COLORADO WATER CONSERVATION BOARD

WATER SUPPLY RESERVE ACCOUNT
GRANT APPLICATION FORM

Agricultural Weather Data Delivery Improvements to Uncompahgre Valley Irrigators

Name of Water Activity/Project

Approving Basin Roundtable

$112,347	**Amount from Statewide Account**	$35,254
Total Amount of Funds Requested	**Amount from Basin Account**	$77,093

Application Content

Attachments

1. Reference Information
2. Insurance Requirements (Projects Over $25,000)
3. WSRA Standard Contract (Projects Over $100,000)
4. W-9 Form (Required for All Projects)

Instructions

To receive funding from the Water Supply Reserve Account (WSRA), a proposed water activity must be approved by the local Basin Roundtable AND the Colorado Water Conservation Board (CWCB). The process for Basin Roundtable consideration/approval is outlined in Attachment 1.

Once approved by the local Basin Roundtable, the applicant should submit this application, a detailed statement of work, detailed project budget, and project schedule to the CWCB staff by the application deadline.

The application deadlines are:

- Basin Account – 60 calendar days prior to the bi-monthly Board meeting
- Statewide Account – 60 calendar days prior to the September Board meeting

Board Meeting Dates	Basin Account Deadlines	Statewide Account Deadlines
July 20-21, 2010	May 21, 2010	n/a
September 21-22	July 23, 2010	July 23, 2010
November 16-17	September 17, 2010	n/a
January 2011	60 days prior	n/a
March 2011	60 days prior	n/a
May 2011	60 days prior	n/a
July 2011	60 days prior	n/a
September 2011	60 days prior	60 days prior

When completing this application, the applicant should refer to the WSRA Criteria and Guidelines available at: http://cwcb.state.co.us/IWMD.

The application, statement of work, budget, and schedule must be submitted in electronic format (Microsoft Word or text-enabled PDF are preferred) and can be emailed or mailed on a disk to:

Mr. Todd Doherty
Colorado Water Conservation Board
Water Supply Planning Section
WSRA Application
1580 Logan Street, Suite 200
Denver, CO 80203
Todd.Doherty@state.co.us

If you have questions or need additional assistance, please contact Todd Doherty of the Water Supply Planning Section at 303-866-3441 x3210 or todd.doherty@state.co.us.

Water Supply Reserve Account – Grant Application Form
Form Revised March 2009

Part A. - Description of the Applicant (Project Sponsor or Owner);

1. Applicant Name(s): Colorado State University: Colorado Water Institute; Colorado State University Extension; Colorado Climate Center

Mailing address: Colorado State University Extension
Western Region Office
2764 Compass Drive / Suite 232
Grand Junction, CO 81506

Taxpayer ID#: 846000545

Email address: Denis.Reich@Colostate.edu

Phone Numbers: Business: 970-242-8683

Cell: 970-201-8467

Fax: 970-241-3643

2. Person to contact regarding this application if different from above:

Name: Denis Reich

Position/Title: Water Resources Specialist

3. Eligible entities that may apply for grants from the WSRA include the following. What type of entity is the Applicant?

[X] Public (Government) – municipalities, enterprises, counties, and State of Colorado agencies. Federal agencies are encouraged to work with local entities and the local entity should be the grant recipient. Federal agencies are eligible, but only if they can make a compelling case for why a local partner cannot be the grant recipient.

4. Provide a brief description of your organization

The **Colorado Water Institute** (CWI), an affiliate of Colorado State University, exists for the express purpose of focusing the water expertise of higher education on the evolving water concerns and problems being faced by Colorado citizens.

The Colorado Water Institute (CWI) is authorized and funded by Congress and the Colorado Legislature. CWI is accountable to Congress via its annual appropriation, a required annual report, and a thorough congressionally mandated peer review conducted every five years under the auspices of the U.S. Geological Survey. Copies of CWI's Federal and State authorizing legislation are attached to the Annual Report PDF. CWI is operated, by law, as a state-wide water research institute, obligated to connect all water expertise in Colorado's higher education system with research and education needs of Colorado's water managers and users.

CSU Extension was originally authorized through the United States Congress by the Smith-Lever Act (1914) as the Cooperative Extension Service. The USDA's National Institute of Food and Agriculture (NIFA) administers supportive funding for Smith-Lever Act services (including Extension) under the auspices of state and county governments and each state's designated land-grant universities. Extension is a public educational entity for providing research-based outreach to solve problems and improve the lives of US citizens. More simply, *the purpose of Extension is to provide a link between the university and the citizens of the state*, and our philosophy is that the entire state is our campus, and its residents are our students. Extension in Colorado is headquartered at CSU, and our system of county offices also puts Extension resources within easy reach of Colorado's 64 counties. Examples of educational courses provided by CSU Extension include 4-H Youth Development, Healthwise for Life, and Value-Added Agriculture.

The **Colorado Climate Center** is a service and education arm of Colorado State University. We were founded in 1974 to monitor the climate of Colorado, archive climatic data and information, and provide information and expertise on climate matters affecting the citizens of Colorado. The majority of data that we use to monitor Colorado climatic conditions are collected by Federal agencies such as the National Weather Service and the USDA Natural Resources Conservation Service. However, we also coordinate independent monitoring efforts including the Colorado Agricultural Meteorological Network (CoAgMet) and the Community Collaborative Rain, Hail and Snow network (CoCoRaHS). We have the capacity and are currently involved in climate monitoring activities associated with determining water balances (precipitation and evaporation) including consumptive crop water use. Information about the Colorado Climate Center can be found at http://ccc.atmos.colostate.edu

Colorado State University is a Public Institution of Higher Education and an 1862 land grant university.

5. If the Contracting Entity is different then the Applicant (Project Sponsor or Owner) please describe the

Contracting Entity here.

CSU Office of Sponsored Programs
Attn: Marilyn Morrissey, Senior Research Administrator
2002 Campus Delivery, Fort Collins, CO 80523-2002
Phone: (970) 491-2375
Fax: (970) 491-6147
Email: Marilyn.Morrissey@Colostate.edu

The person authorized to sign an agreement is Douglas Leavell, Director, Office of Sponsored Programs. Funds will be administered through the CSU financial system, in accordance with federal regulations.

6. Successful applicants will have to execute a contract with the CWCB prior to beginning work on the portion of the project funded by the WSRA grant. In order to expedite the contracting process the CWCB has established a standard contract with provisions the applicant must adhere to. A copy of this standard contract is included in Attachment 3. Please review this contract and check the appropriate box.

[X] The Applicant will be able to contract with the CWCB using the Standard Contract

[ ] The Applicant has reviewed the standard contract and has some questions/issues/concerns. Please be aware that any deviation from the standard contract could result in a significant delay between grant approval and the funds being available.

7. The Tax Payer Bill of Rights (TABOR) may limit the amount of grant money an entity can receive. Please describe any relevant TABOR issues that may affect the applicant.

Part B. - Description of the Water Activity

1. Name of the Water Activity/Project:
Weather Data Delivery Improvements to Uncompahgre Valley Irrigators

2. What is the purpose of this grant application? (Please check all that apply.)

[ ] Environmental compliance and feasibility study

[ ] Technical Assistance regarding permitting, feasibility studies, and environmental compliance

[X] Studies or analysis of structural, nonstructural, consumptive, nonconsumptive water needs, projects

Study or Analysis of:

- [ ] Structural project or activity
- [X] Nonstructural project or activity
- [X] Consumptive project or activity
- [ ] Nonconsumptive project or activity

[ ] Structural and/ or nonstructural water project or activity

a. Please provide an overview/summary of the proposed water activity (no more than one page). Include a description of the overall water activity and specifically what the WSRA funding will be used for.

The requested funds will be used to pilot improvements in the Colorado Climate Center's CoAgMet (Colorado Agricultural Meteorological) weather station network with agricultural irrigators in the Uncompahgre Valley. Funds would be spent over two years to install or transfer additional weather stations, improve the website[1] functionality, and provide more options for receiving irrigation scheduling information.

Efficiency improvements in on-farm irrigation are considered essential to complete a long term overhaul of water delivery and irrigation management within the Uncompahgre Valley. This is in part being driven by population growth but mostly by the recovery of four endangered fish species in the Lower Gunnison. Improved irrigation efficiency and management are considered a prudent and reasonable alternative to a "take" or injury to the fish which could jeopardize all water rights in the basin. An accurate, meaningful, and user-friendly CoAgMet is a key tool for making such improvements possible.

Improvements Include:

a. Providing the agricultural irrigator with a personalized CoAgMet.com account. This allows the producer to setup crop, soil, planting, and acreage information prior to the irrigation season. The network would automatically send producers irrigation cues via the media of their choice (email and/or cell phone).

b. Tracking water use throughout the season and calculating an estimate of consumptive use and efficiency for required EQIP[2] contract reporting.

c. Providing corn growth degree days (GDD) and real time temperature and wind speed for easier harvest scheduling and more effective aerial pesticide application.

d. Coordinating on-farm soil moisture sensor readings with weather station output so as to improve the resolution of a. and b.

Commercial sweet corn and onion growers from the Olathe-Montrose area would be the primary cooperators on this project. In addition to participating in optimizing network improvements they will also assist with outreach to other producers in the valley.

[1] www.coagmet.com

[2] Environmental Quality Incentives Program is a cost-share program available from the USDA's Natural Resources Conservation Service (NRCS): http://www.co.nrcs.usda.gov/programs/eqip/eqip.html

Part C. – Threshold and Evaluation Criteria

1. Describe how the water activity meets these **Threshold Criteria.** (Detailed in Part 3 of the Water Supply Reserve Account Criteria and Guidelines.)

a) The water activity is consistent with Section 37-75-102 Colorado Revised Statutes.[3]

This project will in not affect or injure water rights. Project collaborators are irrigators within the federal Uncompahgre Project with irrigation shares in the Uncompahgre Valley Water Users Association. The deliverables of the project will not impact the title, allocation, priority, transferability of irrigation shares (or water rights) in the valley; but rather provide irrigators with additional and more accurate information for scheduling their allocation.

b) The water activity underwent an evaluation and approval process and was approved by the Basin Roundtable (BRT) and the application includes a description of the results of the BRTs evaluation and approval of the activity. At a minimum, the description must include the level of agreement reached by the roundtable, including any minority opinion(s) if there was not general agreement for the activity. The description must also include reasons why general agreement was not reached (if it was not), including who opposed the activity and why they opposed it. Note- If this information is included in the letter from the roundtable chair simply reference that letter.

This project will be reviewed by the Gunnison Basin Roundtable's Projects committee and voted on at the October 4th 2010 meeting of Roundtable members.

[3] 37-75-102. Water rights - protections. (1) It is the policy of the General Assembly that the current system of allocating water within Colorado shall not be superseded, abrogated, or otherwise impaired by this article. Nothing in this article shall be interpreted to repeal or in any manner amend the existing water rights adjudication system. The General Assembly affirms the state constitution's recognition of water rights as a private usufructuary property right, and this article is not intended to restrict the ability of the holder of a water right to use or to dispose of that water right in any manner permitted under Colorado law. (2) The General Assembly affirms the protections for contractual and property rights recognized by the contract and takings protections under the state constitution and related statutes. This article shall not be implemented in any way that would diminish, impair, or cause injury to any property or contractual right created by intergovernmental agreements, contracts, stipulations among parties to water cases, terms and conditions in water decrees, or any other similar document related to the allocation or use of water. This article shall not be construed to supersede, abrogate, or cause injury to vested water rights or decreed conditional water rights. The General Assembly affirms that this article does not impair, limit, or otherwise affect the rights of persons or entities to enter into agreements, contracts, or memoranda of understanding with other persons or entities relating to the appropriation, movement, or use of water under other provisions of law.

b) The water activity meets the provisions of Section 37-75-104(2), Colorado Revised Statutes.[4] The Basin Roundtable Chairs shall include in their approval letters for particular WSRA grant applications a description of how the water activity will assist in meeting the water supply needs identified in the basin roundtable's consumptive and/or non-consumptive needs assessments.

One of the deliverables for the project is calculated estimates of seasonal consumptive use and resulting irrigation efficiencies for participating producers. This will not only provide the basin with new data on agricultural consumptive use but provide local producers who are enrolled in EQIP with the ability to quickly generate the annual report of water use that is required by the USDA of contract holders.

c) Matching Requirement: For requests from the Statewide Fund, the applicants is required to demonstrate a 20 percent (or greater) match of the request from the Statewide Account. Sources of matching funds include but are not limited to Basin Funds, in-kind services, funding from other sources, and/or direct cash match. Past expenditures directly related to the project may be considered as matching funds if the expenditures occurred within 9 months of the date the application was submitted to the CWCB. Please describe the source(s) of matching funds. (NOTE: These matching funds should also be reflected in your Detailed Budget in Part D of this application)

Total Match: $27,660. 25% of total project cost; 78% of statewide fund request.
Colorado State University Cash Match:

PI: Denis Reich – Water Resources Specialist (Grand Junction) $11,705
Monthly Salary = $4,385
Year 1: $4,583 (1 mo) + Year 2: $4,767 (1 mo) + Fringe: $2,355

Co-PI: Nolan Doesken – State Climatologist (Fort Collins) $5,106
Monthly Salary = $8,000
Year 1: $2,000 (0.25 mo) + Year 2: $2,080 (0.25 mo) + Fringe: $1,026

Partner: Wendy Ryan - Field Technician / State Climate Center (Fort Collins) $2,553
Monthly Salary: $4,000
Year 1: $1,000 (0.25 mo) + Year 2: $1,040 (0.25 mo) + Fringe: $513

[4] 37-75-104 (2)(c). Using data and information from the Statewide Water Supply Initiative and other appropriate sources and in cooperation with the on-going Statewide Water Supply Initiative, develop a basin-wide consumptive and nonconsumptive water supply needs assessment, conduct an analysis of available unappropriated waters within the basin, and propose projects or methods, both structural and nonstructural, for meeting those needs and utilizing those unappropriated waters where appropriate. Basin Roundtables shall actively seek the input and advice of affected local governments, water providers, and other interested stakeholders and persons in establishing its needs assessment, and shall propose projects or methods for meeting those needs. Recommendations from this assessment shall be forwarded to the Interbasin Compact Committee and other basin roundtables for analysis and consideration after the General Assembly has approved the Interbasin Compact Charter.

Co-PI: Troy Bauder – State Water Quality Specialist (Fort Collins) $6,381
Monthly Salary = $5,000
Year 1: $2,500 (0.5 mo) + Year 2: $2,600 (0.5 mo) + Fringe: $1,281

Partner: Allan Andales – Assistant Professor / Soil and Crop Sciences (Fort Collins) $1,915
Monthly Salary = $6,000
Year 1: $750 (0.13 mo) + Year 2: $780 (0.13 mo) + Fringe: $38

Indirect Match – CSU's 26% indirect rate for off campus applied research $7,192

2. For Applications that include a request for funds from the Statewide Account, describe how the water activity meets the **Evaluation Criteria.** (Detailed in Part 3 of the Water Supply Reserve Account Criteria and Guidelines.)

This water activity is proposed for the (Lower) Gunnison Basin. The CoAgMet network is currently available for all Colorado Irrigators but this pilot project would be confined to the Uncompahgre Valley. This is because the existing management of irrigation water in the valley is under unique pressure from the Endangered Species Act. The Programmatic Biological Opinion for reoperation of the Aspinall Unit lists irrigation efficiency improvements as one of the ten strategies that should be implemented for fish species recovery. A failure to make measureable improvement in Uncompahgre irrigation water management could jeopardize the ability of local agricultural stakeholders to utilize their water rights.

Improving and quantifying agricultural water use is also only a priority for certain areas of the state. Statewide funds have been requested (for the second year of the project) since resulting benefits of this pilot study will be ultimately available to other irrigators in the state. Other agricultural regions are also pursuing CoAgMet improvements specific to their regions through local roundtable funds as needed (North Platte, Arkansas).

Part D. – Required Supporting Material

1. Water Rights, Availability, and Sustainability

This information is needed to assess the viability of the water project or activity. Please provide a description of the water supply source to be utilized, or the water body to be affected by, the water activity. This should include a description of applicable water rights and the name/location of water bodies affected by the water activity.

The project will partner with irrigators in Uncompahgre Project irrigation system and will focus only on the management of water downstream of the head-gate. No supply source or body of water will be affected in this study.

2. Please provide a brief narrative of any related or relevant previous studies.

a. *Validation and Demonstration of the Colorado Agricultural Meteorological Network – COAGMET for Improved Irrigation and Pest Management*. Colorado NRCS Conservation Innovation Grant (CIG) – funding to Colorado State University 2006-2008 (PI: Mr. Troy Bauder). Project to enhance the precision of pest and disease forecasting and expand knowledge and adoption of CoAgMet for irrigation scheduling in the Lower Arkansas Valley. Project was successful at improving pest and disease forecasting and use of CoAgMet for irrigation scheduling during the project period.

b. *Using the ASCE Standardized Reference Evapotranspiration Equation and Appropriate Crop Coefficients for Irrigation Management in Colorado.* Colorado NRCS Conservation Innovation Grant (CIG) – funding to Colorado State University 2009-2012 (PI: Dr. Allan Andales). Field testing of the American Society of Civil Engineers (ASCE) standardized equation for reference EvapoTranspiration (ET). Four CoAgMet sites in the South Platte (two sites) and Arkansas (two sites) basins will be used to compare accuracy of the ASCE standardized equation to the Kimberly-Penman equation that has been the more recent standard for Colorado.

c. *Improvement of lysimeter operations and consumptive use quantification in high-altitude, irrigated meadows in the Yampa /White Basin.* 2010-2011. WSRA funding to Colorado Climate Center / Division of Water Resources, Division 6 (PI's: Nolan Doesken, Erin Light). This study will install new bucket type lysimeters and a fully automated weather station on the Carpenter Ranch owned by the Nature Conservancy. The lysimeters that will be installed are weighing lysimeters instead of compensating lysimeters. This will allow for operation of the lyismeters to closely mimic the irrigation environment of the Yampa basin. Four lysimeters plots, buckets in this case, will be installed - two will be seeded with grass-reference vegetation and two will be seeded with vegetation representative of the surrounding irrigated meadow. This will allow for direct

determination of crop coefficients that could be applied to any future weather-based calculations of grass-reference ET.

d. The North Platte Roundtable and the CWCB board recently approved a study submitted by the Colorado Climate Center to quantify consumptive use throughout North Park for their consumptive use needs assessment. Three automated weather stations were placed around North Park to not only characterize weather conditions across North Park but to also understand differences in consumptive use across the basin. Crop coefficients for North Park will be developed by utilizing the lysimeter data at the Arapahoe National Wildlife Refuge operated by the Colorado Division of Water Resources and data from low cost atmometers (ETgages).

3. Statement of Work, Detailed Budget, and Project Schedule

The statement of work will form the basis for the contract between the Applicant and the State of Colorado. In short, the Applicant is agreeing to undertake the work for the compensation outlined in the statement of work and budget, and in return, the State of Colorado is receiving the deliverables/products specified. Please note that costs incurred prior to execution of a contract or purchase order are not subject to reimbursement.

Please provide a detailed statement of work using the following template. Additional sections or modifications may be included as necessary. Please define all acronyms. If a grant is awarded an independent statement of work document will be required with correct page numbers.

Statement of Work

WATER ACTIVITY NAME - Agricultural Weather Data Delivery Improvements to Uncompahgre Valley Irrigators

GRANT RECIPIENT – Colorado Water Institute / Colorado State University Extension.

FUNDING SOURCE – Gunnison Basin Roundtable (69%) and Statewide (31%) Water Supply Reserve Account.

INTRODUCTION AND BACKGROUND

This project provides the tools for this group of producers to lead adoption of irrigation scheduling techniques that will maximize instantaneous and seasonal irrigation efficiency and help quantify agricultural consumptive use in the Uncompahgre Valley. Benefits include mitigation of selenium leaching from local soils that threaten the recovery of local endangered fish species. Incentives for local agricultural irrigators are increased, more consistent productivity and profitability.

The described improvements for the CoAgMet (Colorado Agricultural Meteorological) network will reorganize the existing system of relaying weather data to irrigating producers. Each producer will be able to tailor the site to provide only the data they want via the media of their preference at a frequency of their choosing.

These benefits are particularly important within the Uncompahgre Valley where the dominant Mancos shale soils are rich in salt and selenium. These contaminants and are easily flushed to the river by excess irrigation water that percolates beyond the root zone. Soil and surface water concentrations of selenium in the Uncompahgre, Lower Gunnison and Upper Colorado (confluence with Gunnison to Utah state line) are some of the highest in the country. Percolation by irrigation water through the local selenium laden soils has been described within the Department of the Interior's Programmatic Biological Opinion (PBO) for the Aspinall unit as inhibiting recovery of four local endangered fish species and concentrations in the Gunnison River at Whitewater exceed the state chronic standard (4.6 ppb).

OBJECTIVES

Approximately 8000 pounds per year of selenium need to be eliminated from the current selenium load to the Upper Colorado Basin in order to meet the water quality standard acceptable for the four local endangered fish species (chronic standard of 4.6 ppb). Of the 8000 pounds about one third to half is believed to be due to inefficient irrigation systems and practice. With delivery and irrigation

improvements across the entire Uncompahgre Project 3000 pounds could potentially be eliminated from the annual load to the river. Such strategies would ensure local water rights are not jeopardized by the existing threat to the endangered fish.

The incentive for cooperating producers and other agricultural irrigators in the valley is instantaneous and seasonal irrigation efficiency improvements. If well managed these enhancements will create increases in average yields and profit.

Additional benefits of the project are automatic irrigation cues via email and/or texting that is customized to each producer's operation. These improvements innovatively reduce producer workload which in turn lowers the use of machinery and maximizes crop uptake of fertilizer; both increasingly expensive fossil fuel based products.

TASKS

Provide a detailed description of each task using the following format

Improving the CoAgMet network and data delivery to producers consists of four components:

TASK 1 – Improved coverage by weather stations in the Uncompahgre Valley

Description of Task

A number of weather station dead spots currently limit the accuracy of weather data for some producers in the Uncompahgre Valley. The addition of one weather station and the upgrading of the three existing stations in the area will assist in eliminating these dead spots.

Method/Procedure

EvapoTranspiration (ET) research in the Uncompahgre Valley over the past two years has identified dead spots in the weather station network. A third weather station was moved into the area (Olathe2) in 2010 and a fourth would be added with this project in the Montrose area to accommodate micro-climates around the valley.

Deliverable

Improved resolution of daily agricultural water use data for key crops irrigated in the Uncompahgre Valley.

TASK 2 – Overhaul of CoAgMet website.

Description of Task

The CoAgMet website is considered cumbersome and limiting by most producers in the area. Even the most organized irrigator is required to monitor and tabulate daily crop water use (ET) for each field he has planted. For larger sweet corn and onion growers this could be 20 fields a day. The new website would ask producers to establish an account that is updated with planting and acreage information at the beginning of each growing season. The website software would automatically tabulate crop water use for each field that the producer enters into their account. In addition to crop water the software would also provide corn growing degree days (GDD) for sweet corn maturity.

Method/Procedure

David Patterson is a programmer with Colorado State University with expertise in website design, programming, and maintenance. He has budgeted three months of work in year one and one month of work in year two of the project to program, and optimize the desired upgrades with the CoAgMet website.

Deliverable

The improved website would allow producers to track and manage water use on select fields. The result would be the ability to track water use throughout the season for participating producers.

TASK 3 – Enhanced agricultural weather data delivery

Description of Task

Data delivery currently depends on the producer visiting the website to collect daily crop water use and to calculate GDD. With the upgraded data delivery system producers with an active account on the CoAgMet network would be provided with irrigation cues for each field in their account. Producers would only need access their account to enter the time and amount they irrigated. GDD, wind, and temperature alerts would also be an option for each field.

Method/Procedure

As part of the improvements to the CoAgMet website, water use for each field would be tracked automatically removing the burden of "check-booking" water use from the producer. Participating producers would be able to select the medium for receiving irrigation cues (in addition to what's available on the improved website): cell phone text or email. Additionally each producer will be provided with an end-of-season report that will meet the new reporting requirements for producers with improved irrigation systems enrolled in the USDA's Environmental Quality Incentives Program (EQIP).

Deliverable

Irrigation scheduling would be less cumbersome for producers since the website would automatically track water use for each field and provide automated irrigation cues via the medium of their choice (website, cell text, or email).

TASK 4 – Outreach

Description of Task

The project will include annual workshops with producers to promote:

I. The importance of seasonal irrigation scheduling and good irrigation management (year 1).
II. How to use the upgraded CoAgMet network, website, and data delivery system (year 2).

Site visits for project personnel have been included in the project budget to exchange ideas and provide training on smaller revisions. Final reporting will include a report on the project, a journal publication and long-term outreach materials.

Method/Procedure

Summer and winter workshops will be advertised and hosted by the project team to raise awareness of the CoAgMet network in its improved form, the advantages it provides for the agricultural irrigator in the Uncompahgre Valley, and provide training in how to use it effectively. Experiences from these workshops will inform online instructions that will be available from the website by the conclusion of the project. A journal article (Journal of Extension, Journal of Water Resources) will also be written and published on the successes and lessons learned from the project.

Deliverable

Outreach would assist with informing agricultural irrigators of the importance of more efficient irrigation and the benefits of using CoAgMet to manage irrigations. In addition producers interested in participating would be trained in how to use the website and manage automatic irrigation cues. The ultimate deliverable would be valley-wide adoption of more efficient irrigation scheduling and an improved understanding of agricultural water use in the valley.

REPORTING AND FINAL DELIVERABLE

Reporting: The applicant shall provide the CWCB a progress report every 6 months, beginning from the date of the executed contract. The progress report shall describe the completion or partial completion of the tasks identified in the statement of work including a description of any major issues that have occurred and any corrective action taken to address these issues.

Final Deliverable: At completion of the project, the applicant shall provide the CWCB a final report that summarizes the project and documents how the project was completed. This report may contain photographs, summaries of meetings and engineering reports/designs.

BUDGET

Provide a detailed budget by task including number of hours and rates for labor and unit costs for other direct costs (i.e. mileage, $/unit of material for construction, etc.). A detailed and perfectly balanced budget that shows all costs is required for the State's contracting and purchase order processes.

Budget Table 1: Labor Costs

Personnel: Monthly Rate:	Months $7,500	2nd Year Inflation	Fringe		Total Costs
Task 2 – Website	4 months	4%	25%		
Total Hours:	$30,000	1 month			
Cost:	$30,000	$300	$7,598		$37,898

Budget Table 2: Complete Project Costs

Item: Units: Unit Cost:	Labor	Materials	Equipment/ Supplies	Mileage Miles	Indirect 26%	Total
Task 1 – Stations		$10,000	$12,240	$5,040		
Task 2 – Website	$37,898			$0		
Task 3 – Data			$16,120	$1,882		
Task 4 - Outreach			$4,624	$1,360		
Total Units:	4 months			10,800 mi		
Total Cost:	$37,898	$10,000	$32,984	$8,282	$23,183	$112,347

Budget Table 3: In-kind Contributions

In-Kind Contributions. Fringe (25%) and Inflation (4%) included.		
	Personnel	Total
Task 1 – Stations	Denis, Wendy	$4,705
Task 2 – Website	Denis, Nolan, Troy	$7,006
Task 3 – Data	Denis, Wendy, Troy, Allan	$6,468
Task 4 – Outreach	Denis, Nolan, Troy, Allan	$9,481
Total Months:		3.75
In-kind Labor:		$27,660
Indirect (26%):		$7,182
Total In-kind:		$34,842

Budget Narrative

*A standard 4% inflationary increase is incorporated in Years 2 unless otherwise noted.

A. Personnel ($37,898):
David Patterson – Programmer. Assistant Director of Integrated Decision Support Group (IDS), Colorado State University.
Monthly Salary of $7,500.

Salary is for 3 months of work in Year 1 of the project to upgrade the CoAgMet website and provide cell phone and email updates. A fourth month is also included in Year 2 for trouble-shooting and revisions.
Fringe benefits are budgeted at university established rates for faculty: 25.0% in Year 1 and 25.3% in Year 2.

David Patterson:
David holds Bachelors degrees in Math and Psychology and a Masters in Computer Science. His strengths are in object-oriented programming using Python, Java, C#, and C++.

He is currently working on a model for calculating crop consumptive use using several types of daily and monthly evapotranspiration equations including ASCE's standardized reference evapotranspiration equation. The model uses weather, soil, and irrigation data to calculate the depletion of water supplies and water stored in the soil. More information on the model can be found here: http://www.ids.colostate.edu/projects/idscu/

Other software in development is a web-based GIS page for developing spatial data that can be used as input to various environmental models.

B. Domestic Travel ($8,282):
Travel is budgeted for the PI and co-PIs to travel to and from the study area. Each year includes one trip to put on training workshops with additional trips to visit weather stations, irrigators, local partners, and present progress to interested stakeholders such as the Gunnison Basin Roundtable, Uncompahgre Valley Water Users Association, and Selenium Task Force. Travel from Fort Collins to the Montrose/Delta area is significant enough to warrant overnight accommodation and per diem. Local travel from Grand Junction does not require accommodation or food costs.

Year 1		= $4,060
PI:	Grand Junction to study area - 6 x 150 mi (roundtrip) x $0.50 /mi	= $450
Co-PIs	Fort Collins to study area: 6 x 750 mi (roundtrip) x $0.50 /mi	= $2,250
& Partners:	Overnight: 8 nights x $110 /night	= $880
	Per Diem: 8 days x $45 (with 2/3 day for travel days)	= $480

Year 2 (with 4% appreciation)		= $4,222
PI:	Grand Junction to study area - 6 x 150 mi (roundtrip) x $0.50 /mi	= $468
Co-PIs	Fort Collins to study area: 6 x 750 mi (roundtrip) x $0.50 /mi	= $2,340
& Partners:	Overnight: 8 nights x $110 /night	= $914
	Per Diem: 8 days x $45 (with 2/3 day for travel days)	= $500

C. Equipment ($10,000):

$10,000 for CoAgMet Weather Stations (2011)

An additional two Weather Stations for the area is required to eliminate dead spots in current coverage. Weather Stations currently run at $7,000 but a new generation of weather station will be piloted with this project which requires an additional $3,000 of instrumentation to allow for real time temperature and wind. A weather station will be installed each year of the project to allow for best placement of the last weather station.

D. Materials and Supplies ($16,120):

$10,000 has been budgeted for supplies in the first year for a new CoAgMet station with real-time temperature and wind recording and relaying capability.

$3,000 has been budgeted for 3 Radio Transmitters and 3 PLC Radio Receivers at $500 each to connect Soil Sensors on third party match acreage to Weather Stations. Comparing soil sensing data to weather data is essential for accurate irrigation scheduling.

E. Other Direct

Publication Costs ($4,000):

Page charges are budgeted in Year 2 of the project at $4,000 to publish a revised CoAgMet Manual and a journal article. This is based off an estimate of $100/page and 40 pages.

Workshops ($624)

Workshops have been budgeted throughout the project:

Workshop 1: with local producers to educate on the importance of using agricultural weather data for irrigation scheduling when attempting improve efficiency and increase yields and profitability.

Workshop 2: with local producers on the upgraded CoAgMet network and how to make use of the automated data delivery, real-time weather information, and new corn growing degree days (GDD) output.

Refurbishment and Maintenance ($12,240)

2 x $3,000 = $6,000 in the first year has been budgeted to replace old and faulty instruments on the existing two weather stations, upgrade temperature and wind sensing to relay in real-time and maintain.

3 x $2000 = $6,240 in the second year has been allocated for annual maintenance and calibration costs for all three stations.

F. Total Direct Costs ($89,164)

G. Indirect Costs ($23,183):
Indirect costs are calculated at 26% of the Total Direct Costs.

Total Requested Funds $112,347

Cash Match by CSU

A. Personnel $27,660 (Includes Fringe Benefits)

PI: Denis Reich – Water Resources Specialist (Grand Junction) $11,705
Monthly Salary = $4,385
Year 1: $4,583 (1 mo) + Year 2: $4,767 (1 mo) + Fringe: $2,355

Denis Reich was born, raised and schooled in Sydney, Australia. He completed a Bachelor of Engineering (Chemical) at the University of Sydney, graduating in 1996. He then worked in the water treatment industry from 1996-2004 throughout Australasia, Europe and North America. He was successful with a Masters in Sustainable Agriculture and Economics at Iowa State University graduating in 2007; his thesis was on USDA agricultural conservation programs. He started work in his current position of Water Resource Specialist with Colorado State University Extension in January 2008 based in Grand Junction covering the Western Slope of Colorado.

In his current role Denis specializes in irrigation improvements and water quality issues. He is currently the chair of the Science and Research sub-committee with the Lower Gunnison Valley Selenium Task Force. Part of his responsibility includes promoting improved irrigation water management among local farmers and ranchers. Improved efficiency measures for irrigation in the study area will assist with selenium (and salt) load reductions to the local rivers.

Co-PI: Nolan Doesken – State Climatologist (Fort Collins) $5,106
Monthly Salary = $8,000
Year 1: $2,000 (0.25 mo) + Year 2: $2,080 (0.25 mo) + Fringe: $1,026

Nolan Doesken is the State Climatologist for Colorado and has worked in that capacity since 2006. Prior to that, he was the Assistant State Climatologist since 1977 responsible for statewide climate monitoring and data archival. The Office of the State Climatologist is a part of the Colorado Climate Center within the Department of Atmospheric Science, College of Engineering at Colorado State University. In the 1990s, the Colorado Climate Center became a participant in the Colorado Agricultural Meteorological Network (CoAgMet), and in 2000 Nolan became the statewide manager of

this large weather station network. Nolan is also director of the historic Fort Collins Weather Station on the campus of Colorado State University and it the national director of the Community Collaborative Rain, Hail and Snow Network.

Nolan is a life-long weather enthusiast and enjoys sharing weather and climate data and information with diverse audiences. He has been involved in many research efforts focused on climate applications in agricultural, natural resources and energy. In collaboration with NOAA and the National Weather Service, the Colorado Climate Center has tested and compared a variety of new and old weather instruments in order to assess the continuity of long-term climate data records in Colorado and across the U.S. He authored a popular book about snow measurements in the U.S. and developed training resources for National Weather Service weather observers.

Partner: Wendy Ryan - Field Technician / State Climate Center (Fort Collins) $2,553
Monthly Salary: $4,000
Year 1: $1,000 (0.25 mo) + Year 2: $1,040 (0.25 mo) + Fringe: $513

Wendy Assists Nolan with field work associated with the CoAgMet program.

Co-PI: Troy Bauder – State Water Quality Specialist (Fort Collins) $6,381
Monthly Salary = $5,000
Year 1: $2,500 (0.5 mo) + Year 2: $2,600 (0.5 mo) + Fringe: $1,281

Troy Bauder, Extension Water Quality Specialist in the Department of Soil and Crop Sciences at CSU is responsible for conducting statewide educational and applied research programs on water quality, especially related to protection of groundwater quality from impairment to agricultural chemicals. Research and outreach experiences include nitrogen and irrigation management, particularly as related to groundwater quality; irrigation water quality; socioeconomic factors affecting adoption of best management practices; aquifer sensitivity/vulnerability to nitrate and pesticide contamination on field and regional scales; evaluation of atmometers for predicting reference evaporation; uses of linear polyacrylamide to prevent erosion in different environments; and limited irrigation. Extension and outreach work also includes improving irrigation management through improved record keeping and irrigation scheduling, particularly through ET-based methods. Troy Bauder received his B.S. degree in Agronomy and his M.S. in Soil Science from Colorado State University.

Partner: Allan Andales – Assistant Professor / Soil and Crop Sciences (Fort Collins) $1,915
Monthly Salary = $6,000
Year 1: $750 (0.13 mo) + Year 2: $780 (0.13 mo) + Fringe: $385

Dr. Allan Andales joined the Department of Soil and Crop Sciences in August, 2007 as an Assistant

Professor. He has Agricultural Engineering (Soil and Water emphasis) degrees from the University of the Philippines (BS) and Iowa State University (MS and PhD). He has worked as an Assistant Professor of Agricultural Engineering at the University of the Philippines at Los Baños, as a postdoctoral fellow working on irrigation of pecan trees at New Mexico State University, and as a Soil Scientist with USDA-Agricultural Research Service-Agricultural Systems Research Unit in Fort Collins, Colorado. His primary research activities with USDA focused on computer modeling of agricultural systems (cropland and rangeland) and related field measurements to characterize the systems. Allan has 15 years of experience in developing and using computer simulation models for field applications such as irrigation scheduling and improved management of cropping or rangeland-livestock systems.

Allan has research, teaching, and extension responsibilities in the areas of irrigation and water science. His teaching responsibilities include SOCR370 (Irrigation Principles) and SOCR371 (Irrigation of Field Crops). Allan's primary research interests are in conserving soil and water resources. He is currently involved in the determination of crop consumptive water use with the weighing lysimeters at Rocky Ford, CO. He is also using computer simulation models of soil-plant-atmosphere systems to analyze limited irrigation strategies and extend site-specific research findings to other locations, management practices, or climate scenarios. Allan is collaborating with members of the CSU Extension Water Resource Management Team to address agricultural and urban water issues in Colorado.

B. Indirect Costs $7,192
Have been calculated at 26%, which is CSU's approved rate for off-campus research.

Two cooperating producers have agreed to use a portion of their acreage for testing the revised CoAgMet weather station network, website, and data delivery system over the life of the project:

David Harold (California Mesa): 250 acres ($97/acre r.e. USDA-NASS) over 2 years: $49,470
Duane Homewood (Coal Creek): 250 acres ($92/acre r.e. USDA-NASS) over 2 years: $46,920

See third party match letters for more detail.

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Total Match $34,852

Water Supply Reserve Account – Grant Application Form

Form Revised March 2009

SCHEDULE

	Year 1				Year 2			
	Dec 2010-Mar 2011	**Mar 2011-Jun 2011**	**Jun 2011-Sept 2011**	**Sept 2011-Dec 2011**	**Dec 2011-Mar 2012**	**Mar 2012-Jun 2012**	**Jun 2012-Sept 2012**	**Sept 2012-Dec 2012**
1. Weather Stations								
Locate 3rd weather Station site								
Install 3rd weather station								
Upgrade existing two weather stations								
Weather Station maintenance								
2. CoAgMet website								
CoAgMet website upgrades								
CoAgMet website testing*								
Final website revisions*								
3. Data Delivery								
CoAgMet data delivery upgrades								
CoAgMet data delivery testing*								
Final data delivery revisions*								
4. Outreach								
Workshops with cooperating producers								
Site Visits with producers								
Final								

Reporting / Publications								

PAYMENT

Payment will be made based on actual expenditures and invoicing by the applicant. Invoices from any other entity (i.e. subcontractors) cannot be processed by the State. The request for payment must include a description of the work accomplished by major task, and estimate of the percent completion for individual tasks and the entire water activity in relation to the percentage of budget spent, identification of any major issues and proposed or implemented corrective actions. The last 5 percent of the entire water activity budget will be withheld until final project/water activity documentation is completed. All products, data and information developed as a result of this grant must be provided to the CWCB in hard copy and electronic format as part of the project documentation. This information will in turn be made widely available to Basin Roundtables and the general public and help promote the development of a common technical platform.

The above statements are true to the best of my knowledge:

Signature of Applicant:

Print Applicant's Name: Denis Reich

Project Title: Agricultural Weather Data Delivery Improvements to Uncompahgre Valley Irrigators

Date: Wednesday, September 29th 2010

Return this application to:

Mr. Todd Doherty
Intrastate Water Management and Development Section
COLORADO WATER CONSERVATION BOARD
1580 Logan Street, Suite 200
Denver, CO 80203

To submit applications by Email, send to: todd.doherty@state.co.us
To submit applications by Fax, send to: (303) 894-2578
For questions, call Telephone No.: (303) 866-3426

Attachment 1
Reference Information

The following information is available via the internet. The reference information provides additional detail and background information.

Colorado Water Conservation Board (http://cwcb.state.co.us/)

Loan and Grant policies and information are available at – http://cwcb.state.co.us/Finance/

Interbasin Compact Committee and Basin Roundtables (http://ibcc.state.co.us/)

Interbasin Compact Committee By-laws and Charter (under Helpful Links section) –

http://ibcc.state.co.us/Basins/IBCC/

Legislation

House Bill 05-1177 - Also known as the Water for the 21st Century Act –

http://cwcbweblink.state.co.us/DocView.aspx?id=105662&searchhandle=28318

House Bill 06-1400 – Adopted the Interbasin Compact Committee Charter –

http://cwcbweblink.state.co.us/DocView.aspx?id=21291&searchhandle=12911

Senate Bill 06-179 – Created the Water Supply Reserve Account –

http://cwcbweblink.state.co.us/DocView.aspx?id=21379&searchhandle=12911

Statewide Water Supply Initiative

General Information – http://cwcb.state.co.us/IWMD/

Phase 1 Report – http://cwcb.state.co.us/IWMD/SWSITechnicalResources/SWSIPhaseIReport/

Attachment 2
Insurance Requirements

NOTE: The following insurance requirements taken from the standard contract apply to WSRA projects that exceed $25,000 in accordance with the policies of the State Controller's Office. Proof of insurance as stated below is necessary prior to the execution of a contract.

13. INSURANCE

Grantee and its Sub-grantees shall obtain and maintain insurance as specified in this section at all times during the term of this Grant: All policies evidencing the insurance coverage required hereunder shall be issued by insurance companies satisfactory to Grantee and the State.

A. Grantee

i. Public Entities

If Grantee is a "public entity" within the meaning of the Colorado Governmental Immunity Act, CRS §24-10-101, et seq., as amended (the "GIA"), then Grantee shall maintain at all times during the term of this Grant such liability insurance, by commercial policy or self-insurance, as is necessary to meet its liabilities under the GIA. Grantee shall show proof of such insurance satisfactory to the State, if requested by the State. Grantee shall require each Grant with Sub-grantees that are public entities, providing Goods or Services hereunder, to include the insurance requirements necessary to meet Sub-grantee's liabilities under the GIA.

ii. Non-Public Entities

If Grantee is not a "public entity" within the meaning of the GIA, Grantee shall obtain and maintain during the term of this Grant insurance coverage and policies meeting the same requirements set forth in **§13(B)** with respect to sub-Grantees that are not "public entities".

B. Sub-Grantees

Grantee shall require each Grant with Sub-grantees, other than those that are public entities, providing Goods or Services in connection with this Grant, to include insurance requirements substantially similar to the following:

i. Worker's Compensation

Worker's Compensation Insurance as required by State statute, and Employer's Liability Insurance covering all of Grantee and Sub-grantee employees acting within the course and scope of their employment.

ii. General Liability

Commercial General Liability Insurance written on ISO occurrence form CG 00 01 10/93 or equivalent, covering premises operations, fire damage, independent Grantees, products and completed operations, blanket Grantual liability, personal injury, and advertising liability with minimum limits as follows: **(a)**$1,000,000 each occurrence; **(b)** $1,000,000 general aggregate; **(c)** $1,000,000 products and completed operations aggregate; and **(d)** $50,000 any one fire. If any aggregate limit is reduced below $1,000,000 because of claims made or paid, Sub-grantee shall immediately obtain additional insurance to restore the full aggregate limit and furnish to Grantee a certificate or other document satisfactory to Grantee showing compliance with this provision.

iii. Automobile Liability

Automobile Liability Insurance covering any auto (including owned, hired and non-owned autos) with a minimum limit of $1,000,000 each accident combined single limit.

iv. Additional Insured

Grantee and the State shall be named as additional insured on the Commercial General Liability and Automobile Liability Insurance policies (leases and construction Grants require additional insured coverage for completed operations on endorsements CG 2010 11/85, CG 2037, or equivalent).

v. Primacy of Coverage

Coverage required of Grantee and Sub-grantees shall be primary over any insurance or self-insurance program carried by Grantee or the State.

vi. Cancellation

The above insurance policies shall include provisions preventing cancellation or non-renewal without at least 45 days prior notice to the Grantee and the State by certified mail.

vii. Subrogation Waiver

All insurance policies in any way related to this Grant and secured and maintained by Grantee or its Sub-grantees as required herein shall include clauses stating that each carrier shall waive all rights of recovery, under subrogation or otherwise, against Grantee or the State, its agencies, institutions, organizations, officers, agents, employees, and volunteers.

C. Certificates

Grantee and all Sub-grantees shall provide certificates showing insurance coverage required hereunder to the State within seven business days of the Effective Date of this Grant. No later than 15 days prior to the expiration date of any such coverage, Grantee and each Sub-grantee shall deliver to the State or Grantee certificates of insurance evidencing renewals thereof. In addition, upon request by the State at any other time during the term of this Grant or any sub-grant, Grantee and each Sub-grantee shall, within 10 days of such request, supply to the State evidence satisfactory to the State of compliance with the provisions of this **§13**.

Attachment 3
Water Supply Reserve Account Standard Contract

NOTE: The following contract is required for WSRA projects that exceed $100,000. (Projects under this amount will normally be funded through a purchase order process.) Applicants are encouraged to review the standard contract to understand the terms and conditions required by the State in the event a WSRA grant is awarded. Significant changes to the standard contract require approval of the State Controller's Office and often prolong the contracting process.

It should also be noted that grant funds to be used for the purchase of real property (e.g. water rights, land, conservation easements, etc.) will require additional review and approval. In such cases applicants should expect the grant contracting process to take approximately 3 to 6 months from the date of CWCB approval.

Attachment 4
W-9 Form

NOTE: A completed W-9 form is required for all WSRA projects prior execution of a contract or purchase order. Please submit this form with the completed application.