Green River, Utah Unit

Monitoring and Evaluation Report, FY2013

U.S. Department of Agriculture

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Project Status

- The Environmental Assessment (EA) for the Green River, Utah Unit was published in April, 2009. The Proposed Action anticipates treating 2,080 acres of flood irrigated fields with sprinkler systems, reducing salt load by 6,540 tons/year.
- For FY2013 no salinity contracts were obligated.
- Local landowners are balancing the need to buy energy for pumping for sprinkler systems, or continue flooding with no energy bill.
- The slope of the Green River is inadequate to provide economical gravity pressure.

Table 1. Project Progress Summary

Green River, Utah Unit, All Programs, FY2013				
CONTRACTS PLANNED	UNIT (S)	CURRENT FY	CUMULATIVE	TARGET
1. CONTRACT STATUS				
A. Contracts Approved	Number	-	3	
	Dollars	$0	$261,513	
	Acres	-	210	2,080
On-farm	Tons/Year	-	660	6,540
Off-farm	Tons/Year	-	-	
B. Active Contracts	Number		2	
Obligated dollars not expended	Dollars		$787	
Planned acres not treated	Acres		1	
Planned salt load reduction not reported On-farm	Tons/Year		4	
Planned salt load reduction not reported Off-farm	Tons/Year		-	
PRACTICES APPLIED	UNIT(S)	CURRENT FY	CUMULATIVE	TARGET
2. EXPENDITURES				
Financial Assisstance (FA)	Dollars	$110,547	$162,607	
3. Irrigation Systems				
A. Sprinkler	Acre	-	30	2,080
B. Improved Surface System	Acre	95	95	
C. Drip System	Acre	-	-	
4. Salt Load Reduction				
A. Salt Load Reduction, On-farm	Tons/Year	95	396	6,540
B. Salt Load Reduction, Off-farm	Tons/Year	-	-	
C. Tons of salt controlled prior to EQIP	Tons		-	

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Historical Background

With settlement of the Colorado River Basin, demands on the Colorado River grew rapidly. In the late 1800s and early 1900s, hundreds of canal companies were created and millions of acres of land were irrigated to sustain growing populations. In the mid-1900s, dozens of dams and water projects were constructed on the Colorado River and its tributaries.

By the 1960s, concern over increasing water consumption and decreasing water quality led to a national effort to direct environmental policy at the federal level. In 1969, the National Environmental Protection Act (NEPA) was signed into law, requiring extensive public involvement and analysis of environmental impacts when planning federally funded projects (federal actions). As part of NEPA, the Council on Environmental Quality (CEQ) was created as part of the Executive Branch.

In 1970, the Environmental Protection Agency (EPA) was created by a Nixon executive order (Reorganization Plan No. 3 of 1970, which also created National Oceanic and Atmospheric Administration). In the early 1970s, salinity control was driven by the EPA.

The Colorado River Basin Salinity Control Forum (Forum) was created in 1973, when the governors of each of the seven Colorado River Basin States appointed three water resource professionals to coordinate salinity control efforts among the states, federal agencies, and other major water management agencies. The Forum has been instrumental in promoting salinity control to the benefit of all.

It is estimated that in the 1960s, more than two-thirds of water taken from the Colorado River was used to irrigate agricultural lands. Nearly all of this irrigation was by flooding, resulting in massive amounts of salt being dissolved by excess irrigation water and carried back to the river. With irrigation being the largest contributor to salt load in the river, it was determined that irrigation improvements, both on-farm and off-farm, would provide the most economical opportunity to reduce salt loading by improving irrigation efficiencies to reduce deep percolation and seepage.

The Colorado River Basin Salinity Control Act of 1974 authorized federal funding of salinity control projects to manage salinity in the Colorado River.

Federal funding of salinity control practices began in the early 1980s in the Grand Valley of Colorado and the Uinta Basin of Utah.

In August, 2009, an Environmental Assessment (EA) was completed. The preferred alternative proposed upgrading irrigation practices from flood to sprinkler on, about 2,080 irrigated acres. The Finding of No Significant Impact (FONSI) was signed by the Utah State Conservationist and the Green River, Utah Salinity Unit was approved by the Forum.

Monitoring and Evaluation History and Background

The Colorado River Basin Salinity Control Program was established by the following Congressional Actions:

- The Water Quality Act of 1965 (Public Law 89-234) as amended by the Federal Water Pollution Control Act of 1972, mandated efforts to maintain water quality standards in the United States.
- Congress enacted the Colorado River Basin Salinity Control Act (PL 93-320) in June, 1974. Title I of the Act addresses the United States' commitment to Mexico and provided the means for the U.S. to comply with the provisions of Minute 242. Title II of the Act created a water quality program for salinity control in the United States. Primary responsibility was assigned to the Secretary of Interior and the Bureau of Reclamation (Reclamation). USDA was instructed to support Reclamation's program with its existing authorities.
- The Environmental Protection Agency (EPA) promulgated a regulation in December, 1974, which established a basin wide salinity control policy for the Colorado River Basin and also established a water quality standards procedure requiring basin states to adopt and submit for approval to the EPA, standards for salinity, including numeric criteria and a plan of implementation.
- In 1984, PL 98-569 amended the Salinity Control Act, authorizing the USDA Colorado River Salinity Control Program. Congress appropriated funds to provide financial assistance through Long Term Agreements administered by Agricultural Stabilization and Conservation Service (ASCS) with technical support from Soil Conservation Service (SCS). PL 98-569 also requires continuing technical assistance along with monitoring and evaluation to determine effectiveness of measures applied.
- In 1995, PL 103-354 reorganized several agencies of USDA, transforming SCS into Natural Resources Conservation Service (NRCS) and ASCS into Farm Service Agency (FSA).
- 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 Incentives Program (EQIP). The 2002, 2008, and 2014 Farm Bills have funded EQIP through FY2018.

Over the years, Monitoring and Evaluation (M&E) has evolved from a mode of labor/cost intensive detailed evaluation of a few farms and biological sites to a broader, but less detailed evaluation of many farms and environmental concerns, driven by budgetary restraints and improved technology.

M&E is conducted as outlined in "The Framework Plan for Monitoring and Evaluating (M&E) the Colorado River Salinity Control Program", last revised in 2001.

Project Status Details

FY2013 Project Results

In this fourth year of salinity funding, no contracts were obligated. (Table 2)

Table 2. Annual results

FY2013	Units	Planned	Applied
Irrigation Improvements	acres	-	95
Federal cost share, FA	$	-	$110,547
Amortized federal cost share, FA+TA	$/year	-	$6,891
Salt load reduction	tons/year	-	$307
Federal cost, FA+TA	$/ton	-	$22

Cumulative Project Results

Cumulatively, through FY2013 $461,000 (2013 Dollars) has been obligated to treat 210 acres at an average cost of $46/ton (2013 dollars). (Table 3)

Table 3. Project goals and cumulative status

Cumulative Improvements thru FY2013	Units	NEPA	Planned	Applied
Irrigation improvements	acres	2,080	210	220
Federal cost share, FA+TA	2013$	$10,429,000	$461,000	$274,000
Amortized federal cost share, FA+TA	2013$/yr	$731,000	$30,200	$10,400
Salt load reduction, tons/year	tons/year	6,540	660	396
Federal cost/ton, FA+TA	2013$	$112	$46	$26

Detailed Progress Analysis

Pre-Project Salt Loading

Agricultural irrigation is a major source of salt loading into the Colorado River and is completely human induced. Irrigation improvements have great potential to control salt loading.

The 2009 EA allocated agricultural salt loading on the basis of **USGS Scientific Investigations Report: 2006-5186, "Hydrology and Water Quality in the Green River and Surrounding Agricultural Areas near Green River in Emery and Grand Counties, Utah, 2004-05"**. (Figure 1)

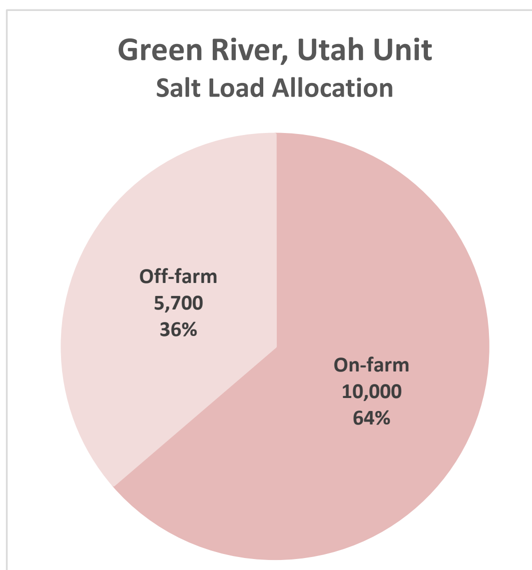


Figure 1. Initial Salt Load Allocation

Salinity Control Practices

In the EA, on-farm practices used to reduce salt loading in Green River, Utah Unit (GRU) were expected to be exclusively sprinkler systems. Due to the unavailability of pressurized pipelines, it is anticipated that each sprinkler system will also require a small settling pond and pump. Due to the increased cost of pumping, some systems have been planned for improved flood irrigation, which are more sensitive to careful irrigation water management. Being on the Green River, there is no water shortage in GRU. Quality water management is more difficult to sell in these situations. Salt loading is reduced only when water is managed and deep percolation is reduced.

Off-farm practices used to reduce salt loading are associated with the reduction and/or elimination of canal/ditch seepage, usually by installing pipelines.

Planning Documents

In 2009 NRCS developed an Environmental Assessment (EA) for the Green River, Utah Unit, to treat 2,080 acres with improved irrigation systems. NRCS' Utah State Conservationist issued a Finding of No Significant Impact (FONSI) shortly thereafter. The Colorado River Basin Salinity Control Forum (Forum) followed with formal acceptance into the Colorado River Basin Salinity Control Program. Development of salinity control contracts began in FY2010.

The GRU is mapped in red on the report cover.

The recommended alternative in the EA addresses only on-farm practices in GRU. An alternative to include pipelines was deemed to be economically impractical using NRCS funding programs. Locally sponsored studies and proposals are underway to find alternative funding for off-farm practices.

Planned Practices

Planned practices (obligations) represent contracts with participants to apply improved irrigation practices to the participant's agricultural activities. Only the federal share of project cost is analyzed in this section.

The installation of salinity control practices is voluntary on the part of landowners. An incentive to participate is created by cost-sharing on practice purchase and installation using federal financial assistance. In essence, federal cost-share purchases salt load reductions in the Colorado River, while the participant's cost-share buys them reduced operating costs and increased production.

Federal cost-share is obligated when a contract is signed with the participant, assuring timely installation of salt load reducing irrigation practices, to NRCS standards.

Table 4 lists annual planned obligations and costs in nominal and 2013 dollars.

Table 4. Planned practices, cost/ton, nominal and 2013 dollars

FY	Federal Water Project Discount Rate	Contracts Planned	FA Planned Nominal	Acres Planned	Salt Load Reduction Planned	Amortized FA+TA Nominal	$/ton FA+TA Nominal	2013 PPI Factor	FA Planned 2013$	Amortized FA+TA 2013$	$/ton 2013$	Cum $/ton 2013$
2010	4.375%	2	$148,328	114	351	$16,458	$47	112%	$165,410	$18,353	$52	$52
2011	4.125%	0	-	-	-	-	-	104%	-	-	-	$52
2012	4.000%	1	$113,185	96	309	$12,075	$39	98%	$111,097	$11,853	$38	$46
2013	3.750%	0	-	-	-	-	-	100%	-	-	-	$46
Totals		3	$261,513	210	660	$28,533	$43		$276,508	$30,206	$46	

FY2013 Obligation

In FY2013, no new contracts were obligated.

Salt Load Reduction Calculation

The estimated salt load reduction for planned practices is calculated by multiplying the original tons/acre for the entire salinity unit, by the acres to be treated and a percentage reduction based on change in irrigation practice. For GRU, the initial estimate of on-farm irrigation salt loading is 3.56 tons/acre-year. As an example, if 100 acres are converted from wild flood to center pivot sprinkler, an estimated 91% of the original salt load will be eliminated. Hence, 100 acres x 3.56 tons/acre-year x 91% = 324 tons/year salt load reduction.

Cost/Ton Calculation

The federal cost/ton for salt load reduction is calculated by amortizing the federal financial assistance (FA) over 25 years at the federal discount rate for water projects (3.750% for FY2013). Two-thirds of FA is added for technical assistance (TA) and the amortized total cost is divided by tons/year to yield cost/ton. Normalization to 2013 dollars is based on the Producer Price Index (PPI) for agricultural equipment purchased, maintained by the National Agricultural Statistics Service (NASS).

Cost-Share Enhancement

Typical federal cost-share, over the last several years, has been about 75% of total installation cost. A feature of the 2002 and 2008 Farm Bills is cost-share enhancement, increasing federal cost-share 75% to 90% of total cost for limited resource, beginning, or socially disadvantaged farmers or ranchers.

In GRU, no contracts have involved cost share enhancement.

Applied Practices

FY2013 Expenditures

In FY2013, $111,000 was expended to treat 95 acres, reducing salt load by 307 tons/years at a cost of $22/ton. (Table 5) Salt load reduction is assumed to be proportional to dollars expended on a contract-by-contract basis.

Table 5. Applied practices, cost/ton, nominal and 2013 dollars

FY	Federal Water Project Discount Rate	FA Applied Nominal	Acres Applied	Salt Load Reduction Applied	Amortized FA+TA Nominal	$/ton FA+TA Nominal	2013 PPI Factor	FA Applied 2013$	Amortized FA+TA 2013$	$/ton 2013$	Cum $/ton 2013$
2010	4.375%	-	-	-	-	-	112%	-	-		-
2011	4.125%	$52,060	125	89	$3,377	$38	104%	$54,091	$3,508	$39	$39
2012	4.000%	-	-	-	-	-	98%	-	-	-	$39
2013	3.750%	$110,547	95	307	$6,891	$22	100%	$110,547	$6,891	$22	$26
Totals		$162,607	220	396	$10,267	$60		$164,638	$10,399	$26	

Hydro Salinity Monitoring

Before implementation of salinity control measures, Green River, Utah Unit agricultural operations contributed an estimated 15,700 tons of salt per year to the Colorado River (on-farm and off-farm), from an average of 4,000 acres of annually irrigated land. Salt loading of 10,000 Tons/year was allocated to on-farm activities and 5,700 tons to off-farm canals and large laterals.

Three assumptions guide the calculation of salt load reduction from irrigation improvements:

1. Salt concentration of subsurface return flow from irrigation is relatively constant, regardless of the amount of canal seepage or on-farm deep percolation.
2. The available supply of mineral salts in the soil is essentially infinite and salinity of out-flowing water is dependent only on solubility of salts in the soil. Therefore, salt loading is directly proportional to the volume of subsurface return flow.
3. Water that percolates below the root zone of the crop and is not consumed by plants or evaporation will eventually find its way into the river system. Salt loading into the river is reduced by reducing deep percolation. (Hedlund, 1994).

Deep percolation and salt load reductions are achieved by reducing or eliminating canal/ditch seepage/leakage and by improving the efficiency and uniformity of on-farm irrigation. It is estimated that upgrading an uncontrolled flood irrigation system to a well designed and operated sprinkler system will reduce deep percolation and salt load by 84-91%.

NRCS salinity control programs focus on helping cooperators improve irrigation systems, better manage water use, and sharply reduce deep percolation/salt loading.

Salinity Monitoring Methods

As a result of labor intensive testing in the Grand Valley and Uintah Basin Units, it was confirmed that irrigation systems installed and operated as originally designed, produced the desired result of improved irrigation efficiencies and sharply reduced deep percolation rates, concurrent with reduced farm labor and improved yields.

A "*Framework Plan for Monitoring and Evaluating (M&E) the Colorado River Salinity Control Program*" was adopted in 2001. Having established that properly installed and operated practices yield predictable and favorable results, the 2001 Framework Plan addresses hydro-salinity by:

- Utilizing random cooperator surveys to collect and evaluate cooperator understanding, and impressions concerning contracts and equipment
- Formal and informal Irrigation Water Management (IWM) training and encouragement
- Equipment spot checks and operational evaluations
- Agricultural statistics collected by government agencies

In GRU, virtually all salinity program irrigation improvements are expected to be improved flood or sprinkler systems.

Cooperator questionnaires, interviews, and training sessions

No cooperator questionnaires have been done in the Green River, Utah Unit. It is anticipated that it will take two or three years for cooperators to become familiar with system operations before interviews would become practical.

Irrigation Water Management (IWM)

The goal of IWM is to assure that irrigated crops get the right amount of water at the right place at the right time, which will accomplish the goal of minimizing deep percolation and salt loading in the river. Proper IWM is achieved by careful equipment design, cooperator education, and maintenance resulting in implementation of effective water management techniques.

In general, sprinkler systems designed by NRCS are capable of irrigating the most water-consumptive projected crop in the hottest part of the year. When growing crops with lower water needs, or at other times in the growing season, these systems are capable of over-irrigating to some extent.

Crops generally use water before irrigation begins and after irrigation ends, leaving the soil moisture profile partially depleted. Filling the soil with water requires additional irrigation, over and above crop needs, in the spring.

Preventing over-irrigation is a contractual obligation of the cooperator. To help cooperators fulfill this obligation they must be educated and coached in the proper use and maintenance of their irrigation systems.

This is achieved by creating financial incentives for IWM, initial IWM training sessions, periodic water conferences, and developing IWM tools that simplify record keeping and help cooperators properly time irrigation cycles. Incentive IWM payments contractually obligate participants to learn proper water management techniques in order to receive federal grants for irrigation projects. Including the IWM practice in irrigation contracts has resulted in greater interest in keeping records and understanding soil/water relationships.

Water management seminars and conventions are sponsored by various government, educational, and commercial groups, encouraging everyone to manage and conserve water. NRCS is a willing and eager participant in these partnership educational endeavors.

Additionally, personal guidance is available to cooperators, on request, at local NRCS field offices.

Intensive and continuous IWM training is essential to successful long term salt load reduction.

To help cooperators with irrigation timing, a major part of IWM, NRCS demonstrates two simple, low-cost approaches:

1. Irrigation record keeping, wherein the cooperator keeps track of water put on the field and compares the volume used to the volume required by the crop
2. Soil moisture monitoring, wherein the cooperator determines when to irrigate, based on measured available water content (AWC) in the soil

Irrigation Record Keeping

To help with irrigation timing, NRCS has developed and provided the, "IWM Self Certification Spreadsheet" which allows cooperators to graphically evaluate available water content (AWC) of the soil and compare actual irrigation with projected average crop water requirements and/or with modeled crop evapotranspiration. Evapotranspiration is calculated from climate data collected by NRCS and other public agencies, using Penman-Montieth procedures outlined by the Food and Agriculture Organization of the United Nations (FAO). The final output of the spreadsheet is two graphs comparing water applied, with water required, on a seasonal basis. See figures 2 and 3.

Sprinkler system design data, plant data, location, soil data, and the beginning dates of each irrigation cycle are input. (Figure 3) The spreadsheet calculates AWC and deep percolation and graphs them on separate pages. (Figure 4)

A modest amount of deep percolation is designed into all irrigation systems to compensate for distribution uniformity anomalies and to leach accumulated salt from the root zone.

In order to receive incentive payment for IWM, each irrigator must

1. attend a two hour IWM training session or a water conference
2. with help, augur a hole and determine the soil moisture by the feel method, and
3. present their irrigation records to the local field office, where data is entered into the spreadsheet and results are calculated, graphed, and discussed. Graphs are printed for the farmer's reference.

In general, cooperators respond positively to this training and work hard to irrigate more efficiently.

In GRU, one salinity project has been completed. However, 13 landowners have submitted irrigation records since 2008. A review of the IWM Self Certification Spreadsheets submitted indicates that no systems were deep percolating excessively and that calculated deep percolation amounted to just 7% of designed deep percolation. (Figure 2)

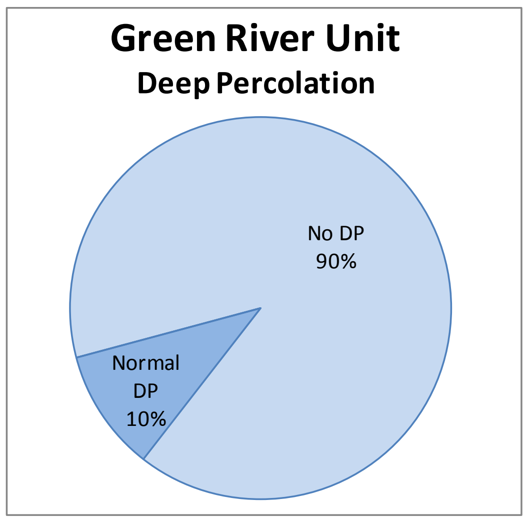


Figure 2. Calculated deep percolating acres.

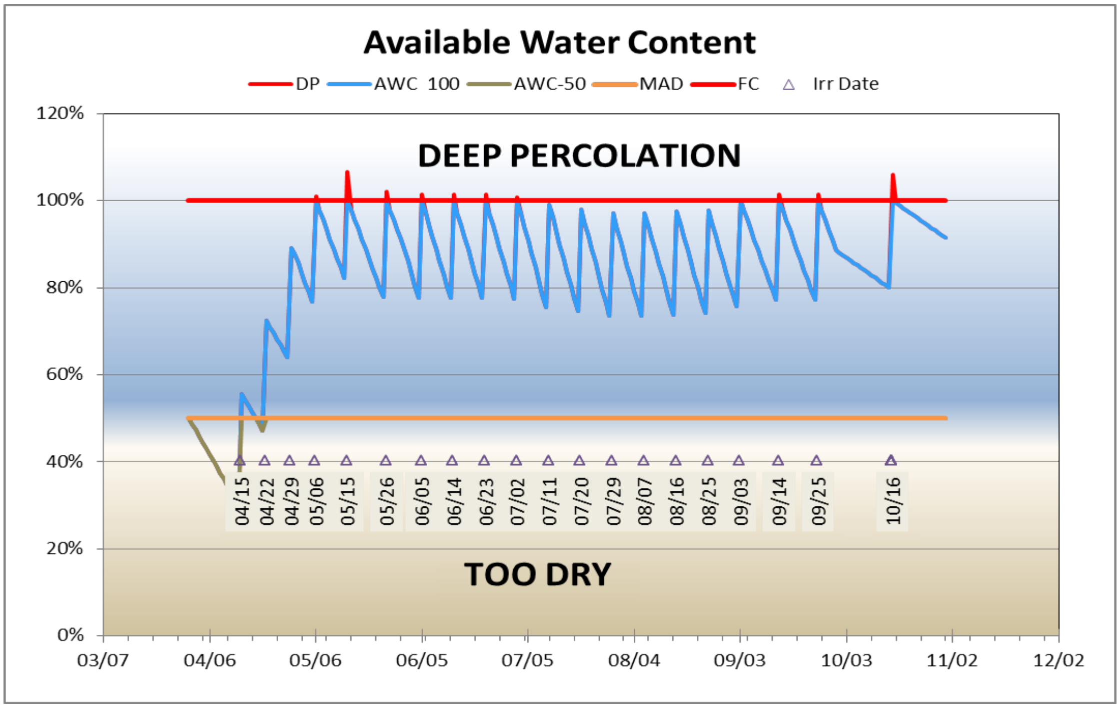
Irrigation Water Use Record - Farmer Self Certification

Cooperator:	NRCS Cooperator	**Crop:**	Alfalfa	**Year:**	2012
Tract/Field:		**Root Depth, ft:**	5.00		
Date:	10/15/2012	**Station:**	Green River	**CU:**	42 inches
		Contract Eligible Acres:	40.00		
Soil Texture:	Clay Loam	**Irrigation method:**	Pivot		
AWC, In/Ft:	1.80	**Efficiency:**	75%		
AWC Max, in:	9.00	**Evaluated Acres:**	125.66		
MAD, in:	4.50	**Evaporation %:**	10%		
Pre-season AWC, In.	4.50	**Cycle Hours:**	168		
		Flow rate, gpm:	900		

Start date of irrigation cycle	End date of irrigation cycle	Total Cycle Hours	Alternate Cycle Hours	Flow, gpm	Inches Applied Cycle	Inches Applied Season	CU Season (Table)	Irrigation Balance	AWC	Deep Perc
04/15/13	04/22/13	168		900.0	2.39	2.39	1.89	0.00	4.50	0.00
04/22/13	04/29/13	168		900.0	2.39	4.79	2.77	1.51	6.01	0.00
04/29/13	05/06/13	168		900.0	2.39	7.18	3.65	1.51	7.52	0.00
05/06/13	05/13/13	168		900.0	2.39	9.57	4.98	1.07	8.59	0.00
05/15/13	05/22/13	168		900.0	2.39	11.96	6.78	0.59	9.00	0.18
05/26/13	06/02/13	168		900.0	2.39	14.36	8.98	0.19	9.00	0.19
06/05/13	06/12/13	168		900.0	2.39	16.75	11.24	0.13	9.00	0.13
06/14/13	06/21/13	168		900.0	2.39	19.14	13.51	0.12	9.00	0.12
06/23/13	06/30/13	168		900.0	2.39	21.54	15.78	0.12	9.00	0.12
07/02/13	07/09/13	168		900.0	2.39	23.93	18.09	0.08	9.00	0.08
07/11/13	07/18/13	168		900.0	2.39	26.32	20.57	-0.09	8.91	0.00
07/20/13	07/27/13	168		900.0	2.39	28.71	23.06	-0.09	8.82	0.00
07/29/13	08/05/13	168		900.0	2.39	31.11	25.54	-0.09	8.73	0.00
08/07/13	08/14/13	168		900.0	2.39	33.50	27.93	0.01	8.74	0.00
08/16/13	08/23/13	168		900.0	2.39	35.89	30.29	0.03	8.77	0.00
08/25/13	09/01/13	168		900.0	2.39	38.29	32.65	0.03	8.80	0.00
09/03/13	09/10/13	168		900.0	2.39	40.68	34.84	0.20	9.00	0.01
09/14/13	09/21/13	168		900.0	2.39	43.07	37.10	0.13	9.00	0.13
09/25/13	10/02/13	168		900.0	2.39	45.47	39.36	0.13	9.00	0.13
10/16/13	10/23/13	168		900.0	2.39	47.86	41.21	0.54	9.00	0.54

Total inches of water applied during the season (total of all lines above):	47.86	1.64
Total Acre Feet Applied during the Season:	501.2	
Seasonal Irrigation Efficiency (CU requirement/inches of water applied per acre):	86%	

Figure 3. IWM Self Certification Spreadsheet input page



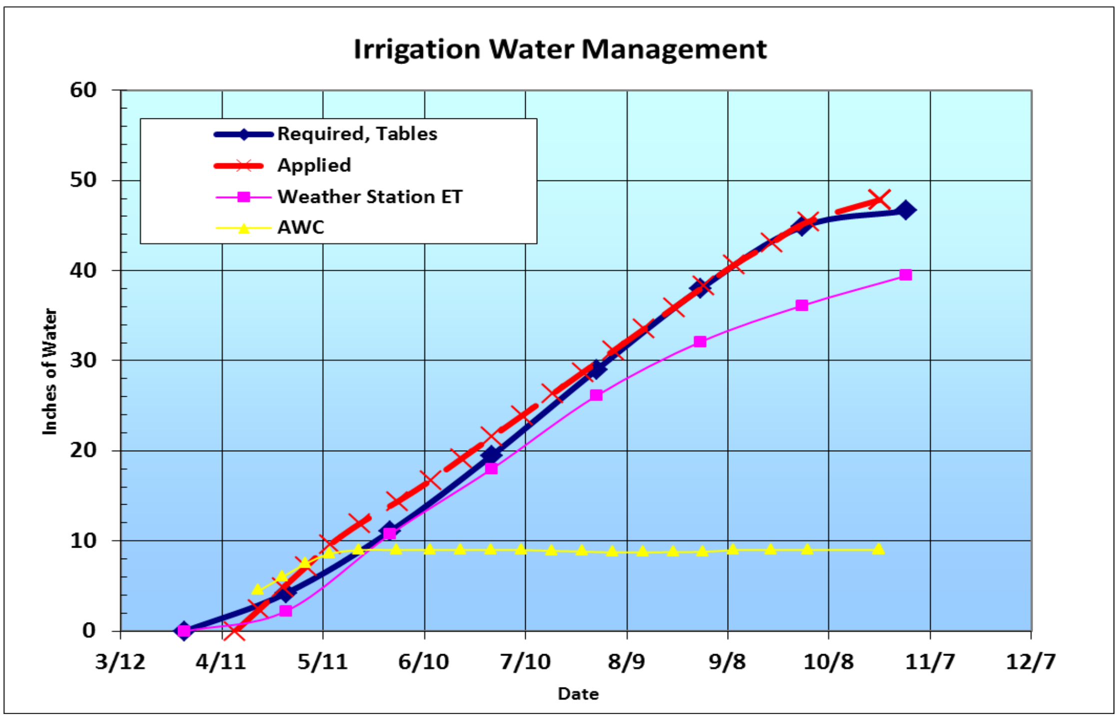


Figure 4. Sample graphs from the IWM Self Certification Spreadsheet

In the first graph, the blue line indicates Available Water Content (AWC). Red spikes above the 100% line are deep percolation. For maximum crop growth, AWC should not be allowed to fall below the Managed Allowable Depletion (MAD) orange line.

In the second graph, the blue line is a long-term average water requirement, based on location and crop. The red line is the actual water applied. Where data is available, the magenta line is modeled from current-year local data collected at a nearby weather station.

Soil Moisture Monitoring

A time-tested method for timing irrigation involves augering a hole and determining the water content of the soil to decide when to apply the next irrigation. This may well be the best method available for irrigation timing, both simple and inexpensive. However, few irrigators take time to do it.

NRCS is demonstrating and guiding cooperators in the use of modern soil moisture monitoring systems, utilizing electronic probes and data recorders. Such systems can now be installed for about $600, giving the cooperator information on the water content of his soil at several different depths, without time-consuming augering.

Figure 5. Sample Soil Moisture Data Logger with graphing

In a typical case, electrical resistance based probes are installed at various depths, such as 12", 24" and 48". Using a simple data recorder, indicated soil pore pressure (implied soil moisture content) is read and recorded multiple times per day. With some recorders, soil pore pressure is presented graphically on an LCD display in the field, making it a simple matter to estimate when the next irrigation will be required. (Figure 5)

Since gravimetric drainage generally does not occur unless the soil horizon is nearly saturated (above field capacity), it is assumed that deep percolation is not occurring if the deepest probe reading is below -10 centibars. Data recorders in other salinity units indicate that deep percolation occurs less than 3% of the time on monitored fields.

Soil moisture data recorders typically store 10 months of data or more in nonvolatile memory and can be downloaded using a laptop computer or pocket computer. Battery life is over a year, using AA or 9 volt batteries. When carefully installed, maintenance requirements are minimal.

Available water content (AWC), the soil moisture available to the plant, can be roughly estimated, using multiple probes. The AWC calculation is dependant on many soil and environmental parameters and is tedious to model precisely, but when an operator becomes familiar with the system, he will be able to use it well for irrigation timing. (Figure 6)

No data recorders have been installed in GRU.

NRCS payment schedules include an IWM Intense (449) practice with a higher payment rate for participants who agree to install soil moisture monitoring equipment in addition to taking classes, attending workshops, and keeping records. It is hoped that future contracts will capitalize on this opportunity to enhance instrumentation and IWM interest at the field level.

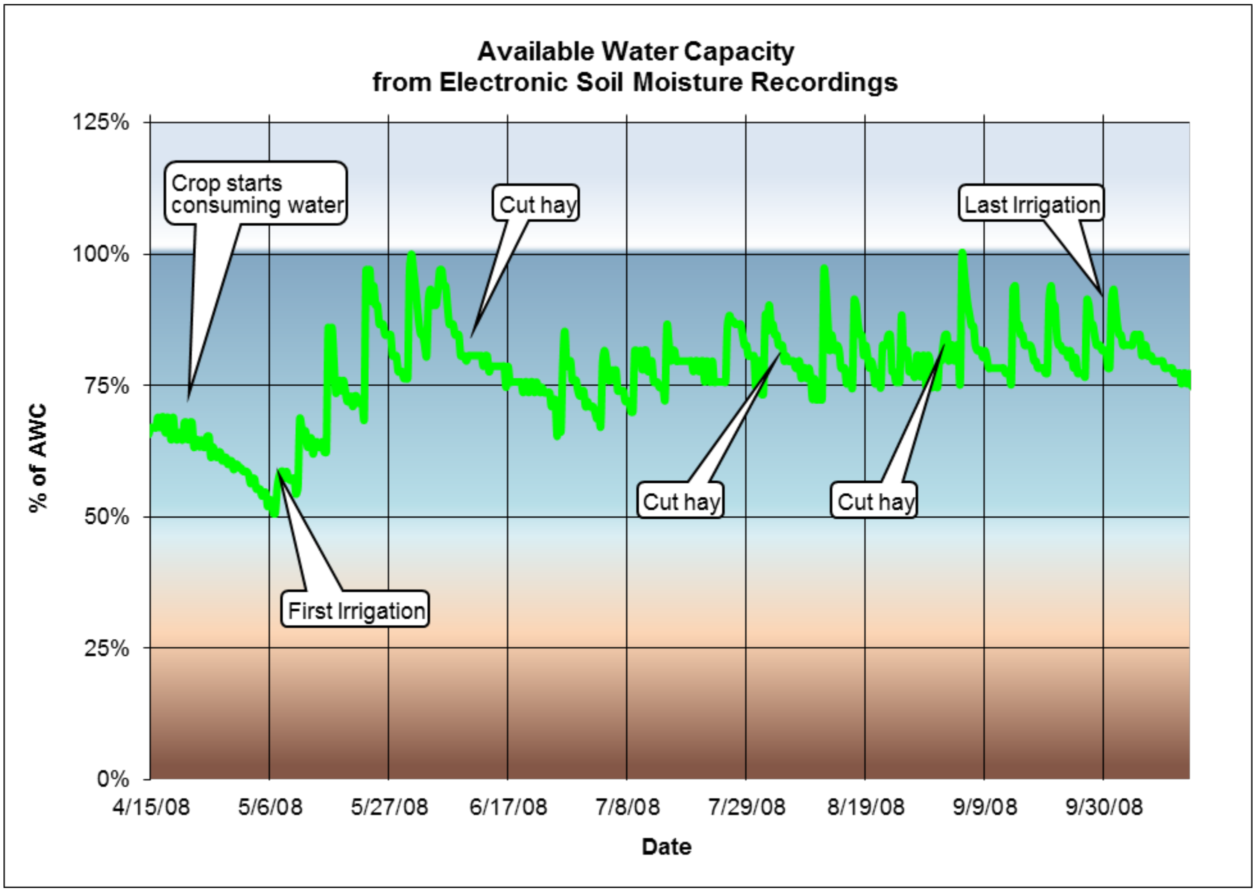


Figure 6. AWC estimated from downloaded soil moisture data

Wildlife Habitat and Wetlands

Background

In April, 2009, the Green River, Utah Unit (GRU) was recognized as a Colorado River Basin Salinity Control Program (CRBSCP) Salinity Area. Salinity irrigation and wildlife habitat development plans are eligible to compete for funds allocated to the CRBSCP. Impacts from this project to wildlife habitat and wetlands will be monitored and evaluated and subsequently compensated. Compensation is accomplished on a voluntary basis from private landowners and American Indian Tribes through applications for funding from the Environmental Quality Incentives Program (EQIP). Impacts may include loss of wildlife habitat and wetlands, conversion of wetland habitats to upland areas such as agricultural fields, or other vegetation changes brought about by the more efficient use of irrigation water.

In the upper Colorado River Basins there are several Salinity Areas, each with its own unique methodology for monitoring and evaluating impacts and replacement of wildlife habitat and wetlands. The Green River, Utah Unit is a relatively small project, and impacts from the project can be observed from project inception. The Monitoring and Evaluation Team (M&E) monitors land cover maps utilizing aerial photography from the National Agricultural Image Program (NAIP). NAIP images are one meter resolution, true color, or color-infrared aerial photos intended to be re-flown tri-annually. With these high resolution photos, M&E has the ability to zoom in close and create a reasonably accurate land cover map which can be verified with minimal ground truthing. These images can be compared through time to monitor land cover changes. By the use of Geographical Information System (GIS) software, estimates of gains or losses in wildlife habitat or wetlands can be quantified. Subsequent images may be utilized if technology advances and NAIP images are surpassed in quality.

Representative photographic points will also be established, to be compared throughout the years, to assist with land cover mapping efforts, defining vegetation composition of the land cover elements and what impacts, if any, are occurring.

Wildlife Habitat Monitoring

On November 27, 2012 NRCS received a response to a letter sent to Ms. Patricia S. Gelatt, Western Colorado Supervisor for the USFWS regarding proposed changes in the assessment method of wildlife replacement needed to offset incidental fish and wildlife values foregone resulting from salinity control projects in the State of Utah. The Service supported the proposal for minimum habitat improvement to be greater than 2 percent of irrigation acres treated for salinity control, and that wildlife habitat losses resulting from irrigation improvements will be replaced on a 1:1 acreage basis. The Service also stated that they agree that permanent easements would be preferred, but if not possible the habitat practice lifespan will be as long as, if not longer, than the lifespan of irrigation improvement practices (see Appendix).

NRCS Salinity wildlife projects are voluntary on the part of landowners. The federal government is committed to mitigate adverse effects of federal actions. Federal and State funding programs are in place to promote wildlife habitat replacement. NRCS is fully invested in outreach for applications for high quality wildlife-only projects on public or private lands, consistent with rules and regulations associated with EQIP. This information is advertised annually in local newspapers, in Local Workgroup meetings, and in Conservation District meetings throughout the Salinity Areas. The Utah NRCS Homepage also has information and deadlines relating to Farm Bill programs.

Through the end of FY2013, improved irrigation practices have been applied on 220 acres. In the same time, Habitat improvement has been applied. In GRU habitat replacements are not concurrent and proportional with salinity irrigation improvements. Efforts to plan and apply habitat replacement, to exceed the committed 2% level, will continue.

Wildlife Habitat Contract Monitoring

In the fourth year of eligibility (FY2013) for salinity projects, there have been no awarded contracts for salinity wildlife only habitat improvement project funds. Table 6 represents annual acres of wildlife habitat improvement planned and applied in the GRU Salinity Unit.

Table 7 represents cumulative acres of wildlife habitat improvement planned and applied in the GRU Salinity Unit.

Table 6. Annual Wildlife Habitat Replacement

Acres of Wildlife Habitat Creation or Enhancement				
FY2013 Annual practices				
Program	Acres Planned		Acres Applied	
	Wetland*	Upland	Wetland*	Upland
BSPP	-	-	-	-
EQIP	-	-	-	-
WHIP	-	-	-	-
Total	-	-	-	-

*Wetland acres include riparian habitat

Table 7. Cumulative Wildlife Habitat replacement

Acres of Wildlife Habitat Creation or Enhancement				
Cumulative practices thru FY2013				
Program	Acres Planned		Acres Applied	
	Wetland*	Upland	Wetland*	Upland
BSPP	-	-	-	-
EQIP	-	-	-	-
WHIP	-	-	-	-
Total	-	-	-	-

*Wetland acres include riparian habitat

Economics

Cooperator Economics

It is logical to expect that upgrading from flood to sprinkler irrigation improves profitability by increasing production while decreasing costs for water, fertilizer, labor, and field maintenance. Irrigation system maintenance may increase somewhat, but should be less variable on an annual basis.

Production Information

Green River, Utah is famous in the region for its production of water melons. Melons are grown on about 300 of 4,000 producing acres in a typical year. Farming in the Green River, Utah area is principally related to livestock production. Forage crops account for 3,400 producing acres or 85% of total production.

Agricultural statistics do not separate Green River, Utah production from other areas in Emery and Grand Counties. Since Green River production is a minor portion of production in these counties, it is impossible to accurately gage production from National Agricultural Statistics Service data (NASS).

Water for the Green River, Utah Unit comes directly from the Green River and is not limited. Rainfall has little bearing on the amount of water available for irrigation.

Expense Information

Reliable expense information is difficult to obtain. Many of the farms are family operations and the cost of family labor is rarely evaluated or reported. From NASS data, labor benefits are elusive as both *Hired Farm Labor* and *Total Farm Production Expenses* have increased steadily over the 1987, 1992, 1997, 2002, and 2007 Agricultural Censuses.

As with production data, labor statistics for Green River (Emery and Grand Counties) are pretty well masked by larger producing areas in the counties.

Public Economics

No cooperator surveys have been completed in GRU, but farmers surveyed in other salinity units have positive attitudes about the salinity program.

Positive public perceptions of the Salinity Control Program include:

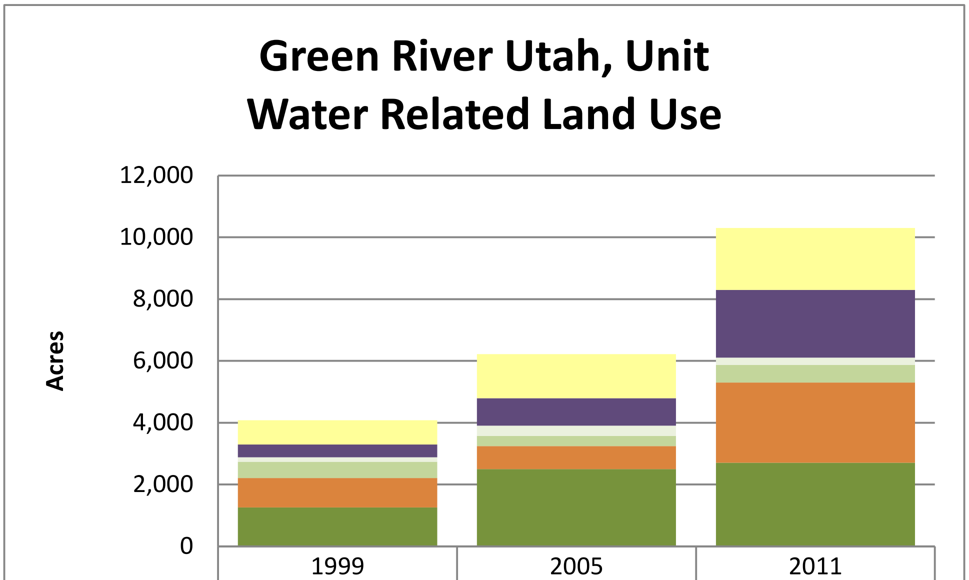
- Reduced salinity in the Colorado River
- Increased flows in streams and rivers
- Economic lift to the entire community from employment and broadened tax base
- Aesthetically pleasing, green fields, denser, for longer periods of time
- Improved safety and control of water resources, with a reduction in open streams

Negative public perceptions of the Salinity Control Program include:

- Conversion of artificial wetlands to upland habitat and other shifts in wildlife habitat
- Changes in Water Related Land Use (WRLU)

Land Use Land Cover

Utah Division of Water Resources maintains a data layer of Water Related Land Use (WRLU), updated every five-six years. (Figure 7) The CRBSCP has not spent enough money in the area to impact growth depicted by the WRLU. Private investors have installed over 20 center pivots, with no help from the federal government, to preserve Utah Water Rights in the Green River.



	1999	2005	2011
Urban	785	1,429	1,998
Idle	414	891	2,191
Other Crops	147	325	244
Pasture	525	332	565
Corn	950	742	2,591
Hay	1,259	2,504	2,710

Figure 7. Pre-project land use land cover, used in preparing 2006 EA

Summary

It is impractical to run a pipeline up the Green River, far enough to obtain gravity pressure for sprinkling. Installing sprinklers, in this unit, generally requires a small settling pond and pump, along with a new power bill for irrigation. Land owners will have to balance these costs against potential production increases, when deciding whether or not to apply for salinity funding.

At present funding levels, ample opportunities exist to install improved irrigation systems and reduce salt loading to the Colorado River system. Salinity programs in other areas indicate that participants are apparently satisfied with results and generally positive about salinity control programs.

Glossary and Acronyms

Available Water Content (AWC) – Water contained in the soil that can be utilized by the plant, defined to be the difference between Field Capacity and Permanent Wilting Point, usually expressed as inches/foot.

Average salt pickup – The increase in the amount of salt carried by a stream as a result of inflows containing increased salt from dissolution of the soil. Usually expressed as tons/acre-foot.

Annual average salt load – The average estimated annual salt load carried by a stream, based on a period of record of several years. Usually expressed as tons/year.

Application efficiency – The portion of the irrigation water delivered to the field that is stored in the soil, expressed as a percentage of the total delivery volume.

Applied Practices – Functioning practices for which Federal cost share dollars have been expended.

BSPP – Basin States Parallel Program – managing LCRB matching funds from FY1997 to FY2012.

BSP – Basin States Program - managing LCRB matching funds starting in FY2012.

Bureau of Reclamation (Reclamation or USBR) – A branch of the U.S. Department of Interior charged with water interests in the United States. Reclamation is the lead agency for salinity control in the Colorado River.

Catch-can testing – a procedure whereby dozens of containers are spread out under a sprinkler system in an array, to determine how much water is being applied to different spots of ground under the sprinkler to evaluate uniformity.

cfs – Cubic feet per second or second-feet.

Christiansen Coefficient of Uniformity (CCU) – a sprinkler uniformity rating. In a catch-can test, CU is the sum of the squares of the ratio of each catch to the average catch.

Continuous Move Sprinkler – a sprinkler system designed to move continuously, such as a center pivot, lateral move, or a big-gun on a reel.

Cover Map – a map categorizing land use based on surface cover, e.g. urban, crop type, wetlands, etc.

Crop Consumptive Use (CU) – The amount of water required by the crop for optimal production. It is dependent on many factors including altitude, temperature, wind, humidity, and solar radiation.

CRBSCP – Colorado River Basin Salinity Control Program

Daubenmire cover class frame – An instrument used to quantify vegetation cover and species frequency occurrences within a sampling transect or plot.

Deep Percolation (DP) – The amount of irrigation water that percolates below the root zone of the crop, usually expressed in acre-feet.

Dissolved salt or Total Dissolved Solids (TDS) – The amount of cations and anions in a sample of water, usually expressed in milligrams/liter, but often expressed in Tons/Acre-foot for salinity control programs.

Distribution Uniformity (DU) – A measure of how evenly the irrigation water is applied to the field. If DU is poor, more water is needed to assure that the entire crop has an adequate supply. Using a catch can test, DU is the ratio of the low quarter average catch to the total average catch.

EQIP – Environmental Quality Improvement Program, FY1997 to present.

Evapotranspiration (ET) - The amount of water used by the crop. ET is generally synonymous with CU and is frequently mathematically modeled from weather station data.

Field Capacity (FC) – The total volume of water contained in the soil after gravimetric drainage has occurred. The soil pore pressure is 0 to -33 cb.

Financial Assistance (FA) – The Federal cost share of conservation practices. For USDA funding, FA is normally 60% of total cost of conservation practices.

Gated Pipe – Water delivery pipe with individual, evenly spaced gates to spread water evenly across the top of a field.

Gravimetric drainage – The volume of water that will drain from a saturated soil profile due to gravity alone.

Hand line – An irrigation system composed of separate joints of aluminum pipe, each with one sprinkler, designed to irrigate for a period of time and be moved to the next parallel strip of land.

Improved Flood – Increasing the efficiency of flood irrigation systems with control and measurement structures, corrugations, land-leveling, gated pipe, etc.

Irrigation Water Management (IWM) – Using practices and procedures to maximize water use efficiency by applying the right amount of water at the right place at the right time.

Leakage – Water loss from ditches and canals through fissures, cracks or other channels through the soil, either known or unknown.

Management Allowable Depletion (MAD) – The fraction of AWC that allows for maximum production. Typically 50%, only the top 50% of AWC should be used for crop growth.

National Agricultural Statistics Service (NASS) - A branch of the U.S. Department of Agriculture (USDA) charged with keeping agricultural statistical data.

Natural Resource Conservation Service (NRCS) A branch of the U.S. Department of Agriculture (USDA) charged with providing technical assistance to agricultural interests and programs.

NEPA – National Environmental Policy Act which sets out requirements for Federal Agencies to evaluate impacts of Federal projects on the environment, prior to initiating the project.

Periodic Move – A sprinkler system designed to irrigate in one position for a set amount of time, then periodically moved to a new position by hand or on wheels repeatedly until the field is covered. (includes sprinkler systems such as hand-line, wheel-line (side-roll), pod, big-gun, etc.)

Permanent Wilting Point (PWP) – The volume of water in a soil profile that cannot be extracted by the plant. Normally, watering a plant at this point will not restore its vitality. Soil pore pressure is about -1,500 cb at the PWP.

Pivot or Center Pivot – A sprinkler system that uses moving towers to rotate a sprinkler lateral about a pivot point.

Planned Practices – Practices for which Federal cost share dollars have been obligated by contract.

Pod – A periodic move sprinkler system consisting of several plastic pods at fixed spacing along a small-diameter (1.25-2.00"), flexible HDPE supply line. Each pod has a sprinkler and the operating lateral is typically moved by dragging it with a four-wheeler.

Ranking – A process by which applications for federal funds are prioritized based on their effectiveness in achieving Federal goals.

Readily Available Water (RAW) – water that a plant can easily extract from the soil. A synonym for Managed Allowable Depletion.

Return Flow – The fraction of deep percolation that is not consumed by plants, animals, or evaporation and returns to the river system, carrying salt.

Salt Budget – Balancing the inflow and outflows of a salinity project to estimate unknown salt pickup.

Salts – Any chemical compound that is dissolved from the soil and carried to the river system by water. Salt concentration is frequently expressed as "Total Dissolved Solids" measured in parts per million (ppm) or milligrams per liter (mg/l). For salinity control work, it is often converted to Tons per acre-foot of water.

Salt load – The amount of dissolved salt carried by a flowing stream, usually expressed in tons/year.

Seepage – Fairly uniform percolation of water into the soil from ditches and canals.

Salt Load Reduction – A measure of the annual tons of salt prevented from entering the waters of the Colorado River. As applied to agriculture, salt load reduction is achieved by reducing seepage and deep percolation from over-irrigating.

Soil Conservation Service – The predecessor agency to NRCS.

Technical Assistance (TA) – The cost of technical assistance provided by Federal Agencies to design, monitor, and evaluate practice installation and operation, and to train and consult with cooperators. TA is generally assumed to be 40% of the total cost of conservation practices in the salinity control program.

Uniformity – A mathematical expression representing how evenly water is applied to a plot of ground by a sprinkler system. The two most common measures used by NRCS are the Christiansen Coefficient of Uniformity (CCU) and Distribution Uniformity (DU).

Utah Division of Wildlife Resources (UDWR or DWR) – Managing division for wildlife resources in the State of Utah.

Water Budget – An accounting for the amount of water entering (irrigation and precipitation) and the amount of water leaving (evaporation, CU, deep percolation) a given plot of land to determine efficiency and estimate deep percolation.

Wheel line, Wheeline, Side-roll– A periodic-move sprinkler system designed to be moved periodically by rolling the sprinkler lateral on large wheels.

WHIP – Wildlife Habitat Incentives Program, a Farm bill program instituted in 1997, designed to create, restore, and enhance wildlife habitat.

Yield (or Crop Yield) – The amount of a given crop harvested annually from an acre of ground. Yield is usually expressed as Tons/Acre or Bushels/Acre, depending on the crop.

Appendix

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
764 Horizon Drive, Building B
Grand Junction, Colorado 81506-3946

IN REPLY REFER TO:
ES/CO:NRCS Salinity Program Habitat Replacement
TAILS 06E24100-2013-CPA-0003

November 27, 2012

David C. Brown, Utah State Conservationist
Natural Resources Conservation Service
125 South State Street, Room 4010
Salt Lake City, Utah 84138-1100

Dear Mr. Brown:

This responds to your July 16, 2012, letter regarding the proposed changes in the assessment method of wildlife replacement needed to offset incidental fish and wildlife values foregone resulting from salinity control projects in the State of Utah. The Fish and Wildlife Service (Service) supports the proposal for minimum habitat improvement to be greater than 2 percent of irrigation acres treated for salinity control, and that wildlife habitat losses resulting from irrigation improvements will be replaced on a 1:1 acreage basis. We agree that permanent easements are preferred, but if not possible, that habitat practice lifespan will be as long or longer than the practice lifespan of irrigation improvements. This change is in line with Colorado Natural Resource Conservation Service (NRCS), and we trust that it will help the salinity program offset real habitat losses with real habitat improvements. We hope this change will allow NRCS biologists to focus their efforts on implementing quality habitat replacement projects with willing landowners.

The Service commends NRCS for the habitat replacements/improvements in both the Uintah Basin and Price San Rafael River Salinity Units, that are proportional and concurrent with salinity irrigation improvements, and exceed 2 percent of the irrigation improvements. We appreciate continuing efforts by NRCS field staff to pursue and implement new projects, as well as to monitor and evaluate ongoing and completed projects. Please let us know if there is any way we can assist NRCS in reaching the replacement needs associated with the Muddy Creek, Green River, and Manila-Washam Salinity Units.

For further assistance, please contact Barb Osmundson by phone at (970) 243-2778, extension 21, or by email at Barb_Osmundson@fws.gov.

Sincerely,

Patricia S. Gelatt
Western Colorado Supervisor

cc: NRCS-SLC Utah (Travis James, Pedro Ramos)
NRCS-Roosevelt Utah (Ed Whicker, Jim Spencer)

BOsmundson:NRCSUtahWildlifeReplacementCommentLetter.docx:112712:KM

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