The Overland Ditch and Reservoir Company Water Management Plan

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Many people contributed to this project. A Steering Committee was formed from shareholders in the Overland Ditch and Reservoir Company: Robert Church, Phil Ceriani, Reg Cridler, and Bill Bishop were instrumental in developing this plan.

Wilmore and Company conducted the mapping and the GIS work for the Overland Ditch and John Milligan provided additional GIS information for the Redlands distribution system.

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Water Management Plans

Background

The Overland Ditch and Reservoir Company (ODRC) is a small irrigation company that provides irrigation water to farms and ranches on mesas between Paonia and Eckert, Colorado. Over the years the conveyance system has been repaired on an as needed basis, however, the ODRC now wishes to conduct an overall plan for repairs and upgrades of the entire conveyance system as well as to raise the dam on the Overland Reservoir. In an effort to obtain funding for the repairs and upgrades of the infrastructure of the conveyance system and the dam, the ODRC Board of Directors decided to develop a Water Management Plan to facilitate requests for future funding. The ODRC has obtained financial assistance from the U.S. Bureau of Reclamation's Water Conservation Field Services Program to develop this Water Management Plan.

Water Management Plans

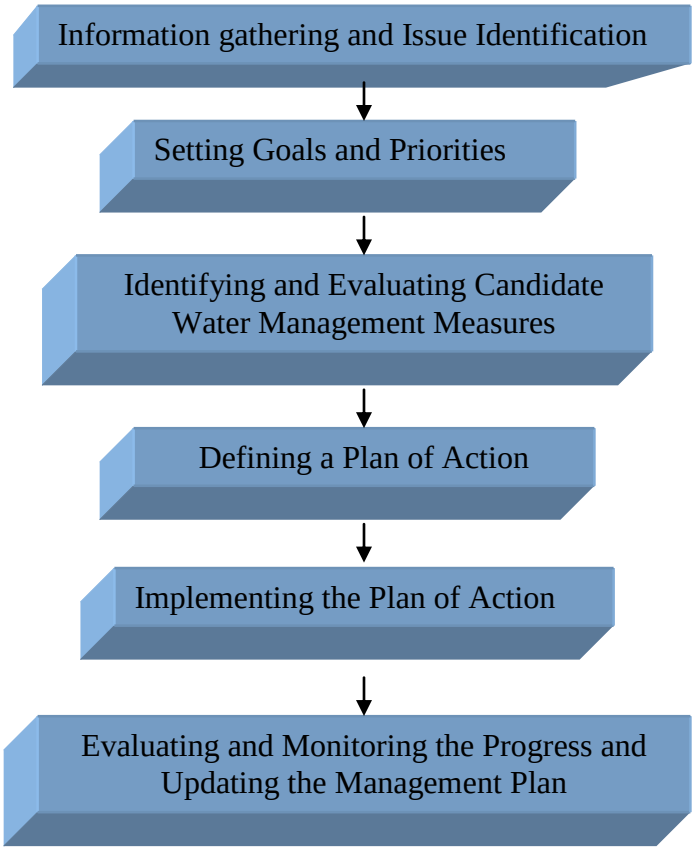
The purpose of the Water Management and Conservation Plan is to facilitate irrigation water providers in the improvement of their overall water management by addressing issues and problem areas and providing a defined method of solving problems and dealing with issues. The goal of the Water Management and Conservation Plan is to achieve long-term and lasting improvements in water use efficiency. A planning process is outlined in the publication *Achieving Efficient Water Management: A Guidebook for Preparing Agricultural Water Conservation Plans* (Hydrospere, 2nd Ed. September 2000). Figure 1-1 illustrates the steps involved in the development of a Water Management Plan. Additional benefits of the Water Management and Conservation Plan is the collection of important documents of the company such as articles of incorporation and bylaws for the company, water court decrees, contracts, maps, and a description of the general operating procedures. Other important information included in the plan are historical water diversions and general water administration for the area.

The Development Process of a Plan

A Steering Committee is formed to provide guidance and to set goals and priorities for the Water Management Plan. The Steering Committee members include : Robert Church, Phil Ceriani, Reg Cridler, and Bill Bishop .

Figure 1-1

The Development of a Water Management Plan



Step 1. Information Gathering and Issue Identification

Background information was gathered and documented in this plan to assist with identifying and analyzing water management concerns and opportunities. Information collected included company articles of incorporation and bylaws, water rights, contracts, general operating procedures of the facilities. Also collected and analyzed were the diversion records for 10 years, cropping patterns and irrigated acreage, conveyance losses and the water delivery efficiencies. This information is summarized in later chapters. Interviewing ditch riders, water commissioners, and major shareholders in the company helped identify water management problems or opportunities. In addition, a survey was distributed to all of the shareholders in the district to identify additional water management concerns.

Step 2. Setting Goals and Identifying and Evaluating Candidate Water Management Measures

Water Management goals and measures were set based on the criteria of:

- Anticipated benefits to the water users
- Expected costs
- Feasibility, both financial and physical

Step 3. Defining a Plan of Action

Water Management plans of action were determined by evaluating proposed alternatives. The Plan of Action that best met the criteria was selected for implementation.

Step 4. Implementation of the Plan of Action

Each Plan of Action was prioritized for implementation based on its relative importance as determined by the Steering Committee. A planning-level budget and schedule was developed as well as prospective funding sources for each action.

Step 5. Evaluating and Monitoring the Progress and Updating the Management Plan

The Water Management Plan will be updated every five years.

Chapter
2

The Overland Ditch and Reservoir Company

History of the Overland Ditch and Reservoir Company

The Overland Ditch and Reservoir Company (ODRC) is a non-profit mutual ditch company formed in 1895 in the State of Colorado. Construction of the Overland Ditch was begun shortly thereafter and the original dam for the Overland Reservoir was completed in 1905. The company currently has 122 shareholders with 10,000 outstanding shares and holds decrees for 7,1271.0 acre-feet of water. Appendix A contains a copy of the Articles of Incorporation and the Company Bylaws.

Climate and Topography

The ODRC provides 17,000 acre-feet of primary and supplemental irrigation to irrigate approximately 4,500 acres in Delta County, Colorado. The altitude of the area irrigated averages 6500 feet above sea level.

The climate of the acreage irrigated by the Overland Ditch and Reservoir is that of moderate winters and hot summers that vary with elevation. The annual average precipitation ranges from 12-15 inches with half of the precipitation occurring as rainstorms from in the spring and fall months (Paonia Station).

Soils in the area irrigated by the Overland Ditch consist of sandy loam of 0-60 inches with subsoil of clay loam and light clay, stony loam from 0-2 inches with subsoil of light and heavy clay from 2–24 inches underlain with cobbly or stony loam, and sandy loam that are well drained with a depth of up to 60 inches.

The Overland Ditch and Reservoir Company Organization Structure

The Board of Directors of the Overland Ditch and Reservoir Company is elected annually by the shareholders and is made up of 5 members that serve for two years. The President and Vice-President are elected by the Board of Directors for one-year terms. As stated in the Bylaws, "the President shall be the Chief Executive Officer of the Company:

he shall sign official documents of the Company, preside at all meetings of the Board, and Company, and under the direction of the Board have general supervision of superintendency of the business of the Company." The Secretary-Treasurer may or may not be a member of the Board of Directors or a stockholder.

The ORDC has issued 10,000 shares of stock valued at $10.00 per share. The shareholders elect the Board of Directors and are allowed one vote per share of stock. The largest shareholder owns 1175 shares and the smallest shareholder owns1 share. Approximately 50% of the shareholders own between 20 and 100 shares with 63% of the shares owned by 20% of the shareholders. The average share receives approximately 1.6 acre-foot of water per season, 0.6 acre-feet from reservoir storage and 1.0 from direct flow water rights.

Contract Obligations

ODRC presently has three contract obligations with the Colorado Water Conservation Board (CWCB). The first two loans with the CWCB were obtained to make required repairs to the Overland dam and spillway and will be payable through 2028. The third loan has been approved by the CWCB to raise the dam on the Overland Reservoir and raise the spillway crest in order to increase storage in the reservoir by 971.0 acre-feet.

Annual Budget

The ODRC receives monies through annual assessments and shareholders are invoiced as the Board deems necessary. For the 2007 irrigation year, assessments were billed twice during the year but were limited to 17.50 per share: The first assessment, billed prior to the irrigation season was billed at $3.00 for operation and maintenance and $3.53 for repayment of the outstanding loan. The second billing occurred towards the end of the irrigation season and was adjusted according to the outstanding operation and maintenance costs plus a second payment on the loan of $3.26 per share.

The 2006 receipts from the assessments totaled $65,000.00 for Operation and Maintenance and $67,900.00 for the CWCB Loan Repayment. The ODRC budget outlays support one seasonal ditch rider, the annual operation and maintenance of the Overland Ditch and Reservoir and repayment of the long term debt as well as administrative costs and professional services and fees. Figure 2-1 illustrates the 2006 income for the Overland Ditch and Reservoir Company and Figure 2-2 illustrates the 2006 budget distribution.

Figure 2-1
Overland Ditch & Reservoir Company 2006 Income

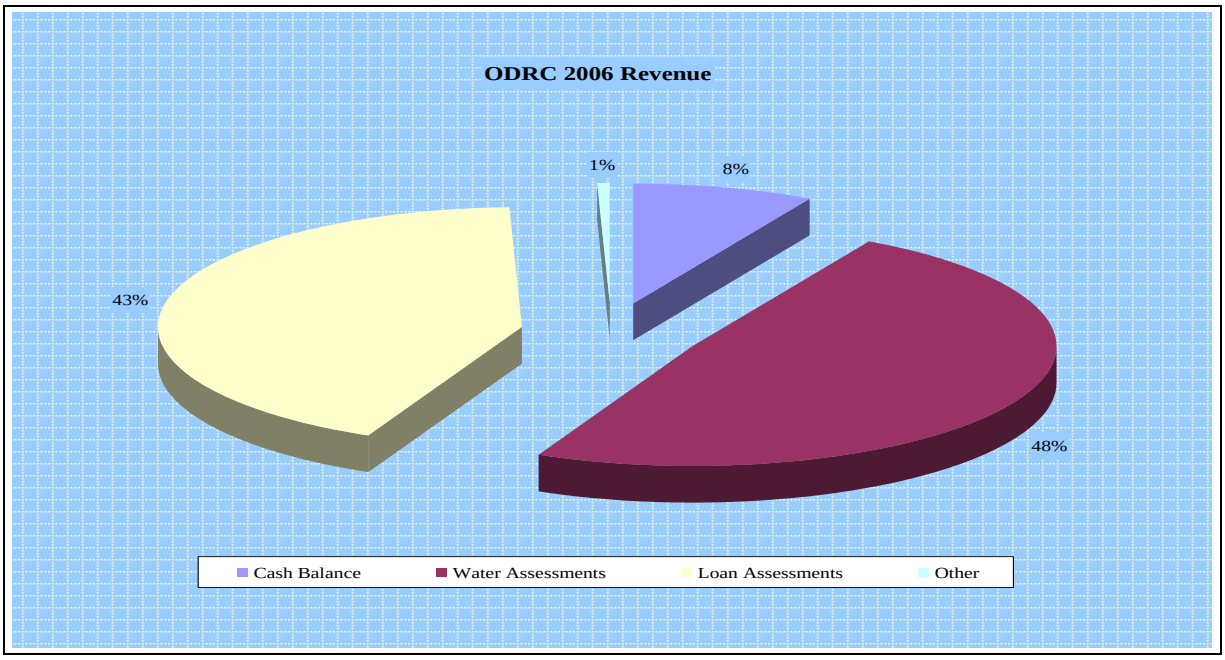
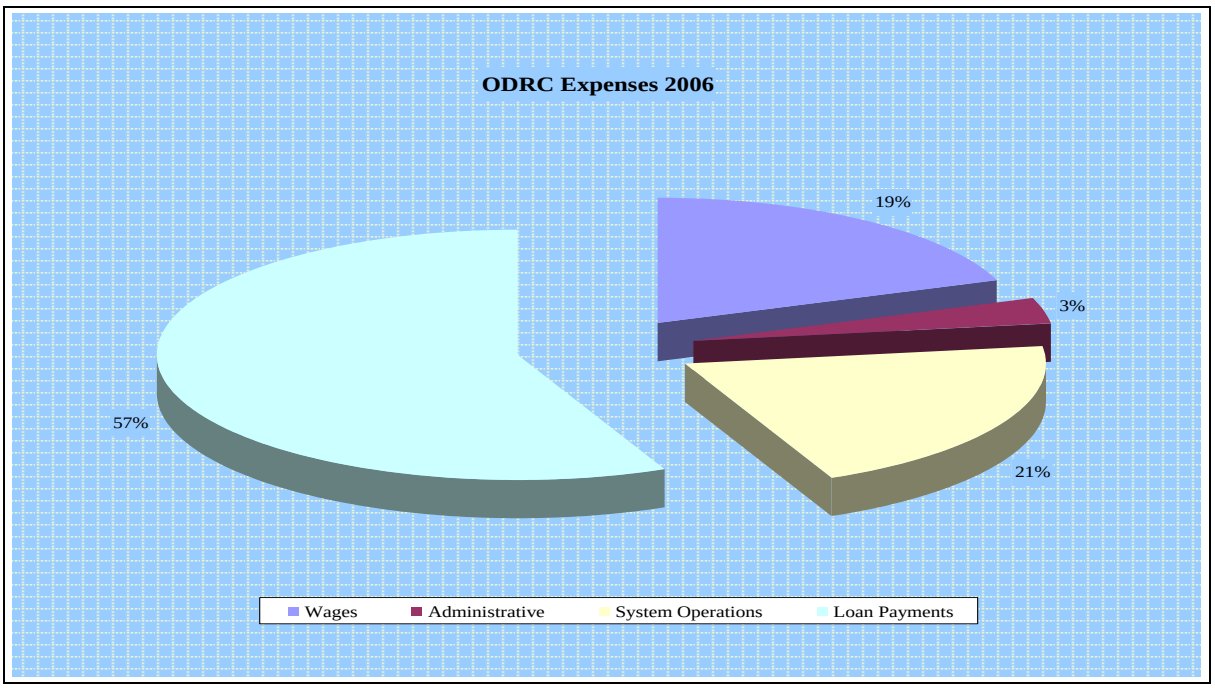


Figure 2-2
Overland Ditch & Reservoir Company 2006 Distributions



Chapter
3

Water Resources Inventory

Overland Ditch and Reservoir Company Water Rights

Water Court decrees were sought for the Overland Ditch and the Overland Reservoir in the early 1900s. The Overland Ditch on Leroux Creek was decreed for 24.73 cfs on March 20, 1908. The Overland Reservoir No. 1 was decreed for 2,000.0 acre-feet on June 23, 1914 diverting water from Muddy Creek. Diversions from Hubbard Creek, Terror Creek, Alder Creek, and Muddy Creek were decreed as well on June 23, 1914 for a cumulative amount of 75.0 cfs. On August 28, 1920, an additional 2,000.0 acre-feet was decreed for the Overland Reservoir No.1 and an additional 75.0 cfs was decreed for diversions at the Overland Ditch on Leroux Creek. On August 28, 1920, a conditional decree was sought for Overland Reservoir No. 2 in the amount of 1050.73 acre-feet. On March 20, 1954 a second enlargement was decreed conditionally to the Overland Reservoir No. 1 in the amount of 2120 acre-feet. On March 20, 1954, domestic and stock water rights were decreed uses from the Overland Ditch on Leroux Creek in the amount of 8.0 cfs. The second enlargement to the Overland Reservoir No. 1 was made absolute on February 2, 1962. During the late 1980s and early 1990s, the conditional water right for the Overland Reservoir No. 2 was transferred to the Overland Reservoir No. 1 and 80.0 acre-feet was made absolute. In water court case 01CW107, augmentation use was added to all decrees in the Overland Reservoir No.1. Table 3-1 is a summary of the Overland Ditch and Reservoir Company water rights. Appendix B contains copies of the Overland Ditch and Reservoir Company water court decrees and Appendix C contains maps of the distribution system and a compact disk of a map of the system is located in a sleeve of the report.

Water Administration

During the non-irrigation season of November through April, Overland Reservoir fills under its own priority. The reservoir is usually filled by the first of June of each year. Concurrently, during the runoff, usually in May and June, the Overland Ditch diverts approximately 60-75 cfs of water through the various diversions from Leroux Creek, Hubbard Creek, Muddy Creek, and Terror Creek. When the spring runoff has subsided, usually between mid June to mid July, the Overland Ditch decrees go out of priority and the water stored in Overland Reservoir is released for irrigation. Storage waters are usually depleted by the end of August.

The Overland Ditch and Reservoir water rights on Muddy Creek, Alder Creek, Terror Creek, and Hubbard Creek are all subject to downstream senior calls on the tributaries and from the North Fork of the Gunnison River. The Overland Ditch diversion on Leroux Creek is subject to senior calls on Leroux Creek.

Irrigation Deliveries

The Overland Ditch system consists of a 28 mile distribution system with diversions from five drainages. The reservoir releases use the Cow Creek drainage as a conduit for 10.0 miles before being rediverted into the main ditch and delivered to the Stucker Mesa, Wakefield Mesa, and Roatcap Creek farm headgates and the Redlands Mesa ditches. The Overland Ditch and Reservoir water is distributed by the Redlands Mesa Water Users to all recipients on Redlands Mesa once the water has passed the "Moore Box". There are six Parshall Measuring Flumes on the ditch, ten "under shots" that deliver water from the drainages to downstream senior water rights, and at every mile is a wastegate that regulates the flow in the ditch.

The releases to the Stucker Mesa, Wakefield Mesa, and Roatcap Creek represent only 6% of the ODRC shares and the Overland Ditch water is the primary source of irrigation water. The balance of the shareholders receive Overland Ditch and Reservoir water as supplemental water to the Redlands Mesa irrigation decrees.

Table 3-1

Overland Ditch and Reservoir Company Water Rights

Overland Reservoir No. 1

Adjudication	Appropriation	AF	Use	Court Case	Source	Comments
6/23/1914	7/01/1903	2000.0	Irrigation	617	West Muddy Creek	Priority A8
8/28/1920	7/01/1903	2000.0	Irrigation	1424	West Muddy Creek	1st Enlargement
8/28/1920	6/11/1902	292.0	Irrigation	90CW33	West Muddy Creek	Conditional, Trans from Res No.2
8/28/1920	6/11/1902	758.73	Irrigation	89CW142	West Muddy Creek	Conditional, Trans from Res No.2
8/28/1920	6/11/1902	0.0	Irrigation	94CW56	West Muddy Creek	80.0 af made absolute
3/20/1954 2/5/1962	7/22/1948	2120.0	Irrigation	3503	West Muddy Creek	Made absolute

Overland Reservoir No. 2

Adjudication	Appropriation	AF	Use	Court Case	Source	Comments
8/28/1920	6/11/1902	1050.73	Irrigation	1424	West Muddy Creek	Conditional, Transferred to Res No.1 90CW33

Note: West Muddy Creek is also known as Cow Creek

Table 3-1

Overland Ditch and Reservoir Company Water Rights

Overland Ditch

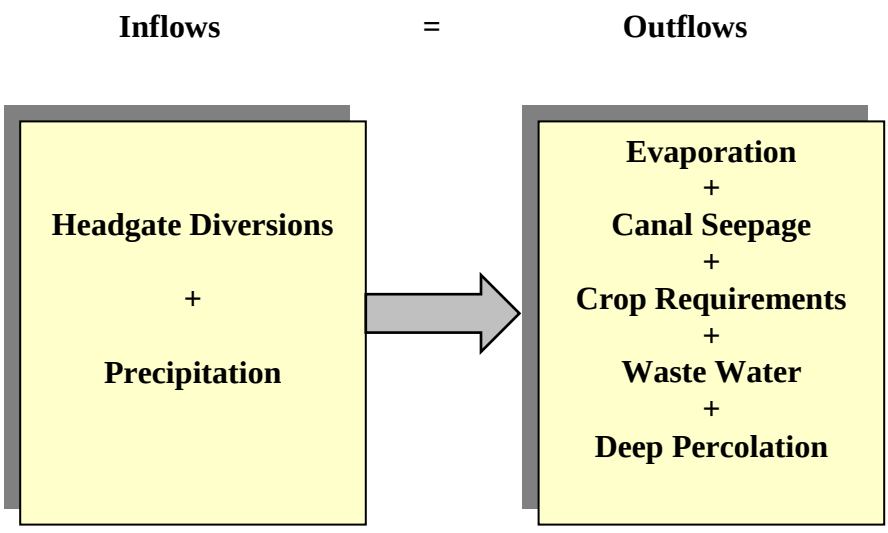
Adjudication	Appropriation	CFS	Use	Court Case	Source	Comments
3/20/1908	8/01/1893	24.72	Irrigation	487	Leroux Creek	
6/23/1914	8/01/1893	75.0	Irrigation	617 pod	Hubbard, Terror, West Muddy,Alder	75.0 cfs cum from all
8/28/1920	4/10/1919	75.0	Irrigation	2030	Leroux Creek	
3/20/1954	8/01/1893	3.0	Domestic, Stk	3503	Leroux Creek	
3/20/1954	6/01/1935	5.0	Domestic, Stk	3503	Leroux Creek	

Chapter
4

Water Budget

The water budget concept is simply a comparison of water inflows to water outflows (Figure 4-1). Water inflows consist of all sources of water supplied to the system by way of diversions and precipitation and outflows consist of water taken out of the system through evaporation, seepage, crop use, runoff, and deep percolation. The Water Budget provides a mechanism to examine operational efficiencies of an irrigation system.

Figure 4-1
A Water Budget

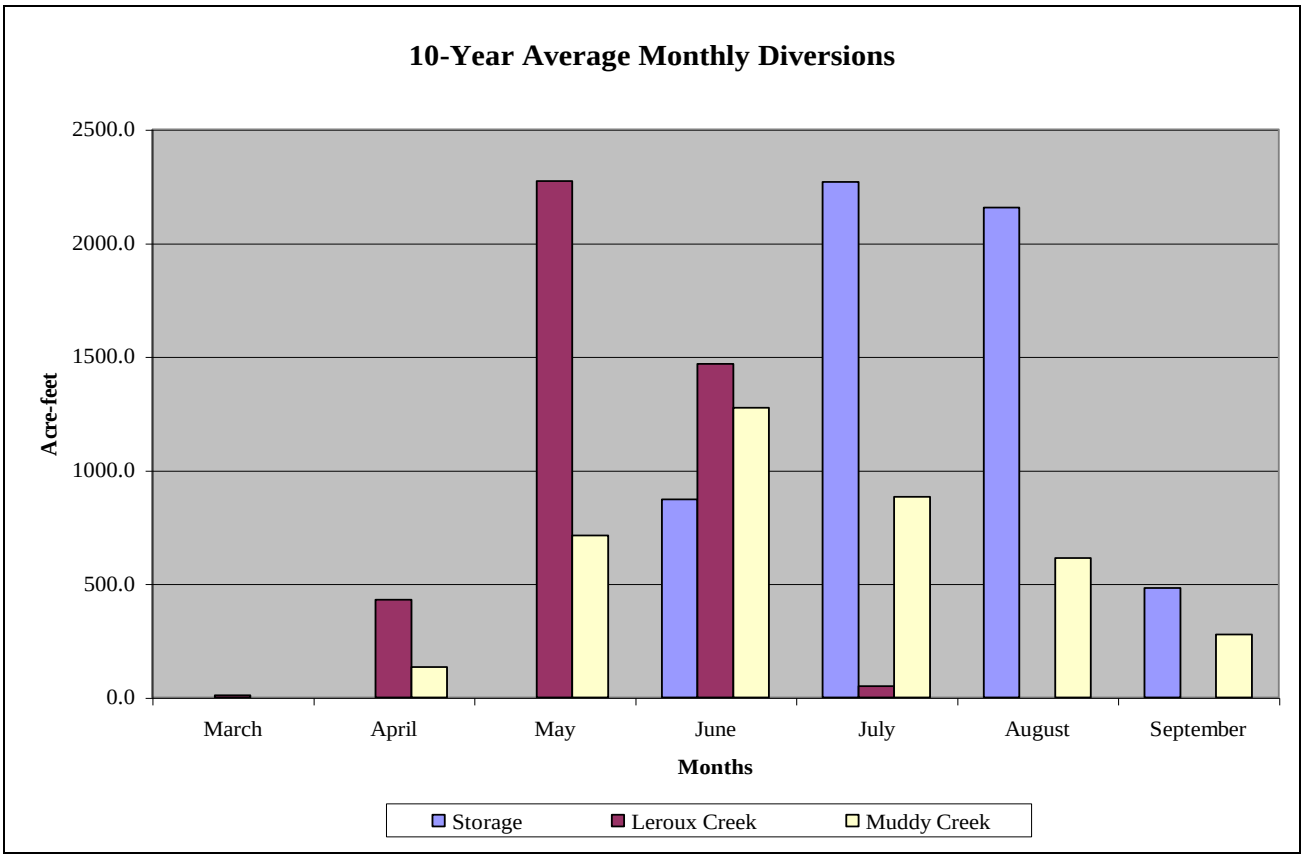


A water budget was developed for the Overland Ditch using two scenarios. The first scenario examined conditions for an average water year of 2001and the other examined the drought year of 2002. Water budget results are summarized at the end of this chapter. The following sections describe the elements used to develop the water budget.

Diversions 1996-2006

Table 4-1 and Figure 4-2 and Figure 4-3 are summaries of the averaged diversions for the years 1996 through 2006. The minimum diversions occurred in the water year 2002 in the amount of 2072.0 acre feet and the maximum diversions occurred in the water year 2005 in the amount of 18,302.6 acre feet. Over the ten-year period, total diversions averaged 13,781.7 acre feet from both storage and direct diversions.

Figure 4-2



The early season diversions are mostly from the Leroux Creek water right and the mid and late season water comes from the Overland Reservoir and the Muddy Creek, Hubbard Creek, and Terror Creek water rights. As depicted in Figure 4-2, on average, direct diversions from Leroux Creek and the West Muddy-Terror-Hubbard Creek diversions are nearly equal with diversions from storage only about 1,600 acre-feet more.

Figure 4-3

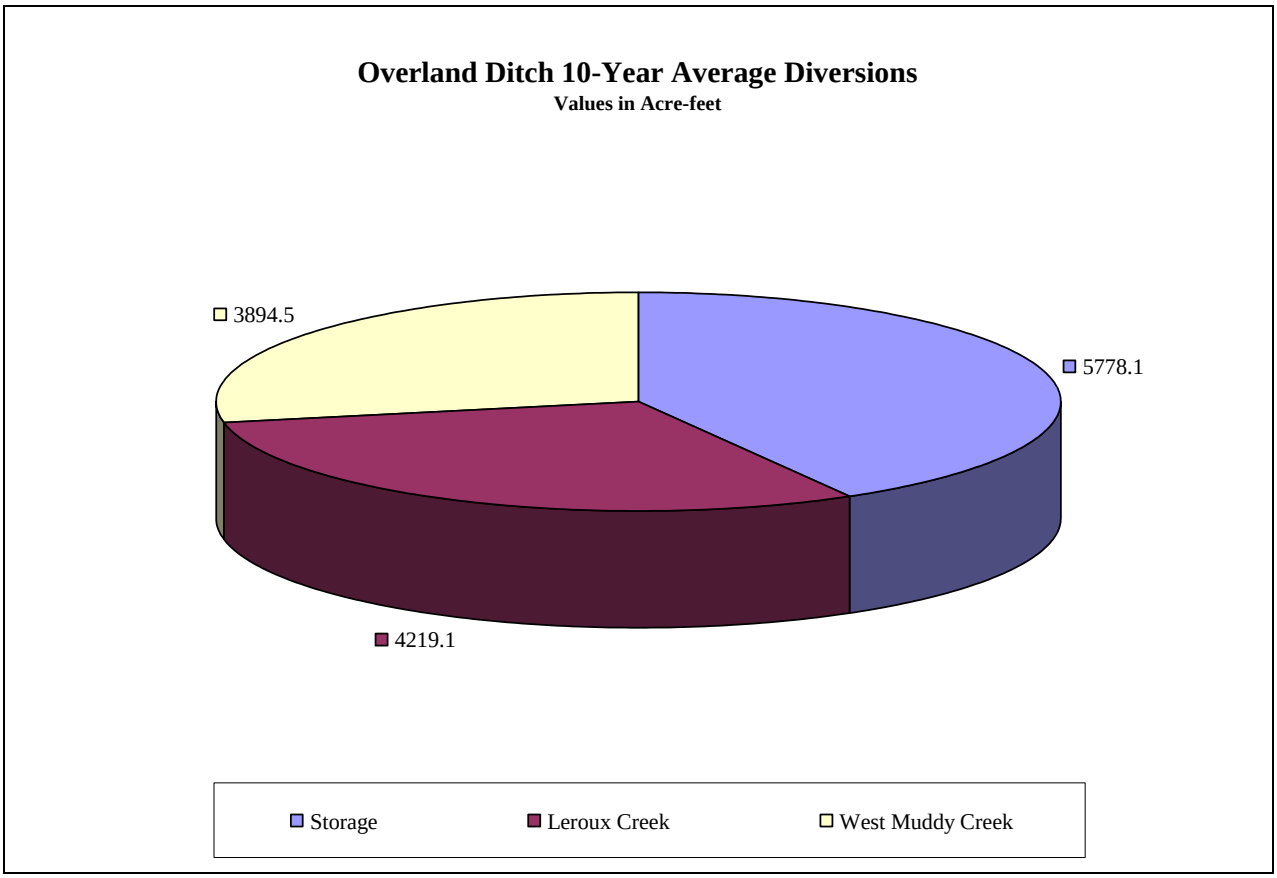

Overland Ditch 10-Year Average Diversions
Values in Acre-feet
3894.5
5778.1
4219.1
Storage
Leroux Creek
West Muddy Creek

Table 4-1

Overland Ditch
Diversions 1996-2006

Year:		April	May	June	July	August	September	Total
2006	Storage	0.0	0.0	1559.0	3074.4	1567.0	0.0	6200.4
	Leroux Crk	848.0	3053.0	0.0	0.0	0.0	0.0	3901.0
	W. Muddy,Terror, Hubbard	59.5	1842.0	1928.0	440.0	166.0	0.0	4435.5
	Total	907.5	4895.0	3487.0	3514.4	1733.0	0.0	14536.9
2005	Storage	0.0	0.0	0.0	1585.2	3590.7	1041.5	6217.5
	Leroux Crk	47.6	3502.0	4272.0	511.0	0.0	0.0	8332.6
	W. Muddy,Terror, Hubbard	0.0	0.0	1734.5	1448.0	412.0	158.0	3752.5
	Total	47.6	3502.0	6006.5	3544.2	4002.7	1199.5	18302.6
2004	Storage	0.0	0.0	1448.0	2750.9	2836.0	166.6	7201.5
	Leroux Crk	0.0	1028.0	4585.0	31.7	0.0	0.0	5644.7
	W. Muddy,Terror, Hubbard	0.0	0.0	2012.0	525.0	213.0	41.7	2791.7
	Total	0.0	1028.0	6033.0	2782.6	2836.0	166.6	12846.2
2003	Storage	0.0	0.0	914.0	2954.0	2058.0	0.0	5926.0
	Leroux Crk	757.0	3413.0	3330.0	0.0	0.0	0.0	7500.0
	West Muddy Crk	0.0	0.0	751.0	396.0	228.0	0.0	1375.0
	Total	757.0	3413.0	4995.0	3350.0	2286.0	0.0	14801.0
2002	Storage	0.0	0.0	2247.3	745.8	0.0	0.0	2993.1
	Leroux Crk	124.0	0.0	0.0	0.0	0.0	0.0	124.0
	West Muddy Crk	714.1	1162.5	71.4	0.0	0.0	0.0	1948.0
	Total	838.1	1162.5	2318.7	745.8	0.0	0.0	5065.1
2001	Storage	0.0	0.0	1705.8	2969.3	1209.9	0.0	5885.1
	Leroux Creek	614.0	1906.0	19.8	0.0	0.0	0.0	2539.8
	West Muddy Crk	0.0	0.0	535.2	1837.7	2536.9	1336.9	6246.6
	Total	614.0	1906.0	2260.8	4807.0	3746.8	1336.9	14671.4
2000	Storage	0.0	0.0	1709.8	2215.6	674.4	0.0	4599.7
	Leroux Creek	866.0	2172.0	0.0	0.0	0.0	0.0	3038.0
	West Muddy Crk	0.0	1416.2	1104.8	654.6	307.4	188.4	3671.5
	Total	866.0	3588.2	2814.6	2870.1	981.8	188.4	11309.2

Table 4-1

Overland Ditch
Diversions 1996-2006

Year:		April	May	June	July	August	September	Total
1999	Storage	0.0	0.0	0.0	1229.8	3381.9	1289.3	5900.9
	Leroux Creek	255.0	1439.0	0.0	0.0	0.0	0.0	1694.0
	West Muddy Crk	688.3	2975.7	2715.0	2582.5	307.4	321.3	9649.7
	Total	943.3	4414.7	2715.0	3812.3	3689.3	1610.6	17244.7
1998	Storage	0.0	0.0	0.0	1374.6	3088.3	1636.4	6099.3
	Leroux Creek	47.6	2735.0	1531.0	0.0	0.0	0.0	4313.6
	West Muddy Crk	0.0	0.0	0.0	1011.6	1586.8	396.7	2995.1
	Total	47.6	2735.0	1531.0	2386.2	4675.1	2033.1	13408.0
1997	Storage	0.0	0.0	0.0	3086.3	2552.8	1158.4	6797.5
	Leroux Creek	745.0	2713.0	2403.0	0.0	0.0	0.0	5861.0
	West Muddy Crk	0.0	438.0	2254.8	717.0	993.7	610.9	5014.4
	Total	745.0	3151.0	4657.8	3803.3	3546.5	1769.3	17672.9
1996	Storage	0.0	0.0	0.0	2975.3	2763.0	0.0	5738.3
	Leroux Creek	421.0	3040.0	0.0	0.0	0.0	0.0	3461.0
	West Muddy Crk	0.0	0.0	922.3	92.2	4.0	0.0	1018.6
	Total	421.0	3040.0	922.3	3067.5	2767.0	0.0	10217.8
10-Year Average								
	Storage	**0.0**	**0.0**	**871.3**	**2269.2**	**2156.5**	**481.1**	**5778.1**
	Leroux Creek	**429.6**	**2272.8**	**1467.3**	**49.3**	**0.0**	**0.0**	**4219.1**
*	**West Muddy Creek**	**132.9**	**712.2**	**1275.4**	**882.2**	**614.1**	**277.6**	**3894.5**
	Total	**592.0**	**3090.1**	**3431.1**	**3153.0**	**2751.3**	**754.9**	**13772.4**

* (Includes Hubbard & Terror Creeks)

Stull Ditch

The Stull Ditch diverts water from Leroux Creek drainage and provides additional irrigation water to Redlands Mesa. Although not a part of the ODRC system, the Stull Ditch diversions for 2001 and 2002 irrigation years were added into the Water Budget in order to give a more accurate picture of the irrigation efficiencies. During an average year, the Stull Ditch provides approximately 33% of the irrigation water to Redlands Mesa. During the drought year of 2002, the Stull Ditch provided 39% of the water that irrigated Redlands Mesa.

Delivery Losses

Losses to the Overland Ditch system include reservoir evaporation, delivery losses that include canal evaporation and seepage, and water consumed by vegetation along the canal. Delivery losses were calculated using diversion records from the 2006 water year which were comparable to the 2001 irrigation year. Daily diversions were totaled for the Hubbard Creek drainages, the West Muddy Creek (aka Cow Creek) drainage, and Leroux Creek. The reading at the Satellite Monitoring station was then divided by the daily ditch total to determine the total ditch efficiency. The ditch efficiency was then subtracted from 1.00 to determine a daily delivery loss percentage. The daily delivery losses were then averaged to determine a monthly delivery loss. Average delivery losses for a normal year range from 5% in April, 18% in June, 22% in July and 24% in August for the Overland Ditch system. Delivery losses were estimated for a drought year and range from 10% in April to 35% in July for the Overland Ditch system. Delivery losses for the Stull Ditch were added into the overall losses adding an additional 5% - 10% to the overall delivery losses.

Farm Headgate Delivery

Water delivered to the Farm Headgates is the water diverted less delivery losses. Monthly calculations of water delivered to farms are displayed in Table 4-2 for an average year and drought year scenario. During an average water year, the Overland Ditch delivered approximately 2.58 acre feet per acre to the farms headgates and 0.83 acre feet per acre was delivered during the drought year of 2002.

Crop Requirements

It is estimated that the Overland Ditch and Reservoir delivers irrigation water to approximately 4500 acres with a crop mix of 87% alfalfa and grass hay and 13% grains and orchards. Crop water requirements were calculated using the Cedaredge climate data and the Natural Resources Conservation Services computer program for calculating crop consumption. The program was developed by J. Dalton in 2000 and is based on the Blaney-Criddle method of calculating crop consumption. Results are presented below in Table 4-2. Overall, an average water requirement of 2.3 acre-foot per acre was estimated for the average irrigation year and 2.5 for a drought irrigation year.

Table 4-2

Crop Requirements

values in acre-feet

Average Year

Crop	Acres	April	May	June	July	August	September	October	Total
Grass Hay	2565	218.03	698.96	1171.35	1440.68	1177.76	673.31	260.78	5640.9
Alfalfa	1350	70.88	456.75	762.75	922.50	736.88	415.13	93.38	3458.3
Grains	315	10.2	95.3	201.1	134.4	3.4	0.0	0.0	444.4
Orchards	270	14.2	91.8	152.6	184.5	147.4	83.0	33.5	707.0
Total	4500	313.3	1342.8	2287.7	2682.1	2065.4	1171.5	387.7	10250.5

Drought Year

Crop	Acres	April	May	June	July	August	September	October	Total
Grass Hay	2565	309.9	855.0	1286.8	1598.9	1363.7	859.3	427.5	6701.1
Alfalfa	1350	85.5	542.3	828.0	1012.5	840.4	516.4	129.4	3954.4
Grains	315	21.0	114.7	216.8	152.0	10.5	0.0	0.0	515.0
Orchards	270	17.1	108.9	165.6	202.5	168.1	103.3	51.3	816.8
Total	4500	416.4	1512.0	2331.6	2763.3	2214.6	1375.7	556.9	11170.5

Notes: Grass hay includes pasture grass

On Farm Water Demand

On Farm water demand is the amount of water that should be delivered to the Farm Headgate in order to adequately irrigate a crop. Standard On Farm water demand assumes a 50% irrigation efficiency plus on farm delivery loss of 20%. A 50% irrigation efficiency assumes that half of the water delivered to the farm is consumed by the crop and the remaining half of the water delivered to the farm is wasted back to the system through deep percolation and evaporation. Since irrigation practices have improved over time to include gated pipe and sprinkler irrigation by side-roll and center pivot methods, it was estimated that overall irrigation efficiency has improved from 50% to 70%. On Farm water demand was calculated at 100% of the crop demand plus a wastage of 30% of the crop demand plus an on-farm delivery loss of 20%. Figures 4-4 and 4-5 show the disparity between the water delivered, the base crop demand and the on farm demand.

Figure 4-4

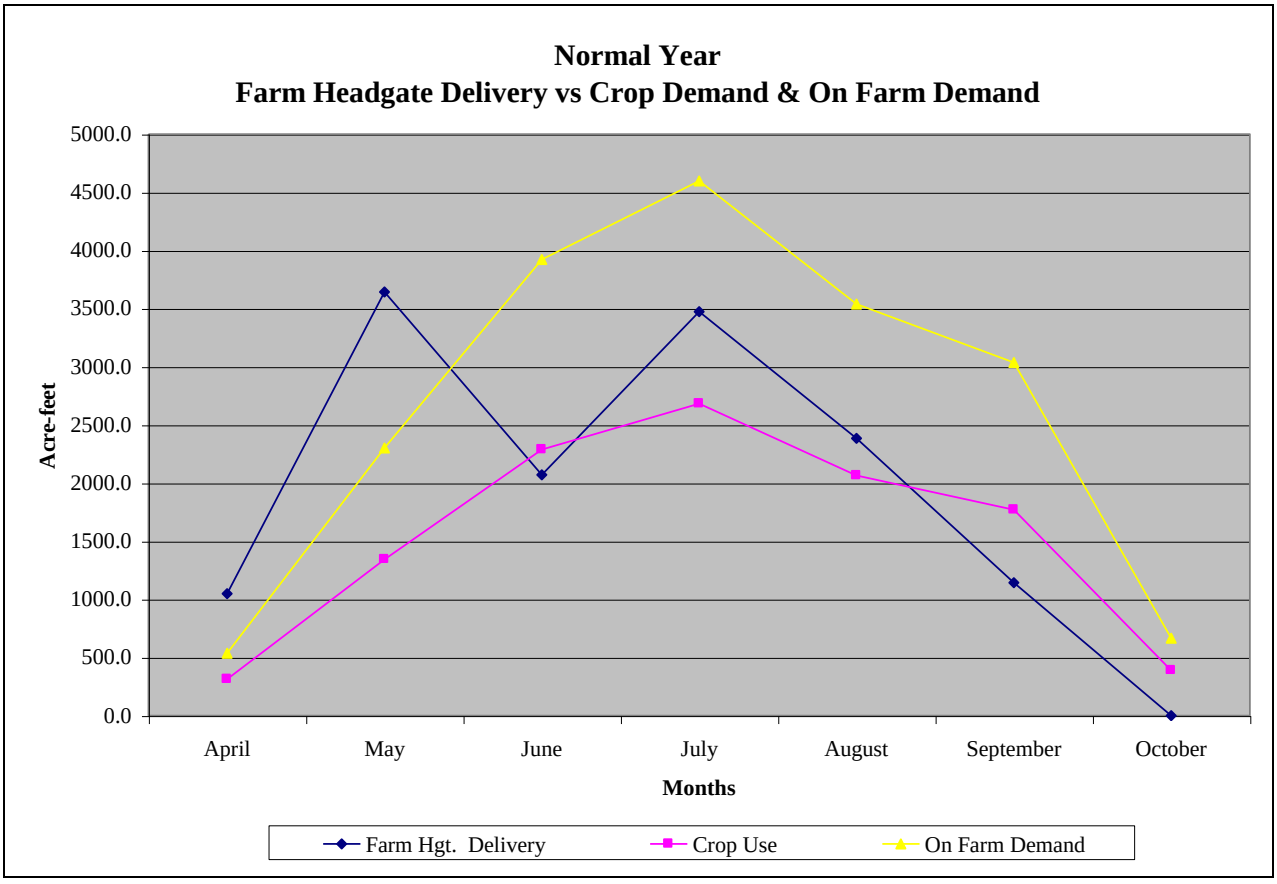
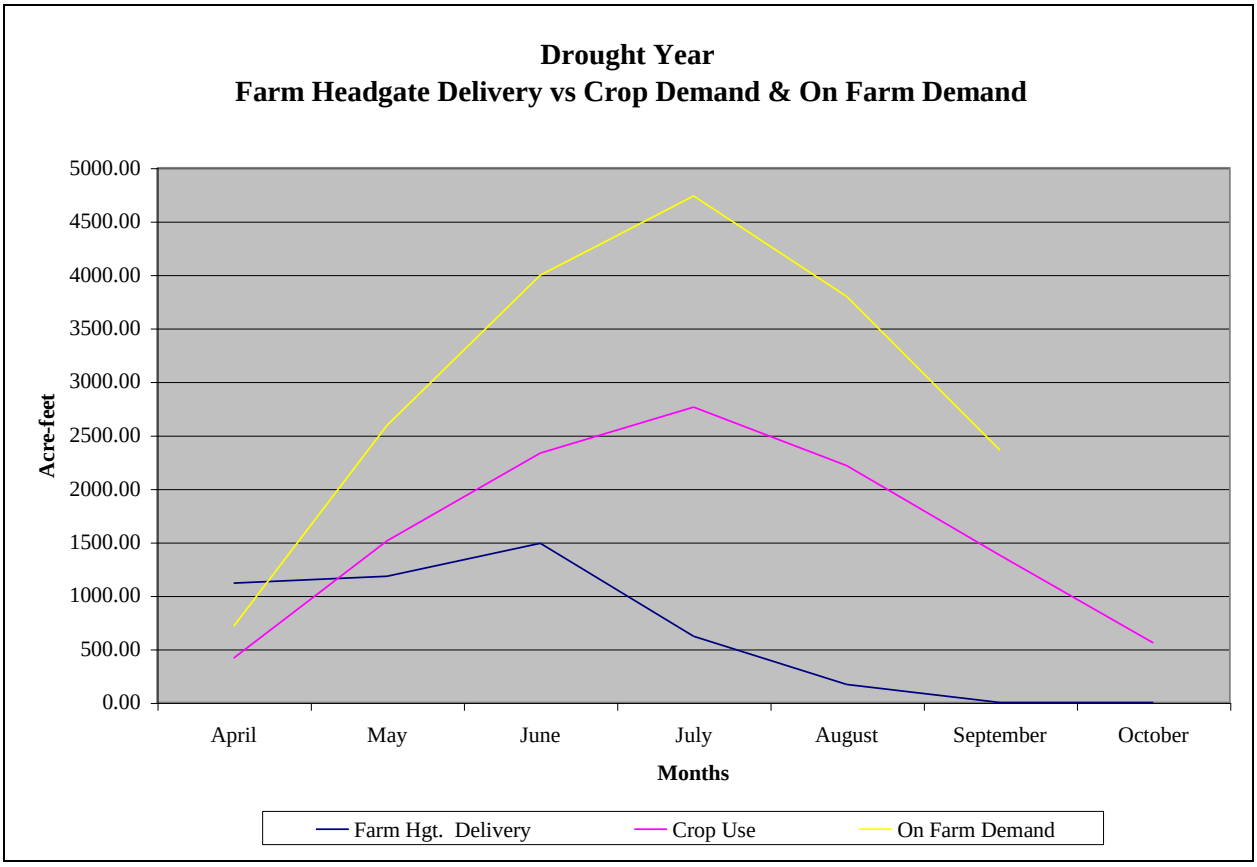


Figure 4-5



Efficiencies

One valuable aspect of the water budget is that it provides a means to calculate efficiencies. Estimating efficiencies helps identify potential areas for irrigation improvements. Efficiencies were calculated as follows:

- Overall Efficiency = Crop Use / Total diversions
- Delivery Efficiency = Farm deliveries / Total diversions
- Farm Efficiency = Crop requirements / Farm deliveries

The Overall Efficiency is a gross calculation that doesn't include delivery losses. The Delivery Efficiency is a more refined calculation that includes delivery losses and the Farm Efficiency shows the efficiency of the water delivered to the farm. Table 4-3 is a calculation of average efficiencies for ODRC for 2001, an average water year, and efficiencies for the drought year of 2002. **Note**: When headgate deliveries were less than the estimated crop requirement, efficiencies were not calculated.

Average Year Water Efficiencies

The average year Overall Efficiency for ODRC for the irrigation season of May through September was calculated to be 47%. This calculation indicates that crops were using 47% of the water diverted and 53% of the water diverted was lost through delivery and on-farm inefficiencies. Efficiencies were not calculated for September and October because crop use exceeded headgate deliveries. The average Delivery Efficiency was calculated to be 72%, indicating that 28% of the water diverted was lost through the main conveyance system. The average Farm Efficiency was calculated to average 58% indicating that 42% of the water delivered to the farm was lost through farm inefficiencies. The average Farm Efficiency is a somewhat unrealistic indicator because during July and August, the efficiencies were in the 80% range and for the months of April and May, the efficiencies were in the 35% range. For the months of June, September, and October, the headgate deliveries were less than the estimated crop consumption. The discrepancy for June values may be due to the lack of water demand because of haying and the discrepancy for the September values are due to the lack of late season water from the Overland system.

Drought Year Water Efficiencies

For the drought year of 2002, water delivery occurred from April until early July. Most water deliveries were made from storage releases for the months of June and July. During 2002, 61% of the irrigation water came from the Overland Ditch and Reservoir and the remainder of 39% was provided from the Stull Ditch. Only during the month of April did the farm headgate deliveries exceed the estimated crop requirement.

Table 4-3

Water Budget for Overland Ditch & Reservoir

Average Diversions Irrigation Year 2001

values in acre feet

	Month	Diversion (3)				Carriage	Delivery Loss (4)			Farm Hgt.	Crop Use	On Farm	Overall	Delivery	Farm Irrigation
		Direct Flow	Storage	Stull Ditch	Total	Loss %	Evaporation	Carriage	Total DL	Delivery (5)	(6)	Demand (7)	Efficiency (8)	Efficiency (9)	Efficiency (10)
(1)	April	614.0	0.0	696.0	1310.0	20%	0.0	262.0	262.0	1048.0	313.0	536.57	24%	80%	30%
	May	1906.0	0.0	2649.0	4555.0	20%	0.0	911.0	911.0	3644.0	1343.0	2302.29	29%	80%	37%
	June	555.0	1705.8	609.0	2869.8	25%	81.2	717.5	798.7	2071.2	2288.0	3922.29	80%	72%	*
	July	1838.0	2969.0	246.5	5053.5	30%	63.0	1516.1	1579.1	3474.5	2682.0	4597.71	53%	69%	77%
(2)	August	2537.0	1210.0	280.0	4027.0	40%	31.5	1610.8	1642.3	2384.7	2065.0	3540.00	51%	59%	87%
	September	0.0	1336.9	314.0	1650.9	30%	11.7	495.3	507.0	1143.9	1771.5	3036.86	*	69%	*
	October	0.0	0.0	0.0	0.0	0%	0.0	0.0	0.0	0.0	388.0	665.14	*	*	*
											Average Efficiencies:		**47%**	**72%**	**58%**
	AF/AC	3.06													

Water Budget for Overland Ditch & Reservoir

Diversions for Drought Year of 2002

values in acre feet

	Month	Diversion (3)				Transit	Transit Loss (4)			Farm Hgt.	Crop Use	On Farm	Overall	Delivery	Farm Irrigation
		Direct Flow	Storage	Stull Ditch	Total	Loss %	Evaporation	Carriage	Total TL	Delivery (5)	(6)	Demand (7)	Efficiency (8)	Efficiency (9)	Efficiency (10)
	April	838.10	0.00	558.00	1396.10	20%	0.00	279.2	279.2	1116.88	416.4	713.83	30%	80%	37%
(1)	May	1162.50	0.00	524.00	1686.50	30%	0.00	506.0	506.0	1180.55	1512.0	2592.00	90%	70%	*
(2)	June	71.40	2247.30	231.50	2550.20	40%	40.00	1020.1	1060.1	1490.12	2331.6	3997.03	91%	58%	*
	July	0.00	745.80	392.00	1137.80	45%	7.00	512.0	519.0	618.79	2763.0	4736.57	*	54%	*
	August	0.00	0.00	281.00	281.00	40%	0.00	112.4	112.4	168.60	2214.6	3796.46	*	*	*
	September	0.00	0.00	0.00	0.00	0%	0.00	0.0	0.0	0.00	1375.7	2358.34	*	*	*
	October	0.00	0.00	0.00	0.00	0%	0.00	0.0	0.0	0.00	557.0	*	*	*	*
	AF/AC	0.98									**Average Efficiencies**		**70%**	**66%**	*****

(1) Start date Apr 1 (2) End date Sep 15 (3) Diversions for Year 2002 (4) Average transit loss estimated to be 25% of diversions (5) Diversions minus Transit Loss (6) Blaney Criddle calculations
(7) Crop Use plus 50% of crop use for ET & transit loss (8) Crop Use divided by Total Diversions (9) Farm Headgate Delivery divided by Total (10) Crop Use divided by Farm Headgate Delivery
***** indicates crop demand exceeded farm headgate delivery and efficiency exceeded 100%

Water Budget Results

Upon review of the Water Budget, Table 4-3, the following observations can be made:

1. In general, excess diversions occur during the run-off season and water shortages occur during times of high crop consumption. More efficient water delivery and irrigation could be obtained if additional storage was built in the lower watershed to store the excess run-off. Shortages will continue to occur until conveyance losses are reduced, water delivery scheduling is improved, and/or less water consumptive crops are planted and/or less acreage is irrigated.

2. Water budget results are sensitive to delivery loss estimates. Since some of the delivery losses were estimated due to lack of data, a new water budget should be developed after measuring devices are reset and/or new measuring devices installed on the main canal and the canal turn-outs.

3. The greatest efficiency improvements would be obtained by upgrading on-farm irrigation systems to more efficient methods such as surge or sprinkler irrigation and by improving delivery scheduling.

Chapter
5

The Overland Ditch and Reservoir Company Water Management Plan

Water Management Issues and Opportunities

Several methods were used to identify management issues and opportunities. The Steering Committee for the ODRC Water Management Plan provided information and identified issues that have been at the forefront of concerns and discussion.

A Shareholder Opinion Survey was sent to all of the shareholders in the district asking general questions regarding water ordering, water pricing and management and delivery of the Overland Ditch and Reservoir water. There were 47 surveys returned out of the 122 surveys sent to shareholders which reflected a response of 57% of the outstanding shares. Most respondents did not have any trouble getting their water and most thought that shareholders would benefit from more accurate measurement. Most respondents, 83%, thought that an educational brochure would be beneficial but only 50% looked at the satellite data (perhaps because not all respondents have access to the internet).

Based on the information developed by the Steering Committee and the Shareholder Opinion Survey, several water management issues were identified and placed into general categories:

1. Conveyance System

    - Measuring Devices
    - "Undershots" & Slide Areas
    - Delivery Losses

2. Water Measurement and Accounting

    - Accuracy of several measuring devices
    - Accuracy of measuring devices on some turn-outs

3. District Water Management:

    - Long-term planning for improvements and upgrades to system
    - Education of ditch shareholders
    - Improvement of late season water

Existing Water Management Measures that ODRC has implemented within the past five years are:

- Installation of a Satellite Station on the Leroux Creek measuring device. The purpose of the installation was to get a more accurate measurement before the final distribution and to determine overall conveyance system losses. A secondary purpose was to manage the Leroux Creek Exchange.

- The Overland Ditch and Reservoir Company's web page was significantly upgraded in 2006 and 2007. The purpose of the upgrade was to provide Board of Directors meetings minutes to shareholder, post the Articles of Incorporation and Bylaws, and to provide links to other water web pages as well as a link to the River District.

- Providing a Water Workshop in 2002 with the Redlands Mesa Water Users and a Water Workshop in 2007.

Water Management Goals and Objectives

The following goals for the ODRC were developed after identifying the water management issues that the ODRC faces:

Goal 1: Develop an infrastructure improvement plan by the end of 2008.

Objective: Meet requirements set by the DWR Water Commissioner.
Objective: Reduce conveyance losses and /or ditch failure.
Objective: Improve ditch flow information and accounting

Goal 2: Develop long-term goals for the ODRC

Objective: Better water management and planning of system in general
Objective: Projection of long-term construction costs and availability of funds

Goal 3: Develop a Water Information-Education Page on the ODRC web page.

Objective: Inform users regarding ODRC policies and accounting and general information.

Alternative Evaluation

Extensive alternative evaluation was not conducted as a part of this Water Management Plan due to the critical need for infrastructure rehabilitation of the Overland Ditch and dam expansion of the Overland Reservoir.

Selected Actions

Table 5-1 summarizes actions selected for implementation and their priorities. Each action is briefly described below. ODRC will actively work to make progress on high priority actions identified in this plan. As more detailed information becomes available, priorities may be modified and completion dates may be changed. Before commencement of each action, compliance reviews will be conducted to ensure all applicable federal, state, and local laws are followed. Specifically, any water management action deemed to be a federal action will comply with the National Environmental Policy Act and the National Historic Preservation Act before commencement.

Infrastructure Improvement Program

The Overland Ditch and Reservoir have been in operation since the early 1900s and are experiencing aging of the infrastructure. Although continued maintenance is expected in a water distribution system, there are turn-outs, "undershots", flood controls gates, and portions of the canal that were identified by the Steering Committee that are in need of repairs, rehabilitation, and/or upgrading and are beyond the District's budget. The following measure were identified as high priority projects and are listed in order of priority:

1. Repair and/or rehabilitation of "undershots" on the Overland Ditch that have recently been identified by the Water Commissioner as high priority. Reset Parshall Measuring flumes identified by the Water Commissioner.

2. Seepage control: "PAM" the Overland Ditch each year to help control the ditch losses due to seepage. Institute a more aggressive weed control program on the main canal.

3. Piping projects:
   - Install a pipe at the 2.0 mile mark
   - Install a second flume across Leroux Creek
   - Concrete the approach to the existing flume across Leroux Creek
   - Pipe areas of high leakage on lower ditch - TBD

4. Install additional measuring devices to improve water accounting:

   - Install Parshall Measuring Device above Elk Creek for administrative purposes
   - Install a Satellite Monitoring stations:
     1. Oak Mesa Parshall Measuring Flume
     2. West Hubbard Creek Parshall Measuring Flume

3. Overland dam.
- Installation of measuring device from Leroux Creek to Cedar Gulch turn-out.

5. Installation of a flood control turn-out at Alder Creek.

Develop Long-term Goals and Objectives for the ODRC

The Steering identified several long-term goals that would require planning and future funding. The items are not listed in order of priority and priorities will be set when funding becomes available.

- Piping and/or lining the entire Overland Ditch to reduce transit loss and ditch instability problems.
- Reduce delivery losses to 20% or less.
- Installation of automated controls on the Overland Dam after Satellite Monitoring station is constructed
- Investigate possibilities for Micro-Hydro Electric Power stations on Overland Ditch
- Investigate storage possibilities:
  1. Core drill Duke Stomp reservoir site
  2. West Reservoir on Oak Mesa
  3. Paulson Reservoir storage contract

Develop a Water Education-Information Program

The Steering Committee agreed that a water information page on the website would greatly improve the knowledge of the shareholders. This action is not a high priority project at this point since the infrastructure problems are more pressing.

Expected Results and Monitoring

The expected results of the ODRC Water Management Plan are:

1. Infrastructure Improvement Program: This action is intended to provide efficiency of the conveyance systems and more accurate accounting of the delivered waters.

2. Development of Long-term Goals: Better planning for future infrastructure needs and upgrades.

3. Development of an Water Management and Education Brochure: This action is intended to provide better communication and education of the water users.

The ODRC Board of Directors has designated Philip Ceriani as the Water Management Coordinator and will annually review the progress of this Water Management Plan. The plan will be up-dated on a five-year cycle. The ODRC will continue to collect information from water users, personnel, and coordinating organizations. Future updated plans will reflect new water management information as it becomes available.

References

CDWR (Colorado Division of Water Resources), 2006. Water rights decrees obtained from the Colorado Division of Water Resources, Division 4, Montrose, Colorado.

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Hydrosphere, 1996. Achieving Efficient Water Management- A Guidebook for Preparing Agricultural Water Conservation Plans. Second Edition, September 2000.

APPENDIX A

Articles of Incorporation

APPENDIX B

Company Bylaws

APPENDIX C

Map of Distribution System

Also see Compact Disk in sleeve

APPENDIX D

Water Court Decrees