The Nature Conservancy
Protecting nature. Preserving life.™

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

November 23, 2010

Re: The Nature Conservancy's application to CWCB's Alternative Agricultural Transfer Method Grant Program

Dear Mr. Doherty,

This cover letter briefly summarizes the joint application by The Nature Conservancy, Trout Unlimited, and Community Agriculture Alliance (collectively, "Project Team") to CWCB's Alternative Agricultural Transfer Method Grant Program. The Project Team, in conjunction with Colorado State University, proposes to investigate fallowing high elevation irrigated hay meadows in the Yampa River basin. Irrigation water consumptively used during the production of hay from high-elevation mountain meadows in Colorado is being sought for alternative uses such as municipal, industrial, or environmental. The proposed project's goal is to make water available for alternative uses while minimizing impacts to local hay producers by investigating the feasibility of rotationally fallowing mountain hay meadows. Unlike studies that have investigated fallowing in annual cropping systems, the perennial forages in these hay meadows will have to go dormant or semi-dormant during the year of fallow and then be able to recover to a productive state when water is reapplied. The proposed project will investigate the agronomic implications of fallowing on forage yield and quality, changes in species composition (especially weed invasion), and changes in soil nutrient status. Although this study will be conducted in Routt County, the results should be applicable to other high-elevation regions in Colorado. The Colorado River Water Conservation District also supports this study in concept and with a generous financial commitment to help cover some of the costs of the proposed project.

Please feel free to contact me directly with any questions about the Project Team's application.

Sincerely,
Adam Bergeron

COLORADO WATER CONSERVATION BOARD

ALERNATIVE AGRICULTURAL WATER TRANSFER METHODS COMPETITIVE GRANT PROGRAM

GRANT APPLICATION FORM

Rotational Fallowing as a Means of Reducing Consumptive Water Use from Irrigated Mountain Hay Meadows – Yampa River Basin

Program/Project Name

River Basin Name

$214,282

Amount of Funds Requested

$98,703

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.

Alternative Agricultural Water Transfer Methods – Grant Application Form
October 2010

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

1. Applicant Name(s): The Nature Conservancy

Mailing address:
The Nature Conservancy
2424 Spruce Street
Boulder, CO 80302

Taxpayer ID#: 53-0242652 Email address: abergeron@tnc.org

Phone Numbers: Business: 720-974-7032
Home:
Fax: 303-444-2986

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

Name: Adam Bergeron

Position/Title Water Project Director

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

4. 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 Nature Conservancy is a 501(c)(3) non-profit founded in 1951. Adam Bergeron, Water Project Director for the Colorado chapter of The Nature Conservancy, will be the official contact for the applicant. Adam Bergeron's contact information is as follows: (address) 2424 Spruce Street, Boulder, CO 80302; (phone) 720-974-7032.

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.

The Nature Conservancy is not a water supplier.

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 Nature Conservancy is a non-profit organization working around the world to protect ecologically important lands and waters for nature and people. The Conservancy has more than one million members and over 3,000 staff worldwide. We receive millions of dollars each year from individuals, foundations and government grants to work on water issues all across the globe. We have internal grant administration capacity and will use that expertise to ensure timely compliance with all aspects of the grant should we be awarded the grant.

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

As mentioned above, The Nature Conservancy has been in operation since 1951, and has grown from a small non-profit into an organization that works in 30 countries and all 50 states in the U.S. The Conservancy has protected more than 119 million acres of land and 5,000 miles of river worldwide, and operates more than 100 marine conservation projects globally. The Conservancy pursues non-confrontational, pragmatic solutions to conservation challenges, and roots our decisions in good science.

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

There are no Tabor issues relevant to this funding request.

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.

Previous Studies
To the maximum extent possible, the results of any previous studies and investigation should be utilized and incorporated into the proposed program/project. The application for funding should include a brief summary of the results of previous studies and how they will be utilized.

The Nature Conservancy ("TNC"), the Community Agriculture Alliance ("CAA") and Trout Unlimited ("TU") (collectively, "Project Team"), with support from the Colorado River Water Conservation District ("River District"), propose to evaluate rotational fallowing of high-elevation Yampa River Basin hay meadows to make irrigation water available for transfer to other uses. The project will evaluate the productivity of irrigated land following a fallow. Researchers from Colorado State University will be responsible for conducting the majority of the project, with assistance from the Project Team on various aspects of the project.

The Project Team and the River District are committed to the maintenance of irrigated agriculture in the Yampa River Basin and around the State of Colorado. The Project Team believes that rotational fallowing can be a viable tool for creating conditions conducive to the continuation of productive and profitable agricultural operations. As demands for water in Colorado for municipal, industrial, environmental and recreational uses grow, market forces are causing agricultural producers to sell irrigation water rights and retire agricultural operations. Using rotational fallowing, however, agricultural producers can take advantage of the increasing value of irrigation water while continuing to irrigate historical acreage. In this case, agricultural operations continue and the producer receives payment for making some amount of irrigation water available for an alternative use. The payment for transferred water can create diversified income streams and increased financial security for the agricultural producer.

The proposed project will keep water saved as a result of fallowing in-stream. As such, the Project Team expects that the unused water will provide some environmental benefit. Indeed, the Project Team's interest in this project stems, in part, from the belief that rotational fallowing, if it proves to be feasible at high elevation, could be used to free up consumptive use ("CU") water for transfer to non-consumptive, in-channel environmental or recreational purposes. Such transfers would benefit fish and wildlife, outdoor recreation, the tourism and recreation economies and overall quality of life. The Yampa River Basin non-consumptive needs assessment recognizes that stream flows for environmental and recreational purposes are increasingly important

in the Yampa Valley, and maintaining and improving stream flow conditions is a high priority for the Project Team. The Project Team believes that agriculture, environmental conservation and recreation are compatible, and we are excited about using this project as an opportunity to promote the common interests among those uses.

While the Project Team has an interest in transferring water to in-stream uses, it is not our intent to use this study for promoting transfer of large quantities of irrigation water to non-consumptive uses. Rather, we view rotational fallowing as a possible method for making small quantities of irrigation water available for transfer to in-stream uses in select locations where it might be most valuable, such as in smaller order streams where the addition of a small amount of water could yield large environmental benefits. Further, it is unlikely that formal in-stream flow protections will attach to the CU water saved as a result of the fallows contemplated for our study. While we will discuss with the CWCB stream and lake protection staff the possibility of making formal arrangements for the state to use the water for temporary in-stream flow rights as well as consider opportunities to market the water for downstream consumptive uses, it is more likely that the small amount of water saved in our study will simply be available for diversion by the next downstream water user.[1]

Though our primary interest is in making water available for in-stream uses, the project is equally relevant to more traditional consumptive uses of water. First, as a legal matter, if a particular fallowing arrangement is capable of making CU water available for transfer to environmental or recreational flows, the same water savings method should be capable of making CU water available to other uses as well. Second, under certain arrangements where irrigation water is transferred to an in-stream use, it may subsequently be transferred to a more traditional consumptive use further downstream.

In the first phase of this project, for which we are currently seeking funding, we will evaluate the effect of fallowing on land productivity after it is returned to irrigation. The project will be undertaken at three sites within the Yampa River Basin. Parcels of land at each of the three test sites will be assigned one of four treatments: (1) control - irrigation continued as usual; (2) fallow in year one, resume irrigation in years two and three; (3) fallow in years one and two, resume irrigation in year three; and (4) irrigate in year one, fallow in year two, irrigate in year three. With this treatment structure, only half of the total plot area will be fallowed in years one and two. In year three, all treatments will be irrigated which will provide a good measure of cumulative effects from the different fallow treatments.

The condition of the parcels will be documented before, during, and after fallowing with particular attention given to changes in species composition and possible encroachment of weeds. After a meadow is returned to irrigation, we will measure its productivity compared to pre-fallowing conditions. Productivity will be measured for several years after irrigation resumes to document any residual effects associated with fallowing. One hypothesis is that there will be increased levels of nutrient mineralization during the year of fallowing which will help offset losses in productivity and reduce the amount of commercial fertilizer needed in subsequent years. Based on our findings, we will develop recommendations for treatment of meadows before, during, and after fallowing to minimize any negative changes in productivity, forage quality, and weed abundance that will affect landowners over time.

[1] Our reason for believing that the water will not be marketed to the CWCB or others is that, at this stage of our study, our intent is to look only at the agronomic effects of a fallow, and not at the specific quantities of water that might be marketable as a result of fallowing. As discussed below, our hope is to analyze the quantity of marketable water resulting from fallowing in a subsequent phase of the study.

Understanding the impacts of rotational fallowing on the productivity of high-elevation hay meadows is especially important because of the amount of irrigation water on the west slope dedicated to this use. In the Yampa and other high-elevation valleys in Colorado, hay production is the predominant agricultural endeavor, and water rights connected to hay meadow irrigation control the vast majority of water. Before rotational fallowing of high-elevation hay meadows can be seriously considered as a method for freeing up CU water for transfer to other uses, it is critical to study the effects of such arrangements on meadow productivity. Thus, the three test sites in our study will be selected to ensure that the results will be representative of working hay operations both within and outside of the Yampa Basin.

This project will build upon studies funded through the CWCB's 2008 Alternative Agricultural Transfer Methods grant program. Several of these studies address rotational fallowing of lower elevation lands within the Arkansas and South Platte River Basins. One study in the Arkansas River Basin is investigating bringing currently fallowed land back into annual crop production and maintaining a crop-fallow rotation as a means of water savings (Cabot et al. 2010). Another study in the lower South Platte River Basin is investigating a number of potential water-saving cropping systems with primary emphasis on annual crops (Hansen et al. 2010). In these annual cropping systems, the South Platte study found that surface evaporation makes fallowing an inefficient approach to water savings and similar amounts of annual water savings could be achieved while producing a low-cost, dryland crop.

While the CWCB's Alternative Agricultural Transfer Methods grant program has funded studies of rotational fallowing of lower elevation agricultural operations, more study is needed to understand the effects of fallowing on higher elevation meadows populated by perennial plants. In the perennial hay meadows that we propose to study, the plants will remain in either a dormant or semi-dormant state. Additionally, there is typically an accumulation of plant residue (litter) on the soil surface which should minimize evaporative losses during fallowing, which proved to be an issue in the aforementioned South Platte study. The South Platte study was also done under sprinkler irrigation which is much more efficient compared to the type of flood irrigation practiced in the high-elevation mountain hay meadows. Therefore, rotational fallowing in these mountain hay meadows may potentially impact both in-stream and return flows to a greater extent.

A search of the relevant literature revealed no studies that investigated rotational fallowing of irrigated perennial grass hay meadows as a means of saving consumptive use water. Observations by Dr. Joe Brummer (CSU) during the drought of 2002 indicate that the perennial plants within these high-elevation hay meadows are very resilient. Because of the low snowpack in 2002, many meadows either received limited irrigation or no irrigation at all. Some meadows never even greened up, but remained dormant through the growing season. Although hay yields were depressed slightly in 2003, the plants in these meadows responded when irrigation water was applied the year following drought. These observations provide evidence that rotational fallowing may be a viable option for saving consumptive use water in these high-elevation systems.

In future years, we hope to fund and complete two additional phases of this study. The second phase of the study would evaluate the amount of water that could be made available for transfer to other uses through rotational fallowing within the confines of Colorado law. This second phase would focus on developing methods for demonstrating and documenting the amount of CU savings fallowing produces and would similarly address methods for assuring maintenance of return flows to which other water users are entitled. The third phase of the study would examine the economics associated with fallowing. The water transfers contemplated here will not occur if they are not in the economic interest of the agricultural water right holder. Thus, the

second and third phases would assess whether, and the extent to which, fallowing methodologies impact the profitability of agricultural operations, taking into account changes in productivity identified in the first phase of the study.

2. Study Area/Service Area Description

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 proposed project will be conducted in conjunction with private land hay producers at three sites within the Yampa Valley. While the exact locations are yet to be determined, the study will focus on high-elevation sites within the Upper Yampa Valley in Routt County. Test sites will likely lie at elevations between 7,000 and 9,000 feet and will be located adjacent to and receive irrigation water from tributaries of the Yampa River, rather than the river itself. Possible tributaries include the Elk River, Bear River, Oak Creek and Trout Creek.

The areas chosen will be representative of irrigated mountain hay meadows found not only within the Yampa River Basin, but also other high-elevation basins throughout Colorado. Mountain hay meadows are typically located either in the floodplain or on benches above the floodplain of the adjacent stream/river system. The close proximity of the meadows to the stream/river system makes it relatively easy to divert water for irrigation. Irrigation water is typically delivered to these meadows through an earthen ditch which in turn feeds a series of smaller earthen ditches that have been installed on the contour within a meadow. These smaller ditches are dammed periodically with simple plastic tarps which cause the water to overflow and spread out across the meadow. This form of irrigation is often referred to as "wild flood". Of all the forms of irrigation, this method has the lowest efficiency of application, ranging from 20 to 30%. Very few meadows are irrigated using higher efficiency systems such as gated pipe with furrows or sprinklers. The general topography of these meadows ranges from flat to gently sloping. Within a given meadow, the micro-topography can be quite diverse ranging from high spots which are difficult to wet to low spots where water accumulates. This diversity in micro-topography occurs because most meadows have never been leveled.

Even though this form of irrigation is relatively inefficient, it tends to work well in these high-elevation systems. Large amounts of water are diverted from the stream/river system relative to the amount consumptively used by the plants. However, the majority of the water diverted is either picked up in tailwater ditches and applied to meadows farther downstream or rather quickly returns (within 2 to 4 weeks) to the system because of the close proximity of most meadows to the point of diversion (Kindquist 1996, Smith et al. 1998, Yampa Ag Water Needs Assessment Draft 2010). The porous soils which are characteristic of most mountain hay meadows also contribute to the relatively quick return flows.

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.

A map depicting the location of irrigated hay meadows in Routt County, including candidate tributaries to the Yampa River that may serve as the location for test sites, is attached as Figure 1.

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.

The primary agricultural enterprise in the Yampa River Basin is livestock production, which is supported by locally grown forages in the form of both pasture and hay. Approximately half of the irrigated acreage in the Yampa Basin is used to grow pasture for grazing while the other half is used to grow hay to support animals during the long winter feeding period. There are also producers that do not have their own livestock and grow hay exclusively for sale. For purposes of estimation, we used numbers from the Colorado Agricultural Statistics report for Routt and Moffat Counties even though the Water District boundaries do not line up exactly with the county boundaries. Based on estimates of mountain meadow hay (Other hay category in the Colorado Agriculture Statistics report) production in 2009 for Routt and Moffat Counties, there were approximately 42,900 acres of irrigated grass hay produced (Meyer and Ott 2010). This estimate does not include any irrigated alfalfa acreage. These irrigated hay meadows are comprised primarily of mixtures of native and introduced grasses such as smooth brome, orchardgrass, common meadow foxtail, quackgrass, and Kentucky bluegrass with minor amounts of red and alsike clovers. The average hay yield was 1.65 and 1.80 tons per acre in Routt and Moffat Counties, respectively, in 2009 (Meyer and Ott 2010). Typically, irrigation efficiency in these high-elevation mountain hay meadows is relatively low (20 to 30%) with about 4 acre-feet of water diverted per acre on average (Smith et al. 1998). Therefore, the total annual diversion associated with the 42,900 acres of hay produced in 2009 would be approximately 172,000 acre-feet.

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.

As discussed above, the proposed project is designed to address the discrete question of the effect of rotational fallowing on productivity of high mountain hay meadows. We will consider the possibility of marketing, on a temporary basis, the CU savings that result from the fallows to either the CWCB's stream and lake protection section or other downstream consumptive water users. Such arrangements would be considered after the locations of our test sites are identified and discussions are initiated with CWCB staff and/or other water users. However, marketing will not be a focus of this phase of the study.

We plan to analyze the amounts of water made available through the fallowing during a later phase of the study, and would focus more on marketing CU water at that time.

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

In 2010, approximately 33,000 people live in Routt and Moffat Counties (Routt 20,000 and Moffat 13,000). Historically, residents have made their living from mining, agriculture, and tourism. While the economy has changed over the years, these industries are still vital to the area. Moffat County's economy has not diversified as much as Routt's over the last 20 years. In terms of property tax collections, most of Moffat County's top businesses are energy related (coal, natural gas, pipelines, and electricity). Routt County's top ten property tax collections include coal, electricity, skiing, and recreational development. Other industries in the counties include medical services, construction, wildlife services, food services, and transportation, to name a few.

Agriculture is a small part of each county's gross economy, but is the largest business in terms of acres of land used. There are approximately 32,000 head of cows in both counties and 83,000 acres of hay was harvested in 2008. About half of those acres were used to produce irrigated mountain meadow grass hay which is the focus of the proposed study. The rest was in dryland grass hay production or irrigated/dryland production of alfalfa hay. Approximately 70% of the land in both counties is available for livestock grazing. The gross market value of agricultural products for both counties was approximately $62 million dollars in 2008.

The Yampa River is the main waterway for both counties. The Yampa is considered one of the least developed water basins in the state.

Historic western ranching culture is still prominent in the social characteristic of both counties.

3. 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.

The alternative water transfer method that we propose to investigate is rotational fallowing. This method of consumptive water use savings is currently being evaluated in the Arkansas River Basin in a corn-based annual cropping system (Cabot et al. 2010) and in the South Platte River Basin utilizing various annual crops in rotation with fallow (Hansen et al. 2010). However, it has not been tested in high-elevation hay meadows that contain a diverse array of perennial forage species. Compared to annual cropping systems, these perennial systems pose a unique challenge because the plants must persist over time by going dormant or semi-dormant during the fallow period. We have considered numerous alternatives, but in our opinion, rotational fallowing is the most viable option for reducing consumptive use in these perennial systems. However, the potential long-term effects of periodic fallowing on plant productivity, forage and soil quality, and weed invasion must be quantified before the system can be recommended. We are going to investigate the effects of one and two consecutive years of fallowing on plant and soil factors, but our hypothesis is that fallowing a given meadow one out of four years will minimize negative effects and allow for sustainable productivity over time. From our perspective, the agronomic questions of potential positive and negative effects on plant and soil responses due to fallowing must be answered first. If the answers to the agronomic questions are positive, then funding will be solicited to implement the second phase of the project looking at actual consumptive water use savings. This subsequent phase of the study would also address the question of how return flows will be maintained to avoid injury to other water users.

Although our project is not specifically tied to a particular water bank concept, the ability to fallow high-elevation irrigated hay meadows will be a critical component of any statewide water bank that may arise in the future for Colorado River Compact compliance or other purposes. Answering the critical question of whether these high-elevation meadows can be fallowed will serve as an important first step in determining the viability of water banking on the west slope. A large percentage of water on the west slope is currently used for irrigating meadows, and in order to free up that water for a water bank, it is first necessary to determine if

fallowing will still allow for a productive meadow post-fallow. If a meadow suffers too much of a loss in productivity due to rotational fallowing, then an irrigator may not have the necessary incentive to participate in a bank. However, if our study shows that productivity post-fallow remains at an acceptable level, then there would be greater incentive to free up the CU portion of the water for participation in a water bank.

4. 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.

See Part B, Section 3.

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.

See Part B, Section 2.

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.

Part B, Section 1 of this application describes the technical issues this study will address. In sum, the study will analyze the impacts of rotational fallowing on hay meadow productivity. An understanding of this technical issue must be achieved before rotational fallowing can be seriously considered or pursued in connection with high-elevation hay production operations.

Because marketing the CU savings will not be a focus of this first phase of the study, we do not anticipate encountering significant institutional or legal issues. However, to the extent that we do pursue marketing of the CU savings that result from the fallowing, attorneys for TNC and TU will address institutional and legal issues, and will do so with their respective organizations' general operating funds. CWCB funds would not be used for these efforts.

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.

Not applicable. See Part B, Section 4c immediately above.

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

We will meet, and exceed, this requirement by providing 28% cash match in the sum of $93,311. In addition, we will also provide "in kind" match of $5,392. In total, we are matching 31.5% of the total project cost. The specifics of our match are set out in the budget section below.

TNC and TU will be providing in-kind match in the form of project oversight and public education and outreach. Also, TNC, TU and the River District are committing a total of $13,000 of cash match that will go to pay only direct project costs. These cash match funds will not be used to cover indirect or administrative costs. CSU is contributing $80,311 in cash match in the form of salary match and foregone indirect costs. CSU has used these forms of match as cash match in the past for federal funds and believes that this type of match should be considered as cash match for this project as well.

CSU is asking for indirect costs as set out in the budget below. Also, TNC is asking for 10% administrative costs as TNC is the Applicant and will bear the majority of the administrative and compliance burden should the Project Team be awarded the grant amount requested above.

5. 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.*

See Part B, Section 1 and Section 3.

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.

As mentioned above, the Project Team will be contributing a total cash match of 31.5% of the total costs of the project and will also be contributing $5,392 of in-kind match.

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.

The purpose of our study is to assess the feasibility of rotational fallowing as a methodology for producing a reliable water supply. Assuming that rotational fallowing does prove to be a feasible tool, the potential for transfers is significant. Mountain grass hay was produced on 28,000 acres in Routt County in 2009 (Meyer and Ott 2010). If we assume that 50% of hay producers participate in fallowing 25% of their land base per year, then that would equate to 3,500 acres from which consumptive use could be saved. Based on an estimate of 0.84 acre-feet of consumptive use per acre (Smith et al. 1998), then 2,940 acre-feet of water would be available for transfer in Routt County alone. Additional water would be available if rotational fallowing were undertaken in Moffat County (another 1,595 acre-feet of water based on14,900 total acres of mountain grass hay produced in 2009, Meyer and Ott 2010).

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).

Results from this study would be transferrable to other high-elevation basins within Colorado that may want to implement rotational fallowing as a means of reducing consumptive water use in mountain hay meadows. Based on acreage from Colorado counties that produce primarily mountain meadow hay (Meyer and Ott 2010), our results would be applicable for use on an additional 300,000 acres of land in the state.

Also, answering the question about whether fallowing high-elevation hay meadows is a viable means of freeing up CU water will help to inform proponents of water bank concepts. Due to the significant amount of water tied to high-elevation irrigated hay meadows, proponents of any water bank concept will need to have a firm understanding of the availability of mountain hay meadow CU water for transfer in order to get a realistic picture of the amount of water available on the west slope for use in a water bank.

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

The project will address at least four of SWSI's management objectives: 1) sustainably meeting agricultural demands; 2) environmental enhancement; 3) protecting cultural values; and 4) sustainably meeting municipal and industrial demands. By finding new ways to share water, in this case through transfer of mountain hay meadow CU, this study will provide valuable information that can inform multi-use efforts to provide water for environmental and M&I needs, while allowing continued productivity in the agricultural sector. The Yampa Basin has a long history of agriculture and a strong culture that has arisen from that history. Finding ways to ensure the long-term viability of agriculture, while providing sustainable water supplies for the environment and M&I, will be critical to the continuation of the longstanding Yampa agricultural culture. This study will be an important step in determining which methods will work best to provide a sustainable future for agriculture, the environment, and M&I uses. If rotational fallowing of high-elevation hay meadows can be shown to be a

productive method for CU transfer, then it will be a critical piece of the picture for water sharing all across the west slope of Colorado.

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.

The production of livestock and associated hay during the long winter feeding period is economically marginal at high elevations. This has lead to the transfer of hay meadow irrigation water rights to municipalities. A good example of this is the South Park water transfers that occurred over the last century and have effectively dried up that region's agricultural industry (Kindquist 1996). Our proposed study will investigate rotational fallowing as an alternative to the traditional buy-and-dry approach to transfers. If this approach proves successful, a portion of the water traditionally used for irrigation of hay meadows would be freed up for other uses while still maintaining a viable agricultural industry in the Yampa Basin. Beyond the agricultural commodities produced, these irrigated hay meadows have numerous other values such as open space for viewscapes and recreation, wildlife habitat, and environmental quality protection. A survey of Routt County residents revealed that ranchlands were highly valued for many of the reasons cited above and that Routt County residents would be willing to pay $220 per year to preserve these lands in the county (Magnan et al. 2005).

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

CU water generated through fallowing at the three test sites in our study will remain in-stream. As such, this water will increase in-stream flows and should produce benefits to fish, wildlife and the environment, in general. Additionally, increased stream flows will enhance the dilution capacity of relevant streams, thereby improving water quality conditions.

The study will demonstrate the feasibility of mountain hay meadow fallowing as a method for freeing CU water for transfer to in-stream uses, and thereby allow for an increase in stream flow and water quality benefits.

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 proposed study will improve our understanding of the impacts of rotational fallowing on productivity of hay meadows and, as such, will increase our understanding of the costs of rotational fallowing to agricultural producers. Subsequent phases of the study will further analyze the economic costs and benefits of rotational fallowing arrangements to mountain meadow hay producers and potential lessees of water generated through fallowing.

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.

In our study, rotational fallowing will be done at three select sites. Even if rotational fallowing proves to be a feasible method of freeing CU water for temporary transfer to other uses, there is no reason that such a program

would interfere with other water users wishing to pursue more traditional, permanent transfers of their water rights.

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.

Should rotational fallowing of high-elevation hay meadows prove to be feasible, we foresee a possible interest among irrigators in the Yampa Valley to join a collective rotational fallowing program or possibly a water bank. Assuming 50% of Yampa Valley hay producers participate in a fallowing program and fallow 25% of their land base per year, that would equate to 3,500 acres from which consumptive use could be saved. Based on an estimate of 0.84 acre-feet of consumptive use per acre (Smith et al. 1998), then 2,940 acre-feet of water would be available in Routt County alone for transfer to other uses. This amount of water would be available on a recurring, annual basis.

Irrigators participating in a fallowing program would be paid fair market price for their water. Since a given producer would not be fallowing more than 25% (1 year out of 4) of their available irrigated land per year, their supply of hay would only be reduced by about 25%. With the income from sale of 25% of their water, they would be able to purchase hay to offset any reduction in supply, thereby keeping their operation viable while providing for open space and the other benefits cited in Part B, Section 5f.

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

The best estimate we have of potential water savings is based on an average consumptive use rate of 0.84 acre-feet per acre (Smith et al.1998). This rate was consistent among the years evaluated (1990 to 1994) for Water Districts 44, 54, 57, and 58. Therefore, slightly less than 1 acre-foot of water would be available for other uses for every acre fallowed. Based on Colorado Agricultural Statistics estimates from 2009 for mountain grass hay produced in Routt and Moffat Counties, there are a total of 42,900 acres of irrigated hay meadows (Meyer and Ott 2010). Assuming that 50% of hay producers participate in a rotational fallowing program, then 21,450 acres would be subject to fallowing. In a given year, only 25% of that area or 5,362 acres would actually be fallowed which would make about 4,500 acre-feet of water available for transfer on a yearly basis from the two counties.

6. 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

WATER ACTIVITY NAME - Rotational Fallowing as a Means of Reducing Consumptive Water Use from Irrigated Mountain Hay Meadows – Yampa River Basin

GRANT RECIPIENT – The Nature Conservancy

FUNDING SOURCE - CWCB Alternative Agricultural Water Transfer Methods Grant Program

INTRODUCTION AND BACKGROUND
Provide a brief description of the project. (Please limit to no more than 200 words; this will be used to inform reviewers and the public about your proposal)

Irrigation water which is consumptively used during the production of hay from high-elevation mountain meadows in Colorado is being sought for alternative uses such as municipal, industrial, or environmental. The proposed project's goal is to make water available for alternative uses while minimizing impacts to local hay producers by investigating the feasibility of rotationally fallowing mountain hay meadows. Unlike studies that have investigated fallowing in annual cropping systems, the perennial forages in these hay meadows will have to go dormant or semi-dormant during the year of fallow and then be able to recover to a productive state when water is reapplied. The proposed project will investigate the agronomic implications of fallowing on forage yield and quality, changes in species composition (especially weed invasion), and changes in soil nutrient status. One hypothesis is that yield the year after fallowing may actually be enhanced due to mineralization of nutrients that accumulate in these perennial systems. This would reduce the need for commercial fertilizers and improve the economic incentive for producers to participate in a fallowing program. Although this study will be conducted in Routt County, the results should be applicable to other high-elevation regions in Colorado.

OBJECTIVES

Determine the impact of rotational fallowing of mountain hay meadows on subsequent forage yields and quality, changes in species composition (including weed invasion), and changes in soil nutrient status.

TASKS
Provide a detailed description of each task using the following format

TASK 1 – Identify Cooperators

Description of Task

The first task upon notification to proceed will be to identify three landowners that are willing to cooperate and commit resources towards this project.

Method/Procedure

Representatives based in the Steamboat Springs, Colorado area from The Nature Conservancy, Trout Unlimited, Community Agriculture Alliance, and Colorado State University Extension will work together to identify a list of potential cooperators. Only landowners with hay meadows which are located along smaller tributaries of the Yampa will be considered for the study. This will facilitate future studies of actual consumptive water use savings and subsequent effects on in-stream and return flows. Once a list of potential cooperators has been generated, one-on-one meetings will then be scheduled with these landowners to explain the program and potential benefits as well as drawbacks. It will be made clear that they will be compensated for any lost hay production over the life of the project. Once the details of the project have been fully discussed, each landowner willing to participate will be asked to sign a letter of intent.

Deliverable

List of the three cooperators and map identifying the location of their property (hay meadow)

TASK 2 – Delineate Plot Areas and Implement Treatments

Description of Task

Once the three cooperators have been identified, the next task will be to delineate the plot area at each respective property and implement the treatments.

Method/Procedure

The size of the actual treated areas at each site will vary depending on the ability to control and manipulate irrigation. Treated areas will need to be large enough to avoid significant edge effects. The potential for underground flow of water will also have to be considered when setting up the treatments. We anticipate that the total amount of area needed at each site will vary from 10 to 40 acres.

The initial phase of this project will be carried out over a three year time period. The following four treatments will be implemented: (1) control - irrigation continues as usual, (2) fallow in year one, resume irrigation in years 2 and 3, (3) fallow in years 1 and 2, resume irrigation in year 3, and (4) irrigate in year 1, fallow in year 2, irrigate in year 3. With this treatment structure, only half of the total plot area will be fallowed in years 1 and 2. In year 3, all treatments will be irrigated which will provide a good measure of cumulative effects from the different fallow treatments.

Deliverable

Map of each site identifying the size and layout of treatments.

TASK 3 – Data Collection, Analysis, and Summary

Description of Task

Collect data allowing the Project Partners to determine the effects of rotational fallowing on forage yield and quality, species composition, and changes in soil nutrient status. This data will be summarized in annual progress reports.

Method/Procedure

Baseline data will be taken during the first spring to characterize species composition and soil nutrient status at each site. Species composition of all treatment plots at each site will be measured using a modified step-point method. Soil samples will also be collected from all treatment plots by randomly taking a minimum of 20 cores per plot. The top 30 cm of the soil profile will be sampled and each core separated and composited into 3 increments for analysis: 0-10, 10-20, and 20-30 cm. Soil samples will be analyzed for the following: pH, organic matter content, electrical conductivity, total carbon and nitrogen, nitrate, ammonium, phosphorus, and potassium. Forage yield within each treated plot will be measured by subsampling, either by hand clipping randomly placed quadrats or mowing random strips with a walk-behind sickle-bar mower, and then collecting and weighing the forage from the strip. Subsamples of forage will be taken and analyzed for the quality parameters of crude protein, neutral detergent fiber, and acid detergent fiber. Species composition and soil nutrient status will also be taken each spring using the methods outlined above and then compared to the baseline data. All plots will be irrigated in year 3 which will allow us to determine the cumulative effects of fallowing on the above variables. All data will be analyzed using standard statistical procedures. The individual cooperator sites will serve as replicates in the statistical model.

Deliverable

Semi-annual progress reports and a Final Summary report.

KEY PERSONNEL INVOLVED IN COMPLETION OF ABOVE TASKS

Adam Bergeron, The Nature Conservancy, abergeron@tnc.org
Geoff Blakeslee, The Nature Conservancy, gblakeslee@tnc.org
Drew Peternell, Trout Unlimited, DPeternell@tu.org
Marsha Daugenbaugh, Community Agriculture Alliance, marshad@communityagalliance.org
Joe Brummer, Associate Professor/Extension Forage Specialist, Department of Soil and Crop Sciences, Colorado State University, Fort Collins, CO 80523, joe.brummer@colostate.edu
CJ Mucklow, Routt County Extension Director, Colorado State University Extension, Steamboat Springs, CO 80477, CMucklow@co.routt.co.us
Tom Holtzer, Professor/Head, Department of Bioagriculture Science and Pest Management, Colorado State University, Fort Collins, CO 80523, Thomas.Holtzer@ColoState.edu

References

Cabot, P., J. Valliant, and J. Tranel. 2010. 2010 ANNUAL REPORT to Colorado Water Conservation Board (Impact of various fallowing periods on corn yield, nutrient needs, and profitability), Alternative Agricultural Water Transfer Methods Grant Program. 5 p.

Hansen, N., T. Holtzer, J. Pritchett, and B. Lytle. 2010. Water-conserving cropping systems: Lower South Platte Irrigation Research and Demonstration Project. Colorado Water: Newsletter of the Water Center of Colorado State University, Vol. 27(4):7-10. (Available online at: http://www.cwi.colostate.edu/newsletters/2010/ColoradoWater_27_4.pdf)

Kindquist, C.E. 1996. The South Park water transfers: The geography of resource expropriation in Colorado, 1859-1994. Ph.D. Dissert., Univ. of British Columbia, Vancouver, Canada.

Magnan, N., A. Seidl, C.J. Mucklow, and D. Alpe. 2005. The value of ranchland to Routt County residents. Colorado State Univ., Dept. of Agri. and Res. Econ., Economic Development Report, EDR 05-02. (Available online at: http://dare.colostate.edu/pubs/edr05-02.pdf)

Meyer, W., and R. Ott. 2010. Colorado Agricultural Statistics 2010. USDA National Agricultural Statistics Service, Colorado Field Office, Denver, Colo. (Available online at: http://www.nass.usda.gov/Statistics_by_State/Colorado/Publications/Annual_Statistical_Bulletin/bulletin2010.pdf)

Smith, D.H., R.H. Nichols, and F.M. Smith. 1998. Irrigation water use in the Yampa River Basin. Colorado Water Resources Research Institute: Water in the Balance, Report No. 8. 14 p. (Available online at: http://www.cwi.colostate.edu/publications/wb/8.pdf)

Yampa Agriculture Water Needs Assessment. 2010. Draft Technical Memorandum for Task 6.

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.

	Total Costs				
Task	Labor	Other Direct Costs	Cash Matching Funds (If Applicable)	In-Kind Matching Funds	Total Project Costs
1 - Identify Cooperators	$3,269	$20,885	$1,420		$25,574
2 - Delineate Plot Areas and Implement Treatments	$22,371	$6,830	$9,668		$38,869
3 - Data Collection, Analysis, and Summary	$101,868	$72,059	$69,223		$243,150
TNC and TU in-kind match				$5,392	$5,392
Total Costs:	$127,508	$99,774	$80,311	$5,392	$312,985

Project Personnel

Task	MS Graduate Student	Summer Hourly Laborer	CSU PI Joe Brummer	Indirect Costs		Total Costs
1 - Identify Cooperators	$0	$0	$2,615	$654		$3,269
2 - Delineate Plot Areas and Implement Treatments	$7,142	$0	$10,755	$4,474		$22,371
3 - Data Collection, Analysis, and Summary	$50,235	$12,071	$19,188	$20,374		$101,868
Cost:	$57,377	$12,071	$32,558	$25,502		$127,508

	Other Direct Costs									
Task	Domestic Travel	Materials & Supplies	Soil/Plant Analyses	Vehicle Rental/Mileage	Graduate Tuition	Indirect Costs	TNC Admin Costs	Landowner Compensation		Total
1 -	$0	$0	$0	$146	$0	$36	$5,703	$15,000		$20,885
2 -	$0	$300	$0	$600	$0	$225	$5,705	$0		$6,830
3 -	$1,000	$3961	$18,730	$10,054	$19,338	$13,271	$5,705	$0		$72,059
Total Cost:	$1,000	$4,261	$18,730	$10,800	$19,338	$13,532	$17,113	$15,000		$99,774

	In-Kind Contributions				
Project Personnel:	Adam Bergeron	Drew Peternell	Brian Hodge		Total
Project oversight	$2,392	$1,500			$3,892
Public Education and Outreach			$1,500		$1,500
Total Cost:	$2,392	$1,500	$1,500		$5,392

Undesignated Cash Match Contributions		
Organization		Total
TNC		$5,000
TU		$3,000
River District		$5,000
		$13,000

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.

	2011									2012										2013										2014		
Task	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
1 - Identify Cooperators																																				
2 - Delineate Plot Areas and Implement Treatments																																				
3 - Data Collection, Analysis, and Summary																																				
- Collect species comp. data																																				
- Collect soils data																																				
- Collect yield/quality data																																				
- Soil/forage quality analysis																																				
- Data analysis																																				
- Progress report																																				
- Final report																																				

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: signed /Adam Bergeron/

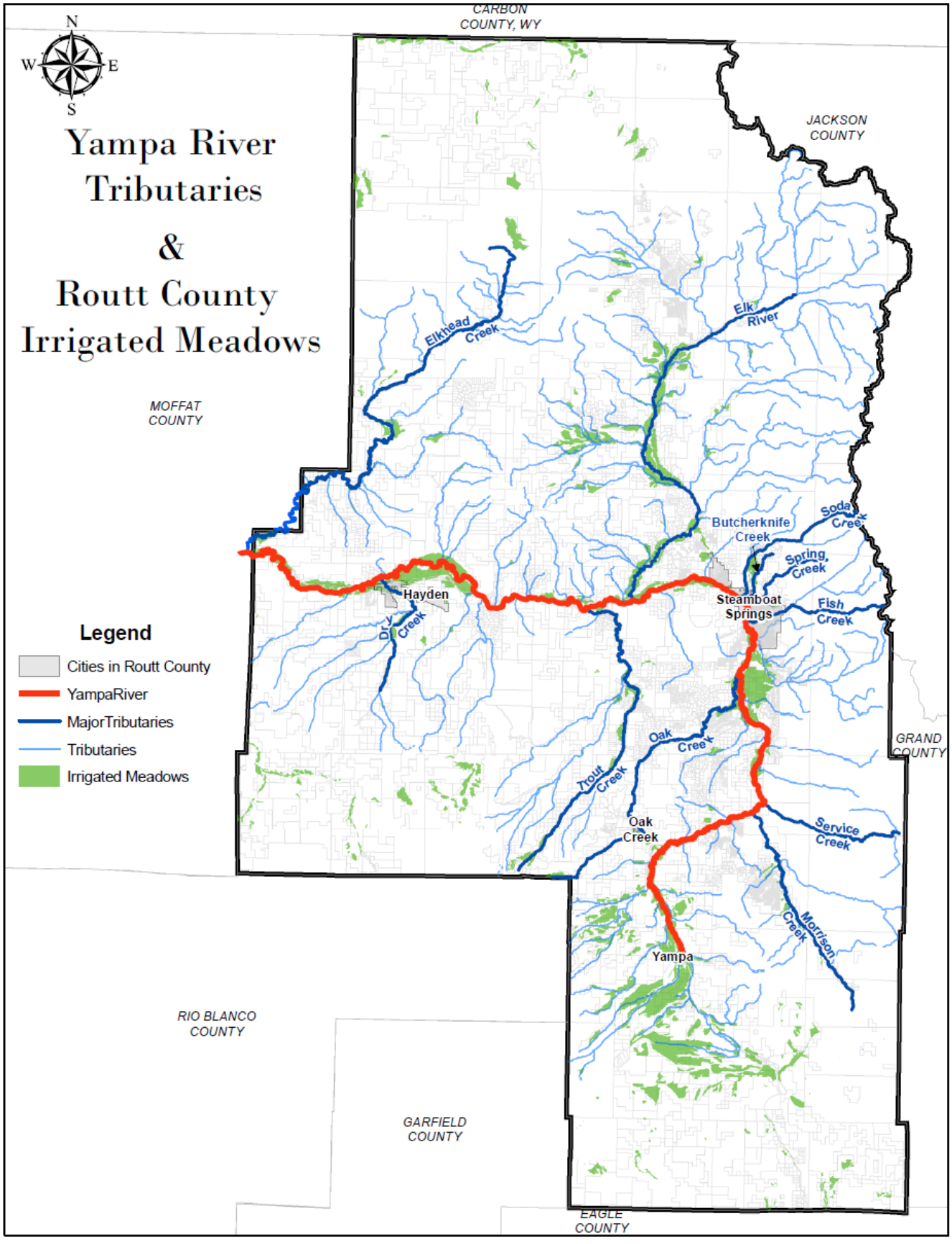
Print Applicant's Name: Adam Bergeron

Project Title: Rotational Fallowing as a Means of Reducing Consumptive Water Use from Irrigated Mountain Hay Meadows – Yampa River Basin

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

FIGURE 1


Yampa River
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MOFFAT
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GARFIELD
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EAGLE
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GRAND
COUNTY
Elkhead Creek
Elk River
Butcherknife Creek
Soda Creek
Spring Creek
Fish Creek
Hayden
Steamboat Springs
Dry Creek
Oak Creek
Trout Creek
Oak Creek
Service Creek
Morrison Creek
Yampa
Legend
Cities in Routt County
YampaRiver
MajorTributaries
Tributaries
Irrigated Meadows