Work Plan
Agricultural Water Needs Assessment and Water Supply Analysis
Gunnison River Basin

Introduction and Background

In 2005, House Bill 05-1177, the Colorado Water for the 21st Century Act, was signed into law. Among other provisions, the bill provides for the creation of Basin Roundtables. Each Basin Roundtable is charged with formulating a water needs assessment, conducting an analysis of available unappropriated water, and proposing projects or methods for meeting those needs. In 2006, the House Bill 06-1400 was signed into law. HB 06-1400 provides a source of funding for basin roundtables to conduct and develop work plans for such studies.

In 2003, the Colorado Water Conservation Board (CWCB) completed the Statewide Water Supply Initiative (SWSI). That study included estimates of water demands in the Gunnison River Basin through 2030. SWSI concluded there was little "gap" between projected municipal and industrial water demands and available water supplies in the Gunnison Basin. While SWSI provided a coarse assessment of water demands for the municipal, industrial, and agricultural sectors, concerns were raised at that time that the analysis did not accurately reflect the agricultural water shortages in several of the water districts and especially on the tributaries of the Gunnison River. The estimates of agricultural water demand in the Gunnison Basin presented in the SWSI report should be reviewed for accuracy and as to the methodology that was used

One concern was that the Gunnison River Basin analysis of agricultural demand was not based on the most recent high altitude crop coefficients, thus understating the demand for water in the Gunnison River Basin by as much as 15%.

An additional concern was that the correct efficiencies for the various component structures in the basin may not have been adequately reviewed and incorporated in the current analysis, thus seriously understating the demand for agricultural water in the various tributaries at points of diversion.

An additional serious deficiency in the SWSI information was the total absence of any data on agricultural water supply shortages on the North Fork of the Gunnison River. This included areas around the cities of Delta, Cedaredge, Hotchkiss, Paonia, and Crawford.

After two years of assessing and reviewing available data, the Gunnison Basin Roundtable believes that the irrigation demands and the magnitude of existing irrigation shortages have been underestimated. The consequences of underestimating

these amounts are three-fold: First, the need for additional water storage in the Gunnison Basin is understated; second, the potential future demand for supplemental irrigation water out of the Aspinall Unit may be unacknowledged; and, third, an understatement of the agricultural shortages gives the impression that there may be water available for new appropriations in the Colorado River system when, in fact, there is not.

Comment [jhm1]: is?

Comment [jhm2]: I don't understand this one.

Comment [jhm3]: This paragraph is not very persuasive. Does this analysis have any impact on the SWSI gap projection? If it does, that would be important to note.

It is important that the analysis be performed for the stream segments where known critical shortages in water supply occur in close coordination and consultation with water users, water managers, and water administration officials. It is also important that this analysis be performed using historical records related to minimum supply conditions as appropriate (e.g., during the drought of 2002 – 2003). Also, the Gunnison Roundtable believes additional analysis of water shortages in below average runoff years must be conducted to better understand the reasons for the reported agricultural water shortages by certain canals and ditches.

Given this background, it is appropriate for a study to be undertaken under the auspices of HB-1177 and the Gunnison River Basin Roundtable as part of its statutorily required needs assessment to accurately identify agricultural water needs and shortages throughout the basin and identify possible management options and potential projects to satisfy those needs.

This proposed work plan is being submitted by the Upper Gunnison River Water Conservancy District as the Applicant ***on behalf of the Gunnison River Basin Roundtable*** to the Colorado Department of Natural Resources (DNR) Office of Interbasin Compact Negotiations for review and approval. The UGRWCD is acting as formal Project Applicant and Project Administrator for the purpose of managing the Project funds as it is "de-Bruced" and able to apply for and pass the funding through to Cooperators and sub-contractors on the Project. Those cooperators tentatively identified with UGRWCD on this Project are:

Uncompahgre Valley Water Users Association
Delta County
North Fork Water Conservancy District
Grand Mesa Water Conservancy District
Colorado River Water Conservation District
Office of the Division Engineer, Water Division 4.

A preliminary plan of work was prepared under a task order to DNR's initial study contractor (CDM, August 13, 2008). That plan of work has since been substantially revised by a working subcommittee of the Gunnison Basin Roundtable. This plan of work forms the basis of a Water Supply Reserve Account application. Coordination and the concurrence of CWCB will be important in any tasks involving refinement of the Colorado Decision Support System.

The plan of work is anticipated to be executed in an 18 month period, commencing on approval and receipt of a Notice to Proceed. The initial water users interview stage is anticipated to last over 7 months to facilitate user cooperation and availability of related personnel, including part-time water commissioners.

Objectives

The objectives of this proposed study are:

1. To interview, on a sub-basin level, water users and other sources of local information for agricultural water supply issues (both physical and legal, i.e. called out,) during the most recent drought period, 2000 – 2007.

2. Based on the results of those interviews, refine and update (ground truth) previous estimates of current agricultural water demands, supplies, and shortages for the Gunnison River Basin, including the State's Decision Support System (DSS) models and updated data.

3. Compare water user identified water short agricultural water systems with those in the updated DSS models and State Mod.

4. Revise DSS models as necessary to reflect water user knowledge of water short systems.

5. Provide detailed Basin level needs assessment information for the Gunnison Basin Roundtable and the Colorado River Water Availability study.

Tasks

This work plan is divided into four major tasks with multiple sub-tasks under each, addressing each of the objectives. The following is a list and description of tasks to be completed under this work plan.

Task 1 – Interview Water Users for Ag Water Supply Issues during the Most Recent Drought Period: 2000 - 2007

1.1 Identify Upper Gunnison Basin Ag Water Supply Issues (Water Districts 28, 59, 62)

Interview water users, water managers, and water officials knowledgeable about agricultural water use practices and obtain their input on water short systems during the relevant period. This may include, but not necessarily be limited to, legal limitations due to a demand by a downstream senior water right, physical limitations due to low flow conditions, or changing irrigation practices such as applying water for a second cutting or for pasture after the first cutting of hay. A description of water short systems will be prepared with the type of shortage included. Key "command" irrigation structures will be identified.

1.2 Identify Lower Uncompahgre River and Lower Gunnison Basin Ag Water Supply Issues (Water Districts 41, 42)

Interview water users, managers, and water officials knowledgeable about agricultural water use practices in the Lower Uncompahgre River basin and Lower Gunnison River basin near Delta to obtain their input on water short systems during the relevant period. This may include, but not necessarily be limited to, legal limitations due to a demand by a downstream senior water right, physical limitations due to low flow conditions, or water management constraints created by the inability to use return flows or waste water decrees to supply users in the lower end of the Uncompahgre Valley Water Users Association system. A description of water short systems will be prepared with the type of shortage included. Key "command" irrigation structures will be identified.

1.3 Identify North Fork of the Gunnison Basin/Grand Mesa Agricultural Water Supply Issues (Water District 40)

Interview water users, managers, and water officials knowledgeable about agricultural water use practices and obtain their input on water short systems during the relevant period. This may include, but not necessarily be limited to, legal limitations due to a demand by a downstream senior water right or other legal or regulatory constraints, physical limitations due to low flow conditions, or water management constraints created by lack of reservoir capacity on the Grand Mesa, or changing irrigation practices related to residential growth and smaller irrigated areas, less orchards being irrigated, and other changes. A description of water short systems will be prepared with the type of shortage included. Key "command" irrigation structures will be identified.

1.4 Identify Upper Uncompahgre Agricultural Water Supply Issues (Water District 68)

Interview water users, managers, and water officials knowledgeable about agricultural water use practices and obtain their input on water short systems during the relevant period. This may include, but not necessarily be limited to, legal limitations due to a demand by a downstream senior water right, physical limitations due to low flow conditions, or water management constraints created by lack of reservoir capacity, or changing irrigation practices related to residential growth and smaller irrigated areas, less orchards being irrigated, and other changes. A description of water short systems will be prepared with the type of shortage included. Key "command" irrigation structures will be identified.

Task 1 Deliverables

- A description of water short irrigation systems with the type(s) of shortages will be provided for each of the four sub-basins. A preliminary estimate of the estimated shortages for each of the four sub-basins in a 2002 type runoff year will be made.
- Technical memo describing methodology, assumptions, and results of interviews.

Task 2 – Refine Estimates of Agricultural Water Demands and Shortages using the DSS Models

2.1 Revise Agricultural Water Demands

The approach used in SWSI for agricultural water demands relied on the calculation of irrigation demands based on year 2000 irrigated acreages and State DSS calculations of total maximum annual irrigation water requirements (IWR), and comparison to estimated historical levels of water supply (based on historical diversions) to obtain current estimates of supply available to the crops (water supply limited values, WSL). In SWSI, the difference between these two parameters (IWR – WSL) by water district was assumed to be a reasonable estimate of agricultural shortages.

While records of diversion exist, the Gunnison Basin Roundtable believes they are only a starting point representing the quantity of water ***actually used*** and do not necessarily accurately reflect the true user ***demand*** for irrigation water. As part of Task 2.1, the following calculation basis will be re-examined and, potentially, refined and updated as appropriate.

- The year 2000 DSS irrigated acreage coverages should be re-examined with Roundtable members, water users, and water administrators through the presentation of plots of the year 2000 irrigated acreages on more recent (2005) aerial photographs.

- Irrigation water requirements will be re-examined to determine the maximum *demand* achievable by users assuming the operational capacity, length of growing season, and crop mix to maximize water use over a full growing season.

- Current level of agricultural water demands in the models will be updated to reflect, where appropriate, high altitude crop coefficients. This will require execution of the State's StateCU program component of the CDSS. Irrigation water requirements are expected to increase by 10 to 15 percent with the high altitude coefficients.

- Maximum use efficiencies used in the models will be reviewed and updated as to major structures or similar groups of structures. The review will occur with water users, water managers, water administrators and Roundtable members and may occur as part of the interview process.

This type of work may be conducted in coordination with the current or planned State DSS updates for the basin.

2.2 Revise/Execute CDSS Water Allocation Model (StateMod)

The input data files for the StateMod Program will be revised to reflect the agreed on revisions from subtask 2.1. Discussions with the Roundtable members, water users and water officials will occur on concerns about application of the DSS tools and data for estimating current water availability and current shortages in the basins. A new base flow data set for the StateMod model will be prepared and executions of the model performed. Re-calibration of the model may be required if dictated by comparisons between historical stream flow/diversion data and simulated results. This new Baseline data set will reflect current operations for the 1909 through 2006 period. Results of these simulations will be summarized in Microsoft Excel.

Comment [jhm4]: ?

2.3 Present Results of Revised Current Agricultural Water Shortage Analysis

Prepare charts, annotated maps, figures, and tables showing the location, timing, and amounts of current agricultural shortages. Prepare a technical memorandum of the refinements for estimating current agricultural demands, methodology, assumptions, and results. Discussions will be conducted with Roundtable members on their concerns

Task 2 Deliverables

- Simulation inputs and outputs used in presented analyses of current water shortages.
- Excel based spreadsheets used in calculation of shortages.
- Technical memo describing methodology, assumptions, and results of revised analyses.

Task 3 – Compare Water User Identified Water Short Systems with Updated DSS Models Water Short Systems and Revise DSS Models if Necessary, and Compute Water Shortages

3.1 Identify Differences between Water Users and DSS Water Short Systems

For each of the four sub-basins, a comparison of water user's short systems and DSS water short systems will be made to determine if the DSS models have correctly predicted the water short systems for the 2000 – 2006 period of recent drought conditions.

3.2 Identify Possible Causes of the Differences

Review and report on various possible causes of the differences between water users short irrigation systems and those in the DSS models such as:

- Temporal variation in irrigated areas as compared to the modeled irrigated areas

- Comparison of temporal variation in crop types with modeled crop types
- Comparison of actual ditch capacity with modeled capacity
- System operation assumptions in the model as compared to how the water users really operate the irrigation system.
- Model time step requirements that may not allow determination of shorter time step water shortages, i.e. monthly versus daily time steps

3.3 Revise the DSS Models to Better Predict Water Short Systems and Compute Water Shortages

To the extent necessary and practicable, the DSS models will be revised to better predict water short systems during the 2000 – 2007 timeframe based on the water user input. Recalibration of the model may be required if dictated by comparisons between historical stream flow/diversion data and simulated results. The new baseline data set will reflect current operations for the 1909 to 2007 period. Results of these simulations will be summarized in Microsoft Excel which will show water short systems in the sub-basins for the 1909 to 2006 period and computed water shortages.

Comment [jhm5]: Are all of the date ranges consistent?

Task 3 Deliverables

- A detailed comparison of water user versus DSS modeled water short irrigation systems within the Gunnison River Basin.
- Updated and, if necessary, revised DSS models for the Gunnison River basin.
- Excel based spreadsheets used in calculation of agricultural water shortages for the sub-basins of the Gunnison River Basin.
- Technical memo describing findings of water shortages and the methodology, assumptions, and results of revised analyses including if necessary, revised model codes for the DSS models

Key Personnel to Date for Development, Management and Implementation of the Agricultural Water Needs Assessment and Water Supply Analysis.

1. **Agricultural Water Needs Subcommittee of the Gunnison Basin Roundtable-** Marc Catlin, Ken Spann, Tom Alvey, Hank LeValley, Bud Burgess, Michele Decker, Cary Denison.

Comment [jhm6]: I don't recognize this name. Is it Rachel?

2. **Project Application and Detailed Work Plan Development-** Ken Spann (UGRWCD), Tom Alvey (North Fork Conservancy District), Cary Denison (Ouary County), Dave Kanzer, (CRWCD), Tyler Martineau, (Gunnison Municipalities), Frank Kugel (UGRWCD), with substantial input from Hal Simpson, P.E. and the office of the Division Engineer, Water Division 4.

3. **Project Administration.** The Project is expected to be administered in terms of upstream and downstream contracting obligations and subcontractor oversight by Frank Kugel, Manager of the UGRWCD with assistance from John McClow, General Counsel of the UGRWCD. These costs are in the nature of an in-kind contribution to the Assessment in the amount of $8,250.00 once the notice to proceed is given. All development costs to date have been donated.

4. **Other Key Personnel.** Other individuals expected or anticipated to be involved in the study effort include several west slope water consultants, several part time water commissioners, and several individuals with detailed knowledge of computer modeling and the operation of StateMod and CDSS.