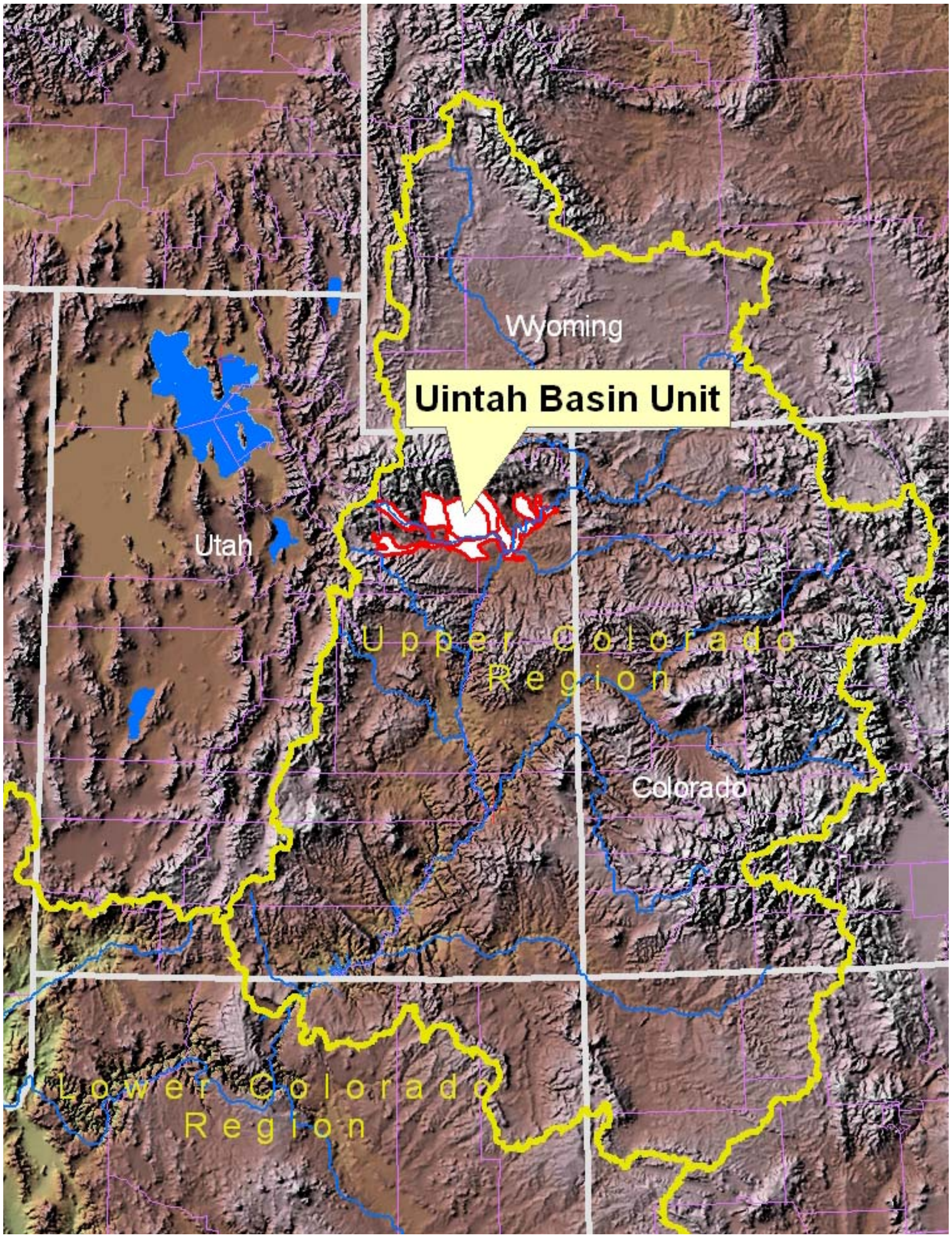
Colorado River
Salinity Control Program
Uintah Basin Unit

Monitoring and Evaluation Report, FY 2005



U.S. Department of Agriculture
Natural Resources Conservation Service
March 24, 2006

Table of Contents

Executive Summary

Hydro Salinity

- Measures applied in FY2005 will result in a salt load reduction of 15,192 Tons/year on 6,309 treated acres. $6.4 million Financial Assistance (FA) and Technical Assistance (TA) were applied, netting a cost of $38/Ton, amortized over 25 years at 6.625%.

- Due to increased petroleum costs, the cost of plastic pipe is escalating. The Uintah Basis is in an oil boom, and labor/equipment costs are also escalating.

- In FY2005, 159 Contracts were signed for $7,095,154 (FA) on 7,106 acres. Nearly all of the planned practices were sprinkler systems, with a 50/50 spilt between wheel lines and center pivots on an acreage basis.

- Total Contracts since inception indicate a Salt Load Reduction of 162,630 tons on 137,667 acres at a cost of $ 69,816,398. Evaluation of past reports indicates that cumulative tons of salt load reduction may not be proportional to acres treated. Future adjustments to the cumulative number and goals for the future are likely.

- All inactive contracts in the CRBSCP program have been completed or cancelled.

- Irrigation induced erosion is generally eliminated by the installation of sprinkler systems.

- One hundred, forty-eight Sprinkler Evaluations indicate that the majority of systems are adequately maintained, but there is room for improvement.

- New cooperators have shown a keen interest in improving Irrigation Water Management (IWM) skills. The present requirement for new cooperators to attend IWM training and to present irrigation records is having a positive effect on understanding and implementation of good IWM principles and skills.

Wildlife Habitat and Wetlands

- An additional water and wetland coverage image of Pleasant Valley for July 14, 2005 was compared to the images in the 2004 M&E Report. Results showed that wetland acres recorded in 2005 exceed acres recorded for the pre-treatment year, 1984. Annual precipitation plays a major role on the ability of Landsat to accurately distinguish small narrow wetlands from upland vegetation during a wet year.

- The 1984 image reported 782 acres; in 2004 there were 366 acres, and in 2005 there were 857 acres of wetlands.

- Conclusion was drawn that remote sensing alone is not sufficient to quantify changes in wetland/wildlife habitat extents.
- Detailed land-cover mapping, permanent photo points, and smaller scale case studies are needed to accurately depict losses or gains of wetland/wildlife habitat impacts.
- In FY2005 six Wildlife Habitat Development Plan (WHDP) applications were planned and funded for a total of 246.8 acres; three WHDP were applied in FY2005 for a total of 2,023.6 acres.
- Wildlife habitat replacement will continue to be encouraged and applied on a voluntary basis.

Economics

- Public interest is high and additional opportunities exist to further reduce salt loading.

- Cooperators are willing and able to participate in wildlife projects.

- Private and public economics are favorable.

- Table 1 summarizes project status.

Table 1. Program Summary.

Uintah Basin Unit FY2005 Program Summary				
Practices Applied	**Units**	**FY2005**	**Cumulative**	**Target**
1. Irrigation Systems				
A. Sprinkler System	Acres	6,277	118,516	130,000
B. Improved Surface System	Acres	32	14,262	
C. Drip Irrigation System	Acres	-	65	
2. Irrigation Water Management	Acres	6,277	105,422	
3. Wildlife Wetland Habitat Management	Acres	10	2,649	
4. Wildlife Upland Habitat Management	Acres	2,090	17,028	
5. Salt Load Reduction, on-farm*	Tons/Year	15,192	145,630	140,500
5a. Salt Load Reduction, off-farm	Tons/Year	-	17,000	
6. Deep Percolation Reduction (Includes seepage) Note: deep percolation is not equal to return flow.	Acre-Ft/Yr	13,485	106,063	
7. Total Irrigation Contracts (Planned) since inception of all five programs	Number		2,784	
	Dollars, FA		69,816,398	
	Acres		137,667	

***Note: Reported Cumulative Salt Load Reduction numbers are being evaluated for possible downward revision. As reported, they appear to be out of proportion with acreage treated..**

Salinity Control Programs			
Program Name	**Acronym**	**Start Year**	**End Year**
Agricultural Conservation Program	ACP	1980	1987
Colorado River Basin Salinity Control Program	CRBSCP	1987	1996
Interim Environmental Quality Incentive Program	IEQIP	1997	1997
Environmental Quality Incentive Program	EQIP	1997	Present
Basin States Parallel Program	BSPP	1998	Present

For further information, please contact:

Jim Spencer, Wildlife Biologist
USDA-NRCS
240 West Highway 40 (333-4)
Roosevelt, UT 84066
(435)722-4621 ext 128
jim.spencer@ut.usda.gov

Ed Whicker, Civil Engineer
USDA-NRCS
240 West Highway 40 (333-4)
Roosevelt, UT 84066
(435)722-4621 ext 124
ed.whicker@ut.usda.gov

Monitoring and Evaluation History and Background

The Colorado River Salinity Control Program has been established by the following Congressional Actions:

1. 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.
2. Congress enacted the Colorado River Basin Salinity Control Act (PL 93-320) in June, 1974. Title I of the Act addresses the United States' commitment to Mexico and provided the means for the U.S. to comply with the provisions of Minute 242. Title II of the Act created a water quality program for salinity control in the United States. Primary responsibility was assigned to the Secretary of Interior and the Bureau of Reclamation (Reclamation). USDA was instructed to support Reclamation's program with its existing authorities.
3. 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 the basin states to adopt and submit for approval to the EPA, standards for salinity, including numeric criteria and a plan of implementation.
4. In 1984, PL 98-569 amended the Salinity Control Act, authorizing the USDA Colorado River Salinity Control Program. Congress appropriated funds to provide financial assistance through Long Term Agreements administered by Agricultural Stabilization and Conservation Service (ASCS) with technical support from Soil Conservation Service (SCS). PL 98-569 also requires continuing technical assistance along with *monitoring and evaluation* to determine the effectiveness of measures applied.
5. 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).
6. 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).

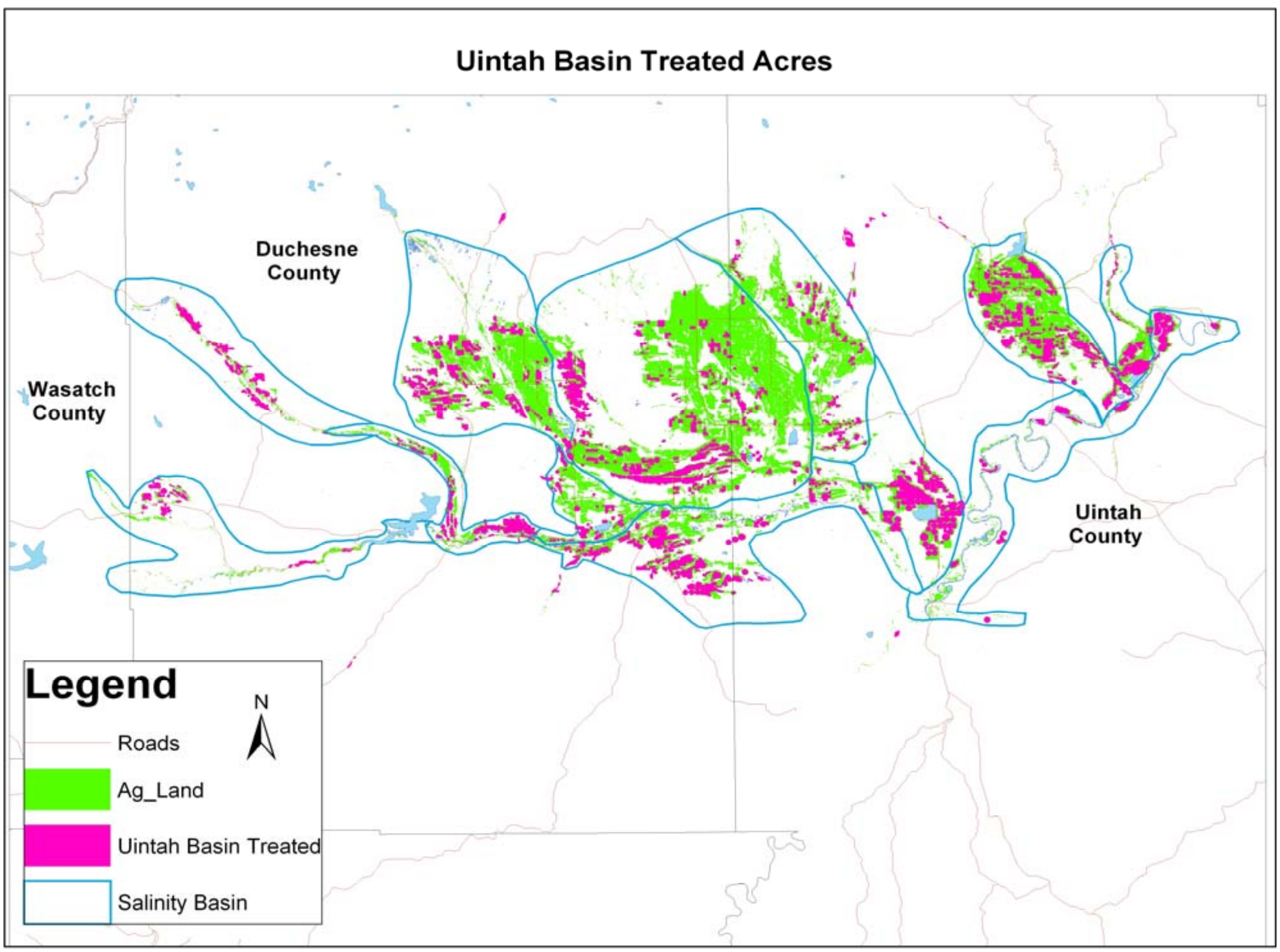
   Over the years, Monitoring and Evaluation (M&E) has evolved from a mode of labor/cost intensive detailed evaluation of a few farms and biological sites to a broader, but less detailed evaluation of many farms and environmental concerns, driven by budgetary restraints and improved technology.

   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. A progress summary is shown in Table 2. A generalized map of treated acres is shown in Figure 1.

Table 2. Historical Progress Summary.

Colorado River Salinity Control Program									
Uintah Basin Unit Cumulative									
	Planned			Applied					
FY	**Total Contracts**	**Total Dollars**	**Total Acres**	**Total Acres**	**WL Wetland Habitat Management**	**WL Upland Habitat Management**	**Salt Load Reduction**	**Deep Perc Reduction**
Projected			**205,000**	**205,000**			**140,500**	
1980-90	1,183	23,470,138	71,712	71,712	852	5,090	41,985	37,606
1991	1,305	26,634,138	78,633	78,633	986		49,972	39,195
1992	1,589	30,016,937	83,459	83,459	1,140		55,485	41,272
1993	1,745	32,797,649	90,209	90,209	1,530	10,724	70,367	53,859
1994	1,858	36,115,061	93,950	93,950	1,743	11,592	77,549	56,001
1995	1,885	36,835,622	94,849	94,849	1,838	12,347	83,643	59,039
1996	1,984	40,451,590	99,185	99,185	2,493	12,751	86,362	60,320
1997	2,007	41,061,871	100,381	100,381	2,582	12,785	89,168	60,973
1998	2,023	41,697,194	101,158	101,158	2,606	12,807	92,303	62,315
1999	2,046	42,467,416	102,409	102,409	2,606	12,810	96,029	63,858
2000	2,090	43,404,429	107,205	106,508	2,601	12,805	97,550	64,281
2001	2,090	46,791,355	109,587	109,678	2,615	14,850	105,914	68,153
2002	2,338	52,931,660	118,136	117,494	2,615	14,865	117,890	72,173
2003	2,427	55,596,190	125,289	124,551	2,617	14,879	123,531	77,092
2004	2,624	63,727,960	129,997	125,664	2,632	14,948	142,302	91,132
2005	2,784	69,816,398	137,667	132,843	2,649	17,028	162,630	106,063

Figure 1. Uintah Basin Treated Acres.



Hydro-salinity

Before implementation of salinity control measures, Uintah Basin agricultural operations contributed an estimated 244,000 tons of salt per year into the Colorado River, from 204,000 acres of irrigated land. (Dept. of Interior, 2001)

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

1. The salt concentration of subsurface return flow from irrigation is relatively constant, regardless of the amount of canal seepage or on-farm deep percolation. The supply of mineral salts in the soil is infinite and the salinity of the out-flowing water is dependant only on solubility of salts in the soil. Therefore, salt loading is directly proportional to the volume of subsurface return flow. (Hedlund, 1992)

2. 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, 1992).

Deep percolation and salt load reductions are achieved by reducing or eliminating canal/ditch seepage/leakage and by improving the efficiency of surface irrigation. It is estimated that upgrading an uncontrolled flood irrigation system to a well designed and operated sprinkler system will reduce deep percolation and salt load by 80-90%.

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

Federal agencies have been tasked to "*Provide continuing technical assistance for irrigation water management as well as monitoring and evaluation of changes in salt contributions to the Colorado River to determine program effectiveness"* (Dept. of Interior, 2001).

In the past, detailed studies of installed irrigation systems determined that when operated as designed and approved, irrigation efficiencies were greatly enhanced and deep percolation sharply reduced (Draper et al., 2001).

Over the life of the Colorado River Salinity Control program in the Uintah Basin, cooperator preference has made a distinct shift from improved flood to sprinkler systems. In the Uintah Basin, over last few years, center pivots have become the system of choice and for the past two years, more acres were treated with center pivots than with wheel lines.

To ascertain continued conformance with approved design, systems are randomly evaluated on the basis of:

1. Cooperator questionnaires and interviews.

2. Irrigation Water Management (IWM) training.

3. Equipment spot checks and operational evaluations.

4. Long term irrigation water budgets.

Cooperator questionnaires, interviews, and training sessions

From 2002 to 2005 538 Cooperators were surveyed 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.

Table 3 is a summary of cooperator responses to the survey.

Table 3. FY2002 - FY2005 Cooperator's Survey Summary. About 20% of all contracts have been surveyed.

Crop Acres	**alfalfa**	**pasture**	**grains**	**other**	
	23,742	**12,959**	**4,585**	**6,765**	
Is the current irrigation system the same as designed and planned at start of contract? (Circle one)	**Substantially improved**	**Slightly improved**	**Same as designed**	**Slightly degraded**	**Substantially degraded**
	27	**56**	**442**	**4**	**0**
Describe any changes to and the general condition of sprinkling equipment:					
Is water measured? (Circle one)	**Yes**	**No**			
	318	**209**			
If Yes, acre-ft/acre applied?					
Is soil moisture monitoring used for irrigation scheduling? (Circle one)	**Yes**	**No**			
	248	**349**			
If yes, what type? (Circle all that apply)	**"Feel" method**	**Tensio- meters**	**Gypsum blocks**	**Neutron probe**	**Remote sensing**
	208	**0**	**6**	**9**	**1**
Are Evapotranspiration calculations used for irrigation timing? (Circle	**Yes**	**No**			
	14	**191**			
Have you attended any irrigation water management classes, workshops, or demonstrations?	**In the last 12 months?**	**In the last 2 years?**	**In the last 5 years?**	**Never?**	
	53	**36**	**54**	**472**	
Do you employ or use a consultant or service that advises irrigation scheduling? (Circle one)	**Yes**	**No**			
	5	**621**			
Have the changes in yield, labor used, irrigation operation and maintenance cost as well as other pre-harvest and harvest costs offset your share of the practice costs? (Circle one)	**Yes**	**No**			
	567	**48**			
My initial investment for the new system resulted in: (Circle one)	**Substantial economic gain**	**Minor economic gain**	**No economic change**	**Minor economic loss**	**Substantial economic loss**
	311	**251**	**49**	**7**	**2**
Do you feel that there is an effect economically overall to your area and region from this program? (Circle one)	**Substantial positive effect**	**Slight positive effect**	**No effect**	**Slight negative effect**	**Substantial negative effect**
	434	**169**	**14**	**3**	**1**
Has this project changed the quantity and quality of wildlife on your property? (Circle one)	**Substantial positive effect**	**Slight positive effect**	**No effect**	**Slight negative effect**	**Substantial negative effect**
	14	**32**	**80**	**24**	**5**

Irrigation Water Management (IWM) Training

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

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

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

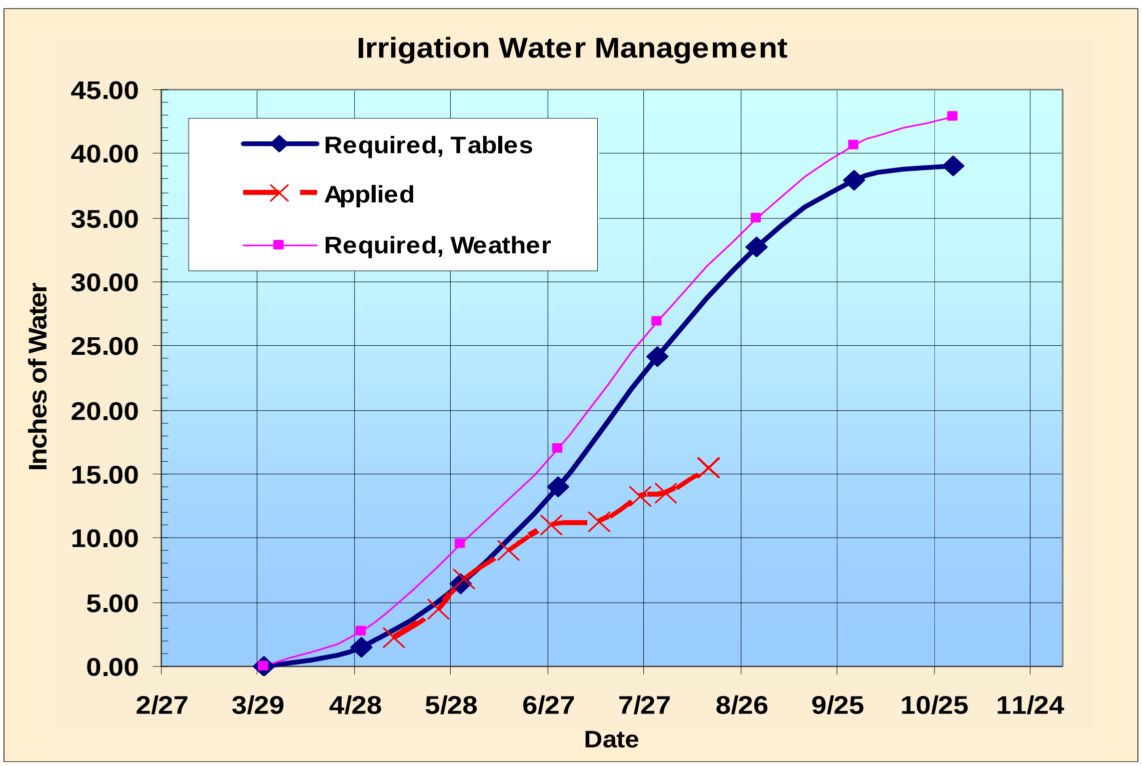
In the Uintah Basin, this is achieved by creating financial incentives for IWM, initial IWM training sessions, periodic water conferences, and developing IWM tools that simplify record keeping and help cooperators properly time irrigation cycles.

At the present time, IWM training for new system operators is scheduled quarterly. Attendance is required for new cooperators to receive payment of IWM incentives ($8-10/acre). In addition, maintaining and presenting irrigation records is required for payment. When requested, individual, onsite instruction is made available to any and all cooperators.

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

To help with irrigation timing, NRCS has developed and provided an Excel Spreadsheet, which allows a cooperator to graphically compare his actual irrigation with projected average crop water requirements and /or with modeled crop evapotranspiration. Evapotranspiration is calculated from weather data collected using ten weather stations operated by NRCS, using crop simulation techniques developed by Utah State University. The final output of the spreadsheet is a graph comparing water applied with water required on a seasonal basis, shown in figure 2, which indicates this field was under-irrigated.

Figure 2. Seasonal Irrigation Water Management.



In FY2005, 33 IWM analyses were delivered to the M&E Team. 55% had no deep percolation, 9% were between 0 and 1 inch of deep percolation (acceptable range), and 36% exceeded 1 inch of deep percolation. IWM payments created the opportunity to meet with new sprinkler owners, discuss these principles, and graphically illustrate how they can reduce deep percolation and increase production, by properly timing irrigation and keeping good records. NRCS personnel anticipate that nearly all new sprinkler owners will improve their IWM in the second year, based on training and expressed interest is these techniques.

NRCS is demonstrating and guiding cooperators in the use of another tool for timing irrigation - modern soil moisture monitoring systems, utilizing electronic probes and data recorders. Such systems can now be installed for about $500, giving the cooperator information on the water content of his soil, at several different depths, without time-consuming augering.

Providing improved IWM tools and training is essential to proper irrigation timing, based on actual soil moisture content and/or evapotranspiration tracking.

On-going guidance and advice is required to maintain positive results from salinity control practices.

Equipment Spot Checks and Evaluations

In FY2004 - 2005, 148 sprinkler systems, randomly selected, were evaluated using standard catch-can procedures. Along with normal testing, field personnel were asked to make particular note of leaks and other noteworthy equipment abnormalities.

Testing results are tabulated in Table 4.

Table 4. Summary of Sprinkler Evaluations.

	Number Systems Tested	Average Age	Christiansen Uniformity, CU		Within Specification	Estimated Average Field Size
System Type	No.	Years	NRCS Standard	Measured	%	Acres
Wheel Line	109	14	75	80	77	14
WL - Wobbler	10	15	75	78	80	15
Center Pivot	27	8	85	77	37	59
Handline	2	14	75	72	0	10
All	148	13				

It is noteworthy that center pivots fail to reach the Christiansen Uniformity (CU) specification more often than wheel lines. This can be partially explained by testing procedures.

CU ratings obtained from catch-can testing of wheel lines do not reflect well on actual performance of the system. When testing a wheel line, three adjacent, normally operating sprinklers are selected to do the test, typically representing only about 3% of the total field. Since the tested sprinkler heads are selected for their normalcy and those three heads represent a very small portion of the total field, the calculated CU is more representative of system design than overall system performance. High CU on wheel lines is not a reliable indicator of adequate operation and maintenance (O&M). The best indicator of good performance on wheel lines is conformance to original design and apparent quality of maintenance. Some data has been collected along with catch-can test reports that reflects the level of maintenance and indicates;

1. The majority of systems are operated as designed.
2. 18% of wheel line systems tested had some leaks in drains, hoses, joint connections, etc.
3. On systems that leak, the average estimated total leak volume is 9 gpm. The estimated average field size is 14 acres, making the average deep percolation due to leaks 2.3 inches/season, if allowed to leak the entire 135 day season.
4. Applied to all 119 wheel line systems tested, 187 gpm in leaks, over approximately 1,670 acres, if allowed to leak the entire season, would contribute 0.4 inches of deep percolation.

5. This leak count represents a snap-shot in time. It is not known if and when the noted leaks were corrected, but one might infer that at any given time, a similar number of sprinklers might be leaking.

6. Neither leak severity nor CU can be reliably correlated with system age. By design, more tests were run on older systems. See figures 3 and 4.

Figure 3. Leak severity vs. Age.

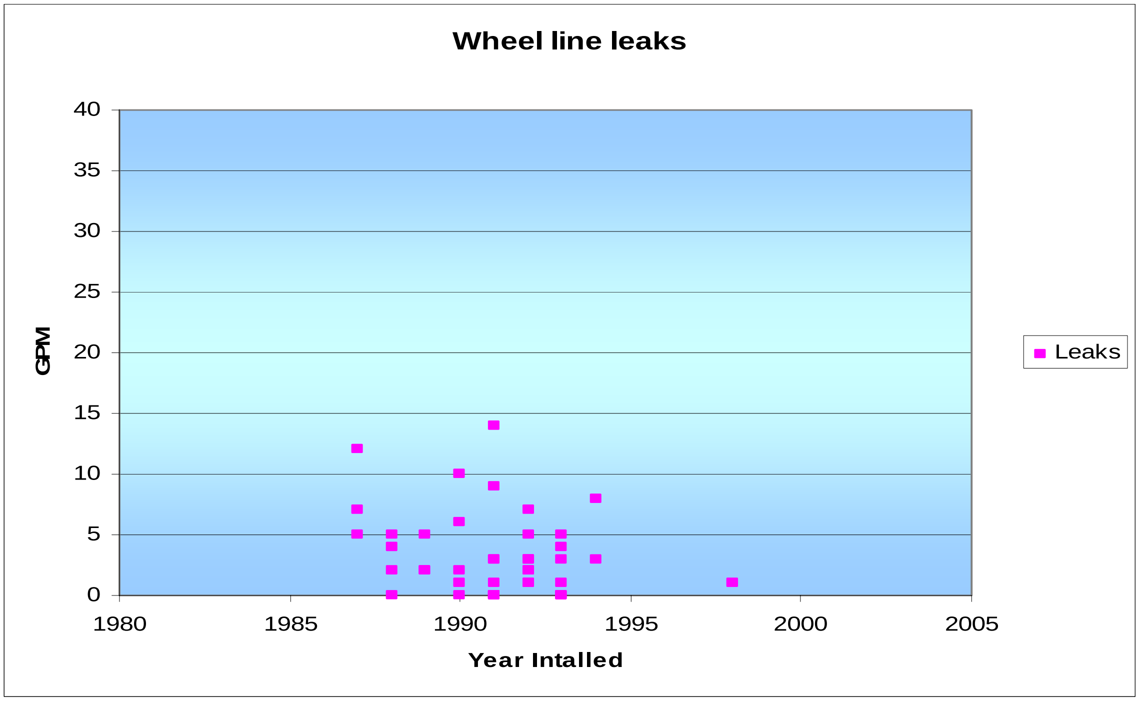
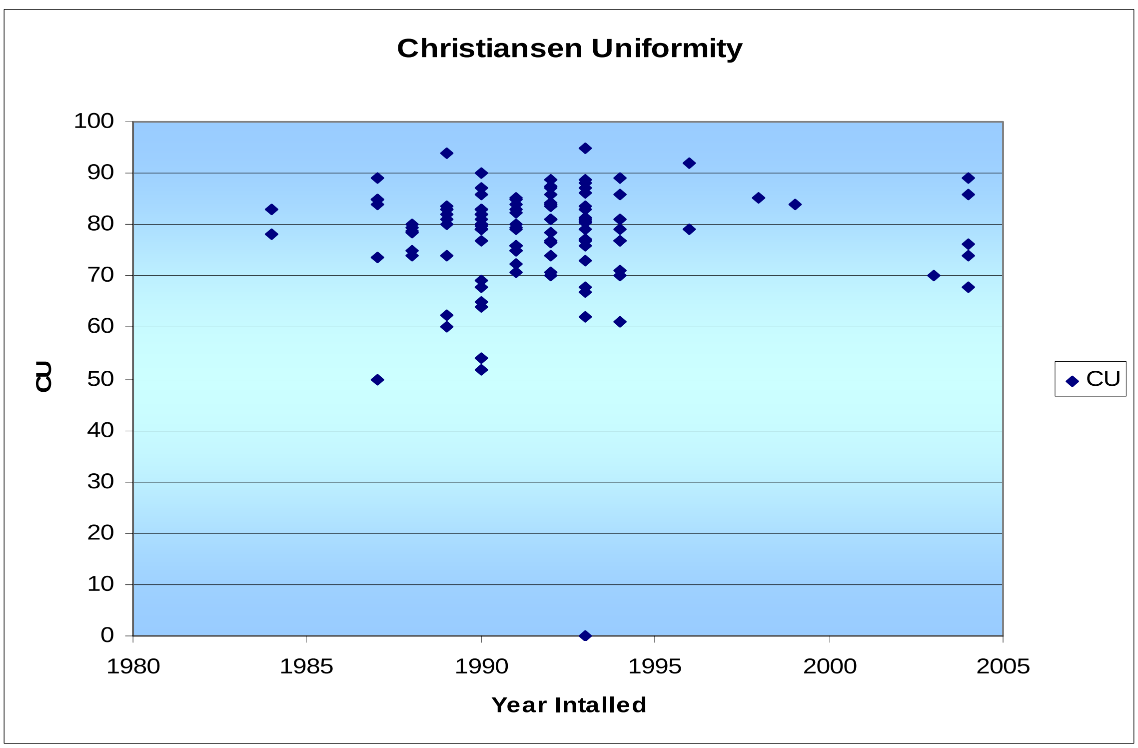


Figure 4. Christiansen Uniformity vs. Age.



Conversely, CU ratings obtained for catch-can testing on center pivots are a reliable indication of system performance. When testing a pivot, only a fraction of sprinkler heads are tested, but they represent the entire length of the pivot, and hence the entire field, effectively reflecting performance of the complete system.

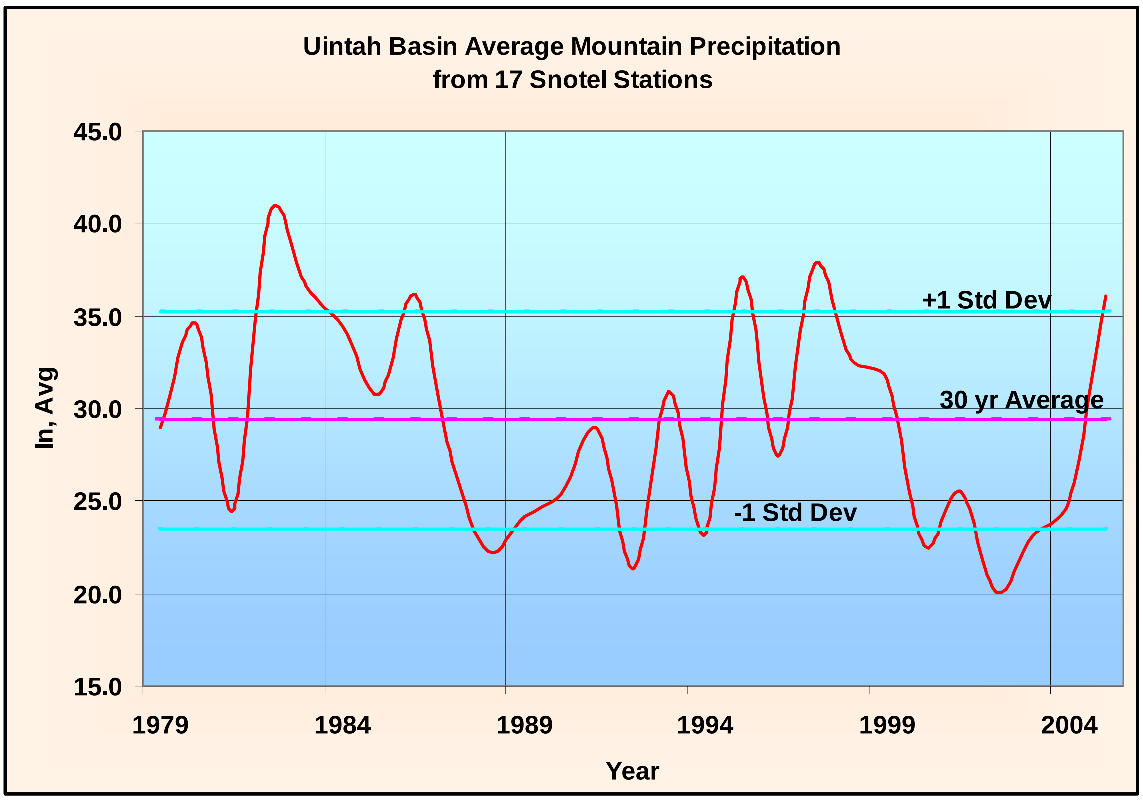
Inadequate CU on center pivots does indicate that better O&M is needed. Leaks on center pivots are rare. It is assumed that regular nozzle cleaning and conformance to the design nozzle package are the most important factors in keeping CU within specifications.

In light of this information, a study has been contracted by NRCS to determine design conformance of a large sampling of systems. Results will be discussed in the FY2006 M&E Report. In addition, the M&E team has proposed to contract a large scale field inventory of operating sprinkler systems, observing and mapping leaks and other visually obvious operating anomalies. One or two field employees should be able to visually observe and map hundreds of sprinklers in a very short period of time, in lieu of doing two or three catch-can tests per day. This data will better reflect on the quality of O&M being performed and general condition of installed practices.

Long Term Sprinkler System Water Budgets

Three sprinkler systems continue to be monitored, recording hourly flow data and attempting to determine deep percolation through detailed water budgets. Two of these systems have changed ownership over the years, requiring retraining in IWM principles. FY2005 was a stellar water year in Eastern Utah, and still none of these systems had excessive deep percolation. One operator, new this year, substantially under-irrigated, even while nursing a new alfalfa crop, reinforcing the need for constant education and guidance of cooperators, in the best interest of government and landowner..

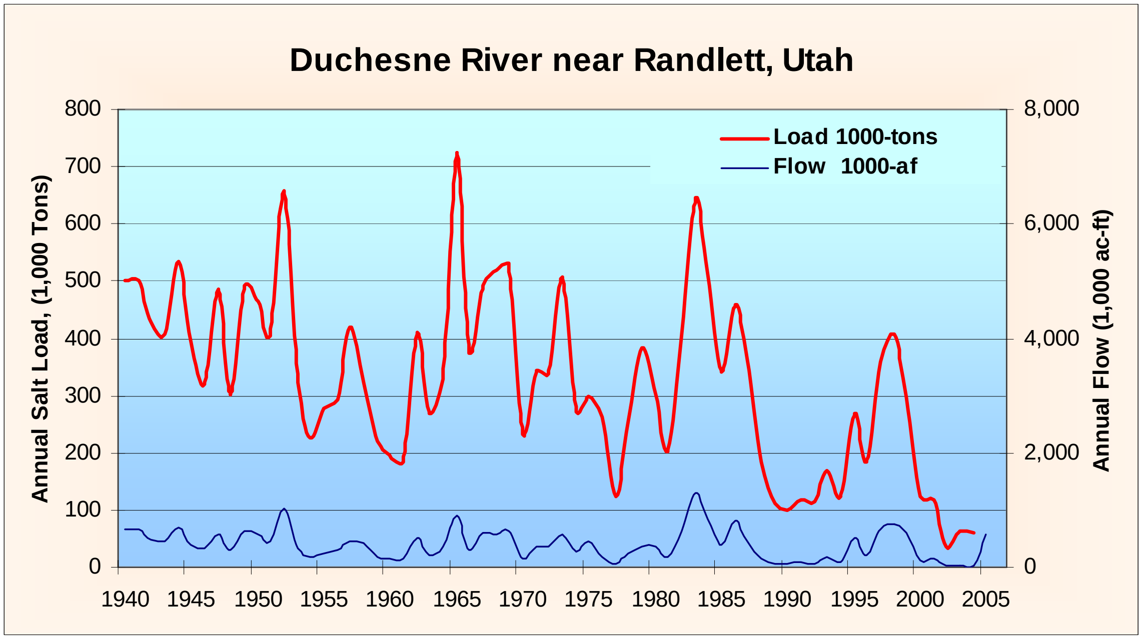
Figure 5. Average Mountain Precipitation.



Salt Load from Irrigation

Federal agencies are tasked to "*determine the salt load resulting from irrigation . . . practices*" (Dept. of Interior, 2001). The effectiveness of salt load reduction in the river system has been studied and assessed by the U.S. Geological Survey (USGS) and U.S Bureau of Reclamation (BOR). An update to their evaluation seems to indicate that salt loading in the river has been reduced significantly. Measured salt levels appear to be stable or down trending. Figure 2 is a graph of the calculated salt load in tons/year carried at the USGS gauging station on the Duchesne River, near Randlett (downstream of most Duchesne County irrigation).

Figure 6. Total Salt Load, Duchesne River near Randlett.



Wildlife Habitat and Wetlands

Background

In accordance with *"The Framework Plan for Monitoring and Evaluating (M&E) the Colorado River Salinity Control Program"*, first issued in 1980 and later revised in 1991, 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 on 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 new employees, a biologist and a civil engineer, were hired in September 2002 as the new Monitoring and Evaluation (M&E) team.

In 2001 "The Framework Plan for Monitoring and Evaluating (M&E) the Colorado River Salinity Control Program" was revised and as mentioned in the previous section 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 restraints 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 their vegetation extents, to quantify losses or gains of wetlands and wildlife habitat extents. 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 current date.

Off –Farm Wildlife Habitat Monitoring

The 2004 M&E Report produced a series of images depicting water and wetland extents derived from remote sensing technology. Three thirty-meter resolution Landsat 5 images of the Pleasant Valley area taken June 2, 1984, July 8, 1997, and August 12, 2004 were the base images used for the analysis. These images were then classified and mapped using commercial geospatial imaging software (Figures 7-10). The obvious outcome of the maps showed a decrease in wetlands from 782 acres in 1984, to 366 acres in 2004. The point was also made that there were many variables acting on the Area of Interest (AOI), such as climate. NRCS Snow Survey data from 1984 indicate an above average water supply year, in fact, a very wet year. In contrast 2004 was one of the driest years on record. The M&E team had concerns about information the data was portraying. To answer some of these questions, further investigations were made in 2005. Like 1984, 2005 was an above average water supply year. A replication of procedures completed in the 2004 M&E Report was effected on the same AOI with the Landsat 5 image from July 14, 2005. The results show that there are 857 wetland acres in 2005, even higher than those reported in 1984 (compare Figure 7 and Figure 10). These results confirm the suspicions of the M&E team, that climate plays a major role in small remotely sensed wetland areas.

The purchase of geospatial imaging software and acquisition of Landsat images has helped NRCS answer many questions on how to accomplish large scale vegetation monitoring. Classification of thirty meter Landsat images is an excellent tool for quantifying and assessing land cover classes on large scale projects where there are large tracts of similar vegetation. The M&E team 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 Utah salinity units. Landsat images help locate areas of potential wetlands and wildlife habitat areas; once these areas are located, detailed mapping of actual extents of features is required to accurately identify and define real losses or gains of wetland/wildlife habitat. A photographic history would be useful in documenting changes in vegetation type. Remote sensing alone will not achieve desired results sought by NRCS to report concurrency and proportionality of wildlife habitat replacement.

The M&E team has decided to redirect its methodology to include more precise measurements of actual habitat extents by incorporating detailed mapping, establishment of permanent photo points, and smaller-scale case studies. As this is more labor intensive, additional manpower may be needed to assist the M&E Team in gathering data needed to create accurate land cover maps. However, the M&E team believes it necessary to achieve the most accurate and reliable result possible.

Figure 7. Pleasant Valley wetlands and water classified from Landsat 5, June 2, 1984; 782 acres.

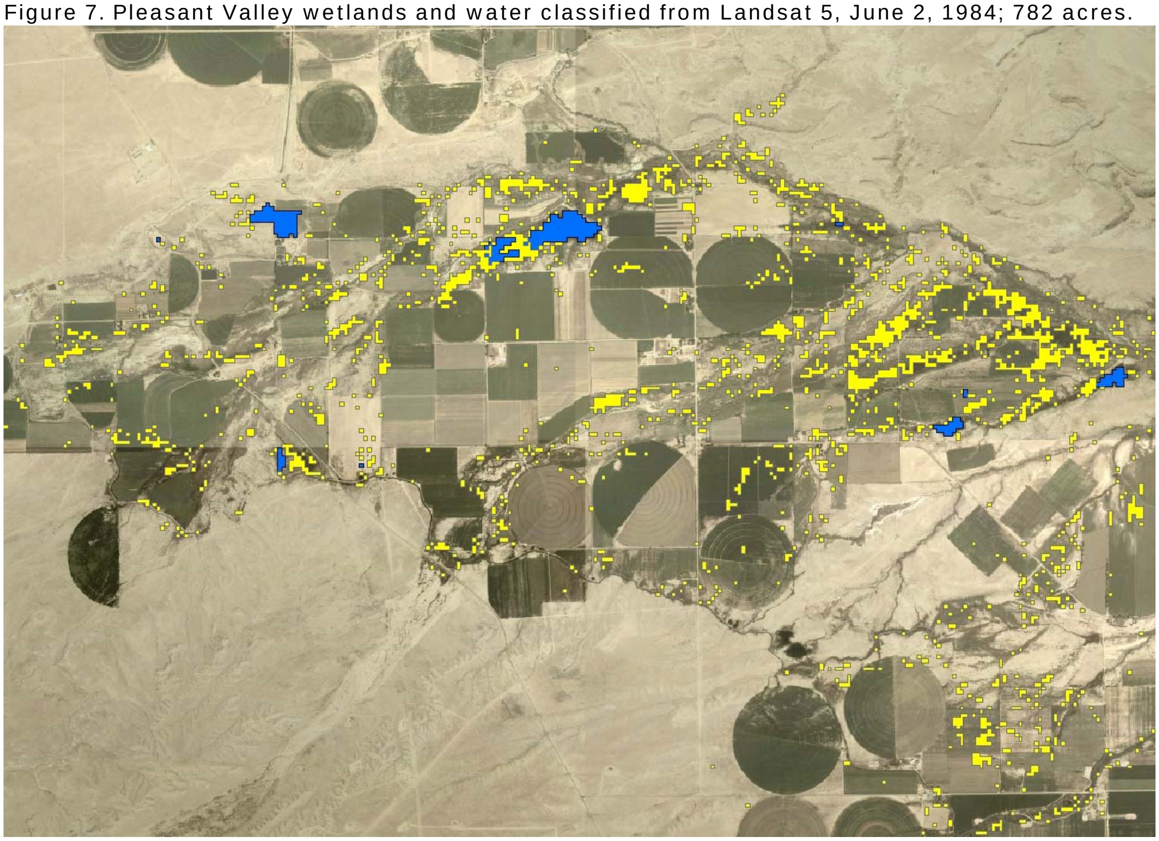


Figure 8. Pleasant Valley wetlands and water classified from Landsat 5, July 8, 1997; 645 acres.

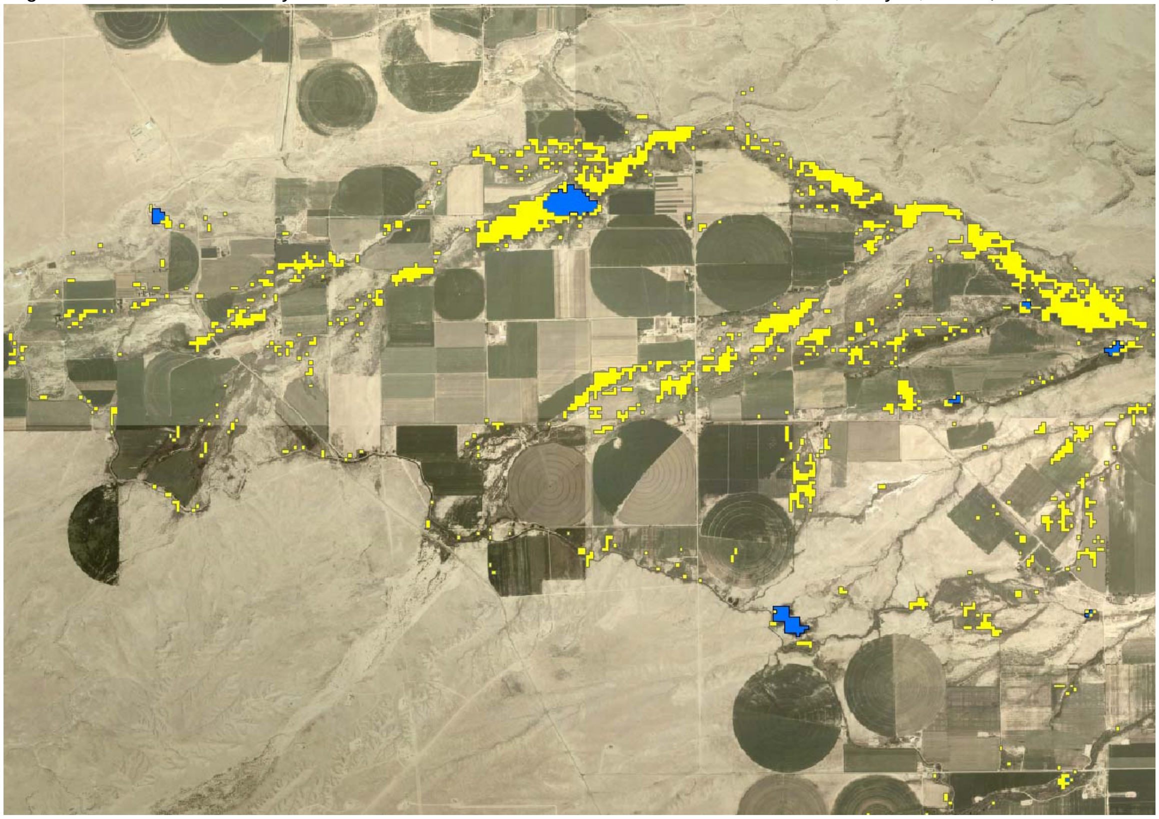


Figure 9. Pleasant Valley wetlands and water classified from Landsat 5, August 12, 2004; 366 acres.

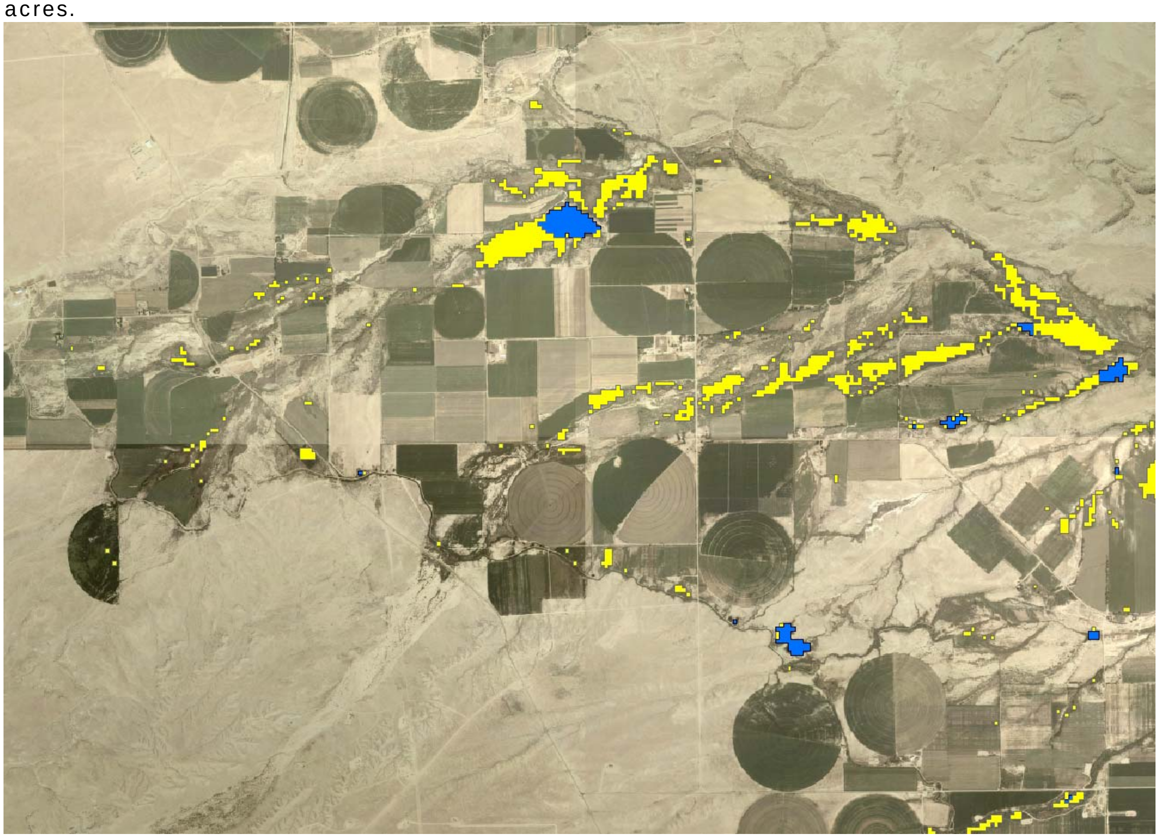
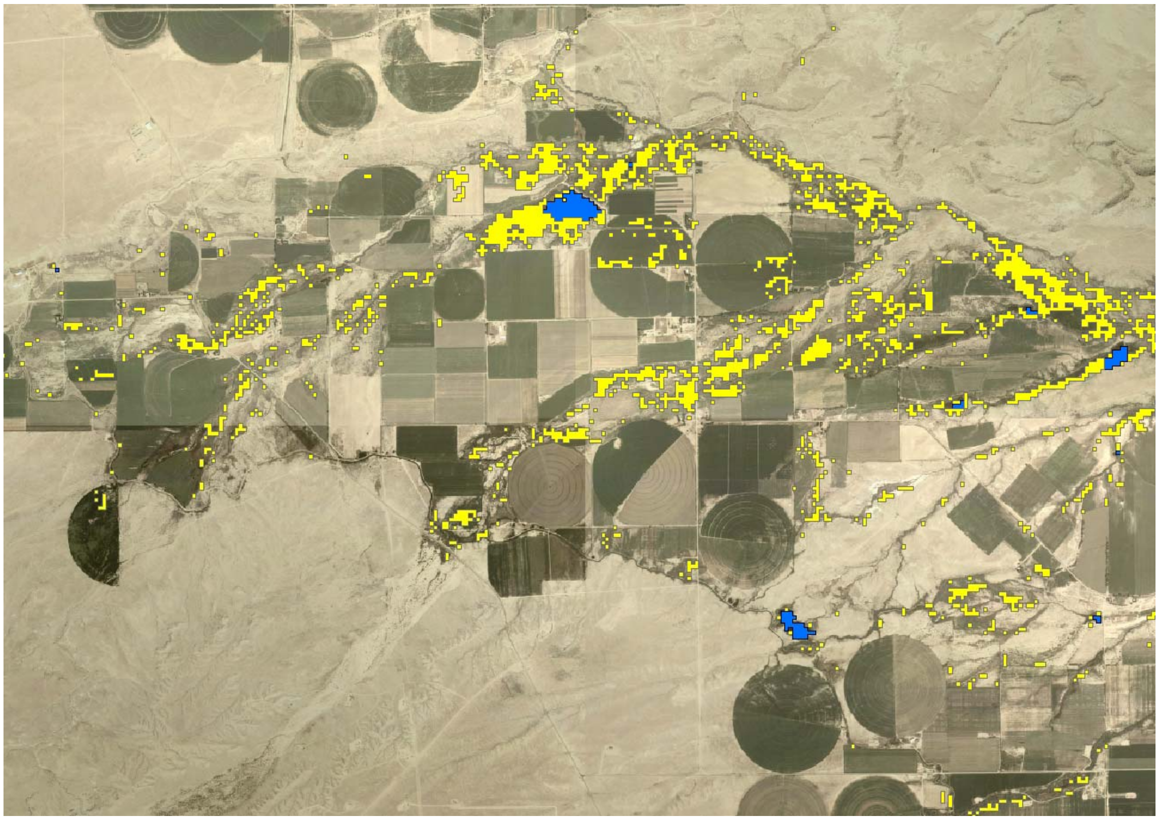


Figure 10. Pleasant Valley wetlands and water classified from Landsat 5, July 14, 2005; 857 acres.



On-Farm Wildlife Habitat Monitoring

Six Environmental Quality Incentive Program (EQIP) Wildlife Only projects were planned and funded in the Uintah Basin in FY2005 for a total of 136.3 acres. One Wildlife Habitat Incentive Program (WHIP) project was planned and funded totaling 110.5 acres. There were no Basin States Parallel Program (BSPP) projects with wildlife habitat practices planned or funded in 2005 (Table 5).

Salinity funding levels appropriated to the area to implement the Colorado River Salinity Control Program are at an all time high. Due to personnel constraints, wildlife habitat projects tend to be a second priority when dealing with large fund appropriations. In 2005 and also in 2006, NRCS has assigned a wildlife biologist to dedicate 25 percent of the staff year to the acquisition, planning, and application of wildlife habitat projects located with in the Uintah Basin Salinity Unit particularly in Duchesne County. Also in 2006 an agreement has been reached with the Utah Division of Wildlife Resources (DWR) to hire four additional wildlife biologists throughout the state to work in NRCS offices. One of these biologists will be assigned to the Price, Utah office and will be available to work in all salinity units in Utah. This should help alleviate the problem of wildlife habitat projects languishing due to the lack of oversight and attention. It should also facilitate acquisition of new projects and increase landowner awareness of various programs available for wildlife habitat projects.

Another issue is the difficulty NRCS has experienced in their attempts to utilize Basin States Parallel Project (BSPP) funds for wildlife habitat enhancement projects. To help alleviate the situation, in FY 2005 NRCS requested and was granted by the Salinity Forum, $100,000 in BSPP dollars to fund a Request for Proposals (RFP) for accelerated habitat replacement projects. NRCS is partnering with local Resource Conservation and Development Councils (RC&D) who will provide administration of the program. The first RFP was released in spring of 2005; results of the awards are yet to be made public, an additional $150,000 was granted for the 2006 RFP. A total of $250,000 in the BSPP RFP program is available for wildlife habitat replacement projects. RC&D Councils have been assigned goals by NRCS to help direct the creation, enhancement, and restoration of wetlands and wildlife habitats. NRCS anticipates the number of BSPP wildlife projects to increase due to this new funding mechanism.

Table 5.

Acres of Wildlife Habitat Creation or Enhancement Planned and Funded by Program and County
Uintah Basin, FY2005

	EQIP		WHIP		BSPP		Total (acres)
Management Type	**Wetland (*644)**	**Upland (*645)**	**Wetland (*644)**	**Upland (*645)**	**Wetland (*644)**	**Upland (*645)**	
Duchesne County	67.8	68.5	0	110.5	0	0	246.8
Uintah County	0	0	0	0	0	0	0
2005 Basin Totals	**67.8**	**68.5**	**0**	**110.5**	**0**	**0**	**246.8**

* Practice 644 is Wetland Wildlife Habitat Management; practice 645 is Upland Wildlife Habitat Management.

Table 6.

Acres of Wildlife Habitat Creation or Enhancement Applied by Program and County
Uintah Basin, FY2005

	EQIP		WHIP		BSPP		Total (acres)
Management Type	**Wetland (*644)**	**Upland (*645)**	**Wetland (*644)**	**Upland (*645)**	**Wetland (*644)**	**Upland (*645)**	
Duchesne County	10	2000	0	0	0	0	2010
Uintah County	1	12.6	0	0	0	0	13.6
2005 Basin Totals	**11**	**2012.6**	**0**	**0**	**0**	**0**	**2023.6**

* Practice 644 is Wetland Wildlife Habitat Management; practice 645 is Upland Wildlife Habitat Management

Three EQIP Wildlife Only projects planned in prior years were applied in FY 2005 for a total of 2023.6 acres. Eleven acres are attributed to wetland/riparian habitat types and 2000 acres are primarily upland in nature (Table 6).

Voluntary Habitat Replacement

NRCS continues to encourage replacement of wildlife habitat on a voluntary basis. Federal and State funding programs are in place to promote wildlife habitat replacement. This information is advertised annually in local newspapers, in local workgroup meetings, and Soil Conservation District meetings throughout the Salinity Unit. The Utah NRCS Homepage also has information and deadlines relating to Farm Bill programs.

The addition of the BSPP RFP will give more flexibility in the acquisition of potential projects as RC&D Councils will be able to actively solicit projects from landowners and possibly leverage funds with other government and non-governmental agencies.

Economics

Cooperator Economics

Production Information

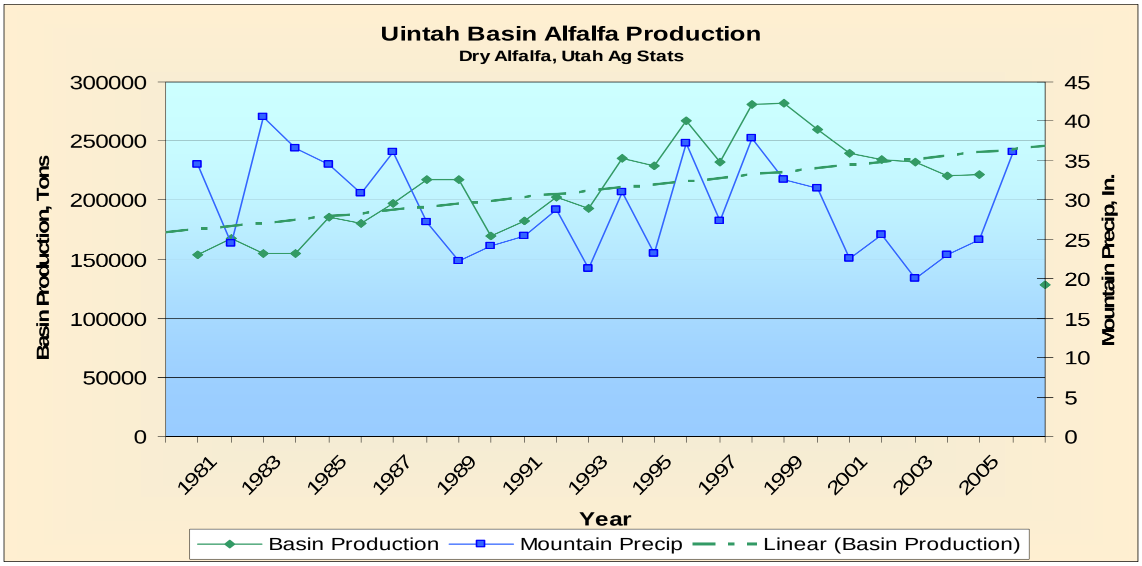
Field studies completed in 1995 concluded that upgrading from unimproved flood irrigation to either improved flood or sprinklers improved alfalfa crop yields from about 2.5 tons/acre to about 4.5 tons/acre. This magnitude of increase is consistent with anecdotal information from diligent cooperators.

Alfalfa production data downloaded from the National Agricultural Statistics Service (NASS), indicates that 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 125,000 acres treated out of 204,000 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 over 70% since 1980, while alfalfa acreage has increased about 40%. From 1980 to 2004, production increased from 154,000 tons to 222,000 tons, while alfalfa acreage increased from 47,500 acres to 64,500 acres, implying a yield on the order of 4.0 tons/acre for acreage upgraded to alfalfa production from another crop, most often grass pasture.

Figure 11 is a graph of Uintah Basin alfalfa production and mountain precipitation.

Figure 11, Uintah Basin Alfalfa Production.



Source data is tabulated in Appendix 4.

Labor Information

From National Agricultural Statistics Service (NASS) data, labor benefits are elusive as both *Hired Farm Labor* and *Total Farm Production Expenses* have increased steadily over the 1987, 1992, 1997, and 2002 Agricultural Censes.

While numerical data seems negative, anecdotal information is positive.

Since the majority of farmers, 69% reported in the 2002 Agricultural Census, do not hire outside labor, it is assumed that most cooperators are satisfied with their own personal labor savings. The 2002 Agricultural Census also reports that 68% of Uintah Basin farmers work at off-farm jobs more than 200 days/year. The local labor market is hot, due to booming oil prices and a rapidly expanding oil business. It seems logical that landowners will be spending even more time in off-farm employment.

Another perceived labor benefit 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.

Summary

Local land owners are willing and able to participate in salinity control programs. At present funding levels, ample opportunities exist 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 oil prices and national catastrophes have resulted in much high costs for plastic pipe, transportation, and equipment. In addition, the local economy is in an oil boom, and the upward pressure on labor and equipment prices is significant.

With labor, material, and equipment prices rising, it is expected that the cost/ton of salinity control measures will also increase. In addition, recent refinements in methods used to calculate salt load reduction are expected to exert upward pressure on calculated cost/ton.

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

Positive public perceptions of the Salinity Control Program include:

- Reduced salinity in the Colorado River.
- Increased flows in streams and rivers.
- Economic lift to the entire community from employment and broadened tax base.
- Local availability of expertise, information, and materials for public conservation.
- Aesthetically pleasing, green fields, more dense, for longer periods of time.
- Improved safety and control of water resources, with a reduction in open streams.

Negative public perceptions of the Salinity Control Program include:

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

Appendix

Appendix 1. Uintah Basin Alfalfa Production History.

Uintah Basin Alfalfa Production
Dry Alfalfa, Utah Ag Stats

Year	Producing Acres	Tons Produced	Yield Tons/Acre	Average Mountain Precip, In
1980	47,494	154,000	3.24	34.5
1981	49,488	167,900	3.39	24.5
1982	44,122	154,500	3.50	40.5
1983	45,412	154,400	3.40	36.6
1984	51,000	186,000	3.65	34.4
1985	50,467	180,500	3.58	30.8
1986	51,469	197,000	3.83	36.1
1987	53,511	217,000	4.06	27.1
1988	58,996	217,000	3.68	22.3
1989	51,498	169,800	3.30	24.2
1990	54,969	182,000	3.31	25.4
1991	54,251	202,500	3.73	28.8
1992	53,127	192,600	3.63	21.3
1993	55,712	235,600	4.23	31.0
1994	60,289	229,100	3.80	23.3
1995	63,857	267,000	4.18	37.1
1996	63,947	232,600	3.64	27.4
1997	66,461	281,000	4.23	37.8
1998	66,806	282,000	4.22	32.6
1999	61,502	260,000	4.23	31.5
2000	64,649	240,000	3.71	22.6
2001	61,802	234,000	3.79	25.5
2002	62,507	232,000	3.71	20.1
2003	62,949	221,000	3.51	23.1
2004	64,500	222,000	3.44	25.0

References

"FRAMEWORK PLAN FOR MONITORING AND EVALUATING THE COLORADO RIVER SALINITY CONTROLL PROGRAMS of the U.S. Department of Agriculture (USDA)-Natural Resources Conservation Service (NRCS)", May, 2002.

"QUALITY OF WATER COLORADO RIVER BASIN – Progress Report #20", U.S. Department of the Interior, 2001.

"Colorado River Salinity Control Program, Uintah Basin Unit, Monitoring and Evaluation Reports", 1989 – 2001.

2002 Final Mason Report 1016021. An Excel spreadsheet by David Mason, National Salinity Program Manager, NRCS Headquarters.

"Colorado River Salinity Control Program, Uintah Basin Unit, Monitoring and Evaluation, 2001 Report", Draper, Brent W., Goins, Donald J., Lundstrom, D. Nick.

"Colorado River Salinity Control Program, Uintah Basin Unit, Monitoring and Evaluation, 2005 Report", USDA-NRCS.

Habitat Evaluation Procedures, U.S. Fish and Wildlife Service 1980.

"Salt Primer – Water and Salt Budgets", John C. Hedlund, Soil Conservation Service, 1992.

1987, 1992, 1997, 2003 "Census of Agriculture", United Stated Department of Agriculture, National Agricultural Statistics Service.