2009
a) Solicit interest in potential projects.	X	X	X	X	X
b) Pursue funding opportunities through voluntary conservation programs.	X	X	X	X	X
c) Reduce conveyance loss through the installation of conservation practices.	X	X	X	X	X
d) Coordinate technical aspects of projects.	X	X	X	X	X

Objective 2: *Improve water efficiencies for irrigation delivery systems to reduce conveyance loss.*

Action Items	2005	2006	2007	2008	2009
a) Assist with the development of entities to utilize grant/loan programs.	X	X	X	X	X
b) Coordinate technical aspects of projects.	X	X	X	X	X
c) Continue to offer cost-share assistance through the IWM Program.	X	X	X	X	X

Objective 3: *Improve water efficiencies for on-farm irrigation systems.*

Action Items	2005	2006	2007	2008	2009
a) Publicize availability of cost-share programs for on-farm irrigation improvements.	X	X	X	X	X
b) Assist landowners and other agency partners with coordination of projects.	X	X			
c) Assist private landowners with pursuit of funding opportunities.	X	X	X	X	X

Issue 2. Water use/demand versus water resource availability.
Objective 1: *Develop a plan and identify water uses for the Popo Agie Watershed.*

Action Items	2005	2006	2007	2008	2009
a) Evaluate USFWS recommendation for minimum flow in the Middle Fork.	X	X			
b) Evaluate the current and future water use projections for municipalities.	X	X			
c) Further investigate potential reservoir storage sites identified in ACE Level 1.	X	X	X	X	X
d) Encourage installation of measuring devices and other conservation measures.	X	X	X	X	X
e) Summarize existing information from the SEO and other studies.	X	X	X		
f) Investigate weather modification project opportunities to increase water supply.	X	X	X		

Objective 2: *Promote conservation ethics for all uses/users to improve water efficiency.*

Action Items	2005	2006	2007	2008	2009
a) Utilize education formats each summer to encourage water conservation at home.	X	X	X	X	X
b) Encourage municipalities to provide incentives for conservation.	X	X	X	X	X
c) Continue to publish water conservation tips in newsletter.	X	X	X	X	X
d) Offer water conservation education in local schools.	X	X	X	X	X
e) Publish water conservation for landscapes.	X	X	X	X	X
f) Publish water conservation for irrigation.	X	X	X	X	X
g) Continually promote the use of Xeriscape ™.	X	X	X	X	X

Issue 3. Flooding and associated threat to property and public safety.
Objective 1: *Continue to sponsor the PL-566 Watershed Protection and Flood Prevention project for the City of Lander.*

Action Items	2005	2006	2007	2008	2009
a) Coordinate Planning Team meetings and public meetings.	X	X	X	X	X
b) Represent local constituents and local issues in the planning process.	X	X	X	X	X
c) Incorporate stream rehabilitation and restoration in the flood prevention project.	X	X	X	X	X
d) Restore natural flood plain based on alternatives presented in the PL-566 project.	X	X	X	X	X
e) Improve vegetation and landscaping to assist with managing flood flows.	X	X	X	X	X
f) Assist with planning efforts in the community.	X	X	X	X	X
g) Recommend the installation of in-stream structures to reduce flood velocity.	X	X	X	X	X
h) Recommend enhancements to riparian habitats.	X	X	X	X	X
i) Investigate reservoir storage opportunities.	X	X	X	X	X

Riparian & Wetland Goals					
Issue 1. Streambank stabilization and channel restoration.					
Objective 1: *Maintain and restore ecological health in the Popo Agie Watershed.*					
Action Items	**2005**	**2006**	**2007**	**2008**	**2009**
a) Investigate voluntary project opportunities for streambank and channel restoration.	**X**	**X**	**X**	**X**	**X**
b) Conduct public education/outreach for streambank stabilization demonstrations.	**X**	**X**	**X**	**X**	**X**
c) Publish a Rural Living Handbook for the Lander Area.	**X**	**X**			
Issue 2. More effective land management which considers the unique and critical ecological role of riparian areas/wetlands.					
Objective 1: *Utilize BMP's to more effectively manage riparian areas and wetlands across the watershed.*					
Action Items	**2005**	**2006**	**2007**	**2008**	**2009**
a) Seek appropriate funding sources through voluntary conservation programs.	**X**	**X**	**X**	**X**	**X**
b) Utilize technical resources available (local, state, federal, & tribal partnerships).	**X**	**X**	**X**	**X**	**X**
c) Promote appropriate distance for development to occur without disruption.	**X**	**X**	**X**	**X**	**X**
d) Promote habitats for viable and diverse plant/animal populations.	**X**	**X**	**X**	**X**	**X**
e) Promote protection of fisheries, waterfowl breeding sites, and other wildlife needs.	**X**	**X**	**X**	**X**	**X**
Issue 3. Channel manipulation/alteration which changes natural hydrology.					
Objective 1: *Raise awareness regarding stream dynamics and effects of channel disturbance and manipulation.*					
Action Items	**2005**	**2006**	**2007**	**2008**	**2009**
a) Educate contractors and landowners regarding effects of channel manipulation.	**X**	**X**	**X**	**X**	**X**

Upland Condition Goals

Issue 1. Lack of available data/incomplete data for the upland areas of the Popo Agie Watershed.

Objective 1: *Collaborate with local, state, federal, and tribal agencies to collect credible data to assist in upland management and land use planning.*

Action Items	2005	2006	2007	2008	2009
a) Participate as cooperating agencies in USFS & BLM Resource Management Plans.	X	X	X	X	X
b) Encourage joint cooperative monitoring between partners.	X	X	X	X	X
c) Participate in two grazing demonstration projects and develop I & E.		X	X	X	X

Issue 2. Landowner participation in voluntary incentive programs to implement conservation practices.

Objective 1: *Identify available programs and funding opportunities for federal, state, tribal, and private lands.*

Action Items	2005	2006	2007	2008	2009
a) Compile database of available programs and funding opportunities.	X	X			
b) Encourage landowner participation for voluntary conservation programs/practices.	X	X	X	X	X
c) Coordinate survey, design, construction, and evaluation of conservation practices.	X	X	X	X	X
d) Assist with locating funding and technical assistance through voluntary programs.	X	X	X	X	X

Issue 3. Education of landowners and the general public in principles of conservation and range management.

Objective 1: *Provide informational opportunities, publications, and documents to the public regarding land use and range management.*

Action Items	2005	2006	2007	2008	2009
a) Coordinate the development of a grazing matrix.	X	X			
b) Publicize principles of grazing and range management.	X	X	X	X	X
c) Sponsor one grazing or range management seminar every two years.		X		X	

Issue 4. Limitations of small acreages (ability to support livestock/stocking rates) and associated impacts of subdivisions/ranchettes on wildlife habitat, water quality, soil erosion, and invasive plants.

Objective 1: *Educate rural landowners on small acreages (less than forty acres).*

Action Items	2005	2006	2007	2008	2009
a) Sponsor workshops for rural landowners and the general public annually.	X	X	X	X	X
b) Publish and distribute a free Rural Living Handbook for landowners and public.	X	X	X	X	X

Issue 5. Land uses and associated impacts: recreation, oil/gas/mineral development, road development, subdivisions.

Objective 1: *Recommend containment of off-road vehicle (ORV) use to established roads.*

Action Items	2005	2006	2007	2008	2009
a) Provide information/education regarding effects of ORV use on water quality.	X	X	X	X	X
b) Facilitate awareness of established trails and appropriate land use ethics.	X	X	X	X	X

Issue 6. Weed infestation and invasive plants.

Objective 1: *Work cooperatively with landowners and agencies to reduce the spread of noxious weeds and invasive plants.*

Action Items	2005	2006	2007	2008	2009
a) Encourage appropriate grazing management recommendations.	X	X	X	X	X
b) Encourage alternative weed management practices.	X	X	X	X	X
c) Publicize weed management information.	X	X	X	X	X
d) Participate in the Popo Agie Weed Management Area.	X	X	X	X	X

FUNDING & TECHNICAL ASSISTANCE

Project funding and financing is a critical aspect associated with the implementation of watershed improvement projects. Given the scope of the watershed plan, there may be a large variety of funding available for future watershed improvements including local, state, federal, and private/non-profit sources.

Local Funding Sources

Popo Agie Conservation District: Irrigation Water Management Program (IWM)

The Popo Agie Conservation District administers the Irrigation Water Management Program (IWM). The IWM program was initiated with the goal of improving irrigation water systems, reducing soil erosion, conserving water, and improving water quality and productivity. Irrigation ditch companies or groups are eligible to receive funding for projects such as headgate rehabilitation or replacement, pipeline construction, etc. Assistance to the irrigation group is provided on a cost-share basis between the irrigation ditch company or group and PACD.

State Funding Sources

Wyoming Department of Agriculture

The Wyoming Department of Agriculture (WDA) carries out several programs under its own authority and is responsible for the management and administration of programs dedicated to the promotion and enhancement of Wyoming's agriculture, natural resources, and quality of life. WDA assists residents and producers with consumer health, agricultural diversification, drought, groundwater, emergency conservation, grazing and public lands, coordinated resource management, endangered species, etc.

WDA also assists conservation districts with the following:

- Enhance conservation district abilities to protect surface and groundwater quality and enhance natural resources.
- Give districts definite responsibilities regarding watershed planning and natural resource management.
- Assist districts in developing coalitions with all natural resource users, managers, and owners.
- Continue the comprehensive training program for Conservation District officials to be leaders in fulfilling the needs of constituents for water quality and enhanced natural resources.

- Improve recognition of quality district projects as examples for others.
- Utilize Conservation District supervisors and staff as leaders in the CRM program.
- Provide grants and maintain election records for local Conservation Districts.
- Obtain stable funding for active districts.

Office of State Lands and Investments

The Office of State Lands and Investments carries out several programs under its own authority and is responsible for the management and administration of programs affecting resource management, economic development and quality of life in Wyoming.

- Farm and Irrigation Loans: Provides financial assistance to Wyoming's agricultural industry to borrow up to 50 percent of appraisal value of their farm.
- Joint Powers Act Loan Program: Provides aid to cities, counties and special districts needing government services and public facilities.
- Small Water Development Project Loan Program: Provides loans to court approved water districts, agencies of the State and local government, persons, corporations, associations, and other legal entities in Wyoming to finance development and use of water on agricultural lands for agricultural purposes including conversion of dry land into irrigated land, more efficient use of water, and increased crop/forage production.

Wyoming Game and Fish Department

The Wyoming Game and Fish Department offers a funding to help landowners, conservation groups, institutions, land managers, government agencies, industry, and non-profit organizations develop and/or maintain water sources for fish and wildlife.

- *Riparian Habitat Improvement Grant:* Improves/maintains riparian/wetland resources through fencing, herding, stock water development, streambank stabilization, small damming projects and beaver transplanting.
- *Water Development/Maintenance Habitat Project Grant:* The purpose of this program is to develop or maintain water for fish and wildlife. Spring development, windmills, guzzlers, water protection and pumping payments are examples of the extent of this program.
- *Upland Development Grant:* The purpose of this program is to develop upland wildlife habitat. Example projects include management, grazing systems, prescribed burning, wildlife food plots, and range pitting/seeding.
- *Fish Wyoming:* The purpose of this program is to develop public fishing opportunities including boat ramps and fishing access.

Wyoming Water Development Commission (WWDC)

Wyoming Water Development Program: Provides grants and loan funding for water supply feasibility studies and construction projects to address water supply, transmission or storage. Project planning is covered in Levels I (reconnaissance) and II (feasibility), and project construction in Level III (final design and construction). Funds (50% grant, 50% loan) are available through the WWDC to implement improvements associated with the main canal facilities (i.e., diversion structure, main delivery canal, laterals, turnout structures, etc.). These funds are not available for on-farm improvements and require the formation of a district that can incur debt and assess user fees. The loan obligation may be partially reduced through other funding sources that also carry a grant/loan obligation.

Small Water Project Program (SWPP): Partner with other local, state, and federal programs that perform water resources planning and water development in the State. Small water projects must have an estimated total cost of less than $50,000 and provide multiple benefits for an array of interests. Projects may include construction or rehabilitation of small reservoirs, pumping and conveyance facilities, springs, wetland developments, etc. These projects may provide improved water quality and quantity, habitat for wildlife, increased recreational opportunities, or address environmental concerns by providing water supplies to support plant and animal species, or serve as instruments to improve rangeland conditions.

Federal Funding Sources: USDA Natural Resource Conservation Service

USDA Natural Resource Conservation Service (NRCS) offers a number of federal Farm Bill programs which provide technical and financial assistance to install conservation practices.

Watershed Protection and Flood Prevention Program

Also known as the "Small Watershed Program" or the "PL 566 Program," this program provides technical and financial assistance to address resource and related economic problems on a watershed basis. Projects related to watershed protection, flood prevention, water supply, water quality, erosion and sediment control, wetland creation and restoration, fish and wildlife habitat enhancement, and public recreation are eligible for assistance. Technical and financial assistance is also available for planning and installation of works of improvement to protect, develop, and use land and water resources in small watersheds. Local or state agency, county, municipality, town or township, soil and water conservation district, flood prevention/flood control district, Indian tribe or tribal organization, or other subunit of state government with the authority and capacity to carry out, operate, and maintain installed works of improvement are eligible for funding through this program.

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) was established to provide a single, voluntary conservation program for farmers and ranchers to address significant natural resource needs and objectives. EQIP provides technical, financial, and educational assistance related to livestock natural resource concerns and general conservation priorities. Non-federal landowners (including American Indian tribes) that engaged in livestock operations or agricultural production are eligible for funding. Eligible land includes cropland, rangeland, pasture, forestland, and other farm and ranch lands.

Wetlands Reserve Program

This voluntary program provides landowners with financial incentives to restore and protect wetlands in exchange for retiring marginal agricultural land. Landowners may sell a conservation easement or enter into a cost-share restoration agreement. Landowners voluntarily limit future use of the land, but retain private ownership. Landowners and the Natural Resources Conservation Service develop a plan for the restoration and maintenance of the wetland. The program requires acreage authorization levels, not funding levels.

Wildlife Habitat Incentives Program

The Wildlife Habitat Incentives Program (WHIP) is a voluntary program to develop and improve wildlife habitat on private lands. It provides both technical assistance and cost share to help establish and improve fish and wildlife habitat. Participants work with NRCS to prepare a wildlife habitat development plan in consultation with a local conservation district. The plan describes the landowner's goals for improving wildlife habitat, a list of practices and an installation schedule, and details the steps necessary to maintain the habitat for the life of the agreement. To be eligible for funding, individuals must own or have control of the land under consideration and cannot have the land already enrolled in programs that have a wildlife focus, such as the Wetlands Reserve Program, or use the land for mitigation.

More Programs

Flood Mitigation Assistance Program

The Flood Mitigation Assistance (FMA) program helps states and communities identify and implement measures to reduce or eliminate the long-term risk of flood damage to homes and other structures insurable under the National Flood Insurance Program (NFIP). Projects may include: (1) elevation, relocation, or demolition of insured structures; (2) acquisition of insured structures and property; (3) dry flood proofing of insured structures; (4) minor, localized structural projects that are not fundable by state or other federal programs (erosion-control and drainage improvements); and (5) beach nourishment activities such as planting of dune grass. State agencies, participating NFIP communities, or qualified local organizations are eligible for this funding source. Communities must have Flood Mitigation Plans to be eligible for FMA project grants.

Project Impact Grant Program

Project Impact helps communities that have a history of losses from natural disasters or have a significant disaster risk, such as those located in watershed floodplains. Through Project Impact, the Federal Emergency Management Agency (FEMA) assists communities to engage a wide cross-section of its members in a collaborative process to prevent damage due to natural disasters at the local level. Funds are provided to help assess risks, build public-private partnerships, identify and implement projects, and communicate and mentor success. The key is to incorporate and sustain self-reliant disaster resistance into the basic fabric of a community's own vision. All communities/local governments are eligible for funding with the selection process taking place at the state level. Each state receives an equal portion of funds (grants) from FEMA and divides it among qualified communities within that state.

Nonpoint Source Implementation Grants (319 Program)

The 319 program provides formula grants to the states and tribes to implement nonpoint source projects and programs in accordance with Section 319 of the Clean Water Act (CWA). Nonpoint source pollution reduction projects can be used to protect source water areas and the general quality of water resources in a watershed. Examples of previously funded projects include installation of best management practices (BMPs) for animal waste; design and implementation of BMP systems for stream, lake, and estuary watersheds; basin wide landowner education programs; and lake projects previously funded under the CWA Section 314 Clean Lakes Program. Lead state and local governments, Indian tribes, and nonprofit organizations may submit applications for funds in accordance with work program. Formula grants are awarded to a lead agency in each state and territory. Eligible tribes may also receive funds. States/tribes/local organizations are usually required to provide 40 percent of total project or program cost.

Watershed Assistance Grants

EPA established a cooperative agreement with one or more nonprofit organization(s) or other eligible entities to support watershed partnership organizational development and long-term effectiveness. Funding supports organizational development and capacity building for watershed partnerships with diverse membership. These grants are highly competitive, and USEPA reported funding for only 6 percent of applications received over the last 3 years. Organizations eligible for funding include nonprofits, tribes, and local governments. The assistance provided consists of grants (match is encouraged but not required).

Bring Back the Natives Grant Program

This program provides funds to restore damaged or degraded riverine habitats and their native aquatic species through watershed restoration and improved land management. Funding is provided by the BLM, Bureau of Reclamation, USFWS, USFS, and National Fish and Wildlife Foundation. Successful projects will support the applied ecosystem strategy of BLM, BOR, FWS, FS, and NFWF and address: (1) revised land management practices to eliminate causes of habitat degradation; (2) multiple species benefits, (3) direct benefits to native fish and aquatic community resources in watersheds with land managed by BLM, BOR, or FS; (4) multiple resource management objectives; (5) multiple project partners and innovative partnerships; (6) where appropriate, demonstration of a landscape ecosystem approach; and (7) innovative projects that develop new technology that can be shared with others. Local governments, states, and local nonprofit organizations are eligible for funding through this program.

Private/Non-Profit Funding Sources

Ducks Unlimited

Ducks Unlimited, Inc. is a funding source for wetlands and waterfowl restoration. Ducks Unlimited (DU) conducts program development through a "Partner" agency in providing short-term project funding assistance. DU offers a waterfowl habitat development and protection program called Matching Aid to Restore States Habitat (MARSH). This reimbursement program provides matching funds for restoration, protection or enhancement of wetlands and projects

must demonstrate significant and extended (30 years) benefit to waterfowl. Groups requesting assistance must be able to demonstrate capacity to execute long-term habitat agreements, deliver and manage projects, and be willing to assume project liability.

Wyoming Council of Trout Unlimited

The mission of the Wyoming Council of Trout Unlimited is to conserve, protect and restore Wyoming's coldwater (trout) fisheries and their watersheds. TU provides funding and volunteer labor for a variety of stream and watershed projects such as erosion control and fish habitat structures, willow and other riparian plantings and stream protection fencing. Partnerships are encouraged and can include local conservation districts, state and federal agencies.

Partners for Fish and Wildlife Habitat Restoration Program

The Partners for Fish and Wildlife Habitat Restoration Program, through partnerships with conservation groups and federal/state/tribal/local government agencies, provides technical and financial assistance to private landowners interested in voluntarily restoring or otherwise improving native habitats for fish and wildlife on their lands. This program focuses on restoring former and degraded wetlands, native grasslands, stream and riparian areas, and other habitats to conditions as natural as feasible. Under cooperative agreements, private landowners agree to maintain restoration projects, but otherwise retain full control of the land.