MONITORING & EVALUATION REPORT--2011
MCELMO CREEK UNIT
COLORADO RIVER SALINITY CONTROL PROJECT
USDA-NRCS

USDA- Natural Resources Conservation Service
Cortez, Colorado - Field Office Staff

EXECUTIVE SUMMARY
McELMO CREEK UNIT
2011

Hydro-Salinity -

- The project plan is to treat approximately **21,550 acres** with improved irrigation systems.
- To date **13,624 acres** [/1] have been treated with improved irrigation systems.
- The project plan is to reduce salt loading to the Colorado River system by **46,400 tons/year** of salt.
- In FY 2011, salt loading has been reduced by **1,521 tons/year** as a result of installed salinity reduction practices.
- The cumulative salt load reduction is **25,348 tons/year**, or 55 percent of the project goal.

[/1] Note: The 13,624 acres include a few fields that have been treated a second time to a higher level of irrigation improvement and salt savings over the course of this salinity project.

Cost Effectiveness -

- The planned cost per ton of salt saved with FY 2011 contracts (one year) is **$128.16 /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 habitat replacement goal is at 2% of the current irrigation improvement acres, or 2% of the current 13,624 irrigation improvement acres equals **272 acres** of habitat developed or significantly enhanced.
- In Fiscal Year 2011, **4 acres** of additional wetland habitat were reported as applied.
- To date, a cumulative **845 acres** [/2] of upland habitat and **449 acres** of wetland habitat have been applied, or the current wildlife habitat replacement is approximately 165% of the predicted losses based on the wetland habitat, and there may be enough habitat acres established to meet full salinity program implementation and replacement goals.
- An updated evaluation of the habitat replacement acres and status is being conducted to verify the habitat acres still in place and to confirm the goal of replacing habitat lost with habitat of comparable wildlife values.

[/2] Some of the **845 acres** of upland habitat applied may not meet riparian and irrigation enhanced habitat losses, and thus will not be credited toward meeting the salinity habitat replacement goals.

Key Considerations and Conclusions –

- Based on the habitat acres applied, there may be sufficient replacement to account of all the acres needed for a full project implementation of 511 acres of habitat improvements implemented at 2 percent of 25,550 acres irrigation improvement applied, however the current habitat status assessment is needed to assure the goal is met.
- The ongoing wildlife habitat assessment should be completed sometime in 2012.

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.

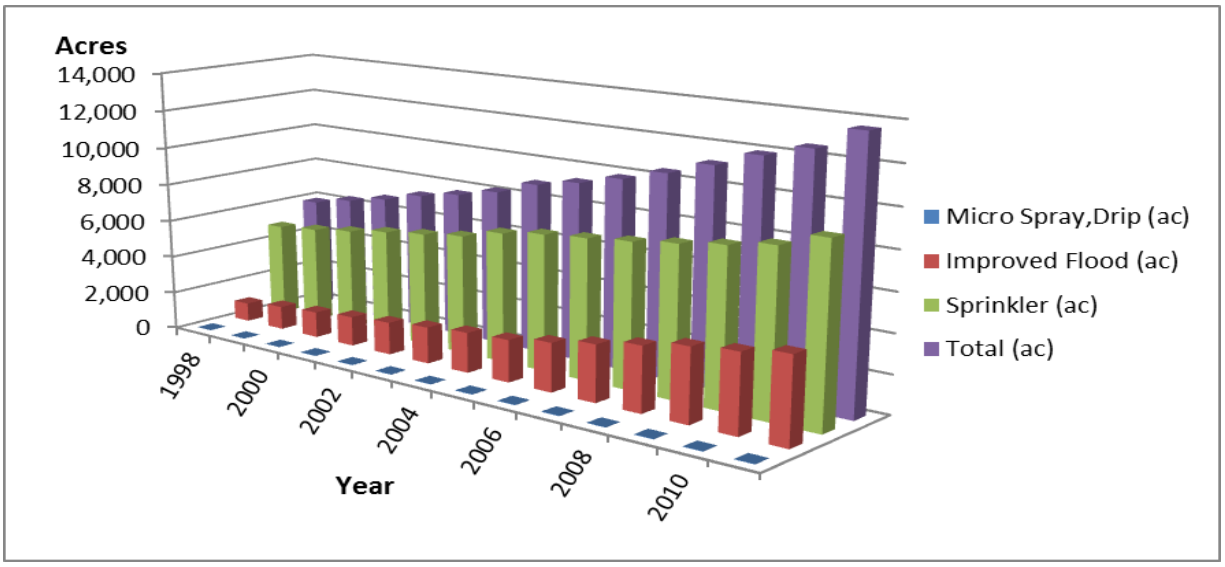
Areas with a greater conversion to sprinkler or micro spray will be at the 15 inch reduction and areas with predominantly flood irrigation will be at the 10 inch reduction. Areas that are converting from unimproved flood systems will have deep percolation plus seepage reductions in the 25 to 30 inch 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 – McElmo Creek Unit Cumulative Irrigation Systems Installed



IRRIGATION SYSTEMS APPLIED (acres)	FY2011	CUMULATIVE
Sprinkler	722	9,185
Improved Surface System	379	4,417
Micro-Spray/ Drip System	0	22
TOTAL	1,101	13,624

Graph 1 and the sub-set table display the cumulative acres of the various irrigation improvements in the McElmo Creek 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, about 75 to 85% reduction for a well-managed sprinkler system, and about 85 to 95% reduction for a well-managed drip or micro-spray system.

Hydro Salinity Monitoring & Evaluation Summary
2011

- Irrigation Systems Applied Acres
  - Acres Treated in 2011 = **1,101 Acres**

- Irrigation Water Conveyance Delivery/ Gated Pipe
  - o Acres Treated in 2011 = **379 Acres**
    - Program Totals **= 4,417 Acres**
  - o Average Efficiency = **50%**

- Sprinkler & Drip Irrigation Systems Installed= **722 Acres**
- (Includes Linear, Center Pivot, Side-Roll, & Big Gun)
  - o Acres Treated in 2011 = **722 Acres**
    - Program Totals = **9,185 Acres**
  - o Average Efficiency = **75%**

- Micro-Spray/Subsurface Drip Irrigation Systems Installed = **0 Acres**
  - o Acres Treated in 2011 = **0 Acres**
    - Program Totals = **22 Acres**
  - o Average Efficiency = **90-95%**

- Overall Average systems efficiency
  - In 2011 = **66%**
  - Cumulative = **64%**

Graph 2 – McElmo Creek Unit Cumulative On-Farm Salinity Load Reduced

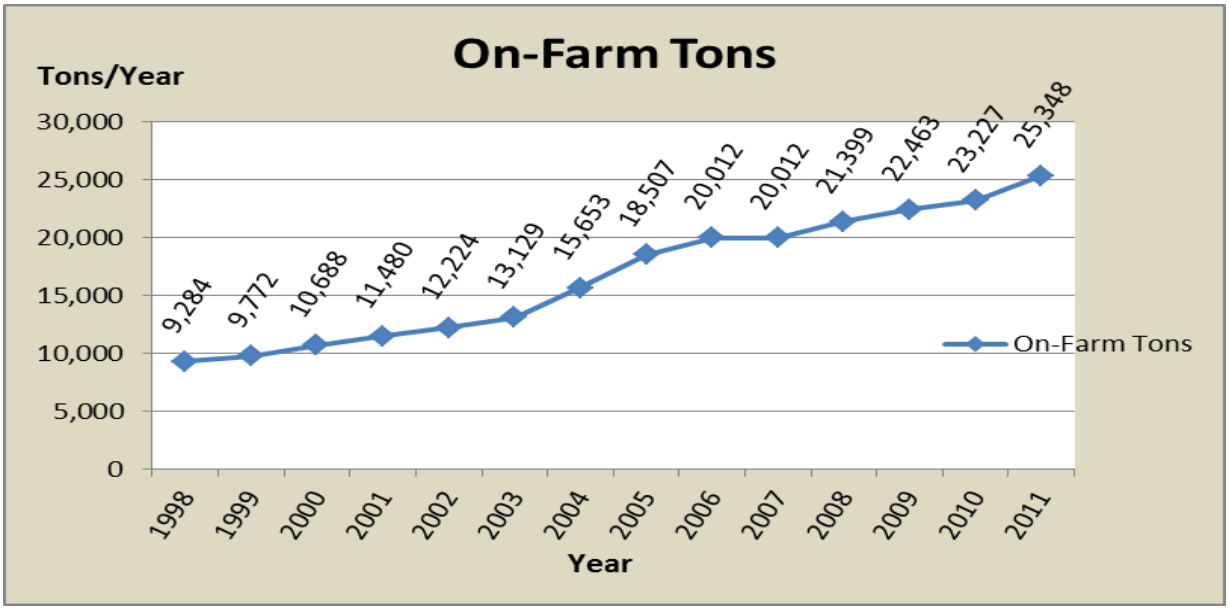


Table 2 - USGS Trend Analysis and Agency Reported Salinity Reduction

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.

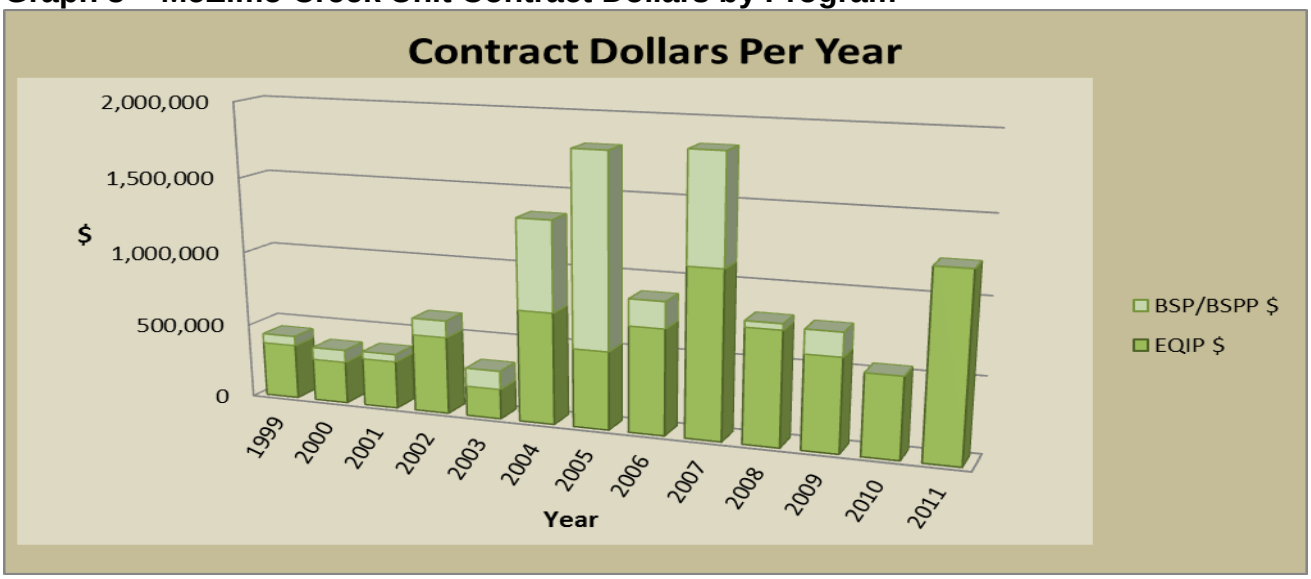
Table 2 References

"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 – McElmo Creek 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 1999 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.

The EQIP contract numbers are up significantly in 2011 and the re-funding of the Basin States Program should allow for additional future contracts with landowners who may not be EQIP eligible.

The trend in McElmo in recent years has been to continue to install sprinklers on untreated irrigation systems, and to upgrade and improve some of the previous improved flood systems. Improvements to technology and design offer additional salinity reduction by improving the more primitive flood systems to pipeline gated pipe with or without surge irrigation valves, or in some cases change from improved flood irrigation to either sprinkler or micro-spray/drip irrigation. The salinity reductions claimed in these situations are based on the incremental improvement offered by making the change from the current system to the improved system. Additionally the higher levels of improvement typically have more management built into the system and the level of performance has a higher assured performance.

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.

MCELMO CREEK IRRIGATION MONITORING & EVALUATION
2011 REPORT

Introduction

For numerous years, the Natural Resources Conservation Service (NRCS) has been applying improved irrigation systems and practices with cooperators in the McElmo Creek Salinity Control Area. This has occurred through the Colorado River Salinity Control Program including both Environmental Quality Incentives Program (EQIP) and Basin States Parallel Program Funding. All EQIP and Basin applications undergo a ranking process that yields the most cost-effective projects on cost per ton of salt saved. Monitoring and evaluation of the salinity levels has been critical to implementing and maintaining these programs. The McElmo Creek Monitoring & Evaluation Plan was established in August 1988 and revised April 1994. Monitoring of on-farm hydro-salinity was continued for five years from 1995-1999. Monitoring was suspended in 2000 because it was determined that the values were redundant from the previous five years. A revised hydro-salinity, monitoring plan was implemented in 2002. This plan included monitoring 2 sites per year and completing 20 interviews of participants to see how their irrigation systems were working.

The majority of the improved irrigation in the Cortez-Montezuma County (McElmo Creek) area is characterized by side-roll move sprinklers on gently rolling, wind-blown loess soils. The intake rates of the soils are generally medium to high. Previous irrigation was by very inefficient surface flow over the same soils. By converting the surface flow irrigation to side-roll irrigation, the efficiencies have been greatly increased. Hence, the deep percolation losses of water have been greatly lessened. It is anticipated that the trend of moving from flood irrigation to sprinkler irrigation will continue. This is primarily due to the increased development in the area. Large water rights and land parcels are being sold and split into multiple small ownerships. This division makes the large volume required for flood systems infeasible.

2011 Activities

Several activities were undertaken in 2011 to improve salinity management. The lower end of the Lone Pine lateral was put into a pipe. This generated gravity pressure and as a result we had 4 new contracts converting from flood irrigation to sprinkler and gated pipe.

A large emphasis was placed on irrigation water management. In 2011, 43 IWM plans where written on 743 acres of pasture and hayland and 1,036 acres if IWM was applied. The IWM specialist held 4 half day classes where the fundamentals of IWM where

taught. These classes also include some hands-on teaching on how to test for soil moisture. A stronger effort was put forth to provide one-on-one training of IWM with the irrigator in the field. Multiple pivot evaluations were conducted to ensure the sprinkler systems had correct nozzle packages installed, and were being operated at the correct speed for optimal efficiency.

Other activities included outreach to educate landowners about the salinity program and its benefits. Some of the activities included displays at the Four Corners Ag Expo, newspaper articles, and radio announcements. Work was also done with the local conservation districts and irrigation water districts to encourage large canals and ditches to consider converting to pipeline systems to reduce seepage and improve efficiency.

Salinity Outreach Activities include:

Dec-09	Passed out info on Salinity Program at the Dolores CD annual meeting
Jan-10	Mailed 1,500 postcards to landowners about the EQIP Salinity Program
Mar-10	Promoted Salinity Program at AgExpo
Apr-10	Talked about the Salinity Program at Mancos CD annual meeting
May-10	Talked about the Salinity Program at Mancos CD annual meeting
Jul-10	Article on IWM for salinity control
Aug-10	Promoted Salinity Program at Verde Fest
Jan-11	Posted flyers at public locations in Cortez, Mancos and Dolores
Jan-11	Info on Salinity Program in FSA Newsletter
Jan-11	Contact groups by phone that may be interested in Salinity Program
Feb-11	Article in newspaper on Salinity Program
Feb-11	Info on Salinity Program in MVIC Newsletter
Feb-11	Posted posters on Salinity Program at Ag Stores,
	1/2 hour radio magazine show on Salinity Program
Mar-11	Presentation at Cattleman's Annual meeting about Salinity Program
Mar-11	Promoted Salinity Program at AgExpo

Future IWM Goals & Recommendations & Tasks

1. Future monitoring efforts should focus on the conversion of large agricultural tracts into smaller tracts to monitor the effects the change in land use has had on Salinity. Future monitoring efforts should also focus on maturing irrigation conservation practices to address their declining Irrigation efficiencies. This should include the investigation of cost-share methods to help producers adapt their existing systems to the new technologies, to bring these systems up to new NRCS Irrigation standards.
2. It is recommended that the Irrigation Water Management Specialists continue to provide assistance to the landowners during the first season of use, for the improved irrigation systems installed under the Salinity Program.
3. 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. This IWM activity will provide the lacking and much needed follow up assistance and public relations, with the landowners to help them maximize their irrigation efficiencies and over-all success.
4. Utilizing and partnering with other skilled professionals like the CSU Extension, irrigation suppliers, Conservation District Boards, and irrigation districts can accelerate the Success of the IWM Program and its acceptance.

2012 OUTLOOK

Several major endeavors are being planned or implemented in 2012. The conversion of a large supply canal, the Moonlight Lateral, to a piped system occurred in 2012. It is anticipated that this pipeline will aid tremendously in increasing the amount of on farm projects. There are still a lot of irrigation improvements to make and our outreach efforts have been increased.

Continued improvement of the IWM program offered by the NRCS is planned Documentation of soil infiltration rates under sprinkler irrigation with consideration of current field status of tillage, crop residue, and available water holding capacity of soil profile will be accomplished by means of an infiltrometer. Increased accuracy of surface irrigation systems will result from flow metering devices. Monitoring of salinity issues will now be available to the area to identify and target control problem areas. Special emphasis is planned for areas in McElmo Canyon where potential salt problems are higher. Efforts are also underway with the cooperation of the local conservation districts to obtain an automated weather station to provide a local and more accurate source of ET data for agricultural producers to use when scheduling their irrigations. All of this equipment will also afford the chance to offer services and data never available to the area before.

Monitoring of projects in O&M phase of contracts will be expanded. Especially with the trend of sub-dividing old large farms and ranches into “ranch-etts”, IWM assistance will be critical to maintaining good water management to ensure water quantity and quality for all users.

M&E Summary- McElmo Wildlife

Table 4 - HEP/HSI Data from Accomplishments through I-EQIP, EQIP, WHIP and BSP/BSPP, 1996-2011

Species	Cumulative HUV's 2010	Cumulative HUV's 2011	Net Change for 2011
	Applied		
Pheasant	-1024.52	-997.79	26.37
Mallard Winter	257.36	251.15	-6.21
Mallard Breeding	-2553.79	-2487.41	66.38
Yellow Warbler	-51.7	-50.38	1.38
Meadow Vole	-310.16	-301.97	8.19
Marsh Wren	193.5	201.61	17.11
Screech Owl	-138.1	-136.14	1.96
Snipe	38.07	37.13	-0.94

Note: Programs represented include Interim Environmental Quality Incentives Program (I-EQIP), Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), and the BOR matching Basin States Program (BSP/BSPP).

Table 5 - Acres of Wildlife Habitat Applied 2011

Habitat Type	2010 Cumulative (acres)	2011 Cumulatvie (acres)	Net Change for 2011 (acres)
Upland	845	845	0
Wetland	445	449	4

Table 6 - Wetland Impact Data 2011

Cumulative Acres Impacted Year 2010	Cumulative Acres Impacted Year 2011	Net AREM Unit Change in 2010	Net AREM Unit Change in 2011	Net Change for 2011
246	256	11.2	19.5	8.3

Table 7 - Funding for Wildlife Habitat 2010

% of Total Funds Spent on Wildlife through 2010	% of Total Funds Spent on Wildlife through 2011
4.32%	4.61%

The McElmo Unit wetland data reflects cumulative changes (impacts) to wetland AREM scores. The net change in 2011 shows the cumulative impact of implementation (practice application) of enhancement and losses resulting from irrigation improvements completed that year. The funding percentages changed this year due to re-evaluation of all contracts and elimination of those cancelled from the database due to the 2008 NRCS audit.

Projected HSI values have remained consistent with past years except for the fact that most contracts have now been applied, due to increased efforts by our engineering staff and the use of Technical Service Providers.

WILDLIFE HISTORY

PROJECT SETTING

The McElmo Creek Unit, known locally as the Montezuma Valley, is in the southwest corner of Colorado within Montezuma County. The City of Cortez, centrally located in the project area, is at an elevation of 6200 feet above mean sea level. The McElmo Creek watershed originates in the lower foothills of the LaPlata Mountains to the East. Its north boundary is the Dolores River Canyon Rim and the South by Mesa Verde and the Ute Mountain to the Southwest. McElmo Creek is a tributary to the San Juan River.

The McElmo Creek basin, having a limited watershed area, is a relatively dry basin under natural conditions. Montezuma Valley Irrigation Company (MVIC), the major user and distributor of irrigation water, diverts approximately 116,000 acre feet of Dolores River water annually (1957-1973 data) into the Montezuma Valley. Diverting water from McPhee reservoir on the Dolores River through a tunnel and extensive canal system, MVIC presently distributes water to approximately 29,000 acres. Return flows from irrigation and municipal discharges constitute most of the continuous channel flow in McElmo creek.

Mancos Shale underlies much of the Montezuma Valley. This shale is of marine origin with a high salt content, and provides the main salt source for the return flow into McElmo Creek. Excessive irrigation and seepage from delivery systems cause deep percolation. This water dissolves salts, which move downward until they reach McElmo Creek, then the San Juan River, and finally the Colorado River.

The farmland elevation ranges from 5,800 to 7,000 feet. The annual precipitation is nearly 12 inches, including snowfall.

METHODS

The Habitat Evaluation Procedures (HEP) were used on six alternative plans including future without. An interagency team determined the change of Habitat Unit Values (HUV) for all the alternatives. Eight wildlife species models were used, representative of the ten prevalent cover types in the study area (see list below).

SPECIES

- marsh wren
- mallard-winter
- mallard-breeding
- ring-necked pheasant
- great-horned owl
- yellow warbler
- meadow vole
- common snipe.

COVERTYPES

- Cropland (AC)
- Annual Herbland (ANNHERB)
- Perennial Herbland (PERHERB)
- Woodland (WOODY)
- Pasture and Hayland (AP)
- Native Rangeland (SSSB)
- Orchards and Vineyards (AO)
- Palustrine Emergent Wetlands (PEM)
- Streams, Rivers and Canals (RIVERSn)
- Lakes, Ponds and Reservoirs (LAKESn)

NRCS also conducted a wetland inventory between 1979 and 1980. These wetlands were mapped, classified according to Circular 39 and the Cowardin System for Classification of Wetlands and Deepwater Habitats, and given a wildlife value rating using a system developed by Francis Golet, and provides a wetland numerical value. The system rates factors such as water regime, wetland class richness, size, and juxtaposition.

AVIAN RICHNESS EVALUATION PROCEDURES (AREM)

Paul R. Adamus developed this evaluation method in cooperation with the Environmental Protection Agency for use in the “Lowland Wetlands of the Colorado Plateau”, specifically the Salinity Control Units in Utah, Colorado and Wyoming.

In 1994 the Colorado Natural Resources Conservation Service decided to adopt AREM for evaluating wetland impacts in the McElmo Creek, Lower Gunnison and Grand Valley salinity control units.

Evaluation of all McElmo Creek salinity contracts used this method.

Values were obtained by averaging the “six habitat scores weighted by species,” multiplied by .01, and then multiplied by the acres to obtain unit values. Approximately 103.8 net wetland acres of the 615 acres projected in the EIS have been lost. Through creation of new and enhancement of existing wetlands we have perceived a net gain of 22.4 value points.

HABITAT EVALUATION PROCEDURES (HEP)

Since 1997, the NRCS discontinued wildlife tracking and monitoring measures as outlined for the salinity program. In 1999, due to increased workloads and a 75% reduction in staff, the

NRCS chose to track cost-share, acres and wildlife practices for EQIP salinity. A statistical analysis of HEP data (collected through 1998) was conducted to determine adequate sample size needed to calculate mean habitat suitability indices (HSI) with 95% confidence. The calculated mean is within + or -.1 of the real mean. Data from 1999 and 2001 was also collected, desired sample sizes were achieved, and mean HSI values calculated for each wildlife species (for contracts with and without wildlife practices). Habitat Unit Values (HUV's) were then calculated by multiplying HSI's by HUV's, to estimate project impacts.

WILDLIFE PRACTICES

Wildlife practices implemented to improve or develop upland and wetland wildlife habitat have changed over the years, mainly to reflect certain constraints and NRCS priorities, as well as those of the various agencies charged with oversight. The NRCS stopped using the practice of pothole blasting in wetlands, due to the increase of dwellings and the limited effectiveness. Pond construction has been limited by the Division of Water Resources permitting process, and the limited habitat values achieved by the practice. Locations where shallow water was included in the designed, the project was more effective as habitat. However, the permitting process limits shallow water construction. In addition unlined ponds that are perched above the water table introduce a new potential seepage and salt loading source. Typically management practices such as rotational grazing, setting aside alfalfa for nesting, and small grain for food are not popular practices in the area.

The following practices are used effectively within the study area:

- Grass/legume cover plantings for upland nesting and roosting
- Shallow water developments for waterfowl and shorebird feeding and resting
- Tree and shrub plantings for upland wildlife nesting, roosting and food
- Fencing to exclude livestock grazing either permanently or during critical use periods
- Bioengineering practices to improve or protect riparian habitat
- Occasional development of irrigation to improve forage quality for wildlife
- Brush management to enhance under story in pinon/juniper stands.

WILDLIFE HABITAT ASSEMENT RESULTS
1990-1996

The following four Wildlife Habitat Assessment tables summarize the data tracked from 103 contracts covering the period from 1990 through 1996. All contracts have been applied, and these figures represent the best assessment of project impacts.

Wildlife Habitat Assessment Table 1

1990-1996 Wetland Impacts (Acres/Values)

Type	Existing		Applied		Change	
	Acres	Value	Acres	Value	Acres	Value
1	5.08	0.84	2.30	.54	-2.78	-.30
2	203.76	82.60	112.7	76.41	-91.10	-6.20
3	106.3	47.94	106.9	72.81	+.57	+24.87
4	10.80	5.95	9.30	7.95	-1.50	+.20
5	10.40	8.35	28.50	16.19	+10.10	+7.84
6	46.85	19.68	41.49	19.48	- 5.36	-.20
9	24.20	4.73	11.20	.87	-13.70	-3.86

Wildlife Habitat Assessment Table 2

1990-1996 Cover Type Changes (Acres)

Cover	Exist	Apply	Change
AC	.00	109.97	+109.97
ANNHERB	327.90	189.70	-138.20
AP	2963.50	3118.3	+154.80
LAKESn	25.80	37.10	+11.30
PEM	375.20	259.60	-115.60
PERHERB	146.50	198.20	+51.70
SSSB	172.60	115.3	-57.30
WOODY	299.40	275.90	-23.50
AO	12.30	9.70	- 2.60

Wildlife Habitat Assessment Table 3

1990-1996 HUV Summary (Values)

Species	Existing	Applied	Change
Pheasant	3585.50	3484.70	- 99.80
Warbler	51.33	43.21	- 8.12
Mallard	4074.00	4552.40	+478.40
Breeding Mallard	6.6	97.75	+ 91.15
Winter Vole	873.40	866.93	- 6.47
Wren	101.73	143.75	+ 42.02
Owl	3235.43	2956.68	- 278.75
Snipe	326.33	259.43	- 66.90

Wildlife Habitat Assessment Table 4
(Replacement Summary-Applied 1990-1996)

Practices	Planned	Applied
Cover Plantings	74.9 ac	36.68 ac
Fencing	85,465 ft	53,785 ft
Pipelines	538 ft	507 ft
Tree/shrub Plantings	18.22 ac	8.86 ac
Sprinklers	240 ft	160 ft
Wildlife Upland Habitat Management	277.84 ac	152.9 ac
Shallow Water Development (includes Ponds)	18.43 ac	15.94 ac
Potholes	42	25
Wildlife Wetland Habitat Management	294.74 ac	297.3ac

1996-Present

Since 1997 the NRCS discontinued wildlife tracking and monitoring measures as outlined for the salinity program. Currently the NRCS is tracking cost-share, acres and wildlife practices planned and applied. WHIP planning efforts within the priority unit were also recorded. The following table reflects wildlife habitat planning and application activity between 1996 and 2011 under Interim-EQIP, EQIP, WHIP and the Basin States Parallel Program.

Wildlife Habitat Assessment Table 5

	ft.	ac.	ac.	ft.	ac.	ac.	ft.	no.	ac.	ac.	ac.	ac.
	Gated	Brush	burn	fence	cover	Shrub	Pipe	pond	grazing	upland	wetland	Forest
	Pipe	Mgt.			plantings	Plantings	lines		mgt.	mgt.	mgt.	Stand imp.
Planned	8,284	34.4	20	18,419	244.06	11.59	18,004	9	565.5	616.3	184.2	33.6
Applied	4,334	24	5	15,758	200.75	6.23	20,520	6	156.7	506.5	141.39	33.6

The following table is a compilation of long term impacts to wetlands associated with salinity control measures, using the Avian Richness Evaluation Method, and includes the wetland habitat creation or enhancement occurring between 1996 and 2011. Overall impacts have been positive. Protection and enhancement of larger riparian areas along stream corridors is beginning to gain popularity. This focus will hopefully allow the NRCS to replace habitat losses from canal and lateral piping projects, which may become a larger part of the future NRCS salinity control activities.

Wildlife Habitat Assessment Table 6

					AREM-1997-2011				
AREM WETLAND SCORES FOR EQIP PRIORITY APPLIED CONTRACTS						**CONTRACTS NOT APPLIED**			
Field	ACRES	EXISTING	APPLIED	NET CHANGE	WETLAND TYPE	Field	ACRES	EXISTING	WETLAND TYPE
1	4	1.66	3.88	2.22	LAC/PEM Complex	27	4.8	3.18	PEM/PSS
2	2	0.25	0.69	0.44	LAC/PEM Complex	30	7.6	11.64	PSS/RUPe
3	2		1.7	1.7	LAC	31	14	18.49	PSS/RUPe
4	1		1.2	1.2	LAC	32	6	11.08	PSS/RUPe
5	1.5	0.16	0.87	0.71	LAC/PEM Complex	34	.25	.09	PEM/PSS
6	0.5		0.13	0.13	LAC	35	2.7	2.22	PEM/PSS
7	2.9	0.69	0.95	0.26	LAC/PEM Complex	36	12	18.35	PEM
8	2.1	1.95	2.59	0.64	LAC/PEM Complex				
9	1.7	0.905	1.09	0.185	LAC				
10	0.2	0.128	0.128	0	PEM				
11	15	10.19	10.74	0.55	LAC/PEM Complex				
12	1	0.19	0	-0.19	PEM				
13	4.2	2.1	2.1	0	PEM/LAC Complex				
14	0.54	0.068	0	-0.068	PEM				
15	4.99	8.82	10.95	2.13	PEM				
16	0.25	0.267	0.267	0	PEM/LAC Complex				
17	1.4	0.18	0	-0.18	PEM				
18	26.6	52.14	56.59	4.45	PEM/LAC Complex				
19	.8	.025	0	-0.025	PEM				
20	2.04	.45	0	-0.45	PSS				
21	20.7	9.59	10.874	1.28	PEM				
22	12.7	13	0	-13	PEM/PSS				
23	1.8	2.57	0	-2.570	PEM/PSS				
24	4.1	3.79	4.62	0.83	PEM				
25	30.6	55.83	62.052	6.22	PSS				
26	12	18.35	23.05	4.7	PEM				
28	2.3	4.26	8.44	4.180	PEM/PSS				
29	2	1.82	3.88	1.820	PEM/PSS				
33	6	7.79	10.35	2.360	PEM				
				0					
				0					
				0					
				0					
Total				19.522					

DISCUSSION & CONCLUSION

Interest in developing and enhancing habitat for wildlife has leveled off in the McElmo Creek Unit. Typically producers are putting more time and money into improving their irrigation systems in order to improve profitability. The current economy seems to be dictating this priority. The landowners currently applying for program benefits are interested in making it easier and more efficient to irrigate their small acreages, and are moving towards intensive local farmer's market type agriculture.

Currently the level of replacement is adequate to cover the on-farm habitat losses and will likely continue to cover program replacement goals, particularly if some of losses in the McElmo Unit can be offset with extra gains in the Mancos Unit. However, there may be additional need in the future to track and offset the losses associated with some of the lateral improvement projects, if the EQIP and/or Basin States Program are used to fund these types of projects. The potential loss to habitat values from these types of canal or ditch projects may be more significant than any of the losses associated with the current on-farm improvements. The local irrigation company is accelerating implementation of these large canal piping projects using outside grant money and stimulus money, and the potential loss to cottonwood and willow habitat appear to be significant. The ditch company is considering requesting additional financial assistance from NRCS for these types of projects in the future. As habitats are impacted from these larger scale off-farm canal and lateral improvement projects, the funding Federal Agency needs to assure the impacts to wildlife are fully considered and the habitat replacement responsibilities from the salinity control work are fully addressed.