

## CSU Extension. Innovation Award Proposal Final Report. June 2010

### Mesa County / Tri-River area Small Acreage Irrigation Audit program

**Explain why this proposal is innovative and creative -- in terms of content, audience, methodology, etc.**

The *Small Acreage Irrigation Audit* program has been innovative since it addresses a growing demand for more cost effective use of water in the Grand Valley/Lower Gunnison area. It also lays the groundwork for connecting water conservation techniques to end users in an area anxious to establish a reputation for wise water use across all water applications.

Water in the Tri-River area of the Western Slope remains less expensive and more abundant than many other areas of the state. This combined with a rapid transition of large agriculture to smaller acreages has seen an escalation in irrigation practices that facilitate erosion, compound downstream water quality problems, exacerbate weed infestations, and are also increasingly costly to the land owner.

The Tri River Area Extension office has had significant success with domestic irrigation audits of lawn and xeriscape sprinkler systems in the Grand Junction area. Driven by rising domestic water fees, Grand Junction area residents have been anxious to improve irrigation efficiency if only to lower their water bill. Irrigation audits have proven an excellent tool for residents seeking a reduction in water waste and related costs.

Small acreage owners have been slower to feel the effects of rising water costs, but an increasing number of requests for small acreage audits have been fielded by local Extension staff. Even though staff had time and willingness, they previously lacked other key resources to answer such requests.

Grand Junction area domestic audits follow the well established format developed by the Irrigation Association (a Virginia based non-profit representing the irrigation industry at the national and international level). The *Small Acreage Irrigation Audit* program has creatively translated these tools from the turf sprinkler system to the more traditional furrow and side-roll systems. The pilot visits performed as a result of this program have seen the local conservation districts in the area: Mesa, Delta, and Shavano take the lead on procuring funds to start and continue the program in their areas for 2011.

**Clearly state the issue to be addressed, why it is a priority, and why it is timely.**

In 2001, the state experienced the worst drought on record and water users in the Grand Valley area were confronted with the prospect of immediate water scarcity. The ongoing efforts of local water outreach specialists to prepare the Valley for the next drought have been partly hindered by the continued rapid transfer of agricultural land and water rights into small acreages. Residents of these smaller agriculturally zoned land parcels, typically 2-40 acres in size, often are not from Colorado, a rural area, or even the Western United States. As a result, their familiarity with irrigation and water resource management in the area is limited. The *Small Acreage Irrigation Audit* program acts as a bridge between

small acreage residents looking to reduce their land and irrigation management costs and the outreach resources available to help them to do so effectively and sustainably.

There are three key reasons why development and promotion of small acreage irrigation audits are both timely and a priority: 1) The 2001/2002 drought has highlighted the need for a growing Grand Valley population to cooperatively enhance its water resource management and stewardship in preparation for future droughts and climate change impacts on water supply. 2) Based on population projections, continued land and water right transfers from production agriculture to small acreages are inevitable. As a result the need for quantifying water use and facilitating irrigation outreach among small acreage residents will only become more pressing. 3) Water providers and related agencies are increasingly willing to work together on improving water resource protection in the Tri-River area (as evidenced by the support of local Conservation Districts, Mesa County, and the Grand River Mosquito Control District). The *Small Acreage Irrigation Audit* program supports such efforts as a means for collecting small acreage water use data and promoting wise water use in the Grand Valley area.

**List faculty involved. \*Must include at least 1 county-based AND one campus-based OR regional OR one experiment station-based faculty.**

Curtis Swift, PhD (Mesa County) and Denis Reich (Western Region)

**List outputs; discuss the activities, products, methods and services that reached people and users.**

#### Outputs

The primary output for the *Small Acreage Irrigation Audit* program was face-to-face time with irrigators who are typically the most lacking in experience and understanding of basic agricultural irrigation principles: small acreage owners and managers.

The primary knowledge gap among small acreage irrigators is the relationship between crop water use and soil type. Without outreach in this area, many of the small acreage community are relying on guesswork or piecemeal experience from marginally more experienced neighbors. This program's primary focus has been to build accurate understanding of how to devise irrigation set length and interval with respect to soil and crop type. Sometimes water availability limits flexibility with scheduling, but in these instances it is seen as even more critical that irrigators understand what soil moisture conditions are optimum and sub-optimum for healthy crop growth.

With improvements in irrigation water management among small acreage owners there will be reductions in ponding, flooding, and deep percolation. All of these contribute to problems such as mosquito outbreaks, weed infestations, and water quality problems (nutrient loading, sediment, salinity, and selenium). For the landowner improved irrigation water management

means less time and money spent irrigating and dealing with the consequences of poor management like weeds and poor yields.

### Activities

Each audit assessment consists of a one to two hour visit to the irrigator's field(s). For furrow irrigation the visit has been scheduled so that irrigation has been running and water has advanced across the field.

Included in each visit was:

- Examination of soil type
- Discussion of irrigation scheduling and set length
- Use of 5/8" ball probe\*. Examination of soil moisture from top of field to bottom.
- Root zone measurement and examination
- Furrow or side-roll snapshot for Distribution Uniformity (DU)<sup>1</sup> measurement.
- Soil and water analysis

\* irrigators not familiar with use of a 5/8" ball probe were given a free probe and shown how to use it.

Once soil and water samples were returned a short report detailing the visit and reinforcing recommendations was sent to the irrigator with an offer for a free follow up visit.

### Products

The primary product from the program has been the protocol and Excel™ tools that accompany small acreage irrigation audits for furrow and side-roll systems. An instruction manual and equipment list along with the spreadsheet for calculations is now available for use within all counties of Colorado.

### Methods

Three methods were used to assess irrigation water management in each irrigators field:

1. Snapshot of furrows (gated pipe) or heads (side-roll). Using the Distribution Uniformity (DU%) principle each system is evaluated for efficiency of water application to the field.
2. Root zone examination and ball probe check of soil moisture. An examination of how well the soil is holding moisture and how deep the root zone extends.
3. Interview with irrigator. To estimate seasonal efficiency the irrigator is interviewed on irrigation frequency and set length.

These three methods provide a complete enough picture of how the irrigator manages irrigation throughout a season and provide the basis for recommendations and feedback.

### Services

The Small Irrigation Audit service was provided for April and May of 2010 as irrigation water came on. This was partly due to delays in fall 2009 testing of the audit protocol. As it turns out

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<sup>1</sup> DU is a measure of flow consistency between furrows. 100% means flow is evenly distributed among furrows. Above 50% is acceptable for furrow systems.

this also appears to be the time when small acreage owners, particularly small acreage owners are most interested in addressing irrigation concerns.

### **Budget**

Small Acreage Account Balance is \$2,755

*These remaining funds were originally allocated to purchasing a electromagnetic flow-meter that was borrowed off local NRCS.*

### Expenditure:

#### *Auditing:*

Ardith Blessinger's Salary = \$483.06

Ardith's mileage = \$26.55

Denis Reich mileage = \$457.60

#### *Promotion and Advertising:*

Adam's Quickprint = \$240.00 (promotional brochures)

The Daily Sentinel = \$1,114.69

#### *Miscellaneous*

Office Supplies & Fed Ex = \$219.69

### **Describe what outcomes you evaluated and how the evaluation was done.**

The primary source of evaluation is a follow up phone call at the end of the program implementation period to request feedback and ask if behavioral changes were made.

Results. Feedback was provided from a random sample of follow up calls (mostly to irrigators that were struggling with their irrigation):

*Auditee #1.* "The 'slower' irrigation [surging with surge valve] you recommended has allowed for clearing up of some dry patches."

*Auditee #2.* "Comprehensive report." "From now on we will be irrigating on a more efficient schedule with less water."

*Auditee #3.* "The visit was very helpful. I was able to talk to NRCS about options to improve my irrigation pipework."

*Auditee #4.* "Nice report. I will take a look at your recommendations."

*Auditee #5.* "I found the report very useful and have already made adjustments to how I apply irrigation water to my fields." "The soil test information was very useful as well."

- See Appendix for Sample Audit Report -

## Appendix: Sample Report

### Small Acreage Irrigation Assessment Report

Name: [REDACTED]

Address: [REDACTED]

Field: ~5 acres of alfalfa / grass hay.

Irrigation System: Stubb Valve feeding 6" gated pipe, 30" furrow spacings.

#### Description of work:

- 12 furrow flow snapshot,
- 5/8" ball probe,
- water sample (pond sample included),
- soil sample.

#### Comments:

1. The irrigator had severe ponding at bottom of the field which is a symptom of excessive irrigation volume (see photo 1). This field and crop would receive sufficient water with a 12 hour set every 10 days (14 days in spring and fall). Any more than 24 hours of irrigation will hurt the quality of the crop, create a mosquito breeding environment, and promote weed growth.
2. Distribution Uniformity (DU<sup>2</sup>) was 48.3% (poor) due to leaking gates and creases that were either not recently marked or cleaned after marking. Seasonal Efficiency (SE<sup>3</sup>) was 4.6% (very poor) which means most of the water entering the field is ponding or running off. Leaking gates can be addressed by lowering feed pressure at Stubb Valve (see photo 2). This will also eliminate the need for straps to hold pipe together.
3. Clean vent valve. This valve is probably collecting trash due to high pressure, push ball release down to vent and clean (see photo 2).
4. Irrigation and Pond water quality parameters were all within acceptable limits (see attached lab reports).
5. Soil quality parameters are all acceptable for this area. Excessive irrigation will wash nutrients into groundwater or waste ditch rendering them unavailable for crop use. This will also contribute to water quality problems in local streams and rivers.

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<sup>2</sup> DU is a measure of flow consistency between furrows. 100% means flow is evenly distributed among furrows. Above 50% is acceptable for furrow systems.

<sup>3</sup> SE is an *estimated* measure of water applied to a field versus water consumed by crop over a season. Above 30% is acceptable for furrow systems.

Please feel free to call us for a free follow up visit to answer any additional questions. Thank You for your interest in irrigation water management.



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Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating.  
Extension programs are available to all without discrimination.



Photo 1: Ponding at bottom of field, a symptom of excess irrigation water.



Photo 2: Stubb Valve with strapped leaking pipe and vent valve (vent valve is on the right spraying water at larger Stubb Valve). Choking back Stubb Valve will eliminate a lot of leaks and need for straps.