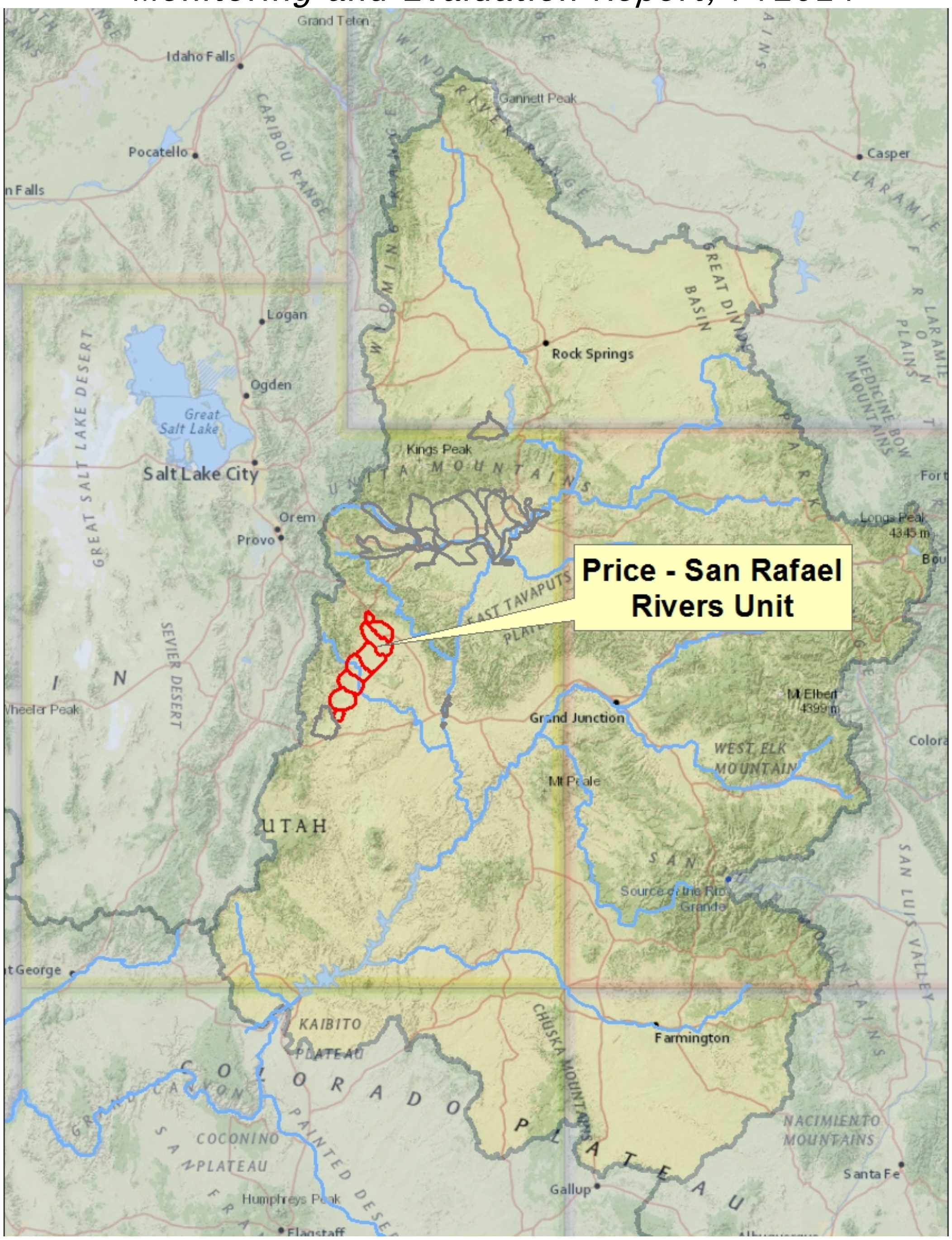
Colorado River Basin Salinity Control Program

Price – San Rafael Rivers Unit

Monitoring and Evaluation Report, FY2014



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Project Synopsis

The Salinity Control Act (PL-93-320) (SCA) and subsequent related legislation authorizes the U.S. Department of Agriculture (USDA), acting through the Natural Resources Conservation Service (NRCS), to implement salinity control throughout the Colorado River Basin. The NRCS' Price – San Rafael Rivers Salinity Control Unit (PSR), in eastern Utah, encompasses 66,450 agricultural acres irrigated with water diverted from tributaries of the Price and San Rafael Rivers in Carbon and Emery Counties. This area, approximately 20 miles northwest to southeast 60 miles southwest to northeast, is a source of dissolved solids from Cretaceous marine (Mancos Shale) deposits. The pre-project agricultural salt load was estimated to be 170,800 ton/year, on-farm. Water, diverted to irrigate cropland and pasture, deep percolates through the saline sediment, dissolving and transporting salts to the river system. PSR was established by a 1993 environmental impact statement, prepared jointly by U.S. Bureau of Reclamation (USBR) and Soil Conservation Service (now NRCS). The first USDA projects were funded in FY1996. Salt load reduction is achieved by improving irrigation efficiency and reducing deep percolation. The 1993 EIS anticipated treating 36,050 acres, controlling 120,200 tons/year of on-farm salt at a cost of $65/ton (2014 dollars). Through the end of FY2014, USDA has treated about 32,200 acres and USBR has treated about 5,000 acres controlling about 111,000 tons/year (101,600 tons/year on USDA funded acres), on-farm. Of the original 66,450 irrigated acres, 27,000 acres or 41% have yet to be planned for irrigation improvements. As prescribed by the Salinity Control Act, impacts to wildlife habit foregone resulting from salinity control implementation, are evaluated to assure that replacement of habitat is "concurrent and proportional" to installation of salinity control measures. With concurrence from U.S. Fish and Wildlife Service, habitat replacement acreage is to exceed two percent of improved irrigation acreage, or 740 acres through FY2014. Actual habitat replacement in PSR is about 3,339 acres, or 10.4% of improved irrigation acres. Opportunities remain for additional salt control. NRCS will continue to use its resources to implement salt control and habitat replacement consistent with its authorities and resources.

Executive Summary

Project Status

- **TREATED ACRES:** Of 66,450 irrigated acres with water rights, perhaps 70% or 45,000 acres may ultimately be improved. Since 1997, treatments on approximately 34,400 acres have been planned and 32,200 acres applied. In FY2014, 1,466 acres were planned and 1,535 acres applied.
- **ON-FARM SALT LOAD REDUCTION:** Of approximately 171,000 original on-farm tons/year of salt load, 102,000 tons/year salt load reduction has been planned and 96,000 tons/year has been applied, calculated using procedures revised in 2007. In FY2014, 4,248 tons/year were planned and 4,375 tons/year applied on-farm.
- **PLANNED OBLIGATIONS:** For FY2014, NRCS obligated $2.62 million in financial assistance (FA). Cumulative obligations total $41.8 million FA nominal ($58.0 million 2014 dollars).
- **APPLIED EXPENDITURES:** For FY2014, NRCS expended $3.14 million, FA. Cumulative expenditures total $34.5 million FA nominal ($45.4 million 2014 dollars).
- **COST/TON:** Planned salt load reduction cost for FY2014 contracts is $62/ton, FA+TA. The cumulative cost is $68/ton, FA+TA (2014 dollars) for planned practices. For practices applied in FY2014 the cost is $73/ton FA+TA, with a cost of $55/ton FA+TA (2014 dollars), for cumulative applied practices.
- **NEPA PROJECTED COST/TON:** In 2014 dollars, pre-project NEPA documents anticipated a salt load reduction cost of $65/ton. Cumulative planned cost is $68/ton, and cumulative applied cost is $55/ton.
- **IRRIGATION WATER MANAGEMENT (IWM):** Deep percolation due to poor system maintenance or inadequate irrigation water management is relatively minor. Operators of new sprinkler systems are more likely to under-irrigate than to over-irrigate.
- **CONSISTENT TRAINING** and emphasis on IWM, results in a better outcome for the environment and the participant.
- **INCENTIVE PAYMENTS FOR IWM** have resulted in enhanced interest in IWM and quality system maintenance.
- **THE 2014 FARM BILL** funds EQIP through FY2018.

Wildlife Habitat and Wetlands

- In FY2014, no wildlife habitat replacement projects were planned or obligated.
- In FY2014, 241 acres of wildlife habitat replacement were applied, mostly in the Hatt Ranch WHIP project.
- As of FY 2014, wildlife habitat replacement in PSR Unit is concurrent and proportional with Salinity Irrigation acres. Actual habitat replacement in PSR is 3,339 acres, or 10.4% of improved irrigation acres.

Economics

- Alfalfa production is clearly in an upward trend, but yield/acre is declining slightly.
- Applications for salinity control projects remain strong.

Table 1. PSR unit progress summary

Price - San Rafael Rivers Unit, All Programs FY2014 ProgramSummary				
CONTRACTS PLANNED	UNITS	CURRENT FY	CUMULATIVE	TARGET
1. CONTRACT STATUS				
A. Contracts Approved	Number	52	983	
	Dollars	2,621,576	41,792,943	
	Acres	1,466	34,403	45,000
On-farm	Tons/Year	4,248	97,991	128,000
Off-farm	Tons/Year	-	3,628	
B. Active Contracts	Number		169	
	Dollars		2,927,790	
	Acres		1,553	
On-farm	Tons/Year		487	
Off-farm	Tons/Year		-	
PRACTICES APPLIED	UNITS	CURRENT FY	CUMULATIVE	TARGET
2. EXPENDITURES				
Financial Assisstance (FA)	Dollars	3,143,569	34,453,443	
3. IRRIGATION SYSTEMS				
A. Sprinkler	Acres	1,535	32,141	45,000
B. Improved Surface System	Acres	-	-	
C. Drip System	Acres	0	71	
4. SALT LOAD REDUCTION				
A. Salt load reduction, on-farm	Tons/Year	4,375	92,345	128,000
B. Salt load reduction, off-farm	Tons/Year	-	3,628	
C. Tons of salt controlled prior to EQIP	Tons/Year		-	

NRCS Salinity Control Programs			
Program Name	Acronym	Start Year	End Year
Environmental Quality Incentive Program	EQIP	1997	Current
Basin States Parallel Program	BSPP	1998	2011
Basin States Program	BSP	2012	Current

*Note: On-farm Salt Load Reduction has been recalculated using the procedure adopted in FY2007 by three Upper Basin States. All EQIP and BSPP contracts were reviewed and acres corrected. All cumulative numbers reflect results of recalculation.

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Table of Contents

Tables

Figures

Historical Background

With settlement of the Colorado River Basin, demands on Colorado River water 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 in 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 directed by EPA.

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

An EIS, prepared jointly by the Bureau of Reclamation (USBR) and Soil Conservation Service (NRCS), gave birth to the Price-San Rafael Rivers Unit in 1993.

In FY1997, the first salinity contracts were obligated in the Price – San Rafael Rivers Unit, using financial assistance from the Environmental Quality Incentives Program (EQIP). EQIP funding is authorized through September 2018.

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.

- In June 1974, Congress enacted the Colorado River Basin Salinity Control Act (PL 93-320) (SCA). 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 (USBR). USDA was instructed to support Reclamation's program with its existing authorities.

- In December 1974, the Environmental Protection Agency (EPA) promulgated a regulation, which established a basin wide salinity control policy for the Colorado River Basin and 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 (CRSCP). 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 required 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 Farm Security and Rural Investment Act of 2002, the Food, Conservation, and Energy Act of 2008, and the Agricultural Act of 2014 reauthorized and amended EQIP, continuing opportunities for USDA funding of salinity control measures.

All federal actions are governed by the National Environmental Policy Act of 1970 (NEPA). Subject to NEPA, a *Planning Report/Final Environmental Impact Statement* was published in December 1993, by United States Department of Interior (USDI), Bureau of Reclamation (USBR) and Untied States Department of Agriculture (USDA), Soil Conservation Service (SCS), now Natural Resources Conservation Service (NRCS), establishing the Price – San Rafael Rivers Unit (PSR) of the Colorado River Basin Salinity Control Program (CRBSCP).

Monitoring and evaluation (M&E) is required by the amended Salinity Control Act. 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", first issued for Uintah Basin Unit in 1980 and revised in 1991 and 2001.

Project Status

FY2014 Project Results

FY2014 project results for the Price – San Rafael Rivers Unit (PSR) are summarized in table 2.

Table 2. FY2014 results

FY2014	Units	Planned	Applied
Federal cost share, FA	$	2,622,000	3,144,000
Amortized federal cost share, FA	$	159,100	190,800
Irrigation improvements	acres	1,466	1,535
Salt load reduction	tons /year	4,248	4,375
Federal cost, FA+TA	$/ton	62	73

Cumulative Project Results

The normalized, amortized cost of salt load reduction is relatively close to the cost anticipated by the EIS. (Table 3) Cooperators continue to apply for salinity control contracts and opportunities exist to further reduce salt loading at an average cost/ton comparable to that expected at project inception.

Table 3. Project goals and cumulative status, 2014 dollars

Cumulative	Units	EIS	Planned	Applied
Federal Cost Share, FA+TA	2014 $	$77,100,000	$96,600,000	$75,580,000
Amortized federal cost share, FA+TA	2014 $	$7,770,000	$6,900,000	$5,300,000
Irrigation Improvements	Acres	36,050	34,000	32,200
Salt load reduction	Tons /year	120,220	102,000	96,000
Federal cost FA+TA	2014 $ /ton	$65	$68	$55

Detailed Analysis of Progress

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.

In 2007, NRCS and USBR reviewed available literature and came to a consensus agreement on the most reasonable pre-project salt contribution from agriculture prior to implementing Federal Salinity Control Programs. (Figure 1)

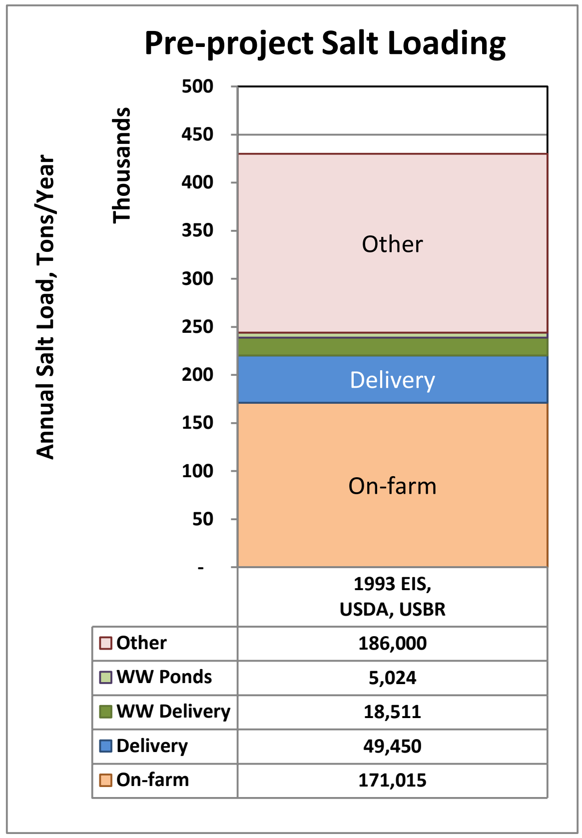


Figure 1. PSR pre-project agricultural salt load allocation. (WW=Winter water)

Salinity Control Practices

On-farm practices used to reduce salt loading include improved flood systems, sprinkler systems, and advanced irrigation systems, along with diversions, water delivery systems, pumps, ponds, etc., required for the proper operation of irrigation systems. Salt load reduction is achieved by improving uniformity of water application and reducing over-irrigation and deep percolation.

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

For PSR, in 1993, SCS (now NRCS) and USBR developed a joint environmental impact statement (EIS). The USBR Regional Director and the NRCS State Conservationist signed the Record of Decision (ROD) in April 1997. The cause of the four-year delay is unclear. The first on-farm irrigation improvement contracts with irrigators were obligated in FY1997.

The EIS addressed 66,450 acres of agricultural land with water rights. Due to lack of water, 36,500 acres were actually irrigated in any given year. For analysis, the acreage was divided into six sub-units, primarily by canal system. Over time, additional acreage was added in the Helper area, north of Price, Utah. The PSR unit and its sub-units are mapped in red, on the cover of this report.

The preferred alternative estimated the cost of on-farm salt load reduction to be about $27/ton, based on 1989 discount rates. ($65/ton in 2014 dollars)

Table 4, an updated version of Table IV-12 of the EIS, summarizes cost calculations using current procedures with EIS data.

From table 4, , the combined cost of on-farm and off-farm improvements, less winter water improvements, cited in Table IV-12 of the EIS, would have been $44/ton nominal, not the $45/ton calculated using a 50 year practice life. (Based on amortizing $70,032,060 at the 1989 discount rate of 8.875%, over 25 years, as is typical for NRCS' salt cost calculations.) The equivalent cost in 2014 dollars is $120/ton, which might be a good target estimate of the cost of a combined on-farm/off-farm project in FY2014.

With the joint EIS in place, USBR funded several off-farm projects over the years. The costs of these projects were generally justified by combining total federal cost of on-farm and off-farm salinity control components and weighing the cost against total salt load reduction, as was done in the EIS. Regardless of how a project is justified, each agency remains accountable for federal dollars expended by their agency and salt load reduction directly associated with those federal expenditures.

In general, on-farm practices are more cost effective at reducing salt loading than are off-farm practices. However, quality off-farm practices help to optimize installation of on-farm practices by providing gravity pressure and delivery scheduling not available from open delivery systems.

Table 4. Calculation of salt load reduction cost using pre-project, EIS projections, 2014 dollars

1993 EIS, Federal Project Cost, Normalized		On-farm	Off-farm	Winter Water	Total Project
Irrigation projects	acres	36,050			36,050
Canals and ditches	miles		156		156
Winter Water Improvements				Various	
Salt Load Reduction	tons/ year	120,220	7,937	32,885	161,042
Total Federal Cost (1989), FA+TA	2014$	$77,100,000	$75,780,000	$13,200,000	$166,080,000
Amortized @ 8.875%, 25 years[1], FA+TA	2014 $/year	$7,770,000	$7,640,000	$1,330,000	$16,740,000
Salt Load Reduction Cost	2014 $/ton	$65	$963	$40	$104
Salt Load Reduction Cost	2014 $/ton	$65	$962	$40	$104
Salt Load Reduction Cost, combined on-farm & off-farm	2014 $/ton	$120		$40	
Salt Load Reduction Cost, combined off-farm and winter water	2014 $/ton	$65	$220		

[1] The EIS amortized at 8.875% (1989 discount rate) over 50 years. NRCS' contemporary salt load calculations use a 25 year life.

Like a highway, where it is often necessary to build expensive bridges along with less expensive miles of roadway, the most effective irrigation projects include more expensive off-farm practices along with less expensive on-farm practices in a combination that ultimately produces the most cost effective result.

Implementation has not always been divided along agency lines or on-farm/off-farm boundaries. Traditionally NRCS has focused on on-farm projects and USBR has emphasized off-farm projects. (Where on-farm and off-farm come together is blurry at times.) However, this tradition is not hard and fast, USBR has funded some on-farm projects and NRCS has funded some off-farm projects. Consequently, it is expected that USBR and NRCS will each allocate salt load reduction to on-farm and off-farm practices funded through their agency. This report deals only with NRCS funding and associated salt load reduction. NRCS funding includes USDA Environmental Quality Incentives Program and NRCS administered Basin States Program funds.

FY2014 Obligations

Planned Practices

Planned practices (obligations) represent contracts with participants to apply improved irrigation practices to the landowner'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 providing federal financial assistance for improved irrigation practices. 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, to federal standards, of salt-load-reducing irrigation practices. A few of these contracts are never completed, for various reasons, making tracking of the cumulative federal obligation problematic in that it decreases over time, as contracts are modified or cancelled.

Table 5 tabulates annual planned obligations and cost/ton in nominal and 2014 dollars.

Table 5. Cost/Ton of annual planned obligations

FY	Federal Water Project Discount Rate	Contracts Planned	FA Planned Nominal	Acres Planned	Salt Load Reduction Planned, Tons/Year	Amortized FA+TA Nominal	$/Ton FA+TA Nominal	2014 PPI Factor	FA Planned, 2014 Dollars	Amortized FA+TA 2014 Dollars	$/Ton 2014 Dollars	Cum $/ton, 2014 Dollars
1997	7.375%	29	$777,738	1,072	3,044	$115,013	$38	191%	$1,488,430	$220,112	$72	$72
1998	7.125%	36	$464,088	720	2,055	$67,122	$33	195%	$903,750	$130,711	$64	$69
1999	6.875%	33	$881,849	1,876	5,339	$124,703	$23	198%	$1,747,951	$247,179	$46	$57
2000	6.625%	52	$856,158	1,537	4,386	$118,338	$27	188%	$1,610,738	$222,636	$51	$55
2001	6.375%	103	$1,855,898	3,810	10,808	$250,657	$23	185%	$3,433,411	$463,715	$43	$50
2002	6.125%	97	$1,203,817	2,532	7,188	$158,820	$22	182%	$2,190,552	$289,001	$40	$48
2003	5.875%	38	$1,147,673	1,268	3,615	$147,859	$41	176%	$2,022,091	$260,513	$72	$50
2004	5.625%	70	$3,044,481	4,508	12,862	$382,901	$30	168%	$5,120,264	$643,969	$50	$50
2005	5.375%	50	$2,477,342	2,499	7,101	$304,063	$43	159%	$3,928,357	$482,156	$68	$52
2006	5.125%	44	$3,224,288	2,622	8,102	$386,076	$48	150%	$4,836,432	$579,114	$71	$55
2007	4.875%	38	$2,535,227	1,263	4,561	$296,056	$65	141%	$3,562,154	$415,977	$91	$57
2008	4.875%	93	$4,219,162	1,665	4,752	$492,701	$104	123%	$5,203,633	$607,664	$128	$62
2009	4.625%	45	$4,155,922	1,147	3,277	$473,148	$144	128%	$5,302,383	$603,671	$184	$67
2010	4.375%	60	$4,721,709	1,810	7,221	$523,906	$73	123%	$5,823,441	$646,150	$89	$69
2011	4.125%	55	$2,486,802	1,215	3,424	$268,825	$79	111%	$2,760,350	$298,396	$87	$70
2012	4.000%	38	$1,877,622	1,458	4,077	$200,317	$49	105%	$1,966,189	$209,766	$51	$69
2013	3.750%	50	$3,241,591	1,935	5,558	$336,756	$61	106%	$3,426,825	$356,000	$64	$69
2014	3.500%	52	$2,621,576	1,466	4,248	$265,103	$62	100%	$2,621,576	$265,103	$62	$68
	Totals	983	$41,792,943	34,403	101,619	$4,912,362	$48		$57,948,527	$6,941,833	$68	

Salt Load Reduction Calculation

The estimated salt load reduction from FY2014 planned practices is 4,248 tons/year, calculated by multiplying the original tons/acre for the entire unit, by the acres to be treated and a percentage-reduction factor based on change in irrigation practice. For PSR, the initial estimate of on-farm irrigation salt loading is 3.28 tons/acre-year. For example, if 40 acres are converted from wild-flood to wheel-line sprinkler, an estimated 84% of salt loading will be controlled. Hence, 40 acres x 3.28 tons/acre-year x 84% = 110 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 (3.500% for FY2014). Two-thirds of FA is added for technical assistance (TA) and the amortized total cost is divided by tons/year to yield cost/ton. TA is the estimated cost of outreach, administering the contract, designing and monitoring installation, and following through for the contract life.

The National Agricultural Statistics Service (NASS) Producer Price Index (PPI) for agricultural equipment purchased is applied to normalize past obligations to 2014 dollars.

Obligation Analysis

In FY2014, $2.62 million was obligated to treat 1,466 acres, reducing salt loading by 4,248 tons/year. The resulting cost is $62/ton FA+TA.

In 2014 dollars, cumulative obligation thru FY2014 is $58.0 million, planned on 34,400 acres, with a salt load reduction of 101,600 tons/year, resulting in an overall cost of $68/ton, comparable to the $65/ton cost projected by the EIS for on-farm practices.

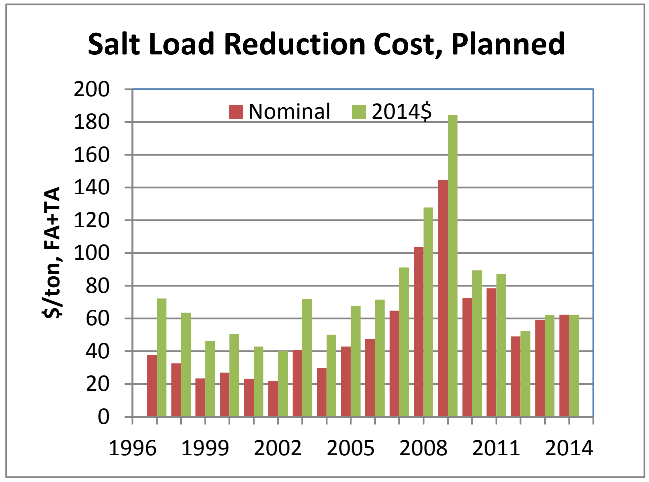


Figure 2. Cost/Ton planned, nominal and 2014 dollars

Except for three years, normalized cost/ton has remained relatively constant. (Figure 2) In FY2007-FY2009 NRCS funded several pipeline laterals needed to connect on-farm projects to the Huntington Cleveland Irrigation Company (HCIC) project, funded by USBR.

Cost-Share Enhancement

Typical federal payment percentage, over the last several years, has been about 75% of total installation cost for salinity projects. A feature of the 2002, 2008, and 2014 Farm Bills is cost-share enhancement, increasing the federal share to about 90% of the total cost for limited resource, beginning, or socially disadvantaged farmers or ranchers.

In FY2014, 18 enhanced contracts were written, obligating $815,000 FA to treat 403 acres, reducing salt loading by 1,175 tons/year at a cost of $70/ton FA+TA.

Since 2003, 306 enhanced contracts have been written, obligating $17.6 million (2014$) FA to treat 10,600 acres, reducing salt loading by 31,000 tons/year at a cost of $65/ton FA+TA (2014$).

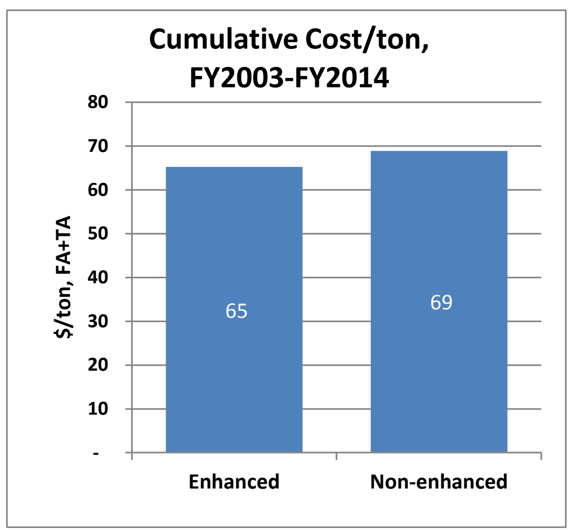


Figure 3. Cost/Ton, comparison

The cumulative average salt load reduction cost for enhanced contracts of $65/ton FA+TA (2014$), compares to $69/ton FA+TA for non-enhanced contracts from the same period. (Figure 3)

The incremental cost of enhancement is $2.64 million FA (2014$), about 7.6% of total FA for all contracts in the FY2003-FY2014 timeframe. Two-hundred, seventy-five contracts are beginning farmers/ranchers, twenty-eight are limited resource farmers/ranchers, and three are socially disadvantaged minorities. (Figure 4)

For the FY2003-FY2014 timeframe, about 51% of obligations were federally enhanced.

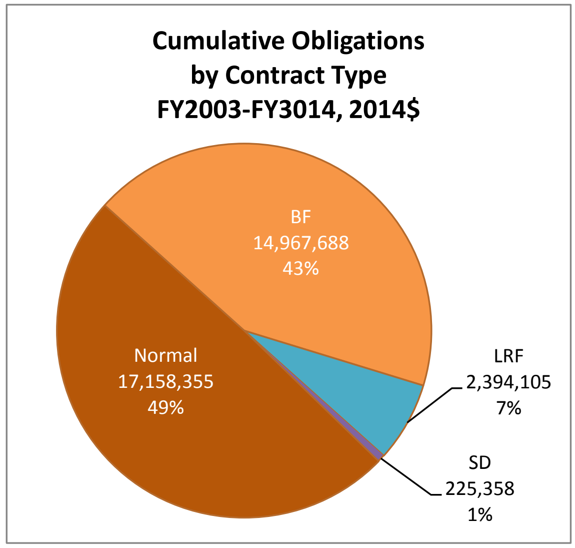


Figure 4. Cumulative obligation by contract type

Sub-basin Projects

Large sub-basin projects have been planned in Wellington (USBR), Ferron, Huntington – Cleveland, and Cottonwood sub basins. Work is completed in Wellington (on-farm and off-farm funded by USBR) and Ferron. Work is ongoing in Huntington – Cleveland and Cottonwood. (Table 6)

Table 6. Obligated acres by sub-basin

Sub Basin	Irrigated Acres	Obligated Acres	Unobligated Acres	% Unobligated
Wellington (USBR)	5,000	5,000	0	0%
Ferron	9,000	9,000	0	0%
Huntington - Cleveland	20,000	12,800	7,200	36%
Cottonwood	7,700	2,000	5,700	74%
All Other	24,800	10,600	14,200	57%
Total PSR	**66,500**	**39,400**	**27,100**	**41%**

Applied Practices

FY2014 Expenditures

In FY2014, $3.14 million FA was expended treating 1,535 irrigated acres. The estimated salt load reduction is 4,375 tons/year at an amortized cost of $73/ton FA+TA.

Cumulative expenditure FY1997-FY2014 is $45.4 million FA (2014 dollars), applied to 32,200 irrigated acres, reducing salt loading by 96,000 tons/year, on-farm and off-farm, at a cost of $55/ton FA+TA (2014 dollars). (Table 7)

Application of salinity control practices lags planning by the time required for practice installation. Between planning and application, a few contracts are de-obligated for various reasons. (Figure 5)

For tracking, irrigation contracts are assumed to be applied in proportion to dollars expended as of September 30, the last day of the fiscal year.

Salt load reduction in this report is calculated using the procedure outlined in "*CALCULATING SALT LOAD REDUCTION*", July 30, 2007.

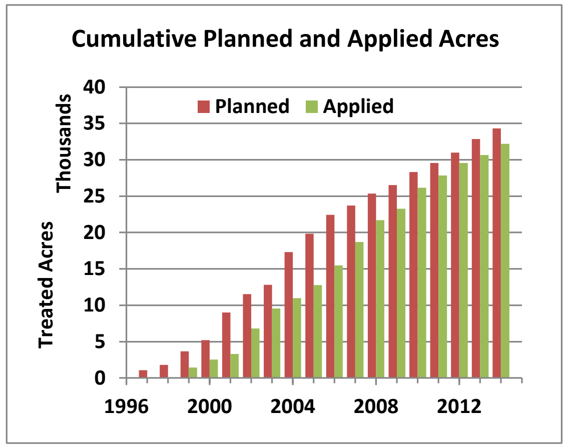


Figure 5. Cumulative Planned and Applied Acres

Table 7. Summary of annual applied expenditures and cost/ton

FY	Federal Water Project Discount Rate	FA Applied, Nominal	Irrigation Acres Applied	Salt Load Reduction Applied, Tons/Year	Amortized FA+TA, Nominal	$/Ton Applied, Nominal	2014 PPI Factor	FA Applied, 2014 Dollars	Amortized FA+TA 2014 Dollars	$/Ton 2014 Dollars	Cum $/ton, 2014 Dollars
1997	7.375%	$0	0	0	$0	$0	191%	$0	$0	$0	$0
1998	7.125%	$0	0	0	$0	$0	195%	$0	$0	$0	$0
1999	6.875%	$598,610	1,447	4,130	$84,650	$20	198%	$1,186,531	$167,788	$41	$41
2000	6.625%	$464,327	1,093	3,119	$64,179	$21	188%	$873,564	$120,744	$39	$40
2001	6.375%	$260,567	771	2,201	$35,192	$16	185%	$482,049	$65,105	$30	$37
2002	6.125%	$2,062,990	3,497	9,980	$272,171	$27	182%	$3,753,965	$495,262	$50	$44
2003	5.875%	$1,542,280	2,743	7,828	$198,697	$25	176%	$2,717,351	$350,085	$45	$44
2004	5.625%	$1,016,295	1,434	4,091	$127,818	$31	168%	$1,709,223	$214,967	$53	$45
2005	5.375%	$1,072,550	1,781	5,081	$131,642	$26	159%	$1,700,758	$208,747	$41	$45
2006	5.125%	$2,037,288	2,708	7,728	$243,945	$32	150%	$3,055,932	$365,917	$47	$45
2007	4.875%	$2,729,685	3,228	12,767	$318,764	$25	141%	$3,835,380	$447,884	$35	$43
2008	4.875%	$1,849,751	3,008	8,257	$216,008	$26	123%	$2,281,360	$266,410	$32	$41
2009	4.625%	$3,835,806	1,560	5,593	$436,703	$78	128%	$4,893,959	$557,172	$100	$46
2010	4.375%	$5,040,696	2,893	6,425	$559,299	$87	123%	$6,216,858	$689,802	$107	$51
2011	4.125%	$4,235,524	1,684	6,951	$457,864	$66	111%	$4,701,432	$508,229	$73	$53
2012	4.000%	$2,620,163	1,703	4,274	$279,536	$65	105%	$2,743,756	$292,722	$68	$54
2013	3.750%	$1,943,342	1,126	3,172	$201,886	$64	106%	$2,054,390	$213,423	$67	$54
2014	3.500%	$3,143,569	1,535	4,375	$317,888	$73	100%	$3,143,569	$317,888	$73	$55
	Totals	$34,453,443	32,212	95,973	$3,946,243	$41		$45,350,077	$5,282,146	$55	

Evaluation by Program

Funding for the Colorado River Salinity Control Project in the Price – San Rafael Rivers Unit (PSR) has been provided by three programs, Environmental Quality Incentives Program (EQIP), Basin States Parallel Program (BSPP), and the Basin States Program (BSP). (Table 8)

EQIP funding is about 79% of total federal funds obligated for on-farm practices. (Figure 6)

About 41% of 66,450 irrigated acres are not yet planned. (Figure 7) Planned area includes approximately 5,000 acres funded by USBR in the Wellington area.

Table 8. Project funding by program in 2014 dollars

FY2014	Planned				Applied				
Program	Contracts	FA	Irrigation Practices	Salt Load Reduction	FA	Irrigation Practices	FA	Salt Load Reduction	Salt Load Reduction
	Number	2014$	Acres	Tons/year	2014$	Acres	$/Acre	Tons/year	Tons/acre
EQIP	835	$43,511,346	27,332	79,566	$31,924,509	25,401	$1,257	73,989	2.91
BSPP	143	$11,422,452	6,392	20,114	$10,042,969	6,161	$1,630	20,107	3.26
BSP	5	$393,153	679	1,939	$239,031	650	$368	1,877	2.89
Totals	983	$55,326,951	34,403	101,619	$42,206,508	32,212	$3,255	95,973	2.98

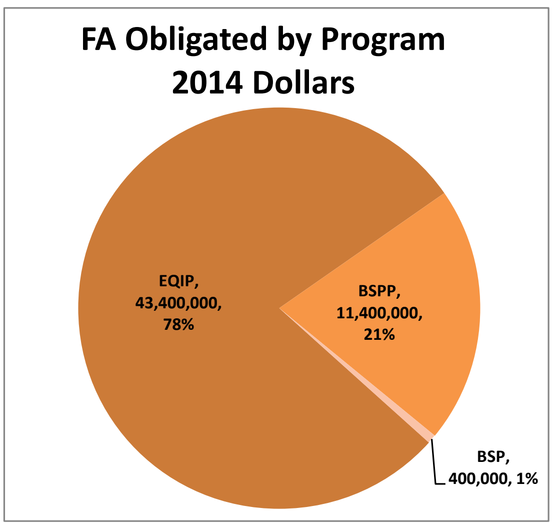


Figure 6. Cumulative FA obligated by program

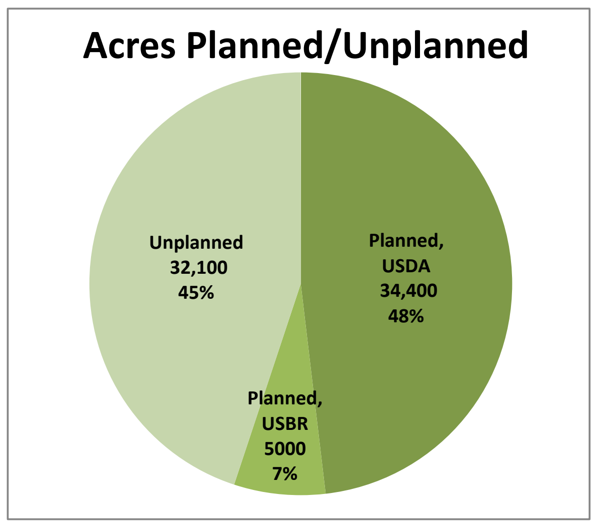


Figure 7. Planned and unplanned acres

Hydro Salinity Monitoring

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 the salt concentration 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 downstream, 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. NRCS estimates that upgrading an average uncontrolled flood irrigation system to a well-designed and operated sprinkler system will reduce deep percolation and salt loading 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

The 1991, "*…Framework Plan for Monitoring and Evaluating (M&E) the Colorado River Salinity Control Program*" as utilized in the Uintah Basin and adopted by the EIS for the Price – San Rafael Rivers Unit, focused on:

- Intensive instrumentation and analysis on several irrigated farms, requiring expensive equipment and frequent field visits to ensure and validate collected data
- Detailed water budgets to determine/verify deep percolation reductions
- Multi-level soil moisture measured weekly, with a neutron probe
- Detailed sprinkler evaluations, using catch cans, ran annually on selected farms
- Crop yields physically measured and analyzed

As a result of labor intensive testing in the Uinta Basin, Utah and Grand Valley, Colorado 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.

Due to budget restraints, field intensive M&E efforts were never fully implemented in PSR. A new "*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

Irrigation Improvements Applied

In PSR, virtually all salinity program irrigation improvements are sprinkler systems. About 66% of applied sprinklers are wheel-lines, 33% center pivots, and 1% pods, on an acreage basis.

(Figure 8) The average field size is 12 acres for wheel-lines, 67 acres for pivots, and 9 acres for pods. (Figure 9)

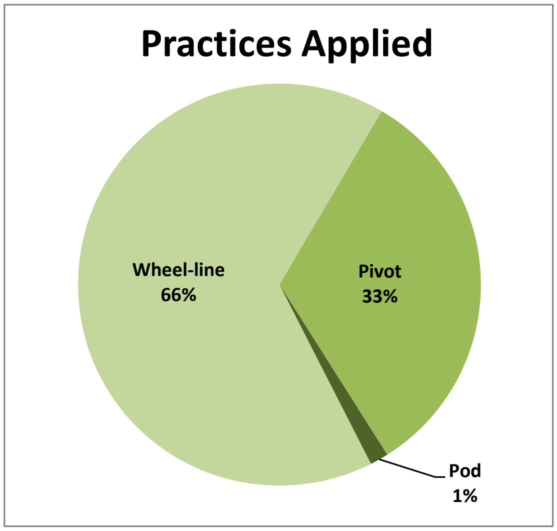


Figure 8. Sprinkler practice ratio.

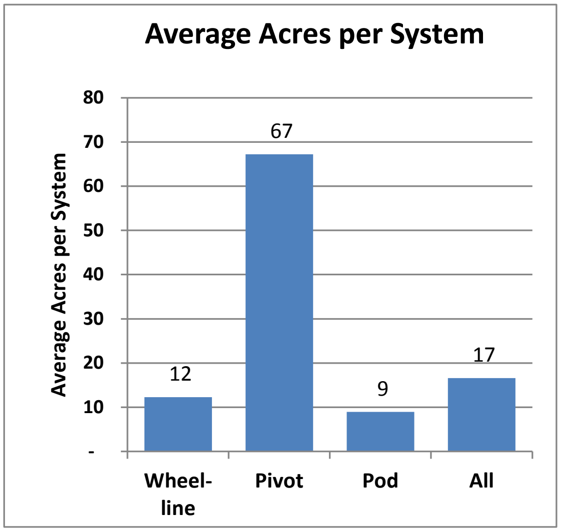


Figure 9. Average system size.

Cooperator questionnaires, interviews, and training sessions

In FY2002 and FY2003, 164 cooperators, selected randomly, were surveyed. No additional surveys have been completed since FY2004.

Irrigation Water Management (IWM)

The goal of IWM is to assure that irrigated fields receive 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 potential crop in the warmest months 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. In the spring, filling the soil with water often requires additional irrigation, over and above crop needs.

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.

Cooperator interest is enhanced by creating financial incentives for IWM. In FY2014, three practice options were available for IWM,

1. Basic IWM, which requires the cooperator to
    a. Attend a two hour IWM training session, an approved water conference, or receive one-on-one training on their farm
    b. Keep detailed irrigation records using the IWM Self-Certification Spreadsheet or another irrigation water accounting system (check book method)
    c. Review the records with an NRCS employee or contractor trained to evaluate and explain IWM principals
2. Intermediate IWM, which requires everything in Basic IWM plus installation and use of simple electronic soil moisture monitoring equipment.
3. Advanced IWM, which requires everything in Basic and Intermediate IWM plus real-time estimating evapotranspiration, monitoring soil moisture, or monitoring crop temperature stress using telemetered data. Irrigation water volumes are recorded from a flow meter near the field.

Most operators are keenly interested in learning to understand IWM principals and operate their irrigation systems professionally, and profitably.

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

In addition, 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.

Irrigation Record Keeping

NRCS has developed and provides the, “IWM Self Certification Spreadsheet” which enables cooperators to graphically evaluate available water content (AWC) in the soil and compare actual irrigation with projected average crop water requirements and/or with modeled crop evapotranspiration. Evapotranspiration is calculated from weather data collected by NRCS and other public agencies, using the Penman-Montieth method developed by the Food and Agriculture Organization of the United Nations (FAO).

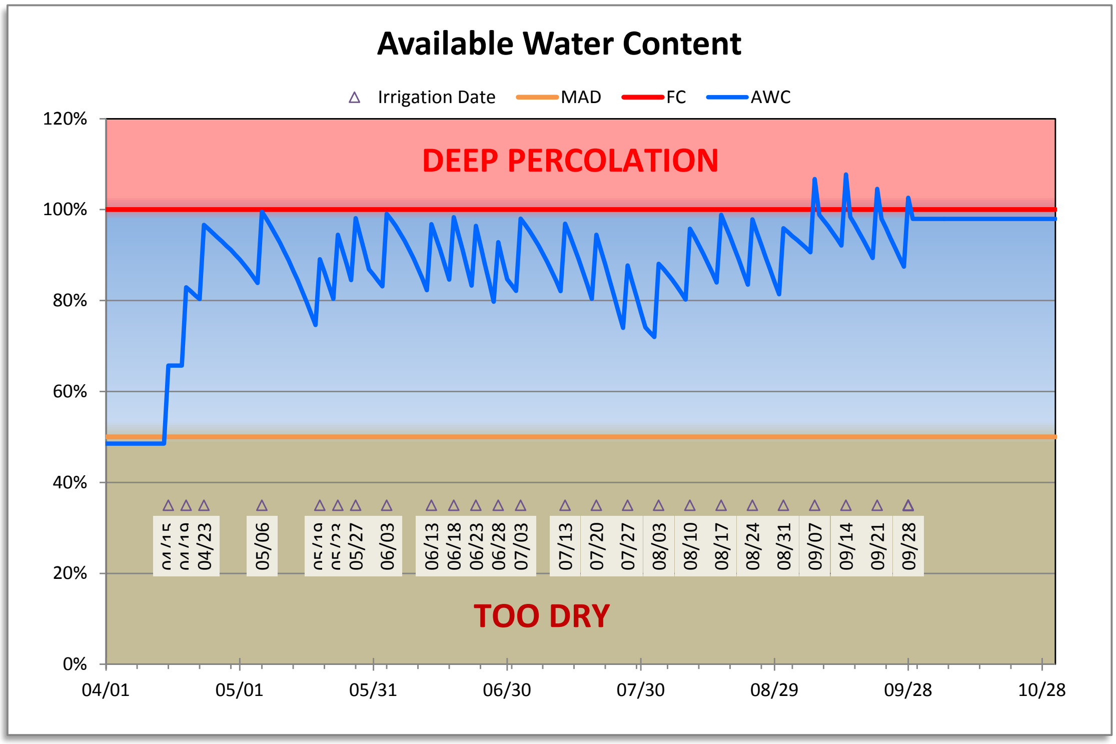
System design, crop information, and soil information is entered on the input form, along with the starting date of each irrigation cycle. The spreadsheet then calculates AWC and deep percolation. (Figure 10). Two graphs are generated, depicting AWC in the soil and comparing water applied with water required on a seasonal basis. (Figure 11)

Irrigation Water Use Record - Farmer Self Certification

Cooperator: Emery County Rancher
Crop: Alfalfa
Year: 2014
Tract/Field: T999F3
Root Depth, ft: 5.00
Date: 10/15/2014
Station: Castledale
CU: 32.28 inches
Contract Eligible Acres: 125.00
Soil Texture: Clay Loam
Irrigation method: Pivot
AWC, In/Ft: 1.80
Efficiency: 75%
AWC Max, in: 9.00
Evaluated Acres: 20.73
MAD, in: 4.50
Evaporation %: 10%
Pre-season AWC, In. 4.50
Cycle Hours: 96
Flow rate, gpm: 168

Start date of irrigation cycle	End date of irrigation cycle	Total Cycle Hours	Alternate Cycle Hours	Flow, gpm	Gross Inches Cycle	Net Inches Season	CU Season	AWC Deficit	AWC	Deep Perc
04/15/14	04/19/14	96		168.0	1.72	1.55	0.00	3.08	5.92	0.00
04/19/14	04/23/14	96		168.0	1.72	3.09	0.00	1.54	7.46	0.00
04/23/14	04/27/14	96		168.0	1.72	4.64	0.31	0.30	8.70	0.00
05/06/14	05/10/14	96		168.0	1.72	6.19	1.60	0.04	8.96	0.00
05/19/14	05/23/14	96		168.0	1.72	7.74	4.08	0.98	8.02	0.00
05/23/14	05/27/14	96		168.0	1.72	9.28	5.15	0.50	8.50	0.00
05/27/14	05/31/14	96		168.0	1.72	10.83	6.37	0.17	8.83	0.00
06/03/14	06/07/14	96		168.0	1.72	12.38	7.83	0.08	8.92	0.00
06/13/14	06/17/14	96		168.0	1.72	13.92	9.58	0.29	8.71	0.00
06/18/14	06/22/14	96		168.0	1.72	15.47	10.99	0.15	8.85	0.00
06/23/14	06/27/14	96		168.0	1.72	17.02	12.71	0.32	8.68	0.00
06/28/14	07/02/14	96		168.0	1.72	18.56	14.58	0.64	8.36	0.00
07/03/14	07/07/14	96		168.0	1.72	20.11	15.66	0.18	8.82	0.00
07/13/14	07/17/14	96		168.0	1.72	21.66	17.31	0.28	8.72	0.00
07/20/14	07/24/14	96		168.0	1.72	23.21	19.07	0.50	8.50	0.00
07/27/14	07/31/14	96		168.0	1.72	24.75	21.23	1.11	7.89	0.00
08/03/14	08/07/14	96		168.0	1.72	26.30	22.74	1.07	7.93	0.00
08/10/14	08/14/14	96		168.0	1.72	27.85	23.60	0.38	8.62	0.00
08/17/14	08/21/14	96		168.0	1.72	29.39	24.86	0.10	8.90	0.00
08/24/14	08/28/14	96		168.0	1.72	30.94	26.50	0.19	8.81	0.00
08/31/14	09/04/14	96		168.0	1.72	32.49	28.23	0.37	8.63	0.00
09/07/14	09/11/14	96		168.0	1.72	34.04	28.80	0.00	9.00	0.61
09/14/14	09/18/14	96		168.0	1.72	35.58	29.65	0.00	9.00	0.69
09/21/14	09/25/14	96		168.0	1.72	37.13	30.79	0.00	9.00	0.41
09/28/14	10/02/14	96		168.0	1.72	38.68	32.10	0.00	9.00	0.24
Totals	**25**	**2,400**	**0**	**168.0**	**42.97**	**38.68**	**32.10**		**8.51**	**1.95**
Acre Feet					**74.25**	**66.82**	**55.46**		**15.55**	**3.36**
Deep Percolation					**Needed:**	**1.44**	**Designed:**	**6.45**	**Actual:**	**1.95**
Seasonal Application Efficiency (CU / water applied):							**Designed:**	**75%**	**Actual:**	**83%**

Figure 10. Sample IWM Self Certification Spreadsheet – Data Entry Page



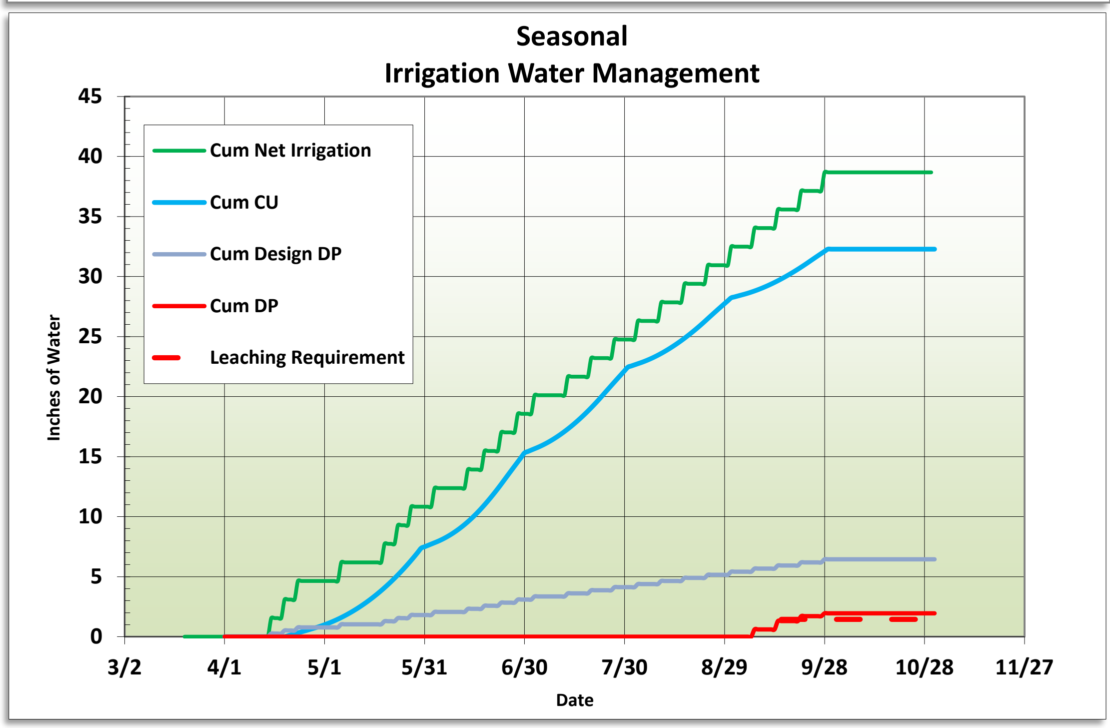


Figure 11. Sample graphs from the IWM Self Certification Spreadsheet

In the first plot, the goal is to keep the blue AWC line between 50% and 100% of root-zone moisture capacity. Spikes above the 100% line indicate deep percolation. In the second plot, the blue line is a long-term average water requirement, based on location and crop. The green line is actual water applied. The grey line indicated design deep percolation. The solid red line is calculated deep percolation. The dashed red line is the calculated minimum leaching fraction required to avoid salt buildup in the soil.

In order to receive incentive payment for IWM, each irrigator must keep irrigation records and present the data to the field office, where data is entered into the spreadsheet and the results are discussed. Graphs are plotted for the farmer's reference. In general, cooperators respond positively to this training and strive to irrigate more efficiently.

This spreadsheet is used by participants to self-certify a participant's irrigation records when presented to and discussed with NRCS employees or contractors.

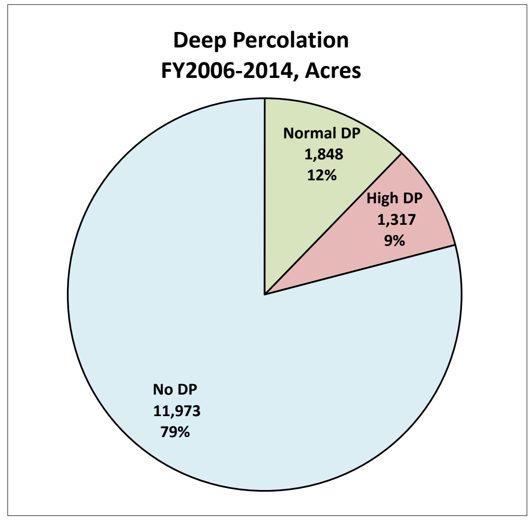


Figure 12. Deep percolation from 815 IWM reports

From 815 completed IWM certification records, over 7 years, it appears that 91% of acres in PSR do not deep percolate excessively. (Figure 12) Actual deep percolation volume is estimated to be about 25% of what is considered normal.

New sprinkler owners in PSR are much more likely to under-irrigate than to over-irrigate. Typically, the price for under-irrigation is reduced yield, not dead crops. Without careful record keeping, the farmer may not recognize this error.

Due to the prevalence of under-irrigation, it can be assumed that, based on irrigation record keeping, on-farm salt load reduction estimation is conservative.

Washington State University (WSU) AgWeatherNet

WSU provides a web-based irrigation timing application that can be used with a connected computer or smart phone. Real-time ET data is accessed from the USBR AgriMet network and the Utah Climate Center (UCC) network. More stations are being added to the system all the time. This system can be accessed at http://weather.wsu.edu/awn.php. Registration is required but there is no charge for the service.

Soil Moisture Monitoring

A time-tested method for timing irrigation involves augering a hole and determining the water content of soil in the root zone 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 operators 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 $700, giving the cooperator information on the water content of his soil at multiple depths and locations without time-consuming augering.

In a typical case, electronic 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 13)

Since gravimetric drainage generally does not occur unless the soil profile is nearly saturated (above field capacity), it is assumed that deep percolation is not occurring if the deepest probe reading is below -10 centibars. In PSR, six installed data recorders indicate that deep percolation occurs less than 3% of the time on monitored fields.

PSR also has several fields with probes but no data recorder. When they were installed, the Soil Conservation District intended to read all of the probes manually, on a weekly basis, and plot the results. Unfortunately, personnel turnover has thwarted this effort. Installing data recorders at each of these fields would be much less expensive and more reliable than manual reading.

AWC is easily graphed from downloaded soil moisture data. (Figure 14)

Figure 13. Soil moisture data recorder with graphing

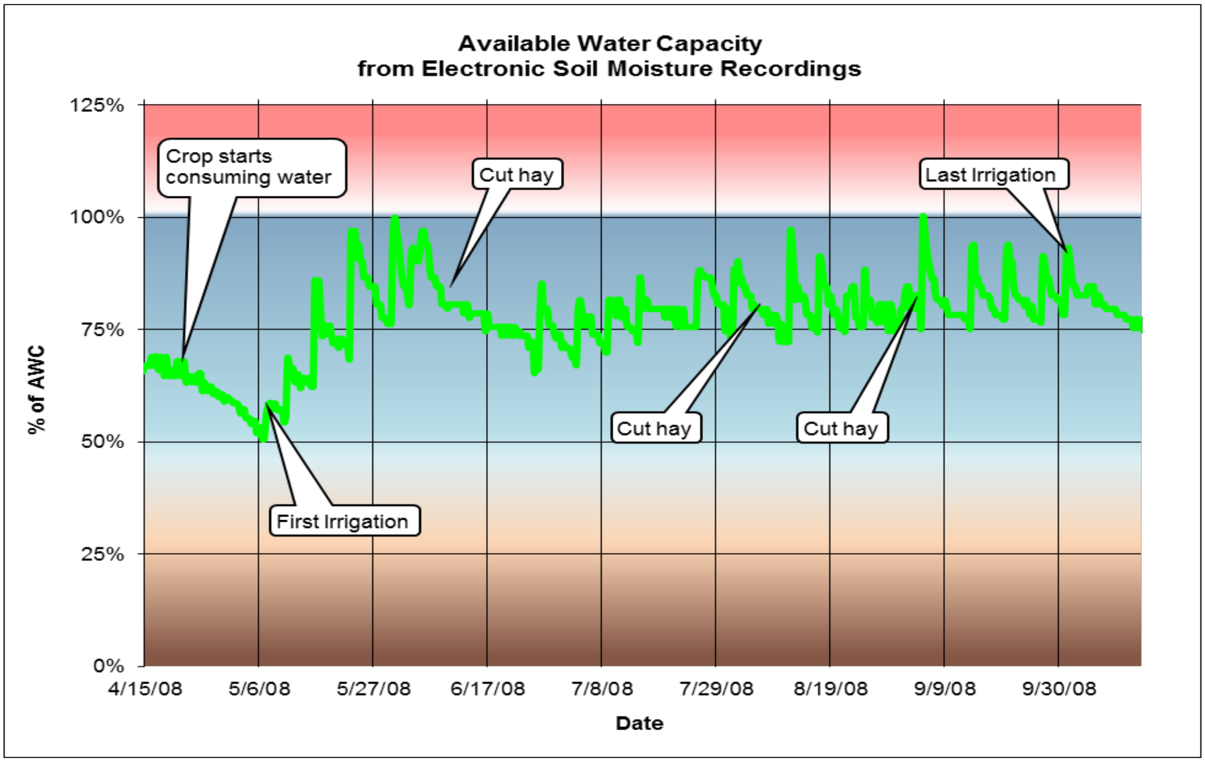


Figure 14. AWC estimated from downloaded soil moisture data

Equipment Spot Checks and Evaluations

Catch-can Testing

The M&E Team has not conducted any catch-can tests in PSR. As reported in the FY2005 M&E Report, the most useful aspects of catch-can testing on wheel lines were observations made before the test was ran. With sprinkler systems running, an assessment of leaks and malfunctioning heads can be made very quickly, often without leaving the vehicle.

Operating Sprinkler Condition Inventory

After a three-year hiatus, field inventory of sprinklers resumed in FY2012. In contrast to inventories in FY2006 and FY2008, all sprinklers are inventoried as opposed to just systems in operation. Mapping all irrigation systems will aid in updating the treated acres layer and provide another indication of how systems are being operated.

Sprinklers were mapped and logged using a laptop computer running ArcGIS, connected to a simple field mapping GPS receiver (Garmin GPSMap 76). Using the 2011 National Agricultural Imaging Program (NAIP) 1 meter true color image as a base map, each observed system was sketched into a poly-line shapefile and attributes recorded. The following rules were used for attributes:

- Age was estimated visually and rated: 1 = 0-3 years, 2 = 4-10 years, 3 = >10 years.
- Condition was rated visually: 1 = no repairs needed, 2 = repairs needed, 3 = not useable without major repairs and 9 = apparently okay but not operating.
- Leaks from hoses, drains, heads, and other sources were evaluated visually and the total gallons per minute (GPM) leakage estimated for the system.
- Sprinkler length was calculated from the shapefile.
- Acres were estimated assuming a 660' long field (approximately 11 sets/irrigation cycle). Net irrigation requirement was assumed to be 8 GPM/acre. The leak % represents the GPM from leaks ÷ GPM for the system and all leakage is assumed to deep percolate (a conservative assumption).

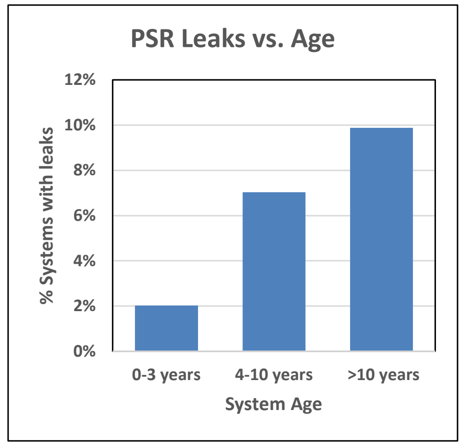


Figure 15. Condition vs. Age.

Only wheel lines in operation were evaluated for potential deep percolation.

As expected, leaks increase with age. (Figure 15)

Average leakage amounts to about 0.35% of water applied, much smaller than evaporation, and minor in the overall scheme of things. Most leaks could be avoided with consistent maintenance.

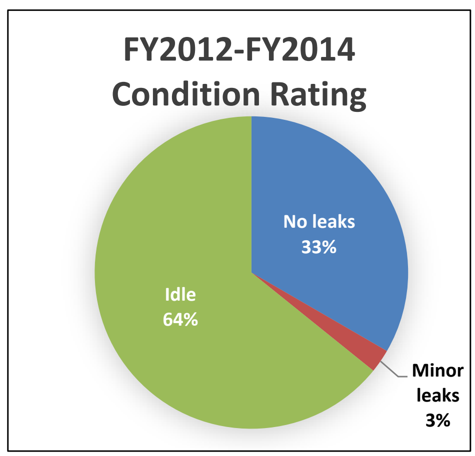


Figure 16. FY2012-2014 Irrigation system condition.

Over four years of observations, 852 systems were visually evaluated for age, leaks, and general condition. Operating wheel lines, pod-lines, or hand-lines accounted for 767 systems.

No inventory was made in FY2013. In FY2012 and FY2014, all inventoried irrigation systems included operating and non-operating sprinklers. All inventories were completed in July. Of 548 systems evaluated, 205, or 37% were operating. Operated as designed, one would expect that well over 70% would be operating in July. The implication is that a large number of participants are likely under-irrigating, reducing deep percolation well below estimated levels. (Figure 16)

Wildlife Habitat and Wetlands

Background

The Final Environmental Impact Statement (EIS) for the Price/San Rafael Rivers Unit was completed in December 1993. The EIS discusses, at length, anticipated impacts that application of the preferred plan will have on the landscape. The EIS states "The replacement of wetland/wildlife habitat with like habitat is a goal of USDA in all of its programs; however, the primary goal of the CRBSCP - to reduce salinity in the Colorado River - is not compatible with the preservation and/or replacement of wetlands supported by over irrigation." This persistent quandary caused much discussion of the necessity of wetland replacement. In the beginning, Soil Conservation Service (SCS) met with Utah Division of Wildlife Resources (UDWR), U.S. Bureau of Reclamation (USBR), U.S. Environmental Protection Agency (EPA), and U.S. Fish and Wildlife Service (USFWS), to discuss alternatives to wetland vegetation replacement. The EIS also states "…physical limitations severely restrict of placement of wetlands in close proximity to irrigated areas". Lined ponds with no outlets, ponds in sandstone members of the Mancos Shale Formation, and many other alternatives were discussed in the EIS.

Guidelines in the 1991 "The Framework Plan for Monitoring and Evaluating (M&E) the Colorado River Salinity Control Program" were adopted and placed in the EIS for the Price San/San Rafael Rivers Salinity Unit. In accordance with this framework plan, wildlife habitat monitoring would be performed along 18 selected transects throughout the area. Color aerial photography would be taken every three years to monitor changes in the extents of wetlands because of project implementation of the CRSC Program. These photographs would be scanned and wetlands digitized and compared to prior year baseline maps. Changes over time would create inferences for the basin as a whole. To supplement aerial photographs, Wildlife Habitat Evaluations from individual plans or contracts would be analyzed to determine accumulated changes in wildlife habitat, both upland and wetland.

Due to a decrease in funding for technical assistance, wildlife habitat monitoring efforts were reduced in 1997 and discontinued in 1999. Two employees, a biologist and a civil engineer, were hired in September 2002 as the Monitoring and Evaluation (M&E) team.

In 2001 "The Framework Plan for Monitoring and Evaluating (M&E) the Colorado River Salinity Control Program" was revised and M&E evolved from a labor/cost intensive, detailed evaluation of a few biological sites, to a broader, less detailed evaluation of large areas and many resource concerns. This change was primarily driven by budget constraints and improved technology. Methodology adopted in 2002 was to utilize remotely sensed images (Landsat), analyze them with commercial geospatial imagery software, classify, map, and measure vegetation extents, quantify losses or gains of wetlands and wildlife habitat. It was also anticipated that with the use of Landsat images NRCS could extrapolate results from current images back in time to images acquired prior to implementation of the Colorado River Salinity Control Program. Thus, NRCS could compare wetland/wildlife habitat extents from pre-Colorado River Basin Salinity Control Program to the current date.

In FY2005, it was determined by the M&E Team that use of Landsat images alone was not sufficient to accurately monitor and track small narrow wetland extents within Salinity Units. Classification of 30-meter Landsat images is an excellent tool for quantifying and assessing land cover classes on large-scale projects where there are large tracts of similar vegetation. The M&E team found it difficult to accurately interpret subtle differences in vegetation types at smaller scales such as presented by small, narrow wetlands found in arid Salinity Units. Landsat images help locate areas of potential wetland and wildlife habitat areas; once located, detailed mapping of actual extents of features is required to accurately identify and define real losses or gains of wetland/wildlife habitat. This can be accomplished with the help of current year, high resolution, aerial photograph interpretation, and on-site visits. A photographic history would also be useful in documenting changes in vegetation type. Remote sensing alone will not achieve desired results sought by NRCS to report concurrency and proportionality of wildlife habitat replacement.

The M&E team changed its methodology to include more precise measurements of actual habitat extents by incorporating detailed mapping, establishment of permanent photo points, and smaller-scale case studies. This approach is more labor intensive. The M&E Team believes that additional staff is needed to assist in gathering data needed to create accurate land cover maps to achieve the most accurate and reliable result possible.

At the end of FY2014, no additional workforce had been acquired to assist the M&E team in data gathering. Photo points will be established and displayed when relevant information can be extrapolated from photos. Case studies are ongoing and will be reported in future versions of this document.

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% 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)

Through FY2014, the Price-San Rafael Rivers Salinity unit has applied irrigation improvements on 32,200 acres. Over the same time, habitat improvements have been applied on 3,339 acres or 10.4% of irrigation improvements. At the end of FY2014, habitat mitigation is *concurrent and proportional* with salinity irrigation improvements according to the above agreement with USFWS (see Appendix). Efforts to plan and apply additional acres of habitat replacement will not relax by virtue of this change in assessment method. NRCS will continue to plan and apply real habitat improvements to offset the losses incurred by the Colorado River Salinity Control Program.

Permanent photo points, at representative locations throughout the area, of wetlands, wildlife habitat, agricultural areas, and areas along pipelines, will be selected and a protocol established to compare across the years.

Wildlife Habitat Contract Monitoring

In the PSR Salinity Unit there were no wildlife habitat replacement projects planned and funded in FY2014. There were 241 acres wildlife habitat replacement applied from prior year contracts (mostly WHIP dollars on the Hatt Ranch Project) (Table 9).

Cumulative acres of practices planned and applied are shown in Table 10.

Planned practices are assumed to be applied in proportion to funds expended.

Tables 11 and 12 provide more detail about money spent on the ground for wildlife habitat replacement using EQIP, BSPP, and WHIP funding.

Table 9. Wildlife Practices Planned and Applied in FY2014

Acres of Wildlife Habitat Creation or Enhancement by				
FY2014 Annual practices				
Program	Acres Planned		Acres Applied	
	Wetland*	Upland	Wetland*	Upland
BSPP	-	-	-	-
BSP	-	-	-	-
EQIP	-	-	-	6
WHIP	-	-	158	77
Total	**-**	**-**	**158**	**83**

*Wetland acres include riparian habitat

Table 10. Cumulative Wildlife Practices Applied in FY2014

Acres of Wildlife Habitat Creation or Enhancement by				
FY2014 Cumulative practices				
Program	Acres Planned		Acres Applied	
	Wetland*	Upland	Wetland*	Upland
BSPP	-	425	-	7
BSP	-	-	-	-
EQIP	613	571	607	283
WHIP	1,685	987	1,532	910
Total	**2,298**	**1,983**	**2,139**	**1,200**

*Wetland acres include riparian habitat

When is a contract completed? As stated above in the Hydro-salinity portion of this document, the cooperator may receive several partial payments in the course of construction. They may complete construction, commence operation, be reimbursed for 99% of FA and still have two years of Upland Wildlife Habitat Management left in the contract before it is officially completed. For this document, all practices in contracts are assumed to be applied in proportion to dollars paid out, on a contract-by-contract basis.

Voluntary Habitat Replacement

NRCS continues to encourage replacement of wildlife habitat on a voluntary basis. Federal and State funding programs are in place to promote wildlife habitat replacement. This information is advertised annually in local newspapers, in Local Workgroup meetings, Conservation District meetings, and on the radio throughout the Salinity Area. The Utah NRCS Homepage (http://www.ut.nrcs.usda.gov/) also has information and deadlines relating to Farm Bill Programs.

Table 11. EQIP, BSPP, and WHIP Habitat Planned

FY	Contracts	Obligation	Wetland Planned	Upland Planned	PPI Factor	Normalized Obligation
	Number	$	Acres	Acres		2014$
1998	2	$7,644	0	15	195%	$14,886
1999	1	$1,139	0	2	198%	$2,258
2000	1	$502	0	1	188%	$944
2001	1	$2,862	0	13	185%	$5,295
2002	1	$962	0	1	182%	$1,751
2003	5	$89,298	0	310	176%	$157,335
2004	9	$0	0	82	168%	$0
2005	1	$0	0	1	159%	$0
2006	5	$122,700	607	36	150%	$184,050
2007	3	$24,927	0	112	141%	$35,024
2008	5	$1,278,201	1,691	1,087	123%	$1,576,448
2009	0	$0	0	0	128%	$0
2010	3	$36,710	0	100	123%	$45,276
2011	5	$125,051	0	220	111%	$138,807
2012	2	$32,659	0	4	107%	$34,857
2013	0	$0	0	0	105%	$0
2014	0	$0	0	0	100%	$0
Totals	44	$1,722,655	2,298	1,983		$2,196,929

Table 12. EQIP, BSPP, and WHIP Habitat Applied

FY	Payments	Wetland Applied	Upland Applied	PPI Factor	Normalized Payments
	$	Acres	Acres		2014$
1998	$0	0	0	195%	$0
1999	$0	0	0	198%	$0
2000	$1,111	0	2	188%	$2,090
2001	$23	0	0	185%	$42
2002	$1,768	0	2	182%	$3,218
2003	$0	0	0	176%	$0
2004	$835	0	1	168%	$1,405
2005	$8	0	0	159%	$12
2006	$0	0	0	150%	$0
2007	$113,212	293	100	141%	$159,070
2008	$6,557	0	46	123%	$8,087
2009	$141,160	360	71	128%	$180,101
2010	$850,227	197	162	123%	$1,048,613
2011	$208,508	203	161	111%	$231,444
2012	$251,351	231	232	107%	$268,269
2013	$377,648	697	341	105%	$395,462
2014	$104,219	158	83	100%	$104,219
Totals	$2,056,627	2,139	1,200		$2,402,031

Economics

Cooperator Economics

Production Information

While alfalfa yields have not improved markedly since inception of salinity control measures, total production of alfalfa is trending up. (Figure 17) This uptrend is most likely the result of converting pastures to alfalfa production with more certain water availability.

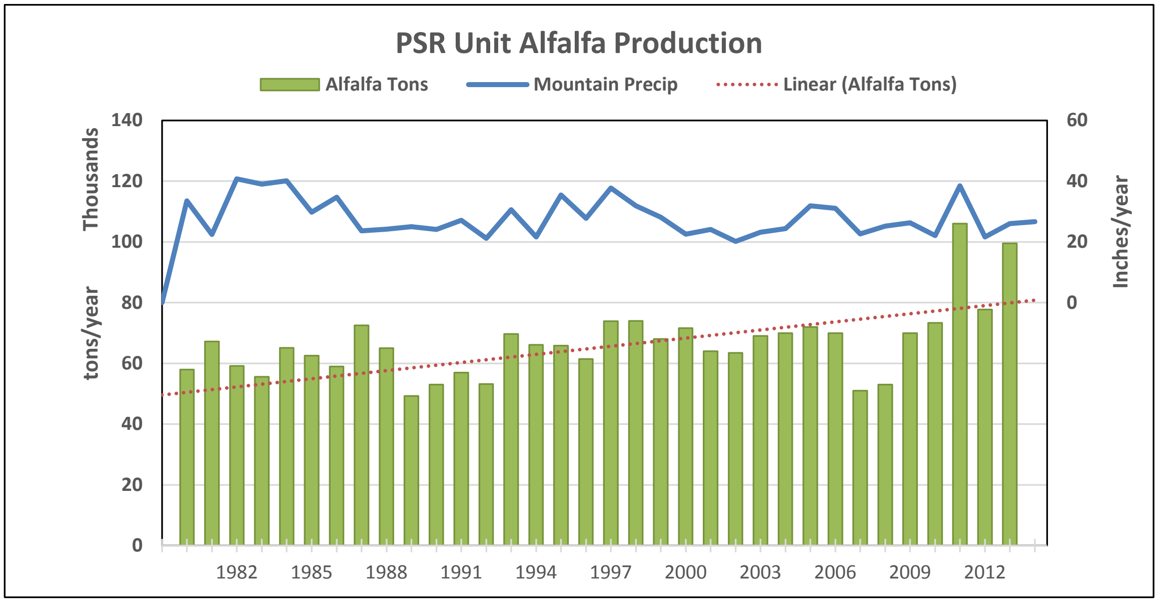


Figure 17. PSR alfalfa production and mountain rainfall

Labor Information

Total Farm Production Expenses have increased steadily over the 1997, 2002, 2007, and 2012 Agricultural Censuses. *Hired Farm Labor* has decreased over the past three censuses.

Increasing production and decreasing labor costs (figure 18) signal positive operational benefits associated with irrigation improvements.

According to the 2012 Census of Agriculture, 56% of farmers have full-time occupations other than farming. Five percent of farm owners hire outside laborers.

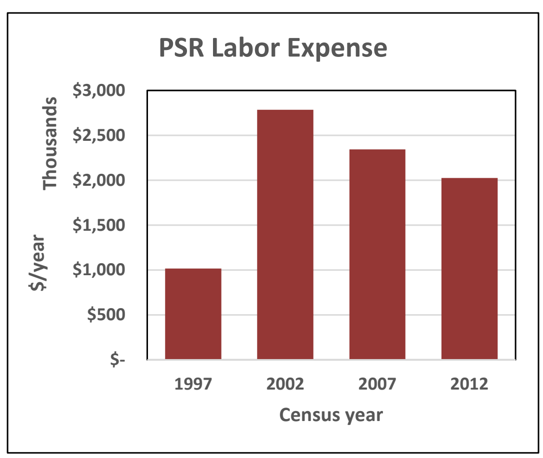


Figure 18. PSR Labor Expense

Agricultural producers are enjoying a surge in the price of cattle and forage, which were selling at all-time high prices in FY2014.

The local labor market in PSR is steady. The October 2014 unemployment rate for PSR was 4.8%, between the national rate of 5.8% and the state rate of 3.6%.

Public Economics

Ninety-five percent of survey respondents believe that salinity control programs have a positive economic effect on the area and region.

Positive public perceptions of the Salinity Control Program include:

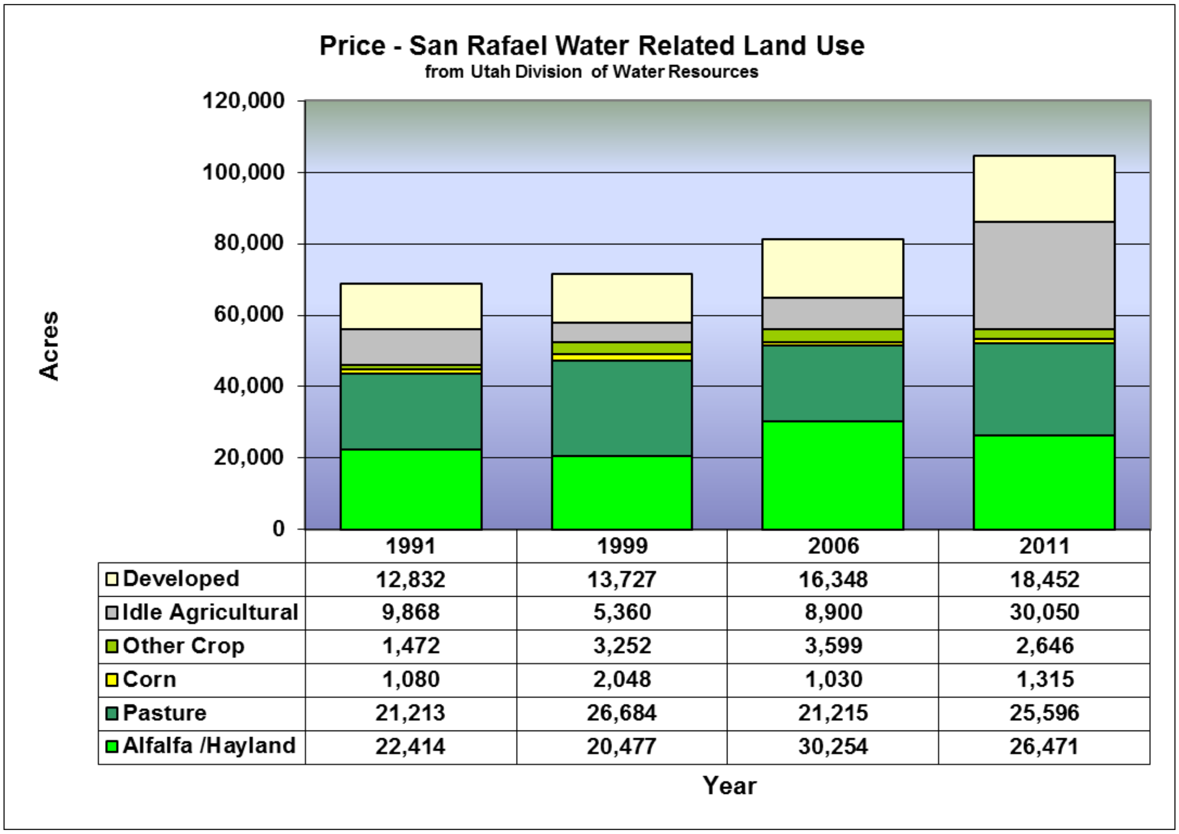
- Reduced salinity in the Colorado River
- Increased flows in streams and rivers
- Economic lift to the entire community from employment and broadened tax base
- Local availability of expertise, information, and materials for public conservation
- Aesthetically pleasing, green fields, denser, for longer 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:

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

Water Related Land Use (WRLU)

The State of Utah Division of Water Resources tracks land use on a regular basis. (Figure 19) The goal of the WRLU report is to account for all agricultural lands in the State along with immediately adjacent water related land uses.



	1991	1999	2006	2011
Developed	12,832	13,727	16,348	18,452
Idle Agricultural	9,868	5,360	8,900	30,050
Other Crop	1,472	3,252	3,599	2,646
Corn	1,080	2,048	1,030	1,315
Pasture	21,213	26,684	21,215	25,596
Alfalfa /Hayland	22,414	20,477	30,254	26,471

Figure 19. Water Related Land Use

Summary

Local landowners are willing and able to participate in the Salinity Control Program. At present commodity prices, return on investment is acceptable.

Past participants are apparently satisfied with results and generally positive about the Salinity Control Program.

The Colorado River Basin Salinity Control Program is successful and cost-effective in reducing salt load in the Colorado River.

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 or total inches in the root zone.

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 reach, 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 volume delivered.

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

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

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

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

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 areas of the field under a 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

CRSCP – Colorado River Salinity Control Program, a USDA funding program from FY1984 to FY1995.

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 inches.

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

Distribution Uniformity (DU) – A measure of how evenly irrigation water is applied to a 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 Incentives 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 centibars, depending on soil texture.

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, adjustable, evenly spaced gates to spread water evenly across the top of a field. A primary form of Improved Irrigation.

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

Hand line – A periodic-move 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.

HDPE – High Density Polyethylene plastic pipe. Very durable and resilient, used for sprinkler systems, both buried and on the surface.

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.

LCRB – Lower Colorado River Basin.

Leakage – Water loss from ditches and canals through fissures, cracks or other channels through the soil, 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 private agricultural producers and landowners.

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

Periodic Move – A sprinkler system designed to irrigate in one position for a set amount of time, then is 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 centibars at the PWP.

Pivot or Center Pivot – A continuous-move 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.

Producer Price Index for farm equipment purchased (PPI) –An economic index compiled by NASS and used to normalize costs in this report. It is available at http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/econ/prices/

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 unmeasurable 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.

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 (SCS) – 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 Department of Agriculture and Food (UDAF) – In Utah, UDAF manages cost share received from the Lower Colorado Basin States to help fund irrigation improvements.

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

USFWL – U.S. Fish and Wildlife Service, responsible to monitor and consult on habitat replacements necessitated by irrigation improvements.

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, Wheelline, Side-roll– A periodic-move sprinkler system designed to be moved 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. The Agricultural Act of 2014 (2014 Farm Bill) eliminated WHIP and made its functionality an integral part of EQIP.

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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