**Alternative Agricultural Water Transfer Methods – Competitive Grant Program**
**Water Activity Summary Sheet**
**Agenda Item 28**

**Applicant:** Upper Arkansas Water Conservancy District

**Water Activity Name:** Building and Assessing Accounting and Administration Tools for Lease-Fallowing in Colorado's Lower Arkansas River Valley

**Water Activity Purpose:** Nonstructural Activity

**Drainage Basin:** Arkansas

**Water Source:** Arkansas

**Amount Requested:** $125,000

**Matching Funds:** $50,000 ($10,000 in cash match from the five sponsors: UAWCD, SECWCD, LAVWCD, Pueblo Board of Water Works and Colorado Springs Utilities).

| **Staff Recommendation** |
| --- |
| Staff recommends approval of up to $121,500 from the Alternative Agricultural Water Transfer Methods Program to help complete the project, Building and Assessing Accounting and Administration Tools for Lease-Fallowing in Colorado's Lower Arkansas River Valley contingent upon satisfying the issues/needs identified below. |

**Water Activity Summary:**
The project will build and assess a tool to quantify values of transferrable consumptive use and assess impacts to the stream-aquifer system. The tools built and assessed will help make available water supplies through lease fallowing by: reducing transactional costs, protecting existing water rights from injury in the least costly fashion, maintaining the area agricultural economy and preserving the institutionalized and long recognized water court process.

The main objective of this project is to develop and assess accounting and administration tools that calculate transferrable consumptive use and assess impacts to return flows pursuant to lease fallowing agreements. The result will be a common platform that can be a template to others for accurately calculating transferrable consumptive use and assess impacts. A common platform will facilitate implementation of rotational crop fallowing/leasing such as the Super Ditch.

The purpose of this project is not to transfer water via temporary leases but make possible the water transfer by: constraining costs, protecting other water rights from potential injury, maintaining agricultural economies, and preserving the institutionalized and long recognized water court process. Without a common technical and widely accepted platform to quantify consumptive use and return flow impacts the marketing through the "Super Ditch" style program may very well be futile due to the high water costs of changing the water rights through water court. In this regard this project helps advance alternative transfer methods via rotational crop fallowing/leasing forward to an actual on the ground program that can provide a reliable water supply while sustaining key elements of the agricultural area from which the water is transferred.

The objectives of the accounting and administration tools are to:

1. Quantify the transferrable consumptive use derived from fallowed land parcels;
2. Quantify the associated changes in the *amount, timing, and location* of:

    (a) surface runoff to drains and to the river,
    (b) recharge to the alluvial aquifer, and
    (c) groundwater return flow to drains and to the river;

3. Support the development of plans to maintain return flows at or above historical levels and to quantify transferrable consumptive use at or below historical levels in a manner that complies with Colorado water law and the Arkansas River Compact; and
4. Develop data interfaces that will complement the Arkansas River Decision Support System (ArkDSS) and build a common technical platform for the transfer of data to and from Hydrobase.

**Discussion:**
Through the CWCB's ATM program, the IBCC Ag Subcommittee and discussions with grant recipients and other stakeholders, several key barriers have been identified to the successful implementation of alternative water transfers. These include: (1) the lack of specific methodologies to ensure non-injury of other water rights, (2) potentially high transaction costs with alternative methods, (3) water rights administration and accounting issues and (4) certainty/permanence of long-term supply for municipalities. To address these barriers, several key recommendations have been developed. Those recommendations include:

1. Development of special review procedures to facilitate ATM agreements;
2. Adoption of presumptive CU procedures;
3. Determination of historical CU for a canal or ditch system;
4. Develop specific methodologies for measuring, calculating, and monitoring CU water transferred through ATM projects;
5. State funding of infrastructure cost;
6. Pursue transfer of a portion of a water right.

If successful these tools will help address the first three barriers listed above and will address those barriers through the implementation of recommendation number four, "developing specific methodologies for measuring, calculating and monitoring CU water transferred through ATM projects." As the application indicates, this effort has been a collaborative effort from the start and includes five sponsors: the UAWCD, SECWCD, LAVWCD, Pueblo Board of Water Works and Colorado Springs Utilities. In addition, the project/technical team has put in significant effort to provide a well thought out scope of work and to ensure the incorporation and coordination of past and current related modeling efforts in the Arkansas basin such as the Division of Water Resources' Irrigation System Analysis Model (ISAM), Colorado State University's enhanced model (predicts groundwater flows and return flows) and the CWCB's Arkansas River DSS.

**Funding**
Staff is recommending a slight reduction of funding from $125,000 to $121,500. The purpose of this reduction is not a reflection of this project in any way but to reserve some funds for a future project that will be considered by the Board in a future meeting.

**Issues/Additional Needs:**

- This request appears to fund the first three phases out of seven. Staff recommends that the applicant pledges to complete phases 1, 2, and 3 (i.e. complete the account tool and provide as a deliverable to the CWCB) regardless of future funding.

**Staff Recommendation:**
Staff recommends approval of up to $121,500 from the Alternative Agricultural Water Transfer Methods Program to help complete the project, Building and Assessing Accounting and Administration Tools for Lease-Fallowing in Colorado's Lower Arkansas River Valley contingent upon satisfying the issues/needs identified above.

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 the general public and will help promote the development of a common technical platform.

In accordance with the Criteria and Guidelines of the Alternative Agricultural Water Transfer Methods Competitive Grant Program, staff would like to highlight additional reporting and final deliverable requirements. The specific requirements are provided below.

**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 scope 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.

**Engineering:** All engineering work (as defined in the Engineers Practice Act (§12-25-102(10) C.R.S.)) performed under this grant shall be performed by or under the responsible charge of professional engineer licensed by the State of Colorado to practice Engineering.

COLORADO
DEPARTMENT OF NATURAL RESOURCES

# COLORADO WATER CONSERVATION BOARD

## ALERNATIVE AGRICULTURAL WATER TRANSFER METHODS COMPETITIVE GRANT PROGRAM

## GRANT APPLICATION FORM

Building and Assessing Accounting and Administration Tools for Lease-Fallowing in Colorado's Lower Arkansas River Valley

**Program/Project Name**

**River Basin Name Arkansas**

$125,000

Amount of Funds Requested

$50,000

Amount of Matching Funds

**Part A. - Description of the Applicant(s)** (Program/Project Sponsor);

1. Applicant Name(s): **Upper Arkansas Water Conservancy District**

Mailing address: **P.O. Box 1090**
**339 East Highway 50**
**Salida, CO 81201**

Taxpayer ID#: **84-0817067** Email address: **manager@uawcd.com**

Phone Numbers: Business: **719-539-5425**
Home: **719-539-6067**
Fax: **719-539-7579**

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

Name: **Ralph L. Scanga, Jr**

Position/Title **General Manager**

3. If the Contracting Entity is different then the Applicant, please describe the Contracting Entity here.

Not applicable.

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**Engineering:** All engineering work (as defined in the Engineers Practice Act (§12-25-102(10) C.R.S.)) performed under this grant shall be performed by or under the responsible charge of professional engineer licensed by the State of Colorado to practice Engineering.

4. Provide a brief description of your organization. Where applicable, include a) thru e):
   a) Year formed, type of organization, statutes under which the entity was formed…

The Upper Arkansas Water Conservancy District (UAWCD) was formed in 1979 pursuant to C.R.S. 37-45-102 and case number 79CV30. The district is a quasi-municipality created to conserve water resources and to provide the greatest beneficial use of water in the Upper Arkansas River Basin by construction as defined in C.R.S. 37-45-103(10): dams, reservoirs, canals, conduits, pipelines, tunnels, and all works, facilities, improvements, and property necessary or convenient for supplying water for domestic, irrigation, power, milling, manufacturing, mining, metallurgical, and all other beneficial uses. About 7,000 District customers use water for irrigation (38% of use); municipal storage (25%); and domestic and commercial augmentation (18%). Its service area covers over 2 million high mountain acres in Chaffee, Fremont, Custer and parts of Saguache and El Paso Counties.

Table 1 describes the five project co-sponsors who will contribute cash matching funds of $10,000 each. The total cash match is $50,000, or 28% of the $175,000 project cost.

**TABLE 1. FIVE PROJECT CO-SPONSORS WITH CASH MATCHES OF $50,000**

| Co-Sponsor | Mission / Description |
|---|---|
| **Upper Arkansas Water Conservancy District** | To acquire and preserve for present and future use all water rights available in the Upper Arkansas Basin, for use within the Valley, whether municipal, agricultural, industrial or domestic; to seek every possible means to increase the water supply available within the Upper Arkansas Valley. Its watchdog efforts include challenging legislation that threatens Basin water supply, and securing sufficient water rights to provide augmentation for residential, commercial and industrial use pursuant to the *Arkansas Ground Water Rules* promulgated in 1996. |
| **Southeastern Colorado Water Conservancy District** | Created under Colorado State Statutes in 1958 to develop and administer the Fryingpan-Arkansas Project, it is the legal agency responsible for repayment of the reimbursable costs of the project. In addition, the District makes supplemental Project water available for use on ~ 280,600 acres of irrigated land, and by the many municipal water suppliers who directly serve ~ 600,000 constituents. |
| **Lower Arkansas Valley Water Conservancy District** | To acquire, retain and conserve water resources within the Lower Arkansas River Valley. To encourage the use of such water for the socio-economic benefit of citizens. To participate in water-related projects that will embody thoughtful conservation, responsible growth, and beneficial water use, including accepting conservation easements, with or without water. |
| **Board of Water Works of Pueblo** | The utility provides water service to Pueblo and has a long-range plan to rebalance and strengthen its water rights portfolio. In 2009, it acquired ~ 27% of the shares of the Bessemer Mutual Irrigation Ditch Company at a cost of ~ $56 million. The acquisition was financed through the Columbine Ditch sale for ~ $30 million and ~ $26 million in taxable water revenue bonds. The Board will gain ~7,000 acre-feet. |
| **Colorado Springs Utilities** | A municipal utility providing electricity, natural gas, water, and wastewater services to the Pikes Peak region. Its 2012 budget is ~ $1,110 million; about 27% is capital expenditures to maintain or rehabilitate aging infrastructure. Its long-range plan includes the Southern Delivery System regional water pipeline project to deliver water to Colorado Springs, Pueblo West, Fountain, and Security. Phase 1 construction is the connection to Pueblo Dam, three pump stations, ~ 60 miles of underground pipe, and a water treatment plant. |

   b) For waters suppliers, information regarding the number of customers, etc.

Not applicable.

c) Whether the applicant has the ability to accomplish the project for which funding is sought.

Upper Arkansas Water Conservancy District (UAWCD) has the ability to collaborate to build and assess accounting and administrative tools that are accepted basin-wide as a preferred methodology — a common platform — for calculating transferable consumptive use and assessing impacts to the stream aquifer system from temporary transfers of water rights pursuant to rotational crop lease fallowing agreements. UAWCD is a leader who can increase cooperation among partners and obtain cash matches and in-kind contributions from the population served by the proposed project.

d) A brief history of the Applicant.

**In 1979**, the Upper Arkansas Water Conservancy District (UAWCD) was created. In 1982, it assumed control of three high mountain reservoirs in Chaffee County. Since assuming control of the reservoirs, UAWCD has provided storage for two growing municipalities on the South Arkansas River: Salida and Poncha Springs.

**From 1980-2000,** UAWCD pioneered conjunctive ground water and surface water management, filing the first-ever blanket water augmentation plan for all of Chaffee and part of Fremont County. It acquired storage at two reservoirs tributary to the Arkansas River. It acquired water rights to meet increased demand for augmentation due to promulgation in 1996 of *Amended Rules and Regulations Governing the Diversion and Use of Tributary Ground Water in the Arkansas River Basin*. The Arkansas River Basin is fully-appropriated.

**By the early-2000s,** population escalated. Double-digit population growth increased municipal demands, intensifying the need for reservoir storage. By utilizing Pueblo Reservoir and Twin Lakes water in conjunction with its tributary storage, UAWCD increased water use efficiency and met municipal demand. To meet growing municipal and augmentation demand, UAWCD expanded the geographic extent of its blanket augmentation plans into eastern Fremont and Custer Counties. As part of its approval, the State Engineer mandated that UAWCD install remote continuous recording instrumentation at most of its reservoirs and certain stream locations.

**In the late-2000s**, UAWCD built 22 high mountain telemetry water data collection platforms To do so, it leveraged federal Bureau of Reclamation funds of ~$285,000 and state funds of ~$285,000. The project was twice selected as a nationwide success story. More than 500,000 down-basin residents are affected by available supplies of Upper Arkansas River water. Data is managed with Colorado Division of Water Resources software so records for administration/augmentation agree. See http://www.dwr.state.co.us/SurfaceWater/ and http://www.uawcd.com/water_resources.php

**In the early 2010s**, UAWCD implemented its ~$400,000 US Geological Survey (USGS) water balance study to quantify both surface water and ground water and characterize the interaction between them in the Upper Arkansas River Basin. UAWCD leveraged federal USGS funds of ~$135,000 and state funds of ~$180,000. Study results will enhance the basin-wide decision-making framework for water users including municipalities, irrigators, and recreationists.

e) Tabor issues relating to the funding request that may affect the Contracting Entity.

The District is able to receive the grant funding requested herein during its fiscal year 2011 – 2012 without triggering any issues related to TABOR limitations.

**Part B. - Description of the Alternative Water Transfer Project –**

1. Purpose of the Project: Provide a summary of the project, a statement of what the project will accomplish, the need for the project, the problems/opportunities addressed, the expectations of applicant, and why the project is important. The summary **must** include a description of the technical, institutional (i.e., how the project will be organized/operated), and legal elements that will and/or have been addressed by the project. Discuss relevant project history, if applicable.

In summary, this project will build and assess accounting and administration tools for lease fallowing. The requirements of the accounting and administration tools are to:

(1) Quantify the transferrable consumptive use derived from fallowed land parcels;
(2) Quantify the associated changes in the *amount, timing, and location* of:
    (a) surface runoff to drains and to the river,
    (b) recharge to the alluvial aquifer, and
    (c) groundwater return flow to drains and to the river;
(3) Support the development of plans to maintain return flows at or above historical levels and to quantify transferrable consumptive use at or below historical levels in a manner that complies with Colorado water law and the Arkansas River Compact; and
(4) Develop data interfaces that will complement the Arkansas River Decision Support System (ArkDSS) and build a common technical platform for the transfer of data to and from Hydrobase.

The project accomplishment will be an accepted basin-wide preferred methodology — a common platform — that can be a state-wide template for temporary water transfers under lease fallowing. Project accomplishments meet various needs: constraining costs, protecting other water rights holders from injury, preserving agricultural economies, and implementing lease-fallowing.

The urgent need is that calculating transferable consumptive use and assessing impacts on the stream aquifer system is complex because lease fallowing derives water from changes of water rights from disparate parcels of land spread over one ditch, in combination with parcels fallowed from other ditches. Because the transferred water will come from rotational fallowing, the potential for injury is compounded, compared to traditional one-time water right purchases where the required dry-up of irrigation is at a permanent location.

The problem is that without an accepted basin-wide preferred methodology — a common platform — for quantifying transferable consumptive use and assessing impacts of a "Super Ditch" style lease fallowing plan, the transactional costs of making water available through lease fallowing to meet increasing municipal and industrial water needs (in the basin and statewide) — while preserving agricultural water rights — will be more expensive than pursuing the historic practice of permanent transfer of water rights from agriculture to municipal use.

The opportunity is that the accounting and administration tools will reduce transactional costs in temporary changes of water rights. Each change of water rights under rotational crop fallowing will require water court approval and the scrutiny associated with that process. In the change of water right court process, each applicant and all objectors develop, at great expense, competing methodologies for

quantifying transferable consumptive use and assessing return flow impacts. In a "Super Ditch" style lease fallowing plan, this will drive the cost of the temporary change to prohibitive levels — with the result that water derived from rotational crop fallowing/leasing would not be marketable. The tools will reduce the complexity of calculating transferrable consumptive use and assessing impacts to return flows resulting from lease fallowing agreements. Downstream and upstream water right owners would be confident that impacts from lease fallowing programs will not negatively impact their water rights and local communities/economies.

The expectations are that collaborating and cooperating to produce an accepted basin-wide preferred methodology — a common platform — for quantifying transferable consumptive use and assessing stream-aquifer impacts will contain costs and further the implementation of lease fallowing. Transactional costs of changing water rights through the existing and well recognized water court process will be contained, making the leased water marketable while protecting from injury remaining water rights in the basin. This will preserve the agricultural water rights and the local agricultural economy.

The importance of the project is four-fold: to contain costs, to protect other water rights holders from injury, to preserve agricultural economies, and to facilitate the implementation of lease fallowing. It is important to reduce transactional costs while protecting existing water rights from injury in the least costly fashion and preserve the institutionalized and long recognized water court process. As applicants seek changes of water rights for transfers through lease fallowing agreements, they can be more confident that the transactional costs of the change of water rights will be more contained. The long established legal form of the water court process will be preserved.

Technical/institutional (project organization) and legal elements include review and feedback by a technical committee of professionals with experience in water rights transfers in Colorado, particularly in the Arkansas River Basin. Technical committee review and feedback will be an on-going process during the development and execution of each phase. The scope of work was developed as a collaborative effort. The technical committee is composed of project co-sponsor representative plus representatives from the Office of the Colorado State Engineer and the Division 2 Engineer including Bill Tyner, Assistant Division 2 Engineer (Surface Water Operations). Input was also provided by technical staff that is developing the Arkansas Basin Decision Support System. A team led by Timothy K. Gates, water resources systems engineer and a Professor of Civil Engineering at Colorado State University, will conduct the work outlined in the scope of work.

The Lower Arkansas Valley Water Conservancy District is investigating technical, institutional, and legal elements needed to implement "Super Ditch" style lease fallowing. That work involves a water exchange application. In 2012, it will initiate a small-scale pilot program for lease-fallowing (3-year, 500 acre feet per year) under the Catlin Canal to test and refine the concept.

Relevant project history includes the 2008 formation of the Arkansas Valley Super Ditch Corporation (Super Ditch) to explore a program to implement water transfers to meet growing state-wide demand under a rotational fallowing plan for leasing the consumptive use portion of irrigation water rights. Participating shareholders from seven ditches would pool a portion of the rights to allow leasing agreements with municipalities. The benefits are that water rights ownership will remain in the Valley. The aim is to ward off permanent purchase of irrigation water rights and affiliated potential

damage to agriculture and rural communities.

Previous Studies / Existing Tools incorporated into the project and how they will be utilized. Existing technical tools will be utilized to build and assess the accounting and administration tool. These include the Irrigation System Analysis Model, Colorado State University irrigation-stream-aquifer system regional modeling combined with MODFLOW-UZF groundwater flow model with the MT3DMS contaminant transport model, Arkansas River Decision Support System, and Lower Arkansas Valley Water Conservancy District report. These are elaborated below.

Irrigation System Analysis Model (ISAM) was developed by Colorado Division of Water Resources to evaluate improvement to irrigation systems, as required by the *"Compact Rules Governing Improvements to Surface Water Irrigation Systems in the Arkansas River Basin in Colorado."* ISAM evaluations and any resulting plan for mitigation insure compliance with the Arkansas River Compact. ISAM incorporates several computational processes of the H-I Model, a lumped parameter model used by Colorado and Kansas to administer the Arkansas River Compact.

ISAM data requirements, and its computational logic and processes, will be incorporated into the accounting and administration tool. For instance, ISAM uses available data to simulate the application of irrigation water to a field. ISAM relies upon input data parameters of crop types, crop evapotranspiration (ET), precipitation, soils types and available water capacity, canal and lateral seepage loss factors, irrigation efficiency, and surface runoff and deep percolation fractions to calculate monthly values of actual crop ET, surface runoff and deep percolation (recharge to the aquifer) based on monthly headgate diversions made by the canal. ISAM will be an integral part of the accounting and administration tool coupled with an appropriate modeling scheme to determine the timing of lagged groundwater return flows [such as a Glover model].

Colorado State University (CSU) developed regional-scale models of the irrigated alluvial groundwater system to help assess the impact of water and salinity management strategies as part of its work since 1999 to identify and solve water management problems in the irrigation-stream-aquifer system of the Lower Arkansas River Basin. CSU models join the MODFLOW-UZF (McDonald and Harbaugh 1988, Niswonger et al 2006) groundwater flow model with the MT3DMS (Zheng and Wang 1999) contaminant transport model. The model has been used to predict [among other output variables] water table depth, soil water content, crop yield, rate and concentration of groundwater return flows to the river, and contribution of groundwater upflux to consumptive use. The model can estimate impacts on these variables due to changes in irrigation patterns and amounts, like those under the proposed lease-fallowing program.

An enhanced version of the CSU model forms a basis for supplying input data and for evaluating the accuracy of developed accounting and administration tools. The enhanced model is designed to predict groundwater flows and return flows to tributaries and the Arkansas in an upstream region (near La Junta, 1999-2009) and in a downstream region (Lamar to the stateline, 2002-2007). The modeled upstream region coincides within the area served by "Super Ditch" canals. It covers ~125,000 acres (~65,300 irrigated). The flow model has been calibrated against depth to groundwater, river return flows, canal seepage, groundwater upflux, and estimates of ET.

Arkansas River Decision Support System (ArkDSS) will provide State agencies, water providers and water users the appropriate data and analytical tools to assist water resources planning and management in the basin. The ArkDSS feasibility study identified several needs that the developed accounting and administration tools will help address. Those include:

- providing a tool for analyzing the impact of a curtailment of water rights;
- incorporating data into an accounting or administration tool;
- providing a tool for quantifying the impacts on groundwater recharge and surface runoff; and
- providing data on the vertical stratigraphy of the alluvial aquifer.

2. Study Area/Service Area Description. Where applicable, include a) thru e):
   a) A narrative description of the study area including: the county, the location of towns or cities, topography, and locations of major surface and ground water features.

The study area is within five counties: Bent, Crowley, Otero, Prowers, and Pueblo. Cities and towns include Pueblo, Fowler, Rocky Ford, La Jjunta, and Lamar. In these counties are contained Pueblo Reservoir (a US Bureau of Reclamation facility) and John Martin Reservoir (a US Corps of Engineers facility). The study area is a rural remote agricultural region with topography characterized as alluvial river valley. Canals and ditches include:

**TABLE 2. STUDY AREA CANALS AND DITCHES**

| County | Canals and Ditches |
|---|---|
| PUEBLO | Excelsior Ditch, Hampbell Ditch, Bessemer Ditch, West Pueblo Ditch, Collier Ditch, Riverside Dairy Ditch, Colorado Canal |
| OTERO | Oxford Farmers Ditch, High Line Canal, Otero Canal, Catlin Canal, Rocky Ford Canal, Fort Lyon Canal |
| CROWLEY | Colorado Canal, Baldwin-Stubbs Ditch, Holbrook Canal |
| BENT | Fort Lyon Canal, Kicking Bird Canal (a storage artery), Las Animas Consolidated Canal, Highland Ditch, Keesee Ditch, Riverside Lateral, Las Animas Consolidated Extension, Canal Fort Bent Canal Comanche |
| PROWERS | X-Y Canal, Buffalo Canal, Manvel Ditch, Fort Lyon Canal, Fort Bent Canal, Lamar Ditch, Graham Ditch, Sisson Ditch, Amity Canal, Hyde Canal, Kicking Bird Canal (a storage artery) |

Source: US Department of the Interior Geological Survey, Southeastern Colorado Water Conservancy District, and the US Bureau of Land Management.

   b) An area map showing each of the items above, as well as the locations of proposed project facilities and boundaries of lands involved in the proposed program/project.

Figure 1 shows the boundaries of three co-sponsor water conservancy districts in the Arkansas River Basin. Figure 2 is a line drawing of the seven participating irrigation ditches located between Pueblo Reservoir and John Martin Reservoir. Figure 3 depicts irrigated acreage of the seven ditches.

   c) Information regarding the irrigated lands involved in the program/project. Include a tabulation of total irrigated acreage, description of cropping types, crop yields, and total average annual water diversions for existing agricultural lands.

The ditch systems involved in the "Super Ditch" style lease fallowing program are seven. The total average annual diversion of water is ~ 577,669 acre feet, allocated among the seven participating canals. Table 3 sums information regarding participating ditches.

**TABLE 3. PARTICIPATING CANALS CROPS, ACREAGE, AND WATER**

| Ditch | Cropping Types | Irrigated Acreage | 1976-2004 Average Annual Diversions |
|---|---|---|---|
| Bessemer Ditch | Alfalfa, corn (silage), dry beans, grass/pasture | 17,980 | 66,226 acre feet |
| Rocky Ford Highline | Alfalfa, grass/pasture, small grains, dry beans | 22,114 | 89,037 acre feet |
| Oxford Farmers Ditch | Alfalfa, dry beans, grass/pasture, small grains | 5,345 | 26,700 acre feet |
| Otero Canal | Alfalfa, grass/pasture, small grains | 3,472 | 7,693 acre feet |
| Caitlin Canal | Alfalfa, grass/pasture, small grains, vegetables | 18,403 | 92,889 acre feet |
| Holbrook Canal | Alfalfa, grass/pasture, small grains | 15,097 | 49,979 acre feet |
| Fort Lyon Canal | Alfalfa, grass/pasture, small grains, wheat | 92,192 | 245,145 acre feet |
| Overall Total | | 174,604 | 577,669 |

Source: 2003 Colorado Decision Support System Hydrobase

d) Information regarding the location of the new water use(s) that will be served by transferred water.

Under its "Super Ditch" style program, the Lower Arkansas River Valley plans to market to growing Front Range municipalities lease fallowing agreements pursuant to a rotational crop fallowing plan. This leased water will assist in meeting the demand gap identified in Statewide Water Supply Initiative (SWSI 2010). The projected gap is 200,000 to 600,000 acre feet by 2050. The Arkansas Basin medium gap was estimated to be 64,000 acre feet by 2050. The tools built and assessed will help make possible the water supplies through lease fallowing by reducing transactional costs, protecting existing water rights from injury in the least costly fashion, maintain agricultural economies, and preserve the institutionalized and long recognized water court process — all needed to facilitate the implementation of lease fallowing.

e) Socio-economic characteristics of the area such as population, employment and land use.

The five study area counties are included in the Southern Colorado Economic Development District designated by U.S. Department of Commerce. Water is viewed by area residents as a factor limiting growth; this view is compounded by concern over out-of-basin agricultural water sales. Barring Pueblo County, four of the five counties are shrinking — losing population. Those four area counties can be characterized by the percent of the population in poverty and unemployment. In Prowers County, 20 percent of the population lives in poverty and unemployment is higher than Colorado average. Per capita income for Bent County is 47 percent below the State average.

3. Description of the Alternative Water Transfer Method: Describe the type of water transfer that will be examined (i.e., long-term agricultural land fallowing). Describe how the transferable consumptive use will be calculated and quantified, and how return flow patterns will be addressed/maintained.

The "Super Ditch" style program contemplates entering into long term agricultural land fallowing

agreements. The problem this project will solve is how to calculate transferable consumptive use and how to assess impacts to return flows. This project will develop and assess accounting and administration tools that calculate transferrable consumptive use and assess impacts to return flows pursuant to lease fallowing agreements. The result of this grant will be a common platform that can be a template to others for accurately calculating transferrable consumptive use and assess impacts. A common platform will facilitate implementation of rotational crop fallowing/leasing. Table 5 estimates transferable consumptive use in each of the seven ditches participating in the "Super Ditch" style program.

**TABLE 5. ESTIMATED AMOUNT OF WATER TO BE TRANSFERRED**

| Ditch | Estimated Amount, Acre Feet |
|---|---|
| Bessemer Ditch | 2,013 |
| Rocky Ford Highline | 10,990 |
| Oxford Farmers Ditch | 3,236 |
| Otero Canal | 982 |
| Caitlin Canal | 11,492 |
| Holbrook Canal | 6,712 |
| Fort Lyon Canal | 26,679 |
| Overall Total | 62,104 |

Source: Rotational Land Fallowing-Water Leasing Program (HDR 2007)

4. Program/Project Eligibility: Describe how the project meets each of the following eligibility requirements (see Criteria and Guidelines). Note: If these requirements are addressed in other parts of the application, simply reference the applicable section.

This project will build and assess a common platform recognized by major basin entities and water users to calculate transferrable consumptive use and the impacts to the stream aquifer system from changes in water use pursuant to rotational crop fallowing/leasing, and specifically the "Super Ditch" style program. The purpose of this project is not to transfer water via temporary leases but make possible the water transfer by: constraining costs, protecting other water rights from potential injury, maintaining agricultural economies, and preserving the institutionalized and long recognized water court process. Without a common technical and widely accepted platform to quantify consumptive use and return flow impacts the marketing through the "Super Ditch" style program may very well be futile. In this regard this project helps advance alternative transfer methods via rotational crop fallowing/leasing forward to an actual on the ground program that can provide a reliable water supply while sustaining key elements of the agricultural area from which the water is transferred. See also, Part B. Description of the Alternative Water Transfer Project.

5. Project Evaluation Criteria: The following evaluation criteria will be used to evaluate and make recommendations to fund, partially fund or not fund a grant application. The criteria are aimed at advancing alternative transfer methods from the literature and studies to actual on the ground projects/programs that provide reliable water supply and sustain key elements of the agricultural area from which the water is transferred. The applicant should fully address and explain in detail in the application how, and the extent to which, the proposed project meets each of the criteria. However, it should be noted that the project does not have to meet all of the criteria to be eligible to receive funding and the criteria below are not listed in any order of important or priority.

a) The project builds upon the work of former alternative water transfer methods efforts and addresses key areas (e.g. reduced transaction costs, presumptive consumptive use, and verification/ administration issues). See "*Alternative Agricultural Transfer Methods Grant Program Summary of Key Issues Evaluation," July 16, 2010.*

This project builds upon the ongoing Lower Arkansas Valley Water Conservancy District alternative water transfer methods effort. Its Super Ditch grant supported funding for engineering to provide a better understanding of water resources / better modeling of water operations of the proposed "Super Ditch" style lease fallowing program. The objectives of its study are: 1) to describe the operations of the major reservoir in the Lower Arkansas Basin, 2) to develop a model of Pueblo Reservoir accounts and their operations and use by the Super Ditch, 3) to study the operations of the Winter Water Storage Program, 4) to analyze options for recovering Super Ditch waters that are not exchangeable to Pueblo Reservoir, 5) to calibrate and optimize the Super Ditch model. The engineering studies currently are in progress. Information and data from this study are essential to the development of the accounting and administration tools proposed herein.

b) Preference will be given to projects that provide matching resources in the form of cash, past expenditures and in-kind contributions that are in addition to the required 10% cash match.

Matching cash resources total 28 percent of the project cost. This amount is above the 10 percent required cash match. The five project co-sponsors are each contributing $10,000 in cash for a total $50,000 contribution toward the $175,000 project.

Past expenditures include work by a technical committee to develop the scope of work. See Part B. - Description of the Alternative Water Transfer Project. Past expenditures involved paid and unpaid labor of individuals from the state and private sector including representatives from the Office of the Colorado State Engineer and the Division 2 Engineer including Bill Tyner, Assistant Division 2 Engineer (Surface Water Operations), technical staff that is developing the Arkansas Basin Decision Support System, and Timothy K. Gates, water resources systems engineer and a Professor of Civil Engineering at Colorado State University.

Future in-kind contributions will accrue from the same or similar state and private sector individuals.

c) The proposed project has the potential to produce a reliable water supply that can be administered by the State of Colorado, Division of Water Resources.

The technical committee that developed the scope of work included representatives from the Office of the Colorado State Engineer and the Division 2 Engineer including Bill Tyner, Assistant Division 2 Engineer (Surface Water Operations).

d) The proposed project produces information that is transferable and transparent to other users and other areas of the state (i.e., would provide an example "template" or roadmap to others wishing to explore alternate transfer methods).

This project will build and assess accounting and administrative tools for calculating transferable consumptive use and assessing impacts to the stream aquifer system from temporary transfers of water to municipal and industrial uses in changes to agricultural water rights pursuant to rotational crop lease fallowing agreements. A common platform will be a template that will be transferable and transparent to other users, other areas of the state, and the entire arid water short west.

e) The proposed project addresses water needs identified in SWSI or a basin needs assessment.

Under the "Super Ditch" style program, the Lower Arkansas River Valley plans to market lease fallowing agreements pursuant to a rotational crop fallowing plan to Front Range municipalities that are experiencing growth. This leased water will assist in meeting the demand gap identified in Statewide Water Supply Initiative (SWSI 2010). The projected statewide gap in water supply is 200,000 to 600,000 acre feet by 2050. The Arkansas Basin medium gap was estimated to be 64,000 acre feet by 2050. The tools built and assessed will help make available water supplies through lease fallowing by: reducing transactional costs, protecting existing water rights from injury in the least costly fashion, maintaining agricultural economies, and preserving the institutionalized and long recognized water court process.

f) The proposed project advances the preservation of high value agricultural lands. Value can be viewed as: the value of crops produced, the value the agriculture provides to the local community, and the value the agricultural area provides for open space and wildlife habitat.

The 2010 Agriculture in the Rockies report of Colorado College reiterated that the value of agriculture goes far beyond the annual market value of crops. It states:

> *It would be remiss to measure the importance of agriculture solely by its contribution to regional employment or income, which only totals a few percent nationally and in the Rockies. Agriculture's importance reaches far beyond sheer numbers of employees or shares of regional income. Agriculture is an essential force for wildlife habitat, riparian health, and the solace millions gain from these apparent "empty" places. We allow agriculture to dwindle and become marginalized at our socioeconomic and environmental peril.*

The United States 2007 Census of Agriculture sums the annual market value of agriculture in the five county study area at $616.8 million. That is ~ $3,056 per capita for the five area counties. Nationally, the value of agricultural production is ~ $1,085 per capita.

Bent County is number 2 in the state in colonies of bees and number 3 in the state in hogs and pigs. Crowley County is number 2 in the state in chicken. Prowers County is 1 in the state in quail, and 3 in the state in both hay / forage and sorghum for grain. Table 6 tallies United States 2007 Census of Agriculture county profiles.

| TABLE 6. VALUE OF AGRICULTURAL LANDS PRESERVED | | | | | |
|---|---|---|---|---|---|
| County | Land in Farms | Farm Land in | Total Annual | Value of | Value of |

| | (acres) | Pasture | Market Value | Crops | Livestock |
|---|---|---|---|---|---|
| BENT | 877,142 | 65 % | $ 82.2 million | $ 19.0 million | $ 63.2 million |
| CROWLEY | 451,225 | 85 % | $ 110.9 million | $ 1.5 million | $ 109.4 million |
| OTERO | 624,123 | 77 % | $ 111.1 million | $ 26.7million | $ 84.5 million |
| PROWERS | 1,037,336 | 44 % | $ 263.3 million | $ 82.1 million | $ 181.2 million |
| PUEBLO | 910,566 | 87 % | $ 49.3 million | $ 15.8 million | $ 33.4 million |

g) The proposed project/program addresses water quality, or provides other environmental benefits to rivers, streams and wetlands.

The project protects water quality by maintaining water quantity by quantifying how lease fallowing changes the *amount, timing, and location* of: (a) surface runoff to drains and to the river, (b) recharge to the alluvial aquifer, and (c) groundwater return flow to drains and to the river. Water quality is preserved and instream flows are maintained to rivers, streams, and wetlands.

h) The proposed project increases understanding of and quantifies program/project costs. This could include: institutional, legal, technical costs, and third party impacts.

A project to build and assess tools to quantify values of transferrable consumptive use and impacts to stream aquifer system will increase understanding of institutional tools needed to account for and administer a lease fallowing program. It also increases understanding of legal cost containment at water court by constraining costs of third party engineering and legal costs involved in water court transfers. The result is increased protection of third party impacts, which are upstream and downstream water users and an area agricultural economy within the five counties that totals $616.8 million.

i) The proposed project/program does not adversely affect access to other sources of water (not subject to/participating in the program) where owners of these water rights may wish to pursue traditional transfer of their rights to other users.

The project will build and assess tool to quantify values of transferrable consumptive use and assess impacts to stream aquifer system.

j) The proposed project/program provides a perpetual water supply for the new and/or alternate use and preserves agricultural production and/or helps sustain the area's economy from which the transfer is occurring.

SEE TABLE 6. VALUE OF AGRICULTRAL LANDS PRESERVED

k) The quantity of water produced by the proposed project/program. Preference will be given to programs that can address larger water supply needs.

SEE TABLE 5. ESTIMATED AMOUNT OF WATER TO BE TRANSFERRED

6. Statement of Work

Provide the proposed statement of work. Use the example format or your own format, provided that comparable information is included. Outline by task how the proposed program/project will be accomplished. It is important to detail the specific steps, activities/procedures that will be followed to accomplish each individual task and the overall program/project and the specific products/deliverables that will be accomplished. The statement of work must include but not be limited to: task description, key personnel, budget, schedule and deliverables and the final report/project documentation upon completion of the water activity. 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. Costs incurred prior to execution of a contract are not subject to reimbursement.

Provide a detailed statement of work using the 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** — Building and Assessing Accounting and Administration Tools for Lease-Fallowing in Colorado's Lower Arkansas River Valley

**GRANT RECIPIENT** — Upper Arkansas Water Conservancy District

**FUNDING SOURCE** — Alternative Agricultural Water Transfer Methods Competitive Grant Program and cash matches from five water entities totaling $50,000

## INTRODUCTION AND BACKGROUND

Provide a brief project description. (No more than 200 words; to inform reviewers and the public.)

The project will build and assess tool to quantify values of transferrable consumptive use and assess impacts to stream aquifer system. The tools built and assessed will help make available water supplies through lease fallowing by: reducing transactional costs, protecting existing water rights from injury in the least costly fashion, maintaining the area agricultural economy valued at $616.8 million, and preserving the institutionalized and long recognized water court process.

## OBJECTIVES

The objective of this project is to build and assess a tool for accounting and administration of a lease-fallowing program in the LARV. The requirements of the accounting and administration tools are:

(1) Quantify the transferrable consumptive use derived from fallowed land parcels;
(2) Quantify the associated changes in the *amount, timing, and location* of:
    (a) surface runoff to drains and to the river,
    (b) recharge to the alluvial aquifer, and
    (c) groundwater return flow to drains and to the river;
(3) Support the development of plans to maintain return flows at or above historical levels and to quantity transferrable consumptive use at or below historical levels in a manner that complies with Colorado water law and the Arkansas River Compact; and
(4) Develop data interfaces that will complement the Arkansas River Decision Support System (ArkDSS) and build a common technical platform for the transfer of data to and from Hydrobase.

### TIMELINE

The lease fallowing tools to be developed are an accounting tool and an administration tool. The project will be completed in seven phases. The accounting tool will be developed by the end of phase 3, scheduled for completion in February 2014. Phases 5 and 6 involve the development of the administration tool. These phases utilize CDWR hydrobase integration. The final phase 7, deals

with development of a GIS interface and annual review process.

Funding of this project will be done in phases with multiple grant applications over the entire period of the tool development beginning now with the application for Alternative Agricultural Transfer Methods grant application and continuing in January 2012 with application for continued funding through the Water Supply Reserve Account and the Arkansas Basin Roundtable. This anticipated funding would get the Accounting Tool completed and allow testing of the tool to commence.

**TASKS**

**Phase 1. Define Basic Data Requirements for Accounting Tool** (Procedure)

- Task 1a. Define the nature of the required output of the Accounting Tool, considering:
  - Type and units of calculated variables
  - Spatial and temporal resolution of calculations
  - Format of calculations
    - Database structure and access
    - Plots
    - Reporting forms
    - Spatial depiction (GIS)
  - User preferences
  - Requirements of daily river water rights administration
  - Requirements of Compact administration

- Task 1b. Describe the general approach for determining farm headgate deliveries of native water rights, considering:
  - Canal headgate diversions
  - Canal system delivery losses
  - On-farm lateral losses

- Task 1c. Describe the general approach for determination of crop ET and consumptive irrigation requirement, considering:
  - Use of Colorado Agricultural Meteorological (CoAgMet) or National Weather Service (NWS) weather station data
  - Compatibility with H-I Model canal-wide crop potential ET estimates
  - Field specific crops
  - Field locations relative to specific weather stations

- Task 1d. Describe the general approach for estimating the impact on the water balance in the unsaturated zone (including the crop root zone), considering:
  - Change in soil water content during fallowing year and post-fallowing year
  - Re-irrigation by groundwater wells during fallowing year
  - Impact of precipitation
  - Contribution from shallow groundwater to changes in soil water content and to soil evaporation

- Task 1e. Describe the general approach for modeling the process by which inflows to the alluvial aquifer accrue to the surface drainage system (open drains, tributary streams, and Arkansas River) for both historic (baseline) and lease-fallowing conditions, considering:
    - Deep percolation from the crop root zone, canal and lateral seepage losses, and groundwater recharge
    - Site specific aquifer transmissivity, specific yield, and distances to aquifer boundaries
    - Regional groundwater flow patterns and location of accretion to the surface drainage system
    - Farm specific analyses
    - Patterns of return flow to the surface drainage system during both fallowing year and post-fallowing years

- Task 1f. Technical Committee review and feedback of Phase 1 work.

- Task 1g. Deliverable Prepare a detailed memorandum including Technical Committee review describing all methods and results of Phase 1.

**Phase 2: Develop and Evaluate Accounting Tool—Farm Headgate Diversion, Crop ET, Surface Runoff & Recharge to Aquifer** (Procedure)

- Task 2a. Describe the land parcels within CSU's Upstream Study Region (extending from west of Manzanola to near Las Animas) for specific investigation as the development context for the Accounting Tool, considering:
    - Super Ditch Pilot Project fields under the Catlin Canal
    - Rule 14 fields (Amended Use Rules well augmentation fallowed parcels) under the Catlin, Holbrook and Ft Lyon Canals

- Task 2b. Define the required data inputs for existing models
    - Irrigation System Analysis Model (ISAM)
    - CSU MODFLOW-UZF models
    - Glover (stream-aquifer response function type) groundwater model (using data derived from calibrated CSU MODFLOW-UZF models)

- Task 2c. Modify and Enhance ISAM (implemented in Excel)
    - Convert to Access and or SQL database
    - Provide flexibility in selection of input data
        - Interface to import data from Hydrobase
        - Incorporate canal diversions, climatic data, and cropping data
        - Provide capability to enter user-developed data independently
        - Interface with CoAgMet data
    - Provide for adjustable distribution of surface runoff and deep percolation fractions (for "water-short" versus "water-long" conditions)
    - Prepare a draft user's manual and example application for the ISAM component.

- Task 2d. Develop link to export ISAM prediction of deep percolation (aquifer recharge) to the Glover (or similar) groundwater model (using a standardized form and format of the output)

- Task 2e. Refine the development and calibration of the CSU model.
  - Develop model logic to incorporate differences in the unit area water supply (cfs/ac or shares/ac) as it may vary from farm to farm.
  - Develop model logic to incorporate definition of a farm unit and to allow rotational fallowing within the farm unit.
  - Update calibration against observed groundwater levels, return flows to the Arkansas River, etc.

- Task 2f. Technical Committee review and feedback of Phase 2 work.
  - Provide ISAM Model with user manual and example data set.

- Task 2g. Deliverable Prepare a detailed memorandum describing all methods and results of Phase 2

**Phase 3: Develop and Evaluate Accounting Tool—Alluvial Aquifer Response** (Procedure)

- Task 3a. Define the alluvial aquifer parameters required for groundwater flow modeling using the Glover model, relying upon calibrated values from CSU MODFLOW-UZF model
  - Outer boundary conditions
  - Saturated thickness
  - Transmissivity and harmonic transmissivity
  - Void ratio
  - Distance to the stream from considered fields (parcels), distance from stream to aquifer boundaries
  - Groundwater gradients (flow paths)
    - Elevation contours
    - Location of impact on streams and rivers with
      - Respect to water rights
      - Respect to inflow to John Martin Reservoir

  Consideration must be given to changes in parameter values as a function of
    - Type of water year (dry, average, wet)
    - Water table elevation
    - Differing share loads among parcels
    - Dispersed versus concentrated parcel locations

- Task 3b. Simulate and compare the timing of recharge (deep percolation, canal seepage, and artificial recharge) to accrue to the surface drainage system, using both the Glover model and the calibrated CSU MODFLOW-UZF model, considering:
  - Regional groundwater flow gradients
  - Effects of selected parcels

- Evaluation of differences in Glover and CSU model predictions with respect to magnitude, timing, and location and in relation to
  - Impact on water rights
  - Impact on inflow to John Martin Reservoir

- Task 3c. If Task 3b differences are significant,
  - Step 1: Compare ISAM predictions of deep percolation (aquifer recharge) with CSU model predictions of deep percolation under irrigated parcels. If necessary, adjust ISAM parameters to achieve an acceptable match.
  - Step 2: Adjust Glover model parameters to achieve an acceptable match.

- Task 3 d. Technical Committee review and feedback of Phase 3 work.

- Task 3e. Deliverable Prepare a detailed memorandum describing all methods and results of Phase 3.

**Phase 4: Document Accounting Tool and Prepare Guidelines for Use** (Procedure)

- Task 4a. Prepare a Methods Reference Document and a User's Manual for the Accounting Tool.
- Task 4b. Technical Committee review and feedback for review of document.
- Task 4c. Deliverable Revise and finalize the Methods Reference Document and User's Manual. .

**Phase 5: Develop and Evaluate an Administration Tool for Augmentation** (Procedure)
**Development of the Administration Tool requires that the engineering to be provided by LAVWCD with funding from the WSRA grant be completed. It is anticipated that the completion of that study will provide data and information (particularly the location of storage vessels and recharge facilities) required for development of this tool. It will also be necessary for the Super Ditch to declare the location or the planned location of augmentation stations and recharge facilities along the routes of the seven participating canals.**

- Identify the procedures required to protect all in-basin water rights considering:
  - Location of controlling call and by pass call.
  - Replacement water requirements by stream reach, considering timing, amount, and location.
  - Volumetric limits including limits on diversions and CU credits to historical levels.
  - Protections to insure compliance with River Compacts.
  - Protections of non-participants within each ditch.
  - Others
- Additional tasks may be identified upon completion of Phases 1 – 4 and the WRSA Grant engineering.
- Subject the methods and results to review by the Technical Committee

**Phase 6: Develop an Administration Tool for Operation of the transfer of consumptive use**

**credits or net depletions to new points of diversions** (Procedure)

- **The scope of work for this phase can only be generally described at this time. The completion of Phase 1 – 5 will primarily determine the nature and extent of engineering required. The Administration Tool for Operation must incorporate terms and conditions required to maintain historical return flows, prevent expansion of use, hold transferrable consumptive use at or below historical levels, prevent injury to other Arkansas River basin water rights, and insure compliance with the Arkansas River Compact.**
- Evaluate whether the Alluvial Aquifer Accretions/Depletions Analysis Tool (AAA/DAT) might be useful as part of the Administration Tool.
- Evaluate administration/operational tools of existing or pending augmentation plans to determine if they may be useful as an Administration Tool for Operation.
- Develop the Tool for Operation in coordination with the Colorado Division of Water Resources (CDWR) Information Technology (IT) staff to ensure that all facets of the tool can be fully integrated into Hydrobase and meets all DWR IT requirements
- Subject the methods and results to review of the Technical Committee

**Phase 7: Evaluate the extent to which GIS-based data display and management might be used to enhance the Administration Tools and the review process for annual operations of the lease-fallowing program.**
**The scope of work for this phase can only be generally described at this time. The completion of Phase 1 – 6 will determine the nature and extent of engineering required.**

## 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

The following budget documentation is attached:

Total Costs by Task
Labor Costs by Project Personnel
Other Direct Costs
In-Kind Contribution

## SCHEDULE

Provide a project schedule including key milestones for each task and the completion dates or time period from the Notice to Proceed (NTP). This dating method allows flexibility in the event of potential delays from the procurement process.

## 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 the public and help promote the development of alternative agricultural transfer methods.

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

**Signature of Applicant**:

**Print Applicant's Name**: Ralph L. Scanga, Jr. General Manager, Upper Ark. Water Cons. District

**Project Title**: Building and Assessing Accounting and Administration Tools for Lease-Fallowing in Colorado's Lower Arkansas River Valley

**Return this application to**:

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

# Building and Assessing Accounting and Administration Tools for Lease-Fallowing in

| TOTAL COST BY TASK | Personnel Costs | Other Direct Costs | Matching Funds | Total Project Costs |
|---|---|---|---|---|
| Timeline: 1 Mar - 31 Aug 2012 (6 months) | | | | |
| **Phase 1: Accounting Tool Basic Data Requirements** | | | | |
| In-Kind Contribution | $13,800 | $0 | $0 | $13,800 |
| Total Costs | $53,708 | $5,925 | | $59,633 |
| Timeline: 1 Jun 2012 - 31 May 2013 (12 months; overlap 3 months with Phase 1) | | | | |
| **Phase 2: Accounting Tool -- FHG Diversion, Crop Et, Surface RO and Aquifer Recharge** | | | | |
| In-Kind Contribution | $27,600 | | | $27,600 |
| Total Costs | $94,417 | $6,470 | | $100,886 |
| Timeline: 1 Dec 2012 - 28 Feb 2014 (15 months; overlap 6 months with Phase 2) | | | | |
| **Phase 3: Accounting Tool -- Alluvial Aquifer Response** | | | | |
| In-Kind Contribution | $27,600 | | | |
| Total Costs | $113,052 | $5,323 | | $118,376 |
| Timeline: 1 Mar - 31 Dec 2014 (10 months) | | | | |
| **Phase 4: Document Accounting Tool & Use Guidelines** | | | | |
| In-Kind Contribution | $6,900 | | | $6,900 |
| Total Costs | $74,989 | $1,831 | | $76,820 |
| Timeline: 12 months | | | | |
| **Phase 5: Develop & Evaluate Adminstration Tool for Augmentation** | | | | |
| In-Kind Contribution | $27,600 | | | $27,600 |
| Total Costs | $100,260 | $4,462 | | $104,722 |
| Timeline: 12 months, 6 months overlap with Phase 5 | | | | |
| **Phase 6: Develop & Evaluate Adminstration Tool for Operation** | | | | |
| In-Kind Contribution | $27,600 | | | $27,600 |
| Total Costs | $62,994 | $4,462 | | $67,456 |
| Timeline: 6 months | | | | |
| **Phase 7: GIS and Annual Review Process** | | | | |
| In-Kind Contribution | $27,600 | | | $27,600 |
| Total Costs | $78,070 | $4,597 | | $82,667 |
| Total for Phases 1 - 4 | $336,166 | $19,549 | | $355,715 |
| Total for Phases 5 - 7 | $241,325 | $13,520 | | $254,845 |
| **Grand Total** | $577,490 | $33,070 | | **$610,560** |
| **In-Kind Contribution Total** | $158,700 | | | |

# Building and Assessing Accounting and Administration Tools for Lease-Fallowing in Colorado's Lower Arkansas

| LABOR HOURS BY Project Personnel | Principal Investigator | Associate Researcher | Graduate Research Assistant | IT Expert | Technical Project Engineer | Project Manager | Total |
|---|---|---|---|---|---|---|---|
| Hourly Rate: | $132 | $96 | $37 | $67 | $115 | $78 | |
| Timeline: 1 Mar - 31 Aug 2012 (6 months) | | | | | | | |
| **Phase 1: Accounting Tool Basic Data** | 43 | 43 | 737 | 43 | 40 | 120 | 1027 |
| Total Labor | $5,741 | $4,161 | $26,957 | $2,890 | $4,600 | $9,360 | $53,708 |
| Timeline: 1 Jun 2012 - 31 May 2013 (12 months; overlap 3 months w | | | $40 | | | | |
| **Phase 2: Accounting Tool -- FHG Diversion, Crop Et, Surface RO and Aquifer Recharge** | 173 | 130 | 910 | 130 | 80 | 60 | |
| Total Labor | $22,963 | $12,484 | $36,420 | $8,669 | $9,200 | $4,680 | $94,417 |
| Timeline: 1 Dec 2012 - 28 Feb 2014 (15 months; overlap 6 months w | | | $37 | | | | |
| **Phase 3: Accounting Tool -- Alluvial Aquifer Response** | 173 | 173 | 997 | 87 | 80 | 240 | |
| Total Labor | $23,882 | $17,310 | $37,929 | $6,011 | $9,200 | $18,720 | $113,052 |
| Timeline: 1 Mar - 31 Dec 2014 (10 months) | | | $39 | | | | |
| **Phase 4: Document Accounting Tool &** | 130 | 130 | 737 | 130 | 20 | 50 | |
| Total Labor | $17,912 | $12,983 | $28,878 | $9,016 | $2,300 | $3,900 | $74,989 |
| Timeline: 12 months | | | $43 | | | | |
| **Phase 5: Develop & Evaluate Adminstration Tool for Augmentation** | 130 | 43 | 1300 | 87 | 80 | 50 | |
| Total Labor | $ 20,148 | $ 4,868 | $ 55,383 | $ 6,761 | $ 9,200 | $ 3,900 | $100,260 |
| Timeline: 12 months: 6 months overlap with Phase 5 | | | $40 | | | | |
| **Phase 6: Develop & Evaluate Adminstration Tool for Operation** | 87 | 0 | 650 | 130 | 80 | 50 | |
| Total Labor | $13,433 | $0 | $26,320 | $10,142 | $9,200 | $3,900 | $62,994 |
| Timeline: 6 months | | | $42 | | | | |
| **Phase 7: GIS and Annual Review Process** | 87 | 0 | 780 | 173 | 80 | 100 | |
| Total Labor | $13,970 | $0 | $33,037 | $14,063 | $9,200 | $7,800 | $78,070 |

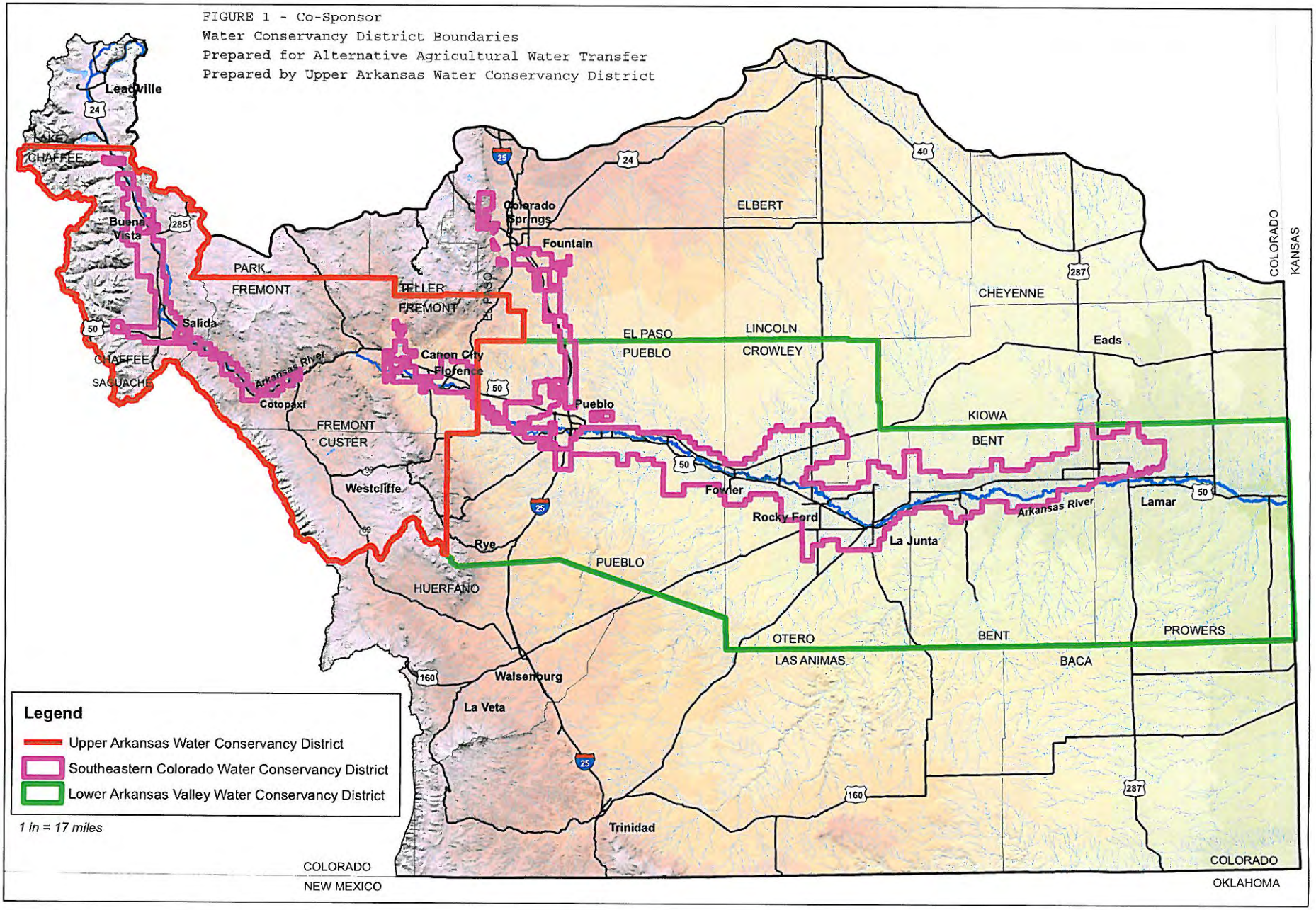
# Building and Assessing Accounting and Administration Tools for Lease-Fallowing in

| OTHER DIRECT COSTS BY ITEM | Supplies | Software | Mgmt Expense | Travel | Total | |
|---|---|---|---|---|---|---|
| **Phase 1: Accounting Tool Basic Data Requirements** | | | | | | Assumed 1 round trip Fort Collins-Pueblo (352 mi), 2 round trips Fort Collins-Salida (404 mi), |
| Total Units | | | | | | |
| Total Costs | $704 | | $953 | $4,268 | $5,925 | |
| **Phase 2: Accounting Tool -- FHG Diversion, Crop Et, Surface RO and Aquifer Recharge** | | | | | | Assumed 1 round trip Fort Collins-Pueblo (352 mi), 2 round trips Fort Collins-Salida (404 mi), |
| Total Units | | | | | | |
| Total Costs | $704 | $1,408 | $1,512 | $2,846 | $6,470 | |
| **Phase 3: Accounting Tool -- Alluvial Aquifer Response** | | | | | | Assumed 1 round trip Fort Collins-Pueblo (352 mi), 2 round trips Fort Collins-Salida (404 mi), |
| Total Units | | | | | | |
| Total Costs | $704 | | $1,512 | $3,107 | $5,323 | |
| **Phase 4: Document Accounting Tool & Use Guidelines** | | | | | | Assumed 3 round trips Fort Collins-Denver (127 mi) at |
| Total Units | | | | | | |
| Total Costs | $704 | | $805 | $322 | $1,831 | |
| **Phase 5: Develop & Evaluate Adminstration Tool for Augmentation** | | | | | | Assumed 1 round trip Fort Collins-Pueblo (352 mi), 1 round trip Fort Collins-Salida (404 mi), |
| Total Units | | | | | | |
| Total Costs | $704 | | $1,512 | $2,246 | $4,462 | |
| **Phase 6: Develop & Evaluate Adminstration Tool for Operation** | | | | | | Assumed 1 round trip Fort Collins-Pueblo (352 mi), 1 round trip Fort Collins-Salida (404 mi), |
| Total Units | | | | | | |
| Total Costs | $704 | | $1,512 | $2,246 | $4,462 | |
| **Phase 7: GIS and Annual Review Process** | | | | | | Assumed 1 round trip Fort Collins-Pueblo (352 mi), 1 round trip Fort Collins- |
| Total Units | | | | | | |
| Total Costs | $704 | | $1,512 | $2,381 | $4,597 | |

# Building and Assessing Accounting and Administration Tools for Lease-Fallowing in Colorado's Lower Arkansas

| IN KIND CONTRIBUTIONS | Technical Review Engineers | Total Value |
|---|---|---|
| Estimated Hourly Rate: | $ 115.00 | |
| **Phase 1: Accounting Tool Basic Data Requirements** | | |
| Estimated Hours | 120 | |
| Total Costs | $ 13,800.00 | $ 13,800.00 |
| **Phase 2: Accounting Tool -- FHG Diversion, Crop Et, Surface RO and Aquifer Recharge** | | |
| Estimated Hours | 240 | |
| Total Costs | $ 27,600.00 | $ 27,600.00 |
| **Phase 3: Accounting Tool -- Alluvial Aquifer Response** | | |
| Estimated Hours | 240 | |
| Total Costs | $ 27,600.00 | $ 27,600.00 |
| **Phase 4: Test & Refine Accounting Tool** | | |
| Estimated Hours | 60 | |
| Total Costs | $ 6,900.00 | $ 6,900.00 |
| **Phase 5: Develop & Evaluate Adminstration Tool** | | |
| Estimated Hours | 240 | |
| Total Costs | $ 27,600.00 | $ 27,600.00 |
| **Phase 6: Develop Water Rights Administration Tool for Transfer of CU Credits** | | |
| Estimated Hours | 240 | |
| Total Costs | $ 27,600.00 | $ 27,600.00 |
| **Phase 7: GIS and Annual Review Process** | | |
| Estimated Hours | 240 | |
| Total Costs | $ 27,600.00 | $ 27,600.00 |

FIGURE 1 - Co-Sponsor
Water Conservancy District Boundaries
Prepared for Alternative Agricultural Water Transfer
Prepared by Upper Arkansas Water Conservancy District




*ARKANSAS RIVER BASIN*
**Water Conservancy Districts**

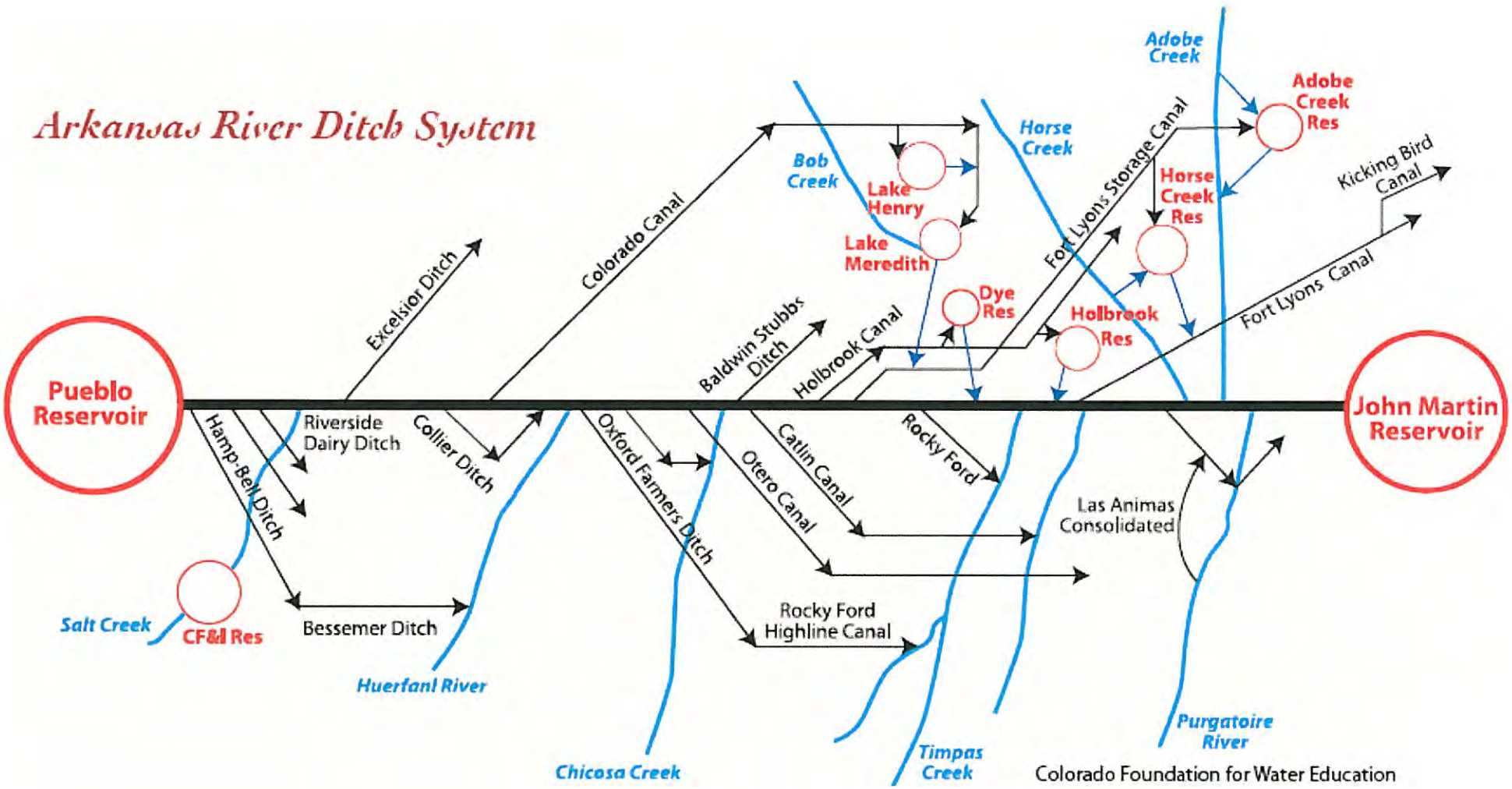



FIGURE 2
Lower Arkansas River Valley Ditch System
Prepared for Alternative Agricultural Water Transfer
Prepared by Upper Arkansas Water Conservancy District

# Map 1. Arkansas Valley Alluvial Aquifer

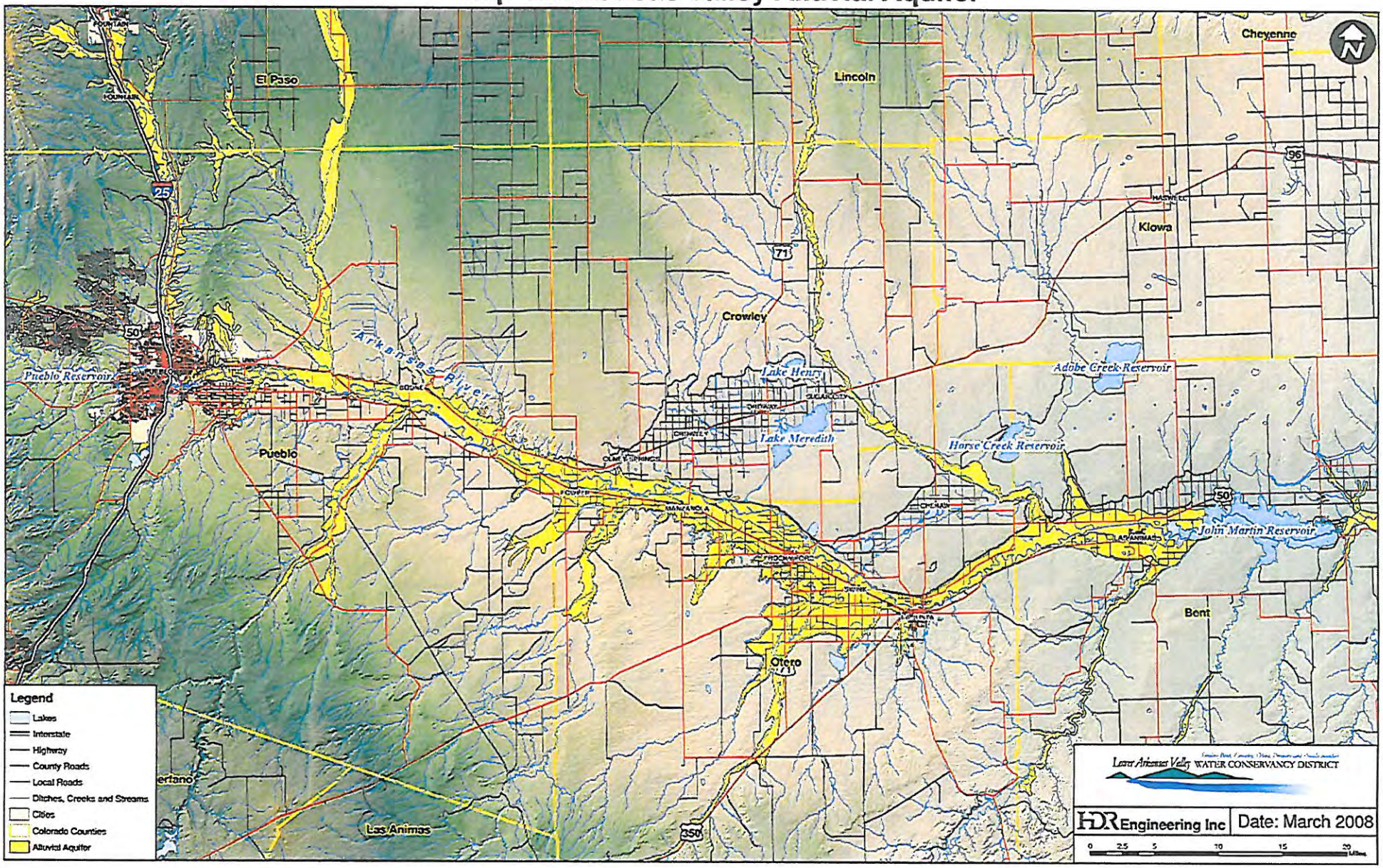
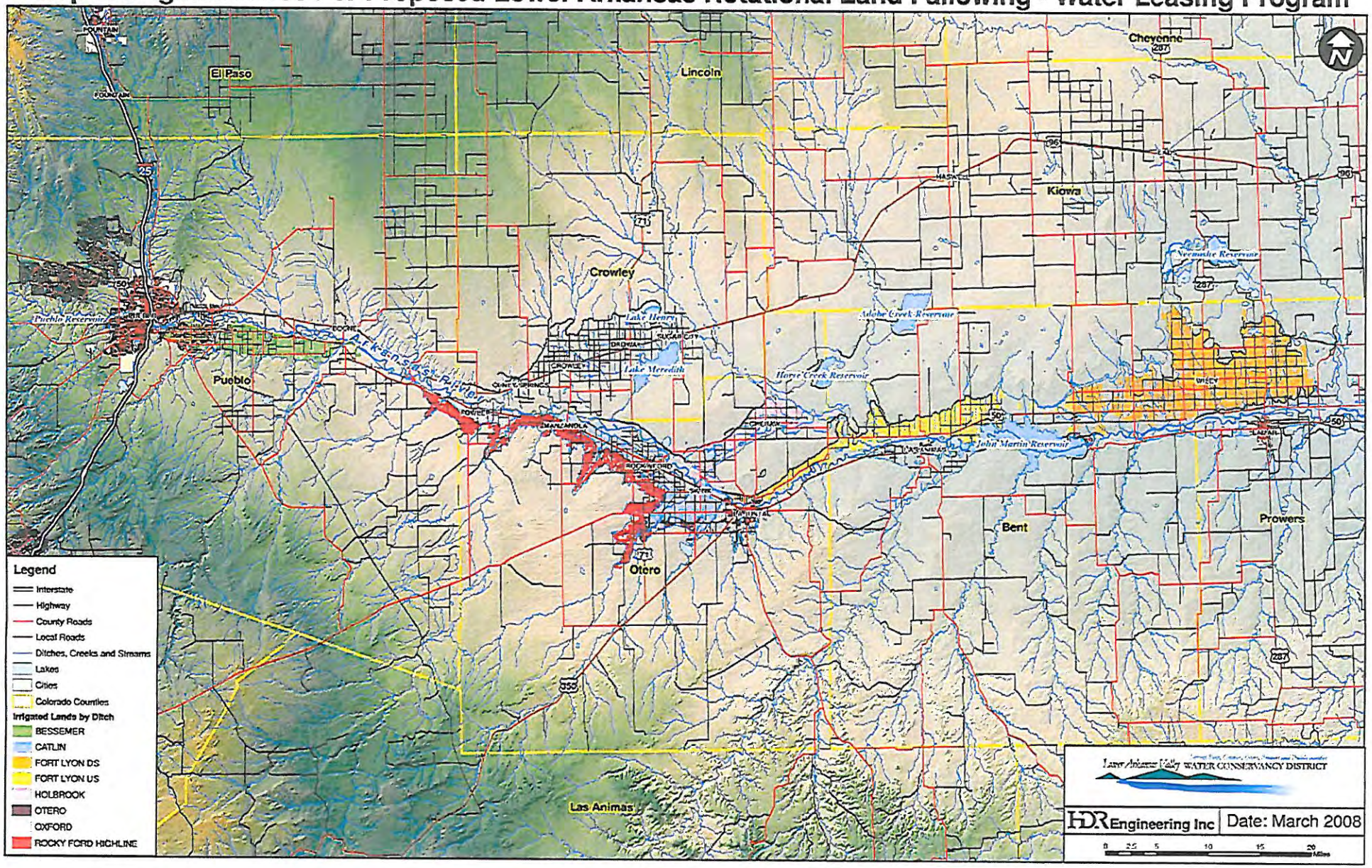



FIGURE 3 ARK. VALLEY ALLUVIAL AQUIFER
Prepared for Alternative Agricultural Water Transfer
Prepared by Upper Arkansas Water Conservancy District

## Map 2. Irrigated Acres For Proposed Lower Arkansas Rotational Land Fallowing - Water Leasing Program




FIRURE 4 - IRRIGATED ACREAGE

Prepared for Alternative Agricultural Water Transfer

Prepared by Upper Arkansas Water Conservancy District