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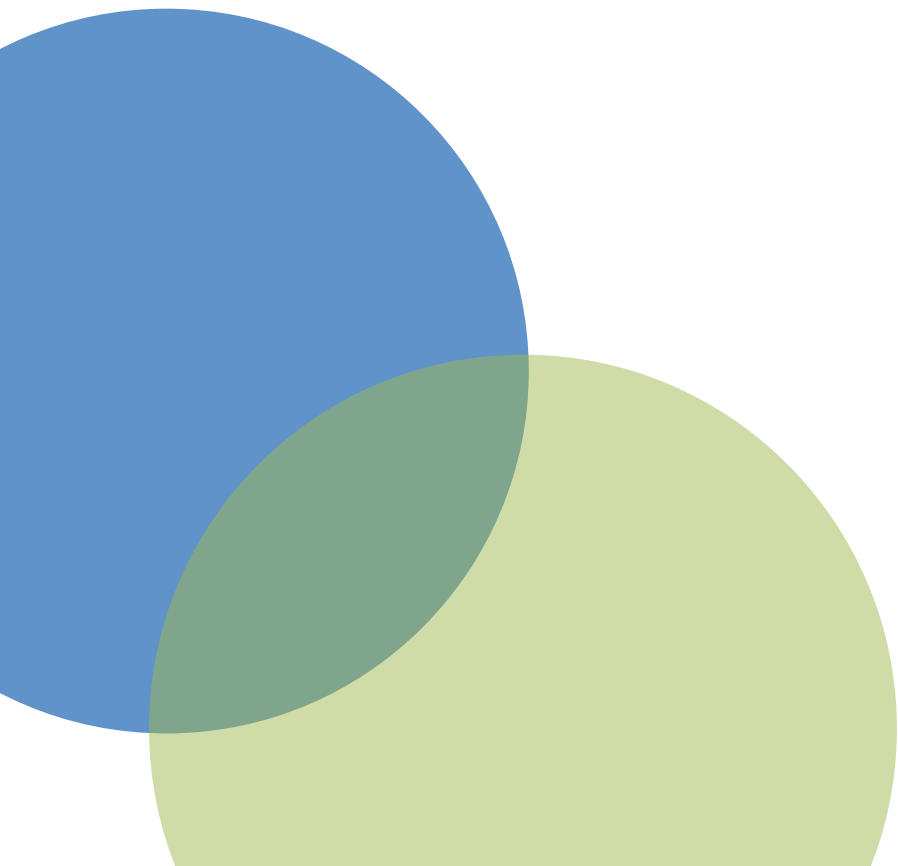
EXECUTIVE SUMMARY
NIOBRARA–LOWER NORTH PLATTE RIVERS WATERSHED STUDY, LEVEL I
WATERSHED MANAGEMENT PLAN

Topical Report RSI-2856

prepared for

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, Wyoming 82002

April 2019



RESPEC

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I hereby certify that this report was prepared by us or under our direct supervision and that we are duly licensed Professional Geologists and Engineers under the laws of the state of Wyoming.

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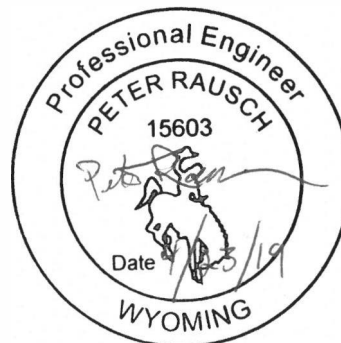
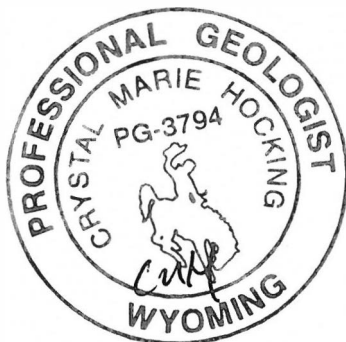




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EXECUTIVE SUMMARY

In 2016, the Niobrara Conservation District (NCD), in cooperation with the other sponsoring conservations districts—Platte County Resource District (PCRD), Lingle-Ft. Laramie Conservation District (LFLCD), and the North Platte Valley Conservation District (NPVCD)—requested that the Wyoming Water Development Commission (WWDC) conduct a comprehensive study of the Niobrara–Lower North Platte Rivers Watershed. In 2017, the WWDC approved funding for the watershed study and then contracted with RESPEC to provide professional services for the Niobrara–Lower North Platte Rivers Watershed Study.

1.1 PURPOSE AND OBJECTIVES

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

- Encourage communication among the landowners, NCD, LFLCD, NPVCD, PCRD, and WWDC
- Solicit public participation in the watershed study
- Inventory and evaluate the watershed conditions
- Perform a geomorphic classification to identify impaired reaches and improvement options
- Assess existing irrigation systems and generate rehabilitation alternatives for the irrigators
- Evaluate potential opportunities to improve water availability for livestock and wildlife
- Develop alternatives for improvements in a Watershed Management and Rehabilitation Plan
- Identify permits, easements, and clearances necessary for plan implementation
- Estimate costs for proposed improvement alternatives and potential projects
- Complete an economic analysis and identify potential sources of funding.
- Complete an economic analysis and identify potential sources of funding.

1.2 STUDY AREA

The study area for the Niobrara–Lower North Platte Rivers Watershed, as shown in Figure ES.1, encompasses the drainage for the Niobrara River and its tributaries, from its headwaters to the Wyoming–Nebraska State Line and the drainage for the North Platte River and its tributaries just east of Guernsey, Wyoming, downstream to the Wyoming–Nebraska State Line. The study area covers 2,022 square miles or 1,294,160 acres and is primarily located within the central and northern portions of Goshen County and southern part of Niobrara County with a small area situated in the southeastern portion of Platte County. The city of Torrington and the towns of Fort Laramie, Lingle, Lusk, Manville, and Van Tassell are located within the watershed. Approximately 70.3 percent of the watershed is located in Goshen County, 24.0 percent in Niobrara County, and 5.7 percent in Platte County. The watershed also covers portions of five conservation districts with approximately 35.6 percent located in the LFLCD, 30.5 percent in the NPVCD, 24.0 percent in the NCD, 5.7 percent in the PCRD, and 4.2 percent within the South Goshen Conservation District (SGCD).

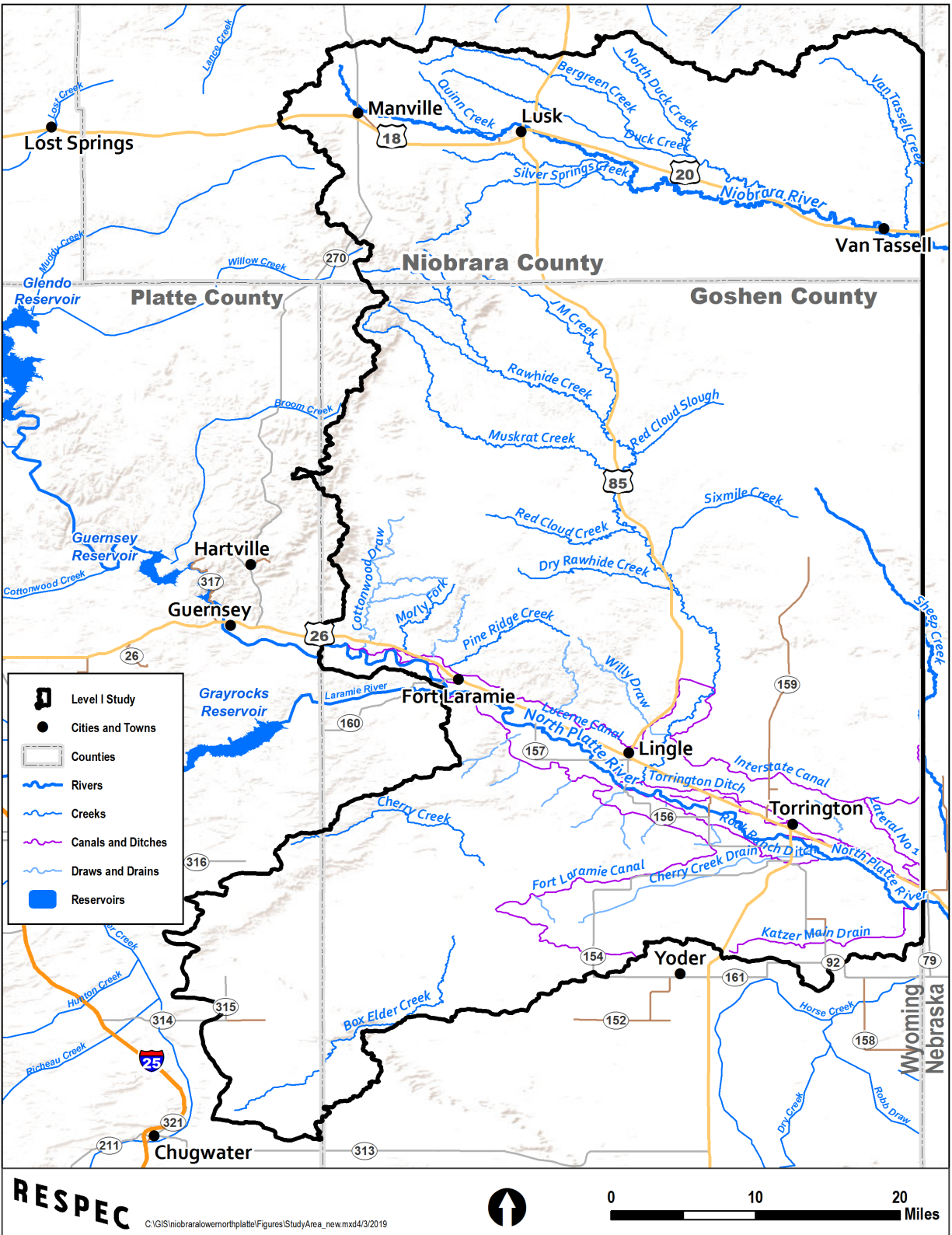


Figure 1.1. Niobrara–Lower North Platte Rivers Level I Watershed Study Area.

1.3 PROJECT OUTREACH

Scoping meetings, landowner open houses, landowner meetings, and on-site field visits were conducted by consultant staff in cooperation with the NCD, LFLCD, NPVCD, PCRD, and WWDC. The objectives of the scoping meeting, landowner open houses, and landowner meetings included the following:

- Discuss the purpose, existing data, and available information for the watershed study
- Obtain input and opinions from residents and landowners about the study area
- Identify concerns and answer questions regarding the area's water and land resources
- Request participation in the study effort and coordinate inventory activities
- Present initial results and preliminary findings from the watershed study.

Invitations to the two scoping meetings and two open houses for the watershed study were sent to more than 1,175 addresses within the watershed on two different occasions. The scoping meetings and open houses were also advertised in the local newspapers, including the *Lusk Herald*, *Torrington Telegram*, and the *Wyoming Livestock Roundup*, and posted on the conservation district website (<http://www.conservegoshen.org/>). During the scoping meetings in Lusk and Torrington in 2017, consultant representatives summarized the study's purpose and tasks. A total of 13 landowners attended the scoping meeting in Lusk and 28 landowners attended the scoping meeting in Torrington. In 2018, two open houses were held in Lusk and Torrington. Fifteen landowners attended the open houses. During the open houses, landowners discussed their concerns and potential projects with the consultant and representatives from the NCD, LFLCD, NPVCD, and the WWDC. Consultant staff met with 15 landowners during two open houses and met with 27 landowners during field visits. The consultant also attended the LFLCD, NCD, and NPVCD board meetings during the watershed study as requested.

1.4 WATERSHED INVENTORY

The Niobrara–Lower North Platte Rivers Watershed is in the eastern portion of the Guernsey to State Line Subbasin of the Platte River Basin and in the southeastern portion of the Northeast River Subbasin in eastern Wyoming. Approximately 1,945 stream miles are located within the watershed with 215 miles of streams classified as perennial, 1,380 miles are categorized as intermittent, and another 350 miles are classified as canals and ditches. The Niobrara River and its tributaries and the North Platte River and its tributaries are important streams within the watershed.

There have been 6 damaging floods in Niobrara County since 1960 and 12 damaging floods in Goshen County since 1955. The most recent events occurred in June 2015 in Lusk and Niobrara County when a large, slow-moving thunderstorm delivered 3–7 inches (in) of rain and hail in 2–4 hours within the Niobrara River drainage. This rainfall event created severe flooding in Lusk and Manville and throughout the surrounding area. The USGS estimated that the peak discharge of the Niobrara River flood was 9,300 cubic feet per second (cfs). Currently, a total of 12 stream gages are located within the watershed and operated by the USGS, SEO, USBR and the Nebraska Department of Natural Resources (NDNR). The USGS has operated nine streamflow gages within the study area in the past but are currently only operate two active gages (06674500/North Platte River at Wyoming–Nebraska state line and 06657000/North Platte River below Whalen Dam) within the watershed. No WWDC temporary gaging stations were installed within the watershed as part of this Level I study.

The watershed's geomorphology can be described as rolling plains, buttes, escarpments, and tablelands dissected by canyons, gullies, channels, and valleys draining to the Niobrara River in the north and the North Platte River in the south. Elevations within the watershed gradually decrease from west to east. The Hartville Uplift is located on the west boundary of the watershed and the Goshen Hole Lowlands is in the southwest area of the watershed. Surficial geology includes residuum, alluvium, and eolian units while Quaternary and Tertiary bedrock geologic deposits underlie almost the entire watershed.

A Level I geomorphic classification was completed using the Rosgen Stream Classification and indicated that most of the streams are C- and E-type channels, which are meandering stream channels that have access to their floodplains and are only slightly entrenched. The channels in the watershed generally appear stable and functioning. However, some segments on the Niobrara River and the North Platte River have been impacted by drought and low flows followed by high flows and flooding events.

Channel morphologies and hydrologic regimes of the Platte River and its tributaries have undergone major changes over the past 150 years. Reservoir storage and river flows are managed to provide water for irrigation water delivery, hydroelectric power production, municipal and industrial water supply, flood control, outdoor recreation, and fish and wildlife preservation in Wyoming and Nebraska. The dominant characteristic of the North Platte River is its flow-regulated conditions controlled by seven impoundments; Seminoe, Kortes, Pathfinder, Alcova, Gray Reef, Glendo, and Guernsey Reservoirs.

The watershed has 32 Wyoming Pollution Discharge Elimination System (WYPDES) point-source discharge permits with a total of 38 outfalls, which includes sanitary wastewater permits for Torrington and Fort Laramie. The WDEQ has classified 19 surface waterbodies in the watershed for water quality standards designation and attainment. The WDEQ completed an assessment on the North Platte River in 2007. The NCD monitored Silver Spring Creek, a tributary to the Niobrara River, and data indicated that the stream exhibited a biological reference condition. No waterbodies in the watershed are listed as impaired or requiring development of a total maximum daily load (TMDL).

Land ownership is predominantly private at 1,837 square miles, or 90.9 percent of the watershed. Of the private land, approximately 1,433 square miles (78.0 percent) consist of grazing land. More than 151 square miles (8.2 percent) of the private lands are irrigated within the watershed. Transportation and energy corridors are concentrated along US Highway 26 from Guernsey to the state line, US Highway 85 from Torrington to Lusk, and US Highway 18 from Manville to the state line. The Colorado and North Wyoming Railroad extends from Manville to Nebraska, and the Burlington Northern is located along US Highway 18 across the southern portion of the watershed. Power and energy development includes wind power complexes with several transmission lines throughout the study area.

Irrigated lands within the watershed mainly consist of center pivot systems and gated-pipe flood-irrigated corn and alfalfa crop fields which are managed to produce grain and hay for livestock forage. These irrigated lands are mostly located on the valleys along the North Platte River and Niobrara River. Irrigated lands are also located on tablelands from northeast of Lusk to south of Prairie Center and east of Jay Em, which are supplied by wells drilled into the Arikaree Formation. In 2006, 108,135 acres of irrigated land were identified within the study area. Since 1909, irrigation water has been diverted at Whalen Dam on

the North Platte River into the Fort Laramie Canal on the south side of the river and into the Interstate Canal on the north side of Whalen Dam. The Fort Laramie Canal was completed in 1924 with a capacity of 1,500 cfs and delivers water for 129 miles. The Interstate Canal was completed in 1915 with a capacity of 2,100 cfs and delivers water for 95 miles.

The four irrigation districts within the watershed include: the Goshen Irrigation District (GID), Hill Irrigation District, Pratte-Ferris Irrigation District, and the Torrington Irrigation District. Irrigation water for approximately 15,000 acres to the Hill Irrigation District and the Lingle Water Users Association is delivered under USBR contracts via the Interstate Canal which is operated by the Pathfinder Irrigation District. In addition to the irrigation districts, there are two water-user associations along with seven companies. A total of 18 irrigation canals and ditches carry 3 cfs or more from existing points of diversion. These canals and ditches total approximately 191.5 miles of conveyance but does not include all of the numerous laterals, ditches, and drains that are operated by the irrigation districts, water users associations, and ditch companies.

A total of 10 proposed projects with 16 associated components were identified for rehabilitation and/or replacement on the 10 irrigation systems evaluated during the field inventory effort. Most of the systems that were inventoried during the study involved weakened or deteriorated diversion and headgate structures along with laterals and ditches that had seepage and erosion issues. Five systems were inventoried within Niobrara County, and five systems were inventoried within Goshen County. Irrigation infrastructure improvements on the Lucerne Canal's main diversion and other canal structures should be investigated for securing future potential project funding.

Cattle grazing is the predominant land use in the watershed. Existing livestock and wildlife water sources were mapped and evaluated within the study area. The results of water-source inventory and mapping indicated that 99 wells, 114 tanks, 9 springs, and 238 stock ponds and reservoirs are viable sources for livestock and wildlife watering within the watershed.

Twenty-seven historical monuments and markers sites are listed on the National Registry of Historic Places and located within the study area. The most prominent historic sites are the Fort Laramie National Historic Site, the Oregon Trail, and the Cheyenne-Deadwood Stage Road. The Oregon, California, and Mormon Trails traverse through the watershed along the North Platte Valley.

Big game wildlife species, including antelope, mule deer, white-tailed deer, and elk, are known to occur within the study area. Approximately 65,485 acres of the study area has been classified as crucial range for antelope and mule deer. A total of ten fish species are considered native to the watershed. Additionally, the North Platte River is an important local sport fishery. The greater sage-grouse was known to occur within the study area; however, no core areas are situated within the watershed.

Groundwater in the watershed is important for livestock/wildlife water, private domestic wells, and municipal water. Quaternary and Tertiary Aquifers are grouped into the High Plains Regional Aquifer System, which is a significant aquifer in eastern Wyoming and the central United States. Approximately 5,426 water wells are located within the study area and the majority of wells are domestic (2,311), stock (1,773) with 713 irrigation wells. Nearly 110 springs and seeps within the study area. Many of the aquifers with hydrologic connection to surface water are unavailable for development because of the 2001

Modified Decree. “Green Area” maps have been developed by the SEO to depict these areas in which the groundwater at any depth is deemed nonhydrologically connected. Approximately 722,200 acres or 56 percent of the study area is a groundwater Green Areas.

Water-storage investigations focused on existing stock ponds and potential water-storage facilities. There are 238 reservoirs/ponds within the watershed and range in capacity from 0.03 acre-feet to 2,207 acre-feet with a mean capacity of 78.4 acre-feet and cumulatively store 11,780 acre-feet. There are 6 reservoirs with a permitted capacity of 500 acre-feet or greater within the watershed and include the following facilities: Detention Reservoir Pine Ridge–1, Detention Reservoir Case Bier–1, Arnold Reservoir, Glomill Reservoir, A-3 Reservoir, and Katzer No. 2 Reservoir. Since 1933, there have been 10 studies on potential reservoir development completed within the watershed.

1.5 WATERSHED MANAGEMENT AND REHABILITATION PLAN

The Watershed Management and Rehabilitation Plan was developed using information from the inventory and provides recommendations for improvements for the following:

- Irrigation system rehabilitation components
- Livestock/wildlife watering opportunities
- Grazing-management opportunities
- Surface-water storage opportunities
- Channel-stabilization opportunities
- Wetland-enhancement opportunities

Table 1.1 lists the irrigation system rehabilitation components of the plan. Table 1.2 presents the livestock/wildlife watering components. The 2019 costs were estimated for the conceptual proposed projects by using the NRCS Environmental Quality Incentives Program (EQIP) cost data, costs for similar projects, and manufacturers’ and vendors’ advertised product prices.

Table 1.1. Estimated Costs Associated With Each of the Proposed Irrigation Rehabilitation Projects of the Watershed Management Plan

Item Number	Project Name	Description	Total Project Costs (\$)
I-01	Hoblit Reservoir	Reservoir and Headgate Project	154,127
I-02	Reynolds No. 1 and No. 2	Diversion, Headgate, and Pipeline Project	93,588
I-03	Emma Ditch	Headgate and Pipeline Project	63,296
I-04	Peterson Draw	Headgate and Pipeline Project	17106
I-05	Ladwig No. 2	Rehabilitate well and pump	78,292
I-06	Lucerne Canal	Diversion Project	122522
I-07	E B Wilson Ditch	Diversion and Headgate Project	79,708
I-08	Glomill Ditch	Diversion and Headgate Project	91,627
I-09	East Draw Regulating Reservoir	Regulating Reservoir Project	61,262
I-10	Peterson Draw Regulating Reservoir	Regulating Reservoir Project	61,262
Total			\$822,790

Table 1.2. Estimated Costs Associated With Each of the Proposed Livestock/Wildlife Water Projects of the Watershed Management Plan

Item Number	Project Name	Description	Total Project Costs (\$)
LW-01	Hoblit Reservoir	Stock Reservoir Project	77,029
LW-02	Siebken #3	Well, Pipeline, Tank, and Pond Project	60,792
LW-03	Home Well #2	Storage Tank Project	27,479
LW-04	Tronvold #1	Well, Pipeline, and Tank Project	34,896
LW-05	Harmony Spring #1	Spring, Pipeline, and Tank Project	35,404
LW-06	Three Buttes	Storage Tank and Stock Tanks Project	51,989
LW-07	Upper Hefflen	Pipeline and Tanks Project	59,132
LW-08	Ole Place 1	Well and Tank Project	32,608
LW-09	South Draw	Spring Development and Pond Project	28,174
LW-10	North Draw	Spring Development and Pond Project	28,174
LW-11	Owens Well #1	Well, Pipeline, and Tanks Project	66,572
LW-12	Twin Tanks	Well, Pipeline, and Tanks Project	71,387
LW-13	Cistern Well	Well, Pipeline, and Tanks Project	54,628
LW-14	Hoblit #1	Well, Pipeline, and Tank Project	38,447
LW-15	Hoblit #4	Well, Pipeline, and Tank Project	28,117
LW-16	Hoblit #5	Well, Pipeline, and Tank Project	23,625
LW-17	Hoblit #3	Well, Pipeline, and Tank Project	34,896
LW-18	Johnson	Well and Tank Project	23,625
LW-19	Colters Pond	Stock Reservoir, Pipeline and Tanks Project	69,223
LW-20	Smith South	Spring Development and Tank Project	41,945
LW-21	Vondra #1	Well, Pipeline, and Tanks Project	89,024
LW-22	Upper Moore	Spring Development and Tank Project	38,604
LW-23	Bass Draw	Well, Tank, and Pond Project	37,292
LW-24	North Pasture #2	Well and Tank Project	44,160
Total			\$1,053,062

1.6 PERMITS

Information was provided regarding clearances, environmental reviews, agency coordination, and determination of potential impacts that may be necessary in implementing the proposed projects. In general, irrigation and livestock/water project activities on private lands are not subject to local, state, and federal agency review and/or approval. However, almost all of the proposed projects that were included in the Watershed Management and Rehabilitation Plan would require some amount of review and/or approval from the appropriate local, state, or federal agency because these projects typically involve constructing a permanent facility such as a water well, irrigation diversion, or storage reservoir. These requirements are program-specific and depend on current criteria of the funding agency.

1.7 FUNDING

The NCD, LFLCD, NPVCD, PCRCD, or an irrigation district could serve as a sponsor for those funding sources that require a sponsoring entity. For example, the WWDC's Small Water Project Program (SWPP) participates with land management agencies and sponsoring entities in providing incentives for improving watershed condition and function. By combining funding from additional sources (i.e., NRCS Farmbill or USBR WaterSMART funding), total costs could be potentially reduced for the participants. Additionally, state and federal agencies, including but not limited to the WGFD, BLM, USFS, USBR, and NRCS, have conservation programs and could potentially assist with project implementation.

1.8 CONCLUSIONS

The following sections describe the inventory efforts, proposed projects, opportunities, and recommendations that were developed as part of the Watershed Management and Rehabilitation Plan.

1.8.1 Irrigation System Components

- A total of 10 proposed projects and 16 associated components were identified during field inventories for irrigation system infrastructure were completed for 10 irrigation systems.
- Five systems were inventoried in Niobrara County and five systems in Goshen County.
- Irrigation infrastructure improvements on the Lucerne Canal's main diversion and other canal structures should be investigated for securing future potential project funding.
- Recommended improvements to existing irrigation systems mainly involve replacing and/or rehabilitating existing diversion and headgate structures and replacing earthen ditches with buried pipelines to reduce conveyance losses and sedimentation.
- Most of the proposed irrigation system projects would require minor involvement or permitting from regulatory agencies to be completed. However, any proposed project should receive clearance from the Wyoming State Historical Preservation Office (SHPO) regarding cultural resources before commencing any installation activities.

1.8.2 Livestock/Wildlife Upland Watering Opportunities

- All of the proposed projects and pipeline components were conceptually mapped and located on only on private property or state lands within the watershed.
- A total of 24 proposed livestock/wildlife water projects that were identified for development, which resulted from an effort that evaluated available water sources in coordination with participating landowners and state land lessees.
- Project components included 13 wells; 6 solar pumps; 6 spring developments; 50,800 feet of buried pipelines; 39 stock tanks; 7 storage tanks; and 7 ponds/reservoirs.
- These components would require additional final planning, design, and permitting to be completed before construction commences.
- The proposed projects and components would need to be installed, operated, and maintained by the landowner or manager according to current standards and specifications to realize the expected benefits within the proposed project areas and to the watershed.

1.8.3 Grazing Management Opportunities

- Reliable water-supply projects need to be developed and constructed in areas with inadequate water sources before grazing management alternatives could be made.
- Technical and financial assistance are available from private range consultants, Conservation District, NRCS, and/or UW-CES personnel in order to improve grazing management plans; evaluate animal and forage balance inventories; generate contingency plan alternatives for drought and/or fire; and monitor field indicators for assessing rangeland health.

1.8.4 Surface-Water Storage Opportunities

- Institutional issues and constraints related to the 2001 Modified Decree and/or the Platte River Recovery and Implementation Program (PRRIP) limit the opportunity to create new reservoirs or increase existing reservoirs through enlargement within the watershed.
- Storage evaluations focused on existing pond/reservoir facilities identified by study participants where conditions limited the ability to store water within the study area.
- Investigate potential off stream storage for excess flood water on the North Platte and Laramie Rivers to help minimize downstream flood damage in coordination with SEO, USBR, WWDC, FEMA, Goshen County, and the USACE.
- One existing reservoir (Hoblit Reservoir) was proposed for rehabilitation within the watershed.
- Three existing stock reservoirs (Colters Pond, Smith South, and Bass Ranch No. 1) were proposed for rehabilitation within the watershed.
- Five new small ponds/reservoirs (East Draw, Peterson Draw, Siebken #3, South Draw, and North Draw) are proposed for construction within the watershed.

1.8.5 Channel Stability

- Channels on the North Platte River are affecting diversion, headgate, ditch, and bridge structures within the study area and require further investigation with multiple landowners and agencies.
- Three channel projects – North Platte River Erosion Upstream of Highway 156; North Platte River Erosion Downstream of Highway 157; and North Platte River Erosion Downstream of US Highway 85 were proposed for stabilization within the watershed.
- Site-specific improvements could be developed to alleviate the channel impairments and restore riparian/wetland function as part of the Watershed Management Plan.

1.8.6 Wetland Enhancement Opportunities

- No specific wetland projects were identified during the study, however there are wetland and riparian improvements associated with certain irrigation, livestock/wildlife, and surface-storage proposed projects included in this plan.
- Potential wetland enhancement projects within the study area should consider site-specific conditions regarding the contributing surface water, groundwater, soil, and geologic formation.

1.9 RECOMMENDATIONS

Several proposed projects, identified opportunities, suggested alternatives, and initial conclusions have been discussed in this report. The recommendations listed below are also included for consideration:

- The Lucerne Canal's irrigation system was too large to inventory within the scope of this study. Although an initial evaluation of the canal's system, indicated that the facilities and infrastructure are aged and need to be rehabilitated; therefore, the Lucerne Canal Company is encouraged to investigate potential funding in coordination with the WWDC and the USBR.
- The Lucerne Canal is also encouraged to pursue forming an irrigation district in order to apply to the WWDC for consideration to complete an Irrigation Master Plan for the irrigation system.
- Several irrigation system rehabilitation projects and livestock/wildlife water projects could be eligible to apply for funding through the WWDC's Small Water Project Program (SWPP).
- Landowners or managers who seek to participate in the SWPP should consult and coordinate with the Niobrara Conservation District (NCD), Lingle-Ft. Laramie Conservation District (LFLCD), North Platte Valley Conservation District (NPVCD), and/or the Platte County Resource District (PCRD), which are eligible sponsors of SWPP applications and project agreements.
- Proposed project narratives, conceptual plans, and cost estimates could be used by local sponsors in developing SWPP applications. Preliminary project benefits were included to also assist in program application submittal.
- Several of the proposed projects require additional planning that would include site-specific engineering, cultural resource, geologic, groundwater, and wetland investigations and surveys.
- Although the study effort attempted to address all of the participants' requests, more projects from additional landowners will probably be identified after the study is completed. These projects are also eligible for SWPP funding because of their location within the watershed but will need additional planning assistance.
- The North Platte River's channel and banks have changed in the past and will continue to change within the study area. A detailed evaluation of the river channel was too vast for this Level I study; however, it is recommended that an effort be initiated locally with assistance from state and federal partners to investigate alternatives to improve channel conditions on the river. There are diversions, bridges, roads, and buildings that are vulnerable along the river and local sponsors are encouraged to consider forming an ad hoc group to evaluate opportunities for addressing channel conditions on the river.
- The study's GIS and digital library should be used as a tool in planning and developing projects and should be updated as necessary from available information sources.
- Innovative strategies for coordinated project funding and financing involving private, local, state, and federal sources such as current partnership efforts between the NCD, LFLCD, NPVCD, PCRD, Natural Resources Conservation Service (NRCS), US Bureau of Reclamation (USBR), US Fish and Wildlife Service (USFWS), and the Nature Conservancy should be considered in association with WWDC programs to address resource concerns within the watershed.
- A coordinated approach based on local, collaborative endeavors, which integrates more than one watershed issue that results in achieving multiple benefits, is essential.