

**The 2007 Mesa County
Irrigation Audit Program
Tri River Area
Final Report**



Culinary water used to irrigate the sidewalk

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Abstract:

The Mesa County irrigation audit program in the Grand Valley of Western Colorado, combined with an extensive educational effort will result in reduced water use in landscaped areas. This will help ensure adequate water supplies for all residents of this area even with the estimations of a doubling of population by 2025 and reduction in annual precipitation. The estimated water reduction as a result of the 2007 audit program is 62 acre feet or 20,203,382 gallons. Correction of the problems noted during the 2005, 2006 & 2007 audits has the potential of reducing water use in the landscape by 171 acre feet (55,425,224 gallons) per year. Survey results show 82% made the recommended repairs and 71% of the participants are interested in installing a SMART irrigation controller which would further reduce water use in the landscape.

Introduction:

Population and Water Availability:

The 2000 Colorado census puts Mesa County's population at ~ 120,000. The Colorado Department of Local Affairs projects Mesa County's population will grow to 143,591 by 2010 (22.8% growth) and 224,820 by 2025 (a 92.3% growth increase).¹ As the population grows, the demand for water will also increase, yet by 2050 water in the Colorado River is expected to decline by 18% and storage by 32%.²

The population increase of 104,000 people in Mesa County by 2025 will require an additional 2.9 billion gallons of water each year.³

Environmental Concerns:

Excessive irrigation moves 580,000 tons of salt into the Colorado River from the Grand Valley each year due to deep percolation.⁴ These salts negatively impact plant and animal health throughout the Colorado River basin. Proper water management reduces deep percolation. Improved irrigation management also reduces pesticide and fertilizer contaminated runoff water which can contaminate rivers and streams.

In addition proper water management has a positive impact on air pollution. Proper water management results in fewer insect and disease pest problems. This results in a reduction in pesticide applications.

Why do we need an Irrigation Audit Program?

¹ http://www.mesacounty.us/about_mesa_county.aspx#Growth

² Eric Kuhn, General Manager, Colorado River Water Conservation District, PowerPoint presentation "The Colorado River's Uncertain Future."

³ Based on a daily per capita requirement of 80 gallons.

⁴ <http://www.usbr.gov/dataweb/html/grandvalley2.html>

The population increase, reduced water availability and environmental concerns highlight the need for water conservation. The Colorado State University Extension Irrigation Audit program is one of the ways these issues can be addressed.

It is estimated that 7.6 square miles or 4,864 acres of the Grand Valley is landscaped. If the water application on all 4,864 acres was reduced by 40%, an annual savings of 11,187 acre feet or over 3.6 billion gallons of water would result. The resulting water reduction would be sufficient to cover the daily water needs of the 104,000 new residents expected in the Grand Valley by 2025.

The 2007 Program:

Ardith Blessinger, Mesa County Certified Irrigation Auditor, conducted audits of sprinkler irrigation systems until mid-October 2007. Audits were conducted on 27 acres including Mesa State College and the common areas for three subdivisions. A number of audits had to be scheduled for 2008 due to the demand. The request for audits is a strong indication of the importance of this program.

An average water savings of 40% can be realized by correcting the problems noted in an audit and adjusting the irrigation controller based on these corrections⁵.

Year	Acres audited	Water Savings ⁶	
		Gallons	acre feet ⁷
2005	18.7	14,015,281	43.01
2006	28.8	21,585,032	66.24
2007	27	20,235,968	62.10
Total	74.5 acres	55,836,282 gallons	171.35 acre feet

Types of audits:

The basic level audit is an inspection of the irrigation system to determine needed repairs. A map of the property with the location of heads, irrigation zones and any problems with the heads was provided to the clients. Turf and soil problems were identified and corrective procedures detailed. Handout material on turf care was provided each participant along with guidance on how to irrigate based on visual symptoms (see attachments).

The advanced level audit determines the precipitation rate and distribution uniformity of each irrigation zone. Catch cans are used to collect precipitation data from each zone or overlapping zone. When combined with the historical

⁵ Problems found during the inspection typically cause of over-watering by 20 to 70 percent for an accumulated average of 40 percent. In the Grand Valley this equates to an over-application of 2.3 acre feet of water per acre of turf.

⁶ The estimates provided are based on an annual ET_o of 49 inches and a sprinkler system efficiency of 70 %. In order to apply 49 inches, ~70 inches are required with 21 inches being lost through evaporation, wind drift, runoff, and deep percolation.

⁷ An acre foot of water contains 325,861 gallons.

Evapotranspiration⁸ (ET_o) data for this area, the soil type, rooting depth and microclimate, this information provides detailed guidance on how each participant should set their irrigation clocks. This includes the number of days each zone should be watered each month, and the number of cycles and length of time for each cycle. Two advanced audits were conducted and details were provided to each participant on how to accurately set their irrigation clocks each month from April through October.

Common problems:

- Wrong size spray, rotor and impact head nozzles. Pop-up spray, rotor and impact heads have nozzles designed to be site specific. Many areas had the same size nozzle on every spray head whether the distance between heads was four feet or 15 feet. Nozzles on impact heads and rotors should match the area they are covering. A head rotating in a full circle would need a larger nozzle than one rotating in a half circle. The head rotating in a full circle will receive half as much water over any given area than one rotating in a half circle if they both have the same size nozzles.
- Improper spacing caused problems for a few people. Trying to save money by installing fewer heads is not the answer. There should be head to head coverage, meaning the spray from any given head should touch of the adjacent heads, not meet in the middle. This allows for optimum overlapping coverage resulting in fewer dry areas.
- Low pressure problems were common this year. One particular site had low pressure on zones using rotors. The result was a “doughnut-shaped” effect around the rotor with the area closest to the rotor being green and outer ring of turf being brown due to lack of water. Water seeps out of the nozzle, creating a lush green area around the head. Low pressure is often caused by too many heads on one zone.
- Many irrigation controllers were improperly set. Turf, tree and shrub areas were placed on the same program (A, B, C or D.) Trees and shrubs require less water than turf. Placing trees, shrubs and turf on separate programs allows them to be watered independently of each other. Many people did not know how to set more than one start time on their controller. Watering multiple times with shorter run times allows the water to “cycle and soak”. This allows the water from the first cycle time to be absorbed into the soil before the next cycle starts thus preventing run-off.

⁸ ET_o indicates the amount of water given off by turfgrass through transpiration plus the water evaporating from the soil surface.

Over watering



High pressure



Improper spacing

Incorrect nozzles

Program Evaluation Results:

123 surveys were mailed to all participants in the 2005, 2006 and 2007 audit program. 56 surveys were returned for a return average of 46%.

1. Who provides your irrigation water?

Domestic water Providers:

Ute Water Conservancy	20 %
City of Grand Junction	12 %
Clifton Water District	2 %

Irrigation water providers:

Redlands Water & Power Company	20 %
Grand Valley Irrigation Company	23 %
Grand Valley Water Users Association	5 %

Orchard Mesa Irrigation District	9 %
Mesa County Irrigation District	2 %
Palisade Irrigation Company	7 %

2. Did you make the suggested repairs we recommended?

43 % of the people responding to the survey have completed the suggested repairs.
 39 % said they had the repairs started but not completed.
 8 % were not able to get them started or completed because it was too late in the season.
 4 % said they did not do the repairs.

3. Have you seen an improvement in your lawn?

70 % saw an improvement in their lawn.
 10 % said it was too soon to tell.
 11 % did not see an improvement.
 9 % did not respond to question.

4. Was the information you received through this program helpful?

93 % said information received was helpful.
 2 % said information was not helpful.
 5 % did not respond.

5. Would you be interested in upgrading to a SMART controller?

We hope to obtain funding to help cover the cost of SMART Controllers for those who participate in this program. These controllers use weather data collected on site to apply the correct amount of water throughout the season.

52 % said they would be interested in a SMART controller upgrade.
 25 % said they are not interested in a SMART controller.
 19 % were interested, but are concerned about the cost.
 2 % were interested if the upgrade was free.
 2 % did not respond.

6. Would you like information on SMART controllers?

73 % wanted information on the SMART controller.
 5 % did not want information.
 22 % did not respond.

7. Would you recommend the irrigation audit program to others?

98 % said they would recommend the Irrigation audit Program to others.

Attachments:

An example of a letter to a participant summarizing problems noted.
A map of the property indicating problems to be corrected.

Note: Additional information regarding the Mesa County Irrigation Project is available at <http://WesternSlopeGardening.org>

Funding:

Funding for this project was provided by the Department of Interior, Bureau of Reclamation, the City of Grand Junction, the Mesa County Irrigation Company, the Grand Valley Irrigation Company, Grand Junction Pipe & Supply and Colorado State University.



Tri River Area
Reply to: Grand Junction

Sample Letter

RE: Irrigation Audit – August 22, 2007

Dear Mr. & Mrs.,

Thank you for participating in the 2007 Irrigation Audit Program. This audit will help you make adjustments on water conservation, maintenance and/or management of your irrigation system. The following are my findings:

Audit Summary:

- Your system consists of 6 zones for the turf areas (zones 3, 4 and 6 - 9.)
- Many heads are tilted, low or need adjustment.
- One head should be changed from a full circle to a half circle.
- Several full circle heads should be changed to rotate in a clock wise direction. All are indicated on the enclosed maps.
- Grubs were found throughout the turf.

Recommendations:

- Tilted sprinkler heads indicated on the map need to be straightened. When heads are tilted just a few degrees it can seriously affect the radius. The top of the sprinkler head should be nearly at and parallel to grade.
- Low heads should be raised enough so the spray does not hit the lawn directly in front of them. An easy way to tell if the sprinkler head is too low is by the presence of a “frog eye” pattern around the head. The blades of the grass will be pushed flat from the force of the water hitting them. When the spray cannot clear the plant material, it results in a broken spray pattern. Some areas will not receive adequate water and pooling occurs at the head.
- The heads in need of adjustment should be rotated to cover the edges of the lawn and not spraying the hardscape or other unwanted areas.
- The heads that rotate in a counter clock wise direction should be changed to rotate clockwise for a better matched precipitation rate with the other heads. To do this, while the zone is running, stop the head, lower the trip spring and let the head start rotating again. When the head stops on the friction spring and starts rotating in a clockwise direction, stop the head again and raise the trip spring. It will now rotate in a clockwise direction.
- Setting your controller with two or more start times allows you to “cycle and soak” your turf. Watering multiple times for shorter periods allows the water from the first cycle to soak in, watering again about an hour later allows the water from the second cycle to soak in deeper. If all of the water is applied in one application, you end up with wasted water and deep percolation.
- It is best to put all of the turf on one program (A, B, C, or D,) trees and shrubs on another program and garden areas on another. With this method, different types of vegetation can be watered independently of each other.

If you are unsure of how to set your controller for this, please give me a call and I will be glad to

assist you.

- I checked several areas where the turf was turning brown. In many of those areas, I was able to grab the turf and easily pull it up like carpeting. When the turf was pulled back, grubs were visible. Applying a treatment such as Dylox according to the label instructions will help. See enclosure on Billbugs and White Grubs.
- I also found areas of Ascochyta Leaf Blight and Melting Out Disease. These disease are a result of the turf being stressed. See enclosed fact sheets on Ascochyta Leaf Blight & Melting Out Disease.
- Once all the problems noted are corrected, you will reduce the amount of water applied. Most people reduce their total water application by 40 percent. Watch the reaction of the turf. If it appears drought stressed, increase the time the system runs by 10%. If the turf is looking great, reduce the amount of time the system runs by 10%. This is done by using the “water budget” / “seasonal adjust” feature on the controller. Continue to cut back on the amount of water applied until you start to see dry areas develop on the turf. This technique will allow you to fine-tune the length of time you water and the amount of water you apply. This will also allow you to reduce the potential for disease and insect problems on your turf. Watering too frequently in the spring can kill deeper roots, which results in more watering during mid-summer to keep it alive. Spring and fall months require less watering, while the heat of summer demands more frequent watering.
- Core aeration can help increase rooting depth, reduce stress and thatch. After aerating, top dress the lawn with a fine organic matter such as Mesa Magic Ultra (found at the composting facility at the Mesa County Landfill or local garden centers). After top dressing, rake the organic matter into the lawn. See attachment on core aeration.
- Follow the late season fertilization program to ensure the correct amount of fertilizer is put on the lawn in the fall to help it get through the winter months and into the following spring. We recommend using Ammonium Sulfate. See enclosed fact sheet on late season fertilization.
- The lawn should be maintained at a height of 2 ½ to 3 inches. If you choose to maintain the lawn at a height of 2 ½ inches, mow the lawn at the height of 3 ¾ inches. If you decide to maintain the lawn at a height of 3 inches, mow the lawn at the height of 4 ½ inches. This will ensure you remove no more than 1/3 of the blade at any one time. If more than 1/3 is removed, root loss will occur. A lawn maintained at a height of 2 ½ to 3 inches is healthier and requires less water.

Once you have the problems noted in this letter corrected, we would suggest you have an Advanced Audit performed. The Advanced Audit will determine the soil type, rooting depth, rate of precipitation and overall efficiency of your system. Using this data, we will then provide you information on how to set your irrigation clock to ensure you are providing the lawn adequate moisture yet avoiding over watering. This will include information on how long to set your clock, the number of days you need to water each month, and the number of cycles you need to use to ensure proper irrigation. Once you have this information, you will know how to adjust your irrigation clock for each month from April through October. Water use by turf changes monthly and your irrigation clock should be adjusted accordingly. We can teach you how to adjust your clock if you are unsure of the process.

Our goal with the Advanced Audit is to improve the efficiency of your system, improve the health of your lawn and reduce over watering. Approximately 580,000 tons of salt are flushed into the Colorado River from the Grand Valley each year due to over watering of lawns and agricultural fields. You can help reduce the salt loading of the Colorado River by having an Advanced Audit conducted and then following the guidance we provide you. The Advanced Audit costs an additional \$25.

If you have any questions, please do not hesitate to call me at 683-4365.

Sincerely,

Ardith Blessinger

Ardith Blessinger, Certified Irrigation Auditor

Enclosures:

Fall and winter watering
Late season fertilization
Watering established lawns

Core Aeration
Lawn Care
Individuals doing sprinkler repair

Sample Map

