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Mailing Address:

Water Resources Data System
University of Wyoming, Dept 3943
1000 E University Avenue
Laramie, WY 82071

Physical Address:

Wyoming Hall, Room 249
University of Wyoming
Laramie, WY 82071

Phone: (307) 766-6651

Fax: (307) 766-3785

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EXECUTIVE SUMMARY
for
LITTLE SNAKE RIVER / VERMILLION CREEK
WATERSHED STUDY, LEVEL I

Prepared for:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002



Prepared by:

Anderson Consulting Engineers, Inc.
375 E. Horsetooth Road, Bldg. 5
Fort Collins, CO 80525
(ACE Project No. WYWDC32)

September 2013



ANDERSON CONSULTING ENGINEERS, INC.
Civil • Water Resources • Environmental

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I.0 INTRODUCTION AND OVERVIEW

On June 2, 2011 Anderson Consulting Engineers, Inc. (ACE) entered into a contract with the Wyoming Water Development Commission (WWDC) to provide professional services for the Little Snake River / Vermillion Creek Watershed Level I Study. ACE was retained to evaluate and describe the study area and specifically develop a watershed management plan. Opportunities and issues within the watershed are to be identified and practical economic solutions proposed. The plan was prepared on behalf of the project sponsors:

- Little Snake River Conservation District (LSRCD) and
- Sweetwater County Conservation District (SWCCD).

This report documents the results of all tasks associated with this effort.

2.0 BACKGROUND

The project study area consists of the Little Snake River and the Vermillion Creek watersheds within the Colorado River Basin in southwestern Wyoming. The Little Snake River watershed is tributary to the Yampa River which is tributary to the Green River. The watershed spans state lines with the Colorado / Wyoming State line effectively dividing the watershed in half. The project study area includes the Vermillion Creek watershed, which lies west of the Little Snake River watershed and is directly tributary to the Green River in Colorado. The Vermillion Creek watershed also spans the Colorado / Wyoming State line. This project, being funded by the WWDC, is limited to the Wyoming portion of the watersheds and lies within Carbon and Sweetwater Counties.

The total area encompassed by these watersheds is approximately 5,052 square miles; however, the Wyoming portion (i.e., the project study area) encompasses roughly one half of the total area and is 2,887 square miles in size. Elevations range from less than 5,620 feet above mean sea level at its mouth to over 11,000 feet on Bridger Peak, resulting in overall relief of over 5,380 feet. Annual precipitation ranges widely throughout the study area, from over 50 inches per year in the Sierra Madres to less than 11 inches in the lower and drier western portions of the area.

The majority of the basin (approximately 74.0 percent) is federally owned and managed by the Bureau of Land Management (65.1 percent) and the United States Forest Service within the Medicine Bow National Forest (8.9 percent). The privately owned portion of the study area consists of approximately 20.6 percent. The State of Wyoming owns the remaining 5.3 percent of the area.

Given the large areal extent of the study area, there is obviously a wide range of environments and resource related management issues. The LSRCD and SWCCD have successfully demonstrated its abilities to complete a wide variety of projects requiring multi-agency coordination within a complex regulatory environment and with funding secured through a range of funding mechanisms.

Some of the issues facing the LSRCD and the SWCCD which will direct their future planning efforts include the following:

- Information and Data Management
- Water Quantity, Location and Timing
- Impacts Associated with Energy Development
- Utilization of Grazing Allotments and Range Management
- Stream Channel Stability/Riparian Restoration/Wetlands Enhancement
- Irrigation System Rehabilitation Needs and Opportunities
- Water Storage Needs and Opportunities

3.0 PURPOSE AND SCOPE

In view of the previous discussions, the goal of this Level I Study is to combine all existing data with data collected and generated from this study to form a comprehensive Watershed Management Plan. The purpose and objectives of the proposed project are itemized below:

- *Facilitate consensus building among the LSRCD, the SWCCD, landowners and the Wyoming Water Development Commission.*
- *Facilitate public participation.*
- *Develop a comprehensive GIS encompassing the vast amount of spatial data, background mapping, and aerial photography (including the legacy of historic aerial imagery,*
- *Construct a Digital Library with which the user can access the extensive amount of existing literature and data. The Digital Library should also be seamlessly available through the GIS environment.*
- *Conduct an evaluation and description of the Little Snake River/ Vermillion Creek watershed (and associated watersheds) based to a large degree on the wealth of available information. Included in the summary should be the discussion of quantity and quality of surface water resources and riparian/upland conditions.*
- *Augment existing baseline geomorphic data by conducting a geomorphic investigation of the primary channels within the watershed and identify potential mitigation measures to improve impaired channel reaches.*
- *Conduct an irrigation system inventory and develop an enhancement / rehabilitation plan for those ditches expressing an interest to participate.*
- *Conduct an evaluation of water storage needs and opportunities to augment water available for livestock and wildlife.*
- *Develop a watershed management plan which identifies problem areas within the watershed and proposes practical economic solutions.*
- *Identify permits easements and clearances necessary for plan implementation.*
- *Develop cost estimates for improvements.*
- *Complete an economic analysis and evaluate alternative sources of funding.*

4.0 WATERSHED MANAGEMENT AND REHABILITATION PLAN

For the purposes of tracking individual components of the watershed management plan, each component was designated a unique project or 'improvement' number. The prefixes used for each

improvement describe the category of the watershed management plan it falls under. The prefixes are as follows:

- Project Components "I": Irrigation system rehabilitation components
- Project Components "L/W": Livestock / wildlife upland watering opportunities
- Project Components "G": Grazing management opportunities
- Project Components "BLM": BLM recommendations
- Project Components "S": Storage opportunities
- Project Components "C": Stream channel stability components
- Project Components "W": Wetland Enhancement opportunities
- Project Components "O": Other watershed management plan alternatives

The plan is summarized in Table 1.

5.0 CONCLUSIONS AND RECOMMENDATIONS

A multidisciplinary inventory of the Little Snake River / Vermillion Creek watershed was conducted in an effort to identify and evaluate key resource issues and concerns. A comprehensive Geographic Information System (GIS) was completed in conjunction with the inventory. The GIS incorporates the data collected and results generated during the study and collates it with information collected from a wide variety of sources. The GIS will be a valuable resource for the community and future studies which will likely be conducted in the watershed.

5.1 Conclusions

Upon completion of the watershed inventory phase of the project, the project team developed the watershed management plan. The plan was developed based upon findings of the inventory phase, a series of public meetings, questionnaires, and interaction with the project steering committee. In previous chapters, the key issues and problems were identified and ultimately, project goals and objectives were formulated to address them. Specifically, plans were developed to address issues associated with the following broad categories:

- Irrigation System Conservation and Rehabilitation,
- Livestock/Wildlife Upland Watering Opportunities,
- Stream Channel Condition and Stability,
- Surface Water Storage Opportunities,
- BLM range improvement recommendations,
- Wetland Enhancement Opportunities,
- Grazing Management Opportunities, and
- Other Upland Management Opportunities.

Table 1. Little Snake River / Vermillion Creek Watershed Management Plan.

| Watershed Management Plan Component | | Watershed Plan Component: Irrigation Rehabilitation Projects (I) | | | | | | | | | | Replace / Rehabilitate / Install |
|-------------------------------------|--|--|--------------------|------------------|----------|------------|--------------|--------------------------------|------------------------------|--|--|----------------------------------|
| | | Structure Type | | | | | | | | | | |
| | | First Mesa Canal Structures | | | | | | | | | | |
| I-01 | | Bendway Weir | | | | | | | | | | Replace |
| I-02 | | Canal Headgate | | | | | | | | | | Replace |
| I-03 | | Cottonwood Creek Spill Rehabilitation | | | | | | | | | | Replace |
| I-05 | | Parshall Flume | | | | | | | | | | Replace |
| I-06 | | Telemetry | | | | | | | | | | Replace |
| I-07 | | Farm Turnout at McKee | | | | | | | | | | Replace |
| I-08 | | Farm Turnout at Marsella | | | | | | | | | | Replace |
| I-09 | | Farm Turnout at Willie | | | | | | | | | | Replace |
| I-10 | | Lining at Weber | | | | | | | | | | Replace |
| I-11 | | Lining at Ely | | | | | | | | | | Replace |
| I-12 | | Lining at Risner | | | | | | | | | | Replace |
| I-13 | | Culvert at Cottonwood Spill | | | | | | | | | | Replace |
| I-14 | | Culvert at Dolan Lane | | | | | | | | | | Replace |
| I-15 | | Culvert at CR 702 | | | | | | | | | | Replace |
| | | Stateline Canal Components | | | | | | | | | | |
| I-16 | | Ditch Headgate | | | | | | | | | | Replace |
| I-17 | | Measurement | | | | | | | | | | Replace |
| | | West Side Canal Components | | | | | | | | | | |
| I-18 | | Measurement | | | | | | | | | | Install |
| I-04 | | Orchard Spill | | | | | | | | | | Replace |
| I-19 | | Spillway | | | | | | | | | | Rehabilitate |
| I-20 | | Spillway | | | | | | | | | | Install |
| I-21 | | Flume (4 Mile) | | | | | | | | | | Replace |
| I-22 | | Drop Outlet (Jon's Drop) | | | | | | | | | | Replace |
| | | Baggs Ditch Components | | | | | | | | | | |
| I-23 | | Hillside Erosion | | | | | | | | | | Install |
| I-24 | | Measurement | | | | | | | | | | Install |
| I-25 | | Culvert | | | | | | | | | | Install |
| I-26 | | Culvert | | | | | | | | | | Replace |
| I-27 | | Culvert | | | | | | | | | | Replace |
| I-28 | | Culvert | | | | | | | | | | Replace |
| I-29 | | Culvert | | | | | | | | | | Replace |
| | | Miscellaneous Ditch Components | | | | | | | | | | |
| I-30 | | Farm Turnout | | | | | | | | | | Rehabilitate |
| I-31 | | Diversion/headgate | | | | | | | | | | Rehabilitate |
| I-32 | | Pipe Drop Structure | | | | | | | | | | Install |
| I-33 | | Flume | | | | | | | | | | Rehabilitate |
| I-34 | | Diversion/headgate | | | | | | | | | | Install |
| I-35 | | Diversion/headgate | | | | | | | | | | Install |
| I-36 | | Pipeline | | | | | | | | | | Replace |
| I-37 | | Diversion/headgate | | | | | | | | | | Rehabilitate |
| | | Watershed Plan Component: Livestock / Wildlife Water Supply Projects (L/W) | | | | | | | | | | |
| Watershed Management Plan Component | Project Name | Solar Pump | Spring Development | Stream Diversion | Pipeline | Stock Tank | Storage Tank | Stock Reservoir Rehabilitation | Stock Reservoir Construction | | | |
| LW-01A | Carrico Pipeline Project | | 1 | | 31,000 | 8 | | | | | | |
| LW-01B | Carrico Pipeline Project | | | | | | | | | | | |
| LW-02 | Carrico Spring Development | | 1 | | 450 | 1 | | | | | | |
| LW-03 | Carrico Stock Reservoir | | | | | | | | 1 | | | |
| LW-04 | McAllister Well Rehabilitation | 1 | | | | | | | | | | |
| LW-05 | Davis Pipeline | 1 | | | 50,500 | 5 | 1 | | | | | |
| LW-06 | Davis Spring Development 1 | | 1 | | | 1 | | | | | | |
| LW-07 | Davis Spring Development 2 | | 1 | | | 1 | | | | | | |
| LW-08 | Waldron Spring Development | | 1 | | 500 | 1 | | | | | | |
| LW-09 | Waldron Stock Pond Rehabilitation | | | | | | | | 1 | | | |
| LW-10 | Sheehan Pipeline | | | | 14,200 | 2 | | | | | | |
| LW-11 | Ladder Ranch Pipeline 1 | 1 | 1 | | 5,500 | 2 | 1 | | | | | |
| LW-12 | Ladder Ranch Pipeline 2 | | 1 | | 3,500 | 1 | | | | | | |
| LW-13 | Ladder Ranch Well Rehabilitation | | | | | 1 | | | | | | |
| LW-14 | Ladder Ranch Stock Tank | | | | 150 | 1 | | | | | | |
| LW-15 | Weber Pipeline | | | | 20,000 | 5 | | | | | | |
| LW-16 | Cow Creek Well | | | | | 1 | | | | | | |
| LW-17 | Wild Horse Buttes Pipeline | | | | 57,100 | 7 | | | | | | |
| LW-18 | Alamosa Gulch Stock Pond | | | | | | | | 1 | | | |
| LW-19 | Dry Cow Creek Stock Pond 1 | | | | | | | | 1 | | | |
| LW-20 | Dry Cow Creek Stock Pond 2 | | | | | | | | 1 | | | |
| LW-21 | Dry Cow Creek Stock Pond 3 | | | | | | | | 1 | | | |
| LW-22 | Dry Cow Creek Stock Pond 4 | | | | | | | | 1 | | | |
| LW-23 | Dry Cow Creek Stock Pond 5 | | | | | | | | 1 | | | |
| LW-24 | Dry Cow Creek Stock Pond 6 | | | | | | | | 1 | | | |
| LW-25 | Lower Barrel Springs Draw Stock Pond | | | | | | | | 1 | | | |
| LW-26 | White Rock Draw Stock Pond | | | | | | | | 1 | | | |
| LW-27 | Dad Stock Pond | | | | | | | | 1 | | | |
| LW-28 | Deep Creek Stock Pond 1 | | | | | | | | 1 | | | |
| LW-29 | Deep Creek Stock Pond 2 | | | | | | | | 1 | | | |
| LW-30 | Deep Creek Stock Pond 3 | | | | | | | | 1 | | | |
| LW-31 | Deep Creek Stock Pond 4 | | | | | | | | 1 | | | |
| LW-32 | Deep Creek Stock Pond 5 | | | | | | | | 1 | | | |
| LW-33 | Dirtyman Fork Stock Pond | | | | | | | | 1 | | | |
| LW-34 | Mill Creek Stock Pond | | | | | | | | 1 | | | |
| LW-35 | Little Savery Creek Stock Pond 1 | | | | | | | | 1 | | | |
| LW-36 | Little Savery Creek Stock Pond 2 | | | | | | | | 1 | | | |
| LW-37 | Middle Savery Creek Stock Pond | | | | | | | | 1 | | | |
| LW-38 | Hog Eye Ranch Stock Pond | | | | | | | | 1 | | | |
| LW-39 | Bird Gulch Stock Pond | | | | | | | | 1 | | | |
| LW-40 | Battle Creek Stock Pond | | | | | | | | 1 | | | |
| | | Watershed Plan Component: Grazing Management Opportunities (G) | | | | | | | | | | |
| G-1 | Expansion of grazing distribution / limited reliance on riparian areas. | | | | | | | | | | | |
| G-2 | Fencing to create pastures of similar ecological condition to enable a rest-rotation grazing system. | | | | | | | | | | | |
| G-3 | Strategic salting and herding are other tools that can be used to enhance grazing distribution. | | | | | | | | | | | |
| G-4 | Consideration of wildlife needs in upland water source development (escape ramps, wildlife watering facilities, etc). | | | | | | | | | | | |
| G-5 | Utilization of Ecological Site Description State and Transition Modeling to optimize range conditions. | | | | | | | | | | | |
| G-6 | Use of prescribed fire to assist in the restoration of range health areas benefiting by this treatment according to the state and transition models. | | | | | | | | | | | |
| G-7 | Application of chemicals may be utilized in the restoration of range health areas benefiting by this treatment according to the state/transition models. | | | | | | | | | | | |

Table 1. Little Snake River / Vermillion Creek Watershed Management Plan (Continued).

| Watershed Plan Component: BLM Recommendations (BLM) | | |
|---|--|----------------------------|
| Watershed Management Plan Component | Name | Project Type |
| BLM-001 | McKinney Creek Spring Development | Spring Development |
| BLM-002 | Poison Buttes Well Rehabilitation | Well Rehabilitation |
| BLM-003 | Deep Gulch | Reservoir Rehabilitation |
| BLM-004 | Exclosure (Beaver Dams) | Fence Exclosure |
| BLM-005 | Cottonwood Hill Sheet Piling | Stream Stabilization |
| BLM-006 | Cherokee Pipeline Project | Pipeline Project |
| BLM-007 | Sweezy Spring Rehabilitation | Spring Rehabilitation |
| BLM-008 | Loco Aspen Spring Rehabilitation | Spring Rehabilitation |
| BLM-009 | Loco Creek Fencing | Fence Exclosure |
| BLM-010 | Koala Bar | Reservoir Rehabilitation |
| BLM-011 | Hangout Solar | Solar Platform |
| BLM-012 | Red Flat Well Rehabilitation | Well Rehabilitation |
| BLM-013 | Niland Well Rehabilitation | Well Rehabilitation |
| BLM-014 | Little Draw Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-015 | Coal Gulch #2 Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-016 | South Echo Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-017 | Private | Reservoir Rehabilitation |
| BLM-018 | Devils Canyon Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-019 | Gambler's Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-020 | Weber Reservoir #3 Rehabilitation | Reservoir Rehabilitation |
| BLM-021 | No Name | Reservoir Rehabilitation |
| BLM-022 | River Bottom Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-023 | No Name | Reservoir Rehabilitation |
| BLM-024 | Greasewood Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-025 | Cherokee Creek #2 Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-026 | Clay Point Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-027 | Fence/line Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-028 | The Hill Allotment Well Rehabilitation | Well Rehabilitation |
| BLM-029 | Mulligan Draw Well Rehabilitation | Well Rehabilitation |
| BLM-030 | JO Solar Pump | Well Rehabilitation |
| BLM-031 | Sulphur/Grizzly Pipeline Rehabilitation | Pipeline Rehabilitation |
| BLM-032 | Cherokee Pit | Reservoir Rehabilitation |
| BLM-033 | Holler Draw Headcut | Stream Stabilization |
| BLM-034 | Bear Canyon Exclosures | Fence Exclosure |
| BLM-035 | Shallow Creek Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-036 | Wheatgrass Pit | Reservoir Rehabilitation |
| BLM-037 | Andy's Project Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-038 | Little Snake Well #2 Rehabilitation | Well Rehabilitation |
| BLM-039 | Sand Creek Well #1 Rehabilitation | Well Rehabilitation |
| BLM-040 | Powder Rim Spring #2 Rehabilitation | Spring Rehabilitation |
| BLM-041 | Powder Rim Spring #1 Rehabilitation | Spring Rehabilitation |
| BLM-042 | CD Fence Well Rehabilitation | Well Rehabilitation |
| BLM-043 | New Pit | Reservoir Construction |
| BLM-044 | New Pit | Reservoir Construction |
| BLM-045 | New Pit | Reservoir Construction |
| BLM-046 | Pasture B Pipeline Project | Pipeline Project |
| BLM-047 | Cherokee Trails Pipeline Project | Pipeline Project |
| BLM-048 | Morgan-Boyer Pit | Reservoir Rehabilitation |
| BLM-049 | North Barrel Spring Reservoir Rehabilitation | Reservoir Rehabilitation |
| BLM-050 | Detention Reservoir | Reservoir Rehabilitation |
| BLM-051 | Highway Reservoir | Reservoir Construction |
| BLM-052 | Lower Horseshoe Reservoir | Reservoir Construction |
| BLM-053 | South Horseshoe Reservoir | Reservoir Construction |
| BLM-054 | Two Bar Trail Reservoir | Reservoir Construction |
| BLM-055 | Shipping Coral 2 Reservoir | Reservoir Construction |
| BLM-056 | Little Scrivener Butte Reservoir | Reservoir Construction |
| BLM-057 | Quaking Springs Reservoir | Reservoir Construction |
| BLM-058 | Goat Springs Reservoir | Reservoir Construction |
| Watershed Plan Component: Storage Opportunities (S) | | |
| Watershed Management Plan Component | Name | Potential Capacity (ac ft) |
| S-02 | Blue Gap 16 | 375 |
| S-12 | Ketchum Buttes 25 | 81.2 |
| S-13 | Ketchum Buttes 34 | 19.3 |
| S-15 | Peach Orchard Flat 6 | 19.3 |
| S-17 | Pine Grove Ranch 1 | 55.8 |
| S-26 | Dutch Joe Creek (3) | 10,000 |
| S-35 | Vermillion Creek | 40 - 60 |
| S-36 | North Fork Vermillion Creek | 60 - 100 |
| S-37 | Coyote Creek | 150 - 200 |
| S-38 | Canyon Creek | 50 - 60 |
| S-40 | Big Gulch | 5,000 |
| S-41 | West Fork Battle Creek at Haggarty Creek | 4,000 - 10,000 |
| S-48 | Upper Willow Creek | 10,021 |
| S-49 | Upper Cottonwood Creek | 3,229 |
| S-50 | Grieve Reservoir | 2,889 |
| S-51 | Pot Hook Reservoir | 60,000 |

Table 1. Little Snake River / Vermillion Creek Watershed Management Plan (Continued).

| Watershed Plan Component: Stream Channel Improvements (C) | | | | | | |
|--|--|---|-----------|--------------------|----------------|----------------|
| Watershed Management Plan Component | Trout Unlimited Identifier | Feature Type | Priority | Affected Stream | Structure Type | Structure Size |
| C-01 | 415 | Grade Control | High | Muddy Creek | Sheet Piling | Very Small |
| C-02 | 412 | Grade Control | High | Muddy Creek | Sheet Piling | Very Small |
| C-03 | 411 | Grade Control | High | Muddy Creek | Sheet Piling | Very Small |
| C-04 | 407 | Grade Control | High | Muddy Creek | Sheet Piling | Very Small |
| C-05 | 406 | Grade Control | High | Muddy Creek | Log Structure | Very Small |
| C-06 | 403 | Grade Control | High | Muddy Creek | Log Structure | Very Small |
| C-07 | 401 | Grade Control | High | Muddy Creek | Log Structure | Very Small |
| C-08 | 8 | Road Crossing | High | Muddy Creek | Culvert | Small |
| C-09 | 378 | Grade Control | High | Muddy Creek | Sheet Piling | Small |
| C-10 | 377 | Grade Control | High | Muddy Creek | Sheet Piling | Small |
| C-11 | 379 | Grade Control | High | Muddy Creek | Sheet Piling | Small |
| C-12 | 380 | Grade Control | High | Muddy Creek | Sheet Piling | Small |
| C-13 | 382 | Grade Control | High | Muddy Creek | Sheet Piling | Small |
| C-14 | 383 | Grade Control | High | Muddy Creek | Sheet Piling | Small |
| C-15 | 357 | Grade Control | High | Muddy Creek | Sheet Piling | Small |
| C-16 | 385 | Grade Control | High | Muddy Creek | Sheet Piling | Small |
| C-17 | 386 | Grade Control | High | Muddy Creek | Sheet Piling | Small |
| C-18 | 346 | Grade Control | High | Muddy Creek | Rock Gabion | Large |
| C-19 | 345 | Grade Control | High | Muddy Creek | Rock Gabion | Large |
| C-20 | 36 | Diversion | High | Muddy Creek | Rock Gabion | Large |
| C-21 | 58 | Ready Ditch Diversion | High | Muddy Creek | Concrete | Large |
| C-22 | 59 | Baggs Ditch Diversion | High | Little Snake River | Concrete | Large |
| C-23 | 63 | Westside Ditch Diversion | Very High | Little Snake River | Concrete | Large |
| C-24 | 66 | First Mesa Ditch Diversion | Very High | Little Snake River | Concrete | Large |
| C-25 | 166 | Savery Creek Crossing | High | Savery Creek | Culvert | Large |
| C-26 | | Installation of stream channel degradation/incision mitigation measures based upon site-specific evaluation of conditions | | | | |
| C-27 | | Installation of stream bank erosion mitigation measures based upon site-specific evaluation of condition | | | | |
| C-28 | | Initiation of routine monitoring of completed stream restoration projects to determine their effectiveness and viability | | | | |
| Watershed Plan Component: Wetland Enhancement Opportunities (W) | | | | | | |
| Watershed Management Plan Component | Acres | Enhancement / Establishment | Priority | Affected Stream | | |
| W-01 | 10 | Enhancement | Moderate | Little Snake River | | |
| W-02 | 12 | Enhancement | Moderate | Little Snake River | | |
| W-03 | 15 | Establishment | Moderate | Muddy Creek | | |
| W-04 | 130 | Establishment | Moderate | Muddy Creek | | |
| W-05 | 10 | Establishment | Moderate | Muddy Creek | | |
| W-06 | 25 | Establishment | Moderate | Muddy Creek | | |
| W-07 | 30 | Establishment | Moderate | Muddy Creek | | |
| W-08 | 30 | Establishment | Moderate | Muddy Creek | | |
| Watershed Plan Component: Other Watershed Management Opportunities (O) | | | | | | |
| Watershed Management Plan Component | Action / Recommendation | | | | | |
| O-1 | Continuation of eradication efforts targeting noxious weeds and undesirable vegetation | | | | | |
| O-2 | Prescribed burns planned and executed in an effort to control juniper encroachment. | | | | | |
| O-3 | Mechanical treatment of juniper infestation should be completed in areas where prescribed burns are not feasible or practical. | | | | | |

In summary, the following conclusions are provided.

5.1.1 Irrigation System Components

1. Previous and ongoing investigations have identified improvements to numerous individual irrigation system components. These recommendations were incorporated directly into this report. Ditch system owners and managers should review the pertinent portions of this report and the specific recommendations reviewed for future planning efforts.
2. In addition to incorporation of results from previous investigations, several irrigation system rehabilitation needs were identified during the course of this investigation. Responsible individuals and ditch company owners should review the pertinent portions of this report and the specific recommendations reviewed for future planning efforts.
3. Completion of the channel restoration projects in conjunction with an irrigation headgate would likely not require a 404 permit through the USACE due to the irrigation infrastructure exclusion. Coordination with the COE Omaha District's Wyoming Regulatory Office in Cheyenne would be necessary to verify permit requirements.
4. Funding assistance for irrigation system rehabilitation projects within the study area is available from a number of sources, especially the WWDC Small Water Project Program and various programs administered by the NRCS.

5.1.2 Livestock/Wildlife Upland Watering Opportunities

1. There appears to be numerous opportunities to improve range and riparian conditions by means of increasing the availability of upland water sources for wildlife and livestock use.
2. Pipeline/tank systems appear to offer the most efficient and cost-effective means to provide adequate watering to large areas of rangeland. Water sources for these systems will depend on the location of the rangeland to be served and the available alternative sources. The most likely sources are wells or spring developments.
3. A total of 40 potential wildlife/livestock water supply projects were identified based upon evaluation of available water sources and input from the LSRCD, local land owners and allotment permittees. Conceptual plans and conceptual level cost estimates were prepared for each project.
4. Any such improvements and practices must be fully implemented and maintained by the responsible landowner / agency to gain the maximum overall benefits to the watershed.

5.1.3 Stream Channel Condition and Stability

1. Based on the geomorphic assessment, several impaired channel reaches were identified within the watershed. The categories of impairments identified include, but are not limited to channel degradation and incision, degradation of riparian vegetation and degradation of riparian condition in the form of stream bank erosion and channel degradation.
2. Site-specific solutions should be developed to mitigate the channel impairment and ultimately included in the watershed management rehabilitation plan.
3. Locally-sponsored stream channel and habitat improvement projects could provide numerous benefits to the watershed. Potential projects would include efforts such as bank stabilization efforts using techniques such as willow plantings. In addition to providing direct benefits to the specific stream, ancillary benefits include education and community involvement.
4. Barriers to fish passage identified in previous investigations were included in the watershed management plan. The itemized sites consist of 24 sites rated as High or Very High priority sites.
5. Savery Creek was specifically investigated to determine the restoration needs on lands owned and managed by the Wyoming Water Development Commission. The results of that effort identified the stream as experiencing channel widening and associated streambank erosion. A conceptual restoration plan was developed with the objective of narrowing the channel to a geomorphically stable configuration which is consistent with existing hydrology resulting from construction of High Savery Dam.

5.1.4 Storage Opportunities

1. The results of the flow availability investigation confirmed that water is available for storage and is available primarily during the spring runoff period, predominantly during May and June.
2. Based upon the review of results of previous investigations, eleven (11) potential reservoir storage sites were included in the watershed management plan. These sites represent the collation of sites recommended storage development in each of the several investigations reviewed. These sites could provide storage opportunities ranging in size from small stock reservoirs with storage capacity of less than 100 acre feet, to larger multiple use reservoirs with storage capacity in excess of several thousand acre feet.
3. The Wyoming Water Development Office is currently evaluating feasibility and design options associated with the West Fork Battle Creek at Haggarty Creek reservoir site. The site, along with others, is described and evaluated as discussed in the Little Snake River Supplemental Storage, Level II investigation completed on behalf of the WWDO by State West Water Resources Corporation.

4. Permitting efforts and NEPA compliance associated with completion of reservoir projects will likely be complicated, lengthy, and involve coordination with several regulatory agencies.

5.1.5 BLM Range Improvement Recommendations

1. Potential range improvement projects were made by each of the two BLM districts within the project study area. The Rawlins Field Office presented 50 projects and the Rock Springs Field Office presented eight.
2. These 58 projects include:
 - o Stock reservoir construction,
 - o Stock reservoir rehabilitation,
 - o Well rehabilitation, including installation of solar platforms,
 - o Fence enclosures,
 - o Stream rehabilitations,
 - o Spring developments, and
 - o Pipeline projects.

5.1.6 Wetland Enhancement Opportunities

1. The LSRCD has identified several locations where wetlands enhancement opportunities exist. These locations represent a variety of sites where wetlands could either be established, or existing wetlands could be enhanced through modification of hydrologic conditions. Several of the sites consist of abandoned oxbows along the Little Snake River where diversion of water from the river would provide flushing flows to maintain the wetland integrity. Other sites would consist of establishment of wetlands in areas where there currently are none. These sites are located along the Muddy Creek corridor.

5.1.7 Grazing Management Opportunities

1. Strategies, recommended in the state and transition models associated with NRCS descriptions of the ecological sites found within the watershed, should be adopted and employed to optimize range conditions through prescribed grazing management and best management practices.

5.2 Recommendations

Based upon the information presented throughout this report and the conclusions presented above, the recommendations listed below are presented for consideration:

The conservation districts have a proven track record of successfully obtaining funding through a variety of sources and completing range/watershed improvement projects. Many of the projects included in the watershed management plan lend themselves to potential procurement of financial and technical

assistance by virtue of their multiple-benefit character. For instance, improvement of several irrigation diversion facilities could not only benefit the irrigation water user, but could provide benefit to instream fisheries through improvement of habitat conditions and facilitate fish passage.

Many of the livestock/wildlife upland watering alternatives fall within the constraints for funding eligibility of the WWDC's Small Water Project Program (SWPP). These projects should be reviewed and selected alternatives should be implemented as soon as is practical. Completion of one or more of these projects in the near future would serve to benefit those directly involved in the project and increase interest and awareness of the benefits associated with the watershed planning process.

Funding through the SWPP does not require formation of a district but does require an entity sponsor such as the local conservation district. Consequently, individuals can seek funding through this program. As discussed in Chapter 8, projects providing multiple benefits and for which total project cost are less than \$100,000 are eligible for funding under this program. Grants are available for up to 50 percent of the total project cost or \$25,000, whichever is less.

Creative strategies for funding/financing of projects should be more fully investigated following identification of projects worthy of additional evaluation and potential implementation. *By combining funding sources, the owner could conceivably obtain grants for most, if not all, of the project costs.*



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