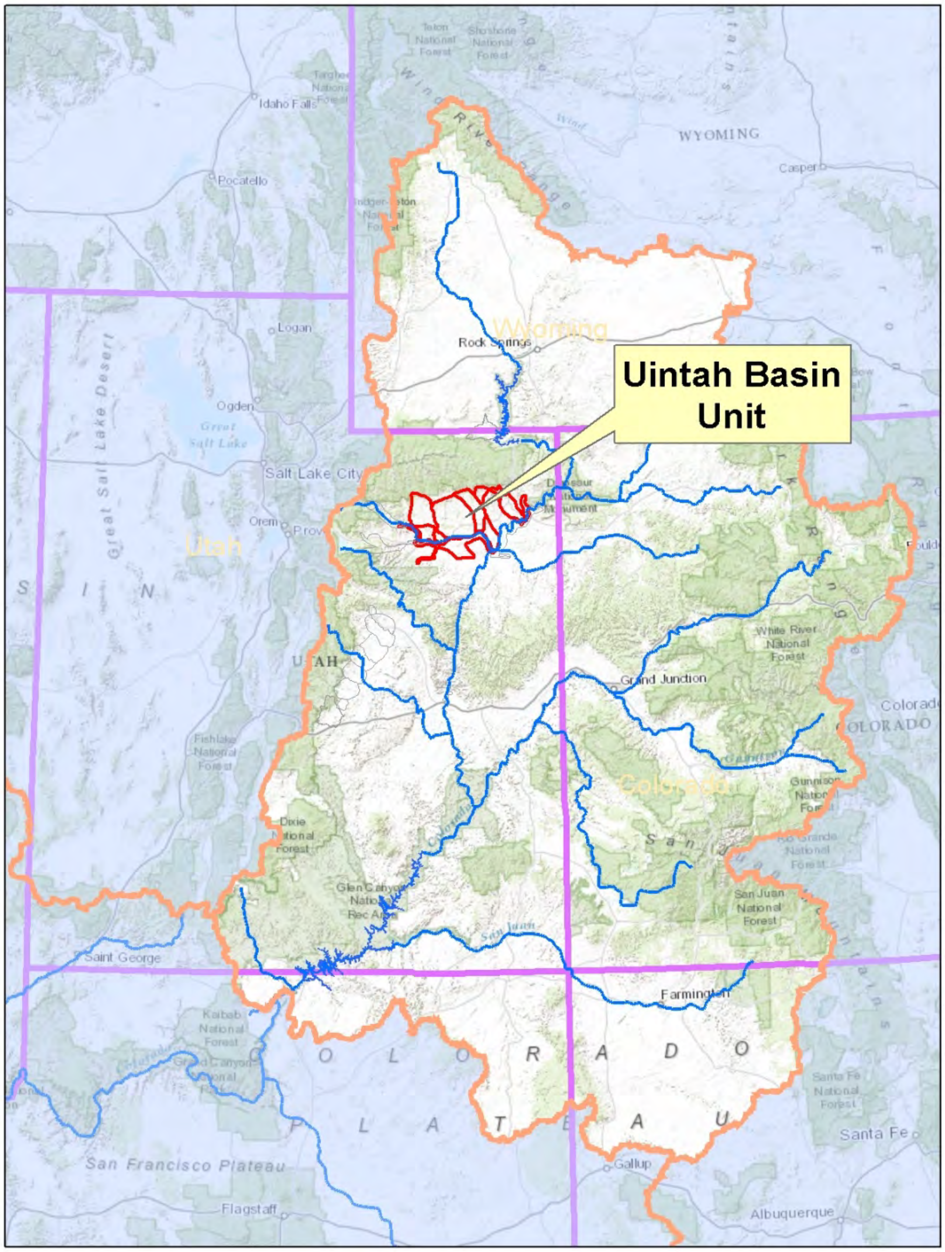
Colorado River Basin Salinity Control Program

Uintah Basin Unit

Monitoring and Evaluation Report, FY2012



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Executive Summary

Project Status

- **TREATED ACRES:** Of 200,000 irrigated acres, perhaps 160,000 acres or more, may ultimately be improved. Since 1980, treatments on approximately 158,800 acres have been planned and 154,300 acres applied. In FY2012, 1,437 acres were planned and 1,766 acres applied.
- **ON-FARM SALT LOAD REDUCTION:** Of approximately 208,000 original on-farm tons/year of salt load, 126,500 tons/year salt load reduction has been planned and 124,900 tons/year has been applied, calculated using procedures revised in 2007. In FY2012, 1,296 tons were planned and 2,287 tons applied on-farm.
- **OFF-FARM SALT LOAD REDUCTION:** Of approximately 120,000 original off-farm tons/year, USDA programs have planned 27,900 tons/year and applied about 27,400 tons/year of salt load reductions. In FY2012, 358 off-farm tons were planned and 1,583 off-farm tons were applied.
- **PLANNED OBLIGATIONS:** For FY2012, NRCS obligated $2.59 million in financial assistance (FA). Cumulative obligations total $96.3 million FA nominal ($179.4 million 2012 dollars).
- **APPLIED EXPENDITURES:** For FY2012, NRCS expended $5.65 million, FA. Cumulative expenditures total $88.8 million FA nominal ($162.7 million 2012 dollars).
- **COST/TON:** Planned salt load reduction cost for FY2012 contracts is $167/ton, FA+TA. The cumulative cost is $167/ton, FA+TA (2012 dollars) for planned practices. For practices applied in FY2012 the cost is $156/ton FA+TA, with a cumulative cost of $154/ton FA+TA (2012 dollars), for applied practices.
- **NEPA PROJECTED COST/TON:** In 2012 dollars, pre-project NEPA documents anticipated salt load reduction costs of $205/ton. Cumulative planned cost is $167/ton, and cumulative applied cost is $154/ton.
- **DEEP PERCOLATION** due to system leaks, inadequate irrigation water management (IWM), and poor system maintenance is relatively minor. New sprinkler operators are more likely to under-irrigate than to over-irrigate.
- **CONSISTENT TRAINING** and emphasis on IWM, results in a better outcome for the Government and the participant.
- **INCENTIVE PAYMENTS FOR IWM** have resulted in enhanced interest in IWM and quality system maintenance.
- **THE 2008 FARM BILL**, with a continuing resolution, funds EQIP through FY2013.

Wildlife Habitat and Wetlands

- **CONVERSION OF WETLANDS TO UPLANDS** is far less than anticipated by the EIS.
- **WILDLIFE HABITAT CREATION/ENHANCEMENTS** were planned and funded on total of 16 acres and applied on 112 acres in FY2012.
- **West Roosevelt Airport Project** Case Study is photographically displayed.

Economics

- From the 2007 Census of Agriculture**, two-thirds of Uinta Basin farmers have full-time occupations** other than farming.
- Cooperators generally believe that their increase in production and decrease in labor adequately offset their participation cost.

Table 1. Project progress summary

Uintah Basin Unit, All Programs				
CONTRACTS PLANNED	UNITS	CURRENT FY	CUMULATIVE	TARGET
1. CONTRACT STATUS				
A. Contracts Approved	Number	59	2,997	
	Dollars	$2,587,337	$96,343,578	
	Acres	1,437	158,799	160,000
On-farm	Tons/Year	1,296	126,528	140,500
Off-farm	Tons/Year	358	27,865	
B. Active Contracts	Number		205	
	Dollars		10,011,324	
	Acres		6,854	
On-farm	Tons/Year		5,407	
Off-farm	Tons/Year		725	
PRACTICES APPLIED	UNITS	CURRENT FY	CUMULATIVE	TARGET
2. EXPENDITURES				
Financial Assisstance (FA)	Dollars	$5,647,470	$88,836,124	
3. IRRIGATION SYSTEMS				
A. Sprinkler	Acres	1,438	140,123	
B. Improved Surface System	Acres	322	14,067	160,000
C. Drip System	Acres	6	87	
4. SALT LOAD REDUCTION				
A. Salt load reduction, on-farm	Tons/Year	2,287	124,946	140,500
B. Salt load reduction, off-farm	Tons/Year	1,583	27,356	
C. Tons of salt controlled prior to EQIP	Tons/Year		93,389	

NRCS Salinity Control Programs			
Program Name	Acronym	Start Year	End Year
Agricultural Conservation Program	ACP	1980	1987
Colorado River Salinity Control Program	CRSCP	1987	1996
Interim Environmental Quality Incentive Program	IEQIP	1996	1996
Environmental Quality Incentive Program	EQIP	1997	Current
Basin States Parallel Program	BSPP	1998	2012
Basin States Program	BSP	2012	Current

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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 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 driven by the 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 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 cost effective opportunity to reduce salt loading by improving irrigation efficiencies and reducing 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.

Soil Conservation Service, the predecessor to NRCS, started funding Uinta Basin salinity control projects in 1980, using Long Term Agreements (LTA) and Agricultural Conservation Program (ACP) grants.

In 1984, Public Law 98-569 amended the Colorado River Basin Salinity Control Act of 1974, establishing the Soil Conservation Service's Colorado River Salinity Control Program (CRSC) which funded USDA salinity contracts from 1984 to 1996.

The Interim Environmental Quality Incentives Program (IEQIP) was active for one year, 1996, and followed by the Environmental Quality Incentives Program (EQIP), funding salinity control projects through FY2013 (presently operating by authority of a continuing resolution).

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 means for the U.S. to comply with 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 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 and the Food, Conservation, and Energy Act of 2008 reauthorized and amended EQIP, continuing opportunities for USDA funding of salinity control measures.

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

Annual Project Results

FY2012 project results are summarized in table 2.

Table 2. FY2012 results

FY2012	Planned	Applied
Irrigation Improvements, Acres	1,437	1,438
Federal Cost Share, FA, 2012 Dollars	$2,587,000	$5,647,000
Amortized Federal Cost Share, FA+TA, 2012 Dollars	$276,000	$602,500
Salt Load Reduction, Tons/Year	1,654	3,870
Federal Cost/Ton, FA+TA, 2012 Dollars	$167	$156

Cumulative Project Results

Cumulative planned and applied results are in line with NEPA expectations and costs. (Table 3)

With respect to NEPA planning documents, salt load reduction has exceeded projections at a lower amortized cost/ton than anticipated. Cooperators continue to apply for salinity control contracts and opportunities still exist to further reduce salt loading at an average cost/ton in line with that expected at project inception.

Table 3. Project goals and cumulative status, on-farm only

Off-farm activities are excluded from this table. Dollar amounts are expressed in 2012 dollars.

Cumulative Improvements	Units	EIS[1]	Projected[2]	Planned	Applied
Irrigation Improvements	Acres	137,000	160,000	158,800	154,300
Federal Cost Share, FA+TA[3]	2012$	$222,098,000	$292,098,000	$299,000,000	$271,200,000
Amortized Fed Cost, FA+TA	2012$	$21,944,000	$27,485,000	$25,800,000	$23,400,000
Total Salt Load Reduction	Tons /year	106,800	140,500	154,400	152,300
Federal Cost/Ton, FA+TA	2012$ /ton	$205	$196	$167	$154

[1] Combined data from 1987 Holt Letter and 1991 expansion EIS.

[2] $33 million nominal FA added for on-farm practices on 23,000 acres.

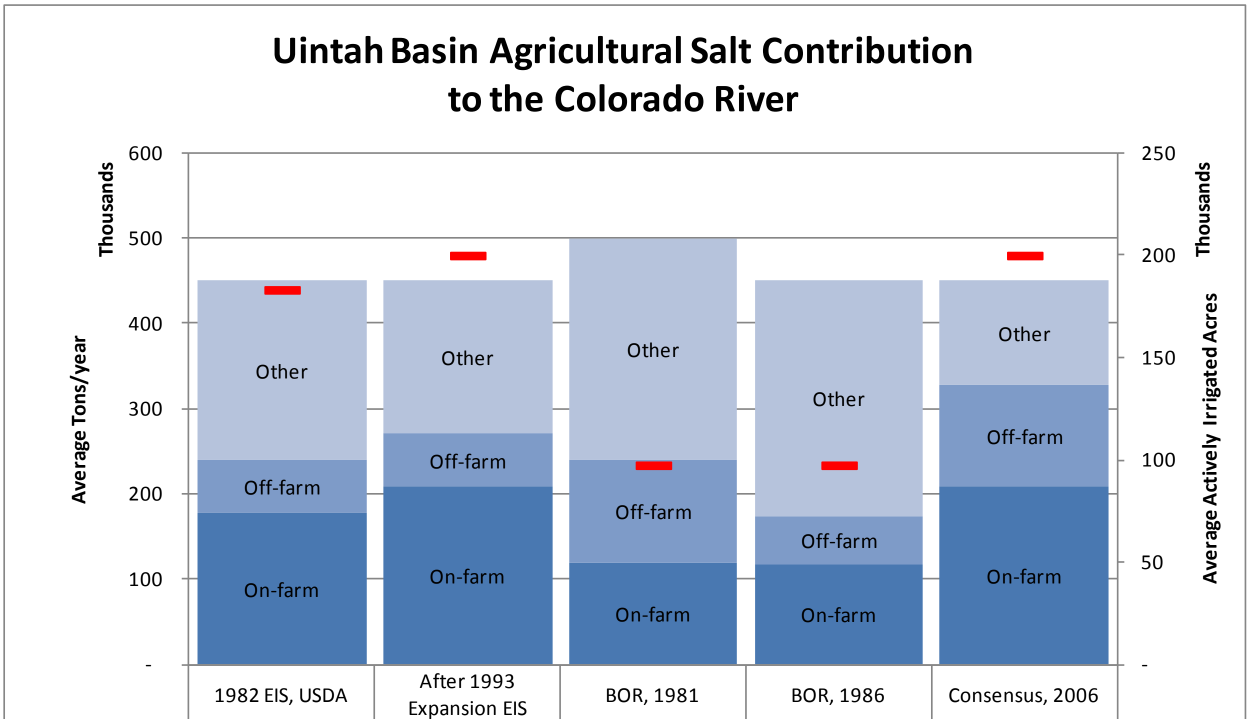
[3] FA+TA is used in this table only, to conform to procedures used in the EIS'.

Detailed 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.

In 2006, NRCS and the Bureau of Reclamation (Reclamation) reviewed available literature and came to a consensus agreement concerning the most reasonable pre-project salt contribution from agriculture in the Uintah Basin, prior to implementing Federal Salinity Control Programs. (Figure 1)



	1982 EIS, USDA	After 1993 Expansion EIS	BOR, 1981	BOR, 1986	Consensus, 2006
Other	210,000	179,080	260,000	275,360	121,880
Off-farm	62,800	62,800	120,000	56,760	120,000
On-farm	177,200	208,120	120,000	117,880	208,120
Active Acres	183,200	200,000	97,477	97,477	200,000

Figure 1. Uintah Basin Salt Load Allocation. The last bar indicates the consensus estimate.

Between 1975 and 1991, at least six studies were completed by federal agencies to quantify the salt contribution of Uintah Basin irrigation to the Colorado River System. Three studies by US Department of Agriculture (USDA) Soil Conservation Service, predecessor to Natural Resource Conservation Service (NRCS) emphasized the contribution of on-farm irrigation systems and attempted to address all irrigated lands in the Uintah Basin. Two studies by Reclamation focused on canals with the greatest water loss, addressing only half of irrigated lands. This discrepancy in scope has led to ambiguity as to the total salt contribution of agriculture. (Figure 2)

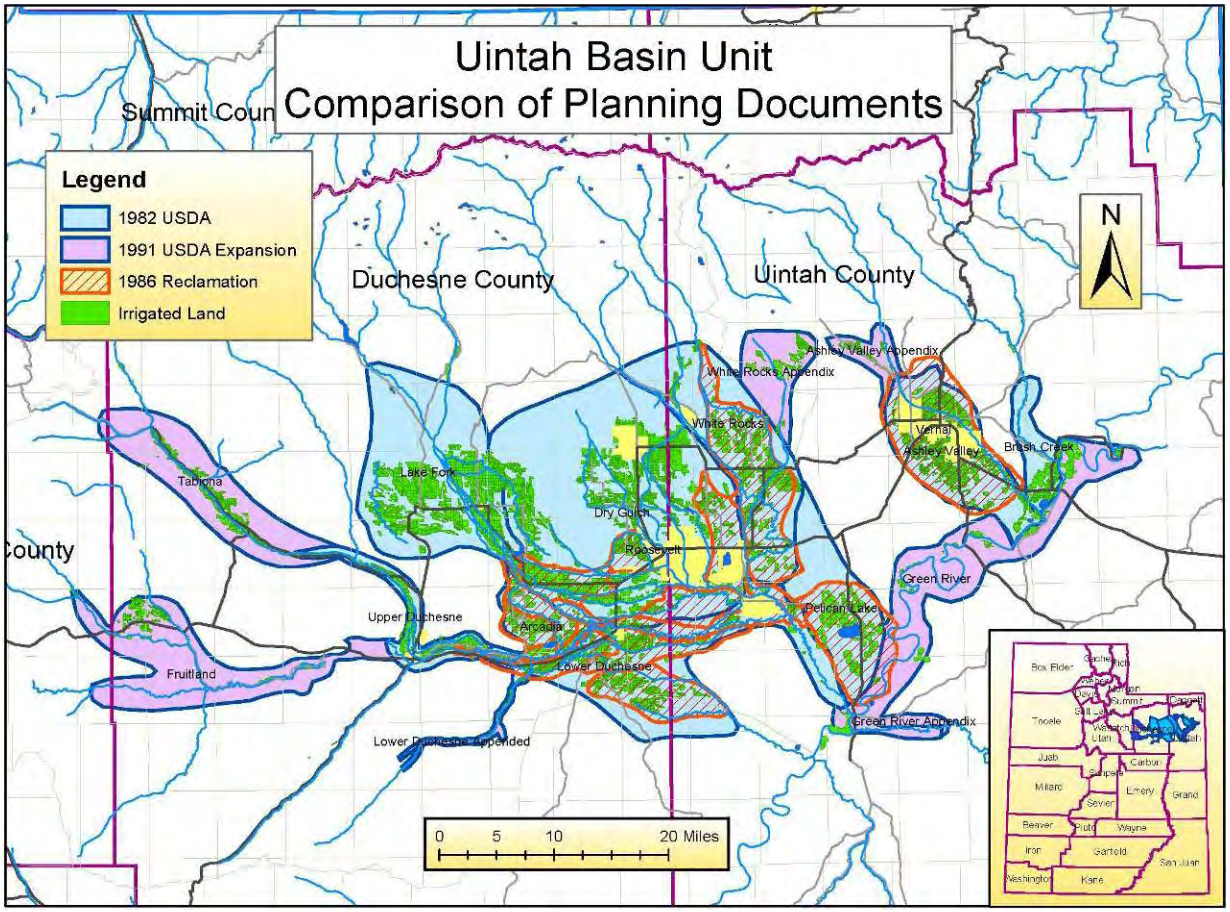


Figure 2. Comparison of Federal Salinity Control Planning Documents

Salt load at a given point in a watercourse is generally estimated by multiplying average flow by average salt concentration over a discreet time interval and summing the results to determine average salt load. Since flow rates and concentrations are highly variable, shorter measurement intervals and longer periods of record result in more acceptable estimates.

Average salt pickup for a given drainage is the average salt load below the drainage minus the average salt load above the drainage.

Salt Pickup has various sources including natural processes, springs, wells, mines, and agricultural activity. Agricultural irrigation, a particularly large source, involves diverting relatively clean water from a watercourse, transporting diverted water to fields and applying water to the soil. Agricultural salt pickup occurs when seepage from canals and excess water application on fields allows water to percolate below the plant root zone, carrying salt dissolved from the soil back to the river system.

Colorado River Basin Salinity Control Project (CRBSCP)

The CRBSCP encompasses multiple federal agencies and programs intended to reduce salt loading to the Colorado River. USDA on-farm salinity control started about 1980, with the Agricultural Conservation Program (ACP) and Long Term Agreements (LTA). Contracts were made with agricultural land owners to install improved irrigation practices for salinity control purposes. In 1984, ACP and LTA were replaced by the Colorado River Salinity Control Program (CRSCP), which functioned until 1996. In 1996, the Interim Environmental Quality Incentive Program (IEQIP) operated for one year, until the current Environmental Quality Incentive Program (EQIP) was established. Salinity control on the Colorado River has been a part of EQIP through the 1996, 2002, and the 2008 Farm bills.

Salinity Control Practices

When more water is applied to the soil than can be absorbed by soil above the depth of the plant roots (root zone), excess water percolates below the roots and is lost forever (deep percolation). 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 efficient operation of irrigation systems. Salt load reduction is achieved by 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, typically by installing pipelines.

Planning Documents

A careful review of NEPA planning documents indicates that the cost of treatment is generally less than anticipated pre-project. (Table 4)

The Environmental Impact Statement (EIS) for the Uintah Basin Unit of the Colorado River Basin Salinity Control Project (CRBSCP) was published in April, 1982. The EIS contemplated treating 122,200 acres with improved irrigation practices at a cost of $64.5 million FA ($168 million in 2012 dollars), reducing salt loading by 76,600 tons/year. It was anticipated that 35% of treatments would be improved flood irrigation. The nominal projected cost was $76/ton, FA+TA. (TA, technical assistance, pays for NRCS services, including taking applications, contracting, designing, construction inspection, and monitoring.)

Amortizing $64.5 million at 7.625% (the federal water project discount rate for FY1982) over 25 years and normalizing to 2012 dollars, using the Producer Price Index for farm equipment purchased (PPI), results in an expected average cost of $199/ton (FA+TA) in 2012 dollars.

By 1987, it was apparent that USDA was installing more off-farm practices than anticipated and that 5,900 on-farm acres in the Whiterocks area, excluded from the initial EIS, would likely be treated after all. By a letter from Utah State Conservationist, Francis T. Holt, dated July 14, 1987, (Holt Letter) projected treatments were increased to 128,100 acres and salt load reduction to 98,200 tons/year of which 82,300 tons/year were on-farm. The letter cites a total federal cost of $76 million at 70% cost-share (1986 dollars), a 50 year project life, and 8.625% discount rate.

Table 4. Comparison of Project Cost Estimates

FA+TA	EIS, 1982	Holt Letter, 1987	EIS, 1991	2002 Adjustment
Added Irrigation Improvements, Acres	122,200	5,900	8,900	23,000
Cumulative Irrigation Improvements, Acres	122,200	128,100	137,000	160,000
Incremental federal cost share, nominal	$64,474,200	$11,525,800	$7,148,700	$40,000,000
Total federal cost share, nominal	$64,474,200	$76,000,000	$83,148,700	$123,148,700
Federal water project discount rate	7.625%	8.625%	8.750%	6.125%
Amortized incremental treatment cost, nominal	$5,848,000	$7,503,000	$713,000	$3,166,000
Total amortized treatment cost, nominal	$5,848,000	$7,503,000	$8,216,000	$11,382,000
Total treatment cost, 2012 $	$167,700,000	$205,748,000	$222,098,000	$292,098,000
Total amortized treatment cost, 2012 $	$15,210,000	$20,313,000	$21,944,000	$27,485,000
Incremental total salt load reduction, tons/year	76,600	21,600	8,600	33,700
Total salt load reduction, tons/year	76,600	98,200	106,800	140,500
Total Cost/Ton 2012 $	$199	$207	$205	$196

While the practice life of buried pipelines may be on the order of 50 years, sprinkler and improved flood irrigation systems have a 15 year practice life (NRCS standards). Amortizing costs over 25 years or less seems more appropriate for on-farm practices than a 50 year amortization and a 25 year amortization has been widely used in recent years for NRCS' cost/ton analysis. Amortizing $76.0 million at 8.625% over 25 years yields an expected salt load reduction cost of $207/ton FA+TA, in 2012 dollars.

In December, 1991, a second EIS was completed, expanding the Uintah Basin Unit by 20,800 acres, of which 8,900 acres would be treated (7.5% improved flood) at a cost of $7.15 million FA+TA ($16.3 million in 2012 dollars) to reduce salt load by 8,600 tons/year. Using the same reasoning as above, the amortized cost is $190/ton (FA+TA) for the incremental acres and $205/ton for the entire project described by the Holt letter and the expansion EIS.

By 2002, it was obvious that improved flood installations were out of favor and nearly all future installations would be sprinklers. It is now anticipated that than 160,000 acres will ultimately be treated, with a total salt load reduction exceeding 140,500 tons/year, on-farm. Salt load reduction costs may settle around $196/ton, in 2012 dollars, for the entire project, in line with costs estimated in the Holt letter in 1987 and after the 1991 expansion EIS.

Distribution of Salt Concentration

Through the 1980s and 1990s, salt loads, for individual contracts, were calculated using a predetermined salt load factor, expressed in tons of salt/acre-foot, multiplied by the estimated return flow to the river in acre-feet/year. Return flow was calculated by using a water budget to estimate deep percolation and subtracting estimated phreatophyte consumption prior to ground water returning to the river system. The salt load factor was determined as part of the EIS, by measuring and comparing salt concentrations in water diverted from the rivers to groundwater flowing from seeps below irrigated lands over just one irrigation season. Salt load factors were always suspect, because they were derived from too few samples over too great an area over too short of time. There is no evidence that any ground water potential studies were done to determine the likely subsurface flow paths of return flow. The salinity sub-units in the EIS do not reflect surface drainage paths defined by hydrologic units.

In FY2007, in an attempt to simplify salt-load accounting and minimize arbitrary estimates, new procedures were established to calculate salt load reductions on the basis of estimated original salt in place and potential salt load reduction based on years of intense monitoring of salt and water budgets on individual practices. In the Uintah Basin, original salt load was averaged over the entire basin with a pre-project load of 1.04 tons/acre-year.

SPARROW (Spatially Referenced Regressions on Watershed Attributes)

In 2009, USGS released Scientific Investigations Report 2009-5007,"*Spatially Referenced Statistical Assessment of Dissolved-Solids Load Sources and Transport in Streams of the Upper Colorado River Basin*" (SPARROW91). This report, which includes a user-interfaced GIS model to access and review data, provides opportunity to compare past salt-loading estimates with state-of-the-art, computerized efforts to numerically model salt transport in the river and its tributaries.

As published, SPARROW91 reports the estimated agricultural salt load for one year only, 1991. Plans are underway to improve input data and run a new SPARROW model to estimate average loads over longer periods of record. Until that effort is completed, conversion to long-term averages is accomplished by applying correction factors to each catchment in SPARROW91. The latest correction factors are based on comparisons of long term average salt loading at USGS gauge stations and have been given the name "Anning 2.2".

Figure 3 compares salt-loads estimated by NEPA documents with SPARROW 91 output. The consensus total agricultural load from NEPA documents is 328,000 tons/year, compared to 320,000 tons/year from Anning 2.2 adjusted SPARROW91 (pink bars). The Anning adjusted SPARROW91 numbers are for the overall average salt load and have been influenced by thirty years of ongoing irrigation practice improvements.

The blue bars represent salt load remaining at the end of 1991. Recalculated progress reports estimated agricultural salt loading to be about 278,000 tons/year at the end of 1991 (eleven years into the program).

SPARROW91 estimates an agricultural salt load of 227,000 tons/year at the same point in time. SPARROW91 represents only one year and not any type of long term average salt loading.

For the Uintah Basin Unit, adjusted SPARROW91 data seems to reasonably agree with other data sources.

Distribution of salt loading is of special interest, in that the SPARROW model indicates an entirely different distribution than does the EIS. (Figures 4 and 5)

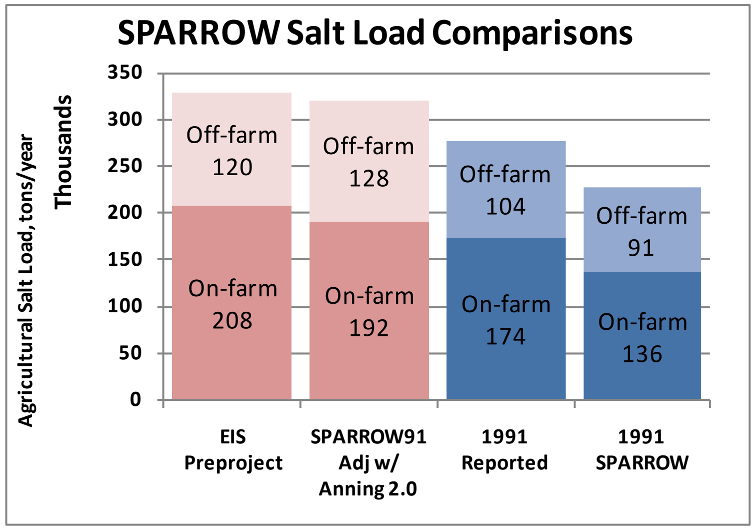


Figure 3. SPARROW91 Salt Load Comparisons

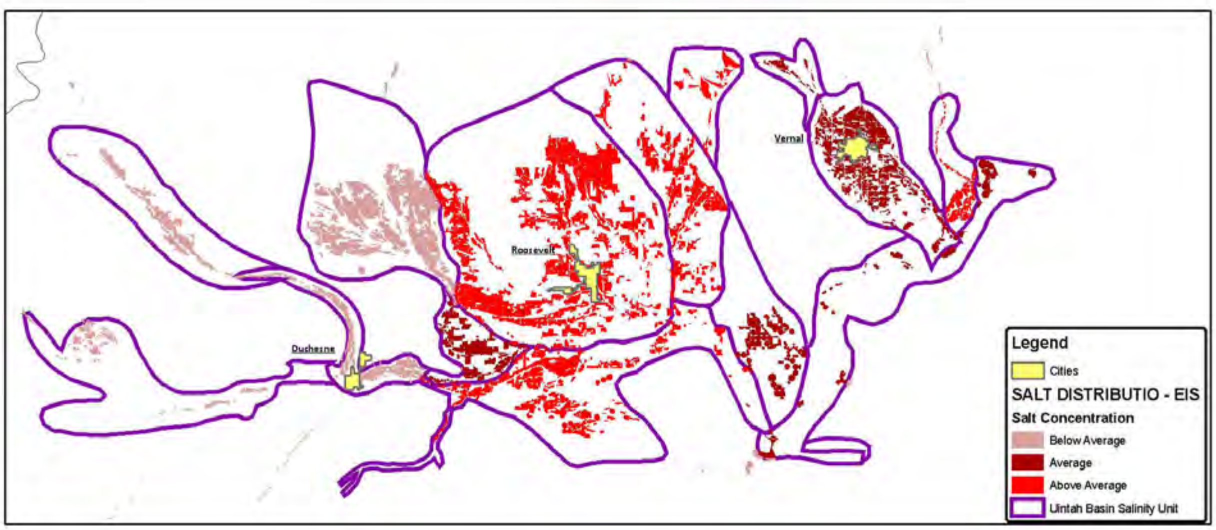


Figure 4. Salt loading distribution estimated by EIS.

Figure 5. Salt loading distribution estimated by SPARROW91, adjusted to long-term averages (Anning 2.2)

Salt load distribution from the EIS was always controversial, in that it was developed by measuring salinity in 64 drains, unevenly spread across 200,000 acres of irrigated land over just one irrigation season. There is no suggestion that potential flow paths back to the river were considered. In 2008, calculating salt load reductions was changed from using sub-basin salinity to a unit-wide beginning average salt loading.

Planned Practices

Planned practices (obligations) represent contracts with participants to apply improved irrigation practices to the participant's agricultural operations. 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 installation using federal grants. In essence, federal cost-share purchases salt load reductions in the Colorado River, while the participants' 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.

FY2012 Obligation

In FY2012, $2.60 million was obligated in 59 contracts to treat 1,437 acres with improved irrigation. Of that amount, $25,000 was for wildlife habitat improvements.

Salt Load Reduction Calculation

The estimated salt load reduction from FY2012 planned practices is 1,654 tons/year on-farm and 358 tons/year off-farm. On-farm salt load reduction is calculated by multiplying the original tons/acre-year for the entire basin, by the acres obligated for treatment and a percentage reduction based on change in irrigation practice. For the Uintah Basin, the consensus estimate of on-farm irrigation salt loading is 1.04 tons/acre-year. As an example, if 40 acres are converted from wild flood to wheel line sprinkler, an estimated 84% of the original salt load will be controlled. Hence, 40 acres x 1.04 tons/acre-year x 84% = 39.9 tons/year salt load reduction. Salt load reduction in this report is calculated using this method, outlined in "*Calculating Salt Load Reduction*", July 30, 2007. In addition to on-farm salt load reduction, when ditches that cross non-irrigated acres are put in pipe, as part of the irrigation project, off-farm salt loading is also reduced. In FY2012, off-farm salt loading was reduced by 358 tons/year, by NRCS funded installation of laterals in the Hancock Cove Project.

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 (4.000% for FY2012). Two-thirds of the FA is added for technical assistance (TA) (the average federal cost of planning, design, construction Inspection, monitoring and evaluation, etc.) and the amortized total cost is divided by tons/year to yield cost/ton. Normalization of past obligations and expenditures to 2012 dollars is accomplished using the Producer Price Index (PPI) for agricultural equipment purchased (1977 series).

For FY2012 the amortized cost of obligated planned projects is $167/ton (FA+TA).

Obligation Analysis

In 2012 dollars, cumulative obligation thru FY2012 is $179 million, planned on 158,800 acres, with a salt load reduction of 154,400 tons/year (on-farm and off-farm), resulting in an overall average cost of $167/ton. Note that in 2012 dollars, the normalized cost/ton has been relatively constant throughout the life of the project. Current cost/ton is not out of line with respect to past years performance or NEPA planning document projections. (Figure 6, table 5)

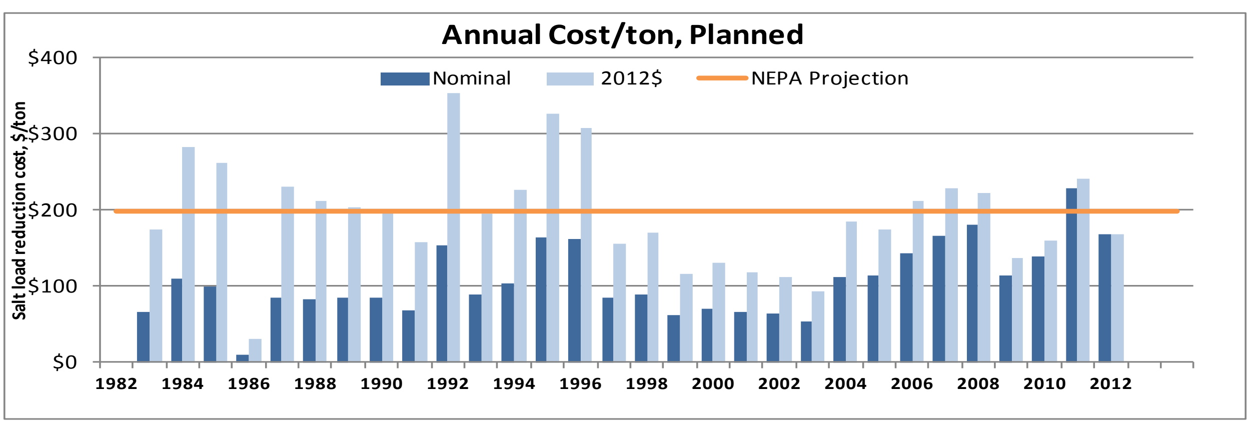


Figure 6. Nominal planned cost/ton and cost/ton in 2012 dollars

Table 5. Cost/Ton of annual obligations since 1980, in nominal and 2012 dollars

FY	Federal Water Project Interest Rate	Contracts Planned	FA Planned Nominal	Irrigation Acres Planned	Salt Load Reduction Tons/Year	Amortized FA+TA Nominal	$/Ton Nominal	2012 PPI Factor	FA Planned 2012 Dollars	Amortized FA+TA 2012 Dollars	$/Ton 2012 Dollars	Cum $/Ton, 2012 Dollars
1980	7.125%	84	$1,848,864	5,000	3,735	$267,404		288%	$5,331,695	$771,132		
1981	7.375%	95	$1,899,073	6,000	4,482	$280,839		269%	$5,106,453	$755,152		
1982	7.625%	76	$1,782,461	5,000	3,735	$269,438		260%	$4,636,263	$700,821		
1983	7.875%	108	$2,641,958	8,282	6,187	$408,097	$66	262%	$6,917,063	$1,068,462	$173	$182
1984	8.125%	36	$1,107,903	2,152	1,608	$174,829	$109	257%	$2,844,523	$448,871	$279	$190
1985	8.375%	70	$1,536,585	3,368	2,516	$247,640	$98	264%	$4,049,665	$652,654	$259	$198
1986	8.625%	39	$1,176,359	2,885	18,055	$193,569	$11	276%	$3,250,999	$534,950	$30	$122
1987	8.875%	63	$797,629	2,121	1,584	$133,971	$85	271%	$2,159,350	$362,688	$229	$126
1988	8.625%	127	$6,153,570	16,362	12,223	$1,012,567	$83	253%	$15,597,928	$2,566,630	$210	$145
1989	8.875%	87	$2,111,397	5,614	4,194	$354,634	$85	238%	$5,031,446	$845,090	$202	$149
1990	8.875%	75	$2,963,581	7,880	5,887	$497,768	$85	233%	$6,896,998	$1,158,431	$197	$154
1991	8.750%	132	$3,358,040	10,968	8,194	$558,282	$68	229%	$7,680,262	$1,276,862	$156	$154
1992	8.500%	284	$3,382,799	4,826	3,605	$550,898	$153	229%	$7,736,889	$1,259,974	$349	$163
1993	8.250%	156	$2,780,712	6,750	5,042	$443,465	$88	220%	$6,113,879	$975,035	$193	$165
1994	8.000%	113	$3,317,415	6,741	5,036	$517,952	$103	217%	$7,198,465	$1,123,906	$223	$168
1995	7.750%	27	$720,561	899	672	$110,109	$164	197%	$1,421,688	$217,249	$323	$170
1996	7.625%	161	$5,840,101	6,816	5,483	$882,794	$161	189%	$11,020,041	$1,665,798	$304	$178
1997	7.375%	24	$610,282	988	1,076	$90,250	$84	184%	$1,122,301	$165,968	$154	$177
1998	7.125%	18	$686,902	1,173	1,115	$99,348	$89	189%	$1,296,157	$187,465	$168	$177
1999	6.875%	22	$770,221	1,950	1,784	$108,918	$61	189%	$1,453,377	$205,523	$115	$176
2000	6.625%	45	$1,674,422	3,456	3,263	$231,438	$71	181%	$3,027,920	$418,519	$128	$175
2001	6.375%	60	$1,604,814	3,461	3,265	$216,745	$66	176%	$2,831,263	$382,389	$117	$173
2002	6.125%	122	$3,601,896	7,784	7,490	$475,200	$63	175%	$6,303,332	$831,601	$111	$169
2003	5.875%	145	$4,695,491	5,782	11,176	$604,936	$54	170%	$7,960,342	$1,025,557	$92	$161
2004	5.625%	140	$5,191,612	5,995	5,824	$652,943	$112	163%	$8,470,543	$1,065,330	$183	$162
2005	5.375%	158	$6,177,762	7,285	6,669	$758,243	$114	152%	$9,374,666	$1,150,623	$173	$163
2006	5.125%	116	$6,212,616	4,366	5,185	$743,898	$143	147%	$9,109,058	$1,090,718	$210	$165
2007	4.875%	62	$3,890,488	2,152	2,749	$454,319	$165	137%	$5,343,245	$623,968	$227	$166
2008	4.875%	77	$4,364,084	3,233	2,839	$509,624	$180	123%	$5,350,372	$624,800	$220	$167
2009	4.625%	62	$2,791,994	2,402	2,770	$317,866	$115	119%	$3,310,694	$376,919	$136	$166
2010	4.375%	65	$4,463,030	2,046	3,583	$495,203	$138	114%	$5,070,536	$562,610	$157	$166
2011	4.125%	89	$3,601,619	3,624	1,713	$389,338	$227	106%	$3,812,476	$412,132	$241	$167
2012	4.000%	59	$2,587,337	1,437	1,654	$276,034	$167	100%	$2,587,337	$276,034	$167	$167
Totals		2,997	$96,343,578	158,799	154,393	$13,328,560	$86		$179,417,227	$25,783,862	$167	

Cost Share Enhancement

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

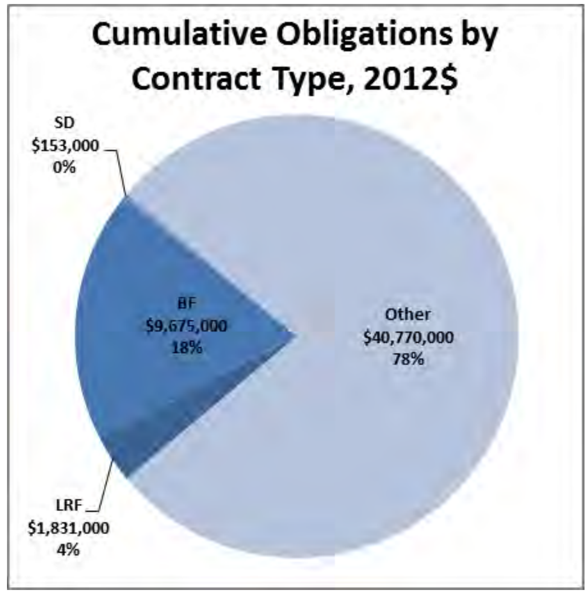


Figure 7. FY2012 planned acres by contract type

In FY2012, $961,000 (37% of Salinity EQIP obligations), was obligated in 24 enhanced contracts, treating 476 acres to reduce salt loading by 536 tons/year. (Figure 7) The average cost for cost-share enhanced contracts is $191/ton, compared to $167/ton for all contracts. About 33% of acres treated in the Uintah Basin Unit are in enhanced contracts.

For FY2003 through FY2012, $11.7 million FA (2012 dollars) was obligated in 232 enhanced contracts, 22% of total obligation. Enhanced contracts were to treat 7,109 acres, reducing salt load by 6,997 tons/year on-farm and off farm. In 2012 dollars, the cumulative average cost for enhanced contracts is $192/ton compared to $167/ton for all contracts.

From FY2003 to FY2012, the incremental cost of enhancement is $1.94 million in 2012 dollars, about 3.6% of total FA for the same period. A preponderance of enhanced contracts are with beginning farmers/ranchers, at an approximate ratio of five to one compared to limited resource or socially disadvantaged farmers/ranchers.

Irrigation System Replacements

In the Uintah Basin Unit, many salinity funded irrigation systems have reached their expected practice life of fifteen years. Sixty-five percent of applied systems are fifteen years old or older and twenty-two percent are twenty-five years old or older.

Many of these systems have been well maintained and continue to function well. Some have been abandoned for a variety of reasons. Some are poorly operated and maintained and in need of repair and careful attention.

Many NRCS funded practices are life limited. Using EQIP, practice replacements can only be funded if significant environmental improvement will result. The question of whether or not replacement of worn-out, salinity funded irrigation systems should be considered for new federal grants is complicated and volatile, involving technical, social, and political issues.

NRCS policy continues to be fluid in regard to salinity control practice replacements in Utah. The following paragraphs describe what has taken place with regard to salinity control irrigation practices that have exceeded their prescribed service life.

Replacement of Prior Treated Practices

Some worn-out sprinkler systems, installed prior to federal salinity funding, have never claimed any federal cost-share or salt load reduction. These types of replacements have occasionally been funded with salinity money for many years. Such funding increased dramatically beginning with FY2008.

Starting in FY2008, replacement of worn-out, prior treated systems has been obligated using salinity funds at a federal payment percentage of about 65%. (About half of these contracts were with historically underserved cooperators and the average payment percentage was increased to 90%.)

Since no salt load reduction or federal funds have ever been used on these fields, cost per ton is calculated on the basis of practice improvement from wild flood to the improved practice.

For FY2012, 1 contract obligated $6,800 FA, on 3 acres, for a salt load reduction of 2 tons/year, resulting in an average planned cost of $218/ton.

For FY2009 – FY2012, 27 contracts have obligated $1.53 million FA (2012 dollars) to reduce salt loading by 1,688 tons/year, on 1,794 acres, resulting in a cumulative cost of $101/ton (2012 dollars).

System Upgrades (Improved flood to Sprinkler)

In FY2008 – FY2012, 26 improved flood practices that had exceeded their useful life, were obligated for upgrade to more efficient wheel line or center pivot systems. These practices had previously had salinity grants and salt load reduction was claimed for their installation. It was assumed that the application efficiency of these improved flood systems had declined from 55% to 45% over the prescribed life of the system and that the average salt loading of these systems was 48% of original salt loading (0.50 tons/acre-year). Systems upgraded to wheel lines would therefore reduce salt loading by 36% of the original loading (0.37 tons/acre-year), and center pivots by 45% of the original load (0.47 tons/acre-year).

Federal payment percentage has been about 65% for normal contracts and 90% for contracts with historically underserved participants.

In FY2012, no contracts were planned to upgrade irrigation practices.

Cumulatively, 26 contracts have obligated $1.31 million (2012 dollars) FA, to reduce salt loading by 448 tons/year, on 974 acres, at an amortized cost of $340/ton FA+TA (2012 dollars). Cumulative cost for all salinity obligations is $167/ton.

System Upgrades (Periodic Move to Pivot)

In FY2012, no contracts were planned to upgrade worn out periodic move sprinklers to center pivots.

Federal payment percentage has been about 65% for normal contracts and 90% for contracts with historically underserved participants.

The cumulative cost for all salinity upgrades is $1.66 million (2012 dollars) obligated on 2,256 acres, reducing salt loading by 475 tons/year at a cost of $377/ton.

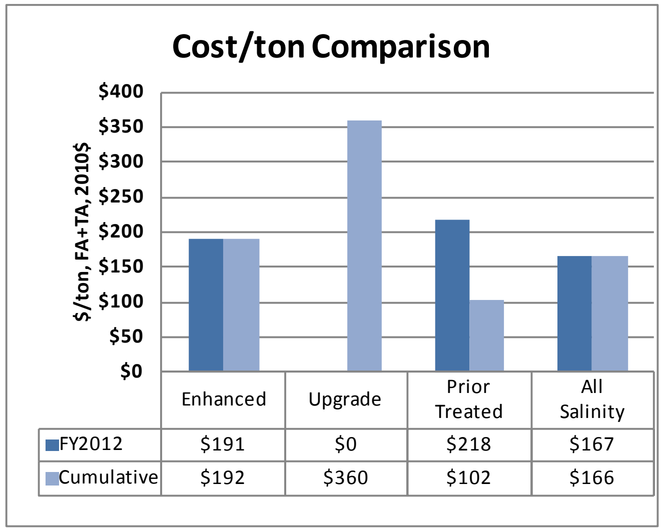


Figure 8. Cumulative cost/ton by contract type, 2012$

Figure 8 compares the relative cumulative cost/ton for FY2012 Enhanced, Upgrade, Prior Treated, and all salinity contracts.

Replacement of worn out like-for-like systems

There is ongoing public pressure and discussion about replacing worn out irrigation systems that have been in service beyond their prescribed life with new systems of the same type, using federal grants.

Through FY2012, no systems of this nature have been obligated with salinity funds. It is assumed that any future funding would be at lower federal payment percentages to keep cost/ton in line with other contract types. Salt load reduction would be calculated on the basis of a 10% drop in efficiency for worn out systems, compared to new systems.

Effect of not Replacing Worn-out Systems

The issue of what would happen to salt loading levels if replacements are not funded has not been fully resolved. Multiple surveys with participants have indicated that the majority would replace their systems without additional federal participation, when needed. Existing modifications to delivery systems would make returning to wild-flood difficult, in most cases. ***(See the "Hydrosalinity" Section below for more detail.)***

The most common concern of participants seems to be that any funding is distributed fairly and equitably. No one wants to replace their system at their own expense, only to have the federal government pay for replacing neighboring systems.

Applied Practices

FY2012 Expenditures

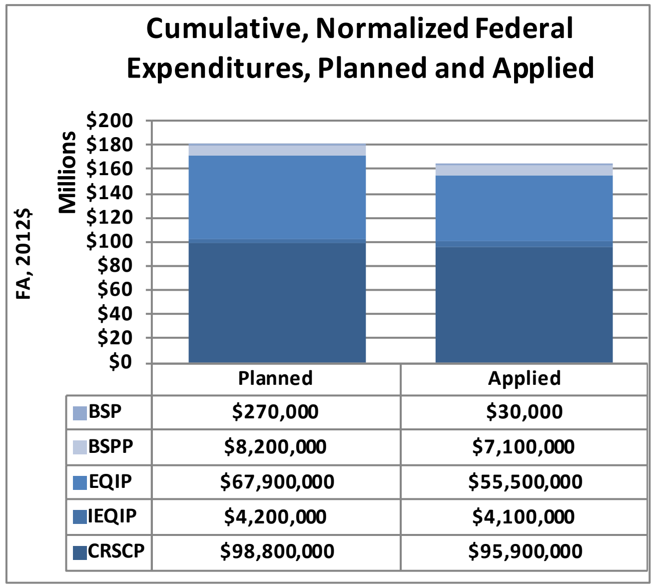
In FY2012, $5.65 million FA was expended applying 1,766 acres of irrigation improvements. The estimated salt load reduction is 3,870 tons/year, on-farm and off-farm, at an amortized cost of $156/ton FA+TA (includes WLO). This calculation is somewhat unreliable in that FA expended cannot be directly correlated to contract completion.

When is a contract completed? 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 IWM left in the contract before it is officially completed. For this document, practices in contracts are assumed to be applied in proportion to dollars paid out, on a contract by contract basis.

Cumulative expenditure FY1980-FY2012 is $163million FA (2012 dollars), applied to 140,100 sprinkler acres, 14,100 improved flood acres, and 87 acres of drip irrigation, reducing salt loading by 124,900 tons/year on-farm and 27,400 tons/year off-farm at an average cost of $154/ton (2012 dollars).

There is a time lag between obligating and installing salinity control practices. Between planning and application, a few contracts are de-obligated for various reasons such as design modification, change in ownership or cancellation. (Figure 9)

For NRCS funded projects, off-farm expenditures are a minor fraction of on-farm spending. (Figure 10)



	Planned	Applied
BSP	$270,000	$30,000
BSPP	$8,200,000	$7,100,000
EQIP	$67,900,000	$55,500,000
IEQIP	$4,200,000	$4,100,000
CRSCP	$98,800,000	$95,900,000

Figure 9. Comparison of Obligated and Expended funds by Program, 2012 dollars

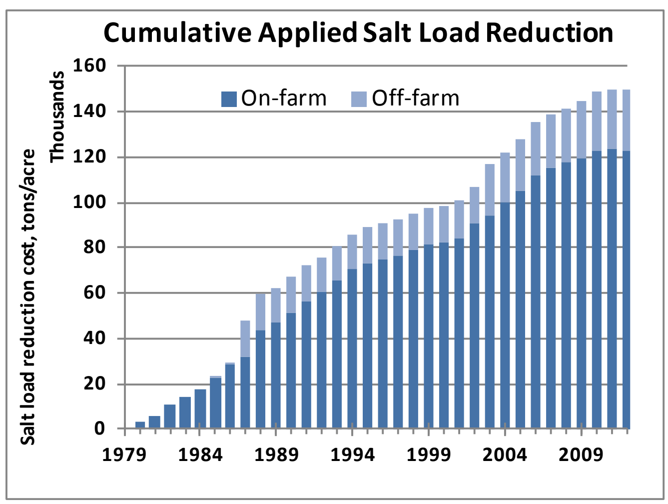


Figure 10. Cumulative applied salt load reduction

Table 6 summarizes annual expenditures and cost/ton calculations for applied practices, nominal and 2012 dollars. Table 7 is a detailed summary of applied practices since project inception.

Table 6. Annual applied cost/ton, nominal and 2012 dollars.

FY	Federal Water Project Interest Rate	FA Applied Nominal	Irrigation Acres Applied	Salt Load Reduction Applied Tons/Year	Amortized FA+TA Applied Nominal	$/Ton Applied Nominal	2012 PPI Factor	FA Applied 2012 Dollars	Amortized FA+TA 2012 Dollars	$/Ton 2012 Dollars	Cum $/Ton, 2012 Dollars
1980	7.125%	$0	4,349	3,234	$0	$0	288%	$0	$0	$0	$0
1981	7.375%	$1,450,506	3,919	2,928	$214,504	$73	269%	$3,900,293	$576,783	$197	$94
1982	7.625%	$1,450,506	5,801	4,333	$219,260	$51	260%	$3,772,832	$570,304	$132	$109
1983	7.875%	$1,899,239	4,823	3,603	$293,371	$81	262%	$4,972,508	$768,091	$213	$136
1984	8.125%	$1,746,366	5,040	3,765	$275,580	$73	257%	$4,483,767	$707,546	$188	$147
1985	8.375%	$1,578,710	6,131	5,405	$254,429	$47	264%	$4,160,685	$670,547	$124	$142
1986	8.625%	$3,491,444	8,285	6,395	$574,515	$90	276%	$9,648,995	$1,587,737	$248	$165
1987	8.875%	$1,500,879	3,691	17,847	$252,090	$14	271%	$4,063,196	$682,461	$38	$117
1988	8.625%	$3,011,008	16,675	12,457	$495,460	$40	253%	$7,632,234	$1,255,880	$101	$114
1989	8.875%	$2,327,840	3,400	2,540	$390,988	$154	238%	$5,547,229	$931,722	$367	$124
1990	8.875%	$1,978,927	6,432	4,716	$332,384	$70	233%	$4,605,461	$773,541	$164	$127
1991	8.750%	$2,823,067	6,922	5,171	$469,342	$91	229%	$6,456,711	$1,073,444	$208	$133
1992	8.500%	$3,382,799	4,834	3,611	$550,898	$153	229%	$7,736,889	$1,259,974	$349	$143
1993	8.250%	$2,752,919	6,750	5,042	$439,032	$87	220%	$6,052,771	$965,289	$191	$146
1994	8.000%	$2,749,248	6,741	5,036	$429,244	$85	217%	$5,965,598	$931,417	$185	$148
1995	7.750%	$4,071,491	3,965	2,962	$622,167	$210	197%	$8,033,171	$1,227,555	$414	$157
1996	7.625%	$882,617	1,902	1,421	$133,417	$94	189%	$1,665,464	$251,753	$177	$157
1997	7.375%	$4,277,813	1,991	1,703	$632,611	$371	184%	$7,866,842	$1,163,364	$683	$167
1998	7.125%	$1,391,042	2,193	2,030	$201,189	$99	189%	$2,624,842	$379,635	$187	$167
1999	6.875%	$852,084	2,488	2,105	$120,494	$57	189%	$1,607,850	$227,367	$108	$166
2000	6.625%	$955,064	1,275	1,239	$132,009	$107	181%	$1,727,077	$238,716	$193	$167
2001	6.375%	$1,104,669	2,357	2,112	$149,196	$71	176%	$1,948,892	$263,216	$125	$166
2002	6.125%	$1,499,522	6,458	6,160	$197,833	$32	175%	$2,624,169	$346,208	$56	$159
2003	5.875%	$3,040,199	4,404	9,884	$391,679	$40	170%	$5,154,099	$664,020	$67	$151
2004	5.625%	$4,096,866	5,517	5,512	$515,258	$93	163%	$6,684,375	$840,686	$153	$151
2005	5.375%	$4,149,302	6,521	5,754	$509,275	$89	152%	$6,296,507	$772,817	$134	$151
2006	5.125%	$6,918,799	6,896	7,080	$828,457	$117	147%	$10,144,477	$1,214,699	$172	$152
2007	4.875%	$4,412,156	3,235	3,706	$515,238	$139	137%	$6,059,710	$707,634	$191	$153
2008	4.875%	$3,424,172	2,104	2,750	$399,864	$145	123%	$4,198,039	$490,234	$178	$153
2009	4.625%	$4,474,513	2,559	2,854	$509,419	$178	119%	$5,305,793	$604,059	$212	$154
2010	4.375%	$4,058,317	3,815	4,261	$450,298	$106	114%	$4,610,734	$511,592	$120	$153
2011	4.125%	$1,436,570	1,037	815	$155,294	$191	106%	$1,520,674	$164,386	$202	$154
2012	4.000%	$5,647,470	1,766	3,870	$602,509	$156	100%	$5,647,470	$602,509	$156	$154
Totals		$88,836,124	154,277	152,302	$12,257,302	$80		$162,719,353	$23,425,186	$154	

Table 7. Summary of Applied Irrigation Practices by Year

Applied Practices										
FY	Nominal FA Applied	2012$ FA Applied	Sprinkler Acres	Improved Surface Acres	Drip Acres	Total Irrigation Acres	WL Wetland Habitat Mgmt	WL Upland Habitat Mgmt	Salt Load Reduced On-farm	Salt Load Reduced Off-farm
Projected						160,000			177,200	30,000
1980	$0	$0	3,651	698	-	4,349	-	-	3,234	-
1981	$1,450,506	$3,900,293	3,371	548	-	3,919	-	-	2,928	-
1982	$1,450,506	$3,772,832	4,452	1,349	-	5,801	-	-	4,333	-
1983	$1,899,239	$4,972,508	2,905	1,918	-	4,823	-	-	3,603	-
1984	$1,746,366	$4,483,767	3,122	1,918	-	5,040	-	-	3,765	-
1985	$1,578,710	$4,160,685	4,155	1,976	-	6,131	-	-	4,580	825
1986	$3,491,444	$9,648,995	6,642	1,643	-	8,285	-	-	6,395	-
1987	$1,500,879	$4,063,196	3,162	529	-	3,691	119	1,013	2,772	15,075
1988	$3,011,008	$7,632,234	15,201	1,474	-	16,675	15	1,638	12,457	-
1989	$2,327,840	$5,547,229	3,027	372	1	3,400	478	1,814	2,540	-
1990	$1,978,927	$4,605,461	6,060	372	-	6,432	280	625	4,716	-
1991	$2,823,067	$6,456,711	6,709	212	1	6,922	109	230	5,171	-
1992	$3,382,799	$7,736,889	4,666	160	8	4,834	154	3,004	3,611	-
1993	$2,752,919	$6,052,771	6,597	145	8	6,750	375	2,400	5,042	-
1994	$2,749,248	$5,965,598	6,581	150	10	6,741	213	868	5,036	-
1995	$4,071,491	$8,033,171	3,934	17	14	3,965	95	755	2,962	-
1996	$882,617	$1,665,464	1,856	42	4	1,902	655	404	1,421	-
1997	$4,277,813	$7,866,842	1,990	-	1	1,991	100	40	1,703	-
1998	$1,391,042	$2,624,842	1,946	236	11	2,193	24	17	1,836	194
1999	$852,084	$1,607,850	2,349	136	3	2,488	-	8	2,080	25
2000	$955,064	$1,727,077	1,200	75	-	1,275	1	17	1,180	59
2001	$1,104,669	$1,948,892	2,114	243	-	2,357	8	26	2,024	88
2002	$1,499,522	$2,624,169	6,322	136	-	6,458	-	15	5,980	180
2003	$3,040,199	$5,154,099	4,400	1	3	4,404	14	9	4,057	5,827
2004	$4,096,866	$6,684,375	5,513	3	1	5,517	24	103	5,168	344
2005	$4,149,302	$6,296,507	6,277	244	-	6,521	56	154	5,746	8
2006	$6,918,799	$10,144,477	6,863	29	4	6,896	78	247	6,274	806
2007	$4,412,156	$6,059,710	3,141	93	1	3,235	212	125	3,181	525
2008	$3,424,172	$4,198,039	2,993	(894)	5	2,104	452	2,308	2,682	68
2009	$4,474,513	$5,305,793	2,553	-	6	2,559	617	143	2,100	754
2010	$4,058,317	$4,610,734	3,878	(63)	-	3,815	342	256	3,344	917
2011	$1,436,570	$1,520,674	1,054	(17)	-	1,037	34	279	737	78
2012	$5,647,470	$5,647,470	1,438	322	6	1,766	12	100	2,287	1,583
Totals	88,836,124	162,719,353	140,123	14,067	87	154,277	4,467	16,598	122,659	27,356

Evaluation by Program

Since 1980, nearly 3,000 contracts have been obligated with landowners, through multiple funding programs, to upgrade irrigation practices on approximately 158,800 acres. (Table 8) As of the end of FY2012, practices are applied on about 154,000 acres. Less than 10% of applied systems are improved flood systems, 91% being higher-efficiency sprinkler systems.

In FY2012, the Basin States Program (BSP) replaced the Basin States Parallel Program (BSPP). EQIP and BSP, current funding programs, represent about 33% of obligated acres. (Figure 11)

Twenty-three percent of irrigated acres remain untreated. (Figure 12) Of 14,800 acres initially treated with improved flood, about 1,200 acres have since been converted to sprinkler systems.

Table 8. Contracts Planned and Applied by Program

FY2012	Planned				Applied				
Program	Contracts	FA, 2012 $	Irrigated Acres	Salt Load Reduction, Tons	FA, 2012 $	Irrigated Acres	$/Acre	Salt Load Reduction, Tons	Salt Load Reduction, Tons/Acre
ACP & CRSCP	1,671	98,796,756	99,185	89,994	95,913,502	101,850	942	91,985	0.90
IEQIP	62	4,196,851	2,480	2,244	4,142,929	2,581	1,605	3,395	1.32
EQIP	1,172	67,945,992	52,538	54,959	55,493,099	45,471	1,220	51,572	1.13
BSPP	4	8,203,268	4,529	7,020	7,141,687	4,054	1,762	6,358	1.57
BSP	88	274,359	67	176	28,136	52	541	25	0.48
Totals	2,909	179,142,868	158,732	154,217	162,691,217	153,956	1,057	153,310	1.00

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 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).

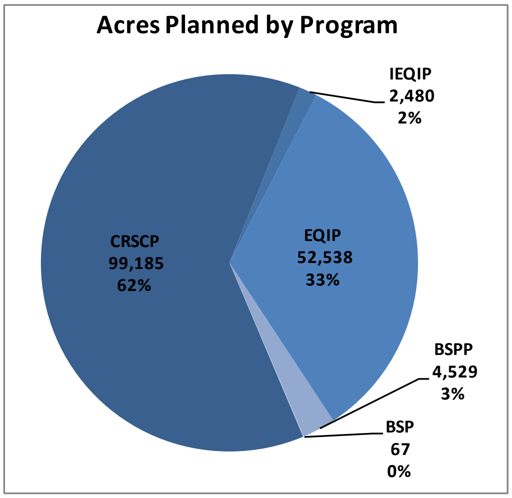


Figure 11. Acres planned by program

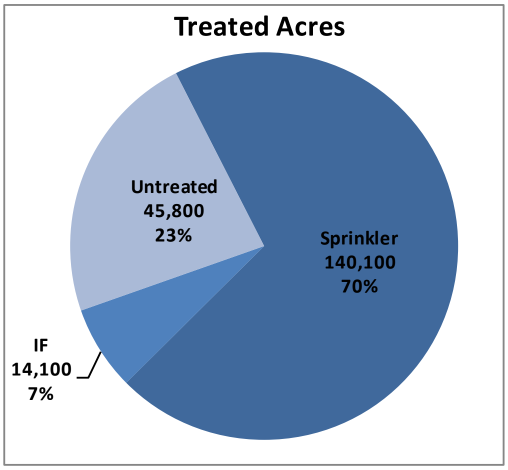


Figure 12. Treated acres

Deep percolation and salt load reductions are achieved by reducing or eliminating canal/ditch seepage/leakage and by improving the efficiency and uniformity of irrigation to reduce deep percolation. 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 participants improve irrigation systems and better manage water use to sharply reduce deep percolation/salt loading.

Over the life of the Colorado River Basin Salinity Control Program in the Uintah Basin, cooperator preference has made a distinct shift from improved flood to sprinkler systems. In the Uintah Basin, center pivots are the system of choice and now account for approximately two-thirds of acres obligated each year.

Salinity Monitoring Methods

The 1980 and 1991, "…Framework Plans for Monitoring and Evaluating (M&E) the Colorado River Salinity Control Program" focused on the following principles:

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

As a result of labor intensive testing, it was confirmed that irrigation systems, installed and operated as originally designed, produced the desired result of improved irrigation efficiency and sharply reduced deep percolation, concurrent with reduced farm labor and improved yields.

Due to budget restraints, field intensive M&E efforts were curtailed in the late 1990s and a new "Framework Plan for Monitoring and Evaluating (M&E) the Colorado River Salinity Control Program" was adopted in 2002. Having established that properly installed and operated practices yield predictable and favorable results, the 2002 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.

Cooperator questionnaires

From 2002 to 2005, 538 Cooperators were interviewed to determine perceptions and attitudes about salinity control practices installed on their property. In general, those surveyed are pleased with their involvement in salinity control programs. Most respondents claim to be operating within original design parameters and operating procedures. Detailed results of these surveys were reported in past M&E Reports.

While no direct questions were asked regarding potential like-for-like replacements, a large majority of participants expressed positive economic consequences from irrigation practice improvements. Ninety percent felt that their share of installation cost had been offset with improved production. Ninety-eight percent said that their initial investment resulted in substantial economic gain. Ninety-

nine percent thought that there was a positive economic effect on the area and region from the salinity program.

With individual benefits described, it seems that few cooperators would willingly revert to flood systems even if they needed to replace equipment at their own expense.

USU Study, FY2007

In August, 2005, Utah State University (USU) was contracted to study the condition of wheel-lines installed under the Colorado River Salinity Control Program (CRSCP) prior to 1995. USU issued a final report for this study, "*Evaluation of Wheelmove Irrigation Systems Nearing End of Practice Life*".

This report was summarized in the FY2007 M&E report.

Of timely interest concerning the present replacement discussion is this quote from the study: ***"Summary findings from 128 responses to the interview question "If or when the present system wears out to the point it can no longer be repaired, how will you continue to irrigate?" indicated that: 88 (69%) would repair or replace with wheel lines, 10 (7.8%) would only replace with financial assistance, 16 (12.4%) would not replace with a wheel line but would change to pivot or flood, and 14 (10.9%) had other responses. The interviewer did not indicate that any cost-share money would be available."***

UACD Study, FY2008

In April, 2007, the Utah Association of Conservation Districts (UACD) was contracted to study the condition of CRSCP improved irrigation systems for which landowners had applied for EQIP contracts to replace or upgrade aging systems. UACD issued a final report for this study, "*Irrigation System Evaluation and Replacement Study*".

This report was summarized in the FY2007 M&E Report.

Of timely interest concerning the present replacement discussion is this quote from the study: ***"In response to the question, "If or when the present system wears out to the point it can no longer be repaired, how will you continue to irrigate?," if cost-share funds were available, 69% of respondents would like to upgrade to a more efficient system, 30% would install a similar system, and 1% would consider returning to flood irrigation. If no cost-share assistance is available, 32% would use other programs or loans to upgrade their systems, 62% would simply replace their systems, and 6% would consider flood irrigation."***

Irrigation Water Management (IWM)

The goal of IWM is to assure that irrigated lands 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 limited over-irrigation.

Crops generally use water before irrigation begins and after irrigation ends, leaving the soil moisture profile partially depleted. Filling the soil with water may require additional water in the spring. (Figure 14) Some over-irrigation and deep percolation is necessary to leach salt buildup from the soil (leaching fraction), and is designed into the system.

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

Cooperator interest is enhanced by creating financial incentives for IWM. To fulfill their contractual obligation and collect payment for the IWM practice (449), a cooperator must accomplish three things:

1. Attend a two hour IWM training session, attend an approved water conference, or receive one-on-one training on their farm
2. Keep detailed irrigation records using the IWM Self-Certification Spreadsheet
3. Review the records with an NRCS employee or contractor trained to evaluate and explain IWM principals

Starting in FY2008, an additional "intensive" IWM practice was made available that pays a higher rate if the cooperator also purchases, installs, and utilizes a soil moisture monitor.

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

Irrigation Record Keeping

To help with irrigation timing, NRCS - Utah has developed and provided the "IWM Self-Certification Spreadsheet" which allows cooperators to graphically compare actual irrigation with mathematically modeled crop evapotranspiration (ET), using either long-term averages or near-real-time climate data. ET 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 spreadsheet incorporates input forms to enter system design information and irrigation records (figure 13) and creates two graphs (figure 14).

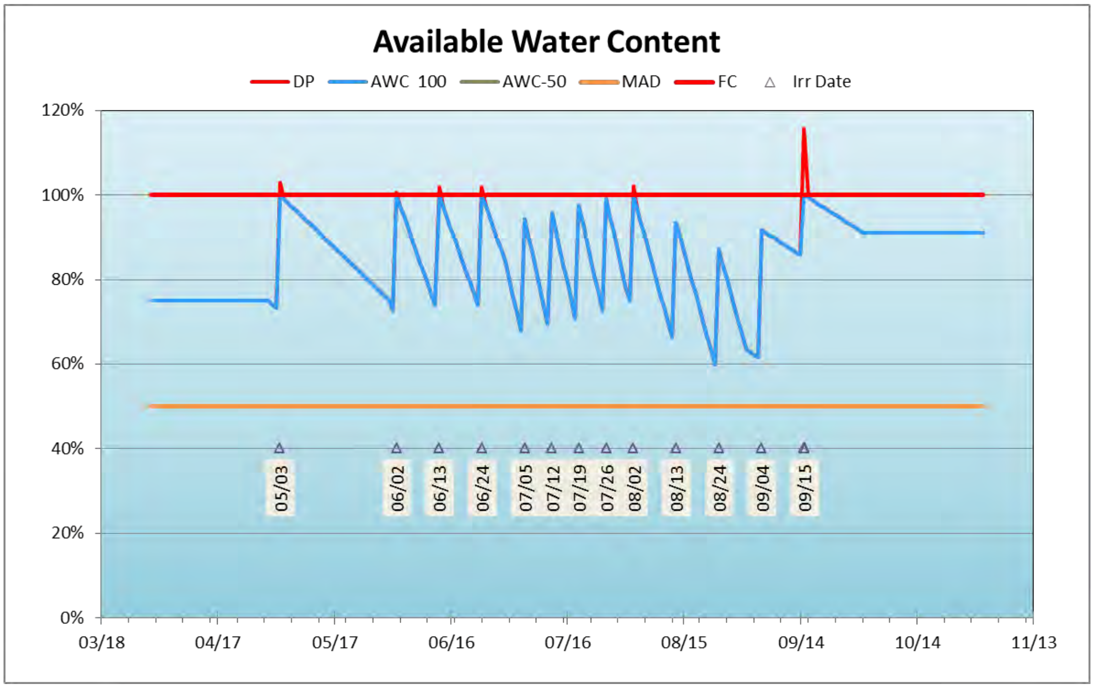
Irrigation Water Use Record - Farmer Self Certification

Cooperator:	Iris Irrigator	**Crop:**	Corn, Silage/Grain	**Year:**	2011
Tract/Field:	Tract 9	**Root Depth, ft:**	3.50		
Date:	01/30/12	**Station:**	Pelican Lake/Ouray	**CU:**	27 inches
		Contract Eligible Acres:	70.00		
Soil Texture:	Loamy Fine Sand	**Irrigation method:**	Pivot		
AWC, In/Ft:	2.16	**Efficiency:**	75%		
AWC Max, in:	7.56	**Evaluated Acres:**	129.98		
MAD, in:	3.78	**Evaporation %:**	10%		
Pre-season AWC, In.	5.67	**Cycle Hours:**	168		
		Flow rate, gpm:	900		

Start date of irrigation cycle	End date of irrigation	Total Cycle Hours	Alternate Cycle Hours	Flow, gpm	Inches Applied Cycle	Inches Applied Season	CU Season (Table)	Irrigation Gain	AWC	Deep Perc
05/03/11	05/10/11	168		900.0	2.31	2.31	0.20	2.11	7.56	0.22
06/02/11	06/09/11	168		900.0	2.31	4.63	2.46	0.05	7.56	0.05
06/13/11	06/20/11	168		900.0	2.31	6.94	4.63	0.15	7.56	0.15
06/24/11	07/01/11	168		900.0	2.31	9.25	6.80	0.15	7.56	0.15
07/05/11	07/12/11	168		900.0	2.31	11.57	9.55	-0.43	7.13	0.00
07/12/11	07/19/11	168		900.0	2.31	13.88	11.74	0.12	7.25	0.00
07/19/11	07/26/11	168		900.0	2.31	16.19	13.93	0.12	7.37	0.00
07/26/11	08/02/11	168		900.0	2.31	18.51	16.12	0.12	7.49	0.00
08/02/11	08/09/11	168		900.0	2.31	20.82	18.20	0.24	7.56	0.17
08/13/11	08/20/11	168		900.0	2.31	23.14	21.00	-0.49	7.07	0.00
08/24/11	08/31/11	168		900.0	2.31	25.45	23.81	-0.49	6.58	0.00
09/04/11	09/11/11	168		900.0	2.31	27.76	25.77	0.35	6.93	0.00
09/15/11	09/22/11	168		900.0	2.31	30.08	26.26	1.82	7.56	1.19
Total inches of water applied during the season (total of all lines above):								30.08		1.93
Total Acre Feet Applied during the Season:								325.8		
Seasonal Irrigation Efficiency (CU requirement/inches of water applied per acre):								87%		

Figure 13. Sample IWM Self Certification Spreadsheet – Data entry page

System design, climate, crop, and soil data are entered into this sheet. Then all that is required is the start date of each irrigation cycle. The spreadsheet makes the calculations and tracks AWC and deep percolation. For maximum crop growth, AWC must be maintained in the upper 50% of its range. Some deep percolation is designed into each system as a leaching fraction to avoid buildup of salts in the soil.



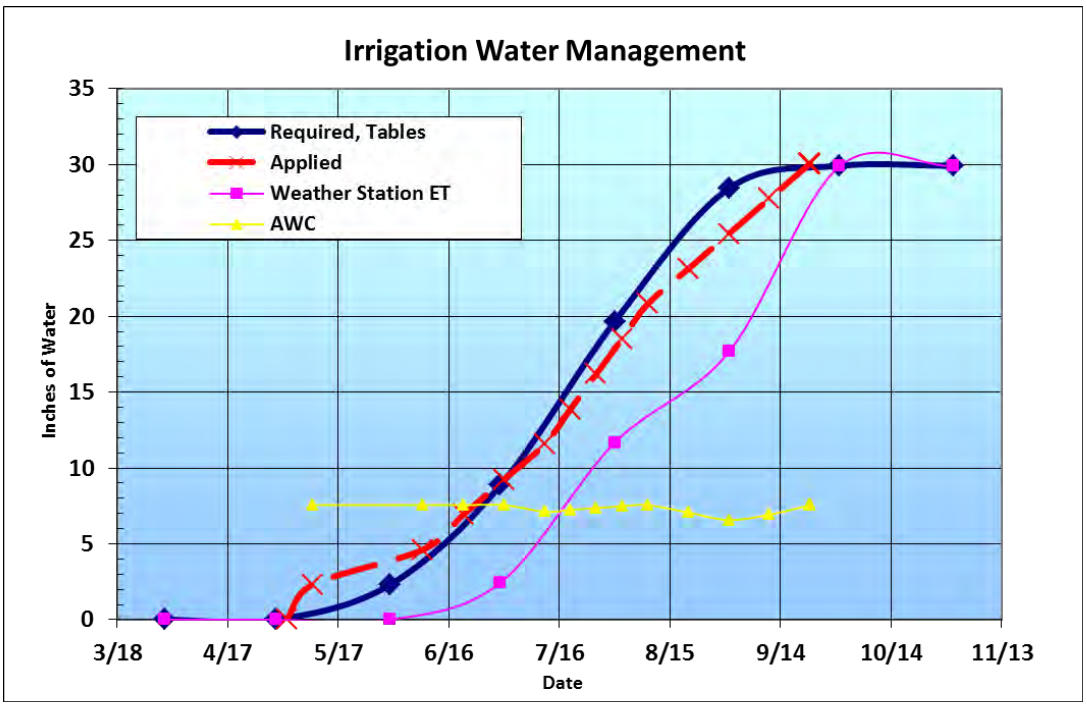


Figure 14. Sample graphs from the IWM Self Certification Spreadsheet.

In the top graph, the blue line is AWC in the soil. Red spikes above the red 100% line are deep percolation. In the bottom graph, the blue line is the long-term average water requirement, based on location and crop. The red line is the actual water applied. Where data is available, the purple line is modeled from near real-time data collected at a nearby weather station. The yellow line indicates AWC.

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

IWM incentive payments have created the opportunity to meet with sprinkler owners, discuss IWM principles, and graphically illustrate how they can reduce deep percolation and increase production by properly timing irrigation and keeping quality records. NRCS personnel anticipate that nearly all new sprinkler owners will improve their IWM in future years, based on IWM training and their expressed interest in irrigation water management.

Since FY2006, 1,065 completed IWM Self Certification Spreadsheets have been delivered to the M&E team, representing 31,300 acres. On an acreage basis 65% had no deep percolation, 18% were within design limits of deep percolation for the irrigation system, and 17% exceeded design limits of deep percolation. (Figure 15)

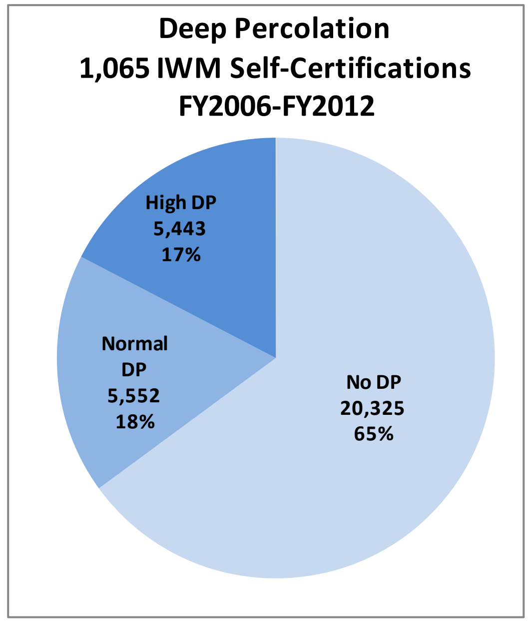


Figure 15. Acres with deep percolation from IWM Certification Spreadsheets

Seven years of IWM Self-certification data indicates that the average actual volume of deep percolation is about 67% of the expected volume, based on normal leaching fractions and system efficiencies.

Soil Moisture Monitoring

A historically proven method for timing irrigation involves augering a hole and determining the water content of the soil to help decide when the next irrigation should be applied. 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 operators in the use of another tool for timing irrigation - modern soil moisture monitoring systems, utilizing electronic concentric granular matrix sensors to measure soil water tension. Soil water tension can be read with a portable electronic reader or automatically recorded with a data recorder. The IWM incentive payment is higher for participants that elect to install soil moisture monitors. Such systems can be installed for as little as $700, giving the operator information, at a glance, about the water content of their soil at multiple depths and locations.

In a typical case, water tension sensors are installed at three or more different depths, such as 12", 24" and 48", along with a single temperature sensor. Using a simple data recorder, indicated soil pore pressure (implied soil moisture content) is sampled 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 16)

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. In the Uintah Basin, three installed data recorders indicate that deep percolation occurs less than 5% of the time on monitored fields.

Figure 16. Soil Moisture data recorder with graphing

If soil characteristics are known, recorded soil moisture data can be used to accurately estimate AWC. The lower limit of the Readily Available Water Content (RAW) may fall in the range of -80 to -120 centibars. Assuming a linear relationship from 0 to -200 centibars, and knowing the AWC/foot of soil, the soil profile can be divided into layers and total AWC estimated for each layer, knowing soil pore pressure (and derived saturation), layer thickness, and capacity. Summing AWC for all layers yields total AWC for the soil profile.

Since actual water storage characteristics are highly variable, based on soil properties, calibrating a soil moisture monitor to accurately reflect actual AWC is tedious. However, the soil moisture monitor is still a useful tool to indicate when water is needed, if operators pay enough attention to get a sense for what it is telling them.

In a graph of AWC, based on recorded soil moisture data, each irrigation cycle is clearly visualized. (Figure 17)

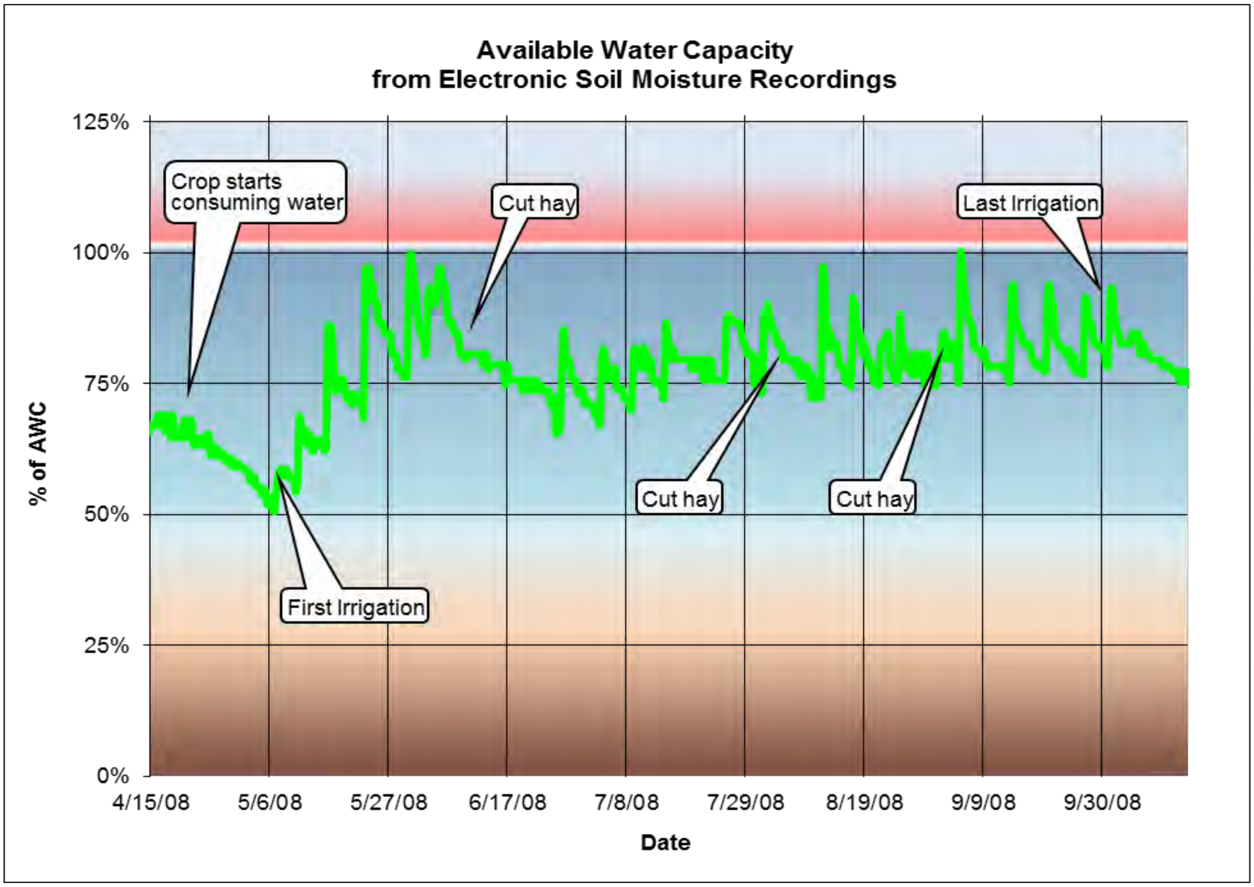


Figure 17. AWC from Soil Moisture Data graphed in Microsoft Excel

This rich loam soil absorbs moisture readily and has good water storage characteristics. In early spring, alfalfa starts to grow, pulling stored moisture from the soil. Irrigation begins, adding water to the soil profile. Each pass of the pivot is a peak in the curve. It is simple to pick cutting times and down times where peaks are missed and total soil moisture declines then peaks because the cut hay uses less water than applied. At the end of the season, irrigation ends, but the crop continues to draw water from the soil profile for a few weeks, leaving soil moisture partially depleted. The soil moisture profile was kept in the MAD zone from 50% to 100% of AWC, through the entire irrigation season, yielding a satisfying crop.

Equipment Spot Checks and Uniformity Evaluation

Catch-can Testing

Since FY2005, catch-can tests have only been ran on request. As reported in the FY2005 M&E Report, for wheel lines, catch-can testing is most useful to evaluate design, but is not particularly useful in determining condition, since three adjacent sprinkler heads, appearing to be the best functioning, are typically picked to run the test, assuring an optimum outcome.

Operating Sprinkler Condition Inventory

After a three-year hiatus, a field inventory of sprinklers was resumed in FY2012. In contrast to inventories in FY2006-FY2008, all sprinklers and gated pipe are being 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 are mapped and logged using a laptop computer running ArcGIS, connected to a simple field mapping GPS receiver (Garmin GPSMap 76). Using the National Agricultural Imaging Program (NAIP) 1 meter true color image as a base map, each observed system is sketched into a shapefile and attributes recorded. The following rules are used for data collection:

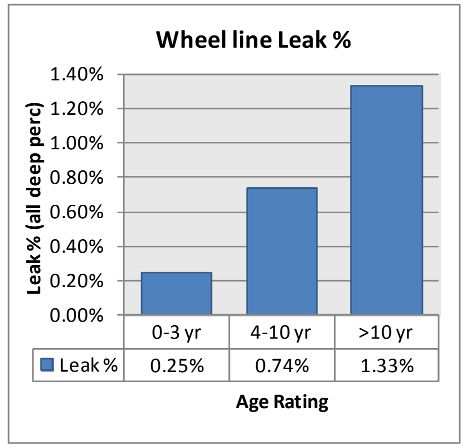


Figure 18. Average wheel-line leakage versus age.

Age iss estimated visually and rated: 1 = 0-3 yrs, 2 = 4-10 yrs, 3 = >10 yrs.

Condition is rated visually: 1 = no repairs needed, 2 = repairs needed, 3 = not useable without major repairs, and 9 = not operating.

Leaks from hoses, drains, heads, and other sources are evaluated visually and the total gallons per minute (GPM) leakage estimated for the system.

Sprinkler length is calculated from the shapefile.

Acres are 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).

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

Age is a major factor in system condition and overall leakage, as would be expected. (Figure 18) However, even with the oldest systems, average leakage amounts to only 1.33% of water applied, much smaller than evaporation, and somewhat minor in the overall scheme of things. Most leaks could be avoided with consistent, quality maintenance. There are more than a few 25 year old systems operating with no leaks.

Over six years, 2,390 systems have been visually evaluated for age, leaks, and general condition. Of those evaluated, 1,273 are operating wheel lines, pod-lines, or hand-lines.

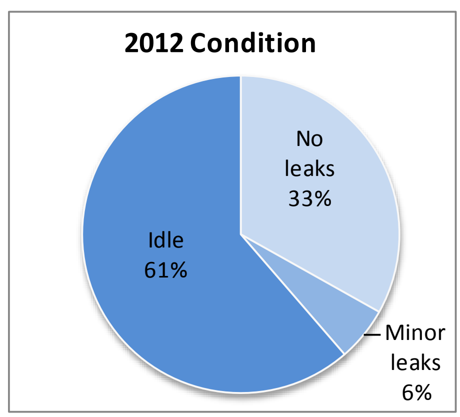


Figure 19. FY2012 Irrigation system condition.

In FY2012, all irrigation systems were inventoried, whether operating or not, all in June. Of three-hundred-twenty-six systems, one-hundred-twenty-six, or thirty-nine percent were operating. Operated as designed, one would expect that well over seventy percent would be in operation, even in June. The implication is that a large number of participants are likely under-irrigating, reducing deep percolation well below estimated levels. (Figure 19)

Long-term Sprinkler Water Budgets

Long term monitoring of water budgets on fields has ended. The effectiveness of salinity control gains from irrigation improvements is well established.

Wildlife Habitat and Wetlands

Background

In accordance with "*The Framework Plan for Monitoring and Evaluating (M&E) the Colorado River Salinity Control Program" (USDA-NRCS 2002),* first issued in 1980 and later revised in 1991 and 2002, wildlife habitat monitoring in the Uintah Basin was performed from 1984 to 1999 at 90 selected sites throughout the area. These 90 sites were monitored on a three-year rotation by visiting 30 sites each year. A monitoring team collected data on site for habitat quality to be evaluated, utilizing Habitat Evaluation Procedures (HEP, 1980).

Along with 90 HEP sites, 18 vegetative transects were monitored using species frequency sampling methods and a Daubenmire cover class frame. These transects are located on various parts of the landscape, and were also evaluated on a three year rotation period by evaluating six transects per year. The purpose of the information gathered from these transects was to provide insight into changes occurring in habitat composition and also changes in wetland plant communities.

Due to a decrease of funding, 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 new Monitoring and Evaluation (M&E) team.

In 2002 "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 is 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, to 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 Salinity Control Program to the present.

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 wetlands within Salinity Units.

Classification of 30-meter Landsat images is an efficient tool for quantifying and assessing land cover classes on large scale projects where there are large tracts of similar vegetation. The M&E team has 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 wetlands and wildlife habitat areas; once located, detailed mapping of actual 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 is also 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.

In 2005 the M&E team decided to redirect its methodology to include more precise measurement of actual habitat extents by incorporating detailed mapping, establishment of permanent photo points, and smaller-scale case studies. This methodology is still in effect as of the current date, or until other more effective methods become available.

1980 Utah Division of Water Resources Water Related Land Use (WRLU)

In 1971, the Utah Division of Water Resources published *Water Related Land Use in the Uinta Hydrologic Area.*

In 1980, the Center for Remote Sensing and Cartography of the University of Utah Research Institute updated the *Water Related Land Use inventory for the Uintah Basin*. This update was done in cooperation with Utah Division of Water Resources (Water Resources), USDA Soil Conservation Service, and National Aeronautics and Space Administration. The 1980 update is the second in a series of land use inventories that has evolved into Water Resources' Water Related Land Use (WRLU), a GIS layer updated every five to seven years and made available to the public.

While the 1971 and 1980 WRLUs focused specifically on wetlands, later versions emphasize crops and have little wetland data. The 1980 version is deemed to be more relevant to salinity projects, installation of which began in 1980, and is assumed to be the source document for indentifying wetlands in the original 1982 EIS.

The 1980 WRLU was developed by categorizing land use on the basis of a Color Infrared (CIR) image shot from a U2 reconnaissance aircraft and overlaid onto a contemporary 60 meter Landsat image. The stated objective of this study was to "…classify and map the wetlands and "water-related" land use of the Uinta Basin". Thirty-eight USGS 7½ minute quadrangles were mapped. The final product included data tables and a Mylar overlay for each quadrangle, depicting polygons of each category, to be overlaid on USGS 7½ minute Quadrangle maps. The Mylar overlays were to be kept on file at Water Resources. When attempting to access overlays, none could be found at Water Resources. NRCS' M&E team has located copies of all but one of the overlays (Myton Quadrangle). Thirty-seven overlays have been digitized for use in evaluating changes in habitat associated with salinity control projects.

Land cover mapping is a subjective science. It is unlikely that multiple detailed land cover maps of the same area and time would yield reproducible results. Past attempts by M&E at creating new land cover maps using Landsat images and remote sensing techniques proved futile, largely because typical wetlands were relatively small compared to the 30 meter resolution of newer Landsat images, but also because the landscape is continually changing and one good rain storm can immeasurably alter the landscape and its associated image. That is to say, a large rainfall would greatly increase detected wetlands on the next image, if the same digital signatures were used for categorization.

With the ability to electronically overlay the 1980 WRLU on modern aerial images, it is possible to detect changes from 1980 to later images. A detected difference in land use must indicate either a change in use or an error in the original classification.

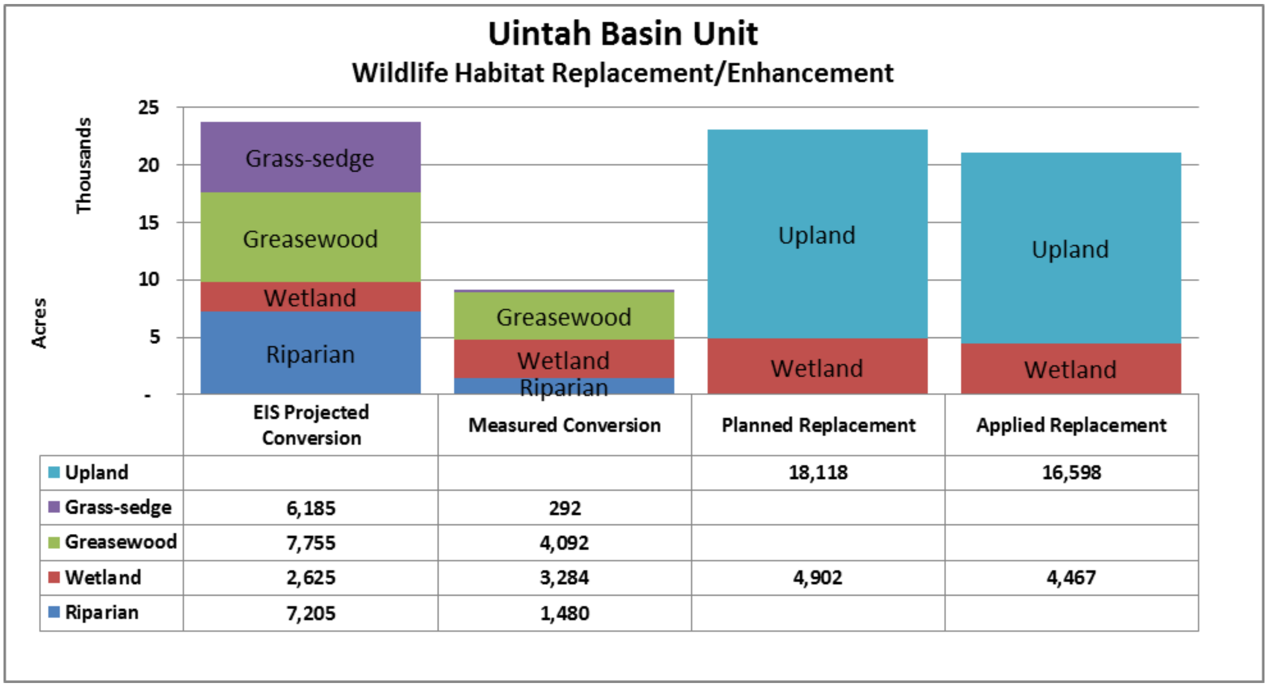
For the Uintah Basin, digital orthoimagery is available in gray scales from the 1990s. Color and infrared imagery is available for later dates, the most recent being the one meter National Agricultural Image Program (NAIP) from 2011 (in four bands, including infrared). The 2006 NAIP is also available in CIR and high resolution (one foot) for agricultural areas. Near the end of 2012, the Utah Geological Survey (UGS) completed an old aerial-photography layer consisting of a mosaic of the oldest available agricultural aerial-photos from Soil Conservation Service archives (mid 1930s).

By overlaying the 1980 WRLU on the NAIP, it is reasonably straight forward to determine if a polygon classified as wetland in 1980 is no longer wetland on the image date. However, without a contemporary image, it is impossible to verify that it was indeed wetland in 1980. Using the 2006 NAIP, M&E evaluated wetland changes on four quadrangles; Bridgeland, Hancock Cove, Vernal NE, and Altonah.

The 1982 EIS for the Uintah Basin Unit combined eleven wetland types into four categories, greasewood, riparian, wetland, and grass-sedge. The EIS indicated that in the worst case, 37% of acres in these four categories might be converted to upland habitat as the result of irrigation system improvements. The four quadrangles studied by M&E contain 17% of 1980 WRLU wetland acres in the same four categories.

Through FY2012, 154,300 acres have been treated with improved irrigation systems, 125% of the 122,200 acres originally projected for treatment. Based on the four quadrangles analyzed, an estimated 9,100 acres have been converted from wetland to upland habitat, compared to 22,200 acres projected by the original EIS. (Figure 20, first two bars) In the same time frame, 4,500 acres of wetland replacement or improvement has been applied along with 16,600 acres of upland habitat improvement. (Figure 20, last two bars)

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).



	EIS Projected Conversion	Measured Conversion	Planned Replacement	Applied Replacement
Upland			18,118	16,598
Grass-sedge	6,185	292		
Greasewood	7,755	4,092		
Wetland	2,625	3,284	4,902	4,467
Riparian	7,205	1,480		

Figure 20. Wildlife habitat management cumulative status

The Uinta Basin Salinity unit has far surpassed this proportion and as of this report the unit is considered concurrent and proportional with salinity irrigation improvements. 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 losses incurred by the Colorado River Salinity Control Program.

Basin Wide Wildlife Habitat Monitoring

Permanent photo points, representative of locations throughout the Uinta Basin of wetlands, wildlife habitat, agricultural areas, and areas where pipelines have recently been built were selected in FY2007 and a protocol established to compare across the years. Photographs will be taken near the same date annually, and compared.

Wildlife Habitat Contract Monitoring

In FY2012 two Environmental Quality Incentive Program (EQIP) wildlife habitat improvement projects were planned and funded in the Uinta Basin for a total of 16 acres. No Wildlife Habitat Incentives Program (WHIP), Basin States Parallel Program (BSPP), or Basin States Program (BSP)

Table 9. FY2012 Wildlife habitat acres planned and applied

Acres of Wildlife Habitat Creation or Enhancement by Program				
FY2012 Annual practices				
Program	Acres Planned		Acres Applied	
	Wetland*	Upland	Wetland*	Upland
EQIP	-	16	12	100
BSPP	-	-	-	-
BSP	-	-	-	-
WHIP	-	-	-	-
Total	**-**	**16**	**12**	**100**

*Wetland habitat type includes riparian areas projects were planned or funded in FY2012 in the UB Salinity Area. (Table 9)

Cumulative wildlife habitat replacement/enhancement is summarized, by program, in table 10.

Tables 11 and 12 provide more insight as to the amount of money spent on the ground for wildlife habitat replacement using EQIP, BSPP, BSP, and WHIP funding.

Table 10. Cumulative Wildlife habitat acres planned and applied by program

Acres of Wildlife Habitat Creation or Enhancement by Program				
FY2012 Cumulative practices				
Program	Acres Planned		Acres Applied	
	Wetland*	Upland	Wetland*	Upland
CRSCP	2,600	12,799	2,600	12,799
IEQIP	-	-	-	-
EQIP	2,172	4,760	1,847	3,348
BSPP	128	395	19	326
BSP	-	-	-	-
WHIP	2	164	1	125
Total	**4,902**	**18,118**	**4,467**	**16,598**

*Wetland habitat type includes riparian areas

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.

Table 11. Annual Habitat Obligated, nominal and 2012 dollars.

FY	Contracts	Obligation	Wetland Planned	Upland Planned	PPI Factor	Normalized Obligation
	Number	$	Acres	Acres		2012$
1997	1	$1,350	12	10	184%	$2,483
1998	2	$8,500	30	100	189%	$16,039
1999	0	$0	0	0	189%	$0
2000	1	$2,566	1	17	181%	$4,640
2001	0	$0	8	27	176%	$0
2002	1	$2,566	0	15	175%	$4,491
2003	8	$35,113	75	257	170%	$59,528
2004	4	$96,528	95	2,597	163%	$157,493
2005	7	$131,476	68	199	152%	$199,513
2006	7	$227,360	87	395	147%	$333,360
2007	8	$590,663	1,794	219	137%	$811,224
2008	3	$119,977	44	67	123%	$147,092
2009	3	$122,744	53	101	119%	$145,548
2010	10	$396,068	36	1,263	114%	$449,981
2011	4	$139,334	0	39	106%	$147,491
2012	2	$25,424	0	16	100%	$25,424
Totals	61	$1,899,669	2,302	5,322		$2,504,306

Voluntary Habitat Replacement

NRCS continues to encourage replacement of disturbed 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, and Soil Conservation District meetings throughout the Salinity Areas. The Utah NRCS Homepage (http://www.ut.nrcs.usda.gov) also has information and deadlines relating to Farm Bill programs.

Table 12. Annual Habitat Applied, Nominal and 2012 Dollars

FY	Payments	Wetland Applied	Upland Applied	PPI Factor	Normalized Payments
	$	Acres	Acres		2012$
1997	$0	100	40	184%	$0
1998	$4,545	24	17	189%	$8,576
1999	$12,132	0	8	189%	$22,893
2000	$8,259	1	17	181%	$14,936
2001	$15,601	8	26	176%	$27,524
2002	$6,883	0	15	175%	$12,045
2003	$8,098	14	9	170%	$13,729
2004	$58,274	24	103	163%	$95,079
2005	$63,760	56	154	152%	$96,755
2006	$95,996	78	247	147%	$140,751
2007	$130,184	212	125	137%	$178,796
2008	$269,661	452	2,308	123%	$330,605
2009	$243,614	617	143	119%	$288,873
2010	$128,652	342	256	114%	$146,164
2011	$192,540	34	279	106%	$203,812
2012	$92,946	12	100	100%	$92,946
Totals	$1,331,145	1,974	3,847		$1,673,483

Case Study: West Roosevelt Airport Project (WRAP)

Background

The WRAP was funded in 2010, and is located near the eastern boundary of Duchesne County, approximately four miles southwest of Roosevelt, Utah. The Roosevelt Airport is located approximately one mile east of the property boundary (Figure 19).

The property comprises about 120 acres of land including two single family homes and a small alfalfa field on the western end. One hundred and eight (108) acres of land were offered to be included in the Wildlife Habitat Conservation Plan, under wildlife land use, excluding the headquarters and the alfalfa field.

Most of land had been heavily grazed by cattle (longhorns) and horses and dominant vegetation consists of grease wood, sagebrush, tamarisk, inland saltgrass, Russian knapweed, and alkali sacaton in the uplands. There is also approximately 10 acres of wetland/riparian areas dominated by buffaloberry, Russian olive, tamarisk, narrowleaf and Fremont cottonwood, inland saltgrass, wiregrass, rushes, and a variety of weed species.

As seen on the aerial imagery (Figure 20), much of this and surrounding land has been impacted by an abundance of water and salt leaching, the northern half of the property is comprised of loose sand dunes and sandstone outcrops with a few Utah juniper growing among the rocks. There is a spring and a pond that begins in the middle of the property and the drainage moves off to the southeast. There are a series of springs that emerge along the transition of two soil layers, a sandy soil and a silty clay soil, creating several wet areas across the landscape.

The area was primarily used as a grazing pasture until the landowner built a small pond on one of the springs and started to change the land use to more recreational activities. This shift in land use is what prompted the landowner to seek out NRCS for technical and financial assistance to enhance the area for wildlife and recreational use.

Figure 21. Location Map for WRAP

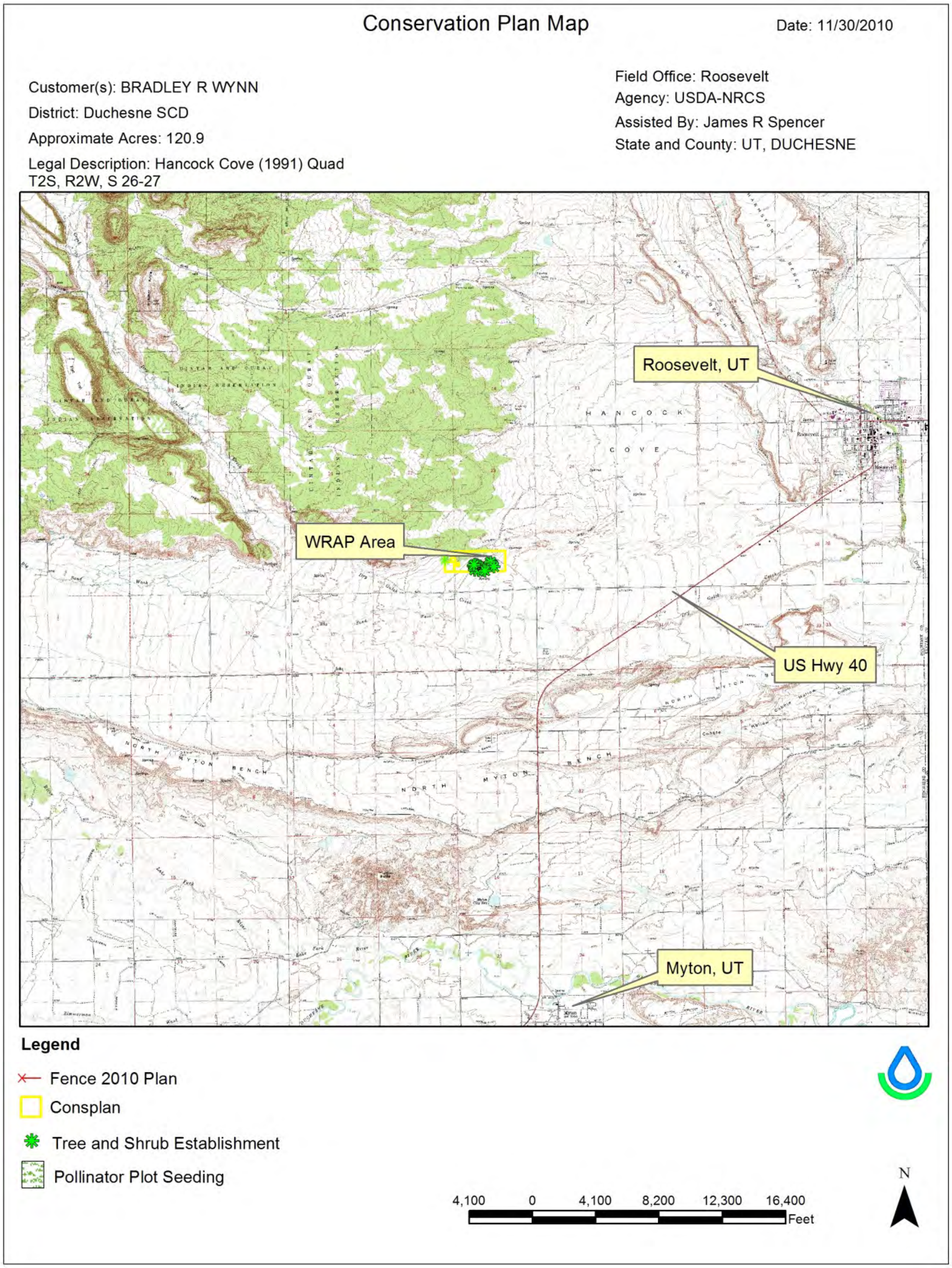
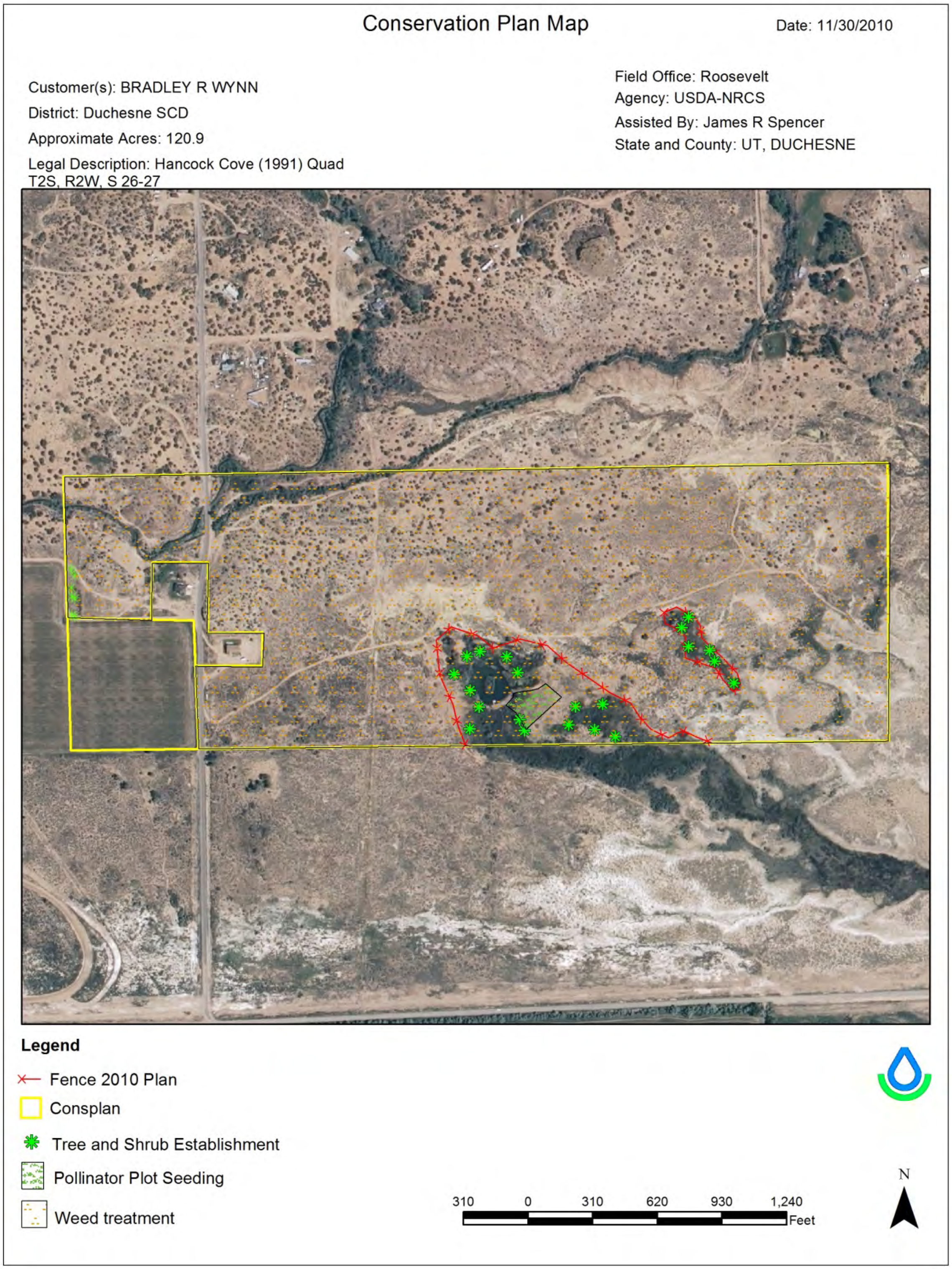


Figure 22. Wildlife Habitat Development Plan Conservation Plan Map for WRAP



Objectives

WRAP, just as many other wildlife salinity replacement projects, is a comprehensive Conservation Plan with multiple objectives. Aspects of this project that facilitated funding were: location in the landscape, nature of the habitat (riparian/wetland), range and pasture management, noxious weeds, poor native bee foraging habitat, upland and big game species, and family recreation. Most objectives revolve around these circumstances and are listed below, in no particular order:

- Control land degradation by livestock and improper grazing practices. Year-round grazing above carrying capacity resulted in erosion, land degradation, loss of native woody and herbaceous plant species, and noxious weed infestation.
- Eliminate or greatly reduce noxious weeds throughout the property. Russian Knapweed (*Centaurea repens*), perrenial pepperweed (*Lepidium latifolium*), and tamarisk (*Tamarix chinensis*), exist on the property to the detriment of the land and the exclusion of native species.
- Wildlife food, shelter, and cover such as woody and herbaceous vegetation were lacking or of poor quality. Woody vegetation throughout the property primarily consists of buffaloberry, tamarisk, Russian olive, and golden currant. Little or no recruitment of native woody riparian vegetation was present before project inception because of livestock herbivory. Herbaceous vegetation was dominated by inland saltgrass, wiregrass, and noxious weeds.
- Lack of flowering plants pollinated/visited by native bees, wasps, and flies was also a resource concern the landowner wanted to address. There was plenty of bare, soft, sandy soil where ground nesting bees prefer to dig burrows, but there was very little forage in the vicinity of the available habitat. Several colonies of ground nesting bees were found near the landowner's home, along his driveway, due to the presence of flower gardens along his home; none were observed on or near the existing potential nesting habitat.
- Beautifying area for a more aesthetic experience for landowner family while recreating. Benefits would be more green vegetation on landscape due to controlled grazing. Fewer manure piles on pond dike and in pond. Cooler temperatures in summer due to the growth of trees, shrubs and other vegetation.

Results

On-the-ground meetings took place March through May of 2010 with the landowner to assess the resource concerns/objectives. From these meetings consensus was achieved and the following practices were included in the Wildlife Habitat Conservation Plan:

- 4,065 feet riparian buck and pole fence
- 500 trees and shrubs w/ weed barrier and protector tubes
- One acre pollinator wildflower seeding
- 108 acres of weed spraying (pest management) over three years
- 108 acres of wildlife habitat management monitoring payments over three years

Most practices were applied and completed in 2010, and 2011; by 2012 all practices but one last weed spraying was complete. The landowner was prompt in keeping with the timeline of the schedule of operations and the project was in compliance and results were becoming visible and were being documented photographically (see Photo Gallery below). Last practice was completed in late December 2012 and payment was delivered in early 2013. Project is now complete and is operating under an Operation and Maintenance Agreement for the life of installed practices.

Figure 23. Aug 14, 2010; looking south, on west edge of riparian habitat

Figure 24. Aug 14, 2010; looking north, on west edge of riparian habitat

Figure 25. Aug 14, 2010; looking south, from north edge of riparian habitat

Figure 26. Aug 14, 2010; looking northwest, from north edge of riparian habitat


Figure 27. Aug 14, 2010; looking southwest, from pond embankment at wetland habitat


Figure 28. Apr 26, 2011; looking southwest, from pond embankment at wetland habitat; newly planted trees

Figure 29. Aug 14, 2010; looking south, at area of pollinator planting and tree/shrub planting

Figure 30. Jul 22, 2011; looking southwest, at area of pollinator planting and tree/shrub planting

Figure 31. Aug 14, 2010; looking southeast, at area of pollinator planting and tree/shrub planting

Figure 32. Jul 22, 2011; looking southeast, at area of pollinator planting and tree/shrub planting

Figure 33. Aug 14, 2010; looking south, at area of pollinator planting and tree/shrub planting

Figure 34. Apr 26, 2011; looking south, at area of pollinator planting and tree/shrub planting

Figure 35. Apr 26, 2011; looking west, at area of pollinator planting and tree/shrub planting

Figure 36. Apr 26, 2011; looking west, at area of pollinator planting and tree/shrub planting

Figure 37. Apr 26, 2011; Pollinator plant seedlings emerging

Figure 38. Apr 26, 2011; Pollinator plant seedlings emerging

Figure 39. Jul 22, 2011; Rocky Mountain beeplant and bumblebee in pollinator seeding plot

Figure 40. Jul 22, 2011; Annual triticale grass was planted as a cover crop for the pollinator seed mix

Figure 41. Jul 22, 2011; Flowering annual plants and bare ground comprise optimal native bee habitat

Figure 42. Jul 22, 2011; Native ground nesting bee burrows were found throughout the pollinator seed plot

Discussion

The Conservation Plan has addressed all six resource concerns in the NRCS Conservation Planning Model: Soil, Water, Air, Plants, Animals, and Human aspects, and the needs for each acre have been considered in the planning process. It is anticipated that this project will be a success and a great asset to the Dry Gulch watershed.

NRCS will continue to monitor the progress of applied practices and supply the landowners with technical assistance and guidance for future improvements and resource concerns.

An "Issue" of Operation and Maintenance

In the late months of 2011, the landowner expressed to NRCS that the Bureau of Reclamation (BOR) and Utah Department of Agriculture and Food (UDAF), who administer the Basin States Parallel Program fund, were preparing to pipe the Hancock Cove Canal and that one of the proposed routes may come close to or intersect the WRAP. NRCS advised the landowner that any disturbances to the installed practices would need to be mitigated and replaced or the contract would be in non-compliance; and that potential impacts should be assessed to allow for the least amount of disturbance possible. UDAF awarded the Hancock Cove Canal pipeline project, Phase 1, to Dry Gulch Irrigation Company (DGIC) who, in turn, hired an engineering firm to design the pipeline and a habitat mitigation plan/project to account for losses of wildlife habitat incurred by all three phases of the Hancock Cove Canal pipeline project. Sometime in fall 2011 the preferred alternative was selected and was proposed to directly intersect the WRAP; straight through the wetland below the pond dike (Figures 41, 42). Unbeknownst to NRCS, DGIC and the engineering firm had been surveying the WRAP property most of the summer of 2011 taking resource inventory and planning a habitat mitigation plan. In January 2012 DGIC and the engineering firm approached NRCS and asked for a meeting concerning the wildlife habitat mitigation plan they had drafted for the WRAP. NRCS explained to DGIC that this land was already contracted under Wildlife Salinity EQIP funds for habitat replacement, and that 107.9 acres of the property had already been claimed by NRCS for salinity wildlife habitat replacement, as well as 117 acres on the adjacent property also having been claimed under the same program in another project. NRCS is still uncertain how the U.S. Fish and Wildlife Service will be able to tease out the acres of habitat replacement awarded to each respective agency where acres are being claimed by two separate agencies on the same piece of land. NRCS also explained that all disturbances to the habitat may place the landowner in non-compliance with their respective contract and that all disturbances must be replaced and contoured to their original state and elevations to maintain compliance.

The design was completed and the pipeline was constructed in late winter/early spring 2012. Problems arose when track-hoes entered the wetland to bury the 34 inch pipe; they began to sink. As a solution the engineering firm decided to leave the pipe above ground and pile fill on top of the exposed pipe to meet the NRCS Specification of having 30 inches of fill over the pipeline. This activity permanently impacted the wetland, destroyed eight trees/shrubs, and a portion of the pollinator planting installed by the WRAP. This action also placed the landowner out of compliance and jeopardized his contract. Meetings were held with UDAF, DGIC, and the engineering firm to determine the best course of action to remedy the impacts and ensure the landowner's contract was in compliance with the terms of the agreement.

The engineering firm reported to the US Army Corps of Engineers (USACE) that the total area of wetland impacts was 0.17 acres (7536 ft^2). As part of the mitigation for the impacts all parties agreed that the engineering firm would construct 0.17 acres of wetland habitat adjacent to existing wetlands and vegetate it with wetland plants. The firm also agreed to smooth out the "hump" left by the pipe and reduce the steepness of the slope of the mound so vegetation might be established there. The mound will also be seeded to help stem erosion.

A three year monitoring and maintenance protocol for the created wetland and its vegetation was agreed upon and all replacement trees and/or herbaceous "plugs" that died will be replaced for a minimum survival rate of 75%. A yearly photo inventory will be recorded from pre-determined photo-points. Noxious weeds will be identified and eliminated within the wetland mitigation site and areas where weeds are eliminated will be reseeded with native wetlands species.

A photo gallery of the impacts of the Hancock Cove Pipeline Project on the WRAP is illustrated on the following pages.

Figure 43. August 14, 2010, looking southwest at pond dike and adjacent wetland

Figure 44. June 5, 2012, looking southwest at pond dike and adjacent wetland

Figure 45. April 26, 2011 looking south at wetland area and tree/shrub planting

Figure 46. May 22, 2012 looking northeast opposite from above photo

Figure 47. May 22, 2012 looking northeast where pipe exits ground

Figure 48. May 22, 2012 looking northeast where pipe exits ground

Figure 49. May 22, 2012 looking southwest at pond outlet

Figure 50. May 22, 2012 looking southeast at pond outlet

Economics

Cooperator Economics

Production Information

Field studies completed in 1995 concluded that upgrading from unimproved flood irrigation to improved flood or sprinklers, increased alfalfa crop yields from about 2.5 tons/acre to about 4.5 tons/acre. This magnitude of increase is consistent with anecdotal information from diligent participants.

Alfalfa production data downloaded from the National Agricultural Statistics Service (NASS) indicates that alfalfa yields from the entire Uintah Basin Unit have increased from about 3.5 tons/acre to about 4.0 tons/acre since 1980, based on a linear regression of the data set.

With 154,000 acres treated out of 200,000 acres originally producing, the projected yield increase would be expected to be nearer one ton/acre than two.

However, more interesting than yields, are total production data. Total tons of alfalfa produced in the Uintah Basin has increased 57% since 1980, while alfalfa acreage has increased about 45%. From 1980 to 2011, average production increased from 170,000 tons/year to 267,000 tons/year, while alfalfa acreage increased from 48,500 acres to 70,200 acres (Utah Division of Water Resource's Water Related Land Use data indicates an acreage change from 41,000 to 90,000 acres for all hay land), implying a yield on the order of 4.5 tons/acre for acreage upgraded to alfalfa production from another crop, most often grass pasture (based on linear regression of the data). (Figure 51)

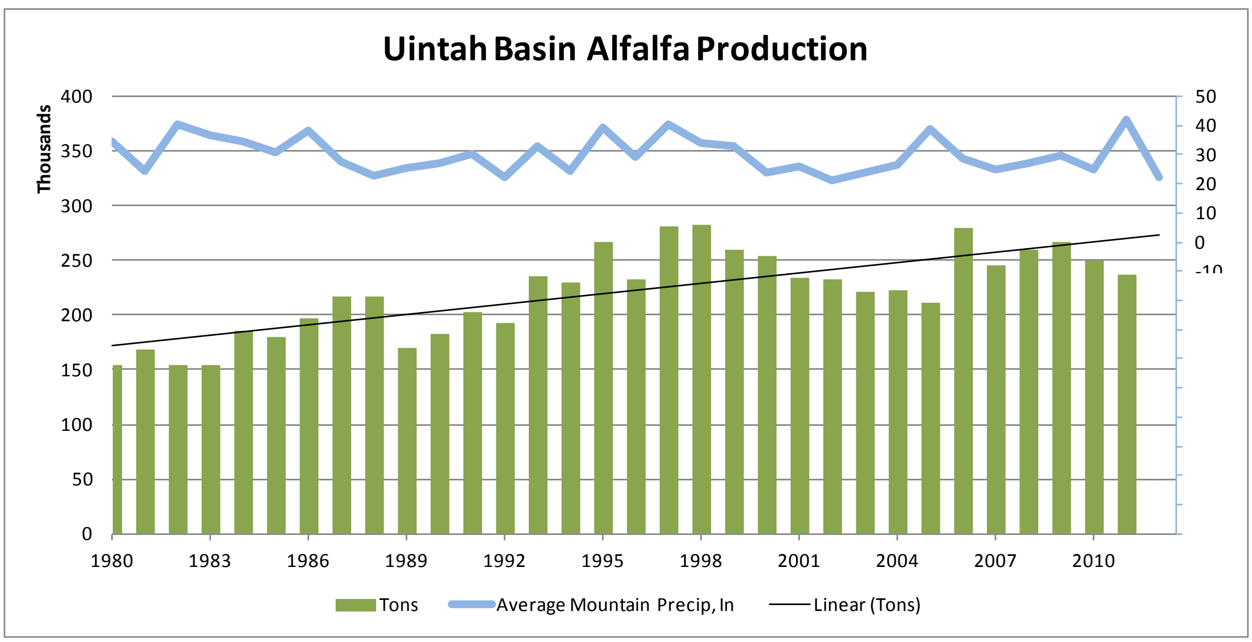


Figure 51. Alfalfa Production and Annual average mountain precipitation

Labor Information

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.

While numerical data seems inconclusive, anecdotal information is positive.

Since the majority of farmers (77%) reported in the 2007 Agricultural Census, do not hire outside labor, it is assumed that most cooperators are satisfied with their own personal labor savings. The 2007 Agricultural Census also reports that 66% of Uintah Basin farmers have full-time occupations other than farming. The local labor market seems steady.

Another perceived labor effect concerns an aging farmer population. Definitive data is not available, but it appears that most Uintah Basin farmers are beyond middle age, and are simply not willing or able to take water turns at night. A distinct preference for Center Pivot Systems has developed -- further evidence of a desire to reduce personal labor commitments.

Public Economics

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

Companies in the sprinkler supply business are now a significant part of the local economy and other sprinkler related businesses appear to be thriving. The availability of a strong local sprinkler business simplifies purchase, installation, and maintenance of sprinkler systems for the cooperator, and improves local competition and pricing.

With labor, material, and equipment prices rising, it is expected that the cost/ton of salinity control measures will also increase. However, the FY2012 average cost of $167/ton for planned practices is not the highest over the life of the program (in 2012 dollars). The cost of downstream damages from excess salt is an elusive target and not well defined. Colorado River Basin Salinity Control Programs are successful and cost effective in reducing salt load in the Colorado River.

<u>Positive public perceptions of the Salinity Control Program include:</u>

- Reduced salinity in the Colorado River and its tributaries
- 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

<u>Negative public perceptions of the Salinity Control Program include:</u>

- “Greening” of desert landscape
- Conversion of artificial wetlands to upland habitat and other shifts in wildlife habitat

- Changes in Land Use

Summary

Local landowners are willing and able to participate in salinity control programs. At present funding levels, there are ample applications for funding, to install improved irrigation systems and reduce salt loading to the Colorado River system. Participants are apparently satisfied with results and generally positive about salinity control programs.

Irrigation installation costs are escalating. Increased world energy prices have resulted in much higher costs for plastic pipe, transportation, labor, and equipment. The local economy is thriving, and upward pressure on labor and equipment prices is substantial.

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.

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 the uniformity of water application.

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) – Usually synonymous with evapotranspiration (ET), 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

CRSC – 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 – 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

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 – 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 assumed to be 60% of the total cost of conservation practices.

Gated Pipe – Water delivery pipe with individual, evenly spaced gates designed to put the same amount of water into each of many furrows.

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% for forage crops. 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. NASS provides the Producer Price Index for farm equipment purchased (PPI) used to normalize costs in this report.

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.

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 competitively prioritized based on their effectiveness in achieving federal goals. Applications may be screened into high, medium, or low priority prior to ranking.

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.

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)

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