MONITORING & EVALUATION REPORT--2011

SILT SALINITY AREA
COLORADO RIVER SALINITY CONTROL PROJECT
USDA-NRCS

IWM MONITORING & EVALUATION REPORT

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WILDLIFE MONITORING & EVALUATION

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M&E EXECUTIVE SUMMARY
EXECUTIVE SUMMARY
SILT UNIT
2011

Hydro-Salinity -

- The project plan is to treat approximately **2,800 acres** with improved irrigation systems.
- To date **1,467 acres** have been treated with improved irrigation systems.
- The project plan is to reduce salt loading to the Colorado River system by **3,990 tons/year** of salt.
- In FY 2011, salt loading has been reduced by **267 tons/year** as a result of installed salinity reduction practices.
- The cumulative salt load reduction is **2,107 tons/year**, or 53 percent of the project goal.

Cost Effectiveness –

- The planned cost per ton of salt saved with FY 2011 contracts (one year) is **$122.24 /ton.**
- The actual cost per ton of salt saved with prior year contracts is **$160.60 /ton**.

This figure is calculated as follows:

(FA + TA = Total Cost) X Amortization factor = Amortized cost
Amortized cost / Tons salt reduced = Cost/Ton
FA = Total dollars obligated in EQIP and Basin States/ Parallel Program (including wildlife)
Amortization for 2011 = 0.0623
TA = technical assistance cost: (FA x 0.67)

Wildlife Habitat Replacement -

- The original Silt replacement goal is **40 acres** of riparian/upland habitat and **10 acres** of wetland habitat developed or significantly enhanced.
- For Fiscal Year 2011 there were **19.4 acres** of riparian/upland habitat replacement applied
- To date, **19.4 acres** or 39% of the original cumulative wildlife habitat replacement goal has been established and is being maintained.
- Additional efforts are being made through wildlife only sign-ups, with various conservation groups, and with other Federal and State agencies to accelerate the implementation of wildlife habitat enhancement projects.
- Estimates of losses so far are as follows: Wetlands – 0 acres; Riparian/Ditches – 15.7 acres
- Mitigation efforts so far have yielded one contract

Key Considerations and Conclusions –

- Given the relatively low level of contracts in 2011, additional follow-up should be conducted to assess whether the 2,800 acre treatment goal is needed or achievable.
- If the 2,800 acre goal is determined to be realistic, additional out-reach may be needed to encourage participation.
- The new agreement for the Basin States Program funding may offer additional opportunities for both hydro-salinity and wildlife contracts the Silt area with landowners who may not meet EQIP eligibility requirements.
- A meeting was conducted with Bureau of Land Management, Bureau of Reclamation, US Fish and Wildlife Service, and NRCS to look for additional opportunities to develop or enhance wildlife habitat to meet the replacement goals.

HYDRO-SALINITY MONITORING AND EVALUATION, COLORADO

Introduction

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 (BOR). USDA was instructed to support BOR'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 the Soil Conservation Service (SCS). PL 98-569, also required continuing technical assistance along with monitoring and evaluation to determine the effectiveness of measures applied.

In 1995, PL 103-354 reorganized several agencies of USDA, transforming SCS into the Natural Resources Conservation Service (NRCS) and ASCS into the Farm Services 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 Food, Conservation, and Energy Act of 2008 reauthorized and amended EQIP, continue opportunities for USDA funding of salinity control measures.

Colorado River Salinity Control

The USDA-Natural Resources Conservation Service (NRCS), formerly USDA-Soil Conservation Service (SCS), both herein referenced as NRCS, initiated a program to make a variety of irrigation improvements to reduce deep percolation and on-farm ditch seepage to reduce the salt load potential to the Colorado River. Salinity control projects were initiated in Colorado starting with Grand Valley Unit in 1979, Lower Gunnison Unit in 1988, McElmo Creek Unit in 1989, Mancos Valley in 2004, and Silt in 2005. The NRCS irrigation improvement work included piping or lining irrigation ditches and small laterals, and improving the on-farm irrigation systems. In 1982 the NRCS identified the need to establish an irrigation monitoring and evaluation program for Grand Valley to assess the effects to deep percolation and seepage from making the various irrigation improvements, and to assess economic impacts and wildlife habitat replacement activities.

The NRCS developed a Monitoring and Evaluation Plan to assess the effects of the Colorado River Basin Salinity Control Program being implemented, "Monitoring and Evaluation Plan, Colorado River Basin Salinity Control Program for Grand Valley Unit, Colorado and Uinta Basin Unit, Utah, July 1982." The long-range monitoring plan described uniform guidelines and procedures to assess the effectiveness of the NRCS program to reduce salt loading to the Colorado River, to determine the

effects of the irrigation improvements on wildlife, and to identify the monetary benefits to the individual participants.

The Natural Resources Conservation Service (NRCS) has been placing improved irrigation methodology with selected cost-sharing to cooperators since 1979 through the Colorado River Salinity Control Program. Irrigation in the Colorado salinity control areas is characterized by mostly gravity-fed systems installed on heavy clayey soils or medium textured soils derived from or overlaying a marine shale formation (typically Mancos shale) that is very saline. The intake rates of the soils are generally low to medium. Plentiful and inexpensive irrigation water coupled with the long irrigation set times, and typically abundant flow rates contribute to the potential salinity mobilization. The available irrigation water and lower efficiency irrigation systems leads to excess deep percolation loss of water and low application efficiencies. The excess water from deep percolation contacts the underlying Mancos shale and subsequently loads salt to the Colorado River. Deep percolation and ditch seepage are considered to be the primary indicators of the effectiveness of the irrigation application.

A variety of irrigation systems were evaluated including earthen ditches with earth feeder ditches, earthen ditches with siphon tubes, concrete ditches with siphon tubes, ported concrete ditches, pipeline to gated pipe, side roll sprinklers, and micro spray. Crops included alfalfa, corn, small grain, dry beans, orchards, grapes, onions, pasture, and vegetables. This monitoring of irrigation system performance took place through the Salinity Program period from 1984 through 2003. The monitoring of wildlife and economic impacts started with each project and continues throughout the life of the project.

Colorado NRCS initiated irrigation monitoring in the Grand Valley Unit in 1984 and to a limited extent in the Lower Gunnison Unit in 1992 and the McElmo Unit in 1993. The irrigation monitoring was designed to assess deep percolation changes and estimate changes to the salt loading derived from irrigated agricultural lands. Those assessments provided a baseline of deep percolation characteristics on agricultural land, and have been used by NRCS to make management decisions related to salinity control projects. Colorado State University, Cooperative Extension took over the irrigation monitoring activities from 1999 through 2003 utilizing the NRCS equipment and similar sampling techniques. The NRCS also conducted selected economic analysis and wildlife habitat analysis in all of the project areas.

The irrigated monitoring sites were selected to represent the variety of conditions common in the salinity control units. The need was identified for each irrigation event to be monitored and evaluated throughout the irrigation season for each site. From the NRCS Monitoring and Evaluation Plan, “Data will be collected to determine the amount of irrigation water infiltrated into the soil.” “For each site on-farm water budgets will be prepared for each irrigation event, starting with pre-plant or start of growing season until crop harvest. The most significant output from the water budget is deep percolation.” The plan proposed water budget was, “…deep percolation equals the amount of inflow plus rainfall prior to or during the irrigation event, less surface runoff and the net irrigation requirement [expressed as the amount of water needed to bring the soils profile to field capacity].” Data was compiled for 289 site years of measured irrigation inflows, outflows, crop consumptive use, precipitation, and deep percolation.

The data indicate that the salinity projects in Colorado are typically achieving a deep percolation plus field ditch seepage reduction of at least 10 to 15 inches for each acre treated which meets or exceeds the deep percolation reduction estimated in the original project reports.

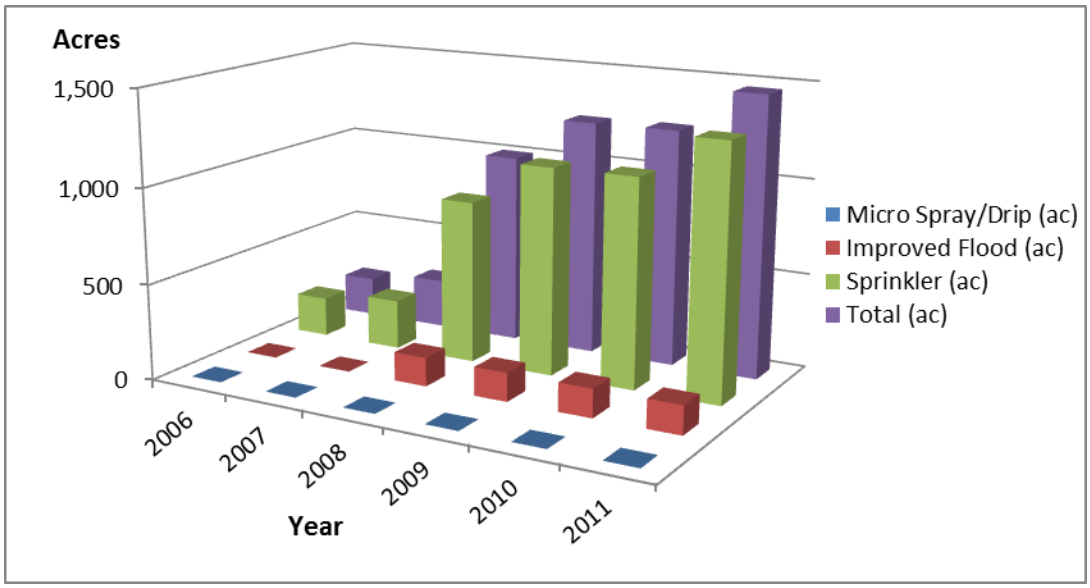
Areas with a greater conversion to sprinkler or micro spray will be at the 15 inch reduction and areas with predominantly flood irrigation will be at the 10 inch reduction. Areas that are converting from unimproved flood systems will have deep percolation plus seepage reductions in the 25 to 30 inch range. Areas that are converting very old flood irrigation systems with limited improvements, will most likely be somewhere between the higher values and the lower values, but probably closer to the 10 to 15 inch reduction.

Table 1 - NRCS Irrigation Application Efficiency Standards for Evaluation

TYPE OF IRRIGATION SYSTEM	% OF MONITORED EFFICIENCY
Open ditch	35%
Open ditch w/ siphon tubes	40%
Concrete ditch w/siphon tubes	50%
Gated pipe	50%
Underground pipe & Gated pipe	50%
Underground pipe/Gated pipe/Surge	55%
Center Pivot Sprinkler	90%
Big Gun Sprinkler	70%
Side roll Sprinkler	75%
Micro spray	90%
Drip Irrigation	95%

Note: Efficiencies listed are the NRCS planning standards for the various types of irrigation systems.

Graph 1 - Silt Unit Cumulative Irrigation Systems Installed



IRRIGATION SYSTEMS APPLIED (acres)	FY2011	CUMULATIVE
Sprinkler	225	1,317
Improved Surface System	0	150
Micro-Spray/ Drip System	0	0
TOTAL	225	1,467

Graph 1 and the sub-set table display the cumulative acres of the various irrigation improvements in the Silt project area. The ease of operation and uniformity of application make sprinklers a desirable option for many irrigators.

In the project area the deep percolation reduction and subsequent salinity control is typically about 50 to 60% reduction for a well-managed improved flood system and about 75 to 85% reduction for a well-managed sprinkler system.

Graph 2 - Silt Unit Cumulative On-Farm Salinity Load Reduced

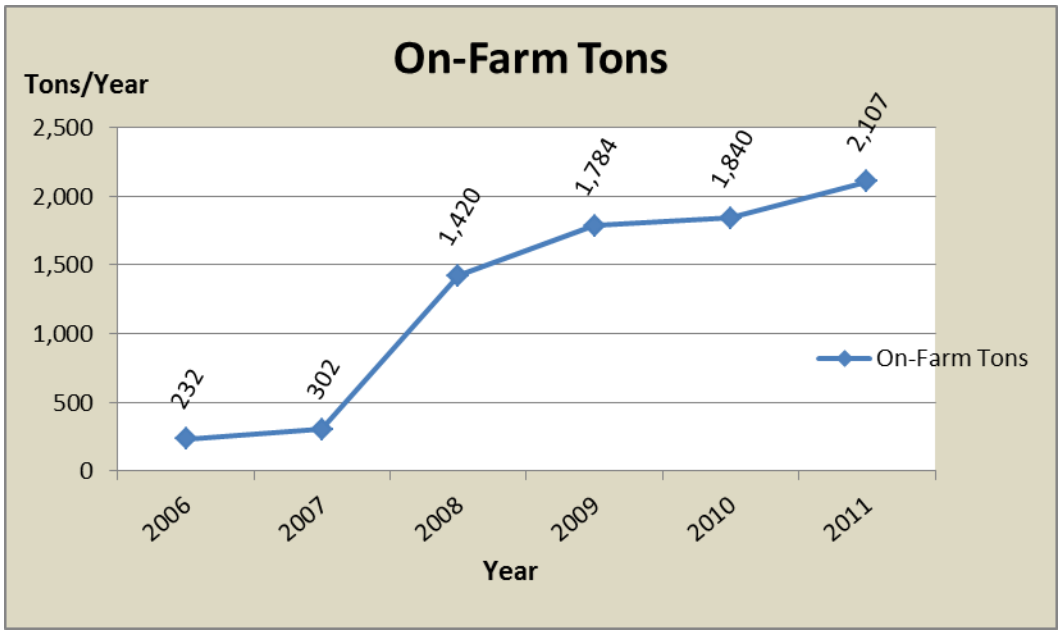


Table 2 - USGS Trend Analysis and Agency Reported Salinity Reduction

Unit	Trend Years	NRCS Project Start Year	NRCS Reported Reduction (tons/year) /1	BOR Reported Reduction (tons/year) /1	Total Predicted Reduction (tons/year) /1	Measured Reduction (tons/year)	Unclaimed Reduction (tons/year)
Grand Valley	1986 - 2003	1979	103,551	122,300	225,851	322,200	96,349
Lower Gunnison	1986 - 2003	1988	66,486	43,675	110,161	201,600	91,439
McElmo	1978 - 2006	1989	20,012	32,000	52,012	90,450 /2	38,438

/1 The number is the cumulative salt load reduction reported for the final trend analysis year for each study, either 2003 or 2006

/2 Includes a measured reduction plus projected salinity increase due to the introduction of the Dolores Project Water

USGS completed two salinity trend analysis reports for the gaging stations that include salt loading trends below three of the Colorado River Salinity Control Projects, and their analysis covered part of the salinity control implementation period. The measured salinity trends in the river exceeded the salinity control reductions claimed by the participating agencies for all three locations for the years represented. Certainly other management and land-use changes contributed to either increases and/or reductions to salt loading in the river, however the USGS trend analysis was corrected to account for the salt variations with changes in annual flow, and is intended to represent a flow adjusted annual change in salinity loading trends. The fact the trend reductions exceed the predicted loading reductions from the program helps support the irrigation improvement work is significantly reducing the annual load contribution from irrigation, and possibly the amount of improvement is somewhat greater than predicted.

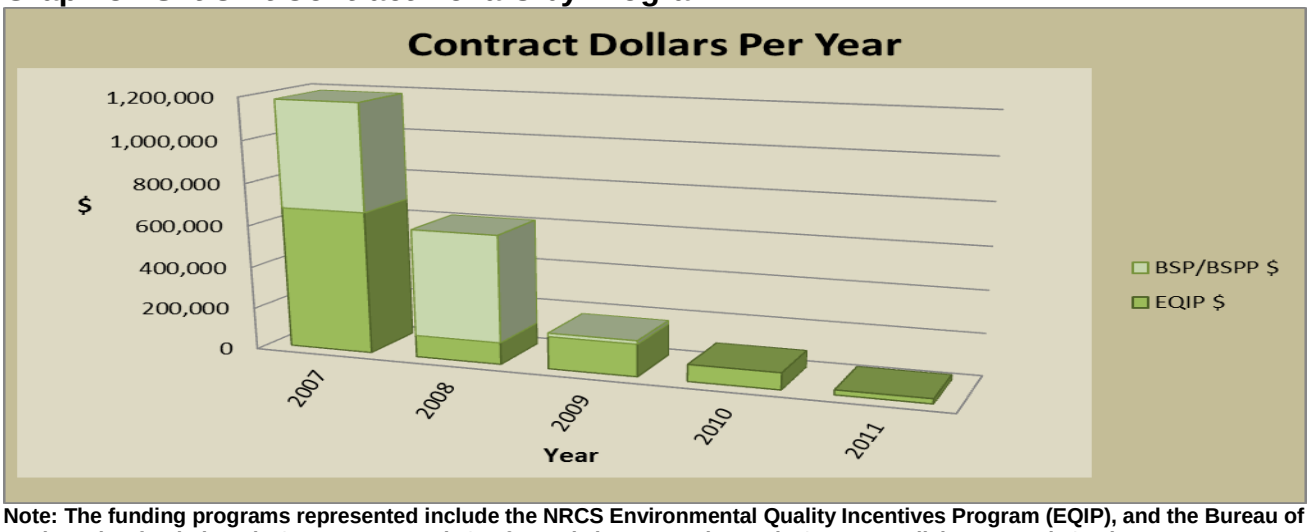
Table 2 References

"Salinity Trends in the Upper Colorado River Basin Upstream from the Grand Valley Salinity Control Unit, Colorado, 1986—2003", USGS Scientific Investigations Report 2007-5288, Kenneth J. Leib and Nancy J. Bauch, 2008.

"Characterization of Hydrology and Salinity in the Dolores Project Area, McElmo Creek Region, Southwest Colorado, Water Years 1978-2006", USGS Scientific Investigations Report 2010-5218, Rodney J. Richards and Kenneth J. Leib, 2011.

US BOR Reported Salt Load Reductions from personal communication with Nicholas Williams, Environmental Engineer, US Bureau of Reclamation, Salt Lake City, Utah.

Graph 3 - Silt Unit Contract Dollars by Program



Note: The funding programs represented include the NRCS Environmental Quality Incentives Program (EQIP), and the Bureau of Reclamation funded Basin States Program (BSP, formerly known as the Basin States Parallel Program (BSPP).

Graph 3 displays the Environmental Quality Incentive Program (EQIP) and Basin States Program (BSP/BSPP) contract dollars per year from 2007 through 2011. The amounts varied significantly on an annual basis in part due to program allocations, the local economy, the cost of the installed systems, and the landowner's ability to cover their portion of the cost. The public funding was typically intended to cover approximately 75 percent of the installation cost, however many of the peripheral costs such as getting power to the site, possible non-irrigation equipment changes, additional management costs, the cost of learning and adapting new technologies, etc. were paid by the landowner and were not eligible for public cost-share.

Although the EQIP contract numbers have been fairly consistent since 2008, the 2009, 2010, and 2011 Fiscal Years been relatively low and declining total contract years. The project has treated approximately 52 percent of the predicted treatment acres identified in the Silt Plan and Environmental Assessment. A follow-up review and evaluation may be needed to determine if the systems have already been improved by the landowner, or whether additional out-reach may increase landowner participation.

The economic value to the community and adjacent states is significant. The projects offer a downstream benefit from reduced damages through the amortized cost per ton that typically covers the public cost of installation. In addition the landowners receive economic benefits from improved crop quality, better utilization of fertilizers, reduced irrigation labor costs, etc. The local community

benefits though the economic turnover in the area from the public cost-share funds, the improved crop qualities, agricultural sustainability, etc.

SILT SALINITY AREA IRRIGATION MONITORING & EVALUATION 2011 REPORT

Introduction

Since 2005, the Natural Resources Conservation Service (NRCS) has been planning and applying improved irrigation systems and practices with cooperators in the Silt Salinity Area Salinity Control Area, through the Colorado River Salinity Control Program including both Environmental Quality Incentives Program (EQIP) and Basin States Program (BSP/BSPP) funding. All EQIP and Basin applications go thru a ranking process that yields the most cost-effective projects on cost per ton of salt saved.

2011 Highlights & Accomplishments

The 2011 highlights of IWM Projects included Irrigation Water Management activities on eight Big-Gun sprinkler irrigation systems, with a total of eight new systems installed in the Salinity area. Landowner interest in new irrigation technology presents a very exciting and challenging atmosphere. The efficiency in water savings and the reduction of farm energy requirements will provide a significant benefit to farmers and ranchers who want to have a future in agriculture.

Salinity Outreach activities include:

April 2010 – Basin Stated Program promotion in the April Conservation District newsletter. The newsletter went out to over 600 producers.

November 2010 – Presentation on the Basin States Program and salinity control to the Bookcliff/Mt Sopris/Southside Conservation Districts annual dinner. Over 100 people in attendance.

IWM Accomplishments include the following:

- Total Producer Contacts: 25
- Total IWM Requests: 25
- Follow-up Contacts: 32
- IWM Contract Evaluations: 25
- Hydro-Salinity & Wildlife Evaluations: 1

2011 Value of Irrigation Practice's Reviewed

BASIN: $1,043,700.00
EQIP: $1,753,883.00
TOTAL: $2,797,583.00 on 1551.2 acres (Cost share dollars)

1. The Goal of IWM program is to provide the necessary assistance and information to help the Salinity Program achieve the level of salinity reduction above what the program originally planned for.
2. Utilizing and partnering with other skilled professionals like the Irrigation Suppliers, Conservation District Boards, and Irrigation Districts can accelerate the Success of the IWM Program and its acceptance.

2011 IWM STATUS REVIEW OF EVALUATED PRACTICES BY ACREAGE / CROP TYPE / PRACTICE
Glenwood Springs Field Office

Table 3 - Irrigation Water Management Reviewed (IWM)

TYPE OF PRACTICE	Hay (acres)	Pasture (acres)	Total (acres)	% BY PRACTICE
Underground Delivery and Gated Pipe	2.2	8.9	11.1	26%
Siide-Roll Sprinkler	7.8	8.3	16.1	36%
Center Pivot Sprinkler				0%
Big-Gun SPrinkler	11.3	5.7	17	38%
Total Acres	21.3	22.9	44.2	100%

2011 OUTLOOK

The Implementation of the NRCS IWM tool for 2011 contracts, and the 2 year commitment for follow-up will provide an added salinity control and production benefit to test with producers. Two years of follow up will be required in future plans. NRCS Planners will continue to use new IWM Tool when developing a basic conservation plan for salinity and water quality.

Advancements in sprinkler irrigation technology and adoption of the more precision irrigation application systems are occurring at an accelerated pace in this area. Adoption of these advanced technologies may help provide a means of sustaining agriculture on irrigated land that is competing with development prices in this area, by linking improved irrigation technology with value added crops.

IWM Specialists are an excellent means to transfer of this information from outside sources to the smaller irrigated areas in Western Colorado.

Energy efficiency is of increasing importance both locally and nationally. The potential energy savings resulting from utilization of higher water application efficient systems should be advocated, publicized, and incorporated in to project ranking considerations.

WILDLIFE
2011 MONITORING & EVALUATION REPORT

History and background

The Silt Salinity Area is located in west central Colorado on the Silt Mesa just north of the Colorado River between the towns of Silt and Rifle. Irrigation water comes from the Colorado River via the Pump Ditch, the Rifle Gap Reservoir via multiple ditches and Grass Valley Reservoir at Harvey Gap via the Farmers Irrigation Canals. The area was added to the Basin States and EQIP salinity programs in 2006. The Silt Area is characteristic of arid, cold desert ecosystems common to western Colorado. Historically, the Silt Area was dominated by desert sagebrush vegetation communities. Narrow wetlands and riparian zones were located along the Colorado River as well as several natural washes. The present mosaic of habitat types (agricultural, riparian, wetland, and desert shrub) is a result of current irrigation systems and practices. With the advent of irrigation and associated waste water return flows and seepage, the natural vegetation has changed. A sparse, saltbush desert community has been converted to crops and habitat types such as wetland, riparian, willow and cottonwood, tamarisk, tall wheatgrass, or a mosaic of these cover types. Habitat types other than cropland are restricted to areas unsuitable for agriculture, such as canal and lateral banks, fence rows, washes, irrigation return flows and drains, roadsides, and other low-lying areas.

Agricultural areas are composed of pastures, and crops. Crops grown are alfalfa, corn and small grains. All crops are entirely dependent upon irrigation for production. Urban and commercial development over the last 20 years has reduced the agricultural area to more small (<40 acres) ranches and farms. The size of most program participant's properties is small (1-20 acres). Many landowners and participants are moving from the city to recently created small parcels. Landowners purchase these parcels for open space, privacy, views, and a rural life style. They manage the parcels as "extra-large lots", rather than farms. Many of these landowners are still interested in improving their land and irrigation but not just for agricultural reasons.

Impacts to wildlife and habitat in the Silt Area are addressed in the Silt Salinity Control Project Plan and Environmental Assessment, prepared jointly by the Bookcliff Conservation District and the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). The Environmental Assessment determined that 50 acres of grass/shrub riparian type vegetation along ditches would be lost due to improvement of on-farm and off-farm irrigation systems. It also states that about 10 acres of irrigation induced wetlands may be lost by the actions. NRCS is responsible for the tracking and mitigation of these acres.

Table 4 - Salinity Control Programs in the Silt Area

Program	Years
Environmental Quality Incentives Program (EQIP)	2005 – 2011
Colorado River Basin States Program (BSP/BSPP)	2005 – 2011

Since the start of this program money from EQIP and BSP/BSPP have been made available to offset any acres lost through the program.

Since the start of the program NRCS has been tracking riparian/ditch habitat loss along with wetland losses due to improved irrigation systems.

Current methods

In the Silt Area wildlife habitat replacement progress is tracked by acres. The process of reporting and field verification of program results and records will continue for the remainder of the program.

For the duration of the salinity program, the type of wildlife improvement practices has remained consistent. Practices include ponds, fencing, grass and forbs establishment, brush (tamarisk control) management, and tree and shrub establishment. To address Colorado River endangered fish concerns, all ponds are constructed with fish screens on outlet structures (unless the pond will be drained during winter), and, water depletion loss is calculated and reported to the U.S. Fish and Wildlife Service for their review.

Results

Progress from wildlife projects, both planned and applied, is updated yearly in a spreadsheet maintained by the NRCS Glenwood Springs Field Office. This data represents the final audit and update for all wildlife projects in the Salinity Area, and are verified from field visits performed by a wildlife biologist.

Estimates of losses so far are as follows:

- Wetlands – 0 acres.
- Riparian/Ditches – 15.7 acres

Mitigation efforts so far have yielded one contract. This Contract is about 50% complete the remaining work will be completed in 2012. Work on the pond has started and the Range seeding is complete.

Table 5 - Goals and Accomplishments 2005-2011

Habitat Type	Replacement Goal (acres)	Completed (acres)	Remaining (acres)
Riparian/Upland	50.0	19.4	30.6
Wetland	10.0	0.0	10.0

Table 6 – Wildlife Practices to be Installed

Practice Name	Units			Total
	acres	feet	number	
Dike		1610		1610
Pond		1200	Cu.yd	1

Table 7 - Funding for Wildlife Habitat Replacement Projects (All Salinity Programs)

Habitat Replacement	Amount
Funds obligated to wildlife projects 2005-2011	$80,296
Funds spent on wildlife projects 2005-2011	$34,945
% of total salinity obligated funds that are obligated to wildlife projects through 2005-2008	3%
% of total salinity obligated funds spent on wildlife projects through 2008	4%

Discussion of Results

In the last 2 years only one landowner has signed up to use the salinity program to install wildlife habitat. This one contract will mitigate many acres of wildlife habitat lost to the installation of irrigation systems. As the program grows and operators see the benefits of these practices we expect the demand to increase. The operator has begun installation of these practices and should have them completed by October of 2012, this contract is about 55% complete. This one contract is with NRCS under the EQIP program. No signups have been taken to do wildlife work under the BSP/BSPP.

Conclusion

Replacement effort for wildlife acres is dynamic as urban development impacts areas that once were managed for wildlife under the salinity programs. Additional efforts should be placed upon increasing the interest of landowners to establish and maintain wildlife habitat. Direct contact with landowners who own large parcels of land along natural washes and drainages may be beneficial. With increasing numbers of landowners having smaller land parcels, the salinity program needs to adapt to accommodate smaller land areas. NRCS can utilize these opportunities by showing landowners the potential benefits of improving small open space parcels for wildlife habitat.

Retention of applied wildlife habitat acres may also be increased by working with lands that have conservation easements in place. This would entail working closely with land trust organizations, to identify possible landowners with conservation easements who are interested in developing or enhancing wildlife habitat.