Colorado River Salinity Control Program
Green River, Utah Unit
Environmental Assessment
Emery and Grand Counties, Utah
August 2009

United States Department of Agriculture
Natural Resources Conservation Service

USDA-Natural Resources Conservation Service

USDA, NRCS

Green River Proposed Salinity Control Area – Emery and Grand Counties, Utah

---

Proposed Action: The USDA, Natural Resources Conservation Service, Utah, proposes to:

> Provide technical and financial assistance for on-farm treatments to reduce deep percolation on irrigated farmland, in order to reduce return flows containing high concentrations of dissolved salts to the Green River. The proposed on-farm treatments are conversion of unimproved flood irrigation systems to sprinkler irrigation systems on approximately 2,080 acres of farmland that are currently irrigated using flood irrigation techniques.

Type of Document: Environmental Assessment

Lead Agency: United States Department of Agriculture, Natural Resources Conservation Service

Responsible Official:
Sylvia A. Gillen
State Conservationist
Natural Resources Conservation Service
125 South State Street, Room 4402
Salt Lake City, Utah 84138-1100
(801) 524-4550

For Further Information:
Ed Whicker
Civil Engineer
Natural Resources Conservation Service
Roosevelt, UT
(435) 722-4621

Special Note: Comments received in response to this Environmental Assessment will be available for public inspection and will be released in their entirety if requested pursuant to the Freedom of Information Act.

Table of Contents

Cover Page 2
Glossary: Abbreviations, Acronyms, and Terms 4
Chapter 1: Purpose and Need for the Action 6
1.1 Purpose of Action 6
1.2 Need for Action 6
1.3 Objectives of the Action 6
1.4 Study Authority 7
1.5 How the Plan was Formulated 8
1.6 Scope of this Environmental Assessment 9
1.6.1 History of Planning and Scoping Process 9
1.6.2 Issues Studied in Detail 9
1.6.2.1 Soil Resources 10
1.6.2.2 Water Resources 10
1.6.2.3 Air Resources 10
1.6.2.4 Threatened and Endangered Species 10
1.6.2.5 Cultural Resources 10
1.6.2.6 Economic and Social Considerations 10
1.6.2.7 Migratory Birds, Wetlands, and Riparian Areas 10
1.6.3 Issues Eliminated From Further Study 10
1.7 The Evaluation Process 12
Chapter 2: Plan Formulation & Alternative Treatments 13
2.1 Treatment Alternatives for the Green River Project Area 13
2.1a The No Action Alternative 13
2.1b Proposed Action 14
2.2 Other Treatment Alternatives Not Carried Forward 15
2.2a Pressurized Delivery System to Sprinkler Lines 15
2.2b Other Alternatives Identified 15
Chapter 3: Conditions and Effects 16
3.1 The Environmental setting 16
3.1.1 Location 16
3.1.2 Climate 17
3.1.3 Geology and Soils 17
3.1.4 Hydrology and Agricultural Water Development 19
3.1.5 Air Resources 21
3.1.6 Land Ownership 22
3.1.7 Irrigated Croplands and Pastures 22
3.1.8 Migratory Birds and Wetland/Riparian Areas 23
3.1.9 Wildlife Resources 23
3.1.10 Cultural & Historic Resources 26
3.1.11 Social & Economic Characteristics 28
3.2 Past Relevant and Future Foreseeable Actions 29
Chapter 4 List of Preparers 30
Appendix 31

Tables and Figure

Table 1. Issues Eliminated From Further Study 11
Table 2. Project Area Canals and Associated Acres..... 20
Table 3. Threatened and Endangered Species Identified in the Project Area..... 24
Table 4. State Sensitive Species Identified in the Project Area..... 24
Table 5. Net Annual Benefit and Costs of Proposed Action 29
Table 6. List of Preparers..... 30
Figure 1. Map of the Project Study Area 18

Glossary: Abbreviations, Acronyms, and Terms

Alternative	An option, choice or approach that achieves the desired condition or meets the project's purpose and need.
Baseline Conditions	Existing and predicted future conditions of a resource about which someone has a concern, such as water, soil, air, or an endangered or threatened species.
CEQ	Council on Environmental Quality, established by the National Environmental Policy Act of 1969. The Council is part of the Executive Branch of the Federal Government.
CEQ Regulations	The regulations that tell federal agencies how to implement NEPA.
Cumulative Effects	Past, present, and reasonably foreseeable effects added together (regardless of who or what has caused, is causing, and might cause these effects)
Decisionmaker	NRCS, Utah State Conservationist
EA	Environmental Assessment
EQIP	Environmental Quality Incentives Program
Farmland of Statewide Importance	Land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Farmlands of statewide importance generally include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable.
FONSI	Finding of No Significant Impact – a document that records the decisionmaker's conclusion that implementing an alternative would have no significant impact on the quality of the *human environment*, as defined in CEQ regulation § 1508.14.
Issue	An environmental resource about which someone has a concern. *Issues* are identified in NEPA § 102(2)(E) as *unresolved conflicts*.
MOU	Memorandum of Understanding
Natural Areas	Land and water units where natural conditions are

	maintained. Natural conditions result when ordinary physical and biological processes operate with a minimum of human intervention.
Need	A resource problem or opportunity.
NEPA	National Environmental Policy Act of 1969
Prime Farmland	Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oil seed crops that is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding." (National Soil Survey Handbook; Section 622.04).
Purpose (Objective)	A goal to be attained while taking action to meet an underlying need.
Selected Alternative	The alternative (option/choice) that the decisionmaker selects to implement.
Short and long term	Each resource issue requires a specific definition of short- and long-term, which definitions are given in the text, usually in Chapter 3: Conditions and Effects. Generally, *short-term* means the duration of the implementation activities plus a few months. *Long-term* means after the short-term.
SHPO	The State Historic Preservation Officer in Utah.
Unique Farmland	Land other than prime farmland that is used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods.
USDA, NRCS	United States Department of Agriculture, Natural Resources Conservation Service.
USFWS	United States Fish and Wildlife Service

Chapter 1: Purpose and Need for the Action

1.1 Purpose of Action

The *purpose* of the Proposed Action is to reduce salt loading in the Green River caused by deep percolation that occurs as a result of excess irrigation water applied to farmlands in the project area. Return flows carry these salts to the Green River and ultimately to the Colorado River.

1.2 Need for Action

There is a *need* to reduce salinity in the Green River and its tributaries in order to achieve salinity reduction goals in the Colorado River. The Colorado River Salinity Control Act (P.L. 93-320, 98-569 and 104-20) authorizes the US Department of Interior – Bureau of Reclamation, (USDI-BOR), and the US Department of Agriculture – Natural Resources Conservation Service, (USDA-NRCS), to enhance and protect the quality of water available in the Colorado River for use in the United States and Republic of Mexico. The Act provides a means to comply with the United States' obligations to the Republic of Mexico under Minute No. 242 of the International Boundary and Water Commission. The law also provides a means to meet the numerical water quality standards for total dissolved solids at three locations in the Colorado River as required by the Water Quality Act of 1965 (PL 89-234) as amended by the Federal Water Pollution Control Act of1972. USDI-BOR provides overall salinity program leadership at the federal level. The two federal agencies must implement salinity control measures that lead to the removal of an additional one million tons of salt per year by 2020 to meet the program goal of 1.8 million tons of salt-load reduction annually.

1.3 Objectives of the Action

The proposed project is intended to reduce salt loading to the Colorado River caused by agricultural return flow from flood irrigation and to improve delivery systems and on-farm irrigation systems on private lands by providing more effective water distribution to agricultural land.

The following objectives will be met as a result of the Proposed Action:

- Reduce the amount of dissolved salts in return flows to the Green River and tributaries of the Colorado River.
- Use limited water resources more efficiently.

Past experience in other salinity control units suggests that limited unimproved-flood-to-improved-flood projects will be done in the proposed salinity control unit. Unimproved-flood-to-wheel-line-sprinkler systems will reduce salt loading by 84% and unimproved-flood-to-center-pivot sprinklers will reduce salt loading by 91%.

Ten thousand (10,000) tons of on-farm salt are introduced into the Green River from area farms each year, a result of return flows resulting from flood irrigation-induced deep

percolation. One thousand, four hundred (1,400) acres of irrigated farmland treated prior to this Proposed Action are assumed to be loading 15% of their *pre-treated* salt load or .54 tons/acre per year (750 tons in total from previously treated acreage). The remaining 9,250 tons of on-farm salt is produced by the 2,600 acres eligible for treatment under the Proposed Action, or 3.56 tons/acre per year (USGS, "Hydrology and Water Quality in the Green River and Surrounding Agricultural Areas near Green River in Emery and Grand Counties, Utah, 2004-05", 2006).

1.4 Study Authority

Although a number of water quality related legislative actions have been enacted on State and Federal levels, four Federal Acts are of special significance:

- Water Quality Act of 1965 and related amendments.
- Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500).
- Colorado River Basin Salinity Control Act of 1974 as amended.
- Clean Water Act of 1977 as amended.

The Water Quality Act of 1965 (Public Law 89-2340) amended the Federal Water Pollution Control Act and established a Federal Water Pollution Control Administration (now the Environmental Protection Agency (EPA)). Among other provisions, it required states to adopt water quality criteria for interstate waters inside their boundaries. The seven Colorado River Basin States agreed to a policy that called for the maintenance of salinity concentrations in the Lower Colorado River System at or below existing levels, while Upper Basin States continued to develop their compact-apportioned waters. The standards did not include numeric salinity criteria for the Colorado River primarily because of technical constraints.

The enactment of the Federal Water Pollution Control Act Amendments of 1972, affected salinity control in that the legislation was interpreted by EPA to require numerical criteria standards for salinity in the Colorado River. In response, the Basin States founded the Colorado River Basin Salinity Control Forum (Forum) to develop water quality standards including numeric salinity criteria and a basin wide plan of implementation for salinity control. The Basin States held public meetings on the proposed criteria as required by the enacting legislation.

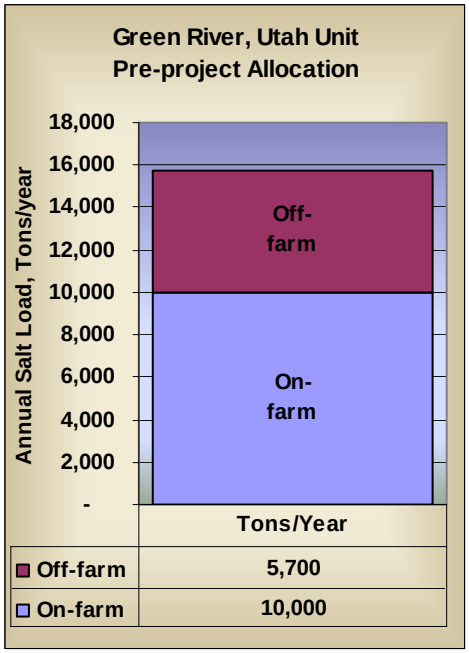
The Forum recommended that individual Basin States adopt the report, *Water Quality Standards for Salinity Including Numeric Criteria and Plan of Implementation for Salinity Control, Colorado River System.* The water quality standard called for maintenance of flow-weighted average total dissolved solids (TDS) concentrations of 723 mg/L below Hoover Dam, 747 mg/L below Parker Dam, and 879 mg/L at Imperial Dam. Included in the plan of implementation were four salinity control units and possibly additional units, application of effluent limitations, and use of saline water whenever practicable, and future studies. Standards are to be reviewed at three year intervals. All Basin States adopted the Forum recommended standards. The Environmental Protection Agency approved the standards.

In recognition of increasing salinity problems within the Colorado River Basin, Congress passed the Colorado River Basin Salinity Control Act of 1974 (Public Law 93-320). Title II, Section 203.(a) authorized the Secretary of Interior to expedite planning reports for a number of various salinity units in the Colorado River Drainage.

Public Law 98-569 amended the Salinity Control Act, and authorized the United States Department of Agriculture (USDA) on-farm program. Public Law 98-569 also directed that preference be given to salinity project areas which reduce salinity at the least cost per ton (cost effectiveness).

1.5 How the Plan was Formulated

The standard for salinity control studies on agricultural areas is to focus on factors that cause excess irrigation water to react with salts in the soil profile and lower geologic strata. Agricultural salt loading is the result of canal seepage and leakage (off-farm) and deep percolation of irrigation water applied to fields (on-farm).



In 2004, the U.S. Geological Survey (USGS) was contracted to study salt loading in the Green River, Utah area. Their report, "Hydrology and Water Quality in the Green River and Surrounding Agricultural Areas near Green River in Emery and Grand Counties, Utah, 2004-05," estimates the annual salt load from agriculture to be 15,700 tons/year. This estimate is based on a very short period of record. Due to the low flow rate of the diversion compared to the flow rate of the river, a slightly unconventional approach was used to make the calculation. No change in flow rate could be reliably detected in the river, so salt loading is based on average flow rate of the river and the difference in salt concentration measured above and below the agricultural area.

Sources of salt loading in this project area were identified and quantified by the USGS, and since evaluated by the NRCS. Using 15,700 tons/year as the total load, the salt budget implies that approximately 10,000 tons are from on-farm sources and 5,700 tons from off-farm canals and large laterals (Gerner, et al, 2006).

Previous salinity control studies have demonstrated that excess irrigation water can be attributed to a number of different sources. The following is a summary of potential sources of excess water causing salt loading in the Green River Project area.

- Canal seepage
- Lateral and on-farm ditch seepage
- Irrigation methods or systems with poor distribution uniformity
- Fields far apart and field shapes that make water management difficult

The following sources of excess water were studied to determine their contribution to the overall salt loading problem:
• Canals and laterals were inventoried and estimated seepage losses calculated. Seepage estimates were determined by average wetted perimeter calculations and comparison to other salinity control units with similar geology and topography.
• Inventories of farm fields, crops grown, water availability, production and yield were analyzed.

Various alternative treatments were then developed to resolve the salinity condition in the Green River Project Area drainage. Treatment alternatives included:
• Structural measures such as; pipelines, reservoirs, pumping plants, canal and ditch lining, on-farm application equipment such as sprinklers, pipelines and leveling.
• Other treatment measures and alternatives are developed such as; change of crops, species of forages, irrigation scheduling and management.

Treatment alternatives were evaluated for effectiveness in solving the salt loading problem. Potential treatments were analyzed to measure associated costs, benefits, and other effects to the environment of various improvements. The economic climate of the community was considered to determine adaptability of treatment to the local area, and potential willingness of the public to adopt the practices. Measures are taken to incorporate conservation practices that enhance or protect the environment, and those practices are included in the *Proposed Action* alternative.

1.6 Scope of this Environmental Assessment

This section defines and explains the scope (boundaries/limits) of the Green River salinity control unit environmental assessment. It briefly describes the history of the planning process, identifies the resource issues studied in detail, and identifies the issues eliminated from further detailed analysis.

The geographic scope of the project includes the historically irrigated croplands of the Green River Area.

1.6.1 History of Planning and Scoping Process

The deep percolation of excessive flood irrigation water on agricultural lands of Green River was identified as a source of salt loading in the Colorado River system. In Fiscal year 2004, plans were made to offer area producers an opportunity to convert from flood irrigation to sprinkler irrigation, assisted by EQIP Salinity funds administered by the NRCS. Before funding could be devoted to assist area producers convert from flood to sprinkler irrigation, the area had to be designated as a salinity control unit, and an environmental assessment had to be completed. Agency and public concerns had to be addressed.

1.6.2 Issues Studied in Detail

The following issues were determined to be relevant to the decisions that must be made concerning the Green River salinity control unit and require further analysis.

1.6.2.1 Soil Resources

Foreseeable impacts on soil resources that may result from the Proposed Action are discussed in detail in Chapter 3 of this document.

1.6.2.2 Water Resources

Foreseeable impacts on water resources that may result from the Proposed Action are discussed in more detail in Chapter 3 of this document.

1.6.2.3 Air Resources

Foreseeable impacts on air resources, especially air quality, that may result from the Proposed Action are described in detail in Chapter 3 of this document.

1.6.2.4 Threatened and Endangered Species

A Biological Assessment was conducted for the threatened, endangered, sensitive and candidate species in the project area. That BA can be found in the appendix to this environmental assessment. The foreseeable impacts on threatened and endangered species that may result from the Proposed Action are discussed in Chapter 3 of this document.

1.6.2.5 Cultural Resources

A cultural resource overview and impacts analysis was conducted for the project study area. That overview and analysis is included as an appendix to this assessment. The foreseeable impacts on cultural resources that may result from the Proposed Action are discussed in Chapter 3 of this document.

1.6.2.6 Economic and Social Considerations

An economic analysis was conducted for the study area. That analysis is included in the Appendix for this document. The foreseeable impacts on economic and social conditions that may result from the Proposed Action are discussed in Chapter 3 of this document.

1.6.2.7 Migratory Birds, Wetlands, and Riparian Areas

The Biological Assessment was used to determine foreseeable impacts to migratory birds, as well as artificial riparian areas and wetlands. The foreseeable impacts on migratory birds that may result from the Proposed Action are discussed in Chapter 3 of this document.

1.6.3 Issues Eliminated From Further Study

As directed by CEQ regulations 1500.1 (b), 1500.2(b) and other sections, the NRCS eliminated the following special environmental considerations from detailed analysis because the Proposed Action would cause only inconsequential or no effect to

occur to these issues. Other than the information presented below, this environmental assessment contains no further information on the eliminated issues.

Table 1. Issues Eliminated From Further Study

Resource/Issue	Rationale for Elimination
Clean Water Act/Waters of the US	This project is not exempt from Section 404 of the Clean Water Act. Some of the activities of the Proposed Action will occur on the banks of the Green River, so Section 404 permits will be completed.
Environmental Justice	The project area is relatively uniform in its social makeup. There are no known distinct low-income populations, minorities, or other special or underserved populations within the project area when compared to the county at large. Based on U.S. Census Bureau and bureau of Labor statistics data, Emery County's unemployment rate is not sufficiently high for the county as a whole to be designated as a limited resource county. EQIP includes special cost share rates for certain underserved groups – first-time farmers or ranchers, limited resource producers, and starting in FY2009, socially disadvantaged farmers or ranchers.
Fish and Wildlife Coordination	The Fish and Wildlife Coordination Act does not apply to this project because it is not a new water resources development project and does not authorize additional diversion of water for irrigation purposes.
Invasive Species	The project will not introduce invasive species to the project area. Sprinkler irrigation will likely control the spread of invasive plants transported through irrigation canals, laterals and ditches, as seeds of invasive plants are not likely to be transported through on-farm sprinklers.
Natural Areas	No natural areas will be affected by the project. The project will occur on private, previously disturbed croplands.
Prime Farmland, unique Farmland, and Farmland of Statewide importance	NRCS Soils staff have analyzed the farmland in the project area and have determined that under technical definitions, there are no lands in the Green River salinity control unit that meet the criteria for Prime Farmland, Unique Farmland, or Farmland of Statewide Importance.
Scenic beauty	There are some beautiful scenic areas that are within the view shed of the project area. However, there would be no impact to these areas from the Proposed Action because the proposed activities and practices would take place on previously disturbed and historically irrigated cropland on private land.
Wild and Scenic rivers	There are not any wild and scenic rivers in the project area.
Floodplain Management	EQIP funds are for practices and activities occurring on farmland that has been irrigated within the last 5 years. As a result, no undisturbed floodplains will be affected by the Proposed Action.

1.7 The Evaluation Process

The Utah State Conservationist of USDA-NRCS must decide if Environmental Quality Incentives Program (EQIP) funds should be expended for the purpose of salinity control in the Green River Project area. These project activities are described in section 2.1b of this document.

The State Conservationist must also determine if the Proposed Action will or will not be a major Federal action, significantly affecting the quality of the human environment. If the State Conservationist determines that the selected alternative will significantly affect the quality of the human environment, then an Environmental Impact Statement (EIS), and a Record of Decision (ROD) must be prepared and signed before the proposed action can proceed.

Chapter 2: Plan Formulation & Alternative Treatments

Overview

This chapter is broken into three parts for comparative purposes.

• The first part describes the "***No Action Alternative***".
• The second part describes the "***Proposed Action Alternative***".
• The third part describes "***Other Alternatives***" not carried forward

The viability of each alternative evaluated was determined by using a ***four-account analysis*** that conforms to the Water Resources Council's *Principles and Guidelines of Water and Related Land Resources Implementation Studies (Principles and Guidelines).* Principles and Guidelines mandate four tests of viability to be considered for each alternative. The tests assess the completeness, acceptability, efficiency, and effectiveness of alternatives. Alternatives which meet a minimum standard under all four tests are to be considered viable and investigated in greater detail.

• *Completeness* is the extent to which a given alternative provides and accounts for all necessary investments or other actions to ensure the realization of planned effects.
• *Effectiveness* is the extent to which an alternative alleviates the identified problems and achieves the specified objectives.
• *Efficiency* is the extent to which an alternative is the most cost-effective means of alleviating the identified problems and realizing the specified objectives.
• *Acceptability* is the workability and viability of the alternative with respect to acceptance by the public and compatibility with existing laws, regulations, and public policies.

2.1 Treatment Alternatives for the Green River Project Area

2.1a The No Action Alternative

The No Action alternative assumes that the Green River area will not be designated as a salinity control area and no salinity control program will be implemented in the Green River Project area. Currently available USDA programs will continue as they have operated in the past. Based on what has occurred in previously designated salinity control areas in the State, the primary difference between the No Action alternative and current benchmark conditions, is an estimated 1,000 acre shortfall in the conversion from surface irrigation methods to sprinkler irrigation. Due to the substantial cost of installing sprinklers, local producers will convert to sprinkler irrigation at a slower rate (or not at all) if the No Action alternative is pursued. It is doubtful that the total amount of acreage required to meet salinity reduction goals would be converted from flood to sprinkler irrigation without federal incentives. It is usually not economically justifiable for a producer to convert from flood irrigation to sprinkler irrigation without financial assistance.

On-farm irrigation system improvements in the past have been relatively minor such as sprinkler systems and gated pipe system improvements installed on small acreages. Accelerated conversion to sprinkler irrigation methods will not likely occur because of

the high initial cost of installation and ongoing pumping costs associated with irrigation water delivery systems that do not provide gravity pressure.

There are no anticipated improvements associated with the off farm delivery systems because of high cost, coordination needs, and limited cost sharing funds available. Acreage under production will be similar to present benchmark conditions, with the majority of crops producing forages to support the area livestock industry. The economic conditions in the project area reflect a community largely dependent on agricultural income. Without federal financial and technical assistance, the initial cost of designing and installing salinity reduction measures is less feasible, and would occur over a longer period of time and only as producers saw economic incentives to convert from flood irrigation to sprinkler irrigation.

Conversion from surface irrigation methods to sprinkler irrigation will occur slowly over the next 10-15 years, impeding salinity reduction goals in the Green River and Colorado River system.

The "No Action alternative" does not meet the test for effectiveness since it does not meet the extent of treatment necessary to alleviate the identified problem or meet the specified objectives.

2.1b Proposed Action

The Proposed Action includes on-farm system improvements. On-farm improvements include 2,080 acres of land currently being irrigated by flood irrigation methods, converting to pressurized sprinkler irrigation systems. NRCS does not plan to treat any canals or major laterals, but there may be local interest in other federal agency programs to do so.

Sprinkler irrigation has shown to be more effective at applying water more uniformly across fields than flood irrigation. Uniform application of water makes it possible to maximize water storage in the root zone while minimizing deep percolation. Reducing deep percolation reduces salt transport to the river and helps to lower water tables. Lower water tables result is less standing water and surface salt accumulation.

It is anticipated that the Proposed Action will treat up to 80% (2,080 acres) of the eligible acreage (2,600 acres) within the project area over a five year period of time. The treatment of 2,080 acres will reduce salt loading to the Colorado River a total of 6,540 tons annually.

Irrigated acreage within the project area will in all likelihood remain stable at 4,900 acres. Overall irrigation efficiency for the project area will increase. The assumed application efficiency is 35% for flood, 65% for wheel lines, and 75% for center pivots.

Implementation of this plan will include a higher priority for group projects with the highest participation of landowners, with the lowest cost/ton.

The cost of the Proposed Action is based on an average cost of $4,182 per acre. The total federal contribution, including both financial and technical assistance (FA+TA), is estimated to be $8.7 million. The amortized cost of the salt reduction is $93 per ton based on an interest rate of 4.875 % for 25 years.

NRCS will comply with monitoring and reporting requirements for any alternative it pursues.

As part of the Proposed Action, NRCS will make available financial assistance to local landowners who volunteer to replace habitat values lost due to project implementation (such as artificial wetland and riparian habitat that is lost where excess flood irrigation and/or seepage water is removed) and assist them in the creation of a Wildlife Habitat Development Plan.

This alternative met the four account analysis of completeness, effectiveness, efficiency and acceptability.

2.2 Other Treatment Alternatives Not Carried Forward

2.2a Pressurized Delivery System to Sprinkler Lines

This alternative included the installation of a diversion upstream of the project area that would divert water from the Green River to supply a gravity-pressurized delivery system to on-farm sprinkler systems. The lack of topographic relief from the Green River to the project area would require locating the necessary diversion far upstream of the project area. The costs of building the required diversion on the Green River, constructing the necessary pipeline to the sprinkler systems, and the maintenance of such a system make this alternative economically unfeasible and unacceptable from a cost-efficiency standpoint.

2.2b Other Alternatives Identified

The following alternatives are not considered viable since they do not meet the test for completeness, or NRCS does not have the legislative authority to implement these methods of salinity control.

- Retirement of land from Irrigation
- Drain water Usage
- Treatment and Disposal
- Conversion to Industrial Uses
- Selective Withdrawal

Chapter 3: Conditions and Effects

Overview

This chapter describes current conditions and resources that may be affected by project implementation. For clarity and organization, the foreseeable impacts of the Proposed Action and No Action are discussed after each resource is described. The resource concerns and effects discussed in this chapter establish the borders in which the decision maker and the public can compare the effects of available alternatives.

Section 3.1 describes the current environment and foreseeable impacts of the Proposed Action on the project area. Section 3.2 describes the past and future foreseeable activities that may contribute to cumulative effects in the project area.

3.1 The Environmental setting

This section defines and explains the scope (boundaries/limits) of the Green River salinity control unit environmental assessment. It briefly describes the history of the planning process, identifies the resource issues studied in detail, and identifies the issues eliminated from further detailed analysis.

3.1.1 Location

The study area covers about 20 square miles along either side of the Green River in the vicinity of the town of Green River, in east-central Utah. The proposed salinity control unit covers an area of about 13,600 acres north and south of Interstate 70 in Green River, Utah. The area straddles the Green River and the county line between Emery and Grand Counties. Included in the proposed salinity control unit are about 4,900 acres of agricultural land, of which about 900 acres are idle in an average year. 1,400 acres are already under sprinkler irrigation systems.

European settlement began in the late 1870s at Blake Station (now Green River), and since that time agriculture and ranching have been important to the Green River economy (Geary, 1996). Today, Green River is primarily a commercial farming and ranching community, and a hub for recreational activity on the Green River. The population of Green River, Utah, in 2000 was about 975.

The Green River flows generally south through the area and forms the boundary between Emery (to the west) and Grand Counties. The northern boundary of the study area is defined by the Book Cliffs, a prominent escarpment that trends generally east-west. South of the Book Cliffs, the terrain generally consists of flat to gently rolling lowlands into which the Green River is incised. Elevations in the area range from about 4,060 ft along the Green River to about 5,200 ft on top of the Book Cliffs escarpment. Natural vegetation in the study area includes tamarisk, saltbrush, greasewood, and rabbit brush; cottonwoods and willows grow along the floodplain of the river.

3.1.2 Climate

Climate in the Green River area is temperate, with warm summers and generally mild winters. From 1893 through 2005, temperatures ranged from a low of -5.5°C in January to a high of 44.4°C in July; however, the annual mean temperature is 11.4°C (Western Regional Climate Center, 2005). On average, the frost-free period is 157 days from May 2 to October 4.

Mean annual precipitation in the Green River area as measured at Green River, Utah, is 6.33 in., with about equal amounts during the spring (1.55 in.) and summer (1.67 in.), and peaking in the fall (1.90 in.) (Western Regional Climate Center, 2005). Precipitation during June 2004 through May 2005 was about 8.4 in. Mean annual snowfall in the area is only about 7.8 in/yr, with higher amounts on the Book Cliffs along the northern boundary of the area. Evaporation rates (May-October) in the study area are 40 to 44.9 in/yr, substantially exceeding precipitation (Hemphill, 2005).

3.1.3 Geology and Soils

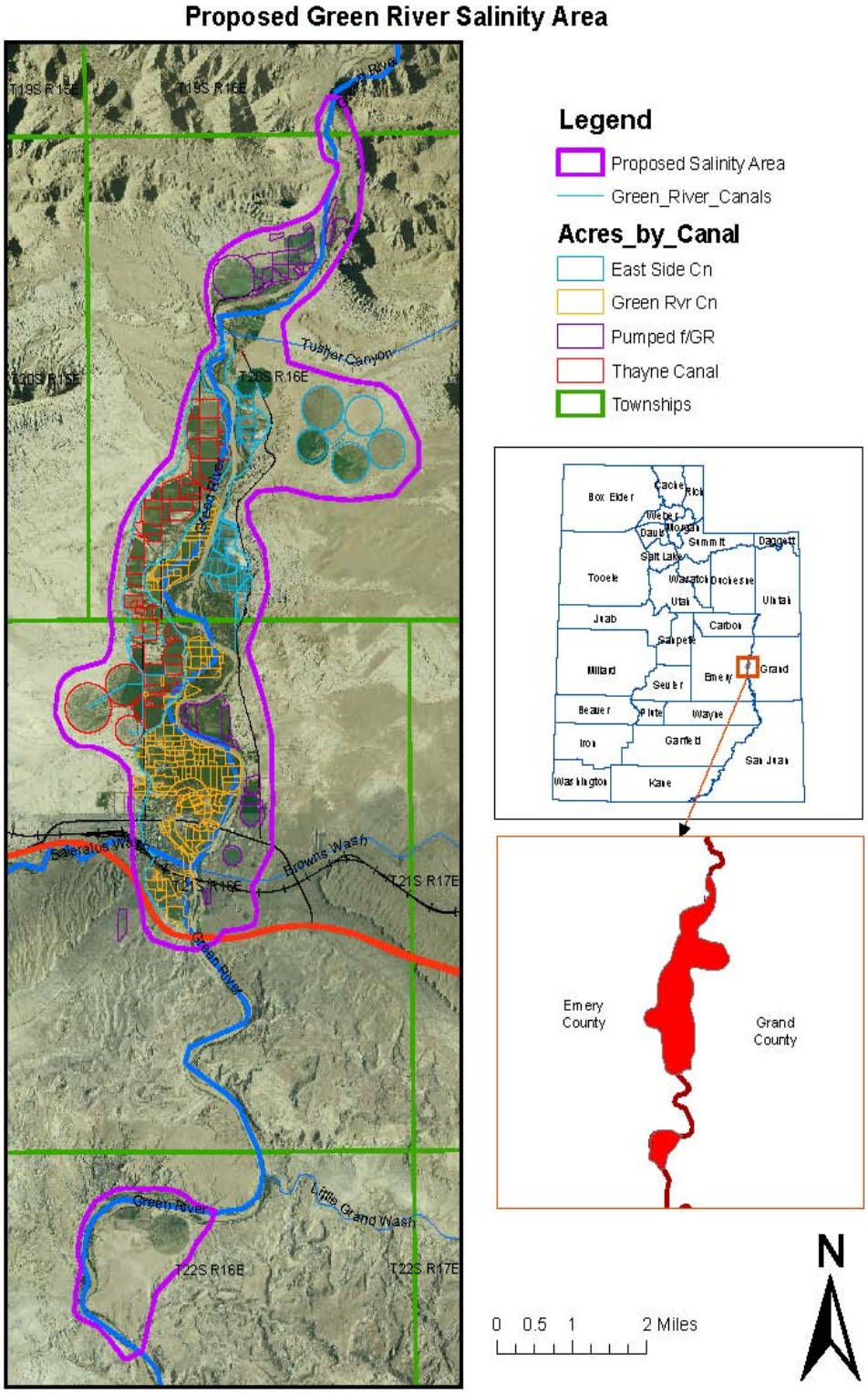
The geology of the study area consists primarily of a sequence of Cretaceous-age sedimentary rocks of marine and terrestrial origin. The Mancos Shale is exposed at the surface throughout large parts of the area and consists primarily of silts and clays that form low undulating hills and badland topography. The Mancos Shale was deposited in an inland sea which at one time covered much of the western interior of the country. Deposition in this restricted marine environment was conducive to the accumulation of alkali salts that result in locally moderate to high concentrations of dissolved solids in ground water. Quaternary-age alluvium is present in the study area along the floodplain of the Green River as well as along smaller tributary drainages to the river. These deposits consist primarily of sands and gravels that have been transported downstream from the Book Cliffs region.

Soil Composition

Soils in the Green River salinity control unit were derived from Mancos Shale and Quaternary-age alluvium. Soils developed from the Mancos shale range in depth from 1 foot to greater than 6 feet over shale. They are typically well drained and soil textures range from silt loam to silty clay. Slopes range from 0 to 50 percent. Major soils developed from shale are Billings, Chipeta, Penner, the Ravola series and Badland. Soils of lesser extent include the Ferron, Hunting, Killpack and the Rafael, Vickel series.

Soils developed in Quaternary-age alluvium are typically greater than 60 inches deep over coarser alluvial materials. Drainage ranges from poor to somewhat excessive. Textures range from loamy sand to clay loam. Slopes range from 0 to 25 percent. Major soils developed from Quaternary-age alluvium are Beebe, Ferron, Garley, Green River, Huntsman, Minchey, Stent and the Tusher series. Soils of lesser extent include the Mesa, Moffat, Nakai, and Sheppard series.

Figure 1. Project Study Area with Major Canals and Associated Acres Shown



Effects on Soil Resources

No Action
The No Action alternative will result in soil conditions continuing to deteriorate, a result of inefficient irrigation, poor irrigation water management techniques, increased reliance on fertilizers, and conditions which result from a high water table exacerbated by flood irrigation.

Proposed Action
The Proposed Action will not have any negative effect on soil conditions in the project area. Sprinkler irrigation, combined with irrigation water management practices will allow for more efficient irrigation, fewer applications of fertilizer, and less deep percolation, all of which will improve or have no negative impact on soil conditions in the project area.

3.1.4 Hydrology and Agricultural Water Development

The Green River is the principal perennial stream in the study area. The river emerges from the Book Cliffs and meanders generally south to its eventual junction with the Colorado River about 120 miles south of the study area. Annual peak discharge of the Green River (at Green River, Utah) generally occurs in May or June as snowmelt runs off from higher elevations to the north of the study area and averages about 28,000 ft^3/s, on the basis of stream flow records for 1905-2004. Minimum monthly mean discharge of the river occurs in January and is 2,300 ft^3/s for the same period of record (Enright and others, 2005). Discharge in the river during low-flow periods (August through February) is primarily controlled by impoundment and release at Flaming Gorge Reservoir about 290 miles upstream from the study area. Numerous ephemeral streams within the study area flow from the east and west across the Green River Valley and discharge into the Green River. These streams generally flow only during and after periods of heavy precipitation that are often associated with summer thunderstorms.

Ground water in the study area occurs within a number of geologic formations. Some ground water is found in the Mancos Shale formation and typically has high dissolved-solids concentrations. In the southern part of the area and within the limits of the town of Green River, the underlying Dakota and Cedar Mountain Formations are capable of yielding water suitable for domestic use. Shallow wells developed in the alluvium along and near the Green River floodplain also can produce adequate yields of ground water for domestic or irrigation use. All water for municipal use is provided by diversions directly from the Green River.

Early settlers used waterwheels or steam-powered pumps to lift irrigation water from the river. River bottom lands were first cultivated in 1880. The Blake City Water Ditch Company was organized at this time and canals were constructed to bring water to the drier bench lands along the river (Geary, 1996). A diversion dam on the Green River was constructed in 1905 to divert water into two canals, then was destroyed in 1907 by floods but later rebuilt.

Presently, a system of canals roughly parallels the Green River and serves to divert water from the river to a system of ditches and laterals for agricultural use (fig. 1). Two major

canals (Thayn and Green River) are located on the west side of the river and the East Side Canal serves to irrigate land on the east side of the river. Water is diverted from the Green River in the northern part of the study area and transported by gravity drainage to croplands along the river to the south. The canals have a combined flow of up to 130 ft^3/s during the irrigation season. Irrigation is mainly gravity-fed flood irrigation but there are scattered fields where irrigation is provided by wheel-line or center-pivot sprinkler systems, using water pumped to the sprinklers.

Table 2. Project Area Canals and Associated Acres

Canal	Length (mi.)	Associated acres (appx.)
Raceway to Hydro. Station	0.53	N/A
Thayn Canal	7.34	1,500
Green River Canal	8.27	1,500
East Side Canal	6.49	1,100
Pump directly from river	N/A	800
Totals	22.63	4,900

Effects on Water Resources

No Action

Baseline conditions could slowly improve, as producers move from flood irrigation to sprinkler irrigation. Return flows from excess flood irrigation will continue to carry dissolved salts and pollutants to the Green River and Colorado River. Slower adoption of sprinkler irrigation practices will lead to failure to meet federal salt reduction goals in the Colorado River. Silt in flood irrigation water will continue to cause negative impacts to producers. Currently, fine silt deposits at heads of fields lead to increased permeability, which in turn results in increases in volume and velocity of flood irrigation water to allow sufficient water to reach bottoms of fields. No affect will occur on water sources on grazing allotments adjoining the project area.

Proposed Action

Under the Proposed Action, water quality will improve downstream in a cumulative fashion in a shorter period of time. Dissolved salts and pollutants sent downstream will decrease as return flows from deep percolation are reduced. Under the Proposed Action, it is more likely that salt reduction requirements in the Colorado River will be achieved. As stated in the hydrosalinity analysis for the Proposed Action, 1,400 acres treated pre-project (converted from unimproved flood irrigation to sprinkler irrigation) are assumed to be loading 15% of their pre-treated salt load, .53 tons/acre per year (or 750 tons/year total for the 1,400 acres). The remaining 9,250 tons of on-farm salt is produced by 2,600 acres that could be treated, or 3.56 tons/acre-year.

Most new sprinkler systems that divert and pump water from canals or the Green river will require settling structures. These structures will allow much of the silt to drop out of the water before being sent through the system. These structures will extend the life of the irrigation system and reduce the rate of silting of croplands. On-farm ditches will be replaced by pipes to sprinkler lines, reducing the amount of time and money spent on

ditch maintenance. The installation of sprinklers could also result in less diversion from the Green River to meet irrigation requirements, less velocity through the canals, and less silt transport in the canals.

For sprinkler treated fields, water requirements are cut nearly in half as compared to flood irrigated fields. The conserved water is then used to bring under-irrigated areas up to maximum productivity or to reduce diversion and depletion from the Green River.

Additionally, as discussed in the Economic Analysis for the Proposed Action, producers experience multiple problems related to water applied using flood irrigation. Some examples of the types of problems that can be addressed through increased irrigation efficiency are logistical difficulties in timing and duration of irrigation activities, excess soil erosion, tillage requirements, salt damage to crops, and waste of water resources due to having to run more water down furrows than is necessary just to make sure water reaches the bottom of all rows. Increasing irrigation efficiency by converting to sprinkler irrigation will address each of these private agricultural production concerns.

One impact from decreased flood irrigation could be less water returning to underground aquifers. However, as the underlying geology of the area is comprised of clays and shales, the underground permeability does not allow for much water to reach potable aquifers in the area, so this impact is not likely to be substantial.

No affect will occur on water sources on grazing allotments adjoining the project area.

3.1.5 Air Resources

The study area is not part of a non-attainment area for air quality. The foreseeable long term impacts to air quality would not result in non-attainment for the study area.

Effects on Air resources

No Action

Impacts to air quality as a result of the No Action alternative would be limited to construction of sprinkler irrigation systems and pipelines, if local producers were to install them. It is likely that due to the high cost of installing sprinkler irrigation systems, which would be borne by the producer, even fewer diesel pumps would be installed and operated under the No Action alternative than under the Proposed Action.

Proposed Action

The Proposed Action may have some short-term impacts on air quality during the installation of pipelines, settling ponds and sprinkler lines, but those impacts are expected to be minor. These effects would result from construction activities and practices associated with construction activities.

Long-term, but minor impacts to air quality might occur as a result of emissions from diesel-powered pumps used to transport and pressurize water for on-farm sprinklers. While electric pumps are favored because they are less expensive to operate, it might be more economical—due to costs associated with installation of power lines—for some

producers to use diesel-powered pumps. Impacts to air quality would likely be minor, due to the small number of diesel-powered pumps that would be used as a result of the Proposed Action.

3.1.6 Land Ownership

Most of the land in the study area is privately owned. Agricultural, residential, some industrial and commercial lands comprise most of the land in the study area. Small amounts of federal and state-owned land may lie within the study area, but would not qualify for EQIP funds. Effects to lands not privately held are not included in this assessment.

Effects on Land Ownership

No Action

No foreseeable impacts on land ownership will result from the No Action alternative.

Proposed Action

No foreseeable impacts on land ownership will result from the Proposed Action alternative.

3.1.7 Irrigated Croplands and Pastures

Irrigated lands in the Green River area extend primarily along the west side of the Green River for about eight miles north of the town. About 4,900 acres of land are considered agricultural in the study area. Predominant crop types include alfalfa (2,400 acres) and corn (990 acres). Fallow land, and land cultivated for grain, vegetables, and fruit (mostly melons) make up less than 300 total acres in the study area. About 600 acres of pasture are distributed along the river. Residential areas consist of about 1,600 acres of land mostly within the town limits of Green River. In addition, commercial/industrial areas make up about 265 acres that are almost entirely located southeast of, and across the river from, town.

The area around Green River is widely known for its production of watermelons, cantaloupe, and other melons. Less well-known is Green River's corn and alfalfa production, which constitutes a substantial portion of the agricultural component of Green River's economy. Within the proposed project area (based on data collected at the time the salt budget for this project was prepared), 60 percent, or 2,199 acres, of irrigated land is planted in alfalfa hay and 19 percent, or 742 acres, is planted in corn.

Effects on Irrigated Croplands and Pastures

No Action

See discussion under Economics section of this chapter for more information on foreseeable impacts from the No Action alternative on croplands.

Proposed Action

See discussion under Economics section of this chapter for more information on foreseeable impacts from the Proposed Action alternative on croplands.

3.1.8 Migratory Birds and Wetland/Riparian Areas

Artificial wetlands and riparian areas exist where water seeps or leaks from canals, laterals and on-farm ditches. Some migratory birds use these artificial wetlands and artificial riparian lands for habitat. Some of these types of habitat could be lost as a result of on-farm salinity control activities. See the discussion on Wildlife for information on plans to minimize impacts on wildlife, including migratory birds, affected by loss of artificial wetlands and artificial riparian areas.

Effects on Migratory Birds

No Action

Under the No Action alternative, canals, laterals and on-farm-ditches will continue to lose water through seepage. Artificial wetlands and riparian areas will likely continue to exist where excess water collects. These conditions will exist on-farm where flood irrigation is used, as well as off-farm where water seeps from laterals and canals. Migratory birds will continue to use artificial wetland and riparian areas. However, as discussed in the biological assessment and the Wildlife section of this document, wildlife generally avoid areas of agricultural disturbance. On-farm areas of intense agricultural activity would reasonably provide the least desirable riparian and wetland habitat for migratory birds.

Proposed Action

One of the primary concerns related to the Proposed Action is that conversion to sprinkler irrigation will lead to loss of artificial wetland and riparian habitat. The primary cause for this loss of habitat would be elimination of seepage water as a result of piping canals and ditches. Since the Proposed Action does not allow any off-farm treatments, the loss of off-farm artificial wetland and riparian habitat (which is reasonably preferable for migratory birds, as compared to on-farm areas of intensive agricultural disturbance) and the impacts to this type of habitat, would be minimal. As a result, effects to migratory birds and artificial wetland and riparian habitat would be minimized. Furthermore, for those areas where on-farm practices result in the loss of artificial wetland and riparian areas, funds have been and will be set aside for the creation of Wildlife Habitat Development Plans to attempt to replace the foregone values of artificial wetlands and artificial riparian areas.

3.1.9 Wildlife Resources

A biological Assessment has been prepared for the Threatened, Endangered, and Species of Special Concern found in the study area. That assessment was attached to this document as an Appendix. Much of the information discussed in this section was summarized or derived from that assessment.

A number of federally listed threatened and endangered species can be found or have been found in the Green River salinity control unit. By their nature, salinity control units have the potential to impact very few threatened, endangered, or sensitive (TES) plant and animal species. This is partly attributed to the fact that most of the conservation

practices occur on previously disturbed agricultural lands. In general, TES species tend to avoid human interaction of any kind.

Wet areas and artificial wetlands can provide important habitat values, similar to natural wetlands and riparian areas. Many species can come to depend on these areas to provide food, water, and cover. Potential habitat impact may occur when canals and lateral ditches are abandoned or piped, and the vegetation surrounding these features dries up. Also, with the implementation of water efficient sprinklers, the artificially wet areas normally located at the bottom of some fields from flood irrigation may be brought to uniformity with the rest of the field. To offset this potential loss of habitat, NRCS has and will set aside funds for the creation of Wildlife Habitat Development Plans to attempt to replace the values of wildlife habitat foregone.

Table 3. Federally Threatened and Endangered Species Identified in the Project Area

Common Name	Scientific Name	Status
Bonytail	Gila elegans	E
Colorado Pikeminnow	Ptychocheilus lucius	E
Humpback Chub	Gila cyphus	E
Razorback Sucker	Xyrauchen texanus	E
Black Footed Ferret	Mustela nigripes	E-Extirpated in Grand and Emery Counties
Southwestern Willow Flycatcher	Empidonax trailli ssp. extimus	E
Whooping Crane	Grus americana	E-Extirpated
Western Yellow-billed Cuckoo	Coccyzus americanus occidentalis	C

E- Endangered
T- Threatened
C- Candidate species for listing as threatened or Endangered
Extirpated- A Threatened, Endangered or Candidate Species that is considered by the US Fish and Wildlife to no longer occur in Utah

Table 4. State Sensitive Species Identified in the Project Area

Common Name	Scientific Name	Status
Bald Eagle	Haliaeetus leucocephalus	SPC
Blue Grosbeak	Passerina caerulea	SPC
Cornsnake	Elaphe guttata	SPC
Great Plains Toad	Bufo cognatus	SPC
Hole in the Rock Clover	Dalea flavescens var. epica	SPC
Jones' Indigo Bush	Psorothamnus polydenius var. jonesii	SPC
Northern Leopard Frog	Rana pipiens	SPC
White Tailed Prairie dog	Cynomys leucurus	SPC
Yellow Blanketflower	Gaillardia flavia	SPC
Flannel Mouth Sucker	Catostomus latipinnis	SPC, CS

Roundtail Chub	Gila robusta	SPC, CS
Bluehead Sucker	Catostomus discolobus	SPC, CS

CS- Species receiving special management under a Conservation Agreement to preclude the need for Federal Listing as a Threatened or Endangered Species
SPC- Wildlife Species of Concern

Effects on Wildlife

No Action

Under the No Action alternative, Threatened and Endangered fishes in the Green River would experience adverse effects related to a number of factors: introduction and competition with non-native predatory fish, decreased water quality in the Green River, and increased diversion and depletion from the Green River. No activity related to the No Action alternative will exacerbate the non-native fish introduction problem. No new diversions from the river would be anticipated for currently irrigated lands, so increased diversion and depletion of the Green River would not exacerbate fish mortality. However, water quality in the project area could continue to degrade under the No Action alternative, as dissolved salts and pollutants continue to enter the Green River in the project area as a result of deep percolation resulting from flood irrigation.

Under the No Action alternative, terrestrial animals in the project area would continue to face threats to their survival at current levels. Encounters with intensive agriculture affect many of the terrestrial Threatened or Species of Special Concern. Additionally, some species have developed differing levels of dependence on habitat associated with seeping ditches. Artificial riparian areas, large trees and even tamarisk galleries provide habitat for some of the species discussed in the Biological Assessment. Under the No Action alternative, the habitat associated with artificially wet areas would remain, as long as flood irrigation is used. As discussed under the water resources section, producers in the area are slowly converting flood irrigation to sprinkler irrigation, at which time artificially wet areas and habitat are lost. The No Action alternative does not provide any funding for replacement of these areas and their associated habitat.

Proposed Action

Similar to the No Action, the Proposed Action does not include any activity that would exacerbate non-native fish introduction. Nor would the Proposed Action lead to increased diversions and depletions from the river; in fact, diversion from the Green River could be reduced as sprinkler irrigation becomes more common. Phreatophyte consumption of irrigation water should decrease on-farm, as ditches would be piped. Finally, water quality in the project area could be expected to increase slightly as return flows containing dissolved salts and pollutants are reduced. While water quality in the project area could improve slightly as a result of the Proposed Action, the cumulative downstream effects are more profound and compounded by efforts made upstream. The effect of all of these factors on the endangered fishes in the Green and Colorado Rivers would be of a positive nature, so no serious impacts should be expected.

One of the primary concerns related to the Proposed Action is that conversion to sprinkler irrigation will lead to loss of artificial wetland and riparian habitat. The primary cause for this loss of habitat would be elimination of seepage water as a result of piping canals and

ditches. Since the Proposed Action does not propose any off-farm treatments, the loss of artificial wetland and riparian habitat, and the impacts to this type of habitat, where it is found within the project area, would be minimal.

Funding will be set aside under the Proposed Action for the creation of Wildlife Habitat Development Plans (WHDP) to attempt to replace the values of wildlife habitat foregone. NRCS programs are voluntary, and thus subject to landowner request to prepare and implement a WHDP.

Effects on Plant Species of Concern

No Action

Under the No Action alternative, new desert lands could potential be cultivated, threatening the survival of clusters of Hole-in–the-rock Clover (HRC) and Jones' Indigo Bush. The No Action alternative does not provide any authority to prevent or encourage new cultivation of desert lands, so the impact of the No Action alternative on the survival of plant species of concern in not likely to be substantial.

Proposed Action

The EQIP rules state that in order to be eligible for program funds, a tract of land needs to be irrigated two out of the last five years. Therefore land with no irrigation history, such as the habitat of HRC, is ineligible for program funds. All construction associated with EQIP Salinity funding will take place on previously disturbed ground. As long as no new desert land is irrigated, the Proposed Action is not likely to have a serious impact on the plant Species of Special Concern. Should new, undisturbed ground need to be broken, a survey would be conducted in order to ensure the protection of any listed species or species of concern

3.1.10 Cultural & Historic Resources

Cultural Resources Overview

The archaeological record in the vicinity of the Green River Unit spans thousands of years, ranging from the Paleo-Indian Period to the historic Period. While the study area has largely been brought under cultivation and modern agricultural use, there remains some potential for encountering previously unknown cultural resources. Based on the number of cultural resource sites that have been identified within the study area, it is reasonable to expect that additional cultural resources are present. For prehistoric cultural resources, it is expected that additional sites would be present in areas of low to moderate surface disturbance. For historical resources, a cursory review of Government Land Office plat maps indicates the presence of several historic farms, residences and irrigation networks within the project area. As such, there is potential that these may be present at certain locations within the study area.

Prehistoric overview

Humans have inhabited the general project area sporadically for at least the past 10,000-12,000 years. Evidence of a number of well-defined periods of that human habitation

have been discovered and documented in the region surrounding the project area. Tools and weapons have been discovered and associated with each period. Structures, tools and containers more sophisticated than their predecessors, and even some human and animal remains have been associated with the most recent periods. Each period of habitation also carries with it theories and evidence about the location and movement of people who lived and traveled through the project area. The Cultural Resource Overview attached to this document in the Appendix describes in detail the identifying characteristics and discoveries associated with each period.

Historic overview

The Native American Ute tribe was the dominant group present in the study area when Euro-Americans first entered the region. Spanish explorers made some of the first Anglo forays into the Green River area in the mid-18th century, followed by French-Canadian and American fur trappers and traders in the early part of the 19th-century. American interest and exploration in the area increased in the mid-1800s, and was soon followed by permanent settlements in the area, primarily by members of the LDS religion. The construction of a railroad from Salt Lake City to Denver brought Green River into relative prominence as a railroad yard.

The 20th-century saw Green River's economy and inhabitants focus its economy on agricultural endeavors. Presently, Green River exists primarily as an agricultural community, but the local economy is supported to a considerable degree by a growing tourist industry of road and outdoor tourism.

The Cultural Resources Overview attached to this document in the Appendix describes in detail the historic development of the project area.

Effects on Cultural Resources

No Action

Under the No Action alternative, cultural resources would not be directly impacted beyond current levels. The impacts to cultural resources from natural geomorphic processes, current land practices, and artifact collection would continue.

Proposed Action

Under the Proposed Action, previously recorded and newly identified cultural resources would not be impacted since the undertakings- both individually and as a whole -will require compliance with Section 106 of the National Historic Preservation Act (NHPA). Further, these undertakings would require compliance with the current memorandum of understanding (MOU) between NRCS and State Historic Preservation Office (SHPO) that requires pedestrian inventories for those practices subject to cultural resource reviews, and avoidance of identified cultural resources during project implementation (see Appendix D, p. 10).

Under EQIP funding requirements, activities of the Proposed Action will take place on historically irrigated and previously disturbed cropland. These areas are typically not locations where identified cultural or historical resources are located. If cultural resources

are found during implementation of the Proposed Action, state and federal law mandate that consultation occurs to resolve adverse impacts to the resources.

In the event that adverse effects to historic properties cannot be avoided, NRCS will conduct consultation with the Utah SHPO and other consulting parties to resolve issue of adverse effects following the protocols established in Section 106 of the NHPA. In the event of archaeological discoveries during project implementation, or in the event that human remains are encountered, NRCS will follow procedures established in the MOU and the NRCS National Cultural Resources Handbook for the protection and treatment of cultural resources until the issue is resolved.

3.1.11 Social & Economic Characteristics

Area Economic Conditions

In the town of Green River the population increased by 5% from 1990-2000. Since a modern high of 976 residents in 2000, the population of the town has declined. In 2007, 921 residents were reported to live in Green River.

Emery County, which is the county for which the State of Utah reports data for the town of Green River, reported an average monthly wage of $3,310 for 2007.

The 1999 median family income in Emery County (which is the last year for which data is available) was $44,086, while the State as a whole reported $51,022.

The reported 2006 personal income per capita was $24,559. This figure includes income from all sources and is equal to the sum of all wages and salaries, supplements to wages and salaries, proprietors' income, rental income, personal dividend income, interest income, and transfer payment income (such as Social Security and retirement pensions), minus social insurance tax payments (such as Social Security withholding). The 2000 Census reported that in 1999 per capita income in Green River was $11,326. This figure includes earned income only.

Effects on Area Economic Conditions

No Action

Under the No Action alternative, producers in the study area would continue to employ flood irrigation techniques, slowly converting to sprinkler irrigation as their own situation demands. The logistical problems that are associated with flood irrigation would continue: high labor costs (when compared to sprinkler irrigation) spent moving and adjusting flood irrigation on croplands and pastures; downtime for stuck machinery that can founder in wet areas of fields; continued use of furrows for directing water down flood-irrigated fields, taking away from surface area that could be used for cultivating more crop.

The No Action would also result in area producers saving money in the form of not paying the producer-portion for installation of on-farm treatments, such as piped ditches, settling ponds, pumps and sprinklers. This outlay of funds would not be required for area

producers that did not choose to participate in EQIP-funded programs in the salinity control area.

Proposed Action

The economic analysis conducted for this EA shows different cost and benefit scenarios under the Proposed Action and No Action. The economic analysis addresses some of the primary concerns listed above, specifically the direct costs to producers for installation and operation of sprinkler irrigation systems vs. continued use of flood irrigation systems by producers. The analysis shows increased annual costs per acre for sprinkler irrigation over flood irrigation, but also predicts that the increased yields and resultant increased profits will offset and outpace the increased operational costs.

It is important to note that the economic analysis does not include increased flexibility in crop types and cultivation practices, decreased damages to agricultural equipment, and other benefits that could be gained by using sprinkler irrigation. These potential benefits are not quantified or specified in the analysis. Also, the net benefits to individual producers will vary depending on cropping decisions, pumping costs, and other farm-specific cost and revenue circumstances. Private benefits and costs related to crop production are for alfalfa and corn crops only and are based on circa 2006 analysis of project area acreages.

Beyond the direct benefit to area producers, there are societal benefits that will be realized by the general public, in the form of decreased salt damage to crops downstream, the value of the increased production in crops, and the increased economic efficiency of increasing the production of crops in the project area. The following table shows the net public benefit vs. the net public costs.

Table 5. Net Annual Benefit and Costs of Proposed Action
(See Appendix C for further explanation)

Evaluation Unit Where applicable, dollar figures amortized over 25 years at 4.875%	**Annual Benefits**		**Annual Costs**		**Benefit/Cost Ratio**
	Local	**National**	**Local**	**National**	
Increase in Agricultural Production Costs Increased Costs for Alfalfa and Corn Production			$97,479		
Reductions in Damage Costs Reduced Salt Damages on All Acres		$1,225,224			
Value of Increased Production of Crops Increased Revenue from Alfalfa and Corn Production	$290,060				
Implementation of Proposed Action Private Cost for System on Alfalfa and Corn Acres Only, Public Cost for System on All Acres			$101,152	$609,440	
Subtotals	$290,060	$1,225,224	$198,632	$609,440	
Totals		**$1,515,284**		**$808,072**	**1.88 : 1**

3.2 Past Relevant and Future Foreseeable Actions

There are some producers that have converted part or all of their irrigation systems from flood to sprinkler irrigation. Currently, about 1,400 acres within the project area are under sprinkler irrigation, or treated pre-project. These acres are assumed to be loading 15% of the pre-treatment salt load, or 750 tons per year (less than half a ton of salt per acre). It is predicted that these acres currently using sprinkler irrigation will add to the success of the objectives of the Proposed Action.

There is some chance that the U.S. Bureau of Reclamation could pursue projects in coordination with the individual canal companies to pipe the canals in the Green River area. Any such involvement would require the Bureau of Reclamation to conduct its own environmental assessment and associated habitat replacement.

Chapter 4 List of Preparers

Table 6. List of Preparers

Name	Title	Contact Info
Julie Suhr Nelson	State Economist	**Julie.Nelson@ut.usda.gov**
Adam Shaw	NEPA Specialist, USFS	**ashaw@fs.fed.us**
Jim Spencer	Wildlife Biologist	**Jim.Spencer@ut.usda.gov**
Ed Whicker	Civil Engineer	**Ed.Whicker@ut.usda.gov**
Andrew Williamson	State Archeologist	**Andrew.Williamson@ut.usda.gov**

References

Gerner, S.G., Spangler, L.E., Kimball, B.A., Wilberg, D.E., and Naftz, D.L., Hydrology and Water Quality in the Green River and Surrounding Agricultural Areas near Green River in Emery and Grand Counties, Utah, 2004-05, Scientific Investigations Report 2006-5186, US Geological Survey, 2006

Specialist Reports as contained in Appendix

Appendix

Appendix A: Hydrosalinity Worksheet and Analysis
Appendix B: Biological Assessment
Appendix C: Economic Analysis
Appendix D: Cultural Assessment
Appendix E: Public Scoping Meeting Notes
Appendix F: Response to Comment

Appendix A

Proposed Salinity Area

Green River, Utah
Hydrosalinity Analysis

Purpose

The purpose of this hydrosalinity analysis is to:

1. Estimate the probable agricultural salt load into the Colorado River System
2. Allocate pre-project salt loading to on-farm and off-farm sources
3. Select a reporting system that assures proportional and concurrent progress evaluation
4. Provide salt loading data appropriate to determine cost effectiveness of the project

Salt Load

USGS Study

In 2004, U.S. Geological Survey (USGS) was contracted to study salt loading in the Green River, Utah area. USGS' report "Hydrology and Water Quality in the Green River and Surrounding Agricultural Areas near Green River in Emery and Grand Counties, Utah, 2004-05" estimates the annual salt load from agriculture to be 15,700 tons/year. This estimate is based on a very short period of record. Due to the low flow rate of the diversion compared to the flow rate of the river, a slightly unconventional approach was used to make the calculation. No change in flow rate could be reliably detected in the river, so salt loading is based on average flow rate of the river and the difference in salt concentration measured above and below the agricultural area.

Local Water/Salt Budget

A Salt Budget has been evaluated, based on an Excel Spreadsheet created for this purpose and used in Attachment IV of the EIS for the Price – San Rafael Rivers Unit. The most troubling issue of this approach is the sensitivity of the outcome to the consumptive use of phreatophytes and other non-agricultural plant life, which is unknown, unmeasurable in a field setting, and highly variable. Using the USGS estimate of 15,700 tons/year as an endpoint the resulting salt budget seems reasonable.

Assumptions used in Salt Budget

1. Based on a one year study, USGS determined that the agricultural salt loading of the proposed Green River, Utah Unit averages 15,700 tons/year to the Green River.
2. From the Utah Division of Water Resources' 2005 Water Related Land Use layer and independent mapping by Natural Resources Conservation Service (NRCS),

there are 4,900 acres of agricultural land in the Unit, of which about 900 acres are idle in an average year. About 1,400 acres have already been treated with sprinkler systems.

3. There are approximately 23 miles of major canals in the Unit.
4. It is assumed that ground water outflow concentration is relatively constant over time, entirely a function of mineral solubility in the water. Measured salt pickup is too large to be the result of only concentration effects of evapotranspiration. Hence, salt load is primarily a function of outflow volume, which can be reduced by irrigation efficiency improvements.

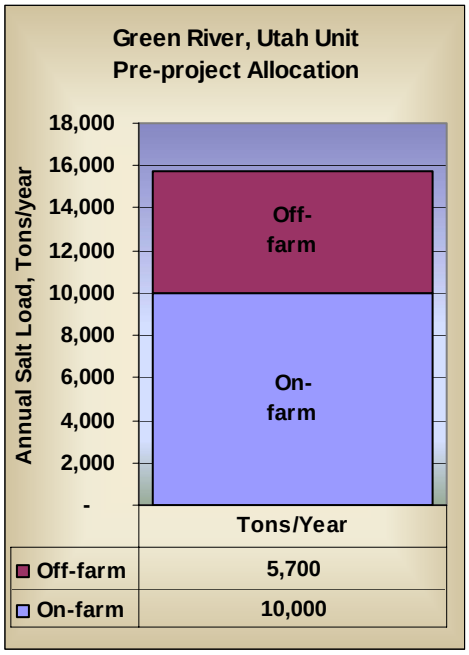
Salt load calculations

The calculation of salt loading is not simple. Data is sparse and expensive to acquire; so much so that treatment is often less expensive than data collection. Salt loading estimates are often a "best guess" based on data available. Nonetheless, agricultural salt loading can be observed and controlled and all long term indicators suggest that salinity control measures are effective and salt concentration in the river is being controlled cost-effectively.

Pre-project Salt Load Allocation

Agricultural salt loading is the result of canal seepage and leakage (off-farm) and deep percolation of irrigation water applied to fields (on-farm).

Using 15,700 tons/year as the total load, the salt budget implies that approximately 10,000 tons are from on-farm sources and 5,700 tons from off-farm canals and large laterals.



Progress Reporting

Of all available data, the most reliable seems to be river flow data and concentration even though these data sets are highly variable. Therefore, the total salt load derived from this data is relatively solid and represents the best starting point for reporting purposes.

In order to assure that salt load reduction reporting is proportional and concurrent, salt loading for individual projects should be based on acres, tons/acre, and a percentage salt load reduction based on the change in irrigation practice. Past experience in other salinity areas suggests that no unimproved-flood-to-improved-flood projects will be done in the proposed Green River Salinity Area. Unimproved-flood-to-Wheel-line-sprinkler systems will reduce salt loading by 84% and unimproved-flood-to-Center-Pivot will reduce salt loading by 91%.

One thousand, four hundred acres treated pre-project are assumed to be loading 15% of their pre-treated salt load or 750 tons/year. The remaining 9,250 tons of on-farm salt is produced by 2,600 acres that could be treated, or 3.56 tons/acre-year.

For the off-farm, 23 miles of main canals and large laterals have been mapped. Assuming an additional 10 miles of laterals that have not been mapped, the estimated off-farm salt loading is an average 173 tons/mile of canal. Funding of canal projects by NRCS is not anticipated. However, it is possible that other federal agencies could fund canal projects in the future in which case, additional evaluation of tons/mile values might be appropriate.

Cost effectiveness

In nearly all cases topographical fall is insufficient for gravity fed sprinkler systems. Therefore, most systems will require a pumping system and some silt control along with the sprinkler system. Based on an average federal cost of $2,500/acre in financial assistance (FA) and $1,667/acre in technical assistance (TA), the cost of salt load reduction will be about $93/ton (FA+TA), for on-farm practices only.

Figure 2 - Water/Salt Budget

Green River	Future w/o	RP On-farm Only	Future w/o	RP On-farm Only	Future w/o	RP On-farm Only
	AF	AF	T/AF	T/AF	Tons	Tons
Farm Delivery Computation (Irrigation Season Only)						
Project Acres, Untreated	2,600	520				
Project Acres, Treated	1,400	3,480				
Project Acres, Idle	900	900				
Average Evapotranspiration ET	33.8	33.8				
Average Seasonal Efficiency	42%	62%				
Irrigation Season Factor	1.00	1.00				
Farm Delivery	26,548	18,181	0.486	0.486	12,890	8,827
Delivery Spillage to River	5,024	5,024	0.486	0.486	2,439	2,439
Delivery Seepage	7,720	7,720	0.486	0.486	3,748	3,748
Net Diversion from River	34,268	25,901	0.486	0.486	16,638	12,576
On-Farm Deep Perc Computation						
Farm Delivery	26,548	18,181	0.486	0.486	12,890	8,827
Irrigation Evaporation	1,609	1,609	-	-	-	-
Crop ET	11,263	11,263	-	-	-	-
Tailwater run off	4,242	848	0.486	0.486	2,060	412
Tailwater Phreatophyte CU	4,242	848	-	-	-	-
On-Farm Deep Perc	5,192	3,613	2.086	2.329	10,830	8,416
Delivery System GW Inflow Computation						
Delivery Sys Seepage	7,720	7,720	0.486	0.486	3,748	3,748
Phreatophyte CU	5,000	5,000	-	-	-	-
Delivery Sys GW Inflow	2,720	2,720	1.378	1.378	3,748	3,748
Winter Water GW Inflow Computation						
Delivery Sys Seepage	-	-	0.486	0.486	-	-
Stock Pond Seepage	-	-	0.486	0.486	-	-
Winter Water GW Inflow	-	-	-	-	-	-
Ground Water Inflow Components						
On-Farm Deep Perc	5,192	3,613	2.086	2.329	10,830	8,416
Delivery Sys GW Inflow	2,720	2,720	1.378	1.378	3,748	3,748
Winter Water GW Inflow	-	-	-	-	-	-
TOTAL	7,912	6,333	1.842	1.921	14,578	12,164
Ground Water Outflow Components						
Computed Phreatophyte CU	2,574	2,574	-	-	-	-
Ground Water Outflow	5,339	3,759	5.671	5.671	30,278	21,320
TOTAL	7,912	6,333	3.827	3.367	30,278	21,320
Regional Salt Pickup (tons)					15,700	9,156
GW Outflow Salt Load Reduction						6,544

Total Phreatophyte Use	11,815	8,422	3,394	3,394	50%

USDA Improvements	**On farm**	**Off farm**	**Total**	
Return Flow Reduction	1,580	-	1,580	AF
Salt Load Reduction	6,544	-	6,544	tons
Change in Colorado River Flow	6,787	-	6,787	AF (increase)

Government Economics	$/Acre	Int Rate	Amortized Cost, FA	Tons/Ac	$/Ton, FA	$/Ton, FA+TA
Off-farm, 100%	-	4.875%	-	-	-	-
On-farm, 75% Cost Share (FA)	2,500	4.875%	175	3.15	56	93
Total	2,500	4.875%	175	3.15	56	93

Appendix B

Biological Assessment

For

Green River Salinity Area

Colorado River Water Quality Improvement Program

And The

Colorado River Salinity Control Program

October 2008

United States Department of Agriculture

Natural Resources Conservation Service

Table of Contents

Table of Contents 37
Introduction 1
Project Description 1
Federally Threatened, Endangered, and Conservation Agreement Species – Request for Concurrence 1
Bonytail (Gila elegans) 1
Colorado Pikeminnow (Ptychocheilus lucius) 2
Humpback Chub (Gila cyphus) 2
Razorback Sucker (Xyrauchen texanus) 3
Flannel Mouth Sucker (Catostomus latipinnis) 3
Roundtail Chub (Gila robusta) 4
Black Footed Ferret (Mustela nigripes) 4
Southwestern Willow Flycatcher (Empidonax trailli ssp. extimus) 5
Whooping Crane (Grus americana) 6
Western Yellow-billed Cuckoo (Coccyzus americanus occidentalis) 7
State Sensitive Species - Evaluation 8
Bald Eagle (Haliaeetus leucocephalus) 8
Blue Grosbeak (Passerina caerulea) 9
Cornsnake (Elaphe guttata) 9
Great Plains Toad (Bufo cognatus) 10
Hole in the Rock Clover (Dalea flavescens var. epica) 11
Jones' Indigo Bush (Psorothamnus polydenius var.jonesii) 12
Northern Leopard Frog (Rana pipiens) 12
White Tailed Prairie Dog (Cynomys leucurus) 13
Yellow Blanketflower (Gaillardia flava) 14
Habitats of Special Concern 14
Critical Habitat for species protected under the ESA 14
Riparian and Wetland communities 16
Conclusion 16
References 18

Introduction

This document identifies and evaluates the potential impacts of the proposed Green River Salinity Area on federally threatened, endangered, Conservation Agreement Species, Utah state sensitive wildlife, fish, and plants identified by the Utah Natural Heritage Program (UNHP) database search. This document is in compliance with Section 7 of the Endangered Species act of 1973 (Public Law 93-205) as amended. If it is determined by the Natural Resources Conservation Service (NRCS), with written concurrence from the U.S. Fish and Wildlife Service (USFWS), that the action is "not likely to adversely affect" federally listed species or critical habitat, the consultation process is complete and no further action is necessary. Should this document reveal that an action of the proposed Green River Salinity Area is "likely to adversely affect" a federally listed species, formal consultation (50 CFR 402.14) with the USFWS will be required.

Project Description

The 1974 Colorado River Basin Salinity Control Act, Public Law 93-320, authorizes the construction, operation, and maintenance of works in the Colorado River Basin to control the salinity of water delivered to the lower Basin States and Mexico. The purpose of the proposed Green River Salinity Area is to reduce salt loading to the Green River, a tributary to the Colorado River located in Emery and Grand Counties, Utah.

The proposed project is intended to improve delivery systems and on-farm irrigation systems on private lands by providing more effective water distribution to agricultural land, and to reduce salt loading to the Colorado River caused by agricultural run off from flood irrigation. Such improvements include, but are not restricted to, converting open canals and laterals to pipelines, and the conversion of flood irrigation systems to sprinkler irrigation systems.

It has been proposed that the U.S. Department of Agriculture (USDA) Environmental Quality Incentives Program (EQIP) be utilized to fund some of the improvements. Proposed project activities would be on lands currently under irrigation or lands with a recent history of being irrigated.

Federally Threatened, Endangered, and Conservation Agreement Species

Bonytail (Gila elegans)
The bonytail was once common in both the Upper and Lower Colorado River Basins, but it is now one of the rarest of the endangered Colorado River fishes. In the last 10 years there have been reports of only a few bonytail captured in the upper Colorado River Basin, in the Green River, Yampa River, and the main stem Colorado River in Cataract

Canyon (Upper Colorado River Endangered Fish Recovery Program, 2004, accessed 1/29/04).

The UNHP database search revealed occurrences of bonytail within the proposed project area. One of the main concerns in protecting the endangered fish of the Colorado River watersheds is the depletion of water from the main stem of the Colorado River due to irrigation diversions. The Water Budget for the proposed Green River Salinity Area shows a reduced depletion from the Colorado River system due to reduced water diversion, therefore, the proposed project is not likely to adversely affect any of the endangered Colorado River fishes mentioned in this assessment.

Colorado Pikeminnow (Ptychocheilus lucius)

The Colorado Pikeminnow was not only common, but abundant throughout its range in both the upper and lower Colorado River Basins. Now, the majority of the population exists in portions of the Green River, Yampa River, lower Duchesne River, White River, Gunnison River, and the main stem of the Colorado River downstream to Lake Powell. Populations in the Upper Colorado River Basin now appear to be stable, and in some areas are increasing. This stabilization and growth may be accredited to recent changes in the operation of Flaming Gorge Dam (Upper Colorado River Endangered Fish Recovery Program, 2004, accessed 1/29/04).

The UNHP database search showed several occurrences of Colorado Pikeminnow within the proposed project area in the Green River. One of the main concerns in protecting the endangered fish of the Colorado River watersheds is the depletion of water from the main stem of the Colorado River due to irrigation diversions. The Water Budget for the proposed Green River Salinity Area shows a reduced depletion from the Colorado River system due to reduced water diversion, therefore, the proposed project is not likely to adversely affect any of the endangered Colorado River fishes mentioned in this assessment.

Humpback Chub (Gila cyphus)

The humpback chub once inhabited the swift, whitewater areas found in the canyons of the Colorado River and four of its tributaries: the Green River, Yampa River, White River, and Little Colorado River. Now there are three main populations two of which are located in the Colorado River near the Utah/Colorado border. The third and largest population is located in the Little Colorado River in the Grand Canyon which may contain up to 10,000 fish. Smaller numbers of the humpback chub have been found scattered in portions of the Green, Yampa, and main stem of the Colorado rivers (Upper Colorado River Endangered Fish Recovery Program, 2004, accessed 1/29/04).

The UNHP database search did not encounter any occurrences of humpback chub within the proposed project area. One of the main concerns in protecting the endangered fish of the Colorado River watersheds is the depletion of water from the main stem of the Colorado River due to irrigation diversions. The Water Budget for the proposed Green River Salinity Area shows a reduced depletion from the Colorado River system due to

reduced water diversion, therefore, the proposed project is not likely to adversely affect any of the endangered Colorado River fishes mentioned in this assessment.

Razorback Sucker (Xyrauchen texanus)
The range of the razorback sucker once extended throughout the Colorado River from Wyoming to Mexico. Currently in the Upper Colorado River Basin the razorback sucker is found in the upper Green River in Utah, lower Yampa River in Colorado, and occasionally in the Colorado River near Grand Junction, Colorado. Smaller populations have been reported in Lake Powell near the mouths of its tributaries. In the lower Colorado River Basin, the majority of the razorback suckers are found in Lake Mojave, with smaller numbers in the Colorado River below Hoover Dam (Upper Colorado River Endangered Fish Recovery Program, 2004, accessed 1/29/04).

The UNHP database search showed several occurrences of the razorback sucker within the proposed project area. One of the main concerns in protecting the endangered fish of the Colorado River watersheds is the depletion of water from the main stem of the Colorado River due to irrigation diversions. The Water Budget for the proposed Green River Salinity Area shows a reduced depletion from the Colorado River system due to reduced water diversion, therefore, the proposed project is not likely to adversely affect any of the endangered Colorado River fishes mentioned in this assessment.

Flannel Mouth Sucker (Catostomus latipinnis)
The Flannel Mouth Sucker is found throughout the Colorado River Basin, from southwestern Wyoming to southern Arizona and Sonora; more widespread in the upper basin than in the lower basin of California, Arizona, and Nevada (Sublette et al., 1990 in NatureServe, 2008, accessed 9-15-2008). It usually inhabits moderate to large rivers, seldom in small creeks, absent from impoundments. Typically found in pools and deeper runs and often entering mouths of small tributaries (Lee et al., 1980 in NatureServe, 2008, accessed 9-15-2008); also riffles and backwaters (Sublette et al., 1990 in NatureServe, 2008, accessed 9-15-2008). Young are usually in shallower water than are adults (Sigler and Miller, 1963 in NatureServe, 2008, accessed 9-15-2008). Flannel Mouths spawn in riffles, usually over a substrate of coarse gravel (Lee et al., 1980 in NatureServe, 2008, accessed 9-15-2008). They are bottom feeders and are reported to feed on diatoms, algae, fragments of higher plants, seeds, and benthic invertebrates (Sigler and Miller, 1963; Lee et al., 1980 in NatureServe, 2008, accessed 9-15-2008).

The UNHP database search found one occurrence of Flannel Mouth Sucker in the proposed project area from the summer of 1891. A Personal Communication with UDWR, Southeast Region Aquatics Manager, Paul Birdsey (2008), indicated that Flannel Mouth Sucker are present throughout the Green River, and should be considered in NEPA documents for the area.

The main threats to the Flannel Mouth Sucker are the introduction of non-native predatory fish, de-watering of streams and rivers, and the impoundment of waterways. The proposed activities of the Green River Salinity Area will not exacerbate the non-native fish introduction problem and the Water Budget for the proposed Green River

Salinity Area shows a reduced depletion from the Colorado River system due to reduced water diversion. Therefore, the proposed project is not likely to adversely affect any of the Colorado River fishes mentioned in this assessment.

Roundtail Chub (Gila robusta)

The Roundtail Chub is a relatively large minnow that ranges from 25-35 cm long with a maximum length of 43 cm. It ranges in warm streams and large tributaries of the Colorado River basin (Wyoming, Utah, and Colorado south to Arizona, Nevada, and New Mexico), south through Rio Yaqui basin, to Rio Piaxtla, Sinaloa, Mexico; also Pluvial White River, eastern Nevada (Miller and Lowe, 1964; Minckley, 1973; Sublette et al., 1990 in NatureServe, 2008, accessed 9-15-2008). Adults are associated with the largest, most permanent water in streams (Minckley, 1981 in NatureServe, 2008, accessed 9-15-2008). They inhabit pools and eddies, below or adjacent to rapids and boulders, in cool to warm water mid-elevation streams and rivers (Minckley, 1973; Bestgen and Propstm 1989 in NatureServe, 2008, accessed 9-15-2008). They are usually found near cover such as rocks, rootwads, undercuts, or deep water (Bestgen and Propst, 1989 in NatureServe, 2008, accessed 9-15-2008). Large populations often occur in pools behind irrigation diversions (Barber and Minckley, 1966 in NatureServe, 2008, accessed 9-15-2008). Other habitat types include rocky runs, rapids, and pools of creeks and small to large rivers; also large reservoirs in the upper Colorado River system; generally it prefers cobble-rubble, sand-cobble, or sand-gravel substrate. It is an opportunistic feeder eating available aquatic and terrestrial insects, gastropods, crustaceans, fishes, and sometimes filamentous algae (Sublette et al., 1990 in NatureServe, 2008, accessed 9-15-2008).

The UNHP database search reported several occurrences of Roundtail Chub within the proposed project boundaries in the Green River and in a tributary to the Green River. The main threats to the Roundtail Chub are similar to those of the Flannel Mouth Sucker; they are the introduction of non-native predatory fish, and de-watering of streams and rivers. The proposed activities of the Green River Salinity Area will not exacerbate the non-native fish introduction problem and the Water Budget for the proposed Green River Salinity Area shows a reduced depletion from the Colorado River system due to reduced water diversion. Therefore, the proposed project is not likely to adversely affect any of the Colorado River fishes mentioned in this assessment.

Black Footed Ferret (Mustela nigripes)

A small member of the weasel family the Black Footed Ferret (BFF) was nearly extinct in the late 1980s. Since then, captive breeding and reintroductions have been successful. Several hundred individuals now exist in captivity and in reintroduced populations in several states and Mexico (Bard 2002, in NatureServe 2008 accessed 10-1- 2008). As of mid 2008, a total of about 800-900 were alive in the wild in all the states where releases have occurred (USFWS, 2008).

The range of the BFF formerly encompassed a large area of the Great Plains, mountain basins, and semi-arid grasslands of North America. Subsequently the species was extirpated virtually everywhere. The last known wild population existed in the vicinity of Meeteetse, Wyoming, until early 1987. Ferrets from that area were captured and used for

captive breeding. The species was reintroduced in Shirley Basin, Wyoming, in the early 1990s; since then it has also been reintroduced in South Dakota, Montana, Arizona, Utah, Colorado, and Chihuahua (Federal Register, 13 April 1993, 27 June 1994, 18 August 1994, 20 March 1996, 29 April 1997; Bard 2002 in NatureServe 2008, accessed 10-1-2008).

The UNHP database search reported two sightings documented in 1966, and 1968 near the town of Green River, UT, where "Boner (1977) reported 2 sightings, both considered by UDWR (1988) to be of probable validity" (UNHP, 2008).
As mentioned above, the BFF was nearly extirpated from its entire range by 1987, where the last know wild population was trapped and put into a captive breeding program. Tony Wright (UDWR 2008) writes "*Until definite evidence is found to the contrary, DWR assumes the ferret is extirpated from southeastern Utah*". Based on the data, the BFF is considered extirpated from Emery and Grand counties in Utah. The proposed Green River Salinity Area is not likely to adversely affect the BFF.

Southwestern Willow Flycatcher (Empidonax trailli ssp. extimus)
The Southwestern Willow Flycatcher (SWWFL) is a small brownish-olive colored bird that shares many features in common with its closest flycatcher relatives. The most distinctive characteristic of the SWWFL is its call; "Song differs from that of other subspecies by being a more protracted, slurred "fit-a-bew" with a burry "bew" syllable rather than a crisp, sneezy "fitz-bew" (USFWS 1995in NatureServe, 2008, accessed 10-1-2008). The SWWFL has declined greatly in range and abundance in riparian areas of the American southwest, primarily because of habitat loss and degradation; cowbird parasitism is also a problem in some areas. An estimated 1200-1300 pairs remain, more than half of which are confined to only ten breeding sites. (NatureServe, 2008, accessed 10-1-2008).

Decline is due primarily to destruction and degradation of cottonwood-willow and structurally similar riparian habitats. The causes of habitat loss and change are water impoundment, water diversion and groundwater pumping, channelization and bank stabilization, riparian vegetation control, livestock grazing, off-road vehicle and other recreational uses, increased fires, urban and agricultural development, and hydrological changes resulting from these and other land uses. Increased irrigated agriculture and livestock grazing have also resulted in increased range and abundance of Brown-headed Cowbirds; and, in some areas, heavy brood parasitism by cowbirds has contributed to the decline (Harris 1991, Brown 1988 in NatureServe, 2008, accessed 10-1-2008). Tamarisk has replaced native riparian vegetation in many areas, with varying effects on flycatcher populations. Native riparian plant communities probably have a greater recovery value for flycatchers, but currently occupied and suitable tamarisk habitat should be maintained (USFWS 2002 in NatureServe, 2008, accessed 10-1-2008).

The UNHP database search did not report the occurrence of any confirmed observations of SWWFL. Tony Wright indicates: "We detected willow flycatchers at a number of locations above Green River during the past field season (image attached). These are assumed not to be southwest willow flycatchers based on location, but in truth, the

subspecific identity of these birds is unknown. There is some evidence that they [willow flycatchers] may be breeding in this area, but they could be just migrants" (UDWR, 2008).

Most of the Green River Salinity Area is located north of Interstate 70. The I 70 corridor has been designated by the USFWS as an arbitrary northern boundary line for "potential nesting habitat" for the SWWFL. Appropriate genetic research has not been completed to confirm if the willow flycatchers observed along the Green River corridor are indeed the Southwestern subspecies.

The intent of the Green River Salinity Area is not to increase acres of land under irrigated agriculture, but to make the current agricultural use of water more efficient. With efficient use of water it is anticipated that linear features such as ditch line and canal vegetation strips may be reduced. These habitats, however, are "edge" features where SWWFL may be susceptible to nest parasitism from the Brown-headed cowbird. Large tracts of cottonwood/willow riparian habitat are not likely to be threatened by the proposed activities of the Green River Salinity Area. Tamarisk removal may be a part of the activities in the proposed Salinity Area as a best management practice for wildlife habitat development plans. These activities will be dealt with on a case by case basis where NRCS will consult with UDWR and USFWS biologists to ensure protection of potential SWWFL habitat, compliance with the ESA, and the replacement of native woody riparian structure where tamarisk may be removed.

It is anticipated that the proposed Green River Salinity Area is not likely to adversely affect the SWWFL.

Whooping Crane (Grus americana)

The Whooping Crane is a large, slender, mostly white bird with long legs and neck. The black tips of the primary wing feathers are visible in flight. Whooping Crane decline was due to loss of habitat to agriculture, human disturbance of nesting areas, and uncontrolled hunting. Collision with power lines became a major cause of death after hunting was stopped (Matthews and Moseley 1990 in NatureServe, 2008, accessed 10-2-2008). As of early 1996, total population was about 260, with 96 captives and 163 in the wild population (only 4 remain in the Rocky Mountain population), including 43 experienced wild breeding pairs; Wood Buffalo/Aransas population included 133 individuals; reintroduced population in Florida included some 26 sub-adult captive-produced individuals (USFWS, Federal Register, 6 February 1996 in NatureServe, 2008, accessed 10-2-2008). In 1996, USFWS proposed to designate the Rocky Mountains population as an experimental nonessential population (Federal Register, 6 February 1996). The Rocky Mountain population was designated as experimental nonessential in July 1997 (Federal Register 62:38932-38939, 21 July 1997 in NatureServe, 2008, accessed 10-2-2008). Introduced individuals migrate from Idaho (also Utah, Montana, and Wyoming) south primarily to central New Mexico (this population is headed for extirpation) (Howe 1989, in NatureServe, 2008, accessed 10-2-2008).

The UNHP database search reported an observation of three adult birds seen flying near the town of Green River UT, with no specified date. As of 1996, only four birds remained in the experimental Rocky Mountain population. Currently the Whooping Crane is considered extirpated from the State of Utah.

It is anticipated that the proposed Green River Salinity Area is not likely to adversely affect the Whooping Crane.

Western Yellow-billed Cuckoo *(Coccyzus americanus occidentalis)*
The Western Yellow-billed cuckoo (WYBC) is approximately 11-13" (28-33 cm), and has a characteristic slim, sinuous look, with a brown back, rufous (rust) colored wing primary feathers, white under-parts, and white spots at tips of black under-tail feathers (http://www.charlesvanriper.com/ybcu/).
There is still some confusion regarding the taxonomy and genetics of the eastern and the western subspecies. Regardless of their taxonomic position, the USFWS consider YBC occurring west of the Rocky Mountain crest a distinct population segment (USFWS 2000 in NatureServe, 2008, accessed 10-2-2008).

The WYBC is now very rare where formerly generally local and uncommon in scattered drainages of the arid and semiarid portions of western Colorado, Idaho, Nevada, and Utah (USFWS 2003 in NatureServe, 2008, accessed 10-2-2008). The primary threat is the loss and degradation of habitat, particularly riparian forests (Gaines 1974, Gaines and Laymon 1984, Laymon and Halterman 1987b, Hughes 1999 in NatureServe, 2008, accessed 10-2-2008). Habitat fragmentation is a major threat; in California, nesting by yellow-billed cuckoos may require intact woodlands of at least 40 hectares, and woodlands greater than 80 hectares appear to be preferred (Laymon and Halterman 1989 in NatureServe, 2008, accessed 10-2-2008). Along the Sacramento River, California, much of the remaining riparian habitat occurs in narrow, disconnected strips (Halterman et al. 2001 in NatureServe, 2008, accessed 10-2-2008), which are not utilized by the cuckoo for nesting (Gaines 1974 in NatureServe, 2008, accessed 10-2-2008).

Considerable habitat degradation in the Southwest has been caused by the invasion of tamarisk (*Tamarix* spp.). Tamarisk changes riparian forests by destroying plant community structure, replacing three or four vegetation layers with one monotonous layer. Human disturbance of riparian habitats (e.g. damming and flow alteration, cattle grazing) has allowed tamarisk to outcompete native vegetation (USFWS 2003 in NatureServe, 2008, accessed 10-2-2008). Tamarisk invasion typically coincides with reduction or loss of bird species associated with cottonwood-willow habitat, including yellow-billed cuckoo (Hunter et al. 1987, Hunter et al. 1988, Rosenberg et al. 1991 in NatureServe, 2008, accessed 10-2-2008). However, along the Pecos River in Texas, tamarisk has invaded where no riparian forest existed before, and this has allowed some cuckoos to establish there (Hunter et al. 1988 in NatureServe, 2008, accessed 10-2-2008).

The UNHP database search reported one element occurrence where a WYBC was seen and heard near the town of Green River, UT in May 2005. Tony Wright, sensitive species biologist for UDWR, confirms: “this species has been found in the town of Green

River in recent years. Undoubtedly individuals go through the [proposed] project area, but we have no evidence of breeding (UDWR 2008)". It is anticipated that in the proposed Green River Salinity Area impacts to riparian vegetation such as cottonwood and willows could occur along narrow ditch lines and canals and possibly at the lower ends of fields. These features would be very narrow and linear. Disturbance of large, mature cottonwood and willow galleries is not anticipated from the implementation of the proposed activities.

It is anticipated that the Green River Salinity Area is not likely to adversely affect the WYBC.

State Sensitive Species - Evaluation

Bald Eagle (Haliaeetus leucocephalus)

The bald eagle inhabits the North American continent from the Gulf of Mexico to the Arctic. It is usually found near the sea coast, inland lakes, and rivers [USFWS Bald Eagle Recovery Plan (Southwestern Population), 1982]. In portions of the Intermountain Region, bald eagles commonly winter in semi-arid valleys. Though the bird will take and eat what is plentiful in supply, fish, waterfowl, and small mammals are the common prey. Carrion is also utilized, particularly during the winter period (U.S. Forest Service et al, 1980). Bald Eagle winter and summer home ranges can be very large. One example in Arizona cites an immature bald eagle had a winter range of greater than 40,000 square kilometers. The same eagle spent the summer in Canada in a range of greater than 55,000 square kilometers (Grubb et al., 1994). In general, bald eagles avoid areas with nearby human activity such as boat traffic, pedestrians, buildings etc. (Buehler et al., 1991). This species has been removed from the Threatened and Endangered Species List, but is still considered a species of concern by the Utah Division of Wildlife Resources (UDWR, 2007).

The UNHP database search encountered several occurrences of the bald eagle within the proposed salinity area. The UDWR has reported observing an unknown number of bald eagles in 1979 and 1985 (UNHP, 2008). Tony Wright, Sensitive Species Biologist for the DWR Southeastern Region, confirmed the finding of the UNHP database search and concurred that the congregations of bald eagles occur in the winter and early spring and represent winter migrants (Wright, Pers Comm. 2008). Currently, there are no known or reported nesting bald eagles in the Green River Salinity Area. The bald eagles in the area were observed along the Green River roosting in tall cottonwood trees. It is not the purpose of the Green River Salinity Area to impact un-farmed ground along the Green River. The project may, however, dry up canals and irrigation ditches that may be lined with large trees; resulting in their possible destruction. NRCS anticipates this impact and has and will set aside monies for the creation of Wildlife Habitat Development Plans (WHDP) to attempt to replace the values of wildlife habitat foregone. NRCS programs are voluntary, and thus subject to landowner request to prepare and implement a WHDP.

It is anticipated the Green River Salinity Area is not likely to adversely affect the bald eagle.

Blue Grosbeak (Passerina caerulea)
The blue grosbeak is a small passerine bird with a thick, heavy, seed eating beak. Breeding plumage in males is a bright blue color with brownish wings. The blue grosbeak occupies partly open situations with scattered trees, riparian woodland, scrub, thickets, cultivated lands, woodland edges, overgrown fields, hedgerows. Blue grosbeak nest in low tree or bush tangle of vegetation, usually about 1-3 m above ground, often at edge of open area (Harrison 1979 in NatureServe, 2008, accessed 10-6-2008).

Breeding Bird Survey data indicate a significant blue grosbeak population increase in eastern North America, 1966-1988 and 1978-1988, and a significant increase in western North America, 1966-1988 (Sauer and Droege 1992 in NatureServe, 2008, accessed 10-6-2008).

Several element occurrences of blue grosbeak were reported in the UNHP Database search dating from 1956. Undoubtedly blue grosbeaks occur today all along the riparian corridor of the Green River and its tributaries. Tony Wright (UDWR 2008) indicates: "…they are so ubiquitous in riparian areas that they are no longer on the state sensitive species list". Due to limited of riparian habitat in Utah, species that inhabit them are somewhat vulnerable to habitat destruction or change. Riparian areas are considered by NRCS as areas of high biological diversity and of great importance to many wildlife species. The intent of the proposed Green River Salinity Area is not to introduce irrigated agriculture to new areas where it does not currently exist. There may be some loss of riparian habitat along ditches, canals, and lower ends of fields where flood irrigation water collects. Another goal of the proposed activity is to accept voluntary requests from landowners to replace habitat values lost due to project implementation and assist them in the creation of a Wildlife Habitat Development Plan. The financial assistance for these plans would come through the proposed Green River Salinity Area plan. Projects that create woody vegetation cover along the edges of fields would enhance blue grosbeak habitat.

It is anticipated that the proposed Green River Salinity Area is not likely to adversely affect the blue grosbeak.

Cornsnake (Elaphe guttata)
The cornsanke or red cornsnake is a strikingly colored, colubrid snake with red and yellow bands alternating down its length. It is primarily nocturnal and grows to a length of approximately 183 cm. The UDWR describes the habitat of the cornsnake as follows: "Cornsnake populations in Utah are disjunct from the primary geographic range of the species east of the Rocky Mountains and may be genetically distinct. This species occurs in a variety of habitats associated with riparian habitat, including rocky hillsides, forests, and canyons, but are usually observed near stream or river margins. In Utah, the cornsnake is associated with the Colorado River and Green River corridors. This nocturnal, secretive snake spends much of its time in rodent burrows. Rodents, bats, birds, insects, lizards, and other snakes are prey of cornsnakes. Habitat degradation and vegetation changes are major threats to cornsnake populations in Utah. Flow regimes in the Colorado and Green rivers have been altered and minimized. This, in turn, influences

what type and the successional stage of vegetation communities occurring in the riparian areas of these rivers" (UDWR 2007).

The UNHP Database search revealed one element occurrence of a cornsnake near the town of Green River, UT in 2004. Tony Wright (UDWR 2008) indicated that anything that increases road density, nighttime traffic, or vehicle speed is very detrimental to this species. The proposed Green River Salinity Area is not anticipated to increase road density, night time traffic, or vehicle speed. There may, however, be some loss of riparian habitat along ditches, canals, and lower ends of fields where flood irrigation water collects. The intent of the proposed activity is to accept voluntary requests from landowners to replace habitat values lost due to project implementation and assist them in the creation of a Wildlife Habitat Development Plan. The financial assistance for these plans would come through the proposed Green River Salinity Area plan.

It is anticipated that the proposed Green River Salinity Area is not likely to adversely affect the cornsnake.

Great Plains Toad (Bufo cognatus)

The Utah Division of Wildlife Resources in the Utah Sensitive Species List – December 14, 2007 Appendix A – Rationale for Wildlife Species of Concern Designations relates the following:

> **Species status statement.** This species was formerly rare in Utah and has not been detected in many years. Although it has been reported from 12 localities in Utah, most of these have been considered suspect or questionable in a recent evaluation of the status of the species in Utah by herpetologists at Utah State University (Mulcahy et al. 2002). Mulcahy et al. (2002) regarded only two localities for this species in Utah as "legitimate, verified records", both of these being in the vicinity of the town of Green River, Emery County. They did note, however, three other reported localities (Krupa 1990)—one in western Grand County (presumably not far from the town of Green River) and two in San Juan County—for which they were unable to locate voucher specimens and thus could draw no conclusions about the validity of the records. The most recent valid Utah record of this species for which the date is known is from 1962, but no adequate effort has been made to look for it since that time.
>
> **Statement of habitat needs and threats for the species.** This species is an inhabitant of prairies and deserts. In addition to grasslands, it occurs in creosote bush scrub, mesquite woodlands, desert riparian situations, and sagebrush steppe. Its elevational range is from near sea level to around 8,000 ft. It breeds in shallow, temporary pools formed after heavy rains and in quiet waters of streams, marshes, irrigation ditches, and flooded fields (Stebbins 2003). Threats to the species have not been reported but almost certainly include several diseases known to have devastating effects on populations of a variety of amphibians, including

> other species of toads, in Utah and adjacent states. These diseases and their causative pathogens include chytridiomycosis (chytrid fungus, *Batrachochytridium dendrobatidis*) and red-leg (bacterium, *Aeromonas hydrophila*). Illegal transport, by people, of other species of amphibians may also be a threat to this species, as it is to other amphibians of conservational concern in Utah, resulting in predation, competition, and spread of amphibian diseases. The Great Plains Toad uses some cultivated areas successfully. However, intensive cultivation and herbicide/pesticide use has probably led to reduced populations in some regions. Breeding sites are typically the result of heavy rains and hence not generally subject to loss via water projects. However, suburban sprawl has eliminated breeding and non-breeding habitats in areas adjacent to growing cities in Colorado (Hammerson 1999), and some adults at these sites experience road mortality. Across the breeding range, populations appear to be localized (UDWR 2007).

The UNHP Database search revealed one element occurrence in the vicinity of the town of Green River UT, dated from 1931. The excerpt above indicates the last reported sighting of the Great Plains toad in Utah was in 1962. NatureServe Explorer (accessed 10/14/2008) indicates the species is possibly extirpated from Utah. Utah is on the fringe of the range of the Great Plains toad and as the second "driest" state of the lower 48 states amphibians in general already have a difficult time persisting in the harsh environment. One of the objectives of the proposed Green River Salinity Area is to assist in the conversion of wild flood irrigation systems to sprinkler irrigation systems. This practice could possibly affect the breeding habitat for Great Plains toads. The excerpt above suggests the toads select their breeding sites as a result of heavy rains and not necessarily flooded fields, but it does not eliminate the possibility. The intent of the proposed activity is to accept voluntary requests from landowners to replace habitat values lost due to project implementation and assist them in the creation of a Wildlife Habitat Development Plan. The financial assistance for these plans would come through the proposed Green River Salinity Area plan.

Depending upon the status of this species, whether it is considered extirpated from Utah or not, the proposed Green River Salinity Area could potentially adversely affect the Great Plains toad. The likelihood of this adverse affect is slim given the current evidence the species is unlikely to persist in Utah. Since this species does not enjoy the protection of the Endangered Species Act, NRCS will consult with UDWR biologists and discuss what measures would be practicable to protect this Utah State Species of Concern.

Hole in the Rock Clover (Dalea flavescens var. epica)

Hole in the Rock clover (HRC) is a desert forb 20-52 cm tall with compound leaves and a tight conical racemose inflorescence with whitish to cream colored flowers. HRC occurs in sandstone bedrock and sandy areas in blackbrush, mixed desert shrub community between 4,700 and 5,000 feel in elevation and is endemic to Carbon, Emery, Grand, Garfield, Kane, San Juan, and Wayne counties. HRC flowers in May-June (Welsh et al 1993, 2003).

The UNHP Database search reported several occurrences for HRC outside the riparian band that surrounds the Green River. This plant grows in dry undisturbed habitats in sandy soil. The EQIP rules state that in order to be eligible for program funds, a tract of land needs to be irrigated two out of the last five years. Therefore land with no irrigation history, such as the habitat of HRC, is ineligible for program funds. As long as no new desert land is irrigated, the proposed Green River Salinity Area is not likely to adversely affect the HRC.

Jones' Indigo Bush (Psorothamnus polydenius var.jonesii)
Jones' indigo bush (JIB) is a low desert shrub typically less than 0.5 m tall; it has small purple flowers and velvety haired branchlets with yellow or orange resinous glands. JIB is primarily found on the Bluegate and the Tununk members of the Mancos formation in shadscale, mat salt brush, ephedra, and galleta communities from 4200 to 4900 feet elevation and is endemic to Emery and Grand counties (Welsh et al 1993, 2003).

The UNHP Database search reported several occurrences for JIB outside the riparian band that surrounds the Green River. This plant grows in dry undisturbed habitats in heavy clay/shale soil. The EQIP rules state that in order to be eligible for program funds, a tract of land needs to be irrigated two out of the last five years. Therefore land with no irrigation history, such as the habitat of JIB, is ineligible for program funds. As long as no new desert lands are irrigated, the proposed Green River Salinity Area is not likely to adversely affect the JIB.

Northern Leopard Frog (Rana pipiens)
The northern leopard frog is a slim, long-legged, green or brownish frog usually with well-defined, pale-bordered, oval or round dark dorsal spots; white stripe on upper jaw; white or cream below; well-defined, pale ridges along its back (Stebbins 1985 in NatureServe accessed 10/14/2008). It prefers to live in or around springs, slow streams, marshes, bogs, ponds, canals, flood plains, reservoirs, and lakes; usually in or nearby permanent water with rooted aquatic vegetation. In summer the northern leopard frog commonly inhabits wet meadows and fields. It takes cover underwater, in damp niches, or in caves when inactive and usually overwinters underwater (NatureServe accessed 10/14/2008).

The UNHP Database search reported several element occurrences of northern leopard frogs along the riparian corridor of the Green River. One of the main threats to this frog is habitat destruction or modification. The EQIP rules state that land needs to be irrigated two out of the last five years in order to be eligible for program funds. There may be some loss of riparian habitat along ditches, canals, and lower ends of fields where flood irrigation water collects. Another goal of the proposed activity is to accept voluntary requests from landowners to replace habitat values lost due to project implementation and assist them in the creation of a Wildlife Habitat Development Plan. The financial assistance for these plans would come through the proposed Green River Salinity Area plan.

One of the objectives of the proposed Green River Salinity Area is to assist in the conversion of wild flood irrigation systems to sprinkler irrigation systems. This practice could possibly affect breeding habitat of northern leopard frogs by eliminating standing water at the bottom of fields. These "artificial" breeding areas are not optimal due to the activity of intensive agriculture. Mortality may be high in the presence of this disturbance. The proposed Green River Salinity Area could potentially adversely affect the northern leopard frog. Since this species does not enjoy the protection of the Endangered Species Act, NRCS will consult with UDWR biologists and discuss what measures would be practicable to protect this Utah State Species of Concern.

White Tailed Prairie Dog (Cynomys leucurus)

The white-tailed prairie dog (WTPD) is found in Colorado, Montana, Utah, and Wyoming. Unlike its close relative the black-tailed prairie dog, the WTPD will form loose colonies. Golden eagles and badgers, considered major predators of the WTPD, account for only a minor cause of mortality (NatureServe, 2008, accessed 9-15-2008).The WTPD prefer xeric mixed shrub and grass sites. However, they also live at higher elevations in meadows, unlike the black-tailed prairie dog (NatureServe, 2008, accessed 9-15-2008).

Tony Wright (UDWR 2008) indicates that "switching from flood to sprinkle irrigation, because it does not flood burrows, will actually improve habitat for prairie-dogs. Prairie-dogs will abandon flooded burrows and leave the area. However, because prairie-dogs are not compatible with intensive agriculture, improving their habitat in fields is not a good thing. This project may increase pressure to use toxicants on lands adjacent to fields. Zinc phosphide applied in grain baits could kill non-target animals that eat grain (i.e. turkeys, sandhill cranes). Aluminum phosphate used to fumigate burrows kills whatever wildlife is in the burrow, not just prairie dogs".

The UNHP database search produced reports of multiple WTPD colonies throughout the proposed project area. The implementation of the proposed Green River Salinity Area project would improve irrigation practices and increase the efficiency of the distribution of water onto cropland. This should neither increase nor decrease WTPD populations. Currently, intensive agriculture and WTPDs are not compatible. WTPD's are routinely disposed of, or have been eradicated from agricultural fields (UDWR 2007). The proposed Green River Salinity Area project will not aggravate this situation further. It is expected that confrontation between WTPD and humans will continue as WTPD will be attracted to the productive ag-fields. As previously mentioned, EQIP program rules indicate that land needs to be irrigated two out of the last five years in order to be eligible for program funds. As long as no new lands are irrigated, no new WTPD colonies will be put in jeopardy.

However, NRCS will continue to consult with UDWR to try and preserve and enhance WTPD populations wherever possible. Recently, NRCS became a signatory to the multi-agency "**Utah Gunnison's Prairie Dog and White-tailed Prairie Dog Conservation Plan**" (UDWR 2007). NRCS will honor commitments made therein to attempt to preclude listing of the WTPD and help perpetuate the species.

It is anticipated that the proposed project is not likely to adversely affect this species.

Yellow Blanketflower (Gaillardia flava)
Yellow blanketflower (YB) is found in stream terraces and valley bottoms, commonly in cottonwood, willow, and tamarisk communities in Emery and Grand Counties where it is endemic (Welsh et al 1993, 2003). The plant resembles a small flowered yellow sunflower without the dark center and the green herbage is shortly hairy with glandular, sticky hairs.

The UNHP Database search reported several hits for YB outside and within the riparian band that surrounds the Green River. This plant grows in undisturbed habitats in stream terraces and valley bottoms. The EQIP rules state that in order to be eligible for program funds, a tract of land needs to be irrigated two out of the last five years. Therefore land with no irrigation history, such as the habitat of YB, is ineligible for program funds. As long as no new lands are irrigated, the proposed Green River Salinity Area is not likely to adversely affect the YB.

Habitats of Special Concern

Critical Habitat for species protected under the ESA
Portions of the Green and Colorado Rivers in Utah are considered by the USFWS and the ESA to be critical habitat for the four endangered fishes mentioned in the assessment. Currently in Utah there are 1,172 miles of river (Colorado and Green Rivers) that are designated as Critical habitat for the four Colorado River Basin endangered fishes (F.R. 1994). The impacts to this habitat have been many throughout the time that humans have inhabited the west. One of the major impacts has been the impounding of the wild river systems, and the regulation of the water flow regime. Below is and excerpt for the Federal Register (March 21, 1994) addressing the affected environment:

Affected Environment

The four Colorado River endangered fishes evolved in the Colorado River Basin (Basin) and were adapted to the natural environment that existed prior to the beginning of large-scale water development and introduction of nonnative species. This natural environment was characterized by highly fluctuating seasonal and annual flows, distinctly different habitat types (i.e., whitewater, lower gradient and meandering main channels, off-channel backwaters, and others) and varying water quality (i.e., sediment load, temperature, salinity, etc.). Recent population declines and disappearances of endemic Basin fish species from much of their former range have been associated with the onset of rapid and widespread anthropogenic changes to the natural environment. The cumulative environmental impact of these changes has resulted in alteration of the physical and biological characteristics of many rivers in the Basin. These impacts presumably occurred so rapidly that the fish could not adapt to them (Carlson and Muth 1989). Dams and diversions have fragmented former fish habitat and restricted fish movement. As a result, genetic interchange (emigration and immigration of individuals) between some fish populations is no longer possible. High flood flows were once normal in the Basin and provided food and nutrient exchange between river channels and shallow-water flood plain habitats. These high flows are now controlled by numerous dams. As a result of these dams, major changes also have occurred in water quality, quantity, temperature, sediment load and nutrient transport, and other characteristics of the aquatic environment (Carlson and Muth 1989). The altered river conditions that have resulted now provide suitable habitats for introduced, nonnative fish. Some of these nonnative fish species have flourished in the Basin (Minckley et al. 1982; Tyus et al. 1982; Carlson and Muth 1989). These physical and biological changes have impacted the river environment to the extent that no completely unaltered habitat remains in the Basin for the four Colorado River endangered fish species.

Another impact commonly cited as detrimental to the Colorado River Basin endangered fishes is water depletion. In the western U.S., water is one of the most precious resources to humans, and there is a finite amount. Water from rivers and streams is used for irrigation, culinary uses, waste disposal, power generation, and a whole host of other uses and activities. The de-watering of streams and rivers is a serious threat to aquatic organisms, including those species that enjoy the protection of the ESA.

The proposed Green River Salinity Area has multiple objectives. The primary objective is to reduce the amount of salt (dissolved solids) that enter the Colorado River system. Another is to more efficiently use the limited water resource. By installing measures like converting wild flood irrigation systems to sprinkler systems, the proposed project can accomplish both objectives. The proposed project also has in place a method to restore or

replace wildlife habitat by making funds available to private landowners to perform the task. These habitat plans will be focused on riparian/wetland areas, such as the Green River, to further protect the natural resources that depend on them.

It is anticipated that the Green River Salinity Area is not likely to adversely affect critical habitat for species protected under the ESA.

Riparian and Wetland communities

The Green River bisects the proposed Green River Salinity Area As well as several small tributaries and ephemeral washes. The importance of these areas is obvious; in any desert, water is precious and usually the limiting factor for many plant and animal species. Many birds, reptiles, amphibians and mammals depend on the presence of trees and other riparian plant species for their survival. Waters of the U.S., such as the Green River, are also regulated under Section 404 of the Clean Water Act of 1972 as well as Section 10 of the Rivers and Harbors Act of 1899.

Wetlands are also considered Waters of the U.S. and are afforded similar protections as are rivers and streams. One of the potential impacts introduced by the proposed Green River Salinity Area could be the de-watering of artificial wetlands by the efficient use of irrigation water. These wetlands are considered artificial because the water source is man made (irrigation water). Wildlife habitat enhancement projects could be implemented within the proposed Green River Salinity Area to offset the habitat values forgone by the efficient use of irrigation water. These projects are focused upon creating, enhancing and restoring, riparian and wetland communities.

A land cover map is currently being created to try and account for all land cover types that occur within the proposed project area. This data will be used by the Monitoring and Evaluation (M&E) team from USDA-NRCS to address potential future impacts from the proposed project.

It is anticipated that the proposed Green River Salinity Area is not likely to adversely affect the riparian area and natural wetlands that coincide with the Green River and its tributaries within the proposed area.

Conclusion

By their nature, salinity control areas have the potential to impact very few threatened, endangered, or sensitive (TES) plant and animal species. This may be attributed to the fact that most of the conservation practices occur on previously disturbed agricultural lands. In general, TES species tend to avoid human interaction of any kind.

As the conservation practices of the proposed area will not occur in the reservoir and the water flow to the river will not be depleted, no potential adverse impacts are anticipated. Disturbance in these areas should be avoided if practicable.

Wet areas and artificial wetlands are where many species of common wildlife have adapted to life. Potential habitat impact may occur when canals and laterals are abandoned, and the vegetation surrounding these features dries up. Also, with the implementation of water efficient sprinklers, the artificially wet areas normally located at the bottom of some fields from flood irrigation may be brought to uniformity with the rest of the field. Again as mentioned above, wildlife habitat enhancement projects could be implemented within the proposed Green River Salinity Area to offset the habitat values forgone by the efficient use of irrigation water. A land cover map is currently being created to try and account for all land cover types that occur within the proposed project area. This data will be used by the Monitoring and Evaluation (M&E) team from USDA-NRCS to address potential future impacts from the proposed project.

As for TES plants, most of the ones listed in the assessment are species that grow in natural, undisturbed sites. The majority of construction activities of the proposed Green River Salinity Area will take place on previously disturbed ground. Pipelines may be laid where the canals and laterals are currently located. Should new, undisturbed ground need to be broken, a survey would be in order to ensure the protection of any listed species or species of concern

Over all, it is anticipated that the Green River Salinity Area is not likely to adversely affect any TES species or habitat of special concern within its influence.

References

American Ornithologists' Union (AOU). 1957. The A.O.U. Check-list of North American Birds, 5th ed. Port City Press, Inc., Baltimore, MD. 691 pp.

American Ornithologists' Union (AOU), Committee on Classification and Nomenclature. 1983. Check-list of North American Birds. Sixth Edition. American Ornithologists' Union, Allen Press, Inc., Lawrence, Kansas.

Atwood, N. Duane, et al, U.S. Forest Service and other Federal and State Agencies and Indian Nation and Tribe. Utah; Endangered, Threatened and Sensitive Plant Field Guide. 1991.

Barneby, R.C. 1989. Fabales, Vol. 3 Part B. IN: A. Cronquist, A. H. Holmgren, N.H. Holmgren, J.L. Reveal, and P.K. Holmgren. Vascular Plants of the Intermountain West, USA. New York Botanical Garden, Bronx, NY.

Birdsey, Paul, UDWR, Aquatics Manager, Southeastern Region. Personal communication, Oct 1, 2008, Price, UT.

Buehler, D. A., et al. 1991. Differences in distribution of breeding, nonbreeding, and migrant bald eagles on the northern Chesapeake Bay. Condor 93:399-408.

Buehler, D. A., et al, 1991. Effects of human activity on bald eagle distribution on the northern Chesapeake Bay. J. Wildlife Management 55:282-290.

Federal Register Vol. 59, No.54, March 21, 1994. 50 CFR Part 117 Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Colorado River Endangeres Fishes: Razorback Sucker, Colorado Squawfish, Humpback Chub, and Bonytail Chub.

Gaufin, A. R., G. R. Smith, and P. Dotson. 1960. Aquatic survey of Green River and tributaries with the Flaming Gorge Reservoir basin. pp. 139 – 175, in C. E. Dibble (ed.), Ecological studies of the flora and fauna of Flaming Gorge Reservoir basin, Utah and Wyoming. University of Utah Anthropological Papers, No. 48. November 1960.

Grubb, T. G., W. W. Bowerman, and P. H. Howey. 1994. Tracking local and seasonal movements of wintering Bald Eagles HALIAEETUS LEUCOCEPHALUS from Arizona and Michigan with satellite telemetry. Pages 247-358 IN B.-U. Meyburg and R. D. Chancellor, editors. Raptor conservation today. Pica Press, Moose Jaw, Saskatchewan.

Hammerson, G. A. 1999. Amphibians and reptiles in Colorado. Second edition. University Press of Colorado, Boulder. xxvi + 484 pp.

Isely, D., 1998. Native and Naturalized Leguminosae (Fabaceae) of the United States (exclusive of Alaska and Hawaii). Monte L. Bean Life Science Museum, Brigham Young Univ., Provo, UT.

Krupa, J. J. 1990. Bufo cognatus. Catalogue of American Amphibians and Reptiles 457: 1–8.

Mulcahy, D. G., M. R. Cummer, J. R. Mendelson III, B. L. Williams, and P. C. Ustach. 2002. Status and distribution of two species of *Bufo* in the northeastern Bonneville Basin of Idaho and Utah. *Herpetological Review* 33: 287–289.

National Geographic Society (NGS), 1999. Field Guide to the Birds of North America. Third edition. National Geographic Society, Washington, DC. 480 pp.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.7. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: September-October, 2008)

Oldemeyer, J. L., et al. 1993. Proceedings of the symposium on the management of prairie dog complexes for the reintroduction of the black-footed ferret. U.S. Fish and Wildlife Service Biological Report 13. iii + 96 pp.

Sibley, D.A. et al, 2001. The Sibley Guide to Bird Life and Behavior. Chanticleer Press Inc., New York, 607 pp.

Smith, G. R. 1966. Distribution and evolution of the North American Catostomid fishes of the Subgenus Pantosteus, Genus Catostomus. Museum of Zoology, University of Michigan.

Upper Colorado River Endangered Fish Recovery Program 2003. Endangered Colorado River Basin Fish, U.S. Fish and Wildlife Service, Denver, Colorado, available online at: http://coloradoriverrecovery.fws.gov/

U.S. Department of Agriculture, Forest Service et al. Threatened and Endangered Animal and Plant Species. U.S. Government Printing Office: 1980, pp 669-883, Ogden, Utah, 1980.

U.S. Department of the Interior, Fish and Wildlife Service. Bald Eagle Recovery Plan (Southwestern Population). U.S. Department of the Interior, Fish and Wildlife Service, Albuquerque, New Mexico, 1982.

U.S. Fish and Wildlife Service, 2008; Personal communication with Drew Crane on 10/14/2008, Utah BFF Lead Biologist, USFWS/BLM Energy Pilot Office, Vernal, UT.

Utah Division of Wildlife Resources, 2008. Personal Communication [email] from Tony Wright and Ken Bridinger UDWR Southeastern Region Sensitive Species Biologist and Fisheries Biologist, Price, UT

Utah Division of Wildlife Resources, 2007. **Utah Gunnison's Prairie Dog and White-tailed Prairie Dog Conservation Plan, Final Draft.** November 2007, Salt Lake City, UT.

Utah Division of Wildlife Resources 2007. Utah Sensitive Species List – December 14, 2007 Appendix A – Rationale for Wildlife Species of Concern Designations http://dwrcdc.nr.utah.gov/ucdc/ViewReports/SSL&Appendices121407.pdf (Accessed 10/14/2008).

Utah Native Plant Society, 2003-2006. *Utah Rare Plant Guide*. Salt Lake City, UT: Utah Rare Plant Guide Home Page. http://www.utahrareplants.org.

Utah Natural Heritage Program. 2008. Data compilation for J. Spencer, completed 9/2/2008. Unpublished report. Utah Natural Heritage Program, Utah Department of Natural Resources, Salt Lake City, Utah.

Vanicek, C. D., Kramer, R. H., and D. R. Franklin. 1970. Distribution of Green River fishes in Utah and Colorado following closure of Flaming Gorge Dam. Southwestern Naturalist 14(3): 297-315.

Van Riper Charles, USGS, Arizona Game and Fish, NBII, Yellow Billed Cuckoo accessed 10-6-2008, <http://www.charlesvanriper.com/ybcu/

Welsh et al. A Utah Flora. Provo, Utah: Brigham Young University, Second Edition (revised) 1993

Welsh et al. A Utah Flora. Provo, Utah: Brigham Young University, Third Edition (revised) 2003

Woodbury, A.M. and D.M. Woodbury. 1942. Studies of the rat snake, *Elaphe laeta*, with description of a new subspecies. Proceedings of the Biological Society of Washington 55:133-142.

Appendix C

Green River Unit of the
Upper Colorado River Salinity Control Area
Economic Analysis

Introduction

According to the basic principles of engineering economy, a project that is proposed to be added to an existing or prospective enterprise should be undertaken only if the proposed addition, in and of itself, is expected to be a profitable venture, regardless of the profitability of the enterprise as a whole.

When evaluating the benefits and costs of an agriculture-based project that is expected to contribute to the effort to control salinity in the Colorado River, there are two types of benefit/cost comparisons to consider:

1. The public benefits that will be generated by removing salt from the Colorado River system should be greater than the public costs of the undertaking.
2. The private benefits to landowners of cooperating in implementing the project should be greater than the private costs they will incur by installing new infrastructure and by making changes in how they operate their farms or ranches.

The purpose of this benefit/cost analysis is to determine whether or not the proposed Green River Unit of the Upper Colorado River Salinity Control Program in Emery County, Utah, meets these economic requirements.

Historical and Socio-economic Context

For thousands of years, native peoples lived in the area comprising Emery County. They left behind a wide variety of rock art and other archeological artifacts. From about 1800 until the mid-1800's, the Spanish Trail passed through present-day Emery County. While there is little evidence that Native Americans permanently inhabited the Green River area, it does seem to have served as a stopping point for migrating tribes. The first Europeans to permanently settle in Emery were Mormon pioneers. Beginning in the late 1870s, pioneers began to establish homesteads and small settlements that later became the towns of Huntington, Ferron, Castle Dale, Emery, and other towns that lie within the slice of land between the eastern edge of the Wasatch Plateau and the western edge of the San Rafael Swell.

On the eastern side of Emery County, a river crossing was established in 1876 as a location and means for transporting U.S. mail across the Green River. This river crossing gradually evolved into what is now Green River City, which was developed after the railroad was built through the area, requiring permanent support bases at regular

distances along its route. Green River served as one of these stations, providing hotel rooms, meals, and other support services to railroad employees and travelers. Since that time, the region has gone through multiple cycles of booms and subsequent downturns in both economic activity and overall population. While farming and ranching have historically been—and continue to be—important parts of the Emery County economic base, mining (primarily coal and uranium), national defense, the railroad industry, and the power industry have played significant roles in the economic development of the region. The population of Green River City, officially incorporated in 1906, now stands just below 1,000, a level that has remained fairly stable over the past decade.

The area around Green River is widely known for its production of watermelons, cantaloupe, and other melons. Less well-known is Green River's corn and alfalfa production, which constitutes a substantial portion of the agricultural component of Green River's economy. Within the proposed project area (based on data collected at the time the salt budget for this project was prepared), 60 percent, or 2,199 acres, of irrigated land is planted in alfalfa hay and 19 percent, or 742 acres, is planted in corn.

Private Costs and Benefits

The primary feature of salinity control projects in the Upper Colorado River region is irrigation system improvements. These typically involve replacement of flood irrigation systems with sprinkler irrigation systems and/or replacement of leaking canals with closed pipelines, although some projects also include upgrading diversion facilities. "Off-farm" costs include those costs associated with the system of main canals and lateral canals or ditches that deliver water to individual farms. The off-farm improvements proposed for the full-treatment option for the Green River Unit of the Salinity Control Program include settling ponds (or other structures designed to allow sediment from the Green River to drop out of the water prior to its introduction into irrigation system pipelines) and pumps. The recommended proposal alternative consists of "on-farm" treatments only with no such large-scale infrastructure improvements.

"On-farm" costs include those costs associated with installing on-farm infrastructure for the application of agricultural water. The costs associated with the on-farm portion of the proposed Green River salinity control project would be directly generated by the conversion from flood irrigation to sprinkler irrigation and would include the costs of conservation practices such as installing on-farm water delivery pipelines, sprinkler lines, and other components of sprinkler systems. Under the current Upper Colorado River Salinity Control Project, on-farm costs are divided between the NRCS and local agricultural producers with a 75% NRCS/25% Local Cooperator split. In the case of on-farm costs, the 25% cost share must be borne by the individual producers served by the project.

Estimated potential increases in revenues and potential net gain were calculated for current and potential future productivity over a range of sizes of operations by subtracting costs from potential increases in revenue. The irrigation system improvement costs

included in the analysis were obtained from the project salinity budget prepared by NRCS Utah Area III engineering and resources staff members. Individual producers who are interested in participating in the project should compare the data included in this report with their own situations and assess how installing irrigation system improvements would be likely to affect them. Individual producers can generate their own estimates using market prices and installation costs that seem appropriate to them.

According to one producer in the project area, every problem he has in production is related to water. Some examples of the types of problems that can be addressed through increased irrigation efficiency are logistical difficulties in timing and duration of irrigation activities, excess soil erosion, tillage requirements, salt damage to crops, and waste of water resources due to having to run more water than is necessary down flood irrigation rows just to make sure water reaches the bottom of all rows. Increasing irrigation efficiency by converting to sprinkler irrigation will address each of these private agricultural production resource concerns.

Additional benefits to agricultural producers provided by the proposed action include increased flexibility in how and when they water their crops, increased ease of cultivation, and easier harvesting. Also, increased irrigation efficiency will result in more effective use of fertilizer and pesticides. Total use of fertilizer per unit of agricultural output is reduced through elimination of unnecessary leaching of fertilizer into the deeper layers of soil, resulting in lower fertilizer costs per unit of output and lower application costs due to elimination of redundant applications. An upgrade to sprinkler irrigation also offers the prospect of more options for crop rotations and cropping patterns within existing field boundaries. In general, converting from flood irrigation to wheeled sprinkler irrigation—including the removal of flood irrigation ditches within cultivated fields—will enable producers to cultivate and harvest their crops in less time with less physical effort. Examples of these reductions in production costs include: A reduction in the amount of labor time required per acre per year for irrigation changes; the reduction of wear and tear on farm equipment, gained through the elimination of irrigation ditches; and a decrease in collected excess irrigation water, resulting in less time lost due to stuck vehicles and equipment.

Table 1 shows estimated costs of pumping under three alternative irrigation systems and for electric versus diesel-powered pumping plants. In each case, implementing an improved irrigation system leads to higher pumping costs per acre per year. These increased costs are expected to be either partially or entirely offset by increased net revenue due to increases in yields.

Table 1. Pumping Costs (Costs are based on 10-acre field except in the case of the pivot)

Scenario						Electricity - $.0419 per KwHR			Diesel - $4.65 per Gal		
Source of Water/ Irrigation System Type	HP	Flow	Feet of Lift	psi	Hours	Cost for Kw per Hour	Cost per Year	Cost per Acre per Year	Cost for Diesel per Hour (.048 gal/HR/HP)	Cost per Year	Cost per Acre per Year
Out of Canal											
Flood	0	5 cfs	0	N/A	0	$0.000	$0.00	$0.00	$0.000	$0.00	$0.00
Sprinkler	2	82 gpm	0	30	24/day	$0.084	$301.68	$30.17	$0.446	$1,607.04	$160.70
Pivot (130 Acres)	22	900 gpm	0	30	24/day	$0.922	$3,318.48	$25.53	$4.910	$17,677.44	$135.98
Out of River											
Flood	12	5 cfs	15	N/A	10/week	$0.503	$107.74	$10.77	$2.678	$573.94	$57.39
Sprinkler	3	82 gpm	30	30	24/day	$0.126	$452.52	$45.25	$0.670	$2,410.56	$241.06
Pivot (130 Acres)	32	900 gpm	30	30	24/day	$1.341	$4,826.88	$37.13	$7.142	$25,712.64	$197.79

Table 2 shows the estimated cost of the labor required to operate each type of irrigation system. The labor rate is based on the average wage for farm labor in Utah in 2007 according to U.S. Bureau of Labor Statistics data.

Table 2. Labor Costs (Costs are based on 20-acre field except in the case of the pivot)

Labor Rate	Irrigation System	Hours per Irrigation Operation	Irrigation Operations per Season	Total Hours	Total Labor Cost per Year	Total Labor Cost per Acre per Year
$10.17	**Flood**					
	Unimproved Flood	6	10.71	64.29	$653.79	$32.69
	Improved Flood	3	10.71	32.14	$326.89	$16.34
	Sprinkler					
	Wheel Line	0.417	300	125.1	$1,272.27	$63.61
	Pivot (130 acres)	1	21.43	21.43	$217.93	$1.68

Table 3 compares the estimated yields that are expected to be obtained for various crops under different irrigation systems with varying efficiencies in water application. Yield amounts are based on consumptive use and climate data for Green River. The figures in the table are based on the assumption that irrigation efficiency is the limiting factor in productivity (all fertilizer and pesticide application rates are assumed to be optimal). 10-year average commodity market prices were used rather than recent prices in order to avoid results that are skewed due to short-term market fluctuations. Estimated production costs in Table 3 are directly crop-related and do not include expected changes in pumping or irrigation-related labor costs, nor do they include the cost of irrigation system improvements.

Table 3. Estimated Per Acre Crop Yields and Revenues

		Unit	Unimproved Flood (35% system efficiency)	Improved Flood (50% system efficiency)	Wheel Line (65% system efficiency)	Wheel Line (70% system efficiency)	Pivot (85% system efficiency
Alfalfa		Ton	3.61	4.71	5.82	6.19	7.29
10-yr. Average Market Price	$90.00	Ton					
Estimated Production Costs	$15.00	Ton					
Gross Revenue per Acre			$324.90	$423.90	$523.80	$557.10	$656.10
Net Revenue per Acre			$270.75	$353.25	$436.50	$464.25	$546.75
Corn for Grain		Bushel	79.57	113.68	147.78	159.15	193.25
10-yr. Average Market Price	$2.84	Bushel					
Estimated Production Costs	$333.00	Acre					
Gross Revenue per Acre			$225.99	$322.84	$419.69	$451.97	$548.82
Net Revenue per Acre			-$107.01	-$10.16	$86.69	$118.97	$215.82
Corn for Silage		Ton	14.41	20.59	26.77	28.83	35.00
10-yr. Average Market Price	$29.56	Ton					
Estimated Production Costs	$333.00	Acre					
Gross Revenue per Acre			$426.05	$608.64	$791.23	$852.10	$1,034.69
Net Revenue per Acre			$93.05	$275.64	$458.23	$519.10	$701.69

Table 4 shows estimated dollar costs and benefits associated with various potential "before" and "after" irrigation systems within the four primary pumping cost scenarios. All dollar figures included in the table were estimated using "typical" circumstances within the project area in conjunction with specific resource costs. The dollar costs and market prices used in the analysis are subject to revision over time as general economic and specific market conditions change. Diesel costs in particular are quite variable as they are subject to frequent fluctuations in the global petroleum market. If a producer wants to evaluate how a specific irrigation system improvement is likely to affect his or her cost and revenue projections, he or she should carefully consider how the cost assumptions in the table compare with the actual costs he or she expects to incur over time combined with expected market conditions for the crops being produced. When evaluating potential dollar effects of system improvements, producers are cautioned to use long-term average figures rather than short-term high or low costs or market prices. Using long-term figures will reduce the probability of embarking on a project that relies on abnormal or short-lived market conditions in order to be financially-viable in the long-run.

Table 4. Detailed Estimates of Private Benefits, Costs, and Net Benefits Under Various Crop and Irrigation Scenarios

Pumping Scenario: Electric Pump, Out of Canal ($0.0419 per KwHR)													
Crop	"Before" Irrigation System	"After" Irrigation System	"Before" Net Crop Revenue per Acre	"After" Net crop Revenue per Acre	Difference in Net Crop Revenue per Acre	"Before" Total Labor Cost per Acre per Year	"After" Total Labor Cost per Acre per Year	Difference in Labor Cost per Acre per Year	"Before" Total Pumping Cost per Acre per Year	"After" Total Pumping Cost per Acre per Year	Difference in Pumping Cost per Acre per Year	Typical Amortized (3% over 15 Years) Producer's Share (25%) of Cost of System Upgrade per Acre per Year (Not Including O&M Costs)	Net Benefit of the Irrigation System Improvement per Acre per Year
Alfalfa													
	Unimproved Flood	Improved Flood	$270.75	$353.25	$82.50	$32.69	$16.34	$16.35	$0.00	$0.00	$0.00	$20.10	$78.75
	Unimproved Flood	Wheel Line	$270.75	$464.25	$193.50	$32.69	$16.34	$16.35	$0.00	$30.17	-$30.17	$19.48	$160.20
	Unimproved Flood	Pivot	$270.75	$546.75	$276.00	$32.69	$1.68	$31.01	$0.00	$25.53	-$25.53	$12.04	$269.44
	Improved Flood	Wheel Line	$353.25	$464.25	$111.00	$16.34	$63.61	-$47.27	$0.00	$30.17	-$30.17	$19.48	$14.08
	Improved Flood	Pivot	$353.25	$546.75	$193.50	$16.34	$1.68	$14.66	$0.00	$25.53	-$25.53	$12.04	$170.59
	Wheel Line	Pivot	$464.25	$546.75	$82.50	$63.61	$1.68	$61.93	$63.61	$25.53	$38.08	$12.04	$170.47
Corn for Grain													
	Unimproved Flood	Improved Flood	-$107.01	-$10.16	$96.85	$32.69	$16.34	$16.35	$0.00	$0.00	$0.00	$20.10	$93.10
	Unimproved Flood	Wheel Line	-$107.01	$118.97	$225.98	$32.69	$16.34	$16.35	$0.00	$30.17	-$30.17	$19.48	$192.68
	Unimproved Flood	Pivot	-$107.01	$215.82	$322.83	$32.69	$1.68	$31.01	$0.00	$25.53	-$25.53	$12.04	$316.27
	Improved Flood	Wheel Line	-$10.16	$118.97	$129.13	$16.34	$63.61	-$47.27	$0.00	$30.17	-$30.17	$19.48	$32.21
	Improved Flood	Pivot	-$10.16	$215.82	$225.98	$16.34	$1.68	$14.66	$0.00	$25.53	-$25.53	$12.04	$203.07
	Wheel Line	Pivot	$118.97	$215.82	$96.85	$63.61	$1.68	$61.93	$63.61	$25.53	$38.08	$12.04	$184.82
Corn for Silage													
	Unimproved Flood	Improved Flood	$93.05	$275.64	$182.59	$32.69	$16.34	$16.35	$0.00	$0.00	$0.00	$20.10	$178.84
	Unimproved Flood	Wheel Line	$93.05	$519.10	$426.05	$32.69	$16.34	$16.35	$0.00	$30.17	-$30.17	$19.48	$392.75
	Unimproved Flood	Pivot	$93.05	$701.69	$608.64	$32.69	$1.68	$31.01	$0.00	$25.53	-$25.53	$12.04	$602.08
	Improved Flood	Wheel Line	$275.64	$519.10	$243.46	$16.34	$63.61	-$47.27	$0.00	$30.17	-$30.17	$19.48	$146.54
	Improved Flood	Pivot	$275.64	$701.69	$426.05	$16.34	$1.68	$14.66	$0.00	$25.53	-$25.53	$12.04	$403.14
	Wheel Line	Pivot	$519.10	$701.69	$182.59	$63.61	$1.68	$61.93	$63.61	$25.53	$38.08	$12.04	$270.56

Pumping Scenario: Diesel Pump, Out of Canal ($4.65 per Gal)													
Crop	"Before" Irrigation System	"After" Irrigation System	"Before" Net Crop Revenue per Acre	"After" Net crop Revenue per Acre	Difference in Net Crop Revenue per Acre	"Before" Total Labor Cost per Acre per Year	"After" Total Labor Cost per Acre per Year	Difference in Labor Cost per Acre per Year	"Before" Total Pumping Cost per Acre per Year	"After" Total Pumping Cost per Acre per Year	Difference in Pumping Cost per Acre per Year	Typical Amortized (3% over 15 Years) Producer's Share (25%) of Cost of System Upgrade per Acre per Year (Not Including O&M Costs)	Net Benefit of the Irrigation System Improvement per Acre per Year
Alfalfa													
	Unimproved Flood	Improved Flood	$270.75	$353.25	$82.50	$32.69	$16.34	$16.35	$0.00	$0.00	$0.00	$20.10	$78.75
	Unimproved Flood	Wheel Line	$270.75	$464.25	$193.50	$32.69	$16.34	$16.35	$0.00	$160.70	-$160.70	$19.48	$29.67
	Unimproved Flood	Pivot	$270.75	$546.75	$276.00	$32.69	$1.68	$31.01	$0.00	$135.98	-$135.98	$12.04	$158.99
	Improved Flood	Wheel Line	$353.25	$464.25	$111.00	$16.34	$63.61	-$47.27	$0.00	$160.70	-$160.70	$19.48	-$116.45
	Improved Flood	Pivot	$353.25	$546.75	$193.50	$16.34	$1.68	$14.66	$0.00	$135.98	-$135.98	$12.04	$60.14
	Wheel Line	Pivot	$464.25	$546.75	$82.50	$63.61	$1.68	$61.93	$160.70	$135.98	$24.72	$12.04	$157.11
Corn for Grain													
	Unimproved Flood	Improved Flood	-$107.01	-$10.16	$96.85	$32.69	$16.34	$16.35	$0.00	$0.00	$0.00	$20.10	$93.10
	Unimproved Flood	Wheel Line	-$107.01	$118.97	$225.98	$32.69	$16.34	$16.35	$0.00	$160.70	-$160.70	$19.48	$62.15
	Unimproved Flood	Pivot	-$107.01	$215.82	$322.83	$32.69	$1.68	$31.01	$0.00	$135.98	-$135.98	$12.04	$205.82
	Improved Flood	Wheel Line	-$10.16	$118.97	$129.13	$16.34	$63.61	-$47.27	$0.00	$160.70	-$160.70	$19.48	-$98.32
	Improved Flood	Pivot	-$10.16	$215.82	$225.98	$16.34	$1.68	$14.66	$0.00	$135.98	-$135.98	$12.04	$92.62
	Wheel Line	Pivot	$118.97	$215.82	$96.85	$63.61	$1.68	$61.93	$160.70	$135.98	$24.72	$12.04	$171.46
Corn for Silage													
	Unimproved Flood	Improved Flood	$93.05	$275.64	$182.59	$32.69	$16.34	$16.35	$0.00	$0.00	$0.00	$20.10	$178.84
	Unimproved Flood	Wheel Line	$93.05	$519.10	$426.05	$32.69	$16.34	$16.35	$0.00	$160.70	-$160.70	$19.48	$262.22
	Unimproved Flood	Pivot	$93.05	$701.69	$608.64	$32.69	$1.68	$31.01	$0.00	$135.98	-$135.98	$12.04	$491.63
	Improved Flood	Wheel Line	$275.64	$519.10	$243.46	$16.34	$63.61	-$47.27	$0.00	$160.70	-$160.70	$19.48	$16.01
	Improved Flood	Pivot	$275.64	$701.69	$426.05	$16.34	$1.68	$14.66	$0.00	$135.98	-$135.98	$12.04	$292.69
	Wheel Line	Pivot	$519.10	$701.69	$182.59	$63.61	$1.68	$61.93	$160.70	$135.98	$24.72	$12.04	$257.20

Pumping Scenario: Electric Pump, Out of River ($0.0419 per KwHR)													
Crop	"Before" Irrigation System	"After" Irrigation System	"Before" Net Crop Revenue per Acre	"After" Net crop Revenue per Acre	Difference in Net Crop Revenue per Acre	"Before" Total Labor Cost per Acre per Year	"After" Total Labor Cost per Acre per Year	Difference in Labor Cost per Acre per Year	"Before" Total Pumping Cost per Acre per Year	"After" Total Pumping Cost per Acre per Year	Difference in Pumping Cost per Acre per Year	Typical Amortized (3% over 15 Years) Producer's Share (25%) of Cost of System Upgrade per Acre per Year (Not Including O&M Costs)	Net Benefit of the Irrigation System Improvement per Acre per Year
Alfalfa													
	Unimproved Flood	Improved Flood	$270.75	$353.25	$82.50	$32.69	$16.34	$16.35	$10.77	$10.77	$0.00	$20.10	$78.75
	Unimproved Flood	Wheel Line	$270.75	$464.25	$193.50	$32.69	$16.34	$16.35	$10.77	$45.25	-$34.48	$19.48	$155.89
	Unimproved Flood	Pivot	$270.75	$546.75	$276.00	$32.69	$1.68	$31.01	$10.77	$37.13	-$26.36	$12.04	$268.61
	Improved Flood	Wheel Line	$353.25	$464.25	$111.00	$16.34	$63.61	-$47.27	$10.77	$45.25	-$34.48	$19.48	$9.77
	Improved Flood	Pivot	$353.25	$546.75	$193.50	$16.34	$1.68	$14.66	$10.77	$37.13	-$26.36	$12.04	$169.76
	Wheel Line	Pivot	$464.25	$546.75	$82.50	$63.61	$1.68	$61.93	$45.25	$37.13	$8.12	$12.04	$140.51
Corn for Grain													
	Unimproved Flood	Improved Flood	-$107.01	-$10.16	$96.85	$32.69	$16.34	$16.35	$10.77	$10.77	$0.00	$20.10	$93.10
	Unimproved Flood	Wheel Line	-$107.01	$118.97	$225.98	$32.69	$16.34	$16.35	$10.77	$45.25	-$34.48	$19.48	$188.37
	Unimproved Flood	Pivot	-$107.01	$215.82	$322.83	$32.69	$1.68	$31.01	$10.77	$37.13	-$26.36	$12.04	$315.44
	Improved Flood	Wheel Line	-$10.16	$118.97	$129.13	$16.34	$63.61	-$47.27	$10.77	$45.25	-$34.48	$19.48	$27.90
	Improved Flood	Pivot	-$10.16	$215.82	$225.98	$16.34	$1.68	$14.66	$10.77	$37.13	-$26.36	$12.04	$202.24
	Wheel Line	Pivot	$118.97	$215.82	$96.85	$63.61	$1.68	$61.93	$45.25	$37.13	$8.12	$12.04	$154.86
Corn for Silage													
	Unimproved Flood	Improved Flood	$93.05	$275.64	$182.59	$32.69	$16.34	$16.35	$10.77	$10.77	$0.00	$20.10	$178.84
	Unimproved Flood	Wheel Line	$93.05	$519.10	$426.05	$32.69	$16.34	$16.35	$10.77	$45.25	-$34.48	$19.48	$388.44
	Unimproved Flood	Pivot	$93.05	$701.69	$608.64	$32.69	$1.68	$31.01	$10.77	$37.13	-$26.36	$12.04	$601.25
	Improved Flood	Wheel Line	$275.64	$519.10	$243.46	$16.34	$63.61	-$47.27	$10.77	$45.25	-$34.48	$19.48	$142.23
	Improved Flood	Pivot	$275.64	$701.69	$426.05	$16.34	$1.68	$14.66	$10.77	$37.13	-$26.36	$12.04	$402.31
	Wheel Line	Pivot	$519.10	$701.69	$182.59	$63.61	$1.68	$61.93	$45.25	$37.13	$8.12	$12.04	$240.60

Pumping Scenario: Diesel Pump, Out of River ($4.65 per Gal)													
Crop	"Before" Irrigation System	"After" Irrigation System	"Before" Net Crop Revenue per Acre	"After" Net crop Revenue per Acre	Difference in Net Crop Revenue per Acre	"Before" Total Labor Cost per Acre per Year	"After" Total Labor Cost per Acre per Year	Difference in Labor Cost per Acre per Year	"Before" Total Pumping Cost per Acre per Year	"After" Total Pumping Cost per Acre per Year	Difference in Pumping Cost per Acre per Year	Typical Amortized (3% over 15 Years) Producer's Share (25%) of Cost of System Upgrade per Acre per Year (Not Including O&M Costs)	Net Benefit of the Irrigation System Improvement per Acre per Year
Alfalfa													
	Unimproved Flood	Improved Flood	$270.75	$353.25	$82.50	$32.69	$16.34	$16.35	$57.39	$57.39	$0.00	$20.10	$78.75
	Unimproved Flood	Wheel Line	$270.75	$464.25	$193.50	$32.69	$16.34	$16.35	$57.39	$241.06	-$183.67	$19.48	$6.70
	Unimproved Flood	Pivot	$270.75	$546.75	$276.00	$32.69	$1.68	$31.01	$57.39	$197.79	-$140.40	$12.04	$154.57
	Improved Flood	Wheel Line	$353.25	$464.25	$111.00	$16.34	$63.61	-$47.27	$57.39	$241.06	-$183.67	$19.48	-$139.42
	Improved Flood	Pivot	$353.25	$546.75	$193.50	$16.34	$1.68	$14.66	$57.39	$197.79	-$140.40	$12.04	$55.72
	Wheel Line	Pivot	$464.25	$546.75	$82.50	$63.61	$1.68	$61.93	$241.06	$197.79	$43.27	$12.04	$175.66
Corn for Grain													
	Unimproved Flood	Improved Flood	-$107.01	-$10.16	$96.85	$32.69	$16.34	$16.35	$57.39	$57.39	$0.00	$20.10	$93.10
	Unimproved Flood	Wheel Line	-$107.01	$118.97	$225.98	$32.69	$16.34	$16.35	$57.39	$241.06	-$183.67	$19.48	$39.18
	Unimproved Flood	Pivot	-$107.01	$215.82	$322.83	$32.69	$1.68	$31.01	$57.39	$197.79	-$140.40	$12.04	$201.40
	Improved Flood	Wheel Line	-$10.16	$118.97	$129.13	$16.34	$63.61	-$47.27	$57.39	$241.06	-$183.67	$19.48	-$121.29
	Improved Flood	Pivot	-$10.16	$215.82	$225.98	$16.34	$1.68	$14.66	$57.39	$197.79	-$140.40	$12.04	$88.20
	Wheel Line	Pivot	$118.97	$215.82	$96.85	$63.61	$1.68	$61.93	$241.06	$197.79	$43.27	$12.04	$190.01
Corn for Silage													
	Unimproved Flood	Improved Flood	$93.05	$275.64	$182.59	$32.69	$16.34	$16.35	$57.39	$57.39	$0.00	$20.10	$178.84
	Unimproved Flood	Wheel Line	$93.05	$519.10	$426.05	$32.69	$16.34	$16.35	$57.39	$241.06	-$183.67	$19.48	$239.25
	Unimproved Flood	Pivot	$93.05	$701.69	$608.64	$32.69	$1.68	$31.01	$57.39	$197.79	-$140.40	$12.04	$487.21
	Improved Flood	Wheel Line	$275.64	$519.10	$243.46	$16.34	$63.61	-$47.27	$57.39	$241.06	-$183.67	$19.48	-$6.96
	Improved Flood	Pivot	$275.64	$701.69	$426.05	$16.34	$1.68	$14.66	$57.39	$197.79	-$140.40	$12.04	$288.27
	Wheel Line	Pivot	$519.10	$701.69	$182.59	$63.61	$1.68	$61.93	$241.06	$197.79	$43.27	$12.04	$275.75

Public Costs and Benefits

There are no off-farm components—such as piped canals or laterals—planned in association with the Green River unit of the Upper Colorado River Salinity Control Program. Each acre of treatment within the project area is expected to reduce salt in the Colorado River system by an average of 3.15 tons per year. All public costs associated with the project area will be federal cost-share dollars for upgraded on-farm irrigation systems. The 75 percent federal share of the cost of installing new sprinkler irrigation systems with their necessary components is estimated as being approximately $2,500 per acre. Amortized at 4.875 percent, this translates into a cost of approximately $56 per ton for infrastructure plus an additional $37 per ton for the cost of the technical assistance (planning and design work) required to develop and implement the new irrigation systems, resulting in a total public cost of $93 per ton of salt removed.

When salinity projects are implemented, there are sometimes public environmental costs incurred in the form of lost wildlife habitat. This occurs when a canal or lateral is piped and artificial wetlands subsequently dry up. Because there is currently no plan to pipe any canals or laterals during implementation of this project, it is not anticipated that there will be any such costs incurred.

The primary purpose of the proposed action is the reduction of salt loading in the Colorado River. Current estimates provided by the Bureau of Reclamation put a monetary value of $187 on each ton of salt removed from the Colorado River.[1] This amount was calculated by estimating the dollar value of the reduction of damage to downstream water systems and crops achieved through the removal of salt from the river. The proposed action is projected to remove 3.15 tons of salt per acre per year from the Colorado River. At a public value of $187 per ton of salt removed, with a public cost of $93 per ton removed, the resulting net public benefit is estimated as being approximately equal to $94 per ton of salt removed.

At an amortized cost of $293 per acre, the total annual public cost is estimated as being $609,440 to treat 2,080 acres, assuming an 80 percent participation rate on flood-irrigated acres within the project area. The resulting reduction in salt being contributed to the Colorado River system is equal to 6,552 tons per year. The total public value of this salt reduction is equal to $1,225,224 per year. The estimated net annual public benefit for the project as a whole is $615,784.

Additional benefits that are shared between private and public interests include reduced soil erosion due to the switch to sprinkler irrigation and any other economic or natural resource benefits that might arise as a result of increased efficiency the use of irrigation water.

The National Economic Development (NED) Account

[1] *Quality of Water, Colorado River Basin, Progress Report No. 21*, Draft, U.S. Department of the Interior, January 2003

National Economic Development (NED) benefits are the value of increases in the agricultural output of the nation and the cost savings in maintaining a given level of output. The benefits include reductions in production costs and in associated costs, reduction in downstream damage costs from salinity, the value of increased production of crops, and the economic efficiency of increasing the production of crops in the project area.

Comparison of NED Costs and Benefits

Table 5. NED Costs and Benefits[2]

Evaluation Unit Where applicable, dollar figures amortized over 25 years at 4.875%	**Annual Benefits**		**Annual Costs**		**Benefit/Cost Ratio**
	Local	**National**	**Local**	**National**	
Increase in Agricultural Production Costs Increased Costs for Alfalfa and Corn Production			$97,479		
Reductions in Damage Costs Reduced Salt Damages on All Acres		$1,225,224			
Value of Increased Production of Crops Increased Revenue from Alfalfa and Corn Production	$290,060				
Implementation of Proposed Action Private Cost for System on Alfalfa and Corn Acres Only, Public Cost for System on All Acres			$101,152	$609,440	
Subtotals	$290,060	$1,225,224	$198,632	$609,440	
Totals		**$1,515,284**		**$808,072**	**1.88 : 1**

[2] Analysis does not include increased flexibility in crop types and cultivation practices, decreased damages to agricultural equipment, and other benefits not specified in the table. Participation rate assumed to be 80% of acres currently under flood irrigation. As shown in Table 4, net benefits to individual producers will vary depending on cropping decisions, pumping costs, and other farm-specific cost and revenue circumstances. Private benefits and costs related to crop production are for alfalfa and corn crops only and are based on circa 2006 analysis of project area acreages.

Appendix D

Cultural Resource Overview, Impacts Analysis, and Recommendations for the Green River Unit of the Upper Colorado River Salinity Control Area, Emery and Grand Counties, Utah

Introduction

This document provides a cultural resource overview for the Green River Unit of the Upper Colorado River Salinity Control Area in Emery and Grand Counties, Utah. The Natural Resources Conservation Service (NRCS) is proposing to upgrade on-farm delivery systems for approximately 4,900 acres of agricultural land near the town of Green River, Utah in an effort to reduce the salt loading to the Green River. The proposed project includes implementation of the following practices: Irrigation Water Conveyance (428 & 430), Irrigation Systems (441, 442 & 443), Pump Plant (533), Irrigation Pit or Reservoir (552), Irrigation Storage Reservoir (436), Pond (378), Structure for Water Control (587), Forage Harvest Management (511), Irrigation Water Management (449), and Pond Lining (521). Because NRCS plans to provide financial and technical assistance, the proposed action is an undertaking as defined by 36 CFR 800.16 (y) of the implementing regulations of Section 106 of the National Historic Preservation Act (NHPA).

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. Historic Properties are defined in 36 CFR 800.16 (l) (1) as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places… The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria." Federal agencies are required to identify historic properties that may be affected by the undertaking, assess the effects of the undertaking on historic properties, and seek ways to avoid or minimize any adverse effects on historic properties (36 CFR 800.1 [a]).

In addition to the requirements of the NHPA, cultural resources are protected by a number of other laws including the National Environmental Policy Act (NEPA). Section 101 (b) (4) requires Federal agencies to use all practicable means to "…preserve important historic, cultural, and natural aspects of our national heritage." NRCS recognizes that cultural resources are an integral part of our national heritage and acknowledges its legal obligations in historic preservation. It is NRCS policy to protect and enhance cultural resources in their original location to the fullest extent possible, and minimize adverse effects that can not be avoided through treatment of historic or cultural properties.

The purpose of this overview is to identify known cultural resources that may be impacted by the proposed project and recommend actions for further identification, evaluation, and protection efforts. To that end, a literature review was conducted in August 2008 at the Utah State Historic Preservation Office (SHPO) to identify known cultural resource sites and previous archaeological work in the Green River Unit. The results of this literature search are presented in this document. Also presented is a synopsis of the cultural history of the area as well as information about the known cultural resources of the project area. This document concludes with a discussion of the potential impacts to cultural resources from the proposed action and recommendations for protection.

Project Area and Environmental Setting

Located north of the town of Green River, Utah, the Green River Unit of the Colorado River Salinity Control Area encompasses approximately 4,900 acres of agricultural land on either side of the Green River. The project area is located on the northern periphery of the Gunnison Valley, and is bounded on the north by the Book Cliffs escarpment. Elevation in this area ranges from approximately 5,200 feet atop the Book Cliffs to approximately 4,060 feet along the Green River. Topography is characterized by steep-sided escarpments and tableland-mesa formations along the northern margins, while the southern portions of the project area are dominated by lowland areas that alternate between low hills and floodplains.

Climate in the project area is characterized by warm summers and mild winters. On average, the Green River area receives approximately 6.33 inches of moisture annually, and ranges in temperature between 22.1° F in January and 111.9° F in July. The warm summers and mild winters, combined with the low annual precipitation, has resulted in the establishment of a shadscale vegetation community. Species present include low sagebrush, saltbrush, shadscale, greasewood, and rabbitbrush. These species occur naturally throughout the project area, while additional vegetation such as tamarisk, cottonwood, and willows are present within floodplain areas adjacent to the river. Presently, much of the project area is under cultivation as agricultural land.

Geology and sediments present within the project area include Mancos Shale formations that are interspersed with alluvium gravel benches adjacent to the river and moderately-deep residual deposits. Soils throughout the project area range between sand and silt loams, while those soils closest to the river exhibit higher clay content as a result of alluvium deposition. While the outlying soils within the project area are relatively free of alkali deposits, those areas closest to the river have elevated salinity levels due to the collection of runoff from the surrounding areas as a result of agricultural development.

Cultural Context

In order to assess the periods of historical significance for the cultural resources within the boundaries of the Green River Unit of the Colorado River Salinity Control Area, it is crucial to understand specific themes, individuals, and events influential to the regions' past. It is therefore customary to prepare a cultural context that addresses the chronological and thematic framework for cultural resources that occur within the project area. The culture history is divided into two thematic periods: prehistory and history. Brief discussions of each period are presented in the following sections.

Prehistoric Overview

Humans have inhabited the general project area sporadically for at least the past 10,000-12,000 years. This time span is most expediently divided into five generally defined periods: Paleoindian, Archaic, Formative, Late Prehistoric and Historic. The specific timing and duration of these periods varies according to interpretation. However, it is possible to assign approximate temporal values by associating time periods with specific adaptive strategies.

On the northern Colorado Plateau, the Paleoindian period in this area has been assigned dates of ca. 10,000-7,800 B.C. (Schroedl 1991; Horn, Reed, and Chandler 1994). This time period is generally characterized in western North America as a period in which highly mobile bands of big game hunters subsisted primarily on now extinct Pleistocene megafauna such as woolly mammoth, camels and horses (Frison 1991; Jennings 1978). Major Paleoindian traditions include Clovis, Folsom and Plano. Documented Paleoindian sites in the region are rare and consist mostly of isolated projectile points that are clustered relatively close to the Green River (Copeland and Fike 1988).

Following the Paleoindian Period, the Archaic Period on the northern Colorado Plateau is traditionally sub-divided by Schroedl (1976) into the Black Knoll phase (7,800-5,300 B.C.), the Castle Valley phase (5,300-3,300 B.C.), the Green River phase (3,300-1,500 B.C.), and the Dirty Devil phase (1,500-300 B.C.). The Black Knoll phase (7,800-5,300 B.C.) is characterized by increasing diversity in subsistence strategies at the end of the Pleistocene period. During this phase, it is believed that populations on the northern Colorado Plateau exploited resources in both upland and lowland environmental settings through the use of a generic tool assemblage that included Pinto projectile point types (Schroedl 1976). Archaeological sites from this period appear to reflect an emphasis on hunting deer, antelope, and bighorn sheep in the upland contexts, while the lowland contexts featured harvesting plant resources. During the Castle Valley Phase (5,300-3,300 B.C.) that followed, evidence of increasingly dry climatic conditions likely necessitated the relocation of subsistence activities to lowland settings where plant and animal resources were more stable (Black and Metcalf 1986). The archaeological assemblage from this period increases in diversity as a

number of different projectile point types appear in the archaeological record, and there is also evidence for increasing use of slab-lined fire hearths. Following the Castle Valley Phase, the Green River phase (3,300-1,500 B.C.) in this area shows an increasingly diversified artifact assemblage as local inhabitants transitioned from a generalized subsistence pattern to the exploitation of locally available materials. At this time, there is evidence for an increased emphasis on hunting mountain sheep while weedy plants such as amaranths figure prominently among harvested plant resources. The Dirty Devil phase (1,500-300 B.C.) is generally a period of transition in this area to the adaptive strategies characteristic of the later Formative stage. Developments during this period include the introduction of the bow and arrow, the use of corn as a food resource, an increase in sedentism, the advent of pithouse architecture, and the increased use of storage pits. Archaeological sites from this late time period are widespread in the region and are relatively common.

The Formative Period (A.D. 150-1,200) on the northern Colorado Plateau is notable for widespread sedentism as corn-based horticulture increases throughout the area while being supplemented by hunting and gathering subsistence. During this period, reliance on domesticated plants resulted in the aggregation of populations into small sedentary or semi-sedentary settlements in areas where conditions allowed. These unique characteristics, along with the presence of Emery Gray ceramics and stone-lined pit structures, were used by Marwitt (1970) to define the San Rafael variant of Fremont Complex. While sharing characteristics with other culture patterns throughout the eastern Great Basin that have generally been ascribed to the Fremont Tradition, the San Rafael pattern differs by the dwelling and ceramic types that were used in the area, and by the use of fire pits lined with clay and flag stones. Generally, the Formative period in this region is sub-divided into the Proto-Formative phase (A.D. 150-700), the Muddy Creek phase (A.D. 700-1,000), and the Bull Creek phase (A.D. 1,000-1,200) (Black and Metcalf 1986). Throughout each period, cultural complexity becomes increasing evident in the archaeological record as populations become more sedentary and reliant on horticulture as a main economic resource. Evidence in the southern portion of the northern Colorado Plateau also suggests trade and exchange with the Anasazi to the south (Horn, Reed and Chandler 1994).

The greatest examples of the San Rafael variant are located within Nine Mile Canyon, which is a tributary of the Green River. Additional exploration of archaeological sites in Range Creek Canyon east of the project area has also highlighted the depth and extent of the San Rafael variant in the area. The end of the Formative Period and the San Rafael variant of the Fremont Complex is generally attributed to the abandonment of a horticultural economic pattern and the renewal of hunter-gatherer economics. This abandonment may have been attributed to changing environmental conditions towards the end of the Formative period, yet there were undoubtedly other factors that contributed to the return to the earlier

economic pattern. Archaeological evidence from Nine Mile Canyon and Range Creek indicates deteriorating social conditions and increased competition for resources. Storage cysts and granaries from this period are often found in inaccessible places, while structures located along prominent ridges suggest defensive posturing. The occasional discovery of burned and cut human bone in other Fremont sites may suggest an uncertain and volatile phase of prehistory that ultimately resulted in the wholesale end of a particular way of life.

The Late Prehistoric Period (A.D. 1,300-1,800) is characterized by the decline of intensive-level horticultural practices and a return to an economy based on hunting and gathering. The migration of non-farming peoples into the region has traditionally been invoked to explain cultural transitions that occurred during this period. The so-called 'Numic-Expansion' hypothesis proposes that Numic language speakers moved into the region late in the prehistoric sequence, replacing or subsuming the people already living there (Lamb 1958; Steward 1940). Generally, archaeological evidence from this period is characterized by lithic scatters, low-density ceramic scatters, sporadic use of wickiups, and the use of small side-notch projectile points (Jennings 1978). The end of this period is marked by varying quantities of Euroamerican artifacts such as sheet metal cone tinklers, tin cans, weaponry, and equestrian tack (Horn 1988).

Historical Overview

Supplemental histories of the Green River area and the northern Colorado Plateau are available for review. Among these are comprehensive books prepared by Edward A. Geary (1996) and Richard A. Firmage (1996) that summarize the history of Emery County and Grand County as part of the Utah Centennial County History Series. As only a brief history is provided for the purposes of this document, interested readers are encouraged to reference the aforementioned sources for detailed information.

The Numic-speaking Ute tribe was the dominant Native American group present in the study area when Euro-Americans first entered the region. As early as the mid eighteenth century, Spanish explorers entered southern Utah in search of trade routes in the Southwestern region of the country. The first to reach the Castle Valley area was an expedition led by Juan Maria Antonio de Rivera in 1765, and this was followed 11 years later by the now famous Dominguez-Escalante expedition (Geary 1996). Portions of the route followed by the Dominguez-Escalante expedition were incorporated into the Spanish Trail, and this trail system further opened up portions of southern and central Utah to Euroamerican exploration and trade. In particular, the Green River became heavily traveled at this time, and was frequented by French-Canadian fur trappers such as Antoine Robidoux and Etienne Provost in the early 19th century. The period of fur trapping and trading was short-lived, as declining beaver populations and

falling fur prices in the 1940s resulted in a widespread decline in the profession.

The era of fur trading and exploration was followed by exploration and survey of the area by the U.S. government. Under the direction of John C. Fremont, survey parties in 1843 and 1845 completed expeditions through the region for the U.S. Army Corps of Topographical Engineers (Geary 1996). These expeditions were followed a short-time later by the rapid settlement of the region by members of the Latter-Day Saints (LDS) Church, which constituted the first permanent Euroamerican presence in Utah. As early as 1855, Mormon settlers from Manti established a small colony at present-day Moab (Firmage 1996:79). Occupation at this colony was short-lived due to ongoing hostility with indigenous populations, and it was not until settlements in the vicinity of Price became established that permanent Euroamerican occupation of the area was solidified. In 1877, members of the Sanpete Stake in Mount Pleasant entered the Castle Valley in three primary groups to establish colonies at Huntington, Cottonwood Creek, and Ferron Creek. Meanwhile, the city of Green River began earlier in 1876 as a river crossing for U.S. mail (Geary 1996). Small farming and ranching establishments appeared along the river shortly thereafter, and the city of Green River grew dramatically after the Denver and Rio Grande Railroad established a narrow-gauge track connecting Salt Lake City and Denver in 1883 (Horn, Reed, and Chandler 1994). A rail yard was established at Green River, and the town experienced a considerable economic boom until the railroad transferred most of its operations to Helper in 1894 (Geary 1996).

Following the establishment of the railroad, cattle and sheep ranching activities became widespread in the Green River area. The combination of vast expanses of rangeland and an established railhead proved to be a vital point for livestock transportation and shipping resulted in economic development that was independent of agriculture. Agricultural developments in the vicinity of Green River were limited to the floodplains on either side of the River. Initially, water was diverted from the river through small irrigation networks to provide supplemental water. These networks were supplemented to a small degree by water wheels and steam pump stations. In 1880, farmers organized to establish the Blake City Water Ditch Company to administer the distribution of water through a series of designed waterworks and canal systems that conveyed water to a broader area (Geary 1996). The establishment of moral formalized irrigation networks resulted in agricultural expansion from subsistence farming to commercial operations. By the end of the 19th century, oat, wheat, barley, corn, and alfalfa crops all increased in production. The rich soils and warm conditions also resulted in the development of a large melon market, the seeds of which were sold as far away as France. Orchards were also started for the production of apples, cherries, peaches, apricots, pears, and plums. These benefitted considerably from the extended growing season and warm conditions afforded by the local climate.

The removal of the railroad operations to Helper in 1892 dramatically decreased to economy and population of Green River and the surrounding area. Following the transfer of railroad operations, Green River became a community primarily focused on agriculture as well as livestock ranching. This economic pattern remained consistent through the late 19th and early 20th centuries as the community endured two World Wars and the Great Depression. Following the Second World War, the economy of Green River experienced renewed growth as the onset of the Cold War and developments in nuclear technology resulted in a growing market for Uranium mining. Uranium from sources in the San Rafael swell, the Four Corners Mining District, the Henry Mountains, and Lake Powell were hauled in to the Green River area for transfer to refinement locations. In 1964, the Green River Launch complex was also established by the U.S. Air Force as a missile launching and testing area (Geary 1996). In 1970, a two-lane highway was constructed past Green River as part of the Interstate 70 highway system. As a virtual crossroads between I-70 and the previously established U.S. 6, Green River was well situated to take advantage of commerce from passing motor vehicle traffic. Presently, Green River exists primarily as an agricultural community, but the local economy is supported to a considerable degree by a growing tourist industry of road and outdoor tourism.

Previous Research

In an effort to identify known cultural resources that may be impacted as a result of this undertaking, a literature review was conducted in August 2008 to identify known cultural resource sites and previous archaeological work in the Green River Unit. These searches included a review of documentation for cultural resource projects and sites at the Utah State Historic Preservation Office (SHPO), an online review of General Land Office (GLO) plat maps from the State Office website of the Utah Bureau of Land Management, and an online review of the National Register of Historic Places (NRHP). Numerous cultural resource inventories have been conducted within or near the Green River Unit of the Upper Colorado River Salinity Control Area. These inventories resulted in the identification of 26 cultural resource sites as shown in Table 1.

Table 1. Cultural Resources Identified in Association with the Green River Unit of the Upper Colorado River Salinity Control Area

Site Number	Site Type		NRHP Eligibility
42GR000507	Prehistoric	Prehistoric lithic debris scatter	Unevaluated
42GR000508	Prehistoric	Prehistoric lithic debris and tool scatter	Unevaluated
42GR000509	Prehistoric	Prehistoric lithic debris scatter	Unevaluated
42GR000801	Prehistoric	Prehistoric lithic debris scatter	Unevaluated
42GR000802	Prehistoric	Prehistoric lithic debris scatter	Unevaluated
42GR001061	Prehistoric	Prehistoric lithic debris and groundstone tool scatter, campsite	Eligible
42GR002082	Historic	Historical residential trash dump piles	Not Eligible
42GR002083	Historic	Two historical rock cairns	Not Eligible

Table 1. Cultural Resources Identified in Association with the Green River Unit of the Upper Colorado River Salinity Control Area

Site Number	Site Type		NRHP Eligibility
42GR002551	Prehistoric	Prehistoric encampment with thermal features, lithic debris, groundstone	Eligible
42GR002552	Historic	Historical structure debris, trash scatter	Not Eligible
42GR002553	Historic	Historical structure foundation	Not Eligible
42GR002554	Prehistoric	Prehistoric lithic debris scatter	Eligible
42GR002555	Prehistoric	Prehistoric lithic debris scatter	Eligible
42GR002556	Prehistoric	Prehistoric lithic debris and tool scatter	Eligible
42GR002557	Prehistoric	Prehistoric lithic debris scatter	Eligible
42GR002558	Prehistoric	Prehistoric lithic debris and groundstone tool scatter, campsite	Eligible
42GR002559	Prehistoric	Prehistoric lithic debris and tool scatter	Eligible
42GR002560	Historic	Historical House Foundation, Cistern, debris scatter	Not Eligible
42GR002561	Prehistoric	Prehistoric lithic debris and tool scatter	Eligible
42GR002562	Prehistoric	Prehistoric lithic debris and tool scatter	Eligible
42GR002563	Historic	Historical homestead	Not Eligible
42GR002651	Historic	Historical Highway alignment from the original US 50/6	Eligible
42GR002907	Historic	Historical trash dump	Not Eligible
42GR002908	Historic	Historical debris scatter from a probable sheep camp	Not Eligible
42GR003271	Historic	Historical debris scatter	Eligible
1989-01-05	Historic	Green River Presbyterian Church	NR Listed

Known and Suspected Cultural Resource Sites in the Green River Unit of the Upper Colorado River Salinity Control Area

The archaeological record in the vicinity of the Green River Unit spans thousands of years, ranging from the Paleo-Indian Period to the historic Period. While the study area has largely been brought under cultivation and modern agricultural use, there remains some potential for encountering previously unknown cultural resources. Literature reviews indicate that 26 known archaeological sites have been recorded within the boundaries of the study area. The prehistoric sites that are present consist primarily of lithic debris and tool scatters, and some show evidence of extended occupation judging from the presence of groundstone artifacts and thermal features. Historical sites that have been identified in the study area include historical debris scatters and remnant historical structures. The Green River Presbyterian church is the only site within the study area that is listed on the NRHP.

Based on the number of cultural resource sites that have been identified within the study area, it is reasonable to expect that additional cultural resources are present. For prehistoric cultural resources, it is expected that additional sites would be present in areas of low to moderate surface disturbance. For historical resources, a cursory review of GLO plat maps indicates the presence of several historic farms, residences and irrigation networks within the project area. As such, there is potential that these may be present at certain locations within the study area. At present, much of the Green River Unit has been developed for agricultural use, reducing the probability for encountering cultural resources due to the

extent of farming. The construction of Flaming Gorge Reservoir in the 1950s has also impacted the Green River Unit by altering stream flows and flooding cycles, thus eroding locations that may have once contained cultural resources. Despite these impacts, there remains potential for encountering previously undiscovered cultural resources.

In general, the literature review for previous cultural resource projects and sites indicates that most of the Green River Unit has not been extensively inventoried for cultural resources. This is primarily due to the fact that most of the land within the study area is privately-owned and is under cultivation at present. These inventories that have occurred have primarily been restricted to linear inventories associated with road development, fence lines, geophysical studies, transmission lines, or water pipelines. Block surveys have been conducted within the study area, though these are few in number and are often less than 100 acres in size. Based on the reviews, it is estimated that less than 15% of the Green River Unit has been examined for cultural resources.

Identification of Traditional Cultural Properties

The NRCS National Cultural Resources Procedures Handbook defines Traditional Cultural Properties (TCP) as: properties [that are] associated with cultural practices or beliefs of a living community that are rooted in the history of the community, and are important in maintaining the continuing [the] cultural identity of the community. TCPs may be determined eligible for the NRHP, and as such, are considered under the [National Historic Preservation Act] Section 106 process. Examples of TCPs include: 1) locations where Native American or other groups traditionally gather wild foods or medicines; 2) ethnic neighborhoods whose cultural character is important to those who live in them; 3) rural landscapes reflecting traditional patterns of agriculture or social interaction; and 4) landforms associated with Native American traditions and religious practices.

NRCS, Utah has identified federally-recognized Native American tribes that may have traditional cultural ties to lands within or in the vicinity of the project area. Initial consultation letters and project maps will be sent to the tribes requesting assistance in identifying any traditional cultural properties that may be affected by the proposed project.

Potential Impacts to Historic Properties as a Result of Development in the Green River Unit of the Upper Colorado River Salinity Control Area

Proposed Salinity Control practices and activities receiving state or federal funding are subject to review for cultural resources under under UCA 9-8-404, Section 106 of the NHPA, and in 36CFR 800 as appropriate. These laws mandate a process of consultation to identify historic properties that may potentially be affected by State or federal undertakings, and to seek ways to avoid or minimize any adverse effects to historic properties prior to

the expenditure of state or federal funding or any permits necessary for the completion of the work.

Typically, the process of compliance with Section 106 involves an archival review for information on historic properties located in the vicinity of the project area, an intensive-level pedestrian inventory of the area of potential effects (APE) by an archaeologist meeting Qualification Standards of the current Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation, and the preparation of a report detailing the results of the review and inventory. If no historic properties are affected as a result of the undertaking, the project may proceed as planned. If it is found that historic properties will be affected as a result of the undertaking, state and federal law mandates that consultation occur among appropriate consulting parties (i.e., the Utah SHPO, Native American Tribes, local groups, etc.) to resolve adverse affects.

In 2002, a state-level agreement between the NRCS and the Utah SHPO was reached and signed in a Memorandum or Understanding (MOU). This MOU stipulated that trained NRCS field personnel may be used to conduct limited cultural resource inventories for NRCS undertakings on private land, and further stipulated practices conducted by NRCS that are or are not subject to review for cultural resources. In addition, the MOU noted the standard procedures for cultural resource documentation on NRCS projects, and established a 65-foot (20 meter) buffer zone around cultural resource boundaries for avoidance purposes.

Proposed Action

Under the proposed action, previously recorded and newly identified cultural resources would not be impacted since the undertakings- both individually and as a whole -will require compliance with Section 106 of the NHPA. Further, these undertakings would require compliance with the current MOU between NRCS and SHPO that requires pedestrian inventories for those practices subject to cultural resource reviews, and avoidance of identified cultural resources during project implementation.

In the event that adverse effects to historic properties cannot be avoided, NRCS will conduct consultation with the Utah SHPO and other consulting parties to resolve issue of adverse effects following the protocols established in Section 106 of the NHPA. In the event of archaeological discoveries during project implementation, or in the event that human remains are encountered, NRCS will follow procedures established in the MOU and the NRCS National Cultural Resources Handbook for the protection and treatment of cultural resources until the issue is resolved.

No Action Alternative

Under the no action alternative, cultural resources would not be directly impacted beyond current levels. The impacts to cultural resources from natural geomorphic processes, current land practices, and artifact collection would continue.

REFERENCES

Black, K.D and M.D. Metcalf
1986 ***The Castle Valley Archaeological Project: An Inventory and Predictive Model of Selected Tracts*. Utah Bureau of Land Management Cultural Resource Series No. 19. Department of the Interior, Bureau of Land Management, Utah State Office, Salt Lake City.**

Copeland J.E. and R.E. Fike
1988 Fluted Projectile Points in Utah. *Utah Archaeology*

Firmage, Richard A.
1996 A History of Grand County. Utah Division of State History, Utah Centennial County History Series. Utah State Historical Society, Salt Lake City.

Frison, G.C.
1978 *Prehistoric Hunters of the High Plains*. Academic Press, New York.

Geary, Edward A.
1996 A History of Emery County. Utah Division of State History, Utah Centennial County History Series. Utah State Historical Society, Salt Lake City.

Horn, J.C.
1988 Euro-American Goods in the Material Culture of the Ute Prior to 1892. In *Archaeology of the Eastern Ute: A Symposium*, Paul Nickens (ed.) pp. 54-61. Colorado Council of Professional Archaeologists Occasional Papers No. 1, Denver, Colorado.

Horn, J.C., A.D. Reed, and S.M. Chandler
1994 *Grand Resource Area Class I Cultural Resource Inventory*. Document Prepared for the Utah Bureau of Land Management, Moab Field Office. Alpine Archaeological Consultants, Inc. Montrose, Colorado.

Jennings, J.D.
1978 *Prehistory of Utah and the Eastern Great Basin*. University of Utah Anthropological Papers No. 98. University of Utah, Salt Lake City.

Lamb, S.
1958 Linguistic Prehistory in the Great Basin. *International Journal of American Linguistics* 24(2):95-100.

Schroedl, A.R.
1976 *The Archaic of the Northern Colorado Plateau*. Unpublished PH.D. Dissertation, Department of Anthropology, University of Utah, Salt Lake City.
1991 Paleo-Indian Occupation in the Eastern Great Basin and Northern Colorado Plateau. *Utah Archaeology* 4(1).

Steward, J.H.
1940 ***Basin-Plateau SocioPolitical Groups*. United States Bureau of American Indian Ethnology Bulletin No. 120. Smithsonian Institution, Washington D.C.**

Appendix E

Green River Salinity Control Area

Public Scoping Meeting

May 24, 2004 Green River City Hall

- Meeting commenced at 6:02 p.m.
- Meeting proceeded with introductions
- Gary Roeder explained the need for the Scoping meeting and why Green River is being considered
- Robert King (DEQ) explained the history and need for the Salinity Program
- Gary touched on the BOR role in the Salinity Program
- Gary turned the floor over to the meeting body for concerns
- Gary discussed how the salts reach the river through excess irrigation
- Gary identified that USGS will do the preliminary salt loading numbers and water budget
- Gary explained that the project's success depends on community support because ultimately they are the ones that live with the project
- Gary asked that they please touch on SWAPA
- Gary discussed irrigation efficiency and the minimum efficiency requirements to meet the Salinity Guidelines i.e. drip tape, pivots, wheel lines, graded border, etc

Community Concerns

Water Quality

- Sediment in water supply is a real problem in the spring time, as it damages pumps, sprinkler heads, and causes sedimentation on heads of fields
- Clays sediments are filling furrows and ditches and results in high maintenance costs; cleaning time is down time, financial cost is $20,000 a year per canal
- 100% of irrigation shares' assessment is going to maintenance
- Sedimentation is thought to cause up to 50% loss in ditch capacity
- Overflows cause mosquito habitat which leads to increased danger of West Nile virus
- Green River water is laden with minerals and contaminants, which is a concern as it is used for culinary supply for the city
- Irrigation water is contributing to down stream salinity
- Weed seeds are carried in open ditches
- Community feels political pressure to help solve the salinity problem downstream, which results in concern about state or federal regulations
- Contaminant loading of on field soils, especially salt loading
- Salty groundwater
- Biological contamination, organics

Water Quantity

- Concern about the ability to get allowed diversion from the Green River, since the Raceway Canal diversion structure is an ongoing maintenance problem
- Irrigation diversion into the Thayn Canal is in conflict with diversion at the hydroelectric generation structure
- Concern that some agreement can be reached
- There are inefficiencies in irrigation systems, mostly in the delivery system. There is significant loss from seepage in canal, although the amount has not been quantified
- Producers are forced to over water the tops of fields
- Water forecast for future does not look outstanding

Soils

- Heavy Soil, varying soil types make it difficult to irrigate, forces inefficient irrigation
- Soil nutrients move through the soil profile, as a result of deep percolation and use of tail water for irrigation
- Fertilizers are less effective than they should be in the current application, leading to increased use of or wasted fertilizers, which is expensive
- There is a high level of alkali or salt affected soils, which leads to alkali and salt loading on farm
- High water tables compound the problem of salt affected soils
- Improved irrigation techniques could increase the number of farmable acres

Air Quality

- Croplands in the area are highly erodable; high wind erosion area (Food Security Act)
- Air quality is compromised by wind erosion of soils; burning ditch lines to control weeds leads to smoke in the area

Plant Concerns

- Noxious weeds (Knapweed, Russian Olive, Goatheads, Plantain) are a concern and open ditches are a transport mechanism
- Salt water damages crops, resulting in more than a 10% decrease in yields
- Water quantity limits productivity by more than 20% Green River produces 6-7 tons/ acre per year
- Markets limit what producers are able to grow and sell
- Insect control affects productivity and yields
- Wildlife (raccoons, ravens, turkeys) impacts crops, decreases yields
- Animal wastes return to river
- Low yields result in lack of feed for animals, so producers have to buy feed for animals
- West Nile virus is impacting the horse population, which could be serious concern for the human population
- Some in the community think that the mosquito problem is compounded in nutrified warm water, such as tail water

- Risks associated with canals (death or injury by drowning, electrocution) result in higher insurance premiums and liability
- Open canals pose a danger for livestock and pets drowning in canals
- Endangered species in Green River, such as the pike minnow
- Concern for threatened & endangered species in canal system

Social and Economic Concerns

- It takes a day job to supplement income from farming
- Sustainability of an agricultural economy is questionable
- Community sustainability, economic development are concerns of the community
- Drainage and storm water issues are having a negative impact on homes and property
- There is a concern over whether people can work together on a project like salinity control
- Operating costs of new irrigation systems are a concern

People who should be involved in project planning

- Canal Companies
- SCD Boards
- City Council/ Mayors
- Get project's objectives and goals established, then use them as guidelines through the challenges that come up

Meeting was adjourned at 8:00 p.m.

Appendix F

Response to Comments submitted to the Draft EA, Green River Unit of the Upper Colorado River Salinity Control Area, Emery and Grand Counties, Utah

This Appendix was prepared to document and respond to comments submitted to circulation of the draft EA for the Green River Unit of the Upper Colorado River Salinity Control Area. NEPA regulations require federal agencies to consider all comments submitted to an EA and the associated Proposed Action. In the case of this EA, all comments from the public as well as partner agencies were considered. Some comments that were made offered editorial suggestions or asked for clarification in the final EA; if applicable, such suggestions were accepted and incorporated into the final EA. Those comments (and where applicable, their responses) are contained in the project record. Those comments that raised questions about the validity or accuracy of the EA or the analysis therein are included here, with a response. The commenter is identified, and their comment or concern has been excerpted from their letter and included in this document.

1. Where in the Purpose and/or Need sections does the EA ever indicate how many acres are being proposed for treatment? The information sheet (page 2) cannot be used as a substitute to disclose the Proposed Action. (BLM, Vernal Field Office)
Response: *Please see description of the Proposed Action (Section 2.1) for the number of acres proposed for treatment.*

2. The NRCS Rapid Watershed Assessment [RWA] (HUC # 1406008 – Lower Green River) dated March 2007 contradicts the [Green River] EA… Page 1 of this report [RWA]… states that "there are 747 acres of Prime farmland if those acres are irrigated."… Unfortunately, neither the map nor the text [in the RWA] indicates where these potential acres are located. The [Green River] EA does not indicate whether or not any unique farmland lies within the project area, and if so, how many acres there are…. (BLM, Vernal Field Office)
Response: *The majority of the acreage so mapped in the RWA is desert, without irrigation, and hence not Farmland of Statewide Importance. Furthermore, Farmland Classification is the sole responsibility of NRCS Soils staff, who assert that under technical definitions, there are no Prime or Unique Farmlands and no Farmlands of Statewide importance in the study area, regardless of potential sited in the RWA.*

3. The HUC [RWA] identifies a far greater number of at-risk species than what is listed in Appendix B (i.e. Mexican Spotted Owl, Sage grouse, etc.). Further, you have the bald eagle listed as a state sensitive species, but the HUC says it is Federal threatened. In short, it appears that there are a number of items found in the HUC that are either ignored or contradict what is found in the EA. Was the data from the HUC… considered/consulted in the preparation of the EA? (BLM, Vernal Field Office)

Response: *The Bald Eagle is no longer listed as threatened under the ESA. The data in the HUC that the commenter is referring to is likely the RWA (HUC# 1406008 – Lower Green River), created by the NRCS Utah State Office in March 2007. That assessment covers a much larger area than the Area of Interest (AOI) for the Green River EA. When creating the biological assessment (BA) for this project, NRCS focused specifically on the AOI and completed detailed species searches through the Utah Natural Heritage Database, USFWS, and DWR. Short of on-ground surveys and sampling all parts of the AOI, the methods used to prepare the BA represent the most comprehensive resource for threatened and endangered species NRCS has available. These searches fulfill the requirements of NEPA.*

4. Why are black-footed ferret listed in Table 3 as "extirpated"? The BA acknowledges that they have been reintroduced into Utah. I believe that the correct status is: 10J experimental… Have any ferrets been reintroduced into the prairie dog colonies that lie within the project area? (BLM, Vernal Field Office)
Response: *The Black Footed Ferret is considered Extirpated in the two counties within the Green River EA: Grand and Emery Counties. The experimental populations are located in Uintah County.*

5. In light that a Biological Assessment (Appendix B) was created, is any sort of consultation with USFWS proposed? Does the USFWS concur with your "not likely to adversely affect" conclusion. (BLM, Vernal Field Office)
Response: *An EIS will be prepared if USFWS does not concur with the not likely to adversely affect conclusion.*

6. The EA as well as Appendix D state: "Under the proposed action, previously recorded and newly identified cultural resources would not be impacted since the undertakings-both individually and as a whole -will require compliance with Section 106 of the NHPA." Wouldn't the Section 106 protection also apply to the No Action alternative? The way this reads, the protection only takes affect if the Proposed Action is selected. (BLM, Vernal Field Office)
Response: *Under the regulations of NEPA and NHPA, Section 106 protection would apply if a federal agency (NRCS in this case) funds implementation of improved irrigation systems. The same process and protection would not apply if landowners take actions on their own (without federal funding) to improve irrigation systems.*

7. Is there a report that supports the 84% (wheel line) and 91% (center pivot) sprinkler system reduction numbers described in section 1.3? (BLM, Vernal Field Office)
Response: *Much of the info for water efficiency and water use come from previous NRCS experience with EQIP practices and salinity control projects. See specifically: Colorado River Basin Salinity Control Program, Uintah Basin Unit, 2007 Monitoring and Evaluation Report;Colorado River Basin Salinity Control Program, Price – San Rafael Rivers Unit, 2007 Monitoring and Evaluation Report;Colorado River Basin Salinity Control Program, Manila - Washam Unit, 2007 Monitoring and Evaluation Report*

8. If the [salinity] reduction numbers in section 1.3 are correct, why does the Proposed Action (page 15) assume that wheel lines will only be 65% [efficient] and center pivots 75% [efficient]? (BLM, Vernal Field Office)
Response: *Irrigation Application Efficiency and percentage salt load reduction are two entirely different entities. Irrigation Application Efficiency is the consumptive use of the crop/the water delivered. Efficiency is only part of the calculation of salt load reduction. Salt load is the best estimate of the tons of salt flowing into the river, from agricultural operations. Salt load reduction, in this citation, is the percentage decrease in original salt loading due to improved application efficiency, distribution uniformity, yield improvement, elimination of runoff, and changes in phreatophyte consumption. The 84% and 91% reductions represent long term averages arrived at by monitoring installation of salinity control practices (sprinklers) over 29 years of the salinity control program and represent the best judgment of NRCS technical experts from three states.*

9. Where does the assumption that 1,400 acres are loading 15% of their salt load or 750 tons/year come from?... If 1,400 acres generates 15% of the pre-treated salt load or 750 tons/year (i.e., 1.87 ton/acre-year), why do the remaining 2,600 produce 9,250 tons at a rate of 3.56 tons/acre-year? (BLM, Vernal Field Office)
Response: *1,400 acres are contributing 15% of their original salt loading (0.54 tons/acre per year post-treatment vs. 3.56 tons/acre per year pre-treatment), not 15% of the present total salt loading. Present salt loading from untreated acreage is 9250 tons of salt/2600 untreated acres=3.56 tons/acre. The final EA will be revised to better explain the relationships between acres treated previously and acres eligible for treatment, as well as percentage of salt loading pre- and post-treatment.*

10. How many of the 1,400 acres overlap the 2,080 acres that make up the Proposed Plan? (BLM, Vernal Field Office)
Response: *None, the 1,400 acres referred to are already using sprinkler or other improved irrigation practices. They are not part of the 2,080 acres referred to in the Proposed Action. The final EA will be revised to better explain the relationships between acres treated previously and acres eligible for treatment.*

How many of the 2,600 acres overlap the 2,080 acres that make up the Proposed Action? (BLM, Vernal Field Office)
Response: *2,080 acres is the 80% subset of 2,600 acres. The final EA will be revised to better explain the relationships between acres treated previously and acres eligible for treatment.*

Would it be possible to make up a map to show where the 1,400 and the 2,600 acre areas [referenced in the Proposed Action , Section 2.1) are within the Proposed Action? (BLM, Vernal Field Office)
Response: *No, it is not possible. Participation in this project is entirely on fee (private) land and is voluntary. It is not known at this time who will and who will not wish to participate, nor the participating acreage.*

11. On page 15 [of the Green River EA], the Proposed Action says that the area consists of 2,080 acres. Three paragraphs later, it says that "Irrigated acreage within the project area will in all likelihood remain stable at 4,900 acres." Which project area figure is correct: 2,080 or 4,900? (BLM, Vernal Field Office)
Response: *Total number of irrigated acres in the project area is 4,900. Number of acres within that 4,900 that are eligible for EQIP funding under the Proposed Action is 2,600; number of acres within that 2,600 that are expected to take advantage of EQIP funding is 2080, or 80% of 2,600.*

12. Page 15: How is the 6,540 ton annual salt loading reduction determined? Does this figure assume that all 2,080 will be treated or only "up to 80%" (i.e. 80/2,080 = 1,664 acres)? Is the 6,540 achieved only after the end of the 5-year project? (BLM, Vernal Field Office)
Response: *The estimated salt load reduction is based on an assumption that 80% of eligible acreage will participate in the program. 80% is based on experience in the Uintah Basin Unit. The actual percentage of voluntary participation and the time required to achieve it are both best estimates based on experience in other salinity control units. The 6,540 ton annual salt loading reduction is the amount that will be realized after 80% of the eligible acreage (2,080 acres of the 2,600 eligible acres) have converted from unimproved flood irrigation to sprinklers or center pivots, assuming a percentage salinity reduction of 85%.*

13. Why propose a project that will treat up to 80% of the area proposed? Is there any possibility that the project will reach the 100% treatment level? (BLM, Vernal Field Office)
Response: *Participation is on private land and is purely voluntary. The 80% figure is based on producer participation in other salinity reduction projects in the region.*

14. Why aren't the entire 4,900 acres that lie in the project area being considered for treatment? It would seem that the point of the project is to reduce as much salt loading as possible, wouldn't it make more sense to treat more acres so that salt loading is reduced even more? (BLM, Vernal Field Office)
Response: *1,400 acres are already under sprinkler irrigation and would not benefit from additional treatment. Participation is on private land and is voluntary. NRCS controls no land and cannot force treatment on anyone. All historically irrigated acres not currently under sprinklers (2,600 acres) are eligible for participation.*

15. Where does the $8.7 million figure come from? Is this the amount that has been set aside for the project?... How much of the $8.7 million goes towards financial assistance (FA) and how much for technical assistance (TA)? (BLM, Vernal Field Office)
Response: *$8.7 million is an estimate of the total project cost. No funds have yet been set aside for this project. The EA is being written to qualify the Green River, Utah Unit for participation in annual salinity control funding that is allocated annually, by state, to cover all salinity units, and may or may not be available in a given time frame. TA will be used for Environment Assessments, planning, design, construction inspection, certification, contract creation and monitoring, performance monitoring and evaluation,*

etc. FA will cover equipment and installation costs. 60% of the $8.7 million is for financial assistance and 40% is for technical assistance.

16. $4,182/acre seems very expensive farmland treatment. What is specifically being done to the land that justifies such a high cost/acre? (BLM, Vernal Field Office)
Response: *The cost/acre is based on historical costs of installing sprinklers and associated settling ponds, pumps, pipelines, power, etc. in other salinity control projects undertaken by NRCS. The money is many individual grants.*

17. The evaporation estimates comparing flood irrigation and sprinkler irrigation are identical. Some hydrologists assert that sprinklers will lose at least 10% more water to evaporation than does flood irrigation. (Utah Department of Natural Resources)
Response: *For the purposes of this study, 5% evaporation was used for surface and 10% for sprinkler, as the commenter points out. However, efficiency under sprinklers increases by a factor of 2, from 35% to 70%. 5% of the total diversion required at 35% efficiency is exactly the same as 10% of the diversion required at 70% efficiency.*

Consider this: flooding puts a lot of water on the ground for several days. If 5% of the water evaporates when the ground is wet, that could easily be more than when sprinkling. Sprinkling only covers the same area of ground about a tenth of the time. A typical wheel line is moved every 12 hours, maybe 20 times in an irrigation cycle. Evaporation occurs at a higher rate under the sprinklers, but at a much lower rate on the 90% of the field that is not being sprinkled.

18. The EA seems to assume that deep percolation is lost. It is in fact, returned to the system fairly efficiently and becomes an important part of conjunctive management. (Utah Department of Natural Resources)
Response: *The EA does not assert that deep percolation is lost; rather, that most of the deep percolation returns to the Green River laden with dissolved salts.*

19. Some irrigators in Green River assert that melons cannot tolerate sprinkler irrigation. [Is the] acreage for conversion [in the Green River EA] …all alfalfa and grains? (Utah Department of Natural Resources)
Response: *Melons are a very small portion of the crop in Green River. Very few farmers raise them. NRCS is not requiring sprinklers of any producer, only offering it as a practice that qualifies for EQIP funding. While much of the irrigated acreage in the area is planted in alfalfa or corn in any given year, some acreage is indeed planted with melons. Melon producers will likely opt to use another approved practice that qualifies for EQIP funding. That could include drip irrigation, LEPA (using hoses or socks on a pivot to deliver water to the ground), or other higher efficiency systems such as flooding with gated pipe. Just as wheel lines do not work well in tall corn, producers must decide what makes sense for their situation in order to voluntarily receive federal financial assistance for irrigation.*

20. We feel it is crucial that livestock water on the surrounding allotments be covered and planned for in the original environmental assessment. (Green River Conservation District)
Response: *The proposed project applies only to private lands, not to state or federal grazing allotments. Water sources on adjacent grazing allotments would not be adversely affected.*

Additionally, the Proposed Action does not deal with off-farm delivery systems and no proposal is made to terminate any water delivery. If stock water rights exist in the canal system, they will be unaffected by the preferred plan. On-farm irrigation plans may include a stock watering component, if the participating producer owns stock water rights and stock watering is part of the present irrigation operation. However, NRCS has no authority to grant new water rights or to fund non-salinity (or stock water only) projects with salinity control funds.