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EXECUTIVE SUMMARY
BITTER CREEK / EAST FLAMING GORGE
WATERSHED LEVEL I STUDY




Prepared for:
Wyoming Water Development Commission
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Cheyenne, WY 82002

Prepared by:

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(ACE Project No. WYWDC38)

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I.0 INTRODUCTION AND OVERVIEW

In 2016 the Sweetwater County Conservation District (SWCCD) requested funding from the Wyoming Water Development Commission (WWDC) for the completion of a watershed management plan for the Bitter Creek / East Flaming Gorge watershed. The intent of the funding request was to have a comprehensive watershed inventory completed, which identified issues related to land use and water resources, and to then develop a plan addressing those issues. The WWDC approved funding for the study and Anderson Consulting Engineers, Inc. (ACE) was ultimately contracted in June 2017 to complete the project.

2.0 BACKGROUND

The project study area lies within the Upper Green River basin and is defined as the Bitter Creek / East Flaming Gorge watershed, located in Sweetwater County, Wyoming. Bitter Creek itself is defined by the United States Geologic Survey (USGS) as the fourth order basin: Bitter Creek (Hydrologic Unit Code 14040105). In the interest of eliminating potential "gaps" between this study and areas covered in previous Level I investigations, Wyoming Water Development Office (WWDO) staff added the portion of the Upper Flaming Gorge HUC8 (Hydrologic Unit Code 14040106) lying east of Flaming Gorge Reservoir and north of the Wyoming / Colorado State line. Consequently, the project study area consists of Bitter Creek and its principal tributaries: Antelope Creek, Salt Wells Creek, Patrick Draw, Sweetwater Creek, Tenmile Creek, and Killpecker Creek in addition to the east Flaming Gorge watershed which includes Sage Creek, Currant Creek and Red Creek (among others).

The study area covers approximately 1.8 million-acres (2,853 sq. mi.) in southwest Wyoming. The watershed is located entirely within Sweetwater County. The cities, towns, and communities of Rock Springs, Superior, and Reliance lie within the watershed boundary. Most of the area's residents live in the City of Rock Springs and its vicinity. The remainder of the study area is sparsely populated and consists primarily of open range lands.

3.0 Project Purpose and Objectives

The purpose of this Level I watershed study was to combine the available data and information with the study-generated inventory data to develop a comprehensive watershed management and rehabilitation plan that outlines proposed and potential water-development opportunities. To accomplish this effort, the following objectives were completed:

- *Facilitate consensus building among the conservation district, landowners and the Wyoming Water Development Commission.*
- *Facilitate public participation through public meetings, open houses/workshops, SWCCD contacts, and advertisements.*
- *Conduct an evaluation and description of the Bitter Creek / East Flaming Gorge watershed, including quantity and quality of surface water resources, and riparian/upland conditions.*

- *Inventory and describe Irrigation systems, water storage, and flood control needs present within the watershed.*
- *Conduct a geomorphic assessment of the primary channels within the watershed and identify potential mitigation measures to improve impaired channel reaches.*
- *Conduct an irrigation system inventory and develop a 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 water resource related 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 PLAN

Potential improvements were developed and categorized into the following:

- **Irrigation System Conservation and Rehabilitation:** The inventory and evaluation of existing infrastructure was completed and improvements were identified.
- **Livestock/Wildlife Upland Watering Opportunities:** Based upon an evaluation of existing water sources and the condition of upland grazing resources, potential upland water source development projects were identified.
- **Surface Water Storage Opportunities:** Results of previous investigations pertaining to development of water storage and opportunities identified during the project inventory phase of this investigation are incorporated.
- **Stream Channel Condition and Stability:** Stream channels within the watershed were characterized with respect to their condition and stability. Impaired channels were identified for further evaluation and alternative improvements developed.
- **Grazing Management Opportunities**: Based upon a review of the pertinent Ecological Site Descriptions (ESDs) and the ambient vegetation and soil conditions, grazing strategies are presented.
- **Environmental Enhancement Opportunities**: Several projects were identified which would fall under the category of environmental enhancement; including potential wetland development and fisheries-related opportunities.

The plan is summarized in Table 1.

Table 1. Bitter Creek / East Flaming Gorge Watershed Management Plan.

Watershed Management Plan Component	Project Name	Description	Watershed Management Plan Component	Project Name	Description
Irrigation Rehabilitation Projects (IRR)			**Livestock / Wildlife Water Supply Projects (L/W)**		
IRR-001	Ramsay Pipeline	Conversion of open ditch to buried pipeline	L/W-001	Kinney Spring Reservoir	Reconstruction of failed reservoir
IRR-002	Desert Claim Fencing	Fencing of irrigated acres to reduce wildlife damages	L/W-002	Fifteenmile Knoll Reservoir	Reconstruction of breached embankment
Stream Channel Opportunities (STR)			L/W-003	Bitter Creek Springs	Development of existing springs / stock tanks
STR-001	Pierotto Ditch Diversion Structure Monitoring	Monitoring plan following completion of existing construction project	L/W-004	Well Rehabilitation	Refurbishing an existing well in need of repair
STR-002	Big Pond	Study design for mitigation of erosion and sedimentation feature	L/W-005	Upland Spring Development	Rehabiliitation of existing spring / stock tank
STR-003	UPRR Crossing Headcut	Stabilize active headcut at UPRR crossing	L/W-006	Upland Stock Reservoir Rehabilitation	Rehabilitation of a stock reservoir filled with sediment
STR-004	Gooseberry Creek Wildlife/Livestock Exclosure	Continuation/modification of fence exclosure to promote stream stabilization	L/W-007	Upland Stock Reservoir Rehabilitation	Rehabilitation of a stock reservoir filled with sediment
STR-005	Trout Creek Wildlife/Livestock Exclosure	Continuation/modification of fence exclosure to promote stream stabilization	L/W-008	Well Rehabilitation	Rehabilitation of an existing well in need of repair
STR-006	Green River Streambank (Scotts Bottom)	Stabilize active bank erosion on Green River	L/W-009	Upland Stock Reservoir Re-Permit	Conversion of mining-related reservoir to livestock / wildlife use
STR-007	Killpecker Creek Stabilization Project	Develop a stream stabilization plan	L/W-010	Upland Stock Reservoir Re-Permit	Conversion of mining-related reservoir to livestock / wildlife use
Storage Opportunities (STO)			L/W-011	Upland Stock Reservoir Re-Permit	Conversion of mining-related reservoir to livestock / wildlife use
No project entailing construction of new storeage facilities or enhancement of existing facilities were identified			L/W-012	Upland Stock Reservoir Rehabilitation	Rehabilitation of a stock reservoir filled with sediment
			L/W-013	Well Re-Permit	Conversion of mining-related well to livestock / wildlife use
Environmental Improvement Opportunities (ENV)			L/W-014	Upland Stock Reservoir Rehabilitation	Conversion of mining-related reservoir to livestock / wildlife use
ENV-001	Trout Creek Barrier	Fish population management	L/W-015	Upland Stock Reservoir Rehabilitation	Conversion of mining-related reservoir to livestock / wildlife use
ENV-002	Currant Creek Barrier	Fish population management	L/W-016	Upland Stock Reservoir Re-Permit	Conversion of mining-related reservoir to livestock / wildlife use
ENV-003	Kid's Pond - Green River	Provide cleansing mechanism for public fishing pond	L/W-017	Upland Stock Reservoir Rehabilitation	Rehabilitation of a stock reservoir filled with sediment
ENV-04	Oxbow / Wetland Enhancement	Sites identified where wetlands could potentially be created or existing wetlands enhanced	L/W-018	Upland Stock Reservoir Rehabilitation	Rehabilitation of a stock reservoir filled with sediment
ENV-05			L/W-019	Well Re-Permit	Conversion of mining-related reservoir to livestock / wildlife use
ENV-06			L/W-020	Spring Rehabilitation	Rehabilitation of a previously developed spring damaged by feral horses
ENV-07			L/W-021	Well Construction	Construction of a groundwater well in area void of other water sources for livestock / wildlife
ENV-08			L/W-022	Uncle Billy Pipeline Project	Spring development / pipeline / stock tank construction
ENV-09			L/W-023	Well Construction	Construction of a groundwater well in area void of other water sources for livestock / wildlife
ENV-10			L/W-024	Well Construction	Construction of a groundwater well in area void of other water sources for livestock / wildlife
ENV-11			L/W-025	Well Construction	Construction of a groundwater well in area void of other water sources for livestock / wildlife
ENV-12	Stormwater Quality Management / TMDL Plan	Incorporate projects developed in coordination with ongoing TMDL planning efforts	L/W-026	Well Rehabilitation	Construction of a groundwater well in area void of other water sources for livestock / wildlife

5.0 CONCLUSIONS AND RECOMMENDATIONS

A multidisciplinary inventory of the Bitter Creek / East Flaming Gorge watershed was conducted in an effort to identify and evaluate key resource issues and concerns related to watershed function and condition. 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, and interaction with the SWCCD staff. 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,
- Surface Water Storage Opportunities,
- Stream Channel Condition and Stability,
- Grazing Management Opportunities, and
- Environmental Enhancement Opportunities.

In summary, the following conclusions are provided.

5.1.1 Irrigation System Components

1. The extent of irrigated lands, and corresponding irrigation infrastructure is extremely limited within the project study area. There are no large scale irrigation systems within the area. However, there is a large number of privately owned systems irrigating anywhere from a few to a couple hundred acres. Although small in size, they are valuable to the user and should be considered for evaluation and improvement where necessary. During the completion of this project, the project team reached out to as many individuals as possible. Only one stakeholder ultimately met with the team to discuss his system.

2. Funding assistance is available from a number of sources, as previously mentioned, especially from the WWDC Small Water Project Program but also from various programs administered by the NRCS.

3. Partnering opportunities may exist for construction of in-stream structures such as irrigation diversions. For example, Trout Unlimited (TU) has recently provided partial funding for projects within the region in an effort to manage fisheries populations.

4. Many of the potential irrigation system improvements foreseen in the study area would require minor involvement or permitting from regulatory agencies to be completed. However, work completed within stream channels (waters of the US) would require coordination with the USACE. Rehabilitation activities would likely be exempted from Section 404 permitting due to the USACE's exclusion of irrigation system maintenance efforts. Construction of new facilities would likely require Section 404 permitting.

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. Opportunities to improve range and riparian conditions require installing and operating well-distributed, reliable upland water sources and watering facilities for wildlife and livestock. Installing pipelines and stock tanks is the foundation of effective grazing management and can be an economical way to improve rangeland conditions. Strategic fencing is frequently required to optimize these benefits.

3. 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.

4. Through discussion with local landowners and stakeholders, a total of 26 potential livestock / wildlife water supply projects were identified. Conceptual plans and conceptual level cost estimates were prepared for each project. Projects ranged from installation of stock tanks to well spring development and pipeline construction.

5. Many of the livestock / wildlife projects could be completed entirely on private lands. Consequently, permitting issues are greatly simplified. However, many will involve coordination with the Bureau of Land Management (BLM) through the Rock Springs Office. BLM consultation will be necessary in order to obtain the requisite permits and cultural clearances.

6. Several of the livestock / wildlife projects identified through conversations with stakeholders would involve re-permitting existing reservoirs constructed in conjunction with mining activities to livestock / wildlife usage. This effort would require coordination with the mining companies

and the State Engineers Office in order to facilitate retention of the ponds following cessation of mining activities in accordance with the mining plan.

5.1.3 Surface Water Storage Opportunities

1. No new storage facility projects were identified in this study and no previous studies were found which identified any. Based upon the limited hydrologic data which is available and its incorporation into the WWDC's Green River Basin Plan spreadsheet model, there may be a limited amount of water available for storage. Because of the hydrologic regime in the area and water quality concerns, storage of potentially available water would appear problematic.

5.1.4 Stream Channel Condition and Stability

1. Based on the geomorphic assessment and input from the project Sponsor, the project team concluded that channel degradation appears to be systemic. Numerous factors likely have contributed to the existing conditions, including channel alterations due to railroad construction, city construction, historic mine dewatering, historic grazing practices, climatic changes and other factors. The categories of impairments identified include, but are not limited to:

    - Sediment transported to downstream reaches (ex. Green River)
    - Loss of aquatic habitat
    - Lowering of groundwater tables
    - Degradation of water quality
    - Loss or damage to infrastructure
    - Base level lowering causing tributaries to degrade

2. Channels in portions of the study area appear to have begun to heal from historic entrenchment and downcutting, particularly those streams in the southwest portion of the basin (East Flaming Gorge). For example, Sage Creek appears to be forming a stable E-type channel within a deeply entrenched floodplain.

3. Several specific stream channel stabilization projects were identified, including: Pierotto Ditch Stabilization Project Monitoring, Big Pond Stabilization Investigation, the UPRR headcut stabilization, and the Killpecker Creek Stabilization Study.

5.1.5 Grazing Management Opportunities

1. Construction and operation of reliable water supply projects must be developed and implemented in areas with inadequate water sources before adjustments or alternatives in grazing management could be made on a particular area or allotment.

2. Development of reliable water sources and associated watering facilities can aid in distribution, timing, and frequency of grazing animals. However, additional measures such as cross-fencing, low-stress herding, mineral/salting, and grazing density should be evaluated as part of the site-specific, grazing management inventory and plan.

3. Available tools such as the ESD and the STM can be used by landowners and managers to become aware of the growth potential of desirable vegetation and predicted responses on a particular range site.

4. These tools could be used in developing appropriate rangeland treatments and grazing practices to begin the transition from an undesirable to a desirable plant community.

5.1.6 Environmental Enhancement Opportunities

1. Several environmental enhancement opportunities were identified. Two of the projects involve construction barriers to fish passage to facilitate fisheries management objectives. Funding for these projects could potentially be completed through partnering with agencies such as Wyoming Game and Fish and private entities such as Trout Unlimited.

2. Other environmental enhancement opportunities include the potential to convert abandoned stream channel oxbows to wetland features. Similar projects have been recently completed within the Little Snake River watershed which could potentially be implemented providing valuable wetland habitat.

3. A TMDL investigation has recently been completed on Bitter Creek and Killpecker Creek targeting fecal coliform and chloride. A water quality management plan is currently being initiated by the SWCCD and their consultant. The goal of the plan would be to reduce contaminant loading to Bitter Creek and Killpecker Creek through implantation of practical Best Management Practices (BMPs).

5.2 Recommendations

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

1. Many of the irrigation rehabilitation alternatives and 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 public entity as defined by WWDC criteria. Consequently, individuals can seek funding through this program by applying through a conservation district as their sponsor. As discussed in Chapter 7, projects providing multiple benefits and for which total project cost are less than $135,000 are eligible for funding under this program. Grants are available for up to 50 percent of the total project cost or $35,000, whichever is less.

Several alternative sources exist for funding of improvements within the watershed including on-farm improvements, irrigation rehabilitation projects, stream enhancements/restoration projects, and conservation and flood control projects. Creative strategies for funding/financing of projects should be more fully investigated following identification of projects worthy of additional evaluation and potential implementation. As an example, replacement of a failing ditch headgate and diversion which are also identified by WGFD as barriers to fish passage, could potentially be eligible for funding through SWPP (if total project cost meets SWPP criteria). Additional funding could also be attained through WGFD, Trout Unlimited, and other sources because of the fisheries and stream habitat benefits achievable with completion of the project. *By combining funding sources, the owner could conceivably obtain grants for most, if not all, of the project costs.*

2. Continued communication between the SWCCD and stakeholders regarding irrigation system improvements is highly recommended. Irrigation system infrastructure is generally eligible for funding through the WWDC's Small Water Project Program (SWPP). We have found through the completion of previous watershed studies, that interest in the program grows as projects are completed. Therefore, we highly recommend that the SWCCD include reference to the SWPP in future newsletters and communications in an effort to broadcast its benefits. Upon completion and with consent of the existing participant, SWCC could include reference of project completion to demonstrate SWPP opportunities.

3. The Rock Springs Grazing Association (RSGA) controls the majority of the grazed lands either through ownership or lease through the BLM. The project team found many stakeholders seemingly reluctant to discuss potential watershed improvements because, they said "the RSGA would cover it." Consequently, continued communications between the RSGA and the SWCCD is highly recommended. It is our understanding (based upon our experience) that the RSGA attends SWCCD meetings and events and provides their input and comments. ***Because of the extent of their holdings, RSGA and Anadarko (the two major land owners in the study area) should be invited to share in the decision making for public agency decisions. Without their participation, management plans could potential fall short of expectations.***

4. Management of wild horse populations is a locally controversial and problematic issue for land managers. Many of the potential livestock / wildlife water supply projects recommended in the study would likely be beneficial in terms of easing pressures on riparian areas and helping to optimize grazing opportunities. However, due to the horse populations, conditions around water

sources could be exacerbated. Consequently, steel jack fencing has been recommended for all new water sources to protect the resource from damages related to horses. The fencing increases costs and should be considered on a case by case basis.

5. Community-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. Specifically, Bitter Creek and Killpecker Creek clean up projects could be completed.

6. A large number of unimproved roads exist in the watershed; particularly in areas of energy development. Transportation Management Planning conducted in conjunction with the BLM's forthcoming revised Resource Management Plan is expected to contain strategies to address road density and redundancies. Coordination among participating parties should be encouraged to implement recommended strategies which could result in improved habitat, grazing conditions, and reduced erosion and sediment contribution to surface waters.

7. Numerous buried pipelines traverse the area. Field observations indicated that reclamation of the disturbed areas is frequently incomplete, unsuccessful or apparently non-existent. In addition, vehicular activity appears to have destroyed some reclamation attempts. Investigation of site-specific reclamation responsibility and obligations could lead to completed improvements.

8. Landowners or managers seeking to participate in the SWPP should consult and coordinate with the SWCCD, which is the eligible sponsor of SWPP applications and project agreements. Guidance and design from NRCS can help offset potential costs to the applicant.

9. The SWCCD is in the process of initiating a watershed management plan in conjunction with the TMDL efforts associated with Bitter Creek and Killpecker Creek. Implementation of BMPs associated with the plan when completed, could potentially be funded through the various mechanisms discussed in this report. In an effort to reduce confusion among landowners and stakeholders, we recommend the SWCCD refer to the TMDL effort's plan as the "Water Quality Management Plan" in an effort to differentiate it from this project.

10. The Bitter Creek / East Flaming Gorge study's GIS and digital library should be used as a tool in planning and developing potential projects and should be updated as necessary from available information sources. This information used in conjunction with the Wyoming Association of Conservation District's (WACD) SuiteWater tools provide powerful watershed analytical capabilities. In addition, the Digital Library provided in this project contains a wealth of information and resources pertinent to SWCCDs activities.

11. Potential funding opportunities exist for proposed and future improvement projects within the watershed including ranch and farm improvements, irrigation system rehabilitation,

riparian/wetland enhancements, river corridor and stream channel restoration, and urban drainage and flood control projects. For example, the Saratoga Encampment Rawlins Conservation District (SERCD) was recently granted funding through the USDA Regional Conservation Partnership Program (RCPP). The funding is intended for achieving resource management goals from improving water quality and wildlife habitat to streambank restoration. Where appropriate, partnering SWPP funding with RCPP funded projects could provide multiple benefits.

12. Innovative strategies for coordinated project funding and financing should be investigated and focus on local, collaborative endeavors that integrate more than one watershed issue or concern that could potentially result in achievement of multiple benefits.

13. Every effort was made to provide information within this document to support the application for SWPP funding from the WWDC with SWCCD sponsorship. Project narratives, conceptual designs, cost estimates, and discussion of project benefits can all be incorporated directly into the SWPP application by the SWCCD.

14. The public outreach portion of this project attempted to accommodate all interested parties. To the best of the project team's knowledge, all who expressed interest in participating were contacted. However, our experience has shown that additional "new" individuals will come forward wishing to participate after this Level I study is completed. These individuals must be made aware that they <u>are</u> eligible to apply for SWPP funding; the WWDC has removed the requirement of a completed watershed study for eligibility. They simply have not had the benefit of having met with the project team and having a portion of their application needs provided to them. They would be subject to the same application requirements and deadlines as those who did participate.

15. The Bitter Creek / East Flaming Gorge Watershed Management plan was completed based primarily upon input obtained from the SWCCD and participating agencies, landowners, and stakeholders.

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