COLORADO WATER CONSERVATION BOARD

ALERNATIVE AGRICULTURAL WATER TRANSFER METHODS COMPETITIVE GRANT PROGRAM

GRANT APPLICATION FORM

Compact Water Bank	*Colorado River Basin*
Program/Project Name	**River Basin Name**

$180,000	*$120,000 cash plus in kind*
Amount of Funds Requested	Amount of Matching Funds

*** The deadline for Grant Applications is November 26, 2010 for consideration at the January 2011CWCB meeting.** It is anticipated that there will be one round of application submittals, yet if funds are not exhausted, the Board will determine when it will consider the next round of grant applications at their January 2011 meeting.

* In completing the application you may attach additional sheets if the form does not provide adequate space. If additional sheets are attached please be sure to reference the section number of the application that you are addressing (i.e., A.1. etc.).

Instructions: This application form must be submitted in electronic format (Microsoft Word or Original PDF). The application can be emailed or a disc can be mailed to the address at the end of the application form. The Alternative Agricultural Water Transfer Methods Competitive Grant Program, Criteria and Guidelines can be found at http://cwcb.state.co.us/LoansGrants/alternative-agricultural-water-transfer-methods-grants/Pages/main.aspx. **The criteria and guidelines must be reviewed and followed when completing this application**. You may attach additional sheets as necessary to fully answer any question, or to provide additional information that you feel would be helpful in evaluating this application. Include with your application a cover letter summarizing your request for a grant. If you have difficulty with any part of the application, contact Todd Doherty of the Water Supply Planning Section (Colorado Water Conservation Board) for assistance, at (303) 866-3441 x3210 or email at todd.doherty@state.co.us.

Generally, the applicant is also the prospective owner and sponsor of the proposed program/project. If this is not the case, contact Todd before completing this application.

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

1. Applicant Name(s): *Colorado River Water Projects Enterprise of the Colorado River Water Conservation District*

Mailing address: *PO Box 1120*
Glenwood Springs, Co 81601

Taxpayer ID#: *98-05001* Email address: dbirch@crwcd.org

Phone Numbers: Business: *970.945.8522*
Home:
Fax: *970.945.8799*

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

Name: *Daniel R. Birch*

Position/Title *Deputy General Manager, Colorado Water Conservation District*

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

The Contracting Entity and Applicant are the same.

Provide a brief description of your organization. The applicant may be a public or private entity. Given the diverse range of potential applicants, not all of the following information may be relevant. Where applicable and relevant the description should include the following:

a) Type of organization, official name, the year formed, and the statutes under which the entity was formed, a contact person and that person's position or title, address and phone number. For private entities, a copy of the Articles of Incorporation and By-laws should be appended to the application.

The Colorado Water Conservation District (River District) was chartered by the General Assembly in 1937. Pursuant to its organic statute, the River District is charged with "the conservation, use and development of the water resources of the Colorado river and its principal tributaries…to which the state of Colorado is equitably entitled under the Colorado river compact." (CRS 37-46-101)

Contact: *Dan Birch, Deputy General Manager*
Colorado River Water Conservation District

P.O. Box 1120
Glenwood Springs, CO 81601
(970) 945-8522 (w)
(970) 945-8799 (fax)

b) For waters suppliers, information regarding the number of customers, taps, service area, and current water usage, and future growth plans, water related facilities owned or used, funding/revenue sources (existing service charges, tap fees, share assessments, etc.), the number of members or shareholders and shares of stock outstanding or a description of other means of ownership.

See below.

c) For other entities, background, organizational size, staffing and budget, and funding related to water that is relevant in determining whether the applicant has the ability to accomplish the program/project for which funding is sought.

The River District has an annual budget of $8.5MM and a staff of approximately 20. Staff includes managers, attorneys, engineers, water resource specialists, accountants, dam operators and administrative staff members who are experts in water matters. In addition to the River District staff, our partners in this effort will work cooperatively to ensure that the project is completed. (See below for information on project partners.)

d) A brief history of the Applicant(s).

The River District has been working on Colorado River issues since 1937. It has a broad mission to serve residents living within the district's boundaries and to the State of Colorado. The River District has been working in partnership with the Southwestern Water Conservation District, the State of Colorado, the Nature Conservancy, and of late, the Front Range Water Council in the development of a Compact Water Bank Coalition (CWBC). This group will continue to work collaboratively to complete the work identified in this grant application. The Coalition asked the River District to act as the contracting entity for the contract because it has the ability to do so under TABOR.

e) Please include any relevant Tabor issues relating to the funding request that may affect the Contracting Entity.

The River District operates a governmental enterprise (Enterprise) that would receive the grant, if awarded. Pursuant to TABOR, the Enterprise may not receive more than 10% State grant funds annually. This effectively limits the Enterprise to receive no more than about $400,000 annually from the State. Given current and anticipated State grant revenues, including this grant, the River District sees no difficulty maintaining compliance with TABOR's outside revenue limitations.

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

1. Purpose of the Program/Project

Please provide a summary of the proposed program/project, including a statement of what the program/project is intended to accomplish, the need for the program/project, the problems and opportunities to be addressed, the expectations of the applicant(s), and why the program/project is important to the applicant(s). The summary must include a description of the technical, institutional (i.e., how the program/project will be organized and operated), and legal elements that will and/or have been addressed by the applicant and proposed program/project. The summary should also discuss relevant project history, if applicable, and any other relevant issues.

Preface

The Water Bank project described in this grant application is intended to compliment and supplement two other studies; (1) the CWCB Compact Compliance Study, and (2) a joint investigation of the Gunnison and Arkansas Roundtables that will be formally proposed prior to the end of 2010. The scope of work for the Roundtable effort is under development and has not yet been completed.

The River District recognizes that it may be appropriate to modify and update the attached scope of work to ensure that all work is completed in the most efficient manner possible, and to ensure that none of the proposed work tasks are redundant with other study efforts. The River District will coordinate with the CWCB and the two Roundtables, and update the final scope of work for this project as necessary.

Summary

Under the Colorado River Compact of 1922, the states of the Upper Division (Colorado, New Mexico, Utah and Wyoming) are obligated to not cause the flow of the Colorado River at Lee Ferry, Arizona to drop below 75 million acre-feet (maf) during any consecutive 10-year period. While the mechanics of a curtailment are unclear, both within the Upper Division and within any Upper Division state, all parties agree that a curtailment would cause significant social and economic disruption. In Colorado, the Colorado River Water Conservation District, the Southwestern Water Conservation District, The Nature Conservancy, and Front Range Water Providers (collectively "The Coalition"), have worked with CWCB staff to explore how a "Water Bank" could help Colorado prevent, address, and respond to a compact curtailment and its effects on Colorado water users. The proposed water bank seeks to provide a means for pre-compact water rights to be used to allow critical post-compact water uses to continue under a Compact curtailment order. Specifically, certain lands that are irrigated by pre-compact water rights would be temporarily fallowed, and these water rights would be used to offset depletions associated with critical post-compact water uses. This innovative concept has captured the attention of the water user community in Colorado. This proposal would fund an investigation of the technical, hydrological, and operational aspects of a "Water Bank" within the State of Colorado, recognizing that the Coalition wants to keep its options open as to what the best mechanism might be to accomplish its goals. In addition an assessment of the regional economic and environmental issues associated with the temporary fallowing of irrigated land would be completed. This study will develop critical information that is required to evaluate and implement a water bank.

The goal is to supply sufficient water to replace "critical uses" statewide that are junior to 1922. The Water Bank proposes to use the market to manage Colorado's water "deposits" and "withdrawals" in a Compact curtailment situation.

Need for the Project

Under Article III of the Colorado River Compact of 1922, Colorado shares an obligation with the other states of the Upper Division of the Colorado River Basin (New Mexico, Utah, and Wyoming) to "not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years." In the event that the Upper Division states cause flows to fall below that threshold, the Upper Division states may be required to curtail consumptive water uses in order to comply with Article III of the Compact.

Article VIII of the 1922 Colorado River Compact contains the provision that "present perfected rights to the beneficial use of waters of the Colorado River System are unimpaired by this compact." The common interpretation, which is used here, is that water uses perfected at the time of the signing of the 1922 Compact could continue in use, and post-1922 water uses may be curtailed.

While the mechanics of a curtailment process are unclear in either the Upper Division or within any Upper Division state, a curtailment would be felt statewide, as water from the Colorado River Basin is used nearly statewide in Colorado. Front Range municipalities may be particularly vulnerable to a curtailment, as a significant portion of the water from the Colorado River in Colorado is diverted to the Front Range for municipal use, as the associated water rights are predominantly junior to the Compact.

Absent a mechanism to respond proactively to a Compact curtailment, water providers on both sides of the Divide may be compelled to purchase pre-1922 water rights. The majority of pre-1922 water rights serve irrigated agriculture. The proposed water bank would provide for or facilitate a free market mechanism for pre-compact water uses to be used for compact compliance, while allowing critical post-compact water rights to continue to divert rather than be curtailed, in the event of a compact curtailment. The Bank is also intended to provide both certainty and equity to post-curtailment water use. Without a Water Bank in place, one can envision pre-1922 Compact water rights being controlled by a select few who could presumably then use those rights without regard to criticality of use or lack of supply to other Colorado water users.

The purpose of the water bank is three-fold: 1) proactively develop interruptible supply agreements to temporarily cease irrigation during a Compact curtailment and then return it to irrigation afterwards to minimize disruption 2) develop the bank before there is a curtailment to minimize the impacts, and 3) create a trusted broker for transactions to minimize the risk to buyers, sellers, and the State of Colorado.

The Coalition believes the chance of a compact curtailment is remote in the next 10 years. However, the past ten years have been dry and the major droughts of 2002 and 2003 have resulted in a decline in the 10-year running average of the flow at Lee Ferry and have resulted in reduced storage in Lakes Powell and Mead, heightening the potential for compact compliance situation. In addition, climate models suggest a further reduction of flows in the Colorado River. With basin-wide demands already exceeding the River's supply, reduced hydrology for any reason, coupled with increasing demands may hasten a compact curtailment. The Coalition believes it is important to have a mechanism in place <u>before</u> curtailment occurs.

The information that will be developed in this project is required to define and evaluate a water bank. This project will facilitate the ultimate implementation of a water bank.

<u>Problems & Opportunities Associated with a Water Bank</u>

Water Banks have been put in place across the West, with varying degrees of success. It is critically important to study the Water Bank concept with input from affected stakeholders and with the best information possible. If the Coalition is successful, however, we will have developed an alternative mechanism that addresses the political, social, and economic disruption associated with a compact curtailment. Moreover, establishment and operation of a successful banking mechanism could provide a means for senior agricultural water rights owners to capitalize on at least a portion of the value of their water asset without having to sell their rights, which in turn may assist the current economics and thereby allow for continuation of their agricultural operations.

In reviewing water banks in the West; several key lessons emerge regarding how to build a successful water bank. The proposal outlined herein will develop important technical information that will facilitate the future evaluation of the issues summarized below..

- ***Clearly define the need for a bank:*** *In this case, the Coalition has articulated a case for a bank in their case study, and Colorado River water users throughout Colorado are generally aware of the significant consequences of a Compact curtailment. The partners in a bank could refine the need statement by evaluating actual economic impacts of curtailment administration, determining what water users would be eligible for participation in a bank, and getting consensus on public policy objectives of the bank. This allows proponents to develop a bank that is tailored to meet the identified need. The study proposed herein will evaluate and quantify the potential need for a water bank and will evaluate the types of uses that may be associated with a bank.*
- ***Engage all parties involved in development of the bank:*** *The water rights holders who would provide supply for the bank and the water users who would create demand from the bank should be involved in the development of the bank. In their review of the Arkansas Water Bank in Colorado, John Wilkins-Wells and Troy Lepper attribute the bank's failure to the lack of input from potential participants in the Bank. They recommended, "[m]ore participation and inclusiveness in the outreach program associated with building these innovative institutional arrangements." By engaging participants, they will gain familiarity with the institution, have a hand in its structure, gain trust in the function of the bank, and be more inclined to participate when the bank is in place. Ultimately, this may include building public support from the broader, non-water user community in Colorado for the compact water bank. There is a broad coalition of stakeholders driving this process already, but this project will assure that all interested stakeholders will be consulted with as this Water Bank is developed.*
- ***Put the bank in place in advance of the need:*** *A water bank should be put in place before the need occurs. Developing administrative rules and allowing negotiations and agreements in advance of a crisis event will enhance the chances that a bank will function when a crisis emerges. This was a lesson for the California Water Bank in 2009, where administrative problems, environmental questions, and a surge in crop prices resulted in the inability of the bank to achieve its design objectives. The Water Bank should be considered an insurance policy for Colorado River water users. Because of the unlikelihood of a compact call in the next ten years, this Project should be able to be accomplished before a crisis event occurs. The information developed in this study will facilitate the timely implementation of a bank.*
- ***Provide institutional support for the bank:*** *A water bank should receive public sanction from appropriate government agencies, to provide credibility to the bank for buyers and sellers and to ensure that transactions through the bank are legitimate, enforceable and appropriately*

administered. WestWater recommends that the state should enact general authorizing legislation to create the water bank, to strengthen the bank's authority and legitimacy. Officials responsible for administering water can also create rules or guidelines to ensure that water rights that are transferred through the bank are administered appropriately, without undue risk to buyers and sellers. Such measures will be evaluated as a critical component of this study.

- ***Use market processes to ensure appropriate pricing:*** *Using market pricing mechanisms ensures a fair and efficient solution to the curtailment challenge. On the one hand, post-1922 water users will pay the appropriate amount for the protection they seek, and pre-1922 water users will be compensated fairly for their willingness to forego use. This is one of the primary advantages of a bank: it provides a willing participant with a market-optimized solution, rather than a regulated or imposed mandate. The economic evaluation proposed in this study will help define a reasonable range of expected costs and expenses associated with a bank.*
- ***Define Critical Use:*** *The Coalition suggests that a Compact water bank would limit protected uses through the bank to "critical" post-1922 water uses. Reaching consensus on which uses are "critical" in the event of a Compact curtailment (and attendant drought) will also be a critical effort of this study.*

Individual Fallowing Protocols and Community Impacts

Nearly every pre-1922 water user who was interviewed expressed concerns about fallowing. Questions that were raised include the following: How would fallowing affect an individual farm operation? Which crops are amenable to fallowing? What is the impact of fallowing on perennial crops? How can I maintain my farmland in years that I fallow, including preventing infestation by weeds? What are the costs associated with resuming farming? What are the third party impacts to the community where fallowing might occur? These questions would need to be addressed before soliciting participation from pre-1922 water users. We anticipate working with Dr. James Prichett and others at Colorado State University who have addressed these questions from an economic and agricultural perspective. The Coalition will engage West Slope agriculturalists in the formulation and execution of studies.

Importance of a Compact Water Bank:

The Coalition has conceived of a bold and innovative approach to help address the challenge of a Compact curtailment. In our preliminary review, we have concluded that a water bank as proposed by the Coalition could be an effective way to reduce the risk and impacts associated with a Compact curtailment, specifically the adverse consequences to Colorado agriculture in the absence of a water bank. Although we cannot answer all questions prior to putting the bank in place, one of the primary benefits of a bank is that it is an adaptable solution to the challenges posed by compact compliance. It will allow water users to adjust their participation in the bank according to the hydrologic conditions, economic needs, and risk tolerance. We acknowledge uncertainty but suggest a thorough exploration of the water bank concept so that it can be in place well in advance of a Compact curtailment.

Previous Studies

In late 2009 a report was completed by Tom Iseman, then at The Nature Conservancy, in conjunction with the Property Environment Research Center and WestWater Research (Iseman Report) on behalf of the Coalition which made an initial examination of issues surrounding a compact water bank. The Iseman report serves as the basis for many of the ideas and topics presented in this grant application. The report

is attached as Attachment A.

The study area/service area is generally the geographic area that is the subject of the proposed program/project (include both the source of supply and location and type of new use). The description should include the following items:

a) A narrative description of the study area/service area including: the county, the location of towns or cities, topography, and locations of major surface and ground water features.

The study area is the entirety of Colorado's West Slope and Front Range municipalities from Pueblo to Fort Collins. Several Front Range water providers are expected to be key participants of a water bank and this water bank study.

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

See Attachment B.

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

Information about irrigated lands that are irrigated using pre-compact water rights and are possibly suitable and available for incorporation in a Compact Water Bank will be developed as an integral part of the grant study. The study will rely upon information developed by the CWCB Compact Compliance Study to the extent possible.

d) Information regarding the location of the new water use(s) that will be served by transferred water including the estimated number of users/taps and/or uses served.

The Water Bank aims to protect critical uses of water from being shut off if Compact curtailment were to occur. Information about those essential uses will developed as an integral part of the grant study.

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

This effort encompasses a vast area -- all of the West Slope of Colorado and all of the area of the Front Range that utilizes Colorado River water to meet municipal and industrial water demands. A meaningful and brief description of the socioeconomics of such a vast area is not possible in this application but will be developed as an element of the proposed study.

2. Description of the Alternative Water Transfer Method

Please describe the type(s) of water transfers that will be examined/utilized (i.e., conceived transfer methods include, but are not limited to: 1) interruptible water supply agreements; 2) long-term agricultural land fallowing; 3) water banks; 4) reduced consumptive use through efficiency or cropping changes while maintaining historic return flows; and 5) purchase by end users with leaseback under defined conditions). In

addition, please describe how the transferable consumptive use will be calculated and quantified, and how return flow patterns will be addressed/maintained.

Separate from the studies being performed under the grant, the Coalition will examine alternative water banking concepts, interruptible supply agreements and fallowing agreements. The Coalition will explore various models of transfers that could help Colorado mitigate a Compact curtailment. The report in Attachment A, describes various water banking models such as the Broker, Insurer and Market Maker models. Each of these models has pros and cons, and the Coalition will explore which one best suits the purposes of the Colorado Compact Water Bank. In addition, the Coalition will explore mechanisms for banking the agricultural water. For example, we may develop interruptible supply or short term fallowing agreements. The Coalition will also examine the role of storage under various banking alternatives. The Coalition will work with agricultural interests to determine which mechanisms work best considering things like crop types, water rights, and irrigation institutions.

3. Program/Project Eligibility

Please describe how the proposed program/project meets each of the following eligibility requirements (please see Criteria and Guidelines for additional information regarding the alternative water transfer methods/strategies that qualify for funding). Note: If these requirements are addressed in other parts of the application you may simply reference the applicable section(s).

a) A description of how, if implemented, the proposed program/project will protect property and water rights.

If curtailment occurred without a water bank or similar mechanism in place, there would be a significant impact on agricultural property and water rights. There would be increasing uncertainty and there could be a rush by post-1922 rights holders to buy pre-1922 rights. The purpose of the water bank is to provide certainty and insurance in the event of a curtailment situation. Without a water bank, the impacts of a Compact curtailment in Colorado would be significant. In one basic scenario, a curtailment would last several years and require so much water that all water rights in Colorado junior to the Colorado River Compact would be curtailed at the same time. This would affect cities in the Front Range of Colorado and resort communities in Western Colorado, ski areas, and even many agricultural water users in both Western and Eastern Colorado. The implementation of a Compact water bank would allow water managers to use the water bank to facilitate trades between pre- and post- Compact water rights, allowing critical post-Compact water rights to continue to divert without permanently removing irrigation from the pre-1922 irrigated lands. A bank could also help preserve and protect pre-1922 rights and the agricultural uses and economy relying on those rights by setting aside funds to ensure the continued use and maintenance of those pre-Compact water rights.

b) Identified group(s) of agricultural users that are or may be willing to transfer a portion of their water and identified entity(s), group(s) or area(s) where the transferred water could or would be put to the new use and a description of the new use.

The project team interviewed major water users in several of the water basins in Western Colorado who could potentially offer water supplies into a compact water bank. Most of these are water districts or irrigation companies that use significant pre-1922 water rights. The following water user groups participated in these interviews: Grand Valley Water Users, Orchard Mesa Irrigation District, Montezuma

Valley Irrigation Company, Dolores Water Conservancy District, Yampa Valley, and Uncompahgre Valley Water Users. Generally, these senior, west-slope agricultural water users recognized the significant potential disruption to post-1922 water users, particularly front-range cities, of a Compact-curtailment in Colorado. They indicated a willingness to consider how a water bank could help to address these impacts through willing-participant, free-market transactions.

c) The program/project must at a minimum conceptually describe the technical, institutional, and legal elements of the water transfer. Grant monies may be used to address one or more of these elements. If grant monies are not requested for all three elements, the grant applicant must describe how the applicant has or intends to address the elements, which are not included in the grant request, through other efforts.

The Coalition plans to use the grant funds to answer certain technical questions as outlined in the Scope of Work. Grant funds will not be used to address a variety institutional and legal questions associated with the development of a Compact Water Bank. The Coalition plans to examine these matters separate from the grant, principally using in-kind resources.

d) If grant monies are proposed for use for legal assistance then the use of those funds shall be oriented toward advancing the knowledge of alternative agricultural water transfer methods and techniques; not for preparation of a specific water court case. The total requested funds for legal assistance shall not exceed 40 percent of the total grant request. In addition, grant monies proposed for use for legal assistance must be used to collaboratively address issues and concerns related to agricultural water transfer. Funds shall not be used to solely advance the cause of the project proponents.

Grant funds will not be used for legal assistance. As explained above, the Coalition may use in-kind resources to explore certain legal issues associated with the development of a Compact Water Bank.

e) A minimum of a 10 percent cash match of total project cost (past expenditures and "in kind" cannot be counted toward the 10 percent match).

The Coalition partners have each committed to contribute $30,000 as cash match (for a total of $120,000). See attached letters of commitment included as Attachment C.

4. Program/Project Evaluation Criteria

The following grant evaluation criteria will be used by the CWCB 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/program meets <u>each</u> 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 proposed project/program builds upon the work of former alternative water transfer methods efforts and addresses key areas that have been identified (e.g. reduced transaction costs, presumptive

consumptive use, and verification/administration issues). For more detailed information on this work, please refer to the draft technical memorandum, "*Alternative Agricultural Transfer Methods Grant Program Summary of Key Issues Evaluation," July 16, 2010.*

This proposal builds on Tom Iseman's Report (See Attachment A) that identifies issues and proposes possible approaches to developing a Compact Water Bank. In addition, and more importantly, this proposal complements the CWCB's Compact Curtailment Study that is underway. The Coalition plans to use as much information as possible developed by the State of Colorado and to work closely with the State to facilitate solutions to how the State of Colorado might respond in the event of a curtailment.

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

The Coalition proposes to provide $120,000 (40% of the total) in cash to serve as matching funds. In addition, every partner is prepared to provide extensive in-kind support. Please see attached letters of commitment (Attachment C).

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

While this project is not aimed at producing a new supply of water, it is critically important to protect critical water uses in time of extreme drought. This project will focus providing a system to allow "critical juniors" to continuing diverting while mitigating the impacts on West Slope irrigated agriculture. The project proponents will work closely with the Division of Water Resources to address questions concerning administration of the water bank and to ensure protection of water that is critical to health, safety and welfare.

d) The proposed project/program 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).

While some of the issues associated with developing a Compact Water Bank will be unique, the project will certainly provide a template for dealing with many issues associated with creating a successful water bank in Colorado. For example, the Coalition must work through many issues that any water bank would need to address. These include, but are not limited to, how to quantify consumptive uses on a ditch or irrigation system, if and how the U.S. Bureau of Reclamation will administer or contract for project water rights in a water bank, how Reclamation project beneficiaries can participate in a water bank, how to quantify supply and demands, how to develop the appropriate market approach for a water bank in Colorado, and how to quantify and mitigate third party impacts.

e) The proposed project/program addresses key water needs identified in SWSI or as identified in a basin's needs assessment.

As stated in other parts of the application, this project is unique in that it is meant to protect critical uses from Compact curtailment. The project's primary purpose is to establish a mechanism that ensures critical junior water rights can continue to divert if curtailment were to occur while protecting irrigated agriculture on Colorado's West Slope.

f) The proposed project/program 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.

This is one of the key objectives of the Water Bank. The proposed project aims to ensure that important West Slope agriculture, including orchards, vegetable and vineyards, are protected as much as possible. The alternative is to allow the market to drive permanent dry-up of large blocks of pre-1922 irrigation without regard to the impacts on surrounding communicates and economies. The Water Bank can provide a market for better designed transitions to occur that do not require such permanent dryups, that instead sustain the surrounding communities, environment, and economies.

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

In particular, the Coalition believes it is important in the event of a compact curtailment that measures are put in place to provide some level of protection for endangered fish species of the Colorado River. A considerable amount of time and money has been expended to promote recovery of these species and the Coalition would not want to see a decline in the fish species as a result of a curtailment. By way of example, pre-compact supplies could be stored on a space available basis and released downstream in the late summer and fall when the additional flows would help preserve and protect the species. These and other approaches will be examined during the grant study.

In addition, the Coalition will examine the potential for fallowing the most unproductive lands first that are currently contributing to salinity and selenium loading. By taking those lands out of production first could provide additional water quality benefits in Colorado, as many segments are currently listed on the impaired water bodies list, and to the endangered fish.

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

The Coalition fully expects to address important questions, including but not limited to the following: 1) What kind of institution would best work in Colorado for a water bank? 2) How do we structure the market to make the bank successful? 3) Who owns the water rights associated with Reclamation facilities and how much flexibility is associated with those rights regarding fallowing and use of water in a bank? 4) Do we need federal legislation to use Reclamation facilities? 5) What are the technical costs associated with setting up a successful water bank? and 6) How do we quantify and mitigate third party impacts? The project associated with this application will provide important information to address these issues.

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 Water Bank would be voluntary. The Coalition does not believe that the project will adversely affect a water rights holder from pursuing traditional transfers. In fact, the bank is conceived with the express purpose of protecting water rights and water uses both currently and in the event of a Compact curtailment.

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.

The Water Bank is not meant to provide a perpetual water supply, but instead aims to ensure that critical uses can continue if curtailment were to occur. The Coalition is very much concerned with preserving production and sustaining the West Slope's agricultural economy while enlisting the pre-1922 agricultural water rights holders' help in solving a statewide problem.

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

While the Water Bank will not produce new supply, the Coalition contemplates that it could produce a very substantial supply of water for deposit in the Water Bank, which would replace depletions of many critical post-1922 water rights. The bank could also support West Slope agriculture by providing direct financial assistance for those senior water users willing to participate in the bank.

5. Statement of Work

Provide the proposed statement of work. On the following page there is an example format for the statement of work. You can use the example format or your own format, provided that comparable information is included. The statement of work should outline by task how the proposed program/project will be accomplished. It is important that the statement of work 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. 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

Attachment D is the Scope of Work under the grant and includes schedule and budget.

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. Sample budget tables are provided below. Please note that these budget tables are examples and will need to be adapted to fit each individual application. Tasks should correspond to the tasks described above.

See Attachment D

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. Sample schedules are provided below. Please note that these schedules are examples and will need to be adapted to fit each individual application.

See Attachment D

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.

Additional Information – If you would like to add any additional pertinent information please feel free to do so here.

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

Signature of Applicant: */s/ Daniel R. Birch*

Print Applicant's Name: *Daniel R. Birch*

Project Title: *Colorado River Compact Water Bank*

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

Colorado River Compact Water Bank
Reconnaissance Study
Tom Iseman, December 2009

Executive Summary

Under the Colorado River Compact of 1922, the States of the Upper Division (Colorado, New Mexico, Utah and Wyoming) are obligated to curtail uses if they cause the flow at Lee Ferry, Arizona to fall below 75,000,000 acre-feet during any consecutive 10-year period. The recent drought has demonstrated that the curtailment of uses in the Upper Division states pursuant to the Compact is a possibility. While the mechanics of the curtailment process are unclear, both within the Upper Division and within any Upper Division state, all parties agree that a curtailment would cause significant social and economic disruption. In Colorado, two leading water managers, the Colorado River Water Conservation District and the Southwest Water Conservation District (the Districts), have proposed to develop a 'Compact Water Bank' to prevent and respond to a compact curtailment. The proposed water bank seeks to provide a means for pre-compact water uses to be used to allow critical post-compact water rights to continue to divert rather than be curtailed in the event the an interstate compact curtailment is imposed pursuant to the 10-year running average flow at Lee Ferry, Arizona falling below 75 MAF. This innovative concept has captured the attention of the water user community in Colorado.

This report is a reconnaissance-level assessment of the fundamental economic issues and mechanics of a Compact Water Bank, on behalf of the bank's proponents.

Methods: This paper was developed on behalf of the Colorado River Water Conservation District and the Southwestern Water Conservation District. The purpose is to understand the fundamental economics and mechanics of operating a regional water bank. The authors of this report used three primary methods to develop this report:

1) A review of existing water banks in the Western United States;
2) A high-level of assessment of 'supply' and 'demand' for a water bank in Colorado; and
3) Interviews of water users who may participate in a Compact water bank if developed.

This report was completed with funding from the Property and Environment Research Center.

Conclusion and Next Steps: This high-level review concludes that a compact water bank could help to mitigate the risk and impacts of a Compact curtailment in Colorado. Section 8 of this report identifies several next steps the Districts could take, in conjunction with partners, to advance the concept of a Compact Water Bank.

Clients: The managing clients for this project are the Colorado River Water Conservation District (CRWCD) and the Southwest Colorado Water Conservation District (SWWCD), or 'the Districts', as potential sponsors of a Colorado River Water Compact Bank.

Project Team

- Clients: CRWCD and SWWCD, 'the Districts'
- Project Manager: Tom Iseman, The Nature Conservancy/Western Governors' Association
- Economic Advisors
    - Property and Environment Research Center: Terry Anderson/Greg Chiracklis
    - WestWater Research – Clay Landry/Harry Seeley/Deb Stephenson

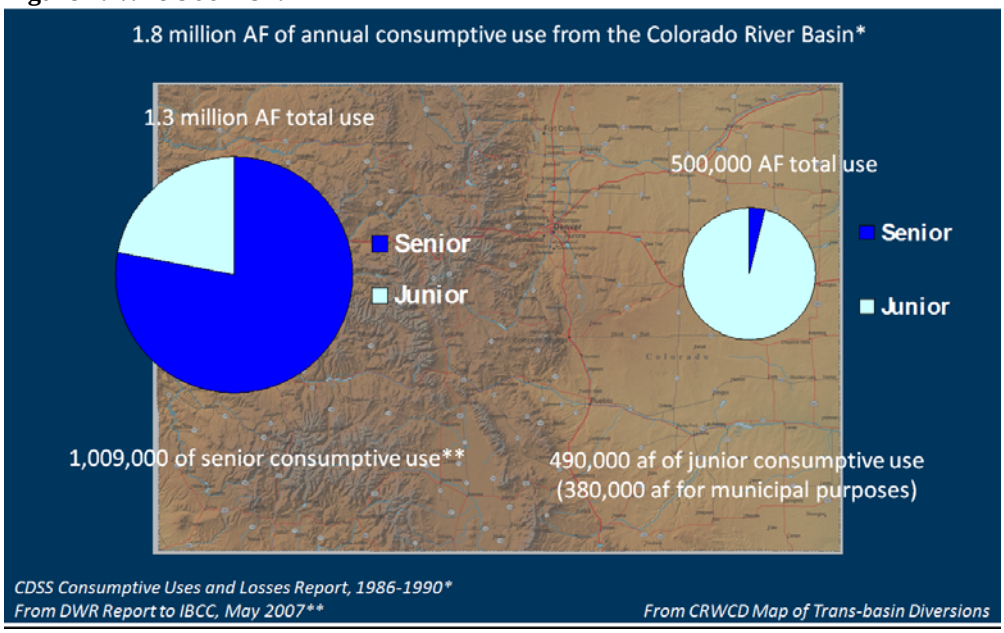
1. Background and Assumptions

Under Article 3 of the Colorado River Compact of 1922, Colorado shares an obligation with the other states of the Upper Division of the Colorado River Basin (New Mexico, Utah and Wyoming) to "not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years." In the event that aggregate flows fall below that threshold, the Upper Division states may have their water use 'curtailed' to ensure compliance with Article 3 of the Compact[1].

Article VIII of the 1922 Colorado River Compact contains the provision that "present perfected rights to the beneficial use of waters of the Colorado River System are unimpaired by this compact." The common interpretation, which will be used in this assessment, is that water uses in place as of the 1922 Compact could continue to divert unimpaired in the event of a curtailment[2]. In short: pre-1922 water uses could continue in use, post-1922 water uses would be curtailed.

While the mechanics of a curtailment process are unclear, both within the Upper Division and within any Upper Division state, all parties agree that a curtailment would cause significant social and economic disruption. The impacts of a curtailment would be felt statewide, as water from the Colorado River Basin is used on the West Slope as well as for a variety of urban and agricultural purposes on the Front Range of Colorado. Front range municipalities may be particularly vulnerable to a curtailment, as a significant portion of the water from the Colorado River in Colorado is diverted to the front range for municipal use, and that water is predominantly junior to the Compact (see Figure 1).

Figure 1: Who's at Risk?



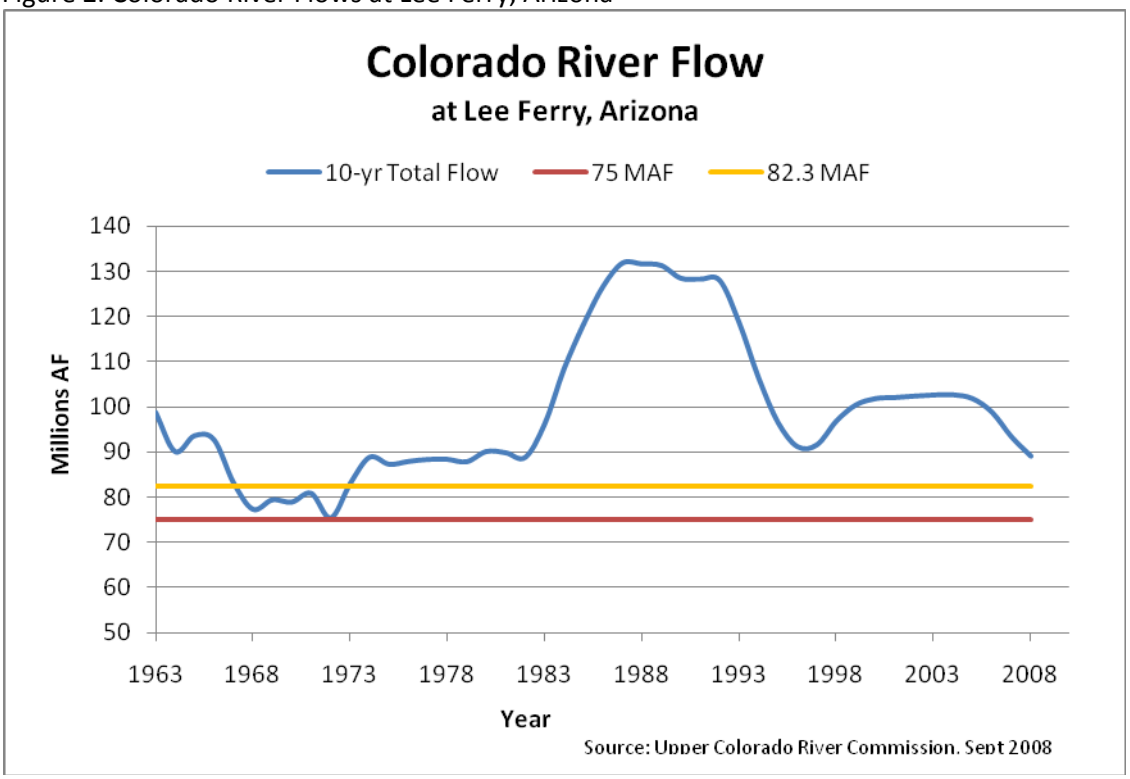
Rather than discontinue water use during a Compact curtailment, municipalities, particularly the large east slope municipalities, are likely to purchase pre-1922 irrigated land in order to dry up

[1] Colorado River Compact Curtailment Alternative Concept Paper, Draft Four, September 10, 2008.
[2] Ibid.

the land and transfer the pre-1922 depletion to their uses. The likely result would be a permanent reduction in irrigated land. The concept of the water bank is two-fold: 1) temporarily dry up irrigated land during a Compact curtailment, and then return it to irrigation afterwards to minimize disruption; and 2) develop the bank before there is a curtailment to avoid a crisis.

The Districts believe the chance of a compact curtailment is remote. As they state, "The chance of a curtailment in the next decade or two is extremely remote. In the last 10 years, we've delivered MUCH more water than 75,000,000 acre-feet at Lee Ferry[3]. " However, the past ten years have been relatively dry and the major drought of 2002 and 2003 has resulted in a decline in the 10-yr total towards the critical thresholds for compact compliance. (See Figure 2).

Figure 2. Colorado River Flows at Lee Ferry, Arizona



In Colorado, two leading water managers, the Colorado River Water Conservation District and the Southwestern Water Conservation District, have proposed the development of a 'Compact Water Bank' to prevent and/or respond to a compact curtailment. A fundamental premise of this concept is that states can use the consumptive use from pre-1922 water uses to replace depletions made by post-1922 water rights. The proposed water bank would provide or facilitate a free market mechanism for pre-compact water uses to be used for compact compliance, while allowing critical post-compact water rights to continue to divert rather than be curtailed, in the event of a compact curtailment. Without a bank, the critical post-1922 water users may permanently purchase and/or condemn pre-1922 water rights rather than lose

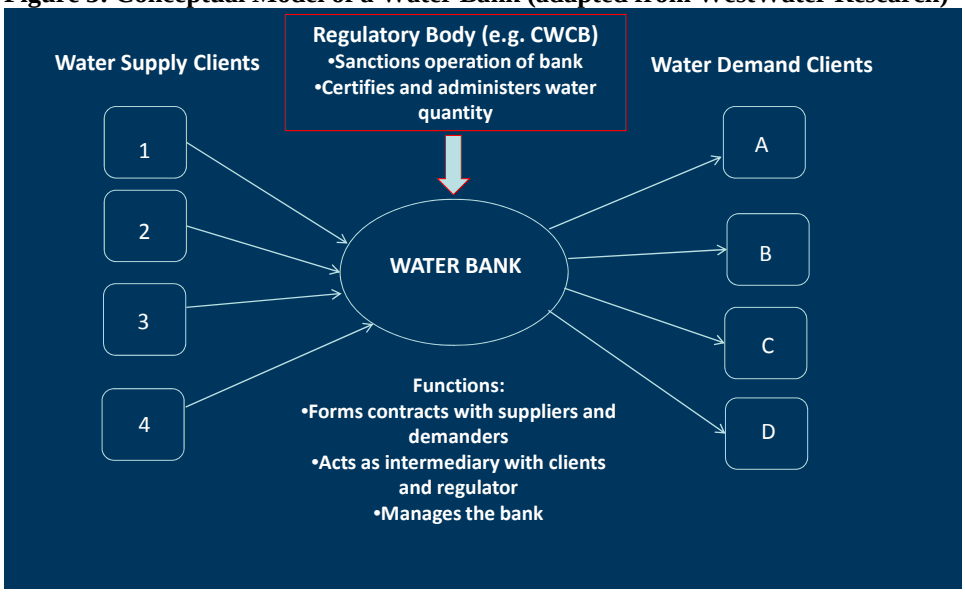
[3] Ibid.

their water supply. This could result in an irrigation crisis on the west slope. The proposed water bank is intended to mitigate the impacts to both post-1922 municipal users and pre-1922 irrigators. For a list of the Districts' specific assumptions, see Appendix 1.

2. Background on Water Banks

In the most basic sense, a water bank is an institution that uses free-market transactions to facilitate the temporary or permanent transfer of the rights to use water among water users. It does this by acting as an intermediary to bring together those holding legally-valid water rights with those in need of additional water supplies[4]. A water bank has a regular, transparent, 'institutionalized' process for transferring water rights, which serves to reduce the confusion and costs associated with water transfers. A water bank often has a public sanction or purpose, for example to alleviate the impacts of water shortage in a basin. In short, the common goal of a water bank "is moving water to where it is needed most.[5]" (See Figure 3.)

Figure 3: Conceptual Model of a Water Bank (adapted from WestWater Research)



Water banks have emerged as an important management tool in the Western United States in particular, where increasing water demand and unpredictable and over-allocated supplies create a need to reallocate reliable water supplies. There is no one template or strict format for a water bank; the participants, purposes, and rules of a bank can be tailored to meet the unique needs of a situation. In its review of western water banks, WestWater Research found water banking activity in 9 of 12 Western states, much of which commenced in the early 1990s to early 2000s.

Importantly, water banks do not necessarily require storage or a physical 'bank' for water. WestWater Research describes an 'Institutional' bank, which "provides a legal mechanism for exchanging water rights and other various forms of entitlements" over large geographic areas[6].

[4] MacDonnell, Lawrence J., "Water Banks: Untangling the Gordian Knot of Western Water," 1995.
[5] WestWater Research, *Analysis of Water Banks in the Western States*, 2004.
[6] Ibid, p4.

This may be true in large part for a Colorado River Compact Water Bank, as will be discussed later in this paper.

3. Developing a Successful Water Bank

As discussed, water banks have been put in place across the West, with varying degrees of success. In reviewing water banks in the West, several key lessons emerge in how to build a successful water bank.

- Clearly define the need for a bank: In this case, the Districts have articulated a case for a bank in their case study, and water users throughout Colorado are aware of the significant consequences of a Compact curtailment. The partners in a bank could refine the need statement by evaluating actual economic impacts of curtailment administration, determining what water uses would be eligible for participation in a bank, and getting consensus on public policy objectives of a bank. This allows proponents to develop a bank that is tailored to meet the identified need.
- Engage all parties involved in development of the bank: The water rights holders who would provide supply for the bank and the water users who would create demand from the bank should be involved in the development of the bank. In their review of the Arkansas Water Bank in Colorado, John Wilkins-Wells and Troy Lepper attribute the bank's failure to the lack of input from the participants in the Bank. They recommended "more participation and inclusiveness in the outreach program associated with building these innovative institutional arrangements[7]." By engaging participants, they will gain familiarity with the institution, have a hand in its structure, gain trust in the function of the bank, and be more inclined to participate when the bank is in place. Ultimately, this may include building public support from the broader, non-water user community in Colorado for the compact water bank. As WestWater observed, "water banks may appear as a threat to losing a "community" resource[8]." They encourage outreach to the broader community by local and state water agencies that support the bank.
- Put the bank in place in advance of the need: A water bank should be put in place *before* the need occurs, particularly if a bank is driven by a physical or legal event that heightens competition for water. Developing administrative rules and allowing negotiations and agreements in advance of a crisis event will enhance the chances that a bank will function when a crisis emerges. This was a lesson for the California Water Bank in 2009, where administrative problems, environmental questions, and a surge in crop prices resulted in the inability of the bank to achieve its objectives. The headline for the bank became 'few sellers lining up for Drought Water Bank[9].' Establishing a bank in advance is the way to address a key question posed by the Concept Paper: How do we sell insurance before the fire has occurred?
- Provide institutional support for the bank: A water bank should receive public sanction from appropriate government agencies, to provide credibility to the bank for buyers and sellers and to ensure that transactions through the bank are legitimate, enforceable, and appropriately administered. WestWater recommends that 'the state should enact general authorizing legislation to create the water bank,' to strengthen the bank's authority and legitimacy. Officials responsible for administering water can also create

[7] Wilkins-Wells, John, and Troy Lepper, *Water Banking and Traditional Irrigation Enterprises*, 2006.
[8] WestWater Research, p25.
[9] "Few Sellers Lining Up for Drought Water Bank", Oroville Mercury-Register, March 15, 2009.

rules or guidelines to ensure that water rights that are transferred through the bank are administered appropriately, without undue risk to buyers and sellers.

- Secure seed funding for the bank: The sponsors of a bank will need up-front or seed funding to establish the bank. Start-up costs for the bank will include detailed quantification of supply and demand, developing the appropriate structure and operating framework, promoting public awareness, and conducting initial transactions. Once the bank is up and running, it should be self-sustaining, where administrative costs can be incorporated into transactions through the bank. The more transactions the bank conducts, the lower the transactional costs associated with each 'deal'.
- Spread the risk: According to WestWater Research, a bank should be structured, 'to appropriately spread the risks associated with the water transfer among the bank, buyers and sellers.[10]' WestWater notes that the 1991 drought water bank in California assumed all financial risk for the transfers; when adequate demand did not materialize, the bank was left holding an over-supply of water and bore a significant financial loss. In order to build a successful bank and to engage willing buyers and sellers, the bank must distribute risk evenly among the bank, sellers, and buyers.
- Use market processes to ensure appropriate pricing: Using market pricing mechanisms ensures a fair and efficient solution to the curtailment challenge. On the one hand, post-1922 water users will pay the appropriate amount for the protection they seek, and pre-1922 water users are compensated fairly for their willingness to forego use. This is one of the primary advantages of a bank: that it provides a willing-participant, market-optimized solution, rather than a regulated and imposed mandate.

4. Goals of a Compact Water Bank

As discussed above, the impacts of a Compact curtailment to Colorado would be significant. In one basic scenario (a scenario considered probable by the Districts), a curtailment would last several years and require so much water that all water rights in Colorado junior to the Colorado River Compact of 1922 would be curtailed at the same time. This would affect cities in the front range of Colorado, but also growing and resort communities in Western Colorado, ski areas, and even many agricultural water users in both Western and Eastern Colorado. Nearly all of the reservoirs on the west slope are post-1922.

The primary purpose of a Colorado River Compact Water Bank would be to protect critical water uses in Colorado, and the Colorado economy, from the impacts of a Compact curtailment. This protection could take two forms:

1) To prevent or delay a compact curtailment: Using triggers like the 10-year rolling average, reservoir storage levels, and climate signals, water managers could use a Compact Water Bank to deliver additional water that otherwise would have been stored or consumed in Colorado to raise the 10-year rolling average and to delay or prevent a formal Compact curtailment;
2) To respond to or mitigate the impacts of a curtailment: In the event of a curtailment, water managers could use a water bank to facilitate trades between pre- and post-Compact water rights, to allow critical post-Compact water rights to continue to divert without permanently removing pre-1922 irrigated lands.

A Colorado River Compact Water Bank could also be used to achieve several additional goals.

[10] WestWater, p13.

1) To preserve Colorado's pre-Compact water rights: As the Districts' concept paper states, "because pre-1922 perfected rights are excluded from curtailment, protecting and preserving the continued beneficial use of these rights should be a policy priority." A bank could help to preserve water rights by setting aside funds to ensure the continued use and maintenance of pre-1922 water rights.
2) To assist with identification and mitigation of the secondary impacts of fallowing lands irrigated by pre-Compact water rights: The fundamental mechanism of a compact water bank would require the temporary non-use of senior water rights on the West Slope of Colorado, many of which would be agricultural water rights. In addition to the price a farmer might receive for entering water into the bank, the bank could provide funding to help farmers fallow land, including the maintenance costs of fallowing and the costs of resuming farming. Further, a bank could conceivably mitigate the secondary economic impacts to a community of the temporary loss of agricultural production due to fallowing.

A Colorado River Compact Water Bank could provide additional, ancillary benefits to water users and the state of Colorado. A water bank could serve to enhance recreation and the environment of Western Colorado, by strategically enhancing flows in key river reaches. For example, the bank could target flows in rivers that support the recovery of the Colorado pikeminnow and other endangered fish. In addition, a Colorado River Water Bank could serve as a demonstration of new and flexible institutions and management arrangements needed to address the uncertainty and variability associated with climate change.

5. How a Colorado River Water Bank would work

Essentially, a Colorado River Compact Water Bank would work almost like the conceptual model described in Section 2. A Compact Water Bank would provide an institution for post-1922 water users to establish agreements with pre-1922 water users. In the event of a Compact curtailment, the agreements would allow the critical post-1922 water use to continue by committing to the downstream delivery of the depletion associated with the pre-1922 water use. The agreements would all be through willing seller-willing buyer transactions. The Compact Water Bank would provide the institutional structure and serve as the venue for transactions among willing buyers and sellers.

Figure 4 below suggests the potential gains from trade of developing a water bank. This is a hypothetical figure listing a set of water rights and assigning a value and compact priority for each water right. The table on the left shows the impacts of a curtailment on this hypothetical set of water rights, with an attendant loss of 'value' of $48,000. The table on the right shows how a bank could ameliorate this loss by allowing trades between high-value and low-value water rights. High-value, post-compact water rights would conduct trades with lower-value, pre-compact water uses to allow continued high-value use. The willing seller, lower-value uses would be compensated at a price negotiated under a bank. (Note that low-value, post compact water uses would not participate, nor would high-value, pre-compact uses, for example irrigation of orchards or vineyards.) Under the bank scenario, the loss of 'value' would be only $10,000.

Figure 4: Gains from Trade.

Several factors would need to be considered in formulating the bank.

Role of the Bank: The fundamental role of a Compact water bank is to provide a forum to facilitate agreements between pre- and post- Compact water users. Agreements could be formed and exercised for two primary purposes: 1) to prevent a curtailment; 2) to respond to a curtailment. (See Table 1.) The bank would serve as a sanctioned and trusted institution, which would establish procedures, bring together buyers and sellers, conduct transactions, and monitor implementation. Because transactions require commitments over years, rather than an immediate exchange of goods, the bank would need to establish contractual arrangements or other enforceable agreements (e.g. water decrees) to ensure the rights and duties of each party and to monitor and enforce agreements over time. The bank would work with the state to ensure proper administration of water transacted through the bank. By providing a standardized, transparent, and trusted forum, the bank can reduce the transaction costs when compared with individual agreements and facilitate more transactions between willing buyers and sellers.

The bank could also seek to achieve public policy objectives through its rules and pricing structure. For example, a bank could define 'critical' uses, or the post-1922 water uses that would be eligible to participate in transactions under the bank. The bank could also create funds for the preservation of pre-1922 water rights and secondary impacts of fallowing to communities. It is important to note that public policy objectives may distort pure market forces, for example by limiting demand from some potential high-value but 'non-critical' uses or by artificially inflating prices to compensate for community impacts. These trade-offs will need to be considered in formation of the bank.

Table 1: Prevention and Response.

	Prevention	Response
Purpose	To delay or avoid a compact curtailment	To protect critical use water for specific, participating junior water rights holders under a curtailment
Trigger	10-yr rolling average Storage levels and climate signals	Curtailment
Method	Agreements with *senior or junior* (including front range) water rights to forgo use as needed	Agreements with *senior water* users to forgo use as needed
Funding	State of Colorado – fund or tax Coalition of Water Users	Individual junior water rights holders
Administration	Prevent increased yield to projects Administer water to state line Ensure contribution at Lee Ferry Ensure credit accrues to Colorado	Allow juniors to continue to divert Administer water to state line Ensure contribution at Lee Ferry Ensure credit accrues to Colorado

Structure of the Bank: A curtailment water bank could consider three potential models for serving buyers and sellers: 1) a 'Broker' model; 2) an 'Insurer' model; or 3) a 'Market Maker' model. Under a broker model, the bank would help to facilitate individual transactions between buyers and sellers. Under an insurer model, the bank would allow buyers to subscribe to the bank for a certain level of protection in exchange for payment; the bank would then be responsible to ensure that it had agreements with sufficient senior water rights to provide the guaranteed level of protection for subscribers. Under the market maker model, the bank would seek to match demand with supply in aggregate, to ensure that the water available is equal to the protection subscribed. The bank would then execute the transactions as appropriate.

Table 2 compares the different models and how they would work. The market maker model would require the most work up front by the bank, but it would distribute risk among buyers, sellers, and the bank, and it would provide the best way to achieve the optimal/equilibrium participation from buyers and sellers. The market maker model would also provide an opportunity to achieve the public policy goals of the water users. For these reasons, we consider the market maker model the best model to pursue. However, there are advantages to each model, and the optimal model will be informed by the specific needs and goals of the bank. The bank's structure will be an important issue for the Districts and other stakeholders to evaluate as they move forward.

Table 2: Options for bank structure.

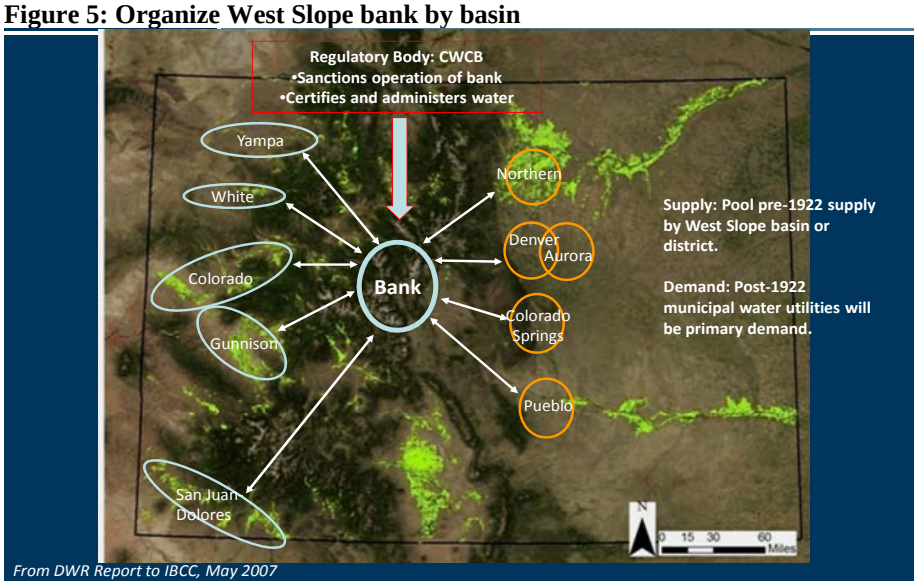
	Method	Advantage	Disadvantage
Broker	Set up individual transactions between specific junior and senior water rights.	Low administrative cost for bank. Low risk for bank.	Transaction costs increased due to multitude of individual transactions. Case-by-case enforcement.
Insurer	Charge premium for protection and guarantee coverage to providers.	Bank may determine how much coverage and when to secure it, based on its assessment of curtailment probability.	Risk resides wholly with bank. Lack of 'Certainty' for subscribers.
Market Maker	Match demand with supply to ensure that water available is equal to protection subscribed. Execute transactions.	Distributed risk. Relative certainty in the event of curtailment Achieve policy goals for water users Spread benefits to users	Highest administrative costs up front for bank.

Types of Agreements allowed under the Bank: The primary form of agreement that a bank would employ would be a temporary option agreement. These could be long-term or even permanent agreements; the key feature would be that they would only allow the option to be invoked on a 'temporary' basis, e.g. for 1-3 years. A post-1922 water user, with qualified 'critical' use, could secure agreement to protect their critical uses in the event of a curtailment. The bank would then establish agreements with a corresponding number of pre-1922 water users to agree to forgo water use for a certain period in the event of a curtailment. (Agreements with pre-1922 water users could be with individual water users or with 'pools' of water users, as discussed below.) It is important to note, only the consumptive use portion of a pre-1922 water use could be credited to the bank, not the diversion amount. The post-1922 water user would then pay a fixed 'option' price, to secure the protection into the future, and they would pay a 'strike' or 'exercise' price in the years in which they invoke the protections under curtailment. Similarly, the pre-1922 water user would receive an option payment upfront and an exercise price in the event of a curtailment. These agreements would probably be made for a fixed term, i.e. the 'option' would only be available for an agreed-upon number of years. In the event that the option is never exercised, the initial, one-time option payment would be the only payment exchanged. The option payment could be structured in a variety of ways, e.g. to be paid annually over the term of the agreement.

Organization of the Bank: The bank would be organized to facilitate and execute transactions between pre-1922 and post-1922 water users. The bank may benefit from 'pooling' pre-1922

water by river basin or district. Rather than creating agreements with each individual water user, the bank could create agreements with existing (or new) districts or basin authorities that represent the major West slope basins or water users. (See Figure 5.) The districts would then solicit participation from individual users. This could minimize the administrative overhead of the bank and facilitate flexible, locally-tailored agreements on fallowing and rotation within groups of water users. The pooling approach is being used in the Super Ditch in the Arkansas Basin. It is also being used in the Palo Verde District, where the fundamental agreement is between the District and the MWD, the District solicits water users on a willing participant basis, and the District actively manages fallowing based on land-user preferences and annual demand.

Figure 5: Organize West Slope bank by basin

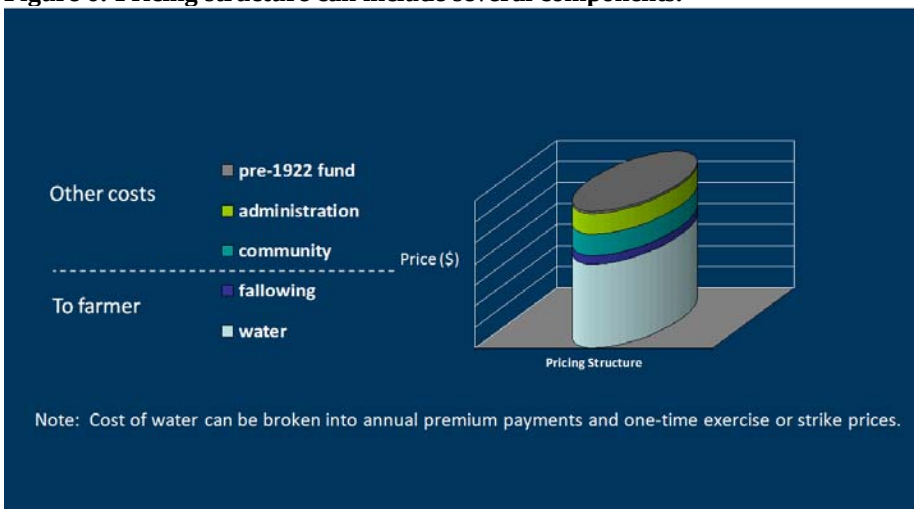


Pricing under the Bank: The fundamental driver for a water bank is the free market. In this case, transactions through the water bank would be driven by the difference between the price a post-1922 water right holder is willing to pay for protection and the price a pre-1922 water right holder is willing to accept to forgo use. Most of the pre-1922 water in Colorado is used for grass pasture or alfalfa; a high-level analysis and several reports estimate that the production value of this water may vary from between $800/af - $2,000/af. On the other hand, several recent transactions from front-range water providers indicate that post-1922 water rights holders are currently paying between $12,000/af-$15,000/af to purchase their next units of water. (Note: These prices reflect the capital cost of permanent acquisitions, not annual leases.) Any actual deals would have to be negotiated and agreed upon by the parties through the bank. Further, prices through the bank would be expected to be far lower than those cited here, as they would be for only temporary option agreements, not permanent supplies. However, the significant potential discrepancy in values suggests that there would be active participation in a bank from both buyers and sellers, based on financial incentives.

As discussed above, the Bank could consider including additional components in pricing of transactions through the bank. At the most basic level, the bank would include the costs of water, fallowing, and resuming production to the farmer. The bank would also need to charge for the administrative costs of operating the bank. The bank could also consider charges to establish funds for community/third-party impacts or for the protection of pre-1922 water

rights. (See Figure 6.) The more additional costs that are imposed on post-1922 water users, the fewer transactions will occur through the bank. Post-1922 water users would likely first attempt to make individual and permanent 'buy-and-dry' agreements with pre-1922 water users but may also look to alternative sources of water, including conservation, non-renewable groundwater, or front-range agriculture, to respond to a curtailment.

Figure 6: Pricing structure can include several components.



Governance of the Bank: The bank would need to be governed by a diverse board comprising West-slope and front range water users. Board composition could also include the state of Colorado, the Bureau of Reclamation, and other affected stakeholders. The board and institution would be founded and managed as a not-for-profit or quasi-governmental enterprise. The state would need to endorse the bank, enforce agreements, and administer water as appropriate. The bank would need to provide transparency for its participants.

Infrastructure: A Colorado River Compact Water Bank may not require new infrastructure. Pre-1922 Colorado River water users would subscribe to the bank so they could continue to divert 'critical' use water through existing facilities, including the existing transbasin diversions. Post-1922 water users who entered water into the bank would forgo or bypass water that they would normally divert and use; this water would flow to Lake Powell and count towards Compact compliance. Thus, new storage and conveyance may not be necessary for the essential function of the bank.

That said, the Bank could benefit from the use of new or existing storage. For example, instead of over-delivering a 10-year rolling average, water from both pre- and post- 1922 water rights that was deposited in the bank and not used in any one year could be held in CRSP storage units. This water would be held in storage accounts controlled by the bank, which could then determine the timing of releases and optimize credit for delivery for compact compliance. Conceivably, the water bank could build storage accounts over long periods of time and could exchange water among CRSP units, including Lake Powell. This concept is analogous to *Intentionally Created Surplus* in the lower Colorado River. While this storage concept would require significant work with the Bureau and other basin states, it would provide Colorado additional flexibility and certainty regarding the function of a bank in the context of Compact compliance.

Conceptual Model: Based on the rough numbers for supply and demand and the concepts above for structuring the bank, this model attempts to illustrate how a bank might work in practice. (See Figure 7.) First, the bank would solicit demand for protection through the bank from post-1922 water users. Assuming a 'critical use' constraint, we make an assumption that 50% of post-1922 water use is critical, or approximately 200,000 acre feet of consumptive use demand. The demand solicitation would include a request for the target price per acre-foot per year for protection of post-1922 water uses that different junior users would be willing to pay. Demand-side subscribers may be willing to pay different amounts for protection through the bank. And individual users may be willing to pay more for the first units of protection than the last units of protection. The demand solicitation would draw out the value of water to different potential subscribers and the value of different amounts of water to any individual subscriber.

The bank would then solicit bids from pre-1922 water users who are interested in committing senior water to the bank. These bid requests would include the amount of consumptive use acre-feet and the seller's target price per acre-foot per year for participation in the bank. The solicitation could also include a request for evidence of historical consumptive use. As discussed above, bid requests could be targeted at individual water users or pools of water users through Districts or other institutions. Individual water users could conceivably offer amounts of water at different prices, although proper administration may require complete dry-up of discrete parcels.

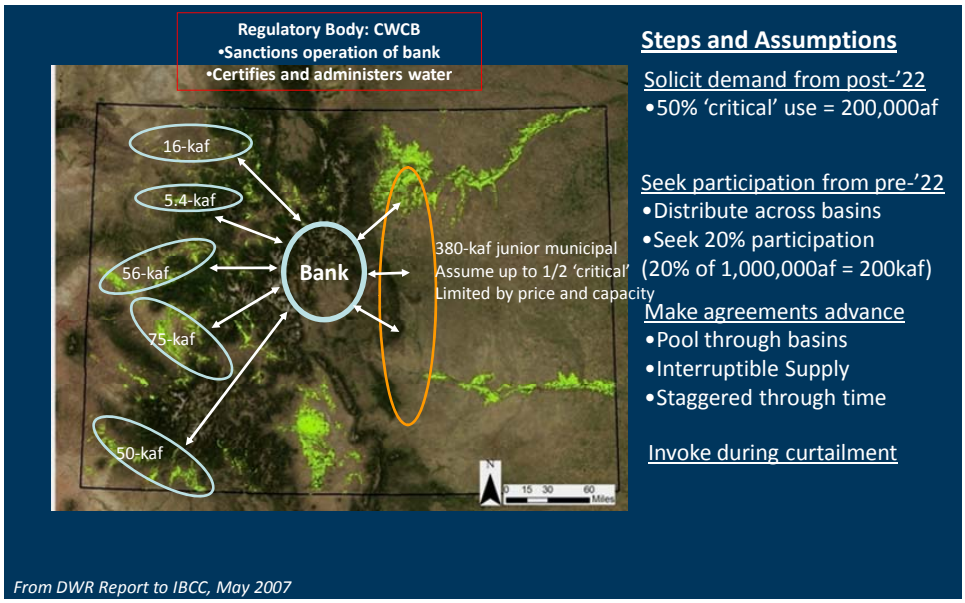
The market-maker bank would then cross match the 'demand' and 'supply' sides of the bids. At some point, the two would intersect. The intersection could be below the 200,000 af target, in which case the demand side could increase their bids or accept a lower amount of protection. Or the intersection could be above the 200,000 acre-foot target, in which case the bank could satisfy the demand at a lower price or use additional willing supply at the higher price to create redundancy or rotational flexibility.

In essence, this is a 'double-auction' design[11] matching demand and supply through a bank. It provides the bank as 'market maker' the flexibility to manage supply and demand and to incorporate public policy goals into the management of the bank. It is desirable to buyers and sellers because it reduces transaction costs, facilitates deals, arrives at a 'socially-efficient' resource allocation, and provides political credibility.

One critical point about double auctions: they do not work well if there is significant variation in the resource being traded. The bank would need to find a way to 'pre-certify' the consumptive use associated with pre-1922 water uses offered to the bank, to ensure post-1922 water users that they would be receiving a viable credit to offset their junior uses. Other important details are left unaddressed in this model, but it provides a conceptual illustration of how a bank could conduct deals. For additional detail on double-auction designs for water markets, see Hartwell and Aylward (2007).

[11] Hartwell, Ray, and Bruce Aylward, *Auctions and the Reallocation of Water Rights in Central Oregon*, Deschutes River Conservancy River Papers, April 2007.

Figure 7: Conceptual model of bank.



6. Pre- and Post-Compact water right holders would consider participation in a bank

The project team conducted interviews with the potential participants in the bank: the post-1922 water right holders who would subscribe to the bank for protection for their critical uses, and the pre-1922 water users who might be willing to enter their water into a bank to delay or mitigate the impacts of a curtailment. The interview team included Tom Iseman, a participant from WestWater Research, and a representative of the Colorado River District and/or the Southwest Water Conservation District. The interviews were conducted in the spring of 2009.

The results of the interviews indicated that both 'buyers' and 'sellers' may be willing to participate in a bank. The interviews also highlighted several issues that would need to be addressed to ensure participation in a bank.

Post-1922 Water Right Holders

The project team interviewed six major post-1922 water right holders from the Colorado River Basin. These included several front range utilities or districts with significant trans-basin diversions and a representative of several growing resort communities in Western Colorado (see Table 3).

Table 3: Post-1922 Interviews

Water User	*Representative*
Denver Water	Dave Little, Bill Bates, Marc Waage
Northern Water	Eric Wilkinson, Don Carlson
Colorado Springs Utilities	Wayne Vanderschuere
Aurora Water	Mark Pifher
Pueblo Water	Alan Hamel, Terry Book, Bud O'Hara.
Summit/Eagle County	Glenn Porzack

Several conclusions emerged in discussions with post-1922 water right holders.

1) Water supplies are vulnerable to a Compact curtailment. These water users, which include several major front range utilities, would be vulnerable to a Compact curtailment on the Colorado River. These providers rely heavily on post-1922 water from the Colorado River basin, which comprised 25%-100% of the total water supply portfolio of these providers.
2) Water providers are paying relatively high prices for new water supplies. The providers interviewed are generally facing growing demands and are actively seeking water. They are paying between $9,000 and $15,000 per acre-foot of new supply, either through estimated new project costs or for direct acquisitions of existing water rights. In an analysis for the Inter-Basin Compact Committee, consultants estimated the costs of several potential new water supply projects at between $15,000 to $45,000 per acre-foot. (Again, prices under the bank would be expected to be far lower than those cited here, as the bank provides temporary option agreements, not permanent water acquisitions.)
3) Post-1922 water rights users would be interested in participating in a water bank. All of the parties interviewed expressed an interest in participating in a Colorado River Compact Water Bank. They expressed an interest in both the 'prevention' and 'response' functions of a potential bank. They expressed an interest in participating in the governance of the bank; they recognized the primary role of the Districts, but said they would need some representation to the board to feel confident engaging in transactions.
4) 'Certainty' is a critical consideration for post-1922 water rights holders. The water users who were interviewed expressed a desire for 'certainty' from a compact water bank. They wanted to know that if they invested in protection for their water uses from a compact water bank, that it would be complete and ensured, not contingent on future events or conditions. They also expressed a desire for the bank to be a 'one-stop shop' for protection, i.e. that a bank would have the capacity to address administrative, financial, and legal aspects of any transactions.

Pre-1922 Water Users

The project team interviewed major water users in several of the water basins in Western Colorado who could potentially offer water supplies into a compact water bank. (See Table 4.) Most of these are water districts or irrigation companies that use significant pre-1922 water rights.

Table 4: Pre-1922 Interviews

Water User Group	*Representative*
Grand Valley Water Users	D. Kim Albertson
Orchard Mesa Irrigation District	Rita Crumpton, Bob Sowell
Montezuma Valley Irrigation Company	Jim Siscoe
Dolores Water Conservancy District	Don Schwindt, Mike Preston
Yampa Valley – independent irrigators	Jay Fetcher, Geoff Blakeslee
Uncompahgre Valley Water Users	Marc Catlin

Generally, these senior, west-slope agricultural water users recognized the significant potential disruption to post-1922 water users, particularly front-range cities, of a compact curtailment in Colorado. They indicated a willingness to consider how a water bank could help to address these impacts through willing-participant, free-market transactions. However, they expressed several concerns that would need to be addressed in order for a bank to achieve the support of West slope water users and participation from individual water rights holders.

1. Are crops amenable to fallowing? The pre-1922 water right users were concerned about the impacts of temporary fallowing on their agricultural operations. They observed that some crops may be more amenable to fallowing than others; they were particularly concerned about the impact of fallowing on alfalfa or other perennial (multi-year) crops. They were also concerned about the need for maintenance during fallowing and the challenges of resuming farming after fallowing.
2. Can federal projects participate? Several of the large water districts in Western Colorado are associated with Bureau of Reclamation projects. This means that the Bureau helped to finance the projects, the Bureau often holds the water rights to the project, and the use of water must often occur within established district boundaries. The proponents of a water bank would need to determine whether pre-1922 water uses associated with a Bureau project could be used for the purposes of the bank.
3. Can a bank address community needs? Transfers of water from rural, agricultural areas can have measurable adverse impacts to the region and community.[12] Water users expressed concern over these adverse impacts, especially of a reduction in local irrigated agriculture on the agriculture-dependent businesses in the local community. They also expressed concern about a concentration of fallowing and associated impacts in any one basin.
4. Are the protections for 'critical' needs? While West slope water users were willing to consider ways to participate in a water bank and even expressed a responsibility to help to mitigate the impacts of a curtailment to the State of Colorado, they wanted to understand what uses would be protected by a curtailment water bank. They supported protections for what they considered 'critical' uses of water on the front range, most clearly drinking water for communities; however, they objected to protections for non-critical uses, for example golf courses or median strips.

Table 5: West slope agricultural water use (consumptive use)[13].

Supply	**Agricultural Water Rights (AF)**	
	Junior	Senior
Yampa	14,000	80,000
White	5,000	27,000
Colorado	26,000	277,000
Gunnison	26,000	375,000
San Juan	37,000	250,000
Total West Slope	**108,000**	**1,009,000**
Arkansas	25,000	
South Platte	85,000	

[12] National Academy of Sciences, *Water Transfers in the West: Efficiency, Equity, and the Environment*, 1992.
[13] Colorado Division of Water Resources, Presentation: *Colorado River Compact Administration*, to IBCC, May 2007.

7. Critical issues

In the course of this project and in particular in the issues with potential participants, several critical issues emerged that would need to be addressed by the compact water bank in order to succeed. These include the following:

1. Critical Uses: The Districts suggest that a Compact water bank would limit protections through the bank to 'critical' post-1922 water uses. The Districts' concept paper defines critical uses as "uses that have a significant health, safety, and/or economic impact if water use were discontinued and would likely include: indoor municipal/domestic, certain industrial uses (e.g. power plant cooling), critical agriculture uses such as orchard or vineyards, essential outdoor municipal uses."

   A restriction to 'critical uses' of water may introduce confusion into the operation of the bank. Front range water users asked repeatedly about which of their uses would be allowed and what level of conservation restrictions they might have to achieve in order to qualify for participation in the bank. They also asked how this provision would be enforced; they were particularly concerned that the bank would seek to investigate in detail municipal water allocation.

   A restriction may also exclude certain uses of high economic value which may not be deemed 'critical' under the definition of a bank. For example, several participants cited golf course irrigation and snow making as two high value uses that may seek to participate in a bank. However, despite their willingness and ability to pay the price of water through the bank, they may be excluded under a definition of 'critical uses'.

   Recommendation: A restriction to 'critical use' may be important to constrain the demands on a bank, limit the impact to West slope water users, and enhance the political viability of the project. If so, it will be important to develop a clear, widely-accepted, and enforceable definition of 'critical uses' in advance. We recommend using that definition to determine how much water a prospective subscriber may be eligible for, and then allowing participation up to that level of critical use. (The bank may also consider 'tiers' of critical use. At a lower tier of critical use, a post-1922 water user may pay a higher price for participation in the bank.) We recommend against monitoring end uses of water, as in most cases it would be difficult to segregate the use of bank water supply from other supplies and could be perceived as an intrusion into the operations of demand-side users of the bank.

2. Individual Fallowing Protocols and Community Impacts: Nearly every pre-1922 water user who was interviewed regarding participation in the bank expressed concerns about fallowing, specifically: how would fallowing affect an individual farm operation? Which crops are amenable to fallowing? What is the impact of fallowing on perennial crops? How can I maintain my farmland in years that I fallow, including preventing infestation by weeds? What are the costs associated with resuming farming? Answering these questions will be a pre-condition for participation from any individual farmers.

   In addition, pre-1922 water users expressed concern about the impacts of fallowing on local communities. Specific concerns included the spread of weeds to neighboring farms and adverse impacts to the local, farm-dependent economy. Colorado law does require revegetation and noxious weed management and provides the water court the authority to

impose payments to mitigate the economic impacts, especially to the local tax base, of permanent water transfers. Though these provisions are not frequently invoked, the Arkansas Basin may provide a model for considering these community impacts.

In a review of the literature, Larry MacDonnell concludes, "all studies have identified measureable adverse local economic effects associated with transfers that take water out of local agriculture.[14]" Effects include loss of jobs, loss of income, and loss of tax revenue. The effect varied depending on the proportion of land out of production, the dependence of the local economy on agriculture, and the duration of transfer. But the effect held even for temporary transfers.

One of the goals of the water bank is to facilitate *temporary* agreements that would be invoked during curtailment, rather than allow permanent dry-ups that may occur without a bank. Though temporary fallowing does not eliminate community impacts, it would reduce their long-term effect.

Recommendation: These questions would need to be addressed by a bank before soliciting participation from pre-1922 water users. We recommend working with Dr. James Pritchett and others at Colorado State University who have addressed these questions from an economic and agricultural perspective. We also recommend engaging West slope agriculturalists to participate in the formulation and execution of studies. The Colorado Water Conservation Board's program on Alternative Agricultural Water Transfers Grant Program may be a source of funding to support this work.

One additional note on fallowing under a bank. Farmers generally assumed that perennial crops would be poor candidates for periodic fallowing, because the crop could be fallowed in the first or second year of planting, causing the loss of a multi-year investment. The bank may seek to establish agreements with perennial crop water users to stagger the planting of perennial crops over time. Depending on when a curtailment occurred, the bank could then exercise agreements with those farmers whose crops are approaching re-planting, thus minimizing the cost to the farmer of a lost multi-year investment.

3. Clarify Administration of Water Under Curtailment: First, it will be essential to understand how the State of Colorado would administer a curtailment in the absence of a bank. This information will allow both pre- and post-1922 water right holders to rationally assess their risk in the event of curtailment as a basis for participation in a bank.

   Second, a Compact water bank would need to work closely with the state of Colorado on administration of the bank, in particular to ensure that participants in the bank have full confidence in their rights. Pre-1922 water users who enter water into a bank would need to be ensured that there is no implied abandonment and that they will have the right to resume full use of the water outside of the provisions in their lease agreements. Post-1922 water right holders would need to be ensured that the amount of water that they contract

[14] MacDonnell, Lawrence J, *Protecting Local Economies: Legislative Options to Protect Rural Communities in Northeast Washington from Disproportionate Economic, Agricultural, and Environmental Impacts when Upstream Water Rights are Purchased and Transferred for Use, or Idled and Used as Mitigation, in a Downstream Watershed or County*, Report to the Legislature, State of Washington, 2008.

for through the bank would be protected for their continued use under administration by the state in the event of curtailment. Water users who do not participate in the bank will want to ensure that their rights are not impaired by the operation of the bank.

Third, it will be important to understand how the State of Colorado would interact with the Upper Colorado River Commission and the other basin states in the event of a curtailment. For example, it will be necessary to ensure that the State of Colorado receives credit for increasing deliveries above a 10-year rolling average in advance of a curtailment.

Recommendation: The State of Colorado's Compact Administration Study should help to address questions about how water would be administered within Colorado in the event of a curtailment. It may also address preliminary questions about how a compact water bank could be incorporated within the state's curtailment administration scheme. The Districts and other proponents of the bank should work closely with the bank to track and to help formulate the recommendations in the state's report.

A Compact Water Bank will also need to consider its relationship with the other Upper Basin states and ultimately the seven Basin states in the Colorado River Basin. The bank's proponents may be able to examine scenarios and begin to build agreements for how a bank could prevent or respond to a curtailment in the context of broader basin-wide administration.

4. Alleviate Administrative Hurdles: It is clear that a bank would face significant administrative or transaction costs, even if administration under a bank is clarified by the state, in terms of engineering and water court. The state could take several steps to encourage participation in a bank by helping to streamline the administrative process.

   Several ideas emerged in the course of interviews:
   - Ensure senior water rights holders who participate in a bank are not penalized in their record of historic consumptive use, by removing those years from the consumptive use record. This protection is already in place for water rights holders who loan or lease water to the state's instream flow program.
   - Establish a 'rule of thumb' approach for quantifying the amount of consumptive use of any pre-1922 water use that could be credited for participation in the bank. This rule of thumb could be based on assumptions for crop type, acreage, elevation, and other data and algorithms from the Colorado River Decision support system.
   - Standardize and streamline the water court process for any transactions that occur through the bank, particularly with respect to injury of downstream users.
   - Standardize or minimize the appraisal process for any water rights transactions through the bank.

   Recommendation: These reforms may be difficult to achieve, particularly due to heightened competition for water that might attend a potential curtailment. However, the state and its water users have a significant interest in facilitating effective responses to a potential curtailment. The Districts should work with stakeholders to identify ways to streamline administrative requirements and transaction costs for transfers through a bank.

5. Bureau of Reclamation Participation: The Bureau of Reclamation will be a key partner in the development and implementation of a Compact water bank. The Bureau's facilities, including several major transbasin projects and reservoirs, could provide operational benefits to a bank.

   More importantly, many of the pre-1922 water rights in Colorado were developed as part of a Bureau project or have subsequently become integrated with the operation of Bureau facilities. As a result, the Bureau's consent, or even federal legislation, may be required for operational changes or transfers of water, particularly when project water would be used for the purposes of the bank outside of project boundaries. This includes major pre-1922 water rights in the Uncompahgre Project and the Grand Valley Water Management Project. Operational decisions by the Bureau could affect non-Bureau projects as well, for example the Montezuma Valley Irrigation District or Orchard Mesa Irrigation District.

   The Bureau has shown a willingness to accommodate innovative water transfers. In March 1989, the Bureau of Reclamation established policy on *Voluntary Transfers of Project Water.* These Principles stated Reclamation Policy to be 'supportive of voluntary transfers and conversions of project water in accordance with State and Federal law from existing to new users and/or uses.'[15] Since that time, the Bureau has recognized the need to facilitate transfers at several projects, including through the Yakima River Basin Water Enhancement Project (PL 103-434) and the Central Valley Project Improvement Act (PL 102-575). One of the primary purposes of the CVPIA is "To increase water-related benefits provided by the Central Valley Project to the State of California through expanded use of voluntary water transfers and improved water conservation."

   More recently, Senators Boxer and Feinstein have introduced legislation (S1759) to promote up to 300,000 acre-feet of water transfers in the Central Valley. This legislation would authorize the Bureau to approve new transfers, streamline environmental reviews for water transfers on a programmatic (rather than project-by-project) basis, and examine other ways to facilitate future transfers.

   Recommendation: The Districts should work with the Bureau of Reclamation to understand the constraints on pre-1922 water rights, the operational issues with Bureau facilities, and the opportunity to engage the Bureau as a constructive partner in the bank. Bringing additional partner support, including from front range water users and the state of Colorado, may increase the probability that the Bureau will work to accommodate the bank.

8. Next Steps

This report provides a high-level overview of the mechanics of a bank and identifies several challenges that will need to be addressed to establish a Colorado River Compact Water Bank. The Districts will have to do significant additional work to bring a Bank into existence.

1. Engage stakeholders in development of the bank: The Districts have presented the concept of the Compact water bank to stakeholders throughout the state, including the IBCC, the front range water users, the bureau of reclamation, the environmental community, and most importantly, pre-1922 water managers in Western Colorado. Nearly all stakeholders

[15] Reclamation Manual, WTR P02, *Voluntary Transfers of Project Water*, Office of Policy, D-5000.

have expressed support for the concept, while raising fair questions about how it would work for their interest. We recommend forming a small, District-led group of stakeholders to advance the concept from here. We also recommend periodic update to the broader water user community, as the Districts have done to date.

2. Address questions about interruptible supply for agriculture: Throughout development of the report, pre-1922 water rights holders considering participation in the bank raised the question of fallowing. Specific questions included: Which crops are amenable to fallowing? What maintenance needs to be done when crops are fallowed? What are the costs of resuming farming after fallowing? The proponents of the bank will need to address these questions. We recommend seeking a CWCB 'Alternative Agricultural Water Transfers Grant' to address these questions, possibly with Dr. James Pritchett and other experts at Colorado State University. We recommend working closely with the pre-1922 water users on this study and updating them periodically on its progress.

3. Build partnership with Bureau of Reclamation in development of Bank: The Bureau will be a key partner in development of the bank, both for the operation of its facilities and for its cooperation in the use of pre-1922 project water in the bank. We recommend working with the Bureau immediately as a potential partner in the bank, focusing on the ability of project water to participate in the bank. The Bureau of Reclamation's Basin Study for the Colorado River may be one entry point for discussion of the bank. We believe there are models in California and Washington that demonstrate that the Bureau can allow project water to participate in a bank, but it will require close collaboration with the Bureau and may need federal legislation.

4. Refine quantification of 'supply' and 'demand': This white paper used coarse quantification to examine the high-level distribution of pre-1922 and post-1922 Colorado River water use in the State of Colorado and made simple assumptions about who might participate in a bank to consider its feasibility. Several pending studies will provide data to refine the estimates of supply and demand to the bank, including the CWCB's Colorado River Water Availability Study and Compact Administration Study, and the Bureau of Reclamation's work on the Basin Study for the Colorado River Basin. The District and other stakeholders may develop an application to study the supply and demand and mechanics of a bank through the Bureau's system optimization reviews: http://www.usbr.gov/wci/system.html.

   One specific component of demand for the bank that will need to be addressed is the definition of 'critical uses'. While there is a component of data and quantification to this question, it is largely a matter of public policy. We recommend the Districts work with the state and post-1922 water users to craft a workable definition of 'critical uses'. In our view, it is not the most immediate priority, but it will need to be addressed as the bank comes to development.

5. Consider market tests: One way to evaluate alternative structures for a bank prior to putting a bank in place may be through 'experimental economics'. Economists can develop simulated scenarios and interview potential participants in a bank to examine which institutional structures and agreements work best and how much participation a bank might receive under different scenarios. These tests can also familiarize participants with the bidding structure and process prior to actual negotiations, which can increase participation

and improve outcomes once the bank is in place. As WestWater states, "mock trading programs are a useful approach to help potential banking participants learn and understand the functions of the market.[16]" Economists at Colorado State University and other universities have employed these tools to understand markets and devise strategies in advance of investing in institutions.

Conclusion: The Districts have conceived a bold and innovative approach to addressing the challenge of a Compact curtailment. In our high-level review, we have concluded that a water bank as proposed by the districts would be an effective way to reduce the risk and impacts of a Compact curtailment. One way to move forward with the next steps proposed here may be to develop the stakeholder group proposed in step 1 above; that group could then develop a scope of work to address steps 2-5, and other needs as appropriate, to advance the bank. Even these preliminary steps will require 'start-up' funding, as noted above; because of their interest in averting and mitigating the impacts of a curtailment, we believe the State of Colorado and Bureau of Reclamation would be appropriate source of funding for these next steps.

One thing is clear: we cannot answer all questions prior to putting a bank in place. We will have to learn by doing. One of the primary benefits of a bank is that it is an adaptable solution to the challenges posed by compact compliance: it will allow water users to adjust their participation in the bank according the hydrologic conditions, economic needs, and risk tolerance. That said, it will also require the proponents of the bank to be adaptable as well, to make adjustments to the structure and management of the bank over time to best suit the needs of water users and the State of Colorado. We encourage all parties to acknowledge uncertainty but to move forward in establishing this bank so it can be put in place in advance of a Compact curtailment.

[16] WestWater, p14.

Appendix 1: Assumptions.

For the purpose of this concept paper, the River District and Southwestern make the following assumptions in order to frame the concepts and initiate meaningful discussions. Not all of these assumptions have been legally tested, there may be different but valid views, and no entity is bound to support any of these preliminary assumptions. .

1. It is legal under the 1922 Colorado River Compact and the 1948 Upper Colorado River Basin Compact for individual Upper Division States to utilize the consumptive use from pre-1922 rights to replace depletions made by post-1922 water rights.

2. If a compact curtailment were to occur, it is most likely to be a significant and even protracted curtailment. Smaller curtailments are more likely to be worked out through negotiations among the parties. This means that as a practical matter, a compact curtailment would operate in a binary manner, when it occurs it would curtail all post November 24, 1922 compact uses.

3. Within Colorado, senior pre-1922 rights would still have the right to administer a call against more junior pre-1922 rights. For example, an 1885 right could still curtail a 1905 right.

4. Within Colorado, water stored by post-1922 storage rights in the nine water years preceding the water year in which curtailment is required likely would be excluded from curtailment.

5. The State Engineer will ultimately issue rules and regulations on the administration of water rights within the State of Colorado and the Colorado River basin, pursuant to statutory authority, the Colorado River compacts, and the associated Law of the River. The Colorado General Assembly may also be involved.

6. Present perfected rights are those rights that are “pre-1922 perfected rights.”

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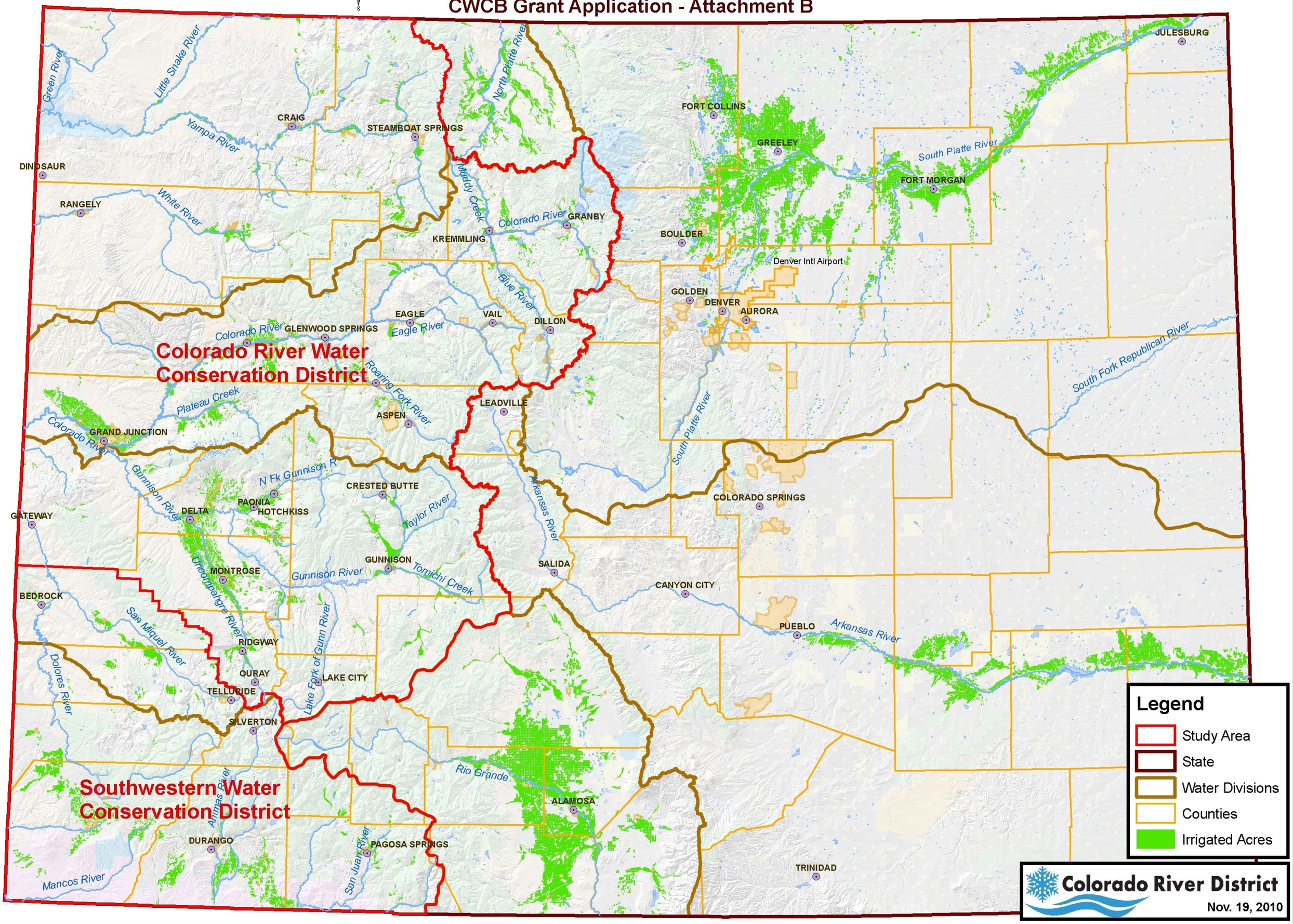
Compact Water Bank Study Area

CWCB Grant Application - Attachment B



The Nature Conservancy
Colorado River Program
2424 Spruce Street
Boulder Colorado 80302

November 17, 2010

Colorado Water Conservation Board
Attn: Todd Doherty
1313 Sherman Street
Denver, CO

Re: CWCB Alternative Agricultural Water Transfer Methods Grant Application for a Colorado River Compact Water Bank

Dear Colorado Water Conservation Board Members:

Please accept this letter of commitment from The Nature Conservancy to contribute **$30,000** in cash and additional in kind to support the above referenced grant application to be submitted by November 26, 2010. This commitment will be effective upon finalization of the grant agreement between the State and the Colorado River District.

We believe that this application is tremendously important to the sustainability of the Colorado River Basin and look forward to strengthening the partnership needed to develop and implement the proposed Water Bank in the State of Colorado. Please feel free to contact me at thawes@tnc.org or 303-541-0322 if you have any questions or require additional specification about this commitment.

Sincerely,

Taylor Hawes
Colorado River Program Director

cc: Tim Sullivan, Acting State Director, The Nature Conservancy of Colorado

SCOPE OF WORK

EVALUATION OF A WATER BANK TO MITIGATE A COLORADO RIVER COMPACT CURTAILMENT FOR STATE OF COLORADO WATER USERS

SPONSORS:

COLORADO RIVER WATER CONSERVATION DISTRICT
COLORADO WATER CONSERVATION BOARD
FRONT RANGE WATER COUNCIL
SOUTHWESTERN WATER CONSERVATION DISTRICT
THE NATURE CONSERVANCY

Prepared in support of a Grant Application associated with the
Alternative Agricultural Water Transfer Program

November 24, 2010

INTRODUCTION

Under the Colorado River Compact of 1922, the States of the Upper Division (Colorado, New Mexico, Utah and Wyoming) are obligated to curtail water uses if they cause the flow at Lee Ferry, Arizona to fall below 75,000,000 acre-feet during any consecutive 10-year period. The recent drought has demonstrated that the curtailment of certain uses in the Upper Division states pursuant to the Compact is a possibility. While the mechanics of the curtailment process are unclear, both within the Upper Division and within any Upper Division state, all parties agree that a curtailment would cause significant social and economic disruption. An informal group composed of representatives of the Colorado River Water Conservation District, Colorado Water Conservation Board (CWCB), Front Range Water Council, Southwestern Water Conservation District, and The Nature Conservancy (the Water Bank Group) is investigating the development of a "Water Bank" that may prevent a compact curtailment, or allow continued water use in the event of a compact curtailment. The water bank would seek to provide a means for pre-compact (pre-1922 and not subject to curtailment) water rights and post-compact reservoir storage to be used to allow critical post compact water rights to continue to divert rather than be curtailed in the event the 10-year running average flow at Lee Ferry, Arizona falls below 75 MAF.

At a conceptual level, the bank would operate as follows. Willing agricultural participants in the Water Bank would temporarily fallow certain lands that are irrigated by pre-1922 water rights. These willing participants would be compensated for the loss of economic value that is incurred while the irrigated lands remain fallow, and the consumptive use of the fallowed land would be available to a Water Bank. Post-1922 water users would "subscribe" to the bank, and thereby gain access to pre-1922 water that would offset or replace water use that would otherwise be curtailed by Colorado River Compact administration. It is anticipated that any land that is fallowed, may be done so on a rotational basis, in conjunction with other irrigated lands. The fallowing may avoid permanent irrigation dry-up, and minimize the economic and environmental impacts that can occur in surrounding communities and economies.

The Water Bank Study described in this Scope of Work is intended to complement and supplement work that will be conducted for the CWCB's "Compact Compliance Strategies Study" (Compliance Study), to the extent possible under the State's confidentiality requirements associated with the Compliance Study. The Water Bank Study will utilize resources and support from the Water Bank Group, non-confidential technical information from the Compliance Study and other sources, and the technical expertise of qualified consultants.

This Scope of Work describes the specific work tasks that will be associated with the Water Bank Study. The scope describes the role of the project sponsors, and the specific work tasks that will be completed by the selected consultants. In addition, a project budget and a completion schedule are defined.

WORK PHASES AND TASKS

The Water Bank Study will be completed in three distinct phases (Table 1). Phase 1 of the study will evaluate the amount of water supplies that may be associated with a Water Bank, and will also evaluate the potential demand for these supplies. Phase 2 of the study will assess the actual on-farm implementation of a water bank for representative pre-1922 irrigation systems. The final phase of the study will assess regional economic and environmental considerations.

Table 1

PHASE 1 - Supply & Demand	PHASE 2 - Test Cases	PHASE 3 - Resource Considerations
WATER SUPPLY AND WATER DEMAND Evaluation of Basin-Wide Scenarios	EVALUATE CANDIDATE IRRIGATION SYSTEMS	ECONOMIC & ENVIRONMENTAL
1.1 Assess Water Supply Scenarios (using various definitions of present perfected rights)	2.1 Define Operational Criteria and Scenarios for the Evaluation of Candidate Irrigation Systems	3.1 Scope and Budget Development for Phase 3
1.2 Quantify Demand Scenarios	2.2 Identify Representative Candidate Irrigation Systems	3.2 Regional Economic Evaluations
1.3 Develop Hydrology / Water Bank Sensitivity Analysis	2.3 Evaluate Candidate Systems (operation, how to fallow, water yield, economics, etc.)	3.3 Environmental Evaluations
1.4 Evaluate Storage Opportunities and Scenarios	2.4 Summary Report	3.4 Findings and Recommendations
1.5 Develop and Apply Scenario Analysis Tool (amount of fallowing required for different demand, storage & hydrology)		
1.6 Summary Report		

The specific work tasks associated with the Water Bank Study are described below. It is anticipated that the three work phases will be implemented sequentially, with each subsequent phase building upon previous information, although it may be desirable to complete portions of the work concurrently.

PHASE 1 – SUPPLY AND DEMAND

It is important to understand the amount of pre-1922 consumptive water use that could be available to a water bank, and to also understand the amount of demand that may be associated with post-1922 water users. Phase 1 of the study will assess regional water

supply and water demand scenarios. Six specific work tasks are planned, culminating in the development a Scenario Analysis Tool. This tool will provide insight into the amount of acreage that must be fallowed, and the duration and frequency of fallowing, that would be required to meet different water demand scenarios. The six work tasks associated with Phase 1 of the study are illustrated in Attachment 1.

Task 1.1 – Assess Water Supply Scenarios

In this task, the Consultant Team will estimate the amount of supply that may be available to a Water Bank under different fallowing scenarios. The specific fallowing scenarios to be addressed will be developed by the Water Bank Group, with the assistance of the Consultant Team. It is anticipated that fallowing scenarios will vary by crop types, type of irrigation system, location of irrigated land, ownership (Federal vs. non-Federal), and other factors.

This work task will largely require a supplemental evaluation and screening of non-confidential information that is developed by the Compliance Study. Specifically, the Consultant Team will be provided the following information from the Compliance Study:

a) The locations of all pre-compact perfected water rights in Water Division 4-7 and the major drainage basins within the Water Division in which they lie;
b) An estimate of the amount of consumptive use (in-volume) of the pre-compact water rights by major basin, individually if appropriate, suitable for transfer or exchange;
c) The type of use and the seasonality or period of use during a year for the rights; and
d) A summary of how much pre-compact perfected water given the current conditions is potentially available to help offset potential curtailments.

The Consultant Team will screen this information for the various fallowing scenarios that are defined by the Water Bank Group. The product of this task will be a quantification of the water supply that is potentially associated with each fallowing scenario, and mapping of candidate areas for fallowing.

This work task will require an estimate of pre-1922 consumptive use versus post-1922 consumptive use for ditch systems with combined water rights. The Consultant Team will coordinate with the CWCB to obtaining water right and irrigation data for pre-1922 water rights (CDSS).

In addition to providing direction as outlined above, the Water Bank Group will be responsible for the review of work task products of the Consultant Team.

Task 1.2 – Quantify Demand Scenarios

A Water Bank may supply water for critical purposes only. During a Compact Curtailment, use of water will not continue in a normal pattern. The quantification of critical uses is necessary to evaluate the operation of a Water Bank. Critical uses may be defined in several ways. One option would determine uses that qualify for participation (e.g. in-house use, orchards, substantial economic loss) and only provide Water Bank supplies to those uses. Another option would consider a certain percentage of an existing municipal or industrial use as critical and the Water Bank would only provide supplies up to that percentage.

The objective of this task is to quantify the potential demands of post-1922 water users on a scenario basis. The demand scenarios will be developed and finalized by the Water Bank Group, with the assistance of the Consultant Team. It is anticipated that the demand scenarios may differentiate between critical water use categories, or other factors. For example, one demand scenario may only consider the amount of water required to protect supplies for basic health and safety needs. Another demand scenario may consider the amount of water required to operate power plants and other critical economic uses, while another scenario may additionally supply irrigation water to public parks. The scenarios will include options that use native water within the Arkansas and South Platte basins to supply some of the critical demands of East Slope water users.

The Consultant Team will be responsible for quantifying water demands for each identified scenario. The Water Bank Group will provide the Consultant Team with pertinent information regarding water demands from internal planning studies of the stakeholders, to the extent that such information is available. In addition, water demand estimates developed through the Compliance Study (to the extent that this information is not confidential) will be reviewed and considered by the Consultant Team. As with the Compliance Study, the Consultant Team will summarize demand information by Water Division and by the major drainage basins in each Water Division.

The Water Bank Group will be responsible for review of work task products of the Consultant Team.

Task 1.3 – Develop Hydrology / Water Bank Sensitivity Analysis

In this task, the Consultant Team will work with the Water Bank Group to complete a sensitivity analysis for the frequency and duration of use of the Water Bank. This task will rely upon existing hydrologic studies (Reclamation's Hydrologic Determination, Compliance Study, etc.), and the development of additional hydrology information will not be extensive. Scenarios will be defined regarding the duration, magnitude, and frequency in which a Water Bank may be used. This information will be used in the Scenario Analysis Tool (Task 1.5).

Task 1.4 – Evaluate Storage Opportunities and Scenarios

Water storage may be advantageous to a Water Bank in several ways. First, access to reservoir capacity may allow the storage and accumulation of pre-1922 water prior to the time that a curtailment occurs. Second, pre-1922 water (or yield) that is stored in existing reservoirs may be available for lease while a curtailment is occurring.

The Consultant Team will identify potential storage opportunities by location, volume and yield (if any). Assuming that water stored in reservoirs (either pre or post Compact water rights) when a curtailment begins does not have to be released to meet the curtailment, the Consultant Team will evaluate selected reservoirs identified in the Colorado River Water Availability Study and the Compliance Study for potential use in the Water Bank. Only those storage options that are judged to provide a substantial benefit will be assessed. It is estimated that no more than 20 individual reservoirs will be evaluated. This task will be coordinated with the storage assessment that is currently being conducted by the Front Range Water Council.

The Consultant Team will develop and recommend a reasonable range of storage scenarios. An amount of storage space available to store pre-1922 water, and an amount of storage water available for lease, will be quantified for each scenario.

The Water Bank Group will be responsible for review of work task products.

Task 1.5 – Develop and Apply a Scenario Analysis Tool

The Consultant Team will develop an interactive Scenario Analysis Tool. The tool will allow the evaluation of the specific supply, demand, curtailment, and storage scenarios that are developed in Tasks 1.1 through 1.4. An example application of the tool is as follows. The tool will allow the selection of a given demand scenario (type of use to be protected), the selection of a curtailment scenario (frequency and duration of curtailment), and the selection of storage options (available space and yield available

for lease). The tool will then calculate and illustrate the amount of acreage, the crop types, and the duration of fallowing that would be required for these assumptions.

This tool is intended for planning purposes only and is not anticipated to be a detailed modeling exercise. The tool may be similar in detail to the Portfolio tool that has been developed for use by the CWCB.

The Consultant Team will apply the tool to estimate the fallowing and storage required to satisfy the demand and curtailment scenarios.

The Water Bank Group will be responsible for review of work task products.

Task 1.6 – Develop and Apply A Scenario Analysis Tool

The Consultant Team will prepare a Draft and Final Report summarizing results of the above work. The Water Bank Group will provide a timely review of a draft report.

PHASE 2 – TEST CASES

Phase 2 of the project will begin once Phase 1 has been completed. In this phase, an on-farm level evaluation of approximately 10 candidate irrigation systems will be completed. The work tasks associated with Phase 2 of the study are illustrated in Attachment 2.

Task 2.1 - Define Operation Criteria and Scenarios for the Evaluation of Candidate Irrigation Systems

Under this task, the Consultant Team will summarize and recommend operational scenarios to be applied to candidate irrigation systems. In order to complete this task, the Water Bank Group will provide direction to the Consultant Team regarding important regulatory, legal and operational conditions to consider in the evaluation.

Task 2.2 - Identify Representative Candidate Irrigation Systems

The Consultant Team will screen the irrigated areas evaluated in Task 1.1, and identify up to ten representative candidate irrigation systems for detailed evaluation. The candidate systems will represent a range of locations, crop types, and irrigation systems (i.e. sprinkler, flood). The Water Bank Group will provide review, comment and direction regarding the specific candidate systems.

Task 2.3 - Evaluate the Candidate Irrigation Systems

An evaluation of crop fallowing for each of the candidate systems will be completed. The evaluation will focus on water yield, replanting options, and administrative and regulatory issues. The following information will be developed for each system:

a) Quantify the pre-1922 consumptive use
b) Evaluate how the land would temporarily not be irrigated
c) Estimate costs of fallowing and replanting
d) Review physical and legal availability of water in priority during a curtailment
e) Review administration and operation within the irrigation system if all shareholders in the ditch join and if not all join

Task 2.4 - Summary Report

The Consultant Team will prepare Draft and Final Report summarizing results. The Water Bank Group will be responsible for the timely review of work task products.

PHASE 3 – REGIONAL CONSIDERATIONS

Phase 3 of the project will begin once Phase 2 has been completed. For Phase 3, regional economic and environmental evaluations will be completed for the overall water banking scenarios that were evaluated in Phase 1 of the study. The work tasks associated with Phase 3 of the study are illustrated in Attachment 3.

Task 3.1 – Scope and Budget Development for Phase 3

The Consultant Team will complete a scope of work and budget for Phase 3. The Water Bank Group will be responsible for review of work task products.

Task 3.2 - Regional Economic Evaluations

Under this task, the Consultant Team will complete a regional economic evaluation of the key water bank scenarios that were evaluated in Phase 1 of the study. Sub-tasks include evaluating the local and regional economic value of the crops to be fallowed, an estimation of costs that would incur to pre-1922 users participating in the bank, and potential costs to post-1922 subscribers. Specific items to be assessed include:

- An estimate of economic value of crop to local area during curtailment

- The impact of temporary dry up on local economy
- An estimate of cost for pre-1922 users to participate in water bank
- An evaluation of range of value of water to post-1922 water users

The Water Bank Group will be responsible for review of work task products.

Task 3.3 - Environmental Evaluations

During a compact curtailment, it is likely that water use and diversions will be restricted, and that stream flow will increase in many areas in Colorado. However, the operation of a Water Bank may provide additional opportunities to enhance environmental conditions. The Consultant Team will work with the Water Bank Group to identify important environmental resources for protection or enhancement (resource, location, requirements, etc.). The Consultant Team will evaluate opportunities to maintain or enhance these important environmental resources through the operation of a Water Bank. This work will specifically review the affect of a water bank upon identified threatened and endangered species within the State of Colorado.

Task 3.4 - Findings and Recommendations

A draft and final report that summarizes findings and recommendations of the study will be prepared. The Water Bank Group will be responsible for the timely review of work task products.

PROJECT COSTS AND SCHEDULE

The Water Bank Group proposes to fund this study with assistance from an Alternative Agricultural Water Transfer Program grant. Total costs, excluding portions of Phase 3, are estimated at $300,000 (Table 2). Of this total, $120,000 in funds would be provided by the Colorado River District, the Southwestern Water Conservation District, the Front Range Water Council and the Nature Conservancy ($30,000 each). An additional $180,000 would be supplied from an Alternative Agricultural Water Transfer Program grant.

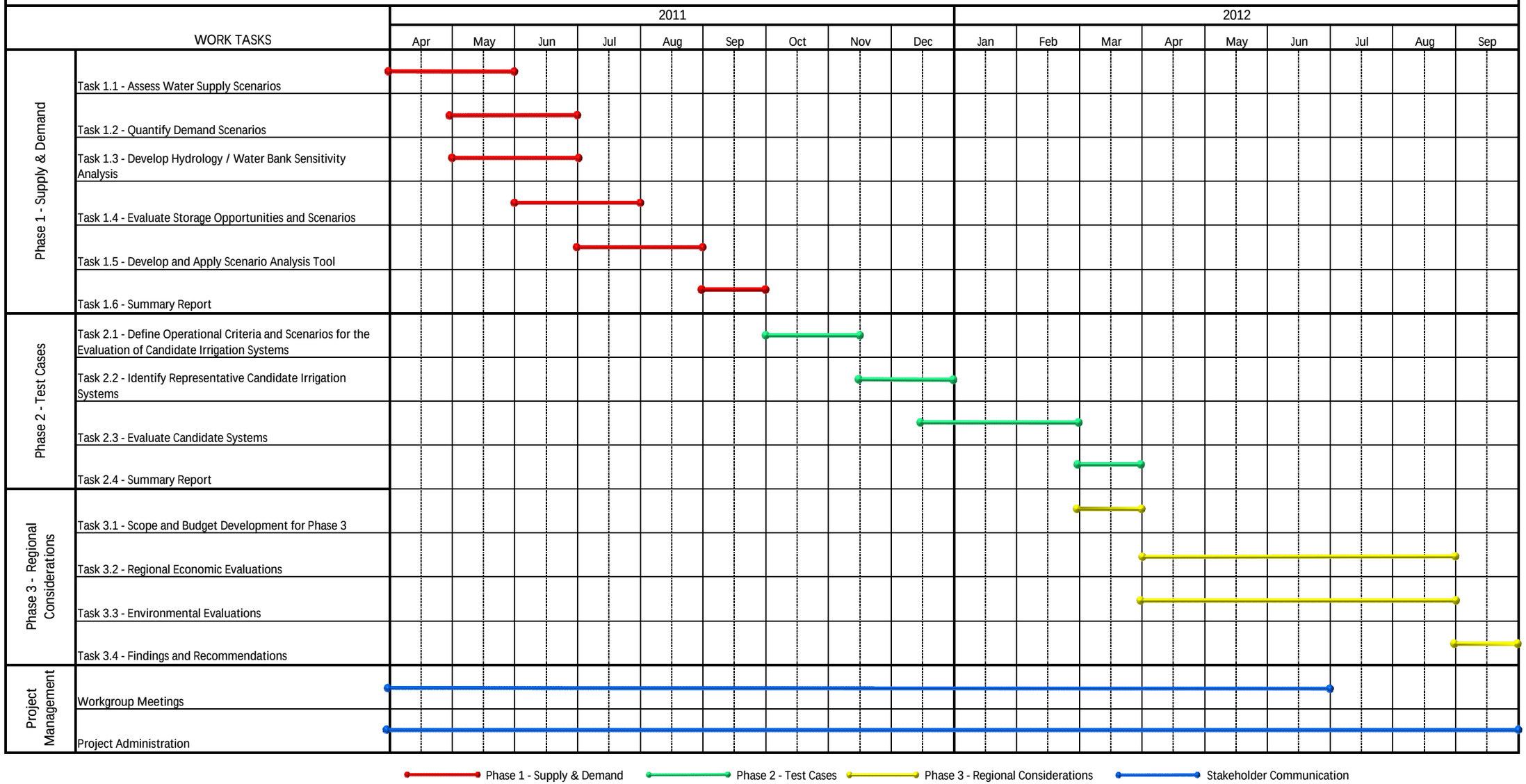
Table 2
Project Costs
Water Bank Study

Work Tasks		Cost
Phase 1 - Supply & Demand		
Task 1.1 - Assess Water Supply Scenarios	$	55,000
Task 1.2 - Quantify Demand Scenarios	$	45,000
Task 1.3 - Develop Hydrology / Water Bank Sensitivity Analysis	$	15,000
Task 1.4 - Evaluate Storage Opportunities and Scenarios	$	20,000
Task 1.5 - Develop and Apply Scenario Analysis Tool	$	20,000
Task 1.6 - Summary Report	$	15,000
Phase 1 Total =	$	170,000
Phase 2 - Test Cases		
Task 2.1 - Define Operational Criteria and Scenarios for the Evaluation of Candidate Irrigation Systems	$	20,000
Task 2.2 - Identify Representative Candidate Irrigation Systems	$	20,000
Task 2.3 - Evaluate Candidate Systems	$	60,000
Task 2.4 - Summary Report	$	15,000
Phase 2 Total =	$	115,000
Phase 3 - Regional Considerations		
Task 3.1 - Scope and Budget Development for Phase 3	$	15,000
Task 3.2 - Regional Economic Evaluations		TBD
Task 3.3 - Environmental Evaluations		TBD
Task 3.4 - Findings and Recommendations		TBD
Phase 3 Total =	$	15,000
Total Project Cost =	$	300,000

The project stakeholders intend to complete Phase 3 of the study upon successful results from the first two phases of the work. Funding options for the Phase 3 portions of the study have not yet been identified. The water bank study outlined herein will develop a

scope and budget for the completion of Phase 3 work (Task 3.1). In addition, funding alternatives for Phase 3 will be identified. The proposed implementation schedule for the entire study is provided in Table 3 attached.

Table 3
Preliminary Project Timeline
Water Bank Study



ATTACHMENT 1

PHASE 1 - Supply & Demand	WATER BANK GROUP		CONSULTANT TEAM
WATER SUPPLY AND WATER DEMAND Evaluation of Basin-Wide Scenarios	CWCB	WEST SLOPE USERS, EAST SLOPE USERS & TNC	
1.1 Assess Water Supply Scenarios (using various definitions of present perfected rights)	1. Provide water right and irrigation data for pre-1922 Water Rights (CDSS) Mapping of irrigated areas Crop types CU estimates of pre-perfected rights 2. Review of Work Task Products	1. Define Water Supply / Fallowing Scenarios. Provide direction to consultant regarding determination of pre-22 vs post-22 C.U. Crop types Location Type of Ditch System Ownership etc. 2. Review of Work Task Products	1. Screen and assess CDSS data, and develop water supply estimates by fallowing scenarios developed by stakeholders 2. Estimate pre-22 C.U. vs post-22 C.U. for ditch systems with combined rights
1.2 Quantify Demand Scenarios (by critical use categories, % of existing demand, etc.)	1. Review of Work Task Products	1. Define Demand Categories and Scenarios to be Considered by Consultant (West & East Slope Users) 2. Quantify East Slope Demand by Scenario (East Slope Users) 3.Review West Slope Demands Quantified by Consultant (West Slope Users) 4. Review of Work Task Products	1. Quantify West Slope Demand by Category 2. Review and Modify East Slope Demands provided by FRWC 3. Summarize Total Demands by Category and Scenario (West and East Slope Demands)
1.3 Develop Hydrology / Water Bank Sensitivity Analysis	1. Provide curtailment information from Compact Compliance Study & Other Sources 2. Review of Work Task Products	1. Identify Scenarios regarding need for Water Bank from Existing Information (Hydrologic Determination, Compliance Study, etc.) Frequency Duration Volume	
1.4 Evaluate Storage Opportunies and Scenarios	1. Review of Work Task Products	1. Review of Work Task Products	1. Identify Potential Storage Options Location Volume (space) Yield (if any) 2. Define Storage Scenarios for Use in Analysis Tool (storage of pre-22's prior to curtailment, lease of storage yield after curtailment, etc.)
1.5 Develop and Apply Scenario Analysis Tool (amount of fallowing required for different demand, storage & hydrology)	1. Review of Work Task Products	1. Review of Work Task Products	1. Develop Interactive Assessment Tool 2. Evaluate fallowing required to meet identified hydrology, demand, and storage scenarios
1.6 Summary Report	1. Review of Work Task Products	1. Review of Work Task Products	1. Prepare Draft and Final Report Summarizing Results

ATTACHMENT 2

PHASE 2 - Test Cases	WATER BANK GROUP		CONSULTANT TEAM
EVALUATE CANDIDATE IRRIGATION SYSTEMS	CWCB	WEST SLOPE USERS, EAST SLOPE USERS & TNC	
2.1 Define Operational Criteria and Scenarios for the Evaluation of Candidate Irrigation Systems	1. Provide direction to Consultant regarding important regulatory, legal and operational conditions to consider new regulations required Water Court options duration of fallowing etc.	1. Provide direction to Consultant regarding important regulatory, legal and operational conditions to consider new regulations required Water Court options duration of fallowing etc.	1. Recommend and summarize operational scenarios to be applied to candidate irrigation systems
2.2 Identify Representative Candidate Irrigation Systems	1. Review Consultant Product	1. Review Consultant Product	1. Screen irrigated areas and identify representative candidate irrigation systems location crop type of system etc.
2.3 Evaluate Candidate Systems (operation, how to fallow, water yield, economics, etc.)	1. Review Consultant Product	1. Review Consultant Product	1. Conduct and Document Evaluation of Candidate Systems yield / supply replanting administrative & regulatory issues etc.
2.4 Summary Report	1. Report Review	1. Report Review	1. Prepare Draft and Final Report Summarizing Results

ATTACHMENT 3

PHASE 3 - Regional Considerations	WATER BANK GROUP		CONSULTANT TEAM
ECONOMIC & ENVIRONMENTAL	CWCB	WEST SLOPE USERS, EAST SLOPE USERS & TNC	
3.1 Scope and Budget Development for Phase 3	1. Review Consultant Product	1. Review Consultant Product	1. Develop Scope and Budget for Phase 3
3.2 Regional Economic Evaluations	1. Identify Regional Fallowing Scenarios for Economic Evaluation 2. Review Consultant Product	1. Identify Regional Fallowing Scenarios for Economic Evaluation 2. Review Consultant Product	1. Complete Economic Evaluation of Identified Scenarios Local & Regional Economic Evaluation On-Farm Economics: Estimate Cost to Pre-1922 Users Cost to Post-1922 Subscribers
3.3 Environmental Evaluations	1. Review Environmental Resources and Consultant Product	1. Identify Important Environmental Resources for Protection or Enhancement (resource, location, requirements, etc.) 2. Review Consultant Product	1. Evaluate Opportunity to Enhance Identified Environmental Resources with Water Bank including reservoir operations 2. Evaluate Potential Permitting Requirements
3.4 Finding and Recommendations			1. Summary Findings and Recommendations

THE SOUTHWESTERN WATER CONSERVATION DISTRICT
Developing And Conserving the Waters in the
SAN JUAN AND DOLORES RIVERS AND THEIR TRIBUTARIES
IN SOUTHWESTERN COLORADO

West Building – 841 East Second Avenue
DURANGO, COLORADO 81301
(970) 247-1302 – Fax (970)259-8423

November 23, 2010

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

Re: River District "Alternative Agricultural Transfer Methods" Grant Application

Dear Todd:

The Southwestern Water Conservation District (SWCD) is supportive of the Colorado River Water Conservation District (CRWCD) application to the CWCB for an "Alternative Agricultural Transfer Methods" grant. SWCD has been involved with the CRWCD, The Nature Conservancy, State of Colorado, and the Front Range Water Council since the initiation of the Colorado River Compact Water Bank concept. SWCD is a partner with the other entities in the Compact Water Bank and will provide in-kind services and has budgeted its share of the matching funds for the grant in fiscal year 2011.

Please contact SWCD office if you have any questions.

Sincerely,

John Porter

John Porter, President
SWCD Board of Directors

Front Range Water Council
220 Water Avenue
Berthoud, CO 80513

November 24, 2010

Mr. Todd Doherty
Water Supply Planning Section
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, CO 80203

Subject: Alternative Agricultural Water Transfer Grant – Colorado River Compact Water Bank Study Proposal

Dear Mr. Doherty:

The Front Range Water Council has recently joined the ongoing efforts of the Colorado River Water Conservancy, the Southwestern Colorado Water Conservancy District, the Nature Conservancy, and the state of Colorado in exploring a water banking arrangement for the Colorado River water users to help lessen potential impacts from water use curtailments under the Colorado River Compact.

We believe the water bank study will aid in planning for a reliable, long-term water supply for the state of Colorado. We support the proposed study of options to reduce the potential effects of curtailment and to provide a reliable supply of water to critical uses that depend on water from the Colorado River. We also support the effort to explore alternative means to temporarily transfer agricultural water to municipal uses, providing benefits for both interests.

The water bank study is intended to compliment and supplement two other studies: (1) the CWCB Compact Compliance Study, and (2) a joint investigation of the Gunnison and Arkansas Roundtables. The scope of work for the Roundtable effort is under development and has not yet been completed. It may be appropriate to modify and update the proposed water bank scope of work to ensure that all work is completed in the most efficient manner possible, and to ensure that none of the proposed work tasks are redundant with other study efforts. We ask that these three related studies be coordinated, at the state level, with the Seven Basin States' Colorado River Study to understand the best arrangements available to Colorado and its water users.

The FRWC requests that the CWCB provide the $180,000 grant for the proposed water banking study. The FRWC commits to provide $30,000, to be combined with the $90,000 in commitments from the three other study partners, for a total of $300,000 to be used for the water bank study. The FRWC also commits in-kind services of its members through participation in the study.

Sincerely,

Mark Pifher, Chairman
Front Range Water Council

Members – City of Aurora; Colorado Springs Utilities; Denver Board of Water Commissioners; Municipal Subdistrict, Northern Colorado Water Conservancy District; Northern Colorado Water Conservancy District; Pueblo Board of Water Works; Southeast Colorado Water Conservancy District; Twin Lakes Reservoir & Canal Company