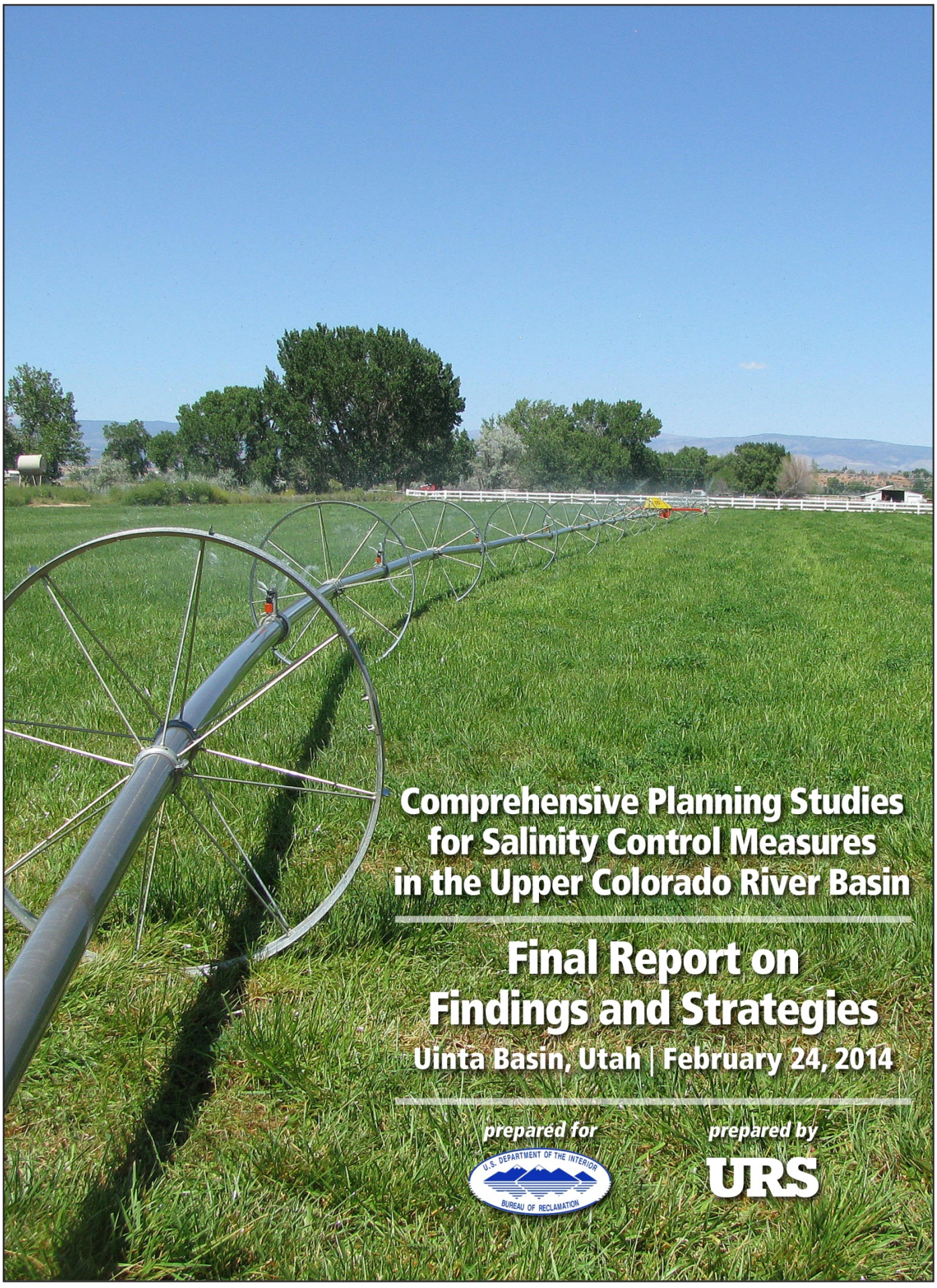

Comprehensive Planning Studies for Salinity Control Measures in the Upper Colorado River Basin

Final Report on Findings and Strategies

Uinta Basin, Utah | February 24, 2014

prepared for

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

prepared by

URS

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Comprehensive Planning Studies for Salinity Control Measure in the Upper Colorado River Basin

Task Order R12PD40031 – Uinta Basin

Cover Photo Credit: photo by Mark Monsen, NRCS, August, 2009 near Roosevelt, farm owned by Jim Lisonbee.

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List of Abbreviations/Acronyms

BIA – United States Bureau of Indian Affairs
BLM – Bureau of Land Management
BSP – Basin States Program
CRBSCF – Colorado River Basin Salinity Control Forum
DCWCD – Duchesne County Water Conservancy District
EQIP – Environmental Quality Incentives Program
FOA – Funding Opportunity Announcement
M&E – Monitoring and Evaluation
NRCS – Natural Resources Conservation Service
Reclamation – United States Bureau of Reclamation
UACD – Utah Association of Conservation Districts
UDAF – Utah Department of Agriculture and Food
UDWR – Utah Department of Water Resources
UIIP – Uintah Indian Irrigation Project
USDA – United States Department of Agriculture
USGS – United States Geological Survey
USU – Utah State University
UWCD – Uintah Water Conservancy District
WRLU – Water Resources 2012 GIS water related land use data

Executive Summary

The United States Bureau of Reclamation (Reclamation) has authorized a comprehensive planning study for salinity control measures within the Uinta Basin. Both an advisory council and a study team were selected to oversee and direct the study. The Uinta Basin Salinity Study Team consists of staff members from federal and state agencies, water resource managers, and local stakeholders involved with the Salinity Control Program in the Uinta Basin. For this study, the Salinity Control Program refers to the efforts of the Reclamation, Natural Resource Conservation Service (NRCS), and Basin States Program (BSP) to control salinity. The Study Team developed the study purpose and objectives and provided guidance to URS during the study.

The purpose of this study is to identify and prioritize cost effective salinity control opportunities, identify impediments to these opportunities, and to describe how a variety of control measures might be best implemented in a coordinated manner to maximize local and basin-wide benefits in cooperation with other potential funding partners in the Upper Colorado River Basin.

Study Objectives

The study objectives are:

1. Identify and summarize information regarding sources of salinity in the basin. Much information concerning the sources of salinity in the basin is available through Reclamation, NRCS and UDWR. New technical studies into salinity sources are not an objective of this study.
2. Identify and summarize salinity control accomplishments. Much information is available as to accomplishments from Reclamation, NRCS, and the UDAF and UDWR. All significant canals have been mapped in the Uinta Basin. Reclamation can identify the canals that have been piped or lined by its program. NRCS can provide a numerical summary of on-farm improvements accomplished to date by their Environmental Quality Incentive Program (EQIP) by county. NRCS cannot, however, provide site-specific data. Site-specific data was not investigated.
3. Identify and prioritize future salinity control opportunities. Identify ways to optimize off-farm delivery system improvements so as to enhance on-farm participation by producers.
4. Identify impediments to full implementation of the Salinity Control Program, both off-farm and on-farm. Impediments considered are physical, technical, social, cultural, and/or economic in nature. While many impediments are likely common to all irrigation systems, certain impediments are anticipated to be unique to the Uinta Basin.
5. Identify strategies that move the salinity control program forward in the Uinta Basin. Salinity control strategies can only be adopted and moved forward by the authorized implementing agencies. Due to limited time and funds this study effort focuses on implementation of the program and identification of technical and data needs rather than performing additional scientific investigation.

Assessment

The Team of URS, Keller-Bleisner Engineering and Colorado Water Institute was contracted in August 2012 to conduct the above assessment of the salinity control program in the Uinta Basin and to provide strategies to move the program forward. Participation in salinity control projects in the Uinta Basin has been ongoing since the late 1970s. Consequently, only 40 percent of the irrigated acreage remains untreated. Off-farm improvements have been actively implemented since 1999 and approximately 37 percent of the canals have been treated.

Participation rates in the Salinity Control Program by the Ute Tribe and its members have been significantly lower than participation rates by other agricultural producers. This can be attributed to a greater percentage of tribal members and their leadership valuing wildlife and wildlife habitat and winter stock watering over agricultural production. Of the remaining 1,077 miles of untreated canals in the Uinta Basin, approximately 800 miles are either BIA canals (Uintah Indian Irrigation Project) or canals that pass over Ute controlled lands.

The treatments of non-Ute lands and canals through the Uinta Basin Salinity Control Program are mature, having completed significant portions of the on-farm and much of the canal treatments. Many of the remaining non-Ute lands and canals are the more difficult to treat or many agricultural producers have justifiable reasons for not participating in irrigation improvement projects. Although 1,077 miles of the 1,761 total miles in the Uinta Basin remain untreated, only approximately 269 miles remain that do not require participation by the Ute Tribe. Approximately half of this total is in the Vernal area where on-farm treatment is essentially completed.

The URS study team interviewed 44 individuals located in the Uinta Basin representing all the principal regions of the study area. In addition, the team made presentations to the two county water conservation districts, the Uintah Indian Irrigation Project Board and to the Ute Tribe Business Committee. An additional 8 agency staff outside the Uinta Basin were interviewed. By the conclusion of this project, the Team will have also conducted separate focus group meetings with agricultural producers, agency staff and the Ute Tribe Water Commission. The URS team will have also met with the Uinta Basin Salinity Study Team four times to present project scope and findings.

Findings and Strategies

The URS team was tasked with identifying impediments to the Salinity Control Program and strategies to overcome those impediments. This document describes issues and strategies to address those issues. The views, conclusions and recommendations presented are those of the authors and do not necessarily represent the position of the US Government, Bureau of Reclamation, Natural Resources Conservation Service or the Salinity Control Program. Publication of this document does not provide endorsement of the report's findings or recommendations and is intended solely for the purpose of sharing information and ideas with the public. There were 22 issues identified and 44 strategies developed to address them. The most promising strategies to consider are:

1. Engage the Ute Tribe and its members to identify non-irrigation projects that meet salinity goals.

2. Consider a Focused Funding Opportunity Announcement (FOA) for the Ute Tribe that could include both irrigation improvements and non-irrigation improvements.

3. Receive feedback from the Ute Tribe through its water resource engineer and appointed liaison.

4. Increase non-federal funding sources, State and Ute Tribe, to spread the costs of local cost share.

5. Increase local planning efforts to identify most cost effective projects and plan smarter ways to compete for federal funds. Seek federal planning funds such as WaterSmart funding.

6. Leverage non-salinity funds such as Ute Settlement, Mitigation Commission and State Revolving Loan funds to supplement local increases in local cost sharing to make projects more competitive for FOA funding.

7. Ute Tribe contracting for on-farm improvements to lessen cost-share and remove impediments to treatment of leased lands.

In summary, advancing the Salinity Control Program in the Uinta Basin at the levels historically experienced will be challenging. Moving the program towards greater local funding of off-farm projects and engaging the Ute Tribe will be the two most important changes needed to meet those challenges.

I. Introduction

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Both an advisory council and a study team were selected to oversee and direct the study. The Uinta Basin Salinity Study Team consists of staff members from federal and state agencies, water resource managers, and local stakeholders involved with the Salinity Control Program in the Uinta Basin. For this study, the Salinity Control Program refers to the efforts of the Reclamation, Natural Resource Conservation Service (NRCS), and Basin States Program (BSP) to control salinity. The Study Team developed the study purpose and objectives and provided guidance to URS during the study. The Study Team members represent:

- Reclamation
- NRCS
- United States Geological Survey (USGS)
- United States Bureau of Indian Affairs (BIA)
- Utah Department of Water Resources (UDWR)
- Utah Department of Agriculture and Food (UDAF)
- Ute Indian Tribe
- Duchesne County Water Conservancy District (DCWCD)
- Uintah Water Conservancy District (UWCD)
- Colorado River Basin Salinity Control Forum (CRBSCF)

I.1 Study Objectives

The study objectives are:

1. Identify and summarize information regarding sources of salinity in the basin. Much information concerning the sources of salinity in the basin is available through Reclamation, NRCS and UDWR. New technical studies into salinity sources are not an objective of this study.
2. Identify and summarize salinity control accomplishments. Much information is available as to accomplishments from Reclamation, NRCS, and the UDAF and UDWR. All significant canals have been mapped in the Uinta Basin. Reclamation can identify the canals that have been piped or lined by its program. NRCS can provide a numerical summary of on-farm improvements accomplished to date by their EQIP by county. NRCS cannot, however, provide site-specific data. Site-specific data was not investigated.
3. Identify and prioritize future salinity control opportunities. Identify ways to optimize off-farm delivery system improvements so as to enhance on-farm participation by producers.

4. Identify impediments to full implementation of the Salinity Control Program, both off-farm and on-farm. Impediments considered are physical, technical, social, cultural, and/or economic in nature. While many impediments are likely common to all irrigation systems, certain impediments are anticipated to be unique to the Uinta Basin.
5. Identify strategies that move the Salinity Control Program forward in the Uinta Basin. Salinity control strategies can only be adopted and moved forward by the authorized implementing agencies. Due to limited time and funds this study effort focuses on implementation of the program and identification of technical and data needs rather than performing additional scientific investigation.

I.2 History of Salinity Control Program in Colorado River Basin

The Colorado River and its tributaries provide municipal and industrial water to about 36 million people and irrigation water to nearly 5.5 million acres of land in the United States. The river also serves about 3.3 million people and is used to irrigate 500,000 acres in Mexico ([1], page 1). Historically the Colorado River carried an average salt load of about 9 million tons per year at Hoover Dam. The effect of salinity is a major concern in the southwestern United States and quantified economic damages resulting from salinity are estimated to be $295 million per year([1], page 1). The Salinity Control Act (Public Law 93-320) and amendments (Public Law 98-569, 104-20, 106-459, 104-127, 107-171, and 110-246) authorizes the Secretaries of the U.S. Department of the Interior (Interior) and USDA to enhance and protect the quality of water available in the Colorado River for use in the United States and the Republic of Mexico by implementing salinity control projects throughout the Basin.

Salinity control projects are implemented by the Reclamation, the Bureau of Land Management (BLM), and the NRCS. Projects implemented to date by these agencies now prevent an estimated 1.295 million tons of salt per year from reaching the Colorado River system ([1], page 26). Reclamation, BLM, and NRCS have a combined control target of 1.85 million tons per year by the year 2030.

Irrigation induced salt loading is estimated to contribute 37% of the salinity at Imperial Dam and is the primary target for salinity control projects by Reclamation and NRCS. Salinity control project areas for reducing irrigation related salt loading have been established throughout the Upper Basin States of Colorado, New Mexico, Utah, and Wyoming (see map below). Monitoring and studies have been conducted in each of these areas to provide estimates of salt loading from irrigation related, or agricultural, sources.

I.3 Uinta Basin, History & Background

The Uinta Basin is located in north-eastern Utah in Duchesne and Uintah Counties. The area feeds primarily to the Duchesne River and its tributaries. The basin includes approximately 200,000 irrigated acres. The Uinta formation underlies the central and southern part of the basin and is the principle source of salt loading. Elevations in the area range from 4,655 feet in Ouray, UT on the Green River to 13,528 feet at King's Peak. Figure 1 show the study area within the Upper Colorado Basin.

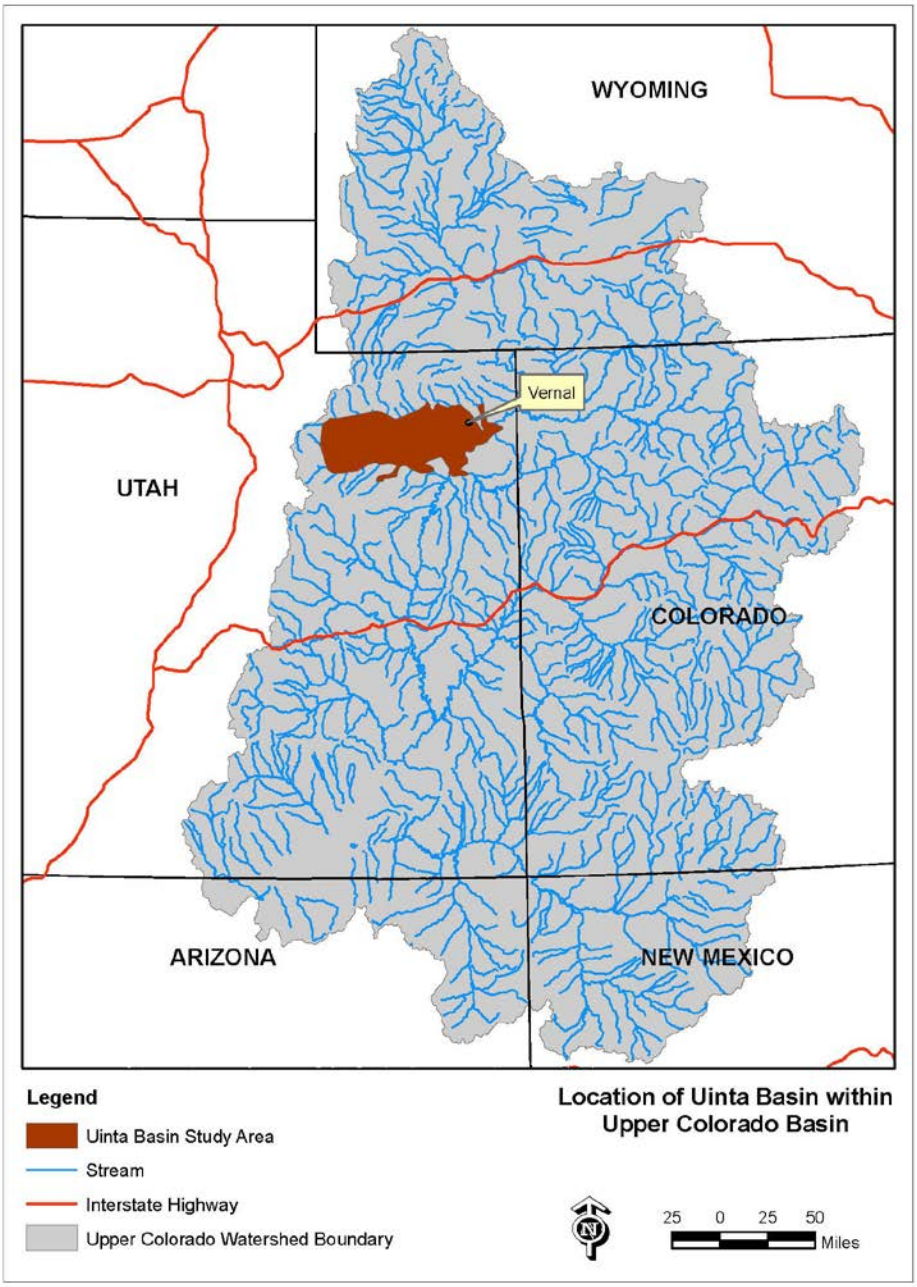
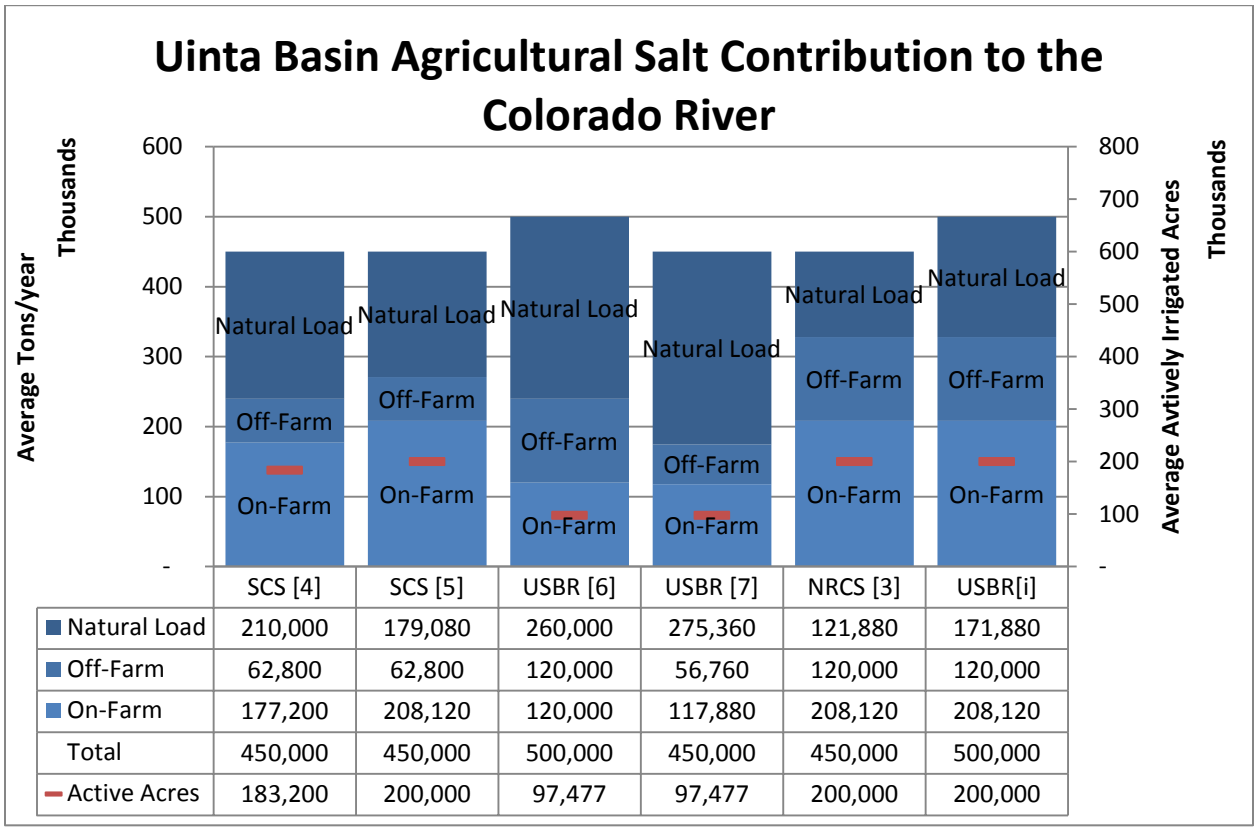


Figure 1 Location of Uintah Basin

Figure 2 shows the Uinta Basin Study Area with respect to the communities in the basin.

Figure 2 Uinta Basin--Project Area

Hydrosalinity studies of the Uinta Basin estimate the salinity load to be 500,000 tons annually of which 328,120 tons is attributed to agricultural practices. On-farm practices, which include field irrigation and near-farm delivery ditches, are estimated to contribute 208,120 tons annually. Off-farm practices, which include larger irrigation delivery systems such as canals and laterals, are estimated to contribute 120,000 tons annually. Figure 3 shows the salt load sources, in tons per year, of the Uinta Basin according to different studies done by the NRCS and Reclamation. The final column shows the current contribution scenario.



	SCS [4]	SCS [5]	USBR [6]	USBR [7]	NRCS [3]	USBR[i]
Natural Load	210,000	179,080	260,000	275,360	121,880	171,880
Off-Farm	62,800	62,800	120,000	56,760	120,000	120,000
On-Farm	177,200	208,120	120,000	117,880	208,120	208,120
Total	450,000	450,000	500,000	450,000	450,000	500,000
Active Acres	183,200	200,000	97,477	97,477	200,000	200,000

Figure 3 Uinta Basin Salt Load Allocation

Salinity control projects by Reclamation were first implemented in the Uinta Basin beginning in 1986. However, on-farm improvements started in 1981 under Soil Conservation Service's Agriculture Conservation Program. Salt loading in the Colorado River is now reduced by approximately 179,000 tons per year by both on-farm and off-farm measures. Colorado Basinwide projects implemented to date by cooperating agencies prevent an estimated 1.295 million tons of salt annually from reaching the Colorado River System ([1] page 26]). Reclamation, BLM and NRCS have a combined salinity control target of 1.85 million tons per year by the year 2030 ([1] page 26).

I.4 Accomplishments Report Summary

There have been significant accomplishments by the Salinity Control Program in the Uinta Basin since its inception in 1980 when NRCS started on-farm improvements. Key accomplishments of the program include the treatment of approximately 653 miles of canal or laterals out of 1,761 possible miles and improved irrigation methods on approximately 126, 600 acres out of 211,600 total irrigable acres. There are approximately 1,108 miles of canals or laterals that remain untreated and 84,600 acres of flood irrigated acres that lack improved irrigation practices; 17,900 of which are irrigated Tribal lands.

The quantification of salinity levels and treatments has changed over time. The methods for computing salinity control benefits have also evolved. Therefore, it would be difficult to make a direct historic comparison of salinity reduction over time. Nevertheless, there is a consensus that improved water quality in the Colorado River, based on historical water quality data, can be attributed to salinity control improvements in the Uinta Basin.

Data used for the evaluation of the Salinity Control Program were provided from Reclamation GIS, NRCS GIS, and BIA GIS. These data sources are represented in the following maps found in the Accomplishments Report (Appendix C):

1. Figure 2: Reclamation Canal Upgrade Status
2. Figure 3: NRCS Canal Upgrade Status
3. Figure 4: BIA Canals
4. Figure 5: Combined Canal Upgrade Status
5. Figure 6: Irrigated Non-Tribal Land
6. Figure 7: Irrigated Tribal Land
7. Figure 8: Total Irrigated Land

I.5 Treatment Status

I.5.1 Off-farm Improvements

Total treated canals (off-farm improvements) are summarized in Table 1 (see page 13, Accomplishments Report, Figure 5, Appendix C).

Table 1 Summary of Treated Canals and Laterals

	(miles)
Total Canal and Laterals	1,761
Treated Canals and Laterals	653
Remaining Untreated Canals and Laterals	1,108

I.5.2 On-farm Improvements

Table 2 below summarizes the non-Tribal irrigated acreage and treatments in the Uinta Basin with an adjustment for under reporting of improved flood irrigation (see page 14, Accomplishments Report, Figure 5, Appendix C).

Table 2 Irrigation on Non-Tribal Lands in Uinta Basin

Source	Irrigation Category		Acres
WRLU 2012	Total Irrigated Acreage		190,200
WRLU 2012	Sprinkler Irrigated Acreage		109,500
WRLU 2012	Flood + Sub/Irr	80,700	66,700*
NRCS Contracts Applied	Improved Flood Irrigation		14,000

*WRLU value (80,700) was adjusted by subtracting NRCS Contract Applied value for Improved Flood Irrigation.

The following Table 3 summarizes irrigation on Tribal lands (see page 14, Accomplishments Report, Figure 5, Appendix C).

Table 3 Irrigation on Tribal Lands in Uinta Basin

Source	Irrigation Category	Acres
WRLU 2012	Total Irrigated Acreage	21,000
WRLU 2012	Sprinkler Irrigated Acreage	3,100
WRLU 2012	Flood Irrigation	17,900

The following Table 4 totals the acreage within the Uintah Basin (see page 14, Accomplishments Report, Figure 5, Appendix C). The category "Flood Irrigation" is the acreage remaining that has not been treated with either improved flood irrigation practices or sprinkler irrigation.

Table 4 Irrigated Acreage in the Uinta Basin

Irrigation Category	Acres	Percent of Total
Total Irrigated Acreage	211,200	
Sprinkler and Improved Flood Irrigated Acreage	126,600*	60%
Flood Irrigation	84,600	40%

*Note: 109,500 sprinkler on non-Tribal lands, 14,000 improved flood on non-Tribal lands and 3,100 sprinklers on Tribal lands.

The above description of irrigated acreage is based on the best available data at the time the Accomplishments Report was completed, WRLU 2012 GIS water related land use data. However, there are known inaccuracies and conflicts in the data as reported by Ed Whicker, NRCS. For example, field confirmation by NRCS indicates that idle lands that have improved irrigation were reported as not irrigated by WRLU, resulting in under reporting of sprinkler and improved irrigated acreage.

I.6 Quantification of Salinity Load Reduction

I.6.1 Off-Farm Salinity Load Reduction Quantification

To quantify the existing salt load per year of each canal within the Uinta Basin, Reclamation uses a weighting factor to calculate the canal's annual salt load proportion of the annual basin wide load. The annual basin wide, off-farm salt allocation is 120,000 tons. The total basin wide allocation (120,000 tons), a canal weighting factor, and the total sum of the weighting factors of all of the canals are used to calculate the canal salt load contribution per year.

$$Canal\ Salt\ Load\ Contribution\ per\ year = 120{,}000 * \frac{canal\ weighting\ factor}{sum\ of\ weighting\ factors\ of\ all\ canals\ in\ basin}$$

The weighting factor assigned to each canal is a factor of the length of the canal, the days in operation, and canal flow in cfs to the 0.39 power. The sum of all of these weighting factors calculated for each canal is then used to calculate the canal salt load contribution per year.

$$Weighting\ Factor = length * days * cfs^{0.39}$$

Once the salt load per year for each canal is quantified, using treatment efficiencies, salt load reductions for canals proposed to be treated are calculated and ranked. Proposed canal treatments offering the least cost per ton of salt treated receive the higher ranking. The average cost rate per treatment for the 2012 FOA selections was $55 per ton.

Through 2011, Reclamation has estimated a salinity reduction from off-farm improvement (lining or piping of canals) of 42,454 tons per year from 23 projects between 1999 and 2011. One project, Ashley WWTP was a non-agricultural project, representing 9,125 tons reduction. Excluding salt load reductions through the Ashley WWTP, 42,454 tons per year represent only 28% of the off-farm salt loading in the Uinta Basin.

I.6.2 On-Farm Salinity Load Reduction

To quantify the reduction in salt load per year with each NRCS application in the Uinta Basin, the NRCS uses a Salt Load Reduction factor (SLR). SLR is the irrigation efficiency used to compare against the existing practice to determine the change in efficiency. The salt load reduction for each salinity treatment is calculated using the product of the acreage under treatment, the salt load factor of 1.04, and salt load reduction (SLR) percentage.

$$Tons\ of\ Salt = Acres * 1.04 * change\ in\ SLR$$

Table 5 is a listing of SLR values as used by NRCS.

Table 5 Salt Load Reduction Factors

Irrigation Type	SLR
Unimproved Flood	0%
Previously Improved Flood System	37%
Minor Application of Improved Flood System	52%
Major Application of Improved Flood System	72%
Wheel Line	84%
Center Pivot	91%
High Tech	96%

Total reduction from on-farm and off-farm improvements in the Uinta Basin reported by NRCS in the Monitoring and Evaluation Report for FY2012 is 152,300 tons per year ([3] page 11). This number is derived from the accumulation of each annual report from 1987 to present. Since the process for

estimating salt savings has changed, the tons reported for any particular practice may be different in any given year. As processes changed, previous year reporting data was not adjusted. In 2007, all the prior on-farm salt loading was re-calculated using the revised procedure. The estimate of tons treated has been reduced with time and revisions. It is important to note that NRCS claims some off-farm treatment as part of its salinity reduction efforts.

Totaling the Reclamation and NRCS reported cumulative salinity reductions, the Uinta Basin Salinity contribution has been reduced by 190,854 tons or 58 percent of the total on-farm and off-farm salinity loading of 328,120 tons per year for the Uinta Basin. Given that only 60 percent of the on-farm acreage has been treated and only 37 percent of the canals have been treated, around 58 percent of the salt loading is a reasonable estimate of what has been removed.

I.7 Salinity Control Program Interviews

Interviews were conducted by the URS team throughout the Uinta Basin with many Salinity Control Program stakeholders. The purpose of the interviews was to identify impediments to full implementation of the Salinity Control Program, both off-farm and on-farm. Focus within these discussions was placed on physical, technical, social, cultural and economic impediments. Individuals representing various private and public entities were interviewed. Table 6 shows the affiliation of individuals interviewed and Figure 4 shows the area they represent in the Basin. A total of 44 individuals were interviewed during the interview process.

Table 6 Interviewees Affiliation

Affiliation	
Duchesne Conservation District	Deep Creek
Dry Gulch Irrigation Co. Class B	BIA, UIIP O&M
Uintah Indian Irrigation Project (UIIP)	Uteland Ditch Canal
Ute Tribe, Water Settlement	Ioka
Farnsworth Canal	UWCD
USU Extension, Duchesne	Jenson
Uintah Conservation District	Hicken Ditch
DCWCD	Dry Gulch Irrigation Co. Class E
Duchesne Irrigation Co.	Dry Gulch Irrigation Co.
Whiterocks Canal	USU Extension, Uintah
Uinta Basin Irrigation Co.	NRCS
UWCD	

In addition to above interviews, the URS study team met with the Uintah County Water Conservancy District Board, the Duchesne County Water Conservancy District Board, the Uintah Indian Irrigation Project Board and the Ute Tribe Business Committee.

In addition to above interviews of individuals and meetings with organizations, URS met with staff from various agencies outside the Uinta Basin. Following is a list of agency staff consulted.

Table 7 Agency Staff Interviews

Interviewee	Affiliation
Baxter, Lee	Department of Interior, formerly Reclamation
Brown, Dave	NRCS, State Conservationist
Hansen, Lynn	Department of Interior, formerly BIA
James, Travis	NRCS, Salinity Coordinator
Parry, Brad	Reclamation, Salinity Control Program Coordinator
Parry, Brian	Reclamation, Native American Affairs
Quilter, Mark	State of Utah, Dept. of Ag, Basin States Coordinator
Williams, Nick	Reclamation, Water Quality Specialist

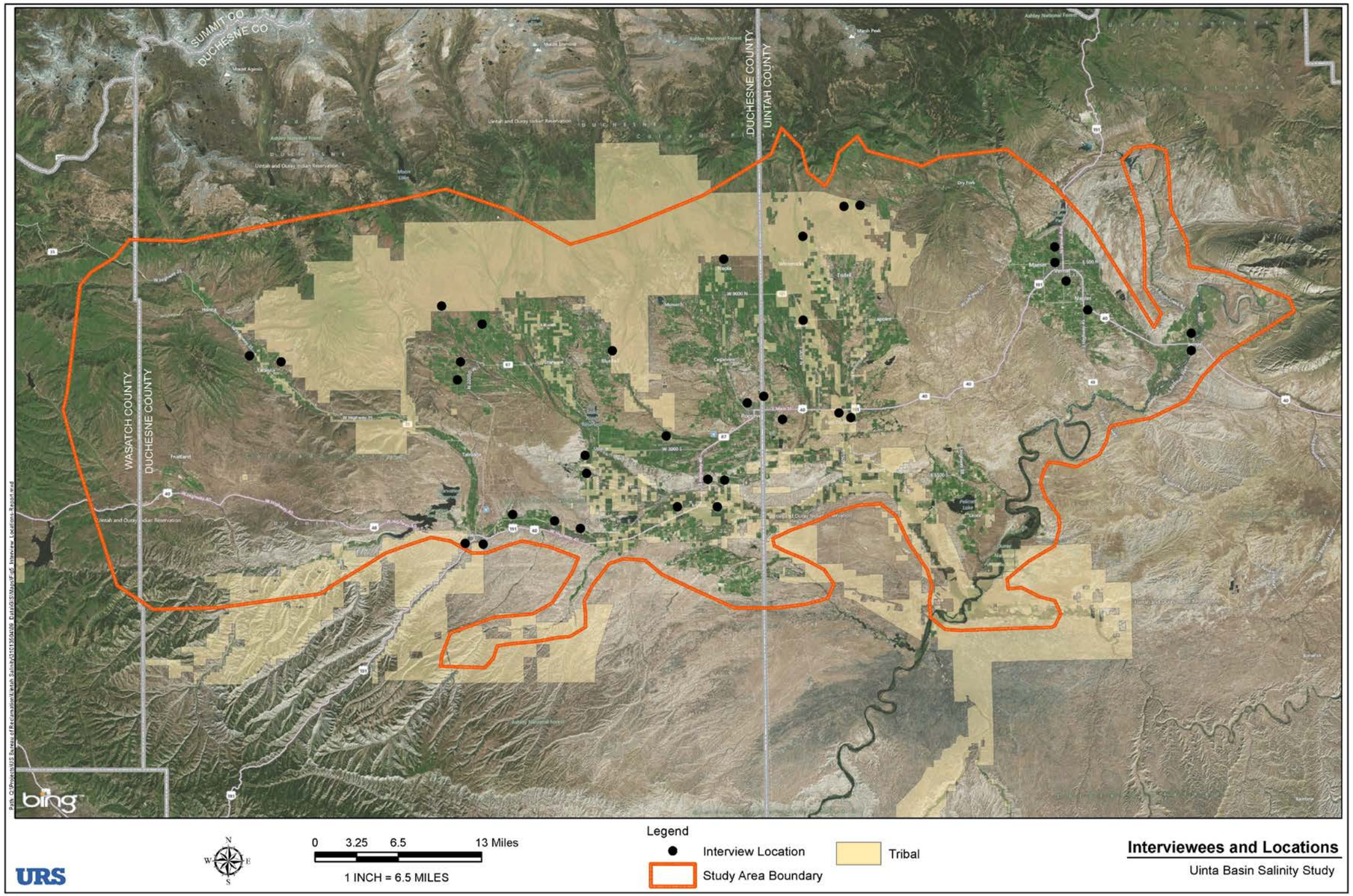


Figure 4 Interviewees and Locations

I.8 Positive Feedback for the Salinity Control Program

This section reports information obtained from those with knowledge of the Salinity Control Program in the Uinta Basin. It does not represent findings from a survey with statistically significant data to provide definitive and quantitative conclusions. However, the reports of those interviewed on their experiences with the Salinity Control Program are useful to the study and provides a basis for strategies to move the program forward.

Discussions and interviews held with the many agricultural producers, canal operators and owners, agency representatives, Ute Tribe representatives, and other interested stakeholders have led to significant positive feedback for many different aspects of the Salinity Control Program. This is a government program that has seen nearly unanimous approval from those participating. In all the discussions with farmers or representatives of farmers, there was not one report of an individual who wished they had not participated in the Salinity Control Program. Some of the most frequently identified benefits of the Salinity Control Program include effective and localized technical assistance, increased yields, and operating cost savings. A continued stream of applicants to the program also adds ample evidence of the Program's continued benefits. The following benefits of the Salinity Control Program have been found to be particularly significant.

I.8.1 Local Assistance

Multiple farmers expressed appreciation for the ease of completing on-farm treatments, attributing this to the NRCS technical staff. The more localized the administrative and technical the interactions, the better the response by farmers. The farmers credited the capabilities of the staffers to their hands-on experience with farming.

I.8.2 Increased Yields

Most, if not all, farmers were quick to realize increased yields following on-farm treatments. Upwards of 50% increases in yields were reported by interviewees. These increased yields have had a multiplying effect on the community economy as farmers have greater revenue from farm production.

I.8.3 Operating Cost Savings

Farmers reported decreases in operating cost, depending on the type of irrigation system installed. Canal operators reported operating savings associated with piping of canals.

I.8.4 Application Process Fairness

There are perceptions among some irrigators that the technical challenges associated with fairness between applicants for funding have not always been met. However, many of those interviewed acknowledged that these challenges are very difficult and express appreciation for the efforts made by Reclamation and NRCS to make the program as fair as possible and to facilitate the application process.

I.8.5 Basin States Funding Success

Those who participated in the Salinity Control Program through BSP funding found the process more flexible and easier to implement than either NRCS or Reclamation funding processes. However, these reports were for the former Basin States Parallel program that no longer exists.

I.8.6 Drought Resilience

With the implementation of irrigation efficiency measures, drought resiliency has increased.

I.9 Issues Facing Full Implementation of the Salinity Control Program

These discussions and interviews also led to an identification of issues that impede full implementation of the Salinity Control Program in the Uinta Basin. The following are reoccurring issues which were identified in interviews and are ranked by frequency in discussions.

- Ute Tribe Considerations
- Lack of Off-Farm Improvements
- Aging On-Farm Equipment
- Inconveniences Associated with Canal Upgrading
- Local Understanding of Reclamation FOA Process
- Capital Investment and Operating Costs
- Salinity Control Program Administration has Become Less Accessible

One issue identified through interviews was not elevated to strategy level because it has been previously addressed by the agencies and additional efforts to strategize how to overcome this impediment are not warranted. Some FOA applicants have stated that delays between approval of a FOA application and implementation cause significant financial hardship to the applicants because increased costs associated with this long time between approval and funding fall to the applicant without offsetting increases in federal funding. Federal procurement requirements prevent any changes to address this issue.

II. Findings and Strategies

Table 8 on the following nine pages is a matrix of the information learned from interviews and meetings with focus groups. It includes the issues that were identified, strategies developed by URS and by focus groups, benefits and disadvantages of strategies, obstacles to the strategies and mitigation of the obstacles. Following the table are more detailed descriptions of findings and strategies.

DISCLAIMER: The following descriptions of Ute Tribe considerations have not been vetted with the Ute Tribe Water Rights Commission, the entity identified by the Business Committee to participate in this study.

Table 8 Matrix of Issues and Strategies

Issue	Strategy	Purpose/Benefits	Disadvantages	Obstacles	Mitigation
1 Ute Tribe Considerations					
1.1 Mutually beneficial relationship required	**1.1.1** Request Ute Liaison and Regular Liaisons Meetings	To establish trust and consistent communication.	Liaisons may not meet expectations of their respective entities.	Limited resources	Assign individual with existing overlap with the Tribe.
	1.1.2 Foster Relationship with Ute Water Resources Engineer	Provides a key opportunity for agencies to work effectively with the Tribe in reducing challenges with participating in the Salinity Control Programs.	Reliance on water resource engineer continuing to have the trust of the Tribe needed to accomplish salinity goals.	The availability and resources of staff and Dr. Mesghinna to interact in evaluating salinity control program opportunities are limited.	Commit NRCS and USBR staff to meeting regularly with Dr. Mesghinna under the direction of the Ute Business Committee.
	1.1.3 Cultivate Cultural Awareness	It is important that non-Utes adopt a sincere interest in understanding Ute culture out of respect.	Will take long-term commitment to develop trust	Frequent tribal leadership changes and limited training resources.	Request information on Ute culture training opportunities. Develop close relationship with Tribe water resources engineer and legal counsel.
	1.1.4 Listen to Ute needs and investigate ways to meet those needs	To gain insight to the values and interests of the Ute Tribes.	Time intensive	Tribal hesitancy or lack of interest	Encourage the Tribe to use its own staff and/or consultants to solicit input from tribal members.
	1.1.5 Utilize the Expertise of Reclamation's Native American Affairs Program	For assistance in reviewing strategies and aid communications.	--	--	--

Issue	Strategy	Purpose/Benefits	Disadvantages	Obstacles	Mitigation
	1.1.6 BIA Canal System Master Plan	To identify and prioritize different salinity control needs. To streamline tribal right-of-way support and acquisition.	Additional funding required	Supplementary funding	BIA will seek external funding sources or request Ute Tribe to conduct preparation of master plan.
	1.1.7 Develop a "Focused FOA" for the Ute Tribe	To encourage Ute Salinity Control Program buy-in and interest.	Fairness	Fairness	Sub-basin FOAs for each sub-basin in Upper Colorado Basin
1.2 Ute Right of Way	**1.2.1** Early ROW Negotiation	To reduce risk and maximize benefits of design efforts.	Requires increased effort from applicants	--	--
	1.2.2 Show Benefits of Salinity Reduction Practices	To gain appreciation for canal piping or lining, reducing right-of-way barriers for non-Utes.	Difficult to demonstrate site specific benefits and may slow process for projects.	Agency staff should not be promoting the Salinity Control Program.	Use the Reclamation Native American Affairs office and the Tribe water resources engineer to identify benefits to the Tribe and to present them.
1.3 Leased Ute Lands	**1.3.1** Ute Tribe Contract with NRCS on Ute Leased Lands	The Ute Tribe would increase the value of the lease in perpetuity and leasees are not burdened with risk.	--	--	--
	1.3.2 Show Benefit of Revising Ute Lease Policy	Non-Ute leases of Ute land too short to incentivize private investment.	Requires additional cooperation from the Ute Tribe.	Lack of resource of NRCS to negotiate individual lease changes or an overall change in the lease policy.	Use existing Ute liaison to accomplish this purpose.
	1.3.3 Ute Buy-Out Policy	To undertake a policy whereby the Utes would buy out the	Requires Ute funding to buy out equity.	This could become an administrative cost to the Ute Tribe to	Establish a formula for buy-out based on the initial costs provided to the NRCS by the

Issue	Strategy	Purpose/Benefits	Disadvantages	Obstacles	Mitigation
		remaining equity (leasee's investment only) of the on-farm improvements.		manage the buy-out program and determine value of remaining equity.	leasee.
1.4 Loss of Seepage for Wildlife Habitat	**1.4.1** Identify Properties of Least Value to Utes for Upgrades	Elimination of some canals results in identification of those canals that should be treated and establishes Ute support for their treatment.	Does not get all the salinity reduction possible.	Resources of both agencies and the Utes would need to be expended to identify high and low value wildlife habitat.	Incorporate evaluation of wildlife habitat into a Ute lead master plan for their canal system. See Strategy II.1.1.6.
	1.4.2 Identify Supplemental Riparian Area Irrigation for Wildlife Benefits	To implement provisions for irrigation of riparian habitat into projects and where wildlife habitat is valued by the Utes.	O&M	O&M	Incorporate system maintenance into operation and maintenance of the proposed off-farm project.
	1.4.3 Identify Properties for Wildlife Habitat Improvement	to identify areas appropriate for mitigation that are visually positive to Utes and their life values.	--	May be significant obstacles that diminish the environmental mitigation benefits.	Work closely with Utes to identify environmentally appropriate sites that meet all purposes.
1.5 Lack of Winter Water for Livestock	**1.5.1** Identify and Correct Projects Missing Committed Winter Water Service	Restores broken trust	Engineering at extreme colds for delivery is impractical.	Winter water requires O&M and contributes to salinity levels.	Acquire access to potable water systems for stock watering as part of project costs is an option. It also resolves water right issue.
1.6 Value of Flowing Water	**1.6.1** Improve Canals to Complement	To work with the Utes in identifying those areas where	Cost and additional installation requirements	The FOA application less competitive. In addition, piping a	Participants may be more inclined to increase local cost share for these costs

Issue	Strategy	Purpose/Benefits	Disadvantages	Obstacles	Mitigation
	Cultural and Wildlife Values	improvements could be made and salinity reduced, without piping the canals.		canal provides downstream pressure for on-farm sprinkler systems.	when 50%+ of water is saved.
1.7 Cost Effectiveness of Ute Off-Farm Projects	**1.7.1** Leverage Ute Settlement Funds	To provide federal funds for Ute-identified projects.	Expenditure of Ute settlement funds.	The level of Ute funding may exceed their willingness to participate in the program.	Complete planning level studies to determine competitiveness of projects and level of buy down needed to be competitive prior to submitting application.
	1.7.2 Refer to Strategy II.1.1.7				
1.8 Low Farming Interest	**1.8.1** Work with Tribe's Water Resources Engineer to Educate and Motivate.	Non-Ag options will widen opportunities of Utes to participate in salinity program. Salinity goals can be met in other ways than pipes and pivots.	Unconventional on-farm treatment and may not satisfy EQIP requirements.	The Ute Tribe may not understand the flexibility of Reclamation and NRCS purposes.	Work with water resources engineer to instruct Tribe of all of the options available.
2 Lack of Off-Farm Improvements					
2.1 Lack of coordination between Reclamation and NRCS	**2.1.1** Assign In-Basin Coordinator	To ensure that off-farm and on-farm projects were completed concurrently so that the farmers would not lose part of their irrigation season.	Requires resources to provide in-basin coordination.	Increasing coordination does not insure coordination.	Contracting entity to provide coordination between the off-farm construction projects and on-farm projects.
2.2 Non-Competitive FOA Applications	**2.2.1** Increase Local Funding Participation	Buy down costs to increase competitiveness of FOA applications.	No identified sources of funding and increased cost for farmers	Willingness to incur greater costs by farmers.	Look to other non-federal supplemental sources of funding to help with local cost share of project costs.
	2.2.2 Educate	More Uintah Basin	Cost to participants	Reclamation cannot	Local water conservation

Issue	Strategy	Purpose/Benefits	Disadvantages	Obstacles	Mitigation
	Applicants Regarding Reasonable Project Local Cost Share	projects funded and salinity funds extended for more projects.	increases.	assist applicants to the disadvantage of other applicants in educating them on strategies for making the applications more competitive.	districts could take leadership role in helping applicants to be more competitive.
	2.2.3 Combine Canal Systems	Reduce costs, improve FOA competitiveness.	Finding "just right" projects	Few opportunities for combining canal system exist. Canal companies reluctant to give up control of system.	Water conservation districts could lead efforts to identify canals that could be combined and facilitate discussions between canal companies.
	2.2.4 Study Sub-Basins for Salinity Loading	Salinity control funds could be redirected to more effective salinity control projects.	1. Requires funding of hydrogeologic study. 2. Would exclude sub-basins with small salt loading from future competition/ increase local cost share 3. "Unfair" claimed by competitors (in-basin and out)	1. Significant funding 2. Risk of little remaining salt. 3. Conflicting with consistent basin-wide practice of same salt loading factor.	1. State of Utah funding 2. None 3. None
	2.2.5 Conduct Planning Studies	To identify viable FOA-competitive projects that align with the priorities of the FOA evaluation committee. Such studies would complete much of the	Unfair to FOA applicants in those basins that do not get planning level studies and difficult to deny FOA applications after	Hard feelings between Uinta Basin applicants if their projects were determined to be non-competitive.	Water conservation districts could lead efforts to identify canals to be combined.

Issue	Strategy	Purpose/Benefits	Disadvantages	Obstacles	Mitigation
		due diligence incurred by applicants.	recommending in planning study.		
	2.2.6 Correct Misconception about Existing BSP	Applicants believe fewer regulatory requirements for BSP. Need for reeducation to explain BSP current program.	Applicants remember historical BS parallel program.	An effort will need to be made to explain the current BSP to applicants by NRCS, Reclamation and the State of Utah, Department of Agriculture.	Prepare a written statement with concurrence of all three agencies.
2.3 Completed On-Farm Areas are not Competitive for Off-Farm.	**2.3.1** Recognize and Value On-Farm Improvements for Off-Farm Proposals	To not penalize those farmers who have committed to on-farm, expecting future completion of off-farm. Elimination of canals ensures long-term on-farm improvements.	On-farm salt reduction is typically much greater than off-farm and therefore, completing only off-farm improvements have limited salt reduction benefits.	FOA rules would have to be changed to provide some additional credit for previously completed on-farm improvements.	--
2.4 Ute ROW approval	**2.4.1** Early Right of Way Negotiation (See Strategy II.1.2.1)				
	2.4.2 BIA Canal System Master Plan (See Strategy II.1.1.6)				
3 Aging On-farm Equipment					
3.1 Risk of Reversion to Flood Irrigation	**3.1.1** No Funding of On-Farm Equipment Replacement	Establishes understanding and those committed to improved irrigation will replace equipment using private funds. Preserves salinity funds for new projects with potentially	Potential for reversion to flood irrigation and unfair that farmers do not share in salinity control benefits that accrue in perpetuity.	None, this is essentially the current NRCS *policy*.	--

Issue	Strategy	Purpose/Benefits	Disadvantages	Obstacles	Mitigation
		greater salt load reduction.			
Note: strategies 2,3,&4 are mutually exclusive. Only one of three can be implemented.	**3.1.2** Continue Funding of Incremental Improvements	Provides a mechanism for fair equipment replacement.	This policy only creates marginal salinity load savings.	None. This is also the current policy of NRCS. The combination of the two policies has created some confusion among producers and requires education of these policies.	--
	3.1.3 Use "Unallocated" Salinity Funds	Provides some limited funding for on-farm equipment replacement.	1. Not consistent policy. 2. Difficult to allocate funds fairly.	There is no reasonable or equitable way identified to allocate unused NRCS funds for end-of-year projects.	--
	3.1.4 Pro-rated Funding of Replacement	Consider this "contract renewal". Provides cost sharing but requires participation by owner. Provides long-term plan for sustaining salt load reduction. Prorating funding does not reward deferred maintenance.	No demonstration that funding is more effective than other and no evidence of reversion to flood.	No existing policy. This would require development of detailed pro-rated schedules for various equipment.	--
4 Preference to Not Upgrade					
4.1 Not All Lands or Canals are	**4.1.1** Acknowledge Limited Available	To focus on other projects and lands	Dismisses lands and canals from	Expenditure of resource to identify	Do not implement strategy.

Issue	Strategy	Purpose/Benefits	Disadvantages	Obstacles	Mitigation
Good Candidates for Treatment	Lands and Canals Suitable for Treatment	that are more amenable to salinity control treatment.	treatment that might be good candidates for subsequent generations or subdivision of land in future	lands to be excluded.	
	4.1.2 Target Best Candidates	More focused approach than waiting for applicants to demonstrate willingness to participate.	1. Requires effort to identify candidates and to approach operators. 2. "Not salinity program's responsibility to convince people to participate"	Expenditure of resources to identify good candidates.	Use existing NRCS staff and assign this work on a low priority basis.
4.2 Benefiting from Canal Seepage or Stock Watering	**4.2.1** Provide Irrigation Company Shares to Compensate those Losing Benefits from Seepage	To replace sub-irrigation with project that reduces deep percolation.	Requires modification of water right of canal company to bring in new lands.	Need to modify water rights to include new areas served.	File change application. Issue additional irrigation company stock.
4.3 Valued Open Channel, Riparian Habitats	**4.3.1** Non-Irrigation Related Benefits	Consider funding of salinity improvements that do not include irrigation improvements but meet salinity reduction goals.	--	A methodology would need to be developed to evaluate non-irrigation salinity control practices. This will require resources to perform this work.	--
5 Local Understanding of Reclamation FOA Process					
5.1 Discouragement from FOA	**5.1.1** Increase Applicant Engagement and	Will help potential applicants understand level of local cost	Expend resources on low-viability projects.	Canal company staff may continue to rely on consultants to	Make personal requests to attend and to not rely solely on consultants representing

Issue	Strategy	Purpose/Benefits	Disadvantages	Obstacles	Mitigation
Application Failures	Ownership in the FOA Process	share required to be successful FOA project.		represent them at workshops.	canal companies.
	5.1.2 Increase Applicant Expectation of Increased Local Cost Share	To remind applicants of the need to adjust their local cost share to a higher competitive level and to identify additional funding resources to meet these higher local cost share needs.	--	Reclamation cannot coach applicants on how to be more competitive with other applicants.	The local water conservancy districts could lead effort to evaluate and improve competitive applications and to help identify outside funding sources.
6 Capital Investment and Operating Cost					
6.1 Pumping Costs are Too Great	**6.1.1** Fund Power Installation	To pay federal share of cost for a pre-determined maximum distance to convey power to the farm.	No precedent	This is not current NRCS policy.	--
7 Salinity Control Program Administration Has Become Less Accessible					
7.1 NRCS Decision Making Has Become Less Local	**7.1.1** Push Authority for Decisions to Field Offices	Reduce the administrative process.	Less oversight	Requires directive of NRCS to push more authority to the field office.	--
	7.1.2 Restore Conservation District Board Participation	A step to build consensus locally.	--	None. Participation by Conservation District Boards has been reinstated. Salinity Coordinating Board is not functioning.	Re-establish Salinity Coordination Board.

II.1 Ute Tribe Considerations

During interviews conducted with stakeholders across the basin, issues associated with the Ute Tribe came up more frequently than other issues. Concerns raised were primarily in regard to the inability to line or pipe either canals that cross Ute lands or canals for which Utes and/or BIA have responsibility. Ute Tribe low-participation or level perceived unwillingness to allow use of right-of-way appears to frequently effect the ability of non-Utes to benefit from the Salinity Control Program either on-farm or off-farm. In the one case where the URS team talked to a tribal member who has participated in the Salinity Control Program there was satisfaction in the program, but there is a need to work more closely with tribal leadership to make the program fit the needs of the Utes. In addition, some Utes are resistant to canal piping because of the loss of habitat; in some cases where habitat mitigation was employed the results have not met the satisfaction of the Utes involved. The Ute governing body, its Business Committee, directed its legal and water engineering counsel to work with the URS team to address Ute issues.

II.1.1 Issue: Mutually Beneficial Relationship Required

In interviews with Ute Water Settlement personnel and BIA representatives, it was determined that there is a need to establish and maintain mutually beneficial relationships between agencies and the various players in the Ute community, including the BIA, in order to build trust and increase interest in participation in the Salinity Control Program. Past interaction with Reclamation, in particular, has led to a sense that the program is intransigent and Ute preferences are not addressed by the program.

II.1.1.1 Strategy: Request Ute Liaison and Regular Liaisons Meetings

In order to establish trust and consistent communication between the Tribe and the agencies, it may be helpful to request the Ute Tribe Business Committee to identify an individual, preferably a Ute Tribe member, to serve as a liaison with the agencies promoting the salinity control programs. The NRCS currently has a person assigned to work specifically with Ute Tribe members (Andrea Merrill) regarding its on-farm improvements program. It could be beneficial to assign an individual from Reclamation to communicate directly with the Utes in regards to off-farm improvements or use the existing Reclamation Native American Affairs Officer in this role. Ideally, the three liaisons (Ute, NRCS, and Reclamation) would work closely and meet regularly to provide consistent communication and overview of activities promoting the Salinity Control Program. Working together, they could identify hurdles and bring their constituencies together to strategize solutions. Refer to related strategy II.2.1.1: Assign In-Basin Coordinator.

Obstacle:

Reclamation staff has stated that funding for this position will be difficult to secure. However, the Provo Area Office salinity coordinator, the Regional Office Coordinator and/or the Native American Affairs Officer could fill this role.

Mitigation:

Communication between all entities involved would greatly benefit the Salinity Control Program. Reclamation, if not able to find resources for such a position, could assign these responsibilities to an individual whose work already has existing overlap with the Tribe.

II.1.1.2 Strategy: Foster Relationship with Ute Water Resources Engineer

The Ute Tribe has within the past two years hired a new water resources engineer who has made significant progress helping the Tribe resolve some of its lingering water rights concerns. This individual has the trust of the Tribe and the URS team's opinion is that he provides a key opportunity for agencies to work effectively with the Tribe in reducing challenges with participating in the Salinity Control Programs. He recently presented to the Ute Business Committee a memo that stated in part:

> "Salinity is a major issue of concern in irrigated agriculture, and ongoing efforts to reduce its prevalence in the Uinta Basin show the value in modifying aging irrigation infrastructure and practices on- and off-farm. A comprehensive evaluation of the entire UIIP system's salinity contributions would help better serve the lands of individual farmers that have undertaken their own salinity control projects. As reported in HKM Engineering's 2009 Condition Assessment, $30-70 million may be necessary to rehabilitate or replace the aging canals and structures of the UIIP. A study of the UIIP's salinity contributions may help justify these improvements and encourage outside funding. An upgraded UIIP infrastructure would decrease flow losses during water transport, increase on-farm irrigation efficiency, and improve the water quality of downstream UIIP diversions. These improvements would increase the reliability of irrigation service to Tribal members and encourage the recognition and preservation of the Tribe's reserved water rights."

Working closely with the Ute Tribe's water resources engineer could pave the way for significant participation by the Ute Tribe in the Salinity Control Programs.

Obstacle:

The availability and resources of staff and the Ute Tribe water resources engineer to interact in evaluating salinity control program opportunities are limited.

Mitigation:

Commit NRCS and USBR staff to meeting regularly with the Ute Tribe water resources engineer under the direction of the Ute Business Committee.

II.1.1.3 Strategy: Cultivate Cultural Awareness

Agency personnel practice cultural awareness frequently when they interact with agricultural stakeholders, adjusting their communication and scheduling approaches to take into consideration the lifestyle differences of a farmer versus an urban business person. It is important that those

interacting with Ute tribal members show interest in learning about and respecting tribal cultural attributes as well, particularly in regard to communication, scheduling, and chain of command. It is important that non-Utes adopt a sincere interest in understanding Ute culture, not for the purpose of getting their own needs met, but out of respect. This strategy is for agency staff dealing directly with the Ute Tribe to receive cultural awareness training specific to the Ute Tribe and to establish mutual agreed upon communications protocol.

Obstacle:

Resources are limited for training. This strategy requires identifying an individual or individuals, perhaps within the Ute community, with knowledge of Ute culture and willingness to share their information. Turnover of agency staff and Ute Tribe staff will diminish the benefits of developing trust.

Mitigation:

As part of this study, request information on Ute culture training opportunities. When there are leadership turnovers, it will be important to rely on the Tribal Water Resources Engineer and other staff to bridge trust during changes in personnel.

II.1.1.4 Strategy: Listen to Ute Expression of Needs and Investigate Ways to Meet Those Needs through the Salinity Control Program

An obvious but easily overlooked strategy is to provide a framework in which Ute tribal members and organizations are able to express what they would like to see on the reservation in regards to their water resources and landscape. Agency personnel may gain insight by hearing the values and interests inherent in that expression. Some of these insights could lead to creative strategies outside typical irrigation improvements. Engaging Ute tribal members in developing those strategies rather than developing the strategies for them will be important in securing ownership.

Obstacle:

The Utes may be hesitant or lack interest to participate with Salinity Control Program representatives who may be perceived as outside the culture.

Mitigation:

Encourage the Tribe to use its own staff and/or consultants to solicit input from tribal members.

II.1.1.5 Strategy: Utilize the Expertise of Reclamation's Native American Affairs Program

Reclamation's Native American Affairs Program personnel should be consulted for assistance in reviewing all of these strategies. Not only should their insights be useful in evaluating strategies, but they would be a good resource for helping agency members improve their cultural awareness. However, they should be considered as only one source of assistance and not be relied on for all the answers.

Obstacle:

None

II.1.1.6 Strategy: BIA Canal System Master Plan

The BIA staff has expressed a need to develop a BIA Canal System Master Plan. Each focus group discussed and saw merit in such a direction. Cooperation with the Tribe is seen as having utmost importance. In creating a Canal System Master Plan, the BIA and the Ute Tribe could identify and prioritize different salinity control needs. The more initial input and overall involvement from the Tribe, the greater success the Salinity Control Program will see with their partnership with the Ute Tribe. A major aspect of the proposed master plan would include an agreement or understanding which streamlines tribal right-of-way support and acquisition. As discussed previously, right-of-way hurdles are currently a major, time- and cost-intensive barrier to on- and off-farm upgrades over Tribe-controlled land. The master plan could either outline a streamlined process for right-of-way cooperation or identify approved areas for right-of-way cooperation. Refer to related Strategy II.2.2.5, Conduct Planning Studies.

Obstacle:

Reclamation or NRCS will not be able to fund the master plan. Additional funding sources should be sought out by the BIA. These might include internal BIA funds or Ute Tribe funds. If performed by the Tribe instead of BIA, other grant options, such as WaterSmart (USBR) would be available.

Mitigation:

BIA will seek external funding sources or request Ute Tribe to conduct preparation of master plan.

II.1.1.7 Strategy: Develop a "Focused FOA" for the Ute Tribe

Though not typical, Reclamation may be able to formulating a FOA focused to a particular need. A focused FOA is intended to meet its goals in a manner more likely to fit the needs of a particular group of applicants. Developing a focused FOA for the Ute Tribe would greatly improve Ute participation in the Salinity Control Program and resolve many of the concerns of the Utes. If focused to allow for non-Ute projects requiring Ute participation, it would also benefit the non-Utes whose projects require Ute involvement, either in providing right-of-way or Ute water. A focused FOA would be funded at a much lower level than the Colorado Basin-wide FOAs but may stimulate interest of Utes in participating in the program.

Obstacle:

Concerns as to the fairness of implementing a focused FOA for the Ute Tribe may arise among those who have no potential for Ute involvement. In addition, funding for a focused FOA may be difficult to allocate from other funding allocations.

Mitigation:

To overcome objections to a Ute focused FOA, the opportunity for similar focused FOAs could be provided to other sub-basins that have comparable issues addressing underserved populations.

II.1.2 Issue: Ute Right of Way

A significant number of non-Ute stakeholders interviewed desire to undertake both off-farm and on-farm improvements but cited lack of right-of-way for canal piping through Ute lands as their major obstacle. Without the pressurization provided by canal piping, on-farm improvements often require pumping and the attendant energy cost. The policy undertaken by the U.S. federal government to establish non-Ute settlements on land earlier set aside as Ute land created a checkerboard of Ute and non-Ute lands that led to this problem. Securing rights-of-way through Ute land has come to be seen as a hindrance in the FOA application process because this uncertainty requires alternatives to obtaining rights-of-way or extended alignments. In some cases, right-of-way misunderstandings have taken place at the end of the FOA approval process. If a method could be developed to secure right-of-way agreements more easily for canals that pass through Ute lands, additional canals might become more competitive in the FOA proposal process.

II.1.2.1 Strategy: Early Right-of-way Negotiation

Due to the continued increase of risk associated with obtaining Ute Tribe rights-of-way, there would be a benefit to negotiating and clearing right-of-way issues as soon as possible. Early right-of-way negotiations would reduce risk and maximize benefits of design efforts.

Obstacle:

None

II.1.2.2 Strategy: Show Benefits of Salinity Reduction Practices

Working with the Tribe's water resources engineer to show benefits of salinity reduction to the Ute Tribe may help them gain appreciation for canal piping or lining, reducing right-of-way barriers for non-Utes. This strategy would be to identify specific locations within the reservation that would benefit from salinity control projects.

Obstacle:

As discussed in the Agency Focus Group, the obstacle to this strategy was agency staff may recommend the Program but are not tasked with selling the program to potential participants.

Mitigation:

Use the Reclamation Native American Affairs office and the Tribe water resources engineer to identify benefits to the Tribe and to present them.

II.1.3 Issue: Leased Ute Lands

The Ute Tribe leases Ute lands to non-Utes for farming and ranching purposes. The terms of the leases often are 10 years or less and this short lease term discourages non-Ute lessees from participating in the on-farm Salinity Control Program.

II.1.3.1 Strategy: Ute Tribe Contract with NRCS on Ute Leased Lands

NRCS requires only 10 percent cost share with the Ute Tribe. Leasees wanting to participate in EQIP pay 25% or more. Leasees are reluctant to participate because their 25% cost share may be lost if the lease is canceled at the end of its term. The Ute Tribe could contract for on-farm improvements, use Ute funds for the cost share and recover those capital expenses through a modest increase in the existing lease. The leasee would pay less than if participating in a cost share and have no risk of losing investment. The Ute Tribe would increase the value of the lease in perpetuity.

Obstacle:

None

II.1.3.2 Strategy: Show Benefit of Revising Ute Lease Policy

Working with the Tribe's water resources engineer, NRCS could show the benefit to the Tribe of having more reservation land under improved irrigation. With that enhanced appreciation, the Ute Tribe might be amenable to revising their lease policy to have longer term, renewable leases to clear the way for participation of non-Ute lessees in the NRCS on-farm irrigation improvement program. BIA would also need to concur with the Ute's decision and ensure compliance with CFR 25.

Obstacle:

The primary obstacle is NRCS's lack of resources to negotiate individual lease changes or an overall change in the lease policy.

Mitigation:

Use existing NRCS Ute liaison to accomplish this purpose.

II.1.3.3 Strategy: Ute Buy-Out Policy

Participants in the NRCS on-farm Salinity Control Program must contribute a portion of their own funds or labor for the irrigation improvement chosen. To leave investment behind at the termination of a lease period discourages leasees from participating. One strategy would be to work with the Ute Tribe to undertake a policy whereby the Utes would buy out the remaining equity (leasee's investment only) of the on-farm improvements.

Obstacle:

This could become an administrative cost to the Ute Tribe to manage the buy-out program and determine value of remaining equity.

Mitigation:

Establish a formula for buy-out based on the initial costs provided to the NRCS by the leasee.

II.1.4 Issue: Loss of Seepage for Wildlife Habitat

A side benefit of unlined canals is canal seepage. Those benefitting from wildlife access and sub-irrigation often oppose the lining or piping of canals, whether Utes or non-Utes. For the Utes, the loss of wildlife benefits appears to be a primary concern rather than the loss of sub-irrigation. Presumably, seepage for wildlife habitat was not a feature of the landscape prior to the advent of irrigation and canals over 100 years ago. Still, Utes and others have become accustomed to that benefit and resist losing it. Wildlife and wildlife habitat have a particular spiritual value for the Utes.

II.1.4.1 Strategy: Identify Properties of Least Value to Utes for Upgrades

One strategy for dealing with this concern is to work closely with the Utes to identify areas of greatest value for wildlife habitat, and those of lesser value. Projects could then be pursued in those areas with the least wildlife value. Refer to similar Strategy II.4.1.1, Acknowledge Limited Available Lands and Canals Suitable for Treatment.

Obstacle:

Resources of both agencies and the Utes would need to be expended to identify high and low value wildlife habitat.

Mitigation:

Incorporate evaluation of wildlife habitat into a Ute led master plan for their canal system. See Strategy II.1.1.6.

II.1.4.2 Strategy: Identify Supplemental Riparian Area Irrigation for Wildlife Benefits

One non-Ute interviewed has embraced piping and lining of canals with great enthusiasm, but still is concerned about providing wildlife habitat for the amenity value on his property. He has solved the problem by providing supplemental drip irrigation for trees in a selected area. This strategy would be to implement provisions for irrigation of riparian habitat into projects and where wildlife habitat is valued by the Utes. Refer to similar Strategy II.4.3.1, Non-irrigation Related Benefits.

Obstacle:

Operation and maintenance of such small linear systems is difficult, requiring time and management.

Mitigation:

Incorporate system maintenance into operation and maintenance of the proposed off-farm project.

II.1.4.3 Strategy: Identify Properties for Wildlife Habitat Improvement

One of the requirements of the Salinity Control Program is to mitigate loss of wildlife habitat by constructing replacement for such habitat. Interviews with both Utes and non-Utes suggest such mitigation has been appropriate for improving wildlife habitat and managing replacement habitat in a centralized location. However, remote habitat replacement was often deemed to be of less value to the populace who want to live and experience the habitat on a daily basis.

This strategy is to engage the Utes in identifying areas appropriate for mitigation—areas that do more than just meet the environmental mitigation criteria but are visually positive to Utes and their life values. This meaningful mitigation could be seen as positive and would encourage Ute participation in the Salinity Control Programs.

Obstacle:

Depending on the sites chosen, there may be significant obstacles associated with its topography, water availability, soils or other parameters that diminish the environmental mitigation benefits.

Mitigation:

Work closely with Utes to identify environmentally appropriate sites that meet all purposes.

II.1.5 Issue: Lack of Winter Water for Livestock

Open canals have historically provided the opportunity for those with livestock to easily attain water during the winter for their animals. Piping canals removes this opportunity because it is less costly to dewater pipelines in the winter than to engineer facilities to provide water without freezing of any pipes.

II.1.5.1 Strategy: Identify and Correct Projects Missing Committed Winter Water Service

One Ute irrigator interviewed recalled that when the canal he accesses was piped through Reclamation funded project, he was promised mitigation for the loss of his livestock watering. He claims that winter water has not been provided. Even if this is one instance out of many, it is important because winter livestock water is an important Ute value and others may be discouraged from participation after hearing this person's experience.

Obstacle:

Winter water systems require considerable operation and maintenance. Providing engineered systems to prevent freezing adds costs to projects that are already not competitive for funding. Also, some systems water rights do not include winter stock watering and consequently would be illegally providing stock water if provided through their system.

Mitigation:

Acquire access to potable water systems for stock watering as part of project costs is an option. It also resolves water right issue.

II.1.6 Issue: Value of Flowing Water

Occasionally an operator chooses not to participate in canal improvements because of a desire to retain the flowing water amenity provided by an open channel. This would likely be of particular interest to those who have purchased agricultural land largely for the aesthetic value, and not just its production value. However, it is understood that maintaining flowing water is of particularly high value to the Utes. In some cases, open channels on the reservation are regularly used for ceremonies. In addition, water flowing across parcels of Ute lands provides a sense of spiritual connection to the earth.

II.1.6.1 Strategy: Improve Canals to Complement Cultural and Wildlife Values

Presumably, lining canals instead of piping them would maintain the flowing water amenity. Reclamation requires a 50 year liner with cover that withstands livestock use. Effort could be made to work with the Utes in identifying those areas where improvements could be made and salinity reduced, without piping the canals. In particular, those canals currently being used for ceremonies should be excluded from piping.

Obstacle:

This comes at an additional cost that makes the FOA application less competitive. In addition, piping a canal provides downstream pressure for on-farm sprinkler systems.

Mitigation:

Participants may be more inclined to increase local cost share for these costs when 50%+ of water is saved. The balance between values and cost would need to be evaluated.

II.1.7 Issue: Cost Effectiveness of Ute Off-Farm Projects

One person pointed out that even if all of the impediments to applying for off-farm projects were removed, there would still remain the problem that the Uinta Basin, while having salt loads that need to be reduced, may not have enough salt to compete with other Colorado Basin salinity areas. The concern is that a great deal of effort could be undertaken to gain Ute interest in participating, only to result in discouragement that would prevent future applications.

II.1.7.1 Strategy: Leverage Ute Water Settlement Funds

One strategy would be to work with the Ute Tribe to gain their willingness to provide some of the Tribe's water settlement funds to reduce the federal cost for a project. This approach is used by non-Utes to make projects more competitive, and could also be used by the Utes. The Water Settlement Funds have not been used for this purpose historically. Refer to related Strategy II.2.2.1, Increase Local Funding Participation.

Obstacle:

The level of Ute funding may exceed their willingness to participate in the program.

Mitigation:

Complete planning level studies to determine competitiveness of projects and level of increased local cost share needed to be competitive prior to submitting application.

II.1.7.2 Strategy: Develop a "Focused FOA" for the Ute Tribe

Refer to strategy II.1.1.7.

II.1.8 Issue: Low Farming Interest

There is a perception expressed by Utes and non-Utes that Utes are hunters, not farmers. Examples were provided where Utes used diverted water on their properties not to grow crops, but to provide a setting in which their horses can run through stream-like areas, causing the unfortunate side effect of promoting non-beneficial plants such as Russian olives, and deep percolation that contributes to salinity. Some may run water unproductively just to protect their right to use the water. Nevertheless, there are Utes who are irrigating their lands to grow crops, and who have participated in the on-farm offerings of the Salinity Control Program. It is important that the agencies not fall into the trap of stereotyping individual Utes by the reputed practices of some. However, the low interest in participating in the Salinity Control Program is evidence that the program is not designed for, nor present to, the Utes to meet their needs in significant numbers.

II.1.8.1 Strategy: Work with Tribe's Water Resources Engineer to Educate and Motivate

As indicated above, the Tribe's water resources engineer has great interest in encouraging the Tribe to make the best use of its water resources. There will be many opportunities to work with him to ensure the Tribe and its members understand the value of the Salinity Control Program in helping them use their water in ways that are beneficial to the land and meet the goals of the Salinity Control Program.

Obstacle:

There are many ways in which Reclamation and NRCS purposes can be accomplished that do not necessarily fit in with traditional Salinity Control Program irrigation improvements. A barrier to this strategy would be that the Ute Tribe does not understand the flexibility of Reclamation and NRCS purposes.

Mitigation:

It is vital to this strategy the Tribe's water resources engineer understands how flexible Reclamation and NRCS are to accomplishing their salinity control purposes. He needs to understand each of these purposes and the many ways in which they can be addressed so he can return to the Tribe and explain the options before them that can include non-irrigation practices.

II.2 Lack of Off-Farm Improvements

In many cases, the lack of upstream improvement can impede down-stream, on-farm improvement. Many farmers share a perspective that in order for sprinklers to be cost effective, gravity pressure systems that eliminate pumping costs are needed. In some cases, due to topography, greater head is needed than can be developed by on-farm improvements. In other cases the off-farm improvements are limited because of difficulty in securing a right-of-way. If efforts are made to complete up-stream, off-farm improvements, more incentive will arise for on-farm improvements.

II.2.1 Issue: Lack of Coordination between Reclamation and NRCS

It is perceived that if more coordination between Reclamation and the NRCS existed, projects could be executed more efficiently, the cost per ton of salt would be reduced and construction could be scheduled to not impede farmers during the growing season.

II.2.1.1 Strategy: Assign In-Basin Coordinator

In the Agricultural Producers Focus Group, an assignment of a local basin coordinator was identified as a strategy. This strategy is similar to Strategy II.1.1.1 Request Ute Liaison and Regular Liaison Meetings. However, this is a non-Ute coordinator. This in-basin coordinator would increase cooperation between the various agencies and funding opportunities within the basin. The primary purpose identified was to ensure that off-farm and on-farm projects were completed concurrently so that the farmers would not lose part of their irrigation season because all the components of a system were not in place. Examples were cited of delays in agency decisions resulting in delays in construction, resulting in loss of irrigation season.

Obstacle:

At the Agencies Focus Meeting, the primary obstacle identified was that coordination between the agencies would not necessarily result in more rapid construction of off-farm or on-farm projects. Once authorized for funding by either Reclamation or NRCS, the rate of construction is the responsibility of the contracting entity (canal company or farmer). Therefore, increasing coordination between agencies is not the solution to risk of farmers losing part of an irrigation season.

Mitigation:

The Agency Focus Group suggested an alternative strategy that requires the contracting entity to provide coordination between the off-farm construction projects and on-farm projects. This increased responsibility has the potential of increasing project costs and making the project less competitive in the FOA process. The primary benefit is that the coordination and control is retained at the local level by those benefiting by both off- and on-farm projects.

II.2.2 Issue: Non-competitive FOA Applications

During the 2012 Reclamation FOA, no project within the Uinta Basin received funding. The reasons for a decline in Uinta Basin FOA approvals are:

1. Historically, salt loading calculations used in the early years of the FOA program over allocated salt saving. Those over allocations methods were corrected.

2. As competition for FOA funding has increased, Uinta Basin applicants have not increased their local funding participation to keep up with competition.

There are three concerns if participation in the Salinity Control Program in the Uinta Basin stops or is delayed for a long period. They are:

1. Discouragement from frequent failures may result in applicants not making efforts to apply in the future.
2. The lack of funding for off-farm projects will discourage on-farm participation. On-farm participation is greater when off-farm projects are incorporated, eliminating pumping costs. Loss of on-farm participation has a greater impact on salinity control than loss of off-farm projects.
3. If project funding is lost to the Uinta Basin for many years until other, more competitive projects are completed, the existing capabilities of agency staff and locals to implement salinity control projects may be diminished.

As stated earlier in this report, 1,077 of a total 1,761 miles of canals remain unlined or piped. Figure 5 below shows the status and location of the remaining untreated canals in the Uinta Basin.

These listed canals are summarized in Table 9 with the remaining untreated lengths and service areas of the canals. These miles do not require Ute approval and their system is not impacted.

Table 9 Untreated Canals not requiring Ute Approval

Canal	Length Untreated	Irrigated Area (Acres)	Acres/Mile
Farnsworth	36.6	230	6.3
Lake Fork	15.0	1014	67.6
South Boneta	2.2	396	180.0
Pioneer	7.2	574	79.7
Strawberry	2.8	63	22.5
Bluebell	30.9	1109	35.9
Class E	11.1	657	59.2
Sand Wash	10.7	330	30.8
Mosby	8.6	511	59.4
WR Ouray	40.5	881	21.8
Vernal area	134.7	5,907	43.85
Total	303.3	11,672	

Treatment of a canal does not necessarily mean that treatment of acreage will occur. Therefore, the above table should be used with careful judgment. For example, treatment of these lengths may not necessarily result in gravity pressures sufficient for sprinkler irrigation of all acreage served by canal.

The above canals represent only approximately 303.3 miles of the 1,077 miles of untreated canals. This means that approximately 773 miles of the remaining canals are either UIIP/BIA or are on Ute lands.

This lack of competitive projects is seen as a cause for concern for those within the basin after steady involvement with the Salinity Control Program. As other basins within the Upper Colorado Basin funding area become notified of the benefits of the Salinity Control Program or as others are more aggressive at increasing their local cost share, Uinta Basin FOA applicants are becoming less competitive. Furthermore, the salt loadings currently calculated for canal seepage in the Uintah Basin results in much lower loadings that historical and much lower than other basins.

For these reasons, there is a valid concern that there are no remaining canals to be treated that are competitive with projects in outlying basins within the Upper Colorado Basin.

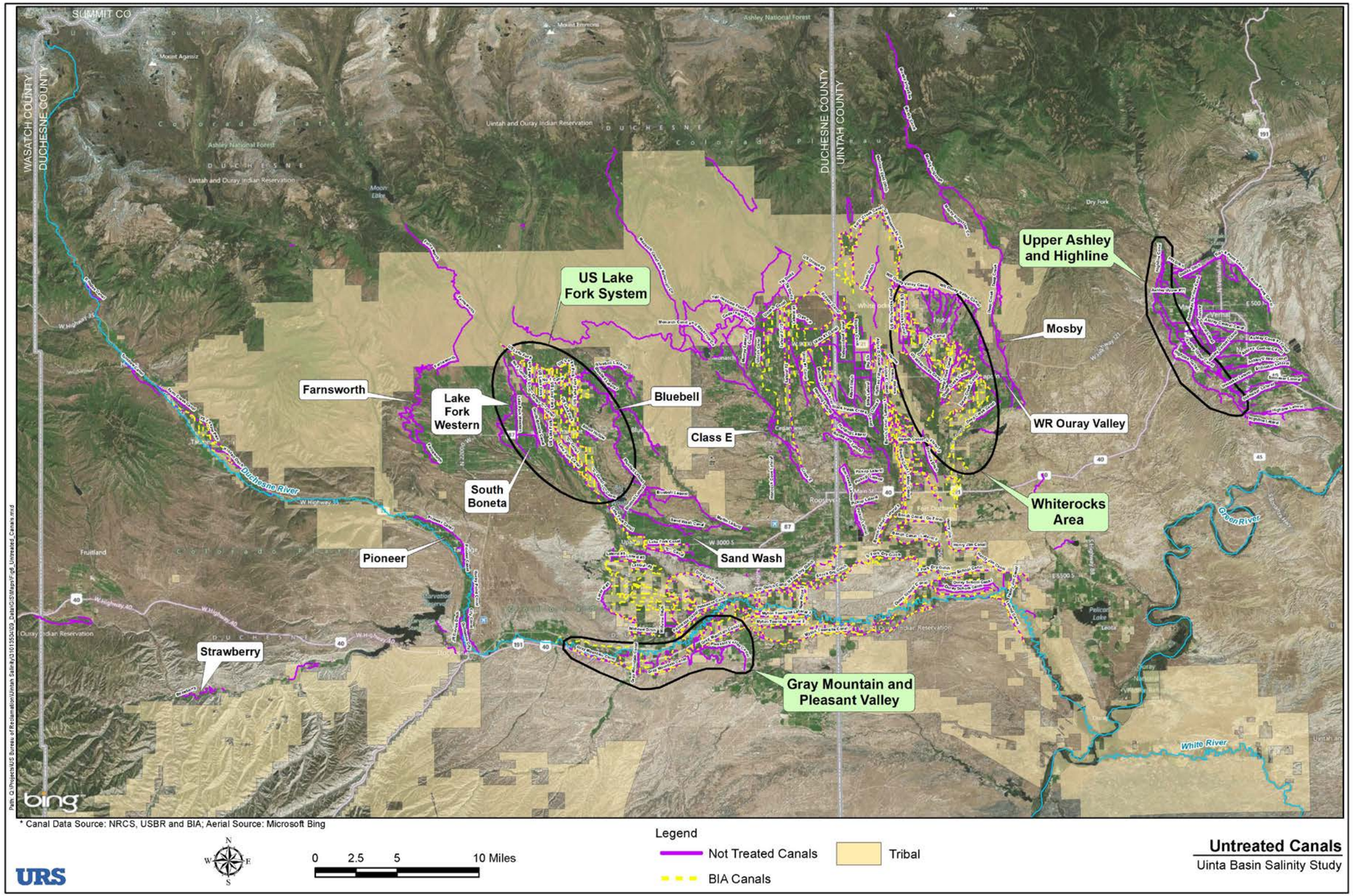


Figure 5 Untreated Canals

II.2.2.1 Strategy: Increase Local Funding Participation

FOA applicants in the Uinta Basin need to consider a higher local funding participation (increased local cost share) than they have historically offered in order to lower the federal funding cost per ton, thus making their projects more competitive. In comparing FOA applications and ranking by cost-per-ton, Reclamation quantifies only the federal portion of the project cost to the amount of tons of salt treated. Such increase in local funding would increase a project's level of competition in FOA applications.

Even as the costs of materials and installation have increased, the cost per ton of salt reduction has remained nearly constant for those projects that have been successful in the FOA competition. Some of the applicants might be increasing their local cost share to be more aggressive in competing for FOA funds, but that is not always the case. Addition of other new areas with higher salt loadings may explain some of the increased competition. Furthermore, lower salt loading calculations in the Uinta Basin than historical calculations make current applications less competitive than they would have been using historical calculation methods.

Many of the more cost effective projects have been constructed. The increase in competitiveness is a great benefit to the Salinity Control Program because more salt loading is being removed from the Colorado River Basin at a lower program cost, allowing more projects to move forward with the same funding level. Refer to related Strategy II.1.7.1, Leverage Ute Water Settlement Funds.

Obstacle:

The willingness to increase local participation in order to obtain a smaller portion of federal funding has its limits. A continuous competitive spiral of lower funding participation by the federal government through an increase of local, private funding will reach its limit. The limit of willingness to increase local funding has been met by those who currently do not submit applications, knowing that their projects are non-competitive. Others are expecting that other, more competitive projects will get built and their higher cost per ton projects will eventually be funded without additional increases in local cost share.

Mitigation:

Applicants can look to other non-federal supplemental sources of funding to help with local increase in cost share of project costs. These may include State of Utah revolving loans or other grant programs not identified. The Ute Water Settlement funds might be a source of local cost share funding for Ute supported projects.

II.2.2.2 Strategy: Educate Applicants Regarding Reasonable Increases in Local Cost Share

There exists a misconception by Uinta Basin FOA applicants of what a reasonable local cost share needs to be to be competitive. It has been suggested that Reclamation provide data on past successful FOA applications, including average, high and low cost per ton, and other decision criteria used. Reclamation provides this information at the pre-FOA workshops but they are poorly

attended in the Uinta Basin. Along with this instruction, a breakdown of life-cycle savings for treated systems might be included.

If applicants were willing to support increases in the local cost share, more of the FOA funds could be extended for further benefit to other applicants. However, due to the increased funding requirement by the applicants, such a strategy is sure to be met with skepticism. This also might be found to be a difficult strategy to apply due to a lack of resources for promoting local cost share issues. Applicants will need assurance that benefits are still in their favor despite their increased financial contribution to system upgrades. Refer to related Strategy II. 5.1.2, Increase Applicant Expectation of Increased Local Cost Share.

Obstacle:

Although Reclamation may provide information on historical project funding and costs per ton of salt, it cannot favor a participant, to the disadvantage of other applicants, by providing strategies to beat competition. Reclamation does offer debriefing to applicants on how to improve application for next FOA.

Mitigation:

Local water conservation districts could take leadership role in helping applicants to be more competitive.

II.2.2.3 Strategy: Combine Canal Systems

If multiple parallel canal systems can be combined for improvements, cost-per-ton treated may be reduced due to less capital requirements. This would make the project more competitive. Other than the combining of two canals in Ashley Valley (Vernal area), there are no opportunities identified for parallel canals to be combined that do not require Ute approval. Strategy II.1.1.6 is a BIA Canal System Master Plan and if implemented, would result in detailed study of the opportunities to combine parallel BIA/UIIP canals and possibly private canals crossing Ute Tribal lands.

Ashley Valley Canals – Ashley Upper and Highline

According to Gawain Snow, General Manager Uintah Water Conservancy District, the only two canals that have been seriously considered for combining in the Ashley Valley are the Ashley Upper and Highline Canals. These two canals are not parallel; consequently the cost savings associated with combining the canals is not significant. The Highline Canal starts at the end of the Ashley Upper Canal. The treated canal length from these two canals is 55.3miles (Ashley Upper 28.5 miles and Highline Canal and Laterals 26.8 mile) and includes two large laterals of the Highline Canal. The remaining untreated acreage in the Vernal area is approximately 5,000 acres but these acres are dispersed and not concentrated under the Ashley Upper and Highline Canals. It would not be appropriate to assume that a defined portion of this remaining acreage would be treated as a result of treating the Ashley Upper and Highline Canals.

BIA/UIIP Canals

The three obvious areas from looking at topography and alignment for combining canals are all BIA/UIIP canal systems. They are:

1. U.S. Lakefork canal system,
2. Pleasant Valley (partially non-Ute) and Grey Mountain Canals
3. Canal system in the Whiterocks area, including the Neola area.

Each of these areas has its own unique problems with combining canals and the proposed BIA canal master plan would be an appropriate mechanism for studying these canal issues because it would address the Ute cultural objections to treating some of them and would be able to look in more detail at the viability of combining canals and laterals.

The U.S.Lakefork system of canals and laterals. The lands under this canal system are a checkerboard of Ute and non-Ute lands. This is the area is labeled on Figure 4, Untreated Canals. It is an area that would appear to have fewer Ute objections to treatment than more easterly areas of the reservation because the Utes do not have significant cultural ties to this area. It also has a significant portion of the canal system serving non-Ute lands with BIA/UIIP canals. The total length of canals and laterals in the US Lakefork canal system is approximately 87.8 miles.

Gray Mountain and Pleasant Valley. Gray Mountain and Pleasant Valley canals are parallel for a significant portion of their lengths. Starting at the point where Pleasant Valley Canal diverts from Gray Mountain, the combined length of treated canal would be 17.6 miles. Of this amount, 6.9 miles would be Gray Mountain Canal and the remaining 10.7 miles would be Pleasant Valley Canal. A major complication of fully combining the two canals is that at least a portion of the Pleasant Valley Canal is not BIA/UIIP. This is illustrated on Figure 4, Untreated Canals.

Whiterocks Area. There are a lot of parallel canals and laterals in the Whiterocks area. See labeled area on Figure 4. However, this is an area that was identified as not being high value crop production area and is mostly dedicated to pasture. Also, there are Ute Tribe members who have expressed an aversion to treating this area because of the cultural benefits of open channels and riparian habitat associated with untreated canals. Therefore, this area is not considered a high value target area for canal improvements. No quantification of canals or acreage was made for this area.

Obstacle:

Few opportunities for combining canal system exist. Also, canal companies are reluctant to give up control of their system(s).

Mitigation:

Water conservation districts and BIA/UIIP could lead efforts to identify canals that could be combined and facilitate discussions between canal companies.

II.2.2.4 Strategy: Study Sub-Basins for Salinity Loading

A basin-wide salt loading factor is currently used to calculate the tons of salt each reach of canal contributes each year (see Section I.1.6). It can also be surmised that there is variability of salt loading rates from sub-basin to sub-basin within the Uinta Basin. Due to this variability and potential opportunities to increase salt loading reduction credits, it has been suggested to study sub-basins that have remaining untreated acreage and untreated off-farm canals to determine if salinity contributions are greater in those sub-basins than the currently used basin-average. A benefit to the Salinity Control Program is that if salt loading is found to be lower than the basin-average in the area studied, salinity control funds could be redirected to more effective salinity control projects.

A difficult aspect of this strategy would be to balance new salt loading rates with historical salt loading allocations. Historically, sub-basin salinity load factors were used but they were based on limited scientific justification and were eventually replaced with the current basin-wide factor. The obstacles below highlight why a basin-wide loading factor is being used instead of sub-basin allocations.

Obstacle 1:

The strategy requires significant funding to perform a Uinta Basin-wide hydro-salinity study.

Mitigation 1:

Ask State of Utah to fund study since goal is to increase competitiveness of Utah in obtaining federal funds. The study plan would have to be approved by Reclamation prior to commencement. For Reclamation to approve the study, it would either be conducted by USGS or the plan and final results reviewed and approved by USGS.

Obstacle 2:

Results might demonstrate that there are no or few remaining watersheds with high salinity contributions greater than the basin-wide average. Potentially, the study could result in no future funding of salinity control projects within the basin.

Mitigation 2:

Would required increasing local cost share to be competitive with smaller salt load reduction.

Obstacle 3:

Sub-basin evaluations may conflict with consistent Upper Colorado basin-specific salt loading factors currently used in comparing projects. Other basins may claim need for hydro-salinity study in an escalating need to compete between basins.

Mitigation 3:

Funding of study by local Uinta Basin entities could overcome Obstacle 3.

II.2.2.5 Strategy: Conduct Planning Studies

It has been suggested to conduct planning studies to identify viable FOA-competitive projects that align with the priorities of the FOA evaluation committee. Such studies would complete much of the due diligence incurred by applicants. In so doing, the most competitively viable projects would be identified and take on less risk associated with non-competitive application. Such planning studies would include feasibility of securing Ute rights-of-way. Refer to related Strategy II.1.1.16, BIA Canal System Master Plan.

Obstacle:

Conducting planning studies to identify competitive projects would benefit applicants in the Uinta Basin. However, these planning studies may create hard feelings between Uinta Basin applicants if their projects were determined to be non-competitive.

Mitigation:

The water conservation districts could take lead in performing these unbiased planning studies and explaining the advantages of knowing whether a project is competitive or not.

II.2.2.6 Strategy: Correct Misconception about Existing BSP

The perception of several agricultural producers is that the BSP is easier to use than USBR/NRCS programs because of fewer regulatory requirements. It is perceived that the BSP requires no competition for funding of off-farm projects and less coordination is needed for on- and off-farm projects. However, this perception is based on the former "Parallel" program that no longer exists. Currently, BSP receives FOA competed projects to fund. All the same requirements apply to the BSP as apply to the NRCS and USBR programs. This strategy is to make a concerted effort to explain the BSP and how it complies with all other salinity control program requirements.

Obstacle:

An effort will need to be made to explain the current BSP to applicants by NRCS, Reclamation and the State of Utah, Department of Agriculture. This will require a common explanation that is easily understood by applicants.

Mitigation:

Prepare a statement or brochure that can be used by all three agencies when explaining the purpose and capabilities of the BSP to applicants. All three agencies should agree to its content.

II.2.3 Issue: Completed On-Farm Areas Are Not Competitive for Off-Farm

Areas such as Vernal have few or no treated canals despite a heavy concentration of on-farm improvements. In some cases, the on-farm improvements were made by the farmers themselves

without the aid of NRCS funds. Many on-farm improvements were made with the understanding that pressurized systems would be built in the future to eliminate their pumping. Despite the on-farm irrigation improvements, current FOA evaluation criteria do not include any credits for prior completion of on-farm improvements.

II.2.3.1 Strategy: Recognize and Value On-Farm Improvements for Off-Farm Proposals

In comparing FOA proposals, there is a benefit to recognize salt savings from existing on-farm projects by emphasizing their impact in controlling salt loading. Not including this evaluation penalizes those farmers who committed to on-farm improvements, expecting future completion of off-farm systems. Such a strategy, however, does not meet the existing competition criteria because adding selection criteria credits for previous on-farm improvements is not the most cost-effective use of salinity funds. The consideration of awarding the most cost-effective methods of salt savings should always be at the forefront of FOA evaluations. Some may consider this strategy unfair or contradictory to competition. Furthermore, this strategy could be contrary to the Basinwide Program objective of selecting on basis of cost effectiveness.

The disadvantage to the Salinity Control Program of this strategy is that on-farm salt reduction is typically much greater than off-farm and therefore, completing only off-farm improvements have limited salt reduction benefits. However, completing off-farm improvement by eliminating canals provides additional assurance that irrigators will not revert to flood irrigation if pumping costs become prohibitive.

Applicants have the option of increasing local cost share to make projects more competitive. If pumping costs are onerous, then capital cost of increasing local cost share might be offset by elimination of pumping costs.

Obstacle:

FOA rules would have to be changed to provide some additional credit for previously completed on-farm improvements. This would require federal legislation.

Mitigation:

None

II.2.4 Issue: Ute ROW Approval

A significant reason for the lack of on-farm improvements is an unavailability of right-of-way across Ute lands. As seen in Figure 6, a large quantity of non-BIA canals route through Ute land. As an example, Figure 6 shows the sections of Altamont and Bluebell area canals with Ute land shown in beige. This figure depicts the underlying challenge of right-of-way acquisition due to the checkerboard of Ute lands throughout the Uinta Basin. Securing right-of-way through Ute land has come to be seen as a hindrance to both the FOA application process and NRCS programs.

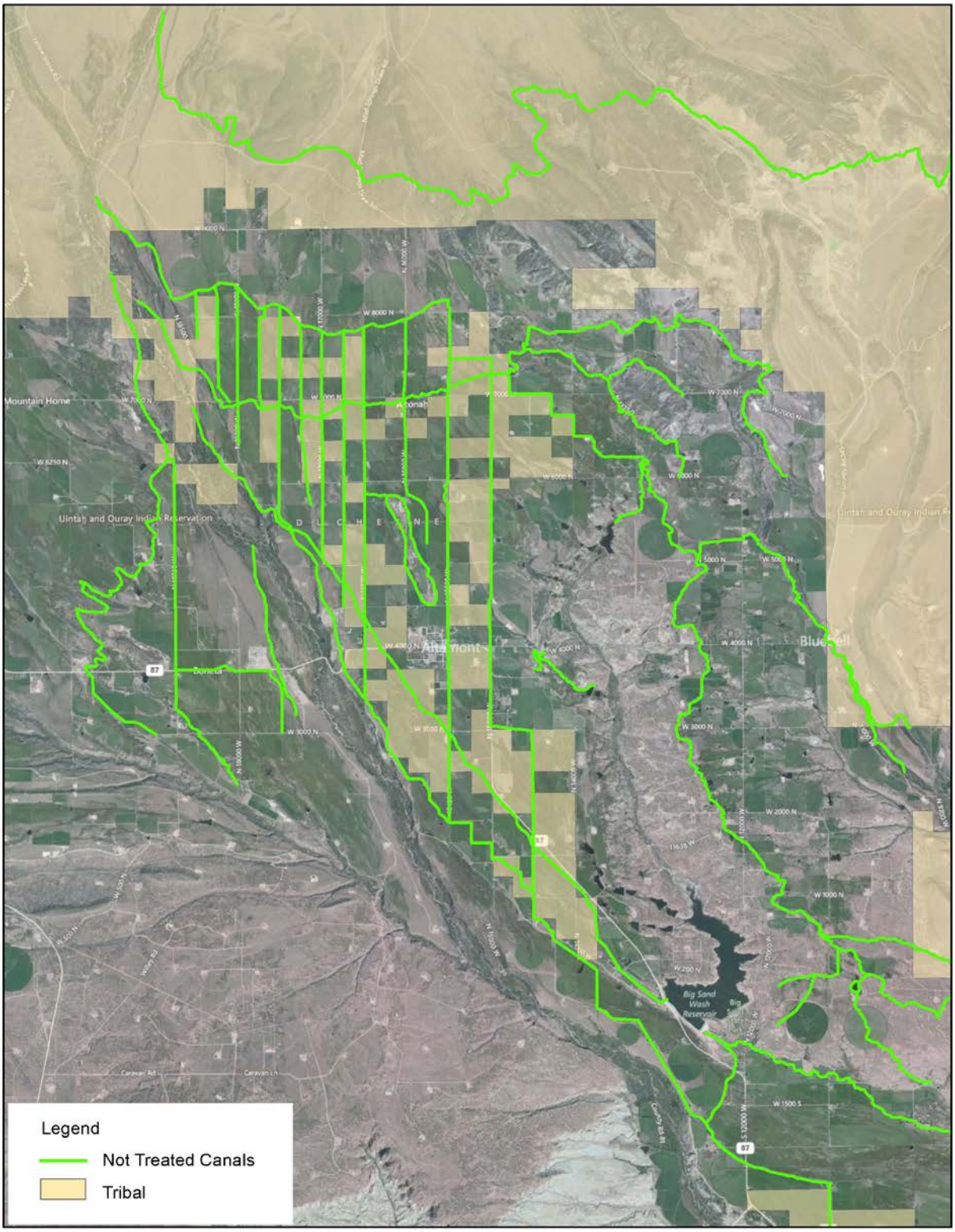


Figure 6 Altamont and Bluebell Property Rights Ovelap

II.2.4.1 Strategy: Early Right of Way Negotiation

Refer to Strategy II.1.2.1

II.2.4.2 BIA Canal System Master Plan

Refer to Strategy II.1.1.6, BIA Canal System Master Plan

II.3 Aging On-Farm Equipment

With 65% of all on-farm installations funded through the Salinity Control Program having now reached the end of their useful life, many farmers are concerned with the replacement of these systems [2]. From interviews with farmers and operators, there are many different thoughts concerning federal funding of equipment replacement. Some make the case that it is within the Salinity Control Program's best interest to continue to fund the replacement of aged irrigation systems because salt reduction benefits continue for those downstream in perpetuity. Others make the case that it is not in the Program's interest since improved irrigation practices have their own inherent economic benefits to the farmer that can fund replacement. Currently, because of limited EQIP funds, "Practice replacements can only be funded if significant environmental improvement will result" ([3], page 21). This has meant that only improvements to irrigation efficiencies warrant federal funding of equipment replacement.

The Agricultural Producers Focus Group reiterated the benefit of receiving continued funding for the replacement of irrigation infrastructure. There was a sentiment among the group that if an investment had been made by the government, the investment would go to waste if the practice were discontinued. Also, there is a precedent for the government to establish a renewal fund once the initial installation has met its useful life. For example, NRCS replaces fences on projects where fencing is the project. There was also a suggestion that the best use of funding would be for the money to stay within the Uinta Basin as opposed to returning uncommitted salinity funds.

In the 2007 NRCS Monitoring and Evaluation (M&E) report [2], two separate reports were summarized concerning the replacements of aged on-farm systems as summarized in table 9. The first report, prepared by Utah State University (USU) in 2005, summarized responses of producers in the Uinta Basin to the question: "If or when the present system wears out to the point it can no longer be repaired, how will you irrigate?" At no time throughout the interview processes were the interviewees under the impression cost-sharing funds would supplement their future replacements. The second report was prepared by the Utah Association of Conservation Districts (UACD). This second report addressed the following question: "If or when the present system wears out to the point it can no longer be repaired, how will you continue to irrigate?" In this second Uinta Basin survey, the question was addressed with and without consideration of cost share. Table 8 presents the findings of these surveys.

Table 10 Aging On-Farm Questionnaire Responses

	USU Study, 2005	UACD Study, 2007	
		Cost-Share	No Cost Share
Total Responses	128	--	--
Repair or replace with wheel lines	88 (69%)	--	--
Only replace with financial assistance	10 (7.8%)	--	--
Would change to pivot or flood	16 (12.4%)	--	--
Upgrade to a more efficient system	--	69%	--
Replace with a similar system	--	30%	62%
Use other programs/loans to upgrade	--	--	32%
Return to flood irrigation	--	1%	6%
Other responses	14 (10.9%)	--	--

A coherent policy to base long-term decisions of agriculture producers would be beneficial.

II.3.1 Issue: Risk of Reversion to Flood Irrigation

In discussions with local partners and participants, there is concern that the lack of on-farm replacement funding may result in a reversion to flood irrigation and a loss of on-farm salinity control benefits.

II.3.1.1 Strategy: No Funding of On-Farm Replacements

Based on the survey reported in the 2007 M&E report referred to above [2], a strong case could be made that salinity reductions would continue if no equipment replacement funding was made available. In the 2005 survey, only 12.4% of respondents answered that they would change to pivot or flood irrigation. It is unclear from this survey how many would revert to flood irrigation. In the 2007 study, only 6% of respondents would revert to flood. From a strictly action-reaction point-of-view, if the NRCS were to establish a policy of withholding funding for on-farm equipment replacement, most farmers would not defer maintenance of their irrigation systems.

Producers have realized a substantial increase in gross profits for many years with the irrigation improvements. This should enable them to replace components as necessary.

Establishing a no-funding policy of equipment replacement would establish an understanding and those committed to improved irrigation will replace equipment using private funds. This would preserve salinity funds for new projects with potentially greater salt load reduction. Unfortunately, some producers may revert to flood irrigation especially if other financial support programs were not available.

Obstacle:

None, this is essentially the current NRCS policy.

II.3.1.2 Strategy: Continue Funding of Incremental Improvements

It has also been suggested that incremental improvements continue with priority for funding based on efficiency rate improvement and cost-per-ton treated. Salt load reductions are calculated on the basis of the increased efficiency rating. For example, an upgrade from improved flood to sprinkler has an increased efficiency rating of 36% and an upgrade from improved flood to pivot has an increased efficiency rating of 45%. "Upgrades" are typically from sideroll sprinkler or handline to pivot. Cost shares for these upgrades for normal projects are funded at the same rate as flood to sprinkler projects. This provides a mechanism for cost effective equipment replacement.

Obstacle:

None. This is also the current policy of NRCS. The combination of the two existing policies; 1) no funding of replacement of like equipment and 2) funding to upgrade on-farm equipment for incremental irrigation efficiencies, has created some confusion among producers and requires education of these policies.

II.3.1.3 Strategy: Use "Unallocated" Salinity Funds

In extreme cases, due to time constraints, unallocated salinity funds have been returned to federal agencies. If this reoccurs, funds could be directed to the upgrade or replacement of treated systems. This would provide some limited funding for on-farm equipment replacement. However, this strategy would be difficult to implement due to a lack of consistency and new criteria would have to be established to allocate renewal funds fairly.

Obstacle:

There is no reasonable or equitable way identified to allocate unused NRCS funds for end-of-year projects.

Mitigation:

None

II.3.1.4 Strategy: Pro-rated Funding of Replacement

System replacements would place a considerable strain on NRCS funds. Recognizing this, the agricultural producers suggested establishing a policy of pro-rating and funding a proportion of equipment replacement. Such an arrangement could be considered almost as a contract renewal. It would require financial participation by the owner based on the age of the equipment beyond the useful life of the equipment. It would also provide a long-term plan for sustaining salt load reduction. An added benefit of such an arrangement would be that it does not reward deferred maintenance since replacement costs would be prorated based on time since initial purchase.

There is little to no demonstration that funding is needed to incentivize continued replacement of aging equipment. In addition, NRCS has made clear their funding policy, which is to not fund like-for-like replacements. Revision of the existing policy would establish a precedent for continued replacement payments, which is neither current practice nor the intent of the program.

Obstacle:

No existing policy. This would require development of detailed pro-rated schedules for various equipment.

Mitigation:

None

II.3.2 Preferred Strategy

The strategy of funding projects with incremental improvements is acceptable to the needs of the EQIP program because it achieves additional salt load reduction. It is also not controversial with local partners and participants. "New" projects have greater salt load reduction and are a higher funding priority for the program. "Upgrades" are funded only after new projects are funded. It is reasonable that this policy be continued as implemented in FY2013.

It is also suggested that this policy be conveyed to those producers waiting for decisions on replacements so as to not continue delaying maintenance.

If funding is still available after the list of new projects and upgrades is exhausted it may be desirable to re-visit this policy and consider strategy 3.1.4 above. Replacements of old sideroll sprinklers to new sideroll sprinklers have an increase of approximately 9% efficiency and therefore minimally meet EQIP program goals. It is the strong opinion of local partners and participants that money allocated for the Salinity Control Program in Utah be allocated and used for its intended purpose in Utah.

It can be argued that the return of $2M in FY2012 salinity funds actually cost the Salinity Control Program in Utah $5.6M. In FY2012 $2M was returned and $ 0.8M in Basin States funding was lost. In FY2013 $2.2M was reduced from the annual allocation (dropping from $7.7M to $5.5M) and $0.8M in Basin States funding was lost.

In addition, further research should be done to investigate the Salinity Control Program cost effectiveness to replace aging wheel lines with what NRCS considers a high tech irrigation system such as automated pivots with irrigation scheduling or even Low Elevation Spray Application or Low Energy Precision Application systems. If replacing worn out and leaking wheel lines, this could increase the irrigation efficiency from 55% to 85%, improve uniformity, and further reduce the salt loading by eliminating the variability in day and night-time sets.

II.4 Preference to Not Upgrade

Some of the interviewees expressed their preference to not upgrade their irrigation systems or canals. Some attitudes were that there are no real incentives to upgrade. In such cases, their current systems provided more benefits than an upgraded system. Some valued a perceived ease and stability only offered through their current system. Some valued the seepage benefits that come with unlined canals. Some were more motivated by aesthetics or habitat and environmental benefits than maximizing profit and production. Some farmers who had multiple competing interests that when combined create a very difficult set of issues to implementing any system upgrade.

II.4.1 Issue: Not All Lands or Canals Are Good Candidates for Treatment

The Salinity Control Program, as currently implemented, identifies the more qualified projects for funding. After three decades of success within the basin, most of the highly cost-effective projects have been implemented, and those remaining may not easily qualify for salinity funding.

II.4.1.1 Strategy: Acknowledge Limited Available Lands and Canals Suitable for Treatment

Some lands and canals would not be good candidates for treatment due to farm operations and land use. It is important to not expend unnecessary effort in considering such areas for upgrades. This will allow focus on other projects and lands that are more amenable to salinity control treatment.

This strategy would be difficult to implement because it dismisses lands and canals from further consideration for treatment that might be good candidates for subsequent generations or as a result of subdivision of land. It also requires expenditures of planning funds to identify those lands and canals least-qualified for treatment. Refer to similar Ute Strategy II.1.4.1, Identify Properties of Least Value to Utes for Upgrades. The criteria is different for these two strategies.

Obstacle:

The obstacle is the cost associated with studying the lands, interviewing producers and determining which lands to exclude from future efforts to improve irrigation.

Mitigation:

Do not implement strategy.

II.4.1.2 Strategy: Target Best Candidates

Some lands and canals are better equipped to qualify for salinity upgrades due to a combination of reasons such as lands use, soils, geography, local support, and cultural dynamics. Proactively identifying targets and best candidates for competitive upgrades would provide a more focused approach than waiting for applicants to demonstrate willingness to participate, and would facilitate the processing of applications.

Targeting best candidates would require additional time and money to identify candidates and approach operators. In addition to this approach being resource-heavy, it confronts the fact that

some individuals may need to be swayed to participate in the program. A lack of detailed land use and canal data compounds the difficulty of this approach. Such an effort would require a substantial amount of resources to implement.

Obstacle:

Expenditure of resources to identify good candidates.

Mitigation:

Use existing NRCS staff and assign this work on a low priority basis.

II.4.2 Issue: Benefitting from Canal Seepage or Stock Watering

A perceived side benefit of unlined canals is canal seepage. Those benefitting from wildlife access to water, creation of habitat, and sub-irrigation are unlikely to support lining canals.

II.4.2.1 Strategy: Provide Irrigation Company Shares to Compensate those Losing Benefits from Seepage

From discussion at the Agricultural Producers Focus Group, it was suggested that water projects impeded by individuals focused on wildlife or seepage benefits transfer a water allocation to those benefitting from the seepage. Such a transfer might incentivize support from those refusing lining due to loss of benefits from reducing seepage. The impacted individual would be supplied water shares based on a portion of the saved water resulting from piping. Replacing sub-irrigation with water saved through a project that reduces deep percolation would be a net-benefit for all parties and meet salinity objectives.

For such an arrangement to be approved, the fairness of granting shares to individuals not members of the canal company would need to be considered. This would require modification of the company's water right place of use to add these additional served lands. Additionally, this arrangement would acknowledge an entitlement to sub-irrigation or excess return flows which does not exist under current water law. The canal company would need to sign off on such an agreement.

Obstacle:

Need to modify water rights to include new areas served.

Mitigation:

File change application. Issue additional irrigation company stock.

II.4.3 Issue: Valued Open Channel, Riparian Habitats

There are reports throughout the Uinta Basin in which operators clearly value open channels and, riparian habitat over improved canal or on-farm irrigation efficiency.

II.4.3.1 Strategy: Non-Irrigation Related Benefits

Consider funding of salinity improvements that do not include irrigation improvements but meet salinity reduction goals. Water can either be diverted to seepage controlled channels with efficient delivery to riparian vegetation or water can be partially diverted to riparian areas. It would be difficult to evaluate salt loading reductions in such cases despite an end-goal being accomplished. Focusing on habitat improvements for the purpose of salinity control could prove difficult since no standard practice for calculating salt load reduction have been developed or could be developed for such systems. In addition, there are no identified precedents established for evaluating non-conventional salinity control methods such as these. Refer to similar Ute Strategy II.1.4.2, Identify Supplemental Riparian Area Irrigation for Wildlife Benefits.

Obstacle:

A methodology would need to be developed to evaluate non-irrigation salinity control practices. It will require resources to perform this work.

Mitigation:

None

II.5 Local Understanding of Reclamation FOA Process

In interviews, FOA applicants cite competitive disadvantages due to recurring changes in salt load reduction calculations and other unseen factors in the FOA evaluation process. These individuals suggest that if the FOA evaluation and selection process was communicated more clearly, they could prepare their applications more competitively. In response, Reclamation has not updated their salt load reduction calculation since 2007. In addition, Reclamation administrators offer both introductory FOA workshops and closeout briefings to discuss the competitiveness of their application. These workshops and debriefings are poorly attended by the applicants. The frustration of the applicants is possibly rooted in a misunderstanding of the competitive disadvantage of the Uinta Basin's relatively lower salt loading in comparison to other sub-basins within the Upper Colorado Basin. Also, applications are typically prepared by consultants who may not convey to their clients all the information provided by Reclamation. Any proposed strategy should be based on addressing this lack of understanding of the FOA process.

II.5.1 Issue: Discouragement from FOA Application Failures

Applicants have communicated an increasing discouragement from repeat non-selections in the FOA process. This increasing discouragement has led to a perceived lack of transparency in the FOA process. When this frustration was reported to agency representatives, an opposite view was conveyed. The application process is outlined clearly in the FOA and a timeline provided for the FOA process. With each FOA, a workshop is offered shortly after the FOA release to help applicants understand the requirements of the FOA, answer questions, and discuss requirements. Thirty days prior to the submittal due date, completed salt load reduction estimates are provided to applicants. From there, applicants are to complete their applications based on their cost share ability. Once the dollars-per-ton figure is determined and the final details decided, the final application is submitted. After applicants are contacted, if not selected, they are offered a debriefing to discuss application insufficiencies.

II.5.1.1 Strategy: Increase Applicant Engagement and Ownership in the FOA Process

Some past applicants expressed a need to understand how the salt load reduction is calculated. They assume that if they knew how the salt load reduction calculation is made, more strategic decisions could be made. Without this calculation detailed, the applicants do not understand how salt load reductions are estimated and consequently have a level of distrust in the evaluation.

Once the final application is submitted, applications go through an initial screening and are reviewed by Reclamation Salinity Coordinators. Once reviewed, the Application Review Committee (ARC) meets and ranks applications based on criteria set out in the FOA.

Applications have been evaluated individually according to the following criteria, listed in descending order of importance:

1. Cost Effectiveness
2. Project Risk
    a. Obtaining Salt Load Reduction
    b. Capability to Implement

   c. Detailed Project Plan and Costs
   d. O&M and Management
3. Enable On-Farm Salinity Control Features
4. Past Performance

The Salinity Control Act directs that cost effectiveness be the prime criteria for ranking and selecting projects for funding.

In the FOA workshops, Reclamation staff explains the criteria used to evaluate the applications. Reclamation staff expressed concern about low attendance at the workshops leading to misunderstanding of the process. The strategy is to increase participation in the pre-FOA workshops by canal company board members by making personal invitations to the workshop by Reclamation.

Potential applicants can also inquire of Reclamation about salt loading, regardless of FOA announcements. Unofficial estimates will be provided.

Obstacle:

Canal company staff may continue to rely on consultants to represent them at workshops.

Mitigation:

Make personal requests to attend and to not rely solely on consultants representing canal companies.

II.5.1.2 Strategy: Increase Applicant Expectation of Increased Local Cost Share

The average of the 2012 FOA selections was $55 per ton of salt reduction. Most of the unsuccessful Uinta Basin applications were much higher than the Colorado Basin-wide average competitive rate. There is a clear misunderstanding of required local cost share for a project to be competitive for FOA selection. Reclamation will share the average past FOA costs per ton and applicants will determine what, if any, local cost share they are willing to commit to be competitive.

Obstacle:

Reclamation cannot coach applicants on strategies to beat competition, only on how to make applications more competitive.

Mitigation:

The local water conservancy districts could lead effort to evaluate and improve competitive applications and to help identify outside funding sources.

II.6 Capital Investment and Operating Cost

There are producers who have the opinion that even a 25% cost share for on-farm improvements is too much for the benefits of increased production and ease of operations. No strategy was identified to address the opinion that 25 percent cost share is too great.

II.6.1 Issue: Pumping Costs Are Too Great

Some irrigators have the opinion that if any pumping is needed, they cannot justify the cost. These positions are not warranted in the opinion of all the participants at the Agricultural Producers Focus Group meeting. It is their opinion that eventually those with these opinions will change their minds or the next generation of farmers will recognize the value of improving irrigation efficiencies.

II.6.1.1 Fund Power Installation

Current NRCS practice is to pay for power installation for only on-farm power conveyance. Any costs for delivery of power to the farm are excluded. This strategy would be to pay federal share of cost for a pre-determined maximum distance to convey power to the farm.

Obstacles:

This is not current NRCS policy. May require changes to EQIP national regulations.

Mitigation:

None

II.7 The Salinity Control Program Administration Has Become Less Accessible

In discussions with participants, local partners, and applicants, a common concern arose of decreasing accessibility to Salinity Control Program administration and authorities. In respect to NRCS administration, participants and local partners identified a widening gap between the program authority and local field offices. Pertaining to the Reclamation FOA process, applicants cited long delays between notice of award and authorization of funding.

II.7.1 Issue: NRCS Decision Making Has Become Less Local

The participants and local partners assert that the widening gap in program authority is a disadvantage and burdens project efficiency. This concern stems from a historically high approval rating of NRCS Salinity Control Program offerings due to local level involvement and high technical guidance. In contrast, it appears that NRCS decisions and approvals are occurring at higher levels in the organization. Historically, many program decisions could be made on the spot by the District Conservationist or Soil Conservation Technician. An example would be minor modifications. The District Conservationist would have approval authority up to a dollar amount or percent of contract that constituted a "minor" modification. The Salinity Control Program was viewed as a model program for many years in the 1980's, 1990's, and early 2000's. Then, there was a decision to shift authority to higher levels which alienated many of the local partners. For example, all modifications that require any additional money go through a two level review that requires approval from NRCS State Office Program staff. The process may take days or weeks for decisions that local officials could have made immediately in the past. This trend is changing because of efforts of the current State Conservationist.

II.7.1.1 Strategy: Push Authority for Decisions to Field Offices

Participants and local partners suggest returning project administration and authority to field offices with oversight and participation shared with conservation district boards. By localizing project administration and authority to field offices, the administrative process would be reduced, local board participation would be increased, and risk assumed by participants would be reduced. However, a localization of project authority would decrease oversight to ensure compliance with EQIP requirements.

NRCS has implemented a local EQIP fund pool, wherein each county identifies needs and selects projects accordingly. Projects are administered by the District Conservationist but decision making authority requires Area Conservationist approval for nearly all contracting decisions. The current trend of strengthening local partnerships and local decision making authority is noteworthy and encouraged.

Obstacle:

Requires directive of NRCS to push more authority to field offices.

Mitigation:

None.

II.7.1.2 Strategy: Restore Conservation District Board Participation

Conservation District Board participation has been re-instated in review of Conservation Plans.

Historically, a local Salinity Coordinating Committee would meet annually and review the upcoming projects. They would prioritize them and make a recommendation to the State Conservationist of how to allocate the salinity funds by county. This was a positive step to build consensus locally and it rarely conflicted with program or agency goals.

Obstacle:

None. Participation by Conservation District Boards has been reinstated. Salinity Coordinating Board is not functioning.

Mitigation:

Re-establish Salinity Coordination Board.

III. Conclusions and Recommendations

The Salinity Control Program, including both NRCS and Reclamation programs, has been a resounding success in reducing salinity contributions to the Colorado River. It has also been acknowledged unanimously by those who have participated as a great benefit to agricultural production, economic growth and way-of-life in the Uinta Basin. The historical success has motivated those with knowledge of its accomplishments to want to see the program continue into the future. However, the challenges for the Program to sustain past levels of participation are significant. They include:

1. With few or no off-farm projects approved for federal funding, there is a potential that on-farm projects will decrease significantly exists regarding future FOA success.
2. With few or no off-farm projects approved for federal funding, there is a potential that on-farm project applications will decrease.
3. Many of those most willing to participate have already treated their lands and canals. Those remaining are less interested in participating. Often, their reasons for not participating are justified because of farm limitations or the nature of their farming operations.
4. The issues that have inhibited Ute participation in both on-farm and off-farm salinity control treatments remain. They include significant objections to pipes and pivots with greater values placed on local habitat, winter stock watering and in-stream flows.
5. Although 60 percent of canals remain untreated, there are few opportunities remaining in the Uinta Basin to treat off-farm canals without some involvement of the Ute Tribe, who has demonstrated reluctance to participate.

It can be concluded, that sustaining historical levels of participation in the Salinity Control Program into the future will require some new strategies. The most promising strategies to consider from those presented above are:

1. Engage the Ute Tribe and its members to identify non-irrigation projects that meet salinity goals.
2. Consider a focused FOA for the Ute Tribe that could include both irrigation improvements and non-irrigation improvements.
3. Receive feedback from the Ute Tribe through its water resource engineer and appointed liaison.
4. Increase non-Salinity Program funding sources, State and Ute Tribe, to spread the costs of increased local cost share.
5. Increase local planning efforts to identify most cost effective projects and plan smarter ways to compete for federal funds. Seek federal planning funds such as WaterSmart funding.

6. Leverage non-salinity funds such as Ute Settlement, Mitigation Commission and State Revolving Loan funds to supplement increases in local cost share to make projects more competitive for FOA funding.

7. Ute Tribe contracting for on-farm improvements to lessen cost-share and remove impediments to treatment of leased lands.

8. Provide an in-basin coordinator to help applicants and to coordinate between applicants, Reclamation, NRCS and Utes.

The treatment of non-Ute canals and lands has been ongoing at a high rate for decades. Many of the remaining non-Ute lands and canals are more difficult to treat or many agricultural producers have justifiable reasons for not participating in irrigation improvement projects. For example, the single largest area of untreated lands in the basin is in the Whiterocks area where farming is comprised of mostly pasturing on lands with shallow soil profiles. This area will see limited participation in either on- or off-farm salinity control treatments. Although 1,077 miles of the 1,761 total miles in the Uinta Basin remain untreated, only approximately 303 miles remain that do not require participation by the Ute Tribe. Approximately half of this total is in the Vernal area where on-farm treatment is essentially completed.

The remaining 773 miles are either BIA (UIIP) canals that pass through Ute lands or canals in high mountain terrain and/or on Ute lands. With almost 18,000 acres of the 21,000 total irrigated Ute lands being flood irrigated, the Salinity Control Program on the reservation has considerable potential. Consequently, the best opportunities for sustaining the Salinity Control Program in the Uinta Basin are to engage the Ute Tribe to participate. Historically Utes have not participated in the program and future participation will depend on strategies not previously applied.

In conclusion, advancing the Salinity Control Program in the Uinta Basin at the levels historically experienced will be challenging. Moving the program towards greater local funding of off-farm projects and engaging the Ute Tribe will be the two most important changes needed to meet those challenges.

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Geographic Information System Data

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End Notes

[I] Personal communication, Nick Williams, Reclamation, October 19, 2012

[II] For more information, see: http://www.usbr.gov/projects/Project.jsp?proj_Name=Grand%20Valley%20Project

Appendix A: Irrigation Technology and the Uinta Basin

Appendix B: Salinity Accomplishments Report

Appendix A: Irrigation Technology and the Uinta Basin

As water supply and water quality concerns are addressed by policy makers, the conversation can quickly turn to irrigated agricultural and irrigation efficiency. In this section irrigation efficiency and technology are briefly discussed, and their impact on both water supply and water quality.

Irrigation Efficiency

From a seasonal perspective, a common definition of irrigation efficiency is:

$$E_i = (V_b/V_f) * 100$$

Where V_b is the water beneficially used by the crop, and V_f is the water delivered to the farm or field. The water beneficially used by the crop includes crop evapotranspiration (ET_c) and the water required for leaching to maintain the soil salt balance. ET_c includes water transpired by the crop and evaporation from the plant foliage and soil surface (Figure 1). Water not beneficially used includes the percolation to the water table in excess of the leaching requirement and surface runoff. Irrigation efficiency can be increased by reducing surface runoff (tail water) and deep percolation, and can be accomplished by improved irrigation water management, system improvements or a combination of both.

Irrigation uniformity is also very important. There are various ways of defining uniformity but conceptually ~~you want to infiltrate~~ the same depth of water is to be infiltrated across the entire field. This can be a challenge with surface irrigation because the opportunity time at the head end of the field is greater than at the tail end of the field. It is easy to over-irrigate the head end and under irrigate the tail end. Sprinklers reduce this problem. It is ~~not un~~common ~~for people~~ for irrigators to correlate increased irrigation efficiency with water savings (reduced basin depletions). The main driver for farmers to invest in new or updated irrigation technology is increased yields. Crop yields should increase with system improvements because of improved irrigation efficiency and uniformity. Higher yields result in more water being depleted from the basin.

There is some degradation in surface water quality as water runs across the field and potentially picks up fertilizer, surface salts and pesticide residue. Deep percolation is of more concern and a focus of the salinity program. As irrigation water percolates below the crop root zone and to the water table, it picks up naturally occurring salts and minerals and eventually transports them to the streams and rivers of the basin. The deep percolation component must be reduced to impact the salt outflow of the basin. If a system has poor irrigation efficiency because of high surface return flow (tail water) and relatively low deep percolation, system improvements that primarily reduce tail water and dramatically increase the irrigation efficiency will have little benefit for salinity control. In such situations the salinity reduction claimed for on-farm system improvements can be vastly overstated. In some areas the surface runoff is reused multiple times, making the basin irrigation efficiency much higher than a particular farm or field irrigation efficiency. When looking at irrigation system improvements for salinity loading reduction, it is important to focus on reducing deep percolation.

Table 1 has been adapted from work by Terry Howell of the USDA-ARS (Bushland, Texas). It shows the range of expected irrigation efficiencies based on system type. Management of the irrigation system can be as important as the system type. A well-managed furrow system on good soils may obtain efficiencies as high as a center pivot that is marginally managed. However, on average a center pivot will produce higher efficiencies (80%) than a furrow irrigation system (65%). The NRCS salt loading calculations use considerably lower surface irrigation efficiencies than presented in Table 1. NRCS assumes from 32% for unimproved flood to 55% for well managed improved flood irrigation. In this context flood and surface irrigation are synonymous.

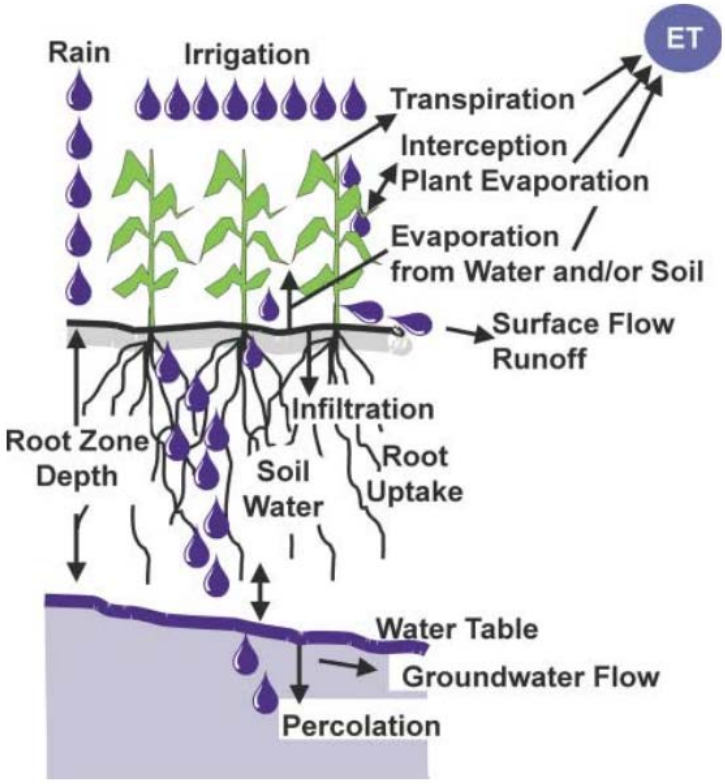


Figure 1. Illustration of the various transport components needed to characterize irrigation efficiency. (From Irrigation Efficiency by Terry A. Howell)

Table 1. Example of Farm and Field Irrigation Application Efficiency and Attainable Efficiencies*

Irrigation Method	Field Efficiency (%)		
	Attainable	Range	Average
Surface			
Graded Furrow	75	50–80	65
w/tail water reuse	85	60–90	75
Level Furrow	85	65–95	80
Graded Border	80	50–80	65
Level Basins	90	80–95	85
Sprinkler			
Periodic Move	80	60–85	75
Side Roll	80	60–85	75
Moving Big Gun	75	55–75	65
Center Pivot			
Impact Heads w/End Gun	85	75–90	80
Spray Heads wo/End Gun	95	75–95	90
LEPA[a] wo/End Gun	98	80–98	95
Lateral Move			
Spray heads w/Hose Fee	95	75–95	90
Spray Heads w/Canal feed	90	70–95	85
Microirrigation			
Trickle	95	70–95	85
Subsurfaced Drip	95	75–95	90
Micro Spray	95	70–95	85
Water Table Control			
Surface Ditch	80	50–80	80

Subsurface Drain Lines	85	60–80	85

[a] LEPA is low energy precision application

*Table adapted from Irrigation Efficiency by Terry A. Howell, USDA, Bushland Texas. Published in Encyclopedia of Water Science, 2003 by Marcel Dekker, Inc.

Irrigation Technology

In the Uinta Basin, large tracts of land have been converted from surface irrigation to wheel-lines under the Salinity Program. Many of these systems are approaching the end of their physical and economic life. For these systems to be replaced under the salinity program, they have to compete in terms of cost effectiveness judged from a cost/ton of salt reduction. The NRCS assumes 65% efficiency for wheel lines in the salinity cost effectiveness calculations. There are two irrigation system tiers with higher efficiency than wheel lines in the NRCS calculations. These are “Continuous move” (75%) and “High Tech” (85%). Continuous move would be a well-managed center pivot or linear move. High tech is somewhat unclear but likely includes technology such as drip and potentially LEPA systems (See Table 1).

Periodic Move Systems

Wheel-lines are extensively used throughout the western United States but present their own challenges. One of the biggest is the labor requirement to move the lines once or twice a day. For small farmers, particularly those with outside employment it can be difficult to have equal day and night-time sets. For example, if the lines are moved at 7:00 am and 5:00 pm each day, this results in 10 hour day sets and 13.5 hour night sets assuming a half-hour down time. Assuming no deficit irrigation, these varying set times reduce uniformity and irrigation efficiency. A continuous move system such as a center pivot, eliminates differences in set times and reduces the labor requirements. Pivots can also be used with tall crops such as mature corn.

Continuous Move Systems

In the Uintah basin there are many small fields that provide design challenges for typical continuous move systems such as quarter section center pivots. There are manufacturers that make low profile mini-pivots that can be configured for a variety of field sizes. One such manufacture is Lindsay Corporation with their Greenfield MP400 Mini-Pivot Product line. Figure 2 shows how the pivot can be configured for fields ranging in size from 1 to 73 acres. Other manufacturers, such as Valmont with their Valley line of pivots, can build shorter length pivots but do not have a mini-pivot.

A Zimmatic Dealer (Lindsay Corporation) and a Valley Dealer were contacted with in Northern Utah to get their opinion of mini-pivots. Both dealers referred to them as toy pivots because of their lighter gauge steel construction, which makes them less likely to hold up under commercial farming operations. Many dealers do not routinely stock parts for mini-pivots, making them more difficult to service and repair. Both dealers commented that with smaller fields you can use standard pivot towers with smaller pipe and longer spans that makes them economically competitive with mini-pivots. For small systems, mini-pivots do have an advantage in that they come with single phase motors instead of 3-phase motors, which reduces the cost of providing power to the field where 3-phase power is not readily available. Another advantage to mini-pivots is that they typically have shorter span lengths and more towers, resulting in less problematic wheel rutting. This advantage, however, can be replicated with standard pivots by decreasing the span pipe diameter so that the water weight per wheel is similar to the mini-pivots.

Linear move systems are also feasible on smaller acreages. They are not used as much as center pivots because of their increased complexity. They are well suited for rectangular fields. Lindsay makes a line of Mini-Lateral systems designated ML400. These systems can be configured to pivot at the end of the field resulting in doubling of the area of coverage, and preventing the need to run them back dry for new irrigation events (Figure 3).

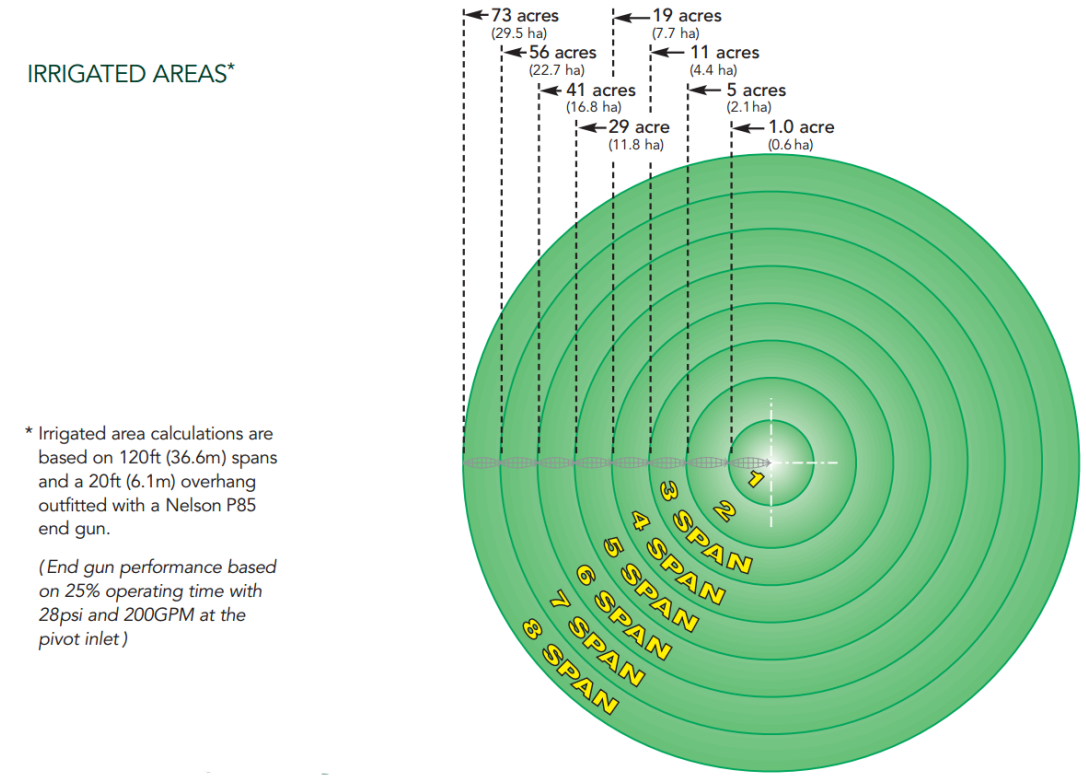


Figure 2. Irrigated areas for various configuration of the Lindsay Greenfield MP400 Mini-Pivot Pivot (Figure adapted from Lindsay Greenfield MP400 Brochure)

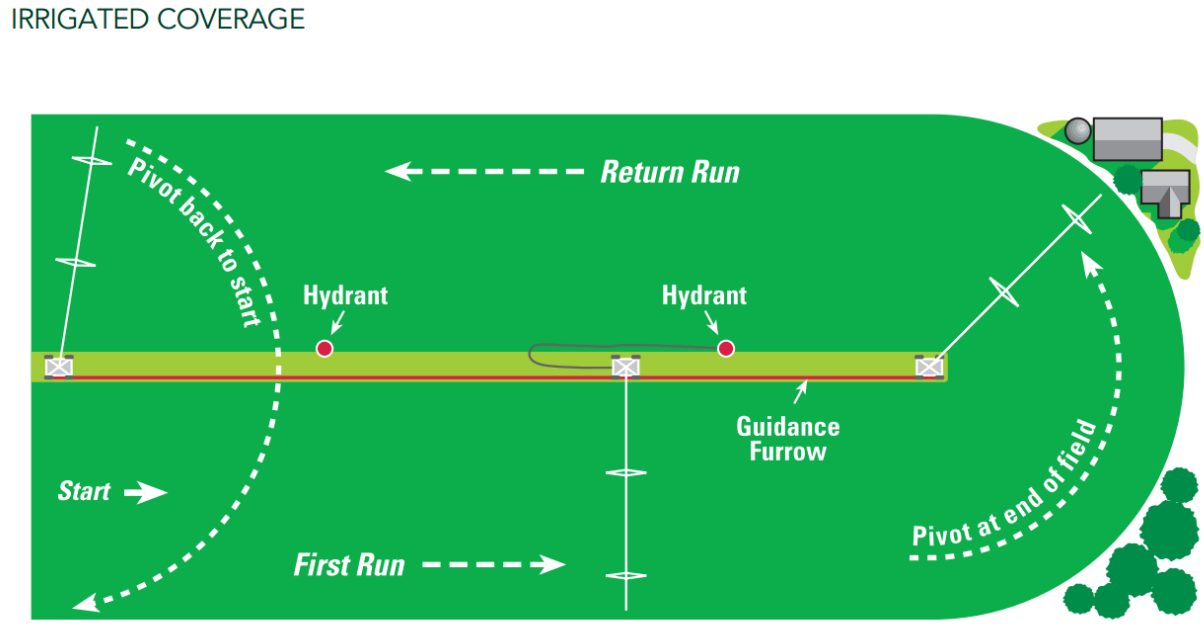


Figure 3. Irrigated area for a Lindsay Lateral move system showing pivoting at the ends of the field. (Figure adapted from Lindsay Greenfield ML400 Brochure)

High Tech Systems

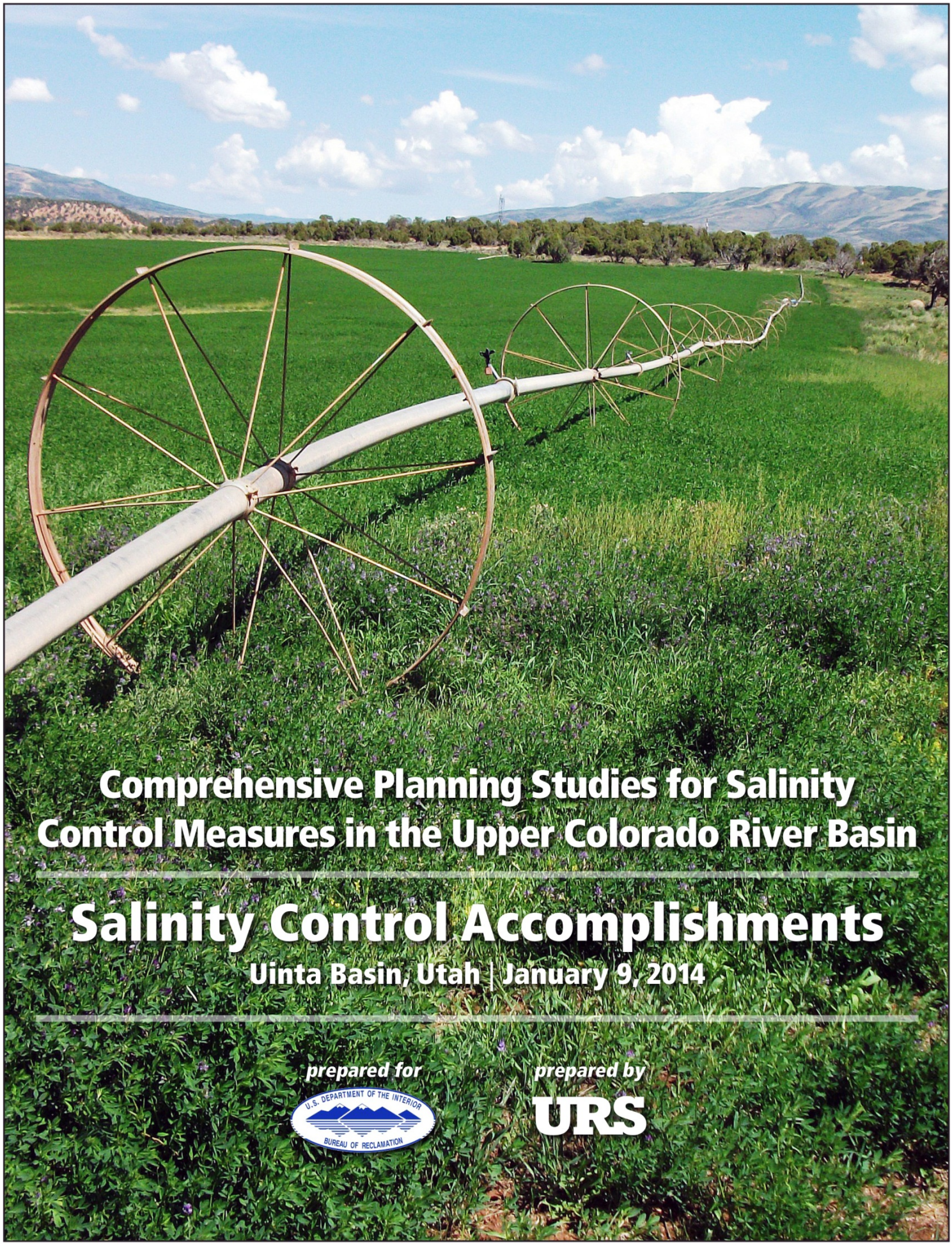
The top tier of the NRCS system efficiencies is termed High Tech. High efficiencies can be obtained with center pivots combined with soil monitoring and an irrigation scheduling program. The goal of irrigation scheduling is to match the crop water requirements with the water applied by estimating crop water use with weather based ET calculations. Soil moisture monitoring helps calibrate the scheduling program by providing a check between field soil moisture and what is calculated. Pivots equipped with Low Elevation Spray application (LESA) or Low Energy Precision Application (LEPA) equipment can obtain very high efficiencies and improved crop yields, and would likely be considered a "High Tech" system for NRCS funding.

Sub-surface Drip Irrigation (SSDI) and Surface Drip irrigation (SDI) would also be considered high tech. These systems are used in areas with high cost water and typically high values crops. In the Central Valley of California, drainage problems and selenium loading to Kesterson National Wildlife led to dramatic changes in irrigation practices since the 1980's. Westland's Water District lost their drainage service, which resulted in more than 200,000 acres having saline groundwater within 10 feet of the surface. This has led to many farmers changing cropping patterns and going to high tech irrigation systems such a drip. It has been reported in the Central Valley of California that drip can use one third of the water and one half of the nitrogen of surface irrigation systems. In California, SSDI and SDI are commonly used on vegetables, melons, trees and vines. Water costs can range from $100 to $150/ac-ft providing great incentive for efficient use of water.

The primary cash crops are grain corn and alfalfa, which do very well under pivots in the basin. SSDI can be feasible to use on field crops such as corn, and some have reported success in using SSDI on alfalfa. However, in the Uinta basin, there is little incentive for a SSDI system with the additional cost and management challenges and relatively inexpensive water and low to moderate value crops. Such systems are likely impractical in the Uinta basin.

Recommendations for the Uinta Basin

Further research should be done to investigate the salinity program cost effectiveness to replace aging wheel lines with what NRCS considers a high tech irrigation system such as automated pivots with irrigation scheduling or even LESA/LEPA systems. If replacing worn out and leaking wheel lines, this could increase the irrigation efficiency from 55% to 85%, improve uniformity, and further reduce the salt loading by eliminating the variability in day and night-time sets.



Comprehensive Planning Studies for Salinity Control Measures in the Upper Colorado River Basin

Salinity Control Accomplishments

Uinta Basin, Utah | January 9, 2014

prepared for

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

prepared by

URS

Salinity Control Accomplishments

Uinta Basin, Utah

January 9, 2014

Comprehensive Planning Studies for Salinity Control Measure in the Upper Colorado River Basin

Task Order R12PD40031 – Uinta Basin

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1 Brief Salinity Program History

1.1 Program Descriptions

The Colorado River Basin Salinity Control Program (Salinity Control Program) was established to preserve and improve the water quality in the Colorado River Basin through salinity control efforts. The Colorado River provides water to about 33 million people and irrigation water to nearly 4 million acres in the United States while supplying Mexico with water for 3 million people and irrigation water to 500,000 acres [7]. Downstream economic impacts due to increased salinity have been quantified at $300 million per year. The Bureau of Reclamation (Reclamation) is the federal agency charged with primacy to supervise and implement the Salinity Control Program. The Natural Resources Conservation Service (NRCS) partners with Reclamation in the Salinity Control Program with prime responsibility to implement on-farm salinity controls.

1.2 Program Authority

The Colorado River Basin Salinity Control Program was established by and has progressed through the following Congressional Actions ([7], [17]):

- The Water Quality Act of 1965 (Public Law 89-234), as amended by the Federal Water Pollution Control Act of 1972, mandated the establishment and maintenance of water quality standards in the United States.
- Congress created the Colorado River Basin Salinity Control Act (PL 93-320) in June, 1974. Title I of the Act addressed the United States' commitment to meet water quality standards set for water delivered to Mexico and provided means for the U.S. to comply with provisions of Minute 242. Title II of the Act created a water quality-salinity control program within the United States. The Secretary of Interior and Reclamation was given primacy. The USDA was authorized to support Reclamation's program.
- The Environmental Protection Agency (EPA) established a basin-wide salinity control policy for the Colorado River Basin in December, 1974. With this policy, the EPA also established a procedure requiring basin states to adopt and submit for approval standards for salinity, including numeric criteria and a plan of implementation.
- In 1984, PL 98-569 amended the Salinity Control Act granting authority and funding to the USDA Colorado River Salinity Control Program. Financial assistance came through Long Term Agreements administered by Agricultural Stabilization and Conservation Service (ASCS) with technical support from Soil Conservation Service (SCS). The effectiveness of applied measures was to be monitored and evaluated by continued technical assistance through the USDA.
- In 1995, PL 103-354 transformed the SCS into Natural Resources Conservation Service (NRCS) and ASCS into Farm Service Agency (FSA).
- In 1995, the Secretary of the Interior was authorized through PL 104-20 to implement a basin-wide salinity control program. The Secretary was authorized to carry out the purposes of this legislation directly, or make grants, enter into contracts, memoranda of agreement,

commitments for grants, cooperative agreements, or advances of funds to non-federal entities under such terms and conditions as the Secretary may have required.

- In 1996, the Federal Agricultural Improvement and Reform Act (PL 104-127) combined four existing programs, including the Colorado River Basin Salinity Control Program, into the Environmental Quality Incentive Program (EQIP).
- The Farm Security and Rural Investment Act of 2002 and the Food, Conservation, and Energy Act of 2008 reauthorized and amended EQIP, continuing opportunities for USDA funding of salinity control measures.
- In 2008, Sec. 2806 of P.L 110-246 amended the Salinity Control Act.

1.3 Colorado River Basin Salinity Control Program Measures and Goals

Instituted in 1974 through the Colorado River Basin Salinity Control Act by the Colorado River Basin States, the purpose of the Colorado River Basin Salinity Control Program is to reduce and maintain salinity concentrations to a level compliant with the Colorado River Basin Water Quality Standards. To meet these standards, continued investment has been placed in more efficient agricultural irrigation systems to reduce salinity in return flows to the Colorado River and its tributaries.

1.4 Funding Allocation

The USBR projects implemented through the Colorado River Basin Salinity Control Program have two funding components, a federal, non-reimbursable component (which funds 70% of the project costs allocated to the program) and a non-federal reimbursement of 30% of the allocated project costs. The non-federal reimbursement is derived from power revenues from the Colorado River Storage Project facilities (15%) and the Lower Colorado Basin Development Fund (85%).

In an effort to implement as much as possible in the way of salinity control measures, the amount of funds to be reimbursed from the non-federal power revenues each year are then made available to the Basin States Program (BSP) for use in the following fiscal year. This represents approximately 43% of the federal funds expended in the previous year. The NRCS efforts are funded through EQIP.

2 Title II Salinity Control Program

2.1 Basinwide Salinity Control Program

Reclamation administers the Basinwide Program. Applications for the program are received from areas throughout the Colorado River Basin for salinity reduction projects. Projects are awarded based on merit and supplemented by the BSP.

2.2 Environmental Quality Incentives Program

Salinity control measures can also be implemented by the NRCS through EQIP. Qualifying applicants typically receive 75% cost share towards their projects through a competitive award system. The applicants compete based on cost effectiveness for funding priority but cannot "buy down" the cost-share rate to be more competitive.

2.3 Basin States Funding

The BSP is a program created and financed by the Upper Colorado River Basin Fund and the Lower Colorado River Basin Development Fund (Basin State Funds). Basin State Funds are financed from the sale of power generated at hydropower facilities along the Colorado River. Reclamation is authorized to use Basin Funds to reimburse allocated costs of salinity projects or supplement salinity projects by meeting cost-share requirements [15]. Basin State Funds used for cost sharing in the Reclamation and NRCS programs are administered through the BSP.

2.4 Summary of pre-project loading estimates

2.4.1 Salt Allocation Scenarios

The annual total salt contribution in the Uintah Basin is composed of natural load (or non-agricultural load) and agricultural load. On-farm and Off-farm loads comprise the total agricultural load. Both NRCS and Reclamation have published reports from approximately the same time period to summarize annual salt load. However, these reports emphasize different components to the Salt Budget using different methodologies to quantify the annual salt load. Figure 1 below summarizes the findings of those studies and is modified from the NRCS M&E Report, 2012 [7] by adding the currently used salt allocation scenario to the far right column. Studies by the SCS, predecessor to the NRCS, emphasized the salt load contribution of on-farm irrigation systems and attempted to address all irrigated lands in the Uintah Basin ([7] page 10). Two studies by Reclamation focused on canals with the greatest water loss ([7] page 11).

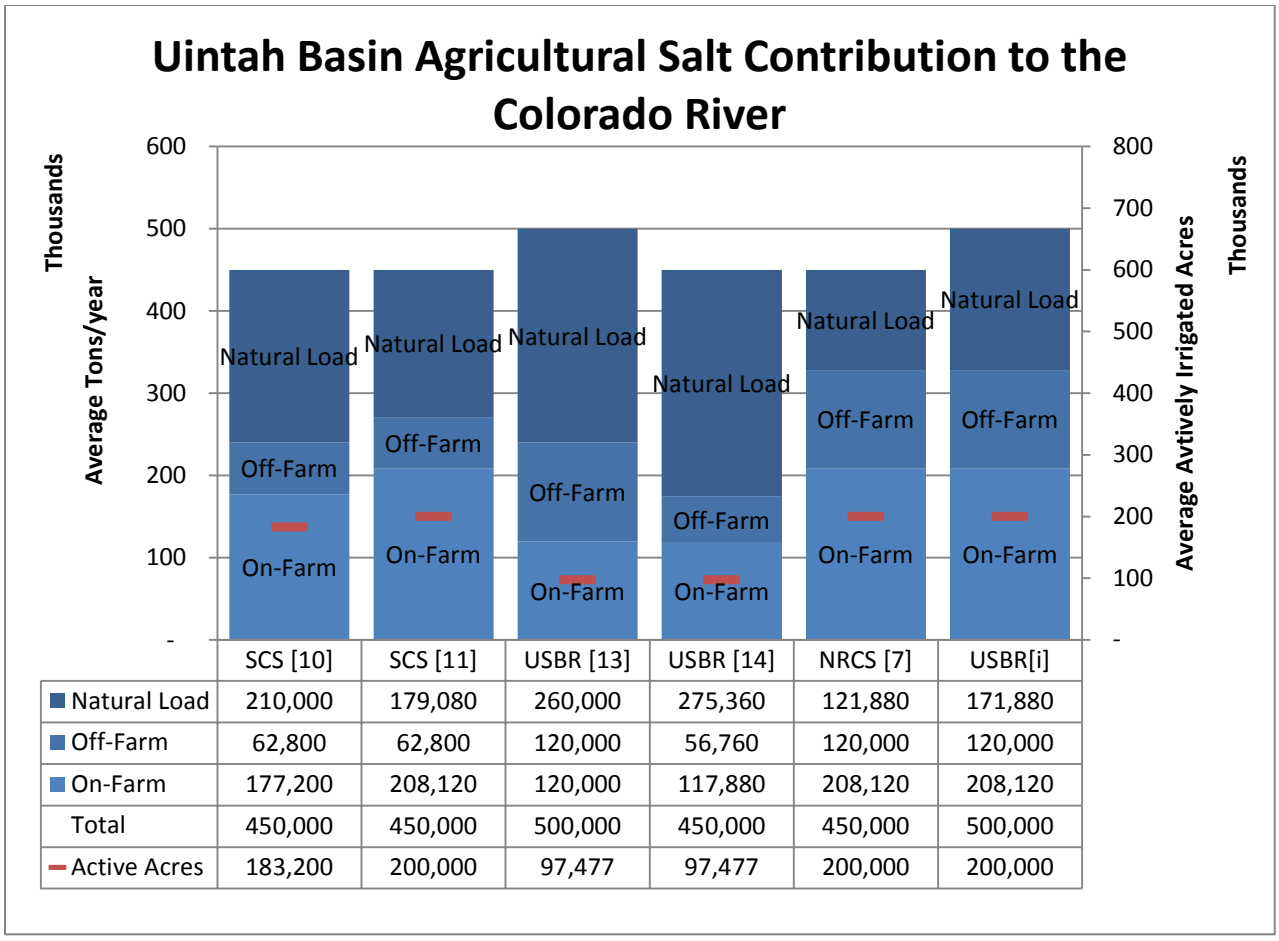


Figure 2. History of Uintah Basin Salt Load Allocation

On Table V-4 of the 1982 SCS Environmental Impact Statement (EIS) for the Lower Gunnison and Uinta Basins [10], an on-farm load of 177,200 tons was identified. The NRCS expanded the Uinta Basin unit with the Uintah Basin unit Expansion Final Environmental Impact Statement dated 1991 [11] which identified an additional 30,920 tons of on-farm load expanding the annual On-farm total salt contribution to 208,120 tons ([11] page 34).

The off-farm load was identified by Reclamation in a report titled "*Colorado River Water Quality Improvement Program, Uinta Basin Unit, Status Report*", July 1981 [13]. The Off-farm load in this report was identified as 120,000 tons. Also within this report, the total salt load for the Uinta Basin was identified as 500,000 tons while the total agricultural load was identified at 240,000 tons. The Salinity Control Program, including Reclamation and NRCS, recognizes the annual 500,000 ton salt load scenario with 120,000 tons annually coming from off-farm sources and 208,120 tons annually coming from on-farm sources. On-farm salt allocation is associated with improvements to irrigation efficiencies, ie flood to sprinkler. Off-farm salt allocation is associated with improvement to conveyance facilities for two or more farm entities that reduce seepage.

3 Project Selection/Criteria

Although related, both Reclamation and the NRCS have separate authority to implement their respective programs. The NRCS Salinity Control program is responsible for on-farm irrigation improvement and rangeland improvements on private lands. BLM is responsible for the rangeland management program on the agency's respective lands. This study excludes any BLM salinity control efforts.

3.1 Off-farm Canal Treatments by Reclamation

The Bureau of Reclamation solicits, ranks, and selects new Salinity Control Projects based on a competitive process open to all irrigators in the salinity control boundary of the Uinta Basin. Cooperative agreements are awarded with the selected applicants. Projects have typically involved converting unlined canals and ditches to pipelines to reduce seepage.

The Secretary, acting through Reclamation, has authorized implementation of a basinwide program for the Uintah Basin. The Secretary carries out the purposes of this legislation directly, or makes grants, enters into contracts, memoranda of agreement, commitments for grants, cooperative agreements, or advances of funds to non-Federal entities under such terms and condition. The type of agreement is determined on a case-by-case basis.

3.2 Historical ranking criteria

Because of changes in allocation of salt reduction, recent projects in the Uinta Basin have been less competitive than earlier projects. Early methods of allocating salt in the Uinta Basin resulted in overstating salt benefits as much as 1000%. When this error was discovered a new method for allocating salt was developed and applied. The new method uses a tod-down approach to allocate salt to the canals based on total remaining available off-farm salt in the Uinta Basin.

3.3 Applicant Eligibility and Ranking Criteria

Applications for funding are ranked on the following criteria: 1) Cost effectiveness [or merit], 2) project risk, 3) potential to enable realization of future on-farm salt reduction benefits, and 4) past performance of applicant.

Reclamation awards up to $35 million in the basinwide program. Reclamation awards up to $6 million in the BSP in the states of Colorado and Utah.

There is a $6 million limit per project. No project receives more than $2 million of funding in any FY. No single entity may have more than a total of $8 million of un-committed obligations in agreements and/or anticipated awards[i].

Any legal entity or individual that is the owner or operator of the features to be replaced and/or to be constructed and capable of contracting within Utah may apply for Reclamation funding. The project being proposed must meet Funding Opportunity Announcement (FOA) requirements. Only those irrigation-related projects that reduce salt from delivery systems are considered. Joint or integrated

project applications that include costs and tons of salt from on-farm applications systems are not considered. However, projects that enable a greater capacity of on-farm work may be given a higher rating. Applications are accepted for projects that cost Reclamation's Salinity Control Program $6 million or less and reduce more than 300 tons of salt. The following are general guidelines on how applications are currently selected:

1. Highest ranking applications with more than 1,000 tons will be selected to be awarded and funded under Reclamation's Basinwide Program.
2. Additional high ranking applications with more than 1,000 tons could be selected to be awarded under the Basinwide Program but funded by BSP administered by the State of Utah.
3. Highest ranking applications with annually more than 300 tons but less than 1,000 tons and an amortized cost effectiveness of $150 or less per ton may be selected by the state to be funded under the BSP and awarded agreements administered by a state agency or administered by Reclamation. An application with a cost effectiveness greater than $150 per ton may only be selected if the project will enable significant on-farm salinity control features to be constructed.

Applications are evaluated and ranked by the Application Review Committee.

3.4 Role of buy-down

With P.L 110-246 in 1992, Reclamation agreed to a 70% cost share for all approved salinity projects with 30% coming from Basin Funds (Power Revenue). Local entities can "buy down" the cost to the Federal government of their project by putting in additional local or state derived funds, thereby keeping the cost per ton of salt saved in a competitive range.

3.5 On-farm and Off-farm Treatments by NRCS

The NRCS accepts applications for financial and technical assistance from farmers for on-farm irrigation improvement that may also include off-farm improvements to convey water and to provide gravity pressures for on-farm systems. The project must be located in an approved salinity control area, and meet specific EQIP program eligibility requirements and are limited to $300,000 cumulative funding over any 6-year period. Although there are criteria for ranking EQIP applications, to date there have been sufficient funds to approve all applications for new land treatments in the Uinta Basin. However, there are $2-3 M of applications for equipment replacement that are not funded [ii].

Applicants are also required to provide individual cost share. The percentage has changed throughout the program but is typically 25% of the total cost and may include in-kind contributions of labor, equipment and materials.

In addition to the financial and technical assistance in developing and constructing on-farm improvements, the NRCS also has an incentive program for Irrigation Water Management (IWM). This program helps the farmers with management of their on-farm improvements in order to ensure the benefits of their systems are realized. The program includes 1) a 2-hour training session, 2) preparation of a IWM self-certification spreadsheet of irrigation practices and 3) review of the spreadsheet with NRCS staff or other contractors to help identify areas of potential improvement in practices. NRCS

reports that since 2006, 898 operators have completed self-certification, representing 27,000 acres ([7] page 31).

3.6 NRCS Salinity Reduction Calculations

Each project approved by NRCS under EQIP has its salt reduction calculated using procedures described in "*Calculating Salt Load Reduction-Modification of Procedure"* dated July 30, 2007 [4]. The calculation procedure has changed since the inception of the program. Currently, the calculation includes using a standardized efficiency for various irrigation methods and a corresponding salt load factor (SLF_e) to develop a salt reduction factor (SLR). The calculations are based on a Uinta Basin-wide salt load value of 1.04 tons/acre per year. The salt load values used are not distinctive for actual salinity in area sub basin to be treated. Also, all improvements of the same type are allocated the same salt reduction regardless the local potential for salt loading. The only variation is in the efficiency of the improvement method; i.e. improved flood, wheel line or pivot.

3.7 Wildlife Habitat and Wetland Improvements

The NRCS program's role to improve or replace wildlife habitat does not necessarily yield a documented direct salinity control program benefit through reduction in salinity loading in the Colorado River Basin. Nevertheless, it is integral to the NRCS salinity control program and its benefits are reported by NRCS within its Monitoring and Evaluation reporting process [7]. A total of 16,499 acres of cumulative wildlife habitat creation have been reported ([7] page 38).

4 Treatment Status

Salinity control projects were first implemented in the Uinta Basin beginning in 1986. However, on-farm improvements started in 1981 under Soil Conservation Service's Agriculture Conservation Program. Salt loading in the Colorado River are now reduced approximately 179,000 tons per year by both on-farm and off- farm measures. Colorado Basin-wide projects implemented to date by cooperating agencies prevent an estimated 1.21 million tons of salt annually from reaching the Colorado River System ([19] page 14]). Reclamation, BLM and NRCS have a combined control target of 1.85 million tons by the year 2030.

Treatments include projects to reduce seepage from canals and improved on-farm irrigation efficiencies. The status of treatment has been reported by NRCS in its annual Monitoring and Evaluation Report [7] and USBR in various interim status reports [13], [15], [16]. This document does not replicate those documents but consolidates and summarizes accomplishments from those other sources and confirms them with GIS data from other sources.

4.1 Data Sources for Canals Treatment

Data used for reporting canal treatment was provided from three sources:

1. Reclamation GIS
2. NRCS GIS
3. BIA GIS

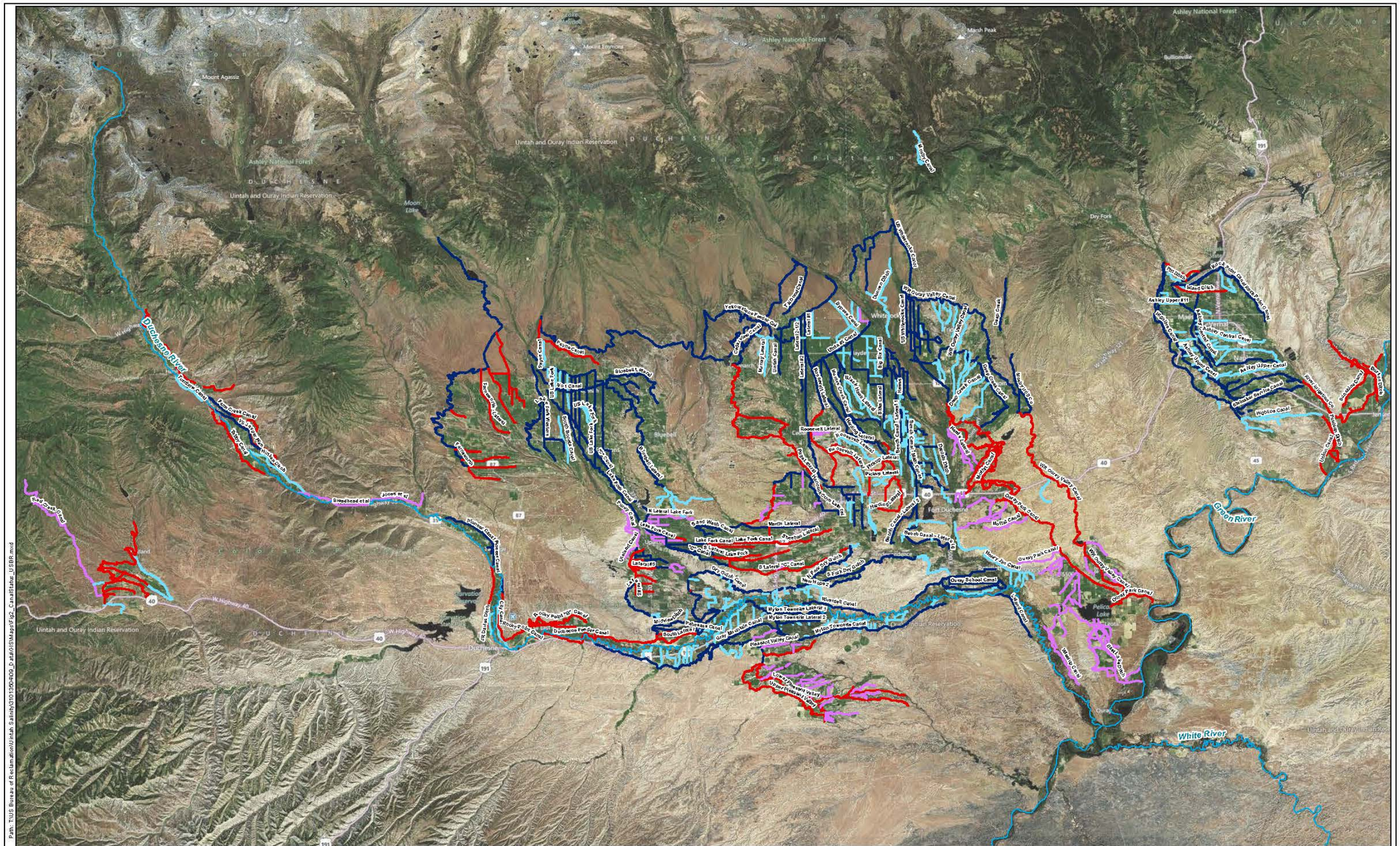
The three sources provided similar data but were different. For example, only canals and larger laterals (those serving as few as 1 irrigator) were shown on Reclamation GIS whereas BIA included on-farm ditches which must be too small for Reclamation's classification of on-farm canals. NRCS data included some canals and some pipelines that replaced canals (instead of the original canal). Figure 2 is the map of the GIS data provided by Reclamation. Figure 3 is a map of the GIS data provided by NRCS. Figure 4 is a map of GIS data provided by BIA. All three are useful and provide important data for this report but they were not developed to represent exactly the same information. Figure 5 is a combination of information from the Reclamation and NRCS data supplemented with BIA data. The BIA data was used only in identifying treated lengths of canal not shown on Reclamation or NRCS data.

4.2 Canal Treatments

Treatment of unlined open channels includes efforts by Reclamation to line canals and by both Reclamation and NRCS to pipe canals and laterals. Historical reporting of treatment of canals has been documented by two methods:

1. lengths of canal replaced (Reclamation) and
2. lengths of pipe installed to replace canals or laterals (NRCS).

For this documentation of accomplishments only lengths of existing canals treated by lining or piping are reported. Lengths of pipelines are not reported.



* Canal Data Source: U.S. Bureau of Reclamation; Aerial Source: Microsoft Bing

URS

N W E S

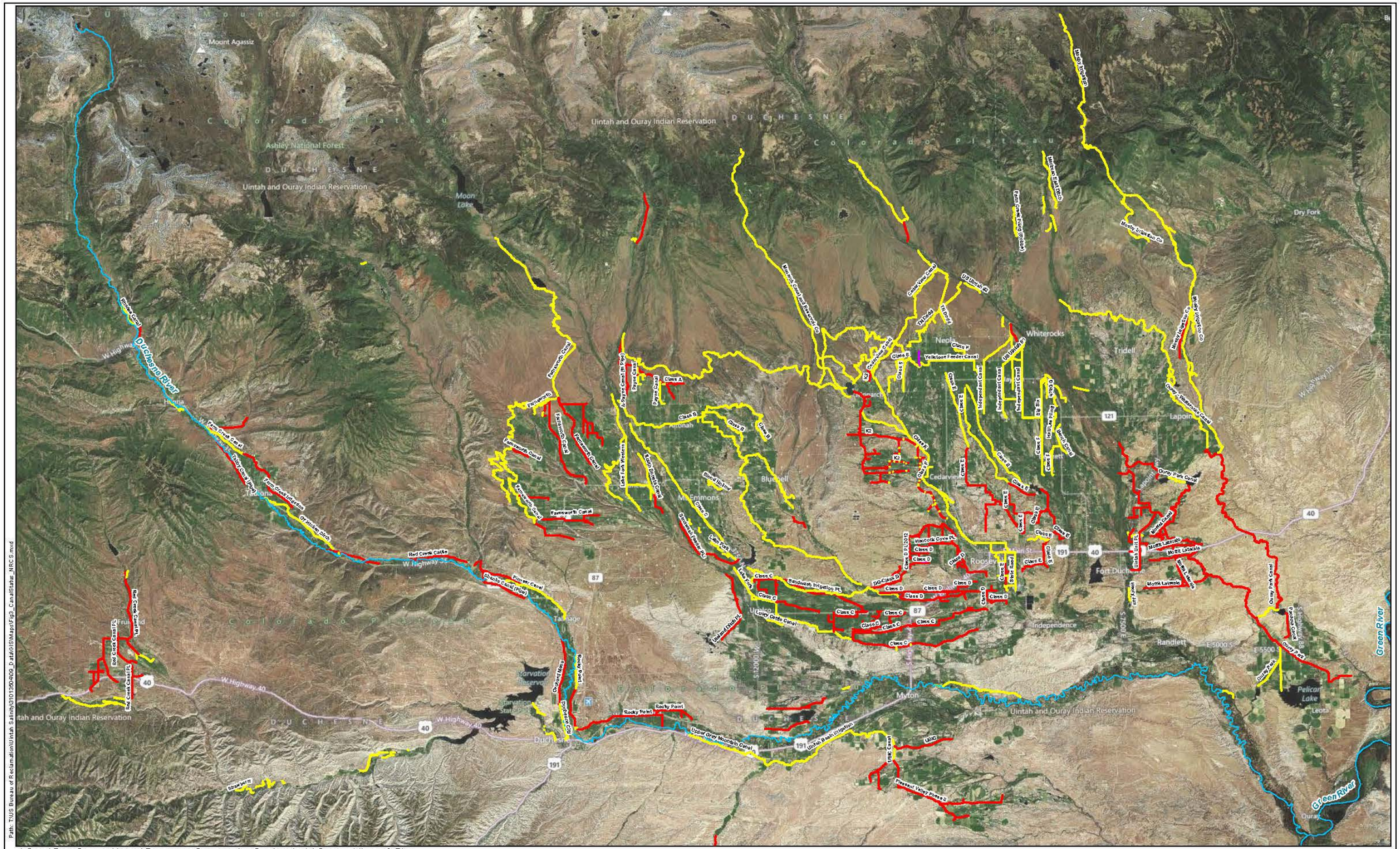
0 2.75 5.5 11 Miles

1 INCH = 5.5 MILES

Legend

- On-farm, Not Treated
- Off-farm, Not Treated
- On-farm, Treated
- Off-farm, Treated

Figure 2
Reclamation Canal Upgrade Status
Uinta Basin Salinity Study



* Canal Data Source: Natural Resources Conservation Service; Aerial Source: Microsoft Bing

URS

N W E S

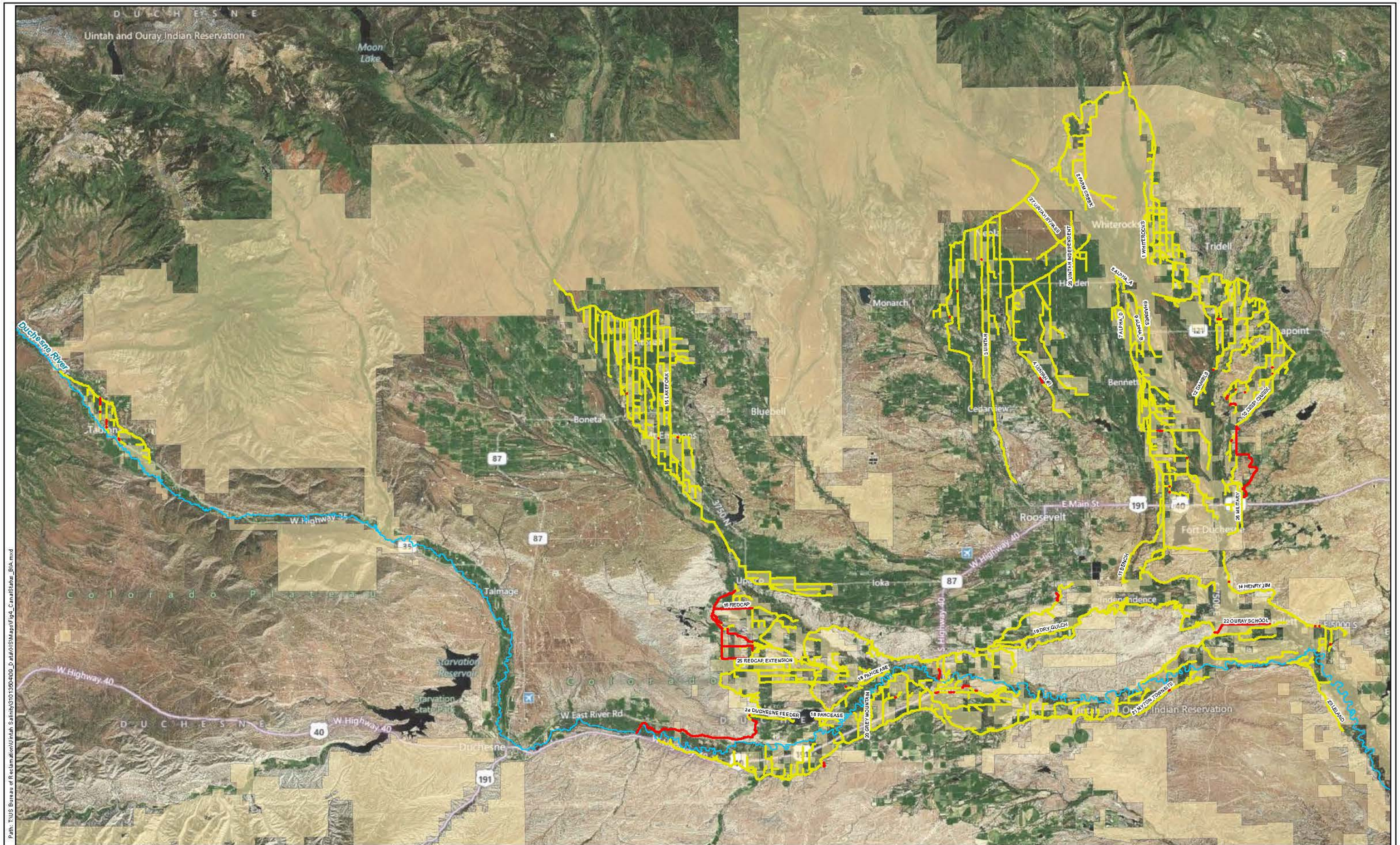
0 2.25 4.5 9 Miles

1 INCH = 4.5 MILES

Legend

- Treated Canals
- Not Treated Canals

Figure 3
NRCS Canal Upgrade Status
Uinta Basin Salinity Study



* Canal Data Source: U.S. Bureau of Indian Affairs; Aerial Source: Microsoft Bing

0 1.75 3.5 7 Miles

1 INCH = 3.5 MILES

Legend

Treated Canals

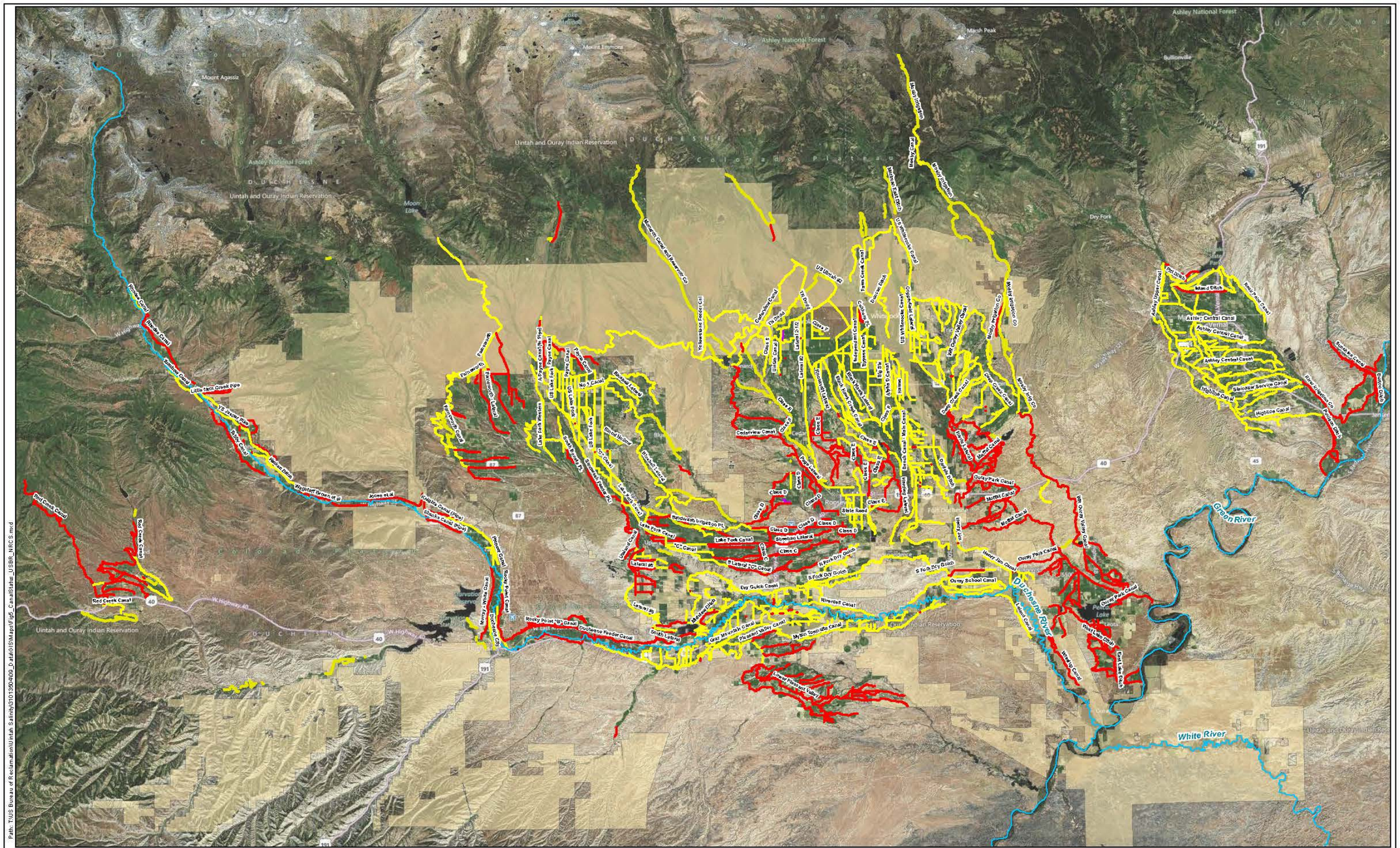
Not Treated Canals

Tribal

Figure 4

BIA Canals

Uinta Basin Salinity Study



* Canal Data Source: NRCS, USBR and BIA; Aerial Source: Microsoft Bing

URS

N W E S

0 2.75 5.5 11 Miles

1 INCH = 5.5 MILES

Legend

- Treated Canals
- Not Treated Canals
- Tribal

Figure 5

Combined Canal Upgrade Status

Uinta Basin Salinity Study

*See text for BIA included canals

The total length of existing canals was provided by Reclamation, NRCS and BIA. The total existing lengths reported differ significantly because of the purpose of the data. For example, BIA reported all canals and laterals related to Ute Tribal Lands, even those that include on-farm ditches. Reclamation reported canals and laterals with a minimum of two irrigators. If the last two users were large land owners, the last reported canal length might be fairly large. NRCS reported canals and pipelines but no criteria for definition of a canal or lateral was identified because canal treatment was based on need of on-farm improvements.

For this documentation of accomplishments and description of canals and laterals remaining that could be treated, a combination of Reclamation and NRCS data is used. Only treated BIA canals were added to the combined GIS map. This result is presented on Figure 5. The other BIA canals and laterals are reported separately. Table 4.1 is a summary of treated canals using the combination of Reclamation and NRCS canals supplemented with BIA reported treated canals only as shown on Figure 5.

Table 4.1 Summary of Treated Canals and Laterals

	(miles)
Total Canal and Laterals	1,761
Treated Canals and Laterals	653
Remaining Untreated	1,108

The above "Treated Canals and Laterals" quantity includes 32.2 miles of Ute Tribal Canals and is 37 percent of the total. Based on BIA GIS data, there remain 618.8 miles of untreated Ute Tribal canals and laterals. This remaining untreated amount is not entirely included in Table 4.1 above because the BIA lengths included only very small on-farm ditches and historically, Reclamation and NRCS have not considered elimination of on-farm ditches in their declared benefits from the salinity control program. Nevertheless, at least some of the above remaining untreated canals are tribal canals. Without performing on-site comparisons of BIA data with field verification of ditches, a reasonable estimate of 300 miles of Ute Tribe canals (excluding the small on-farm ditches) remain untreated.

4.3 On-farm Irrigation Improvements

Reporting of accomplishments from on-farm irrigation improvements are reported as acreage of irrigated land on which improvements in irrigation efficiency have been completed. This could include improvement from flood to gated pipe flood irrigation; from flood to sprinkler; or from gated pipe to sprinkler irrigation. The sources of land use data used to estimate treated lands for salinity control accomplishments include:

1. Utah Division of Water Resources 2012 GIS water related land use data (WRLU). The source data is color 2011 National Agriculture Imagery Program (NAIP). Data is created through line work from heads-up (on screen) digitizing and field verification.
2. NRCS land use evaluation that included GIS overlay of NAIP (NAIP and High Resolution imagery). This was reported by NRCS[iii] as an ongoing effort and not complete.
3. NRCS comparison of data
4. NRCS reported values of applied contracts for on-farm improvements

For this report, acreage of tribal lands is reported uniquely from non-tribal lands.

Comparisons made by Ed Whicker, NRCS, between NAIP data and WRLU data was very helpful in identifying differences between the available sets of land use information. URS is reporting herein the largest reasonable number for treated acreage that can be supported by available geographic data. In most cases the WRLU data was the largest reasonable number supported by basin-wide GIS data. The primary exception was the lack of reporting of improved flood irrigation in the WRLU data set (only 158 acres of gated pipe). NRCS reports almost 14,000 acres of improved flood irrigation. Table 4.2 below summarizes the non-Tribal irrigated acreage and treatments in the Uinta Basin with an adjustment for under reporting of improved flood irrigation.

Table 4.2 Irrigation on Non-Tribal Lands in Uinta Basin

Source	Irrigation Category		Acres
WRLU 2012	Total Irrigated Acreage		190,200
WRLU 2012	Sprinkler Irrigated Acreage		109,500
WRLU 2012	Flood + Sub/Irr	80,700	66,700*
NRCS Contract Applied	Improved Flood Irrigation		14,000

*WRLU values adjusted by subtracting NRCS Contract Applied value for Improved Flood Irrigation.

Figure 6 shows graphically the non-Tribal acreages. The following Table 4.3 summarizes irrigation on Tribal lands.

Table 4.3 Irrigation on Tribal Lands in Uinta Basin

Source	Irrigation Category	Acres
WRLU 2012	Total Irrigated Acreage	21,000
WRLU 2012	Sprinkler Irrigated Acreage	3,100
WRLU 2012	Flood Irrigation	17,900

Figure 7 shows graphically the Tribal acreages. The following Table 4.4 totals the acreage within the Uintah Basin. The category “Flood Irrigation” is the acreage remaining that has not been treated with either improved flood irrigation practices or sprinkler irrigation.

Table 4.4 Total Irrigated Acreage in the Uinta Basin

Irrigation Category	Acres	Percent of Total Irrigated Acres
Total Irrigated Acreage	211,200	
Sprinkler and Improved Flood Irrigated Acreage	126,600*	60%
Flood Irrigation	84,600	40%

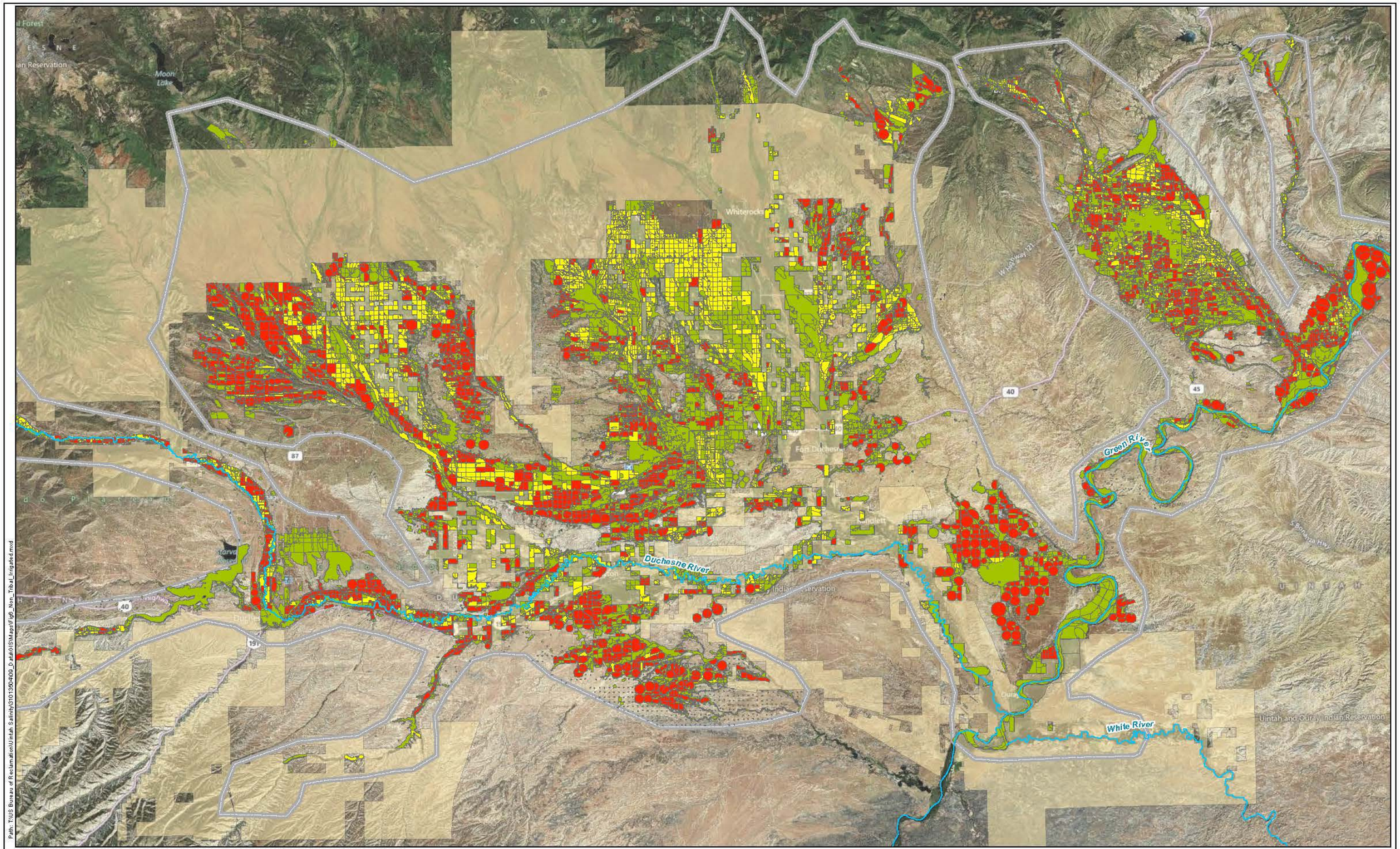
5 *Note: 109,500 sprinkler on non-Tribal lands, 14,000 improved flood on non-Tribal lands and 3,100 sprinklers on Tribal lands.

The total irrigated acreage developed from 2012 WRLU compares favorably with irrigated acreage reported in the 2011 Accomplishments Report [5] on page 3. However, the 126,600 of sprinkler and improved flood irrigated acreage is significantly less than reported by NRCS in the FY2011 M&E Report

[7] that describes applied irrigation improvements at 152,400 acres (page 9, Table 3). This 25,800-acre difference might be attributed to low reporting of irrigated lands in the WRLU data, double counting of acreage in NRCS' contracts (as irrigation systems were improved on land with multiple contracts) or a combination of both. Furthermore, non-irrigated corners of pivots are not included in WRLU data but should be included in salinity benefits. Extensive ground verification of the WRLU GIS data and comparison with NRCS contracts data would be necessary to reconcile this variance.

Figure 8 shows the total acreages of irrigated lands geographically.

January 9, 2014



* Source: 2012 Land Use, Utah Division of Water Resources; Aerial Source: Microsoft Bing

URS

N W E S

0 2.25 4.5 9 Miles

1 INCH = 4.5 MILES

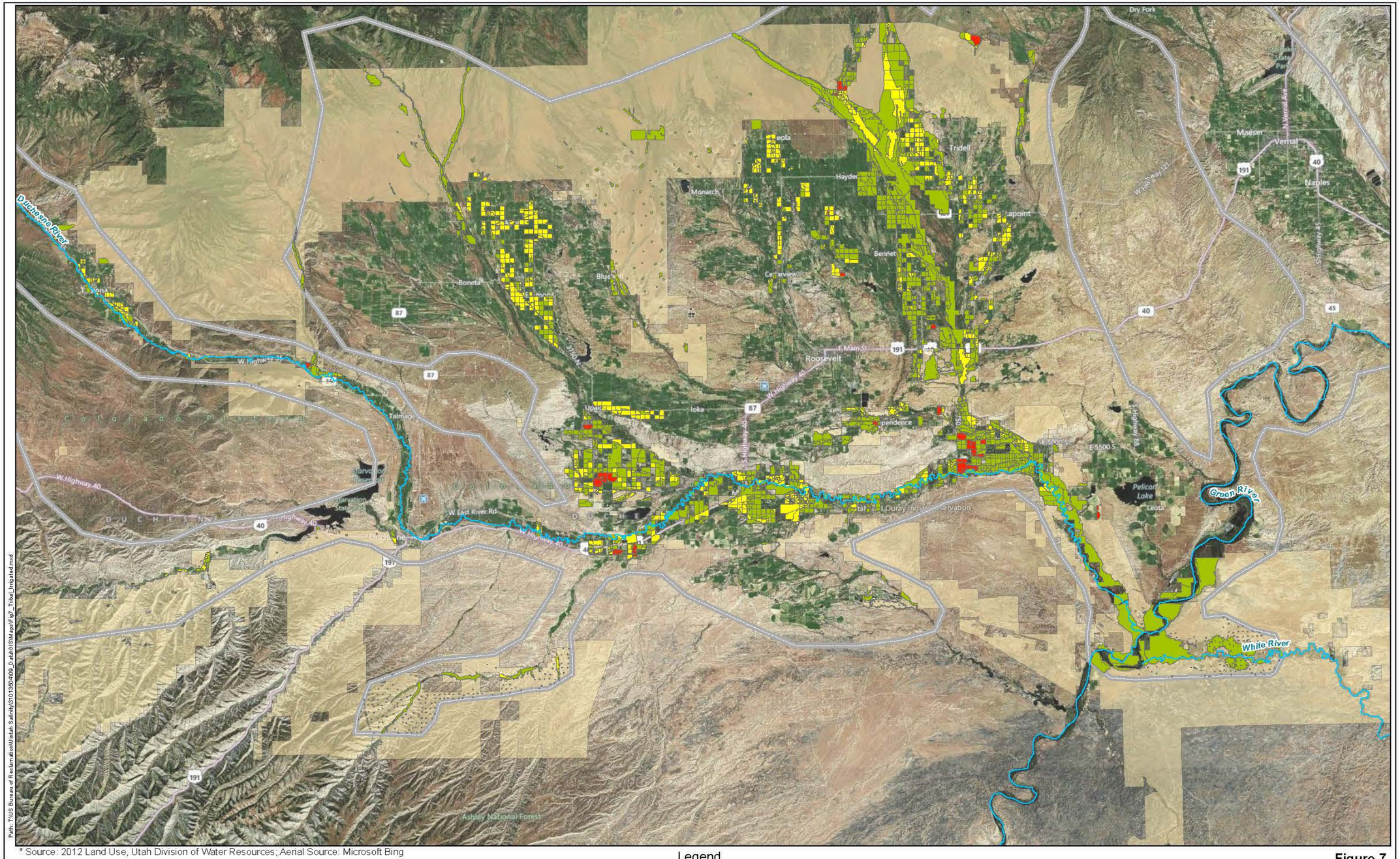
Legend

- Sprinkler
- Flood/Sub-Irrigated
- No Irrigation
- Tribal
- Study Area

Figure 6

Irrigated Non-Tribal Land

Uinta Basin Salinity Study



* Source: 2012 Land Use, Utah Division of Water Resources; Aerial Source: Microsoft Bing

0 2.25 4.5 9 Miles

1 INCH = 4.5 MILES

Legend

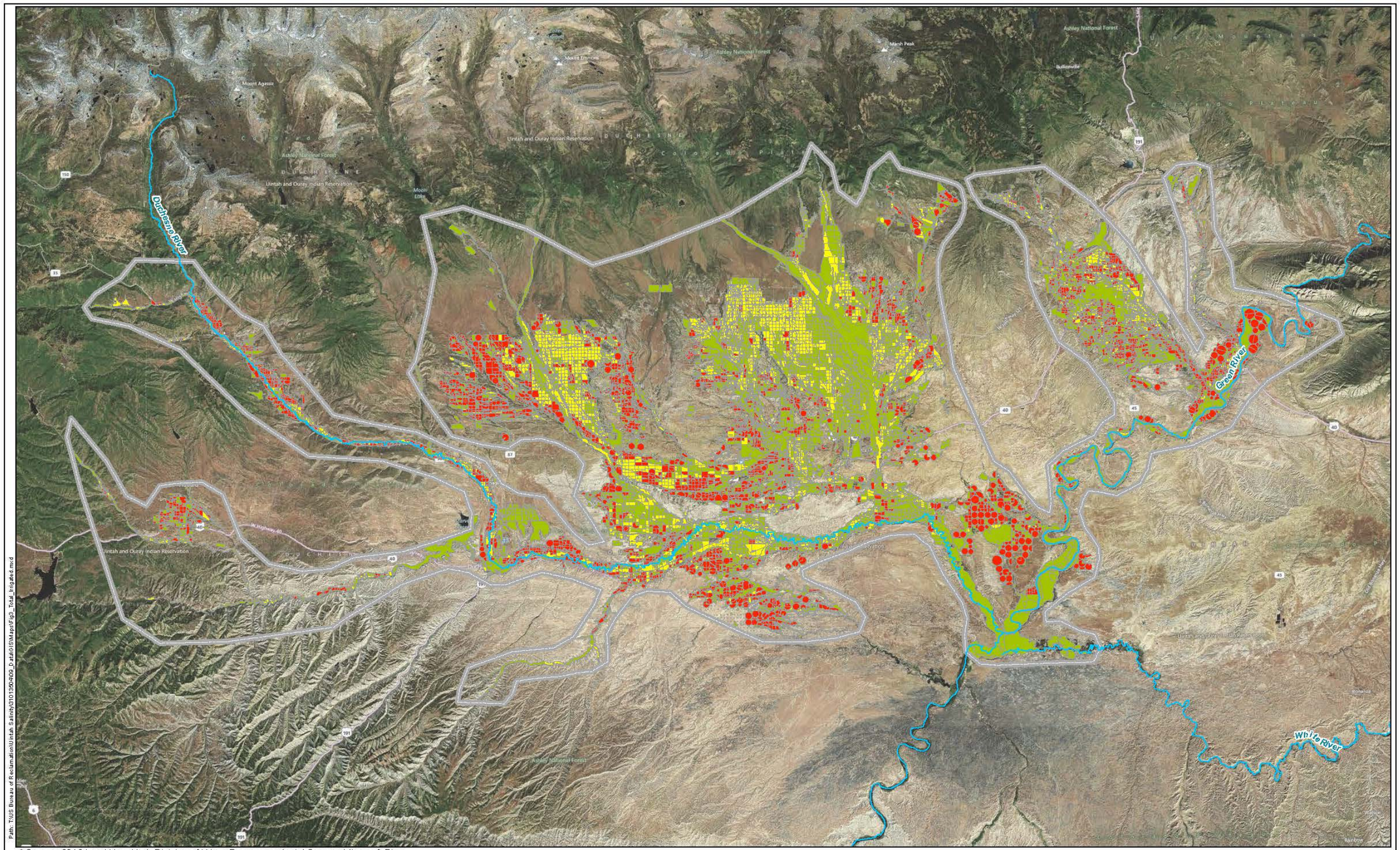
- Sprinkler
- Flood/Sub-Irrigated
- No Irrigation
- Tribal
- Study Area

Figure 7

Irrigated Tribal Land

Uinta Basin Salinity Study

URS



* Source: 2012 Land Use, Utah Division of Water Resources; Aerial Source: Microsoft Bing

0 3.25 6.5 13 Miles

1 INCH = 6.5 MILES

Legend

- Sprinkler
- Flood/Sub-Irrigated
- No Irrigation
- Study Area

Figure 8

Total Irrigated Land

Uinta Basin Salinity Study

5 Quantification of Salinity Load Reduction

The purpose of this section is to describe the reported salinity reductions by Reclamation and NRCS. The methods used by both agencies have evolved significantly over the decades that each program has operated. Furthermore, the raw data on which those computations of salinity reductions have been based are either too extensive to evaluate by this effort or are no longer available.

5.1 Baseline Hydrosalinity Study

Both NRCS and Reclamation have relied on the findings of a hydrosalinity study that occurred before the onset of salinity control efforts in 1982 that quantified the contributions of salinity to the Colorado River from the Uinta Basin at between 450,000 tons per year and 500,000 tons per year. The earliest known documentation of reference to Uinta Basin-wide salinity contributions is in the 1981 *Colorado River Water Quality Improvement Program Uinta Basin Unit Status Report*, page 12 [13]. However, there was no citation of the original hydrosalinity study provided in any of the documentation reviewed.

That original study may have been *Water Resources of the Upper Colorado River Basin – Technical Report 441* [20]. 1965 by the U. S. Geologic Survey and authored by W.V. Iorns, C.H. Hembree, and G.L. Oakland. This comprehensive study includes extensive research and analysis of the dissolved solids in the Green River. Although the gross salinity contribution from the Uinta Basin might be deduced from the information presented in the report on Green River dissolved solids, there is no direct quantification to support the 450,000 to 500,000 tons used by Reclamation and NRCS.

The historic hydrosalinity study of the Uinta Basin is the baseline for estimating all the salinity reductions by both Reclamation and NRCS. The agreed-to totals for on- and off-farm salinity contributions are used to calculate the salinity reduction for all projects. For NRCS on-farm reductions, this results in the salinity load value, 1.04 tons per acre of irrigated lands. For Reclamation off-farm reductions, this is a prorated distribution of salinity based on lengths of canal.

5.2 Reclamation Salinity Reduction

Through 2011, Reclamation has estimated a salinity reduction from off-farm improvement (lining or piping of canals) of 42,454 tons per year[iv] from 23 projects between 1999 and 2011. One project, Ashley WWTP was a non-agricultural project, representing 9,125 tons reduction. Excluding salt load reductions through the Ashley WWTP, 42,454 represents only 28% of the off-farm salt loading agreed to by Reclamation ([7] page 10). Currently, the tonnage reduced in a project is derived by the product of the length of canal treated, the amount of days the canal remains in operation throughout the day, and the flow of the canal (cfs) raised to the 0.39 power divided by the acre-feet of water delivered.

5.3 NRCS Salinity Reduction

Total reduction from on-farm and off-farm (piping of canals) reported by NRCS in the Monitoring and Evaluation Report for FY2011 is 148, 400 tons per year ([7] page 9). This number is derived from the accumulation of each annual report from 1987 to present. Since the process for estimating salt savings has changed many times the tons reported for any particular practice may be different in any given year.

As processes changed, previous year reporting data was not adjusted. Then in 2007, all the prior on-farm salt loading was re-calculated using the revised procedure.[v] The trend has been to reduce the estimate of tons. . It is important to note that NRCS claims some off-farm treatment as part of its salinity reduction efforts.

5.4 Estimate of Cumulative Salinity Reduction

Totaling the Reclamation and NRCS reported cumulative salinity reduction, the entire reduction is 190,854 tons or 58 percent of the total on-farm and off-farm agreed to salinity loading of 328,120 tons per year for the Uinta Basin. Given that only 60 percent (Section 4.3, Table 4.4) of the on-farm acreage has been treated and only 37 percent of the canals have been treated (Section 4.2), it could be surmised that 58 percent of the salt loading is a reasonable estimate of what has been removed. The exception to this would be if treated areas have greater salinity concentrations and were credited with higher values of salt loading than the remaining areas to be treated. Furthermore, this analysis is flawed if the total salinity loading for the Uinta Basin is in reality greater or less than the values agreed to or developed by the original hydrosalinity study.

6 Summary

The accomplishments of the Salinity Control Program, both Reclamation and NRCS, since 1980 have been significant. They include treatment of approximately 653 miles of canal or laterals and improved irrigation methods on approximately 126, 600 acres of farm land. There is approximately 1108 miles of canal or laterals remaining to be treated and 84,600 acres of flood irrigated acres that could have improved irrigation practices of which 17,900 are irrigated Tribal lands.

Quantification of salinity has been a challenge for both Reclamation and NRCS and their methods for computing salinity control benefits have evolved. Consequently, it is not impossible to replicate historic and current salinity reduction calculations and derive through independent methods a cumulative volume of salinity reduction. Furthermore, the basis for the basin-wide volume of salinity loading cannot be verified because documentation of the hydrosalinity study used for the Uinta Basin is not available. Nevertheless, there is a consensus that improved water quality in the Colorado River over historical water quality is attributable to salinity control improvements in the Uinta Basin.

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End Notes

[i] Personal communication, Nick Williams, USBR, October 19, 2012
[ii] Personal communication, Brett Prevedel, former NRCS District Conservationist for Uinta Basin.
[iii] Personal communication, Ed Whicker, NRCS, December 4, 2012
[iv] Spreadsheet, UB Basinwide Project Summary.xlsx
[v] Personal communication, Ed Whicker, NRCS by comments on draft document